Silt Density Index Test (SDI)

The Silt Density Index (SDI) test is used to determine the fouling potential of water feeding a membrane filtration process such as a reverse osmosis (RO) system. This test is defined by its specific procedure (ASTM D-4189). The ASTM procedure should be referenced for a more detailed description of the procedure.

The nature of this test is such that it cannot be run in the laboratory. The SDI test should be run daily on the water entering the RO membranes after the cartridge filters. This frequency can be reduced to weekly once background data proves that less frequent sampling is sufficient. As such, a sample tap should be installed on the RO machine after the cartridge filters.

This test can also be run across vessels such as filters or clarifiers to see if they are doing the job expected of them. SDI tests on the raw supply water should be part of every feasibility study for an RO system and it is good to run one periodically during operation of the system to make sure changes haven't occurred.

It is recommended practice to keep a record of SDI values and filters to observe changes over time.

EQUIPMENT SUPPLIED

1	¼'Ball Valve
1	Pressure Regulator
1	Pressure Gauge
1	Filter Disk Holder
1 pkg.	0.45 Micron Filter Paper
1	500ml Graduated Cylinder
	Fittings

ADDITIONAL EQUIPMENT REQUIRED (not supplied)

Stopwatch
Thermometer
"Dull" Lab Tweezers

Note: All wetted components including sample lines should be stainless steel or of plastic construction.

SDI TEST PROCEDURE

1. Connect the test kit less filter paper for pretest flush.

2. Flush the test kit and supply line for 3 to 5 minutes to remove any possible entrained contaminants.

3. Measure the temperature of the water.

4. Make sure the O-ring is in good condition and properly placed. Set the pressure regulator to 30 psig. The setscrew on the regulator should be adjusted while there is a small flow. Supply pressure to the regulator should be > 40 psig.

5. Open the membrane filter holder and carefully place a 0.45 μ membrane filter shiny side up on the support plate of the holder. Handle the membrane filter only with dull tweezers to avoid puncturing. **Avoid touching the membrane filter with the fingers**.

6. Replace the top half of the filter holder and close loosely.

7. Open the feed valve slightly and adjust the filter housing to overflow, displacing any trapped air. Tighten the filter-housing overflow. Open the feed-valve completely and make final adjustments to the pressure regulator as required. Close the feed valve.

8. Prepare to take measurements. Open the ball valve. Simultaneously, using a stopwatch, begin measuring the time required for the flow of 500 ml. Record the time (*ti*). Leave the valve open for continued flow.

9 Measure and record the times to collect additional 500 ml volumes of sample, starting the collection at 5, 10, 15 minutes of total elapsed flow time. This value is recorded as (*tf*) with *f* being the time used. Measure the water temperature and check the pressure as each sample is collected. The pressure must remain constant at 30 psig (+/- 1 psig) and the temperature must remain constant 1^{o}C.

10 After completion of the test, the membrane filter may be retained for future reference. Record the Date, Sample Location, Time, Operator, SDI Value, and Comments with the filter pad.

CALCULATION

Calculate the silt density index (SDI_T) as follows:

$$SDI_T = \frac{[1 - (ti / tf)] * 100}{T}$$

Where:

T = total elapsed flow time, minutes (e.g., 15 minutes for an SDI_{15}).

ti = initial time required to collect 500 ml of sample

t_f = time required to collect 500 ml of sample after test time *T* (15 minutes for an SDI_{15})

Note: The expression [1 – *ti* / *tf*] should not exceed 75%. If it does exceed this value, use a shorter time for T; that is 5 or 10 minute measurements. If times shorter than 15 minutes are required, the SDI values are too high for membrane.

Comments on Variability

The procedure outlined must be followed exactly for the information to have meaning and be reproducible. Test variability (50-100%) has been a recognized problem with this method and operator training in procedural details is a critical factor in obtaining precision and accuracy.