S2.5.4 DESALINATION BY DIRECT CONTACT AND VACUUM MEMBRANE DISTILLATION USING PILOT SCALE MEMBRANE UNIT: OVERVIEW AND SENSITIVITY STUDY

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Membrane distillation (MD) represents a new class of membrane based separation operations that offers significant advantages for purification applications, water desalination and environmental remediation. Within the broad class of membrane distillation processes, direct contact membrane distillation (DCMD) and vacuum membrane distillation (VMD) have gained more attention as a promising technology. While MD is capable of treating many kinds of wastewaters and brines, its potential to compete with conventional remediation technologies, such as reverse osmosis and thermal-based water treating technologies, is still limited due to its lack of experimental data for pilot-scale membrane systems.

This research provides a state of the art overview of the DCMD and VMD processes from an industrial point of view and their potential for commercialization as an alternative for water/wastewater treatment and purification applications. Fundamentals of DCMD and VMD, and current operational issues such as influence of hollow fiber membrane properties and operational variables are first discussed. A sensitivity study of the design and process parameters on a pilot-scale membrane distillation unit using commercially available microporous Polytetrafluoroethylene (PTFE) hollow fiber membranes was also performed with the aim to provide optimization guidelines for materials and methods. Results indicated that having a low temperature and concentration polarization and maintain a high temperature gradient between the cold and hot side of the membrane module is the most critical operating variable for the design of the MD system.