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PHOSLOCK ENVIRONMENTAL TECHNOLOGIES

“Phoslock® can be used to manage the effects of current and historical nutrient pollution caused by both diffuse and point sources”

Based in Australia, Phoslock Environmental Technologies (PET) offers water treatment and remediation solutions to address excess nutrients in water bodies. Their Phoslock® solution reduces in-lake phosphorous concentrations while ensuring the safety of humans and aquatic biota.

 CRISTINA NOVO PÉREZ

Nutrient pollution affects water bodies worldwide. While it is a natural phenomenon, human activity accelerates the rate at which nutrients like phosphorus enter freshwater. In this interview, we speak with Kate Waters-Hart, Group Manager, Aquatic Science and Damian Whelan, General Manager for UK & Europe, both at Phoslock Environmental Technologies (PET), to learn how Phoslock® can improve water quality conditions. We also hear about PET’s largest project in Europe to date, involving the application of Phoslock® to the Kralingse Plas lake in the Netherlands, directly from Anne Molema, Project Manager at the City of Rotterdam.

Can you tell us about the research behind the development of Phoslock®? How has its safety been assessed?

KW-H Phoslock® has been extensively and independently assessed within

the research community over the last 25 years. Over this time over 100 peer reviewed publications have been produced. Research projects have focused across different scales, from laboratory, mesocosms and whole lake trials and on a range of topics from assessing Phoslock’s efficacy, it’s impact on freshwater biota and human health. From the vast amount of scientific evidence available, these studies have conclusively shown that Phoslock poses negligible risk to both aquatic biota and to human health.

What does the treatment with Phoslock® involve, and how does it work?

KW-H To understand if Phoslock® is a suitable solution to improve water quality in any water resource, we undertake an assessment of its chemistry and sediments. If suitable, a Phoslock dose is calculated and applied as a slurry, by mixing Phoslock granules and lake water



together. The slurry is typically sprayed over the water surface, where it will travel down through the water column, binding phosphate as it goes. As it reaches the bed sediments it forms a fine fluid layer where it will continue to bind any phosphate released from sediment complexes.



Here it will remain and will continue to bind phosphate until all lanthanum binding sites are full. Phoslock and its precipitates will form part of the sediment profile and can help consolidate fine and fluid sediments. The Phoslock slurry is applied during autumn – early

spring to target the majority of the phosphate pool which is in the sediments during this period.

Phoslock is 95% bentonite and 5% lanthanum, and it works by using the ability of lanthanum to bind available phosphorus. Lanthanum bound within Phoslock

binds very strongly to phosphate to form the insoluble, non-toxic, inert, natural mineral Rhabdophane. Rhabdophane is a very stable mineral that will not release the phosphorus under the natural conditions found within lakes. The reaction rates between lanthanum and phosphate



Kralingse Plas lake post application November 2022

are rapid and quickly controls excess phosphorus which helps to improve water quality conditions.

How does Phoslock® compare to other methods to remediate excess phosphorus in water bodies?

KW-H Phoslock® is a versatile product to use for the control of phosphorus pollution as it has several advantages over other commercial phosphorus binders. Once applied, Phoslock does not alter the pH or conductivity of the receiving waters unlike alum or iron salts. This eliminates the need to add buffers to control the pH and prevents any stress induced to aquatic biota through changes in pH. Phoslock can bind phosphate over a wide pH range, in anoxic conditions, in the presence of humic substances and in brackish and saline waters. This is a big advantage over other commercial products. Phoslock is also favourable due to the fact that the bond between lanthanum and phosphate is strong and will not be released under anoxia or through pH changes unlike iron and alum salts, respectively. Unlike alum salts, Phoslock does not crystallise and will not lose its binding capacity

with age. Phosphate bound to lanthanum will not be released as a result of sediment resuspension events caused by wind or waves and it has the ability to increase sediment stability.

How is water quality preserved in the long term, after treatment with Phoslock®?

KW-H Phoslock® is an excellent solution to help control the phosphorus released from sediments that have entered the system through years/decades of uncontrolled sources of nutrient pollution in the catchment. Phoslock is very effective and can last a long time if catchment phosphorus is significantly reduced. A single application of Phoslock has been effective in controlling phosphorus concentrations in lakes for more than 10 years where catchment phosphorus loads have been reduced. Phoslock should be applied alongside catchment management measures to help speed-up recovery from phosphorus pollution. The development of a monitoring plan, if not already in place is vital in understanding the health of a waterbody and to assess how effective restoration measures can be.

How long has it been around, and where has it been used?

DW PET's flagship product, Phoslock®, was originally developed by the Australian national science agency (CSIRO) more than 20 years ago. This unique water treatment product is used globally, with over 300 successful applications to date and clients supported by our various entities, subsidiaries and management teams in Europe, UK, Canada, US, China and ANZ.

How big is the problem with nutrient pollution in Europe and what are the largest contributors?

DW Nutrient pollution is a global problem with many factors contributing to its impact on freshwater biota and human health. It is a natural phenomenon which usually occurs over centuries, as waterbodies fill with sediments, but human activity accelerates the rate at which nutrients like phosphorus enter freshwater.

Climate change and increased catchment loading from population growth and land-use are the main external stressors that can increase the rate of external phosphorus loading to lakes. Recent publications have described the impacts of phosphorus

in waterbodies as the reason for many waterbodies failing current Water Framework Directive ecological quality targets.

Phoslock® is an excellent and effective technology that can be used to manage the effects of current and historical nutrient pollution caused by both diffuse and point sources such as agriculture, livestock, wastewater, industry, surface water, aquaculture, and the natural surrounding environment, to return a waterbody back to its natural state.

Where in Europe are you active? Can you tell us a bit more about these projects?

DW We are active across The Netherlands, Finland, Germany and with interest growing across the UK, Sweden, France, Italy... We have just completed a Phoslock application in The Netherlands where we revisited the Kralingse Plas Lake, applying 19 tonnes of Phoslock to the Wolvenvallei and Heemtuin that connect into the Kralingse Plas.

In early November 2022, Phoslock Environmental Technologies Limited announced a partnership arrangement with SSI Services (UK) Limited aimed at driving improved customer engagement, seamless application support and technical reach nationally via their Operational and technical services business Onsite. I am confident that this won't be the last partnership we announce across UK, Europe and globally.

What is the largest project so far and what did it involve?

DW Our largest European Project to date was the treatment of Kralingse Plas lake located in The City of Rotterdam, Netherlands. The Kralingse Plas lake is PET's largest remediation project undertaken in Europe. We successfully applied 1,064 tonnes of Phoslock® to the 100-ha lake in less than four weeks with excellent support and cooperation from the City of Rotterdam and Hoogheemraadschap van de Krimpenerwaard.

CASE STUDY

PHOSLOCK APPLICATION IN THE KRALINGSE PLAS LAKE IN THE NETHERLANDS

Anne Molema, Project Manager at the City of Rotterdam, explains the water quality issues in the lake and their experience with Phoslock®.



Can you tell us about the water quality issues the Kralingse Plas Lake was facing?

Kralingse Plas is a popular recreational lake visited by millions of visitors a year. Unfortunately, we had a persistent water quality problem related to too much phosphate in the water, which eventually leads to poor water quality.

We realized the 'legacy' phosphorus built up in the lakebed over many years was the primary cause of the high level of nutrients in the lake.

How was the city addressing those issues, and how did you decide to try Phoslock®?

We started to investigate the issue, contacted engineering companies and universities and, of course, we utilised our own knowledge and expertise as the City of Rotterdam. After researching different options for solving the phosphate issue, thanks to different water boards and universities, we discovered Phoslock®. We then did extensive research of 96 recent peer-reviewed scientific research articles about the effects and side-effects of Phoslock, both being tested in the laboratory and in real-world settings, in the lakes that have been treated with Phoslock, and discovered there were no negative effects. We invited a team of science experts, waterboards and water quality professionals who confirmed that Phoslock is a safe and environmentally friendly solution to treat the lake.

What have been the results of applying the treatment, and what is being done to protect water quality nowadays?

Phoslock® is an excellent method to catch the phosphate that is released from the bottom of the lake. With only a layer of about 3 mm of Phoslock on the lake bottom the problem was solved. Every month we analysed how effective the measures were. The results were looking positive, but it was yet to be seen what would happen in the summer, when temperatures rise.

This November, we marked the 1-year anniversary of the first treatment with Phoslock and we are pleased to say the lake is in great health, even after we had one of the warmest summers on record.