

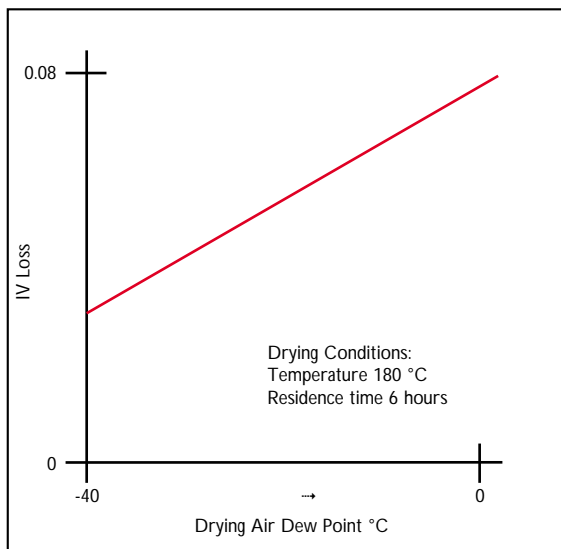


Polymer Chip Drying (Polyethylene Terephthalate)

Background

Polyester polymer chips such as PET are dried prior to injection moulding and extrusion processes in order to reduce free moisture content and improve the quality and appearance of finished product. Careful control of this drying process is an essential pre-requisite for product quality (strength/aesthetics).

In the solid form, PET absorbs moisture from the atmosphere until equilibrium is achieved and this hygroscopic behaviour can mean that the chips contain as much as 0.6 % water by weight. In order to attain maximum performance it is essential to reduce the water content to 0.003 % (30 ppm) prior to heating as any water present at this stage rapidly hydrolyses the polymer, thereby reducing its molecular weight and damaging its physical properties.



Dependence of hydrolytic IV drop after drying on air

Polymer chip material is processed on a hopper load basis by a flow of heated and dried air from a desiccant dryer. The recognised practice is to expose the chips to an air of dew point below -40 °C dew point for a fixed period of time. Following this process the chips are down loaded into another hopper supplying a moulding machine. A typical manufacturers factory will have 10 to 50 such drying and moulding machines.

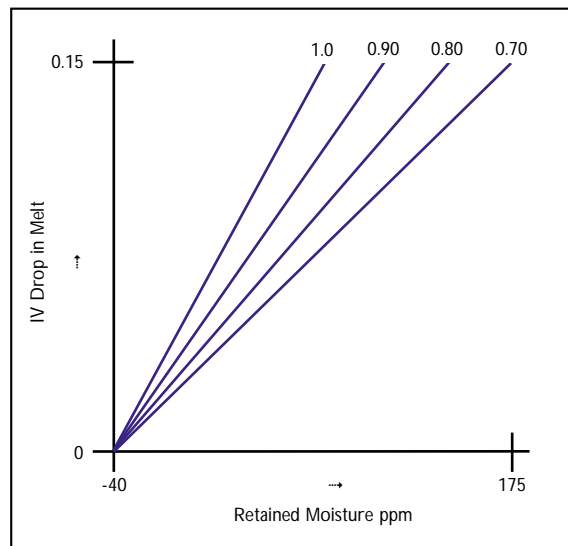
The relationship of drying air dew point and IV - intrinsic viscosity, can be seen in the picture right. Losses in IV result in



Plastic bottles made from polymer chips

adverse effects of the required end product properties - both aesthetically - it is not possible to achieve a consistent, flawless appearance and in terms of strength.

Note: by definition IV or Intrinsic Viscosity is the gradual yielding of solids to forces tending to change their form.



Relationship between IV drop and retained moisture



Typical Problem Areas

- Air filters blocking
- Return air cooling
- Heater failure
- Ingress of air (ambient)

Measurement Technique

1 On-line Continuous Measurement

Cermet II is used to monitor individual dryers to ensure that the air supply is better than the specified dew-point temperature limit of -40°C dew point and so assures that the chip material is processed to a satisfactory degree. Audible and visual alarms can be connected to the Cermet II dual alarm system to warn maintenance staff when the dryer begins to deteriorate.

The sensor is positioned before the hopper to measure the dew point of the air being passed into the dryer and over the chips.

Transmet can be used if the air drying system is PLC controlled with input capability to accept Tansmet's mA or digital outputs.

Measurement Technique

2 Spot Checking

The Cermax Portable Dewpointmeter can be used to check the efficiency of a drier under operational load. Using Cermax to perform spot checks at regular intervals offers a cost effective assurance of product quality. With easy operation and fast

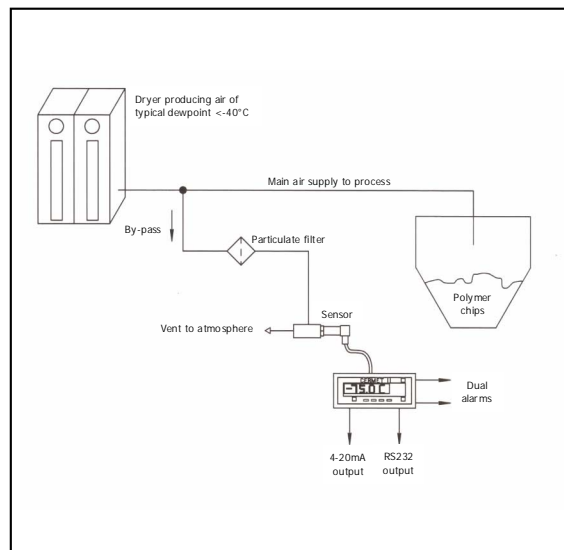


Diagram to illustrate Cermet II in use in a polymer chip drying application

response to industrial standard dewpoints of less than -40°C multiple drying facilities can be monitored within reasonable time frames by maintenance personnel at low costs.

Where particulate contamination (dryer desiccant or polymer dust) is present at the sampling point, in line filtration is recommended.

Reference Users

Bespak Europe Ltd, Conair, Constar International (UK) Ltd, Demag Hamilton Ltd, Hiflex Hose Ltd, Piovan, PL Plastics, Schmalbach-Lubeca PET Containers Ltd, Somos

