ISSN NO: 2770-0003
Date of Publication: 24-08-2022

Experimental Studies of the Composite Shaft of a Saw Cylinder with a Combined Support

Sh.A.Makhmudova, S.Z.Yunusov, Sh.Sh. Kenjaboyev

Abstract Issues of reliability, strength, durability and resource are the most important in modern technology. Due to ever-increasing demands to speed, efficiency, reliability and to reduce the weight of machines strength are becoming more and more complex. They must take into account various operating modes, real properties of materials, loading conditions, technological, operational and other factors.

Keywords:

Issues of reliability, strength, durability and resource are the most important in modern technology. Due to ever-increasing demands to speed, efficiency, reliability and to reduce the weight of machines strength are becoming more and more complex. They must take into account various operating modes, real properties of materials, loading conditions, technological, operational and other factors.

The disadvantage of the existing supports as part of any mechanisms and machines is the direct transmission of the oscillations of the rotating shafts in the machine bodies and mechanisms on the bodies themselves, which leads to an increase in the vibration noise of the corresponding machines and mechanisms. In addition, the design does not allow parallel displacement of the shaft axis with vertical deformations of the supports at non-symmetrical arrangement of masses on the shaft, that is, the center of mass of the shaft is not located in the middle along the length of the shaft. This leads to a violation of the movement of the machine due to violation of technological gaps.

In [1], the authors considered the design scheme of the saw cylinder and the results of the study of the bending of the gin saw cylinder shaft, which determine how to find the deflection and technological gaps, especially between the saw gin saws and the grate, established by the technological regulations. The process of bending vibrations of saw blades of a gin saw cylinder, consisting of a package of steel saw blades and aluminum gaskets, compressed by a longitudinal compression force transmitted by a central shaft, is considered. It is proposed that if the external loads are known, then when calculating the internal force factors in the sections, the shaft should be considered as a beam hinged in rigid supports. Such a model of the shaft shape and fastening conditions is close to to reality for shafts rotating in rolling bearings. Conditional support for shafts resting at the ends on plain bearings is located at a distance from the inner end, but not further from the inner edge of the bearing.

We have proposed a new support design that reduces shaft vibration by parallel displacement of the shaft axis vertically at asymmetrical arrangement of masses on the shaft along its length [2].

The saw cylinder of the genie is designed to capture the fibers of the fly fibers with the teeth of the saw blades, tear them off from the seeds and carry them out through the slotted gaps in the grate to the air-removing device. In addition, simultaneously with the separation of the fiber, the saw cylinder, coming into contact with the raw roller on the arc of the capture of the fiber into the working chamber, rotates it, which creates conditions for the constant supply of fresh air to the saw blades.
The structure of which is shown in Fig. 1.

ISSN NO: 2770-0003
Date of Publication: 24-08-2022

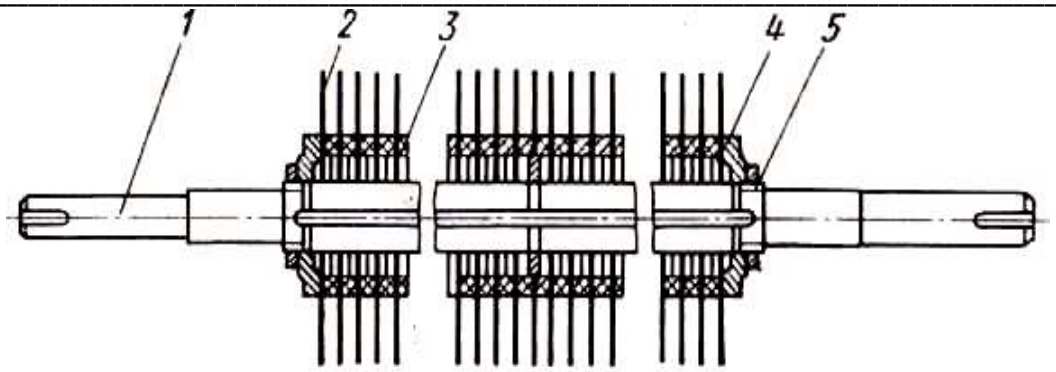

Fig. 1. General view of the genie saw cylinder

1 saw shaft, 2 saw blades, 3 saw spacers, 4 washers,

5-clamp nuts (right and left).

For experimental and comparative tests under production conditions, a saw cylinder with a composite bearing is installed on one of the saw gins, where the parameters of the elastic element differ from each other by different elasticity. The fiber separation process took place according to the established technological parameters. During the experiment, the experimental model and the standard saw cylinder model were compared.

The recommended design of the bearing support is shown in figure 2

Fig 2. Prototype of a bearing with an elastic element (2 different thicknesses) mounted on the saw cylinder shaft.

The difference in the thickness of the elastic element, set for the case when the system of forces acting on the shaft of the saw cylinder is not symmetrical on the bearing base, ensures smooth and smooth operation of the saw cylinder by reducing bending and vibration of the shafts, in which the elastic element is used thicker for area with high tension on the shaft and vice versa. In the process of ginning raw cotton, the total amount of impurities in the fiber affects the quality of the product. As a result of the experiments, a decrease in the amount of impurities in the composition of the fiber was observed. The existing saw cylinder bearing has reduced shaft deflection and increased vibration, which affects machine performance and product quality. Eliminating shaft bending and vibration has a positive effect on machine performance. In addition, the damping of emerging in the supports of the reaction forces acting on the bearings, due to the elastic element, has a positive effect on the system performance. The quality of the manufactured product will improve, and the service life of the bearing and shaft will increase.

In the laboratory of the cotton gin, the quality of the fiber obtained from the ginning process with the recommended compound shaft was determined.

Experimental studies were carried out at the cotton ginning enterprise at the LLC Turakurgan Cotton Processing Plant "Namangan to'qimachi klaster", the results are presented in table 1.

During the experiment, the following was established:

- high efficiency of the new experimental model of the compound shaft of the saw cylinder;
- improvement of the possibility of processing parts (shaft, bearing, bearing shell, saw) in a grinding machine.

Table 1

Readings available	Cotton gin in the department	Experimental model cotton gin
Incoming cotton raw material		
Moisture contents, %	11,9	11,9

ISSN NO: 2770-0003
Date of Publication: 24-08-2022

The amount of pollution is mass fraction,%	8,5	7,5
Mechanical damage, %	3,2	2,5
Accumulation of impurities in the fiber, %	3,7	3,7
Fiber yield, %	31	31
Semen hairiness, %	11,8	12,8

Note: The experiments were carried out in triplicate on the basis of a proven existing methodology, in which the thickness of the elastic element was changed, the parameters are shown in Table 2. The arithmetic mean values are taken in the table.

Table 2

№	Elastic element thickness at point A	Elastic element thickness at point B
1.	0,25 mm	0,5 mm
2.	0,5 mm	0,75 mm
3.	0,75 mm	1 mm

In table. 1 shows the results of experimental studies and quality indicators after determining the quality of the fiber. Analysis of the results showed that, the total amount of impurities in the fiber decreased, fiber yield and seed hairiness by 0.3%, and mechanical damage decreased by 0.2% when using the recommended designs of the saw cylinder shaft support, this in turn shows an increase in fiber yield by 0.4%, in addition during experimental studies it was determined that due to the elastic element, the characteristics of the saw cylinder shaft supports and casing parts, in particular, the service life of the bearings on the saw cylinder shafts, increased by 4 ÷ 4.5 times compared to with the existing option. The service life of saws is increased by 2 times when assembling a saw machine with a belt element mounted on the supporting base of the saw cylinder shaft. The total economic effect from the introduction of the proposed design amounted to 82.95 million sums.

According to the conclusion and proposal of the commission, it was recommended to introduce in the grinding machine new design bearings.

References

1. A.Djurayev, S.Yunusov, A.Mirzaumidov / «Development of an effective design and calculation for the bending of a gin saw cylinder» / International Journal of Advanced Science and Technology, vol.29.№4, (2020), ISSN: 2005-4238, pp. 1371-1390.
2. UZ IAP 06790 Patent of the Republic of Uzbekistan. Support for absorbing vibrations of rotating shafts Makhmudova Sh.A. and co-authors. February 5, 2022.