

# Exploration and Practice on Mode of Oil Field Equipments Maintenance

Li Mingshan and Li Jingxiang

Daqing Oil Field Equipment Management Center of China 163453

**Abstract:** In accordance with the life-cycle cost management concept, different industries, different environments and different production requirements under the equipment, take the best, the most economical and the most effective mode of maintenance, in order to realize the target of the production to protect and improve equipment in creating effectiveness and the ability to reduce maintenance costs.

**Key words:** Equipment; Maintenance mode; Exploration; Practice

## I. Preface

Equipment is the basis for the survival of enterprises and cost-effective source of enterprises. It is to protect the production, management, and service life of an important material foundation. Daqing Oilfield Co. Ltd is a large state-owned enterprise. It is to shoulder the responsibility of safeguarding national oil supply security and to seek corporate responsibility for sustainable economic development, and political and social responsibility. In the coordinated development of the whole process, in order to enhance the capacity to protect equipment, to enhance the effectiveness of management goals, to explore and practice, the oil industry equipment maintenance features of the model has important practical significance.

Daqing Oilfield Co., Ltd. is a large state-owned enterprise with major professional equipment 266,000 sets. It owned 54 secondary units and more than 19 employees. It is mainly engaged in

oil and gas exploration and development, drilling, infrastructure, scientific research and design, fine chemicals, machinery manufacturing, as well as securing water and telecommunications services. Oil field equipments are complex and cover almost all fields of national economy. Wide range of construction environment including indoor, outdoor, outside the field and outside the borders, especially in the out field of construction equipment, result in bad working conditions and difficult equipment protection and management. It makes equipment maintenance mode have a higher demand for the complexity of the equipment failure, maintenance of a variety of environmental and pressing time limits technology.

## II. To explore the application of life-cycle cost for the maintenance of the core mode

With the progress in science and technology, Oil field equipment is gradually automatic, systematic and complicated, digital sets, controlling, communications and other modern science and technology are in one of the machines, electricity, liquids integration of equipment is increasing. Equipment status has been changed dramatically. It becomes more and more critical for production and business activities. Daqing Oilfield Co., Ltd. (it is referred to as the Daqing oil field) in the new period for the new situations and new problems establishes the "three-round" (full, full life, the entire process) of the Integrated Management, adheres to the stand-alone quantitative analysis, adheres

to the management production services, insists on creating effective management, such as equipment management concept, in order to explore the application of life-cycle cost as the core for the oil industry characterized by production equipment maintenance mode. These are well-established methods and ideas.

### **1. Innovation plan maintenance mode and improving the efficiency of drilling equipment to create the capacity**

The procedures for operating the oil fields or equipment, accidents and damage to the sudden failure of the system down easily lead to accidents of engineering, may also result in greater economic losses. For this type of equipment, Daqing oil field carries out a useful model to explore effective control of the sudden and accidental damage to equipment failure.

Oil drilling rig is the formation of large-scale oil extraction technology shaft sets of production equipment. It can be open-air field for operations uninterrupted. Daqing oil field drilling rig have more standardized parts, but partly has been extended active duty. Mechanical properties are lower. Before large-scale repairs, repair of medium and small-scale plans to repair the maintenance mode, can not meet the requirements of the production drilling. Its components are often damaged in the middle of the construction and the whole drill down seriously affects the quality of the casing. And it often leads to a vicious work accident, causing great economic losses. In view of this situation, maintenance mode has been innovated, and a mandatory replacement has been established by the Daqing oil field drilling company, and plans to replace the combination about "mandatory round of the repair mode. Namely, according to the rig parts of the MTBF time to develop a reasonable mandatory replacement cycle, operation of the rig time to reach parts

replacement cycle, upon completion of drilling operations (production wells to build wells for the cycle in general 5-10 days), the equipment is moved, run out of good parts to replace them, they were sent to the maintenance repair shop in order to ensure that every construction wells, drilling rig components to each of the fault-free run. Scheduled mandatory replacement parts costs, drilling companies should be unified reimbursed. To be replaced the components in advance, it may be replaced after the identification of the status, but do not write off the cost, well-drilling team should undertake themselves. To be the replacement cycle, but the status of the well-drilling machine parts are identified that they can apply for long life, then, they may continue to serve. To prolong life in achieving the standard equipment of the rig components, the replacement cost of reunification is written off. At the same time, the device longevity award system should be implemented.

"Mandatory rotation of repair mode" is established to lower construction of drilling rigs operating in the number of replacement parts and reduce work accidents, cut down the cost of drilling, increase drilling and production of limitations casing quality. At the same time, because rig components can be maintained in time, but also extended the service life and improved the ability to create effectiveness.

### **2. The promotion of preventive maintenance mode to lower the cost of production equipment maintenance**

The preventive maintenance is the use of advanced instrument and the science method to keep abreast of the production equipment movement situation accurately, to determine reasonable service method, to guarantee the equipment unusual early time to discover faults the early time removes, and to prevent the

equipment performance reduces, precise deterioration, and breakdown engine off.

The Daqing Oil Field in the production practice, to the project machinery, the project generator, and the note pick the pump and the boiler, and so on. The main production equipment uses the preventive maintenance pattern, combinations methods of "everyday maintenance check" and "professional inspection and maintenance". The using of non-disintegration of the detection engine analyzer, vibration testing analyzer, temperature detectors, oil analysis instrument, such as high-tech equipment, equipment for the operation, vibration, temperature, lubrication, fasteners, and the anti-corrosion, and so on is planned inspection And monitoring. Unusual to find and analyze the reasons for reform in a timely manner, most of the equipment will be nipped in the bud potential, improve performance, reduce downtime and improve maintenance access to opportunity. At the same time, it significantly reduces the integrated equipment maintenance costs.

### **3. Practice of predictive maintenance mode and the display of power equipment safeguard potential**

Predictive maintenance in the world today is a new way of maintenance and is the direction of equipment maintenance, according to the state of its decision to maintain the way of equipment, also known as condition monitoring maintenance. Because this maintenance mode is targeted for equipment maintenance, only when maintained or repaired or replaced to be the early parts of the damage, it can effectively prevent equipment failure.

The Daqing Oil Field electric power group is mainly shouldering for the Daqing Oil Field. The local industry and the city peoples lives the electricity generation, the power supply and the

heating duty, it has 4 power plants with a total installed capacity of 1,000 megawatts. Power generators ensure the smooth functioning of the normal power supply. Therefore, the electric power group to generator temperature, vibration, lubrication oil material carries on the condition monitor, the breakdown diagnosis and exceptionally forewarns, "Three levels inspect" to the key item of spot implementation, accurately grasps the equipment promptly "the health" of the condition, the equipment is judged by according to the examination result analysis of the deteriorated degree, the breakdown spot has the reason, and has the advance line in the breakdown at the right moment and the essential service. This kind of foreknowledge service pattern enable the equipment to obtain the full maintenance, the maintenance and the overhaul, thus has guaranteed the generator steady continuous running.

### **4. To optimize the reliability of maintenance mode to ensure the safety of environmental protection equipment running**

Not only chemical equipment security reliability influence productivity, moreover also involves the environmental protection as well as personnel's safety. It is especially importantly to try finding out a set of the maintenance pattern that suits the chemical equipment, guarantees the equipment security and environmental movement.

The Daqing Oil Field chemical industry group, by the natural gas processing, the light hydrocarbon profound processing and the surface active agent production primarily camp service, has 9 sets of large-scale production equipment (installment). In view of the high temperature, high pressure, the flammable explosive production environment, by the reliable service pattern guaranteed the chemical equipment steady movement, is one effective

management. The technologies of “the distributional intelligent monitor” and “the computer automatic control” are used in the area of the chemical equipment and the key spot. The parameter condition carries on the intelligent monitor and recognize latent malfunction according to pre-set sequence elimination hidden danger. Secondly, in accordance with “the day-to-day closed-loop check” mode, inspection and supervision are combined, equipment is early detected and hidden dangers are eliminated, in order to effectively control the equipment failure. Thirdly, to determinate service countermeasure by the breakdown consequence serious degree, the management of the process is strengthened to ensure the maintenance of the quality of key parts for maintenance of redundancy, so that the equipment is reliable enough to run state. Fourthly, breakdown information report and the analysis of mechanism are established to accumulate experience, promote quality, optimize the reliability operational mechanism unceasingly, and guarantee the chemical equipment security environmental protection movement.

### **5. Carrying out the whole staff to produce the service idea, raising the equipment synthesis management level**

The Daqing Oil Field Combines with the actual production, the primary equipment production unit carries out the whole staff to produce the service idea comprehensively, and obtains the good effect. First, management committee rule should be executed. Participating in the equipment supervisory work as committee member's entire company all departments, the comprehensive policy-making equipment management, the service important matter, the important matter, strengthened the policy-making scientific nature and the feasibility. Second, according to the principle of “instruction, practice, improvement,

enhancement”, the management, the operation and the serviceman organic synthesis, establish the teams and groups as the carrier, the equipment management, the operation and the serviceman participate visible and the invisible equipment management group. Group of self-maintenance equipment can carry out independently mass communication, consultation and guidance, improvement and maintenance activities, so that a large number of potential equipment failures and shortcomings are eliminated. Third, to establish the equipment for the life as the object of preventive maintenance system, where the equipment is involved in the planning, designing, manufacture, using, maintenance and the sector of improvement, from the highest leadership to front-line workers should full participate them to share experiences and give full the initiative to improve all aspects of life equipment management and enhance the level of integrated device Management.

### **III. The innovation and practice of Management-Maintenance mode**

With the improvement of Production automation, the production efficiency is more and more largely by the equipment influence. The level of productivity is from the using of equipment and maintenance, whether they are reasonable decides higher and lower of productivity. The equipment supervisory work is also promoted from the pure safeguard production to the enterprise manages strategic altitude. For the equipment under different circumstances, to choose the most economical and most effective mode of maintenance has become a way to solve business difficult problems. Market-oriented Equipment maintenance makes enterprise survival needed, but also inevitable. How to repair equipment in accordance with the rules of market economy to run and how to set up equipment-operating mode, Daqing Oilfield

makes a great deal of research and practice.

### **1. Professional maintenance mode**

The Construction Group of Daqing Oilfield is a petrochemical engineering general contracting qualifications of the special large-scale infrastructure construction enterprise group. It has 16 major units and 11,000 sets professional equipment. In order to meet the infrastructure industry project management systems, construction group carries out leasing system. In-house maintenance mode is creatively used in the process of professional equipment. It makes production equipment focus on the “machinery equipment company”. Construction of the project team can be in the form of in-house leasing equipment. Equipment is used in the course of construction by the project team to simulate market mechanisms. Company's staff of professional equipment is hired to maintain and repair work in machinery and equipment. The operation of this type of professional maintenance mode makes the equipment more professional, more effective and reasonable repaired.

In the production Operation and Management, Daqing Oil field Group of electricity forms a turbine generating units to make large, medium and minor repaired, installed, debugged, operated and maintained, in other professional service, not only to protect the unit's equipment running efficiently, but also into the market. It has assumed power Sudanjili, Indonesia Palembang power station, tower petrochemical plant in Xinjiang, Shaanxi Yangling more than 20 domestic and foreign power plants, such as technical services to create a substantial income, at the same time, to train further personnel security equipment.

### **2. Point-location test mode**

It is based on the technology equipment status of “day-to-day point-location”, “professional point of seizure” and “sophisticated point-location” and according to the principle of “short downtime, loss of production of small, low-cost repairs, maintenance and efficient” make the equipment maintained. This kind of test is the most economical way of maintenance.

Oil production and transportation companies of Daqing Oil Field implement stand-alone system. In order to reduce maintenance costs, “detection equipment” has been set up and point repair mode is popularized. With the stand-alone cost in-depth, stand-alone personal income and costs links to the mechanism, the activity of “the management” starts actively taking the single plane as the carrier, the operator seeks positively reducing the cost expense the method, gradually steps onto the path of point-location test. First, operator use more elaborate equipment and actively to seek accumulating with minimum capital investment, so that the equipment create effective ability in the experience and methods. Second, the operator actively practice the philosophy of prevention and seriously carry out routine inspections and Professional Inspection and Precision Inspection with the initiative, hidden fault was nipped in the bud with Scientific attitude and approach at the lowest cost. Third, the operator on own initiative provides the omni-directional equipment using information for the service, it has provided the science basis for the choice reasonable service way. Fourth, Inspection equipment maintenance and repair of the quality of the course was full supervised by the operator. At the same time, to ensure that the equipment, operator's technical quality is also improved.

### **3. Environmental maintenance mode**

Maintenance of environmental protection is the strategy of sustainable development and the mode of environmental protection production is reflected. It is an inevitable trend. In the production, Daqing Oilfield conscientiously implements the concept of green maintenance and carries out actively exploration and practice.

### **(1) Application of Maintenance of environmental protection technology**

Daqing oil field application of green technology and maintenance can be largely divided into three. First, resource-saving technology in equipment maintenance, lead-free, antimony-free, non-harmful substances such as chromium lubricant, cleaning fluid, the use of low-volatile, non-toxic paint and primer was used largely. The second is energy conservation technology. The drill and pump machinery and other large electrical equipment are repaired, part of equipment is transformed frequency, so that when the equipment is at work, the power load is always dynamic match and a great deal of power is saved. Third is environmental protection technology. The use of environmentally friendly technology, on the one hand, so that the pollution doesn't be produced. On the other hand, equipment at work with reliable and environmental friendly is ensured.

### **(2) Application of green technology Detection**

Daqing Oil Field testing the wider use of green technologies: magnetic detection, ultrasonic detection, infrared detection, liquid penetration testing and eddy current testing, and so on. Practice has proved that green technology will improve an effective mean of the equipment maintenance efficiency and quality.

### **(3) Application of Waste disposal technology**

Daqing oil field maintenance generated the wastewater emissions, waste residue, and retired after the end-of-life equipment has been appropriate dealt with. First, on the metal for recycling, toxic and harmful substances deal with environmental protection in a professional method. Second, the use of the old repair work is encouraged and supported. Further manufacturing technology is actively expanded. Along with large-scale part again technique of manufacture gear box axis and diameter 500 millimeters above brake drums maturity, Daqing Oil field actively promote wider application of petroleum equipment components and then expand manufacturing technology.

## **IV. Effect**

In the exploration and practice of oil field equipment maintenance mode, Daqing oil field produces a strong feature of the device management culture and management experience, takes the initiative to create a positive atmosphere for the management equipment, and injects vigor and vitality for all kinds of work.

1. A strong security is provided to production of oil field equipment

In accordance with the requirements of the scientific concept of development, Daqing oil field explores and continues to improve for Suiting for the actual production of oil field equipment maintenance mode, the quality of the equipment and the ability to create effectiveness is enhanced, and a strong security is provided to the production of oil field equipment.

2. Re-shape the management of the maintenance process and improve the management of

equipment

Daqing Oilfield takes effective measures to manage innovative ideas and methods, equipment maintenance and management of re-shaping process, establishes a long-term mechanism to stimulate enthusiasm and initiative of the majority of the equipment, management and operation of "possession, use, repair," and lays a solid foundation on the basis of the work and raises the level of integrated management of equipment.

### **3. To create considerable economic and social benefits**

According to the concept of equipment life-cycle cost management, the most appropriate mode of maintenance is taken by different industries, different environments and under the equipment of different production requirement, maintenance costs is reduced, power equipment and potential protection are enhanced to create considerable economic benefits and social benefits.

### **V. Conclusion**

At present, for the realization of 40,000,000 tons of crude oil continued to the goal of stable, on the basis of inheriting and carrying forward the fine tradition, Daqing Oilfield is emancipating the mind and renewing their concepts, and developing plans, In a further concept of practicing the equipment life-cycle cost management, equipment maintenance mode is gradually improved in the industry. With the maintenance management practices continued to deepen, it will certainly open up more innovative oil field equipment management.

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Author brief introduction:

Li Mingshan: city of Daqing in Heilongjiang Province China, Daqing Oilfield Limited liability management center

Li Jingxiang: city of Daqing in Heilongjiang Province China, Daqing Oilfield Limited liability management center

Phone number: 0459-5972210,  
0459-5994121

Email: [lijingxiang@cnpc.com.cn](mailto:lijingxiang@cnpc.com.cn)