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EXPERIMENTAL RESULTS CONCERNING CRACKING OF OIL PUMP SHAFT

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ABSTRACT
The pump vehicles oil product and the shaft make the connection between motor and pump, being situated outside the pump. The shaft of motor cracked in the region of clutch from inside of pillow black bearing. The examination of the shaft was done macroscopic and microscopic.
Keywords: Segregations at the limits , connection forces, crack of material., dynamic equilibrium of I dislocations, tenacity test ductile crack.

1. GENERAL PRESENTATION OF OBJECT FOR EXPERIMENT

Starting from references done in the first part of the paper the experimental results for the metallographic analysis of motor shafts for pump 123 IMA in its crack section.
The pump vehicles oil product and the shaft make the connection between motor and pump, being situated outside of the pump.
The pump 125 P1A was brought into operation at 15.12.1994, at S.C. RAFO S.A. Onesti and it worked 5830 hours.
The shaft of motor cracked in the region of clutch from inside of pillow black bearing.
The disturbance appeared in stationary regime function conditions. It wasn't greasing problems or seizing corrosion or extra stress problems of shafts.
The material of shaft is OLC 45 and its diameter is 85 mm
The examination of the shaft was done macroscopic and microscopic.

2. EXPERIMENTAL RESULTS

2.1 Macroscopic analysis

Macroscopic analysis of crack section of shall (figure 2) shows a mixed brittle - ductile crack with a smooth crack surface in proportion of 30 % and crystalline abrupt crack surface in proportion of 70 % from section.

Figure 1. Macroscopic analysis of crack section

2.2 Microscopic analysis

Microscopic analysis was done in accordance with STAS ISO 643 / 93 and 5000 / 73. The preparation and the attack of the specimens were done in accordance with STAS 4203 / 74.
The microscopic analysis was achieved in the longitudinal section and in the transversal section, too. Figure 2 presents the microscopic analysis at scale 500:1.

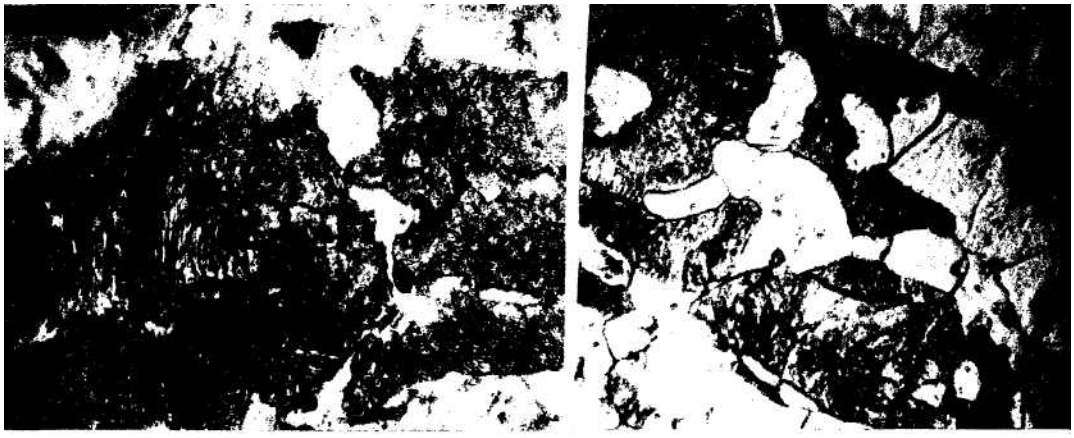

Figure 2. Microscopic analysis - longitudinal section

Experiment was realized with attack in accordance with R. WERNER - XILFN ^ PICRIC ACID + ETHANOL. The careful examination of structure shows the presence of sorbitic pearlite of ferrite and undereutectoide ferrite The polygonal network has dark color at the limits of grains and it shows return brittleness. A figure 3, 4, 5 present's secondary structure of section in crystalline undereuctectoide ferrite rows on air bubble (along inclusions of MnS).

Figure 3, 4, 5 Microscopic analysis of longitudinal section, secondary structure

Figure 6 also presents images of microscopic analysis, ferrite and pearlite of grain 4, 5 can be observed (STAS ISO 643).
Propagated fissures at the limits of grains from ferrite network can be noticed.

Figure 6. Microscopic analysis -longitudinal sections, initial attack 2 %, scale 100:1

Analyzing microscopic a transversal section - figures fissures on the surface of the shaft can be noticed. The existence of the fissures and microfissures at the uncarburizated limits is evidently. They are transversal propagated on the section of the shaft.

Figure 7. Microscopic analysis - transversal section, scale 100:1, initial attack 2 %.

3. CONCLUSIONS

The crack through separation appears when in the second phase, the conditions of suppressing of plastic deformation. This fact is owing to diminution of temperature or owing to metallurgic effects (phase transformations, segregations at the limits of grains, etc.), or geometrical effects (the size of thickness or general dimensions).

The ductile crack is characterized by the development of microfissures in the middle of rounded cavities through intense plastic deformation.

Analyzing previous ideas and images of microscopic analysis the following conclusion can be noticed: the start of fissures is done through pertinent mechanisms for separation phenomenon and the propagation phase of fissure at microscopic level - riling fissure presents ductile characteristics.

They are manifested through; permanent reinitiating of microfissures at front of ruling fissure.

4. REFERENCE

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