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REVIEW

The Results of Research to Determine the Parameters of Hardening Working Area of the Gin and Linter Grates

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ABSTRACT

The article provides substantiation of the choice of the quenching parameters for the working zone of gin and linter grates and the quenching parameters. The results of bench and industrial tests of the grate with a hardened working zone are also given.

1. Introduction

Modern and new business conditions require a constant reserve search productivity growth declines operational costs and cost products, release competitive products. Due with this current value It has improvement of technology and technology of processing raw cotton, ensuring high quality fiber, preserving him natural properties and reduce the loss of strand fiber with waste.

Earlier studies have found that one of the main reasons for reducing the natural properties of fiber is the unfavorable state of the technological surfaces of the working bodies of machines interacting with processed cotton [1]. It leads to destruction and to a decrease in fiber length, to mechanical damage and reduce their strength to growth defects and the content in the pulp fluff.

This in turn leads to a decrease in the spinning properties of the fiber, manifested in an increase in breakage in the spinning industry, a decrease in the strength of the yarn and the quality of the fabric produced, which causes significant losses in the textile industry.

The number of the most consumed spare parts in the

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process of cotton preprocessing includes gin and linter grates. The annual need of the industry is more than 100 thousand of gin and 200 thousand of linter grates. Grate undergoes rapid deterioration in the due to the friction of them drank and fibrous material. The working area of currently used cast iron grates is bleached in order to increase wear resistance. But, at the same time due to the shortcomings of the bleaching process, hardens mainly the "bed" of the grates and only partly, quickly wearing out, the lateral surface and this reduces their service life.

Experience of using steel grate by making proxy steel 45 based on the application of methods rolling with subsequent machining on machine tools gave good results. But they had one major drawback - rapid wear during operation due to the lack of heat treatment.

2. Materials and Methodology

Studies have shown that the most optimal of ways enhance durability of steel grate bars is an surface hardening of the working area.

Currently in engineering applied high-frequency heat treatment for products with a hard, wear-resistant surface layer and a relatively soft and viscous core.

Due to a significant decrease in the tendency to brittle fracture, achieved during the transition from through to surface hardening, increasing the tolerance limits of hardness and resistance to wear.

The second advantage of quenching with surface heating is a significant reduction in strain. during heating and cooling achieved by the stiffness of the cold core.

The third advantage is the almost complete elimination of decarburization, which, while reducing the strain, in some cases, allows the hardening of finally finished parts without grinding.

When superficial hardening, applied for the manufacture of grates of steel grade 45, it is possible to obtain a hardness HRC 58-62. However, fluctuations in the composition of the steel, quenching modes, as well as the need for self-tempering or tempering to crack cracks, lead to the lower the permissible limit of hardness in practice it may be understated to about one level I hardness of chilled cast iron grate.

Important role for quality hardening working The surface of the grate has the right choice of basic parameters - the design and dimensions of the inductor, heating rates frequencies current, heating time, cooling system, etc.

With surface induction heating up excerpt at in most cases, it is unacceptable or undesirable, since the effect of surface heating is lost due to thermal conductivity. A limited heating time may not be sufficient to complete the phase, structural transformations when heated to temperatures recommended this steel. The completeness or degree of transformations is determined, in addition to the final heating temperature, by the residence time of the steel in the temperature range of phase transformations - the total time of austenization.

For surface hardening, the hardening depth is selected first, and it is usually recommended about 10% of the part size.

The method of high-frequency surface hardening allows to obtain a solid surface layer different depths in a very short time. Therefore, the choice of the depth of the hardened layer is determined primarily not technical opportunities and operating conditions. Based on the operating conditions of the grate, was selected depth and 2 mm, because after wear of such a layer and increase the distance between the grate bars can be a passage of seeds between the grate bars, such grates already unsuitable to further exploitation.

When surface hardening of the working area of the grate (up to a depth of 2 mm.) with a width of 17 mm, it may occur that the core is heated at low heating rates. The use of coolant will dramatically accelerate the cooling process.

Cooling the grate by immersion in a liquid (water) is not advisable, since until temperature the surface significantly (hundreds of degrees) exceeds the boiling point of the liquid on the cooled surface is created and the vapor film is held (film boiling period). This film reduces the intensity of the cooling process.

The most convenient method of cooling during hardening of the grate is cooling with a water shower.

At the same time hardening the shower allows you to produce cooling in place without transferring to quenching tank, whereby cooling can begin through split second after heating.

Another important parameter is the quenching temperature.

Features introduced by rapid induction heating in the kinetics of phase transformations, determines the level of temperature required to complete the austenization process.

3. Experimental Results and Discussion

For the grate made of steel stamps 45 hardening temperature selected at surface 960^0C and at the boundary of the heated layer 850^0C.

Based on complex shape grate (curvilinear work area) a consistent heating method was chosen. In this method, a

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ribbon inductor is produced, equipped with a water shower, and the working area is heated with the movement of the grate.

With high-frequency surface hardening a large role playing mode quenching. To ensure the quenching mode, first of all, the current frequency must be selected. It is selected in accordance with the size of the grate and the selected depth of the hardened layer - 8000 hertz.

Based on the selected parameters, an inductor with a water shower was designed, design documentation was developed, he prototype was made and mounted on the HFC generator.

In order to determine the quality quenching p Static preparation surface grates, studies have been conducted to determine hardness and wear resistance. Hardness was measured at two plots - on hardened and not hardened, for comparative evaluation.

As the test results showed, by hardening the surface of the working zone, a surface hardness of up to HRC 55 is achieved, which allows to increase the life of the grate by more than two times.

Comparative wear of steel after quenching and cast iron grates were investigated on a special bench installation [2]. The research results are summarized in the table 1.

Table 1. The results of studies on the comparative wear of hardened steel and serial pig-iron grid bars

№	Time, min.	Hardened steel grate		Serial cast iron grate	
		Wear, um	Contact area mm 2	Wear, um	Contact area mm 2
1	4	55	29	104	35
2	6	80	33	100	40
3	12	115	66	130	72
4	30	210	84	250	93
5	60	270	132	310	140
6	90	350	165	380	174
7	120	380	190	450	194

Analysis of results: As can be seen from the data in the table, hardened steel grate had less wear for the same period of time due to hardening of the side surface.

On two genies of the Bektemirsky experimental cotton mill, five hardened and not hardened steel grates were installed in the grate drawn from cast iron grates.

As a result of observations for three months, it was established that the service life of hardened grid-irons is more than 2 times higher than that of non- hardened. Such indicators allow the use of one set of grates during one season during an overhaul, as opposed to the use of two sets that currently have. Based on research data, it is recommended to use hardened grid-irons in industry.

4. Conclusions

(1) Implemented selection of the main parameters of the surface hardening of the working area of the genie and lining grates.

(2) Comparative tests of grates with a hardened working area using the selected quenching parameters showed that their life is increased by more than 2 times.

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