SELECTED QUALITY PROBLEMS OF MECHANIZED ENCLOSURES

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Abstract: The article presents selected operating problems of mechanical enclosure components. Attention was drawn to the causes of the most common inconsistencies and the suggested range of potential for their elimination.

Keywords: housing, wear, layout, corrosion

1 Introduction

The Investigation of mechanized enclosures for both failure and failure and functionality is a multi-step process that begins with the single-element testing phase and ends with the entire section [1]. These tests are analytical-measuring. They are carried out before the housing is allowed to work, after any modernization and after a failure to find the cause.

The scope of basic research that is carried out in the phase before the new housing is commissioned for operation or after its modernization or general renovation is included in the construction requirements [3].

The research cycle begins with the simplest of actions: product identification, measurement of geometric features in the next order is carried out tests: material, fatigue, overload, functionality, stability and galvanic coatings. Testing and testing of all hydraulic components or finished sections is intended to reflect the natural working conditions of these components and the emergency situations in which they may be exposed. With the use of the latest technology, computerized measurement systems equipped with specialized software are measured and analyze the data received by comparing them with the requirements that must be fulfilled before allowing for further use.

Due to continuous improvement in the process of modernization, during the repair of the section, a test of the worn parts is carried out and tests of the hydraulic and control hydraulics have been carried out for some time. The tests are designed to check the component's integrity and visual assessment.

In order to carry out the examination of individual components, it is necessary to analyze the discrepancies in the individual cycles, from the beginning to the end of the product life cycle [2]. Due to the complexity of the whole system, the focus was on selected components..

2 Discrepancies that occurred at the manufacturing stage of the casing components

These are defects, defects of individual components, parts or fragments of the structure that arise in the subsequent stages of the production process or after its completion, before they become part of the entire enclosure and begin to function.

Most often they occur during machining, when turning, milling, drilling are also the result of malfunction due to poor weld joints or lack of care during transport.

These discrepancies are a problem that occurs directly during the production cycle, so they are not usually the subject of a complaint because they are identified and are eliminated on a regular basis by people involved in the production process.

2.1 Damage caused by machining - uneven surface

The most common damage caused by machining is an uneven, undulating surface (Figure 1), which, consequently, does not correspond to the exact dimensions imposed by the constructor and can lead to damage to other components working against the surface such as seals.

The causes of such a phenomenon can be:

- improper cutting parameters for machined material, inadequate feedrate for rotation and rotation relative to material diameter and hardness,
- inadequate type of tool or knife plate,
- the spindle of the machine or bearings supporting the workpiece.

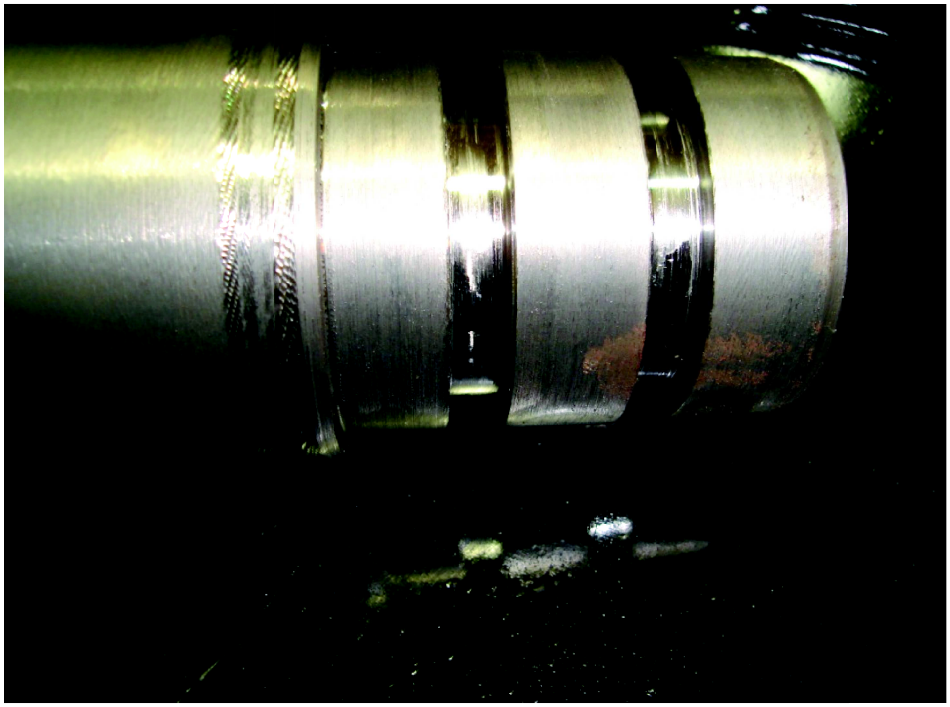

Fig.1 Mechanical damage (piston rods) due to vibrations

The cause of the faults is different, so a thorough analysis is needed to give a true cause and indicate whether the fault lies with the manufacturer, the repairer or the user.

In addition to the illustrated example, fragments of the structure are damaged and steering hydraulics or hydraulic hydraulics are damaged too.

The research and analysis have shown that the most common cause of failure is damage to the steering hydraulics followed by damage to the hydraulic hydraulics seals.

2.2 Damage to the steering hydraulics

The following Table 1 shows the cause of the damage.

Table 1. List of causes of damage to hydraulic control components

	Four-way manifolds	Valve block	Shut off valves	Throttle valves
Corrosion	1890	1410	270	175
No leakage	1871	857	202	80
Loss of funkcionality	1428	705	74	30
Mechanical damage	626	170	119	130

Source: [4]

The data in the table shows that the most common damages are:

- four-way manifolds,
- valve blocks,
- shut off valves,
- throttle valves.

The reason for these defects are:

- corrosion,
- no leakage,
- loss of functionality,
- mechanical damage.

Figure 2 shows the cause of damage to the hydraulic control.

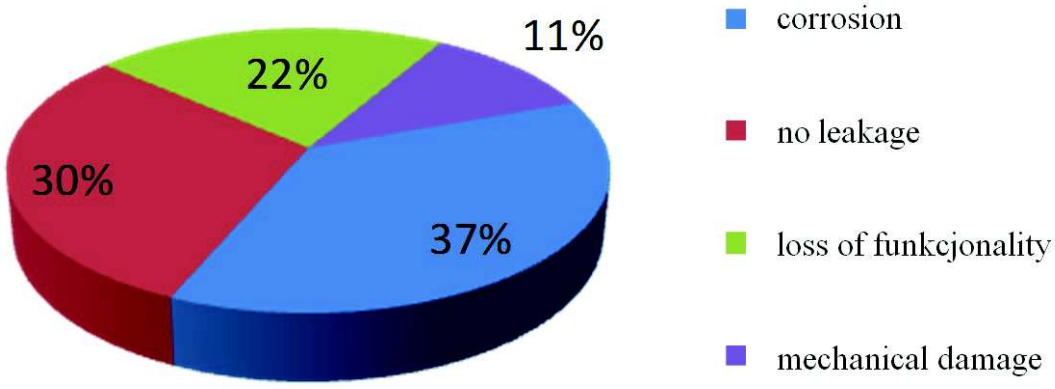

Fig. 2 Main causes of damage to the hydraulic control components

The Corrosion

- inadequate grade of steel;

most of the hydraulic control elements are made of normal low-alloy construction steel (S355, 45). Only the working elements determining the reliability of the system are made of stainless steel: martensitic 2H13 and 4H13 and austenitic 1H18N9 [5].

- improper material handling;

as a result of improper selection of stainless steel material in the grinding or polishing process, free carbon is introduced, which, when combined with chromium, forms chromium-reduced grains, if the chromium content falls below 12% then the corrosion process begins [6,7].

- nadequate proportions of working fluid components;

the working fluid is a mixture of:
95% water of adequate hardness,
4.25% of the base oil of the refined petroleum product,
0.75% emulsifier, substance reducing the surface tension between oil and water [8].
The oil has an additional preservative function and if it is too low relative to water or the water is too hard then the corrosion of the components begins.

No leakage

- accumulation of impurities in the working fluid
- inadequate proportions of working fluid components;

when there is more oil in the working fluid compared to the other components of the concentrate, the hardness and volume of the seals changes.

- mechanical damage.

Loss of functionality

- mechanical damage to internal components,
- suspension of springs,
- clogging of internal flow channels.

Mechanical damage

- the impact of external forces;

as a result of falling dirt, crushes, breakages, crushes, particularly exposed to elements not permanently attached to the structure, such as throttle valves return 31% damaged in this wayseals.

2.3 Damage to the hydraulic hydraulics

Hydraulic components belong to the basic and essential equipment of mechanized housings, they correspond to the support and safety [9]. Their proper functioning and failure is a priority.
Hydraulic hydraulics include:

- hydraulic stands,
- support,
- auxiliary cylinders.

All these elements are known under the common name hydraulic cylinders, they combine common similarity in terms of construction and principle of operation.

It is the seals that are responsible for the proper operation of the actuator and their damage causes dangerous external leaks or internal leaks of the working fluid resulting in rapid changes in the pressure in the cylinder leading to loss of stability of the hydraulic stand or support.

The main causes of damage to the seals of the actuators are damage caused by external forces or mechanical damage and caused by harmful environmental factors such as dust and sand.

Mechanical damage

– damage to the chrome protective layer;

it comes to it due to improper protection of elements during transport, they are mainly scratches and dents, during the operation comes to the splinters in piston rods appear spallions, corrosion process begins. All resulting in inequalities act on the surface of the seal.

– damage to the actuator components;

piston rod deflection, the gland causes incorrect deformation of the piston seals and gland when the actuator is operating.

Damage caused by environmental factors

– damage caused by sand and dust;

due to the long-term impact of sand particles and dust, scratches on the parts of the actuator operating on the outside, such as the piston rod on the chrome protective layer, appear scratches,

– dirty hydraulic fluid;

there is damage to the inner surface of the cylinder and abrasion of the seals piston.

As in the case of hydraulic steering components, preventive actions are taken in the form of sealing damage analysis among randomly selected actuators. The purpose of the analysis is to identify the defects and to find the cause of them while showing the scale of the phenomenon. The cognitive function is to take preventive actions reducing the number of defects, which will significantly affect the number of complaints.

The results of the analysis are presented in Table.2. The test consisted in a leakproof test provided for the repair of the actuators and then a visual inspection of the already dismantled parts.

Table 2 Results of identifying sealing defects and probable causes their formation

Type of damage	Quantity	Mechanical damage		Soiled hydraulic fluid (internal refrigerant)	Impact of sand, dust (external factor)
		Damage to the finishing (failure of chrome layer continuity)	Damage to the actuator components (piston curl, etc.)		
Damage to the scraper ring	82	20	4	0	58
Damage to the guide ring	45	0	35	5	5
Damage to packing gland	30	14	0	8	8
Damage to the piston seal	25	16	0	9	0
Damage of static seal of two fixed surfaces	12	0	12	0	0
SUM	**194**	**50**	**51**	**22**	**71**

Conclusion

1. The main cause of faulty housing is corrosion. The highest occurrence of this phenomenon is in the case of hydraulic steering components, about 37% of the cases. In order to reduce the scale of the phenomenon, stainless steel materials should be used, increased control of the quality and proportion of the individual components of the working fluid in the hydraulic and power hydraulics, and the instructions for proper assembly. Damage to the guide ring is caused by mechanical damage to the actuator components, that is the piston rod.

2. Gland and piston seal defects are caused mainly by defects in the protective layer caused by scratches or corrosion. In the case of stuffing the piston is damaged and in the case of piston damaged cylinder.

3. Damage to the static seal in the case of gland is 100% due to mechanical damage to the gland.

Important - practical application

The results of the study can be used in the heavy machinery and mining industries. This will limit the development of quality defects in mechanized housing subassemblies. As indicated in the article of cause their formation can be very varied. This is due, among other things. from the heavy working conditions of the mechanized teams.

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WYBRANE PROBLEMY JAKOŚCI OBUDÓW ZMECHANIZOWANYCH

Streszczenie: Artykuł prezentuje wybrane problemy eksploatacyjne elementów obudów mechanicznych. Zwrócono uwagę na przyczyny najczęstszych niezgodności oraz sugerowany zakres potencjalnych możliwości ich eliminacji.

Słowa kluczowe: obudowa, zużycie, układ, korozja