

MECHANICAL WASTEWATER PRE-TREATMENT FOR MEMBRANE BIOREACTORS

CASE STUDY



When membrane technology solutions appeared on the market for the treatment of municipal wastewater, the requirements on mechanical wastewater treatment systems changed fundamentally. Conventional screens with their bar spacings or perforations of 6 to 10 mm were no longer sufficient for the membrane bioreactors used today. The efficiency of one-dimensional screens such as wedge wire screens, especially the removal of hairs and fibres, turned out to be insufficient to guarantee the safe operation of membrane plants.

It became necessary to develop a new type of two-dimensional mesh or perforated plate screen to improve the retention of fibres and hairs. As the apertures of the screen's mesh or perforated plate are defined in two dimensions, the screen is able to ensure the maximum retention of hairs and fibres.

On the basis of the worldwide known and well-proven system of HUBER ROTAMAT® fine screens with screening bars we developed the ultra-fine ROTAMAT® Membrane Screen RoMem with mesh and ROTAMAT® Perforated Plate Screen RPPS with perforated plate. These screens rely on the unique system of HUBER ROTAMAT® machines which combines screening, washing, transport, compaction and dewatering in a single unit.

Screens with apertures ≤ 1.0 mm are primarily equipped with a mesh as this offers a very large free surface.

Perforated plate is used for most screens with apertures ≥ 2 mm. HUBER ROTAMAT® Membrane Screens RoMem and RoMem liquid are equipped with mesh sizes from 0.5 to 1.0 mm, HUBER ROTAMAT® Perforated Plate Screens RPPS with perforations from 2 to 6 mm.

The coarse screen is a 5 mm STEP SCREEN®, the fine screen is equipped with a 1.0 mm mesh. The screenings from the fine screen are dewatered and discharged into a container. The selection of the mesh size or perforation depends on to what extent hairs and fibres must be removed to meet the specific requirements of the type of membrane system used (whether hollow fibre modules fixed on one or both sides, or plate modules).

Experience has shown that especially hollow fibre modules need a high removal of hairs and fibres to maintain reliable operation. Fine ROTAMAT® Membrane Screens with 1.0 mm mesh are therefore primarily used to protect hollow fibre membrane modules.

As plate modules are less sensitive to blocking due to their plane surfaces, pre-screening with a ROTAMAT® Perforated Plate Screen RPPS with 3.0 mm perforation is sufficient in most cases.

Two-dimensional mesh or perforated plate screens achieve a high removal of hairs and fibres, i.e. two to four times the amount of solids are removed than one-dimensional screens are able to separate.

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The significantly increased separation efficiency is accompanied by a high level of screen surface blinding and requires larger dimensioning of the fine screens compared to other commonly known screens. The channel system should be operated in a way to ensure that washing and load peaks are avoided as far as possible.

The screenings separated by the fine screen can either be dewatered and discharged into a container or passed on to the sludge treatment system. As fine screenings contain much more sludge and fine particles (silt) compared to coarse screenings, fine screens must be designed to meet the increased requirements of wear resistance and screenings dewatering. If the screenings separated by fine screens are not directly dewatered but passed on to the sludge treatment system, the fine screen can be designed to provide for the possibility to pump the screenings into the sludge storage tank.

Fine screenings in the sludge treatment system enhance the dewatering process due to the structural material contained within fine screenings.

Improved dewatering results are achieved with even a lower specific polymer consumption compared to dewatering without fine screenings.

Without any exaggeration, we can say that HUBER is a leading supplier in the field of pre-screening for membrane plants. Since 2004, we have installed more than 160 fine screens upstream of membrane plants, almost 50% of them with a screen basket diameter bigger than two metres! The extensive experience gathered from real size installations is reflected in the continuous development and optimisation of our fine screens.

