TA Instruments

Thermal Analysis & Rheology

RHEOLOGY SOLUTIONS

EVALUATION OF THE SUITABILITY OF RAVIOLI MEAT FILLINGS

PROBLEM

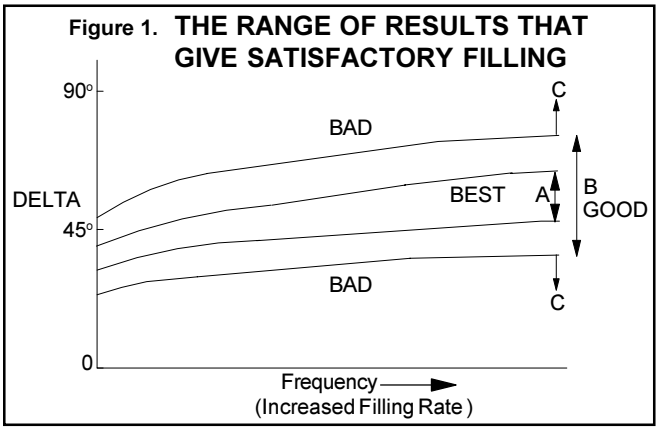
The consistency of meat fillings used in pasta products such as ravioli is a key parameter in determining the success of the filling (stuffing) process and ultimately the quality of the final product. Since improper consistency at the time of filling cannot be corrected, bad meat batches must be discarded resulting in waste. In addition, wasted preparation time and downtime for cleaning the filling machines further increases the cost associated with bad filling. Hence, the need for a quick quality check on consistency during preparation. The consistency of the filling is a property related to its viscosity. However, a conventional single point viscosity measurement is not sufficient to determine proper consistency.

SOLUTION

Meat filling mixtures are in effect "flexible solids". That is, they show varying amounts of liquid or solid behavior depending on the conditions to which they are exposed. This solid-liquid behavior cannot be measured by traditional viscosity tests where the material is forced to flow continuously in one direction. Rather, an oscillatory test where the material is peturbed by a sinusoidal stress must be used. A controlled stress rheometer is typically used for such oscillatory tests. The test variables include oscillation frequency (usually a frequency sweep is used to approximate a range of filling rates), torque (stress), temperature (chosen to be the actual temperature of filling) and time. The results obtained are expressed as the rheological parameter delta (δ). If a material is an ideal solid its δ value will approach 0°, whereas if it is an ideal liquid, δ will approach 90°. A purely elastic material will have a δ of 45°.

Figure 1 shows the range of δ results obtained for a series of different batches of meat filling evaluated over several months. Use of the meat fillings ultimately showed that those whose δ versus frequency curves were unsatisfactory. (Said another way, if the filling had a δ value near 45° at frequencies representing typical filling rates, it was a good material. With this correlation diagram, it was then possible to evaluate future batches using only the 5 minute rheological evaluation.

Figure 1. THE RANGE OF RESULTS THAT GIVE SATISFACTORY FILLING



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