Humidification – Dehumidification (HDH)

Process Description

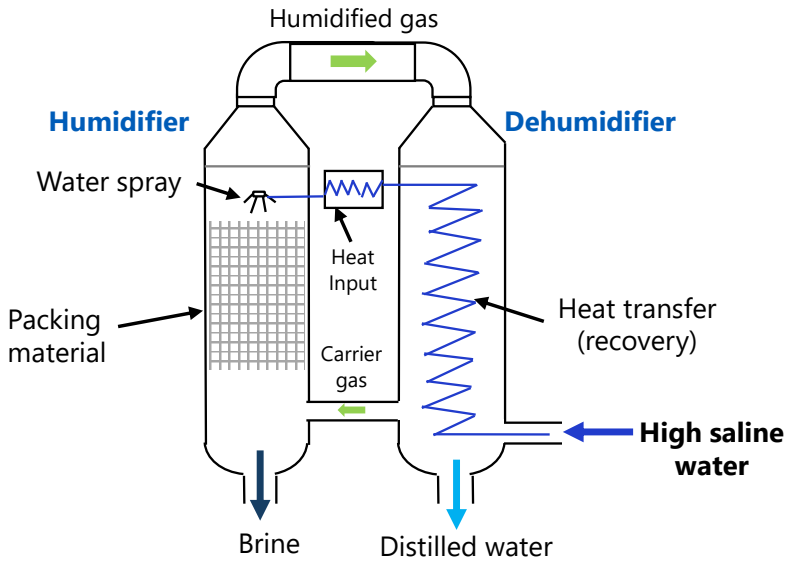
HDH is a thermal desalination process that mimics the natural water cycle by evaporating water into an air stream and subsequently condensing the water vapor to produce high-quality distilled water. HDH is particularly suited for treating highly saline feedwaters beyond the practical limits of reverse osmosis, supporting brine management or zero liquid discharge applications.

The process operates as follows:

- Heated feedwater is sprayed into a recirculating air stream within a humidifier.
- Water evaporates and the resulting humid air is transferred to a condenser.
- In the condenser, the humid air is cooled below its dew point, causing water vapor to condense into distilled water.
- Latent heat released during condensation is recovered through heat exchange and reused to preheat the incoming feedwater, improving thermal efficiency.

Typically, multiple effects are arranged in series to maximize heat recovery, with the final effect acting as a heat-reject stage that removes excess non-recoverable heat through a cooling tower loop.

Process Schematic



Publications

Field evaluation of membrane distillation followed by humidification/dehumidification crystallizer for inland desalination of saline groundwater (Link)

For further information, please contact us at email: GWSC@conocophillips.com