

Innovate the mode of equipment maintenance to adapt sustainable development

- yang xu-ming Department of energy jiangnan machinery(group)

CO.LTD

Abstract: setting equipment management with trouble-free as a target, pushing TPM(Total Production Maintenance) as a means, quality of making one's rounds are controlled, service of equipment management are required in time, accurately and with high quality to ensure the quality choiceness of equipment running. Through promoting the development of preventive maintenance and enhancing the research of new science and technology for state overhaul, analyzing the major technical and economic indicators annually, equipment management are improved to realize the target of equipment running with high quality, credibility maintenance, failure avoided and efficient management .



Fig. 1 jiangnan machinery(group) CO.LTD

Today, in order to create a stronger vitality, seek long-term development, create more space for development, we must do: "eyes focused on the market, considering management on both sides, thinking about innovation, and following the footsteps of the times". We must understand that scientific and technological progress is the decisive factors for enhancing economic development and economic efficiency of enterprises, technological innovation is the soul of sustainable development for enterprises . We must focus on this theme that enhancing innovation of equipment maintenance, encouraging sustainable development, building a resource-saving and environment-friendly enterprise. We must design enterprise development, enhance capacity of enterprises, standardize enterprise behavior. We must pay attention to the enterprise management, adjustment enterprise development steps. with the automation of product equipment is improved, numerical control equipment and various processing center is added, we have a consensus on

the equipment that is if there is no target we will be worthless, no plans we will be chaotic, no budget we will be poor, no technology we will be behind.

First, all must serve enterprise development, that is the overall situation, strategy is put into practice to ensure trouble-free as the starting point and the end result for equipment maintenance to enhance our competitive capability.

Because it is common in most enterprises where exist questions of aging equipment, Outdated concept and so on, to practice the strategy, the more higher requirement is brought forward for our equipment maintenance than before. Based on those questions, equipment maintenance department only do their best to supervise and maintain the enterprise equipments as far as possible. They frequently implement the equipment inspection, maintenance, service and information transmission, play the role of functional departments ,those we did are full to practice the plan trouble-free strategy. In a word, only the best combination of management, equipments will

work with trouble-free.

During production, design department must provide technical information on non-standard design of all kinds of equipment and establishment which are much-needed, then the equipments are prefabricated by the commissioned subsidiary company, after equipment department organize to examine, check and accept the equipments, finally put them into use to ensure production completely successfully. Through self-study, trained, send employees out to study, invite experts to instruct and so on, learning manage experience of domestic and foreign advanced enterprise, enhance the professional knowledge structure, broaden the vision of technician, improve the professional level. We trained outstanding talent, found that talent, make good use of talents and building the ranks of high-quality talent. Each year, the company sent 50 - 80 personnels to participate in training courses of various types of equipment which organized by COCEM(the Committee of Chinese Equipment Maintenance) regularly for 5 - 8 times, the employee engaging in equipment maintenance should take part in examination regularly, those unqualified should be changed their position, this effectively guarantee for the high quality of professional technician.

To really make our products to enter the international market, the corresponding must keep up with technology and equipment, the idea of manager must keep up with the trend of the times, equipment operator must be skillful and master professional knowledge. From 2001 to date, the company has sent 48 people to large foreign companies to study for 15 times, so that we can integrate into the world, but also let the world know our products.

Against the new coefficient of equipments and technical services is lower than general, equipment maintenance departments actively seek efficient policy, speed up the update and upgrade equipments, so our equipment is well as advanced enterprises of the developed countries in the world, and our excellent detection technology services to our equipment effectively, in past equipments were repaired according to plan, maintenance are executed now, and preventive maintenance are realized finally.

To our subsidiary company, they can use the funds of equipment depreciation and can use the

savings cost, company encourage them to update and improve their equipment levels, so we can participate in the core of competition in the market.

Secondly, based on the theme of our economic efficiency, we build efficient management model as the core equipment management.

Equipment management is an important component of enterprise benefit management, we try to do well in equipment management so we can make use of them to create benefit for us. Over the past few years, our management of "targeted to equipment life, the pursuit of life-cycle costs and the economy" concept, reinforce the basic work, the implementation of standardized management, strengthen the life circle of control and build efficiency equipment management.

1. Optimize fore management to ensure the equipment investment return

Fore management imply to the management from planning to running, and is the "leader" of equipment management, which will directly affect the accuracy, reliability and durability of the equipment. Therefore, we must carefully select equipment model, for this point, we have established a flow chart of equipment fore management, which can standardize equipment fore management behavior and control the life circle of management from the selection of equipment model, supervision, installation to acceptance. In this regard, based on optimizing the increment of the equipment and improving investment returns, we focused on grasping the following three aspects.

(1) grasping investment feasibility studies.

The group was set up to study feasibility of investment, establish a major investment of equipment evaluation system. For the investment of more than 200,000 yuan in the major equipment items, we must evaluate comprehensively from the technical, economic, practical and safety, environmental protection.

(2) Grasping management of purchase equipment. Qualification of manufacturer were put on record by us, during equipment evaluation, we will assess comprehensively both from a technical and business aspects. According to cost-effective, good quality, related department check production quality

and prices record of equipment manufacturers and put it on record, then publish on the web. We implement rule of price review, only after prices are audited, equipment can be purchased .for a certain batch of equipment, We execute centralized purchase .if there are bulk order ,we make advantages of bulk purchase through inviting public bidding. These measures not only effectively guaranteed the quality of purchase, but also reduces purchase costs and eliminate bad habit of negotiate , bidding collusively during the bidding and purchasing.

(3)Grasping the installation of equipment and debugging.

Acceptance check of equipment was the most important part of equipment fore management, we must execute acceptance check strictly according to its technical parameters, because it was the foundation of equipment running safety and stability. Professional who are high quality and have strong dedication were sent to organize equipment installation and debugging, training. Equipment department fully play the role of supervisor to ensure the equipment high quality. We pay attention to the acceptance check of new equipment and strict inspection procedures, according to technology agreements and the order contract, "acceptance check operation instructions" are established, which will be used to acceptance check equipment orderly. the deficiencies of equipment we found during acceptance, we use "defects form" feedback them to manufacturer, after equipment manufacturers resolve the defects, we will check it renewly. a closed-loop management to eliminate defects. Through high-quality inspection, the new equipment are ensured to put into run safty and reliability.

(4) grasping benefit assessment.

During the purchase of large equipment,we not only do a good job in fore investigation, and must strengthen the application of testing and assessment after the assessment. due to insufficient investigation, the blind decision caused new equipment idle or low-efficiency, we will investigated the duty and punished related staff and published the result. The purchased equipment which are poor quality must be send back to manufacturer, and add the manufacturer into the blacklist, company which were added into blacklist are not allowed to sale equipment to our

company. So that we will let good quality equipment enter our company, refuse inferior equipment to enter our company.

2. strengthen medium-term management and improve the running efficiency of equipment

Medium-term management mainly refer to the management after the formal use of the equipment. In this connection, in order to ensure the efficient run of equipment, we try to do well in four aspects such as the management, maintenance, use, equipment repair, to establish the annual overhaul schedule, the annual technical improvement schedule. Through the implementation of the schedule our equipments have been improved steadily.

(1) establishing rules and regulations, improving the run efficiency of equipment

We set up the Equipment Management Committee of Company(EMCOC),general manager of the company is the director of EMCOC, and established the classification of equipment management network. We can acquire the all data of equipment anytime so we can understand the run status of equipment. Equipment daily lubrication and maintenance must be done well, equipment management assessment standards has been improved. Through the strict assessment, responsibility of employees has been raised. Through building perfect rules,worker duties are cleared .All of these resolved the problem of who is responsible for the equipment and the problem what they should do and so on.

Establishing rules and regulations, developing technical standards and management standards, that ensure there are rules to follow, and rules and regulations can be used as the basis. In order to strengthen the management of equipment, rules and regulations are established to ensure operator do everything according to these rules, and everything what they did must be recorded and was monitored during the process. Through the analysis of the major technical and economic indicators annually, they are

A. comprehensive rate of equipment in good condition (%)

B. perfectness ratio of main equipment (%)

C. ratio of operational capability of main equipment (%)

D. utilization ratio of main equipment (%)

E. fulfillment ratio of equipment overhaul

plan (%)

F. completion ratio of equipment examines and repair plan (%)

G. ratio of equipment overhaul non-plan (%)

H. ratio of equipment first-aid repair (%)

I. success ratio of trial run once for equipment overhaul (%)

J. fatal equipment accident

Through the analysis of above 10 aspects ,if there are any problems, we will not evade contradictions, and not cover up the defects, we will find our deficiency and seek solutions. What many enterprises do is: they are busy to use equipments and neglect maintenance; they are exhausted to repair equipments. For this question, we established assessment indicators; the data was offered to support equipment management for the coming year. The scientific data is a roll booster for excellent equipment management.

Equipment management information systems are improved, the information platform of equipment management are constructed to achieve the data in time and to realize the sharing of resources. We held a striving for being stars of equipment management activities, through this activity, the interaction of equipment management between functional departments and subsidiary factory was set up, and aroused the go-aheadism of the staff, that promotes the formation of total production maintenance. We build the status of dynamic management mechanism, the implementation of strict rules and regulations, and we attach great importance to minor problems that may emerge , we execute reward and punishment clearly ,through improving quality of tour system to inspect continuously, safe running of equipment was ensured.

(2) To increase management of equipment maintenance

The inspection work of equipment maintenance is the most important, the assessment of the equipment management have been as a means , cost of equipment maintenance is managed as a breakthrough point, set the purpose to enhance the contribution of equipment . That makes functional departments full play a role: management, supervision, inspect, assessment, training, instruction, excellent equipment management can ensure to complete the product task for the company. Specific

ally there are two points: First, manage equipment maintenance

costs, according to the company's request, equipment management departments

develop equipment maintenance costs management methods, and try to complete

the distribution, use , Assessment of the costs.

According to the annual tasks in

the subsidiary company, the number of equipment, new coefficient of equipment,

department of management distribute indicators of maintenance costs to subsidiary company. Second, subsidiary company determines the number of maintenance

staff according to the need, and designated the scope of maintenance, maintenance

staff must tour inspect the equipment that they responsible for daily and recorded the status of equipment run timely ,if there are existed problems,

they should resolve in time. if they are not able to solve the problem, they should immediately

report equipment management department. The equipment department must develop

first-aid repair program , make equipment run correctly as far as possible.

(3) Dynamic monitoring, making good use of equipment

When operation staff was trained frequently to ensure they operate correctly, advanced condition

monitoring and fault diagnosis technology are applied and advanced testing facilities are relied, these ensure

that the equipment will always be in good running condition.

(4) Strengthen equipment maintenance and grasp equipment repair

The management of equipment maintenance was strengthen Further, that ensure the health of

equipment. Management of overhaul plan was strengthened as the "rigid" management ,that ensure

management execute orderly, equipment was repaired according to the manual , the quality of equipment

maintenance had been improved. During overhaul, the subsidiary company must execute overhaul

according to the standard manual of operating equipment issued by our company, the manual must

be practical and effective, and must be complied with the Ministry of Machinery Industry, and must be

pertinency and maneuverability. Whether the subsidiary company execute according to the standard

manual will be included in the annual and quarterly quality control assessment , there are no operating

instructions will be regarded as peccancy , this ensure to intensify the implementation of the operating

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instructions .

We establish a rule that only the excellent repair company can be admitted to repair our equipment, if the ratio of quality and price is high, we will establish long-term cooperative relationship, and record them into the repair database.

The management of spare parts and annex had been improved, first of all, in production shop spare parts, annex must be put onto the shelf, the work site must be clean, spare parts and annex must be treated with anti-corrosion before they are warehoused, the spare parts and the annex of key-point, precise, large scale equipment must be tracked to manage, as far as possible the downtime of key-point, large scale and critical equipment must be reduced due to failure and be ensured to operating with credibility . All spare parts, annex must be recorded into the database. We established the archives of accessory change sheet and so on ,and recorded the running data, according to the data we can describe the curve of maintenance costs and service life, we execute the minimum number of spare parts alarm system to ensure that a minimum reserve of spare parts ,these make disposal of spare parts cost reasonable and scientific.

(5) To enhance lubrication management.

In equipment lubrication management work “the five fixation” of lubrication is upheld that is, fixed point, ensures quality, limited time, limited quantitative, and fixed personnel. Equipment department must designated lubrication management technician for full-time, in subsidiary company cleaning and oil change schedule was established, and the full-time lubrication worker was designated , whose work is to improve lubrication devices and to ensure lubricate equipment in time . Lubrication worker was required to check whether operators lubricate equipment, and make records. Cleaning and oil change record must be clear and complete. Technician must spot check monthly for oiliness of "key-point, large scale, critical equipment ", if oil quality does not meet the requirements, equipment department will distribute "rectification notice", and rectification must be finished within the stipulated time, until the lubrication is eligible.

(6) To treat correctly accidents and equipment failures. During the actual production process, because of the

complex structure of equipment, automation of equipment, the system are linked closely, with the refinement of the production equipment was demanded, they are synchronize production, continuous production and balanced production, once the equipment Failure, even partial failure, will cause the whole device or the entire production line shutdown, that will directly effect production efficiency, so in the process of running production equipment should be reduced the frequency of failure as much as possible ,and equipment failure management should be realized. For this goal, equipment management departments have a full-time technical personnel that responsible for equipment failure statistics, analysis. The subsidiary company must surveyed the data of equipment failures monthly, filled the data and the analysis in the failure sheets and reported to the equipment department, technical personnel of equipment department classified the reported failures to find the rule and proposed solutions. In order to reduce the loss of production to a minimum because of equipment failure, he should establish prevention measures to promptly eliminate failures.

(7)strengthen operation management, improve the quality of tours to inspect equipment

It is be focused on the management for running reliability of key-point, critical, precise and large scale equipment. The operation is strictly controlled and checked on multilayer, the data of run and check must be recorded by notebook, equipment operators must truthfully fill out the daily operation data. Maintenance worker inspect records, and if there are any problems, he can promptly solve during the operation of equipment, and check record again. maintenance mechanic check records weekly, review the implementation of check; the staffs of the equipment department checks monthly, the shop which are not check according to the regulation will be shown the warning as "yellow card" or "red card", for key-point equipment including operation, repair and maintenance the entire process of dynamic closed-loop network management is drawn, new technology is actively adopted to ensure the check quality of equipment running data. Standardized operating instructions of running inspections are developed widely, which can regulate the work of

check, and can improve the quality of the check. The place where should be inspected can be located precisely by GPS (Global Position System) smart inspection system. Through PDA inspection system

the quality of inspections is improved. We do our work as: accurate check, careful maintenance and timely disposal.



Fig.2 Information Center

(8) computer-aided facilities management

Equipments of All units must be entered into the equipment asset management database, its main contents are: main production equipments running time, the load factor, equipment database, equipment state, lubrication, spare parts, inspection, check, accident, failure, detection, monitoring, drawing, and other basic information. In computer, according to these basic data, information are collected, then are classified and analyzed, handled, prevented and finally rectified , which are a closed loop management.

(9) Strengthen technical supervision to ensure that equipment is safe, reliable running.

The equipment management is strengthened by multi-directional video monitor, by which the running process are recorded during the operation, the abnormality of equipments can be observed timely , the illegal operations can be hold out in time, these can stop equipment incidents from occurring and to expand . The technical supervision system is being improved and a working group is set up, in which a specific classification responsibility regulation and post responsibility are established. Administrative and professional management are integrated , that make the technical supervision be more fit for actual production than before, so technical supervision work are ensured to be carried out efficiently. We strengthened management of professional and technical supervision, stressed the life cycle of

supervision. Technical supervision personnel arrived at the scene, found the abnormal phenomenon, carefully analyzed and take measures to resolve the abnormality, ensure that equipment is safe, reliable running.

(10)Improving equipment management level through modern management methods

In order to improve the modernization level of management, the company has developed a system including office automation (OA system), scheduling MIS, product resources such as ERP system, MIS , unit account management of equipment, defect management, production planning management, some subsidiary company have also developed "expert-assisted analysis system," with which surveyed data can be analyzed in time, accurately and completely. In a word, management has being changed with the level of automation increase and information technology, which make the efficiency greatly enhanced, and provide leader a scientific basis for decision-making.

(11)To do well in TPM(Total Production Maintenance) TPM have been carried out widely, the operation of equipment, service, maintenance, lubrication and so on ,these work have been highlighted ,for example the equipment should be lubricated before running, be monitored during its running, be cleaned after running, be served routinely every Friday, and be maintained every quarter. All workshops always should be kept clean with no dirt and no pollution,

and the environment around our company should be kept beautiful ,these have been developed deeply into the thought of our staff, and be formed a fixed system, and formed the habit finally, so equipment economic efficiency be improved sufficiently .

3. To activate the later period management, mine equipment potential to create efficiency

The later period management refers to the management during the treatment stage of the good-for-nothing equipment. In this regard, we strongly advocate the "optimal allocation is mean that we should mine the equipment potential to improve efficiency, and idle equipment is the biggest waste", flexible and effective measures have been adopted to mine the potential as much as possible. We will invite public bidding to sale equipment whose utilization ratio is low.

(1) We have achieved significant result in the management of the treatment with idle equipment which are inefficient, and have enhanced the reorganization of assets professionally. First, our market competitiveness have been enhanced, secondly, the proportion of equipment income-generating has been increased more than 30 percent, thirdly, the corruption which was existed in the old system has been eliminated.

(2)The equipments in use have been redeployed reasonably. In the past few years, more than 368

equipments have been transferred successively between the two subsidiary companies or inside the subsidiary companies, and the redeployment is very effective. First, the need for equipment is balanced in all subsidiary companies, but availability of the stock equipment is greatly enhanced. Second, all leaders are made to pay attention to the use of equipments, maintenance, service more than before. Third, the power are enhanced, which include equipment department control equipment and the implementation that all subsidiary companies perform flexible management.

(3) The re-use of idle equipment have been strengthened, some equipments which were idle because of production technology changes, should be recycled uniformly , since 2003, 523 equipments have been re-used , and 6.2 million Yuan have been saved.

(4) We grasped the technological transformation of outdated equipment. We have invested 18.68 million Yuan on a technological transformation of 158 equipments to improve their performance, lower consumption, the general machine tools were transformed into CNC machine tools, machining accuracy and the equipment efficiency have been substantially improved. Equipment efficiency have been improved more than 25 percent, economic efficiency have been improved 50 percent.



Fig.3 CNC shop floor (there are 4 CNC shop floors in our company)

Schedule of emergency measures have been developed for the continuous running equipments(power equipment), which have been priority of technological transformation, after transformation work efficiency have been raised

nearly double, capacity has been expanded, that greatly reduced the proportion of fault shutdown.

(5)We change abandoned equipment into cash. According to the relevant regulation developed by superior department, equipment that effective life are

limited and withdraw from in use or equipment that are out of high technology, unexploded and sold equipment that are idle and components that are not in use because of technological changes, those are discarded in time, during the disposal ,we flexibly adopted one-time buyout, or commissioned to disposal, sell through price competition and other market-oriented approach to accelerate the speed of cash and improve the economic benefits.

In the past few years, we constructed life-cycle management of equipment, the company has schedules to mature maintenance, preventive maintenance has developed, state of repair are being explored, the overall level of equipment management have been improved, TPM are popular to everyone in a company-wide, our company has been selected as the provincial-level advanced equipment management unit, has won the sixth, seventh national outstanding equipment management unit.

Third, adhere to making overall plans and take all factors into consideration, it is be-all and end-all for equipment management to ensure safety, environmental protection, energy saving.

The realization of security, environmental protection, energy saving is the embodiment to carry out the concept of scientific development, and is also an inevitable long-term development needs for our enterprise itself. In daily management of the equipment, we consciously take a tenet of enterprise production safety, it is “development by leaps and bounds, development safety, development with a clean environment, development with energy saving.”

1. Adhere to equipment management safety.

Our work start with the source and improve the nature security of equipment, implement the responsibility system of equipment management safety at various levels ,sign security construct with the personnel who engage in the operation of special equipment ,and the responsibilities and obligations are clear. As an military factory with a long history, positions of responsibility is the core of equipment management ,so the workers are required to inherit and carry forward the good tradition of equipment management, they are required to do consciously: implementation of total production maintenance, effectively implementation of equipment check, in-depth implementation of preventive maintenance,

first-aid repair timely, inspection without leakage, guarantee for every equipment without hidden troubles.

2. Focus on promoting the building of the internal control system

Machinery and equipment operation safety specification has been established and the specification of equipment operation, service and maintenance have been developed, and that further regulate the behavior of the operation and repair personnel, at the same time, we pay close attention to "oppose three kinds of peccancy behavior ", compiled "collection of habitual illegal peccancy examples" to let staff share, and intensify rectification for existing problems in fact, and make employees consciously operate equipment according to the specification, if worker operate with peccancy, their operation will be warned and compelled to correct timely. Since 2000, the company are appraised as an advanced unit for production safety by the Weapon Group in successive years .

3. to adhere to protect environment during equipment management

We focus on creating the goals of non-polluting working procedure and improving technics ,vigorously promote non-polluting operations and machining, common problem that domestic equipment existed for oil spills, leakage of the coolant, we adopted the method of plugging and recycle, the oil and coolant of seepage are re-used after settled, that not only make work site clean to protect environment, but also reduced consumption of oil and coolant ,and construct a solid foundation for our "6S" management and "double-push" work.

4. to adhere to the management of equipment with energy-saving

In order to construct our company as a resource-saving enterprises, the main equipments with energy consumption are monitored increasedly ,and energy saving and lower energy consumption is an important assessment indicators of equipment management, energy-hungry equipments are centralized on migration (5 heat treatment units, three surface treatment units) , a hot, surface treatment subsidiary company is set up. Production are organized according to the established schedule ,heat treatment stoves are centralized to

