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Drum filter efficiency as particle separator in a recirculated system

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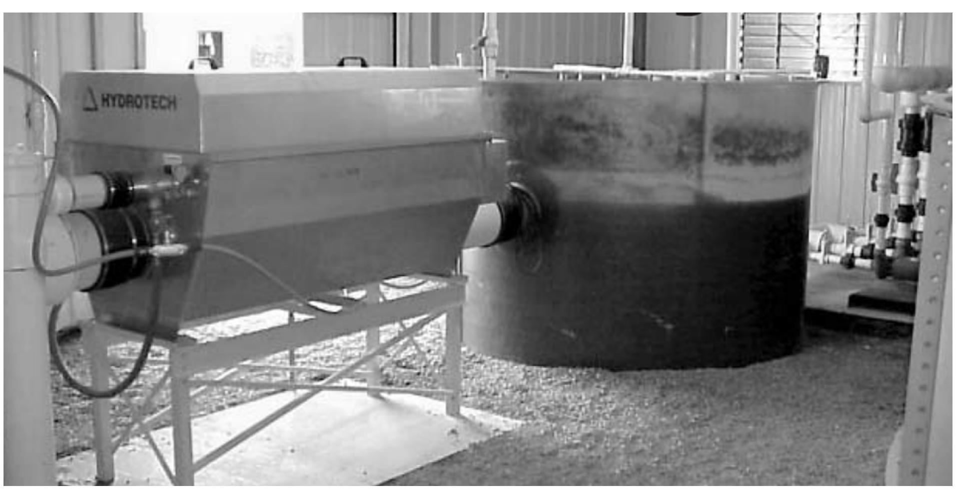
Trials evaluate the effect of different mesh sizes



Drum filter (left) for solids removal from a recirculating system.

Drum filters have been demonstrated to be efficient in several tests, although the effect of using different mesh sizes has not been clearly determined. An extensive investigations was carried out at DIFTA in a recirculated eel farm in Denmark, as part of a ”blue” label project supported by the Commission of the European Union (Fair CT-9158).

Experimental setup

The test system included 18 circular tanks, each 450 liters. The hydraulic load of the drum filter was 27 cubic meters per hectare (Hydrotech model HDF1201-1H), and it was directly connected to the fish tanks and two submerged biofilters combined with one trickling filter. Return flow was through oxygen cones. Three different mesh sizes (30, 60 and 100 microns) were tested for one month each. Filter performance was satisfactory during the entire test period. The drumfilters operated in a discontinous mode, in which drum rotation was actuated by a levelstick indicating headloss over the filter cloth. Filtered water was used to rinse the jet system, spraying the particles down into the sludge trough.

Results

As expected the relative water consumption, as well as the fraction of the recycled water used for spraying, decreased with increasing mesh size, from 200 to 50 liters per kg of feed, and from 0.23 to 0.06 percent of the internal flow (Table 1). Water exchange was satisfactory for a recirculated system.

Mortensen, Relative water consumption for the drumfilte, Table 1

Mesh Size	30 micron	60 micron	100 micron
Liter/kg feed	200	100	50
% of recycled water	0.23	0.11	0.06

Table 1. Relative water consumption for the drumfilter at a feeding level of 10 kg/day with 30, 60 and 100 micron mesh.

Mass balances for suspended solids, COD, nitrogen and phosphorous

Based on measures of internal flow, water consumption of the drum filter and the results of the chemical analyses on samples taken at the end of each test period, the mass balances for suspended solids, COD, nitrogen and phosphorous were determined for the three mesh sizes. Efficiencies were calculated using the energy equation, I = G + R +U + F, where I = feed intake; G = growth; R = respiration; U = Excretion; and F= feces. Efficiency is a measure of how large a fraction of the material in the feed (not used for growth or respiration by the fish) is recovered in the sludge from the drumfilter. Results are shown in Table 2.

All sludge materials were closely examined to evaluate the origin of particles contained. It should be emphasised that efficiency figures include suspended solids in the form of bacteria flocs from the biological filters, hence the values higher than 100 percent. At 30 microns, 25 percent of total suspended solids were accounted for by the bacterial floc fraction. The true efficiency of suspended solids removal can therefore be estimated to be approximately 75 percent.

Mortensen, Removal efficiencies of drumfilter, Table 2

Mesh Size	Suspended Solids	COD	Nitrogen	Phosphorous
30 micron	99%	92%	103%	101%
60 micron	48%	54%	49%	91%
100 micron	21%	20%	24%	47%

Table 2. Removal efficiencies of drumfilter with 3 different mesh sizes.

Conclusion

Aseries of trials were conducted to evaluate the effect of three different mesh sizes (30, 60, or 100 microns) on the efficiency of a drum filter. Water consumption varied between 0.06 percent (100 micron mesh screen) and 0.23 percent (30 micron mesh screen). Removal efficiency for suspended solids, COD, nitrogen, and phosphorus increased with decreasing mesh size. True efficiency of solids removal (excluding bacterial flocs from biofilters) for the 30 micron mesh was estimated to be approximately 75 percent.

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