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STATIC CALCULATION OF THE SAW BLADE OF THE SAW GIN

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Abstract: The article considers the strength of saw blades for conventional and hexagonal shafts. The maximum stress is determined to be 191 MPa and 193 MPa, the maximum displacement is 0.048 mm and 0.026 mm, the maximum deformation is 0.00070 and 0.00051, respectively, and they are formed in the teeth., the minimum safety margin is 1.5. A saw blade designed for a 6-sided shaft, in some mechanical parameters, exceeds a blade designed for a saw with a round cross-section.

Keywords: Shaft, hexagonal shaft, saw blade, stresses, displacements, deformation, safety margin.

Introduction. The saw cylinder is one of the main working parts of existing fiber separation machines. The saw cylinder consists of a stepped shaft, saw blades, spacers, washers and clamping nuts.

To drive the saw cylinder, a coupling is used that fits the electric motor shaft. In most cases, the marking of saw blades is based on the number of blades, for example: models 4DP-130, 5DP-130 have 130 blades, and models DPZ, 7DP, 8DP - 90 blades.
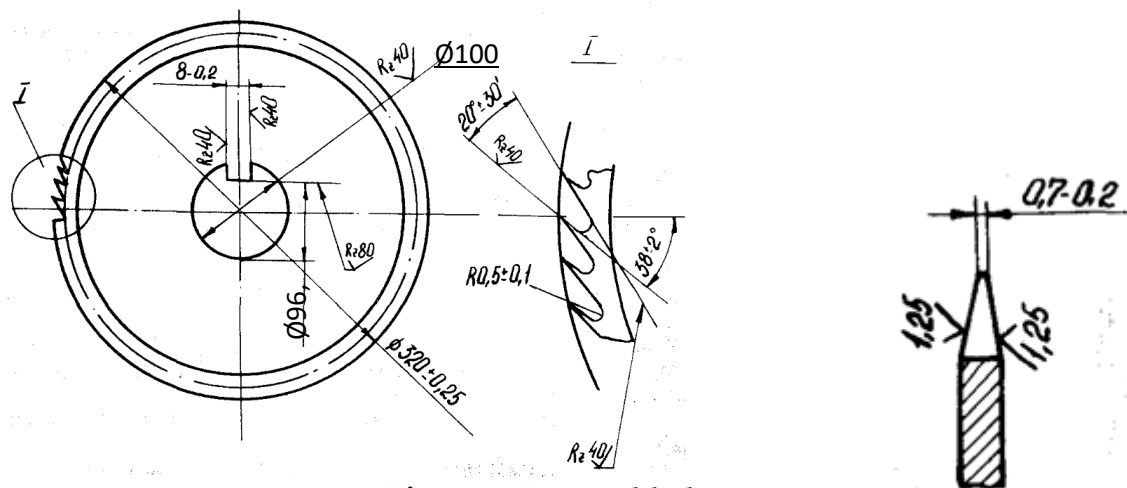

Figure 1. Jin saw blade

The dimensions of the saws are the same for all models: outer diameter 320 mm, inner diameter 100 mm, thickness 0.95 mm (Fig. 1) [1]. The saw teeth are cut according to a special template, sharpened and cleaned of burrs in a sand bath. Saw blades are installed on the main working shaft in the direction of rotation. To ensure that the saw blades rotate together with the shaft, the saws have "fingers" and there is a corresponding groove on the shaft. The number of teeth in the new saw is 280.

Methods. To maintain the technological distance between saws (18 mm), aluminum spacers between saws are usually used. The number of spacers per unit is less than the number of saws.

To ensure the rigidity of the saw cylinder package, the saw and spacers are secured with nuts that are tightened on both sides of the shaft. The rigidity of the cylinder package depends on the tightening force of the nuts $A_0 = 20 \cdot 10^3 \, N$, which is the longitudinal clamping force of the saw blade.

It is known from research that at the moment of separation of the fiber from the seed, 1/4 of the saw teeth are in contact with the raw material roller in the working chamber, and a pressure of $P = 20 \, MPa$ is applied to the teeth. [2]

In order to increase the efficiency of the saw cylinder, the authors proposed replacing the shaft with a circular cross-section with a shaft with a hexagonal cross-section. Studies were carried out to determine the mechanical characteristics of the saw blade for the existing and proposed shaft.
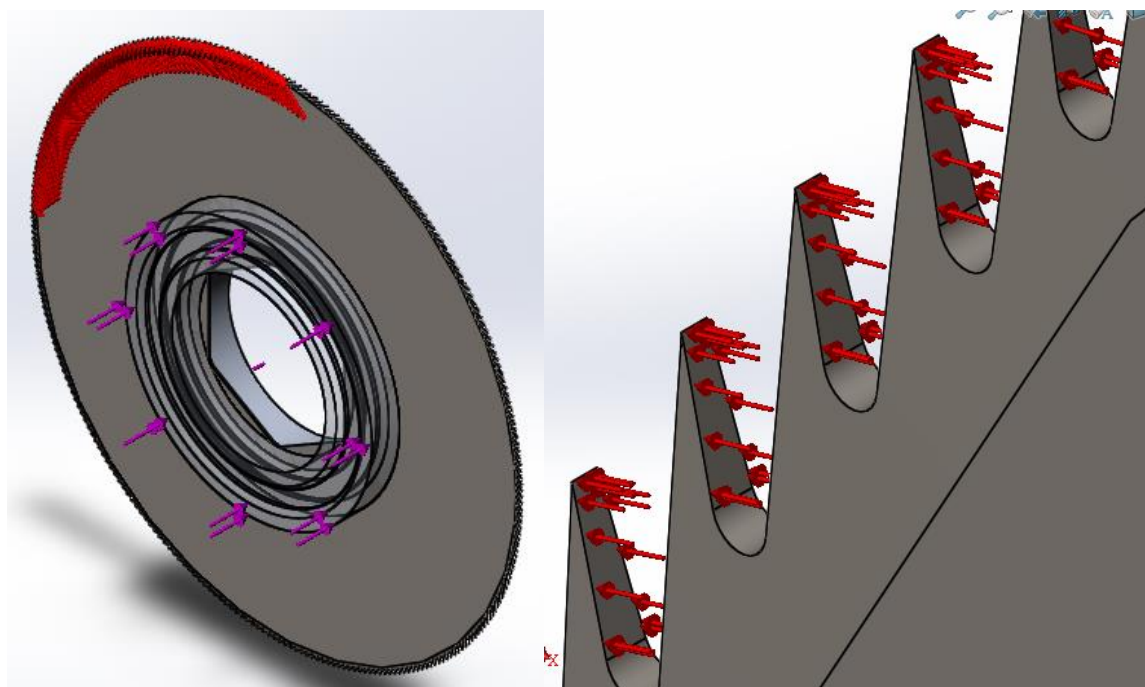
Figure 2. Forces acting on the saw blade

Results. Using the information above, we will perform a static calculation of the saw blade during the ginning process. In the study we use the Simulation package of the SolidWorks computer program.

Table 1. Mechanical characteristics of saw blades for round and hexagonal shafts

Round   6 Garn

Tension

Displacement

Deformation

Запас прочности

Initial failure zone
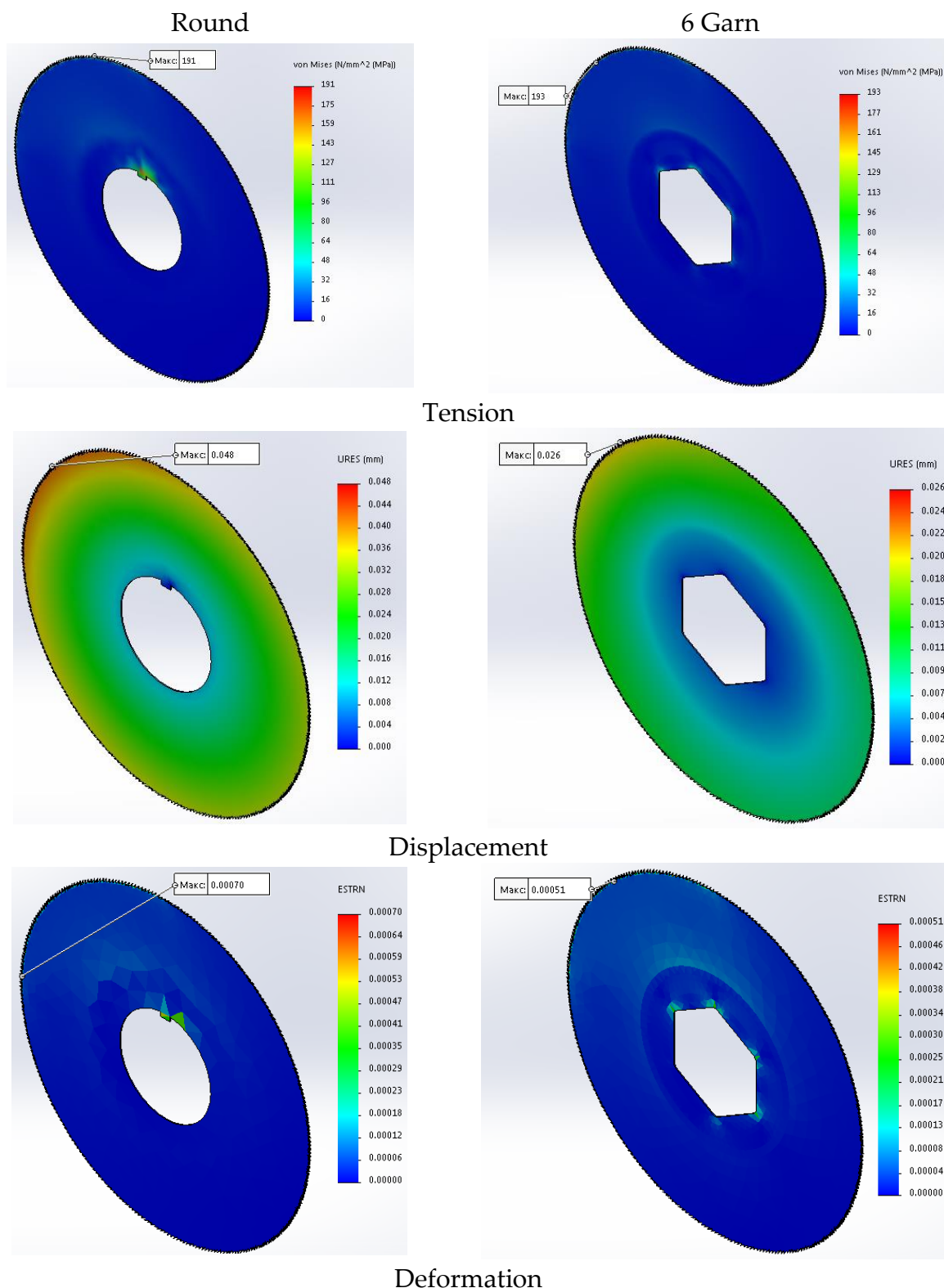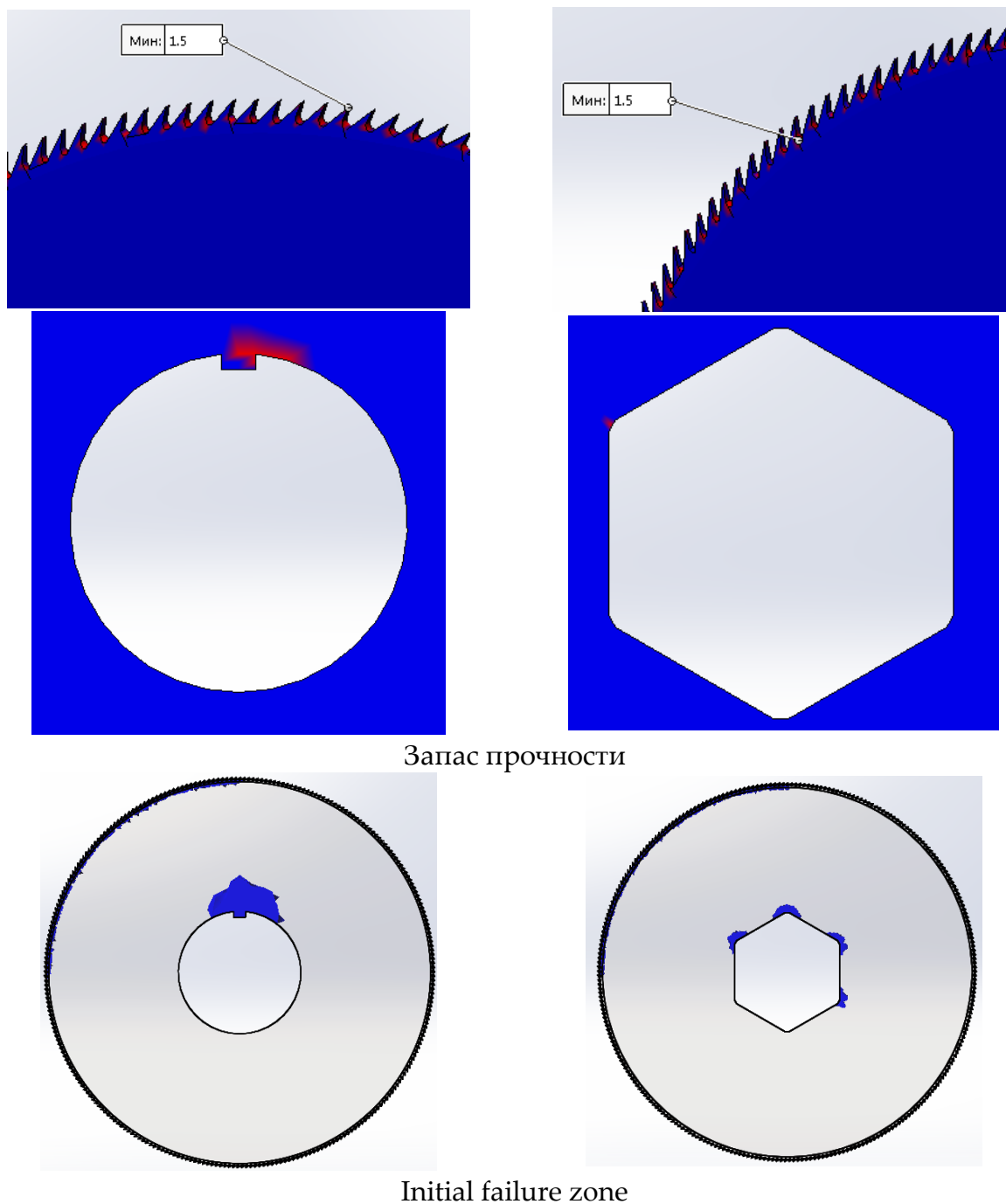
First, we design the saw blade and shim in 3D view, with the saw blade in the middle and shims at both ends (Figure 2). Let us apply these conditions and obtain the following results in the form of graphs (Table 1). Due to the low gravity, we do not consider it.

Conclusion. From Table 1 it is clear that when comparing saw blades for round and hexagonal shafts, the maximum stress is 191 MPa and 193 MPa, the maximum displacement is 0.048 mm and 0.026 mm, the maximum deformation is 0.00070 and 0.00051, respectively, and they are formed in the teeth., the minimum safety factor is 1.5.

Using the results obtained, we can conclude that a saw blade designed for a 6-sided shaft is superior in some mechanical parameters to a blade designed for a circular saw.

Literatures

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