

DHI SOLUTION

MEMBRANE TECHNOLOGY FOR WATER TREATMENT

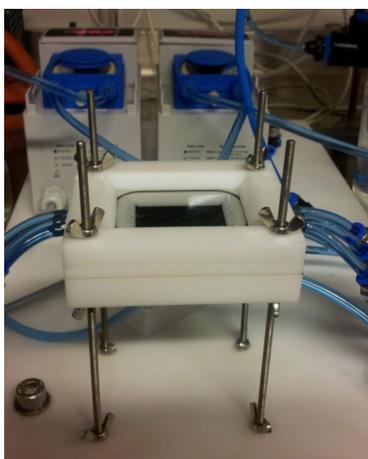
Assisting with testing, optimisation and development

Water scarcity, high water costs and stricter regulations require more advanced water treatment technologies for industrial and urban water processes. Membrane filtration provides an attractive solution for cost-effective removal of contaminants – with a small footprint. We use our advanced knowledge of physico-chemical processes and mechanisms to assist end users with the technical development of their membrane technology for water and wastewater treatment.

SELECTING, DEVELOPING, TESTING AND OPTIMISING MEMBRANE TECHNOLOGY

Selecting the best membrane material for water treatment as well as process conditions is crucial. Combined with non-optimal operating conditions, a membrane with inappropriate properties may result in extensive fouling and operational problems. In addition, the selection of an appropriate pre-treatment process is necessary to ensure optimised membrane performance. To help clients make the best decision, we use our expert knowledge to:

- perform advanced water characterisation for selecting the right membranes
- examine and troubleshoot existing membrane installations
- provide advice on process optimisation including membrane material selection and membrane process design



*Filtration cell used for test of photocatalytic membranes
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SUMMARY

CLIENT

- Industries using membranes such as the food, beverage and textile industries
- Suppliers of membrane systems
- Waterworks companies
- Wastewater treatment plants

CHALLENGE

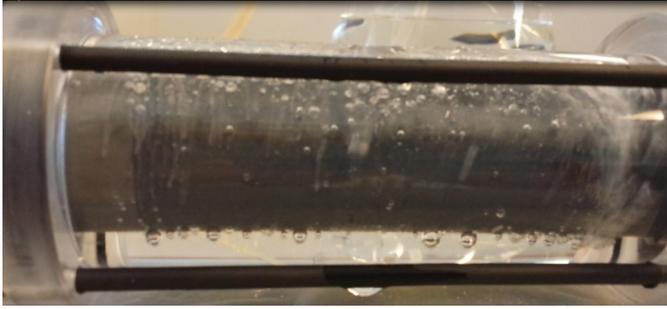
- Matching membrane technology to treatment requirements
- Combating reduced water flow due to fouling (the build-up of unwanted material) of membranes
- Reducing the high energy consumption of the membrane process
- Increasing the lifespan of membranes
- Overcoming barriers to products reaching the market due to potential users being doubtful of new membrane technology

SOLUTION

- Analysing the physical and chemical properties of the feed and permeate stream
- Lab and pilot testing of pre-treatment options, operation and cleaning strategies
- Conducting third party tests for Environmental Technology Verification (ETV) of membrane performance
- CFD modelling of the membrane house and flow characteristics

VALUE

- Higher cost- and energy-efficiency of treatment systems
- Stable operation of treatment system
- Reduced cleaning frequency of membranes
- Longer membrane life
- Increased trust in membrane technology as a reliable and cost-effective alternative to other treatment technologies



Cell for bubble point characterisation of membranes © DHI

Using our laboratory facilities, we test membranes and their performance. In both laboratory and pilot scale, we can design and perform customised analyses of membrane technologies to:

- assess process performance
- provide mechanistic process understanding
- determine their technical and economic feasibility in existing and new applications

In addition, we can utilise computational fluid dynamics (CFD) technology to optimise membrane module design. CFD modelling is considered the most exact numerical modelling tool for analysing flow problems today. Furthermore, a CFD model does not suffer from scale effects. As such, the model can predict flows in small scale test cells as well a large scale modules.

As part of the Danish Centre for Verification of Climate and Environmental Technologies (DANETV), we also offer independent third-party testing of membrane technology. We provide you with a short verification statement of the product, along with the full documentation of the tests results.

RESEARCH PARTNER OF CHOICE

Our wide-ranging experience assisting companies with the development of their membrane technology has made us the research partner of choice. We have extensive knowledge of the use of membrane technology for water and wastewater treatment, gained from our work on several large membrane technology projects. Previously, we've:

- been involved with the development and testing of photocatalytic and biomimetic membranes
- tested membranes for treating water recirculated in swimming pools
- selected ultrafiltration application for drinking water treatment
- collaborated with leading membrane bioreactor (MBR) companies to assist with pilot trials for process improvements with a focus on increased membrane throughput and energy savings

HIGHLY QUALIFIED EXPERTISE

We have experience coordinating large European Union (EU) research programmes focused on the development of membranes. The EU-funded nano-structured TiON photocatalytic membranes (NATIOMEM) project's goal was to develop a photocatalytic membrane that could be used to treat surface water in rural areas. The membrane combined filtration technology with disinfection utilising sun illumination. For this project, we were responsible for membrane characterisation, setting the design criteria of the photocatalytic membrane, and membrane selection.

The goal of the Incorporation of Aquaporins in Membranes for Industrial Applications (MEMBAQ) project – another EU project we coordinated – was to develop a biomimetic membrane which could produce ultrapure water at a low energy cost. Besides coordinating the activities of this project, we also conducted laboratory tests during the development of the biomimetic membrane.

In addition, we assisted a ceramic membrane producer in Denmark with the development, characterisation and testing of a new ceramic microfiltration membrane. This membrane is intended for use as the primary filtration technology to treat swimming pool water.

In Sweden, we helped municipal water companies obtain the most suitable membrane technology for their treatment needs by:

- defining detailed criteria for the choice of membrane system
- preparing the technical specifications for the invitation to tender for the first large, full-scale ultrafiltration plant in the country

Using our expertise, we can help you develop and optimise your membrane technology as well as identify the membrane technology that best suits your needs.



Photocatalytic membrane filtration pilot in Jordan © Inna Horovitz

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