

Enhanced Treatment in Lagoons using ATLAS-IS™

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Environmental Dynamics Inc (EDI) has developed the patented ATLAS-IS™ system, an innovative system to upgrade wastewater treatment lagoons to accomplish complete nitrification in cold climates, and remove nitrogen through denitrification without recycle. The ATLAS-IS system (a) can be installed online; (b) treatment does not need to be interrupted while the system is being installed; and (c) is thus an excellent upgrade option for existing lagoons.

The ATLAS-IS system essentially consists of a series of lagoons or hydraulically separated zones in a lagoon, the first being a high-rate completely mixed (CM) zone, typically operated at 1-4 d hydraulic retention time (HRT) at elevated mixed liquor suspended solids (MLSS) concentrations. Internal separator (IS) modules are placed in this zone to retain biomass. Effluent from the IS modules containing low total suspended solids (TSS) is released to the downstream process. Downstream zones are typically partially mixed (PM) to collect and digest solids that are discharged from the CM zone. The PM zones may be followed by a quiescent zone for final polishing before effluent discharge.

The IS module is a unique concept that achieves retention and recirculation of biomass without the need for return activated sludge (RAS) pumping. There is no requirement to monitor and manage manual wasting of biomass from the CM zone. The only waste activated sludge (WAS) is the biomass leaving the CM zone through the IS module effluent. Thus effluent biomass from the CM zone governs the solids retention time (SRT) maintained in the zone. The WAS is controlled by sizing the IS modules and allows the biomass to reach MLSS equilibrium naturally. When the system works as designed, long SRTs can be maintained, resulting in excellent BOD removal and reliable nitrification.

EDI has demonstrated the effectiveness of the ATLAS-IS system through a demonstration project at Ashland, Missouri. The Ashland municipal wastewater treatment facility was designed to treat 0.29 MGD containing 200 mg/L BOD. The demonstration project was operated from December 2002 through March 2004. The performance of facility was monitored through a sampling program conducted by the University of Missouri in Columbia. The performance of the system during the demonstration phase (December 2002 - March 2004) can be summarized as follows:

- After an extended start-up period, the system produced BOD = 15 mg/L, TSS = 20 mg/L (without the need for tertiary solids control), ammonia-N = 1.5 mg/L and Total-N = 15 mg/L).
- **The system required minimal operator attention for process optimization or maintenance.**
- **The system proved to be a cost-effective option for nitrification in cold climates, well suited for small communities.**
- **The system has demonstrated that it is an effective process to achieve the above targets with minimum capital expense while retaining low operator attention typical of lagoons.**
- **ATLAS-IS™ is thus an ideal upgrade option for lagoons in small communities where operator availability is limited.**

Monitoring Beyond Demonstration Project

The Ashland facility has been monitored periodically for nitrification performance even after completion of the demonstration project, a summary of which is given below.

Date	Inf NH ₃ -N	NH ₃ -N				NO ₃ -N			
		CM	PM1	PM2	Eff	CM	PM1	PM2	Eff
27May04	23.5	2.5	0.5	1.0	1.5	0.0	8.1	5.7	5.3
15Nov04	26.0	0.5	1.0	1.5	2.0	10.3	10.5	8.8	8.0
27Apr05*	19.5	1.8	1.0	2.0	4.0	3.0	7.0	8.8	6.8
3Jan06	19.5	0.4	1.4	NS [#]	0.4	9.3	12.5	NS [#]	12.5

NS[#] - Not Sampled

*Low dissolved oxygen conditions were observed in 2005 due to increased loadings beyond the design capacity of the plant. The blower system was resheaved to address this deficiency. The facility is under design to increase the capacity to 0.49 MGD at this time.