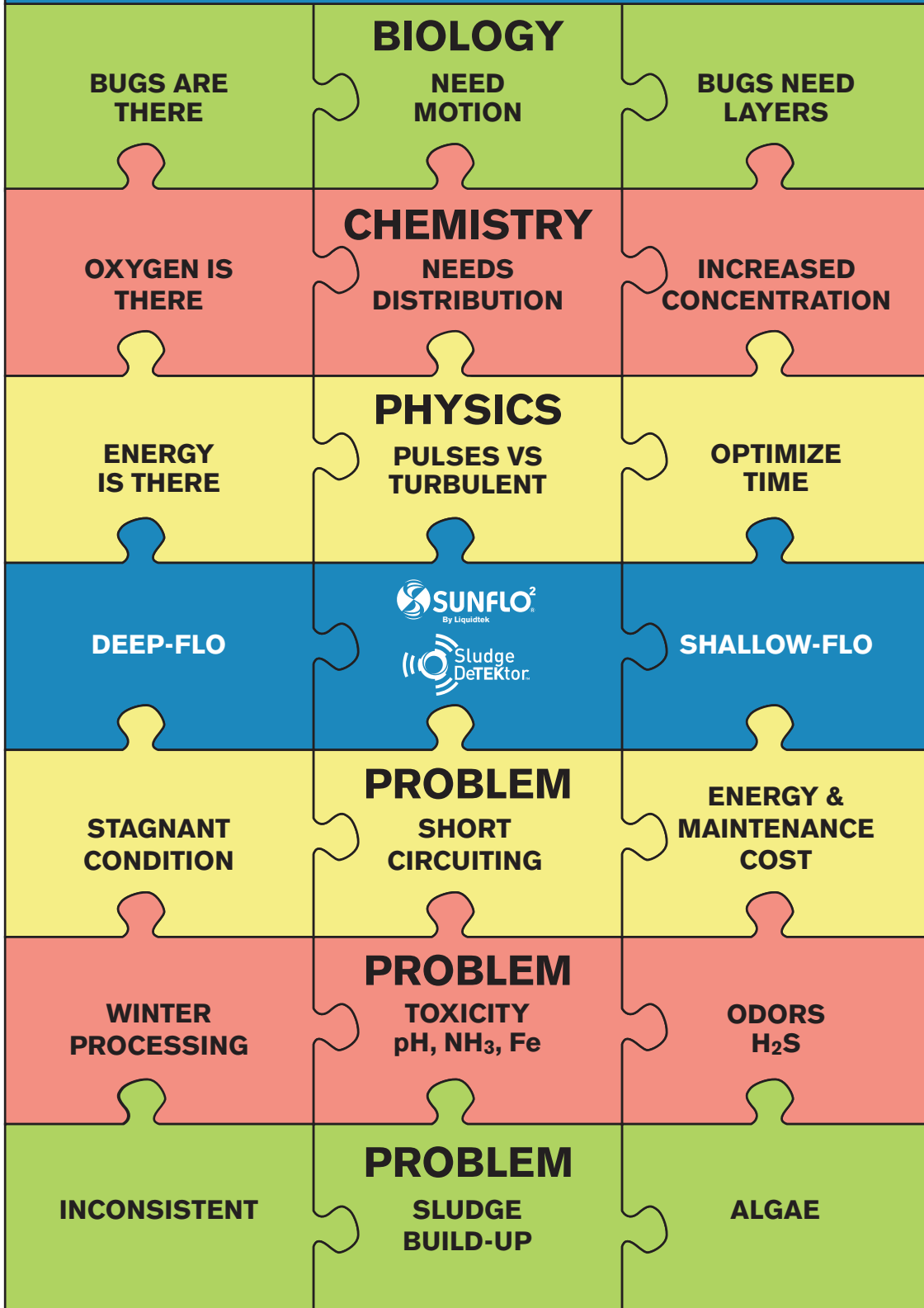


**SOLUTION FOR
PUZZLING POND PERFORMANCE**



BIOLOGY BENEFITS

Aerobic Bacteria - digest soluble BOD (the majority of incoming nutrients). They digest four times (4X) as much BOD as other bacteria. The "Oxic" layer benefits from active but not turbulent mixing which occurs as the nutrients, oxygen and bacteria are in immediate contact. Expanding and increasing oxygen concentrations in the top half (aerobic layer) of a pond, results in greater nutrient removal.

Facultative Bacteria - digest semi-soluble nutrients and benefit from passive mixing that allows settling and uniform nutrient distribution. Facultative bacteria work with or without oxygen and serve to protect the anaerobic layer from oxygen. Facultative bacteria produce acids necessary for anaerobic bacteria.

Anaerobic Bacteria - digest solids (sludge) using acids created by facultative bacteria to break down complex nutrients. Anaerobic bacteria die in the presence of oxygen so must be undisturbed (no mixing) to provide the greatest benefit.

CHEMISTRY BENEFITS

Water equalizes at 9.2 ppm at 60 degrees C (adjusted for Te and elevation). Oxygen is consumed by aerobic bacteria so the more oxygen the greater the removal. Continuous rippling or surface exchange increases the absorption of oxygen.

Everything happens at the surface so continual surface exchange allows for greater oxygen absorption and greater chemical (gas) releases. Increasing the absorption of oxygen results in an exchange so that more chemicals (gases, NH₃, CO₂) can exit.

Continual surface exchange equalizes pond temperature and increases evaporation (a cooling process) while preventing temperature increases at the surface where algae grow and aggregate into mats etc.

PHYSICS BENEFITS

Mother Nature - is strongest when she does things in layers. Turbulent mixers (aspirators, diffused air and splashers) destroy the necessary layering that bacteria need to co-exist and react naturally.

Flow Type - using a flow of less than 1 fps (considered laminar) is close to perpetual motion and extends radially outward on the surface and radially inward at the intake depth. This results in three distinct layers so that hot spots or pockets of limited activity are eliminated.

Pulse Mixing - by creating 80-200 pulses per minute, these "Mini/Micro Waves" – increase or stretch the surface area, and thereby, increasing process time.

ALGAE CONTROL

Algae is a plant, plants need food so too much food = too much algae. Not enough food or poor mixing conditions can result in too little or the wrong type of algae. Sunflo2 technology is the easiest way to control algae by controlling the food supply and creating a larger aerobic layer to digest nutrients more completely or in a shorter time period.

ODOR REDUCTION (H₂S)

Gases such as H₂S are oxidized in the presence of oxygen, therefore more and improved oxygen distribution via Sunflo2 in the top ½ of a pond will neutralize or reduce the strength and duration of odor events.

SLUDGE BUILDUP

Few operators and engineers have detailed knowledge of the sludge layer in a pond. Oftentimes, because of the way they are mixing the pond, the pond bottom looks like the inside of a milk carton with mounds and valleys throughout. The circulation process of Sunflo2 products defines the depth of the mixing so that only the top half of the pond volume is brought to the surface every 3-7 days (re-oxygenation via surface renewal).

WINTER PROCESSING

Contrary to popular belief, the bugs don't stop working when the pond is ice covered. What happens is their respiration rate is slowed and the lack of oxygen results in primarily anaerobic digestion. That explains why ponds can have a major odor event in the spring when the ice comes off and thermal turnover occurs (warmer bottom water rises to the surface and gases escape). Sunflo2 units will maintain a small area of open water (except in the most severe conditions). This small area allows oxygen to be absorbed while also venting odors in the winter (before barbecue season). The units will not eliminate odor (S___ stinks) but the duration and intensity of the spring odors is significantly reduced.

TOXICITY (NH₃, pH, FECAL COLIFORM)

High pH is usually the result of too much algae (see algae control). NH₃ is a volatile gas and the easiest way to reduce it and the toxicity it can create in the WET test (Whole Effluent Toxicity) is to expose it or volatilize it at the air/water interface (i.e. surface renewal). Fecal coliform have a relatively short life span and die in the presence of sunlight (which is why UV are so effective). Similarly, exposing large volumes of the pond contents to the surface via the Sunflo2 method will also result in Fecal coliform reduction.

STAGNANT CONDITIONS

Typically, when water sits idle, bad things happen. Not only is there a breeding ground for insects but algae often accumulates or mats which limits mixing and oxygen absorption. The best solution is to constantly renew the surface via Sunflo2 and create uniform water temperatures to prevent hot spots where algae and insects breed.

OVERLOADING

There are two types of overloading (Organic and Hydraulic).

Organic overloading (too much BOD/acre) may be so severe that a larger pond is required. However, an interim solution (i.e. buying time), is to increase the surface area via pulse mixing as provided by the surface renewal provided by Sunflo2 units. Surface renewal will expand the effective surface area 2-4 times the present area. That's a much larger area to spread the nutrients over and provides the additional time and oxygen to digest excess nutrients.

Hydraulic overloading means there is less reaction time (MCRT) for the bacteria to digest nutrients. The typical solution is a reduction of I & I (Inflow and Infiltration). However, the cost can be very expensive and take years to complete slip-lining the collection system/manhole repairs. Sunflo2 solutions improve the rate of processing or treatment efficiency so that the system can maintain compliance until the repairs are funded and completed.

SHORT CIRCUITING

Virtually all ponds have some sort of short-circuiting as the water velocity between the inlet and outlet is greatest. This means that MCRT (Mean Cell Residence Time) is reduced. In simple terms, MCRT is a measure of the time the bacteria, nutrients and oxygen are in immediate contact (reaction time). With 360 degree radially flow inward at the inlet depth and radially outward on the surface Sunflo2 units ensure that the nutrients are distributed uniformly throughout the pond for optimum MCRT or reaction/digestion time.

ENERGY COSTS

Every standard or typical aeration system is using the same oxygen. The oxygen they are using is from the atmosphere and they simply compress it and blow bubbles or they use an aspirator (modified boat prop), or they spray it into the air (fountain). All methods work to varying efficiency depending on bubble or droplet size, etc. The difference in the Sunflo2 method is it draws large volumes of oxygen deficient water from the lower levels to the surface. Oxygen deficient water absorbs atmospheric oxygen instantaneously and as that O2 is absorbed, it's spread across the surface which increases the volume of oxygen from the top down. Past use of solar mixing has shown a 30 horsepower or greater savings depends on the type/location of the aeration method. A 30 horsepower savings using a cost of \$1.00/day/hp is \$900-\$1,100/month.

COMPANY HISTORY

Since 2014 LiquidTEK LLC has produced solar powered technology that provides lagoon-based water quality solutions throughout North America. LiquidTEK has combined historical observations, empirical data, and established scientific formulas, putting theory into practice. Sunflo2 products meet the practical and reliable everyday needs of their customers. LiquidTEK believes performance data is more important than manufacturer's claims, so they provide operators, engineers, and owners with useful documentation and proof of performance. Several models in the product line of solar powered mixers and aerators are now being marketed throughout the US, Canada, Mexico and worldwide.

OUR MISSION

Practical solutions to improve water quality, reduce energy costs and real time documented proof of performance.



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