

CONTROLLING MIX VISCOSITY DURING BLENDING

Most mixing operations in the food industry work to a set blending formula established by R&D. Even with variations in raw ingredients, due to the differences found in the materials provided by multiple suppliers, mixing equipment has been able to produce relatively consistent batches that meet process requirements. The need to check for viscosity in process has been negligible because experienced process engineers can judge mix quality based on equipment performance and observation of the resulting mixture during downstream processing. New methods of measurement now means that it is easier to quantify and control these parameters than in the past.

Certain applications benefit from measurement and control of in process viscosity during mixing because the flow behavior of the blended material is critical to acceptable performance of the final product. Batter coating of food items incorporates in process viscosity control (see Figure 1) because the thickness of the coating on chicken or fish pieces directly correlates with the viscosity of the batter mixture. The obvious benefit is consistency of final product (uniform coating vs. too little or too much) coupled with minimizing waste due to excess batter consumption.



Figure 2
Brookfield DV-E Viscometer with
Standard Spindle for Quick Single
Point Viscosity Measurement

The movement toward no fat and low fat formulations (sauces, creams, dressings, for example) to meet changing customer demands has led to blended mixtures which have more significant variation in flow behavior. Manufacturers have in some cases adopted grab sample methods to evaluate mixture viscosity in the QC lab before allowing processing to continue. Quick single point tests with a standard benchtop viscometer gives data which permits a rapid pass/fail determination (see Figure 2). Process adjustments are quickly made on the production floor to increase or reduce viscosity, by adding thickening agents or base liquid (water, milk, etc.).



Figure 1
Brookfield AST100 Process
Viscometer Used in Batter
Coating Operations

A new development in viscosity measurement, which helps to characterize mixing methods more completely, is the use of the vane spindle. (See Figure 3) This type of spindle can mix materials while measuring viscosity simultaneously, (See Figure 4) provided the torque capacity of the instrument is correctly matched to the spindle and the mixture. It is particularly effective in the evaluation of suspensions, mixtures which contain particulate material, because settling is minimized and the flow behavior of the “complete mixture” is captured. One additional capability afforded by the vane spindle is the ability to measure the non-flowing “stiffness” of formulations (icings, fillings) using the Yield Stress test method. (See Figure 5)

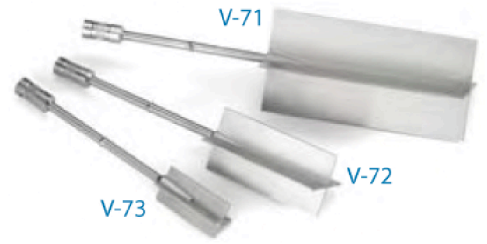


Figure 3
Vane Spindles for Use In Viscosity Measurement of Blended Mixtures (Sauces, Dressings, Condiments)



Figure 4
Brookfield R/S-SST Rheometer with Vane Spindle Keeps Particulate Additives in Suspension during Viscosity Measurement

during blending can be considered for the types of reasons given above.

What’s the conclusion? Mixing operations may benefit from a fresh look at some of the new methods for evaluating quality from batch to batch. If consistency issues or coping with changing formulations are becoming problematical, perhaps it’s time to reassess how viscosity is measured. And then even the possibility of on-line viscosity control

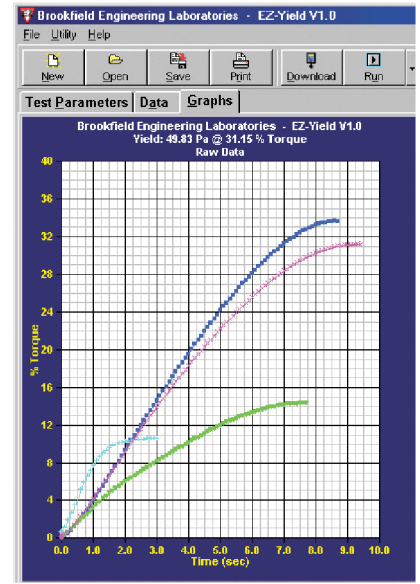


Figure 5
Flow Curve which measures Yield Stress and Provides Assessment on “Stiffness” of Mixture