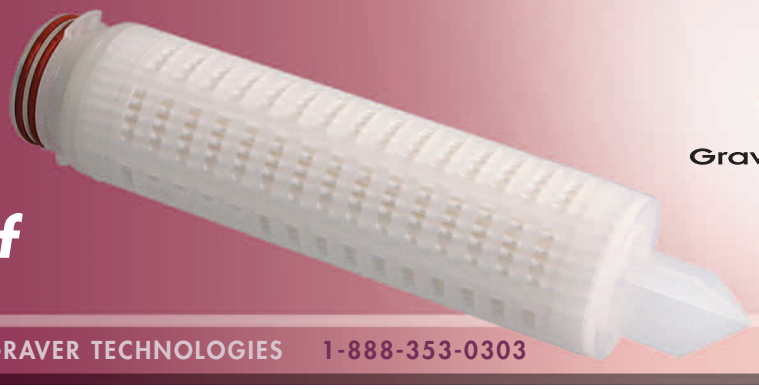

Graver Technologies

# Technical Brief



TB–015

# Silt Density Index

**Reverse Osmosis** (RO) is a membrane-technology filtration method and is most commonly used to produce drinking water from seawater by separating the salt and other substances from the water molecules. Membrane fouling is the main cause of permeate flux decline and loss of product quality in reverse osmosis (RO) Systems, so predicting the potential for fouling in RO systems is a critical consideration of design and operation. Silt Density Index or SDI (ASTM standard test method D 4189-82), is the empirical test developed for measuring the potential rate of fouling of nano filtration (NF) or RO membranes. It represents the potential for fouling of the membranes by finely suspended particles (silt), bacteria, and organics that may be present in the feed water.

SDI has become an accepted method for estimating the rate at which colloidal and particle fouling will occur. As such, membrane manufacturers and system designers insist that the 15 minute SDI value of the feed water should be as low as possible, and in any case, should not exceed 4.0, to minimize fouling of membranes. The index is also used to evaluate the effectiveness of various pretreatment processes like clarification and filtration.

## To calculate SDI follow these steps:

*Step 1:* Measure the time required to filter a fixed volume of water through a standard 0.45µm pore size microfiltration membrane at a constant pressure of 30 psi (2.07 bar). Record this as Ti, or T initial.

*Step 2:* Take additional time measurements, normally after 5, 10 and 15 minutes (after silt build up)

*Step 3:* Calculate the Plugging Factor after 5, 10 and 15 minutes as follows:

$$PF_5 = (1\text{-}T_i/T_5)*100$$
$$PF_{10} = (1\text{-}T_i/T_{10})*100$$
$$PF_{15} = (1\text{-}T_i/T_{15})*100$$

*Step 4:* The SDI value is then determined at each interval as SDI = PF/T.

**Data Interpretation:** The lowest SDI value, which is most often at 15 minutes, is the value reported. Example: Your time measurements indicate a Ti of 1 minute and $T_{15}$ of 4 minutes. Plugging factor is then calculated as PF= 1-(1/4)*100 = 75 The SDI is then calculated as SDI = 75/15 = 5 This means there has been a 4X decay of flow which equates to about 75 % plugged on the 0.45 micron disk. SDI above 5 means the plugging percentage is even higher. On waters with high SDI, it's often useful to measure the SDI at 5 and 10 minute intervals. The resulting values, SDI-5 and SDI-10 can provide a better indication of the rate at which the membrane is plugging.

The test, although popular, is at best an empirical method and its interpretation calls for some expertise on the part of the person carrying out the test. There is no direct correlation between turbidity of a water stream and it's SDI. Experience has shown that water with a very low turbidity (< 1 NTU) may have a high SDI value. Surface water invariably contains high levels of fine suspended solids and therefore exhibits high turbidity as well as high SDI, calling for extensive pretreatment to achieve acceptable values of SDI and turbidity in feed water.

Filter Recommendation: Graver recommend the use of high efficiency, consistent performing melt blown filters, like Stratum A or Stratum C Series to reduce SDI and protect RO membranes.