

ECOLOGICAL AND ECONOMIC ASPECTS OF PLASTICS RECYCLING METHODS MODERNIZATION

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At present mankind produces polymers as many as pig iron, steel, metal-roll and nonferrous metal products together are produced throughout the world. Plastics production increase leads to the amount of waste growth correspondingly. It brings to genesis of two major problems – economic and environmental. The economic problem is the necessity to reduce the use of the fresh raw materials in plastics production since these resources are exhaustible and use the secondary raw materials, i.e. waste, in production. The environmental problem consists of the fact that an overwhelming amount of waste is burnt at special landfill sites and waste incineration plants until now in connection with that a lot of pollutants are emitted into the atmosphere.

Thus, on the one hand, the burning of waste results in pollution of environment and, on the other hand, the increase in plastics production leads to exhaustion of the main source of polymers – oil. Therefore, a major task is to find the co-decision for resolution of these two problems, that may be achieved by introducing the new high technologies for polymer wastes recycling [1].

However, the processing of the secondary raw material has a number of problems, such as sorting of polymer wastes because many polymers can not be mixed, wear of the secondary raw materials in primary operation. The recycled materials have different mechanical properties and ageing resistance compared with the corresponding original polymers. All original polymers should be stabilized to prevent the technological destruction and destruction in the permanent use with the help of carefully selected additives. A great amount of stabilizer is lost during production and operation, in result of that the recycled polymer contains a lower amount of the remaining active stabilizer than it is required for destruction protection. Consequently, when selecting the technology for raw materials recycling, it is necessary to foresee modification of reduced polymers with use of special additives.

Today an extrusion method for plastics recycling is mainly used in Ukraine. However, this method has a number of faults, such as process instability, screw seizure, parts wear, gelation, problems connected with the melt flow in the head and the necessity of special additives adding in order to improve mechanical properties of polymers, that results in complication of the processing line with additional processes and equipment [2].

Today, a molding method with application of the MuCell technology (Microcellular Injection Molding) is widely used in Germany, Japan and other developed countries. This technology consists of the diffusion of “supercritical” gas into molten polymer with generation of the single-phase solution. In molding process gas generates pores around the whole body of the product with a diameter from 0.1 to 10 μm [3]. The generated foamy structure eliminates the necessity to apply the sealing pressure, that improves stability of the product sizes and its mechanical properties making unnecessary to add special additives.

The main advantages of application of the MuCell technology are:

- MuCell-process does not require use of additional foaming agents;
- depending on the used material it is possible to carry out the controlled reduction of the product weight by 95%, that contributes to the raw material saving;
- possibility for molding both large-size products and products with a thickness of up to 0.5 μm without deformation and internal stresses.

LITERATURE

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