Tackling Unwanted Algae Through Motion

Unsightly blue-green algae or cyanobacteria are a growing problem in lakes and dams, mainly as a result of the increased production and concentration of agricultural, municipal and industrial wastes. One method of dealing with blue-green algae in warm, nutrient-rich, stagnant waters is through the use of long-distance circulation, writes Dr Christopher Knud-Hansen and Linda Steenkamp.

Blue-green algae are particularly undesirable because many species contain toxins that can be extremely harmful (even fatal) to aquatic organisms, as well as humans, pets, and livestock, if ingested. Although the waters may appear green, there is very little food for microscopic animals to feed on because blue-green algae are essentially inedible. As a result, dead blue-green algae either remain floating on the water's surface creating that smelly pond scum, or, sink to the bottom where microbial decomposition depletes bottom waters of dissolved oxygen promoting fish kills.

There are basically three lake management approaches for dealing with blue-green algae. The first approach is to kill them with copper-based algaecides. This approach, however, is losing favour worldwide because the benefits are temporary. The second approach is to starve them. This approach emphasises restricting nitrogen and phosphorus availability via watershed management and/or nutrient removal or inactivation.

In contrast, the third approach of disturbing the blue-green algae's preferred habitat of stagnant waters through long-distance circulation (LDC) has provided the desired control. Long appreciated in the scientific literature that habitat disturbance can provide effective algal control, it was not until the development of the so-called SolarBee solar-powered water circulation machine that LDC has become a practical management approach for water bodies of nearly any size.

SolarBees are up-flow pumps with a flexible intake hose that can draw water up from any depth. The bottom plate beneath the one-metre diameter intake hose enables water to come into the machine horizontally from long distances. This prevents resuspension of bottom sediments, even when the intake hose is less than a metre off the bottom. The specially designed distribution dish at the surface allows up to 40 000 ℓ/minute to move radially in all directions up to about 200 m away from the machine. In this way, the upper waters where the blue-green algae grow are put into a slow but continuous motion. Three 80 Watt solar panels provide enough energy to run the sealed, magnetic motor and digital control box 24 hours a day. One unit can treat up to 14 ha of lake surface area.

Since 2000, SolarBees, which are now available in South Africa, have achieved more than 95% success in providing LDC for consistent and effective blue-green-algal bloom control to over 200 water bodies worldwide, including over 80 municipal raw water storage reservoirs. Preventing harmful algal blooms allows nutrients to change into edible, more beneficial algae. Since beneficial these algae do get eaten, water clarity improves. Because blue-green algae are not decomposing on the bottom, deeper waters remain better oxygenated, thus reducing the threat of fish kills. Furthermore, SolarBee-induced circulation has also proven effective at improving fish spawning habitats in near-shore sediments as naturally oxygenated surface waters move down along the sediments and back to the machine.

From the human perspective, benefits of LDC are also numerous. Lake users frequently note that near-shore sediments are firmer and more compacted, a logical result of oxidising the organic muck accumulated on the sediments. These water quality improvements are unrelated to nutrient concentrations – the elimination of algal blooms is by habitat manipulation that impairs their ability to out-compete non-blue-green algae, and not by limiting their nutrient availability. LDC has proven equally effective in wastewater lagoons as well as nutrient-rich lakes.

As human development continues to increase the amount of algal nutrients entering surface waters, it has become increasingly imperative to prevent algal blooms from forming. For nearly a decade, solar-powered LDC has proven to be the 'greenest', most energy efficient and ecologically-sustainable tool in the lake management toolbox to address this global problem.

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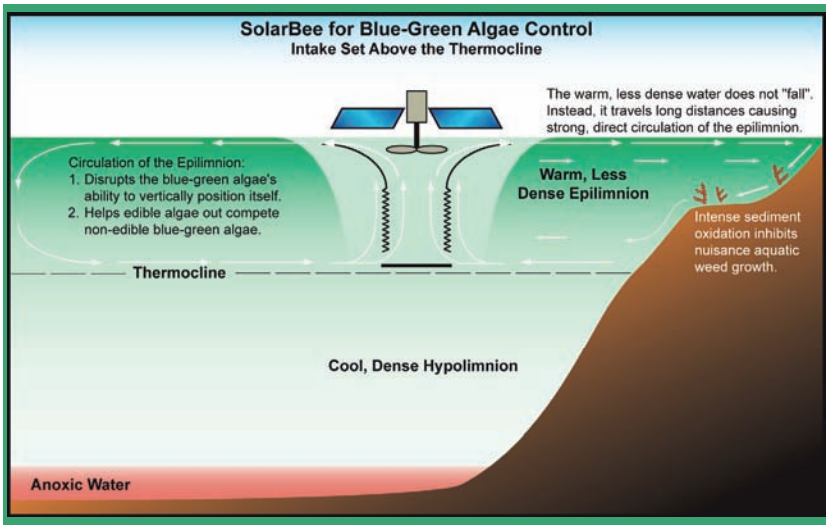

How the solar-powered water circulation machine works.