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# Analysis of the Results of an Experiment to Determine the Bending of the Shaft of a Gin Saw Cylinder

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**ABSTRACT.** The article presents the results of experimental studies to determine the bending vibrations of a saw cylinder with an elastic rubber support using the method of strain gauging. Oscillograms and graphical dependences of the change in the amplitude of oscillations of the saw cylinder with a change in performance and stiffness of the elastic supports are presented. The best values for the parameters of a saw cylinder with an elastic bearing support are recommended.

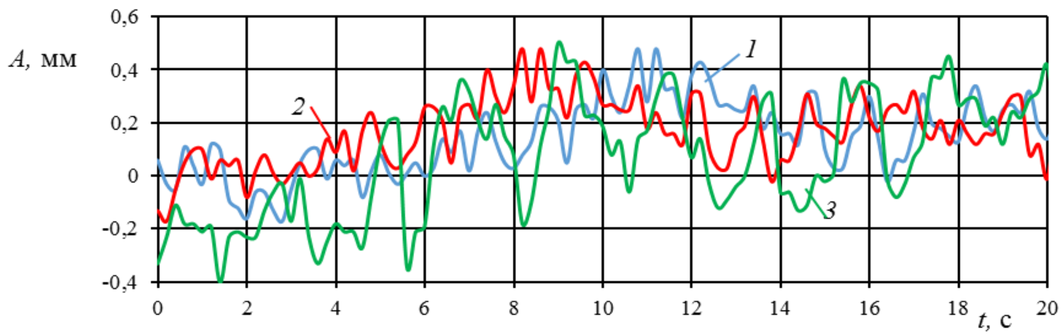
**KEYWORDS**. Saw gin, shaft, bearing, support, rubber, oscillation, bending, strain gauging, productivity, swing stiffness, angular velocity, moment of inertia.

## I. INTRODUCTION

The gin saw cylinder is massive and rotates at a frequency of 730 rpm. Therefore, there is significant bending of the shaft of the saw cylinder. At the same time, technological gaps between the saw blades and grates are violated in the middle zone of the saw cylinder, which can lead to significant damage to the fibers and seeds of cotton, reducing the service life and productivity of the machine [1,2]. Therefore, it is important to study the bending vibrations of the shaft of the saw cylinder.

The use of elastic bearing bearings significantly reduces bending vibrations of the shaft. In fig. 1 shows the oscillograms characterizing the bending vibrations of the shaft of the gin saw cylinder at $\omega_4 = 70c^{-1}$, and in fig. 2 at $\omega_ц = 76{,}4c^{-1}$. Based on the processing of experimentally obtained oscillograms, graphical dependences of the change in the amplitude of the bending vibrations of the shaft of the saw cylinder on the increase in gin productivity were constructed. Chart Analysis Fig. 3 shows that an increase in gin productivity from 3.5 t / h to 4.5 t / h leads to an increase in the amplitude of the bending vibrations of the saw cylinder shaft in the serial version of the bearing support from 0.077 10-3m to 0.179 10-3m. When using elastic support made of 6308-TMKSCHIS rubber, the amplitude of the bending vibrations of the saw cylinder shaft reaches 0.071 10-3 m, and when using rubber of the brand 7317, the amplitude A reaches 0.022 10-3 m. To ensure the amplitude value of the bend no more A$\leq (0{,}02 \div 0{,}03) \cdot 10^{-3}$ the use of rubber grade 10-22 as an elastic bearing support for the saw cylinder is recommended.

In this case, it is important to determine the stiffness coefficient of the elastic support on the value of the bending of the saw cylinder when the gin productivity changes [3,4]. Chart analysis in fig. 4 shows that with an increase in the rotational speed of the saw cylinder from 65 s-1 to 76.4 s-1, the amplitude of the bending vibrations increases to $((0{,}045 \div 0{,}052) \cdot 10^{-3})$м. Therefore, the

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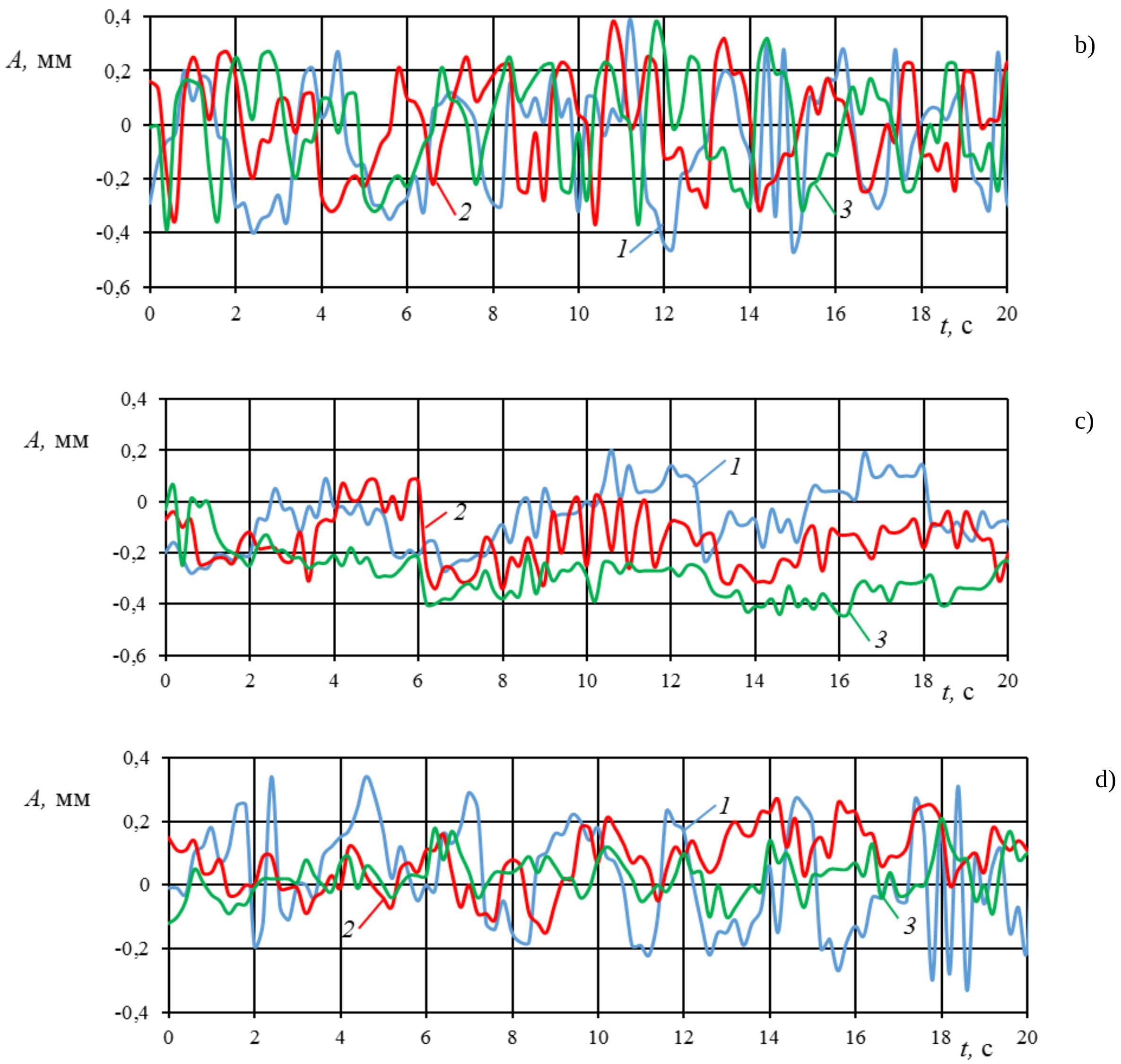
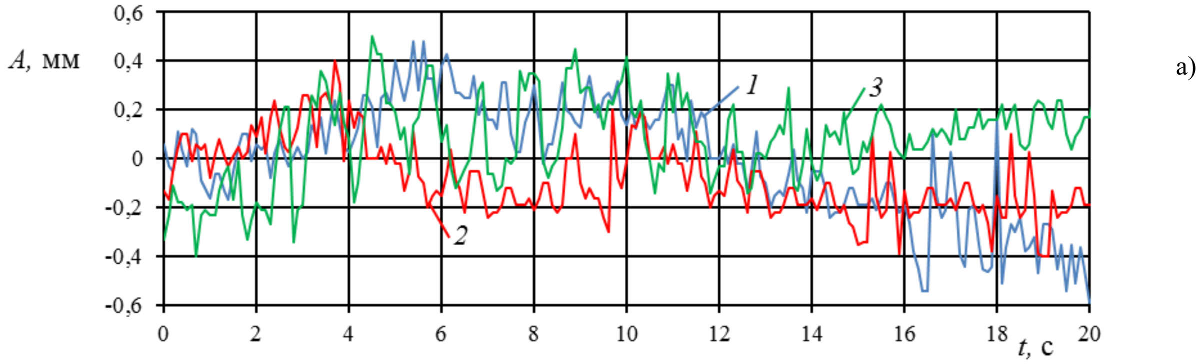



1,2 and 3, respectively, productivity 3,5t / h; 4.0t / h; 4,5t / h;
a) a serial version when using a rubber sleeve brand b) 7317 c) 10-220; d) 6308-TMKSCHIS
**Fig. 1. Oscillograms characterizing the bending vibrations of the shaft of the gin saw cylinder at.**



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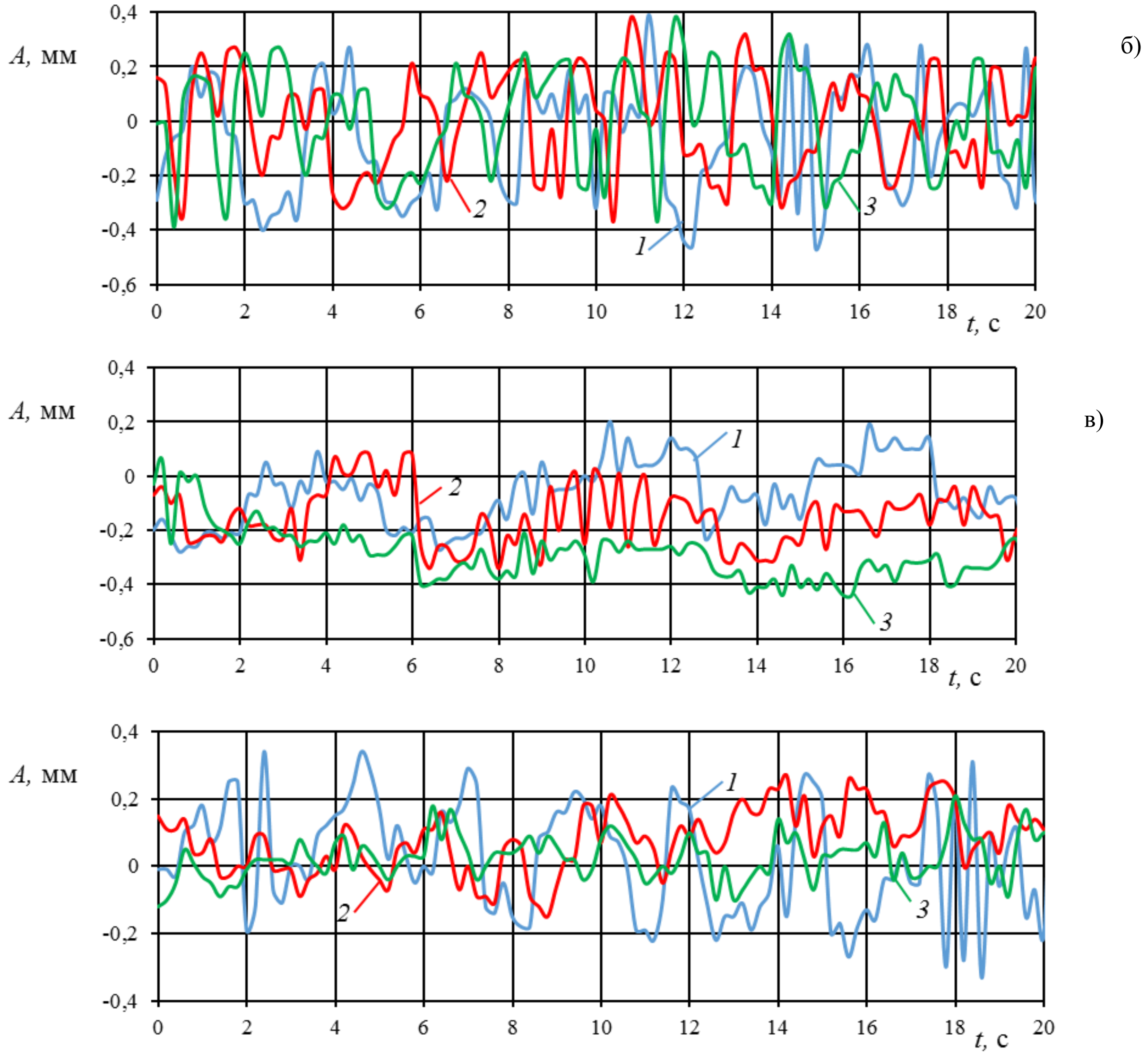


1,2 and 3, respectively, productivity 3,5t / h; 4.0t / h; 4,5t / h; a) a serial version when using a rubber sleeve brand b) 7317 c) 10-220; d) 6308-TMKSCHIS

**Fig. 2. Oscillograms characterizing the bending vibrations of the shaft of the gin saw cylinder at.**

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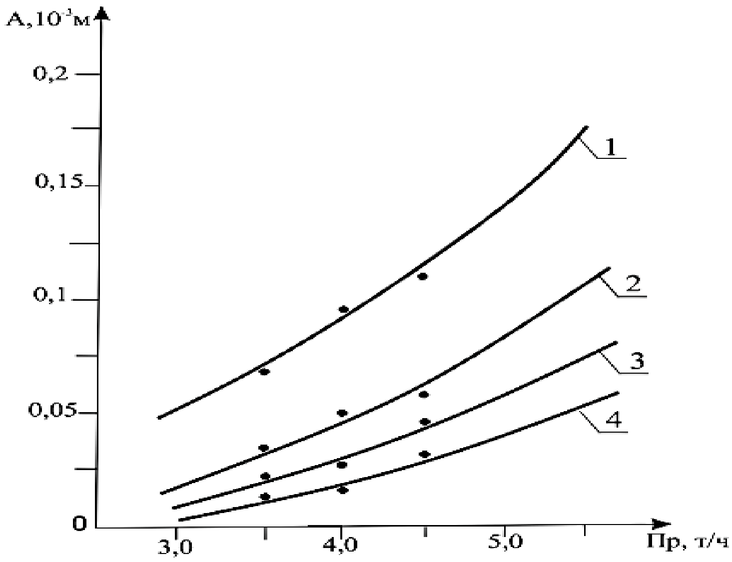
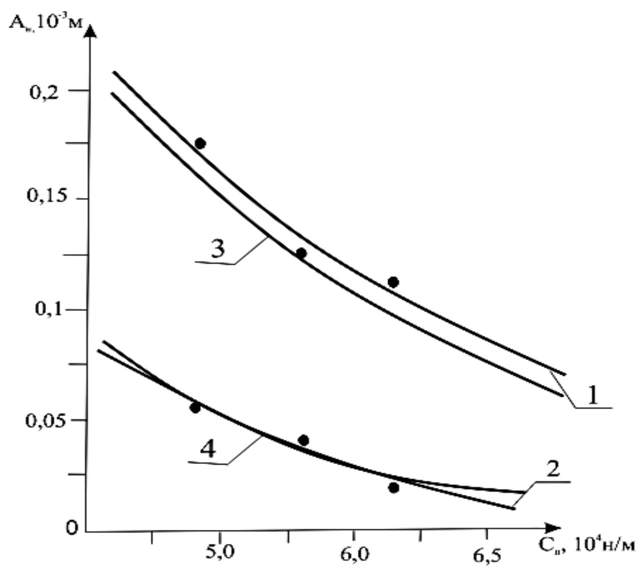



where, 1-serial version of the bearing support of the saw cylinder;
2-when using an elastic bearing support from the rubber brand-7317;
3-when using an elastic bearing support from the rubber brand - 10-220;
4-when using an elastic bearing support from the rubber brand-6308-TMKSCiS;

**Fig. 3. Graphic dependences of the change in the amplitude of bending vibrations of the shaft of the saw cylinder on the increase in gin productivity**




where, 1,2-experimental dependencies; 3,4-theoretical dependencies;
1,3-a $\omega_{н.ц}$=75 $c^{-1}$;  2,4-at $\omega_{н.ц}$=65 $c^{-1}$.

**Fig. 4. Dependences of the change in the amplitude of the bending vibrations of the shaft of the saw cylinder on the increase in the stiffness coefficient of the elastic bearing bearings for various values of the angular velocity of the gin saw cylinder**.

recommended parameter values are: $\omega_4 = (74 \div 77)c^{-1}; A = (0{,}02 \div 0{,}03) \cdot 10^{-3}м, C_n \geq (6{,}2 \div 6{,}6) \cdot 10^4 н/м$. [5]

It should be noted that the experimental results coincide with the results of these theoretical values with sufficient accuracy, the difference is (5.0 ÷ 7.0)% (see Fig. 4) curves 1,2,3,4).

## II. CONCLUSION

The comparative patterns of changes in the bending vibrations of the shaft of the saw cylinder from changes in the performance of the gin and the circular stiffness of the elastic element of the bearing support at different speeds of rotation of the saw cylinder are obtained. Graphical dependences of the change in the amplitude of the bending vibrations of the saw cylinder shaft on the increase in gin productivity and on the increase in the stiffness coefficient of elastic bearing bearings for various values of the angular speed of the gin saw cylinder are obtained. Recommended parameter values are: $\omega_4 = (74 \div 77)c^{-1}; A = (0{,}02 \div 0{,}03) \cdot 10^{-3}м, C_n \geq (6{,}2 \div 6{,}6) \cdot 10^4 н/м$.

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