

On Establishing the Benefit-Centered Fine Oilfield Equipment Management System

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Abstract

This paper proposed and described the benefit-centered fine equipment management system. The effective ways and methods are implemented and summarized. The practice proved that the system's implementation and consummation could obviously improve upgrading the level of equipment management and enhancing benefit.

Keywords: equipment management benefit security oilfield

The petroleum industry is a capital-intensive and technology-intensive industry, which mainly embodies in equipment's sophistication, large scale and high value. As the second largest oilfield in China, Shengli Oilfield has a wide range of equipments. In addition to seismic equipments, rigs, injection and production facilities, there are offshore platforms, petrochemical devices, power generation sets and other types of equipments. It is necessary to strengthen and improve the management of various stages of equipment lifetime not only to ensure equipment assets keep and increase the value, but also to make it good and effective. In the face of the new situation and new requirements, it is an unavoidable realistic problem how we manage well and use well the huge amount of the equipment assets.

The practice of equipment management over years has helped us realize one fact, that is, we must adopt systematic theories and methods to change equipment management ideas and behaviors, and explore ways to establish the benefit-centered fine equipment management system in a creative way.

I. Summary

The system has many characteristics as following:

- specific objective, operation, responsibility and inspection system with node management;
- perfect organizational structure;
- basing on equipment resources and technological progress;
- profit as a springboard and grounding;
- insisting equipment safety and reliability, simultaneously high effectiveness with the low consumption;
- management covering a lifetime of the equipment and
- standardized operation according to the standard procedure.

In the market economy, the internal and external environment of the equipment management system is changing.

Internal environment aspects include: unceasing refinement of enterprise management as well as corresponding increasing requirements of equipment management; an equipment or a sets, as a management unit entity, is the basic cost unit implementing reward and punishment; implementation of QHSE system and so on.

External environment aspects include: rapid development of equipment and technology; improvement and development of equipment factor market; higher requests of people-oriented and harmonious society; functions of the value law, the law of supply and demand and the competition law.

Therefore, to establish and improve the system meeting the requirement of market economy, quality and benefit must be stressed, not only to optimize the elements, but also optimize the procedure, paying attention to the

coordination of relationship in dynamics, fully displaying integrated function, so as to achieve the overall function optimization of the system.

In the face of the new situation of inadequate investment and cost control, we have put forward and implemented the system from 2001. Its theme is to seize the three main lines (security of equipment nature, standardization of equipment operation, rationalization of equipment running), to strive to pursue zero defect, zero failures and zero accident, to strictly implement rules and regulations of equipment management, to emphasize hidden risks of equipments, to persist in the approach of relying on scientific and technological progress, promoting production development, and prevention primarily, to strive to benefit through economical and secure running.

According to the equipment quality supervision method, major defects of equipment are divided into three categories: A, B, C. The pursuit of zero defect means that A and B defects are not allowed to appear, especially defects impacting on production safety. The pursuit of zero-fault requires to strengthening the monitoring equipment and analysis of equipment downtime, to explore an effective way reducing equipment downtime, thus minimizing the downtime losses. The pursuit of zero accidents stands for strengthening integrated management of the human-machine systems to improve its reliability and security, to avoid and reduce happening of the accidents. In practice, we carry out the three main lines through a series of specific economic and technical indicators.

II. The objectives and functions

1. Equipment management must serve the overall objective of the enterprise

When it serves the enterprise's overall development and economic efficiency of the enterprise, equipment management, as a subsystem of enterprise management, will have the right positioning; when it continuously

grows exchanges inside and outside and positively absorb a wide range of new scientific and technological results, equipment management has the driving force of innovation; when it works strictly in accordance with the law, continues to adhere to effective management methods, equipment management is able to ensure the safe operation of equipment and best performance that equipments displayed.

2. Objectives and functions of equipment management must adapt to the new requirements

Equipment management serves not only on-site production, but also product market; it is not only for the economic efficiency of enterprises, product quality and production safety, but also for enhancing the competitiveness, capacity of product development, market adaptability and self-development capacity. This is the major changes of equipment management functions. It is not only broadening of the scope, but also an upgrade of the level.

3. Positively implement changes in behavior mechanism of equipment management

(1) management styles from focusing on technology into combination of technology and economics; (2) the work positioning from the role of logistics support to the forefront of production and management; (3) equipment investment from satisfying production demand to maximum of investment profit; (4) operation mechanism from extensive management to fine management with benefit centered; (5) equipment repair from surplus maintenance to adaptive maintenance and reliability based maintenance; (6) on-site management from the passive renovation to the prevention in advance.

III. Reinforcing equipment life circle management to achieve the security of equipment nature

In order to ensure safe running of equipments, it is very important that we must do a good job in the earlier period paying attention

to the discovery of potential defects and repairing in time.

1. Reinforcing the equipment management in earlier period. It is very important for equipment experts to fully play their roles. All items including purchase plans, programs design, the support standard and layout of the system are evaluated and proofed carefully by experts. Experts participate in the entire process from technical exchange to business negotiations. The performance test of key components and providing of the security devices must be carefully considered by experts. Manufacturing process and quality of large-scale equipment are strictly monitored in the light of technical agreement and relative standards.

2. Reinforcing the maintenance management of equipment. First, we adhere to executive maintenance regulations and do well four works: the repair plan, repair tender, the supervision of repair quality and approval for outside repair. Second, we strengthen the management of maintenance plant qualifications. On the base of a comprehensive evaluation of maintenance plant, the bottom-out is implemented. Third, the implementation of equipment maintenance tender makes plants election system become sunshine operation. Fourth, maintenance quality supervision is implemented. We guarantee the normal operation of production equipment through the norms of equipment maintenance behavior

3. Reinforcing security management of key installations and vital parts. We further strengthen the focus on the management of important equipments, in particular marine equipments, petrochemical devices, large-scale rigs and other key facilities. While we emphasis on management of important equipment, we take many measures for auxiliary mechanical and electrical devices for power supply, water supply, steam supply and so on to achieve improvement in the reliability of the entire sets running.

4. Reinforcing equipment condition monitoring. First, the oilfield set up equipment monitoring stations. The station equipped with better equipments, having complete testing means, has been upgraded for the title of China Petrochemical Oilfield Equipment Testing Center. Second, we implement the mandatory testing related to equipment security aspects. The derricks of drilling rigs and workover rigs in load capacity are regularly tested. Thirdly, we gradually establish and improve mechanism of the condition monitoring and fault diagnosis. To take a combination of professional testing and conventional monitoring, we organized promoting the rapid detection of oil, vibration testing, temperature testing and other conventional monitoring. Fourth, condition monitor technologies are introduced in equipment upgrading. The drilling rig, natural gas compressors and other major equipments which are recently purchased have a detection system. Remote pumping stations are designed or renovated for fully automatic operation on a "fail safe" basis. Operation of the principle equipment of the station can be initiated from the system control room.

5. Reinforcing the management of equipment lubrication. First, we revised the lubricating specification and have strengthened infrastructure construction. Second, strict standard is maintained to lubricants imported to oilfield. Third, we strengthened lubricant testing. Using technology of physics and chemistry, spectroscopy and iron spectral analysis, we implemented regular tests on the important equipment and tracked its trend so as to prevent the abnormal wear. Fourth, we popularized the vacuum oil filter, the engine cleaning technology without dismantle, on-site cleaning with engineering vehicles.

IV. Improving the management regulations and staff quality to realize the standardization of equipment operation

1. Strengthening the construction of the equipment management organization system. To manage this enormous equipments well requires works starting from organization construction, striving to establishment and perfection of the organization system of equipment management, to create the horizontally harmonious equipment management system with a sound body, clear responsibilities, linking up and down.

2. Strengthening the building of regulations and standards. We adhere to improving the rules and systems and promote standardization and institutionalization of the equipment management. We amended and improved in time the professional equipment operation and maintenance rules and equipment inspection standards and produced standardized operation videos for different types of works. We organized editing *Manual of Oilfield Equipment Management and Usage*, *Modern Equipment Management of Oilfield Enterprise* and other professional books and compiled knowledge base of various types of equipments, hence laying a solid foundation for staff training.

3. Enhancing the construction of staff quality. To arouse the initiative of study in the broad masses of workers, we held equipment management knowledge and operation skills competition every year. We have established emergency precaution plan and done the practical exercises. Through targeted analysis of accidents and combat exercises, post worker's emergency handling ability is strengthened continuously.

4. Strengthening supervision and inspection. In view of the actual situation that oilfield operations are always multi-point, long-ling, vast-area, decentralized and in worse environment, a mandatory supervision mechanism for the use of equipment is established and improved. The oilfield organized the equipment yearly examinations, secondary units check every quarter, third-level units every month, grass roots units every week. We take

these regular equipment checks as the main form, with the stochastic on-site supervision as the supplement. Inspection results of oilfield and secondary units are linked to year-end appraisal. Inspection results of third-level and grass roots units are linked to the same month bonus. On-site supervision has characteristics of unscheduled time, uncertain location, random equipment checking, which ensuring equipment under effective control.

The equipment defects found in examinations must be strictly solved. A-type defects are solved by secondary units. B-type defects by third-levels units. C-type defects by grass roots units. If A-type defects are found in checking of higher authority unit, the grass roots units could be fined. The equipment will not be allowed to use before the problem is solved. If B-type defects are discovered or C-type defects exceed the stipulated number of defects, economic punishment could be sure.

Because the on-site equipment supervision is random, can happen at any time and there are strict cash rewards and punishments, the quality of equipment operators are rising and they are able to detect and report device problems in time. This overcame the shortage of a regular check of the equipment management staff, identified and eliminated a great deal of equipment potential accidents, thus became an important driving and restraining means of general equipment operators, helped the upgrading of on-site equipment maintenance and management.

5. Strengthening information technology. Hardware and software investments are increased in the four levels of production control, integrated control, production management, operation decision-making, setting up databases based on management data and real-time data , building a digital oilfield technical supporting platform, realizing real-time monitoring for the whole process of production, equipment performance calculations and analysis as well as running optimizing and operating guidance.

V. Carrying out technological renovation, excavating resources potential to realize rationalization of equipment running

1. The implementation of specialized equipment management and leasing. The same types of equipments, such as special vehicles, seismic instruments, are managed and leased by a basic unit. Equipment operation efficiency and management level are raised synchronously.

2. The implementation of research and development of new equipments and technology renovations of obsolete equipments. We fully mobilize the relevant institutes and units and do research with high-level domestic enterprises to develop required high-tech equipment. We have implemented renovations of obsolete equipments, actively promoted the use of new technologies.

In recent years, ultra deep drilling rig, 26MPa supercritical steam injection boiler and a large number of new equipments have been developed and put into practical use, enabling equipment management directly reaching the front of the production and operation which played a significant role in reducing cost, raising efficiency and opening up the market.

3. The implementation of economic accounting. We promoted single equipment accounting, and contracting assessment of maintenance costs, power consumption and other indicators to reduce the cost of equipment maintaining.

4. The implementation of economic optimal operation of equipment. In view of the problems of pump aging and its low efficiency, the efficient DF Series pumps replaced inefficient DG Series and 6D series water pumps. The impeller level-split transformation as well as configuration of pumps with different displacement volume is widely used in centrifugal water injection station. The pressure difference between pump output and main pipeline is obviously reduced.

Sucker rod pumping is by far the most commonly used method of artificial lift in oilfields. Mainly through reasonable match of energy-saving electrical motors, transformers, pumps, out of high energy consumption equipment, lower power factor and low efficiency of the system could be solved gradually.

5. Implementation of competition of long-life and high-efficiency equipments. Every year, a certain number of long-life and high-efficiency equipments are selected on the basis of comparison. These devices have been put into operation for a long time and have high utilization rate, low downtime rate, low maintenance costs and profit with high return.

VI. The effect of implementation

Through the implementation of the system, remarkable achievements have been made: the rising awareness of equipment management of whole staff, the foundation work of equipment management being enhanced, steadily improving economic and technical indicators of equipment management, improving on-site equipment management and economical equipment operation level.

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