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The Optimal Modeling of an Angular Position of Saw Cylinders in Single-Chamber Two Cylinders Gin

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Abstract: In work considered process of optimal modelling of an angular position of saw cylinders in single-chamber two cylinders gin. For increase, durability work of saw disks and shaft, by the static analysis of pressure upon saws. That will increase wear resistance and will improve quality indicators of a fiber and seeds it will be accepted an optimum corner of an arrangement saw cylinders of 60^0 degrees this decreases loading on bottom saw cylinder on 35% of percent and on top saw the cylinder decreases loading on 50% both increases productivity and working capacity saw cylinders several times.

Keywords: Saw Cylinder, Static Loading, Corner, Loading Distributions, Wear Resistance

1. Introduction

The research shows that, many plants pay attention to effective capacity of technologies and the cleanliness of fiber. After that process the produced fiber is bought from many textile companies. Many textile companies consider that the cleanliness of cotton fiber is necessary for increasing the amount of export. During the research in many textile companies it is affirmed that high amount of short fiber in cotton affects to the price of producing thread nowadays. The expenses of the thread per day that is made of dirty and short cotton fiber costs 7-12% expensive than the thread that is produced from the cotton that has small amount of dirtiness and short fiber. To increase the effectiveness on ginning the amount of saw should be increased in order to do that the distance between saw can be reduced. But overweening reduction of this distance brings about reduction quality filament, seed and shortens filament. [8-10]. Than more distance between saw that big mass seed fits between them. At saw harder goes thorough power to gravity cotton seed. Consequently trimming with fur seed will come out of ginning. With reduction of this distance output cotton seed is labored and their fallout will become possible only under big degree of the baring. Already at distance between saw 11-13мм are broken stability of the functioning (working) the gin and reaches 9кг/ hour for a saw. As well as, increases formation a vice and damage cotton seed. The Studies is installed by that reduction of the distance between saw occurs the growing mechanically damaged and interrupted filaments and increases the rising of the short filament. Since reduction of the distance between saw with 20,64мм before 14,59мм brings about fascination mechanically damaged filaments from 21,3 to 42%, interrupted filaments from 9,7 to 16% and thin skins with filament and fuzz from 1,76 to 2,29%.

To solve this problem, it was made an energy efficiency ginning machine. In old machines their saw cylinder included 130 saws, but there were much more problems described above. Because, the distance between saws is 14,59mm. As a result short cotton fiber increased in amount and it takes more time to gin.

On the factories of cotton preprocessing in our republic and also other countries where the clap is processed and the fiber turns out using gins with one saw cylinder.

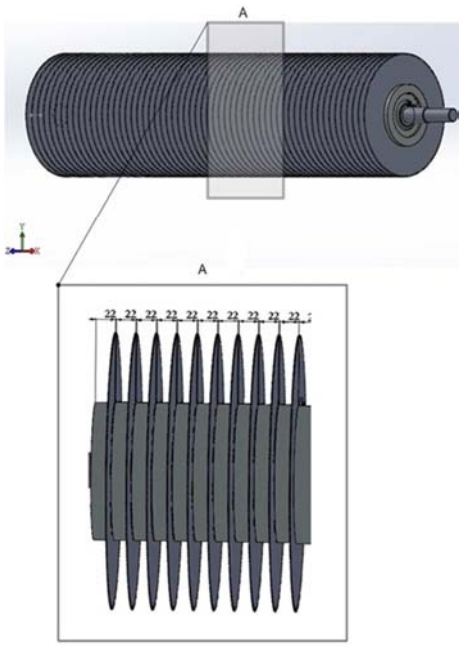

Fig. 1. *Saw cylinder of gin.*

2. Methodology

According to our analysis to produce high quality and having length cotton fiber we made distance 22mm between saws of saw cylinder of gin. However, by increasing the distance between saws length of saw cylinder of gin have also increased. In time of a clap of a raw of the saw cylinders are exposed to constant dynamic loading, as a result there is a deformation which causes bending deformation and they negatively influence technological process and general design of a gin.

Therefore the working surface of a shaft is bent, it leads to premature wear process, and breakages of teeth of saw disks and bearings. To provide trouble-free work of the saw gin it is necessary to reduce dynamic loading on saw cylinder by preservation qualitative and quantity indicators of a fiber clap. [1-2], [7].

To prevent bending deformation by us there was definitely optimum quantity of saw disks in the cylinder saw by means of the three-dimensional schedule of bending fluctuations. [3-4]. For stable work of the saw cylinder the optimum quantity of the saw disks have been made 60pieces and the distance 22mm between the saws of saw cylinder of gin is kept (Fig. 1).

The use of gins with quantity of 60 pieces saw disks decreases productivity twice. To increase productivity with preserving the quality indicators of a fiber, and also wear resistance of saw cylinder it is necessary to simulate gin which would answer all these parameters. [5-6]. We had been simulated single-chamber two cylinder gin of having 60 saws on each cylinder total 120 saws shown on the drawing fig. 2, answering to all these parameters. This energy effective ginning machine (Fig. 2) works through those stages:

Raw material of cotton through feeding platens 1 situated symmetrically at horizontal axis goes to baking powder a drum 2 and moving along different surface goes to chamber sheet 3. The chamber sheet consists of two upper grid bar 7 and lower grid bar 9 making half round grid bars.

Cotton fiber caught by teeth of saw cylinder of gin goes through grid bar, cotton seeds go below along grids. Cotton fiber caught by teeth of saw cylinder of gin 6 comes out through brush drum 4. Upper grids move in the first saw cylinder, lower grids move in the second saw cylinder. Two saw cylinders 6 are put in horizontal axis with 600-800. As a result of setting in this way force to one saw cylinder is divided into two and bending deformation through platen will be null, thus working capacity of saw gin and platen dramatically increases. Chamber sheet 8 working part with grid bar make a round having 196mm radius. Thus in first saw cylinder cotton raw caught by teeth of saw goes through lower grid bar and process of producing cotton fiber begins and unprocessed fiber in the second saw cylinder cotton raw caught by teeth of saw goes through upper grid bar and process of producing cotton fiber repeated. By situating the grids and chamber sheet in this way the number of naps in fiber will decrease.

3. Statically Analyze

Force distribution in single-chamber two cylinder gins in Fig. 3. In this figure it is shown that force of reaction to raw material made by the saw cylinders.

Using a method of static calculation it will be defined the force of reaction to everyone saw cylinder, considering an arrangement corner saw cylinders concerning a horizontal axis.

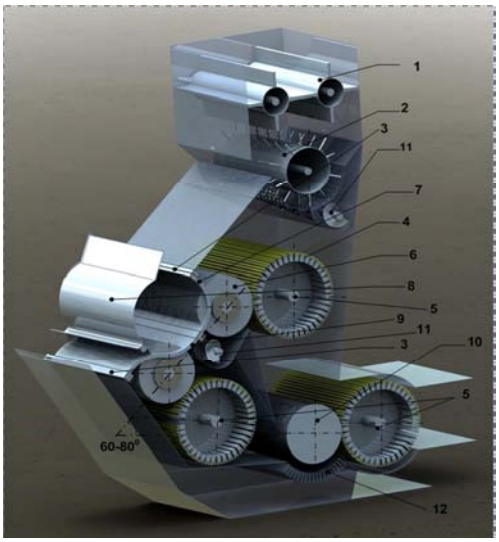

Fig. 2. *Single-chamber two cylinder gin.*

1-Feeding platen, 2 Baking powder a drum, 3 Arm and Planck for compression of grid, 4 Brush drum, 5 Axis, 6 Saw the cylinder, 7 Upper grid bar, 8 Chamber sheet, 9 Lower grid bar, 10- Lattice for fiber clearing drum, 11 Auger, 12 Cleaning grid.

$$\varphi = 90° - \alpha; \quad (1)$$

$$Cos\varphi = Cos(90 - \alpha) = Sin\alpha; \quad (2)$$

$$Sin\varphi = Sin(90 - \alpha) = Cos\alpha; \quad (3)$$

It is statically simulated that the distribution of loading for two saws the cylinder at an arrangement saw the cylinder under the relation of a horizontal axis from 45° to 80° by this formula.

$$\sum Ma = 0;\ R_B = Px = P \cdot Cos\varphi = P \cdot Cos(90 - \alpha) = P \cdot Sin\alpha; \quad (4)$$

$$\sum Mb = 0;\ R_A = Px = P \cdot Sin\varphi = P \cdot Sin(90 - \alpha) = P \cdot Cos\alpha; \quad (5)$$

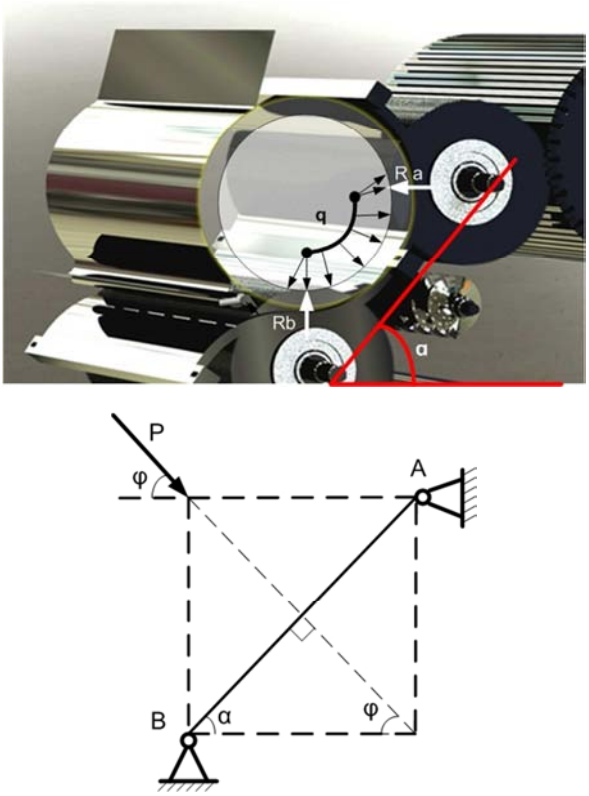

Fig. 3. *Force distribution in single-chamber two cylinder gin.*

Table 1. *Force of reaction Ra and Rb for raw material.*

	45°	50°	55°	60°	65°	70°	75°	80°
Ra	3,53	3,21	2,86	2,5	2,11	1,71	1,29	0,86
Rb	3,53	3,83	4,09	4,33	4,53	4,69	4,82	4,92

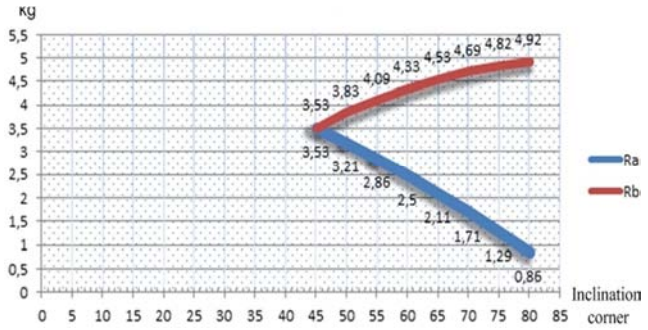

Fig. 4. *The schedule of distribution of static loading on two saw the cylinder.*

By dark blue line Ra it is shown Fig. 4 distribution of loading on first saw the cylinder at an arrangement saw the cylinder under the relation of a horizontal axis from 450 to 800 degrees.

By red line Rb it is shown Fig. 4 distribution of loading on second saw the cylinder at an arrangement saw the cylinder under the relation of a horizontal axis from 450 to 800 degrees. The use of the schedule of distribution of loading it is important to choose an optimum operating mode of ginning, which will for save resource and material, also receive quality fiber.

4. Conclusion

In conclusion, our new model of ginning machine enables energy efficient production. Unlike old models of ginning machine, there are two saw cylinders in the new design of gin with like parameters which are located in one worker chamber.

For stable work of the saw cylinder the optimum quantity of the saw disks have been made 60pieces and it would be important to keep the distance 22mm between the saws of saw cylinder of gin Fig. 1. Upper grids move in the first saw cylinder, lower grids move in the second saw cylinder.

Two saw cylinders (total 120 saws pieces) (6) are put in horizontal axis with 60-80.

When worker chambers consume cotton, it appears loosening and in lengthened round form. This allows reducing the density and accelerating the process of ginning and getting a qualitative fiber.

Having studied the schedule of influence and change of static loading in dependence angular an arrangement saw cylinders we have come to conclusion that optimum corners at modeling single-chamber two cylinders saw gin it could be accepted from 450 - 600 degrees concerning a horizontal axis Fig. 4. Acceptance of 450 degrees to allow will increase working capacity of saws and saw cylinder but process of an exit of seeds of the working chamber will be at a loss. That will increase wear resistance and will improve quality indicators of a fiber and seeds we will accept an optimum corner of an arrangement saw cylinders of 600 degrees this decreases loading on bottom saw cylinder on 35% of percent and on top saw the cylinder decreases loading on 50% both increases productivity and working capacity saw cylinders several times.

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