



# Phoslock Environmental Technologies



## Phoslock Application Methods

*This document provides information on the various methods that can be used to apply Phoslock to water bodies. Phoslock granules are generally mixed with water pumped from the lake or reservoir being treated and applied as a suspension. A variety of mixing systems have been developed with the choice of system depending on the size of water body, ease of access and dosing strategy. Most mixing systems are suitable for use on motorized pontoons, barges or workboats, however smaller systems suitable for land-based applications are also available.*

*This document presents information on the various mixing systems that are available as well as the workboats and barges that can be used in combination with the mixing system. Information is also included on a number of alternative application methods, including dynamic dosing, hypolimnetic injection, dry granule injection and remote controlled application.*

*Most water-based application systems require two or three operators, with one operator steering the vessel according to a pre-determined course while the other operator(s) feed the product into the mixing and application system. The vessel is driven in targeted transects (using Global Positioning Systems-GPS and depth sounders) across the lake or reservoir to ensure an even dispersal of Phoslock across the site or in the targeted areas.*



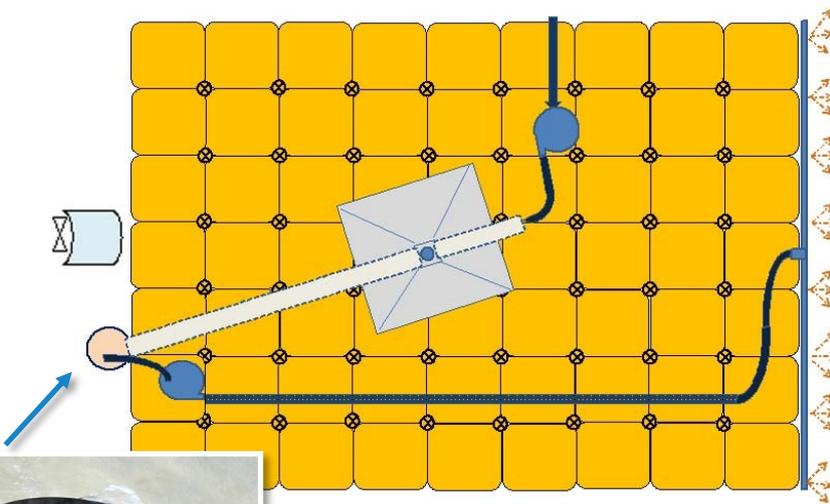
# Mixing Systems

## 1. IDN Mixing System

The IDN Mixing System is a simple system which can be easily fabricated and installed on a variety of vessels, including plastic pontoons, multihull aluminium workboats or steel pontoons. The system consists of two pumps, a hopper holding the Phoslock granules, a series of PVC pipes and a steel mixing chamber attached to the rear of the vessel. Water is pumped from the lake through the pipes and the Phoslock granules are gravity fed into the water flow through a valve at the bottom of the hopper and an opening in the section of piping that is positioned under the hopper. This "Phoslock slurry" then flows into the mixing chamber from where it is pumped to the spray bar at the front of the vessel and dispersed onto the surface of the water body. This system is capable of mixing up to 32 tonnes of Phoslock per day and can therefore be used on large-scale applications.



Very large applications can be undertaken by installing multiple hoppers on the pontoon, by using multiple systems on multiple vessels concurrently or by installing a small crane on board so hoppers can be reloaded without the need to return to shore.



# Mixing Systems

## 2. MD-1 Mixer



The MD-1 is a specially fabricated mixing system which can be used on land or water. It has a mixing / discharge rate of up to 2.5 tonnes per hour. When used on water, the discharge outlet is connected to a spray bar mounted on the front of the application vessel. The system can be fed using 25 kg bags or 1050 kg bulk bags.

## 3. MD-2 Mixer



The MD-2 is a mobile, shore-based all-in-one mixer. Like the MD-1, it has been specially fabricated for Phoslock applications, but is light-weight (100 kg) and ideal for small water bodies where it is impractical to deploy workboats. Slurry is discharged via a lay flat hose and application rates of up to 1,000 kg /hr can be achieved.

# Mixing Systems

## 4. Small Mixing Drum

This system is suitable for small scale, shore based applications. It consists of a simple 200 litre drum mixer (with a baffle down the middle), two small firefighter pumps and hoses. Lake water is pumped through an opening at the bottom of one side of the drum. As the water level rises, Phoslock granules are fed into the chamber and the resulting slurry flows over into the second chamber. This creates further mixing and the final slurry is pumped out and sprayed onto the surface of the water body via a spray nozzle. The system is ideal for large ponds and farm dams.



# Application Vessels

## 1. Modular Pontoon Systems

Pontoon systems using modular components make ideal application vessels. A range of systems exist, including the systems shown in the photos on this page. Motorised pontoons can be adapted to accommodate either the MD-1 or the IDN mixing systems, both of which can be fed using 25 kg or 1050 kg bulk bags. These systems are easily transported and quick and easy to assemble. They are suitable for sites where access using large vehicles is difficult.



Multiple units can be assembled to increase payload capacity, although speed over water is reduced when larger systems are used.

# Application Vessels

## 2. NATO type Steel Barges

With a load rating of up to 12 tonnes (and even more if extra pontoons are used), NATO steel barges are well suited for larger projects. Hydraulic cranes can also be installed to assist in the movement of bulk bags. The barges are self-propelled by a rear mounted outboard and mixing is generally done using an IDN Mixing System. These types of barges have been used in many of the large scale Phoslock applications undertaken globally.



Large NATO pontoon setup with gantry crane and generator



NATO pontoons ready for assembly



# Application Vessels

## 3. Multihull Aluminium Workboat



Aluminium multihull workboats have been used on many Phoslock applications in North America. They are typically powered by 2 x 90 HP Yamaha outboards and larger boats can be fitted with a hydraulic crane for bulk bag handling. Most vessels have a 4 tonne payload but move through the water quickly and can make fast returns to base for quick re-loads. MD-1 or IDN mixers are typically used on these vessels.



Spray bar slurry discharge

Mixer unit

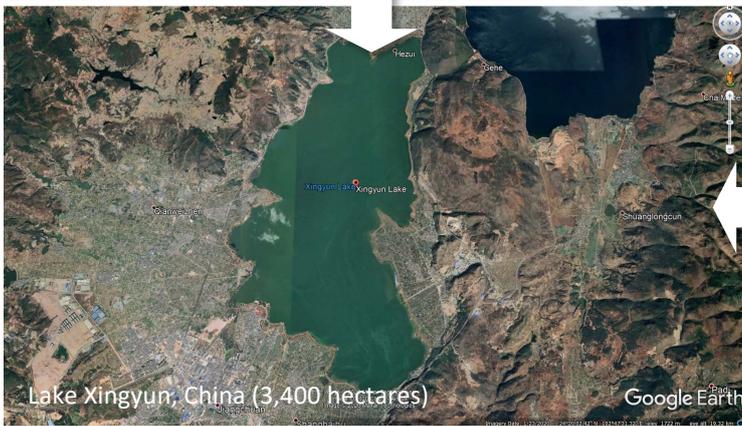
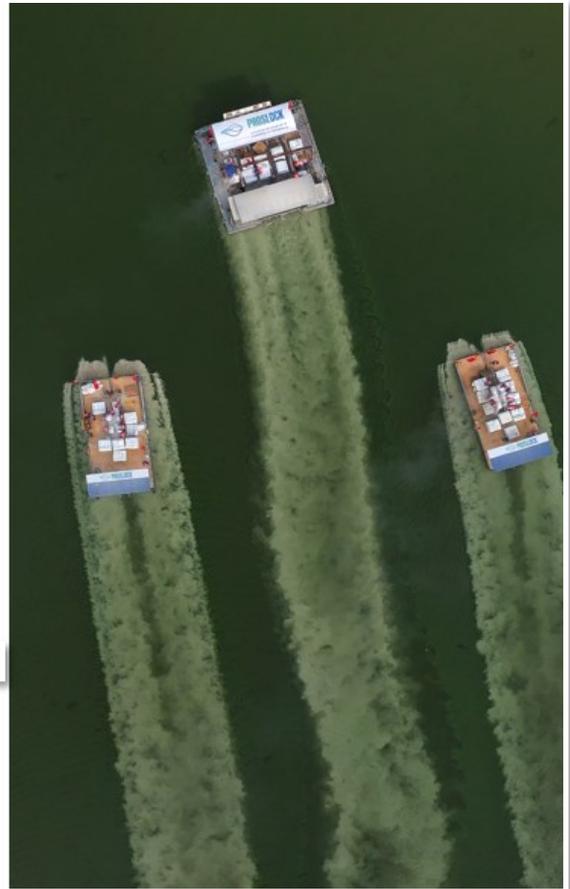
Feed water to slurry mixer

1050kg pallet of Phoslock granules. In this case, extra payload was within limits therefore total dry weight of 2,500kg

# Application Vessels

## 4. Large Barges

Very large pontoons such as the ones shown below can also be used in major projects. The system below shows a purpose-built pontoon fabricated in China for the application of several thousand tonnes of product.



## 5. Airboats

Airboats such as those used in the Florida Everglades can be used to apply Phoslock slurry to very shallow waterbodies such as wetlands where the use of outboards would be impractical. Payload capacity is relatively low however this is compensated by rapid application and fast return to base for reloading.



# Bulk Loading Methods

Phoslock pallets and bulk bags are typically loaded onto application vessels using all terrain forklifts (telehandlers). Where the use of these is not possible, small cranes such as those shown in the photos can also be used.



# Additional Information

## 1. Squid



Shallow, inaccessible sites can be reached with the use of a remote controlled application device known as the "Squid". This device, which has been specially made for Phoslock applications, involves the application of Phoslock through a two head system similar to a lawn sprinkler. The head is connected to a shore-based mixing system (typically an MD-1) via floating hoses and operated via a remote control. Throw distance is a radius of 10-15 metres and floating hoses with a length of up to 200 m can be used. The system is ideal for hazardous water bodies where access is restricted.

## 2. Direct injection



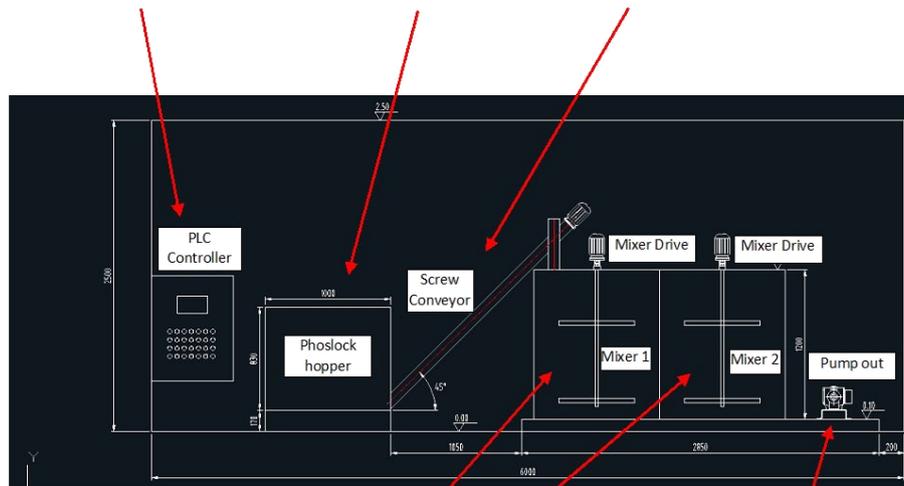
Phoslock slurry is typically applied to the surface of water bodies, however direct injection of the slurry into the deeper water is also possible. This is achieved by pumping the slurry to an underwater supply boom via a series of weighted drop pipes. The drop pipes are PE construction and designed to break if snagged on underwater obstacles in order to prevent damage or loss to on board equipment. Direct injection to deeper water is generally undertaken when the bulk of a water body's phosphate pool is contained either in the hypolimnetic water layer or sediments, rather than in epilimnetic (or surface) waters.

# Additional Information

## 3. Dynamic Dosing



This system allows Phoslock to be continuously dosed (or dosed as required) to flowing water. It consists of a containerized dosing system with “Plug and Play” engineering tailored to each specific situation. Other features of the system include secure, tamper-proof installation, PLC controls with IP camera monitoring of equipment and dosing site and back to base telemetry control. Many other custom design features are also available.



# Additional Information

## 4. Dry Phoslock Application

In situations where P stripping from the water column is not required, Phoslock can also be applied as a dry granule without the need to create a slurry. Dry application systems generally utilize modified agricultural fertilizer spreaders. Some dust is generated due to attrition and coating of the granules to impart slow release properties is beneficial.



## 5. GPS Tracking

Modern GPS tracking systems are used to ensure that Phoslock is applied in the most uniform way possible across the whole water body being treated or to targeted areas

