Fault Detection and Maintenance of Hydraulic Power Generation System Based on Computer Operated Machinery and Equipment

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Abstract. With the development of information technology, the fault detection and state maintenance of power generation system in hydraulic power generation industry pay more and more attention to information operation. In this paper, the necessity of mechanical equipment maintenance of hydraulic power generation system and the related matters to pay attention to are explained, at the same time, the fault detection and maintenance level of hydraulic power generation system based on computer operation of mechanical equipment is discussed, for the reference of readers.

Keywords: Mechanical Equipment, Hydraulic Power, Fault Detection, State of Repair

1. Introduction
Hydraulic power generation equipment in the work due to the long-term erosion of water, which leads to the failure of hydraulic power generation system [1-4]. Therefore, the hydraulic power generation industry needs to carry out necessary state maintenance of hydraulic power generation equipment in the actual production process, so as to reduce the loss in the production process. In the following aspects, the fault detection and state maintenance of hydraulic power generation system based on computer-operated machinery and equipment are discussed.

2. Problems related to fault detection and maintenance of hydraulic power generation system
2.1. Security issues
The electric power industry itself is a high-risk industry in the specific composition of our country. The first priority in the specific analysis of the electric power industry is to pay attention to the relevant safety issues[5-8]. Although the planned overhaul mode is no longer desirable, it is still necessary to introduce a good overhaul plan at the current stage for equipment overhaul, and carry out the best control of overhaul cost to ensure that the cost will not be too high. And in the actual maintenance process, the planned maintenance and fault maintenance should establish an effective connection, that is, the two maintenance modes will be used together. Not only can be clear about the actual condition of the equipment, but also can accurately evaluate the maintenance time of the equipment. Then in the process of maintenance, the scope of maintenance will be determined.
2.2. Management issues
If the hydraulic power generation equipment is in normal operation state, it needs to carry on the condition evaluation and condition maintenance of the equipment, during this period, it needs to have a good management level. In the design process of hydraulic equipment, one should have a relatively clear cognition of equipment, that is to say, in the specific selection process of equipment, one should have a cognition of the specific direction of equipment. Should choose the relevant equipment that some well-known manufacturer produces to be responsible for concretely. At the same time for device status detection and

A clear understanding of the management problems in the maintenance process, to fully ensure the identification of management problems, and for this aspect of the problem to be fully discussed, to prevent the lack of management work resulting in the existence of the corresponding problems.

2.3. Equipment problems
It has been mentioned above that relevant equipment produced by some well-known manufacturers should be selected for the selection of equipment, and the equipment itself is still difficult to repair, etc. Choosing some suitable equipment for maintenance can effectively ensure the good development of related maintenance work. Similarly, in the process of equipment installation, it is necessary to install the equipment in a suitable place. It is better to choose a spacious place, which is suitable for its position in the later monitoring. In addition, it is necessary to monitor the equipment regularly when the equipment is in operation. The monitoring should be in line with the actual situation of the equipment. For equipment, if damage occurs, it means a specific shutdown, if the failure to kill before the damage is extremely important for equipment.

3. Fault detection of hydraulic power generation system based on computer operated machinery and equipment

3.1. Information collection and analysis
In the process of maintenance of power generation equipment, it is necessary to analyze and compare historical data and recent data, and timely and accurately collect equipment status information parameters, which is the basis for carrying out equipment status maintenance (FIG. 1 is the fault diagnosis instrument).

![Figure 1. Fault diagnosis instrument.](image)

3.2. Evaluation equipment
Assessing the importance of power generation equipment in the overall operation of the system helps to prioritize maintenance. The power generation equipment of different importance has direct influence on the method frequency and the order of maintenance plan.

3.3. Determine the state monitoring method and frequency state monitoring method

3.3.1. Status monitoring method
The status monitoring of power generation equipment can be divided into offline status monitoring and online status monitoring. The DAS system widely used in generator sets and the TSI system used
in steam turbines belong to the on-line monitoring system. On-line detection equipment is widely used in the important equipment and main machine of power generation enterprises because of its fast response to faults, large data processing volume and continuous information recording and other advantages. Therefore, the status overhaul will adopt the online status monitoring method for monitoring (Figure 2 is the hand-operated screw hoist).

![Hand Screw Hoist](image)

**Figure 2.** Hand screw hoist.

### 3.3.2. Frequency of status monitoring

Comprehensively considering the operating state of the equipment, its importance in the system and emergency management ability, etc., set and arrange the equipment with the management experience of equipment maintenance and operation. Theoretically, the monitoring frequency should be determined according to the P-F interval of equipment failure. Generally, 5-20 monitoring points can be selected within a P-F interval. In the actual operation, the technical limitation of monitoring equipment should be fully considered and the monitoring frequency should be reasonably arranged. Generally, when the detection equipment is just put into operation, the monitoring frequency can be slightly increased. After accumulating certain experience, it can be adjusted in time. For example, the monitoring frequency should be increased and the early warning and emergency measures should be taken for the equipment with fault signs but unable to be stopped for maintenance (FIG. 3 shows the completion of maintenance of water conservancy equipment).

![Completion of Maintenance](image)

**Figure 3.** Completion of water conservancy equipment maintenance.

### 3.4. Troubleshooting and diagnosis

Fault diagnosis is to analyze and utilize equipment monitoring information to timely capture various information sent out by the changes of various physical and chemical parameters before equipment failure. According to the diagnosis knowledge, the category, position, degree and development trend of equipment fault are judged, and relevant guidance information is provided to guide its operation and operation, so as to avoid the occurrence of fault or minimize its impact on equipment, and provide basis for maintenance decision, so as to make maintenance work with clear purpose, scientific method, economic and reasonable.

### 3.5. Maintenance decision

After the equipment fault diagnosis enters the maintenance decision stage. The theoretical basis of state maintenance decision optimization model is mainly mathematical statistics and stochastic process theory, including stochastic filtering model, time delay model, PHM model, PIM model, Levy process model and Markov decision model.
4. Relevant countermeasures to improve the maintenance level

4.1. Formulate relevant standards to guide the maintenance work
In the process of modern maintenance of hydraulic power generation equipment, it is necessary to have a complete and unified technical standard, between the standards and specifications, can really ensure the good maintenance work. In the actual work, the maintenance work should also be classified into different levels. Some key work should be regarded as the highest level for maintenance, such as the hydro-generator set in the hydroelectric system. In more important, so can set its maintenance work become the most important maintenance work. In the actual work, for the maintenance cycle should also be a good discussion, to ensure the reasonableness of the maintenance cycle, only in this way can really ensure a good maintenance work. Same to overhaul the work to undertake good guidance, should also have clear to technical specification, namely overhaul the specific technical standard that uses in the technology has provision, namely very good guidance is in overhaul the technology that uses specifically. In the modern regulatory system, maintenance work should be well promoted, and the external environment is a very important component. In the new era, more attention should be paid to the construction of the external environment.

4.2. Do well in equipment monitoring
In the process of the actual use of hydraulic equipment, the monitoring of equipment is also essential. In the monitoring work, attention should also be paid to the monitoring work to fully ensure that the monitoring work has a good effect. In the actual work, not only should the monitoring work have a good effect, but also should ensure that the results of the monitoring work are well recorded, so as to provide effective guidance for the later maintenance work. In the process of carrying out the maintenance work in the future, you can put forward a good picture should reference and basis. So, the effect of the monitoring work is also related to the actual use of the equipment to some extent. Just like external supervision, monitoring has been well promoted by modern equipment.

4.3. Skills of relevant personnel
In the actual maintenance process, the focus of most of the work is to improve the professional skills of relevant staff, to ensure that they have a good use of the process. Want to guarantee the quality of overhaul work truly, it is to undertake fundamental work above all, the first is to enhance the own ability of overhaul personnel and the scientific nature of overhaul work, in the specific recruitment of overhaul personnel, need to have a full investigation of the candidates. Also, among those who have been recruited, before they are officially hired, do a good job in the pre-job training, for the maintenance personnel have the ability to fully improve the maintenance. At the same time fully ensure that the relevant practitioners have a relatively good quality of the relevant practitioners.

5. Conclusion
To sum up, using computer operation for fault maintenance and diagnosis of hydraulic power generation system can effectively improve the efficiency of hydraulic power generation equipment maintenance. In addition, in the course of maintenance, relevant standards should be formulated to guide the maintenance work, and do a good job in the supervision of equipment. Related technical personnel should also improve the maintenance level, so as to improve the quality of equipment maintenance.

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