Membrane Distillation (MD)

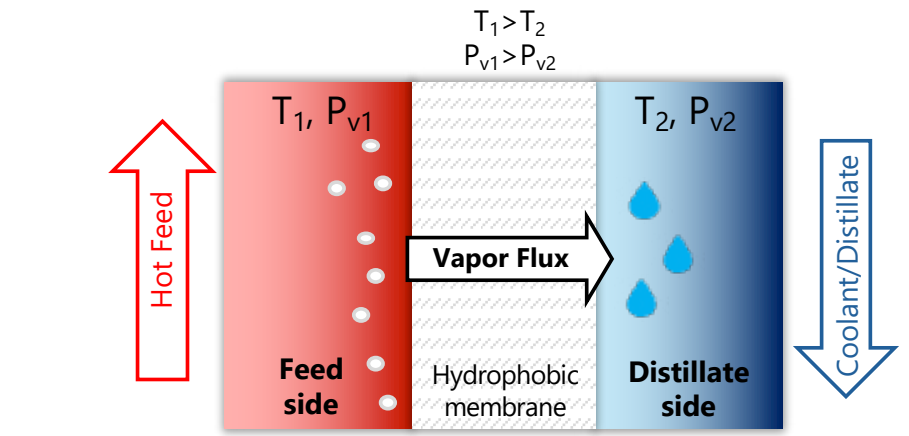
Process Description

MD is a hybrid thermal-membrane desalination process that uses a water vapor pressure difference, generated by a temperature gradient across a hydrophobic microporous membrane, to produce high-quality distilled water from saline brines.

The hydrophobic membrane allows water vapor to pass while preventing the transport of liquid water and/or dissolved salts. Since vapor transport is largely independent of salinity, MD can be applied to treat high salinity streams. MD operates at lower temperatures (≈85°C) compared to the conventional thermal evaporation technologies and at lower pressures compared to pressure-driven membrane technologies.

The process can be applied in multi-effect configurations, as per the design of a leading vendor, where latent heat released during vapor condensation is recovered and reused to drive evaporation in subsequent stages, reducing overall thermal energy consumption and improving process efficiency.

Process Schematic



T: temperature
P_v: vapor pressure

Publications

- Field evaluation of membrane distillation followed by humidification/dehumidification crystallizer for inland desalination of saline groundwater (Link)
- Pilot plant evaluation of membrane distillation for desalination of high-salinity brines (Link)
- Membrane distillation: recent technological developments & advancements in membrane materials (Link)
- Treatment of produced water from oil & gas operations by membrane distillation (Link)
- Application of membrane distillation for desalting brines from thermal desalination plants (Link)

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