

WASTE STORAGE FOR DRILLING AND NATURAL GAS PRODUCTION

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Abstract

The reason for choosing this topic for research is the immeasurable importance that waste depots have in natural gas drilling extraction and production jobs.

This article's main focus comprises waste management resulting from natural gas drilling, extraction and production jobs as well as sorting, separating, recovery, dropping of certain waste materials in order to eliminate and especially process waste mixtures according to specific formulas and then storage in appropriate enclosures.

Key words: waste, storage, natural gas drilling, extraction and production

1. Characteristics of a typical waste treatment and deposit installation

a) **The intermediary storage** consists of a concrete structure with a waterproof exterior that has a volume of 883 cubic meters and is surrounded by a guard rail.

The intermediary storage is compartmentalized into three tanks as follows:

The detritus storage tank with a volume of 200 cubic meters is a buried rectangular, concrete structure with the following dimensions 17,75 x 12 x 2 m, which can be accessed from the side where the embankment has a 1:4,5 slope allowing for machine access in the enclosure. The access way is 9m long and 12m wide and is fitted with iron cleats. On the side it is equipped with an overflow basin through which precipitation water collected in the water sewer drains.

* The water sewer is constructed from steel reinforced concrete and is linked to the detritus storage tank and drilling fluid storage tank through a hole in the wall dividing the two tanks. Plane dimensions are 2,3 m x 1 m. It is 1 m deep; the slab foundation is placed 1 m above the tank's slab foundation and is 12 cm thick. The water sewer is placed symmetrical to the tank's divider wall. An 8 inch metal pipe placed in the drilling fluid storage tank's wall, 0.8 m below the tank's top edge, ensures water drainage to the oil separator's front water sewer.

* The drilling fluid storage tank is a monolith steel reinforced concrete structure, is buried and has the following dimensions 36 x 17,7 x 2 m and a volume of approximately 600 cubic meters. Three openings with 8 inch pipes and dosage valves on the mixture tank ensure used drilling fluid circulation to the mixture tank. The three dosage valves are placed at the following distances from the tank's slab foundation 0.25 m; 0.75 m; 1.25 m. These valves are operated from the outside, from the concrete platform positioned above them.

* The mixture tank is constructed from monolith steel reinforced concrete and has the following dimensions 5 x 17 x 2 m and a volume of 83 cubic meters and is equipped with an access ramp (5 x 9 m) with a 1:4.5 slope.

b) **The storage enclosure** is made up of two compartments:

* Compartment A has the following dimensions 100 m x 130 m, is 8 meters deep and has a work volume of 83 Mm³. Compartment A's enclosure is bordered by a dam, 4 meters in height on the western side and 8 meters in height on the southern side, with a 3 meters tall canopy and the outer and 1:2 inner embankment. On the northern and western side the dams are 1 meter high, the canopy is 3 meters high and a 1:2 outer and inner embankment. Compartment seal is assured by 1 meter thick clay lining on the entire embankment contour up to the height where the dig revealed sands and the base of the depot is positioned on a layer of yellow clay. Precipitation water is drained using a draining sand screen with $k = 10^{-3}$ cm/s which contains tubes and the water is collected in a sewer, sealed with an outer geo-membrane lining from the compartment, by means of gravitational flow to the water collector sewer.

* Compartment B is divided from compartment A by a dirt dam 2 meters in height with a 2 meters canopy and 1:1 embankments. This compartment is sealed with a 1.5 mm thick HDPE geo-membrane, protected with geotextiles and coated with a 50 cm thick filtrating pearl gravel layer. The compartment has a work volume of 7 Mm³ and is used to store office waste and equivalents generated by the various job sites.

Access to these two compartments is done by a concrete roadway with turning ramps.

c) **The oil byproducts separator** which is used to separate oils and oil byproducts from the residual water is an ensemble of concrete structures, pipes and valves comprised of:

- Take over and cool down sewer
- Oil byproducts rough separation compartment
- Fine separation compartment

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The controller is responsible to take all prevention measures or to reduce all likelihood of potential adverse effects for the health of the immediate population and environment while handling and treating wastes resulted from the extraction process. Also the controller must make sure that all waste material that is received and handled are in accordance with the Integrated Environment Authority and abide with the conditions set for environment and human health protection.

The control and reception of waste material is done by the specialized depot personnel while entering the depot as follows:

- ✓ The waste material notice and the loading / unloading of dangerous/not dangerous waste materials form are checked, more precisely: quantity, properties, nature and source of waste material
- ✓ The waste material is checked visually, more precisely the aggregation state and correspondence with accompanying papers of the waste materials
- ✓ The waste material is weighed
- ✓ All reception forms are logged in the "Work journal" and a daily account of all logs concerning waste management is kept. Also the controller must make all logs concerning waste management available to the appropriate authorities.

3. Procedures concerning raw materials and auxiliaries necessary for waste processing

The controller shall use the raw materials described in the following table to the best of his abilities regarding quantity and quality of said materials.

Raw materials	Chemical nature / composition	Required processed material/m ³	Environment impact
Cement	Inorganic, R41, R38, R43 (Xi) powder	200 kg	Inert
Sodium hydroxide	Inorganic, strong base, R35	1 kg	Caustic
Plaster	Inorganic	42,5 kg	Inert

Storing of these materials will be done a special designed storage unit. In order to prevent and limit negative effects on the environment, especially to prevent air, soil, ground and underground water pollution but also odors, noise and other risks to population health all necessary precautions will be taken in order to safely handle, receive, store and utilize raw materials. A monthly log of raw materials used shall be kept. In order to limit the

effect on the environment the controller utilizes the updates the work procedure concerning these kinds of substances and their use. The controller shall abide to HG number 1048/2008 concerning classification, packing and labeling of dangerous substances.

Purchase of these dangerous chemical substances shall be made only under the condition that the supplier delivers security and technical forms in order to take all necessary precautions concerning environment protection, health and job safety.

4. Waste management

Technical waste resulted from depot activity is managed according to their type, as follows:

- ✓ Waste that cannot be capitalized on and is not dangerous for humans and the environment shall be stored in the depot
- ✓ Recyclable waste shall be recovered and the capitalized on
- ✓ Waste that cannot be capitalized on and is dangerous shall be turned over to specialized companies that will dispose of them accordingly
- ✓ Toxic substances that need to be used shall be stored and then used in safe conditions for people and the environment

Waste management is maintained separately for each type as follows:

- ✓ Oil-water separator waste sludge management
- ✓ Filter and absorbent materials waste management
- ✓ Trash waste management
- ✓ Triethylene glycol waste management
- ✓ Oil-water separator oil waste management
- ✓ Residual oil waste management
- ✓ Water treatment sludge waste management
- ✓ Ferrous waste management
- ✓ Nonferrous waste management
- ✓ Bronze-copper waste management
- ✓ Aluminum waste management
- ✓ Injection basin sludge waste management
- ✓ Paper packaging waste management
- ✓ Paper waste management
- ✓ Plastic packaging waste management
- ✓ Plastic waste management

An example of waste management tracking is presented: paper and cardboard packaging for the year 2018

Year: 2018

Type of waste: paper and cardboard packaging

Code: 15 01 01

State: Solid state

Measure unit: kg

No.	Month	Type of waste			
		Generated	of which:		
			Capitalized on	Disposed of	Remained in stock
1.	January	0	0	0	3
2.	February	67	40	0	30
3.	March	0	30	0	0
4.	April	1	0	0	1
5.	May	1	0	0	2
6.	June	1	0	0	3
7.	July	3	0	0	6
8.	August	3	0	0	9
9.	September	1	0	0	10
10.	October	10	0	0	20
11.	November	2	0	0	22
12.	December	1	23	0	0
	Total per year	90	93	0	0

Procedure for capitalizing on waste, by type: paper and cardboard packaging code 15 01 01 is in accordance with Annex 3 from Law 211/2011. The firm has contracts with economic partners that collect, transport process and capitalize waste materials.

Waste management for detritus, drilling fluid, sludge is done using mixtures that utilize the substances mentioned in the formula from the previous chapter and are as follows:

- Using a frontal loader a 20 cubic meters detritus load is transported to the mixing tank where it is mixed with 20 cubic meters of drilling fluid
- To this mixture a 6 tons load of cement is added and 40 kg of Na OH solution that was prepared in 200 liters of water
- The resulting mixture is homogenized and then it is transported using the frontal loader to the first compartment of the depot where it is poured in metal molds to form rigid blocks and as a result can be deposited according to the Depot rules and procedures.

5. Conclusions

In order to maintain strict control over the equipment, materials and waste received in the depot as well as materials that are processed are kept under strict supervision and monthly training sessions regarding environment protection, work health and safety and emergency conditions are held.

Also regular internal and external inspections are performed and all aspects concerning the environment and waste management process are checked and the mandatory documents are inspected like: licenses, contracts, security forms, reports, manifests regarding waste management, waste gathering, storing, handing over of waste material or waste capitalization, environment monitoring also the intervention plan to contain accidental spills and environment protection work health and safety and emergency conditions trainings are checked if they are up to date.

With the appropriate experience and constant care we are heading toward quick success, helping the personnel and the company to achieve the results they want in a short amount of time while being kind to the environment.

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