

Efficiency of Hydrotech microscreens for removal of fish waste from effluent water and in recirculating fish farms

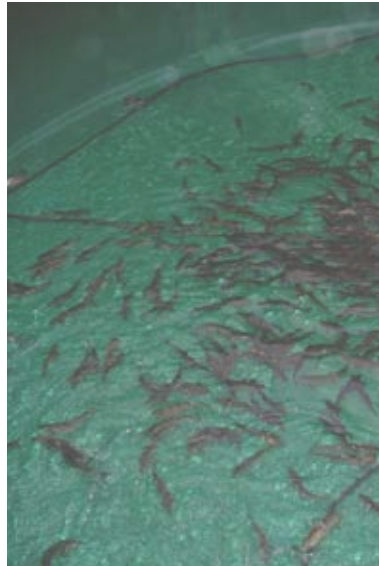


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Microscreens are mechanical filters removing waste in form of particles. In general microscreen technology is the preferred technology to remove waste from water, as it is an efficient, space saving and low cost method.

There are key issues to observe with a view to achieve optimal efficiency of microscreen:

- ▶ Avoid technical installations or processes, which causes strong turbulens.
- ▶ Install microscreen as close as possible to tanks or ponds.
- ▶ Keep an even and high stocking density of fish.
- ▶ Avoid settling zones, where particles can accumulate, without re-entering the water column.
- ▶ Consider feed types and feeding method, even spreading of feed is the best way to avoid waste feed.



Especially in recirculating fish farms, density of waste particles are reported as very low. Microscreens are *independent of density* of waste particles and will filter out any particles bigger than given mesh size.

In order to predict efficiency of Hydrotech microscreens, investigations of the different fractions of pollutants in typical effluents from fish farms, must be performed.

Many old observations on pollution from fish farms, has been based on feed types where waste from feed were more significant.

Specific gravity of feed is varying from more than 1, to floating pellets. Waste in form of faeces are usually close to density of water, varying from 1.19 – 1.005, so they are difficult to capture in sedimentation traps, as settling velocities is from 1 – 2.5 cm/sec.

Recirculating fish farms

In recirculating fish farms there will be particles originating from biofilters, the dead bacterial biomass, can interfere with sampling when test of efficiency is performed. These particles are usually very small. In such cases it is better to evaluate efficiency of microfilters by conducting mass balances.

Below table shows percentage of total waste which typically appear as waste from self-cleaning flow through fish farms.

| Parameter | Particle bound (%) | Max potential removal efficiency (%) |
|------------------|--------------------|--------------------------------------|
| Tot-P | Up to 90 | 84 |
| Tot-N | Up to 32 | 32 |
| BOD ₅ | Up to 90 | 80 |
| Suspended solids | 100 | 91 |

Particles

Today most feed types are high energy extruded feed types. Waste of feed does not contribute to the main part of wasted particles, which mainly comprises of feces from the fish.

After: "Minimierung der ablaufwasserbelastung aus Forellenzuchten" By Alexander Brinker, University of Baden-Württemberg, Germany.

The table below shows the expected efficiency in relation to fish tank construction.

| Parameter | Race-way | Race-way | Race-way | Self cleaning tank | Self cleaning tank | Self cleaning tank |
|------------------|----------------|----------------|----------------|--------------------|--------------------|--------------------|
| | 40 µm | 60 µm | 90 µm | 40 µm | 60 µm | 90 µm |
| | Efficiency (%) | Efficiency (%) | Efficiency (%) | Efficiency (%) | Efficiency (%) | Efficiency (%) |
| Tot-P | 50-75 * | 40-70 * | 35-65 * | 65-84 * | 50-80 * | 45-75 * |
| Tot-N | 20-25 * | 15-25 * | 10-20 * | 25-32 * | 20-27 * | 15-22 * |
| BOD ₅ | 45-75 * | 40-65 * | 30-60 * | 55-80 * | 50-75 * | 35-70 * |
| Suspended solids | 50-80 * | 45-75 * | 35-70 * | 60-91 * | 55-85 * | 50-80 * |

* Efficiency values can only be indicated as intervals, as efficiency depend on inlet concentration to the filter, eg below 2.5 mg/l SS, efficiency is quite low, but at an inlet value of 50 mg/l SS, efficiency can be 91 %. At the same time optimal conditions(see above mentioned key issues)must be considered in order to achieve the best filtration result.

Efficiency of Hydrotech micro screens

As mentioned above, down stream filtration efficiency, is improved if particles are removed fast and with as little turbulence as possible, by the water flow out of the tank.

Sampling procedures

It is important to consider proper sampling procedures, as there are peaks of suspended solids from fish farms during the day eg when fish are feeding or graded.

Composite sampling periods of 2-4 hours will show the daily variations of waste in the outlet.



Size distribution curves

New methods for analyzing of particle sizes in water has been in use on fish farms in order to show:

- ▶ Hydrotech's special cellular structure of filter panels, does not desintegrate particles.
- ▶ Removal of effluent particles can be predicted by analyzing particle sizedistribution curves.

It can be seen that many issues must be considered for optimal sizing of filters.

Hydrotech and our distributors assists fish farmers in order to install the optimal solution for each farm.

Hydrotech AB, January 2008

