

# Bringing wastewater back to life

**Can raw sewage** really be processed into safe household drinking water? Will industries realize that it is cost-effective and environmentally sound to use it in their processes? The water reclamation industry is growing, and technology is growing along with it. Now it's taken another step forward with Alfa Laval's latest advance in membrane technology.

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**ALFA LAVAL HAS BEEN** in the wastewater treatment business for more than 50 years. Products such as decanter centrifuges, drum thickeners and spiral heat exchangers are being used in wastewater and sludge treatment for municipal and industrial applications involving more than 250 million users. Recently another technology has been added to the portfolio. This latest technology, the Hollow Sheet from Alfa Laval, is a new type of membrane filtration module for membrane bioreactors (MBRs). MBRs, used in wastewater treatment facilities for the past 10 years, combine activated sludge treatment processes and membrane filtration equipment to separate liquids and solids. Although only one part of the overall processing set-up, they are vital to the production of clean drinking water.

## What makes the Alfa Laval solution unique?

"We have combined the best from two membrane technologies – hollow fibre technology and flat sheet technology, which are both currently used in MBRs installed in wastewater treatment facilities – and turned them into one membrane configuration," says Ivar Madsen, manager, MBR Unit, Alfa Laval.

Hollow fibre and flat sheet membranes each offer advantages, but until the advent of the Hollow Sheet technology, no membrane has been able to combine the advantages of both products into one. "With the Alfa Laval Hollow Sheet in the MBR, you get complete utilization of the whole membrane area," explains Madsen. "This results in a much greater filtration capacity and at the same time lower energy consumption – 10 to 25 percent lower air consumption per membrane area than what is achieved by the flat sheet and hollow fibre membranes currently in use.



Ivar Madsen, Alfa Laval.

Using the Hollow Sheet instead of the other technologies therefore translates into substantial energy savings."

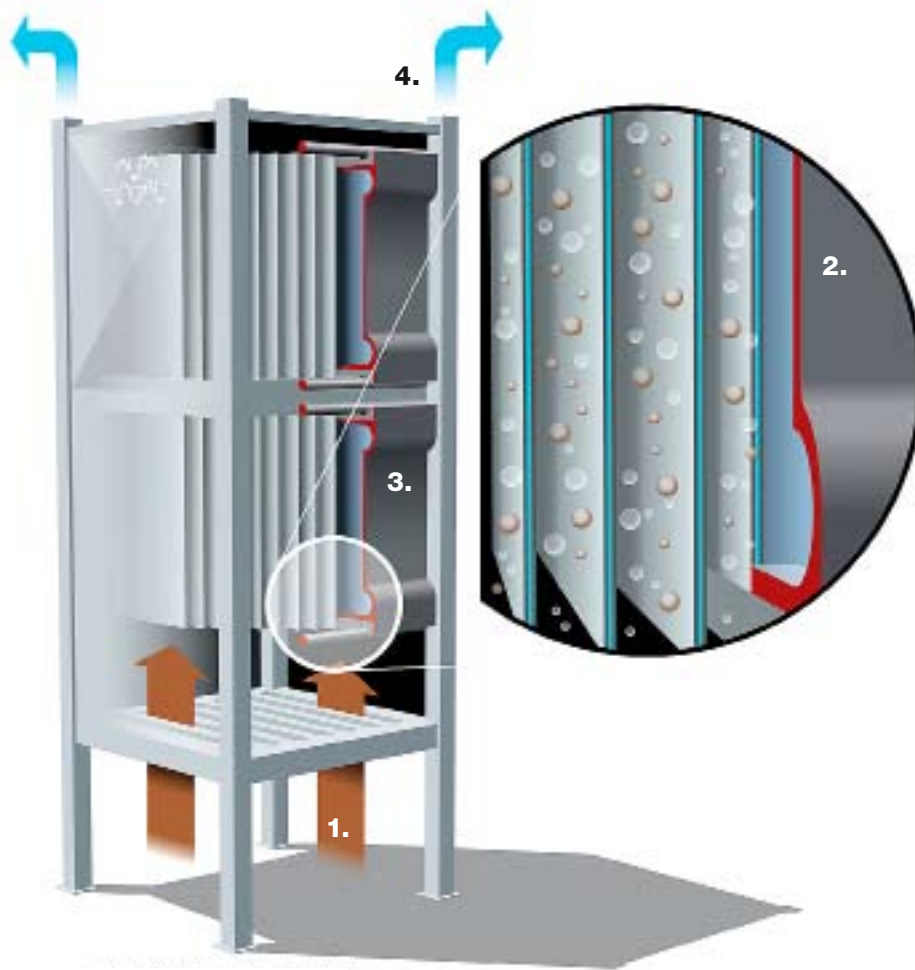
MBRs combine sludge treatment processes and membrane filtration equipment to separate solids as well as liquids.

A Hollow Sheet MBR is designed with a cross-flow velocity of water and waste materials flowing upwards between the membrane

elements while the water (permeate) passes through the membrane sheet. To ensure that this mixed liquid circulates effectively, air bubbles are used to create this cross-flow velocity while providing a scouring effect. The Hollow Sheet membranes are placed in a stainless steel frame within the Alfa Laval Membrane Filtration Module.

**THE HOLLOW SHEET** features taller and wider membranes than anything else currently available, producing an optimized packing density. This design (see illustration) ensures that cleaned effluent is drained from the entire surface of the membrane and emerges all the way round the edges, exiting through connectors at the top of the unit. This means that the pressure drop over the membrane is close to zero. Because the Hollow Sheet creates a 90 percent lower suction or trans membrane pressure (TMP) while flowing through the membrane, an MBR plant will be simpler and easier to operate because it doesn't require complicated vacuum systems that are present in MBRs today. This extremely low TMP (a factor of 10 lower) means

► How it works



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1. The complete Membrane Filtration Module is submerged in the MBR tank. Wastewater sludge enters the module from below and is lifted upwards in a cross-flow generated by a built-in aerator.
2. Water is filtered from the sludge through the membrane pores and drained through the Hollow Sheet.
3. The cleaned water (permeate) passes through hundreds of built-in channels and is collected in the module's Hollow Sheet pipes.
4. The filtered water exits through the top of the Membrane Filtration Module and is piped to the tank outlet for reuse or further processing.

the membranes are significantly less prone to fouling. This reduces the need for cleaning, resulting in lower operating costs.

As urban populations grow, municipal and industrial wastewater treatment will become a priority, Madsen says, noting that within the next 20 years, water reclamation will become an everyday technology mainly because municipalities and industries will be forced to use it. For instance, he points out, in Indonesia, some parts of Jakarta risk sinking because well water has been over-consumed, and this is not an isolated situation.

**MADSEN FORESEES OPPORTUNITIES** within a number of industries to use MBR with Hollow Sheet membranes. "Today there are still sceptics who don't want to use processed wastewater in their fabrication processes – dairies and wineries, for example," he says. "But when they look at how pure the water is and how much it costs to clean bottles, floors and produce boiler water and so on, they will realize that not only is this option safe, but it will also lower their operational costs."

**"We have combined the best from two membrane technologies and turned them into one membrane configuration."**

**IVAR MADSEN, manager, MBR Unit, Alfa Laval**

The opportunity for companies and organizations to lower costs is of course dependent on the price and availability of raw water. An annual price increase of two-digit percentages is not unusual in some regions, and these water prices include both raw water and wastewater treatment.

"The higher the price for raw water and for cleaning wastewater, the better the ROI will be for any MBR with Hollow Sheet usage in these industries," says Madsen. "So I foresee that in the future water reclamation will be used more and more." ■