THE FAILURE CAUSES OF THE FUNCTIONAL SUBSYSTEMS AND THEIR COMPONENTS FROM HPP TILEAGD

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Abstract: The paper aims to identify the failure of the components and elements and the evaluation of their consequence on the functioning of the functional subsystems (installations, equipments) from an HPP.
On the basis of the values of randomize variable lifetime (LT) and maintenance correcting time (TMC), defined in the previous paper, they were determined the indicators of operational reliability at the level of hydro- generator group and there subsystems.
With the view of identification and hierarchy the impact of component elements on the reliability of the groups, it was done in the paper an analysis of the failures causes for each subsystems of group not only under the aspects of faults interval but also of the number faults. The obtained results being represented under graphical form.

Keywords*:* The failures causes /Number of failures/ Time of failure/ Paretto diagrams/ Relative time of unavailability/ Relative number of failure.

1. INTRODUCTION

The hydro-generator groups can be interpreted as technical complex systems, composed from several subsystems. In the view of the evaluation of operational reliability it is necessary to know the technological structure till the level of functioning of subsystems and their components, so as the energetic equipment, of their characteristic and schemes functioning.
To evaluate the operational reliability indicators of the hydro-generator groups from HPP Tileagd, we detailed the analysis to the level of the next subsystems of these:

- The globe valve (GV)
- Hydraulic turbine (HT)
- Interacting automatic control system (governor + pressure oil group) (ACS)
- Hydro-generator (HG)
- Group transformer (GT)

2. THE FAILURES CAUSES HIERARCHY

The function time under analyzed it is extended on a period of 9 years (1995-2004). The values of the randomized variable LT and MCT at the level of subsystems of the groups and also the causes that lead to damage, being overtaken from the register card and from the operative reports that exists in HPP Tileagd.
The processing of existent statistical data for the interval of analysis leads to the hierarchy of the subsystems component impact on the groups reliability. The hierarchy of the failures causes but also of the principal components in the framework of hydro-generator groups subsystems- which contributed to failures-is achieved according to the indicators $\nu^*(T_A)$ and $\beta^*(T_A)$, calculated with relations:

$$\nu_i^*(T_A) = \frac{\nu_i(T_A)}{\nu(T_A)} \cdot 100 \tag{1}$$

$$\beta_i^*(T_A) = \frac{\beta_i(T_A)}{\beta(T_A)} \cdot 100 \tag{2}$$

where:

$\nu_i*(T_A)$, $\beta_i*(T_A)$ – represent the percentage ratio parameters regarding the failures number, respectively failure time for each element/equipment;

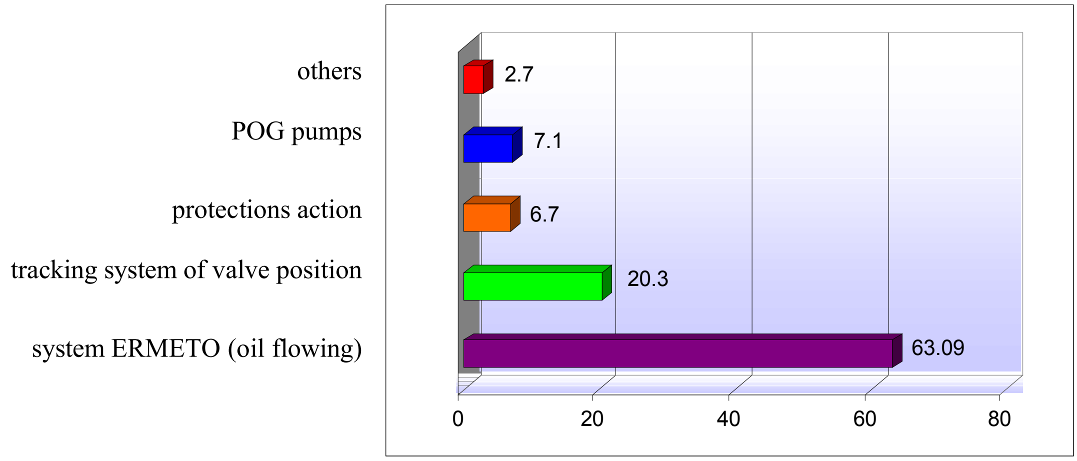
$\nu_i(T_A)$, $\beta_i(T_A)$ – represent failures number, respectively failure time for each element/equipment during the interval of analysis TA;

$\nu(T_A)$, $\beta(T_A)$ – represent the total numbers of faults, respectively total time of failures for each element/equipment during the interval of analysis T_A.

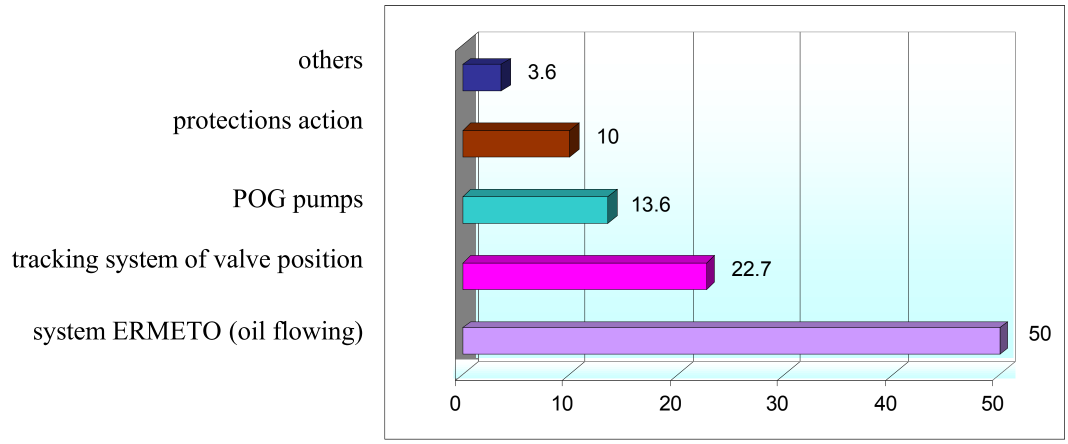
So using the available data, the Paretto diagrams for each subsystem of hydro-generator group, regarding the relatives parameters υ (T_A) and $\beta(T_A)$ are presented in fig. 1 ÷ fig.5.

a) The stope valve (SV)

a$_1$) the hierarchy according to "relative time of unavailability" indicator $\beta^*(T_A)$ [%]

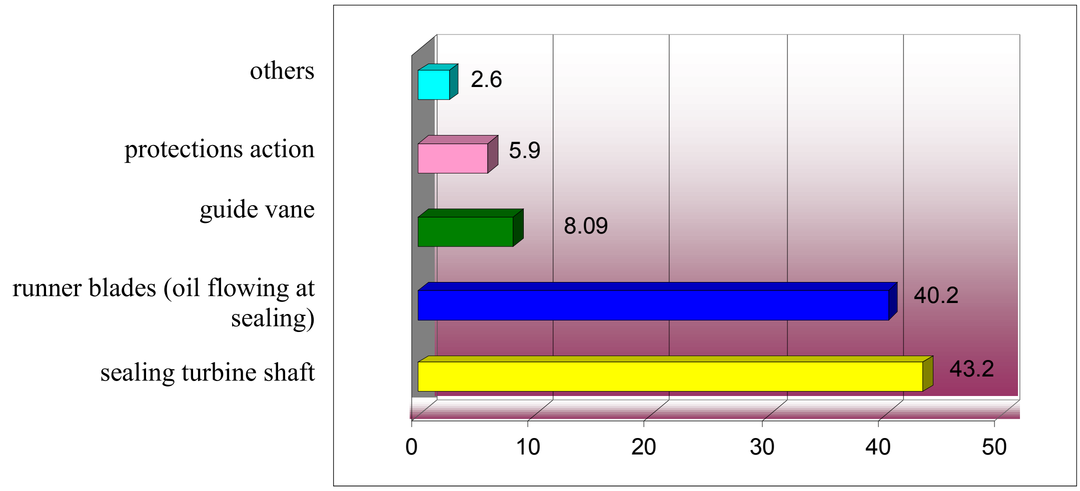


a$_2$) the hierarchy according to "relative number of failures" indicator $\nu^*(T_A)$ [%]

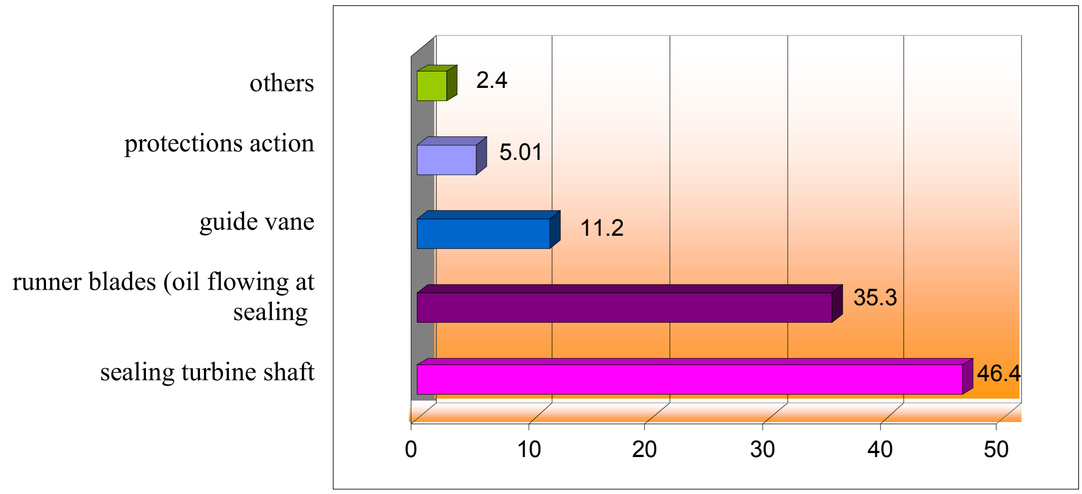


b) Hydraulic turbine (HT)

b_1) the hierarchy according to "relative time of unavailability" indicator $\beta^*(T_A)$ [%]

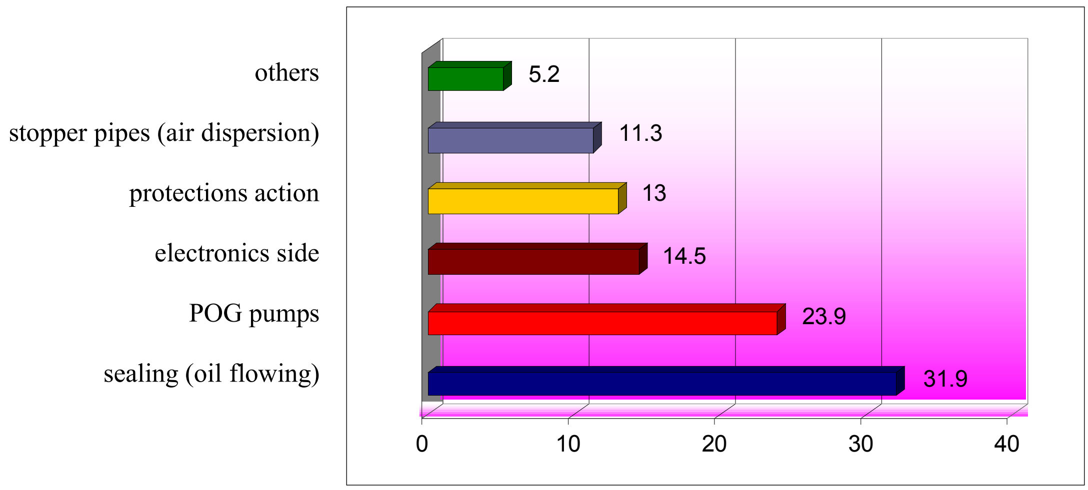


b_2) the hierarchy according to "relative number of failures" indicator $\nu^*(T_A)$ [%]

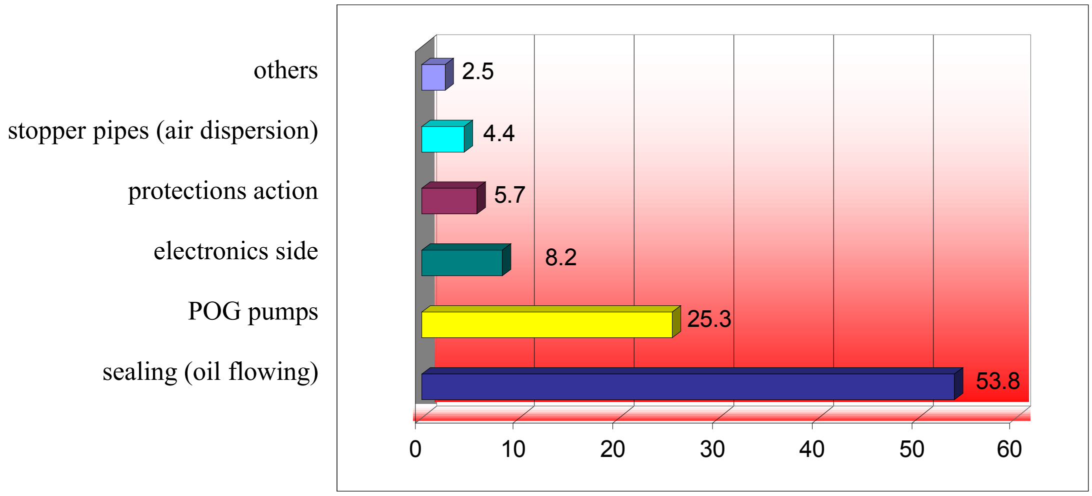


c) Automatic control system (ACS)

c_1) the hierarchy according to "relative time of unavailability" indicator $\beta^*(T_A)$ [%]

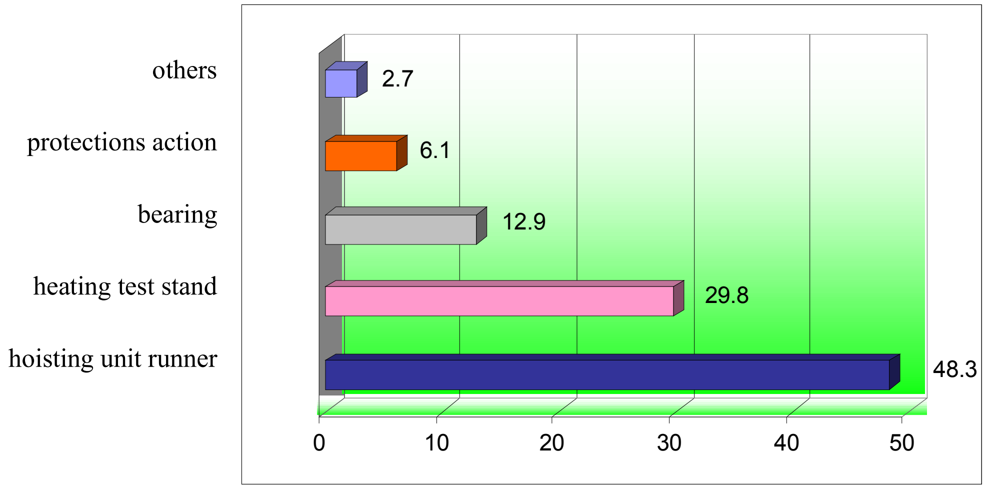


c_2) the hierarchy according to "relative number of failures" indicator $\nu^*(T_A)$ [%]

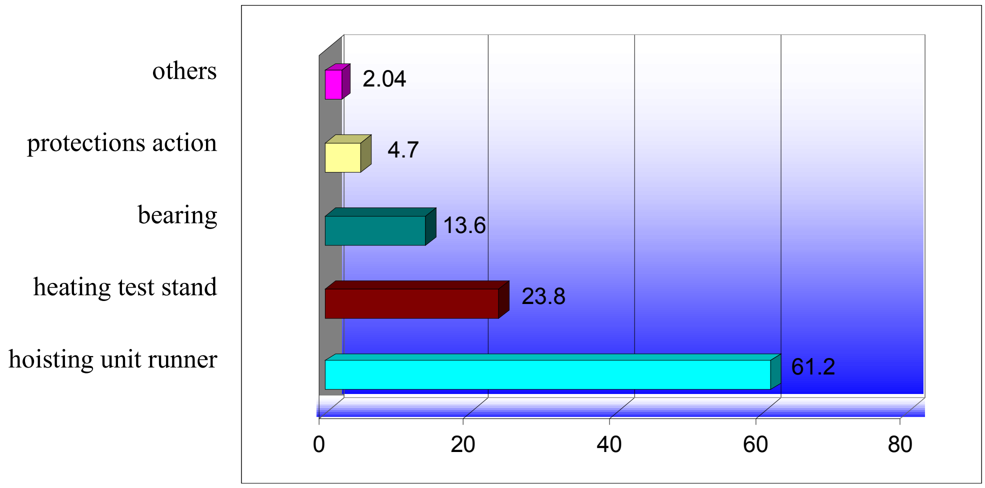


d) Hydro-generator (HG)

e_1) the hierarchy according to "relative time of unavailability" indicator $\beta^*(T_A)$ [%]

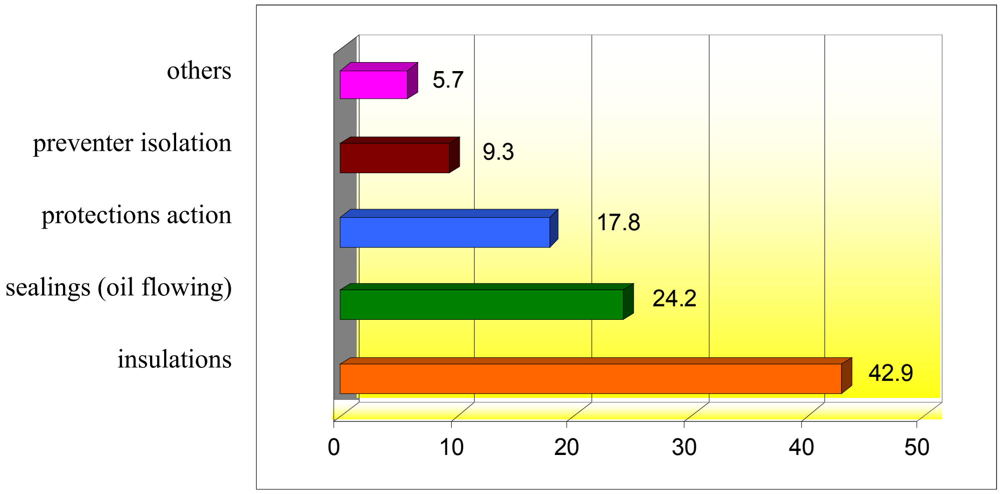


e_2) the hierarchy according to "relative number of failures" indicator $\nu^*(T_A)$ [%]

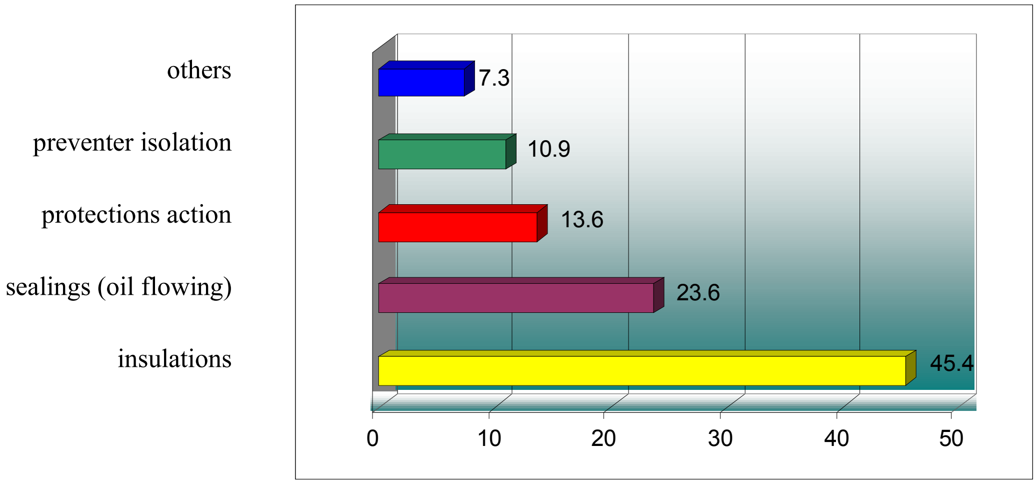


e) Goup transfomer (GT)

e_1) the hierarchy according to "relative time of unavailability" indicator $\beta^*(T_A)$ [%]



f_2) the hierarchy according to "relative number of failures" indicator $\nu^*(T_A)$ [%]



3. CONCLUSIONS

Concerning the studies of operational reliability achieved in this paper it is important to make the next observations:

- ♦they are useful because it offers a first image concerning the state of equipments, the behavior in exploit and the management of their maintenance;
- ♦with all efforts made in the direction of correct declaration of incidents and their parameters, still affected by errors;
- ♦they are not sufficiently detailed and profound, reduced themselves to a relatively small number of equipment followed in exploitation;
- ♦in the framework of study case accomplished it was achieved a failures causes hierarchy and also of the subsystems principal components from the hydro-generator group, which contributed at failures. The results of this analysis are useful to the identification of systems and elements which weak behavior under the aspect of reliability and establishment the actions direction for development of groups reliability.

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