

# POREX® Tubular Membrane Filter Modules for Lime Softening / RO Reclaim

## Choosing Tubular Membrane Filter Modules (TMF) for RO Reject Reclaim

Typical process water systems use RO (Reverse Osmosis) technology as the method of decreasing the level of ions in process water. RO recovery rates normally range from 75-80%, therefore 20-25% of the RO feed water is discharged as wastewater. With the increasing cost of water and waste discharge, more companies are looking to recover and reuse RO reject water.

While it is possible to reuse the reject water from an RO by feeding it directly into a 2nd RO unit, the likelihood of scaling or fouling the 2nd RO without pretreatment is rather high.

Using a TMF system coupled with lime softening will reduce scaling and enhance the operation of the 2nd RO. Lime softening along with TMF provides very efficient softening, silica reduction and solids removal within a single process scheme.

Using this treatment technique, recovery rates can be greater than 95% while assuring substantial reduction of scaling to the RO units. This is an efficient and cost effective method for either retrofitting existing RO systems or incorporating it into newly designed systems.

## Designing a TMF System for RO Pretreatment or RO Reject Reclaim

RO Pretreatment - Figure 1 shows an a TMF system used as pretreatment to an RO system where the feedwater containing hardness, particulates and silica is fed to reaction tank #1 where chemicals are added to enhance particle flocculation. The water is then fed to reaction tank #2 where additional chemicals are added

to promote the precipitation of hardness and silica. The water is then sent to a concentration tank to be treated by the TMF system. System concentrate is recycled to the concentration tank upstream of the TMF system for re-dilution.

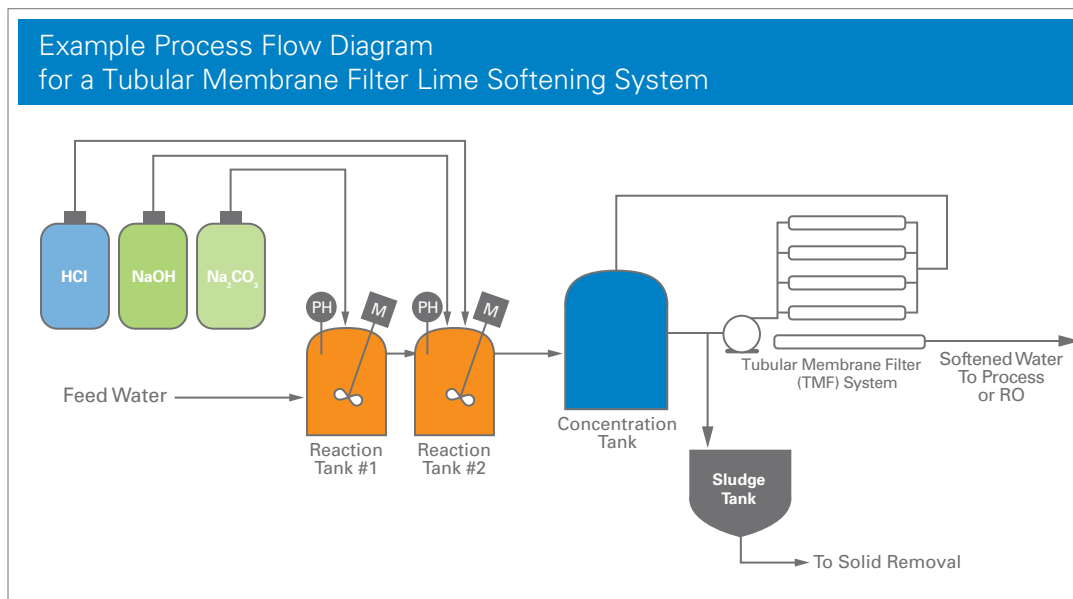


Figure 1 - TMF System for Pretreatment to an RO

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Solids concentration is kept at 3-5% with the excess solids sent through a filter press for de-watering or to disposal. The number of Tubular Membrane Filter Modules required is dependent upon the total flow rate of the system needed and the modules are typically placed in series of up to 12 modules. Systems are designed to allow at least one train or series of modules to be available for further cleaning if required. It is always best to run a small pilot test system as a means of determining the ideal flux rates through the modules and identify any issues, such as colloids, that might require further module cleaning.

RO Reject Reclaim- Figure 2 shows an a TMF system used as pretreatment to a 2nd Stage or Reject Reclaim RO system. Such feed water contains very high levels of hardness, ions, organics and silica. The reject is fed to reaction tank #1 where chemicals are added to enhance particle flocculation. The water is then fed to reaction tank #2 where additional chemicals are added to promote the precipitation of hardness and silica. The water is then sent to a concentration tank to be treated by the TMF system. The concentrate is pumped through the membrane modules with the solids returning to the concentration tank, and the filtrate passes through the membranes. Solids concentration is kept at 3-5% with the excess solids sent through a filter press for de-watering or to disposal.

### How long will Tubular Membrane Filter Modules last?

The typical lifespan of a Tubular Membrane Filter Module is 3 to 5 years or longer with the total TMF system designed for approximately 20 years of operation. The PVDF membranes and the PE or PVDF substrates used in the Tubular Membrane Filter Modules are extremely robust. They are designed to withstand harsh environments and will resist abrasion, high temperature, and pH environments from 0-14 without a decrease in retention efficiency.

### Summary

Tubular Microfiltration or Ultrafiltration systems using POREX Tubular Membrane Filter Modules offer:

- Easy operation, maintenance and control
- Continuous operation and performance
- Resistance to abrasion and temperature fluctuations
- High flux rates

When used to reduce SDI to an RO or Nanofilter, operating a Tubular Membrane Filter Module system will yield a significant process improvement, typically resulting in much longer RO or Nanofilter module life and reduced cleaning frequency. Tubular Membrane Filter Modules provide a cost effective alternative to changing filter bags or cartridge filters on a daily basis. For solids removals, TMF systems offer a compact alternative to bulky clarifiers which are greatly affected by temperature changes, require significant floor space. TMF is a filtration technology that can handle process streams with a high solids concentration that presents a challenge to other membrane based technologies.

When combined with Lime Softening Chemistry, using a TMF system can significantly enhance RO recovery rates.

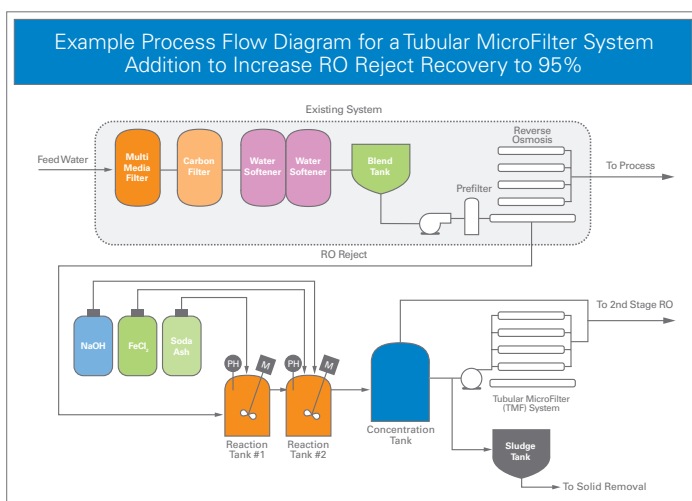


Figure 2 – TMF System for Increasing RO Reject Recovery



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