



# POROVNANIE KONVENČNÝCH A NEKONVENČNÝCH TECHNOLÓGIÍ REVITALIZÁCIE EUTROFIZOVANÝCH STOJATÝCH VÔD

## COMPARISON OF CONVENTIONAL AND NONCONVENTIONAL TECHNOLOGIES REVITALIZATION OF EUTROPHIC STANDING WATERS

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### Abstract

*The paper is a comparison of conventional and non-conventional technologies revitalization of eutrophic standing water on the mechanical and electrolytic principle. There in outlined previous experience at the disposal of cyanobacteria in lakes and dams, as well as procedures to solve this problem, also dealt with the selected method of disposal for promoting non-refundable funds from EU grants.*

### Key words

*Disposal Technology Cyanobacteria, Standing Water, Structural Funds.*

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### Introduction

The occurrence of cyanobacteria blooms in water reservoirs, ponds and recreational waters is a common phenomenon in the industrialized world and can be seen especially well in the summer months at steady weather. The consequence is the proliferation of cyanobacteria bloom formation water, confined water, fish breeding and recreational use of reservoirs. Pollution little stagnant and flowing waters, especially in eastern Slovakia, water managers concerned enough that they are looking for unconventional ways to revitalize these waters. Recreational swimming is at risk of cyanobacteria blooms, which devalues the bathing water and causing health problems for bathers. In addition to the negative impacts of the use of tanks, adverse influence to other organisms that live in the water. Blooms of cyanobacteria have the ability to change the physical and chemical properties of water and release dangerous toxic substances.

### Necessity development of new methods

Eutrophication called excessive growth of algae, cyanobacteria and other microorganism that impair water quality. In the lower layers of the water, where it deposits dead organisms, their decomposition occurs due to excessive reduction in the concentration of oxygen and creates conditions for anaerobic processes, accompanied by secondary water pollution, particularly hydrogen sulfide, ammonia, iron and manganese. After decomposition of biomass phosphorous and nitrogen compounds remain in the water and can again support the growth and reproduction of algae.

Development of methods, techniques and products to reduce the mass development of cyanobacteria deal experts worldwide. On disposal of cyanobacteria water bloom in surface waters, especially water and recreational reservoirs, the four most commonly used conventional ways to limit the growth of cyanobacteria [3]:



Fig. 1 View to eutrophic reservoir TRSTENE, Slovakia

### Methods, techniques to reduce of cyanobacteria

**Physical** - includes mainly limited supply of energy needed for photosynthesis. One of the easiest ways is to cover the levels of smaller tanks opaque film, or other cover. The physical methods also count artificial circulation of water masses in the tank.

**Mechanical** - cutting vegetation, pulling them out of the tank and further processing (composting, feeding). For small tanks can eliminate the floating biomass networks. Nearby is shoveling and removing sediments from reservoirs various mechanical technologies. The fact remains that the sediments after mechanical removal represents a significant source of viable cells for recovery community of cyanobacteria.

For example using suction dredges in the past (2006) solved in Slovakia revitalization of Sunny Lakes (Fig. 2) Completion of the revitalization of the lakes was in May 2008. The dried dredged sludge was used as backfill soil during reclamation of landfills or as bio-fertilizer.



Fig. 2 Suction dredger Sunny Lakes, Slovakia

**Chemical** - there are algicidal agents, their compounds or mixtures thereof, having more or less toxicity to one or more species of cyanobacteria and algae. In practice, the use of algicidal substances normally is left as the last intervention to improve water quality in the reservoir at risk of excessive growth of algae and cyanobacteria. Classic algicidal agent is copper sulfate, but there are many other chemicals that are algicides properties.

**Biological** - biological methods are based on the balance tank biogenesis. They make attempts



to influence the qualitative and quantitative composition of phytoplankton controlled fish crew, or by increasing the population density of consumers. In terms of southern Slovakia and southern Moravia were verified possibilities of herbivorous fish, white carp. Principle of methods of using cyanofags against algal bloom. In the laboratory, grow enough cyanofags, which are then vaccinated in tanks where possible to limit the development of cyanobacteria. It is possible to use those types of fish, and that filter feed on phytoplankton. Biological methods, however, have lagged behind the physical and especially chemical, although their use would be acceptable in terms of organic.

### **Contribution to the evaluation methods**

Having said that, the methods and techniques for removing standing water from the blue-green algae are mainly based on chemical principles, in a variety of dosage of chemicals into the waters, in particular, copper sulfate, alumina, iron and others. For these uses is different dosage of the chemicals added to the water. The disadvantage is the high concentration of undesirable chemicals in the water, which can have a negative impact on other aquatic organisms. However, these methods only prevent or limit the occurrence and propagation of cyanobacteria. Uses of biological methods are environmentally acceptable, but relations between cyanobacteria and micro-organisms have only been tested in laboratories. Various devices are known for mechanical removal of sediments from water reservoirs. The disadvantage of these devices is their high cost and low efficiency. The biggest drawback is the fact that especially in the backwaters of the secondary water contaminates, and it allows further propagation of cyanobacteria.

**To address this issue the authors received a grant project of EU funds. Project Title is: Implementation and modification technology to reduce the occurrence of cyanobacteria in stagnant waters.**

Objectives of the project: Apply unconventional technology in reducing eutrophication of stagnant water, polluted mainly cyanobacteria and lower lashes.

The uniqueness of this project is documented patent survey and granted patent and utility models existing in Slovakia and the Czech Republic. Experimental proposed technical and technological base is also in connection to defended dissertations and opinions on this work at the Department of Environmental Sciences TUKE inadequate, given that it has been tested only in small areas. The assumptions that justify the implementation of the project include:

+ *Simple application being developed technology , low energy , long-term experience with its implementation, non-invasive, positive impact on aquatic life, human health, long-term effects, ease of process equipment , automatic control parameters, hygiene , others impacts,*  
- *Time-consuming application methods, application methods of uncertainty limit the size of the water area.*

### **Summary**

Efforts to reduce the blooms will probably have to involve a combination of different actions aiming at each specific component water flower in the locality. Contribution to solving the issue should be the experience of the proposed scientific research station established by the EU project means to the authors.



## Key words

*Disposal Technology Cyanobacteria, Standing Water, Structural Funds.*

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