

The SolarBee can enhance or supplement your existing partial-mix aerated system. The SolarBee can reduce effluent BOD, TSS, ammonia (N), phosphorus (P), and pH, as shown below. In addition, it can help solve problems of high energy costs and sludge buildup. A major upgrade can often be avoided by just enhancing the system already in place.

INFLUENT, containing high Carbon BOD (CBOD), high Nitrogen (N), and high Phosphorus (P)

Primary Cell

ACTION: Add SolarBee(s) to enhance your aerated process. Operate aeration equipment at nighttime only, just enough to maintain an early-morning detectable DO or prevent ice damage. Usually reduce run time by 50% or more.

DIRECT RESULTS: During the day, with the aeration turned off there will be less turbulence and turbidity to hinder algae growth. The SolarBee mixing causes high algae growth. The algae produces energy-free pure DO, up to 250 lbs of O₂ per acre per day. A high pH also occurs near the surface. The high-DO and high-pH water is continuously and thoroughly mixed throughout the pond. The same BOD reduction occurs as before, and odors are controlled.

Whenever there is a DO deficit at the surface, surface reaeration caused by the Solar Bee can also add up to 225 lbs of O₂ per acre per day. For heavily loaded ponds, a night-time shore power kit can also be added to increase the DO.

Carbon is usually algae's growth-limiting nutrient in municipal ponds. Carbonic acid is created as a result of aerobic biomass respiration. High algae growth strips the CO₂ from the carbonic acid, then drains down the entire carbonate alkalinity buffering pool, ultimately raising the pH and causing a shortage of carbon. This eventually leads to an algae die-off. The carbon that is tied up in dead algae cells that fall to the bottom of the pond is no longer available as an algae nutrient. The dead algae cells are mostly digested anaerobically through methane fermentation. Most of the carbon they contain (50% by dry weight) leaves the pond as CH₄ gas, a non-nutrient. A smaller portion of the methane fermentation carbon re-enters the buffering pool as CO₂ converted to either carbonic acid or carbonates. This is usually referred to as "nutrient feedback" from the sludge.

FURTHER RESULTS, due to the higher average pH: More ammonia (N) is transformed from the liquid ammonium ion state to the ammonia gas state, and is stripped from the pond by the mixing. More precipitation of phosphorus (P) occurs at the higher pH and with the mixing. Better anaerobic sludge stabilization occurs at the higher pH, which relieves the "stuck digester" conditions that commonly occur when acid-former bacteria get ahead of the methane-producer bacteria. As the sludge is stabilized, the volume of sludge is reduced.

Secondary Cell(s)

↓ Less Algae, Less Carbon, less Ammonia (N), and less Phosphorus (P)

ACTION: Add SolarBee(s) to enhance your existing process. Usually no aeration is needed, even at night.

RESULTS: Just as in the primary cell, beneficial algae growth causes large reductions in the carbon, N, and P nutrients, so less of them are passed on to the final cell. Effective ponds in series compound the beneficial effect. When both the primary and secondary cell achieve a 70% reduction of these nutrients, the amount that is passed on to the next cell is 30% x 30% = only 9%. So the Solar Bee reduces carbon, N, and P nutrients in all front end cells to minimize the problems related to algae, BOD, TSS, N, and P in the final cell.

Final Cell

↓ Virtually no Algae, Carbon, Ammonia (N), or Phosphorus (P)

ACTION: Add SolarBee(s) to enhance your existing process.

RESULTS: In the final cell, there is not enough carbon, ammonia (N), or phosphorus (P) to cause permit problems for these nutrients, or to support enough algae growth high enough to result in BOD and TSS problems. And the pH is well under 9.0 due to low algae growth. Removing most of the carbon, N and P in earlier cells prevents problems in this cell. If there is a sludge nutrient buildup here due to past algae problems, there may be a feedback of carbon. The feedback carbon nutrient will become less as the sludge is stabilized, and algae growth will be low.