



WEB SITE: [www.CLEAN-FLO.com](http://www.CLEAN-FLO.com)

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## CLEAN-FLO INTERNATIONAL

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June 8, 2010

George Ambrose  
City Administrator  
Salmon City, ID 83467

Re: CLEAN-FLO System Proposal

Dear George,

Based on your request and the information provided, we have completed the engineering design for a CLEAN-FLO inversion oxygenation system in the two wastewater lagoons in Salmon.

CLEAN-FLO International is a company totally dedicated to the restoration of water bodies all over the world by duplicating and accelerating natural processes already occurring in water bodies. We design each water improvement project based on specific information, utilizing our experience from previous projects over the past forty years.

### **The Importance of Oxygen**

Oxygen is the most important constituent of lagoon health. Oxygen is an essential element for all aquatic organisms that breathe. Therefore, there is a direct relationship between the oxygen concentrations and exchanges occurring in a lagoon, and the physiological status of aquatic organisms.

- Without oxygen at the bottom of a lagoon, anaerobic bacteria (those that live without oxygen) produce acids. These acids not only increase acidity, but also cause a massive release of phosphorus and nitrogen, two major fertilizers, from the organic sediment and into the water column.
- These same anaerobic bacteria put toxic gases in the water including hydrogen sulfide (that rotten egg smell), ammonia, carbon dioxide and methane. These gases are all toxic to fish, beneficial bacteria and insects.
- Lack of bottom oxygen is the cause of odors produced by anaerobic bacteria.
- These same anaerobes kill beneficial bacteria and insects that would feed on the bottom organic sediment and biodegrade it into carbon dioxide, water and a tiny amount of inorganic ash. This ash is beneficial in reducing acidity.
- Lack of oxygen can cause fish kills or prevent fish from feeding on benthic (bottom feeding) insects.
- Anaerobic bacteria include many types of pathogenic (disease-producing) bacteria.

These diseases include cholera, scabies, typhoid, shigella, salmonella, botulism and miscellaneous bacteria that cause infectious boils and sores.

- Without oxygen at the bottom at all times, beneficial bacteria and insects cannot biodegrade the organic sediment. Large accumulations of organic sediment follow.

The concentration of dissolved oxygen found in a lagoon and available to the organisms, insects, fish, etc., is the result of many dynamic processes. The primary sources of dissolved oxygen in a lagoon are the atmosphere and photosynthesis. Oxygen-using processes, both biological and chemical, counterbalance these sources of oxygen. Any oxygen concentrations found in a lagoon at any specific time are the result of numerous dynamic changes.

The most important factor in getting oxygen to the bottom of the lagoon is that it must be done without the nutrients in the sediment, and the anoxic water at the bottom being brought up through the water column of the lagoon by turbulent mixing. The toxic bottom gases must be removed without mixing them with the rest of the lagoon.

### **Proposed Solution**

The most important part of our solution is a unique process called "Continuous Laminar Flow Inversion and Oxygenation." This process enables the other parts of the ecosystem to perform their functions. This energy efficient process was invented and perfected by CLEAN-FLO. CLEAN-FLO oxygenates and rids the entire bottom of gases including ammonia and carbon dioxide.

Our systems utilize our proprietary micro-porous ceramic diffusers. These diffusers have major advantages over other types of diffusers. Membrane diffusers stretch, tear and lose efficiency, and need to be maintained or replaced from time to time. Our micro-porous ceramic diffusers are not altered under pressure and therefore perform at maximum efficiency throughout their lifetime, typically 20 years or more.

### **CLEAN-FLO System Details**

We have designed a system that will work in your lagoons based on the information provided. As we understand, your goal is to improve the water quality and eliminate odor.

Our design for the lagoon includes a 4V1.12 inversion system with four 1 hp compressors, twelve 12" micro-porous ceramic diffusers with brass check valves, and 5,300 feet of self sinking airline to connect the diffusers. The system will include a durable fiberglass outdoor cabinet with a sound reduction lining, cooling blower, filters, and pressure relief valves. The system can be wired for 115 or 230 volt service and is complete with all cable, floats, clamps and fittings. Our design is based on the cabinet being located as shown on the attached aerial with the diffuser layout shown on the lagoons.

In order to help eliminate some of the organic load at the bottom of the lagoons, we recommend adding 12 pounds of C-FLO and 12 gallons of Clean & Clear Enzyme Concentrate. These products feed on the organic sediments, and should be added approximately 10-14 days after the system is installed. In addition to deal with the algal

growth, we recommend that you apply 10 gallons of Lake Clear 2 weeks after the system is started and then apply 7 gallons every week for 4 weeks. This would be a total of 38 gallons of Lake Clear. These bacteria and enzymes are non-toxic, and will not harm the aquatic population in any way.

The cost for the system and airline is \$18,388. The cost for the bacteria and enzymes is \$2,920. The order will be shipped by truck on pallets. The shipping cost will be \$1,728. We understand that the Salmon City staff will install the system. We will provide a technician to oversee the installation and provide on-site support during the installation. Our cost for the technician is \$1,700 to cover all expenses. We anticipate installation will be completed in one day.

### **CLEAN-FLO Warranty**

The CLEAN-FLO warranty is the best in the industry. We provide a one year warranty on the complete system, and a 3 year warranty on the airline and diffusers. The warranty requires that quarterly maintenance be performed. Quarterly maintenance includes checking hoses, pressure relief valves, and adjusting diffuser boils to ensure proper operation. All compressor and cabinet filters should be replaced every 3 months. We provide the first year's supply of filters with the system purchase.

Extended warranty coverage is also available. Please inquire if interested.

Once the system is installed, we recommend that it stay in operation continuously, even during the winter. A prolonged shutdown may require additional equipment maintenance and the system may not achieve the desired benefits.

The CLEAN-FLO system provides many benefits that include improving water quality, increasing dissolved oxygen, preventing fish kills and improving fish growth, reducing/eliminating algae and weeds, eliminating odors and reducing the organic sediment that has accumulated on the bottom of the lagoon.

Once we receive authorization to proceed, we will begin manufacturing the system. Payment will be due at the time of shipping. If you want to proceed, please sign below to authorize the work.

Please feel free to call us with any questions.

Sincerely,



Brian Kling, PE

Accepted By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Date: \_\_\_\_\_