EQUIPMENT FOR WATER OZONATION IN FISH BREEDING LAKES

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Abstract: The invention that is presented in the paper refers to the procedure for the ozonation of waters in the fish lakes. It thus combats the phenomenon of eutrophication due to accidental spills of organic substances, overheating of water attributable to climate change, and also the improvement of water quality, which is very necessary for the proper development of fishing activity..

Keywords: ozonization, eutrophication, fish

1. INTRODUCTION

The paper deals with the ozonation of water from fish ponds in order to eliminate the eutrophication phenomenon due to accidental spills of organic substances, excessive water warming attributable to climate change or to improve the quality of water, a very necessary development of fish farming.

Eutrophication is one of the most challenging environmental problems that the surface water bodies are facing in present time (Smith, 2009; Li Kun et al., 2017). Eutrophication is an ecological process, similar to aging, in which a water body is increasingly enriched with essential nutrients of the aquatic plants (Rast, 1996) which results in increase of the primary productivity, i.e. rate of photosynthesis of the aquatic ecosystem (Qin et al., 2013). The most common signs of eutrophication in lakes and rivers involve heavy algal blooms resulting in high turbidity and anoxic conditions in the deeper parts of the waterbody due to the decay of detritus which leads to fish kills (OECD,1982; Wang, 2009). Eutrophication may lead to severe health hazards to human and animals through various pathways. It is a major health threat if drinking water is collected from eutrophied water body. Eutrophication also results in serious ecological problems as well as have impact on the aesthetic view and economy.

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To address the undesired effect of chemotherapeutants in aquaculture, ozone has been suggested as an alternative to improve water quality. To ensure safe and robust treatment, it is vital to define the ozone demand and ozone kinetics of the specific water matrix to avoid ozone overdose (Aikaterini et al., 2018).

Devices for surface water aeration are known by paddle, winding, driven by internal combustion engines mounted on pontoons, boats or rafts.

It is also known an installation which distributes the ozone-enriched air through some pipes provided with holes mounted on some supports entwined in the agglomerate layer.

Still other methods are known, such as the use of motor boats that have the same role of winding by breaking the fat film that forms over the water in organic spills.

These methods and installations have several disadvantages, such as:

- the introduction into the aquatic environment of vibrations in the form of sounds, infrasounds which present discomfort to fish and other aquatic creatures;
- the introduction into the water of hydrocarbons resulting from internal combustion engine cooling systems;
- repeated failure of the aeration ducts due to blocking the holes by detaching them from the supports on which they were mounted in the agglomerate layer;
- level variations due to hydrostatic pressure influence the volume of ozonized air introduced into the water of the lake.

The device for ozonizing water in the fish ponds consists of two unconventional energy sources mounted on the shore of the lake consisting of a vertical wind turbine group and a solar panel with solar panels with known cooling systems for active surfaces, thus obtained is stored in a space containing a group of accumulators, energy which is then distributed to some modules, a module consists of a device for obtaining the filtered and compressed air passing through a Venturi tube is mixed with the ozone produced by some ultraviolet generators (λ=185 nm) by a known method, after which, by means of another special construction module, it is distributed in the water of the basin or the lake, and for the protection of fish against ihtiophage birds, the distribution system also contains permanent magnets mounted on the surface of the rotating distributor due to the reactive effect of the air exhausted in the lake water creating a discomfort to the birds due to the change of the magnetic field, the birds being confused, leave the area where the lake or basin is located, and in order to provide a protection against theft, this water ozonation facility also contains some GPS circuits for signaling site change at installation, audible, luminous, and presence of malicious people especially when the installation is mounted on the shores of the lake.

The paper has the following advantages:

- the occurrence of the phenomenon of eutrophication is excluded;
- improve water quality and the conditions of fish species development;
- achieves the best performance with regard to the distribution of the

ozonized air in the water with its winding;
- due to the disturbance of the terrestrial magnetic field by the presence of an artificial magnetic field in the installation area, the fishery activity of the ihtiofage birds;
- it does not depend on the variation of the water level, being always positioned at its surface;
- due to the presence in the water of the oxygen atom (O), part of the parasites and bacteria are destroyed;
- if mounted on the shore, it is equipped with GPS circuits and anti-burglary sensors;

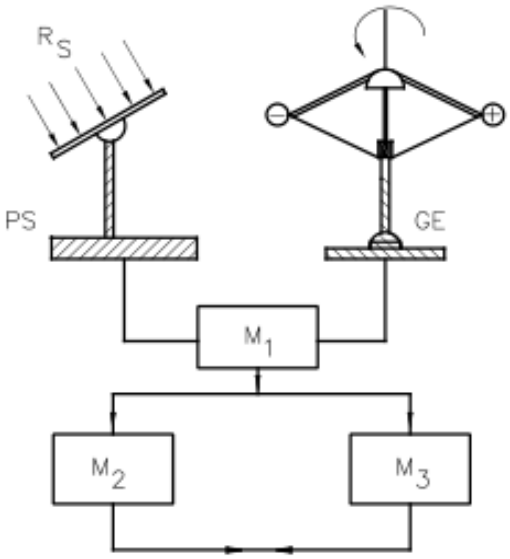

Fig. 1. The overall scheme of the device

The water ozonisation plant consists of an energy module M_1 (Fig. 1) which contains a vertical axis wind group whose active elements for converting the energy of the air currents are aerodynamic cones mounted in such a way that their rotation is in the trigonometric sense (or radial-axial) meaning that coincides with the sense of rotation of the Earth, which is an advantage for increasing the conversion efficiency due to the reduction of friction forces, this phenomenon being little known and applied, and for obtaining energy in cases of meteorological calmness and lack of nebulosity, energy can be obtained using solar cells, the number of which depends on other usage requirements, panels designed to increase the efficiency of cooling systems of the light receiving surface, with cleaning systems for these surfaces and with high-intensity wind protection systems.

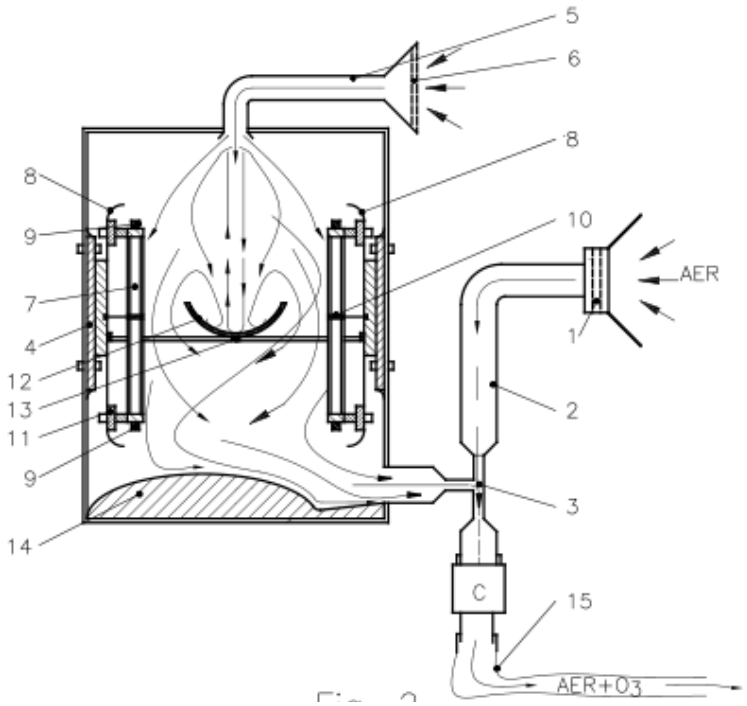

Fig. 2. Section through the ozone-generating device

The ozone system for pools or lakes has a module M_2 containing a compressor C, and if it fails it is replaced by an air turbine TA required to create air intake from the environment that was initially filtered by known means containing the filter group 1 (Fig. 2), after which he enters into a Venturi tube 2, and according to the continuity of flow of fluids through the pipes, a suction of the ozonized air in the narrow pipe is carried out 3 due to the drop in static pressure P_s and increased dynamic pressure P_d, the ozone-mixed air is then compressed into the compressor tank, being sent to a distribution module M_3 to be then discharged into the water of the lake; in the same module M_2 (Fig. 1) the device for ozone generation from the atmospheric air formed by a closed enclosure is also mounted 4 (Fig. 2) where the air is sucked in due to the pressure drop created by the Venturi 2 through the pipeline 5 after being filtered by the filter 6 and subjected to UV radiation (λ=185 nm) issued by two generators 7 mounted in the focus of an ellipsoidal mirror 8, with the sockets 9 and bracelets 10 and reinforced with supports 11, concave chicanery as a crucible 12 caught on a rod 13 has the role of lengthening the aspirated air beam, thus increasing the duration of UV radiation action, of the ozone efficency (O_3) by decomposition of oxygen molecules (O_2) in oxygen atoms (O) and then combining oxygen ($O_2$with an oxygen atom (O) thus forming an ozone molecule (O_3), a reaction similar to those taking place above the stratosphere, a layer that is found after the troposphere; ozone so formed protects us from the other radiation emitted by the Sun; piece of special shape 14 helps with the

Coanda effect follow the curve to help the ozone escape into the Venturi tube, and through the flexible pipe 15 (Fig. 2) the air and ozone mixture is driven to a module M_3 (Fig. 1) to be distributed in water.

The module M_3 (Fig. 3, 4) contains a vertical pipe 16 mounted in a cassette 17 with radial bearings 18 and pressure 19, having another hexagonal shaped box in the upper part 20 having the upper hemispherical wall to ease the air outlet in the pipe 16 to penetrate the water through the pipes 21, which thanks to the construction creates a reaction effect that causes the whole assembly to rotate; the ozone-enriched air enters the pipe 16 through a flexible pipeline 22, and to ensure buoyancy, the whole assembly rests on a circular plastic structure 23 of low density with a circular window in the center in which the box is inserted 17 which contains the bearing system, which allows the distributor to rotate through the reactive effect of the ozonized air at the outlet, the direction of rotation being the trigonometric, identical to Earth rotation, which greatly reduces friction between the water layers during rotation, improving the distribution of ozonized air and water flowing in the installation area, the pipes being curved to allow this; the buoyancy of the device is accomplished by inserting inside the circular structure 23 some niches 24, of some PET containers 25 of different volumes depending on the size of the distribution device and its weight; adjusting the distance to the surface of the water is achieved by introducing a certain volume of water into the PET cointainers, and to create a pressure inside, a spoon filled with lime powder is placed in each container.

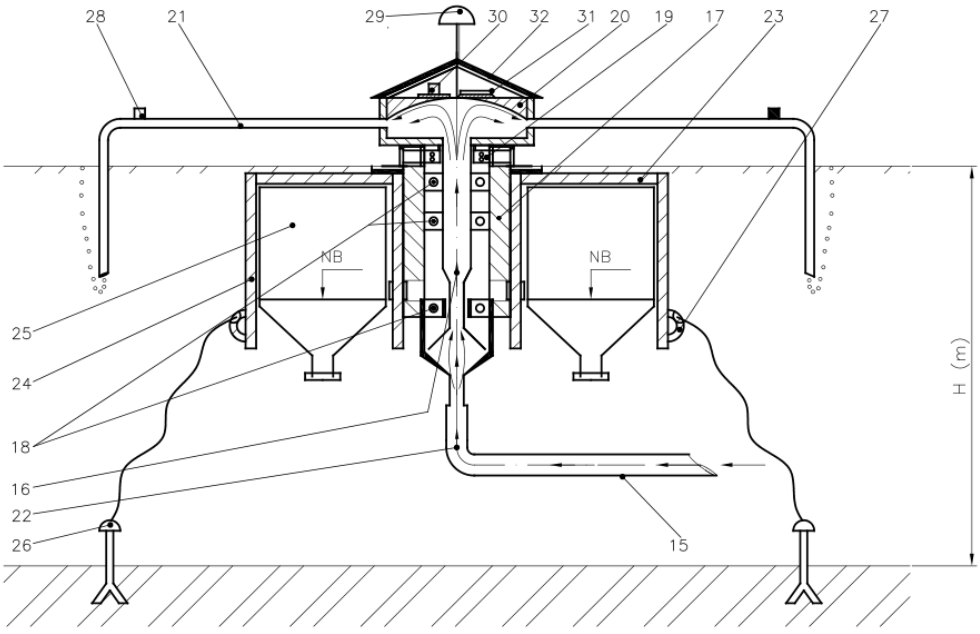

Fig. 3. Section through the ozonization device

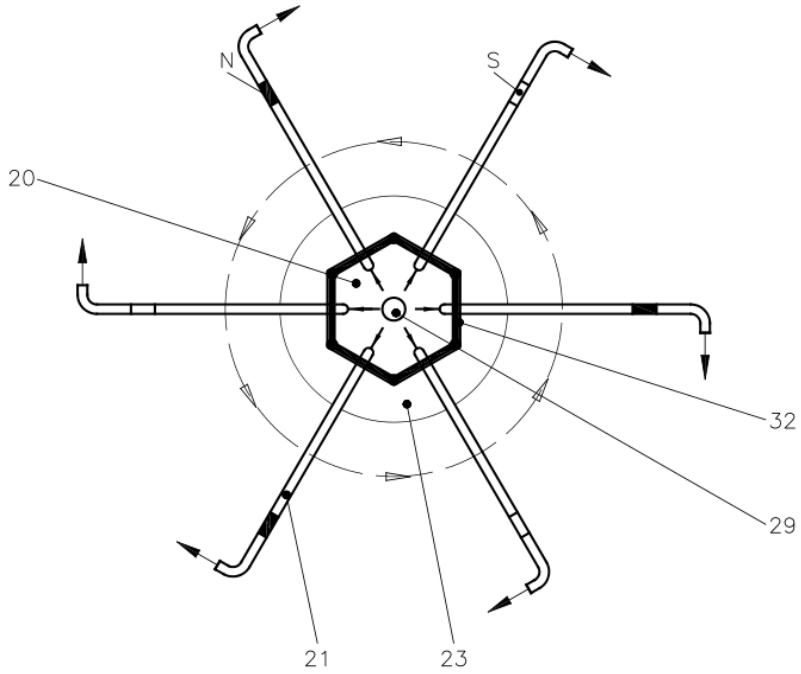

Fig. 4. Above seeing of the distribution device

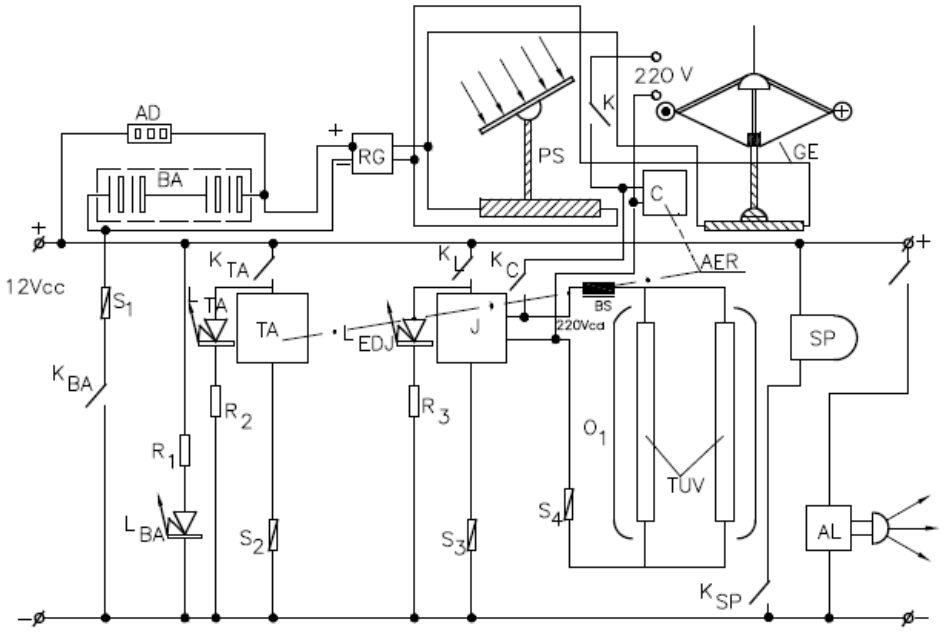

Fig. 5. Electrical scheme of the ozonozation device

Finally, the device is anchored by the anchors 26 through a plastic thread of the supports 27, and for the protection of fish against birds of different species, on the ozone air distribution pipes 21 some permanent magnets are caught (neodim) 28 which by their presence modifies the distribution of the terrestrial magnetic field in the area of the module location, which creates a discomfort to the birds, leaving the area; the phenomenon is accentuated to most of these things because they are oriented in space by the force lines of the Earth's magnetic field and this change frightens them especially when the disruptive magnetic field is variable due to the rotation of the ensemble, the magnets being mounted with different polarities on the top of the pipes, alternatively.

A girofar is used to indicate nighttime operation 29 mounted in the circuit with a battery 30 by means of a twisted electric circuit 31 (connects the girofar in the evening and disconnects it in the morning), these being mounted in the top of the hexagonal cassette 20 on the sides of which are the solar mini-panes 32 to power the battery 30; switch K connects to the network of 220V of the compressor C and the ozone generator when the power of the battery BA falls below projected value due to prolonged weather phenomena (calm and nebulosity).

2. CONCLUSION

This device for ozonizing water in the lakes is made to avoid the occurrence of eutrophication and to improve the quality of water in which various fish species grow and develop are formed, for example, from two conventional sources of energy known in the art, namely a microcentral baffle solar photovoltaic and a vertical axis wind group, the energy accumulated in batteries with accumulators via a regulating relay, which are part of the M1 module, supplying another M2 module, containing the mini-installations for obtaining the air pressure, a turbine, a compressor and the ozone generation device. The plant also contains another M3 module, which is a special device consisting of a counter-rotating distributor due to the reactive effect of the air outlet through some pipes trapped in a hexagonal enclosure, thus achieving a high efficiency in concerns the penetration of ozone into the water of the lake as well as the flow of water.

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