

The curve of fatigue, which characterizes median longevity of details and expresses the number of cycles to destruction, was built after calculated these parameters for of the same type details which had different terms of loading. It is rationally to use a method foremost in the specified calculations for acceptance of final decisions at planning of mass production.

The resulted information served mathematical support at the choice of designer decisions at an improvement and project of automatic half-hose machine.

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## **OPTIMIZATION OF TEXTILE COMPOSITES FORMATION PROCESS**

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The aim of this work is modeling and optimization of the processes occurring during the formation of textile composite materials with impregnation method using modern methods of intensification of physical and chemical processes with using electromagnetic waves of microwave (MW) and infrared (IR) bands that reduce the energy consumption of basic processes and conducting of a comparative analysis of the effectiveness of high intensity methods of forming the textile composite material.

The experiments used the polymer composition (aqueous dispersion of styrene-acrylate) of the three concentrations: 100 g /L 200 g/L 300 g/L; radiation power was set at three levels: 300 W, 450 W, 600 W microwave and 1800 W 2200 W, 2600 W for IR.

Optimizing the process of formation of textile composite materials requires finding such process parameters, when multiple result indicators are optimal: energy

consumption, the height of capillary rise and the temperature of the polymer composition. To solve this optimization problem generalized desirability function is introduced, which takes into account the values of all of the resulting indicators [1]:

$$D = (d_1 \times d_2 \times \dots \times d_k)^{1/k}, \quad (1)$$

where  $d_i$  — partial desirability functions ( $i \in [1..k]$ ),  $k$  — number of partial desirability functions.

Partial desirability functions are determined by normalizing the resulting functions, so that the value ranged from 0 to 1, since the resulting indicators units may have different dimensions and ranges. In this case the value of 0 corresponds to the least, and 1 to the most desirable values of the functions [2, 3].

Derived partial desirability functions of temperature, height, and energy consumption were used to obtain generalized desirability functions in form of (1) for infrared and microwave intensification methods of impregnation process.

It is found that generalized desirability function for IR and microwave methods of intensification have the same nature and allow to determine the optimal exposure time for the selected radiation power and vice versa. After the study of desirability functions formulas for determining the optimal combination of power and time of exposure to various concentrations were obtained.

The studies have found that the intensification of the process of formation of textile composite materials using microwave radiation allows reaching a given height of polymer composition raising (efficiency of impregnation) with significantly less power and in significantly less time.

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### **OPTIMIZATION OF THE PROCESS OF WEAVING TECHNICAL FABRIC**

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Currently, among the weavers of the Republic of Belarus, the highest position is occupied by the production of glass fiber and products on its basis, which today enjoy wide popularity. Range of application of the fiberglass is various: enterprise aviation