CASE STUDY

MD for treatment of textile waste water

Introduction to the project

With the increase of water scarcity and pollution problems the textile industry has a responsibility to reduce the water stress and disposal. New regulations also stimulated local industry to search for new technologies to minimize pollution and reduce water consumption.

Textile is a growing industry in which dyeing, bleaching, printing and finishing grey fabrics uses large amounts of water. Treatment of this textile waste water is difficult due to the variety of materials and processes used in textile manufacturing. The contaminants in the water often contain organics,

Main Goal

Recovery of textile waste water for reuse and water disposal reduction

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deflocculation agents, finishing agents and surfactants which can lead to membrane wetting and/or fouling. Also, moderate salt content is often present. Conventional biological treatment and/or foam fractionation is frequently used as a suitable pre treatment for further concentration of the salt content to volume reduction of the waste water towards zero liquid discharge.

Surat, in the north eastern part of India, is well known for its long tradition in the textile industry and plays an important role in the Indian economy. The waste water generated by a dying industry was used in this project to shown the potential of MD in water reuse and waste water reduction.

Membrane Distillation

The waste heat, generated in a textile plant, needs to be exhausted and can be used for waste water reduction by using membrane distillation. The waste water from a dyeing production plant, containing dyes and TDS values of approximately 4000 mg/ltr, was used as feed water for a membrane distillation experiment on site, in Surat.

A small MD pilot with a full size module and a total membrane area of 26m² was integrated within a waste water stream inside a dye producing factory. Cooling water was taken from a pond and heat was electrically generated because of scale.

The produced distillate can be re-used to minimize overall water use and disposal.

The demo MD setup was operational for 3 weeks. Afterwards it was used at several other locations to treat other waste water streams textile related, which confirmed the large variation in waste water streams in this sector.

Accomplishments/Results

The project was successful, showing after the first tests a remarkable colour difference between the feed and the distillate produced by MD. Also, the distillate showed a TDS-reduction of more than 90%. While testing for a longer period, no problems with regard to wetting, fouling or scaling issues inside the module were encountered.

Process conditions

Circulation/module	Φcir mod	1,4 m³/hr
T membrane in	Tm | in	80,0 °C
T condensor out	Tc | out	73,6 °C
T condensor in	Tc | in	24,0 °C
T membrane out	Tm | out	31,0 °C
Salinity at start	x | o	3,7 gr/kg
Recovery req.	R	88 %
Airgap pressure	Pair	90000 Pa
T feed	Tf	30 °C²

With an average salt rejection of 93,2 %, the produced distillate had conductivities lower than 500 µS/cm. The main benefit was the production of clear water which can be reused in the process.

With the optimum operational conditions of 80°C as shown in the table, the unit was able to process a feed stream of approximately 2 m³/day, reaching a recovery of 88% (C.F. = xxx). The remaining 12%, a concentrate stream of approx.. 240 ltr/day, was sent to the liquid effluent treatment plant.

On average, the specific thermal energy consumption (STEC) was 175 kWhth/m³, the specific electrical energy consumption (SEEC) was neglectable (< 0.95kWh/m³) and the Gained Output Ratio (GOR) was 3.6.

Considering waste water produced at a textile plant of 100m³/day the needed amount of waste heat is approximately 655 kW with a concentrated waste stream of 12 m³/day.

With the implementation of MD, a large amount of textile dye water can be recovered and reused, and the discharge and/or transport costs associated to the effluent streams are strongly decreased.