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EFFECTIVE UTILIZATION OF SOLID WASTE OF PAPER PRODUCTION

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Paper mills are one of the important sources of anthropogenic load due to the large consumption of fresh water in the technology of paper production. Therefore, the surface waters is most affected by the pulp and paper industry. Due to the complexity of the technological process of making paper and cardboard, there is a need for a large amount of fresh water, also for the purpose of technological equipment washing. As a result, wastewater with a high content of sludge and soluble substances is formed [1].

The main source of contaminated wastewater formation is the production of cellulose, which is based on sulfate and sulfite methods of wood cooking and bleaching of semi-finished products using chlorine products. Due to the manufacture of pulp and paper, a significant amount of liquid and solid waste is generated [2]. Therefore, today it is important to find ways to control the amount of this waste and choose a rational way to dispose of it. Which will reduce the anthropogenic load on the hydrosphere, as well as in the case of reuse of raw materials, will reduce the cost of basic products.

Nowadays, only landfilling or incineration is used to dispose of solid wastes on an industrial scale, which has a negative impact on the environment. As an alternative, the possibility of their application in epoxy composites can be considered. It is known from the literature that cellulose-based materials are effective fillers of inorganic and organic matrices [3-5].

Methods of utilization of solid wastes after paper production were described in many publications (as a filler of cement mixtures, in the bricks production, as a filler of gypsum plaster, in wood-fiber boards production, etc.) [6, 7], but none of the mentioned methods were not implemented industrially. Therefore, the problem of effective utilization of wastes from paper production is quite urgent. Cellulose fiber forms a branched fibrous microstructure that should interact well with any resin, especially polyepoxide.

The aim of the work is to study the influence of solid fibrous waste consumption on physical and mechanical properties of epoxy composites.

Solid waste (SW) from the paper industry from paper recycling system in the form of fibrous material was used as a raw material. According to the physical characteristics, it is fibrous material that was accumulated at the treatment facilities of the mill in the form of sludge, which consists of odorless gray-brown fibrous particles. Commercially available epoxy resins CHS-EPOXY520 and polyethylene polyamine were used to prepare the composites. The content of SW in composites was 5-20%. The filler was added immediately after mixing the main components, after which the composition was homogenized and formed into samples. The polymerization took place at room

temperature for 72 hours. Mechanical investigations of the obtained samples were carried out according to standard techniques.

The results of the study of physical and mechanical parameters of the obtained composites are shown in Fig. 1-3. According to the results, the modulus of elasticity increased sharply with the increasing of SW consumption (Fig. 1). It can be seen that the maximum value of modulus of elasticity was achieved at a content of 20% SW in the epoxy composite.

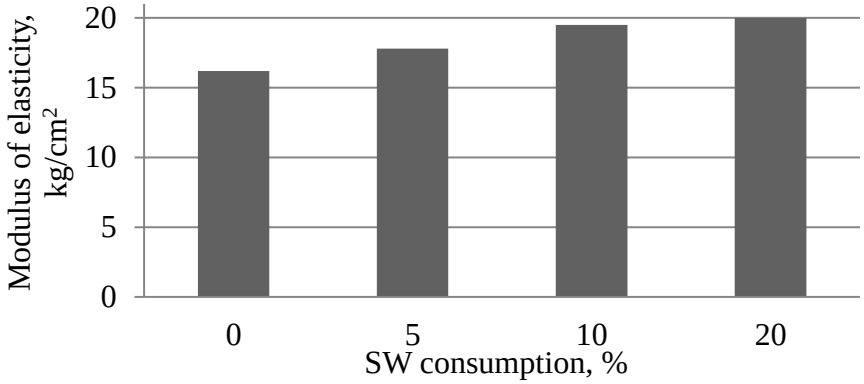

Figure 1. Influence of SW consumption on the modulus of elasticity of epoxy composites

The compressive load of the initial epoxy composite was 320 kgf (Fig. 2). The adding different quantity of SW leads to insignificant decrease in the value of this parameter.

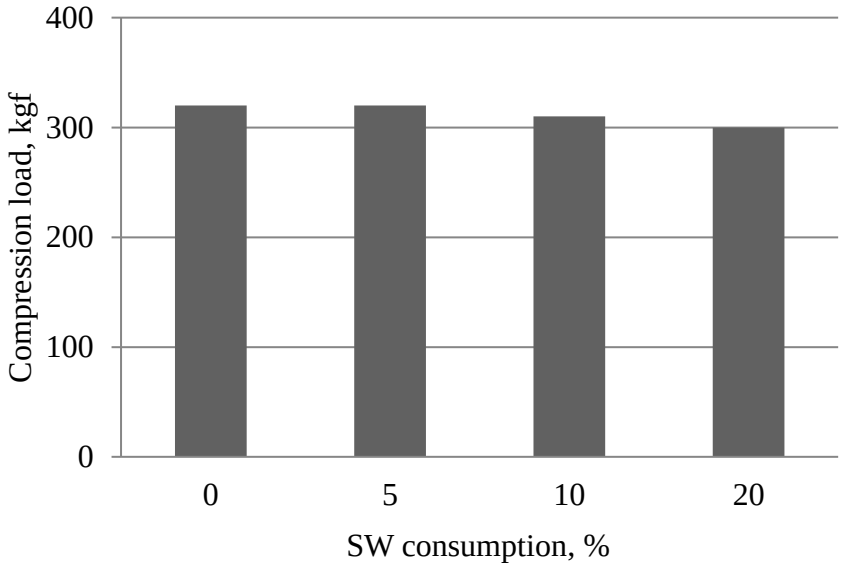

Figure 2. Influence of SW consumption on compression load of epoxy composites

The fire resistance of these composites was also investigated (Fig.3.). As can be seen, the increase in SW consumption leads to increase in the value of fire resistance. The lowest value of the parameter to fire resistance is observed for the composite in the composite without filler. The highest rate corresponds to the composite with WS content of 20%.

Investigation of the properties of composites testify about good interaction between epoxy polymer and waste fibrous materials due to the fact that both studied materials contain a sufficient

quantity of hydroxyl groups. The interaction between the functional groups of both materials determines high strength and flexibility of the obtained composites.

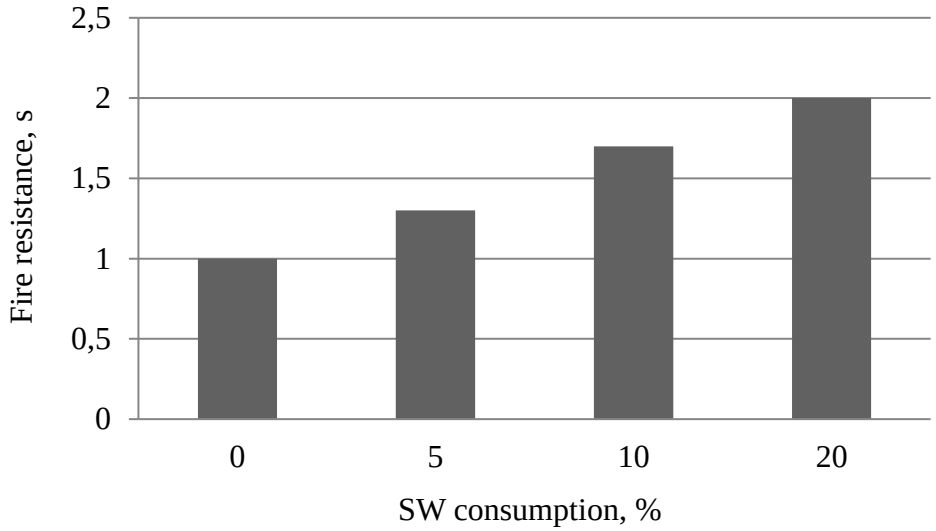

Figure 3. Influence of SW consumption on fire resistance of epoxy composites

In general, it can be said that solid waste from paper manufacture can be considered as a promising material for use as an additive in epoxy composites.

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