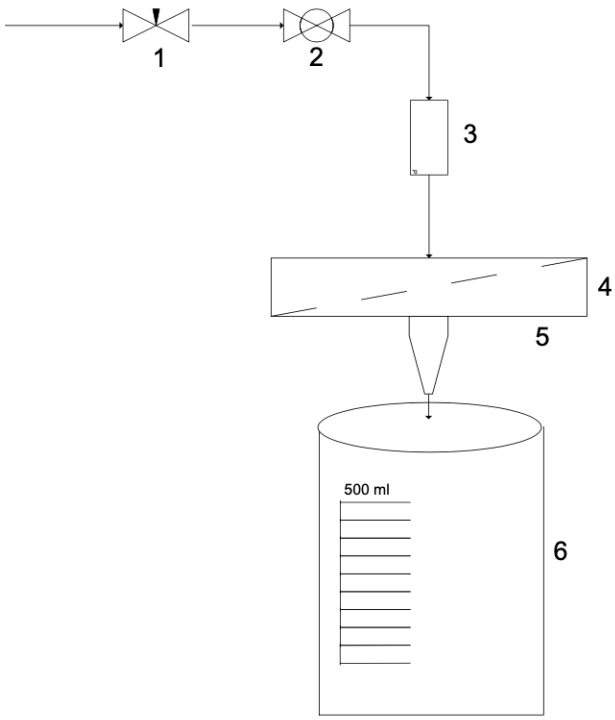
Measuring Silt Density Index (SDI)

The potential for particulate and colloidal fouling in water purification systems can be estimated by the Silt Density Index (SDI). This is done by measuring the time for 500 mL of the feed water to filter through a 0.45 µm membrane at 2 bar (30 psi). Membrania® RO membranes require a feed SDI of <5 at all times. SDI measurements should be scheduled on a regular basis for RO membrane systems. While there is no direct correlation between SDI and turbidity, generally feed waters with a turbidity <1 NTU have an SDI <5 and have very low fouling potential. ASTM Standard D 4189 defines the procedures for this test.

EQUIPMENT

The following equipment is needed to perform an SDI measurement. The figure below illustrates the test set-up. Numbers in the diagram reference the following numbered list:

1. Needle valve or other pressure regulating valve
2. 6.35 mm (1/4'') ball valve
3. 0 - 5 bar (0 - 70 psi) pressure gauge
4. 47 mm diameter filter holder
5. 0.45 µm membrane filter (47 mm diameter)
6. 500 mL graduated cylinder
7. Thermometer
8. Tweezers
9. Stopwatch



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TEST PROCEDURE

1. Measure the feed water temperature, and ensure that the beginning and ending feed temperature does not increase or decrease by more than 1°C (33.8°F).
2. Insert the 0.45 µm membrane filter into the filter holder. Avoid touching the filter with fingers. Use dull tweezers to avoid touching the filter.
3. Bleed entrained air and tighten the O-ring seal.
4. Adjust the pressure regulator to 30 psi.
5. Open the ball valve completely and start the timer. Stop the timer once the graduated cylinder has filled to 500 mL. Record this time as ti.
6. Allow the feed water to continue filtering for 15 minutes.
7. Repeat the step 5, however this time record the time as tf.
8. Retain the filter sample for future reference.

CALCULATION

The following calculation can be used to determine the feed water SDI:

$$SDI = \frac{\left[1 - \frac{t_i}{t_f}\right] \times 100}{15}$$

where ti is the time measured for 500 mL of feed water to filter initially, and tf is the time measured for 500 mL of feed water to filter after 15 minutes.

The maximum allowable SDI value for Membrania® membranes is 5.0. If the SDI value is >5.0, additional pretreatment should be considered. In order to reduce the amount of cleaning needed, RO & NF feed water will ideally have an SDI <3.0.