

# WASTEWATER TREATMENT



**Biostyr<sup>®</sup>**

*Biological aerated filter for wastewater*



JOHN MEUNIER / **USFilter**

# BIOSTYR® (RESIDUAL WATERS)

## APPLICATIONS



BIOSTYR® is a simple and innovative process, which carries out effective biological treatment of residual water at minimum operating cost.

With more than ten years experience in the field of submerged biofilters, OTV has installed approximately one hundred reference plants (in France, Europe, North America and Japan), one of these being the BIOSTYR®. This process was originally developed for nitrogen elimination in secondary and tertiary treatment and is capable of attaining the highest discharge quality standards.

Highly compact, BIOSTYR® combines (in a single structure), the biological reactor that degrades pollution and the phase separation that removes the matter transformed by purification.

## BASIC PRINCIPLES



The BIOSTYR® process consists of upflow filtration through a submerged and floating fine granular media called BIOSTYRENE.

Air is injected either to the base of the bed or into the media itself. In the latter case, the filter can simultaneously nitrify and denitrify. It is capable of eliminating all biodegradable pollutants: carbon pollution (COD and BOD), suspended solids (SS), ammonia (N-NH<sub>4</sub>) and nitrates (N-NO<sub>3</sub>).

The bacteria present in the effluent to be treated attach themselves to the BIOSTYRENE that simultaneously acts as a filter. The pollution is broken down into cellular material, which is retained in the filtering bed by physical retention.

In contrast with other upflow filters (where the media is denser than water) the head loss in the filter ensures that the effluent to be treated is equally distributed without the need for nozzles (which are likely to become clogged) or distribution pipework, and without the need to sieve the effluent before treatment.

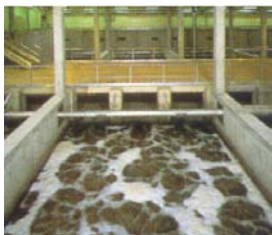
Filtration takes place in a direction that compacts the media rather than expanding it, thus enhancing the capture of the suspended material.

Periodic counter-current washing eliminates excess biomass and suspended solids filtered, without passing it through the whole bed. Downward flushing evacuates residues by the shortest route out of the bed, and the direction that the particles fall.

The BIOSTYRENE media is retained by the cell roof, which is fitted with nozzles (removable from the top face) that are only in contact with purified water and easy to access.

These characteristics are essential to achieving a reliable process protected from any risk of excessive clogging.

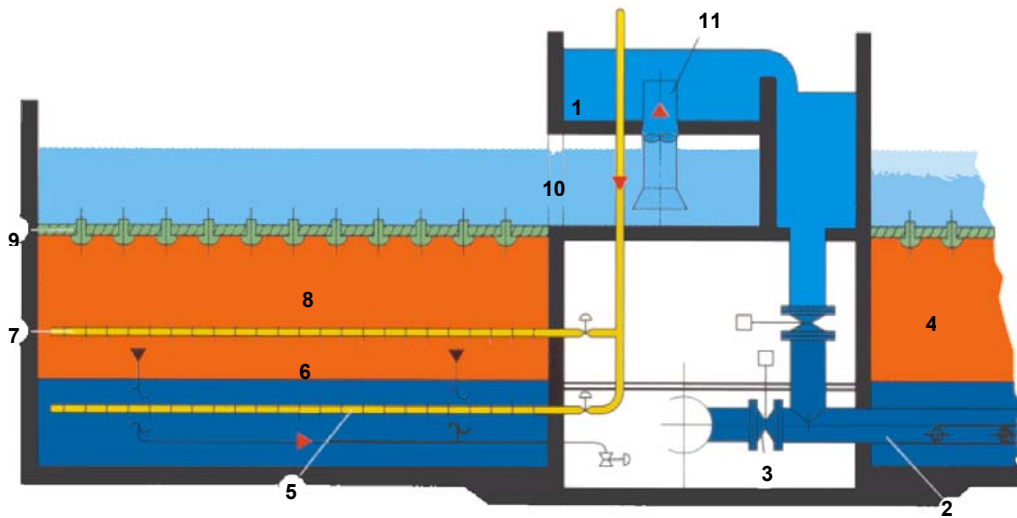
## PERFORMANCE



Biostyrene media is of small size and uniform shape, thus ensuring a high specific surface area, lending itself to:

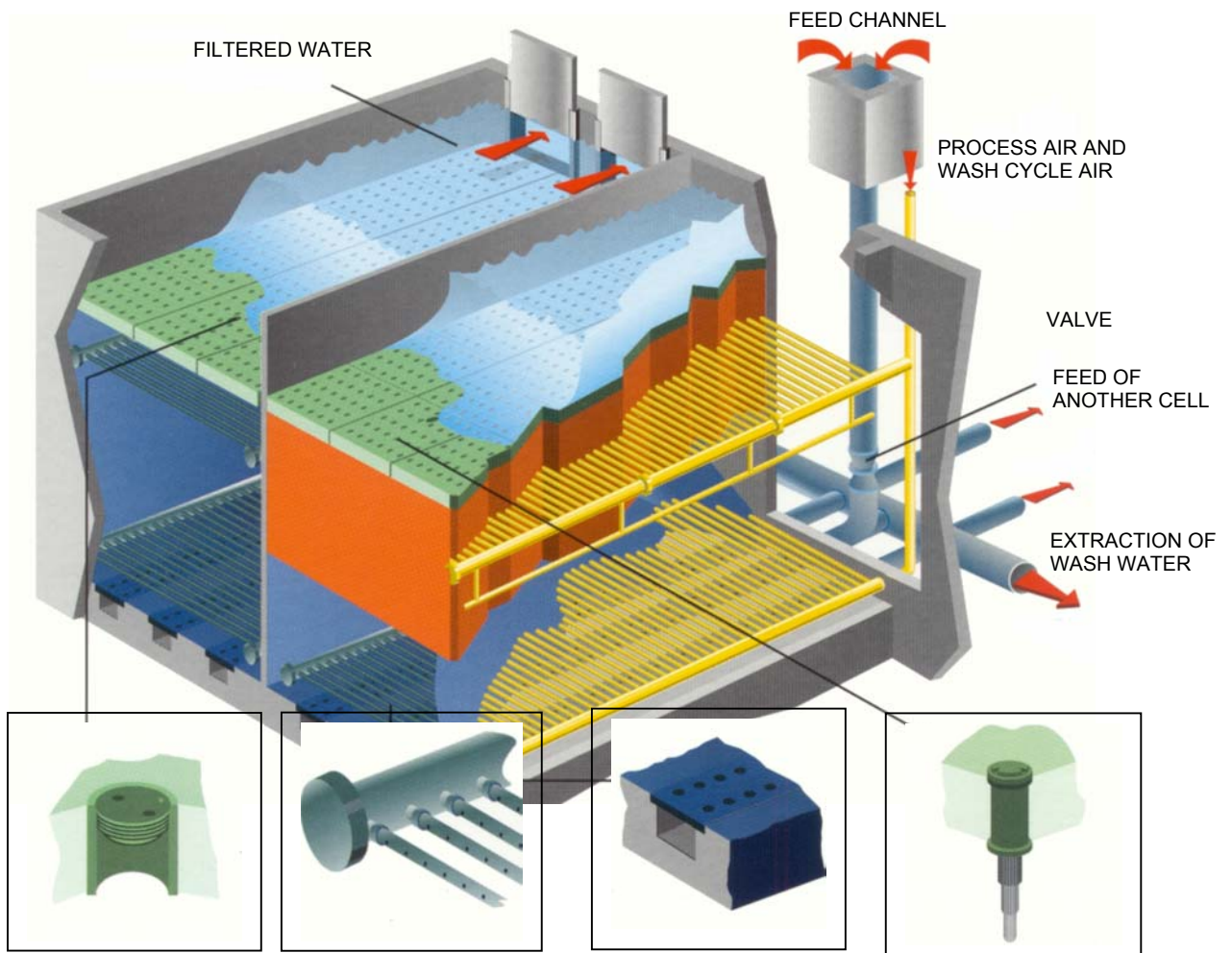
- achieve large purification capacities: a nitrogen load of 1kg N-NH<sub>4</sub>/m<sup>3</sup>/d can be eliminated simultaneously with a maximum reduction in COD
- achieve high velocities within the media of up to 10m/h in tertiary treatment through the co-current flow of air and water.

## OPERATION DIAGRAM



1. Feed channel
2. Filter feed and sludge extraction
3. Wash cycle valve
4. Filter media
5. Wash cycle air ramp
6. Non aerated zone
7. Process air ramp
8. Aerated filter zone
9. Perforated cell roof slab
10. Storage/evacuation of treated water
11. Recirculation pump

## ISOMETRIC SECTION OF A BIOSTYR® CELL



## ADVANTAGES

As the effluent flow is upwards and the material floats, the advantages of downflow filters and upflow filters combine giving the following advantages:

- Separate washwater and washing pumps are not required, as the head of effluent above the filter is sufficient to wash the filter.
- Access to the nozzles is very easy, with no requirement to empty the media,
- The aeration grit may be positioned in the centre of the bed, which gives a non-aerated zone in the lower part and an aerated zone in the upper part of the bed. Thus nitrification-denitrification is achieved in the same cell.
- Odour and aerosol emissions are minimised as follows:
  - the surrounding air is only in contact with oxygen saturated treated water; stripping of volatiles in the effluent is avoided,
  - the dirty washwater remains in a closed space without exposure to the atmosphere.

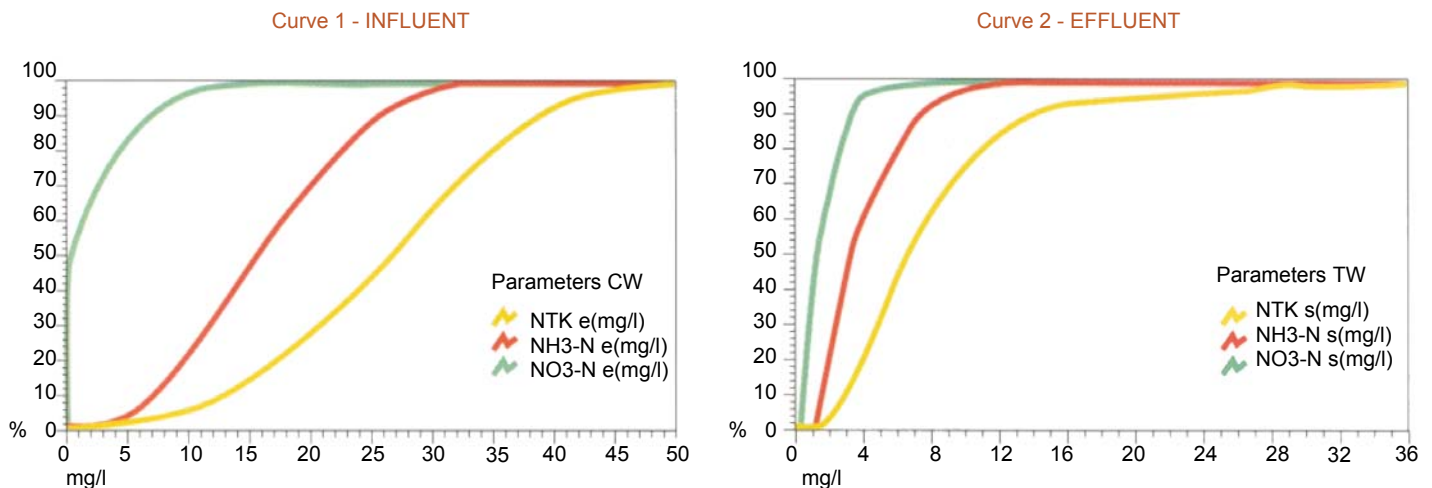
With BIOSTYRENE:

- washing is facilitated because of its light synthetic structure
- its size and density can be adapted to suit the effluent to be treated

The fact that the BIOSTYR<sup>®</sup> process combines a reactor with a filter, no further clarification is needed, thus providing an advanced purification in extremely compact units:

- a residence time of 1 to 2 hours in secondary purification is sufficient to produce an effluent quality, which complies with the strictest effluent consent standards.

### BIOSTYR<sup>®</sup> output quality in secondary treatment



*Concentration of pollution in clarified water (CW) and in treated water (TW)*

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