

QUALITY ENABLES.

Case study about wastewater treatment
in a dye mill in Tirupur, India

QUALITY WORKS.

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Energizing Chemistry

Efficient Wastewater Treatment A Zero Liquid Discharge Operation

Application and system design

Dyeing processes require high concentrations of salt to fix the dyes onto the cellulose textile. At the end of the dyeing process, the wastewater stream consists of a high concentration of salts and organics.

In this dyeing mill in Tirupur, the wastewater is first treated with biological treatment (tertiary treatment) to reduce the amount of organics in the wastewater. This step is followed by quartz filtration. The process water is then passed through an ion exchange treatment stage, consisting of the organic scavenger **Lewatit® S 6368 A** to remove the organic substances followed by water softening with **Lewatit® CNP 80 WS**. Since sodium sulfate is added during the process, calcium must be removed to avoid the precipitation of calcium sulfate.

After the ion exchange sequence, 85 m³/h water is passed through a reverse osmosis (RO) system with **Lewabrane® RO S400 HR** to remove salts and other remaining organics. While the feed contains total dissolved solids (TDS) of 11,000 mg/l the RO process reduces it to less than 100 mg/l. The RO system operates at a recovery rate of 80%. The RO brine with TDS of around 50,000 mg/l is further treated by

NF (nanofiltration) membranes to recover the sulfate, while the sodium chloride, which passes through the NF membrane, is concentrated by a multiple-effect evaporator. The sodium chloride salts are finally dried in a solar pan and disposed of as solid waste. The concentrate of the NF process, which contains mainly sulfate, is reused in the dyeing process.

At a glance

Industry	Textile industry (dye mill)
Application	Wastewater treatment
Location	Tirupur, India
Product	154 pieces Lewabrane® RO S400 HR 7,500 l Lewatit® CNP 80 WS Lewatit® S 6368 A
Production capacity	85 m ³ /hr
Water type	High content of salts and organics
Installation	August 2016

X Lewabrane®

X Lewatit®

Membrane and ion exchange performance

Although the wastewater stream has a carbon oxygen demand (COD) level of up to 200 ppm, a total hardness of 200 mg/l, and salt concentration of 11,000 mg/l, the lifetime of the RO membrane is up to 4 years.

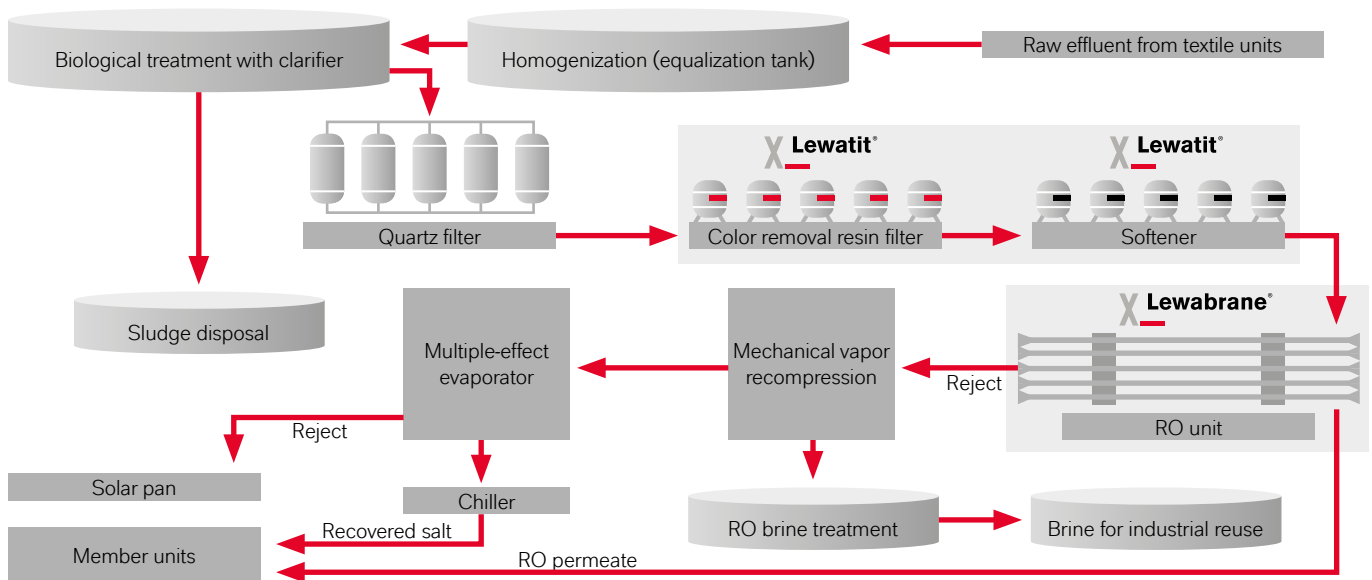
State-of-the-art pretreatment is key to achieving these long lifetimes of RO elements while treating difficult industrial wastewater. The scavenger reduces the COD to a level of 35 ppm, which reduces organic fouling and the bio growth potential of the stream. The following softening reduces the hardness to less than 10 mg/l, which results in a lower scaling potential. Combined with the high rejection and durability of the **Lewabrane® RO S400 HR** elements the expected performance and lifetime can be achieved.

Conclusion

The described industrial example shows that the reduction of wastewater, even in challenging process industries, is possible using the right tools. **Lewatit®** ion exchange resins and **Lewabrane®** reverse osmosis elements are a smart and efficient combination to treat wastewater that contains a high load of organics and high salinity.

In industrial water treatment applications, where a high load of organics could pass through pretreatment by ultra-filtration, the use of scavenger resins before RO treatment should be considered. The removal of organics will lead to a decrease of fouling on the RO membrane.

Tirupur zero liquid discharge process with combination of RO and IXR



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