

COUGAR COATINGS Estd. 1988 WASTEWATER DIVISION

Supplying unique solutions for the water and waste water industry



BIO-BLOK® INTELLIGENT FIXED FILM BIOLOGICAL FILTER MEDIA

3.1.2. The Modern Fish Farm

1. Make it simple!

EXPO-NET Danmark A/S has supplied filter media for treatment and aeration of water from the aquaculture industry since 1988. Since then, a heavy and positive development of the technology within this industry has taken place. The development has especially concentrated on the filter media, aeration and filtration of the water, these are all very important parameters for the water in all fish farms.

Unfortunately, the development has resulted in the fact that establishment and operation of these aquaculture plants have become more and more complicated. Demands on the fish farmer and his staff increase proportionally and the part of manual work in connection with fish production decreases as the work with maintenance of the technical systems takes more and more time.

We can here mention some points that everybody that are involved in the fish farming industry knows all too well:

Cleaning and maintaining of filter media, air diffusers, blowers, micro screens and other mechanical devices. Common to them all is that these installations have movable parts that at some point break and have to be replaced.

For the daily "cocktail", power and maybe also pure oxygen are being used, and this will unfortunately always influence the working budget in a negative way.

Together with Danish fish farmers and advisers, EXPO-NET Danmark A/S has tried to make these things simpler and thus cheaper to run and establish. The system can be used for all fish species and it is suitable for new as well as existing fish farms that receive water through groundwater, rivers or seas.

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The system consists of the following:

- Pumping station with return that backpumps the requested volume of water.
- Aeration unit that aerates and degasses the recirculated volume of water.
- Biological lamella separation that treats the water mechanically from sludge and suspended solids and it also treats the water biologically from BOD, N and P.

Please see principle drawing "Schematic Recirculation System".

2. The pumping station

The pumping station is the only movable unit in the system. With a view to power consumption, a type that is easy to operate and not energy demanding should be chosen. The head depends on the surroundings of the individual fish farm and the size of the aeration unit.

3. The aeration unit

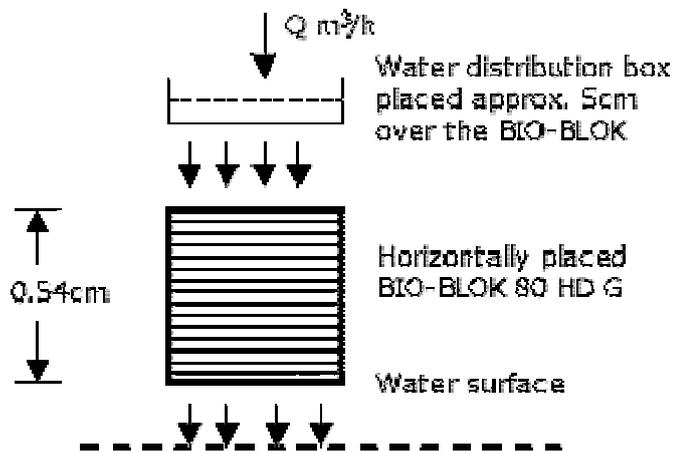
The purpose of the aeration unit is to aerate and degas the recirculated water as much as possible. In Denmark an aeration unit is always constructed as a "tower aerator". In the tower aerator the air can be pulled through horizontally placed net tubes (BIO-BLOK® 80 HD G). Then the air gets in contact with millions of drops of water which secures an effective aeration and degassing of the water.

The conditions to achieve a good result by using BIO-BLOK® 80 HD G are simple because the best result is achieved by a good distribution of the water through the BIO-BLOK® products. In that way the water is "broken" in the best possible way and you get the biggest possible contact to the oxygen in the air, at the same time gasses in the water - if any - can be aired effectively.

The water is distributed over the BIO-BLOK® products by means of a perforate box of stainless steel, plastic or the like. Depending on the volume of water, the holes should have a diameter of 4mm-8mm and with a distance of approx. 5cm between the holes. The box should be constructed in such a way that it is possible to clean the holes as they in the course of time might clog.

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Principle drawing of aeration and degassing of fishfarm water

Experience from Danish fish farms shows that an effective degassing improves the effect of oxygen supply and by using a tower aerator it is possible to attain an almost 100% oxydation saturation in the water by means of aeration through BIO-BLOK® and common air.

In Denmark the tower aerator can by an oxydation saturation of the inlet water of 50% transfer approx. 1.05 kg oxygen to the water corresponding to a kg price of approx. DKK 0.30 per kg oxygen.

Dimensioning of an aeration unit depends on many facts. The most important are as follows:

- * The content of oxygen in the inlet water
- * The distribution of the water over the BIO-BLOK® products
- * The temperature of water
- * The drop through the filter

Depending on above facts, it is possible to achieve oxydation saturation in the water of approx. 90-95% with a filter height of minimum 54cm.

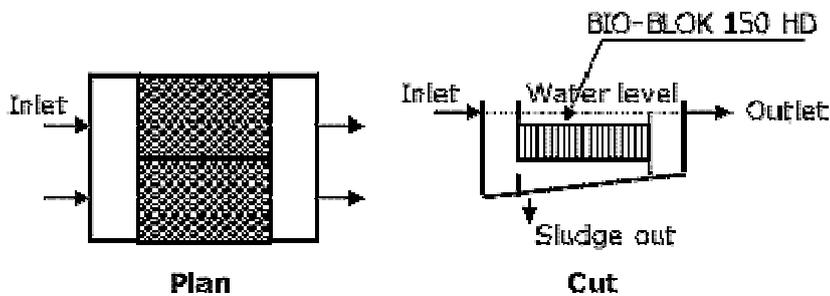
4. Biological lamella separation

By biological lamella separation an effective sedimentation of faeces, an effective filtration of suspended solids, and an effective biological treatment of the water are achieved. All this takes place in the same unit. There are no air diffusers, no air blowers, and no filter media that have to be stirred or replaced.

Biologically lamella separation is normally constructed as shown in the given principle drawing.

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Principle drawing

The principle in biological lamella separation is that the flocs that are being carried by the water through the biological filter (BIO-BLOK® 150 HD) will be attracted to the active biological biofilm that grows on the filter medium BIO-BLOK®. In that way a natural filtration of the water takes place, and at the same time, a thick layer of biofilm will come into existence on the filter medium (sludge).

The plant can be constructed in existing round and square sedimentation tanks.

A new plant is always constructed as minimum two identical chambers connected in parallel as shown on the principle drawing.

Emptying of the plant is done by stopping the supply of water to one of these chambers and lowering the water level so that the BIO-BLOK® products are free of water. Thereafter it is possible to wash down the sludge of the filter, and then the sludge is pumped to further treatment. The emptying frequency is as required.

The process can naturally be automate if this is required.

The effectiveness naturally depends on the speed of water in the filter. The correct hydraulic surface load can be decided by testing the water in question and the actual volume of sludge that is to be separated from the water.

Biological lamella separation can be used instead of expensive microfilters, sand filters and/or expensive extensions of sedimentation tanks. Therefore, a lot of money can be saved by using this system because the establishment costs are low and the system does not need supply of power.

5. The biological treatment

As mentioned, the biological treatment of the water is carried out in the same bioreactor as the biological lamella separation.

The filter medium BIO-BLOK® 150 HD is made from polyethylene and is constructed as a square block consisting of net tubes that are welded together. The special surface of the many net tubes provides a big biological accessible surface area, and at the same time, it improves the biological growth on the filter.

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This filter medium is called BIO-BLOK® and the surface of the filter works as a "house" for the bacteria that are able to treat the different types of wastewater that exist.

The mode of operation is very simple as the treatment capacity depends on the quantity of bacteria that is room for on the filter, i.e. the bigger a surface and thus more bacteria, the bigger a treatment capacity.

Therefore, the future construction of wastewater treatment plants is only a matter of creating good conditions for the bacteria, meaning that the bacteria have to live well in order to work well.

The described method is very simple in its construction and therefore cheap to install. The field of application is all aquaculture plants where demands are made with regard to biological treatment and suspended solids in the outlet water.

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