

Fixed-bed technology

The sewage treatment plant basically consists of various treatment steps that are housed in different tanks or chambers of a tank.

The biology of a sewage treatment plant works on the principle of a submerged fixed bed.

Operators cannot be expected to optimise the treatment plant themselves with sludge (dry matter content) or similar measurements, since wastewater has a different dilution factor at different times. The plant should be able to regulate itself to a large extent, or it should be possible to regulate it with simple control steps. This is only possible with fixed growth media (fixed beds) since here the state or the quantity of the submerged sludge is of lesser importance. A sewage treatment plant working on the principle of a submerged fixed bed was therefore chosen:

In order to avoid having to adopt over-dimensioned biology, steady filling (buffering) is performed to achieve a balance over a period of 24 hours especially for treatment plants that fill intermittently.

Wastewater from kitchens in catering businesses is collected separately and led through a fat separator or other technically suitable equipment (flotation).

The wastewater reaches the first tank (chamber) of the treatment plant via the inlet sewer.

This contains the first real section of the prechamber. The second tank that follows contains the rest of the prechamber and the required buffering, which absorbs hydraulic fluctuations. The prechamber and buffer can be arranged one over the other or one after the other. The sludge storage can be installed separately or integrated with the prechamber.

A filling pump (pneumatic or electrical) feeds the biological stage evenly (over a period of 24 hours).

This ensures that in the event of subsequent load fluctuations the most favourable operating mode can always be set.

Gravity pipes are used to fill standard treatment plants, and there is no buffer pump.

A biological layer (micro-organic colonisation) forms on the fixed-bed material after the start-up period. This transforms the organic contaminants contained in the wastewater into sedimentary and mineral substances. This is mainly the work of aerobic organisms.

The aeration system installed underneath the fixed-bed material supplies the organisms with sufficient air. In addition, the rising air causes a current that, owing to the geometry of the fixed-bed material used, results in the contents of the tank being completely (horizontally and vertically) mixed (characteristic of an intermixed cylinder).

From the fixed-bed reactor, the wastewater flows through gravity pipes to the secondary treatment tank, where secondary sludge and supernatant water are separated.

The sludge return pipe can, as an option, be used for denitrification.

The sludge that has built up can settle in the secondary treatment tank and is transported back to the sludge storage tank or prechamber using a submersible pump or an air-lift pump (secondary pump).

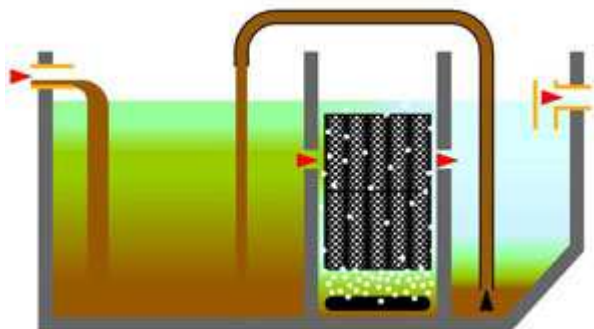
The fixed-bed substrate is made up of UV-stabilised polyethylene which is non-porous, squeeze-resistant and will not biodegrade in the foreseeable future. It has a specific surface (depending on the type of treatment plant) of 100-200 m²/ m³.

It has no toxic or recognisable chemical or physical effects on the process of biodegradation. The fixed bed consists of stable individual tubelike elements that are arranged vertically and which are sideways permeable (tube network) and that are welded to one another at the head ends to form rectangular blocks. The meshed structure also allows the material to be intermixed horizontally.

The low installation height means that the arrangement of tubes in a block must ensure that the fixed-bed material can flow in all three directions.

Sufficient stability and rigidity against static and dynamic stresses are assured for the entire fixed bed. Individual blocks are fixed in the tank by supporting, spacing and holding structures.

Schematic diagram (continuous)



Fixed-bed installation

