Introduction

The Silt Density Index (SDI) is a measure of the suspended particulate in a water stream. All the major membrane manufacturers have traditionally used it, as a criterion for acceptable feedwater quality and its measurement and recording is normally required on a daily basis as part of warranty conditions. It is a useful tool for judging the efficiency of membrane pre-treatment processes such as multi-media filters and is therefore often used in optimisation of these unit operations.

The following note details the equipment required and the procedure followed to measure the SDI from a sample point on an operating plant.

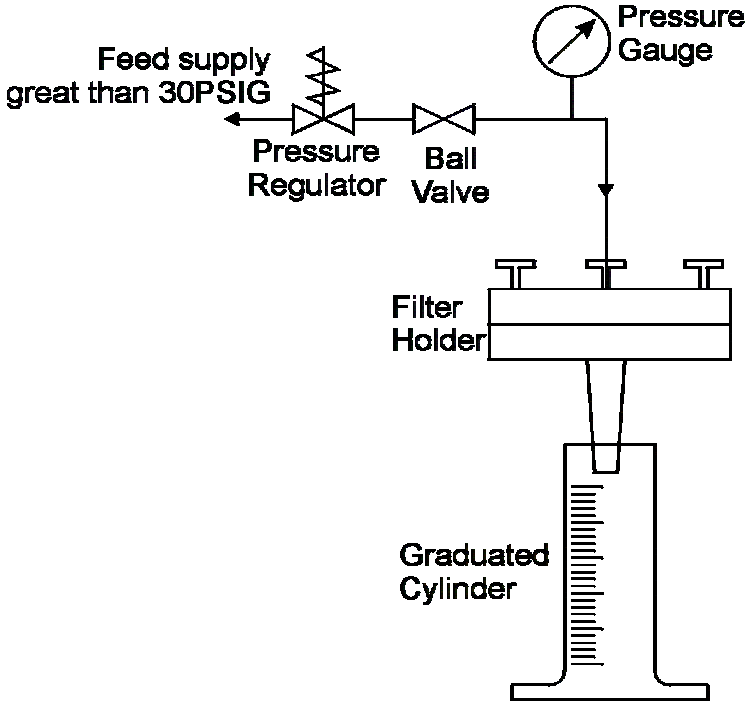

Figure 1: Typical (manual) SDI Measurement Equipment

SDI Measurement Technique

The concentration of suspended particles is determined by measuring the silt density index (SDI) of the water. The test is not an absolute measurement of particulate matter. The SDI is calculated from the rate of plugging of a 0.45 µm filter when the water is passed through the filter at 207 kPa (30 psig). The SDI is a ratio determined by measuring the time taken to pass a known volume of water through a clean filter compared with the time taken 15 minutes later.

The equation to calculate the SDI value is:

$$SDI_{Time} = 100(1 - T_0 / T_{Time})/Time.$$

Where:-

SDI_{Time}=Silt Density Index value

T_0 = initial filtration time (in seconds),
T_{Time} = filtration time (in seconds) after *Time*,
Time = interval between the two readings (in most cases 15 minutes).

If the T_{Time} is more than 5x T_0, then the measurement must be repeated with a reduced *Time* period. The SDI_{Time} is then calculated as before.

SDI measurements are often taken from the raw water, inlet/outlet of media filters and cartridge filter outlets to assess pre-treatment efficiency. Measurements on the raw water may require a shorter SDI measurement interval, (*Time* period). SDI measurement from pressure vessel brine outlets can also prove useful.

Equipment Required

To carry out an SDI measurement the following equipment is required. (Please see figure 1 for a diagram of an SDI kit.)

- Pressure reducing valve
- Pressure gauge
- Feed valve
- Filter holder (0.45micron filter paper)*
- Measuring cylinder
- Stopwatch.

The SDI kit is normally used to measure membrane plant feedwater quality just prior to the high pressure pumps. The kit must be attached to a sample line, which is operating at a minimum of 30 psi.

Procedure.

To make an SDI measurement:

1. Flush the equipment at least for 10 minutes by opening the feed ball valve.
2. Close Feed valve and install a 0.45 micron membrane filter into the 0.45 micron filter holder.
3. Rinse the membrane filter and exclude any air bubbles by 'cracking' open the Feed valve for a few seconds.
4. When ready to measure, place the filter discharge tube in the measuring cylinder at the same time open the feed valve and start the stopwatch.
5. Immediately after that, set the pressure reducing valve exactly to 2.07 bar (= 30 ± 1 psi).
6. Collect 500 ml of water and note the time for collecting the 500 ml (this is T_0). Do not stop the stopwatch.
7. After exactly 15 minutes of total elapsed flow time replace the discharge tube in the measuring cylinder and collect another 500 ml of water, noting the time for collecting the second 500 ml (T_{15}). If conditions permit it is useful to gather SDI_{Time} information at 5 minute and 10 minute *Time* intervals
8. Calculate SDI_{Time} from the equation above.
9. Add the new datapoint to the plant operating log and maintain a trend of the SDI over time.

This procedure is based on **ASTM D4189.**

* Suitable filters and filter holders can be obtained from Millipore (or equal).

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