Incoming Inspection - Is The Viscosity Correct?

Material handling procedures in most food companies utilize pass/fail tests to accept incoming product from suppliers. Viscosity, or resistance to flow, is one of several parameters that may require an inspection check by the QC Department. A problem arises when the supplier simply reports a viscosity value, but gives no information on how the number was established. A typical example is a viscous product like molasses with a reported viscosity of 25,000cP. The number tells us that the material is "thick", but the QC Department is hard pressed to verify without more information.

The science of viscosity tells us that most materials have a flow behavior which exhibits a decrease in viscosity with increasing shear rate. (**See Figure 1**) This is fortunate because it means that we can pump food materials more easily (and with less energy) once everything is moving. So when a vendor cites a viscosity value for a material, the question is what shear rate they used to make the viscosity measurement.

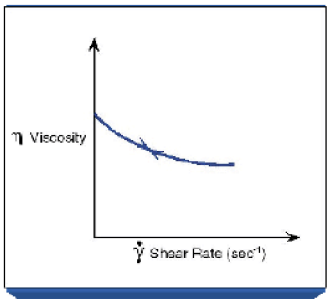

Figure 1
Flow Curve for Viscosity vs Shear Rate for Shear Thinning Materials

Figure 2
Brookfield DV-II+Pro Rotational Viscometer with Disc Spindle

Rotational benchtop viscometers provide an effective yet inexpensive means to make this measurement. (**See Figure 2**) Using a standard disc spindle immersed in the material, such as the molasses mentioned above, different speeds of rotation will produce different viscosity values.

Running at 10rpm with the spindle shown might give the 25,000cP value. But a lower speed, say 1rpm, might give a significantly higher value, perhaps 40,000cP.

There is one other detail to pin down and that's temperature. What was the temperature of the material when they performed the viscosity measurement? Most materials exhibit a viscosity-temperature relationship similar to **Figure 3**. If the material was measured at room temperature, does that mean 68°F (20°C) or 77°F (25°C) or perhaps higher? Now you can see why defining the temperature of the material at the time of test is important. Molasses viscosity might change by more than 10% at a controlled shear rate with a 15°F change in temperature.

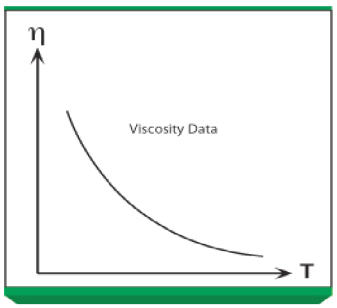

Figure 3
Viscosity - Temperature Profile Characteristic of Most Materals

As you improve incoming inspection with periodic checks to verify vendor claims, make sure that the viscosity spec is clear. Don't let the supplier simply give you a number and assume that they have done their job. Ask for the details of how they performed their test. Then rest assured that your QC Department should get the same cP value. And if you don't, then it's time to challenge your supplier.

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