

Procedure for the mobile inspection of plastic granulates for thermoforming applications in the incoming goods department

Background

Thermoforming is a procedure for shaping thermoplastic materials using vacuum or compressed air. Prefabricated semi-finished products or foils are used which are shaped into the respective products and components. The semi-finished products which are required for this are usually manufactured from plastic granulates using extrusion. The production of granulates from newly produced plastics is a well-known and established process in which granulate can be created with consistent quality and properties. However, it is much more expensive and challenging to manufacture granulates from recycled plastic material, due to the unknown quality of the material, especially the unknown age and the unknown number of previous recycling processes. Therefore, the quality and thus also the mechanical and rheological properties of the recycled granulates vary considerably. It is thus required to examine granulates from recycled material to assess their usability before using the material in manufacturing plastic components. Considering strict EU regulations on the recycling of plastics, an increase in reclaimed plastic materials can be expected. Therefore, a fast and simple inspection method of recyclates and granulates is indispensable.

Problem

Current cutting-edge technologies provide various methods for determining the properties of plastic materials, for example determination of the melt index or melt flow rate, rotational rheometers or high-pressure capillary rheometers. The various testing methods have in common that the polymer melts are examined in shearing, whereby the results (i.e. the conclusions based upon them) are only limitedly applicable to the elongation of the melted material in the thermoforming process. Therefore, there is currently no methodology which can measure the thermoformability of incoming granulate upon arrival at the production site.

Solution

Scientists at the University of Stuttgart have developed a testing procedure and the respective equipment for testing the elongation properties of plastic granulates. Fundamentally new in the procedure is the fact that thermoformability can be assessed based on the biaxial stretching and the resulting maximum stretching or elongation from the material itself. Therefore, it is not required to first make semi-finished products and then test pieces from the granulates in order to determine the thermoformability of the raw material. In the procedure that has been invented, a sample of the granulate to be processed is melted, pressed through the hollow testing device and then inflated until the maximum stretch or deformation is reached. The maximum stretch is determined, which can then be referred to as measurement for the thermoforming suitability of the granulate. In this way, it is possible to quickly

Contact

Dr. Dirk Windisch
TLB GmbH
Ettlinger Straße 25
76137 Karlsruhe | Germany
Phone +49 721-79004-0
windisch@tlb.de | www.tlb.de

Development Status

Validation / TRL4

Patent Situation

DE 10201820998 A1 pending

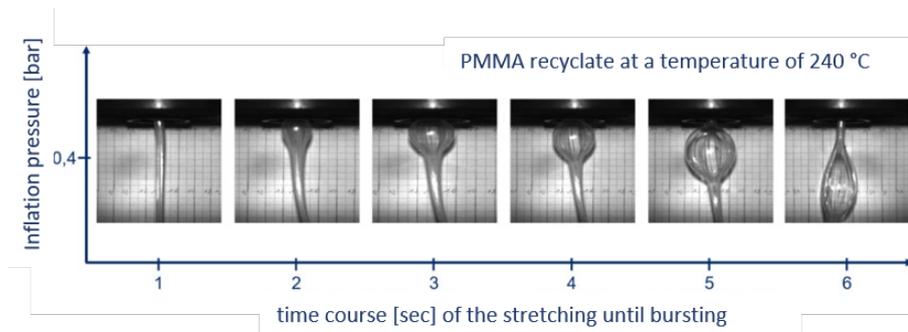
Reference ID

18/016TLB

Service

Technologie-Lizenz-Büro GmbH has been entrusted with the exploitation of this technology and assists companies in obtaining licenses.

and inexpensively examine if the granulate fulfills the expected properties when receiving the material.



Timing of the test procedure in which the granulate to be tested is melted and inflated to its maximum stretch using the testing equipment. [Image: University of Stuttgart IKT]

Advantages

- Immediate examination of the thermoformability using the granulate
- Examination of suitability for blow molding, foil blowing and injection stretch molding
- Quick and simple
- reliable results
- Ideal for the analysis of recycle granulates
- Examination under real process conditions and deformations

Fields of application

Incoming material inspection of plastic granulate/recyclates in thermoforming industry