

II. The Scientific Applications

Natural Resource Development

Until the current oil spills are cleaned up and nature can begin the restoration of the normal habitat of the fish and other marine creatures, an effort must be made to re-oxygenate the rapidly depleting inshore waters.

Conventional methods of aeration such as compressed air, oxygen injection, and splash aeration (such as fountains) are inefficient and expensive and are cost prohibitive on the massive scale required for inshore water re-oxygenation.

Current solutions have already been proposed by Tom Kakovitch. A cost-effective device does exist that will oxygenate water in a cost-effective and efficient manner—**The Flo-Vex Direct Emulsification System**. The Flo-Vex was designed and developed as a device (with no moving internal parts) to emulsify any ambient fluid into a fluid which is at a higher pressure. (Flo-Vex is a patented technology and is covered by U.S. and International patents [5,255,519 – 5,444,981 – 5,810,564 – 6,071,083 – 6,358,015B1 – 12,507,838PCT]).

An application area specifically addressed by the Flo-Vex Technology is the high efficiency aeration of water and similar fluids. Aeration is used in many processes including fish farming, sewage treatment, and methane injection. It can also be employed in a Large Scale Dissolved Oxygen Mitigation system.

The Flo-Vex Direct Emulsification System (Flo-Vex DES) uses the fluid to be aerated as the working medium. The Flo-Vex is designed to draw air into and compress it in the working fluid, in this case, water. The result is micro-fine bubbles emulsified in the fluid. The compression of the air greatly increases the transfer of oxygen into the fluid such that near saturation dissolved oxygen (DO) levels can be achieved in a single pass. Since the transfer of oxygen is not depth dependent, the nearly DO saturated water can be injected to any depth. The remaining micro-fine bubbles will ascend and transfer their remaining oxygen into the main body of water.

Referring to the Efficiency Table below, it can be easily seen that the Flo-Vex DES is 15 times more efficient than the Compressed Air Diffusion System and 114 times more efficient than the Surface Agitation Systems.

System	O ² cu.ft./ min.	Power Required HP	Efficiency cu.ft. (O ²)/ HP-min.
Surface Agitation	48.3	97	0.5
Compressed Air Diffusion	203.2	55	3.7
Flo-Vex Direct Emulsification System	343.8	6	57.1

The Solution to Depletion of Dissolved Oxygen

As an interim solution to the inshore dissolved oxygen depletion problem, Kakovitch proposes using a movable high capacity aeration system consisting of eight (80) Flo-Vex Monica series 4 units mounted on a small deck barge 30 feet by 60 feet minimum, serviced by two (2) diesel powered centrifugal pumps. The barge would be maneuvered by a small push boat at roughly 5–7 knots through the inshore areas to be oxygenated.

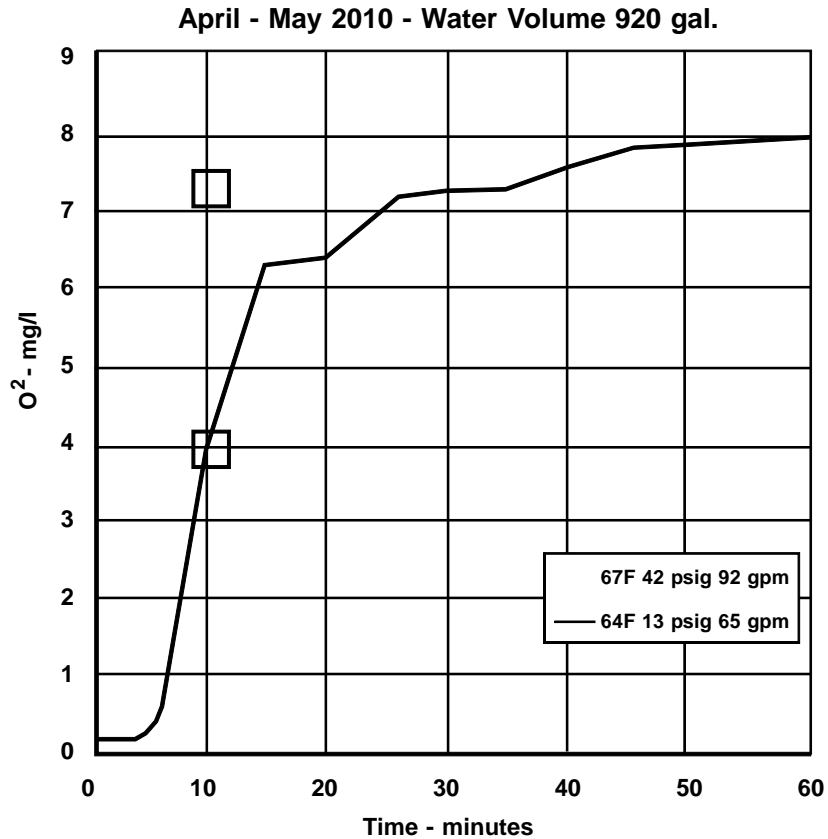


Figure 1. The Effects of the FLO-Vex Test

The Flo-Vex Monica series 4 proved to be a very effective and efficient device for increasing dissolved oxygen in liquid (see Figure 1). The 21 May 2010 test replaced over 90% of the dissolved oxygen of a 900 gallon test tank in 10 minutes with an apparatus flow rate of 92 gpm. It can be inferred from the results that the Flo-Vex, through its micro-fine bubble emulsification aeration, has the ability to increase dissolved oxygen from near zero to over 90% in a single pass. Although future Flo-Vex Monica Series 4 dissolved oxygen tests will be conducted using higher pump discharge pressures to determine the most efficient operating parameters, the Flo-Vex test results indicate a much greater aeration efficiency than other aeration devices available today.