



## FILMTEC Membranes

### System Operation: Adjustment of Operation Parameters

#### Introduction

A membrane system is designed on the basis of a defined set of data such as the permeate flow, feedwater composition and temperature. In reality, the plant operation has to be flexible to respond to changing needs or changing conditions.

#### Brackish Water

The normal way of operating brackish water RO and NF membrane plants is to keep the flows and thus the recovery constant at the design values. Any change in the membrane flux, e.g. by temperature or fouling, are compensated by adjusting the feed pressure. However, the maximum specified feed pressure must not be exceeded, nor should too much fouling be tolerated (for cleaning, please refer to *Cleaning and Sanitization - Section 6*).

If the feedwater analysis changes such that the scaling potential increases, the system recovery has to be decreased, or other measures have to be taken to cope with the new situation. Please refer to *Water Chemistry and Pretreatment (Section 2)*.

The most common situation is that the permeate capacity of the plant has to be adjusted to the needs. Normally, the capacity is designed to meet the peak needs. Operating with overcapacity is generally not recommended. Thus, adjustment means lowering the design permeate output. The easiest way is to shut the plant down when no permeate is needed. A high start/stop frequency, however, can lower the performance and the lifetime of the membranes. A permeate buffer tank may be used to allow a more constant operation.

Reducing the feed pressure is another way to reduce the permeate flow. Preferably, this is done by using a speed controlled pump in order to save energy. Normally, the system recovery is kept constant when the permeate flow is reduced. It has to be ensured by a system analysis using the computer program, that single element recoveries do not exceed their limits (see [System Design Guidelines - Section 3.9](#)). During low flow operation, the system salt rejection is lower than during design flow operation. Also, you must be certain that minimum concentrate flows are maintained during low flow operation.

#### Seawater

In principle, the operation parameters of seawater plants are adjusted the same way as in brackish water applications. However, the maximum allowed feed pressure as specified on the product information sheet, and the permeate TDS are often the limiting factors.

Decreasing feedwater temperature can be compensated by increasing the feed pressure up to the maximum. Once the maximum pressure is reached, a further decreasing temperature causes the permeate flow to decrease.

Increasing temperature is compensated by lowering the feed pressure. This is only possible, however, as far as the tolerated permeate TDS is not exceeded. Alternatively, increasing temperature can be compensated by taking a number of pressure vessels out of service. By reducing the active membrane area, the feed pressure and the permeate TDS are kept about constant. A system analysis has to be run to make sure that maximum element permeate flows are not exceeded. When some vessels are taken out of service, they have to be properly isolated and preserved.

## Seawater (cont.)

An increase in the feedwater salinity can be compensated by increasing the feed pressure up to the maximum. If further pressure increase is not possible, than a lowered permeate flow and system recovery has to be accepted. A lower feedwater salinity allows to decrease the feed pressure and/or to increase the system recovery and/or to increase the permeate flow.

The adjustment of the permeate capacity to reduced needs is normally accomplished by sufficiently dimensioned permeate tanks.

Big plants are split up into a number of identical trains. Then the number of trains in service can be adjusted to the needs.

**FILMTEC™ Membranes**  
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