Frozen Beverages
With The Perfect Viscosity

Challenge: How do you keep a frozen beverage held in suspension as long as possible? An ice-blended Margarita, for example, has the consistency of "slush" – much like partially melted snow. (*See Figure 1*) When the liquids are blended during preparation of the drink, there is bonding between the ice (crushed into fine particles), the pre-mix and any added liquor. The question is how long can this suspension be maintained, which in turn affects customer satisfaction with the beverage.

Figure 1:
Frozen Margarita Beverage

This state of suspension can be measured in a laboratory or production area using a standard benchtop rotational Viscometer and Small Sample Adapter accessory with a Refrigerated Water Bath. *Figure 2* illustrates a test system configuration that can be used to quantitatively measure the "in suspension" viscosity of the slush, as well as determine when and how rapidly the suspension starts to separate. This instrumentation can also control temperature variations from a frozen state to an ambient condition, thus simulating an actual situation that a consumer would experience.

Figure 2:
Brookfield Viscometer with Small Sample Adapter and Refrigerated Circulating Bath

We know that, at some measurable point in time, the separation starts. Observing what happens from that point until full separation is achieved is important to examine. The Viscometer is set to rotate the spindle at a constant speed, say 10rpm (*see Figure 3*). At the outset the sample will be at a relatively high viscosity, possibly over 10,000cP. As the temperature is adjusted from frozen to ambient, viscosity will decrease. (*See Figure 4*) Programming an increasing temperature curve into the bath makes it possible to run an automated viscosity test, which shows how the viscosity of the mixture decreases as the temperature increases.

Figure 3:
Cutaway of Spindle in Small Sample Adapter

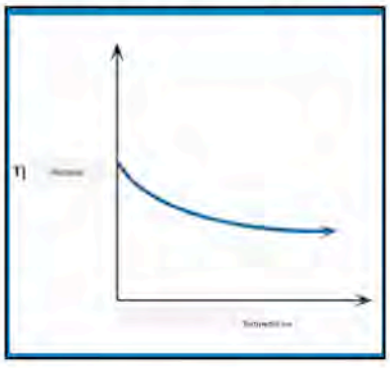

Figure 4:
Viscosity Flow Curve

Some mixtures start to deteriorate almost instantaneously when poured from the blending apparatus to the glass. Others tend to hold together for a longer time, but the question is whether they will hold together long enough. When the separation is complete, drinking the beverage from the glass has two possible outcomes – you get a mouthful of liquid and a nose-full of "slush" or you try and shake the glass a tad bit, hoping to reconstitute the mixture, but maybe ending up with messy, sticky results.

Trying to change ingredient proportions – more ice or more mix may have some effect on the long-term consistency of the beverage. Further tests can be run to see how the viscosity holds up. If separation occurs within only a few minutes, this will create a definite problem because the impact of the

alcohol will be immediate and significant on the consumer. But, if you could get 20 minutes or more worth of a well-mixed concoction, you would have a winner because the sipping pleasure of the blended mix would remain constant.

Now, how can the beverage industry solve this problem? Doesn't it sound like an interesting challenge? Using a Test System like the one shown in Figure 2 provides the equipment required to monitor and predict the potential time period in which the beverage will maintain consistency and is acceptable. A knowledgeable Food Technologist working with a Beverage Ingredient Specialist could come up with the ultimate solution! Perhaps some additive (like an associative thickener), or a special juice concentrate with a secret ingredient from a far away country or new blending idea will be the answer. Of course, test equipment manufacturers like Brookfield are ready to help. Getting a Rotational Viscometer into your beverage lab.... now that is the beginning of a solution!

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