

Vacuum Rotation Membrane VRM® for Membrane Bioreactors



Rotating membrane plates for superior performance:

- energy-efficient scouring system
- low operation and maintenance costs
- proven performance, in over 30 installations
- made of stainless steel, pickled in acid bath
- long membrane life

►► The challenge

Technical progress in the field of municipal wastewater treatment, including nutrient removal, has significantly improved the performance of sewage treatment plants.

However, there remain challenges: most effluents of wastewater treatment plants contain suspended solids, usually in the form of small biological flocs, which include some BOD, COD and nutrients. Such suspended solids can further be removed by sand or cloth filtration, but this requires an additional and expensive treatment stage. Pathogens in effluents require their inactivation by chlorination or UV-radiation, which adds investment and operating costs.

Many wastewater treatment plants are built on confined space: addition of further treatment stages is thus often difficult or even impossible.

Increasing fresh water shortage, particularly in arid regions, requires reuse of treated wastewater.

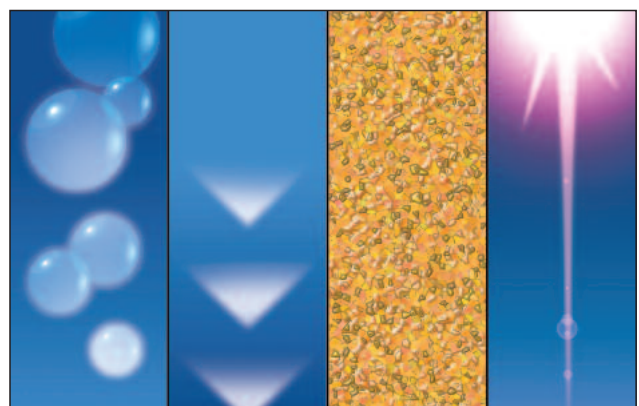
►► The solution

HUBER VRM® membranes are of the ultrafiltration type and submerged in a tank. The resulting high effluent quality meets the most stringent regulations while allowing for the capacity to meet the increasing and higher disposal legislation anticipated in the future, with optimized investment and operating costs.

The HUBER VRM® system is a combination of biological wastewater treatment and high-efficient solids/liquid separation. The pre-screened wastewater is aerated, clarified biologically and all solids within the flow (particles, bacteria, viruses) removed by the ultrafiltration membrane in accordance with the low-pressure principle.

By increasing the concentration of the active biomass to 8,000 – 16,000 mg/L we can improve the efficiency of a conventional wastewater treatment plant without the need to increase tank volumes.

Secondary clarification tanks, sand filters or a disinfection plant for advanced wastewater treatment are not necessary, with the improvement in the effluent quality produced. Alternatively, existing secondary clarification tanks can be used to allow for process optimization.



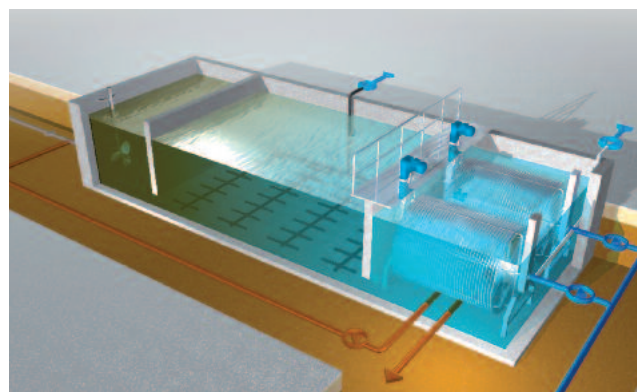
aeration tank

secondary clarifier

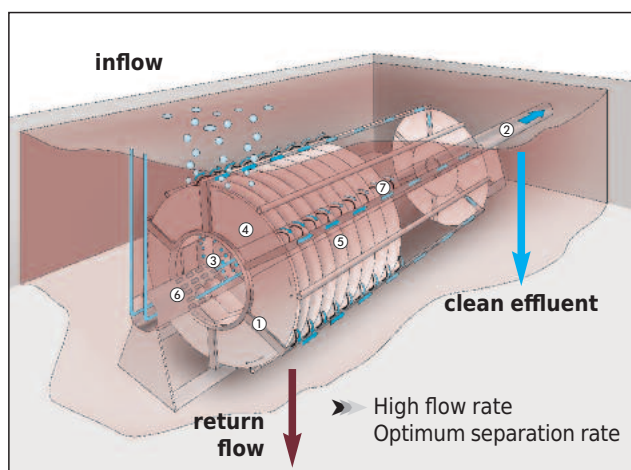
sand filter

UV treatment

REPLACED by
HUBER VRM® Membrane Bioreactor



➤➤ Schematic diagram HUBER VRM®



- ① aeration tank or filtration chamber
- ② permeate discharge
- ③ scouring air inlet
- ④ membrane module
- ⑤ membrane segment
- ⑥ rotating hollow shaft
- ⑦ permeate collecting pipe

➤➤ Functional description

The complete VRM® unit is integrated in a stainless steel support frame and immersed in the aeration tank ① or in a separate membrane filtration chamber. The system consists of a rotating hollow shaft ⑥ around which 6 (VRM® 20) or 8 (VRM® 30) flat sheet modules are installed with a pre-defined distance between the modules.

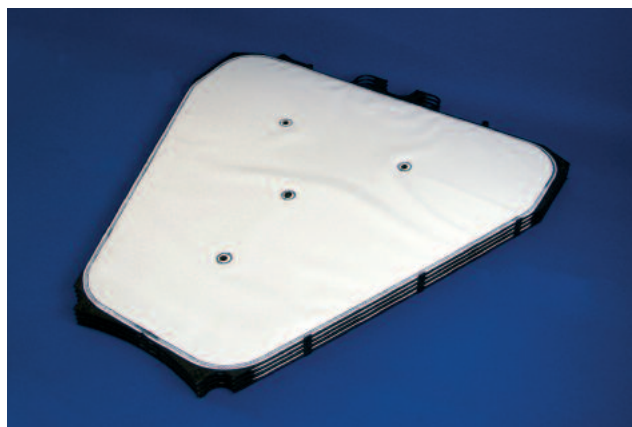
The biologically clarified wastewater is drawn through the membranes by the transmembrane pressure difference prior to being discharged ② via the permeate collecting pipes ⑦.

To prevent production of a covering layer which decreases the flow rate as the liquid component of the activated sludge mixture is passing through the membrane, a crossflow is generated on the membrane surfaces through the introduction of air.

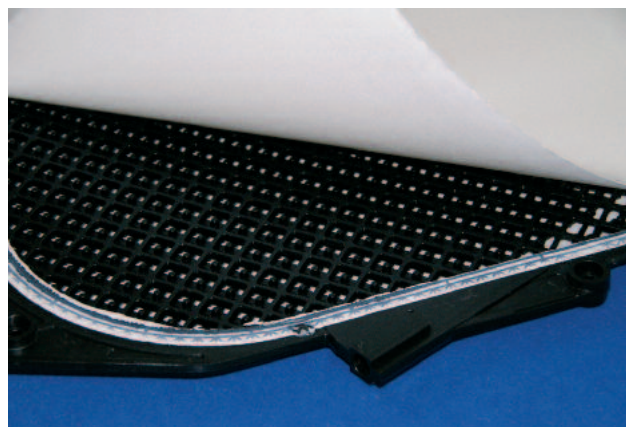
The innovation of the HUBER VRM® system is the new efficient cleaning system for covering layer control which eliminates the need for periodic backwashing.

The principle of membrane cleaning is based on the generation of directed air flows while at the same time causing radial acceleration along the rotating membranes within the reactor. Only one individual membrane segment requires high-intensity cleaning at a time. This sequential cleaning reduces energy consumption of the system considerably. In addition, the scouring air is introduced at only half the water depth which reduces the air pressure and the power consumption of the air blower.

The HUBER VRM® unit can be installed into existing or new concrete tanks, or alternatively into stainless steel or steel tanks.



VRM® 30 module consisting of four membrane plates



Membrane carrier plate

➤➤ Benefits of HUBER VRM® Membrane Bio Reactors

- Ultrafiltration membrane for high and consistent bacteria and virus separation.
- Introduction of shear forces for membrane fouling control through rotational movement.
- Reduced energy consumption for scouring air due to centrally positioned air intake.
- No backpulsing or weekly chemical cleans
- Easy identification and replacement of individual defective membrane module
- Low pre-treatment requirements
- Less chemical cleaning and maintenance
- Simple control system
- Title 22 approved
- Made of stainless steel, pickled in an acid bath
- More than 40,000 ft² (3800 m²) membrane area per VRM® unit
- More than 8 years experience, more than 30 installations
- Expertise in industrial wastewater treatment



Two HUBER VRM® 20 units in tanks at the municipal WWTP La Santa, Lanzarote, Spain



Three VRM® -units installed at municipal WWTP Hutthurm, Germany



Four VRM® 30 units installed at the municipal WWTP Arenas de Iguña, Spain



Three VRM® 30 units installed at the industrial WWTP Hans Kupfer & Sohn GmbH, Germany

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HUBER Vacuum Rotation Membrane
 VRM® Bioreactor