



INTERNATIONAL MULTIDISCIPLINARY SYMPOSIUM  
"UNIVERSITARIA SIMPRO 2021"

- 9th EDITION -

„QUALITY AND INNOVATION IN EDUCATION, RESEARCH AND INDUSTRY  
- THE SUCCESS TRIANGLE FOR A SUSTAINABLE ECONOMIC, SOCIAL  
AND ENVIRONMENTAL DEVELOPMENT”

University of Petroșani  
May 27 - 28, 2021

**ONLINE** edition

**INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC SYMPOSIUM**

**”UNIVERSITARIA SIMPRO 2021”**

**„QUALITY AND INNOVATION IN EDUCATION, RESEARCH AND INDUSTRY -  
THE SUCCESS TRIANGLE FOR A SUSTAINABLE ECONOMIC, SOCIAL AND  
ENVIRONMENTAL DEVELOPMENT”**

**BOOK OF ABSTRACTS**

**UNDER THE AUSPICES OF:**

**MINISTRY OF EDUCATION  
ACADEMY OF ROMANIAN SCIENTISTS  
ACADEMY OF TECHNICAL SCIENCES OF ROMANIA  
GENERAL ASSOCIATION OF ENGINEERS IN ROMANIA**

**IN PARTNERSHIP WITH:**

**National Authority for Scientific Research  
Hunedoara County Council  
Labour Inspectorate  
ALUMNI Association of the University of Petroșani  
CDPM Union  
Salrom – National Salt Society  
Total Business Land**

**MEDIA PARTNERS:**

**MATEC Web of Conferences – open access proceedings journal by EDP Sciences  
Sustainability - an open access journal by MDPI  
Education Sciences - an open access journal by MDPI**

**27 – 28 MAY, 2021  
PETROȘANI**

### ORGANISING COMITTEE

**General Chairman:** Sorin Mihai RADU, Rector of University of Petroșani, ROMANIA

**Executive Chairman:** Maria LAZĂR, ROMANIA

**Co-chairs:**

Codruța DURA, ROMANIA

George Artur GĂMAN, ROMANIA

Dan Codruț PETRILEAN, ROMANIA

**Members:**

Csaba LORINȚ, ROMANIA

Ciprian DANCIU, ROMANIA

Imola DRIGĂ, ROMANIA

Robert PRODANCIUC, ROMANIA

Ilie UȚU, ROMANIA

Dragoș PĂSCULESCU, ROMANIA

**Coordinators of the national and local committees:**

Mihai POPESCU-STELEA, ROMANIA

Florin FAUR, ROMANIA

Oana DOBRE- BARON, ROMANIA

### INTERNATIONAL SCIENTIFIC COMITTEE

Tatiana ANTIPOVA, Institute of Certified Specialists, Perm, RUSSIA

Adam BAJCAR, POLTEGOR-Institut, POLAND

Lia Alexandra BALTADOR, "Lucian Blaga", University of Sibiu, ROMANIA

Daniel BREAZ, "1 Decembrie 1918", University of Alba-Iulia, ROMANIA

Lucian-Ionel CIOCA, "Lucian Blaga" University of Sibiu, ROMANIA

Doru Costin DARABONT, NIRD-INCDPM Bucharest, ROMANIA

Predrag DASIC, High Technical Mechanical School of Professional Studies Trstenik, SERBIA

György DEÁK, National Institute for Research and Development in Environmental Protection Bucharest, ROMANIA

Florinel DINU, University of Oil and Gasses, Ploiești, ROMANIA

Anca DRAGHICI, Politehnica University of Timișoara, ROMANIA

Carsten DREBENSTEDT, TU Bergakademie, Freiberg, GERMANY

Mihalis GALETAKIS, Technical University of Crete, GREECE

Emilian GHICIOI, NIRD INSEMEX Petroșani, ROMANIA

Janusz GRABARA, Czestochowa University of Technology, POLAND

Claudiu KIFOR, "Lucian Blaga" University of Sibiu, ROMANIA

Karoly (Charles) KOCSIS, College of Sciences, Mackay School of Earth Sciences and Engineering, University of Nevada, Reno, USA

Krzysztof KOTWICA, AGH University of Science and Technology, POLAND

Gábor LADÁNYI, University of Miskolc, HUNGARY

Omar LANCHAVA, Georgian Technical University, GEORGIA

Avram LAZĂR, University of Oil and Gasses, Ploiești, ROMANIA

Ramona LILE, „Aurel Vlaicu” University of Arad

Theodoros N MICHALAKOPOULOS, National Technical University of Athens, Greece

Peter MOSER, Montanuniversität Leoben, AUSTRIA

Mariana NAGY, „Aurel Vlaicu” University of Arad

Marek PAWEŁCZYK - Silesian University of Technology, POLAND

Ion PANĂ, University of Oil and Gasses, Ploiești, ROMANIA

Daniel PUPĂZAN, NIRD INSEMEX Petroșani, ROMANIA

Elena Cristina RADA, Insubria University, ITALY

Maria FERNANDEZ - RAGA – University of Leon, SPAIN

Marco RAGAZZI, Università degli Studi di Trento, ITALY

Valentin RĂILEANU, IMI-NOVA, MOLDOVA

Christos ROUMPOS, Public Power Corporation of Greece S.A., GREECE

Krzyszyna SKIBNIEWSKA, University of Warmia and Mazury in Olsztyn, POLAND

Zoltan VIRAG, University of Miskolc, HUNGARY

Dumitru ȚUCU, Politehnica University of Timișoara, ROMANIA

Jean-Jacques WAGNER, IUT de Belfort-Montbéliard, FRANCE

Janusz WIELKI, Opole University of Technology, POLAND

### **NATIONAL SCIENTIFIC COMMITTEE**

Andrei ANDRAȘ - University of Petroșani  
Felicia ANDRIONI - University of Petroșani  
Gabriel BĂBUȚ – University of Petroșani  
Camelia BĂDULESCU - University of Petroșani  
Ioan BUD – Technical University of Cluj Napoca, North Center, Baia Mare  
Angelica CĂLĂMAR - NIRD INSEMEX Petroșani  
Ștefania DEĂK, Government of Romania - Department for Sustainable Development  
Gabriela DUMBRAVĂ – University of Petroșani  
Emilia DUNCA – University of Petroșani  
Andreea IONICĂ – University of Petroșani  
Claudia ISAC - University of Petroșani  
Sabina IRIMIE – University of Petroșani  
Wilhelm W. KECS – University of Petroșani  
Monica LEBA – University of Petroșani  
Mariana MAN – University of Petroșani  
Gheorghe MANOLEA – University of Craiova  
Marius MARCU - University of Petroșani  
Roland MORARU – University of Petroșani  
Vlad PĂSCULESCU - NIRD INSEMEX Petroșani  
Lavinia Elisabeta POPP - University Babes-Bolyai - Resita University Center  
Florin Dumitru POPESCU – University of Petroșani  
Ladislau RADERMACHER – University of Petroșani  
Oana - Carmen RĂVAȘ - University of Petroșani  
Mihaela TODERAȘ – University of Petroșani  
Ioel VEREȘ – Technical University of Cluj Napoca

### **ADVISORY BOARD**

Nicolae DIMA, ROMANIA,  
Nicolae ILIAS, ROMANIA  
Dumitru FODOR, ROMANIA  
Mircea GEORGESCU, ROMANIA  
Iozsef KOVACS, ROMANIA  
Emil POP, ROMANIA,

### **SYMPOSIUM SECRETARIAT**

Arabela PODARU - SIMPRO General Secretariat  
Nelu MIJA - IT and logistics

#### **Secretaries of sessions:**

Monica Crinela BURDEA - 1. Advances in safety science and occupational risk management  
Klaus FISSGUS - 2. Challenges in mining engineering, processing, surveying, and civil engineering  
Izabela Maria APOSTU - 3. Sustainable environmental engineering and protection  
Florin G. POPESCU - 4. Innovational challenges in electrical engineering and energetics technology  
Arun Fabian PANAITE - 5. Developments in systems control, information technology and cybersecurity  
Stela DINESCU - 6. Industrial and mechanical engineering and transportation  
Mirela POPESCU - 8. Recent trends in bussines, economics, law and public administration  
Mihaela GHICAJANU - 9. Contemporary approaches in quality assurance, management and marketing  
Laura MARICA - 10. Achievements in Humanities and Social Sciences + 11. Education research, sustainable development and interdisciplinary studies

## REVIWERS

- |     |                          |     |                           |
|-----|--------------------------|-----|---------------------------|
| 1.  | Andrei Andras            | 27. | Krzysztof Kotwica         |
| 2.  | Iosif Andras             | 28. | Mariana Man               |
| 3.  | Felicia Andrioni         | 29. | Gheorghe Manolea          |
| 4.  | Tatiana Antipova         | 30. | Marek Pawelczyk           |
| 5.  | Gabriel Babut            | 31. | Roland Moraru             |
| 6.  | Izabela Apostu           | 32. | Ion Pana                  |
| 7.  | Camelia Badulescu        | 33. | Dragos Pasculescu         |
| 8.  | Adam Bajcar              | 34. | Vlad Pasculescu           |
| 9.  | Lia Alexandra Baltador   | 35. | Florin Dumitru Popescu    |
| 10. | Ioan Bud                 | 36. | Dan Petrilean             |
| 11. | Angela Calamar ( Gaman?) | 37. | Lavinia-Elisabeta Popp    |
| 12. | Florin Faur              | 38. | Elena Cristina Rada       |
| 13. | Maria Lazar              | 39. | Ladislau Radermacher      |
| 14. | Lucian Ionel Cioca       | 40. | Sorin Mihai Radu          |
| 15. | Doru Darabont            | 41. | Maria Fernandez Raga      |
| 16. | Gyorgy Deak              | 42. | Christos Roumpos          |
| 17. | Stefania Deak            | 43. | Mihai Popescu Stelea      |
| 18. | Anca Draghici            | 44. | Theodoros Michalakopoulos |
| 19. | Imola Driga              | 45. | Mihaela Toderas           |
| 20. | Emilia Dunca             | 46. | Ilie Utu                  |
| 21. | Codruta Dura             | 47. | Ioel Veres                |
| 22. | Klaus Fissgus            | 48. | Zoltan Virag              |
| 23. | Andreea Ionica           | 49. | Janusz Wielki             |
| 24. | Sabina Irimie            | 50. | Monica Leba               |
| 25. | Claudiu Kifor            | 51. | Ciprian Danciu            |
| 26. | Claudia Isac             |     |                           |

## GENERAL PROGRAM

### 27 May 2021

- 09:30 – 10:00 Participants connecting to the Zoom conference room
- 10:00 – 10:20 Opening ceremony
- 10:25 – 12:30 Plenary lectures
- 10:25 – 10:50 **Carsten DREBENSTEDT**, Bergakademie Technische Universität Freiberg, Germany - How to keep raw material awareness in the society- approaches and realization.
- 10:50 – 11:15 **Krzysztof KOTWICA**, AGH University of Science and Technology, Poland - Disk cutters as the alternative for cutting tools in hard rock mining.
- 11:15 – 11:40- **Artur GAMAN**, NIRD INSEMEX Petroșani, Romania - Research on designing and making of a mobile training facility for intervention and rescue personnel in toxic / flammable / explosive environments
- 11:40 – 12:05 **Jean-Jacques WAGNER**, IUT de Belfort-Montbéliard, France - University and Soft Power, a new mission.
- 12:05 – 12:30 **Mihalis GALETAKIS**, Technical University of Crete, Chania, Greece - Applications of fuzzy inference systems in mineral industry - an overview.
- 12:30 – 13:45 Lunch break
- 13:45 – 14:00 Connecting to the Zoom conference rooms (by topic)
- 14:00 – 18:30 Parallel sessions

### 28 May 2021

15:00 Opening of workshops (parallel sessions)

**Dan Codruț PETRILEAN** - EURECA-PRO – Sustainable production and consumption. Today and tomorrow

**Adam BAJCAR** - RAFF – Risk assessment of final pits during flooding

**Alenka MAUKA** - RIS – CuRE – Zero waste recovery of cooper tailings in the ESEE region

**Felicia ANDRIONI** – CoVid -19 Pandemic. Causes, implications and interdisciplinary resolute perspectives

## **PRACTICAL ASPECTS REGARDING THE EVALUATION OF EXPLOSION PROTECTED EQUIPMENT**

**Tiberiu Csaszar<sup>1</sup>, Sorin Burian<sup>1</sup>, Cosmin Colda<sup>1</sup>, Marius Darie<sup>1</sup>, and  
Emilian Ghicioi<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to  
Explosion - INSEMEX, G-ral Vasile Milea Street 32-34, Petrosani, Romania

Corresponding author: Tiberiu Csaszar, Tiberiu.Csaszar@insemex.ro

**Abstract:** Based on the experience accumulated over time on the evaluation of equipment and installations in environments with potentially explosive atmospheres, this paper is intended to be an element of synthesis on issues related to the "in situ" assessment and solutions of solvency the deficiencies found. The assessment of these installations is very important in order to verify the implementation of measures that lead to minimizing the risk of ignition of explosive atmospheres. Evaluation of these installations is made through an on-site visit and on the basis of the technical documentation developed by the care of the user.

In first part of the paper were presented the legal aspects regarding the placing on the market and the use of equipment designed for potentially explosive atmospheres. Even if a product designed for use in potentially explosive atmospheres is placed on the market after the conformity assessment procedures of the ATEX Directive 2014/34/EU were applied, the explosion protection characteristics can be altered due to multiple factors such as: incorrect selection of the equipment, incorrect installation of the product, inadequate performance of inspection operations, inadequate maintenance of equipment, inadequate overhaul or repairing of equipment.

In Romania, in 2007, after the adhesion of Romania to the EU member countries, the normative document NEx 01-06/2007 was adopted. At commissioning of a technical installation operating in potentially explosive atmospheres a verification of the technical documentation and an on-site assessment must be performed by INSEMEX Petrosani. This is to assess the technical installation in order to check if all the measures required to ensure the protection to explosion are adopted, especially those regarding the equipment/protective systems used in Ex classified areas.

The paper is continuing with the presenting the technical aspects regarding the evaluation of equipment and installations operating in potentially explosive atmospheres followed by requirements for electrical equipment.

The main conclusion, of the paper is that the explosion protection of the equipment intended for use in potentially explosive atmospheres may be invalidated by the incorrect selection of the equipment, incorrect installation of the product, inadequate: performance of inspection operations, maintenance or repairing of equipment.

**Key words:** evaluation, explosion protected equipment, ATEX Directive.

## MEASUREMENT OF THE OCCUPATIONAL RISK LEVEL SPECIFIC TO WORKPLACES

**Angelica-Nicoleta Călămar<sup>1</sup>, Sorin Simion<sup>1</sup>, Marius Kovacs<sup>1</sup>,  
Alexandru Simion<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to  
Explosion – INSEMEX Petroșani, 32-34 G-ral Vasile Milea Street, Postcode: 332047,  
Petroșani, Hunedoara County, Romania

Corresponding author: Călămar Angelica, [angela.calamar@insemex.ro](mailto:angela.calamar@insemex.ro)

**Abstract:** Any workplace implies a greater or lesser number of occupational hazards, respectively workers are exposed to occupational risks, putting their health in danger. If we talk about industrial environments (construction, energy, metallurgy, textiles, wood, etc.), these hazards are found to a greater extent, often exceeding the allowable limit, but occupational pollutants such as dust in suspension and microclimate parameters can also be found in offices, whether they are open space or not. In this sense, the current paper reviews some workplaces and quantifies the level of risk to which workers are exposed to show and demonstrate the importance of occupational health prevention in order not to reach further measures, in time, when these occupational diseases occur.

During 2019, the team of the Toxicology Laboratory within INCD INSEMEX carried out several measurement campaigns at several economic agents, having various objects of activity. The current paper summarizes several economic sectors (water analysis and treatment laboratories, steel, automotive, IT and kindergarten activities) on determination of pollutants in workplaces, to emphasize the importance of annual inspection of these pollutants by employers, so measures to prevent or reduce harm could be taken, where appropriate.

Investigating the objectives studied involved knowledge of the work environment, choosing the dominant toxins, choosing the appropriate equipment and working methods, taking samples, analysing and interpreting them.

PMV (Predicted mean vote) and PPD (Predicted percentage dissatisfied) calculation indices were used for determination of microclimate parameters, rising the need to estimate the metabolic rate indices and the clothing insulation with the metabolic rate index was estimated at 1.2, which represents the specific value for office activities (offices, schools, laboratories, housing) and the insulation index of daily clothing was estimated at 1, which represents the specific value for clothing, to which 0.1 is added, represented by the index of office chairs.

The research conducted led to the conclusion that the determined pollutants (dust, gas and microclimate) exceeded the maximum allowable concentration required by national legislation, both at workplaces in various technological flows and in offices. The high concentrations found in offices are caused by staff traffic, large number of employees, as well as the lack of natural ventilation.

**Key words:** work environment, noxae, health, risk, worker's exposure

## **DORSOPATHY IN URBAN PUBLIC TRANSPORT DRIVERS IN RELATION TO OCCUPATIONAL RISKS AND WORKLOADS**

**Delia Mihăilă<sup>1</sup>, Raluca Maria Iordache<sup>1</sup>, and Viorica Petreanu<sup>1</sup>**

<sup>1</sup>National Research and Development Institute for Occupational Safety and Health  
“Alexandru Darabont”, office@inpm.ro

Corresponding author: Delia Mihăilă, diacris8@gmail.com

**Abstract:** Drivers in urban public transport are exposed to specific risks and workloads with both somatic and psychological effects on their health. The most common somatic disorders are musculoskeletal diseases (MSDs), especially those of the spine, and some of them can be occupational diseases. The present paper represents a sequence from an ample study that has followed the effects of this professional activity on work aptitude and workers' health and then has established prevention measures, respectively measures for reduction of identified risk factors. An ergonomic, complex and multidimensional methodology has been used in the ample study. The related to occupational risks and workloads health status of 201 bus drivers, 127 tram drivers and 64 trolleybus drivers selected on age, gender, seniority and seniority at work criteria was analyzed through a cross-sectional, prevalence study.

The results of the work post / activity global risk level evaluation shows that the investigated personnel is subject to an accumulation of occupational risk and workload factors. Risks that play an important role are the physical, environmental and psychosocial work demands, and the ergonomic conditions of activity. Psychosocial risks are related to activity specifics represented by repetitive and monotonous activity with increased level of vigilance, with permanent retrieval of information, with significant mental effort, by the time pressure, and sometimes conflicting requirements. From the evaluation of work related effort based on the subjective evaluation indicators (TLX-NASA) a high perceived level of total work related effort was obtained in all three studied groups. A high level of mental demands, followed in descending order by temporal demands and physical demands were main contributors to the total work related effort in all three groups. In all groups, a high percentage of spinal pathology has been found, especially lumbosacral. Regarding the total percentage of dorsopathies, the highest levels are registered for trolleybus drivers (48%), followed by tram (43%) and bus drivers (42%). The percentage of dorsopathies is over 40% in all groups, for trolleybus drivers being higher than the upper limit of prevalence offered in literature (45%), and for tram and bus drivers slightly lower. The percentage values of disc herniation (occupational disorder) are similar for bus, tram and trolleybus drivers in the studied groups, with slightly higher values in the case of the last two categories (10.5 % in the case of bus, compared to 11% in the case of tram and trolleybus drivers). Spinal pathology, including herniated disc, sets in early, starting in the 36-45 group, which can signalize early wear. The relatively small percentage differences of disc herniation between the three categories of personnel show that the development of this professional activity presents an increased risk of vertebral column MSDs production.

Measures like workplace proper ergonomics, work task organisation, and prompt treatment of already established diseases insuring an optimal return to work are important.

**Key words:** vertebral column MSDs, occupational risk factor, workload, dorsopathies, disc herniation, ergonomics



## NUMERICAL MODELLING OF HYDROGEN RELEASE AND DISPERSION

**Vlad Mihai Pasculescu<sup>1</sup>, Marius Cornel Suvar<sup>1</sup>, Ligia Ioana Tuhut<sup>1</sup> and Laurentiu Munteanu<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 32-34 G-ral Vasile Milea street, 332047, Petrosani, Hunedoara county, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)

Corresponding author: Vlad Mihai Pasculescu, [vlad.pasculescu@insemex.ro](mailto:vlad.pasculescu@insemex.ro)

**Abstract:** Hydrogen is the most abundant element on earth, being a low polluting and high efficiency fuel that can be used for various applications, such as power generation, heating or transportation. As a reaction to climate change, authorities are working for determining the most promising applications for hydrogen, one of the best examples of cross-border initiative being the IPCEI (Important Project of Common European Interest) on Hydrogen, under development at EU level. Traditional energy is facing a crisis, and the demand for alternative energy is growing. The zero emission potential of hydrogen energy in automotive applications has attracted increasing attention. Fuel cell electric vehicles using hydrogen as fuel are being developed globally. Given the large interest for future uses of hydrogen, special safety measures have to be implemented for avoiding potential accidents. If hydrogen is stored and used under pressure, accidental leaks from pressure vessels may result in fires or explosions. Worldwide, researchers are investigating possible accidents generated by hydrogen leaks. Special attention is granted to the atmospheric dispersion after the release, so that to avoid fires or explosions.

The use of consequence modelling software within safety and risk studies has shown its' utility worldwide. In this paper, there are modelled the consequences of the accidental release and atmospheric dispersion of hydrogen from a pressure tank, using state-of-the-art QRA software. The simulation methodology used in this paper uses the "leak" model for carrying out discharge calculations. This model calculates the release rate and state of the gas after its expansion to atmospheric pressure. Accidental release of hydrogen is modelled by taking into account the process and meteorological conditions and the properties of the release point. Simulation results can be used further for land use planning, or may be used for establishing proper protection measures for surrounding facilities. In this work, we analyzed two possible accident scenarios which may occur at an imaginary hydrogen refueling station, accidents caused by the leaks of the pressure vessel, with diameters of 10 and 20 mm, for a pressure tank filled with hydrogen at 35 MPa / 70 MPa. Process Hazard Analysis Software Tool 8.4 has been used for assessing the effects of the scenarios and for evaluating the hazardous extent around the analyzed installation. Accident simulation results have shown that the leak size has an important effect on the flammable/explosive ranges. Also, the jet fire's influence distance is strongly influenced by the pressure and actual size of the accidental release.

**Key words:** consequence modelling, dispersion, hydrogen, leak, pressure vessel, release

**RESEARCH ON DESIGNING AND MAKING OF A MOBILE  
TRAINING FACILITY FOR INTERVENTION AND RESCUE  
PERSONNEL IN TOXIC / FLAMMABLE / EXPLOSIVE  
ENVIRONMENTS**

**George Artur Găman<sup>1</sup>, Daniel Pupăzan<sup>1</sup>, Cristian Nicolescu<sup>1</sup>, Cosmin  
Ilie<sup>1</sup> and Izabella Kovacs<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to  
Explosion – INSEMEX, 32-34 G-ral Vasile Milea street, 332047, Petrosani, Hunedoara  
county, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)

Corresponding author: George Artur Găman, [artur.gaman@insemex.ro](mailto:artur.gaman@insemex.ro)

**Abstract:** The decisive factor in ensuring the success of an intervention and rescue operation in toxic or chemically aggressive environments lies in the optimal and efficient design of a training process for rescue staff, including for intervention in enclosures. Training is a process of psychophysiological preparation, through which an increased efficiency is attained in the professional activity of rescuers. Maximum efficiency is attained by raising the body's functional capacity to the highest degree. In order to comply with safety and health at work regulations and for efficient operations, intervention and rescue personnel in toxic / explosive / flammable environments require good physical and mental training, achievable by using a modern training infrastructure (mobile facility) that can be made available to any economic agent regardless of place and nature of the activity carried out. The current paper shows the designing and making of a modern infrastructure - mobile training facility with different high difficulty degree training routes, allowing the simulation of intervention activities in confined areas, horizontally and vertically, spaces with low visibility, above normal limits temperature and humidity, etc. as well as the measurement of several physiological parameters (pulse, blood oxygen level, calories consumed, etc.) that allow permanent monitoring of rescuers' health condition during the training process. The rescuers' mobile training facility, endowment of INSEMEX Petrosani, is divided into 2 compartments, each with independent access from the external platform, as follows: compartment for fitness equipment and control equipment, comprising an infinity ladder with computer interface, an ergometer bicycle with computer interface, a treadmill, an impact device with computer interface, a stepper with computer interface, control equipment, respectively the enclosure compartment. The training can now take place at the headquarters of beneficiaries, who thus no longer have to make their staff unavailable during training. It provides the possibility of constant monitoring of rescuer's physiological parameters during training, using available equipment. Benefits for economic agents: - authorization activity of intervention and rescue personnel in toxic / explosive / flammable environments which, by using the mobile facility, will ensure an increased OHS level, accident prevention capabilities, and effective protection of patrimony susceptible of being destroyed or disabled.

**Key words:** intervention and rescue staff, toxic / flammable / explosive atmosphere, training

## **RISK FACTORS THAT MAY OCCUR IN THE PROCESS OF CLOSING AND GREENING THE LUPENI MINING EXPLOITATION**

**Manuel Cristian Savulescu<sup>1</sup>, Andreea Cristina Tataru<sup>1</sup>, Aurora Stanci<sup>2</sup>,  
and Dorin Tataru<sup>1</sup>**

<sup>1</sup> University of Petrosani, Department of Mechanical and Industrial Engineering and  
Transports, Universittii street, No.20, Petrosani, Romania

<sup>2</sup> University of Petrosani, Departament of Management, Environmental Engineering and  
Geology, Universittii street, No.20, Petrosani

Corresponding author: Manuel Cristian Savulescu, savio\_scm@yahoo.com

**Abstract:** The process of closing and greening the Lupeni Mining Exploitation is a very complex one. The closure of the mining operation is done in stages for the underground and the surface based on a closure project. When implementing the closure and greening project, all occupational safety and health regulations must be observed. As part of the process of closing and greening a mining operation, it is necessary to redo the risk factor assessment sheets with additional measures for the closure and greening of the mining operation. The starting point in optimizing the activity of prevention of work accidents and occupational diseases at work is the risk assessment. Risk can be defined as a potential event that, if it occurs, causes loss, damage, destruction, suffering, etc. Depending on the field in which the events may occur or their nature, we can speak of a great diversity of risks. The risks are present in all economic and industrial activities that are manifested both by economic losses, failures in installations, equipment and by the occurrence of minor or major accidents with particularly serious consequences resulting in deaths and injuries, environmental pollution. The assessment of risk levels stimulates the interest of economic operators to improve their working and environmental conditions, respectively to take measures to move from high risk levels to lower, acceptable levels. In this paper we aim to establish what are the main risk factors that can be encountered in the process of closure and greening of the Lupeni Mining operation.

**Key words:** risk factors, closure, greening.

## QUALITY ASSURANCE OF TEST RESULTS FOR THE DETERMINATION OF INGRESS PROTECTION CODE FOR EX EQUIPMENT ENCLOSURES

**Dan Gabor<sup>1</sup>, Niculina Vătavu<sup>1</sup>, Mihai Cătălin Popa<sup>1</sup>, Florin Păun<sup>1</sup> and  
Adrian Marius Jurca<sup>1</sup>**

<sup>1</sup>INCD INSEMEX, 32-34 G-ral Vasile Milea, Petroșani, Romania

Corresponding author: Dan Gabor, dan.gabor@insemex.ro

**Abstract:** INSEMEX-OEC is a Conformity Assessment Body for certification activities in accordance with ATEX Directive 2014/34/EU, being accredited by RENAR and notified to Brussels (NB1809). INSEMEX-GLI (Group of Testing Laboratories) is the main provider of laboratory testing services for the product certification body INSEMEX-OEC. The test laboratories meet the requirements of the standard SR EN ISO / IEC 17025. This standard requires laboratories to have a procedure in place to monitor the validity of the test results. This monitoring must be planned and, if possible, should include participation in inter-laboratory comparisons or proficiency testing programs. This paper presents some specific issues highlighted during the successful participation of INSEMEX-GLI in a round of inter-laboratory comparisons organized by the Physikalisch-Technische Bundesanstalt from Germany to determine International Protection Code (IP Code) for equipment enclosures. The results of the inter-laboratory tests for IP54 are presented in this paper. The results of the laboratory within INSEMEX GLI are highlighted in yellow (LC0026). After evaluating the results there are 14 laboratories with warning signal and 3 laboratories with action signal (these laboratories are outside of limits). The most important thing is that INSEMEX GLI laboratory is not part of these laboratories. Comparing the results of the laboratory within INCD Insemex with the results of the other 84 laboratories from all over the world, we find that our results are very good. In order to ensure a good quality of the tests, in accordance with the European and international requirements, investments must be made to ensure the material and human base. Without high performance testing equipment and without trained staff, top results cannot be obtained. INCD INSEMEX has invested a lot in the previous years in the development of the infrastructure and in the training of the personnel and the results started to appear immediately. The equipment necessary for the laboratory tests was purchased partly within some research projects and partly from own sources. The very good results of the inter-laboratory tests led to the validation of the quality of the tests performed within INSEMEX through the GLI laboratories, international level laboratories.

**Key words:** Ingress Protection Code, International Protection Code, IP Code, Ex equipment, Testing Laboratories, Quality assurance.

## COMPUTATIONAL SIMULATION OF HEAT CONDUCTION ON DIFFERENT SURFACES

**Gheorghe-Daniel Florea<sup>1</sup>, Nicolae-Ioan Vlasin<sup>1</sup>,  
Adrian Bogdan Şimon-Marinică<sup>1</sup> Zoltan Vass<sup>1</sup> and Florin Manea<sup>1</sup>**

<sup>1</sup> National Institute for Research and Development in Mine Safety and Protection to Explosion – INCD INSEMEX Petroşani, Romania, insemex@insemex.ro

Corresponding author: Gheorghe-Daniel Florea, daniel.florea@insemex.ro

**Abstract:** The heat conduction from the initiation source to the adjacent surfaces, is a physical phenomenon worth considering in the process of analysing the fire. This complex phenomenon describes how the transport, the exchange, and the redistribution of the thermal energy are carried out. It is based on the theoretical knowledge that describes the initiation and fire evolution in time. The flames transfer heat from nearby surfaces through two distinct physical processes, namely convection and radiation. Another way of heat transfer is conduction, in which case the transfer of heat implies the existence of an environment that can be of a gaseous, liquid or solid nature.

In case of conduction, the energy is gradually diffused through an environment, from a higher temperature point, to a point with a lower temperature. In case of radiation, the energy is transmitted with the speed of light, through electromagnetic waves or photons, the presence of a transmission medium not being required. Convection is defined as the combined effect of conduction and / or radiation and the movement of the transmission medium.

This paper illustrates a brief presentation of how the heat transfer is carried out, the influence of the three phenomena on the mechanism of initiation and development of the fire, and can be seen as well as a case study aimed at the computerized simulation of a fire, having as a source of initiation the radiative transfer of heat to the surrounding combustible surfaces. The ignition of the different materials in a room, due to radiation exposure emitted by an incandescent source at a certain distance from them, even without having a direct contact to the flames, is a common reality in the case of fires that occur in both residential and industrial environments. This fact justifies the importance of thermal radiation study.

**Key words:** heat conduction, fire investigation, FDS, thermal radiation, ignition sources

## ANALYSIS OF THE FIELD OF SPECIFIC KNOWLEDGE OF OCCUPATIONAL RISKS RELATED TO HANDLING TOXIC SUBSTANCES

**Doru Darabont<sup>1</sup>, Alina Trifu<sup>1</sup>, Daniel Badea<sup>1</sup>, Bogdan Țărnău<sup>2</sup>**

<sup>1</sup> National Institute for Research and Development in Occupational Safety “Alexandru Darabont” – INCDPM, B-dul Ghencea 35A, Bucharest, Romania, d\_darabont@yahoo.com

<sup>2</sup> SC Medinet HC Services SRL, Arad, Romania of Petrosani, bogdan@medinethc.ro

Corresponding author: Alina Trifu, alinatrifu@yahoo.com

**Abstract:** This paper presents the findings of an ongoing project developed in collaborations with SC Medinet HC Services SRL that addresses the occupational safety issues related to handling toxic substances, with emphasis on risk identification. INCDPM carried out an extensive literature review of existing published relevant materials, textbooks, journals, conference papers, and internet that were processed with PRISMA method (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) and together with SC Medinet partner that provided an operational study and on-site risk identification, developed an extensive and comprehensive list of occupational risks related to handling toxic substances. The literature search yielded 1722 references, of which 50 articles were selected for full-text screening as specified by the inclusion criteria, and ultimately 22 were included in this review

Operators may be exposed to a pesticide when opening containers, mixing/loading or preparing the product for use, during application of the product, cleaning up spills, maintaining equipment and re-entering treated areas. The main routes of exposure are dermal and inhalation. Risk assessments are carried out for all scenarios of exposure that can be expected to occur through the use of the pesticide. Both acute (immediate) and chronic (long-term) risks need to be considered. Risk with the use of the pesticide product can be mitigated through engineering controls (such as closed application systems) and/or personal protective equipment (such as gloves or respirators). Chemicals (pesticides) used by pest exterminators are usually toxic to man. They may cause acute or chronic poisoning, burns, skin, eyes, throat and other disorders, and be harmful in other ways. Some pesticides are flammable, and their careless handling and storage may cause fires. Pest exterminators often work in uncomfortable postures and handle heavy loads, which may cause traumas and, in the course of time, back, hands and arms pains.

**Key words:** Risk identification, occupational risks, toxic substances, pest control services, pest exterminator.

## **RESEARCH ON PSYCHOSOCIAL RISKS IN THE CONTEXT OF INTERVENTION AND RESCUE ACTIVITIES IN TOXIC / FLAMMABLE / EXPLOSIVE ENVIRONMENTS**

**Izabella Kovacs, Andrei Lucian Gireadă, Alin Irimia and Laurențiu Munteanu**

INSEMEX Petroșani, 32-34 G-ral Vasile Milea Street, Petroșani, Hunedoara, Romania

Corresponding author: Izabella Kovacs, [izabella.eisler@insemex.ro](mailto:izabella.eisler@insemex.ro)

**Abstract:** Occupational psychosocial risks are among the main emerging health and safety risks, and exposure to them can affect the employee's health, both psychologically and physically, through a stress-mediated pathway. In Europe, according to the OSHA (Occupational Safety and Health Administration), among work-related health problems, stress ranks second in frequency of reporting. A quarter of European employees felt that they were facing stress for most of their work schedule, and a quarter of them said that work had a negative effect on their health. Almost half of employed people in Europe felt that stress was not managed effectively in their workplace. This is because, despite the fact that about 80% of managers were concerned about work-related stress, less than a third of companies had implemented specific stress-related procedures. Excessive stress is linked to poor performance, a higher rate of absenteeism and accidents, physical and emotional health problems of workers. Sources of stress are various, being related to work environment aspects, personal factors and the family environment. In general, stress as a system can be seen as fluctuating, open, dynamic and constantly changing. Furthermore, the consequences of a stressful event can be exacerbated by a multitude of everyday events, such as the individual's resources, the interpretation he gives to the situation, the meanings and symbols attached to the experience, the opportunity or ability to act on the environment, support system, etc. The current paper will summarize key issues related to work-related stress and will discuss how stress at work can be best managed in the context of intervention and rescue activities in toxic / flammable / explosive environments. Intervention and rescue activity is characterized by high workload and intense time pressure, coping with injury and death, the need to suppress emotions during work and yet to be at the same time full of empathy, characteristics that can be risk factors for the phenomenon of occupational stress. Psychological training involves processes and abilities such as knowledge, anticipatory processes, recognition, arousal, thinking, emotions, intentions, decision making, and the management of thoughts, emotions, and actions. A better understanding of one's own psychological response and that of others helps individuals to feel more confident, to have more control, and to be better prepared, both psychologically and in terms of effective work planning. Psychological training can help individuals think clearly and rationally, which leads, in the context of intervention and rescue activities in toxic / flammable / explosive environments, to reduce the risk of serious injury and loss of life, thus contributing to the increase of the level of occupational health and safety.

**Key words:** stress, occupational health and safety, rescue, toxic/flammable/ environments

## FINITE ELEMENT METHOD TO SOLVE ENGINEERING PROBLEMS USING ANSYS

**Adrian Bogdan Șimon-Marinică<sup>1</sup>, Nicolae-Ioan Vlasin<sup>1</sup>, Florin Manea<sup>1</sup>,  
Gheorghe-Daniel Florea<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to  
Explosion – INSEMEX Petroșani, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)  
Corresponding author: Adrian Bogdan Șimon-Marinică, [bogdan.simon@insemex.ro](mailto:bogdan.simon@insemex.ro)

**Abstract:** The Finite Element Analysis method, is a powerful computational technique for approximate solutions to a variety of real – world engineering problems having complex domains subjected to general boundary conditions. The method itself has become an essential step in the design or modeling of a physical phenomenon in various engineering disciplines. A physical phenomenon usually occurs in a continuum of matter (solid, liquid or gas) involving several field variables. The field variables vary from point to point, thus possessing an infinite number of solutions in the domain. The basis of finite volume method relies on the decomposition of the domain into a finite number of subdomains (elements) for which the systematic approximate solution is constructed by applying the variational or weighted residual methods. In effect, finite volume method reduces the problem to that of a finite number of unknowns by dividing the domain into elements and by expressing the unknown field variable in term of the assumed approximating functions within each element. These functions also known as interpolation functions are defined in terms of the values of the field at specific points, referred to as nodes. Nodes are usually located along the element boundaries and they connect adjacent elements. The ability to discretize the irregular domains with finite elements makes the method a valuable and practical analysis tool for the solution of boundary, initial and own value problems arising in various engineering disciplines. A few major steps are required for the finite element analysis method, such as the discretization of the domain into a finite number of subdomains, the selection of interpolation functions, the development of the element matrix for the subdomain, the assembly of the element matrices for each subdomain to obtain the global matrix for the entire domain, the imposition of the boundary conditions and the solution of equations. In order to construct an approximate solution based on the finite element method, three main approaches are required, a direct approach is used for relatively simple problems, a versatile method such as weighted residuals that utilizes the differential equations, such as those of heat transfer and fluid mechanics and a variational approach that relies on the calculus of variations, which involves extremizing a functional, that corresponds to the potential energy in structural mechanics.

**Key words:** Ansys, geometry, FEA, simulation, engineering.



**FIRST AID ELEMENTS USED IN POTENTIALLY TOXIC /  
EXPLOSIVE ENVIRONMENTS IN THE CONTEXT  
OF THE COVID 19 PANDEMIC**

**Lorand Toth<sup>1</sup>, George Artur Găman<sup>1</sup>, Daniel Pupăzan<sup>1</sup>, Cristian  
Nicolescu<sup>1</sup>, Cosmin Ilie<sup>1</sup>**

<sup>1, 2, 3, 4, 5</sup>INSEMEX Petroșani, 32-34 G-ral Vasile Milea, Petroșani, Romania,  
[insemex@insemex.ro](mailto:insemex@insemex.ro)

Corresponding author: Lorand Toth, [lorand.toth@insemex.ro](mailto:lorand.toth@insemex.ro)

**Abstract:** Accidents are unplanned occurrences that result in injuries, illness, death, and loss of property and/or production. First aid is emergency care provided for injury or sudden illness before emergency medical treatment is available. A workplace first-aid program is part of a comprehensive safety and health management system that includes the following essential elements: Management Leadership and Employee Involvement, Worksite Analysis, Hazard Prevention and Control as well as Safety and Health Training. The first-aid provider in the workplace is someone who is trained in the delivery of initial medical emergency procedures, using a limited amount of equipment to perform a primary assessment and intervention while awaiting arrival of emergency medical service (EMS) personnel. First aid is usually a critical part in the management of acute injuries and conditions. The rescuer is the first person with medical training to arrive at the scene of a medical incident. He does not replace the doctor and the purpose of his actions is to maintain vital functions, to prevent the occurrence of dangerous complications for the life and health of the victim, before the intervention of medical staff. Despite current concerns about infection with the new coronavirus 2019 (COVID-19), prevention of its spread and treatment, various lesions and conditions unrelated to this virus still occur. Prompt first aid can prevent an additional burden on the health system by taking care of simple ailments at the crime scene, rather than calling the ambulance system or transporting the victim to a hospital. This paper presents first aid elements in the context of the COVID-19 pandemic, highlighting the maneuvers that will be performed minimizing the risk of infection with the SARS-CoV-2 pathogen. Cardiopulmonary resuscitation maneuvers will be delivered to anyone who does not respond to external stimuli or to victims with abnormal or absent breathing. Also, seizure-like movements may occur at the onset of cardiac arrest. The victim will be evaluated after stopping the seizures, and, in case of lack of response and with absent or abnormal breathing, we will start cardio-pulmonary resuscitation (CPR) maneuvers materialized by chest compressions with a frequency of 100 - 120 / minute followed by the administration of artificial breathing if we have the necessary equipment at hand. Rescuers will do everything they can for each victim, but at the same time, they must be aware of their responsibility towards their families, colleagues and the community.

**Key words:** first aid, intervention, semi-automatic defibrillation, resuscitation manoeuvres

## **WORKPLACE RISK MANAGEMENT IN THE CONTEXT OF THE COVID-19 PANDEMIC**

**Andrada Denisa Băbuț<sup>1\*</sup>, Marius Simion Morar<sup>1</sup>, Cristian Raul Cioară<sup>1</sup>  
and Cristian Tomescu<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 32-34 G-ral Vasile Milea Street, Petroșani, Hunedoara, Romania

Corresponding author: Andrada Denisa Băbuț, [andrada.babut@insemex.ro](mailto:andrada.babut@insemex.ro)

**Abstract:** In March 2020, a pandemic was declared internationally, caused by a new coronavirus called COVID-19. With the advent of the COVID-19 virus and the declaration of the pandemic, safety and distancing measures have been instituted, which we cannot say we are used to and which we easily accept, but which are necessary to combat the spread of the virus. We also cannot deny that this pandemic has affected and continues to affect our mental health, triggering a certain state of anxiety and with it the lowering of our immune system, which makes us more vulnerable to disease. Paradoxically, mental health is one of the first things that helps us to resist and survive the crisis, which is why it is important to provide employees with protection to ensure the necessary mental comfort at work.

In this context, this paper synthesizes the basic principles and best practices of psychosocial risk assessment, highlighting how hazard identification and risk management strategies should be based on the involvement of all stakeholders in combating anxiety at workplace.

In the context in which the COVID-19 pandemic significantly affects business by suspending, diminishing and ceasing professional activity, efficient and fast communication is important in relation to the company's shareholders, which management must, on the one hand, regularly inform and with transparency, whenever is necessary, on any aspects or changes of the factual situation and on the other hand, to consult it in order to agree on the directions of action and in the case of multinationals, to act according to the group.

This increase in stress and anxiety has had a negative impact on mental health among employees in the company, causing a lack of balance between personal and professional life due to the fact that most were forced to work from home due to measures and restrictions imposed by pandemic and faced heavy management of routine tasks and juggling work tasks. A significant contribution was also the lack of basic measures that must be taken by any company to create a protective environment for employees so that they have access to all safety and hygiene standards required by current legislation.

The essence of this paper is the negative impact that the coronavirus pandemic has on employees and how anxiety and depression can be combated at work with the help of an appropriate risk management analysis, concluding with opinions from employees to reduce anxiety and some ideas gathered from the study made for a better functioning of the management system in the current pandemic situation.

**Key words:** risk management, pandemic, COVID-19, stress, anxiety.

## ASPECTS REGARDING NUMERICAL MODELS FOR SAFE EVACUATION OF PEOPLE, IN THE CURRENT PANDEMIC CONTEXT

**Marius Cornel Şuvar<sup>1</sup>, Vlad Mihai Păsculescu<sup>1</sup>, Alin Irimia<sup>1</sup>, Dragoş Păsculescu<sup>2</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX Petrosani, 32-34 Gen. Vasile Milea Street, Petrosani, Romania, [marius.suvar@insemex.ro](mailto:marius.suvar@insemex.ro), [vlad.pasculescu@insemex.ro](mailto:vlad.pasculescu@insemex.ro), [alin.irimia@insemex.ro](mailto:alin.irimia@insemex.ro),

<sup>2</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, Romania, [pdragos74@yahoo.com](mailto:pdragos74@yahoo.com)

Corresponding author: Marius Cornel Şuvar, [marius.suvar@insemex.ro](mailto:marius.suvar@insemex.ro)

**Abstract:** In the last years, research on the evacuation of people in emergencies has seen an unprecedented development, fire safety specialists adopting new methods of studying this issue, based mainly on mathematical analysis and computer simulations. The mathematical model converts the current parameters of the evacuation process into mathematical equations, which are to be solved using the computational technique. Currently, more than 30 computer models are known focused on studying the evacuation process from buildings, many of which can simulate evacuation even from other types of structures. Such models are capable of dealing not only with evacuation in the event of a fire but also in the event of any imminent threat or danger to which a group of the population may be exposed. To calculate the time needed to evacuate buildings in case of emergency, numerical models simulate this movement of groups of people, in a closed, delimited physical space, while tracking the trajectory and the position of each individual, under the influence of specific forces, characteristics, and strategies for evacuation. Algorithms for access path and exit selection use both properties of the crowds model and the individual interaction between the event and the people. The pandemic context has raised several questions about the safe use of buildings, given the presence of the risk of disease transmission. The policies adopted in the last year regarding the use of buildings, establishing access flows, and social distance, vary within great limits, being specific to each state and based on the analysis of the virus transmission rate rather than on risk assessments at the building level. The paper aims to present the main challenges to which the models of emergency evacuation, must respond, especially those considering social distancing and interaction between individuals, within a given distance, all to minimize the risk of disease transmission during the evacuation process of the building. Five assumptions on occupant exposures were identified and explained. The conclusions emphasize that current crowd models must be redesigned to support risk assessment based on occupant exposure in confined spaces during pandemics. These new approaches allow more informed decisions concerning building access restrictions during pandemics by performing a quantitative assessment of occupant exposure.

**Key words:** evacuation model, disease transmission, occupant exposure, emergency evacuation, pandemic.

## **RESEARCH IN THE FIELD OF EVALUATION OF ANFO EXPLOSIVE PREPARATION INSTALLATIONS, TESTS AND RESULTS**

**Stefan Ilici<sup>1</sup>, Edward Gheorghiosu<sup>1</sup>, Daniela Rus<sup>1</sup>, and Ciprian Jitea<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion -INSEMEX Petrosani, Department of Safety of Explosion and Pyrotechnic Articles, G-ral V. Milea Street 32-34, Petrosani, Romania, stefan.ilici@insemex.ro, edward.gheorghiosu@insemex.ro, daniela.rus@insemex.ro, ciprian.jitea@insemex.ro

Corresponding author: Ștefan Ilici, stefan.ilici@insemex.ro

**Abstract:** The technical-economic efficiency of rock extraction works depends significantly on the drilling and blasting works as well as the adjacent costs. The cost of the explosive is an important component in these and the generalization of the widespread use of the use of bulk explosives (ANFO) has generated a significant reduction in the cost. Making the explosive close to the place of use in fixed or semi-stationary installations on the quarry stage eliminates the costs related to storage or long-term storage, transport, escort, security. However, installations for the manufacture of ANFO type explosives must consistently produce a simple quality explosive mixture. The quality lies in the participation of the precursors as well as in the degree of homogenization, stability and a good behavior to external stimuli that can lead to sensibility to initiation stimuli or inhibition of sensitivity where the harmful influence of moisture in the raw material or environment must be emphasized. The paper presents tests and results obtained in recent years for such installations used by several companies in Romania performed under the supervision of INSEMEX specialists. These assessments were completed with the certification of explosives manufacturing facilities for the specified operating parameters as well as for explosives.

The quality of ANFO-type explosives manufactured in the field close to the place of use depends on a number of factors such as the quality of the raw materials (ammonium nitrate and mineral oil), the degree of homogenization which must be as high as possible, the correct dosage close to the composition of which the mixture of fuel and oxidant to react completely. This reaction, if carried out by a mixture of suitable quality, will occur at an explosion rate of more than 2200 - 2500 m / s and with a high emission of gases which perform the mechanical work of demolition at a significant pressure.

**Key words:** ANFO, Explosive, installations, certification, manufacturing.

## EDUCATION IN TIMES OF COVID-19: ARE STUDENTS LEARNING IN ERGONOMIC CONDITIONS?

**Maria-Elena Boatca<sup>1</sup>, Diana Robescu<sup>2</sup>, Romulus Corlan<sup>3</sup> and Nicoleta Mirea<sup>4</sup>**

<sup>1,2,4</sup>Politehnica University of Timisoara, Faculty of Management in Production and Transportation, 14 Remus street, 300191 Timisoara, Romania

<sup>3</sup>Politehnica University of Timisoara, Faculty of Electrical and Power Engineering, 2 Vasile Parvan street, 300223 Timisoara, Romania, romulus.corlan@student.upt.ro

Corresponding author: Maria – Elena Boatca, maria.boatca@student.upt.ro

**Abstract:** For more than a year, the way people work and learn witnessed dramatic changes on the back of the Covid-19 pandemic. While workers were supported and provided with trainings and a variety of sources of information, students did not benefit from the same ‘privilege’. In Romania, students had to adapt to online learning system since March 2020. In order to properly assess the impact of online learning on students’ health (both physical and mental), the authors conducted a study with students at Politehnica University of Timisoara. The aim of the study was to understand whether students benefit or not from better learning conditions (from an ergonomic perspective) if they are engaged in online learning arrangement for long periods of time.

Method: ‘Rapid Office Strain Assessment’ (ROSA) is a method designed especially for office users. It is an observational method and includes a checklist with suggestive images for each analyzed posture and risk category. ROSA involves detailed postural analysis depending on various desk, chair, screen, keyboard and mouse features. For each category, the ergonomist/researcher awards a score based on the features and aspects observed. Also, time spent using screen, keyboard and mouse, as well as impossibility to adjust the chair and desk generate additional points that add up to the final score. Using ROSA, the authors performed picture-based assessments of the furniture students use while attending online classes. Traditionally, ROSA is used with in vivo observations, but Liebrechts et al. successfully performed picture-based assessments and, thus, supporting suitability of the current approach.

Results and conclusions: While more than half of the students learn in ergonomic conditions, there are others exposed to high postural risk (primarily generated by use of inappropriate furniture). Despite that the average score was 4, 39.6% of students had a score of 5 or more, indicating a worrying situation with regards to health and wellbeing. The highest score was 8, but it represented a singular case. The main issues observed were use of inappropriate furniture (e.g., dining and coffee tables, armchairs, stools), long hours spent in front of the screen and predominant use of laptops. Using a laptop is not an issue itself if the following conditions are met: (1) ensuring proper screen height, (2) using external keyboard and mouse instead of the ones integrated in the laptop. This assessment is part of a larger ergonomic intervention focused on educating students on the importance of creating ergonomic conditions at home with the aim to improve quality of life.

**Key words:** ergonomic assessment, online education, ROSA, musculoskeletal disorders.

## EVALUATION OF THE SAFETY PARAMETERS FOR A PERMITTED EXPLOSIVE TYPE EMULSION

**Ilie-Ciprian Jitea<sup>1</sup>, Daniela Carmen Rus<sup>1</sup>, Cristian Rădeanu<sup>1</sup>, Dragoş Gabriel Vasilescu<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX Petroşani, 32 34 G-ral Vasile Milea St., 332047 - Petroşani, Hunedoara County, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)

Corresponding author: Ilie-Ciprian Jitea, [ciprian.jitea@insemex.ro](mailto:ciprian.jitea@insemex.ro)

**Abstract:** When preparing a permitted explosive recipe an energy or an explosive heat is considered, which should ensure the detonability of the system and at the same time a power that satisfies the purpose for which it will be used, under the conditions of firedamp hazardous mines. The safety parameters for the explosive charges used in the firedamp hazardous mines are decisive, in order to ensure the safety and health requirements at work together with the efficient performance of the blasting operation. The permitted explosive type emulsion is recommended to be used in underground mines, open pit mines as a special methane explosive and can be used where a coal dust and/or methane explosion hazard exists can be loaded into dry and wet blasting holes and it can be used for mechanical loading. The permitted explosive type emulsion is a Detonator-sensitive explosives that can be reliably initiated in an unconfined state by a No. 8 strength detonator it have safety handling characteristics because of the relatively low sensitivity to friction, shock and impact. Technological changes due to the change of suppliers of certified explosives for civil use for underground use in the firedamp hazardous mines, involve reassessing the safety and efficiency of the loads made with these products, which have not been tested and evaluated for the conditions from the Jiu Valley mines. The laboratory tests showed that the firedamp-proof safety explosive type emulsion corresponds in terms of safety characteristics specific to the Mines in the Jiu Valley, not igniting the potentially explosive atmosphere. The variety of works carried out in a firedamp hazardous mine with the help of explosives is very large and they consist of: galleries, inclined planes, rooms, etc. The transition to the safety explosive type emulsion will continue through a test program for the safe use of the explosive in the mining works at the Jiu Valley Mining Exploitations. In order to ensure the technical-scientific conditions for the implementation of an adequate system for evaluating the parameters of influence of the firedamp-proof atmosphere regarding its ignition by the emulsion-type firedamp-proof explosives, the test method of these types of products was documented, elaborated and validated.

**Key words:** permitted explosive, emulsion, laboratory tests, methane and coal dust

## **SAFETY ASSESSMENT OF INDUSTRIAL LOCATIONS UNDER THE EFFECTS GENERATED BY CONTROLLED EXPLOSIONS**

**Gabriel Vasilescu<sup>1</sup>, Florea Dinu<sup>2</sup>, Attila Kovacs<sup>1</sup>, Robert Laszlo<sup>1</sup> and Claudia Miron<sup>1</sup>**

<sup>1</sup>INSEMEX Petrosani, Department of Safety of Explosion and Pyrotechnic Articles, G-ral V. Milea Street 32-34, Petrosani, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)

<sup>2</sup>Polytechnical University Timisoara, UniversityP-ta Victoriei Street 2, Timisoara, Romania, [florea.dinu@upt.ro](mailto:florea.dinu@upt.ro)

Corresponding author: Gabriel Dragos Vasilescu, [dragos.vasilescu@insemex.ro](mailto:dragos.vasilescu@insemex.ro)

**Abstract:** The identification and consideration of various potential hazards significantly reduce the accidents in the industrial locations where specific operations with explosive materials take place. The purpose of this study was to assess the effects generated by external explosions produced near an experimental steel frame building model. The novelty of the paper is the combination of experimental results on site with data from specialised databases of accidental explosions. These data were integrated using computer modelling to evaluate the risk associated with different hazardous situations (shockwave propagation, spreading of debris), and the effects on the location. The numerical simulations were performed using IMESA<sup>FR</sup> software, which is a quantitative risk assessment tool and can be used to calculate risk to personnel from commercial explosives facilities and operations. The results of the simulations were used to design the perimeter security within the site and the placement of the experimental model, considering the maximum expected blast charge. Considering the limited space available on site, the results of the simulations were very valuable and confirmed the tests that were already planned can be performed without any risk for personnel, nearby buildings and facilities. The scope of the paper was to simulate the explosion risk in the testing site and secure the staff and the assets during experimental blasting operations. The detonation of explosive charges was performed within the FRAMEBLAST research project (UEFISCDI, 2016) and aimed at evaluating the response of a steel frame building when charges of different sizes are detonated at different stand-offs from the building, (see Figure 1).



Figure 1. Testing setup, steel frame structure and location of overpressure sensors

**Key words:** blast loads, damage assessment, damage prevention, risk management, steel frames, hazards, risk & probability analysis

## THE INFLUENCE OF ECONOMIC FACTORS IN THE MANAGEMENT OF HEALTH AND SAFETY SPECIFIC TO SMEs

**Gabriela Caldarescu<sup>1</sup>, George Daniel Tanasievici<sup>1</sup>, Costica Bejinariu<sup>2</sup>,  
and Mihai-Adrian Bernevig<sup>2</sup>**

<sup>1</sup>Labor Inspectorate Iasi, Fire Mill Road, no. 31, 707410 Iasi, Romania

<sup>2</sup>”Gheorghe Asachi” Technical University of Iasi, D. Mangeron Blv., no. 67, 700050 Iasi,  
Romania

Corresponding author: Mihai-Adrian Bernevig, mihaibernevig@gmail.com

**Abstract:** The first of the general objectives of the National Strategy in the field of health and safety at work for the period 2018 - 2020 in Romania was “a better implementation of the choice of occupational safety and health legislation, especially in micro-enterprises and SMEs”. In this context, this paper presents the main vulnerabilities of management in SMEs, where the occupational safety and health component has a formal role being strongly influenced by economic factors. The first part presents a statistical situation of the verification campaigns, carried out in the last 3 years by Labor Inspection, on how SMEs have implemented health and safety legislation in their activities, subsequently, an analysis is made of the economic factors that have limited the development of health and safety management. Based on the statistical data we can issue the following working hypotheses:

1. if 82% of accidents with temporary incapacity for work and 90% of fatal accidents are due to economic activities in SMEs, then in 2019 the total number of 4332 victims shows that about 3489 are workers who have suffered accidents;
2. if 4332 victims have about 233162 days of temporary incapacity for work, an average of 3489 of about 187789 days of temporary incapacity for work results;
3. if in 2019 about 500000 SMEs in Romania were injured 3489 workers and there were registered about 187789 days with temporary incapacity for work then by approximation, we can say that 143 SMEs are injured a worker and an SME reports 2.66 days of temporary incapacity for work. In parallel, in order to be able to discuss the hypotheses made, we present a cost calculation simulation for an employee in two distinct situations, when he is at work and when he is temporarily incapacitated as a result of an accident at work.

Finally, a cost-benefit analysis is presented on the economic consequences that occur in the event of an accident and / or illness that demonstrates the theory that economic factors influence the management of health and safety and health specific to SMEs both before and after an event occurs.

Beyond these conclusions that have emerged as a result of the analysis carried out, there is a need for better information and awareness of the consequences of an accident at work from the perspective of prevention, of the legal implications for both the employer and the employee and not finally of the consequences for the victim of an accident at work and his family, effects that can hardly be estimated for both the period of incapacity and psychological implications with effects over time.

**Key words:** health and safety, management, SMEs, economic factors



**2. Challenges in mining engineering, processing, surveying, and civil engineering**

**FINITE ELEMENT MODELING OF THE STABILITY OF ROOMS AND RESISTANCE STRUCTURES FROM THE CANTACUZINO MINE**

**Dacian-Paul Marian<sup>1</sup>, Ilie Onica<sup>1</sup>**

<sup>1</sup>University of Petroșani, Department of Mining Engineering, Surveying and Civil Engineering, University st., no. 20, Petroșani, Romania

Corresponding author: Dacian-Paul Marian, dacianmarian@upet.ro

**Abstract:** At the moment, the Cantacuzino Mine is the mine in operation from the Slănic Prahova Salt Mine, in this mine, the rock salt has been mined since 1993, on 7 levels, from level V to XI, extracting over 2.3 million m<sup>3</sup> of rock salt. The mining method with small rooms, square pillars and a straight ceiling, was applied, between the levels V and VII, and starting from level VIII, the same method was applied, but with rooms with vaulted ceilings. The sizes of the pillars increased with the depth, from 16m for level V to 18m for level XI. With the help of the CESAR-LCPC software, 2 finite element models were developed, a three-dimensional model, and another one two-dimensional, after a vertical section through the intercameral pillars located in the middle of the extracted area. To simplify the numerical models, two regions with specific geomechanical characteristics were considered, corresponding to the surrounding rocks and the rock salt deposit. The calculations were performed in the hypothesis of elastic-plastic behavior without hardening, Mohr-Coulomb type. The major principal stresses developed in the resistance structures are, in general, compressive stresses (developed in the intercameral and marginal pillars) and tensile stresses, in the ceilings and in the walls of the rooms. The most affected by the maximum principal stresses are the ceilings of the first row of rooms, below the marginal safety pillar, where the principal major stresses can exceed three times the value of tensile strength of the rock salt, in the floor of the rooms on the level XI and in the ceiling between levels IX and X, from the western boundary of the mining field. All minor principal stresses in the analyzed models are compressive stresses reaching the maximum values in the intercameral pillars, with an increase towards the base of the pillars on the last two levels. The maximum shear stresses indicate the structural areas where there is the potential for the occurrence of shear fractures of the rock salt massif or the mobilization of natural fissures or fractures existing into the massif. The plastic deformation norm indicates the local areas in the resistance structures of the Cantacuzino Mine in a state of plastic deformation. We note that, in the case of the Cantacuzino Mine, there are no areas of plastic deformation in the ceilings, but only in the walls of the rooms, respectively at the corners of the pillars. The most affected by the plastic deformation are levels XI and X and the rooms under the eastern marginal pillar, from levels VII, VIII and IX. Following the analysis of the stress-strain state of the resistance structures from the Cantacuzino Mine, resulted from the numerical models, it can be concluded that the overall stability of the pillars and ceilings is relatively good, and acceptable at the last three levels, which makes these levels functional for a limited time.

**Key words:** finite element, salt mine, pillars, stress

## **SWELLING PROPERTIES OF CLAYS, A MAJOR RISK FACTOR FOR THE INFRASTRUCTURE PROJECTS**

**Stănciucu Mihaela<sup>1</sup>, Terteleac Alexandra<sup>2</sup>**

<sup>1</sup>University of Bucharest, Department of Engineering Geology, 6 Traian Vuia Street,  
Bucharest, Romania, [stanciucumihaela@yahoo.com](mailto:stanciucumihaela@yahoo.com)

<sup>2</sup>University of Bucharest, Faculty of Geology and Geophysics, 6 Traian Vuia Street,  
Bucharest, Romania, [alexat\\_1998@yahoo.com](mailto:alexat_1998@yahoo.com)

Corresponding author: Stănciucu Mihaela, [stanciucumihaela@yahoo.com](mailto:stanciucumihaela@yahoo.com)

**Abstract:** Swelling and shrinking properties refers to significant positive or negative variations of volumes due to absorbtion or dessication of water in fine soils under natural or anthropic regime of moisture. These physical phenomena are worldwide spread and had important engineering consequences with associates cost of damages of several billion annually in all climate areas. In spite of the fact that these geotechnical properties are studied for more than eight decades, the particularities of these peculiar relations between water, mineral composition and geomechanical behavior are still unrevealed entirely. In Romania, swell/shrink soils are reported in all regions at different depths, but there are not taken seriously in consideration in the literatures and rarely related to geotechnical engineering accidents such as slope slides or road failures. This work presents some obvious relations between the hydrogeological structure, the presence of “large swell/shrink soils”, their mineralogical composition and geomechanical properties and the ubiquitous landslides on Peri Carpathians Hills. Large infrastructure projects offer the opportunities to put into evidence the swelling properties of Upper Pliocene-Lower Pleistocene deposits, which supports the Holocene alluvial deposits of Argeş River. Analyzed samples allow us to define some basic correlations between plasticity index, colloidal fraction, dry density, swelling pressures or free swelling and mineralogical composition.

**Key words:** expansive, swelling, shrinkage, volume change, mineralogical composition

## THE USE OF MODERN TECHNOLOGIES IN THE SURVEYING FIELD

**Lucian Octavian Dragomir<sup>1</sup>, Roxana Claudia Herbei<sup>2</sup> and Mihai Valentin Herbei<sup>3</sup>**

<sup>1</sup>Banat University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Romania, E-mail address: pfadragomirlucian@yahoo.com

<sup>2</sup>University of Petrosani, University Street 20, Petrosani, Romania, E-mail address: roxanaherbei@yahoo.com

<sup>3</sup>Banat University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Romania, E-mail address: mihai\_herbei@yahoo.com

Corresponding author: Mihai Valentin Herbei, E-mail address: mihai\_herbei@yahoo.com

**Abstract:** In order to achieve or complete the 1: 1.000 scale situation plan and the digital terrain model for the Timișoara - Sibiu highway section, and given the difficult access conditions in the project area, it was decided to use photogrammetric techniques for extraction of spatial information needed for mapping. In order to achieve the mapping requirements at a scale of 1: 1.000, the following activities were performed: Realization of the geodetic support network; Realization of the aerial photography project; Making pre-marking points in areas without clear details or other location possibilities; Simultaneous aerial photography of sub-blocks at different flight heights to ensure a 12 cm pixel and simultaneous laser scanning with LiDAR system; Identification of marking and pre-marking points on the subblock frames; Performing GPS measurements to determine the coordinates of landmarks and photogrammetric pre-marking; LIDAR data processing using permanent GPS stations to obtain coordinates in the ETRS89 system and transform them into the STEREO70 system and Black Sea reference plan 75; Calibration of LIDAR data; Filtering LIDAR data; Realization of aerotriangulation on subblocks or bands; Stereo restitution of planimetric and altimetric details for 1: 1.000 scale (3D mode); Transforming 3D plans into 2D plans; Editing and elaborating topographic plans.

**Key words:** 3D models, LiDAR, GNSS, photogrammetry, situation plan.

## **PHYSICAL - CHEMICAL GEOTECHNOLOGY. INSTRUMENT FOR THE SUPERIOR VALUATION OF MINERAL RESOURCES AND ENVIRONMENTAL PROTECTION**

**Victor Arens<sup>1</sup>, Iulian Offenber<sup>2</sup>**

<sup>2</sup>Russian Academy of Natural Sciences, Altufievskoe Shosse Of. 65, Moscow, Russia

<sup>1</sup>University of Petrosani, IMIT, University Street 20, Petrosani, Romania

Corresponding author: Iulian Offenber, o2fnbrg@yahoo.com

**Abstract:** In the paper, the authors define the purpose, tasks and content of a new working tool in the exploitation and superior valuation of useful mineral substances, based on the principles of geotechnology, respectively Physical - Chemical Geotechnology (P-CG). It presents the vision on Mining Geotechnology as a relatively new science, its theoretical outline having the role of explaining the conditions, means and methods of exploitation and processing of minerals, through underground constructions, but also some ways to adapt existing techniques. It examines how P-CG can improve working conditions, the economy, geocology, safety production, comfort and quality of life all in the geographical environment. The authors describe the main task of P-CG as a complex structure of scientific disciplines in which all processes and transformations that occur in subsoil exploitation must be discovered, researched and solved holistically through non-standard solutions. It also outlines a roadmap for the assessment of deposits suitable for the use of P-CG methods, addresses the preconditions and what needs to be done for the widespread introduction of new technologies in the mining industry. In this sense, the structure of a business plan of a P-CG enterprise is also drawn.

**Key words:** geotechnology, physical, chemical, mining, resources

## PROCESSING OF MEASURES MEASURED IN UNDERGROUND POLYGONATIONS

Larisa-Ofelia Filip<sup>1</sup> and Simona Cucăilă<sup>2</sup>

<sup>1</sup>University of Petrosani, Department of Mining Engineering, Topography and Constructions, University Street 20, Petrosani, Romania, [larisafilip@yahoo.com](mailto:larisafilip@yahoo.com)

<sup>2</sup>Ministry of Education, General Directorate for International Relations and European Affairs, General H.M. Berthelot Street 28-30, Bucharest, Romania,

Corresponding author: Larisa Ofelia Filip, [larisafilip@yahoo.com](mailto:larisafilip@yahoo.com)

**Abstract :** The information, which is the concrete basis for solving geodetic and topographic problems, comes from measurement observations made on quantities that are mainly angles and distances. The quality of the observations has an important role in achieving the objectives for which they are executed, in conditions of efficiency and safety.

As topographically, underground works are conducted using polygonal paths, the methods used for processing measurements are of great interest. The safety in the execution of the mentioned objectives depends on the topographic works used to draw them. Such works must use a database obtained from processing measurements using special scientific methods. Due to the hard-to-reach underground conditions, the underground polygonations are simple, so in the paper I analyzed such a route. The paper uses the theory of small squares in the processing of measurements, but also analyzes common situations frequently encountered. It is necessary, on the basis of the purpose for which the measurements are made, to establish the appropriate values in terms of size and accuracy, taking into account the economic aspect of the volume of necessary and sufficient observations required. Considering the importance of underground polygons in the management of mining, hydrotechnical works, roads, etc., it is necessary to process the measured quantities (angles, distances) by rigorous methods based on the theory of small squares. In topographic practice, there are frequent cases when the angles of the polygons are measured with high precision. This is achieved by small non-concluding on the orientations and consequently small corrections of the angles. In such a situation the measured angles are considered with the same precision, and the non-closing on the orientations is distributed in equal parts on all the measured angles. In practice there is often a particular case regarding the geometric shape of the polygonal path. There are polygonal paths developed in the AB direction with the measured angles close to 200<sup>g</sup>. With the angles thus corrected (compensated) the orientations of the sides are calculated and together with them the coordinates of the points of the polygon. Making an analysis we conclude that in underground mining polygons made in one direction, the errors of lengths act distinctly from the errors of angles. And in this case, in the system of normal equations the correlation coefficients are equal to zero. By analyzing the polygonal paths performed on the processing of the measured quantities, methods are established that have the role of contributing to the increase of safety in the execution of the underground objectives.

**Key words:** underground polygonal paths, linear errors

## SLOPES STABILITY ANALYSIS FROM ROSIA POIENI OPEN PIT MINE, ROMANIA

Mihaela Toderaş<sup>1</sup> and Mykhailo Filatiev<sup>2</sup>

<sup>1</sup>University of Petrosani, Department of Mining Engineering, Surveying and Underground Constructions, 20, University Street, Petrosani, Romania, [toderasmihaela@yahoo.com](mailto:toderasmihaela@yahoo.com)

<sup>2</sup>Volodymyr Dahl East Ukrainian National University, Research Department, 919 Avenue de Bretagne, Severodonetsk, Ukraine, [mfilatiev@gmail.com](mailto:mfilatiev@gmail.com)

Corresponding author: Mihaela Toderaş, [toderasmihaela@yahoo.com](mailto:toderasmihaela@yahoo.com)

**Abstract:** The copper ore deposit from Roşia Poieni is located in the Apuseni Mountains area in the southern extremity of the Metaliferi Mountains. The surrounding area of the deposit is mountainous with elevations between 600 and 1,250 m. The upper elevations in the deposit area have values between 1,150 m and 1,250 m and correspond to the maximum elevations of interest area where the main enclosures of the mining objective were located. The opening, preparation and exploitation of the copper andesite deposit from Roşia Poieni had in focus the exploitation of the deposit in a large quarry, with the exploitation of deposit on a depth of 675 m (final level at the bottom +550) and with a production capacity of 15 million tons/year. In the case of Roşia Poieni open pit mine, the deposit is of great inclination, and the rocks in which this deposit is located are formed by strongly fissured hard rocks, sometimes altered.

Through the analyzed open pit mine variant, the level of +805 m was established as a daily operating limit; the division into benches was based on this level by dividing into horizontal slices with a thickness of 15 m, equal to the height of bench. Thus, there were 27 benches in the Curmătura area and 23 benches in the Ruginiş area. The general slope angle was set at 35°, the angle for which the sterile volumes and implicitly the opening-up coefficient were calculated. The stability analysis was performed for individual bench, two-bench system and general slope of quarry (consisting of 24 benches), using two methods (Fellenius and Janbu). A polygonal slip surface was also modelled; such potential slip surfaces can appear in the slopes of Roşia Poieni open pit mine due to the natural cracking systems of massif but also due to the secondary cracking generated by the used drilling-blasting operations. The stability test was done by applying Hoek's graphical-analytical method; the obtained values for the safety factor satisfy the condition of being greater than 1.3. Under these conditions, no additional measures are required to increase the stability reserve (through re-profiling works of slopes, anchoring, etc.). The value of safety factor depends on the massif stress state, compared to the maximum stresses that the rocks can bear. Since the massif stress state changes under the influence of various natural or artificial factors, it is necessary to choose the safety factor not only by assessing the stress state, but according to unknown, uncertain or subjective elements that affect the slopes stability. In the field of mining engineering, theoretical computation will continue to be a tool through which the degree of influence of the parameters on mining works stability can be established. In the future, the possibility of optimizing the sliding surface in the hypothesis of polygonal surface will be analyzed.

**Key words:** open pit mine, andesite, slope, stability, safety factor

## NUMERICAL SIMULATION OF ROCK CUTTING TEST USING YADE

**Antonios Kalogeropoulos and Theodoros Michalakopoulos**

National Technical University of Athens, School of Mining Engineering and Metallurgy,  
Department of Mining Engineering, Laboratory of Excavation Engineering, Zographou  
Campus, Athens, Greece

Corresponding author: Antonios Kalogeropoulos, akalogeropoulos@metal.ntua.gr

**Abstract:** The open software Yade was used in this study for simulating in three dimensions the laboratory rock cutting test on sandstone samples using a drag pick as cutting tool. Although the discrete element method (DEM) is a reliable tool for reproducing the mechanical behaviour of rocks by representing the system as an assembly of bonded spherical particles, realistic UCS/UTS ratios usually are not achieved regardless of the input values of microparameters. Cluster models, which form complex-shaped larger particles, were used as a first solution to study the influence of the cluster size on the UCS/UTS ratio and on the strength envelope. Despite the fact that the cluster logic was very encouraging, cracking was observed only along the cluster boundaries due to the very high strength assigned on intra-cluster bonds. Rock cutting simulations were conducted in 2D and the relation between the critical depth of cut, which is responsible for the transition from ductile to brittle failure, the material toughness  $K_{IC}$ , and the unconfined strength  $\sigma_C$  was found. During rock cutting simulations the grain crushing phenomenon was taken into account in order to achieve a realistic strength ratio. The cluster logic was adopted in the sensitivity analysis in combination with the inter cluster strength. As a result, the cluster can break, thereby simulating the case where big rocks can be crushed into fine particles during rock cutting, which is commonly observed in laboratory tests. In order to realistically simulate the mechanical behavior of rocks by using the discrete element method, a calibration procedure is needed for identifying suitable values for the microparameters. This is frequently accomplished by 'trial-and-error'. Statistical methods are also used, so as to reduce calibration time and provide acceptable results. Moreover, the experimental design and the optimization method of enumeration was used in rock cutting simulations with PFC3D. The simulation approach in this study is based on the conventional method in conjunction with a texture coefficient that results in achieving a realistic initial strength ratio UCS/UTS. On cylindrical samples, four different cuts in four different paths were carried out. The mean cutting force for each cut was calculated and was chosen to represent the macroscopic response of the numerical model. The optimum set of microparameters is obtained through an experimental design with the Plackett-Burman and Central Composite Design methods, and then optimized, in regard to the microparameters' values, so that the rock cutting simulation is in close accordance with the observations from the actual laboratory cutting tests.

**Key words:** Rock Cutting, Discrete Element Method, Interaction Range Coefficient, Design of Experiment, Optimization, Yade.

## EVALUATION OF SURFACE MINING AREAS THROUGH GEOSPATIAL ANALYSIS. THE CASE OF PTOLEMAIS LIGNITE MINES

**Aikaterini Servou<sup>1,2</sup>, Nikolaos Paraskevis<sup>1</sup>, Christos Roumpos<sup>1</sup> and  
Francis Pavloudakis<sup>1</sup>**

<sup>1</sup> Public Power Corporation of Greece, Department of Mining Engineering, Chalkokondyli Street 29, 10432 Athens, Greece, [nikolasparaskevis80@gmail.com](mailto:nikolasparaskevis80@gmail.com), [c.roumpos@dei.com.gr](mailto:c.roumpos@dei.com.gr), [F.Pavloudakis@dei.com.gr](mailto:F.Pavloudakis@dei.com.gr)

<sup>2</sup>University of Patras, Department of Geology, Aristotelous Street 2, 26504 Patras, Greece, [servoy\\_aikaterini@upnet.gr](mailto:servoy_aikaterini@upnet.gr)

Corresponding author: Christos Roumpos, [c.roumpos@dei.com.gr](mailto:c.roumpos@dei.com.gr)

**Abstract:** The lignite surface mines often occupy large areas to develop the mining activities: pits, dumping areas, bunkers, buildings, workshops, and other auxiliary facilities. The land reclamation methods and the corresponding land use alternatives after the mine closure constitute an important part of an integrated mining planning. In the present contribution, the main parameters of geospatial planning are investigated in order to assess the changes in land uses in a mining area and to correlate them with the spatiotemporal development of the extraction works. As a case study, a geospatial analysis of the current situation in Ptolemais mines is presented. In particular, seven dumping areas are assessed regarding their suitability for specific land uses. The assessment is based on the following criteria: a) slope gradient, b) reclamation works already completed, c) slope aspect, d) proximity to the road network and e) proximity to residential areas. Furthermore, the ArcGIS software is used to compile the layer maps of the corresponding parameters. A raster analysis was conducted for each parameter with the Euclidean distance tool in order to define the parameters' distribution for the dumping areas spatially. It was revealed that the criterion that predominates the land use selection process is the slope of the reclaimed land surfaces. Flat slopes are suitable for agricultural use, gentle slopes favour the development of photovoltaic parks, while steep slopes are more suitable for forest development. The forest land use suitability is validated by the fact that many of these surfaces have already been forestated. Important selection criteria are also the proximity to villages and roads. The spatial distribution of land uses that is proposed in the frame of the present study is incorporated into the existing plan of land uses according to the Just Transition Development Plan of lignite areas. A preliminary evaluation of dumping areas was carried out in the present contribution for several post-mining land uses and during the final reclamation to be proposed.

**Key words:** land use, reclamation, ArcGIS, dumping areas, suitability



## NOTIONS REGARDING THE DESIGN OF SUCTION SYSTEMS FOR INDUSTRIAL VENTILATION

**Ion Gherghe<sup>1</sup>, Doru Cioclea<sup>1</sup>, Florin Rădoi<sup>1</sup>, Adrian Matei<sup>1</sup>  
Răzvan Drăgoescu<sup>1</sup>**

<sup>1</sup>INSEMEX, 32-34 G-ral Vasile Milea Street, Petroșani, Hunedoara,  
Romania, e-mail: [insemex@insemex.ro](mailto:insemex@insemex.ro)

Ion Gherghe, e-mail: [ion.gherghe@insemex.ro](mailto:ion.gherghe@insemex.ro)

**Abstract:** The structure of ventilation systems in industrial rooms and premises requires a thorough knowledge of the technological processes that take place, the equipment and their location in the premises, the nature and amount of gases released, the environmental conditions required in terms of occupational safety and health. If the air velocity at the end of a column with a diameter of 100 mm is 20 m/s, the suction at a distance of 100 mm from it (ie 100% of the diameter) will be only 7% of 20 = 1.4 m/s. For this reason, the suction mouths must be designed so that the source of dust or explosive and/or toxic atmospheres is isolated as far away as possible. If the toxic / explosive atmosphere is moving rapidly, the suction mouth must be placed in the direction of its movement. In order to choose a ventilation installation, an analysis must be made of the workplace to be ventilated so that the chosen solution solves the problem of exhaust evacuation but also respects the comfort of the working staff.

The pressure losses of the air entering the suction mouth depend on its shape and the final air velocity. The inlet coefficient in the suction mouth is defined as the ratio between the actual air flow that is sucked and the theoretical flow that would flow at the same depression if there were no pressure losses. The pressure drop at the inlet to the suction mouth is in some cases as high as the dynamic pressure. This means that the loss can be greater than 200 Pa if the air speed is approx. 20 m/s. If the design of the various vents has been carried out and the air flow to be sucked through each has been determined, the plan of the piping network must be designed so as to reach an air distribution to achieve a speed exceeding the minimum transport speed in all system points. It is not desirable to exceed the minimum speed because on the one hand it leads to an increase in the required power and on the other hand it increases the coefficient of friction of the air through the column. Also, the air ducts must be made of materials with the lowest possible roughness and that make it possible to achieve watertight constructions. To facilitate the calculations, nomograms for assessing the aerodynamic parameters for fiberglass or metal columns are used (applicable only in the case of exhaust systems). These diagrams allow the choice of the diameter of the tube column depending on the static pressure developed by the ventilation fans and the air flow required to be conveyed through the column.

The paper presents in detail the design and calculation of exhaust systems, the choice of suction pipes and nomograms in the choice of fans.

**Keywords:** industrial ventilation, design, speed nomogram, fan selection nomogram, exhaust fans

## **ASSESSMENT OF THE LEVEL OF IMPLEMENTATION OF METROLOGICAL TRACEABILITY REQUIREMENTS SPECIFIC TO MEASUREMENT EQUIPMENT IN THE LABORATORY FOR EXPLOSIVE MATERIALS AND PYROTECHNIC ARTICLES**

**Cristian Cioara<sup>1</sup>, Marius Morar<sup>1</sup>, Andrada Babuț<sup>1</sup> and Ligia Tuhuț<sup>1</sup>**

<sup>1</sup>INSEMEX Petrosani, G-ral V. Milea Street 32-34, Petrosani, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)

Corresponding author: Cristian Cioara, [cristian.cioara@insemex.ro](mailto:cristian.cioara@insemex.ro)

**Abstract:** The scientific article presents a synthesis on the analysis of the implementation of metrological traceability requirements specific to measuring equipment used for performing accredited tests in the field of explosives for civil use and pyrotechnic articles. In order to mitigate / minimize the risk related to the measurement uncertainty it is applied the proper traceability path in compliance with the requirements of the RENAR Policy, so that to ensure the availability of objective evidence for supporting metrological traceability, based on the documents of the implemented system. The general requirement for traceability in SR EN ISO / IEC 17025: 2018 is: The laboratory must establish and maintain the metrological traceability of its measurement results by means of an uninterrupted and documented chain of calibrations, each contributing to the measurement uncertainty, linking these results to an appropriate reference. It is an obligation of the laboratory to justify the need for calibration. In SR EN ISO/ IEC 17025: 2018, the additional traceability requirement for calibration laboratories is: The laboratory must ensure the traceability of the measurement results to the international SI system of units of measurement INSEMEX-GLI requests the calibration and the obtaining of calibration certificates for test equipment from entities that can ensure traceability under the RENAR P-05 policy, such as: a National Institute of Metrology whose services are adequate and covered by the CIPM MRA arrangement and are indicated by the inclusion of the CIPM-MRA logo; an accredited calibration laboratory whose services are adequate and the Accreditation Body is a signatory to the ILAC Arrangement (ILAC MRA). These services are indicated by the inclusion of the national accredited mark on the calibration certificates; a National Institute of Metrology whose services are adequate but not covered by the CIPM MRA arrangement; an accredited calibration laboratory whose services are adequate but not covered by the ILAC arrangement (ILAC MRA).

The periodicity of calibration of measuring and testing equipment is between 2 and 6 years, being established according to the following criteria: level of use, regime of use, accuracy and stability requirements imposed in operation, metrological reliability performances of the equipment, quality of the working environment, the manufacturer's recommendations regarding the stability of the equipment. At the same time, the modification of this period is performed when there are significant changes of one or more parameters taken into account in the previous assessment, and in case of failure of a measuring equipment provided with a calibration certificate, it has to be calibrated again after its' repair.

**Key words:** Metrological traceability, measurement equipment, calibration, measurement uncertainty, traceability path.

## IMPROVING THE PRODUCTIVITY OF GAS WELLS BY STIMULATING "TIGHT" FORMATIONS - PERSPECTIVES FOR CONTINUATION OF EXPLOITATION IN TRANSYLVANIA BASIN¶

**Diana-Andreea Lupu<sup>1</sup>, Lazăr Avram<sup>2</sup>**

<sup>1</sup>Lucian Blaga University of Sibiu, Faculty of Engineering, Department of Industrial Engineering and Management, Sibiu, Str. Emil Cioran, no.4, Romania

<sup>2</sup>Petroleum-Gas University of Ploiesti, Faculty of Petroleum and Gas Engineering, Ploiesti, Blvd. Bucharest, no.39, Romania

Corresponding author: Diana-Andreea LUPU, [diana.lupu@ulbsibiu.ro](mailto:diana.lupu@ulbsibiu.ro)

**Abstract:** The current circumstances of exploitation of natural gas fields in the Transylvanian basin under the rehabilitation concept which aims to maximize the productivity of wells and implicitly increase recovery factors, justifies the assessment of new perspectives for further exploitation of Badenian formations, in which gas accumulations are classified as being tight gas reservoirs types. The concept of stimulating productivity using high pressures in the Transylvanian basin has remained under the significance of the research, therefore it is appropriate to resume analysis of identifying new production technology by integrating new geological data acquired and other geophysical investigations. The current paper presents through a case study the process of identifying a candidate well for stimulation based on the geological-technological considerations, and then, performing a technical-economic analysis to support the proposed program.

The paper presents the lessons learned during stimulation campaign performed between 1994-1995 in some natural gas fields from Transylvanian basin were under an extensive program of research, testing and analysis using high pressure stimulation technology, which included 8 operations. The conclusions of this campaign are that the application of stimulation technology in the Transylvanian basin is still a challenge, even if the results obtained from the experimental campaign were not as expected. This type of treatment should not be excluded from the portfolio of technological options to increase the productivity of wells.

Considering the potential existence in Badenian formation, the case study presented aimed to identify a candidate well for high pressure stimulation on a gas field located in the northern group of the Transylvanian Basin.

After the reservoir description is made, are presented the geological-technical criteria for well selection, followed by productivity analysis of the well where production forecast it was performed in two options for continuation of the exploitation. Based on the economic analysis it was concluded that stimulation treatment intensifies the exploitation and the recovery of reserves is achieved in a much shorter period of time compared to conventional exploitation, in favorable economic conditions.

**Key words:** gas reservoirs, tight , productivity , stimulation, reservoir potential

## **EXPERIMENTATION OF A NEW TYPE OF PERMISSIBLE EXPLOSIVE UNDER THE SPECIFIC CONDITIONS OF THE JIU VALLEY MINES**

**Robert Laszlo<sup>1</sup>, Emilian Ghicioi<sup>1</sup>, Cristian Rădeanu<sup>1</sup>,  
Bogdan Garaliu – Bușoi<sup>1</sup> and Stefan Ilici<sup>1</sup>**

<sup>1</sup> National Institute for Research and Development in Mine Safety and Protection to  
Explosion – INSEMEX, 32-34 G-ral Vasile Milea street, Petrosani, Romania,  
robert.laszlo@insemex.ro, emilian.ghicioi@insemex.ro, cristian.radeanu@insemex.ro,  
bogdan.garaliu@insemex.ro, stefan.ilici@insemex.ro

Corresponding author: Robert Laszlo, robert.laszlo@insemex.ro

**Abstract:** The coal mines in the Jiu Valley are classified as mines with "methane gas regime", which led to the establishment additional security requirements imposed on blasting technologies and explosive materials. Given that the current used permissible explosive will no longer be available on the market, was need to replace it with a new emulsion permissible explosive type. The use of the new type of explosive involved its additional verification in laboratory conditions - in terms of safety parameters against methane and coal dust as well as underground experimentation, in order to establish the appropriate drilling & blasting parameters. For this purpose, was carried out a number of 40 underground experimental blasts at two coal mines. Given the differences in size and weight of the new emulsion explosive, in the experimental blasting work was particularly aimed to establish the maximum amount of explosive in the mine hole correlated with the performance of the blasting work and the ventilation requirements in the work fronts. Compared to the frame blasting patterns used for digging the galleries, blasting variants were tried with a 10 – 15 % reduction in the number of holes on the front, with the use of 300 - 450 - 600 gr. of explosive in the hole or altering the quantities of explosive loaded in the cut holes and at the bottom side of the fronts compared to those loaded in the stopping and profiling holes, respectively 450 gr. or 600 gr. with 300 gr. and 600 gr. with 450 gr. Quantities of 300 - 450 gr. of explosive in the hole were used for blasting in coal long walls, 450 gr. in the holes in the row from the bottom side and 300 gr. in the rest of rows. The parameters with reference to the results of the blasting works were monitored - breaking efficiency, profiling of the mining face at walls and roof, granulometry of the blasted rock, distance and disposition / geometry of the blasted rock from the front face, the granulometry of the blasted rock and the distribution by granulometric classes. Following the experimentation results, the most appropriate blasting patterns which can be applied have with less 10 % number holes and with a charge range per hole from 300 gr. up to 600 gr. of permissible emulsion explosive.

**Key words:** permissible explosive, emulsion, coal mine, drilling & firing pattern, experimental blast, safety.

## DETERMINATION OF GEOLOGICAL STRENGTH INDEX OF JOINTED ROCK MASS BASED ON IMAGE PROCESSING

**Popescu Sorin<sup>1</sup> and Tomuş Ovidiu-Bogdan<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, România

Corresponding author: Popescu Sorin, sorin.popescu@toposystem.ro







**Abstract:** More and more and on a larger scale, the Geological Strength Index (GSI) is used to design and to lead the mining activity. GSI is a unique system to classify rock mass, connected to parameters of resistance and deformity of rocks, based on criteria generalised by Hoek-Brown and Mohr-Coulomb. GSI can be estimated using standard tables on-site, through direct observation of rock surfaces inside subterranean or above-ground mining sites. The GSI diagram for rocks can be quantified by combining digital image processing, the theory of fractals and an artificial neuronal network (ANN).

The fractal dimension of the joints of rock masses can be used as an alternative instrument to quantify standard rock masses in the GS diagram.

The proposed method is comparatively objective and can be easily used to engineer subterranean and above ground mining activities.

This method of determining GSI based on image processing is already known and has been applied with success in multiple projects.

Table 1. Fractal dimensions according to the classification of rocks. By Hoek and Brown

Structure	Geological strength index for jointed rocks		Fractal dimension
	INTACT OR MASSIVE-intact rock specimens or massive in situ rock with few widely spaced discontinuities	90-100	0.99237
	BLOCKY-well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	60-90	1.36661
	VERY BLOCKY-interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets	40-60	1.51057
	BLOCKY/DISTURBED/SEAMY-folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity	20-40	1.68454
	DISINTERATED-poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces	10-20	1.71558
	LAMINATED/SHEARED-Lack of blockiness due to close spacing of weak schistosity or shear planes	0-10	1.59083

**Key words:** geological strength index (GSI), image processing, fractal dimension, artificial neural network (ANN)

## **THE IMPORTANCE OF SEISMIC PROTECTION OF STRATEGIC OBJECTIVES, IN THE AREA OF INFLUENCE OF USEFUL ROCK QUARRIES, IN WHICH BLASTING WORKS ARE CARRIED OUT**

**Bogdan Garaliu-Bușoi<sup>1</sup>, Attila Kovacs<sup>1</sup>, Edward Gheorghiosu<sup>1</sup>, Cristian Rădeanu<sup>1</sup> and Olga Miclea<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion –INSEMEX Petrosani, Department of Safety of Explosion and Pyrotechnic Articles, G-ral V. Milea Street 32-34, Petrosani, Romania, insemex@insemex.ro

Corresponding author: Bogdan Garaliu-Bușoi, bogdan.garaliu@insemex.ro

**Abstract:** In this scientific article was studied the main methods for assessing the seismic effect generated during the blasting operations with explosives, from quarries on essential infrastructure elements, in the analysed situation - railway tunnel and supporting pillars of the railway suprastructure in the adjacent area of the quarry, regarding the most appropriate technique for estimating and assessing the seismic effect through the specificity of the evaluated parameter.

In order to be able to carry out an activity with as little impact as possible on the environment, the economic operator carrying out career blasting works must apply technical measures to ensure the protection of civil / industrial objectives in the area close to carrying out these works.

The establishment of measures leading to the maintenance of the stability and integrity of the objectives, as well as to the protection of the environment, is based on an artificial earthquake assessment process, which highlights the possible effects on the adjacent area.

The evaluation of the seismic effect can be done by monitoring some parameters that characterize the seismic waves produced by quarry blasting such as: frequency of oscillations, amplitude of movement, soil particles oscillations velocity, acceleration of oscillations, duration of their manifestation.

Blasting works, whether surface or underground, concerns useful mineral substances or controlled demolition, are generating local earthquakes that can affect civil and industrial construction, or the stability of rocks in the area of the exploitation area.

The level of acceptability for earthquakes triggered by blasting works is correlated with the importance and vulnerability of the objectives to be protected.

INSEMEX's concerns concern these measurements and evaluations for all the works mentioned, stating that each case study has its own particularity, and neither the measurements nor the evaluation itself can be extrapolated to other similar works.

Following these measurement and evaluation actions, INSEMEX will be able to issue a Certificate attesting that the level of seismicity is acceptable for the given conditions.

**Key words:** blast charges; seismic waves, damage prevention, the oscillation velocity of soil particles.

## **THEORETICAL AND EXPERIMENTAL RESEARCH ON THE POSSIBILITY OF SALINE WATER EVACUATION FROM THE SUMP OF UNIREA SHAFT IN SLANIC MINE**

**Daniel Cosmin Vitan<sup>1</sup>, Sorina Stănilă<sup>1</sup>, Ionela Cristina Lăpăduși  
(Maceșeanu)<sup>1</sup>, Bogdan Brănișteanu<sup>2</sup>**

<sup>1</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering,  
University Street 20, Petrosani, Romania, [ime@upet.ro](mailto:ime@upet.ro)

<sup>2</sup>National Institute for Research and Development in Mine Safety and Protection to  
Explosion - INSEMEX, 32-34 G-ral Vasile Milea Street, Petrosani, Romania.

Corresponding author: Daniel Cosmin Vitan, [vitan.daniel.cosmin@gmail.com](mailto:vitan.daniel.cosmin@gmail.com)

**Abstract:** The paper approaches the necessity and implementation of a viable solution for constant saline water evacuation, and its transportation to the surface of the mine. A major problem in Slanic Prahova salt mine has been found to be water infiltration. Sump flooding is due to the high humidity condensation of the air circulating along Unirea sump, making a constant air exchange between the underground and the surface, at a temperature of 12-15 degrees. Water infiltration coming from ground water layers are also a factor favouring sump flooding.

Water infiltration in underground mines is a general and well-known problem, both at national and at international level. This problem is generally solved by digging close to the galleries and mounting water evacuation installations. Considering that Slanic Prahova Salt Mine there is no such atmosphere, we are allowed to design evacuation installations operating with electricity. On the other hand, the installation made up of absorption pipe, evacuation pipe and exhaust pipe to the mine surface, would have to work in corrosive atmosphere, due to saline water of maximum saturation.

As a result of the analytical calculations made in the previous chapter and the study of the technical offers, the following criteria should be applied in the choice of the pump in the evacuation of saline water: the pump should meet height criteria: evacuation at the height of 208 m, there being no possibility of placing an intermediary basin together with another evacuation pump; the flow rate of the pump should be minimum 2 m<sup>3</sup>/h, this not being so restrictive for us as the exhaust height; in order to simplify the necessity of the materials for the mounting of the exhaust pump, the diameter of the aspiration and exhaust pipe should be of the same size. The necessity of implementation of saline water evacuation system, from the shaft sump of Slanic Prahova salt mine comes from the fact that normal functioning of the winding installation requires this.

Metal and wood materials in the sump area are significantly deteriorated, and can be a threat for the visiting tourists transported with the winding installation, as well as for the lives of the workers, who make periodical verifications.

**Key words:** saline water, flooded sump, water infiltration, underground water evacuation, submersible pump.

## STUDY OF THE POSSIBILITIES OF CO<sub>2</sub> STORAGE IN THE UNDERGROUND CAVERNS OF DISSOLUTION SALT MINES

Sorin Popescu<sup>1</sup>, Mirela-Ancuta Radu<sup>2</sup>, Stela Dinescu<sup>3</sup> and Iulian Vlăduca<sup>4</sup>

<sup>1,3</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, România

<sup>2</sup>INSEMEX Petrosani, G-ral V. Milea Street 32-34, Petrosani, Romania

<sup>4</sup>National Research and Development Institute for Gas Turbines COMOTI Bucuresti, Iuliu Maniu Bd. nr. 220D, 061126, sect.6, România, [iulian.vladuca@comoti.ro](mailto:iulian.vladuca@comoti.ro)

Corresponding author: Popescu Sorin, [sorin.popescu@toposystem.ro](mailto:sorin.popescu@toposystem.ro)

**Abstract:** Evaluating the possibility to store CO<sub>2</sub> in salt mines is made complex because of the lack of necessary data and different mechanisms that act on different time scales. This analysis can be made using traditional methods of geographical survey, lab experiments and digital simulations. Storing of CO<sub>2</sub> needs to be done in a stable geological area. The cavity must be thoroughly analysed for dimensions, depth, permeability and porosity. Based on studies made by the University of Petroșani some areas subject to collapse have been monitored using topography and sonic measurements with the aim to understand their possible evolution.

Monitoring caverns and underground cavities is done using sonar. The sonar is a good instrument to manage a cavern, it increases its safety while it is being exploited and offers important data for the geomechanics model.

CavInfo software package has been specially created to analyse and show individual caverns or systems of caverns. CavView II software allows for results of cavern sonar surveys to be displayed in a variety of ways, with the added possibility to compare surveys, analysis of caverns and export of data. Sonar measures the profile of the cavern and displays volumetric results in two-dimensional plans (2D) or in isometric and tridimensional ones (3D). Drilling may be carried out periodically in order to estimate the change of the volume of the caverns and of the profile of the caverns (figure 1).

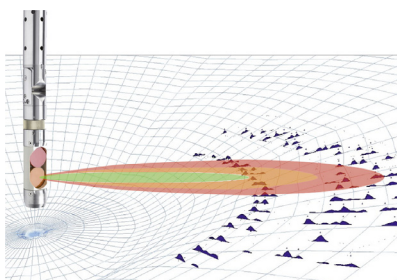


Figure 1. Profile of the cavern measured by a sonar

**Key words:** underground caverns, CO<sub>2</sub> storage, sonar, monitoring caverns



## 3D MODELLING OF COAL SEAMS FOR OPTIMIZATION OF EXTRACTION

Ábel Dániel Antonovits<sup>1</sup> and József Molnár<sup>2</sup>

<sup>1</sup> University of Miskolc, Institute of Mining and Geotechnical Engineering, Miskolc-Egyetemváros, Hungary, bgtabel@uni-miskolc.hu

<sup>2</sup> University of Miskolc, Institute of Mining and Geotechnical Engineering, Miskolc-Egyetemváros, Hungary, jozsef.molnar.dr@gmail.com

Corresponding author: Ábel Dániel Antonovits, bgtabel@uni-miskolc.hu

**Abstract:** Underground coal mining was finished in the north-eastern region of Hungary after its operation of more than two centuries, as a result of economic, technical, environmental and political reasons. A fairly significant part of the reserve is still available to extract. With a different perspective of coal mining, considering different ways of utilization (such as coal chemistry, etc.) the extraction of the material can still be cost effective. In the past few years, several studies were conducted regarding the possible utilization of the available reserve. The properties of the coal are highly mutable, therefore, comprehensive knowledge about the geology is indispensable. With the optimal coal face height, and the expected quality of mining products taken into consideration the two and three dimensional modelling of the reserve can be improved, which is not only important for the utilization, but for the mine planning and production phase also.

The used algorithm based on the 252 borehole consisting dataset. For the samples, ash content, moisture content, calorific value, heat of combustion, fixed carbon, -hydrogen and combustible sulfur content were determined. Using these core samples, which were divided in every 0,1 m, from three input parameters, the minimal and maximal extractable thickness and the expected minimal calorific value, the amount, the average calorific value and the slice thickness of the extractable coal can be calculated. Applying the method presented, the production can fulfil the desired requirements, which can be also implemented on the other previously mentioned parameters.

After the introduction of the calculation method, the results are presented in four cases, the slice thickness, as a function of the average calorific value, the average sulphur content, as a function of the thickness and the weight as a function of the thickness. This way, the correlation between the different parameters can be also examined.

With different input parameters, the process can be used to different kind of raw materials to determine required quality, quantity or technology-related parameters, thereby an improved model of the deposit can be created, which can be used to preform selective mining and can contribute to the economical production of the mine.

**Key words:** coal, quality, mining, modelling, production

## **MANAGEMENT OF AFFECTED AREAS BY THE POLLUTION OF THE SLAG AND ASH DEPOSITS OF CET MINTIA**

**Andreea Cristina Tataru<sup>1</sup>, Aurora Stanci<sup>2</sup>, and Dorin Tataru<sup>1</sup>**

<sup>1</sup> University of Petrosani, Department of Mechanical and Industrial Engineering and Transports, Universittii street, No.20, Petrosani, Romania

<sup>2</sup> University of Petrosani, Departament of Management, Environmental Engineering and Geology, Universittii street, No.20, Petrosani

Corresponding author: Andreea Cristina Tataru, andreeastanci@yahoo.com

**Abstract:** The technological processes from the combustion of certain materials in boilers results in significant amounts of slag and ash waste. Such industries that produce waste as slag and ash as a result of the process obtain electricity in the thermoelectric power plants. The biggest environmental problems caused by the thermoelectric power plants are air pollution and landscaping. In order to reduce the pollution caused by the slag and ash deposits, they should be ecologized upon completion of the slag and ash deposition process. An environmental management system aims at finding the most effective solutions for complying with environmental protection requirements. In this case, more economic solutions are needed to comply with the legislation. In this paper we will present a method of greening the slag and ash deposits of the thermoelectric power plants Mintia and the related costs. The Mintia - Deva Thermal Power Plant represents for a long time the third largest electricity generating unit in Romania. Due to the size of the installed power and the high degree of availability, safety and continuity in operation, the Mintia Thermal Power Plant is a basic source of electricity for the National Energy System. For the storage of slag and ash resulting from the burning of coal in the Mintia thermal power plant, two slag-ash deposits are used, one located in the major bed of the Mureş River, on the right bank, on an area of approx. 67 hectare (ha) and another in the place called Valea Bejan-Tâmăvița, at approx. 4 km from the thermal power plant, occupying an area of approx. 80 ha. The costs of rendering slag and ash deposits in the economic circuit are significant. For this reason, methods of productive recultivation have been proposed. By productive recultivation, greening costs can be amortized over time. In order to reintroduce the areas in the economic circuit, it is necessary to carry out specific preparation of the land surfaces of the slag and ash deposits. These mandatory procedures are very expensive. In order to compensate over time the costs of preparing the land, we proposed to render in the economic circuit of the land areas by cultivating them with vineyards, namely the vine.

**Key words:** management, slag, ash, protection, cost

## HEAVY METAL POLLUTION FROM DUST DEPOSITS IN URBAN AND INDUSTRIAL AREAS IN THE JIUL VALLEY

**Szollosi-Moța Andrei<sup>1</sup>, Prodan Maria<sup>1</sup>, Nălboc Vasilica Irina<sup>1</sup>, Șuvar Sonia Niculina<sup>1</sup>, Ianc Nicolae**

<sup>1</sup> National Institute for Research And Development for Mine Safety and Protection to Exlosion - Insemex, Department of Safety Mineral Recources, Petrosani, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)

Corresponding author: Szollosi-Moța Andrei, [andrei.szollosi@insemex.ro](mailto:andrei.szollosi@insemex.ro)

**Abstract :** The aim of this paper was to determine the concentration of heavy metals in dust samples by the method of analysis by inductively coupled plasma optical emission spectrometry (ICP-OES) and to assess the degree of pollution of the studied areas. The dust samples studied and subjected to analytical analyzes were collected from the vicinity of industrial areas and urban areas of localities in the Jiu Valley, a monoindustrial area. The main heavy metals determined were: Cu, Zn, Pb, Ni, Cr, Co etc. Dust particles depending on their origin can be inorganic or organic. Organic dust comes from plants or animals, an example of organic dust is dust that comes from handling grain. Inorganic substances in dust can come from the crushing of rocks or minerals, soil erosion processes, sand, coal, or loose materials. The main sources of soil and air pollution with dust are associated with the various phases of mining or industrial technological flows that have been taking place in the Jiu Valley: exploitation of useful minerals, transport of minerals or fossil fuels, processes of preparation and storage in dumps formed waste. In recent decades, the share of industrial activities has decreased significantly due to the process of mine closure. Soils can be polluted due to physical and chemical factors: changing the destination of land by excavation and processing of ore extraction and ore transport and tailings, the storage of the tailings from mining in dumps and that resulting from the processing of ores. In the vicinity of the tailings dumps and tailings ponds, tailings entrainment processes take place through meteorological factors, wind, rain, flooding, etc. The composition of street and surface dust is influenced by the various sources from which it comes: materials transported by water, soil erosion processes, deposits from soot and ash resulting from the use of fossil fuels in electricity production, building wear, wear asphalt and sidewalks, degradation of vehicle tires, wear of brake pads, operation of internal combustion engines, etc. Heavy metals along with other toxic substances have a negative effect even in extremely low concentrations, but the effects vary depending on the mode and duration of exposure and metabolism and the detoxification capacity of each body. Toxic mechanisms are varied and may include: inhibition of enzymatic processes, enzymatic potential, membrane damage as well as altered transport processes and decreased neuronal function. Some of these effects are synergistic with other minerals or toxic chemicals.

**Key words:** pollution, dust deposits, heavy metals, toxic

## **IDEAS FOR STORING CO<sub>2</sub> FROM THE TURCENI POWER PLANT, IN CLOSED MINING AREAS FROM THE JIU VALLEY, ROMANIA**

**Iulian Vladuca<sup>1</sup>, Ramona-Manuela Stanciuc<sup>1</sup>, Ana-Maria Obreja<sup>2</sup> and Doru Cioclea<sup>3</sup>**

<sup>1</sup> National Research and Development Institute for Gas Turbines COMOTI, 220D Iuliu Maniu Avenue, Bucharest, Romania

<sup>2</sup> University of Bucharest, Faculty of Geology and Geophysics, 6 Traian Vuia Street, Bucharest, Romania

<sup>3</sup> National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX, 32-34 G-ral Vasile Milea Street, Petrosani, Romania

Corresponding author: Iulian Vladuca, [iulian.vladuca@comoti.ro](mailto:iulian.vladuca@comoti.ro)

**Abstract:** Considering the Getica project, and the feasibility study in order to capture and storage CO<sub>2</sub> from the Turceni Power Plant and in view of the temporary cessation of this project, we propose a study on the storage of CO<sub>2</sub> in disused and closed mining areas, from the Jiu Valley, with impact on the environment and on exploitation and monitoring for long-term more than 1000 years and also alignment with similar projects in other countries, Europeans or not. The project location was thought out to be implemented in Gorj county, in the South West Development Region, at Turceni Energy Complex, Romania. Mainly, the majority of long-term capture and storage projects are carried out in deep-water aquifers, such as aquifers under the North Sea and the Barents Sea, or storage projects in dissolved salt mines, such as those in the Santos Basin in the Atlantic Ocean in Brazil, or with storage in volcanic rocks, India, etc. Structurally, in the Petrosani Basin over the foundation composed of crystalline schists and Mesozoic limestones, appears Aquitanian, Burdigalian, Tortonian and Sarmatian-Pliocene Oligocene formations (Lupei, 1968). The study of stratigraphic columns based on results of research drilling, mapping of horizontal mining works (transversal, directional) and geo-mechanical studies related of mining fields from Jiu Valley Basin, have shown the existence of a wide variety of sedimentary rocks (A. Ionica and others, 2020). Piessens and Dusar (2003) suggested some special requirements which need to be met in order to obtain a safe and stable reservoir with sufficient capacity. The medium of the reserves of coal in the not yet exploited mines from Jiu Valley, is about 110 million tonnes/mine. The medium deposit of methane in the coal is of 543 million m<sup>3</sup>/mine, and the medium potential of CO<sub>2</sub> that will replace the methane, about 16 million tonnes/mine (N. Ilias and others, 2013). The amount of CH<sub>4</sub> that can be extracted is approaching the 20 years lifetime of a high scale implemented project. For H<sub>2</sub> recovery, if we consider a such technology implemented, at \$1.48/kg H<sub>2</sub> produced (L. H. Ting and others), the ROI (return of investment) is around 22% in 20 years, a good value for such development scale. Because the hydrogen can be extracted also by coal gasification, results a great opportunity in reshaping the coal mining industry and transforming the Jiu Valley into green area.

**Key words:** Jiu Valley Basin, CO<sub>2</sub> storage, geological storage, closed coal mines, H<sub>2</sub> recovery.

## **THE QUALITY OF THE ENVIRONMENT IN THE ROSIA OF JIU QUARRY AS A RESULT OF THE USE OF CATERPILLAR 323D L AND 323D LN EXCAVATORS**

**Bogdan Ioan Marc<sup>1</sup>, Alexandra Stanimirescu Soica<sup>1</sup> and Radu Sorin Mihai<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, Romania

Corresponding author : Bogdan Ioan Marc, bogdanmarc94@yahoo.com

**Abstract:** This paper studies the Rosia of Jiu quarry area from Romania. It is considered the largest mining quarry in Europe, but also the one with the largest excavators in Europe. Although it is a quarry of impressive sizes, the extracted coal is of inferior quality and low calorific value. It is used as fuel in thermal power plants.

This paper studies the working of hydraulic excavators found in the Rosia quarry and how their activity affects the environment. The D-Series hydraulic excavators are very easy to operate, have an impressive lifting capacity and use fuel efficiently, thus reducing operating costs. For this paper we chose 323D L hydraulic excavators and 323 D LN. These were observed over a period of 30 days, during which time we collected data on PM 10  $\mu\text{m}$  particles resulting from their drilling activity, and data on noise levels. PM 10  $\mu\text{m}$  suspended particles were measured using the HPM32322550 sensor which uses laser-based light scattering to detect both 2.5 $\mu\text{m}$  and 10 $\mu\text{m}$  particles. Noise level was measured using a Noise Level Sensor. The data read by the sensors are collected in a database for their verification, validation and maintenance, and the results obtained are transmitted to the users. The tests for this paper were performed over a period of 30 days at intervals of 4 hours per day. When performing the measurements, all the norms and laws in force were taken into account, the measurements being performed in accordance with Law no. 104 / 15.06.2011, ISO 14001: 2015 standard and GD.493 / 12.04.2006. Measurements for the detection of PM10 particles were made at 8, 12, 14 and 20 o'clock and it was observed that, although there were periods of time in which the values exceeded 98 units, there were also a considerable number of periods when the values were within the values provided by law. The noise level produced by Caterpillar excavator engines varies from 32 dB to 102 dB.

The evolution of excavators has led to a more efficient way of working both in terms of production and costs and effects on the environment. Their efficient way of working has led to an increase in production and a decrease in the level of pollution in the Roşia quarry area. Following the measurements performed, we can say that the environmental pollution in the Roşia quarry area is decreasing, but not small enough to be able to frame the environment in an unpolluted one.

**Key words** environment, pollution, quarry, excavators, law

## A PROPOSED SCENARIO TO CHARACTERIZE COSTUMERS' PERCEPTIONS ON SOCIAL RESPONSIBILITY

**Iudit Bere Semeredi<sup>1</sup>, Cristina Borca<sup>2</sup>, Anca Draghici<sup>3</sup>,  
Diana Robescu<sup>4</sup> and Dana Fatol<sup>5</sup>**

<sup>1, 3, 4, 5</sup>Politehnica University Timișoara, Faculty of Management in Production and Transportation, 14 Remus str., Timisoara, Romania, [iudit.bere-semeredi@student.upt.ro](mailto:iudit.bere-semeredi@student.upt.ro), [anca.draghici@upt.ro](mailto:anca.draghici@upt.ro), [diana.robescu@student.upt.ro](mailto:diana.robescu@student.upt.ro), [dana.fatol@student.upt.ro](mailto:dana.fatol@student.upt.ro)

<sup>2</sup>Aquatim SA, 11/A Gheorghe Lazar str., Timisoara, Romania, [cristina.borca@aquatim.ro](mailto:cristina.borca@aquatim.ro)

Corresponding author: Iudit Bere Semeredi, [iudit.bere-semeredi@student.upt.ro](mailto:iudit.bere-semeredi@student.upt.ro)

**Abstract:** Water and sewer companies face the challenge of improving customers' satisfaction, simultaneously with their awareness on environmental issues. Results provided by surveys are essential for environment management and to monitor customer perception on services quality. However, their activity is strongly linked with social responsibility because they provide vital services to communities. This study proposes an innovative approach based on a longitudinal study that makes possible the comparison of the customers' perception on the provided services that have been linked with social responsibility dimensions, in the case of the water company Aquatim, Timisoara, Romania; this is a public water supply and sewerage operator located in the Timis county, in the western part of Romania. The proposed research scenario (figure 1) aims improving the communication strategy when developing social responsibility activities and actions that prompt services quality improvements.

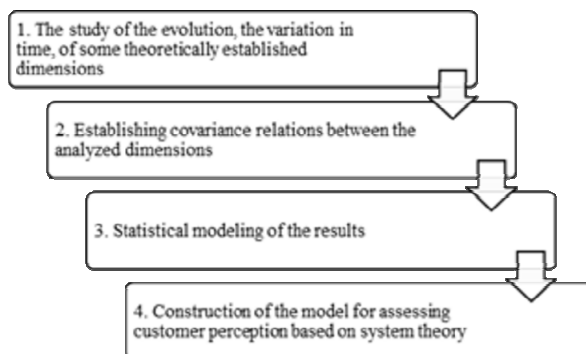


Figure 1. The experimental research scenario.

**Key words:** Water sector, services quality, social responsibility, environmental awareness, research, methodology.

## A LONGITUDINAL STUDY DEVELOPED TO CHARACTERIZE COSTUMERS' PERCEPTIONS ON SOCIAL RESPONSIBILITY

Iudit Bere Semeredi<sup>1</sup>, Cristina Borca<sup>2</sup>, Anca Draghici<sup>3</sup>,  
Larisa Ivascu<sup>4</sup> and Dana Fatol<sup>5</sup>

<sup>1, 3, 4, 5</sup>Politehnica University Timișoara, Faculty of Management in Production and  
Transportation, 14 Remus str., Timisoara, Romania, [iudit.bere-semeredi@student.upt.ro](mailto:iudit.bere-semeredi@student.upt.ro),  
[anca.draghici@upt.ro](mailto:anca.draghici@upt.ro), [larisa.ivascu@upt.ro](mailto:larisa.ivascu@upt.ro), [dana.fatol@student.upt.ro](mailto:dana.fatol@student.upt.ro)

<sup>2</sup>Aquatim SA, 11/A Gheorghe Lazar str., Timisoara, Romania, [cristina.borca@aquatim.ro](mailto:cristina.borca@aquatim.ro)

Corresponding author: Iudit Bere Semeredi, [iudit.bere-semeredi@student.upt.ro](mailto:iudit.bere-semeredi@student.upt.ro)

**Abstract:** Water and sewer companies face the challenge of improving customers' satisfaction, simultaneously with their awareness on environmental issues. Results provided by surveys are essential for environment management and to monitor customer perception on services quality. The descriptive analysis (based on a longitudinal analysis of the available data from four surveys developed in 2009-2019) aims characterize the customers' perception on social responsibility dimensions in the case of the water company Aquatim of Timisoara, Romania. This is the basis for the communication strategy definition for its efficiency increasing from both perspectives: (1) customers, community, and (2) company. The theoretical and experimental approach characterizes aspects of customers' ecological awareness ( $Environmental\ awareness = f(Wastewater\ treatment + service\ payment\ wastewater\ treatment\ plant)$ ) and customers' satisfaction ( $Customers'\ Satisfaction = f(service\ satisfaction + requests / complaints\ solving + interaction\ with\ company\ employees)$ ) that have impact on redefining social responsibility policies of the company. The regression analysis has been used to describe the research results and their impact.

Based on the statistical data analysis of the longitudinal analysis, it has been represented the theoretical model relative to the customers' perceptions on social responsibility in the case of Aquatim water company and for the available data from 2005 to 2019).

**Key words:** Water sector, social responsibility, environmental awareness, customers' satisfaction, longitudinal analysis.

**THE USE OF POLYURETHANE FOAM WASTE RESULTING FROM THE TECHNOLOGICAL PROCESSES OF INSULATION OF REFRIGERATION ENCLOSURES IN OBTAINING CONSTRUCTION PANELS WITH SOUND-ABSORBING AND THERMALLY INSULATING PROPERTIES**

**Laurențiu Marin<sup>1</sup>**

<sup>1</sup>National Institute for Research and Development in Chemistry and Petrochemistry – ICECHIM Bucharest, andree\_marr@yahoo.co.uk

Corresponding author: Laurentiu Marin, andree\_marr@yahoo.co.uk

**Abstract:** Refrigerated enclosures - refrigerators, refrigerated units, vans for transporting perishable goods are thermally insulated with polyurethane foam . The insulation process involves the pressure injection of the component reactants into the spaces to be insulated. Following the polyaddition reaction, the foaming-expansion process takes place with an increase in volume . Finally, a spongy polymeric mass is obtained, which filled the spaces where insulation had to be carried out and which also generated an excess of material which is subsequently removed by mechanical means. Excess material results from the initial dosage of the insulation material and must exist to ensure that the spaces to be insulated are completely filled. Polyurethane foam waste is a real problem for several reasons. With a large volume, it takes up a lot of storage space with unpleasant consequences, polyurethane foam is a slightly non-degradable reactive material that persists in the environment. The combustion of polyurethane foam waste is not an option to be adopted because the combustion, in addition to CO<sub>2</sub>, also results a series of particularly toxic substances : isocyanates, phosgene, cyan. The researches identified a process for the superior use of this waste - which also materialized in a patent application *A 2020-00057 / 07.02.2020 Sound-absorbing structure from polyurethane waste* and it result from the research contract 51PCCDI / 2018. Thus, the polyurethane foam waste is crushed to a granulation of 8 - 10 mm. The material thus obtained is mixed with a polyurethane binder in a proportion of 1 granulated waste 2 polyurethane binder. This mixture is placed evenly on the surface of a construction panel and another panel is placed on top. Finally, a layer is obtained which has in the middle the granular structure made of the mixture of crushed polyurethane binder waste. The polyurethane binder also achieves the adhesion of the structure to the wall of the panel.

**Key words:** insulation, polyurethane waste, sound-absorbing, construction panels



## LONG-TERM STABILITY OF THE FINAL SLOPES OF THE MINING WASTE DUMPS FROM OLTENIA

Lazăr Maria<sup>1</sup>, Faur Florin<sup>2</sup>, Apostu Izabela-Maria<sup>3</sup> and Rada Constantin<sup>4</sup>

<sup>1</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, marialazar@upet.ro

<sup>2</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, faurfloring@yahoo.com

<sup>3</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, izabelamaria.nyari@yahoo.com

<sup>4</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, constantin.rada1965@gmail.com

Corresponding author: Faur Florin, faurfloring@yahoo.com

**Abstract:** The waste dumps resulted from the lignite exploitation activities from Oltenia are constructions that reach, in most cases, impressive dimensions and store large volumes of sterile rocks. Usually, the dumps are arranged and ecologically restored, but between the moment of their release from technological tasks and the beginning of the arrangement works, periods of time, measured even in years, can pass. The calculations regarding the geometry of the waste dumps are performed in the design stage, taking into account the mechanical strength characteristics of the mixture of sterile material that forms them, so as to ensure a sufficient stability reserve during the construction period and when the projected storage capacity is achieved. If the arrangement and ecological restoration works do not start immediately after the depositing activity is stopped, the exposure of loose and disaggregated material to the influence of external factors (especially erosion and rainfall infiltration) can lead to landslides with disastrous consequences on natural and anthropogenic objectives located in the influence area.

Among the objectives of the performed stability analyses were the verification of the stability conditions of the individual dump steps and the establishment of the dependence between humidity and stability over time. It was observed that when only structural cohesion is considered to be maintained over time, taking into account Maslov's 2<sup>nd</sup> criterion and the thixotropic behavior of clayey rocks, the stability coefficient is reduced by about 25%. From the analyses performed, it is clear that the humidity of the rocks in the waste dump greatly influences the stability reserve, causing a substantial reduction of it over time.

As waste dumps store large volumes of tailings and their slide endangers all objectives located in their area of influence, a safety factor of 1.3 (a 30% stability reserve) is currently recommended. However, given the fact that over time there are deformations in the body of waste dumps, significant amounts of water infiltrate from precipitation, and the stability reserve decreases by about 25%, rethinking the geometry, as well as increasing the required long-term stability reserve to at least 50%, especially in the case of large dumps, is required.

**Key words:** instability, landslides, mining, rheology, slopes, waste dumps.

## COMPARATIVE STUDY REGARDING THE CAUSES OF LAND INSTABILITY PHENOMENA IN THE AREA OF THE GETIC SUBCARPATHIANS

**Rada Constantin<sup>1</sup>, Lazăr Maria<sup>2</sup>, Faur Florin<sup>3</sup> and Apostu Izabela-  
Maria<sup>4</sup>**

<sup>1</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, constantin.rada1965@gmail.com

<sup>2</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, marialazar@upet.ro

<sup>3</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, faurfloring@yahoo.com

<sup>4</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, izabelamaria.nyari@yahoo.com

Corresponding author: Faur Florin, faurfloring@yahoo.com

**Abstract:** The Getic Subcarpathians of Romania represents an area, with great extension, which is naturally prone to landslides. In general, this predisposition of the mentioned area to landslides is favoured by its geology and hydrogeology, its lithological structure, its morphology, the rainfall regime and to a lesser extent the tectonics of the region. In this paper, we have conducted a comparative study aimed at highlighting in a more concrete manner the causes that led to the onset of land instability phenomena recorded in the past 17 years in this area (taking into account the human activities). For this purpose, we delimited three study areas, corresponding to the counties of Gorj (area with shutdown mining activities), Vâlcea (area with lignite open-pits in operation) and Argeş (infrastructure constructions, especially by excavation, other constructions and also deforestation).

Based on those presented in this study, some general conclusions can be drawn valid for the entire area of the Getic Subcarpathians:

- the lithological composition of the Getic Subcarpathians consists of clays, sandstones, marls, conglomerates, sands, etc. The artificial earth constructions, represented by mining waste dumps, consist of a heterogeneous mixture of these sedimentary rocks;
- heavy rainfall and snow melting are the main cause for the occurrence of landslides;
- open pit mining influences the number and intensity of landslides more than other anthropogenic interventions, involving the entrainment of much larger volumes of rocks;
- reactivation of landslides is manifested mainly in the areas of mining perimeters In Argeş County, their reactivation is sporadic, affects limited areas and involves small volumes of material.

The absence of stability improvement engineering works caused the repeated manifestation of landslides and other geostructural phenomena that affected households and road infrastructures of local or national importance.

**Key words:** Getic Subcarpathians, instability, landslides, mining, slopes.

## ENVIRONMENTAL MODELLING - A MODERN TOOL TOWARDS SUSTAINABILITY

Gelu Madear<sup>1</sup>, Camelia Madear<sup>2</sup>

<sup>1</sup>ECO-ROCCA Engineering, 3, Mihai Viteazu Street, Petrosani, Romania,  
[gelu.madear@eco-rocca.ro](mailto:gelu.madear@eco-rocca.ro)

<sup>2</sup>University of Petrosani, Department of Environmental Engineering and Geology, University Street 20, Petrosani, Romania, [cameliamadear@upet.ro](mailto:cameliamadear@upet.ro)

Corresponding author: Gelu Madear, [gelu.madear@eco-rocca.ro](mailto:gelu.madear@eco-rocca.ro)

**Abstract:** One way to solve environmental problems is through modelling. Humankind developed a series of models, from mental models, physical models to computer simulation models. Building a model assumes abstraction, simplifying the natural system by considering only the essential details and discarding irrelevant ones. Mapping the real worlds to the world of models is done by choosing an abstraction level and the corresponding modelling tool. The right abstraction level is paramount for any modelling project, depending on the real problem being analysed. As shown in Figure 1, there are three simulation modelling methods, each serving a class of specific problems. System Dynamics (SD) is mainly used for strategic modelling, whereas Discrete Event (DE) modelling is used for a medium and low-abstraction class of problems. Agent-Based (AB) models have a more comprehensive range of applications:

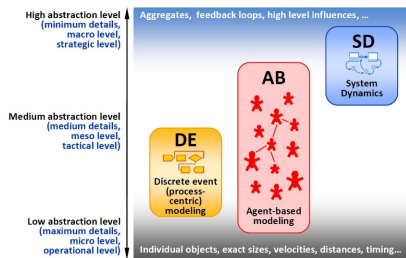


Figure 1. Simulation methods based on abstraction level

Ecosystems and generally any environmental problems (real world) are complex dynamics that challenge our comprehension. Understanding the significant environmental challenges is vital to adopt adequate policies for a sustainable environment through modelling and simulation. Simulation can be used in a wide range of environmental problems, from predator-prey models to climate change problems as presented in this paper, and it is very helpful in interdisciplinary modelling. Systems Dynamics and Agent-Based Modelling and Hybrid Modelling are the most used and recommended methods for Environmental Modelling.

**Keywords:** environmental modelling, sustainability, system dynamics, abstraction, simulation

## IDENTIFICATION OF POLLUTION SOURCES IN CLOSED MINING SITES WITH AN IMPACT ON THE QUALITY OF SURFACE WATER IN THE BRAD AREA

**Emilia-Cornelia Dunca<sup>1</sup>, Tiberiu Rusu<sup>2</sup>, Dorin Iancu<sup>3</sup>**

<sup>1</sup>University of Petroșani, Department of Environmental Engineering and Geology, University Street 20, Petroșani, Romania, E-mail: [emiliadunca@upet.ro](mailto:emiliadunca@upet.ro)

<sup>2</sup>Technical University of Cluj Napoca, Department of Environmental Engineering and Sustainable Development Entrepreneurship, Bd. Muncii 103-105 Cod 400641 Cluj-Napoca, Romania, E-mail: [tiberiu.rusu@imadd.utcluj.ro](mailto:tiberiu.rusu@imadd.utcluj.ro)

<sup>3</sup>National Commission for the Control of Nuclear Activity, B-dul. Libertatii, Nr. 14, Sector 5, Bucharest, Romania, E-mail: [dorin.iancu@cncan.ro](mailto:dorin.iancu@cncan.ro)

Corresponding author: Emilia-Cornelia Dunca, [emiliadunca@upet.ro](mailto:emiliadunca@upet.ro)

**Abstract:** Pollution caused by mining activities is particularly difficult to treat because it has been around for a very long time. Water pollution comes from the large-scale disturbance of the land on which the underground exploitation of the useful mineral substance took place. Discharges from underground mines can be treated as diffuse point sources; water quality is due to reactions that occur in an area that can cover tens of square kilometers. The main sources are groundwater, which increases after stopping pumping, and tailings stored in dumps and tailings ponds. When the mine closes, the pumps are stopped and the groundwater level rises until it reaches the surface or discharges into the aquifers above. Although discharges from wells and galleries are often the most visible sources, surface activities such as mineral processing, tailings and waste disposal are also a significant source of pollution. These are often spread over a large area and many small individual discharges can be added to create a meaningful diffuse source. Barza Valley brook, which is located on Barza Valley, where the Barza mine was located, where gold and silver ores were mined. The diffuse nature of mine water pollution is best demonstrated by the results of the following recent basin investigations. These were carried out to establish the relative contribution of diffuse and point sources to the overall water quality in receiving rivers. The flows and water quality in the Barza Valley brook and at the point sources for over a year in meteorological conditions with precipitation and drought were investigated. In the case of low flow, diffuse sources accounted for about 50% of the pollutant load. In the case of high flows, it has increased to over 95%. The study confirmed that diffuse inputs from tailings dumps, the entrainment of previously deposited iron-rich sediments and the direct input of groundwater through the creek bed are often more important than point sources and discharges. The paper aims to identify the sources of surface water pollution in the Barza closed mining site that influences the quality of surface water.

**Key words:** pollution, dump, tailings pond, mining site, mine water, diffuse sources

## **MONITORING THE NOISE LEVEL AROUND THE JIU VALLEY MINES USING BRUEL&KJAER NOISE DOSE METER TYPE 4448**

**Alexandra Stanimirescu Soica<sup>1</sup>, Florin Flavius Soica<sup>2</sup>, Angela Egri<sup>3</sup> and Mirela Ancuța Radu<sup>4</sup>**

<sup>1,3</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, Romania

<sup>2</sup>S. CEH SA, University Street 20, Petrosani, Romania,

<sup>4</sup>INCD INSEMEX, General Vasile Milea Street 32-34, Petrosani, Romania

Corresponding author : Alexandra Stanimirescu Soica, [alexandra\\_valynikalay@yahoo.com](mailto:alexandra_valynikalay@yahoo.com)

**Abstract:** The purpose of the paper is to determine the noise level and how it can be reduced so that it falls within the limits imposed by law. Noise pollution is the spread of noise on the environment and its effects on the human and animal body. Worldwide, the source of external noise is mainly determined by transport and industrial equipment, but also by poor urban planning. We conducted a study of the noise level in three key points in the Jiu Valley, namely the perimeter of the Livezeni mine, the perimeter of the Lupeni mine and the perimeter of the Vulcan mine. The Jiu Valley is a region in southwestern Transylvania, Romania, in Hunedoara county, situated in a valley of the Jiu River between the Retezat Mountains and the Parâng Mountains. The region was heavily industrialised and the main activity was coal mining, but due to low efficiency, most of the mines were closed down. The region was populated since ancient times, being part of Dacia. During the Middle Ages, the inhabitants of the Jiu Valley lived in huts spread along the mountains, and often near the river, and the main activity was shepherding. The development of coal mining started in the Jiu Valley about 160 years ago, around the middle of the 19th century, when Hungarian, German, Czech and Polish workers were brought from all parts of the Habsburg Empire to work in the coal mines.

For the measurements we chose Personal Noise Dose Meter Type 4448. This helps to measure and collect data to evaluate noise exposure. Type 4448 measures all parameters required by the ISO, ANSI and OSHA standard. The measurements were performed over a period of three months, namely December 2020, January 2021 and February 2021 at different times of the day. The three months were divided into periods of ten days, at the end of which the average was presented. In terms of noise and vibration, it must be taken into account that the mining units are located in the perimeter of the localities, near the residential neighborhoods and for this reason they can become the main factor responsible for noise pollution. The measurements carried out at a distance from the above-mentioned premises do not indicate exceedances of the rules in force. It can be concluded that the noise due to mining activities has a rather influential aspect in terms of occupational safety and security and not directly on human health.

**Key words** environment, noise, pollution, mines, sensors

## STUDY OF PHOTOVOLTAIC SYSTEMS USING MODELLING AND SIMULATION

Aurelian Nicola<sup>1</sup>, Cosmin Vitan<sup>1</sup>, Cristian Aron<sup>1</sup>, Daniel Matei<sup>1</sup> and Ionela Grecea<sup>1</sup>

<sup>1</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, Romania, [ime@upet.ro](mailto:ime@upet.ro)

Corresponding author: Cosmin Vitan, [vitan.daniel.cosmin@gmail.com](mailto:vitan.daniel.cosmin@gmail.com)

**Abstract:** The article presents mathematical models and simulation programs, made in MATLAB - Simulink, of the main components within photovoltaic system. For the continuous supply of electricity to consumers, in addition to photovoltaic panels are used electric accumulators and static converters, which have the role of converting direct current into alternating current or alternating current into direct current and to monitor and control the charging–discharge batteries process. The assembly consisting of all the elements presented above, interconnected and dimensioned to operate in a single system, is modelled and simulated and the results obtained reflect the limits but especially offers the possibility of choosing the optimal solution for a park of energy production based on solar radiation, Figure 1. Continuous evolution of humanity is closely related to consumption of electricity, with development of society (increasing dependence on comfort), has led to both increased pollution and declining sources of fossil fuels. Under these limiting conditions, priorities of energy stability policies are represented by energy efficiency and environmental protection. A solution to related issues is to increase generation of energy from renewable sources, where the sun is a clean source of inexhaustible energy.

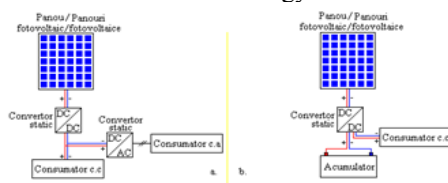


Figure 1. Autonomous photovoltaic systems (SFA) – a. without energy storage; b. with energy storage

Paper makes a constructive and functional classification of photovoltaic systems, components of these systems, this are modelled and simulated and results of simulations show limits but especially offer possibility of choosing the optimal solution for an energy production park based on solar radiation. Simulation programs, presented in this article can be applied for more complex photovoltaic systems, being of real use for those interested in this field in order to design such photovoltaic systems.

**Key words:** renewable energy, solar radiation, photovoltaic systems, modelling and simulation

## COMPARATIVE MEASUREMENTS BETWEEN THE RESULTS ACHIEVED WITH REFERENCE METHOD AND THE OPTICAL METHOD FOR DETERMINATION OF PM10 DUSTS IN AMBIENT AIR

Marius Kovacs<sup>1</sup>, Angelica-Nicoleta Călămar<sup>2</sup>, Lorand Toth<sup>3</sup>, Sorin  
Simion<sup>4</sup>, Alexandru Simion<sup>5</sup>

<sup>1</sup>INSEMEX Petroșani, 32-34 G-ral Vasile Milea, Petroșani, Romania, [marius.kovacs@insemex.ro](mailto:marius.kovacs@insemex.ro)

<sup>2</sup>INSEMEX Petroșani, 32-34 G-ral Vasile Milea, Petroșani, Romania, [angela.calamar@insemex.ro](mailto:angela.calamar@insemex.ro)

<sup>3</sup>INSEMEX Petroșani, 32-34 G-ral Vasile Milea, Petroșani, Romania, [lorand.toth@insemex.ro](mailto:lorand.toth@insemex.ro)

<sup>4</sup>INSEMEX Petroșani, 32-34 G-ral Vasile Milea, Petroșani, Romania, [sorin.simion@insemex.ro](mailto:sorin.simion@insemex.ro)

<sup>5</sup>INSEMEX Petroșani, 32-34 G-ral Vasile Milea, Petroșani, Romania, [alexandru.simion@insemex.ro](mailto:alexandru.simion@insemex.ro)

Corresponding author: Marius Kovacs, [marius.kovacs@insemex.ro](mailto:marius.kovacs@insemex.ro)

**Abstract:** According to the Integrated National Plan in the field of Energy and Climate Change 2021-2030, Romania must implement a program to reduce impact on atmosphere, including air quality monitoring, thus leading to an increase in the number of monitoring points and an increase in the number of samples required for monitoring.

In general, the efficiency of samplers / devices is influenced by several factors such as: speed, humidity, temperature, barometric air pressure, etc.

The wide range of different dusts and particle sizes in the ambient air, has led to diversification of sampling and quantification equipment for the aforementioned fractions.

Currently, PM10 dust monitoring stations use the gravimetric method, consisting in absorbing a known volume of air on filters and weighing the dust deposited on them. As the use of this method requires a minimum of 3 days, it is necessary to apply an alternative measuring method, with short response time, namely the optical method.

During 17 ÷ 21.02.2021, comparative measurements were performed with the two devices, namely the reference gravimetric device LVS-PM10 and the optical device FIDAS, within the industrial premises of an economic unit, where heat treatment technology of metallic, non-metallic and other materials parts is applied, from whose production hall's chimneys gases and powders were evacuated.

Analysis of values determined for a continuous period of 24 hours with the LVS gravimetric device, showed that the highest concentration of PM10 (46.62 µg/m<sup>3</sup>) was recorded during 18÷19.02.2021, in the eastern part of the administrative building, and the lowest (28.45 µg/m<sup>3</sup>) in the southern part of the building.

Parallel experimentation of the two measuring devices that use different principles was performed in several series of measurements at an economic agent that has the obligation to monitor dust at premises borders.

Results obtained from comparison of the two devices can support future researchers in order to find limitations of the optical method of measuring PM10 dusts and to validate the method, in order to use it routinely.

**Key words:** first aid, intervention, semi-automatic defibrillation, resuscitation manoeuvres

## DETERMINATION OF THE CHEMICAL COMPOSITION OF THE RESIDUAL POWDER IN ORDER TO IDENTIFY THE SOURCE OF RELEASE

Niculina Sonia Șuvar<sup>1</sup>, Maria Prodan<sup>1</sup>, Andrei Szollosi-Moța<sup>1</sup>, Irina Nălboc, and Aurelian Nicola<sup>2</sup>

<sup>1</sup>INSEMEX Petrosani, Department for Safety of Mineral Resources, 32-34 Gen. Vasile Milea Street, Petrosani, Romania,  
[sonia.suvar@insemex.ro](mailto:sonia.suvar@insemex.ro), [maria.prodan@insemex.ro](mailto:maria.prodan@insemex.ro), [andrei.szollosi@insemex.ro](mailto:andrei.szollosi@insemex.ro),  
[irina.nalvoc@insemex.ro](mailto:irina.nalvoc@insemex.ro)

<sup>2</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, Romania, [aureliannicola@upet.ro](mailto:aureliannicola@upet.ro)

Corresponding author: Niculina Sonia Șuvar, [sonia.suvar@insemex.ro](mailto:sonia.suvar@insemex.ro)

**Abstract:** In order to ensure the protection of human health, knowing the aspects regarding the environmental factors is an essential activity. Particles in suspension are small fragments of solids or liquids that can float in the air. Prolonged exposure to these particles, especially those with an aerodynamic diameter below 10 μm, can lead to the occurrence of various diseases, from inflammation and intoxication to lung cancer, asthma or cardiovascular diseases. Airborne particles come mainly from pollutant emissions generated by industry, traffic, home heating, etc. The paper aims to establish the source of release for two samples of residual powder collected from different location of a production hall, based on determination of their chemical composition. Using the FTIR (Fourier Transform Infrared Spectroscopy) method with the ATR (Attenuated Total Reflectance) module and the X-ray spectrometry method, the two dust samples were analyzed directly on samples. One liquid sample was subjected to a drying process, the analysis being performed on the dust obtained after drying, by the FTIR-ATR method. Due to the identification of the silicon dioxide peak, the three samples were analyzed for metal content by X-ray spectrometry to determine the approximate silicon dioxide content. FTIR measurements were performed using the Nicolet IS 50 FTIR spectrometer with ATR mode included. The Hitachi X-MET8000 Geo portable XRF spectrometer was used for X-ray spectrometry analysis. To determine metal concentrations: Al, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Zn, Be, Bi, As, Ca, Li, Mg, Na, Sr, Sb, Ti, V, Se, Te, from liquid and solid samples, the method of inductively coupled plasma optical emission spectrometry (ICP-OES) was used, respectively the Perkin Elmer ICP-OES equipment. Following the analyses, it may be concluded that the two dust samples analyzed come from the same source, representing micronic powders resulted from the use of the compound ULTimod 01 – Precoating powder, while the analyzes of the liquid sample shown no similarities or common peaks with the other two samples, so it can be said that the two powders cannot come from its use. The three analytical techniques provided a versatile tool for achieving the proposed goal.

**Key words:** Powders, FTIR, ICP-OES, XRF, particles in suspension.



## ENVIRONMENTAL MONITORING ODDS BY CARBON NANOTUBES

**Marwan Mousa<sup>1</sup>, Ildiko Tulbure<sup>2,3,4</sup> and Saleh Fawaer<sup>5</sup>**

<sup>1</sup>Mu'tah University, Department of Physics, Al-Karak, Jordan, mmousa@mutah.edu.jo

<sup>2</sup>University "1 Decembrie 1918" Alba Iulia, Department of Cadastre, Urban and Environmental Engineering, Unirii Street 15-17, Alba Iulia, Romania,

<sup>3</sup>Technical University of Cluj-Napoca, Doctoral School "Materials and Environmental Engineering", C-tin Daicoviciu Str. 15, Cluj-Napoca, Romania

<sup>4</sup>Clausthal University of Technology, Adolph Roemer – Str. 2A, Clausthal-Zellerfeld, Germany, ildiko.tulbure@uab.ro

<sup>5</sup>University of Jordan, Jordan, salehfawaer@gmail.com

Corresponding author: Ildiko Tulbure, ildiko.tulbure@uab.ro

**Abstract:** After the Conference for Environment in Stockholm in 1972 and the first report to the Club of Rome „Limits to Growth“, which has been published in same year, was finally understood, that besides wanted effects of technological advance, undesired unintended effects can arise. Since then a lot of reports have been published in an attempt to accurately emphasize this dilemmatic situation. Currently humanity is confronting with several global challenges, which can be grouped in three categories, as growth of the world population, increase of energy and natural resources consumption, and environmental pollution. Usually they are called "old" global challenges, in the meantime other stringent issues having had emerged, being called "new" global challenges. For instance issues related to the use of ICTs or biotechnologies could be mentioned in this category. As a consequence of recognized facts debates have started concerning potential solutions, which could be worldwide applied, independently of realities in each country. After long debates on scientific and socio-political levels, the concept of Sustainable Development has emerged and been 1987 defined in the Brundtland Report of the World Commission on Environment and Development. Sustainable Development was debated 1992 on the Conference for Environment and Development in Rio de Janeiro, known as "Rio" - Conference, as well as in the conference closing document, „Agenda 21“. Many actions after this time, as for instance the "Rio + 10" - Conference or "Rio + 20" - Conference emphasize that the evolution of technical, economic, as well as environmental and social systems has to be approached in synergetic relation by considering physical, chemical, biological, economic and social processes with the goal of successfully operationalizing sustainable development. Deep researches in this pretty new field are still carried out by considering inter-, trans- and multidisciplinary approaching ways in order to succeed delivering a manageable concept to be applied for real situations. Registered advances in technological field combined with physics, representing basics for developments in nanotechnology have emphasized its using odds also in environmental field. In particular, the application of carbon nanotubes, CNTs in the process of designing environmental sensors for environmental monitoring assures advances in environmental protection field.

**Key words:** environmental pollution, environmental monitoring, nanotechnologies, carbon nanotubes, environmental sensors, sustainable development

**4. Innovational challenges in electrical engineering and energetics technology**

## **CONDUCTING SAFETY ANALYSIS AND SIMULATIONS FOR PROTECTION OF A DELIVERY ELECTRIC SYSTEM WITH ESSENTIAL POWER CONSUMERS**

**Mariana Dumitrescu<sup>1</sup>**

<sup>1</sup>University Dunarea de Jos, Automation and Electric Engineering Department, Stiintei 02, Galati, Romania

Corresponding author: Mariana Dumitrescu, Mariana.Dumitrescu@ugal.ro

**Abstract:** The paper presents a real power delivery system with essential consumers safety analysis. The two levels voltage networks 6kV and 0,4kV are modeled with the help of Edsa software and short-circuit simulation is conducted in order to obtain the computed values of the currents to all the network buses. The results are used to implement a technical solution for an important safety improvement of the analysed system.

The delivery electric system with essential consumers is located on the Galati Liberty Still factory platform. The software EDSA program calculates the values for direct, inverse and homopolar succession, short-circuit impedances using the impedances of the supply cables, the impedances of the coils, the impedances of the transformers, the contribution of the motors to the short-circuit current, the short-circuit power of the system. The analyzed results for the short-circuit calculation allows to the specialists to propose and implement a new advanced protection system to improve the safety, replacing old equipments with the new advanced one.

To maintain safety of the power systems to the high standards imposed it is a continuous process. In order to achieve this goal detailed power system modeling and simulation is needed. With the help of the professional software Edsa we conduct the safety analysis for a power delivery real system with essential consumers, which must be continuous power supplied. The two levels voltage networks 6kV and 0,4kV were first modelled, which brings the possibility to use Edsa specialized modules like power flow analysis and short-circuit analysis and to compute the network currents flow, while short-circuit are simulated. In this paper the results of the short-circuit analysis, for all the network buses supplying essential consumers, are presented and are used for the system safety increasing. The delivery power system safety get big improvement by replacing old protection equipments with the new advanced Siprotec Siemens devices and by the complete replacement of the cells in the 6kV electric stations, which gives very important safety benefits.

**Key words:** safety analysis, electric system, essential power, power system safety

## STEAM TURBINE EFFICIENCY ASSESSMENT, FIRST STEP TOWARDS SUSTAINABLE ELECTRICITY PRODUCTION

Sorina Anutoiu<sup>1</sup>, Ion Dosa<sup>1</sup> and Dan Codrut Petrilean<sup>1</sup>

<sup>1</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering,  
20 Universitatii, Petrosani, Romania

Corresponding author: Ion Dosa, i\_dosa@hotmail.com



**Abstract:** The main objective of actual energy policies around the world is the transition to renewable energy. EIA forecasts nearly 50% increase in world energy usage by 2050, which is hard to achieve using only renewable energy. For year 2019 the electricity production in EU relies mainly on conventional thermal (42.8 %) and nuclear energy sources (26.7 %). The accelerated transition to electrical cars puts more pressure on energy producers. As a result, in order to match the ever-growing demand of electrical energy, the conventional thermal energy generation will play a key role, among them coal-based production. In order to meet the environmental goals and for sustainable production of electrical power, energy assessment of power production of coal-based power plants must be performed. The purpose of this paper is to perform an energy assessment of the electrical power production, focusing on a key component of this, the steam turbine. The performance characteristics of the turbine in condensing operation were determined. The loads for performance tests were fixed to 115 MW, 130 MW and 150 MW power output for condensation operation. A proper efficiency of the turbine will have a significant impact on sustainable production of electricity. Typical efficiency of condensing steam turbines according to literature are in the range of  $\eta_e = 36$  to 42%, rated efficiency for K 200-130-1 steam turbine is 44.7%, while other data in literature is consistent with data presented above as they show efficiencies of 36% as well as 37% HHV (Higher Heating Value) in equivalent to approx. 32% LHV (Lower Heating Value). Comparing the values calculated in the process of efficiency assessment, in the range of  $\eta_{ea} = 39.71\%$  for 115 MW load to 37.45% for 150 MW load, with those presented above can be concluded that the turbine works within the expected range. At the same time, it should be noted that the lower efficiency values are characteristic of low power turbines, as a result the analysed turbine is performing very well. Resulting from calculations performed, isentropic efficiency for HP turbine is in the range of  $\eta_{iip} = 62.61\%$  to 65.97% and for the RT turbine in the range of  $\eta_{iip} = 74.11\%$  to 74.43 %, lower than expected, but as literature points, the decrease of internal efficiency of turbines in operation occurs often, for various reasons. Isentropic efficiency for LP turbine is in the range of  $\eta_{iip} = 79.87\%$  to 85.60%, as expected. The heat rate of the turbine is in the range of 9.487·10<sup>3</sup> to 9.907·10<sup>3</sup> kJ·kWh<sup>-1</sup> higher than values presented in literature. In the end, can be concluded that the analysed turbine is working properly, having an efficiency at the higher end of its class.

**Key words:** energy efficiency, sustainable production of electricity, steam turbine performance

## COMPARATIVE ANALYSIS OF PERFORMANCE INDICATORS FOR PHOTOVOLTAIC PANELS AND COGENERATION GENERATORS

**Dragoș Ștefan Roibu<sup>1</sup>, Sabin Ioan Irimie<sup>2</sup> and Dan Codruț Petrilean<sup>3</sup>**

<sup>1</sup>Teletrans Bucharest,

<sup>2</sup>University of Petrosani, Department of Management and Industrial Engineering

<sup>3</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering,  
20 Universitatii, Petrosani, Romania

Corresponding author: Sabin Ioan Irimie, [nibas8511@yahoo.com](mailto:nibas8511@yahoo.com)

**Abstract.** The energy perspective of the near future relies on the use of natural gas and renewable energy resources and for the distant future hydrogen energy is shaping up. In order to provide the correct information necessary for a high-performance option in the case of the availability of photovoltaic panels or cogeneration generators, this paper addresses energy performance and environmental impact in the case of the two systems based on different primary energy resources. The comparison method is based on the calculation of energy balance elements and the results obtained are used to calculate quantitative and qualitative performance indicators. Based on the obtained indicators, the level of response to the requirements of a sustainable energy is verified, for the analyzed variants. In order to highlight the current degree of capitalization of the available energy resources and of the afferent performance elements, based on the information from the specialized literature, a series of synthetic diagrams are presented. The main aspects, represented in the diagrams, refer to: graphical representation of the energy currently used as electricity on a planetary level, graphical representation of the efficiency of capitalization of different energy sources, graphical representation of the specific cost of different energy resources, energy return rate (heroes) for renewable energy resources. The separation of the two systems (generators with cogeneration, photovoltaic panels) is achieved by comparing the following technical characteristics: efficiency, ecological footprint, fuel cost, specific investment, occupied area, energy density.

The characteristic values, mentioned above, are aggregated using a radar diagram. By processing the radar diagram, a global indicator is calculated - the indicator of the energy synergistic effect. Based on this indicator, the optimal energy solution can be outlined.

**Key words:** CHP generator; photovoltaic panels; energy performance; environment impact

## ENERGY SECURITY ASPECTS RELATED TO THE NATIONAL POWER GRID

Nicolae Daniel Fîță<sup>1</sup>, Dragoș Păsculescu<sup>2</sup>, Florin Gabriel Popescu<sup>3</sup>,  
Alina Daniela Handra<sup>4</sup> and Emilia Grigorie<sup>5</sup>

<sup>1, 2, 3, 4, 5</sup>University of Petrosani, Universitatii street, No. 20, Petrosani, Romania,

Corresponding author: Nicolae Daniel Fîță, daniel.fita@yahoo.com

**Abstract:** The lack of electricity supply to industrial and household consumers leads to national crises that cause a state of societal imbalance causing extreme damage to the safety of citizens, industry, the national economy and thus national security, because all sectors of a national economy depend on electricity. But Romania's energy security is endangered by various elements of instability that may threaten the safety and security of NPG: vulnerabilities (natural and anthropogenic hazards); threats (terrorist acts, political instability, armed conflict and piracy); dangers (lack of raw materials, use of electricity as a weapon or pressure tool, high costs of electricity, etc.). In order to stabilize and increase energy security, the NPG must be constantly subject to security assessments to identify vulnerabilities, risks, dangers or threats, in order to prevent, combat or eliminate these sources of instability that may lead to NPS insecurity and general insecurity, and the recommendation is that these identification and evaluation processes be carried out more preventively than corrective. The NPG infrastructure is as follows: 81 power substations, from which: 1 power substation of 750 kV; 38 power substations of 400 kV; 42 power substations of 220 kV; 8931.6 km overhead power lines - OHL, from which: 154,6 km. – 750 kV; 4703,7 km. – 400 kV; 4035,2 km. – 220 kV and 218 distribution units totalling 37794 MVA. Identified vulnerabilities: a) Internal vulnerabilities with internal impact within NPG; b) External vulnerabilities with external impact within NPG; c) External vulnerabilities within neighbouring power systems with internal impact on NPG. The National Energy Strategy (short, medium and long term) following proposed solutions by the authors to eliminate (combat) the internal or external vulnerabilities of the NPG. Following this study we have identified 26 vulnerabilities: 13 internal vulnerabilities with internal impact within NPG; 4 external vulnerabilities with external impact within NPG and 9 external vulnerabilities within neighbouring power systems with internal impact on NPG. The identified vulnerabilities are eliminated by National Energy Strategy 2021 – 2036 (short, medium, and long term) proposed by the authors, with the aim of increasing energy and national security, resulting from the following: 5 solutions: U – Urgently in S – Short Period/Term (1 – 5 years); 7 solutions: VI – Very Important in M – Medium Period/Term (5 – 10 years) and 5 solutions: I – Important in L – Long Period/Term (10 – 15 years). Energy security vulnerability should be prevented, combated and eliminated through major investments in power infrastructure (power substations, overhead power lines and power plant) and qualified personnel in following activity regarding electrical installation high, very high and ultra high voltage: operational, maneuvers, maintenance, dispatch, occupational health and safety, critical infrastructures protection and emergency or crisis response.

**Key words:** energy security, National Power Grid

## **FACTORS OF ACHIEVING AND ENSURING ENERGY SECURITY IN THE CONTEXT OF NATIONAL AND EURO – ATLANTIC SECURITY**

**Nicolae Daniel Fiță<sup>1</sup> and Emilia Grigorie<sup>2</sup>**

<sup>1</sup>University of Petrosani, Universitatii street, No. 20, Petrosani, Romania,  
daniel.fita@yahoo.com

<sup>2</sup>University of Petrosani, Universitatii street, No. 20, Petrosani, Romania,  
emilia\_grigorie@yahoo.com

Corresponding author: Nicolae Daniel Fiță, daniel.fita@yahoo.com

**Abstract:** In Chapter 1 The concept of energy security, has shown the following: The energy security of a state represents: the existence, accessibility and provision of (re) finished sources of raw materials (oil, natural gas, coal, hydrocarbons, uranium, etc.) and renewable, sufficient and available; clear and stable international / European trade agreements on access to these (re) finite sources of imported raw materials; price stability of these (re) finite sources of raw materials; control of transport and distribution routes and alternatives of finite (re) sources of raw materials; the safety and security of the transformation of these finite (re) sources of raw materials into electricity; clear and stable trade agreements on trade in electricity with neighboring countries or those of the European Union; electricity price stability; control of electricity transmission and distribution routes; accessibility of each consumer (domestic / industrial) to electricity. 1.2. Dimensions: economical growth and political power. 1.3. Components: energy primary resources (finite sources and renewable sources) and electricity (centralized design and concept distributed). In Chapter 2 Elements of energy security instability, has shown the following: The following elements are generating energy security instability: risks (physical; economic; geopolitical and geostrategic; social; environmental protection); threats (terrorism; political instability; armed conflicts; piracy); dangers (lack of supply of oil, natural gas, coal, uranium and electricity for technical or other reason; the finite nature of energy resources; the use of energy as a pressure instrument or energy weapon; the use of energy revenues to support undemocratic regimes; global climate change; high energy costs for developing countries), and vulnerabilities (natural hazards and anthropogenic hazards). In Chapter 3 Factors of achieving and ensuring energy security, has shown the following: ways to achieving energy security, ways to ensuring energy security, energy security quantification scenarios. In Chapter 4 Conclusions, has concluded the following: For the purpose to ensure the stability of national and Euro-Atlantic security, the following factors are proposed by authors to achieve and ensure energy security: 25 proposed way to achieving energy security (19 critical factors (strong points); 6 important factors; 8 proposed way to ensuring energy security (6 critical factors (strong points), 2 important factors; 9 proposed scenarios to quantification energy security almost complete. In this context, the energy security of a state is in fact the national security of that state.

**Key words:** energy, national, euro – atlantic security

## THE NECESSITY OF STORAGE TECHNOLOGY DEVELOPMENT FOR UNPREDICTABLE ENERGY SOURCES

**Stochițoiu Maria Daniela<sup>1</sup>, Uțu Ilie<sup>1</sup> and Pană Leon<sup>2</sup>**

<sup>1</sup>University of Petrosani, Department of A.C.I.E.E, University Street 20, Petrosani, Romania,  
[danielastochitoiu@upet.ro](mailto:danielastochitoiu@upet.ro), [utuilie@upet.ro](mailto:utuilie@upet.ro)

<sup>2</sup>Naval Academy "Mircea cel Batran", Department of IEEN, [leon\\_pana@yahoo.com](mailto:leon_pana@yahoo.com)

Corresponding author: Stochitoiu Maria Daniela, [danielastochitoiu@upet.ro](mailto:danielastochitoiu@upet.ro)

**Abstract:** The problem of storage of conventional energy sources, like oil, coal, accumulation lakes, has been discussed since the electrical systems have been developed when considering the unpredictability of the electrical load. The hydroelectric power plants with accumulation lakes and hydropower plants with pumped accumulation lakes provide the traditional energy reserve for covering the sudden load demands. Renewable energy sources continue to gain popularity. However, two major limitations exist that prevent widespread adoption: System power reliability under varying weather conditions and the corresponding system cost. Therefore, alternative resources such as solar irradiation and wind have attracted energy sectors worldwide to generate power on a large scale. A drawback, common to wind and solar options, is their unpredictable nature and fluctuating energy generation. One way to face this problem is to support renewable energy sources with energy storage devices. The paper emphasizes the importance of energy storages possibilities in conditions of sustainable development and coal production diminution due to fossil energy has hidden costs like air pollution, health damages.

Table 1. The main energy storage systems and their forecast

Storage system	Research	Develop	Eloquent	Application	Mature technology
Li-Ion battery	→	→	→	→	→
Redox		→	→	→	→
Na-Ion battery		→	→	→	→
NaS/Na beta battery		→	→	→	→
Metal-air battery	→	→			
Semiconductor coils	→	→			
Steering wheel		→	→	→	→
CAES				→	→
Lead battery				→	→
Hydro CHEAP					→

Actual state → forecast →

**Key words:** power plant, energy sources, perturbations, power flow, renewable sources

## CONSIDERATIONS REGARDING THE NEW REQUIREMENTS FOR THE EVALUATION OF ROTATING ELECTRIC MACHINES WITH INCREASED SAFETY PROTECTION TYPE "E"

Marcel Daniel Rad<sup>1</sup>, Diana Sălăsan<sup>1</sup> and Sorin Zsido<sup>1</sup>

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX PETROSANI -Romania

Corresponding author: Marcel Daniel Rad, marcel.rad@insemex.ro

**Abstract:** The evaluation of explosion-proof electrical equipment for certification is particularly important given the risk of explosion and must be minimized. This in order to ensure the safety of life, health of workers, to prevent damage to goods and the environment when they meet the essential security requirements at European level. Directive 2014/34 / EU states that equipment used in explosive atmospheres must be designed to operate without endangering the environment for which it is intended. This paper proposes the study and evaluation of the requirements for the evaluation of rotating electric machines with increased safety protection type "e".

The paper briefly presents the new requirements for rotary electric machines with the type of protection increased safety regulations that are imposed for Level of Protection "ec" assume that the occurrence of an explosive gas atmosphere and a motor start sequence do not occur simultaneously, and Level of Protection "ec" is not generally suitable in those cases where these two conditions do occur simultaneously. Motors of Level of Protection "ec" with an elevated risk of rotor sparking, are not intended to be used where the probability of an explosive gas release cannot be totally disassociated with the start sequence as an independent event. The oil seal systems of centrifugal compressors are known to produce such releases during starting. 'Normal' operating conditions for electrical machines for Level of Protection "ec" are assumed to be rated full-load steady conditions. Starting (acceleration) of rotating electrical machines is excluded as part of 'normal' operation for Level of Protection "ec" under duty S1, S2, S6, or S9. Due to the potential for more frequent starts of motors with duty S3, S4, S5, S7, S8, or S10, the requirements for rotor sparking address the risk of rotor sparking during starting as a 'normal' condition.

Degrees of protection provided by electrical machines, Level of Protection "ec" for electrical machines operating at voltages up to 1 kV, may be opened to the interior of the machine, only when the degree of protection of the electrical machine is at least IP44. Covers and entries of the terminal box shall provide at least degree of protection IP54. For test purposes, the interface of the terminal box to the electrical machine enclosure can be simulated with a blanking plate replacing the electrical machine enclosure. The normal seal or gasket is used in the interface. For the IP5X dust test, the volume to be used for the extraction calculations is the free internal volume of only the terminal box.

**Key words:** electrical machine, increased safety, explosive atmosphere, degree of protection, terminal box.



## ANALYSIS OF THE PURGE TIME VALUES FOR PRESSURIZED ENCLOSURE USING A PARAMETERIZED CFD MODEL

Danuț Grecea<sup>1</sup>, Gabriela Pupăzan<sup>1</sup>, Zoltan Vass<sup>1</sup>, Cosmin Colda<sup>1</sup> and Adriana Andris<sup>1</sup>

<sup>1</sup>National Institute for Research and Development in Mine Safety and Protection to Explosion - INSEMEX, 32-34 G-ral Vasile Milea Street, Petrosani, Romania, [insemex@insemex.ro](mailto:insemex@insemex.ro)

Corresponding author: Danuț Grecea, [danut.grecea@insemex.ro](mailto:danut.grecea@insemex.ro)

**Abstract:** The use of computerized simulations offers definite advantages in understanding phenomena and analyzing parameters that have influence during a complex process, more can provide on the basis of scenarios valuable information on the effects for physical processes analyzed. Thus, in this paper, using mathematical models and numerical solutions based on physical principles and functions with assumed accuracy are analyses, using CFD (Computational fluids dynamics), the values of purge time for pressurized enclosure, resulting in the action of post-processing of construction for graphs and colour icons, in order to render images as representative possible both for the design phase of the equipment with protection type pressurization “p” and for their evaluation for certification. Determining the values of purging time by using computer simulations is particularly important for avoiding catastrophic events caused by explosions that can lead to human casualties, significant material losses or have significant environmental consequences.

Simulation with CFD utility method is becoming increasingly used in modelling systems that include fluid flow in many areas. CFD codes make it possible to numerically solve transport of fluids, mass and energy balances in systems with very complicated geometry. The obtained results present special flow and transfer models that are difficult to obtain experimentally or by conventional modelling methods.

Use of CFD numerical analysis media in research of conformity for equipment’s with pressurized enclosure type of protection, allows determination of important parameters such as: pressure distribution and velocity field inside encapsulation; determining the flow lines of current generated by supply and many other parameters (pressure, temperature). This fact allows evaluation of performance for studied equipment without considerable expenses, with minimum effort and maximum operability.

The simulation shows that, even if enclosure has a symmetry, values of filling and purging time, regarding the internal volume ratio do not show symmetry and also show influence of turbulence created by internal structure on distribution of CO<sub>2</sub> concentration values.

Even if type of pressure protection mentions that, in some cases, purging inner volume with air (five times the inner volume) will guarantee that for all interior points volume ratio thresholds are met, some interior topology structures may exhibit a behavior unexpected. In this case, an intuitive way to set the position of measuring points is not 100% accurate.

**Key words:** explosion risk, protection type, pressurized enclosure "p", CFD simulation.

## CONSIDERATIONS REGARDING THE INSPECTION OF EQUIPMENT DESIGNED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES

**Lucian Moldovan<sup>1</sup>, Mihai Magyari<sup>2</sup>, Marcel Rad<sup>3</sup>, Clementina  
Moldovan<sup>4</sup> and Sorin Zsido<sup>5</sup>**

<sup>1</sup>INCD INSEMEX, Department for Safety of Explosionproof Equipment and Installations,  
32-34 G-ral Vasile Milea Street, Petrosani, Romania, lucian.moldovan@insemex.ro

<sup>2</sup>INCD INSEMEX, Department for Safety of Explosionproof Equipment and Installations,  
32-34 G-ral Vasile Milea Street, Petrosani, Romania, mihai.magyari@insemex.ro

<sup>3</sup>INCD INSEMEX, Department for Safety of Explosionproof Equipment and Installations,  
32-34 G-ral Vasile Milea Street, Petrosani, Romania, marcel.rad@insemex.ro

<sup>4</sup>University of Petrosani, Department of Environmental Engineering and Geology, University  
Street 20, Petrosani, Romania, clemymoldovan@gmail.com

<sup>5</sup>INCD INSEMEX, Department for Safety of Explosionproof Equipment and Installations,  
32-34 G-ral Vasile Milea Street, Petrosani, Romania, sorin.zsido@insemex.ro

Corresponding author: Lucian Moldovan, lucian.moldovan@insemex.ro

**Abstract:** The special characteristics providing protection to explosion for equipment design for use in potentially explosive atmospheres must be preserved during their entire period of use. Thus, the equipment designed for use in potentially explosive atmosphere shall be subjected to specific inspections in order to verify that the characteristics on which explosion protection is based were not depreciated in time. In the paper were presented relevant aspects related to inspection of electrical equipment designed for use in potentially explosive atmospheres. The focus was on electrical equipment designed for use in potentially explosive atmospheres generated by flammable gas, vapours or mists having the types of protection flameproof enclosure “d” and increased safety “e”; but there are also a lot of common elements to other types of protection. The first and second part of the paper presented some important aspects related to inspections: regulations and standards applicable to equipment designed for use in potentially explosive atmospheres with a specific focus regarding the inspections, importance of performing inspections, classification of inspections, operations to be performed during inspections, factors influencing the inspection program, competence of personnel and the content of an inspection sheet. In the third part of the paper were presented some examples of equipment with type of protection “d” and “e” presenting deficiencies (frequent deficiencies).

All the presented aspects have a specific importance for the personnel involved in performing inspection and maintenance activities.

**Key words:** equipment, inspections, explosive atmospheres, competence of personnel, inspection sheet.

## **CONDUCTING POWER FLOW ANALYSIS AND SIMULATIONS FOR A DELIVERY ELECTRIC SYSTEM WITH IMPORTANT CONSUMERS**

**Mariana Dumitrescu<sup>1</sup>**

<sup>1</sup>University Dunarea de Jos, Automation and Electric Engineering Department, Stiintei 02,  
Galati, Romania

Corresponding author: Mariana Dumitrescu, Mariana.Dumitrescu@ugal.ro

**Abstract:** The goals of the paper are to conduct the simulation and to analyze the power flow in a real complex industrial system. Professional Edsa digital simulation for the case study has the purpose to determine and to control/correct the operational state of the power system. The analyzed power system is connected to the national grid system through the SC1 connection stations with 110kV voltage. The industrial company has important consumers (over 50%), with a total power between 5 MVA and 40 MVA. The main consumers are supplied with an average voltage of 6 kV. After the design phase and the implementation in practice of the proposed MV electrical delivery station with important consumers, Edsa professional modules gives methods and computing algorithms to determine the buses drop voltage, to optimize and maintain the level of voltage, methods to compute the branches power flow, the branches current flow, the transformer loading, the short circuit current analysis (tri phase and mono phase), the torque and performance of the motors. It can help us to determine the most efficient solution of the power flow for the analysed system.

The proposed analysis consist of the node voltage (Bus Voltage), the branch current (Branch Current Flow), the power circulation on the branches (Branch Power Flow), the transformer load (Transformer Loading), the voltage violation (Bus Violation) ), Current Violation, Transformer Violation. The automatic voltage control can be implemented in the study case analysis by setting the parameters of the transformers. Beside the standard load flow, we can also simulate the effect of starting the motors in terms of voltage drops.

With the help of a professional software like Edsa it is possible to analyze, from the point of view of safety in operation any type of network, whether three-phase or single-phase. This program is working according to IEC and IEEE standards. It helps to easily build the model of a complex networks, like the real study case of an industrial power delivery system with important consumers, we presented in this paper.

Load flow analysis gives detailed information about branches currents flow and violations, the buses voltages and violations, the loading of equipment like transformers and violations, the control of the power flow, the automation control for improving of the voltage drops, the torque and engine performance, but it helps also for determining of the most economical load circulation solution.

**Key words:** power flow, analysis, simulations, delivery electric system

## **APPLICATIONS OF FUZZY INFERENCE SYSTEMS IN MINERAL INDUSTRY-AN OVERVIEW**

**Michael Galetakis<sup>1</sup>, Anthonla Vasiliou<sup>1</sup>, Emmanuel Steiakakis<sup>1</sup>,  
Athanasia Soultana<sup>1</sup> and Vassilios Deligiorgis<sup>1</sup>**

Technical University of Crete, School of Mineral Resources Engineering, University  
Campus, Chania, Greece

Corresponding author: Michael Galetakis, [galetaki@mred.tuc.gr](mailto:galetaki@mred.tuc.gr)

**Abstract:** Recent advances in FIS have provided a new approach in solving many problems related to mineral industry, a traditional economic activity which is heavily based on the experiential knowledge. The success of Fuzzy Inference Systems (FIS) is mainly due to their similarity to human perception and reasoning, and their intuitive handling and simplicity, which are important factors for the acceptance and usability of the mining systems. FIS have the ability to handle imprecise or incomplete information and to incorporate them into decision-making processes, based on the knowledge of an expert. This study examines Fuzzy Inference Systems (FIS) applications in mineral industry by conducting a literature review (2010-2020) in engineering and earth sciences oriented journals. From the literature review it is clear to be a major trend in the use of fuzzy logic in the fields of mineral exploration, mining and mineral processing. FIS superiority over conventional systems is based on their capability to acquire knowledge from mining engineers, geologists, operators, and other experts and to represent and manipulate it in expert systems in a human-like manner. More specifically, in the area of mineral exploration the main advantages of FIS are their ability to capture easily and effectively the geologic knowledge and to describe geological variables which are usually expressed in natural language. FIS combined with Geographic Information Systems can be used as a framework to store, manage and analyze both crisp and uncertain data obtained during the mineral exploration from remote sensing, geophysical, geochemical, geological surveys and boreholes. In mining and mineral processing FIS can be used to select the most suitable mining method, to improve the efficiency of mining equipment during excavation and to control effectively mineral processing plants. The transparency, intuitive nature, flexibility, and short response time of FIS, make them unique for controlling processes such crushing or froth flotation. Moreover fuzzy logic-based controllers are suitable for on-line monitoring systems (assaying from mineral streams) and for fault detection. Many fuzzy-based systems were also used in combination with previous developed deterministic models. These hybrid fuzzy systems are combinations of knowledge-based and model-based fuzzy systems. Another interesting approach that is growing rapidly with remarkable potential for applications in mineral industry is the fusion of fuzzy systems, artificial neural networks and genetic algorithms.

**Key words:** Mineral industry, uncertainty, experiential knowledge representation, fuzzy logic, fuzzy inference systems

## AN IMPLEMENTATION OF A FAULT-TOLERANT DATABASE SYSTEM USING THE ACTOR MODEL

Ioan Cristian Schuszter<sup>1</sup> and Marius Cioca<sup>2</sup>

<sup>1</sup> University of Petrosani, Department of Computer and Electrical Engineering, Universitatii 20, Petrosani, Romania, chrisschuszter@gmail.com

<sup>2</sup> University “Lucian Blaga” of Sibiu, Faculty of Engineering, Emil Cioran 4, Sibiu, Romania, marius.cioca@ulbsibiu.ro

Corresponding author: Ioan Cristian Schuszter, chrisschuszter@gmail.com

**Abstract:** Fault-tolerant systems and services are an important discussion subject in a world of inter-connected devices. Failure often occurs at the database level, which leads to a cascade of failures to all other dependent components. One way of achieving higher availability in a traditional SQL database is to shard it, but it is often a difficult and error-prone behaviour, and better solutions exist for this particular use-case.

This paper discusses the development of a NoSQL in-memory alternative for data storage, similar to the way Redis behaves, but with a few key advantages. The database system privileges the partition-tolerance and availability aspects of the CAP theorem, while only achieving eventual consistency through replication between the nodes. The technology behind its implementation is the Akka actor system, a library that allows the development of actor systems in a type-safe and functional way. Akka HTTP is also used for providing web access to all the clients in the system. Actor systems can be viewed as a sort of primitive for computation, initially evolving from a model based on physics, and they are very good at implementing systems that do not need to lock for data access, as the data is immutable and is passed around through messages between the different actors.

In terms of architecture, the solution that is described in this paper consists of several different key roles for the actors. Firstly, a master actor coordinates access to data and starts up a heartbeat actor, responsible for checking whether any of the storage actors is not responding. The data is stored as key-value pairs in the database, split across several partitions. Each partition holds a copy of data inserted in all the other partitions, and the data is replicated across from other partitions in the case there is a data loss in the system. An advantage of Akka is the possibility of clustering the actors across several computers; the loss of one unit of computing is not so catastrophic for the system itself.

The paper also presents a case study and comparison between the developed solution and Redis. Several tools are used in order to simulate real-life concurrent access to the data, and the results show that the solution based on Akka is able to scale much better than Redis, especially when taking into account concurrent insert operations.

**Key words:** NoSQL, databases, actor-system, performance, fault-tolerance, self-healing

## AUTOMATIC IDENTIFICATION OF NBOME ILLICIT PSYCHOACTIVE SUBSTANCES BASED ON COMBINED MOLECULAR DESCRIPTORS

Adelina Ion<sup>1</sup>, Mirela Praisler<sup>2</sup>, Catalina Mercedes Burlacu<sup>3</sup> and Nicolae  
Catalin Stanica<sup>4</sup>

<sup>1</sup>”Dunărea de Jos” University, Department of Science and Environment, Domnească Street,  
47, Galati, Romania, Adelina.Ion@ugal.ro

<sup>2</sup>”Dunărea de Jos” University, Department of Science and Environment, Domnească Street,  
47, Galati, Romania, Mirela.Praisler@ugal.ro

<sup>3</sup>”Dunărea de Jos” University, Department of Science and Environment, Domnească Street,  
47, Galati, Romania, Catalina.Burlacu@ugal.ro

<sup>4</sup>”Gh. M. Murgoci” National College, Mathematics Department, Independentei Boulevard  
Street, 4, Braila, Romania

Corresponding author: Mirela Praisler, Mirela.Praisler@ugal.ro

**Abstract:** During the last decade, a growing prevalence of new psychoactive substances (NPS) has been noticed by the law enforcement agencies. Although NPS have no medical use due to their very high toxicity, they are often sold on the black market. NBOMe defines a group of toxic amphetamines that has as parent compound 25I-NBOMe, a synthetic derivative of 2C-I (2,5-dimethoxy-4-iodophenethylamine). In this paper, we are presenting a series of Artificial Neural Networks (ANNs) designed to identify the NBOMe class membership based on a mixture of topological and 3D-MoRSE descriptors. For this purpose, the molecular structures of 160 compounds representing NBOMe compounds, narcotics, sympathomimetic amines, potent analgesics, as well as their main precursors have been first optimized. Then a molecular database was formed by computing a large number of topological and 3D-MoRSE descriptors that characterize these structures. This database was used as input for building an ANN system designed to recognize NBOMes. The relevance of the input variables on its classification performance has been assessed and new systems have been built by using different combinations of selected topological and 3D-MoRSE descriptors. The best performing system has been found by comparing the ANN systems based on various criteria describing the classification efficiency.

The results of this study show that the most efficient ANN system screening for NBOMe is obtained by including in the input database only those topological and 3D-MoRSE descriptors that were found to be the most important, as assessed with the initial ANN (built with all the available descriptors). This system can be used successfully to predict and estimate the toxicity of any novel compounds having a molecular structure similar to NBOMe psychotropic drugs of abuse. This way, it may save the high costs of analytical and toxicological studies.

**Key words:** NBOMe, topological and 3D-MoRSE descriptors, Artificial Neural Networks

## POSE AND MOTION CAPTURE TECHNOLOGIES

**Arun Fabian Panaite<sup>1</sup>, Sebastian Rosca<sup>1</sup> and Remus Sibişanu<sup>1</sup>**

<sup>1</sup>University of Petroşani, Department of Automation and Computers, University Street 20,  
Petroşani, Romania

Corresponding author: Arun Fabian Panaite, FabianPanaite@upet.ro

**Abstract:** The multitude of sensors, transducers and data acquisition systems used in the ever-increasing domains of today's industry, were designed and created on a purpose-based agenda. Most of these technologies were rarely used for different purposes than the ones they were meant for. This research, explores the possibility of using those technologies for the purpose of motion capture. The results of the motion capture data acquisition can further be used for other purposes, itself. Because the motion capture data isn't calculated, but only captured, the compression algorithms may result in mathematical formulas of motion, which can be the same formulas of calculating the motion synthetically. The same way the parameters and formulas are being calculated for a robot's movement, motion can be captured, and the key position parameters can be selected, and implemented on the movement, while not only making the movement more natural, but saves time during the programming process. Sports, entertainment and medicine are only a few of the ever-increasing number of domains in which motion capture technologies are being widely utilised. From using cameras of many types, shapes and sizes to sensors such as MEMS, accelerometers and gyroscopic sensors, data acquisition for motion capture hasn't always depended on the processing or data manipulation power of the motion capture systems that were used, but also in the ingenuity of those who designed and operated the devices and systems involved in the motion capture processes. This paper is a brief literature review of multiple approaches over motion capture. In this literature review, some of the most intriguing and successful data acquisitions for motion capture have been analysed and reviewed, to find not only solutions, but also the challenges of motion capture that have yet to be resolved. Some of the components of the studied motion capture systems were the Microsoft Kinect v1 and v2, the Autographer lifelogging device, the GoPro action cameras, PET/MRI scanning systems and accelerometers (IMU) using multiple methods, like a shaker table, marker-based motion capture, marker-less motion capture, in various layouts, various conditions and environments, and different levels of invasiveness. The data had been collected, filtered and assembled into a table where it was sorted to show the advantages, disadvantages and the most viable destination for the proper use of the right technology. Figures are shown for comparisons between the technological generations of devices used in motion capture and also to aid in deciding which generation, type or approach can be used in a known environment.

**Keywords:** health, safety, computer vision, wearable, sensors

## **ELECTRIC VEHICLES IN SMART GRID AND SMART CITY FOR PETROȘANI CASE**

**Cosmin Rus<sup>1</sup>, Monica Leba<sup>1</sup>, Nicoleta Negru<sup>2</sup>, Răzvan Marcuș<sup>2</sup> and Marius Rîsteiu<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department of Automation, Computers, Electrical Engineering and Energetics, University Street 20, Petroșani, 332006, Romania, ime@upet.ro

<sup>2</sup>Doctoral School of University of Petrosani, University Street 20, Petroșani, 332006, Romania, scoala.doctorala@upet.ro

Corresponding author: Cosmin Rus, cosminrus@upet.ro

**Abstract:** The success of the development of electric vehicles and the growing demand for them due to greater autonomy of power systems and the development of charging infrastructure also highlights the possibility of using these vehicles as an integral part of a Smart Grid system around the Smart City concept. This paper aims to present new research developed around the idea of Smart Grid and Smart City in Petroșani, starting from electric vehicles that can serve both as a means of transport and as a monitoring system of environmental parameters, but which can be also integrated into the electricity grid, so that, during periods of high consumption, they can supply electricity when needed and will be charged during periods of over-production of electricity. The electric vehicle produced and presented was mainly made of recycled components and parts, and the main problem that arose after it was manufactured was the need to make a power supply system from renewable sources, so that the vehicle is truly ecological. Thus, it was proposed to build a Smart Grid system in the city of Petroșani (consisting of renewable energy sources and equipment and electric vehicles) that would fully integrate the concept of V2G (vehicle-to-grid). The energy potential from wind and solar sources was calculated for the entire city based on measurements provided by the National Meteorological Administration. Although the wind energy potential is relatively good due to the high costs of wind turbine installations, a system of photovoltaic panels scattered on the roofs of city buildings is preferred. The need for electricity only to supply all the electric vehicles needed for a percentage of 70% of the population of Petroșani is 17.72% of the production potential only from photovoltaic sources. So, it can be said that the whole concept is durable and can be used. Regarding the concept of vehicle-to-grid, a dedicated intelligent charging station for electric vehicles has been created and thus another point of the development of the smart grid system can be reached by the fact that electric vehicles can become prosumer units, if it is necessary in the general network of production and supply of electricity based only on renewable sources. Prosumers are those who not only consume energy from the electricity grid, but also produce and supply energy from renewable sources. Although it seems hard to believe at the level of each city, such a system can be developed and thus can be achieved if not a total energy independence at least a partial independence from conventional forms of electricity production.

**Key words:** sustainable development, network, power system, monitoring, prosumers



## A STUDY ON THE VLC SECURITY AT THE PHYSICAL LAYER FOR TWO INDOOR SCENARIOS

**Riurean Simona<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department ACIEE, University Street 20, Petrosani, Romania, sriurean@yahoo.com

Corresponding author: Riurean Simona, sriurean@yahoo.com

**Abstract:** The visible light communication (VLC) systems are generally considered secure since the light cannot penetrate through solid objects. However, both in the line of sight (LoS) scenarios as well as in non LoS scenarios with wide and strong optical signal, the security of data transfer must be investigated. The conventional information security technologies used for wireless communications based on radio frequency are not suitable to be applied straight for VLCs because of the limited hardware resources, especially for the optical receivers (oRx). In this paper, a study on the VLC security at the physical layer approach based on optical beamforming to achieve secure transmissions for indoor (in medical facilities) (Fig. 1.) and underground spaces (Fig. 2.) scenarios, is presented.



Figure 1. VLC setup in hospital room



Figure 2. VLC setup underground

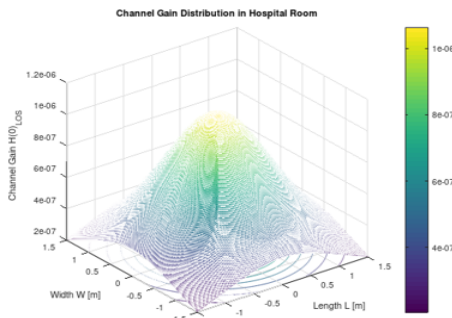


Figure 3. Channel gain in hospital room

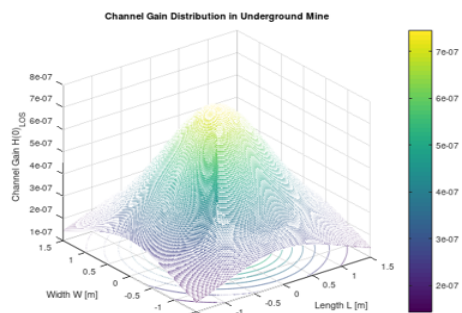


Figure 4. Channel gain in underground space

**Key words:** optical beamforming, channel gain, intelligent reflective surface

## EXOSKELETON - WEARABLE DEVICES. LITERATURE REVIEW

**Marius-Leonard Olar<sup>1</sup>, Monica Leba<sup>1</sup>, Marius Risteiu<sup>1</sup>**

<sup>1</sup>University of Petroșani, Department ACIEE, University Street 20, România

Corresponding author: Monica Leba, [monicaleba@upet.ro](mailto:monicaleba@upet.ro)

**Abstract:** Exoskeletons are companion devices that help a person perform various daily tasks. These may vary from work to medical rehabilitation. The type of activity performed constrains the construction and control of the exoskeleton, so that some devices are only for one arm, others for both, can be driven by motors directly or by cables. Exoskeletons can be driven on the basis of information received from position, force, speed sensors or using EMG, EEC signals. Exoskeleton wearable devices began to appear around 1980, as an aid in physical work, in the handling of various objects. Over time, they have also covered the preventive-reparative medical part, to reduce muscle pain or to restore specific movements (upper limb), alleviated or even missing as a result of accidents or diseases of the upper limb muscles. The paper presents an overview of the types of exoskeletons developed for the human arm, especially bio-inspirational and cable-operated ones. An exoskeleton is an inferior system attached to a superior system, in this case, the human arm. In this complex system the inferior system must copy, as far as possible, all the capabilities of the superior system, or as many, and then be able to reproduce them. By the possibility of reproducing the capacities of the superior system, the inferior one can control and rehabilitate, in the event of malfunctions, the superior system. This control can see which of the elements of the second system needs to be assisted or improved. Exoskeletons for assistance or rehabilitation may single-cover or pair one or more upper arm joints, shoulder, elbow, shoulder and elbow, wrist or for the entire arm. Those in charge of the design and development of these devices must combine knowledge of human anatomy, biomechanics, sensor and motor control with a design appropriate to the intended purpose, with kinematic chain control algorithms and others. The design can be bio-inspirational (trying to reproduce human anatomical components, optimize their shapes and functionalities), mechanically optimized, the exoskeleton can be fixed/wearable, soft or hard. The operation of the exoskeleton elements is carried out by means of several types of actuators, electrical, pneumatic, hydraulic or elastic, each having advantages and disadvantages in terms of power, control, mobility or maintenance of the system. Cable transmission can lead to an ergonomic pattern of an exoskeleton. All heavy or bulky elements, such as actuators and controls, can be found on the back of the device, and light ones will compose the part that will come into contact with the user's arm. In order to create and develop a wearable exoskeletal system that does not disturb or obstruct the movements of the wearer, researchers should consider the human musculoskeletal pattern, with the reproduction of essential elements and functionalities. The product, in its bio-inspirational format, must have an optimized, compact mechanical design that is lightweight, durable, to become an "invisible" companion in the life of the wearer.

**Key words:** exoskeletons, medical rehabilitation, bio-inspirational

**AGGREGATE INDICATOR FOR QUANTIFICATION OF  
SUSTAINABILITY TO INCREASE ENERGY EFFICIENCY OF  
INDUSTRIAL PROCESSES**

**Sabin Ioan Irimie<sup>1</sup> Dragoș Ștefan Roibu<sup>2</sup> and Maria Oana Jurca<sup>3</sup>**

<sup>1</sup>University of Petrosani , Department of Management and Industrial Engineering,

<sup>2</sup>Teletrans Bucharest,

<sup>3</sup>Petrosani School Sports Club

Corresponding author: Sabin Ioan Irimie, [nibas8511@yahoo.com](mailto:nibas8511@yahoo.com)

**Abstract:** The paper is motivated by the need to provide relevant synthetic indicators, on the basis of which decision makers can evaluate and compare, the extent to which the proposed projects fall within the goals of sustainable development - economic efficiency, environmental responsibility, social solidarity, circular economy, production and responsible consumption. The case study, introduced in the paper, refers to the real and optimal thermal energy balance, made for an installation for the preparation of asphalt mixtures. The approached example took into account the perspective of multiplication and modernization of asphalt mixture preparation stations. Based on the measurements, performed "on site" and the calculations performed, the values of some indicators referring to energy performance, economic efficiency and environmental impact were obtained. The obtained indicators were aggregated in a global indicator, useful for administrative decision makers. Performing the following calculations: - the sum of the energies used on the company outline, taken from the synthetic summary table of the complex energy balance for the company outline - E; - the sum of energy savings achievable by applying the proposed measures - C; - determination of the CO<sub>2</sub> footprint related to the energy used - I; - specific energy consumption - S, and the results, being aggregated in a global indicator - ECIS, with the help of a radar diagram, the decision makers are offered a global indicator to evaluate the opportunity of some measures to streamline the analyzed processes.

**Key words:** economic-energy efficiency, ecological responsibility, circular economy, energy analysis, aggregate indicator

## EXPERIMENTAL STUDY ON THE DETERMINATION OF AVERAGE CONCENTRATIONS OF POLLUTING EMISSIONS FOR A THERMOELECTRIC POWER PLANT

Stela Dinescu<sup>1</sup> and Claudiu-Andrei Popescu<sup>2</sup>

<sup>1</sup>University of Petroșani, Department of Mechanical, Industrial and Transport Engineering,  
University Street 20, Petroșani, România, [dinescustela@yahoo.com](mailto:dinescustela@yahoo.com)

<sup>2</sup>Ministerul Afacerilor Interne – Poliția Română, România, [claudiuandrei@yahoo.com](mailto:claudiuandrei@yahoo.com)

Corresponding author (who send the abstract): Stela Dinescu, [dinescustela@yahoo.com](mailto:dinescustela@yahoo.com)

**Abstract:** The main objective of this paper is to determine the emissions of pollutants from a thermoelectric power plant that uses coal with an average calorific capacity of 15392 kJ/kg from the Jiu Valley Basin. The measurements included monitoring of the flux of combustion gasses and of pollutant in the flue gas. The flux of pollutants includes harmful substances (ash, compounds of Nitrogen and Oxygen, NO<sub>x</sub>; compounds of Sulphur and Oxygen, SO<sub>x</sub>; hydrochloric acid, HCl; un-combusted hydrocarbons, HC, etc.) which are discharged into the atmosphere together with the flue gas. It depends on improvements of systems that remove the harmful substances and is limited by strict environmental protection norms. This paper presents a comparative analysis of the greenhouse gases and particulate materials for two power generator units (nr. 5 and nr. 2) from the same power station. Comparative graphs were prepared using the results obtained through experimental measurements. The results were compared with data from the technical literature and solutions to reduce the values measured “in situ” were developed. Experimental measurements were taken from locations situated at the outlets of the electrostatic filters as well as from the access points located after the combustion gas discharge fans. The measurements included the mass flow rate (t/h) and concentrations (% , p.p.m., mg/m<sup>3</sup><sub>N</sub>) for the following indicators: O<sub>2</sub>, CO, CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub>, and particulates such as: PM 10, PM 2,5, as well as total emissions. The values of the experimental measurements were adjusted as functions of the atmospheric conditions (atmospheric pressure, temperature and relative humidity). In conclusion: the paper is important in the context of the efforts of energy producers in terms of complying with the current legislation as well as for reducing greenhouse gas and particulate pollution. The values determined from “in situ” studies show that the legal limits were significantly exceeded. So: SO<sub>2</sub> emissions (mg/m<sup>3</sup><sub>N</sub>) exceeds 6 to 15 times the legal limits; NO<sub>x</sub> emissions (mg/m<sup>3</sup><sub>N</sub>) exceeds 3.5 times the maximum legal limits; particulate emissions (mg/m<sup>3</sup><sub>N</sub>) exceeding 7 to 9 times the legal limits. Their reduction may be possible by a more careful control of the combustion process and using fuel mixtures compositions according to the specifications of the burner manufacturers. The possible solutions are: installing a desulphurization and dense sludge facility, special installations for NO<sub>x</sub>, 4 field electrical filters with up to date maintenance.

**Key words:** pollutant emissions, combustion gases, particulates, flue gas, electrostatic filters

## CONTRIBUTIONS TO DEVELOPMENT OF AN INERTIAL SEPARATION SYSTEM FOR SUSPENDED SOLID PARTICLES IN AIR

**Daniel Ion Matei<sup>1</sup>, Marin Silviu Nan<sup>2</sup>, Cristian Aron<sup>2</sup>, and Cristina Lapadusi-Macesaru<sup>2</sup>**

<sup>1</sup>ECOTECH, FN Mesteacanului Street, 435100, Maramures, Romania, [dm@ecotech.ro](mailto:dm@ecotech.ro)

<sup>2</sup>University of Petrosani, Department of Mechanical, Industrial and Transport Engineering, University Street 20, Petrosani, Romania, [nan.marins@gmail.com](mailto:nan.marins@gmail.com)

Corresponding author: Daniel Ion Matei, [dm@ecotech.ro](mailto:dm@ecotech.ro)

**Abstract:** The present work analyses the separation process on cyclone equipment, when air is divided in separate flows using a corrugated plate on the slope side of the inlet. Although cyclone equipment are intensively studied in specialized literature, corrugated inlet plate add some important advantages by channelizing of an important part of the air flow and reducing the impact angle between particle and inlet surface. The research bring up a new method for cyclones separators, to guide flow and particles to form a laminar layer in the sloped inlet region, using a corrugation plate, as shown in fig 1.

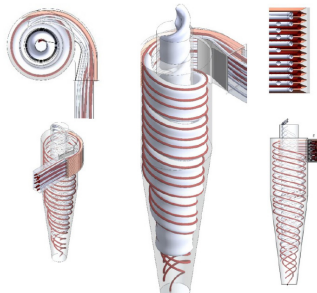


Figure 1. Air flow partition on a corrugated plate.

The research uses the results of previous studies, regarding sizing and calculating cyclones main parameters according to desired performance (cut size, grade efficiency or pressure loss), but add up an increasing of those performances when channeling a part of flow in laminar streams. Among the main results/findings of the work we mention an increased grade efficiency (up to 30%) compared to same size of traditional cyclone, pressure loss decreased with values between 10%-20% based on corrugation height and inlet speed, and the corrosion resistance have increased significantly on heavy and abrasive particles. The work has theoretical and practical implications, opening an approach which may be further investigated and documented with more theoretical demonstrations and equations or practical tests, involving for example, different corrugation shapes, sizes or layers.

**Key word:** cyclone separator, corrugated inlet, inertial separator, flow lamination, shock absorber

## THE DEVELOPMENT OF PID TEMPERATURE CONTROLLERS BASED ON FEM THERMAL ANALYSIS

Tudor George Alexandru<sup>1</sup> and Cristina PUPĂZĂ<sup>2</sup>

<sup>1</sup>University Politehnica of Bucharest, Department of Robots and Manufacturing Systems, 313 Splaiul Independenței Blvd, Bucharest 6, Romania, alexandru\_tudor\_imst@yahoo.com

<sup>2</sup>University Politehnica of Bucharest, Department of Robots and Manufacturing Systems, 313 Splaiul Independenței Blvd, Bucharest 6, Romania, cristinapupaza@yahoo.co.uk

Corresponding author: Tudor George Alexandru, alexandru\_tudor\_imst@yahoo.com

**Abstract:** In the present industrial context, the development or retrofitting of computer control units brings into discussion arising thermal issues due to the increased power densities of the underlying electronic circuits and the coexistence of localized hot spots. In this regard, cooling systems ensure the safe and reliable operation of the entire shop floor device by taking away the heat from the active components whilst maintaining their operational temperature close to a set point value. A wide range of simulation based approaches can deal with the selection of optimal cooling components. Even so, such tools are rarely deployed in the development of temperature controllers due to their high computational demands. The present paper proposes a simplified approach for developing PID temperature controllers by re-using the existing simulation models. The dimensionality of the problem is reduced to enhance the computational efficiency of the transient thermal analysis. Unidirectional elements are deployed to replicate the behavior of the proportional, integral and derivative terms. To facilitate parametric studies, the range of results is limited only to the output of the controller. Tuning of the gains is completed with the support of the Ziegler-Nichols heuristic method. The advantage of Finite Element Method (FEM) PID controllers is emphasized by the replacement of the physical hardware with a lumped-parameter simulation environment. From this perspective, a high level of formalization is achieved. An experimental stand comprising a ceramic resistor and a thin sheet metal cooler is deployed to prove the given concepts. MSC Patran pre/post-processing software for FEM analysis is employed to transpose the test bench system to a simplified simulation model. In the next stage, the SAMCEF Mecano Thermal solver is used for implementing the DIGI CBOX 1002 PID controller unidirectional element with upper and lower bounds. The actuator corresponds to the internal heat generation of the resistor. For the study, the heat source power dissipation is scheduled based on the output of the simulation control model. Isothermal vertical plate natural convection is assumed for the ambient junctions. The results indicate a maximum error of  $\varepsilon=4.55\%$  between the experimental and simulation temperature curves. The original contribution of the paper is summarized by the simplification of the problem study method with the advantages related to time and costs. The approach proves an acceptable level of accuracy and can be considered suitable for developing FEM PID controllers with lower computational demands and a higher level of process formalization

**Key words:** simplified modelling, simulation, cooling, temperature control

## SIMULATION OF THE PULSATION BOTTLE FOR A RECIPROCATING COMPRESSOR IN DYNAMIC REGIME

Ion Pana<sup>1</sup> and Florinel Dinu<sup>2</sup>

<sup>1</sup>University of Petroleum and Gas, Department of Mechanical Engineering, 39 Avenue  
Bucuresti, Ploiesti, Romania, [ion.pana@upg-ploiesti.ro](mailto:ion.pana@upg-ploiesti.ro)

<sup>2</sup>University of Petroleum and Gas, Department of Well Drilling, Extraction and Transport of  
Hydrocarbons, 39 Avenue Bucuresti, Ploiesti, Romania, [flgdinu@yahoo.com](mailto:flgdinu@yahoo.com)

Corresponding author: Ion Pana, [ion.pana@upg-ploiesti.ro](mailto:ion.pana@upg-ploiesti.ro)

**Abstract:** The pulsations generated by the compressors are turned into agitation forces at the elbows, reductions, valves, which in turn excite the connected pipeline network. Vibrations can cause stresses beyond the limit strength of the pipe material, damage to pipeline, supports and equipment. The main results selected from the bibliography are: analytical calculus of the pressure pulsations with transient one/ tridimensional dimensional Navier Stokes model; two-port theory model of a pipeline network; nonlinear mathematical model used to simulate the pulsating flow; 3D acoustic models using the finite element method (FEM); validation of the analytical solutions through experimental results; the pulsation damping performance with different devices. Computing tools have evolved and include libraries from different engineering fields. They can be used for the construction and study of engineering systems, including: mechanics, hydraulics, pneumatics, acoustics, etc. The LMS Amesim program is an example of this direction and was developed by Siemens for the company's design and testing work. The program is offered free of charge in the form of academic licenses. The article shows how to use this program to solve this application. The design of a model for the problem of pressure pulsations in a reciprocating compressor includes several details that improve the quality of the model and the results of the study. The program tracks 53 variables simultaneously. Thus we have models for the: drive mechanism; compressor cylinder including dead space; compressor valves; anti-pulsating bottles; acoustic filters; pneumatic pipelines, a distributive parameter sub model suitable for situations where wave dynamics is likely to be important; compressibility, inertia and friction effects are considered; the composition of natural gas it is taken into account; variations in pressure and temperature in the pipelines can be introduced. The effects of the settings can be easily studied and the program has virtual measuring instruments. The main aspect of using a complex model is that of broadening the horizon of knowledge by introducing a series of details that bring us closer to the real model. Because many of the simplifying hypotheses that can totally / partially modify the study results are abandoned, the results are better in terms of concordance with the experimental results. A good model reduces the risk of using the compression system in variable working conditions. Using a dynamic model gives the following advantages: simplifies the mathematical aspect using the elements from the program library; shortens the realization time of the model; it allows to obtain a model that takes into account most of details of the application. The situations of using: of an anti-pulsation bottle and an acoustic filter, with the advantages and disadvantages was exemplified with numerical results.

**Key words:** reciprocating compressor, LMS Amesim, pressure pulsations

## INFLUENCE OF ALLOYING ELEMENTS ON THE THERMAL BEHAVIOR OF NITI SHAPE MEMORY ALLOYS

Nicoleta-Monica Lohan<sup>1</sup>, Ștefan-Lucian Toma<sup>1</sup>, Mihai Popa<sup>1</sup>,  
Alin Marian Cazac<sup>1</sup>, Bogdan Pricop<sup>1</sup>

<sup>1</sup>”Gheorghe Asachi” Technical University of Iasi, 67 Dimitrie Mangeron Blv., Iasi, Romania

Corresponding author: Bogdan Pricop, bogdan.pricop@academic.tuiasi.ro

**Abstract:** Shape memory alloys (SMAs) are a group of materials that are part of the “smart materials” category. NiTi based SMAs are one of the most intensely studied alloys from its class. Diverse commercial applications have been developed due to certain properties of these alloys such as: shape memory effect, superelasticity and corrosion resistance. In recent years, NiTi shape memory alloys have been alloyed with a third element in order to improve the above-mentioned properties. The shape memory effect of Ni-Ti SMAs is due to a reversible martensite phase change. Thus, on heating, the reverse martensitic transformation (MT) results in a single-stage, from the low temperature martensite phase to the high temperature austenite phase. The functional properties and transformation temperatures of NiTi SMAs are strongly sensitive to the composition of the alloy. For medical applications, a good candidate for Ni substitution is Ta, which in addition to good biocompatibility also gives good visibility during X-ray monitoring. The alloying of NiTi with Nb leads to a higher thermal hysteresis, which is useful in the case of coupling elements used on an industrial scale. In order to investigate the influence of the alloying elements on the thermal behavior of NiTi alloys, the addition of the third alloying element (Ta and Nb) is under investigation in the present study. In this study, a commercial NiTi alloy was used as a comparison material. The other two alloys were obtained by induction melting. The NiTiNb and NiTiTa ingots obtained were cut on a spark erosion machine and the obtained rectangular specimens were then subjected to plastic deformation processes by hot rolling at 1073 K followed by water quenching. From these lamellas, fragments with a mass of less than 50 mg were cut and cleaned in alcohol in an ultrasonic bath and subjected to differential scanning calorimetry (DSC) analysis. The temperature program was: (i) for NiTi sample, heating from room temperature (RT) to 120°C followed by cooling to RT; (ii) NiTiNb sample, cooling from RT to -100°C, followed by heating to RT and (iii) NiTiTa sample, heating from RT to 200°C followed by cooling to RT. Following the experiments, it was observed that the addition of the third alloying element influences the critical transformation temperatures as follows: (a) the alloying of NiTi binary alloy with Nb contributed to the modification of the reverse and direct transformation temperatures and their displacement to negative values. Also, the thermal hysteresis increased in the case of this alloy; (b) the alloying of NiTi binary alloy with Ta contributed to the increase in the reverse and direct transformation temperatures. In this case, a larger amount of absorbed and released heat has occurred.

**Key words:** shape memory alloy, shape memory effect, NiTi alloy, thermal behavior, transformation temperature, alloying element



## FINITE ELEMENT ANALYSIS OF AN OPTIMIZED HYBRID STIFFENED PLATE

Sándor Szirbik<sup>1</sup> and Zoltán Virág<sup>2</sup>

<sup>1</sup>University of Miskolc, Institute of Applied Mechanics, H-3515 Miskolc, Hungary,  
sandor.szirbik@uni-miskolc.hu

<sup>2</sup>University of Miskolc, Institute of Mining and Geotechnical Engineering, H-3515 Miskolc,  
Hungary, gtbvir@uni-miskolc.hu

Corresponding author: Zoltán Virág, gtbvir@uni-miskolc.hu

**Abstract:** This paper is devoted to the modal analysis and buckling of a stiffened plate with simple supported conditions on the four edges of the base plate within the framework of shell theory. The main objective of a finite element analysis (FEA) is to investigate the natural frequencies of the structure subjected to uniaxial compression in the direction parallel to its ribs. The loading is applied as a shell edge load in the software which is the commercial program Abaqus. In this study, the numerical analysis is performed for such a design of the stiffed plate which has already been optimized for uniaxial compression, some design variables and the cost of welding, and the objective function to be minimized is defined as the material cost. The optimum results for different fabrication costs calculated by Excel Solver NLP using the gradient method are given in previous studies, assuming that the welding technology is SAW. The base plate and welded flat stiffeners were made of different steel materials, provided that the difference in steel quality is simply described by Young's modulus changing between 190 MPa and 210 MPa, while Poisson's ratio of  $\nu = 0.3$ , density of  $\rho = 7.85 \times 10^{-9} \text{ t/mm}^3$ , and yield stress of  $f_Y = 235 \text{ MPa}$  remain the same. The effect of Young's modulus changing in the base plate and the stiffeners has a minimal influence on the optimum results calculated by Excel Solver NLP. In numerical modelling, we have performed the eigenvalue extraction to calculate the natural frequencies and the corresponding mode shapes by the Lanczos iteration method. Two analysis steps are used for natural frequencies belonging to the in-plane loaded plate, at the first step the applied loads and geometric nonlinearity were considered so that at the second step the load stiffness determined at the end of the first general analysis step can be included in the eigenvalue extraction. By taking the geometric imperfections allowed by designed constraints into account, the conclusion can be drawn from the FEA that the influence of initial geometric imperfections on frequencies is less significant. It can be also shown, that the eigenfrequencies show noticeable differences when the modulus of elasticity is changed. Therefore, it is important that the structure is properly designed and made from proper materials.

**Keywords:** stiffened plates, simple supported conditions, uniaxial compression, hybrid, FEA, natural frequencies

## **THE ROLE OF SOCIAL MEDIA PLATFORMS IN INCREASING THE EFFICIENCY OF ONLINE COMMUNICATION ACTIVITY**

**Anca Jarmila Guță<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department of Economic Sciences, University Street 20, Petrosani, Romania

Corresponding author: Anca Jarmila Guță, [gancajarmila@yahoo.com](mailto:gancajarmila@yahoo.com)

**Abstract:** Given the terms of the social media revolution that we pass, the goal of the paper is to identify the main types of social media platforms that contribute to increasing the efficiency in the online environment, where we work now. Starting from their characteristics we identified the degree of knowledge and use of main social media platforms in the current activity of a number of 39 teachers of the University of Petrosani who participated in a training course on e-learning platforms and online communication, a study that provided a realistic perspective on these issues.

The remainder of our paper is organized as follows. Section 1 introduces us to the paper by presenting the notion of online community virtual community whose members communicate with each other through interactive tools such as forums, chat, social networking sites or virtual worlds. Interactivity is the extent to which messages in a communication sequence are connected to each other and the degree to which subsequent messages are correlated with existing messages. Section 2 of the paper presents the main tools of asynchronous online communication, namely: e-mail, discussion forums, newsletters, wikis, blogs, webcasting and podcasts capturing the ways to build these types of online communities. Section 3 of the paper presents the synchronous online communication tools, which require direct interaction in the online environment between the members of that community, namely: chat and instant messaging, opinion polls and audio and video conferences. The 4th section of the paper is the most representative in terms of information presented on the main existing social networks (Facebook, Instagram, LinkedIn and ResearchGate) and from the perspective of the study conducted in the last section of the paper. The research presented in section 5 presents through the answers provided to the 5 questions of the questionnaire the degree to which the participants in the study consider it important to know and especially communicate in social media platforms in order to introduce this type of communication as much as possible. in their current work, which has proved necessary in the current context in which education has taken place in a proportion of almost 100% in the online environment as a result of the pandemic period that we are all going through worldwide.

**Key words:** online communication, synchronous communication, asynchronous communication, social media, education, efficiency, target group

**ACTIVE HARMONIZATION OF HIGHER EDUCATION  
BACHELOR STUDY PROGRAMME IN THE AREA OF TRADE,  
TOURISM AND SERVICES WITH THE LABOR MARKET  
DYNAMICS**

**Codruța Dura<sup>1</sup> and Claudia Isac<sup>2</sup>**

<sup>1</sup>University of Petrosani, Department of Economic Sciences, University Street 20, Petrosani, Romania, [codrutadura@yahoo.com](mailto:codrutadura@yahoo.com), [isacclaudia@gmail.com](mailto:isacclaudia@gmail.com)

Corresponding author: Claudia Isac, [isacclaudia@gmail.com](mailto:isacclaudia@gmail.com)

**Abstract:** Practitioners in the economic field require, to a larger extent, from business graduates to manifest and to put into practice both hard skills (namely planning, coordinating, controlling, problem solving –ability, innovative intelligence, organizational capabilities etc.) and soft skills (i.e. communication abilities, critical thinking, leadership, positive attitude, teamwork, business ethics, multitasking etc.). In this respect, the issue of young graduates' insertion on the labor market is a critical one within the framework of the current economic situation, while the inclusion of higher education alumnus represents a topic that gave rise to a great amount of interest in recent years among the institutional stakeholders involved in the academic education domain.

The remainder of our paper is organized as follows. Section 2 describes the methodology of our paper, which involves a qualitative description approach that comprises manifold aspects: the statistical analysis of trade and tourism branches from the V West Region (and Hunedoara County area) in correlation with the labor market dynamics; the job opportunities analysis before and after the pandemic etc. Section 3 provides a synthesis of several studies and projects addressing the issue of harmonizing the higher education system with the dynamic requirements of the labor market and displays the cognitive and behavioral competences achieved by grads from the The Economy of Trade, Tourism and Services (ETTS) Bachelor study program in order to become well trained specialists in their area of interest. Specifically, the main object of our paper is to highlight the interplay between the demands of the workforce market from Hunedoara county and the competences obtained by the graduates from the (ETTS) Bachelor study program.

The results of our investigations led us to the following conclusions: the pandemic brought about continuous oscillations in the trade and tourism labor market in such a way that, having skills in both fields, graduates from the ETTS Bachelor program could get compensation of the declining trend of available jobs in the hospitality industry by the increase of vacant jobs within the trade domaine (especially within the online commerce segment); Hunedoara Conty – an area with various types of tourism resources – mountain tourism, historical tourism, religious toursim etc. – has witnessed an upsurge in the number of tourists in spite of the pandemic; a paradigm shift occurred in the perspective regarding the jobs occupied by the grads from ETTS before and after the crisis. In this respect, we have highlighted the following trends: the movement from the trade/services organised in physical locations to those provided on-line and the graduates' migration from traditional jobs in the tertiary field towards free lancing and entrepreneurship mainly organised through teleworking.

**Key words:** economy of trade, tourism and services, labour market, , the pandemic

## COMPETITION IN THE GEORGIAN BANKING SECTOR AND ITS IMPACT ON THE CREDIT POLICY OF COMMERCIAL BANKS

George Abuselidze<sup>1</sup> and Mariam Sharabidze<sup>2</sup>

<sup>1,2</sup> Batumi Shota Rustaveli State University, Department of Finance, Banking and Insurance,  
Ninoshvili Street 35, Batumi, Georgia, george.abuselidze@bsu.edu.ge

Corresponding author: George Abuselidze, george.abuselidze@bsu.edu.ge

**Abstract:** Due to the high degree of impact on the economy of the banking sector, we consider it important to study/analyze the situation in this sector in Georgia. The efficient functioning of the banking sector is ensured by the competitive environment in this sector. The aim of the research is to assess/analyze the competitive environment in the Georgian banking sector, make relevant conclusions and develop recommendations. The article uses non-structural and structural research models to assess the competitive environment of the banking sector. To demonstrate/analysis the interrelation between competition in banking sector and interest rates, also for to assess their role in the money supply, we examined the level of competition in Georgian banking sector by using H-statistic. The given non-structural model evaluates the elasticity of interest and non-interest income using three indicators: the cost of funds raised the cost of labor and other costs. As a result of this research, in 2016-2019, the Georgian banking sector was assessed as monopolistic. In order to evaluate the infallibility of the research, we use another method to measure competition in Georgian banking sector - The Herfindahl-Hirschman Index. Based on the research, the concentration rate determined by different methods is characterized by an increasing trend every year and reached its maximum in 2019. The study revealed the dominant role of the two leading banks participating in the banking sector in terms of assets, as well as interest income, capital and other financial indicators. In addition, we used the net interest income to assess the competitive environment in the banking sector. The monopoly, that we have already, repeatedly proven is clearly seen in the case of net interest income. The two leading banks in the banking sector have the largest share of net interest income, their income dynamics are mostly growing. Therefore, we considered it necessary to study one of the determinants of net interest income. For this, we study the interest rate of Georgian commercial bank's on mortgage, consumer and business loans. The interest rates on mortgage and consumer loans are non-competitive. As for business loans, there is competition, as banks offer more or less different interest rates, and in the case of this loan, the interest rate set by the two leading banks is more competitive than other types of loans and is acceptable to consumers due to its relatively low rate. This indicates that in the Georgian banking sector these two banks have monopoly rules for a defined loan portfolio. The monopoly in Georgian banking sector has limited the reduction of interest rates on loans. It also restricts the competition in lending and promotes to increase net interest income for monopoly banks. The competition in the banking market has deteriorated due to the pricing policy of monopoly banks.

**Key words:** banking market, competition, spread, interest income, commercial banks

## APPROACHES REGARDING TO THE ENTREPRENEURIAL PRACTICES OF STUDENT IN ROMANIA

Maria Ciurea<sup>1</sup>

<sup>1</sup>University of Petrosani, Department of Economics Sciences, University Street 20, Petrosani, Romania, mariamacris2011@yahoo.com

Corresponding author: Maria Ciurea, mariamacris2011@yahoo.com

**Abstract:** Entrepreneurship is a skill that can be learned, so you do not have to be born with this skill to be a successful entrepreneur, but you can become a successful entrepreneur by learning and training certain skills. Entrepreneurial education contributes to the development of skills, knowledge and aptitudes necessary to achieve the objectives that stakeholders have set for themselves to become responsible and enterprising. These are relevant aspects for people with entrepreneurial education who are a real help in accessing a job more easily or more chances in setting up their own companies. The development of entrepreneurship among students generates a number of benefits both personally and in the community in which they live, such as: individual well-being, job creation, reduction of poverty and social inequities, economic growth. Therefore, this study aims to debate the topic of entrepreneurship and especially the identification of the main entrepreneurial practices that will be of real use in the development of entrepreneurial skills among students who want to opt for this field. The mentioned aspects will result in the increase of confidence, of the multiple perspectives and opportunities in the establishment and development of successful businesses of the graduates of higher education in Romania. In the extensive process of substantiating and launching entrepreneurial ideas by students, great attention must be paid to the importance of entrepreneurial innovation, emphasizing that innovation appears as a key factor in entrepreneurship today, due to fierce competition and the ever-changing economic environment

This study has a theoretical character and for its elaboration we conducted investigation of the scientific literature, using various search engines such as: entrepreneurial education, entrepreneurial practices, student entrepreneurial skills, entrepreneurial activity, successful business, specific to Romanian entrepreneurship. In order to synthesize the information collected, more logical methods of scientific research were used, such as: analysis, synthesis, induction, deduction and analogy. Thus, their use resulted in their own approach to some relevant aspects of identifying student entrepreneurial practices in the phase of their acquisition, application, media coverage and stimulation, the knowledge of which makes a significant contribution to the development of students' skills in entrepreneurship.

**Key words:** entrepreneurial practices, entrepreneurial skills, students, entrepreneur, business ideas

## USING A SOFTWARE AS A SERVICE PROGRAM IN SALES MARKETING: A CASE STUDY ON ODOO

Ana Maria Mihaela Iordache<sup>1</sup>, Cezar Octavian Mihalcescu<sup>2</sup>, and  
Beatrice Sion<sup>3</sup>

<sup>1</sup>Romanian-American University, Department of IT, Statistics and Mathematics. No.1B Expoziției Bld, Bucharest, Romania, iordache.ana.maria.mihaela@profesor.rau.ro

<sup>2</sup>Romanian-American University, Department of IT, Statistics and Mathematics. No.1B Expoziției Bld, Bucharest, Romania, mihalcescu.cezar.octavian@profesor.rau.ro

<sup>3</sup>Romanian-American University, Department of IT, Statistics and Mathematics, No.1B Expoziției Bld, Bucharest, Romania, sion.beatrice@profesor.rau.ro

Corresponding author: Ana Maria Mihaela Iordache,  
iordache.ana.maria.mihaela@profesor.rau.ro

**Abstract:** In the last period the online environment has become increasingly dynamic, vast and has grown in complexity a lot. Internet communication can be done extremely easily, no longer geographical and temporary barriers, the only ones left are those of a cultural nature. Starting with 2020, with the onset of the covid-19 pandemic, the number of sales transactions on the Internet has increased at a fast pace, the companies having to adapt their main activity and, implicitly, the sales activity to the new reality. The customer asks for much more information about a product before deciding to buy it, and a prompt response from the sales team will tip the balance decisively in favor of the seller. The success of an efficient sales team is represented by addressing to the right customers at the right time and in the right way. According to Terminanto et al, the use of CRM (Customer Relationship Manager) software and, in particular, Odoo's in the sales department, has led to the acceleration of "the process of making the offer", to higher sales, thus increasing the efficiency of the activity. Another study made by Suryo et al on the effects of implementing Odoo on Mc Cake showed that important advantages can be obtained, such as: "speed, accuracy, and relatively lower costs" compared to using traditional methods. Using specific modules (Discuss, Calendar, Contacts, CRM, Sales and Accounting), we followed the information flow of the marketing process, from market prospecting and to the registration in accounting of the invoices resulting from the orders made. We also presented the way in which marketing campaigns can be carried out, having modules such as: Email Marketing, Events, Social Marketing, Appointments, Surveys and SMS Marketing, depending on the target group to which it is addressed. The balance of benefits brought - resources spent is super-unitary, which means that Odoo can be implemented at the level of companies with quite low costs, the benefits being high, in a short time. A company, depending on the held resources and internal requirements, chooses the right product in order to obtain a competitive advantage.

**Key words:** CRM, Saas, marketing, company, Odoo, service.

## THE IMPACT OF COVID-19 ON GLOBAL INSURANCE MARKET

Ana Preda<sup>1</sup>, Mirela Popescu<sup>1</sup> and Imola Drigă<sup>1</sup>

<sup>1</sup>University of Petrosani, Department of Economics, University Street 20, Petrosani, Romania, mirelapopescu.up@gmail.com, imola.driga@gmail.com

Corresponding author: Ana Preda, ana\_preda79@yahoo.com

**Abstract:** The purpose of the paper is to present the changes occurred on global insurance markets during the current pandemic situation. The effects are largely felt through asset risks, weaker premium growth prospects, and also insurers' long-term investment. Developed markets, particularly life ones, are likely to shrink in real terms as a result of the economic slowdown. Higher mortality rates due to the coronavirus pandemic are affecting the bottom lines of many life insurers. Insurers have made additional efforts to keep their customers well informed during the crisis by setting up dedicated websites and engaging in targeted information activities. Some companies have also made additional efforts to help protect customers from fraud, especially online fraud which has grown during the crisis. Preliminary data and estimates available for the first quarters of 2020 would suggest that the evolution of underwritten premiums varied greatly depending on the type of insurance business. Gross written premiums decreased in the first half of 2020 in the life segment compared to the same period in 2019, while they increased in the non-life segment, a explanation for the decrease in gross written premiums in the life segment, is the increase of expiration rate or a decline in new business written. Difficulty meeting in person may have contributed to declining sales of a new life insurance policy. The increase in life premiums in emerging markets returned in 2019, after falling in 2018, the recovery was mainly driven by China. In emerging Asia, the volume of life premiums continued to grow supported by robust growth in key markets. In Latin America, the growth of premiums has expanded sharply, based on a strong increase in the return of demand for savings products in Brazil following social security reforms. Growth in the Middle East and Africa remained weak, reflecting the challenge of the region's economic environment. The pandemic significantly changed the claims experiences for several types of insurance. In some countries there has been an increase in claims on the life insurance segment due to COVID-19. This crisis has affected the solvency, profitability and profitability of the insurance sector, following an initial shock on the financial market, the insurance sector demonstrated resilience - helped, in some regions, by monetary and fiscal support measures on financial markets. In the first half of 2020, the pandemic significantly affected investment income and, to a lesser extent, insurance business income. Investment income was mainly affected by depreciation and loss of investment in financial market recessions. The increased expenses associated with facilitating distance work and ensuring business continuity also put pressure on profitability for some insurers. The impact on liquidity has been limited, without raising any immediate concerns about the ability of the insurance sector to meet its obligations in the first half of 2020.

**Key words:** written premiums, benefits paid, life insurance, pandemic situation, solvency, profitability

## IS IT WORTH INVESTING IN CRYPTOCURRENCY?

**Tatiana Antipova<sup>1</sup>**

<sup>1</sup>Institute of Certified Specialists, Lunacharskogo Street 95A, Perm, Russia, E-mail:  
[antipovatianav@gmail.com](mailto:antipovatianav@gmail.com)

Corresponding author: Tatiana Antipova, [antipovatianav@gmail.com](mailto:antipovatianav@gmail.com)

**Abstract:** Skyrocketed Bitcoin's price manifested a general trend of rising cryptocurrency values during COVID-19 pandemic. Considering that bitcoin was worth a few cents at the beginning of its creation and now excels thousands of USD per unit, it seems that investing in bitcoin is a very profitable. Hence the related research question, is it worth investing in cryptocurrency? The answer to this question depends on many factors, one of the decisive ones is the high volatility of cryptocurrency. The result of calculating the average price and volatility of bitcoin for four-years period 13.03.2017 – 13.03.2021 between 4.14 and 5.05%. So, it means that the investment in this active is very risky. Will it be profitable?

Current work considers volatility and profitability of cryptocurrency, and discusses how to determine volatility and profitability of cryptocurrencies and its importance in investing. In addition, the profitability/losses of cryptocurrency transactions are analysed. If cryptocurrency will be stable in the future, then it is easily accepted through worldwide and in the long run, people would have more trust to the cryptocurrency and its usability. But we should take into account many other factors that make investment in cryptocurrency very risky and they are: high volatility; unstable profitability and losses; costly expenses on electricity and equipment, and many others. Let's consider the profitability/loss of Cryptocurrency Mining Results. There were analysed data of 15 Cryptocurrencies which were on the first position at the beginning of this study on 03.09.2019. It is necessary to note that the "Profit or (Loss) per day" the values shown are net of electricity costs. Profitability of cryptocurrencies' mining is very unstable and unpredictable. Some cryptocurrencies were losses (e.g. Vertcoin, Florincoin, Einsteinium, and Litecoin) on 03.09.2019 and became profitable on 13.03.2021 and 01.05.2021. The most interesting is LitecoinCash (LCC) behaviour: it was profitable on 03.09.2019 with fourth position, losses on 13.03.2021, and had got highest of studied cryptocurrencies profit on 01.05.2021 with second position. So, there is no possible to predict which one will be profitable, which – losses. In addition, we can conclude that Profit per day is not so much: from \$7.54 to \$86.59. And it proves once again that investing in cryptocurrency is not very profitable. Another factor that affects investing in cryptocurrency is the time to mine and obtain a unit of cryptocurrency.. From March 13, 2021, **to mine 1 Bitcoin** would take **1,550.8 days**. To conclude, this paper considered the most common factors influence the attraction on investing in cryptocurrency: Volatility, Profitability, and Mining time. Due to high volatility cryptocurrency, person can either make a huge profit, or lose everything and stay with nothing in one milli second. Therefore, the decision to invest in cryptocurrency is made by each person individually.

**Key words:** virtual currency, high volatility, top loser, cryptocurrency mining, top gainer, volatility index



**NEW TENDENCIES IN PUBLIC ADMINISTRATION: FROM THE  
NEW PUBLIC MANAGEMENT AND NEW GOVERNANCE TO E-  
GOVERNMENT**

**Dorina Țicu<sup>1</sup>**

<sup>1</sup> "Alexandru Ioan Cuza" University, Faculty of Philosophy and Social and Political Studies,  
Department of Political Sciences, International Relations and European Studies, bd. Carol I,  
Iasi, Romania, [www.uaic.ro](http://www.uaic.ro)

Corresponding author : Dorina Țicu, [ticudorina@yahoo.com](mailto:ticudorina@yahoo.com)

**Abstract:** This article aims to realize an analysis on the current public administration through the prism of new explanatory theories: The New Governance (NG) and the New Public Management (NMP), beyond the classical bureaucratic theories, the sociological theories, etc.

The article is based on a qualitative analysis of the local public administrative system: trying to identify whether the elements of e-government are present at this level, as well as what their role and their necessity are at the public-administrative level by correspondence with the new theories applied, presented above: NG and NMP.

**Key words:** public administration, New Public Management (NPM), New Governance (NG), e-government

## OPTIMISATION THROUGH OFFSHORE – BETWEEN REALITY AND LEGALITY

**Bianca Cristina Ciocanea<sup>1</sup>, Ioan Cosmin Pițu<sup>2</sup>, Paraschiva Mihaela Luca<sup>3</sup> and Dragoș Mihai Ungureanu<sup>4</sup>**

<sup>1</sup> Lucian Blaga University of Sibiu, Department of Doctoral Studies B-dul Victoriei Street 20, Sibiu, Romania, sb19biu@gmail.com, [cosmin\\_pitu@yahoo.com](mailto:cosmin_pitu@yahoo.com), mihaluca2006@yahoo.com

<sup>4</sup> Spiru Haret University, Bucharest, România, dragos.ungureanu@yahoo.com

Corresponding author: Bianca Cristina Ciocanea, sb19biu@gmail.com

**Abstract:** The study highlights the complete image of the characteristics regarding offshore areas, by taking into account the perspective to deploy new measures of fiscal transparency. The importance of such areas stems from the fact that world economies lose important sums of money, every year by default of taxes. This happens as a consequence of corporative international abuse of fiscal evasion and the relocation of the profit made by big companies. The sums resulted from erosion of national taxation bases, from fiscal evasion and fraud and other infringements connected with fiscal evasion (are often being transferred to offshore companies so that their illegal characteristics gets lost and after that to be reintroduced into the economic cycle. The main characteristics of these offshore centres is lack of transparency and cooperation with foreign authorities, fiscal and banking secrecy being considered the guarantee of the offshore areas, measurable variables, fleshes in indicators that reflect the secret degree for each state. Therefore, fighting against such practices through offshore societies aims at enforcing some measures to enlarge transparency and for the regions do not cooperate there is no granting of fiscal deductibility for transactions that entail the transfer of sums to the respective regions. The conclusions of this study are based on the existing literature in the field, on the processing and data interpretation through data comparative analysis. Due the fact that the use of fiscal optimisation represents the main practical utility and very often within the legal limit concerning offshore companies, we consider that the only way for minimising the effects of this process is represented by stressing transparency, also we must identify new ways through which offshore companies should be coerced to increase transparency. Starting with the main characteristics, of an offshore namely, the fiscal and bank secrecy, relaxed fiscal environment and low taxes, the fight for debunking offshore mechanisms must be focussed mainly on international fiscal transparency in order to enforce taxation in home countries. Such steps must be completed with not granting deductibilities for transactions with offshore. An important step would be the enforcement of taxation systems onshore for such transactions. Taking into account the spreading and crossborder nature of this phenomenon we conclude that the measures taken internally only cannot demonstrate efficiency or have even have an opposite effect by breaking up the unique market. Therefore, the approach of some coordinated and unitary measures taken at EU level are no doubt imperative.

**Key words:** offshore companies, transparency, taxes, fiscal evasion, tax havens

## ISSUES REGARDING THE IMPACT OF THE CORONAVIRUS PANDEMIC ON THE LABOUR MARKET

**Alina Nițescu<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department of Economic Science, University Street 20, Petrosani, Romania, [al.nitescu@gmail.com](mailto:al.nitescu@gmail.com)

Corresponding author: Alina Nițescu, [al.nitescu@gmail.com](mailto:al.nitescu@gmail.com)

**Abstract:** A year has passed since humanity was hit, on all levels, by the COVID-19 pandemic. In addition to the specific health, social, moral, etc. consequences, the pandemic has strongly influenced, perhaps in some segments even irretrievably, the economic sector, causing a new economic crisis that has put pressure on the economies of all states in the world.

The year 2020 is marked, from an economic and social point of view, by the global spread of the SARS-CoV-2 virus, which has generated a shock of a major magnitude, both among developed and emerging economies or in development. At the level of Romania, the medical crisis and the measures taken to limit the spread of the virus have left their mark on many sectors of activity and have imposed appropriate interventions.

The consequences of the coronavirus pandemic are multiple and diverse: the negative impact on incomes, labor market tensions, psychological effects on consumers (reduction of expenditures considered non-essential, uncertainty about job security, etc.), closure of a significant part of the services sector.

In this context, the labor market, as a whole, has recently undergone important changes, which have led to its transformation and the emergence or deepening of vulnerabilities, the effects being felt both in terms of unemployment and in terms of changes that have occurred on the typical and structure of work.

At the level of our country, the main industries affected by the massive job losses were transport, tourism, HoReCa, entertainment, trade, manufacturing, construction. On the contrary, there has been a positive increase in employment in a number of service sectors such as information and communication and financial and insurance activities. The economic activities in which work itself could be replaced by telework, as well as those in which there was a rapid digital transformation, suffered the least. This is also observed at the employee level; those employees who had the skills and competencies necessary for a reorientation towards automated, digitized activities were the least exposed to the phenomenon of unemployment.

Thus, the paper aims to capture the main consequences of the pandemic on the labor market, especially on the fragile balance of the Romanian labor market and to reproduce the main measures taken to reduce the negative impact of the COVID-19 crisis.

**Key words:** labour market, COVID-19 pandemic, workforce, economic sectors

## THE COMPANIES' CHARACTERISTICS IMPACT ON THE PERFORMANCE'S SUSTAINABLE REPORTING. CASE STUDY ON BUCHAREST STOCK EXCHANGE LISTED COMPANIES

Maria-Mădălina Bogueanu-Popa<sup>1</sup> and Mariana Man<sup>2</sup>

<sup>1</sup>University of Craiova, Al. I. Cuza Street 13, Craiova, Romania, E-mail address [madalinabogeanu@yahoo.com](mailto:madalinabogeanu@yahoo.com)

<sup>2</sup>University of Petrosani, Department of Economic Sciences University Street 20, Petrosani, Romania, E-mail address [man\\_mariana2006@yahoo.com](mailto:man_mariana2006@yahoo.com)

Corresponding author: Maria-Mădălina Bogueanu-Popa, [madalinabogeanu@yahoo.com](mailto:madalinabogeanu@yahoo.com)

**Abstract:** The economic entities are subject to the dynamic economic environment in changing the annual statements reporting. In the current context, the sustainable reports represent the communication mean of the entity regarding its sustainable actions, the achieved performance level, and the impact of the activities regarding the environment. The economic entities in Romania are headed in a progressive manner towards implementing practices of sustainable development and implicitly drafting sustainable reports given the appearance of the 95/2014/EU Directive. Integrating the economic, social, and environmental exigencies as a sustainable report represents in the long run an indispensable requirement for an economic entity. This paper's objective is to analyze the impact of the companies' characteristics regarding the performance's sustainable reporting in the context of sustainable development, having as case study the Bucharest Stock Exchange (BSE) listed companies on the Regulated Market, during 2019, sample composed of 83 entities. During this research, a dependent variable was established, referring to the content of the sustainable report of performance of a BSE (ERS) listed economic entity; three independent variables referring to: the economic entity's dimension (ED), the economic entity's rentability (ARR) and the economic entity's recognition (EER); and a control variable referring to the economic entity's objectives (EO). As research methods, one resorted to using qualitative research as well as quantitative research. The qualitative research is represented by the specialty literature study and the quantitative research is rendered through econometric models such as: the descriptive statistics analysis, the correlation coefficient between variables, the ANOVA test, and the regression analysis. The research's results indicate the fact that the three independent variables of the entity: the economic entity's dimension (ED), the economic entity's rentability (ARR) and the economic entity's recognition (ARR), have a significant impact on drafting the sustainable report (ERS). The importance of this study is given by the perspective offered to the management in order to improve the drafted annual statements and to transform them into sustainable reports. Thus, one appreciates the sustainable report's content as being important for the Romanian economic entities to support their activity and competitiveness in the long run as well as to attract investors.

**Key words:** company characteristic, sustainable reporting, sustainable development, financial information, non-financial information

**9. Contemporary approaches in quality assurance, management and marketing**

**A CHALLENGE FOR THE ROMANIAN MANAGEMENT COMPANIES - THE COMMUNICATION SPECIALIST**

**Nicolae Tașcă<sup>1</sup>, Nicu-Pantelimon Rotaru<sup>1</sup> and Lucian Lupu-Dima<sup>2</sup>**

<sup>1</sup>University of Petrosani, 332006 Petroșani, Romania, [nicutasca@gmail.com](mailto:nicutasca@gmail.com),  
[nicu.p.rotaru@gmail.com](mailto:nicu.p.rotaru@gmail.com)

<sup>2</sup>University of Petrosani, Department of Mining Engineering, Surveying and Construction,  
Petroșani, 332006, Romania, [lucianlupu@upet.ro](mailto:lucianlupu@upet.ro)

Corresponding author: Nicolae Tașcă, [nicutasca@gmail.com](mailto:nicutasca@gmail.com)

**Abstract:** In this paper, the purpose of the authors was to analyze the importance of managerial communication in the companies of Hunedoara county, especially through the presence of the specialist in communication.

I researched the specialized literature that presents the situation of managerial communication in European countries, as well as in countries near Romania. Last but not least, we researched what happened in the field of managerial communication in the COVID-19 pandemic, when many jobs moved home.

The authors conduct a survey using the survey method through a short questionnaire, ensuring that it does not take more than 5 minutes for respondents to complete. The questionnaire consisted of 14 questions, was distributed online and applied to a group of over 500 companies in Hunedoara County, between September 13, 2020 - September 30, 2020.

The authors received 34 responses, and these responses form the basis of the research. They were interested in the existence of managerial communication procedures at the company level and also focused on the characteristics of managerial communication in these companies.

They looked at whether these companies use task-centred communication or human-centred communication, whether the communication used is formal or informal, or what method of communication is mainly used - bottom-up or top-down. Even if the current research was limited to the borders of Hunedoara county, the authors demonstrate the need for the existence of communication specialists in the management area of the organization.

We concluded that for many managers, especially in small companies, the existence of managers or communication specialists is relatively new. The vast majority of those who know about their existence, consider it an unnecessary expense and not as a plus, as they see the online and offline promotion of their business.

This study contributes to the development of managerial communication, allowing managers and business owners to understand the usefulness of the presence of communication specialists in companies.

**Key words:** business, management, managerial communication, organization, communication specialist, public relations

## **BUSINESS MODEL BASED ON COMMUNITY FOR A SUSTAINABLE TOURISM DEVELOPMENT**

**Ionela Samuil<sup>1</sup>, Andreea Cristina Ionică<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department of Management and Industrial Engineering, University  
Street 20, Petrosani, Romania

Corresponding author: Ionela Samuil, ionelasamuil@gmail.com

**Abstract:** Improper management practices in tourism can have an undesirable impact on the environment and society and can threaten both the development of tourism and the economic viability of communities. Awareness of this challenge has led to widespread acceptance of the concept of sustainable development. In the volatile economic conditions generated by globalization, development can only be sustained by improving competitiveness, requiring a high quality of environmental protection policies among the various actors involved in tourism activities, no longer sufficient economic efficiency. The development of tourism requires the development of a complex policy, because the interaction between actors is never free from conflicts arising from divergent and / or opposite interests generated by the unequal distribution of influence between stakeholders. The success of sustainable development is based in part on the support and participation of stakeholders in tourism. Communication and dialogue between stakeholders are essential, and the analysis and recognition of these tensions is a valuable methodological focus for the realization of legitimate and socially sustainable tourism development projects. It is obvious that for the successful development of tourism in an area, it is also necessary to obtain a positive attitude of the locals towards this action and the active involvement of the host community. The purpose of this paper is to highlight that sustainable development is achieved with the support and participation of all parties involved in tourism. As tourism is promoted as a tool for community conservation and development, the emphasis must be on local communities and their needs and capacities. If well designed, community-based tourism can become a mechanism for reducing poverty and improving the quality of life, providing economic benefits to people in local communities. Community-based tourism is a form of local tourism, owned and managed by the community and the development of a community-based tourism model requires the active participation of the community where the development process takes place. Despite the multitude of existing studies in the literature both in relation to community-based tourism and on the evaluation of the models used, there is no analysis of the levers and barriers in its realization. The objective of this research is to highlight the importance of collaboration actions between authorities, stakeholders and the community for the development of the Petrila Theme Park. Also, based on social and technical-economic studies, a business model will be proposed to allow the visualization of the potential impacts generated by the development of tourism.

**Key words:** Business model, community based tourism, post-industrial tourism, sustainable development.

## **BETWEEN PROJECT EFFICIENCY AND STAKEHOLDERS' INTERESTS: PROJECT INTAKE DECISIONS IN NONPROFIT ORGANIZATIONS**

**Ibrian Caramidaru<sup>1</sup> and Andreea Ionica<sup>2</sup>**

<sup>1</sup>University of Petrosani, Department of Engineering and Management, Universitatii Street 20, Petrosani, Romania, [ibrian.caramidaru@gmail.com](mailto:ibrian.caramidaru@gmail.com)

<sup>2</sup>University of Petrosani, Department of Engineering and Management, Universitatii Street 20, Petrosani, Romania, [andreeaionica@upet.ro](mailto:andreeaionica@upet.ro)

Corresponding author: Ibrian Caramidaru [ibrian.caramidaru@gmail.com](mailto:ibrian.caramidaru@gmail.com)

**Abstract:** Nonprofit organizations implementing their strategies through multi-project environments are perennially confronted with the difficulties embedded into their institutional design. Assessing their social results is dependent on the depiction of social change and it is performed in settings of project networks influenced by multiple stakeholders. In order to balance the project efficiency, in terms of the triple constraint of scope-time-budget, and the need for stakeholder satisfaction, a procedural decision making approach is required for project intake decisions. The research question is - how can nonprofit organizations select projects under the requirements of stakeholders, while complying with the project constraints? The aim of this paper consist in proposing a decision making process set for project intake decisions, in order to balance the project efficiency, in terms of the triple constraint and the need for stakeholder satisfaction. The structured process of strategic project intake decisions, consists in manipulating project proposals through four main procedural steps informed by endogenous and exogenous data. We drafted a prototype for the process of project intake decisions entailing the steps grounded in the relevant literature and proposing a score function in the final step of the process. In order to use the score function, each project proposal should supply information on: the stakeholders of the project, the values of project outcomes, the project inputs and their associated costs, the flexibility of the triple constraint elements, the statistical values for delivery and schedule efficiency. To ensure the comparability of the information provided, the organization should have in place homogenous project management practices for reporting on the triple constraint compliance and social outcomes yielding. In terms of the triple constraint flexibility, the historical efficiency would serve for informing the management on whether the organization could comply with the requirements of the financiers. In the prototype the weighting system is the average time preference for the output, whereas the project efficiency ratios are pointing to the probability of the project completion within the established project constraints. The main theoretical contribution consists in producing an intake function and a project intake procedure that explicitly link the social outcomes with project efficiency and stakeholder relevance criteria.

**Key words:** project selection, nonprofit strategy, nonprofit management, project management, stakeholder theory

## KNOWLEDGE MANAGEMENT SYSTEMS IN QUALITY 4.0

**Raluca Dovleac<sup>1</sup>**

<sup>1</sup>University of Petrosani, Department of Management and Industrial Engineering, University Street 20, Petrosani, Romania, raluca.dovleac@yahoo.com

Corresponding author: Raluca Dovleac, raluca.dovleac@yahoo.com

**Abstract:** Quality management has evolved throughout time in ways that allowed companies to adapt quality practices and principles into their activities in order to provide better products/services to their customer. The latest trends point to the pivotal role that quality plays in the Industry 4.0 era, where it is expected to synergize with Industry 4.0 practices in order to ensure that not only products are built faster and cheaper but also that they can meet the quality expectations of the customers. This gave birth to the concept of Quality 4.0, a new way of managing quality which uses modern technologies such as: IoT, Blockchain, Big data, AI and sensors in order to gather relevant information, monitor process performance and act preemptively in regard to the quality of the process output. Quality 4.0 highlights eight key components for effective implementation and focuses on using the tools and technologies available currently in order to help provide quality management solutions for companies that operate within Industry 4.0. Quality 4.0 supports the digitalization of quality management including not only the products and the technologies but also the processes and the people. An issue that emerges however, is identifying the relevant data and ways to manage it as this is considered to be a major obstacle in the implementation of Quality 4.0 practices. Knowledge management (KM) refers to the process or set of processes through which an organization makes use of the individual and collective intelligence within itself, in order to reach the established strategic goals. Furthermore, it aims not only at creating and/or acquiring knowledge but also to the practices involved in storing, retaining, transferring and using the available knowledge. The research focuses on providing the foundational base for Knowledge management practices of companies looking to embrace Quality 4.0 to ensure that these companies use relevant data in their daily activities. Like so, the author looked to answer the following question: *How does a company ensure that it gathers the right/relevant data and transfers this data into explicit knowledge as soon as possible?*

For this, an important delimitation must be made first, that of understanding what sort of tools and techniques will be used by Quality 4.0 organizations, then understanding the skills and abilities required by Quality 4.0, the selection basis for establishing that relevant data is being collected and transformed into tacit knowledge, and last but not least important, understanding the knowledge management process and the most effective way of managing it. As a proposed solution to the concerns regarding the means of managing knowledge, a knowledge management approach based on the PDCA cycle that focuses on categorizing the key elements of knowledge management life cycle and integrating these into the PDCA cycle has been designed and presented.

**Key words:** Quality 4.0, Blockchain, Big data, Knowledge management systems, IoT, Industry 4.0



## COULD BE EFFICIENT MANAGEMENT A SOLUTION FOR THE SUCCESS AGAINST COVID-19

**Nicu-Pantelimon Rotaru<sup>1</sup>, Nicolae Tașcă<sup>1</sup> and Eduard-Victor  
Edelhauser<sup>2</sup>**

<sup>1</sup>University of Petroșani, 332006 Petroșani, Romania, [nicu.p.rotaru@gmail.com](mailto:nicu.p.rotaru@gmail.com),  
[nicutasca@gmail.com](mailto:nicutasca@gmail.com)

<sup>2</sup>Head of Management and Industrial Engineering Department, University of Petroșani,  
332003 Petroșani, Romania, [edi1ro2001@yahoo.com](mailto:edi1ro2001@yahoo.com)

Corresponding author: Nicu-Pantelimon Rotaru, [nicu.p.rotaru@gmail.com](mailto:nicu.p.rotaru@gmail.com)

**Abstract:** Globally, the last 15 months have put health systems under unprecedented pressure during the last century, facing significant challenges in the management of organizations, patient care and the protection of medical staff, and the time to respond to the needs of communities. The context created by the SARS-CoV-2 pandemic shows us how important the functionality of a health system is, how managers could prevent the spread of the virus, how the number of tests or vaccinations could stop the spread of the virus. It is also important to provide access to health services for as many patients as possible, especially for those in vulnerable categories, but also to succeed in ensuring maximum safety conditions for specialized personnel (doctors, nurses, paramedics, ambulance drivers, pharmacists etc.). The authors considered that the essential features of each health system, in the analysis of how they responded to the challenges of the SARS-CoV-2 (or COVID-19) pandemic, must be analyzed from the perspective of the medical act, its financing, and also from the use of modern technologies and resilience. Synthesis was made between the results of the 4 official studies presented by the Commonwealth Fund, Health Consumer Powerhouse, Bloomberg and U.S. This information, put by the authors in a comparative analysis with the updated data of the World Health Organization, constantly highlighted several health systems that had an effective management in the fight against the Covid-19 pandemic. In the conditions of a pandemic that spread at a very fast pace, the authors highlighted the most important health systems in the world, designated according to well-defined criteria in very rigorous studies. The authors emphasize that the success of various health systems in the fight against the Covid-19 pandemic depended on several cumulative factors, such as: rapid reaction and coordination of institutions, training of specialists, medical infrastructure, management at central level and at hospital unit level, geographical positioning, population size, information and awareness, social discipline or use of digital technologies.

**Key words:** health systems, COVID-19, healthcare management, health financing, resilience of health systems

**A MANAGERIAL PERSPECTIVE OVER ONE YEAR OF ONLINE  
EDUCATION IN ROMANIA.  
A CASE STUDY AT THE UNIVERSITY OF PETROȘANI**

**Eduard Edelhauser<sup>1</sup>, Lucian Lupu-Dima<sup>2</sup> and Georgina Grigoras<sup>3</sup>**

<sup>1</sup>University of Petrosani, Head of the Management and Industrial Engineering Department,  
Universitatii Street 20, Petrosani, Romania, eduardedelhauser@upet.ro

<sup>2</sup>University of Petrosani, Mining Engineering, Surveying and Construction Department,  
Universitatii 20, Petrosani, Romania, lucianlupu@upet.ro

<sup>3</sup>University of Petrosani, Management and Industrial Engineering Department, Universitatii  
Street 20, Petrosani, Romania, grgeorgiana@yahoo.com

Corresponding author: Eduard Edelhauser, eduardedelhauser@upet.ro

**Abstract:** The authors tried to analyze the implication of one year of online education in one of the smallest Romanian university. The analysis was seen as a challenge for the management of a university who was not prepare for e-learning or online education at the beginning of the pandemic crisis. They have made a double investigation, one from the professor perspective and another from the students one. They had investigated the main feature of a standard online or a classical eLearning solution, such as the meeting solution or the videoconference software, the collaborative work such as homework or projects and the testing method or the quizzes from both perspectives. Because the university didn't adopt a unique solution they had made a comparison between the used solutions, and more important they identified the efficiency of the university management in implementing the online education in the pandemic crisis period. The summary conclusion of the paper is that online education methods and tools have been very well accepted by the teachers and students as well but using different tools for each component of the online teaching, respective meeting solutions, virtual classrooms or testing methods are not favorable for the students. Using more than tree methods for all the online elements, such as teaching, projects or testing are difficult to accept for both students and teachers. One year ago, at the beginning of the pandemic, the management had made two huge mistakes in the field of online education. First in the academic year 2019/2020 they did not implement the existing Microsoft Office 365 that offers all the collaborative and online tools, and second in the academic year 2020/2021 they implement a pour and rudimentary eLearning platform called Academis. This platform does not offer a meeting instrument, has a pour developed testing tool, so it was used only by a small number of students, in fact 8-9% have used this platform. Today, after more than a year of online learning, thanks to the personal teacher effort, the teaching process can be considered as acceptable. The authors propose to implement a collaborative platform for the probably future hybrid education system, and the authors proposed the Microsoft solution being the safest solution and also the most used solution in the Romanian academic system.

**Key words:** eLearning, online education, academic education, COVID 19, virtual classroom, academic management

## IMPLEMENTATION AND IMPACT OF INDUSTRY 4.0 AND QUALITY 4.0 IN THE BANKING SECTOR

**Celina Pogăciaș<sup>1</sup> and Raluca Dovleac<sup>2</sup>**

<sup>1</sup>University of Petrosani, Doctoral School, University Street 20, Petrosani, Romania,  
celina.pogacias@gmail.com

<sup>2</sup>University of Petrosani, Department of Management and Industrial Engineering, University  
Street 20, Petrosani, Romania, raluca.dovleac@yahoo.com

Corresponding author: Raluca Dovleac, raluca.dovleac@yahoo.com

**Abstract:** The digitalization of banking services refers not only to the application of new technologies, but also involves a completely different approach and way of thinking for all actors involved. In the last thirty years, civilization has gone through three industrial revolutions, and the fourth industrial revolution also called Industry 4.0. is in progress. The digital economy is considered a post-industrial, global economy, based on internet transactions and advanced technology, as a global network of economic activities based on information communication technology, as an economy based on digital technology is an information-based economy, knowledge, ideas and innovations. It is estimated that the digital economy is growing seven times faster than other economies and that in developed countries it produces 10% of gross domestic product, which means that the digital economy is constantly growing and the traditional economy will be transitioning to the digital form. One of the trends in bank digitalization is the emergence of blockchain technologies being determined by the emergence of cryptocurrencies. The emergence of cryptocurrencies, i.e., digital money, is an inevitable consequence of the Industry 4.0 revolution. Many cryptocurrencies have appeared in the market, but some of them have gained popularity and full assertion, one of the most popular cryptocurrencies being the Bitcoin.

Given the dominance of the technological environment and unprecedented customer expectations, banks in Romania have concluded that the practices of quality management can be implemented for banking activities, inspired by the actions of international banks that have entered the national market. Knowing and anticipating customer needs and expectations as they evolve, by focusing on achieving and maintaining a maximum degree of satisfaction to retain customers is a primary objective. In Romania, it was observed that the marketing efforts made to promote internet banking were continuous and aggressive, which determined that between 29% and 71.5% of the customers of the largest banks to become digital customers.

It is strategically relevant that the impact of Industry 4.0 on the transformation of the banking sector does not jeopardize security, which fuels the need for a balance between competition, innovation, security and customer satisfaction. In addition to the accelerated digitalization processes in the banking sector, the human factor will continue to play a key role in the future, as the focus will remain on the bank's customer, security and trust.

The aim of the paper is to explore the possibilities of implementing Quality 4.0 and Industry 4.0 in banking systems and their impact by studying the literature.

**Key words:** banking, digitalization, Quality 4.0, Industry 4.0, quality management

**ACADEMIC LIBRARIES AS USER-CENTERED ORGANIZATIONS.  
CASE STUDY: QUALITY OF SERVICES PROVIDED BY LBUS  
LIBRARY**

**Elena Mărginean<sup>1</sup> and Claudiu Vasile Kifor<sup>2</sup>**

<sup>1</sup>“Lucian Blaga” University of Sibiu, The LBUS Library, 10 Victoriei Blvd., Sibiu, Romania

<sup>2</sup>“Lucian Blaga” University of Sibiu, Faculty of Engineering, 10 Victoriei Blvd., Sibiu, Romania

Corresponding author: Elena Mărginean, elena.marginean@ulbsibiu.ro

**Abstract:** Ever-growing digital services determine libraries to update almost all of their activities. Traditional library services must be transformed into electronic libraries, and library specialists must always be prepared for advanced digital services to come. Thus, libraries in the digital era must offer digital deposit services, digitisation services, research data management, metadata creation, digital cataloguing and conserving, and counselling in what regards digital copyrights, informational alphabetising. In this article, the emphasis falls on the necessity of developing and transforming libraries, bringing awareness to their role and their importance for society and at an individual level.

The case study starts from the premise that the Academic Library, like any other efficient service organization, tries to respond to all possible requests of its beneficiaries, both in depth and as an extension, by maximizing the capacity of services, without affecting quality level. The main objective was to analyze the satisfaction of library users and their expectations to support research and meet the need for information - documentation. In order to achieve this goal, we started from the hypothesis that the better you know the offers and the types of services offered, the better you can manage them and orient them to the users' needs.

As a result, libraries must continually reinvent their relationship with their users. They must take on these new roles that involve changes in the services provided, staff, available space and access to collections. The new structure highlights the importance of services offered to users. This also has an influence on the organization of collections. The library activities management has as main objective the increase of the performance indices of the managed system. Properly structured information provided on time and on adequate support, is the result of the work in this sector, therefore the performance indices can be associated with the level of satisfaction of these requirements.

The academic library, through a management based on strategic growth and development, must permanently increase the quality of the services offered to attract more users and to increase its value, a value that appears only when its resources are used. Demonstration of the full value of the academic library can only be achieved when there is sufficient evidence of the impact of the library on its users.

**Key words:** academic library, the value of the academic library, digimodernism, digitising, quality of library services

## STUDY ON THE EUROPEAN FRAMEWORK FOR THE APPLICATION OF THE ACTIVE AGEING INDEX

Gianina Chirugu<sup>1</sup> and Felicia Andrioni<sup>2</sup>

<sup>1</sup>University of Craiova, Faculty of Social Sciences, 13 A. I. Cuza Street, Craiova, Romania

<sup>2</sup>University of Petroșani, Department of Socio-Human Sciences, 20 University Street,  
Petroșani, Romania

Corresponding author: Felicia Andrioni, [felicia\\_andrioni@yahoo.com](mailto:felicia_andrioni@yahoo.com)

**Abstract:** The challenges associated with the ageing population are important and continuous growth across the world, especially in Europe, the continent with the oldest population. The fundamental objective of active ageing interventions is to optimise opportunities for health, participation and security so as to increase the quality of life of the population with ageing. The Active Ageing Index is a flexible comparative analysis tool that has the mission to help promote and implement active ageing. Thus, the purpose of this paper is to analyse the phenomenon of active ageing from the perspective of the active ageing index in the European area. The methodology used consisted of document analysis, study for several countries in the European space such as: Italy, Germany, Poland, Spain, Romania, analysis and comparison of statistic data. The results obtained show that the role of this active ageing index is to capture the various facets of active ageing, measuring the contribution of older people (women and men) to economic and social life and to the extent to which the environment in which they live stimulates them in this regard to provide more active participation in employment, social life and to lead independent lives.

**Key words:** active ageing, participation active ageing index, elderly, Europe.

## **PROFESSIONAL INCLUSION OF YOUNG PEOPLE AFFECTED BY THE HUMAN IMMUNODEFICIENCY VIRUS IN THE JIU VALLEY**

**Cosmin-Constantin Sicrea<sup>1</sup>, Felicia Andrioni<sup>2</sup>**

<sup>1</sup>University of Craiova, Faculty of Social Sciences, 13 A. I. Cuza Street, Craiova, Romania

<sup>2</sup>University of Petroșani, Department of Socio-Human Sciences, 20 University Street, Petroșani, Romania

Corresponding author: Felicia Andrioni, feliciaandrioni@gmail.com

**Abstract:** The background: The spread of the infection with the human immunodeficiency virus (HIV) globally and nationally among the population, mainly its young and adult segments, is a constant concern for various categories of specialists who analyse and seek solutions to reduce this phenomenon. HIV infection is not just a medical condition, but is a complex issue with social, psychological, educational, and economic implications for individuals and communities. Purpose: Identifying the level of professional inclusion of young people affected by HIV in the Jiu Valley. Method used: questionnaire-based survey. Results and conclusions: The existence of HIV diagnosis continues to be one of the main barriers in relation to the educational and professional path of young people in the studied community. The vast majority of the affected youth have experienced marginalization, discrimination and labelling. The educational and professional environment plays a particularly important role in the lives of young people affected by HIV, contributing to their involvement in an educational and professional process appropriate to their age, and to the growth of the degree of networking and socialization with others. The professional inclusion of young people affected by HIV is an essential step in the personal and professional development of youth.

**Key words:** HIV, young people, professional inclusion, labour market, implications.

## **THE ELDERLY AND QUALITY IN SOCIAL SERVICES: STANDARDS, INDICATORS, PROCEDURES AND TOOLS**

**Sorina Corman<sup>1</sup>**

<sup>1</sup>Lucian Blaga University of Sibiu, Facultatea de Științe Socio-Umane, 5-7 Victoriei, Sibiu, România, sorina.corman@ulbsibiu.ro

Corresponding author: Sorina Corman

**Abstract:** The paper presents an inventory of standards, indicators, procedures and tools that ensure the assessment and monitoring of quality in elderly-oriented social services and proposes a synthetic analysis of the concept of "elderly people" as reflected in documents specific to the field of social assistance.

The main reason for choosing this research topic is related to the particular grade that older people give to time and space. We position ourselves with this theme between futuristic challenges and the resistance of tradition, defining the vulnerability of the elderly. For a start it was made an inventory of standards, indicators, procedures and tools that ensure the assessment and monitoring of quality in elderly-oriented social services.

These social services present the elderly as beneficiaries of these services. Starting from this inventory, we associated each service for the elderly with specific standards, procedures and tools. Then we selected from each category, the representative standards. Data analysis follows the classic stages of content analysis: inventory of standards, indicators, procedures and tools; standardization of the information contained in the aforementioned quality standards, classification into units of analysis, establishment of the main categories of analysis, coding and final analysis of the data. The analysis was made on three types of specific standards: Standards for day care centers for the elderly, standards for residential centers for the elderly and standards for home care services for the elderly.

The information obtained was broken down into three categories: senior citizens in specific roles, the elderly in the relational system, this age group in the dynamics of integration. Each category resulting from the analysis provides a specific picture of the life dimensions of institutionalized seniors.

The main conclusion is that the intervention of social workers in a quality management system can be correlated with these resulting dimensions, and one can start from these indicators when it comes to the elaboration of intervention techniques and tools.

Analyzing the standards and procedures that ensure the functioning of social services, we identified the three dimensions that shape the image of the elderly beneficiary of social services. First, the roles of the elderly were in the spotlight. Then came into focus the rights and contractual obligations of the elderly that define his relational system. And finally, the processes that condition the quality of the beneficiary were in the center of attention: evaluation, service planning, monitoring of the services provided. All this, analyzing the standards and procedures mentioned, underlies the status of elderly person receiving social services.

**Key words:** elderly people, social services, standards, quality, indicators

## PSYCHOSOCIAL IMPLICATIONS OF MARITAL RAPE

Oana Lavinia Filip<sup>1</sup> and Lavinia Elisabeta Popp<sup>2</sup>

<sup>1</sup>University „Babeş-Bolyai” - Reşiţa University Center, Faculty of Sociology and Social Work, Department of Social Work, Traian Vuia street, 1-4, Reşiţa, Romania, [lavinia\\_popp@yahoo.com](mailto:lavinia_popp@yahoo.com) (10 pt)

<sup>2</sup>University Babeş-Bolyai” - Reşiţa University Center, Faculty of Sociology and Social Work, Department of Social Work, Traian Vuia street, 1-4, Reşiţa, Romania, [oanalaviniafilip@yahoo.ro](mailto:oanalaviniafilip@yahoo.ro)

Corresponding author: Lavinia Elisabeta Popp, [lavinia\\_popp@yahoo.com](mailto:lavinia_popp@yahoo.com)

**Abstract:** The paper deals with spousal rape, an act of violence with a high degree of social danger and the elements by which the perception of marital rape is determined by the The issue of marital rape has aroused the interest of many researchers concerned with the causes, and especially the effects of this phenomenon so controversial in contemporary society. Civil society, representatives of religious entities, legal specialists and others have sought an answer to the question of whether the sexual abuse of a husband against his wife is understandable. social and cultural context, by the religious affiliation, by local traditions as well as by society’s mentality. The aim of the approach was to highlight the correlation between spousal rape and patterns of conduct induced by this phenomenon on the family level, resulting in consequences that affect the sexual freedom of the person, and restrict a person’s right to protection of psychic and mental health. The study used the following research methods: documents’ analysis, counselling and semi-structured interview. The techniques used in the applied research counselling and the semi-structured interview, applied between September and December 2020, to a number of 13 women who suffered incidents of rape by their partner in the area of Mountainous Banat, Caraş-Severin county. The study started from the elements through which the perception of marital rape is determined by the social and cultural context, religious affiliation, local traditions and mentality. The aim of the approach was to highlight the correlation between marital rape and patterns of behaviour induced by this phenomenon on the family level, emphasizing the risk of depression, on the one hand, and on the other hand, women found that they can regain their dignity, reshape their personality, they begin to know their rights to private and public life through care and psychological counselling sessions. The effects of marital rape are dramatic and stay with the victims for long periods also after the end of the relationship in which they were raped, because this trauma does not go away along with the separation from the aggressor, people can remain with states of fear.

**Key words:** marital rape, violence, consequences, rights, society



**COMPARATIVE APPROACH TO ICT PRACTICES IN CIVILIAN  
AND MILITARY ENVIRONMENTS FOR ORGANIZATIONAL  
MANAGEMENT DURING THE PANDEMIC CRISIS**

**Diana Elena Ranf<sup>1</sup>, Hortensia Gorski<sup>2</sup>, Dorel Badea<sup>3</sup> and Ioan Virca<sup>4</sup>**

<sup>1</sup>Nicolae Balcescu" Land Forces Academy, Military Management Faculty, 3-5 Revolutiei Street, 550170, Sibiu, Romania, ranfd@yahoo.com

<sup>2</sup>Nicolae Balcescu" Land Forces Academy, Military Management Faculty, 3-5 Revolutiei Street, 550170, Sibiu, Romania, tenzig11@yahoo.com

<sup>3</sup>Nicolae Balcescu" Land Forces Academy, Military Management Faculty, 3-5 Revolutiei Street, 550170, Sibiu, Romania, dorel.badea@yahoo.com

<sup>4</sup>Nicolae Balcescu" Land Forces Academy, Military Management Faculty, 3-5 Revolutiei Street, 550170, Sibiu, Romania, virca\_ioan@yahoo.com

Corresponding author: Diana Elena Ranf, ranfd@yahoo.com

**Abstract:** It is well known that change affects people and implicitly the organizations they belong to, as a place of manifestation and storage of their capabilities. Consequently, the changes also give rise to concerns for at least an acceptable solution to the management of the main changes that occurred in the situation prior to the occurrence of the disruptive events. In this context, the onset of the pandemic crisis puts organizations in front of a fragile reality (relative to the stability of the normal state of functionality of society), fully characterized by volatility, insecurity, complexity and ambiguity. In the search for ideas to improve resilience, there are no predetermined solutions, any method that has registered results in a certain organizational field becoming a candidate of good practice. In this framework, it is proposed the comparative investigation (civilian-military) of ICT practices, as a macro agent of change, used in the field of organizational management during the current pandemic crisis. The approach is based, for each of the two mentioned organizational categories, both on theoretical aspects with hypothetical value identified or derived from the specialized literature specific or complementary to the field in question, and on identified practices. We considered this approach useful because there are enough arguments that the military organization has been a model of organizational-managerial development, which finds wide applicability for business continuity management situations, applicable to civilian organizations. Final expectations are directed, based on data existing so far, towards the identification of flexible and adaptable solutions, with the value of good practice.

**Key words:** management, information and communication technology, practices, crisis

## SUSTAINABLE DEVELOPMENT: BEYOND APPEARANCES

Tatiana Dănescu<sup>1</sup> și Radu - Bogdan Matei<sup>2</sup>

<sup>1</sup>University of Medicine, Pharmacy, Science and Technology „G. E. Palade” Tg. Mureș, Gh. Marinescu Street, no. 38, Romania, tatiana.danescu@gmail.com

<sup>2</sup>University „1 December 1918” Alba Iulia, Gabriel Bethlen Street, no. 5, Romania, radubogdanmatei@gmail.com

Corresponding author: Radu – Bogdan Matei, radubogdanmatei@gmail.com

**Abstract:** Global resilience and stability have produced changes in the collective mentality aimed at developing the spirit of resource conservation, increasing the number of recycled materials, with effects in reducing climate change. The interdependence between economic, environmental and social considerations for ensuring sustainable development is obvious, their trend being of real interest in current research, because like those presented in the Brundtland report, only this will ensure "the needs of current generations without compromising the possibility of future generations to meet their own necessity". Based on a cascading research, from the global approach to sustainable development, to the practices reported by entities in Romania in the last five years, we aim to take stock of the achievements to identify where we are currently compared to the global target launched through the 17 sustainable development goals set by the UNGC in the 2030 Agenda. To stage the research, we set the following related objectives: identifying and analyzing the practices reported by entities in the last five years from the sustainability / non-financial reports of companies in the UNGC database, determining whether the 3 sides of the "sustainability triangle" - economics, ecology and ethics - are interconditioned, and the modification of one influence the evolution of the others.

Regarding the situation of sustainable development objectives and targets in the 2030 Agenda, according to information published in Romania and at the level of the companies studied, taking into account that 5 years have passed since the implementation, the balance is not very favorable placing us in last place from the European Union to many chapters. Dropout rate, lack of investment in basic infrastructure (water, sewerage, road, education, health), high number of people living in relative poverty are issues to consider because they will directly affect sustainable development, social and digital inclusion of the population generating unemployment and health problems.

Based on the information published in the sustainability reports, the research hypothesis regarding the existence of a causal relationship between the profitability rates and the sustainability of the companies was confirmed. The values of Pearson's R coefficient demonstrate a strong correlation between the defined elements, and if the management of companies focuses on carrying out social responsibility actions in purely ethical conditions, they will attract new customers and investors, with direct effect on the result of the year.

**Keywords:** sustainable development, sustainability, environment, Agenda 2030, National Strategy for Sustainable Development

## **THE DEVELOPMENT OF ENVIRONMENTALLY RELEVANT EDUCATIONAL ACTIVITIES WITHIN INNOVATION PARKS: THE CASE OF UKRAINE**

**Mykola Petrushenko<sup>1</sup> and Hanna Shevchenko<sup>2</sup>**

<sup>1</sup>Institute of Market Problems and Economic-Ecological Research of the National Academy of Sciences of Ukraine, Department of Economic Management of Natural Resources, Frantsuz'ky Blvd, 29, Odesa, Ukraine, petrushenkom@gmail.com

<sup>2</sup>Institute of Market Problems and Economic-Ecological Research of the National Academy of Sciences of Ukraine, Department of Economic Management of Natural Resources, Frantsuz'ky Blvd, 29, Odesa, Ukraine, hannashevchenko@gmail.com

Corresponding author: Mykola Petrushenko, petrushenkom@gmail.com

**Abstract:** Combining industrial, environmental, social and scientific aspects of sustainable development in the form of innovation parks in emerging economies, inevitably leads either to the short-term functioning of too comprehensive and unviable organizational structures, or to the creation of modern platforms not only for sustainable production, but also for the greening of education. The purpose of the paper is to analyze the possibilities of developing environmentally relevant educational activities within innovation parks, on the example of industrial, scientific and technological parks in Ukraine. The research methodology: the quintuple helix model in analyzing the structure of activities within the innovation parks along the vertical “education – environment”, a comparative analysis of the concepts of Ukrainian industrial parks, namely such components as the purpose and tasks of creation, and functionality, location and size of the land plot, requirements to participants, information on estimated total volumes of energy consumption and transport infrastructure, development plan, indicative resources (financial, material, technical, labor, natural, etc.) and expected sources of their involvement, organizational model and expected results of functioning. The approach developed in the paper to the activation of natural and ecological activities of industrial parks in Ukraine allows identifying the level of formalization of the environmental component in their concepts, as a basis for the development of environmentally relevant education. At the conceptual level, the broad possibilities of this development depend primarily on the sufficient validity of organizational models reflecting the environmental-oriented powers of initiators, management companies and participants. At the practical level, these opportunities are partially realized in Ukrainian science parks. The paper proposes the integration of ecologically relevant education in two directions: within eco-industrial parks, which provide for environmentally relevant education, at both university and business levels; and dissemination of experience in all Ukrainian universities, where there are science parks and environmentally relevant courses are studied. In this way, there may also be a solution to the shortage of funding: if today environmental projects are financed mainly by universities' own funds with little other investment, then in the long run attracting business will also mean raising funds.

**Key words:** environmentally relevant education, Innovation Park, sustainability, Ukraine

## **IMPROVING THE EXECUTION SPEED OF CHILDREN ALPINE SKIERS, IN ACCORDANCE WITH THE EVOLUTION OF TECHNIQUE FOR SLALOM TESTS**

**Maria Oana Văduva<sup>1</sup>, Laura Marica<sup>2</sup> and Maria Luminița Brabiescu Călinescu<sup>1</sup>**

<sup>1</sup>University of Craiova, Faculty of Physical Education and Sport, 146 Brestlei Street, Craiova, Romania, [mariajurca2007@yahoo.com](mailto:mariajurca2007@yahoo.com), [lumi\\_calinescu@yahoo.ca](mailto:lumi_calinescu@yahoo.ca)

<sup>2</sup>University of Petrosani, Department of Socio-Human Sciences, University Street 20, Petrosani, Romania, [lauramarica@upet.ro](mailto:lauramarica@upet.ro)

Corresponding author: Maria Oana Văduva, [mariajurca2007@yahoo.com](mailto:mariajurca2007@yahoo.com)

**Abstract:** Today, among winter sports, skiing is the most beloved discipline by young people due to the natural environment in which it is practiced and the satisfaction it offers to those who manage to master its technique. Competitive alpine skiing consists of five distinct events: slalom, giant slalom, super-giant slalom, downhill, and combined alpine. In competitive alpine skiing, the athlete's goal is to cover a given route, in the shortest possible time, masterfully applying the acquired knowledge, skills, and abilities, capitalizing on his physical and mental potential and fulfilling the competition rules.

Starting from the premise that special physical training, by increasing the execution speed indices, has an important role in improving the technical training of the alpine skier, the specific objectives of this research established by the author consisted in designing an optimization of an experimental approach and applying adequate training structures and drive systems, aiming to improve the motor qualities necessary for the athlete in the test, and improving the execution speed, in conditions of sliding on snow.

The subjects who participated in the research consisted of athletes, boys and girls, aged between 9 and 11 years, legitimized at the C.S.S. Petroșani (Petroșani School Sports Club) and who does not participate in the competitive system of F.R.S.B. (Romanian Ski Biathlon Federation). Within them, two groups were formed, the Control Group and the Experiment Group, with an identical number of subjects (10 athletes), coordinated by different teachers. The control group carried out the training process according to a traditional program of skiers training in Romania, within the training lesson, while the experiment group followed a "slalom workshop" type training project, implemented within the training lesson. The snow control parameters were: rhythmic vertical line, arrhythmic vertical line, diagonal line, and slalom.

Analyzing the data obtained by the athletes of the two groups of the study, we can conclude that the results obtained for the experiment group are significantly higher in all tests, confirming the hypothesis regarding the increase in execution speed indices and improvement of the technical training of alpine skiers. The control group did not progress significantly to any test sample, between the initial and final tests. The conditions are met to consider the methodology appropriate and applicable in the training of children alpine skiers.

**Key words:** alpine skiing, execution speed, slalom, workshops, ski technique

## ECONOMIC AND SOCIAL DEVELOPMENT BASED ON EDUCATION, RESEARCH AND INDUSTRY

Constantin Anghelache<sup>1</sup>, Mădălina-Gabriela Anghel<sup>2</sup>, and Ștefan Virgil  
Iacob<sup>3</sup>

<sup>1</sup>Bucharest University of Economic Studies, Department of Statistics and Econometrics, 15-17 Calea Dorobanti / Artifex University of Bucharest, Department of Finance and Accounting, 47, Economu Cezarescu Street, Bucharest, Romania, [actincon@yahoo.com](mailto:actincon@yahoo.com)

<sup>2</sup>Artifex University of Bucharest, Department of Finance and Accounting, 47 Economu Cezarescu Street, Bucharest, Romania, [madalinagabriela\\_angel@yahoo.com](mailto:madalinagabriela_angel@yahoo.com)

<sup>3</sup>Artifex University of Bucharest, Department of Finance and Accounting, 47 Economu Cezarescu Street, Bucharest, Romania, [stefaniacob79@yahoo.com](mailto:stefaniacob79@yahoo.com)

Corresponding author: Mădălina-Gabriela Anghel, [madalinagabriela\\_angel@yahoo.com](mailto:madalinagabriela_angel@yahoo.com)

**Abstract:** The main objective of this article is to analyse, based on the data we have, the situation of the Romanian economy and European Union member states, in the context in which education and research have an immediate effect on the quantitative and qualitative development of industry. The study shows that there is a large discrepancy between the allocation of the national consolidated budget for education and research between European countries. In this context, the results obtained in the field of industry are equally disproportionate. The research methods used also took into account the possibility offered by the data system we have. Thus, in Romania, we used, above all, the interpretation of data statically and dynamically to highlight how this triangle of activities has evolved, which we consider to be among the main priorities of the government strategy. conducting a comprehensive EU-level study, we used the comparative study extensively. At the same time, the analysis was performed using graphical representations and the index method. In this context, we appreciate that, through the analysis method, from simple to complex, we used an adequate statistical-economic model. The amounts allocated by each state to increase new opportunities for recovery and transformation of the economy of the future must be an important element. Unfortunately in Romania, we find that research is allocated 0.48% of GDP, a tiny amount that cannot result in outstanding results in terms of innovation, discovery of new directions and bringing the economy to a higher level. Funding for education and research is an aspect that must be taken into account in the sense that without allocating serious sources in the field of funding, research projects cannot be initiated, they cannot be carried out and developed, in the sense of discovering new and new methods applicable in industry, so that the level of production in this branch increases and consequently the concrete results measured by the GDP also increase. The final conclusion of this research is the need to intensify efforts, including financing an economy based on deep and quality education, connecting high-level education with research and bringing through innovations new attributes that the industry must fulfil.

**Key words:** innovation, education, research, industry, sustainable development, balanced economy, increased standard of living

## SCIENCE, RESEARCH AND INNOVATION, ESSENTIAL ELEMENTS IN THE ECONOMIC EVOLUTION OF THE EUROPEAN UNION

Constantin Anghelache<sup>1</sup>, Mădălina-Gabriela Anghel<sup>2</sup>, and Ștefan Virgil  
Iacob<sup>3</sup>

<sup>1</sup>Bucharest University of Economic Studies, Department of Statistics and Econometrics, 15-17 Calea Dorobanti / Artifex University of Bucharest, Department of Finance and Accounting, 47, Economu Cezarescu Street, Bucharest, Romania, [actincon@yahoo.com](mailto:actincon@yahoo.com)

<sup>2</sup>Artifex University of Bucharest, Department of Finance and Accounting, 47 Economu Cezarescu Street, Bucharest, Romania, [madalinagabriela\\_angel@yahoo.com](mailto:madalinagabriela_angel@yahoo.com)

<sup>3</sup>Artifex University of Bucharest, Department of Finance and Accounting, 47 Economu Cezarescu Street, Bucharest, Romania, [stefaniacob79@yahoo.com](mailto:stefaniacob79@yahoo.com)

Corresponding author: Mădălina-Gabriela Anghel, [madalinagabriela\\_angel@yahoo.com](mailto:madalinagabriela_angel@yahoo.com)

**Abstract:** The aim of this study is to highlight the essential role that science, research and innovation play in economic evolution, and therefore of economic growth, in the European Union, as well as individually in some states in the economic community. The elements underpinning Community programs must be based on research and innovation. Increased funding for education, research and innovation is needed. The aim of the research is to highlight the need for sustained efforts to overcome the current situation affecting the world economy and the economy of each country individually. To achieve this goal, we used the data series published by the National Institute of Statistics and Eurostat. Carrying out the study at EU level, we used extensively the comparative study, analysis and interpretation, statically and dynamically, of the data we have. In the study, we used the method of graphic representations in order to facilitate the understanding of the approach performed by the authors. Also, we used the statistical index / indicators to highlight and argue the opinions derived from the study. The programs and objectives set by the EU are primarily aimed at raising science, research and innovation to a higher level, a context in which new projects, achievements of science and technology, are applied in the economic field. The European Union has become involved in wanting to help the Member States that have suffered due to the pandemic and economic and financial crisis. The basic element of science, research and innovation is that in the national economy must be selected those areas in which there are specialists, there is a positive past, based on which research can advance and new technologies emerge, based on which to achieve the development of the economy as a whole and why not, of all the structural elements that are sources of growth of the GDP. The EU and the Member States must reach solutions to allocate from the GDP, with priority, significantly higher amounts for the development of science, research and innovation. In some countries, Romania being one of them, it is found that the amounts allocated from the consolidated budget are smaller compared to the requirements and needs to boost the evolution of activity in these three areas.

**Key words:** strategy, innovation, industry, economic and social development, macro stability

## THE METHOD OF OBSERVING THE STUDENT'S BEHAVIOR IN THE EDUCATIONAL ENVIRONMENT

Niculeta Cristea Pleșan<sup>1</sup>

<sup>1</sup>University of Petrosani, Department of Socio-Human Sciences, University Street 20, Petrosani, Romania, nicoleta\_plesan@yahoo.com

Corresponding author: Niculeta Cristea Plesan, nicoleta\_plesan@yahoo.com

**Abstract:** This paper aims to highlight the efficiency of using the method of observing student behavior in the educational environment. Observation is one of the most widely used research methods in the social sciences. The characteristics aimed at constructing the instrument were: accuracy, focus, duration of observation, awareness of the presence of the observer, the level of information of the subject. In order to observe the student's behavior in the school environment, the observation grid with standardized answers was designed on the Likert scale (scale from 1 to 10), following the degree of expression of the described behavioral manifestations. The observation grid of the student's behavior in the school environment aims at supervising 4 dimensions (each with 5 items: observable behaviors): interest in school activities, organization of activity / punctuality in the school environment, resistance to intellectual effort, socio-affective relationships. Following the application of the research tool, depending on the scores obtained, it is recommended the targeted psycho-pedagogical intervention at the level of the deficient dimension / behaviors, as well as the monitoring of the results through the periodic application.

An example of using the survey grid of pupil behavior is using it within the educational partnership, "My School, the foundation of my future!", by conducting an action based on multi-disciplinary team working in the school, the objective of which is psycho-psycho-psycho-psycho intervention on the target group. The target group of the project was represented by 25 students with parents who went to work abroad.

The present study falls within the typology of an action research in the educational field having as foundation the work in the multidisciplinary team in the school institution and the observance of the conditions of an action research. Participation in the project was done on a voluntary basis;

The activities of the educational project and implicitly, the development of the action-research, took place inside the General School "Teodora Lucaciu", subordinated to the Technical College "Mihai Viteazu" Vulcan, Hunedoara County, in the second semester of the 2015-2016 school year.

The action research had as main objective the psycho-pedagogical intervention on students with parents working abroad, in a club of children affected by external economic migration, whose activity, based on working in a multidisciplinary team to support the development of school motivation and improvement strategies. learning. In the long run, this desideratum can be a support for the harmonious crystallization of personality traits.

**Key words:** method, observation, size, behavior, education

## **BIOMECHANICAL CHANGES OF THE TEMPOROMANDIBULAR JOINT IN RESTORATION WITH IMPLANT SUPPORTED OVERDENTURES. FUNCTIONAL ANALYSIS**

**Cristina Adriana Dahm Tataru<sup>1</sup>**

<sup>1</sup>Lucian Blaga University, Department of Dental Medicine and Nursing Bdul Victoriei 10, Sibiu, Romania

Corresponding author: Cristina Adriana Dahm Tataru, info@dentalsibiu.ro

**Abstract:** Research conducted in this paper aims to analyse biomechanics and temporomandibular joint among patients who, one the one side have implants placed over a history of joint disease, emphasising developments along post-interventio. On the oder side, patients without a history of joint pathology were recieving implant supported overdenture. Biomechanical principles can not guarantee the avoidance in the case of biopathological response to overload (respectively outer-implant bone resorption). These will not lead to the prognostic for all types of prosthetic overstructures with implant support, because the individual variations of bone resistance can not be apropiatly measured. The present paper is an applied research which is designed to solve short term problems, in order to contribute to the development of an interdisciplinary scientific field. Chronic degenerative changes of the temporo-mandibular joint including periarticular structures have a very high incidence among the population, the vast majority, still suffering from an early age in a lesser or greater extent of this condition. Most diseases are characterized by a worsening trend over many years, being more obvious with age. However, following the biomechanical principles can not guarantee that the biopathological response to overload will be avoided. The main condition to make a biodinamic ideal superstructure is a static position in the dental arch with favorable spatial links. Specimens will be fixed in the articulator and will be marked with the ideal implant position and orientation. Also, will be a preoperative planned layout of the superstructure to allow considerations of biomechanical system and occlusion. Analysing the biomechanical principles applied in clinical dentistry jaw movements, especially in terms of functional occlusal relationships can be followed by studying the biomechanics of the jaw at the level of 3D- movements and jaw positions. Any jaw movement, is the result of mobilizing all groups that operate in couples as protagonists and antagonists. This can be accomplished by grading the contraction force, by allowing the alternate contractions bilaterally symmetrical and asymmetrical unilateral and by the fact that these muscles may act on several fronts. Gyded Implantology provides optimal placed implants so that the overstrucures can achieve optimal occlusal Equilibration. This helps the joints biomechanics maintaining the health of the temporomandibular joint structures. Similar with the care of natural teeth supported overdenture, in implant supported overdentures it is mandatory to complete the prosthetic work with correct occlusal equilibration. Because there is one major difference between the way dental implant acts in the bone structures, compared with natural teeth (dental implant has no mobility and proprioception), it is indicated that from the early prosthetic design plan to be given large importance to joint biomechanics.

**Key words:** temporomandibular, overdenture, dentistry, prosthetic, implant



## PSYCHOLOGICAL PREDICTORS OF FORMATION AND DEVELOPMENT OF PERSONAL IDENTITY OF OLDER PRESCHOOL CHILDREN

Liubov Pomytkina<sup>1</sup>, Ruslana Moroz<sup>2</sup>, Oleksandr Kovalchuk<sup>3</sup> and Eduard Pomytkin<sup>4</sup>

<sup>1</sup>National Aviation University, Department of Aviation Psychology, ave. Liubomyra Huzara, 1, 03058, Kyiv, Ukraine, [Lyubvit@ukr.net](mailto:Lyubvit@ukr.net)

<sup>2</sup>Methodological Center for Practical Psychology and Social Work of the National Academy of Pedagogical Sciences of Ukraine, shose Chapaevske, 98, 03045, Kyiv, Ukraine, [ruslanamoroz@gmail.com](mailto:ruslanamoroz@gmail.com)

<sup>3</sup>National Defence University of Ukraine named after Ivan Cherniakhovskiy, ave. Povitroflotskyi, 28, 03049, Kyiv, Ukraine, [5201@i.ua](mailto:5201@i.ua)

<sup>4</sup>Ivan Ziazun Institute of Pedagogical and Adult Education of the National Academy of Pedagogical Sciences of Ukraine, str. Maxim Berlinsky, 9, 04060, Kyiv, Ukraine, [Edalex@bigmir.net](mailto:Edalex@bigmir.net)

Corresponding author: Liubov Pomytkina, [Lyubvit@ukr.net](mailto:Lyubvit@ukr.net)

**Abstract:** The article presents the results of the study to determine the predictors of the formation and development of personal identity of older preschool children. The conceptual basis of the study is the assumption that the formation of triangulatory relations internalized in the personality structure of maternal and paternal objects is an important prerequisite for the development of a holistic, stable, differentiated personality.

The purpose: to highlight the results of empirical analysis of features and to determine the factors of formation and development of personal identity of older preschool children.

Methods: biographical, semi-structured interview, analysis of family narratives; test of M. Kuhn and T. McPartland "Who I am?", "Three trees", "Compose a fairy tale"; H. Olson, J. Portner, I. Lavi "FASES-3", "Interaction of parents and the child" of I. Markovska; E. Eidemiller's "Analysis of Family Interaction"; "Scale of rejection of the child in the family" of A. Barkan; content analysis; methods of mathematical statistics SPSS-17.

As a result of a factor analysis parameters of the family system, identification with the maternal or paternal object, four factors were identified: ability to triangulatory relations, stability/instability of personal identity of older preschool children, neutral self-attitude, factor of prerequisites for the formation of personal identity.

Thus, in the course of the study it was determined that the formation of personal identity of a child of older preschool age is determined by the correlation between the place that the child occupies in the system of human relationships, and above all in the system of family relationships, and psychological features which have already been formed.

**Key words:** mental development of the child, emotional attachment, personal identity, image of "I", triangulatory relations, identification with the maternal or paternal object

## PSYCHOLOGICAL AND PEDAGOGICAL CORRELATES OF FORMATION OF COMMUNICATIVE COMPETENCE OF FUTURE PSYCHOLOGISTS-PRACTITIONERS

Lada Yakovytska<sup>1</sup>, Viktoriia Synyshyna<sup>2</sup>, Eduard Pomytkin<sup>3</sup> and  
Olena Khokhlina<sup>1</sup>

<sup>1</sup>National Aviation University, ave. Sviatoslav Huzar 1,03058 Kyiv, Ukraine

<sup>2</sup>Uzhhorod National University, Narodna Square, 3, 88000, Uzhhorod, Ukraine

<sup>3</sup>Ivan Ziazun Institute of Pedagogical and Adult Education of the National Academy of  
Pedagogical Sciences of Ukraine, str. Maxim Berlinsky, 9, 04060, Kyiv,  
Ukraine <mailto:Edalex@bigmir.net>

Corresponding author: Lada Yakovytska, [lada\\_yakovickaya@ukr.net](mailto:lada_yakovickaya@ukr.net)

**Abstract:** In the process of acquiring communicative competence, specific professionally important qualities of personality are formed, which is a necessary condition for successful self-realization in the labor market.

The purpose of our research was to study the psychological and pedagogical correlates of communicative competence of future psychologists-practitioners through the analysis of its separate components, which are resources for building effective communications. During the empirical research we studied: the psychological correlates of the communicative competence of future professionals in the assisting professions. Students of the specialty "Psychology" of the National Aviation University of Kyiv and National University of Uzhgorod participated in the study. The sample was 88 people. Conversations and standardized surveys were conducted to find out the personality resources for building effective communications. Based on previous theoretical analysis of recent research, we have formulated psychological and pedagogical resource components of communicative competence and selected methods for their research.

A multivariate correlation study to test the hypothesis of a relationship between psychological and pedagogical correlates with communicative competence showed that in the created sample of future psychologists-practitioners, there was a significant positive correlation between tolerance and introversion indicators ( $r=0.3$ ;  $p<0.041$ ), tolerance and escapism ( $r=0.36$ ;  $p<0.038$ ). In addition, a negative statistically significant relationship was found with indicators of emotional intelligence level ( $r=-0.37$ ;  $p<0.029$ ), lability ( $r=-0.34$ ;  $p<0.032$ ), acceptance of others ( $r=-0.38$ ;  $p<0.029$ ), flexibility ( $r=-0.37$ ;  $p<0.029$ ), and self-acceptance ( $r=-0.53$ ;  $p<0.001$ ). The results obtained prove that tolerance as a psycho-emotional stability in a situation of uncertainty is positively associated with escapism as an adaptation strategy. Thus, escapism is functionally similar to tolerance, it is a compensatory mechanism that arises because of the decrease in the level of adaptation of the personality to the existing reality.

Analysis of the components of psychological and pedagogical correlates of communicative competence showed that tolerance, as a constructive correlate of communicative competence, is positively associated with escapism as an adaptation strategy and introvertivity of personality.

**Key words:** communicative competence, tolerance, intolerance, escapism, communicative control