

## Eflo SNAF Submerged Non-Aerated Filter

# Biological Nutrient Removal from TSE

### General Description

The **EfloSNAF** is a Fixed Bed Bio Reactor using "Attached Growth" to biologically remove nutrients from TSE before discharge to the sea, waterways and ground water reservoirs.

Nitrate as nitrogen is typically in the region of 20 mg/l in well treated TSE but this concentration is still high and can lead to algae growth when discharged the sea, especially creeks, which then cause disruption to intakes of desalination plants. In landscape features such as lakes & rivers, the algae is aesthetically bad. In both the sea and lakes, the algae rapidly consume the available oxygen leading to fish deaths.

Long term recharge of ground water aquifers requires nitrate removal to prevent a steady build up of nitrates, particularly if the ground water is considered as a future source of potable water.

The **EfloSNAF** is a development of the successful EfloSAF submerged aerated filter used extensively for aerobic biological treatment of sewage and industrial waster waters. The EfloSAF uses a series of air diffusers to deliver the necessary oxygen to the biomass as well as provide the unique flow patterns within the media, ensuring high rates of biological oxidation with relatively low retention times and energy consumption.

At the 'heart' of the **EfloSNAF** process is a similar structured to that found in the EfloSAF but instead of using air diffusion for the flow patterns in the media, hydraulic flow circulation is generated to ensure complete mixing and a very high concentration of attached, nutrient reducing biomass is maintained in the Biozone.

For the removal of nutrients in TSE, it is necessary to provide both an aerated oxidation step followed by a non-aerated reduction step. In this way, any ammonia in the TSE is oxidised to nitrate and the nitrate is reduced to nitrogen gas for release to the atmosphere.



[-----Nitrification Step-----] [-----Denitrification Step-----]

The two steps of Nitrification and Denitrification are performed in separate process stages. They are both biological steps. The **EfloSNAF** denitrification step requires dosing with a carbon source such as methanol or molasses

Nitrates in ground water, rivers & lakes and the sea are an increasing problem worldwide and are a result of agricultural and sewage discharges. Even arid regions such as the Middle East are suffering with increasingly high nitrate levels in ground water sources. The **EfloSNAF** will remediate these problems.

### Eflo - About Us

**Eflo International Ltd, UK.**  
OEM technologies for advanced wastewater treatment systems and water re-use.

**Eflo** has designed & installed treatment plants in Europe, the Middle East, Africa, Caribbean the Indian Ocean islands over a period of more than 40 years.

As well as the **EfloSNAF** Non-Aerated Filter, **Eflo** offers a range of other innovative waste water treatment products and water recycling systems, including industrial waste water processes.

**Eflo** is part of the Concorde Corodex Group of companies and through this group can offer bespoke, potable, water treatment plants including River Water Treatment and Seawater Reverse Osmosis. Water treatment plants for small communities to cities.



**EfloSNAF** 1500 m3/day to reduce nitrate as nitrogen in TSE from 25 mg/l to < 5 mg/l before re-use as lake and river make-up water, Al Barari, Dubai,

#### EFLO Products :

- EfloCT** Extended Aeration
- EfloSAF** Submerged Aerated Filter
- EfloSBR** Sequential Batch Reactor Filandraw
- EfloMBR** Membrane Bio-Reactor
- EfloDAF** Dissolved Air Floatation
- EfloSEP** Oil Water Separator
- EfloGREY** Grey Water Re cycling

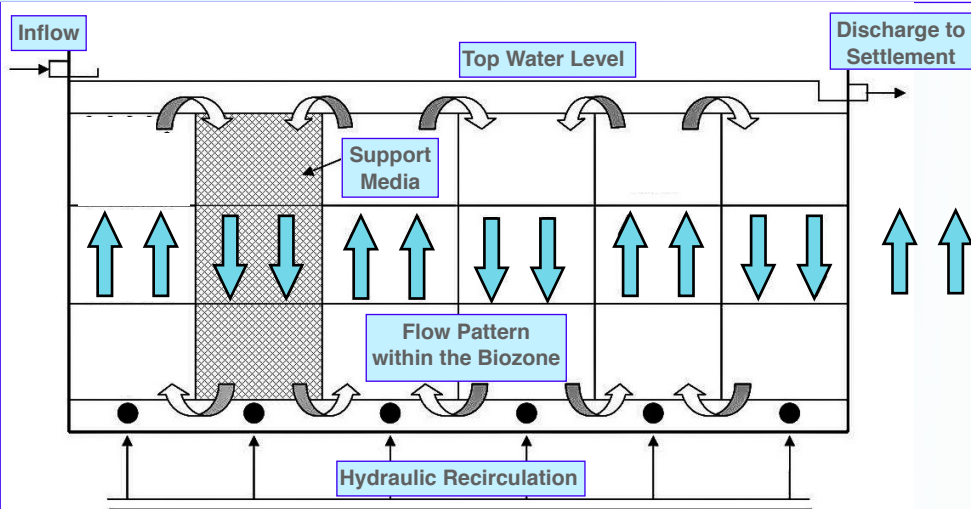
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### EfloSNAF Flow Pattern in the Biozone

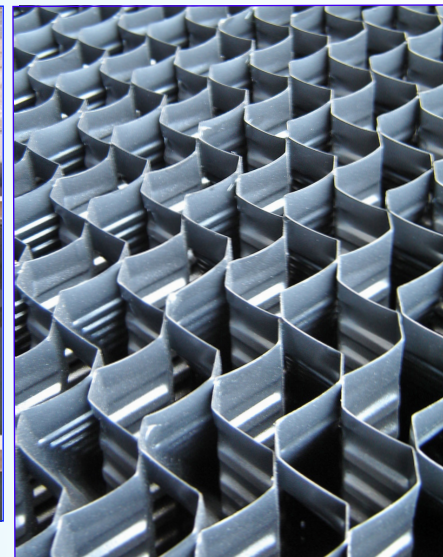
The flow can be considered, fully mixed due to the hydraulic recirculation driven through submerged sparge pipes under the biomass support media. The water fully circulates within the entire biomass support media giving maximum contact both physical and in time between the water and the biomass.

The support media is in effect a multitude of “zig zagging” tubes. With the specific spacing of the hydraulic sparge pipes below the media, the hydraulic effect lifts the flow in alternate sections of the media. In the other sections, the flow falls by gravity.

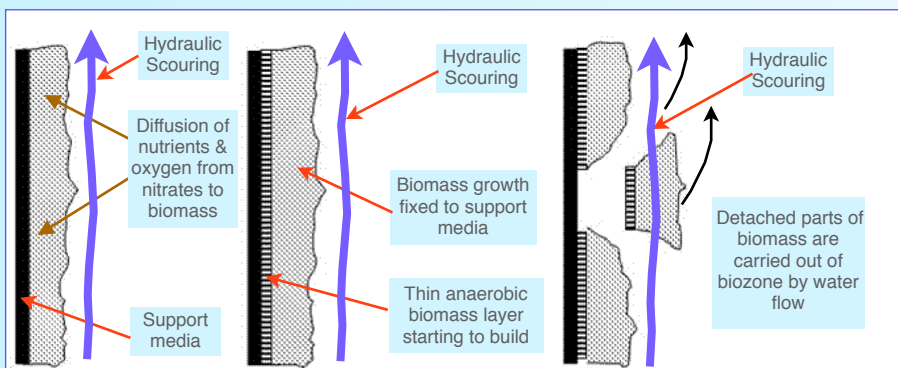
The nitrogen reducing bacteria readily adhere to the support media. They are however, fairly delicate and so a gentle environment is provided within the biozone for the bacteria to thrive. Eventually, when they reach a prescribed thickness, they “slough” away from the support media and are carried out with the hydraulic flow to be captured in the downstream settlement tank.



Tertiary Treatment Multi Media Filters above and Settlement Tank right



Eflo manufactured **EfloSNAF** Biomass Support Media 240 m<sup>2</sup> per m<sup>3</sup> and greater



### EfloSNAF Biomass “Sloughing” Process.

The sloughed biomass is captured in the settlement tank, from where it is sent to a waste sludge tank & further treatment.

There is no return sludge pumping in the **EfloSNAF**.

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