JAM ANYONE?

Jams are popular food items with consumers and have a number of broad based applications, such as being spread onto breads, used as fillings in pies and pastries or as decorative coatings on confectionary items. To obtain the desired consistency, the food manufacturer will make a viscosity measurement to evaluate the jam's resistance to movement. Holding shape, once applied, is the key to a successful application and ultimate customer acceptance.

Figure 2: Brookfield RS-SST Rheometer with Vane Spindle

Traditional testing with a rotational viscometer and accessory, such as a T-bar spindle, can be difficult as jams often have solid particles, like pieces of fruit or seeds, which can cause large variations in viscosity values whenever the "T" makes contact with these small objects. (See Figure 1.)

Figure 1: Viscosity can be measured with T-bar Spindle

A more comprehensive test method requires the use of a rheometer as shown in Figure 2. The approach is to run a specific test which produces two numbers: a yield stress value and the modulus (slope of line leading up to yield stress). Yield stress defines how much resistance the jam has to movement before flow begins. Modulus characterizes the stiffness of the jam.

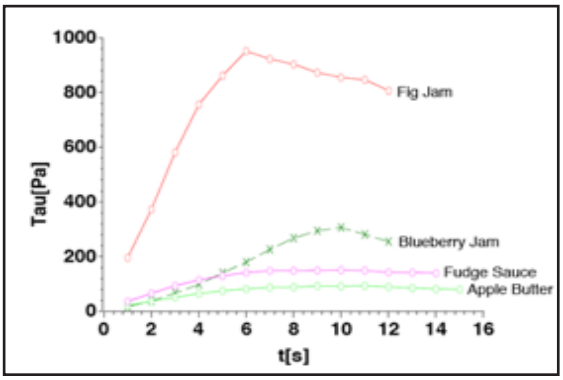
One convenient fact about the yield stress test is that it can be done quickly, usually in less than 30 seconds. The type of spindle used is known as a "vane spindle". The technical advantage afforded by this spindle is that it can be inserted into the jam without disturbing the gel structure. When the spindle rotates, the jam trapped between the vanes shears against the jam outside the circumference around the vanes. The test setup would be as follows:

TEST EQUIPMENT	TEST METHOD	PROGRAM
• Instrument: R/S+SST Rheometer (Soft Solids Tester)	• Controlled Shear Rate (CSR)	• On step
• Geometry: V80-40, V40-20 Vane Spindles		• Start RPM = 0.5
• Software: RHEO 3000		• End RPM = 0.5
		• Time = 20 seconds

Plot: Shear Stress on Y-axis, Time on X-axis

The unit of measurement for yield stress is Pascal, which is abbreviated "Pa". Yield stress is one example of a shear stress value that is associated with the flow behavior of the jam. Once the jam starts to flow, the viscosity can be measured as a separate test to further evaluate the physical properties. In this application, we will limit the discussion to measurement of yield stress.

The following graph shows yield stress data for four different types of jams and toppings. The maximum shear stress value in each graph is the "Yield Stress" for that particular material. The fig jam has a yield stress just below 1000 Pa, while the others have considerably lower values, all under 300 Pa. The vane spindle geometry easily distinguished these four different ranges and allows for a quick pass/fail test.



In going forward with your Quality Control program, consider the measurement of Yield Stress as a way to improve the consistency of your product.

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