



## FILMTEC Membranes

### Silt Density Index

#### Introduction

Particulate or colloidal fouling of reverse osmosis (RO) elements can seriously impair performance by lowering productivity and sometimes salt rejection. An early sign of colloidal fouling is often an increased pressure differential across the system.

The source of particulate or colloids in reverse osmosis feedwaters is varied and often includes bacteria, clay, colloidal silica, and iron corrosion products. Pretreatment chemicals used in clarification such as alum, ferric chloride, or cationic polyelectrolytes can also cause fouling if not removed in the clarifier or through proper media filtration. In addition, cationic polymers may coprecipitate with negatively charged antiscalants and foul the membrane.

The best available technology for determining the colloidal fouling potential of reverse osmosis feedwater is the measurement of Silt Density Index (SDI). This is an important measurement to be carried out prior to designing an RO pretreatment system and on a regular basis during RO operation (2-3 times a day is recommended for surface waters).

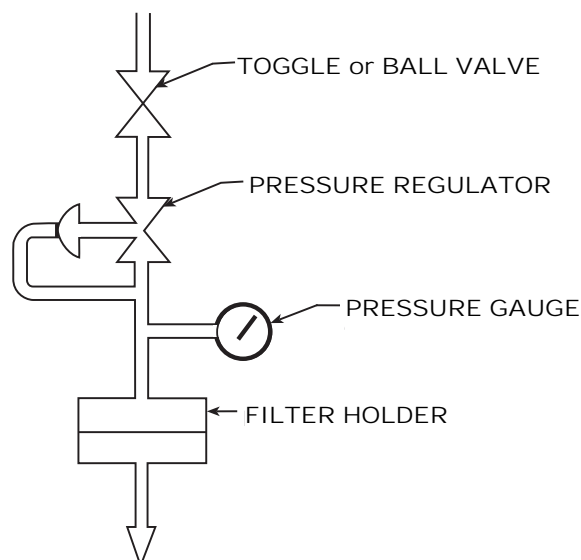
The Standard Test Method has been described in ASTM test D 4189-82.

#### Equipment

- 47 mm diameter membrane filter support
- 47 mm diameter membrane filters (0.45  $\mu\text{m}$  pore size)
- 0-70 PSI (0-5 bar) pressure gauge
- Pressure regulator (manual needle valve can be substituted)

Figure 1 shows the equipment arrangement needed to measure SDI. The above equipment is available from Millipore Corporation.

**Figure 1. Apparatus for measuring the silt density index (SDI)**



## Procedure

- a. Place the membrane filter on its support, bleed pressure on carefully, tighten O-ring seal and fix the support vertically.
- b. Adjust feed pressure to 30 PSI (2.1 bar) and measure initial time,  $t_0$ , necessary to filter 500 ml of water. Feed pressure should be kept constant throughout the test.
- c. Keep filter in operation for 15 minutes.
- d. After 15 minutes measure again the time,  $t_1$ , necessary to filter 500 ml of water. Membrane filter may be retained for further analysis.
- e. Calculation:  
$$SDI = [1 - t_0 / t_1] \times 100 / 15$$

When  $t_1$  is four times as long as  $t_0$ , the resulting SDI is 5. A water sample that totally blocks the membrane filter has an SDI value of 6.7.

The guideline is to maintain SDI at less than or equal to 5. A number of pretreatment technologies have proven effective in SDI reduction including media filtration, ultrafiltration, and cross flow microfiltration. Polyelectrolyte addition ahead of filtration sometimes improves SDI reduction.

**FILMTEC™ Membranes**  
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