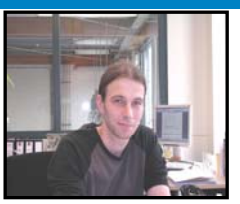
# The removal of inorganic compounds from water streams via supercritical water



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## Background

With the growing global need of fresh water, new resources and technologies for fresh water production have to be developed and improved. A disadvantage of current desalination technologies is the occurrence of a waste brine stream.

Supercritical Water (**SCW**, $T_c$ = 647 K, $p_c$ = 22.1 MPa) has adjustable and strongly diverting properties compared to water at ambient conditions. Water in its supercritical state changes from an excellent solvent for inorganic compounds at ambient state to a poor one at supercritical conditions [1]. With these changed properties, SCW offers a desalination technology which avoids the drawback of a brine stream while being energetically feasible.

*Figure 1: Experimental setup*

## Basic Principle of SCD

Upon entering the supercritical area, inorganic compounds start to precipitate due to lower solubility in SCW (Figure 1). This effect can be used for separation of the solid and the SC phase (i.e. hydro cyclone). In order to design a separation setup, it is essential to know the effects of the system parameters like density and mass flow on the efficiency of the separation and precipitation.

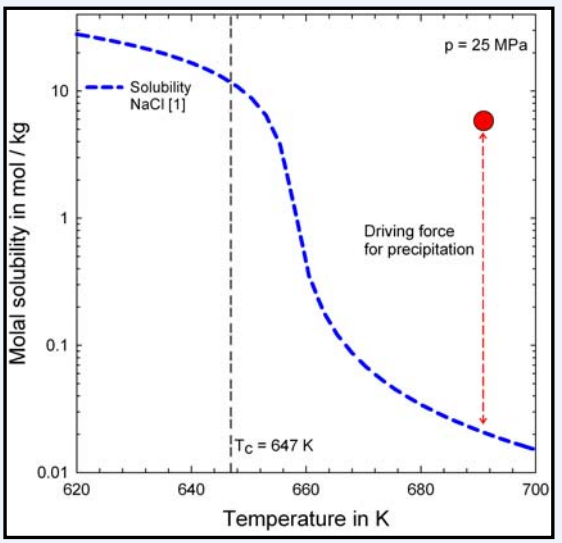


*Figure 2: Thermodynamic Principle of SCD*

## Advantages SCD:

- Pure solid and liquid phase
- Optimal usage of feed streams
- Avoidance of a brine stream
- No additional chemicals necessary
- Separation of salt fractions possible
- High degree of energy recovery possible

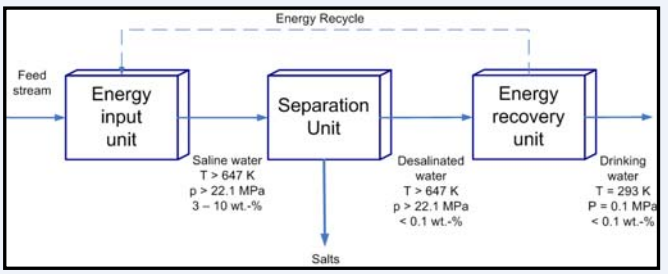


*Figure 3: Conceptual design*

## Research topics:

- System properties
- Separation method and efficiency
- Energy recovery and Scale Up
- Combination with existing technologies and stand-alone applications

*[1 ] Leusbrock, I. et al., Journal of Supercritical Fluids,2008,47,p.117*



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