

# Use of Belt Filters for Thickening Waste from Conventional Microscreen Drum Filters

By JAMES M. EBELING AND CARLA WELSH

**A**s environmental regulations become more stringent, environmentally sound waste management and disposal are increasingly more important in all aquaculture operations. Two of the primary concerns are the suspended solids and phosphorus in the discharged effluent. In many recirculation systems, microscreen filters are used to remove and concentrate the suspended solids from the process water, because they require minimal labour and floor space and can treat large flow rates of water with little head loss. Microscreen filters, though, generate a separate solids waste stream that can be further concentrated to reduce the quantity and improve the quality of discharge water. In addition to suspended solids, phosphorus is one of the most scrutinized nutrients discharged by aquaculture systems, due to its potential for eutrophication of receiving waters. While some progress has been made in reducing the phosphorus content of feeds, few attempts have been made to reduce the phosphorus levels in the effluent water from intensive aquaculture systems.



(above) Hydretech Belt Filter System – coagulation/flocculation tank and belt filter. Photos courtesy James Ebeling, The Conservation Fund Freshwater Institute

Over the last decade, the Conservation Fund's Freshwater Institute has researched and demonstrated several technologies and strategies to manage and reduce the wastes generated from intensive recirculating aquaculture systems, including improved feed and feeding strategies, technologies to minimize water use and to concentrate waste streams, and an overall review of waste management and treatment. One such technology currently being evaluated is the Hydretech Belt Filter, designed to thicken sludge from the backwash water of a microscreen filter. When used in conjunction with a coagulation / flocculation and polymer mixing system, significant reduction of suspended solid and soluble



Thickened waste from a conventional microscreen drum filter with coagulation and flocculation aid, alum and polymer.

phosphorus are possible. By eliminating the need for settling tanks or ponds, the leaching of nutrients (phosphorus, nitrogen) is minimized and the dewatered sludge is in a form for easy transport, storage, or disposal.

Testing of the Hydretech coagulation/flocculation system was conducted using the backwash effluent from several aquaculture production systems at the Conservation Fund Freshwater Institute in Shepherdstown, WV. Alum was used as the coagulant because of its availability in dry form, ease of storage, and mixing. A commercially available polymer was

used as the flocculation aid to increase suspended solids removal. The Hydretech coagulation/flocculation system is plumbed into the waste discharge stream of a microscreen filter and used as final treatment of discharge water from several large-scale recirculating aquaculture production systems growing arctic char and trout.

Typically, sludge from the microscreen drum filter has a dry matter content of 600 – 1400 mg/L (0.06 – 0.14%) and a soluble phosphorus concentration of 1.7 mg/L-P. The coagulation/flocculation system consists of three chambers with variable speed driven paddle mixers. As the waste stream enters the first chamber, the coagulation aid alum neutralizes the electric charge on the small particles, and with gentle stirring small clusters of particles are formed. In the second chamber, a polymer is mixed intensively with the waste stream. Finally, under gentle stirring in the third chamber, the polymer acts like millions of short ribbons that bind the small clusters of particles into larger flocs. The inclined belt filter then gently lifts the floc out of the clarified water and deposits it into a receiving chamber.

Initial tests showed a after passing through the Hydretech Belt Filter System, the dry matter content of the sludge was increased to approximately 13%, and both the suspended solids and soluble phosphorus concentration of the effluent was reduced by 96% to less than 30 mg/L TSS and 0.07 mg/L-P respectively. Current research is aimed at determining the optimal dosage of alum, and evaluating other commercially available polymers. The combination of coagulation/flocculation aids and the Hydretech Beltfilter show excellent potential to greatly reduce the volume of solids generated, and significantly reduce the concentration of phosphorus in discharged effluents.

For more information contact James Ebeling by email at: [j.ebeling@freshwaterinstitute.org](mailto:j.ebeling@freshwaterinstitute.org), or by phone at +1 304 876 2815. The Hydretech Belt Filter was supplied by Water Management Technologies, Inc. Baton Rouge, LA. For more information phone +1-225-755-0026, or email: [info@w-m-t.com](mailto:info@w-m-t.com).