

MPT Inspection of Helicopters' Driving Roller Chains Parts

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Abstract. The objective of this work was testing parts of the drive roller chains for helicopters "Mi". In this work, optimum modes of the magnetization were designed and developed. Indicator materials which ensuring control on the conventional level of sensitivity "B" was selected. And the demagnetization parts of roller chains was conducted.

Introduction

Driving roller chain is one of the most important parts of the helicopter "Mi" control system. It's produced at the Kirov driving chains factory as per the technical documentation. According to this technical documentation the rollers, outer and inner plates that make up the chain to be exposed 100 % magnetic particle testing.

The work on control of parts of the drive roller chains for helicopters was carried out At the All-russian scientific research institute of aviation materials "VIAM". The objective of this work was to detect radial cracks extending from a hole for the axle of the roller on the outer surfaces of the plates links, as well as transverse cracks on the surface of the rollers.

In this work optimum modes of the magnetization were designed and developed. Indicator materials which ensuring control on the conventional level of sensitivity "B" was selected. And the demagnetization parts of roller chains was conducted. Conditional level of sensitivity "B" can detect defects with the width of 25 microns. Moreover, the surface roughness parameter R_a should be not less than 10 microns [1].

Methodology

The material of the inner and outer plates chain is steel "Y7A", surface - oxidation, the material of rollers is steel "20X".

In practice, the method of applied field (AFM) is the most commonly used. The method of applied field lies in the fact that the operations: magnetizing, applying the magnetic indicator to the surface and inspection are carried out simultaneously. However, the application of this method makes it difficult to survey and interpretation the test results, because it restricts access to the object of control. In this paper, the control of details was conducted by the method of residual magnetization (RMM). RMM gives the ability to set the tested item at any convenient position to ensure good surface inspection. [2].



For inner and outer plates inspection it was selected a suspension prepared on the basis of a concentrate of fluorescent magnetic powder “Diagma -1613” (the firm “Orion-M”). The plates were magnetized by the horizontal defectoscope for non-destructive testing (NDT) “UNIMAG 905 MDS”: circular magnetization, AC 1300 A. The results of inspection are shown in figure 1.



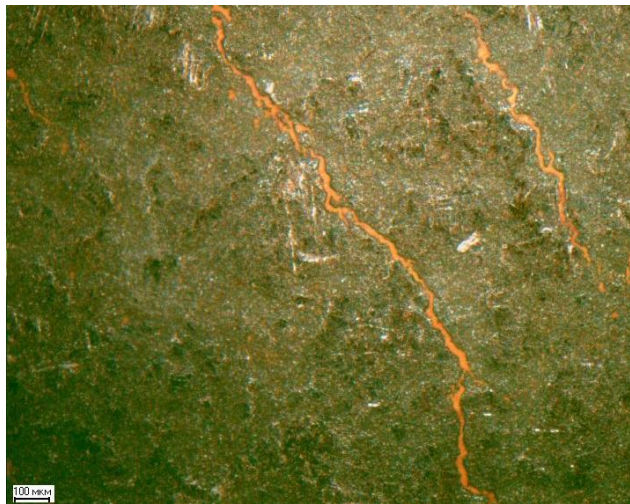
Fig. 1. Defects found out on the surface of a plates with suspension application, prepared on the basis of a concentrate of fluorescent magnetic powder “Diagma -1613”.

For the inspection surfaces of rollers it was selected a suspension, prepared on the basis of the black magnetic powder (the company “Anker”). Concentration of powder in the suspension was 20 g/l. The rollers were magnetized by the horizontal defectoscope for non-destructive testing (NDT) “UNIMAG 905 MDS”: circular magnetization, AC 1000 A. The results of inspection are shown in figure 2.

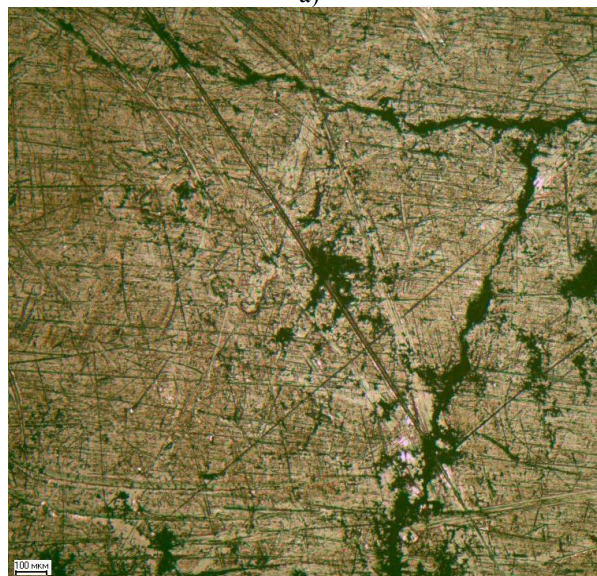


Fig. 2. Defects found out on the surface of a roller with suspension application, prepared on the basis of the black magnetic powder.

The parts of chains (plates) were also inspected by using an inverted metallographic microscope LEICA DM IRM with increase in $100\times$. Photos of defects obtained out of microscope are shown in figure 3.



a)



b)

Fig. 3. Photographs of defects on wafers made using an inverted metallographic microscope LEICA DM IRM with an increase in $100\times$.

Conclusion

The proposed method will allow control of parts of the driving roller chains for helicopters by using the method of residual magnetization (RMM) maintaining control sensitivity "B" as in the stages of production and in service. It helps to enhance the reliability and increase the safety of aircraft.

References

- [1] Specification 1.2A.020-2011 "The non-destructive testing. MPT Inspection of aviation details", FSUE "All-Russian Scientific Research Institute of Aviation Materials".
- [2] G.S. Shelehov, MPT Inspection of details and knots, Moscow, 1995.