Секция «Инновационное природопользование»

Resources Efficiency in Plastic product production

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In order to achieve Circular Economy goals until 2030, the EU countries have set in strategic documents to increase the intensity of the use of secondary raw materials in the manufacturing industry: to 65 % from municipal waste stream and 75 % fram packaging waste [1, 2]. The use of recycled plastics in the production of plastics is increasing, but its processing requires considerable energy resources [3].

The aim of this study is to increase energy efficiency by optimizing plastic recycling processes and reducing their impact on climate change. The object selected for the experiment is one of the largest plastic processing companies in the European Union - AB Plasta, which annually recycles over 30 thousand t of polyethylene waste, and produces the same amount of production by obtaining secondary raw material.

Applying the methodology of Cleaner Production (CP) implementation in industrial enterprises [5], the materials and energy flows of AB Plasta technological processes were analyzed, material and energy balances were creative, the main environmental problems, and the reasons for their formation were identified. It has been set up, that polyethylene recycling consumes up to 1.68 MWh/t of electricity and heat, including up to 23 % for drying the plastics. A great amount of energy is lost with hot sewage. The study proposes to install a thermal energy recovery system (water-air). This would reduce the energy consumption for drying the plastics by 50 %. An estimated payback period of this innovation investment is about 1 year.

The study also analyzes the possibility of increasing the recycling of plastic from the municipal waste stream. In Lithuania and other EU countries, a significant amount of plastic is directed to general incineration plants [2]. At this stage, one of the main principles of Industrial Ecology - Industrial Symbiosis would be applied [5].

Applying the principle of industrial symbiosis would increase the amount of recyclable waste from the Lithuanian municipal stream. Later, this recycled waste would be transferred to municipalities for further use of waste products.

Recycled production could increase by 10 thousand. t /year. [1]. This would further reduce the impact of plastic recycling on climate change (CO_2 would be reduced from 1 to 0.8 kg CO_2/t plastic waste, i.e. 20%) [4]. The estimated results after the implementation of the projects are presented in Table 1.

References

1) EU Commission, EU circular economy package, retrieved from: https://ec.europa.eu/commission/presscorner/
2) Lithuanian Department of Statistics, Waste treatment in Lithuania, retrieved from: https://osp.stat.gov.lt/
3) Ministry of Energy of the Republic of Lithuania (2012), The National Energy Independence Strategy of Lithuania, retrieved from: https://enmin.lrv.lt/
4) K. Hillman, A. Damgaard, O. Eriksson, D. Jonsson & L. Fluck. Nordic Council of Ministers (2015), Climate Benefits of Material Recycling
5) Staniškis J.K., Stasiškienė Ž, Kliopova I., Varzinskas V. (2010). Sustainable innovations in Lithuanian Industry: Development and Implementation. Monograph. P.458.

Illustrations

	The current situation in AB Plasta	**After CP project**	**After the implementation of the industrial symbiosis principle**
The Energy intensity energy, MWh/t	1.68	1.3	1.14
GHG, CO_2 kg/kg	1.2	1	0.8

Рис. 1. Estimated results