Information on silt density index (SDI) testing.

What's new in the 2007 version of ASTM D4189?

An update, to the standard for Silt Density Index testing (ASTM D4189-07) was released in July of 2007. The update addresses a deficiency and in our opinion corrects an error that has existed since the standard was first released in 1989.

Perhaps the most critical component of the SDI test is the membrane filter used in the test. Previous versions of the standard had defined the membrane as follows:

> **6.2** Membrane Filter, 47 mm in diameter, gridded, and with a mean pore size in the range 0.45 +/- 0.02 µm, inclusive. Use only filters that are packaged in the same orientation.

Note that the type of membrane, that is, the polymer, was never specified. While standard practice has been to used mixed cellulose ester membranes, the lack of a specification meant that membranes of other polymers could be used. Since membranes of different polymers have widely varying permeability characteristics this is a potentially huge source of variation in test results.

The error in the old standard was the designation to use a "gridded" membrane. This never made sense and in conversations with water professsionals all around the world I never encountered one who was using "gridded" membranes. This is significant because the process of "gridding" the membrane affects the surface of the membrane making it more permeable. This obviously introduces an unwanted and unneeded variable.

Both of these issues have been corrected in the new standard. Section 6.2 has been expanded to include the following definitions of the membrane filter properties:

> **6.2** Membrane Filter:
> 6.2.1 Membrane—white hydrophillic, mixed cellulose nitrate (50–75 %) and cellulose acetate (MCE).
> 6.2.2 Mean Pore Size—0.45 µm.
> 6.2.3 Diameter—47 mm nominal, plain.
> 6.2.4 Thickness—115–180 µm.
> 6.2.5 Pure Water Flow Time—25–50 seconds/500 mL.
> 6.2.6 Pressure—91.4–94.7 kPa (13.3–13.8 psi).
> 6.2.7 Bubble Point—179–248 kPa (26.0–36.0 psi)

How do the membranes from different manufacturers compare?

For many users, the Millipore membrane has been the "standard" membrane for silt density index testing. If you Google silt density index you'll even find a reference or two that actually states that the test is to be performed with a Millipore membrane. Since the characteristics of the membrane has a profound effect on the results, we prepared a comparison of the leading membranes.

Manufacturer	Type	Part #	Bubble Point psi	FlowRate (mL/min/cm^2)	Porosity (%)	Thickness µm
Advantec-MFS	MCE	A045A47A	≥ 35.0	45 (1)	78	145
Whatman	ME-25	10401612	36	38 (3)	74-77	135
Millipore	MF	HAWP04700	32	60 (2)	79	180
Pall-Gelman	GN-6	63069	26	65 (1)		152

This comparison reveals some interesting differences. Especially interesting is the relatively "loose" characteristics of the Millipore membrane which is so widely used. The "loose" designation is supported by the relatively low bubble point and a corresponding high flow rate of the Millipore membrane. For use in SDI testing, "looser" translates to less consistency and less reliable results. Given the many variables in the silt density index test, adding membranes as a variable doesn't make sense. We don't have any experience with the Whatman membranes, but based on their specs they look like a viable option. And of course, we recommend Advantec-MFS membranes without reservation.

Which side of the membrane is the feed side?

The membranes used for silt density index measurement are asymmetrical. This asymmetry means that one side is slightly shinier than the other. The shiny side of the membrane has pores that are smaller than the "dull" side. For consistent and the most accurate results, you should always use the "shiny" side of the membrane as the feed side.

Why does it matter which side of the membrane is used as the feed side?

Because the membranes are asymmetrical, the pores are smaller on the shiny side. Using the side with the smallest pores ensures that the particle size retained by the membrane are more consistent with the rating of the membrane. In practical terms, the difference is small, but if you want consistent results, its worth the effort.
