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paper text:

Feasibility study in plastic production Zehra Gülten YALÇIN¹ Mustafa DAĞ², Ercan AYDOĞMUŞ³, Yasmin Mohamed DAOUD⁴ 1,2,4 Institute of Science,

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Abstract Masterbatch is the raw material of plastics and products that are frequently used in daily life. In most industrial and factory productions, masterbatch is used in the production of raw materials. Masterbatch usage areas; automotive, white goods, electrical and electronics, pet bottle and packaging industries. During the production phase of the facility, Calcite masterbatch and White masterbatch, known under commercial names, are produced in different proportions. Raw materials are produced automatically from cyclones in granular form. Mixtures are prepared in weight ratios according to the characteristics of the product to be obtained

as a result of production. In addition, it is produced in

granule form by cooking at the entrance of the extruder. A feasibility study was carried out in production and the hourly extruder and granulating capacity was calculated as C280.PP 700 kg/hour, C370.PE 700 kg/hour, T370.PE

1000kg/hour. The amounts of polypropylene, calcite, titanium, polyethylene, paint, polyethylene sacks, wooden pallets, stretch nylon, plastic packaging straps and filter mesh, which are the materials required for production, were also calculated. Keywords: Plastic production, Feasibility study, Masterbatches, Used areas

1. Introduction

The use of plastics has started in the recent past, and the

reasons for their preference are that they are durable, lightweight and economical. World plastic production reached 348 million tons in 2017 and 359 million tons in 2018

, from 2 million tons in 1950.

In general, plastics are synthetic organic polymers that have a structure consisting entirely of C-C bonds and whose raw materials are mostly obtained from fossil fuel, coal, oil and natural gas

[1-2]. Plastic use has increased since the 20th century. 1. 1 Plastic definition It is a material that uses petroleum as a raw material. It is also known that it is produced from cellulose in addition to petroleum [3-4]. Plastic consists of

organic-based polymers. Different commercial products are available with different additives. Many additives are used to improve polymeric properties. The main additives used are flame retardants, lubricants, antioxidants, color additives and antistatic agents. With these additives, products of different qualities are obtained due to their strength and

colorants. It consists mainly of monomers and additives[5-6]. 1.2 Use of Plastic The use of plastic began to become widespread with the industrial revolution. It is especially used as a storage container in the food industry [3]. With the

rapid increase in studies in the field of polymers, it has been observed that the development of plastics in the chemical industry has also accelerated. It is seen that this process has increased especially since the 20th century.

*Corresponding author. e-mail address: 228103205@ogrenci.karatekin.edu.tr 1 Firstly, the use of plastics in billiard ball making was first used in America. Later, it became widespread in the field of music with the production of plastic records, plastic cassettes, and CDs. Later, it became the preferred choice for maintaining hygiene in hospitals. By improving some features, plastic items have started to come to the fore instead of glass products. To date, plastic production has become widespread during the war years with the discovery of polyethylene. Widespread areas of use have developed, from the manufacturing of garbage bags to the storage of food products to the toy industry. It was implemented by reducing the use of plastic bags due to the plastic waste that has accumulated in the environment in recent years.

1.3 CaCO₃ Filled masterbatches It is a granulated composition by adding calcite to the main carrier polymer. It is used as filling material. However, adding it to the polymer as a filling material causes some problems. These problems adversely affect the mechanical properties of the material by separating the powders due to density differences, not being able to obtain a homogeneous mixture, and causing accumulation in certain places. It also causes the formation of different colors, wear and pressure increase in the machine, and also causes excessive energy consumption. The requirements for filled products are good strength, UV stabilization and antistatic properties [4].

Titan masterbatches It is a masterbatch product produced especially in certain proportions and colors, with or without filling. The desired properties are to obtain a composition with impact resistance, UV stabilization and antistatic additives. It adds properties such as good coating, dispersion, high heat resistance, high capacity and brightness [4].

1.2 Fill and White masterbatches It eliminates the use of titanium in products that are not desired to be colored. It also provides the product with heat resistance, hardness and therefore increased strength. It causes a decrease in product cost [4]. 1.3 Katkı masterbatchler These are the materials added during the shaping and use phase of the product.

These are additives that give the product long-lasting properties. It provides features such as color, mechanical strength, oxidation prevention, process facilitation, brightness, high transparency, and dust retention. Additionally, it provides moisture retention, prevents spoilage and saves energy. It also has conductivity enhancing properties [4]. 2. Materials and Methods Plastic raw material is produced in granule form. Calculations were made based on 350 days and 8 hours in production. Raw materials are produced automatically from cyclones in granular form. This production is done by taking certain proportions and mixing them according to the characteristics of the product to be obtained. In addition, it is cooked at the entrance of the extruder and produced as granules. 80% calcite masterbatch and 70% calcite masterbatch are used in annual production and the hourly extruder and granulation capacity is C280.PP

700kg/h, C370.PE 700kg/h, T370.PE 1000kg/h. Calculations were made based on working efficiency of 90%. Annual Production Amounts: 80% Calcite Masterbatch C280.PP= 1700 kg/year 70% Calcite Masterbatch C370.PE = 1700 kg/year 70% White Masterbatch T370.PE = 2000 kg/year Need Items: There is a 20% usage rate in Polypropylene = C280.PP and C370.PE for use in production. 700000 kg/year Calcite = 2800 kg/year Titanium = There is a 70% usage rate. 1500 kg/year Polyethylene = 30% usage. 5200 kg/year Dye = It is used at a rate of 1% in total. 25000 kg/year Polyethylene sack = Products are placed in 25 kg sacks. 240000 pieces/year Wooden pallet = 1 pallet is used for every 1 ton. 6000 pieces/year Plastic packaging strap = 1.7 m is used for every 1 ton. 10282 m/year Filter Mesh = 1 piece is used for every 10 tons of product. 605 units/year 3. Results Calculations were made for the annual production amount and the required items using the products required for the production of plastic raw materials. References [1]

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