



Location: Jezioro Skrzyneckie
Małe lake, 10.7 ha

Description: LG Sonic MPC
Buoy deployment in Poland. June
2013.

Project objective: As part of the
Clearwater PMPC project, 2
MPC Buoys were deployed in the
Skrzyneckie Małe Lake to test
the performance of this unique
technology.

Recreational Lake

Background

The ClearWaterPMPC project was initiated by LG Sound and funded by "Research for SMEs" within the EU 7th Framework Programme. The goal of the ClearWaterPMPC (Predicting, Monitoring, Preventing, and Controlling) project was to develop an environmentally friendly technology to prevent growth of blue-green algae in large water reservoirs.

In contrast to currently available ultrasound based algae control systems, the technology developed within the scope of the ClearWaterPMPC has an implemented online lake monitoring system and offers the option to remotely change the frequency programs to control different organisms.

The first step of the project was to run pilot scale experiments with the most common cyanobacteria, in order to determine the optimal ultrasonic program. Polyester containers of 5m³ were used, to cultivate algae. Ultrasonic transmitters, especially designed for the Clearwater PMPC project, were used to emit different frequencies, waveforms, amplitudes and burst times. The tests continued for 5 days, constantly monitoring algae cell count, Chlorophyll a levels and photo-activity of the algal species.

Figure 1 shows the percentage of algae control of *Microcystis aeruginosa* under different ultrasonic programs.

These experiments show that cyanobacteria control is frequency specific.

These findings on ultrasound parameters were incorporated in the LG Sonic MPC Buoy, developed thanks the Clearwater PMPC project.

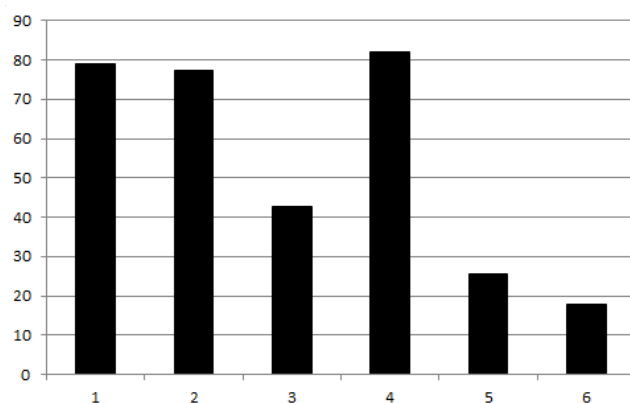


Figure 1: The percentage of Chlorophyll a, lowered under different frequency programs, show that the effective control of blue-green algae is frequency specific when using low power ultrasound.

Installation

The project required highly skilled researchers within the ultrasound, telecommunications and biology world to proceed with the correct configuration and deployment of the units.

The combined electrode and optical sensors to measure real-time in situ data were started on site. Total Suspended Solids, Phycocyanin and Chlorophyll a are measured with a fluoroprobe, Dissolved oxygen, temperature, pH and Redox are measured by an optical and respectively combined electrode sensor.

The team set up the MPC-Buoy communication system (GPRS, Radio, Zigbee or other wireless communication methods) to transmit the measured data to an online server. The MPC-View software has been developed to:

- Visualize, summarize and publish the data provided by the in-situ sensors in maps, charts and graphs for the user to have an overview of the current water quality status with 10 to 20 minute intervals.
- Analyses the data, determining the algal species and designing the correct ultrasonic program to control the algae present in the water.
- Predict upcoming algal bloom events and design an ultrasonic program to prevent bloom forming.



After treatment

The samples taken from the lake showed that while cyanoprokaryota are not dominating the phytoplankton of Skrzyneckie Małe lake, most of the lakes within the region generally suffer from cyanobacterial blooms in summer. Kórnickie Lake, located in the same catchment area as lake Skrzyneckie Małe, was reported to support cyanobacterial blooms since at least 2008 (Zagajewski, 2012). Analysis of a single sample from Kórnickie lake (collected on 5 August 2013) proved cyanobacterial bloom in the lake also this year, with number of cyanobacterial cells more than 9 times higher than in Skrzyneckie Małe lake (fig. 2) on the date with the highest cyanobacterial number, 12 August.

Also a small lake nearby, Łęgno, suffered from cyanobacterial bloom, composed of different species and life forms. The number of cyanoprokaryota cells in this lake was 6 times higher than in lake Skrzyneckie Małe (fig. 2).

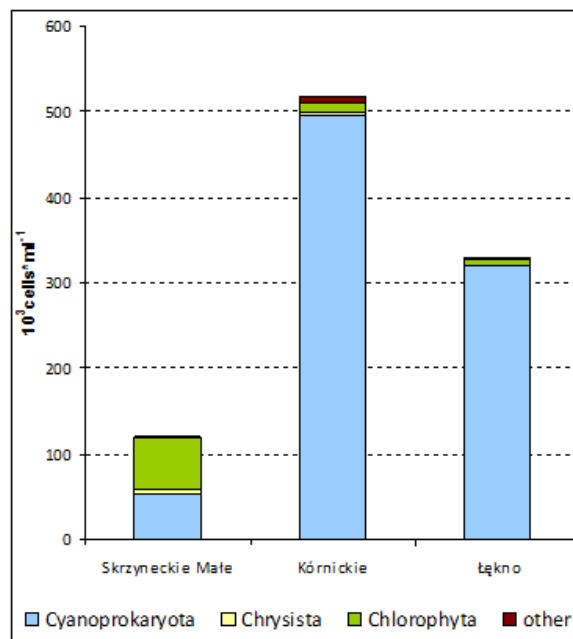


Figure 2: Algae population in different lakes. All lakes have the same water catchment area in common.

Results

- Cyanobacteria 9 times lower at Skrzyneckie Małe lake
- Substantial improvement in water quality