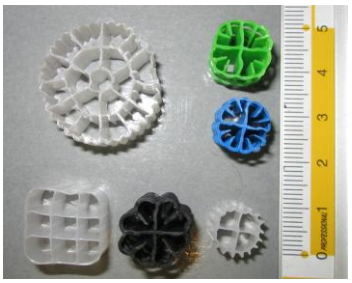
SHEET

TECHNOLOGY:**MBBR** (Moving Bed Bio Reactor)

Attached growth biomass over moving bed

MBBR (Moving Bed Bio Reactor) is among the latest and most enhanced variant of attached growth biomass waste water treatment application: in these kind of plants the biomass who perform degradation of pollutants load is not floating in the liquid mass, as it happens in conventional biologic active sludge plants, but it lives and grows attached to special plastic supports (media carriers) freely floating in the tank.

Media carriers (pictures 1-2) may have different shapes and sizes depending on the application, but are usually cylindrical shake, 1 – 3 cm diameter, whit little internal radial partitions aimed to increase the specific surface area, because it is over the surface that the biomass - who perform depuration – grows: the greater the area, the greater the biomass concentration in the reactor, the effective the treatment.

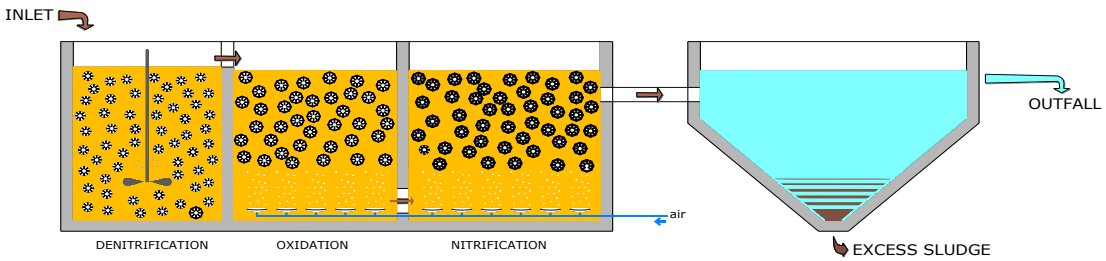


Picture 1 – Type of supports

Picture 2 – "Colonized" supports

Media carriers are made of polyethylene with specific weight of about 0.95 Kg/dm^3, and total area between 500 and 1000 m^2/m^3 depending on the model: the tank, or reactor, can be filled with medias in a filling rate among 30% to 60%, depending on the biomass concentration to be kept inside. Broadly: the higher the filling rate, the smaller the required volume for the reactor.

Typical layout of an MBBR treatment plant is showed in picture 3: note that nutrients removal stages (oxidation and nitrification) and nitrate removal stage (denitrification), are carried out in separated and different reactors: this peculiarity, together with absence of sludge recirculation from final settler, lead to high bacteria specialization in each reactor, that entails removal rates closed to maximal ones, because each biological species grows and lives in its own optimal environment.



Picture 3 – Typical layout o fan MBBR plant

In aerobic reactor, such as oxidation and nitrification, oxygenation and liquor stirring are carried out with air feeding by means of external blowers coupled with a special submersed air distribution network, while in anoxic stages (denitrification) it is adequate to keep liquors and media carriers constantly mixed by means of a simple external low speed stirrer. Media carriers are held inside their own tanks with special self cleaning grids.

Exceeding biomass grown over media carriers, that is the excess sludge naturally, detachs from carriers and, together with the flow, goes to settle into the final settler, from where it is regularly taken out (by means of pumps, air lift or gravity) and sent to the thickener, ready for disposal: thus, there is neither sludge recirculation or needing to continuously adjust recirculation and excess sludge flows. This results in an easier plant's operating.

Faster reaction kinetics in each treatment stage, together with the higher biomass concentration that can be held into reactors, allows to reach the same performances with up to 70% smaller volumes over conventional active sludge treatment plants.

Picture 4 - Upgrading of existing primary **150 P.E.** treatment into a biologic MBBR **350 P.E.**

Picture 5 – Upgrading of existing primary **50 P.E.** treatment into a biologic MBBR **400 A.E.**

STRENGHTNESSES OVER CONVENTIONAL TREATMENT PLANTS :

- Over 70% reduction of volumes required for reactors, because of the faster reaction kinetics
- Easy to operate (no specific biological process settings are required)
- No sludge recirculation is required
- Hydraulic overloads (rainy waters, sewage diluition..) doesn't cause biomass loss with discharge flow, typical event that often affect conventional plants that is, because biomass is not floating alone but it is attached to medias
- Very suitable for upgrading of already existing treatment plants (picture 5) and for prefabricated/containerized/mobile treatment plants (picture 7)

MBBR's find their best applications where is necessary to contain plant's dimensions because of the little space available or, by the other side, where a capacity enhancement must take place re-using already existing tanks; or, if high treatments rates has to be guaranteed in spite of severe operating conditions, such as:

- Variability/periodicity of incoming load, both organic and hydraulic
- Diluition of the sewage with ground water
- Forced discontinuity of ordinary work-services
- Lacks of skilled manpower for plant's managing and maintenance

Picture 6 – **3000 A.E.** MBBR municipal plant

MBBR technology, because of lower reactor's volumes and operational simplicity, is very suitable for design and construction of compact mobile containerized treatment plants (picture 7).

Picture 7 – **2000 A.E.** MBBR containerized plant

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