

**PERSPECTIVES CREATION EQUIPMENT FOR
MANUFACTURING OF MONOFILAMENT FOR 3D PRINTING**

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**ПЕРСПЕКТИВИ СТВОРЕННЯ ОБЛАДНАННЯ ДЛЯ
ВИГОТОВЛЕННЯ МОНОФІЛАМЕНТУ ДЛЯ 3D-ДРУКУ**

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Abstract. *Prospects for the creation of equipment for the manufacturing of monofilament for 3D printing are considered. The definition of additive technology is given. The tasks which need to be solved at creation of the device for manufacturing of a monofilament are resulted. Describes the design scheme and principle of operation of the extruder. A review of developers of equipment for the manufacture of monofilament.*

Ключові слова: ПОЛІМЕРНИЙ МАТЕРІАЛ, АДИТИВНА ТЕХНОЛОГІЯ, МОНОФІЛАМЕНТ, ЕКСТРУДЕР, 3D-ДРУК.

Анотація. *Розглядаються перспективи створення обладнання для виготовлення монофіламенту для 3D-друку. Дається визначення адитивної технології. Приводяться задачі, які необхідно вирішити при створенні пристрою для виготовлення мононитки. Описується конструктивна схема та принцип роботи екструдера. Здійснюється огляд розробників устаткування для виготовлення монофіламенту*

Keywords: POLYMERIC MATERIAL, ADDITIVE TECHNOLOGY, MONOFILAMENT, EXTRUDER, 3D PRINTING.

Today, additive technologies are widely used in enterprises, firms and in everyday life.

Additive technologies are innovations in industry and production, digital innovations using 3D printing [1].

Additive technologies - the manufacture (construction) of a physical object (part) by layer-by-layer application (addition, English - "add") of the material, in contrast to traditional methods of forming parts, by removing (subtraction - subtraction) of the material from the workpiece.

The use of additive technologies in various industries, in particular in light, has significant advantages over other methods of manufacturing parts and products, in particular: saving resources; acceleration of the manufacturing process; accuracy of parameters; mobility.

Every company, firm, educational institution, household consumers who use 3D printers need consumables. One of the factors holding back the development of FDM printing is the relatively high cost of consumables. The difference between the costs of raw materials (granules) used to make monofilament and the cost of the finished monofilament in some cases can reach dozens of times.

Portable, desktop devices (extruders) for making monofilament from granules or polymer waste can help to solve this problem. Such installations will significantly reduce the cost of printing and improve the environment.

In order to reduce the cost of consumables, you need to develop your own extruder to produce plastic thread for a 3D printer, which in turn will significantly reduce the cost of purchasing consumables. It can be made based on practical skills and theoretical knowledge.

To achieve this goal you need to solve the following problems [1]:

1. Monitor existing devices for the manufacture of polymer monofilament and their price range.
2. To study typical designs of devices.
3. Develop your own analogue of the device.

4. Calculate the cost and profitability of the extruder for the manufacture of monofilament.

An extruder is a device for forming products by melting or thinning consumables and extruding mass through a hole of a certain shape.

Figure 1 shows a diagram of the extruder for the manufacture of monofilament [2].

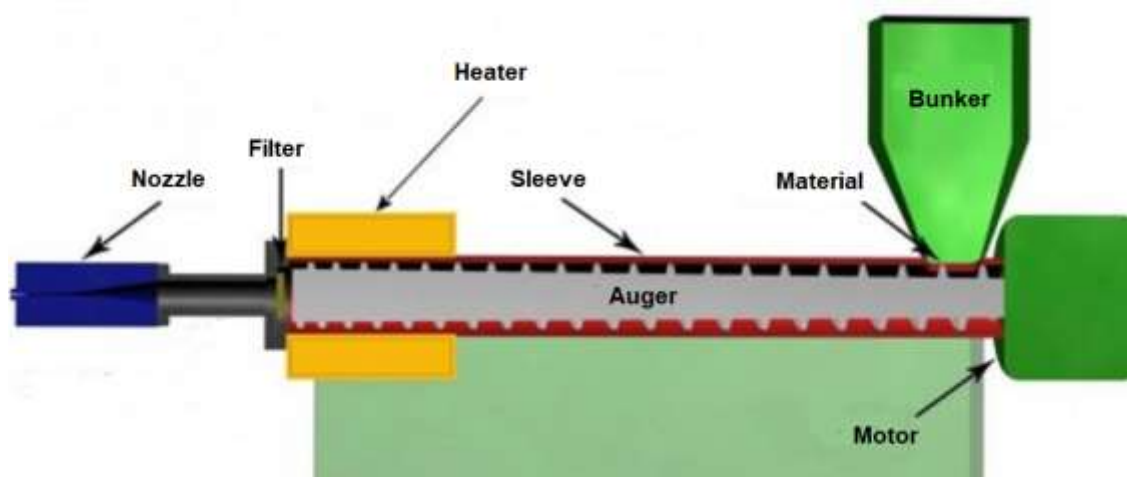


Fig.1. Scheme of the extruder for the manufacture of monofilament

The principle of operation of the extruder for the manufacture of monofilament is as follows. Granules or crushed polymer waste are poured into the hopper. The stepper motor rotates the auger, captures the polymeric material and moves it along the material cylinder (sleeve) to the heating element, which melts the raw material to a plastic state. Next, the molten material enters the cylindrical head of the extruder, where the finished rod, for example with a diameter of 1.75 mm, is extruded under the action of pressure, which creates an auger. Subsequently, the monofilament is cooled and wound on a spool.

After analyzing the Internet resources for companies engaged in the manufacture of such devices, we can conclude that only one company in Ukraine is trying to implement this task.

Among foreign manufacturers of this equipment, more progress has been made in this regard. About twenty developers are engaged in this direction, who

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managed to bring this equipment to industrial design. Among them are the following brands: Filabot, Filastruder, Lyman extruder, Filabot Original, Filabot Wee and others.

In the manufacture of monofilament for 3D printing, along with the economic benefits that can be obtained, you should take into account some other technological features, namely that not all types of plastic can be remelted, and repeated processing leads to degradation of the material.

This problem can be solved by using primary granules and mixing them with crushed secondary polymer. In general, this can lead to significant savings in the manufacture of materials for 3D printing.

As a result of the creation of a device for the production of monofilament for 3D printing, it will be possible to conduct experiments with different materials, create monofilaments with specified properties and reduce the amount of polymer waste, thus improving the environment.

Literature.

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