**Intrinsic Viscosity Measurement**

**Issue:** Processability and end product properties of recycled PET require adherence to best practice specifications. One critical quality control parameter for recycled (and virgin) PET is Intrinsic Viscosity (IV), which is a measure of resin molecular weight. A standardized test method for measuring IV would establish a protocol acceptable to most suppliers and consumers of recycled PET, and minimize the variance in reported values for IV caused by different test methods or test conditions.

**Background:** The IV is related to the composition and molecular weight of the PET resin, and is a common descriptor of PET flowability. The Best Practice specifications for PET flake and pellets stipulate IV requirements for end products using recycled PET.

Intrinsic viscosity is determined by dissolving a small sample of PET in a solvent and measuring the time required for 100 ml of the solution to flow through a capillary viscometer at a fixed temperature. The flow time is compared to that for a standard solvent under the same conditions. Concentration and time then are used to compute the IV.

Several different procedures are used by the PET recycling industry to measure IV. These include test methods developed independently by resin companies, equipment suppliers, recyclers, and American Society for Testing and Materials (ASTM). Although correlations exist between some of these methods, these relationships are subject to variations. An industry accepted test method would result in more accurate and comparable measurement of IV for recycled PET products.

**Best Practice:** The Best Practice for determining IV of post-consumer PET is to measure it according to ASTM D4603, *Standardized Test Method for Determining Inherent Viscosity of PET*. This test standard also establishes a method for calculating Intrinsic Viscosity. The primary equipment used is a capillary viscometer, such as the Cannon Ubbelohde Type 1B Viscometer referred to in ASTM D4603.

Refer to the sampling Best Practice for information on obtaining a representative sample to test IV properties. Once obtained, the sample must be conditioned to achieve consistent, repeatable IV measurements. All PET samples must be dried to a moisture content of less than 100 ppm. Accuracy of measurement of wet samples is severely compromised. Several PET recycling companies have experienced inconsistent test results due to inadequate drying of test samples.
The IV test procedure must be precisely followed to minimize variability in results. Employees also must be trained in safe handling of the chemicals used and required to wear personal protective equipment.

**Benefits:** An industry accepted test method would result in more accurate and comparable measurement of IV for recycled PET products amongst suppliers, processors and manufacturers.

**Contact:** For more information, contact CWC at (206) 443-7746 or e-mail at info@cwc.org.

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