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# Technical and Economic Efficiency of the Use of Antifriction-Vibration-Sound-Absorbing Composite Polymer Materials and Coatings Made of Them in the Working Bodies of Cotton Gins

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**Annotation:** A review of publications had made, the calculation of the economic effect was made by comparing the results of the work of the working bodies of machines and mechanisms, in particular, fans and cleaners of raw cotton without coating and coated with composite polymer materials.

**Key words:** cotton processing, vibration and sound absorbing antifriction, reduction expense, noise absorption.

The calculation of the economic effect was carried out by comparing the results of the work of the working bodies of machines and mechanisms, in particular fans and cleaners of raw cotton uncoated and coated with composite polymer materials.

Coatings have been developed and implemented on the working bodies of cotton processing machines and mechanisms made of vibration-sound-absorbing and antifriction-wear-resistant composite polymer materials, which allowed to increase the service life of the working bodies due to high adhesion properties, impact strength and micro hardness, low coefficient of friction and wear between composite polymer coatings and raw cotton, allowing to reduce the damage of cotton fibers and crushing of seeds, increase productivity and reduce the cost of power consumption of machines and mechanisms in the process of cleaning and processing raw cotton.

Pilot production testing and application was carried out at the Piskent cotton gin plant, during the operation of these machines, the 2020 harvest of raw cotton in the amount of 32449 tons was processed. The introduction of vibration- and sound-absorbing antifriction-wear-resistant composite polymer materials in the working bodies of machines for cleaning large and small litter of raw cotton gave the following technical and economic results:

- ✓ productivity of cotton machines and mechanisms increased by 7.0-14.0%;
- ✓ power consumption costs decreased by 7.0-12.0%;
- ✓ damage to cotton fibers decreased by 0.10 -0.26%;
- ✓ The crushing of seeds in raw cotton decreased by 0.18-0.36%.

The overall economic effect of the introduction of vibration- and sound-absorbing antifriction-wear-resistant composite polymer materials into the working bodies of cotton gins and mechanisms is calculated according to the following formula [4]

$$Э_{общ}^{=} (Э_{э.эл}+Э_{\text{сн пов.зол}}+ Э_{си.др.сем.}+Э_{пов.пр}) К_{д.}-З_{доп},$$

where $Э_{э.эп}$ - savings by reducing electricity consumption;

$Э_{сн.пов.вол.}$ - savings by reducing fiber damage;

$Э_{сн.др.ем}$ - savings by reducing the fragmentation of seeds;

$Э_{сн.др.ем}$- savings due to increased productivity of machines;

$К_д$ - coefficient of durability of composite polymer parts,

$К_д$=1,5-1,8

$З_{доп}$ - costs for the cost of vibration-absorbing composite polymer materials, the manufacture of molds, etc., Which amounted to about 185 million soums (according to the PFD)?

The total daily capacity of cotton machines and mechanisms is 496.8 kW.

Daily power consumption:

Ncyx = Nobsh. ·τsut = 496, 8·8·3 = 11923.3 kWh.

Annual power consumption:

Ngod. = Nsut.304 11923.3·304=362652.8 kWh.

where, 304 is the number of working days per year.

As a result of the use in KPM, the cost of power consumption decreased by an average of 9.5%, while the energy saved was

Ng - 362652.8·0.095 = 34452.016 kWh.

The resulting savings are equal to:

E1 = 34452.016 ·133.66 =4604856.458 sum, where 133.66 is the cost of 1 kW.ch energy, sum.

Calculation of savings by reducing the damage of cotton fibers

The volume of fiber output at the plant was

$Q_a=Q_{x-c} \cdot К_в$ /100 = 32449 · 31,0 / 100 = 10059,0 t,

where Qx-c is the annual volume of processed raw cotton, t;

Kv is the fiber yield coefficient for the plant, %.

According to GOST 3279-96, if the amount of fiber damage deviates from the calculated norms, a discount is made from the weight or a cape to the weight of the delivered batch of cotton fiber in the amount of 1.0% for each percentage deviation from the norm.

As a result of the introduction of spike working bodies from the KPM, the damage to the fibers decreased by 0.18 or

$Q_н= Q_в \cdot$ 0, 18/100 = 10059,0 · 0,18/100 = 18,106 t

The average annual actual cost of 1 ton of fiber at the plant (19320000, 18400000, 17365000 and 14220000 soums per ton for grades I -IV, respectively) was 17326250 soums.

The economic effect due to the reduction of fiber damage was according to the first grade:

$Э_2= Q_н \cdot \cdot$ 17326250 = 18.1 · 17326250 = 313605125 sum

Calculation of the economic effect of reducing the crushing of seeds in raw cotton:

The volume of seed yield at the plant was:

Qc=32449. 50.7 /100= 16452.64 tons,

where 50.7% is the seed yield rate.

The annual volume of reduction of seed crushing is

$Q_c$ =16452,64 · 0,27 / 100 = 44,420 t .

The average annual cost of seeds was 2822000sum per ton.

The savings due to the reduction of seed crushing is

$Э_З$ = 44.420 · 2822000 = 125353240sum.

Calculation of savings due to the productivity of mechanization means

The daily productivity of machines is equal to

$Q_д$ =32449:304=106.74 t/day

The daily productivity of the working bodies of machines and mechanisms coated with composite polymer coating (CPM) is 10.5% higher than the productivity of serial machines. Consequently, the productivity of machines and mechanisms of working bodies from KPM coatings has increased and amounted to

$Q_д$ = 32449:304 ·1,105 = 106,74·1,105 =118,13 t/day

Ego makes it possible for the plant to process the actual volume of raw cotton in 32449:118.13 = 275,112 = 275 days or 29 = (304-275) ahead of schedule, which allowed saving electricity by the sum of 4=496,8·133,66·29,0 = 1925666,352 sum.

Additional capital costs.

Additional capital investments are associated with an increase in the production of vibration-absorbing composite polymer materials using highly efficient finely ground mineral fillers, product quality and noise absorption, and payment of wages and for the performance of auxiliary work according to the planning and financial department of SUE "Fan va Tarakkiet" amounted to Zdop = 185000000 sum.

The overall actual economic effect of the introduction of working bodies of machines and mechanisms that are covered with vibration-absorbing composite filled with thermosetting polymer materials.

$\mathbf{Э_{общ}}$=($Э_{э.эл}$+$\mathbf{Э_{си.пов.вол}}$+$\mathbf{Э_{си.до.сем.}Э_{пов.пр}}$) $К_д$ — $\mathbf{З_{доп}}$ =(4604856,458+313605125+ 125353240+1925666,352) ·1,5 – 185000000=483233331,715 sum

The calculation was carried out at a typical single-battery cotton gin plant.

Thus, the total economic effect of the introduction of the developed vibration-absorbing composite filled thermosetting polymers on the working bodies of cotton machines and mechanisms designed to clean large and small litter amounted to about 483 million. sum per year.

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