HIGH-RECOVERY, MEMBRANE-BASED, NON-THERMAL CONCENTRATION TECHNOLOGY TO TREAT PRODUCED WATER

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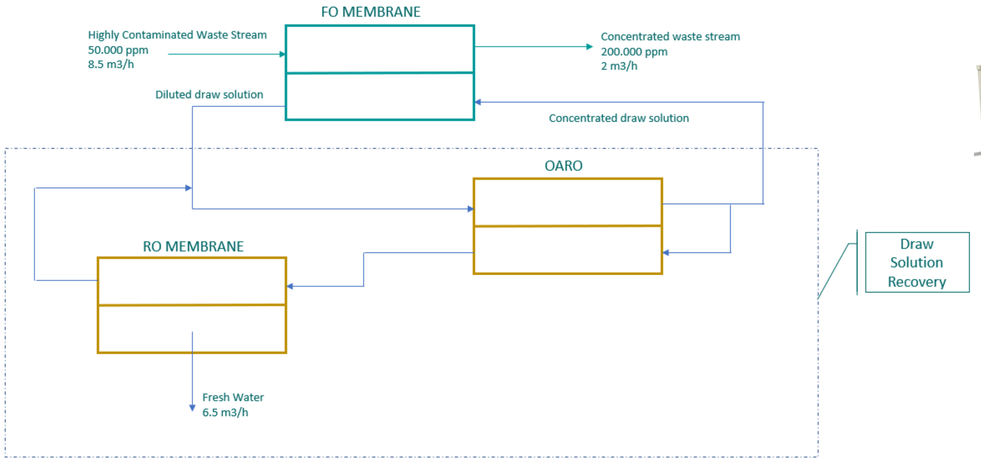
Details of the demo / pilot

Location of plant: New Mexico
Application Type:Produced Water Treatment
Influent and effluent parameters:

- ✓ Influent: 50.000 ppm TDS
- ✓ Effluent: 200.000 ppm TDS
- ✓ Feed Flow Rate: 8.5 m3/h
- ✓ Concentrate Flow Rate: 2 m3/h
- ✓ Fresh Water Flow Rate: 6.5 m3/h
- ✓ Energy Consumption: 15 kWh/m3 of permeate

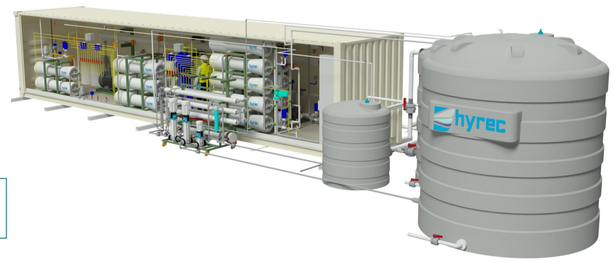


Value proposition

For every barrel of oil, 3-5 barrels of wastewater are produced. These wastewaters are difficult to treat with extreme environmental issues. Handling and disposal costs of produced water significantly affect OPEX, profitability and overall economic competitiveness. Volume-based costs range between $3.00/bbl(US$ 26/m3) and $22.00/bbl (US$ 190/m3) in New Mexico. Hyrec's hybrid technology delivers;

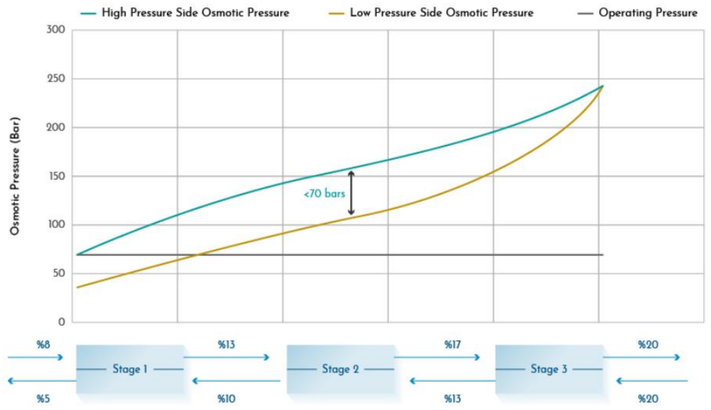
- ✓ Reduction in the waste volume by 70%
- ✓ 75% water recovery from the waste water
- ✓ 1/3 of total energy consumption, compared to thermal systems.
- ✓ Containerized systems for easy transportation
- ✓ Waste stream concentrations in excess of 200,000 ppm

Hyrec OARO System Pilot Plant



The Experience

Hyrec's OARO pilot has been working since February, 2018. System can concentrate the brine solution(NaCl) to 250.000 ppm. System is fully automated.



What problem did this aim to solve?

Hyrec's patented brine concentration technology is targeting to solve economical and environmental challenges with its Forward Osmosis+ Osmotically Assisted Reverse Osmosis hybrid application.

-Highly efficient draw solution recovery method

-No pressure is applied on waste water which reduces the fouling and scaling propensity

-Higher membrane performance

-Re-concentrated and recycled draw solution

-Concentrating salts to near saturation levels

-Significant cost advantage compared to evaporative solutions

-Creates a high dissolved solids output for draw solution, up to 250,000 ppm.

-Utilises electrical power, eliminating the use of thermal energy and its complexities common to other brine concentration approaches

What this means for the future?

-Hyrec's brine concentrator technology has opened a new era for membrane-based concentration applications.

System with capital cost of approximately US$ 2.1M with a 5% interest rate with 15 years useful life, plant has annual savings of US $2.3 M from disposal cost and US $0.7M from water purchase with an OPEX of US $0.34M. (5$/bbl waste disposal cost, 1.4$/bbl water purchase prices were assumed). Total annual saving of US$ 3M from waste disposal and water purchase.

-Hyrec process is applicable in a wide range of applications like power, textile, pharma, mining,food & beverage when there is a need for concentration with a low capital and operating cost.