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Short Communication

Studies on the Determination of Hardening Parameters Working Area of Gin Grates

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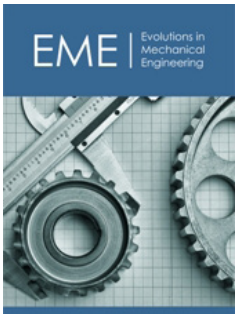

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Abstract

The article provides justification for the choice of hardening parameters for the working area of gin grates and hardening parameters. The results of bench tests of grates with a hardened working area are also presented.

Introduction

Previous studies have established that one of the main reasons for the decrease in the natural properties of the fiber is the unfavorable state of the technological surfaces of the working bodies of machines interacting with processed cotton [1-3]. It leads to the destruction and reduction of the length of the fibers, to mechanical damage and a decrease in their strength, to an increase in the content of defects and fluff in the fibrous mass. This, in turn, leads to a decrease in the spinning properties of the fiber, which is expressed 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.

Gin grates are among the most consumed spare parts in the technological process of primary processing of cotton. The annual demand of the industry is more than 100,000 gin grates. The grates are subject to rapid wear due to the friction of saws and fibrous material on them. The working area of the currently used cast-iron grate is bleached to increase wear resistance. But, at the same time, due to the shortcomings of the bleaching process, the "bed" of the grates is strengthened mainly and only partially, the quickly worn side surface, and this reduces their service life.

Experience with steel grates made from steel 45 based on the application of rolling methods followed by machining on metal-cutting machines has given good results. But they had one significant drawback - rapid wear during operation due to the lack of heat treatment.

Studies have shown that the most optimal way to increase the durability of steel grates is surface hardening of the working area. With surface hardening used for the manufacture of grates from steel grade 45, it is possible to obtain a hardness of HRC 58-62. An important role for high-quality hardening of the working surface of the grate is the correct choice of the main parameters - the design and dimensions of the inductor, heating rate, current frequency, heating time, cooling system, etc.

The method of high-frequency surface hardening makes it possible to obtain a hard surface layer of various depths in a very short time. Therefore, the choice of the depth of the hardened layer is determined primarily not by technical capabilities, but by operating conditions. Based on the operating conditions of the grate, a depth of 2mm was chosen, because after the wear of such a layer and an increase in the distance between the grates, the

passage of seeds between the grates may take place, such grates are no longer suitable for further operation.

During surface hardening of the working area of the grate (up to a depth of 2mm) with a width of 17mm, the core can be heated at low heating rates. The use of coolant will dramatically speed up the cooling process. Cooling the grate by immersion in a liquid (in water) is not advisable, because. as long as the surface temperature significantly exceeds the boiling point of the liquid, a film of vapor is created and retained on the cooled surface. This film reduces the intensity of the cooling process.

The most convenient method of cooling when hardening grates is cooling with a water shower. With simultaneous hardening, the shower allows cooling on site without transferring the grate to the hardening tank, so that cooling can begin in a fraction of a second after the end of heating.

Materials and Methods

It is known that the main reason for the wear of the grate is the grazing of the saw on the grate, which occurs due to the inaccuracy of the assembly of the grate and the saw cylinder. To study the wear of the grate, a stand was made that simulates the grazing of the saw on the grate in real conditions [4,5].

In order to determine the quality of hardening of the working surface of the grate, studies were carried out to determine the hardness and wear resistance. Hardness was measured in two areas - hardened and not hardened, for a comparative assessment.

As the test results showed, by hardening the surface of the working area, a surface hardness of up to HRC 55 is achieved, which allows increasing the life of the grates by more than two times. Comparative wear of steel after quenching and cast-iron grates was studied on a special bench installation [6,7]. The research results are shown in the table 1.

Table 1: The results of studies of the comparative wear of hardened steel and serial cast-iron grates.

No	Time, Min	Hardened Steel Grate		Serial Cast Iron Grate	
		Wear, Micron	Contact Area, mm^2	Wear, Micron	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

Results

As can be seen from the data in the table 1, hardened steel grates had less wear over the same period of time due to hardening of the side surface.

Conclusion

The choice of the main parameters of surface hardening of the working area of gin and linter grates has been carried out. Comparative tests of grates with a hardened working area using the selected hardening parameters showed that their service life is increased by more than 2 times.

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