demem

Modern Membrane Technologies for Wineries

WineEng 2019

Nuriootpa, SA, 12 September 2019

SECTION 1

INTRODUCTION TO DE.MEM GROUP

DE.MEM GROUP: MODERN SYSTEMS AND SOLUTIONS FOR CLEAN WATER

- De.mem Ltd is an Australian-Singaporean supplier of innovative systems and solutions for water and wastewater treatment
- Strong customer base in the mining / resources, infrastructure / municipal and food & beverage / agricultural sectors
- Listed on the Australian Stock Exchange since April 2017 (ASX: DEM)
- In Australia, De.mem operates under the De.mem-Akwa (est. 2002) and Pumptech Tasmania (est. 2000) brands
- Group offices in Caboolture/Brisbane, Adelaide, Melbourne, Launceston, Singapore and Ho Chi Minh City, Vietnam
- Approx. 60 employees' group-wide

PARTNERING WITH LEADING PLAYER IN WATER TREATMENT RESEARCH

EXTENSIVE KNOW HOW IN MEMBRANE-BASED WATER TREATMENT THROUGH PARTNERSHIP WITH LEADING RESEARCH INSTITUTION

- Long Term collaboration with Nanyang Technological University (NTU), Singapore, in research & development
- NTU ranked no. 2 in membrane research worldwide by Lux Research (2013)
- De.mem owns the exclusive rights to a range of membrane technologies developed by NTU
- Plus in-house developed technologies
- Technology portfolio includes break through innovations such as:
  - Low pressure hollow fibre Nanofiltration (NF) membrane and
  - Hollow fibre Forward Osmosis (FO) membrane

NANYANG TECHNOLOGICAL UNIVERSITY

Inventors Prof. Wang Rong and Prof. Anthony Fane awarded with the Alternative Water Resources Prize by UN Secretary-General Ban Ki Moon

TOTAL WATER MANAGEMENT SOLUTIONS FOR OUR CLIENTS

- Deep technical know-how through **partnership in R&D with NTU, Singapore,** one of the leading research institutions in water treatment worldwide
- **Access to proprietary products:** Portfolio of different types of hollow fibre membranes which give De.mem a competitive edge and unique product offering
- Exclusive distribution rights to a wide range of **additional high value add products** for different applications in water and waste water treatment
- **Strong know-how in automation** and capability to supply all standard PLC types; proprietary de.live platform for automation and remote monitoring of water treatment plants
- Highest quality standards ensured through **industry qualifications** i.e. ISO 9001:2015, 14001:2015, 4801:2001
- **"Made in Australia" products for our Australian customers** with a strong supplier network enabling De.mem to meet all client design and installation requirements
- **Strong after-sales support** through supply of all required services and consumables
- **Build, Own, Operate and Operations & Maintenance offer**

A "ONE-STOP-SHOP" FOR THE CUSTOMER

- Potable Water
- Sewage Treatment
- Industrial Waste Water Treatment
- Remediation of Contaminated Waters
- Process Water and Recycling
- Chemical Dosing
- Pumps, Pump Stations and Hydraulic Equipment
- Chemicals and Consumables Supply
- Servicing and Operations & Maintenance
- Build Own Operate, Build Own Operate Transfer
- Project Management

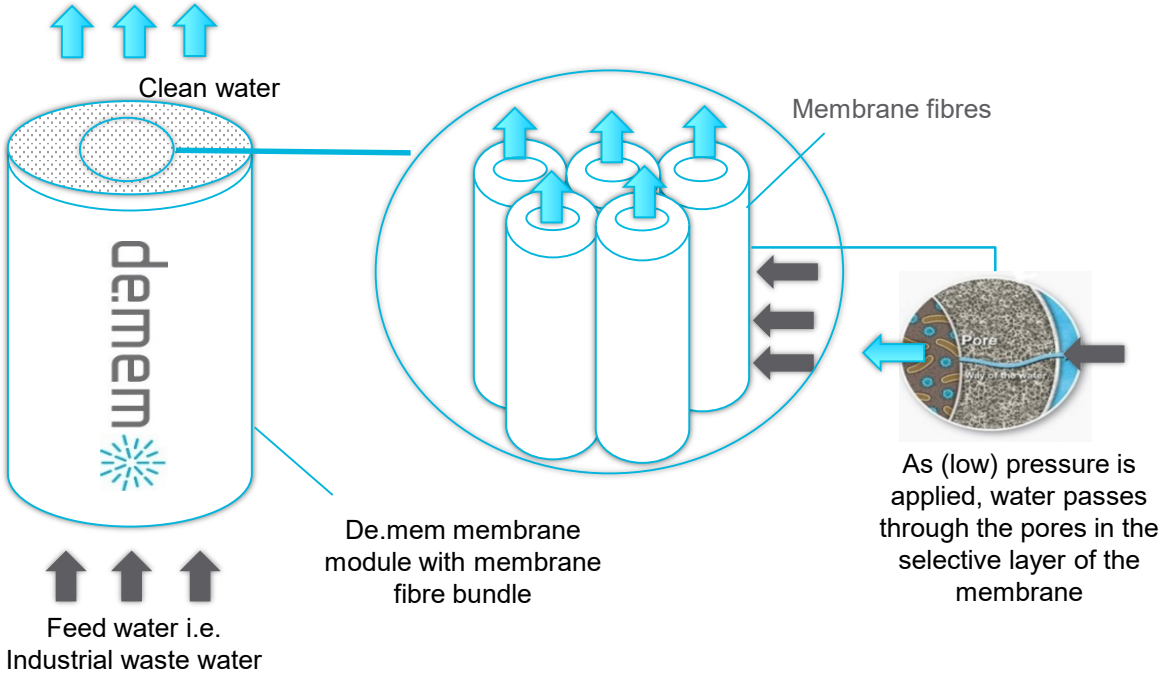
De.mem makes use of a portfolio of proprietary hollow fibre membrane technologies, which are commercialised as a key component within the Company's water and waste water treatment systems.

De.mem has a diverse range of added value products to compliment and to optimise various water and waste water treatment processes.

SECTION 2

MEMBRANE-BASED WATER TREATMENT PRODUCTS FOR WINERIES

Working Principle of Hollow Fibre Membrane Filtration

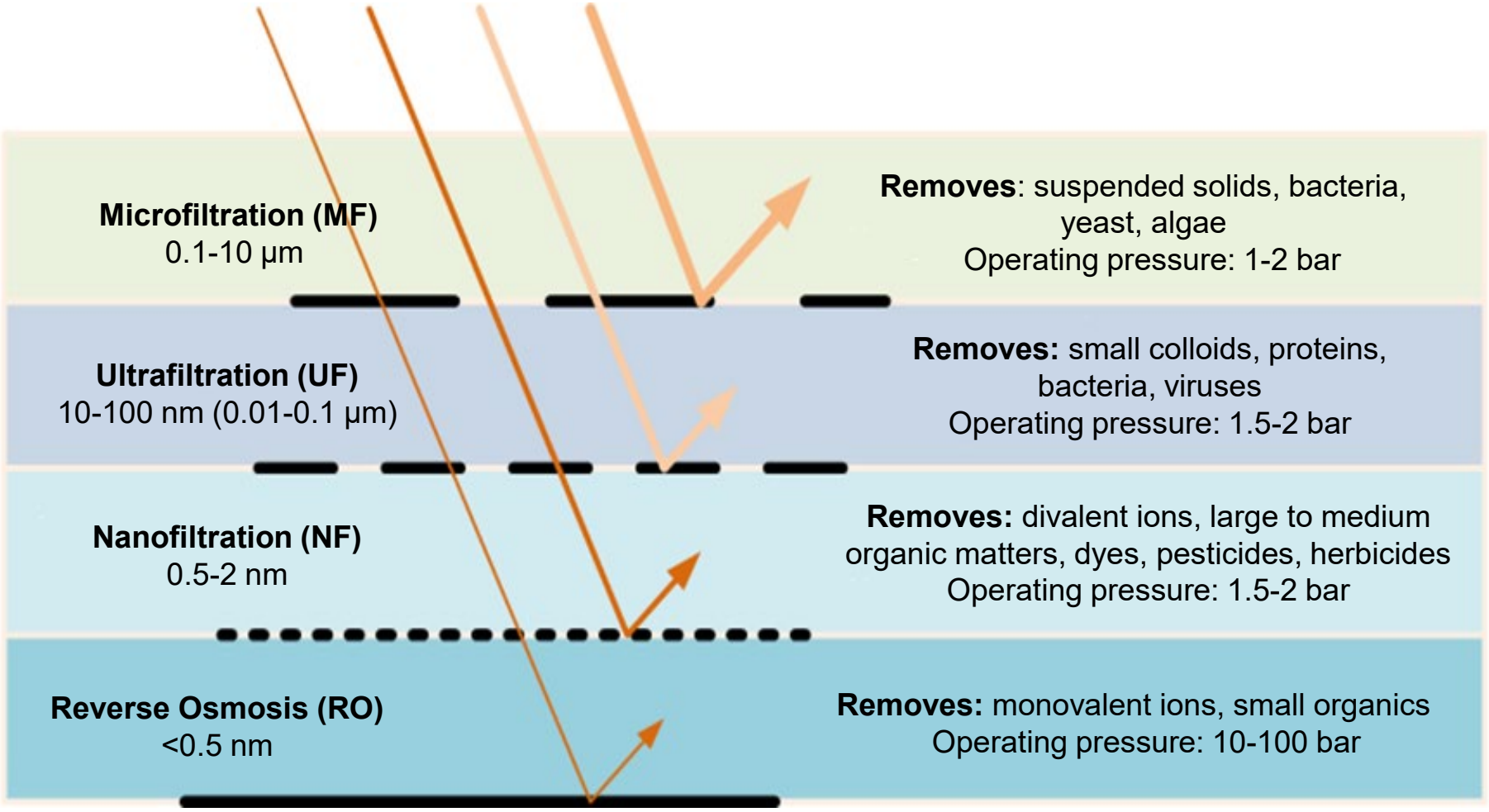


- Membranes are a microporous structure
- Similar to a “sieve”, water molecules can pass through the selective layer of the membrane, while particles larger than the pores are rejected based on pore size
- De.mem offers a range of hollow fibre membranes which differ i.e. in pore size
- The membranes/membrane modules serve as the key component (the actual filter) in De.mem’s water treatment systems

HF Membrane Bundles

Membrane Modules

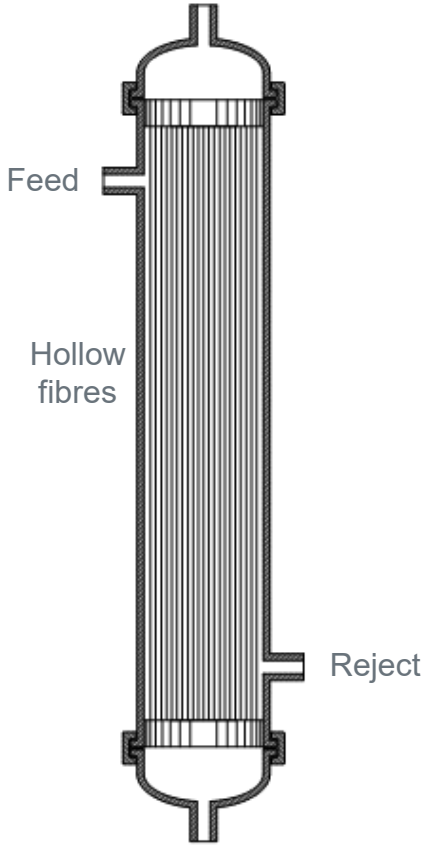
MEMBRANE FILTRATION BY PORE SIZE: CHART



DE.MEM's MICROFILTRATION PRODUCT (NEW LAUNCH)

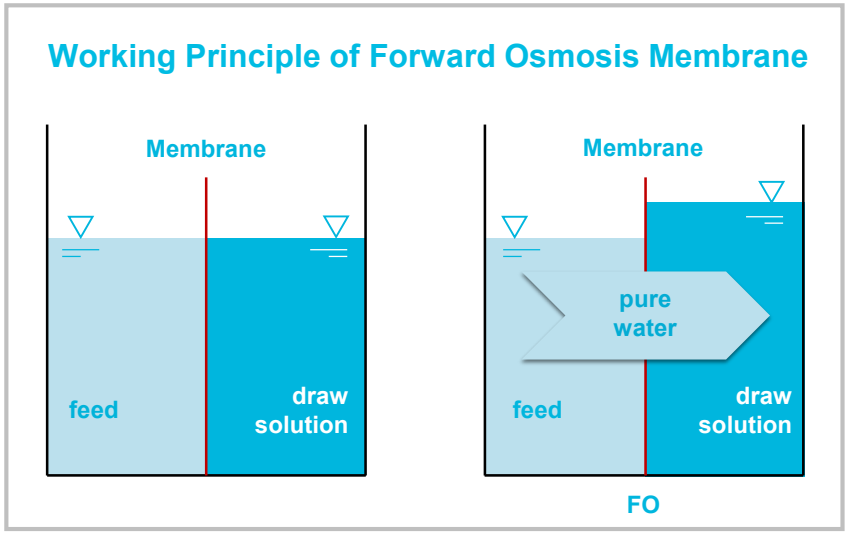
NEW PRODUCT

- De.mem offers a newly developed hollow fibre **microfiltration** membrane for cross-flow filtration
- The membrane comes with a pore size (measured by MWCO) of approx. 500k Da
- Well suited for wine filtration
- De.mem can potentially vary membrane pore size depending on winemakers' requirements and feedback
- Membrane can clear out suspended solids, enzymes, yeast to give the wine a clearer appearance, improve its microbiological profile, etc
- De.mem delivers a turn-key system plus related servicing and support
- Seeking partners for trial phase prior to later implementation



DE.MEM's FORWARD OSMOSIS-DEWATERING MEMBRANE

- **Forward Osmosis (FO)** is a membrane separation technology based on osmotic pressure differences; without any external mechanical pressure being applied
- Salt concentration in a "draw solution" exerts osmotic force which pulls water molecules out of a feed liquid, through the membrane, and effectively concentrates the feed
- The **De.mem technology is based on a hollow fibre membrane**. It was originally developed by NTU and won prestigious industry awards
- It enables "gentle" concentration of liquids, preserving Volatile Organic Compounds (=taste), nutrients such as proteins, enzymes, vitamins
- The De.mem FO has been deployed on coffee and tea concentration so far with superior results compared to existing state-of-the-art (=evaporation)
- Potentially applicable to fruit juice, dairy products, beer, wine, etc



DE.MEM's ULTRAFILTRATION AND NANOFILTRATION MEMBRANES

- De.mem's **Ultrafiltration** membrane technology is an established separation process using a pore size around 100 nm (approx. 100k Da MWCO)
- The membrane can be deployed in a wide range of applications – from waste water treatment to process/production related applications

- De.mem's **hollow fibre Nanofiltration** membrane is unique in the industry
- The membrane comes with a pore size in between 1 and 10 nm (approx. 500 Da MWCO)
- While flat sheet (high pressure) Nanofiltration is available, hollow fibre (low pressure) Nanofiltration is a new technology. De.mem's membrane runs under 1-2 bar operating pressure only, enabling significant savings on energy consumption
- It can filter out small molecules such as dyes, pesticides, herbicides, and small organics, with applications in potable and waste water treatment, or may be deployed for concentration processes

- **Waste water treatment** (to comply with regulatory/legal discharge standards)

- **Recycling** of waste water for
  - Irrigation
  - Re-use in the production i.e. cleaning of equipment
  - Re-use in the production process

- **Process requirements**
  - To provide clean/filtered water of highest standards for production processes
  - Filtration of the product (wine, beverages) to remove solids, particles

- **Liquid / beverage Concentration**

F&B Industry Waste Water

- Membrane based waste water treatment plant for F&B industry factory in Singapore
- Treats factory waste water to regulatory discharge standards, recycling “option”
- Customer is a leading multinational from the flavours & fragrances industry
- High amount of oil & grease and volatile organic compounds in the waste water
- Integration different process steps including Ultrafiltration, Nanofiltration and carbon filter

Forward Osmosis concentration system

- Delivery of hollow fibre Forward Osmosis concentration system to leading multinational from the flavours & fragrances industry
- Deployed to concentrate different types of beverages and aromas

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