FILMTEC Membranes
System Operation: Record Keeping

Introduction

In order to be able to follow the performance of the RO unit, it is necessary that all relevant data are collected, recorded and kept on file. Apart from keeping track of the performance, the logsheets are also valuable tools for troubleshooting, and are needed in the cases of warranty claims.

This chapter is for general guidance only and must not be used in place of the operating manual for a particular plant. Site-dependent factors prevent specific recommendations for all record keeping. Thus, only the more general record keeping is covered here.

Start-up Report

- Provide a complete description of the RO plant. This can be done using a flow diagram and equipment, instrumentation, and material list to show water source, pretreatment system, RO configuration and posttreatment system.
- Give results of checking according to check list (*Pre-Start-up Check and Commissioning Audit - Section 5.2.2*)
- Provide calibration curves of all gauges and meters based on manufacturers' recommendations.
- Record initial performance of RO and pretreatment system as provided below.

RO Operating Data

The following data must be recorded and logged into an appropriate logsheet at least once per shift, unless otherwise stated (see Table 5.1 for an example).

- Date, time and hours of operation.
- Pressure drop per filter cartridge and per stage.
- Feed, permeate and concentrate pressure of each stage.
- Permeate and concentrate flows of each stage.
- Conductivity of the feed, permeate and concentrate streams for each stage. Permeate conductivity of each pressure vessel weekly.
- TDS of feed, permeate and concentrate streams for each stage. The TDS is calculated from the water analysis. It can also be calculated from the conductivity (at 25°C) EC_{25} and an appropriate K factor:

  $$TDS = K\ EC_{25}$$

  The K factor has to be determined for each specific stream. Typical K factors are shown in Table 5.2.

- pH of the feed, permeate and concentrate streams.
- Silt Density Index (SDI) or turbidity of the RO feed stream, or both.
- Water temperature of the feed stream.
- Langelier Saturation Index (LSI) of the concentrate stream from the last stage (for concentrate streams < 10,000 mg/l TDS).
- Stiff and Davis Stability Index (S&DSI) of the concentrate stream from the last stage (for concentrate streams >10,000 mg/l).

* Trademark of The Dow Chemical Company

RO Operating Data (cont.)

- Calibration of all gauges and meters based on manufacturer's recommendations as to method and frequency but no less frequent than once every three months.
- Any unusual incidents, for example, upsets in SDI, pH and pressure and shutdowns.
- Complete water analysis of the feed, permeate and concentrate streams and the raw water at start-up and every week thereafter.

  The water analysis shall include:
  - Calcium
  - Magnesium
  - Sodium
  - Potassium
  - Strontium
  - Barium
  - Iron (total, dissolved and ferrous)
  - Aluminium (total and dissolved)
  - Bicarbonate
  - Sulfate
  - Chloride
  - Nitrate
  - Fluoride
  - Phosphate (total)
  - Silica (dissolved)
  - Total dissolved solids
  - Conductivity
  - pH
  - TOC

* Trademark of The Dow Chemical Company

Figure 1. Reverse osmosis operating log (example)

Per Shift

Train #

		Design							
	Date								
	Time								
	Operating hours								
Pressure (psig)	Feed Array 1								
	Feed Array 2								
	Permeate								
	Concentrate								
Δ p (psid)	Cartridge								
	Array 1								
	Array 2								
Flow (gpm)	Feed								
	Permeate								
	Concentrate								
	Recovery (%)								
Conductivity (mS/m)	Feed								
	Permeate								
	Concentrate								
TDS (mg/l)	Feed								
	Permeate								
	Concentrate								
	Salt Passage (%)								
pH	Raw Water								
	Feed								
	Concentrate								
	Permeate								
Feed	Cl_2 (mg/l)								
	SDI								
	Turbidity (NTU)								
	Temperature (°C)								
Acid	Level								
	Refill (l)								
	Consumption (g/m^3)								
Inhibitor	Level								
	Refill (l)								
	Consumption (g/m^3)								
Normalised	Permeate flow (gpm)								
	Salt Passage (%)								
	Remarks								

* Trademark of The Dow Chemical Company

RO Operating Data (cont.)

Table 1. Factors for estimating TDS from conductivity

Water	EC251 (mS/m)	K
Permeate	0.1 - 1	0.50
	30 - 80	0.55
Seawater	4,500 - 6,000	0.70
Concentrate	6,500 - 8,500	0.75

Pretreatment Operating Data

Since the RO system performance depends largely on the proper operation of the pretreatment, the operating characteristics of the pretreatment equipment should be recorded. Specific recommendations for all record keeping cannot be given, because pretreatment is site dependent. Typically, the following items must be recorded:

- Total residual chlorine concentration in the RO feed (daily - unless known to be completely absent).
- Discharge pressure of any well or booster pumps (twice a day).
- Pressure drop of all filters (twice a day).
- Consumption of acid and any other chemicals (daily - if used).
- Calibration of all gauges and meters based on manufacturers' recommendations as to method and frequency but no less frequent than once every 3 months.
- Any unusual incidents, for example, upsets and shutdowns as they occur.

Maintenance Log

- Record routine maintenance.
- Record mechanical failures and replacements.
- Record any change of membrane element locations with element serial numbers.
- Record replacements or additions of RO devices.
- Record calibration of all gauges and meters.
- Record replacement or additions of pretreatment equipment, for example cartridge filters and include date, brand name and nominal rating.
- Record all cleanings of RO membranes. Include date, duration of cleaning, cleaning agent(s) and concentration, solution pH, temperature during cleaning, flow rate and pressure (for cleaning procedures see *Cleaning and Sanitization - Section 6*).

FILMTEC™ Membranes
For more information about FILMTEC membranes, call the Dow Liquid Separations business:
North America: 1-800-447-4369
Latin America: (+55) 11-5188-9222
Europe: (+32) 3-450-2240
Pacific (ex. China): +800-7776-7776
China: +10-800-600-0015
http://www.filmtec.com

Notice: The use of this product in and of itself does not necessarily guarantee the removal of cysts and pathogens from water. Effective cyst and pathogen reduction is dependent on the complete system design and on the operation and maintenance of the system.

Notice: No freedom from any patent owned by Seller or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. Seller assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

*Trademark of The Dow Chemical Company