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The Model of Equipment Integrated Maintenance Management Based on MES

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Abstract: With the development of information technology and use of intelligent sophisticated equipment. Factory automation has improved continuously, the situation of maintenance surplus and maintenance insufficient had often occurred. Through the application research of MES, in-depth understudied fault diagnosis and maintenance technology. In-depth analyzed the theory of equipment integrated maintenance in MES. Designed implementation program for equipment integrated maintenance management for MES by the thought of integrated. Used the idea of segmentation in time and space to establish the model of decomposition for maintenance target. Extraction state information of equipment and parts. Finally, designed operation framework model for equipment integrated maintenance for MES. Analyzed the mode of operation and the process integration of maintenance management detail. Establish integrated maintenance system for equipment in MES implementation to improve the effectiveness of equipment maintenance.

Introduction

Manufacturing execution system (MES) is development rapidly international, production implementation for shop floor production management technology and real-time information management system that can provide users with a rapid response, flexibility, fine manufacturing and environment for management, help businesses reduce costs, delivery time, improve product and service quality[1], it can pass through information, MES device management module of the equipment in the entire production process to optimize the management of state information. With the increasing degree of automation and the emergence intelligent precision processing of equipment, making the production and management relies more and more intense on equipment maintenance. The purpose of maintenance and management of device integration is to reduce the failure, making the production system to maximize the available time, reduce maintenance costs while meeting the requirements. Integrated maintenance management of equipment requires a real-time; maintain a high degree of consistency and integrity of the target information source to support the equipment manufacturing execution system management device status has greatly improved the accuracy and completeness of the information. MES manufacturing execution system device management capabilities of existing equipment ledger information management, management of equipment failure, equipment failure to achieve the maintenance management, equipment maintenance costs, statistics management, equipment maintenance costs exceed the value of the alarm management; equipment situation management and dynamic view device status management; provide equipment ledger view and query statistical data, while providing new equipment ledger. Equipment is the foundation of industrial enterprises to create efficiency. Play equipment effectiveness depends mainly on two aspects, the process equipment design and manufacturing process of the realization of the technical indicators; the second is the production process equipment maintenance and management performance. Equipment maintenance play

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equipment effectiveness as a means to ensure that some of the important, not only to maintain the machine manufacturing business one of the key factors of success, but also because of its core competitiveness of the manufacturing sector's contribution to enhance the sustainable development of society has an important meaning, can effectively promote the production, the environment and the harmonious development of society [2]. Increasing complexity of modern business equipment composition and characteristics vary for different devices and even different parts of the same equipment and in different periods, and its reliability, availability, economy and other aspects of the maintenance target different, showing a demand for equipment maintenance " flexible "trend, that is, a certain period depending on the specific equipment status and require the use of appropriate, targeted maintenance strategy, and the maintenance mode of modern enterprises in the maintenance strategy and objectives as flexible on the limited capacity of equipment and denied the individual needs of maintenance parts, and therefore inevitably lead to maintenance scheduling and maintenance strategy selection misconduct. Therefore, the establishment of a comprehensive consideration of all factors to maintain the concept of effective demand has become increasingly evident reality [3], based on the integration of MES equipment maintenance management model is based on this integrated view from a new proposed Maintenance Management.

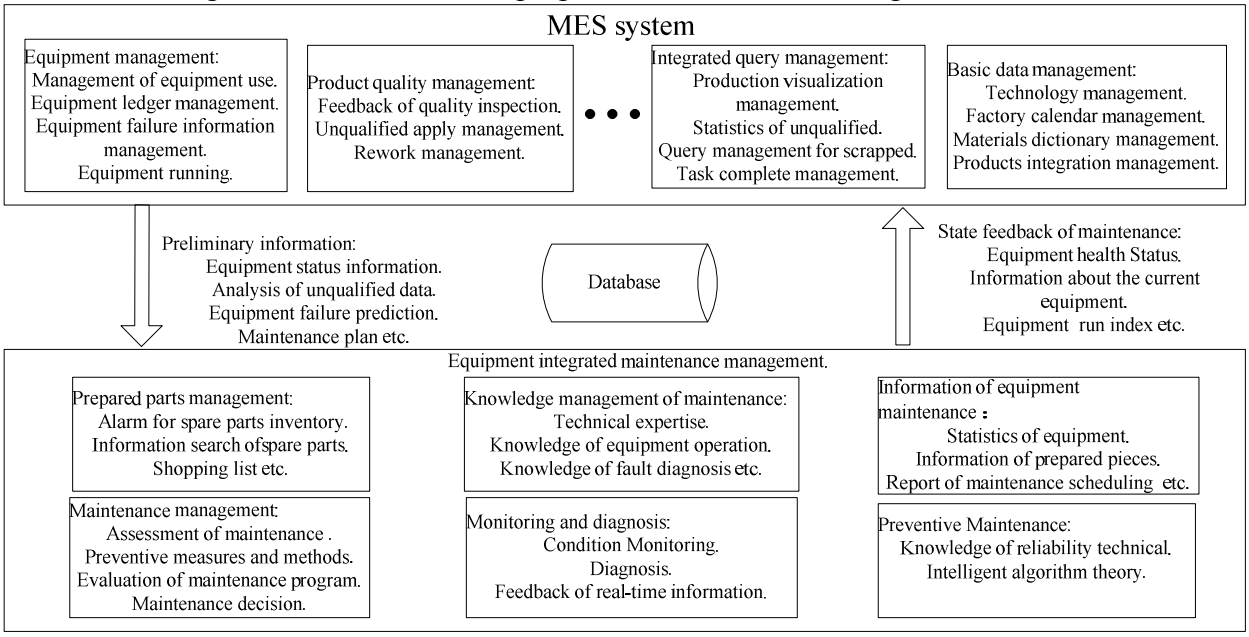

Fig1 Unified management platform for maintenance information, materials and maintenance processes etc.

Theoretical of Integrated maintenance based on MES

MES equipment maintenance management subsystem to provide program management: used to establish maintenance rules, the system alerts the user equipment maintenance time; equipment status records: for the establishment and lifting of equipment status; parameter management: to set the device parameter values and the current implementation of standards parameter formula, as confirmation of the correctness of field device parameters; parameters can be used as the quality of reports of record, what kind of parameters such as the best quality; also provide access to reporting. Integrated maintenance management theory is the formation of the objective needs of the environment and grows up. Integrated maintenance management theory is to solve real production process production maintenance management theory and the actual demand is not fully adapt to the conflict, is to meet the conditions of modern enterprise information technology and computer integrated manufacturing environment for highly automated production equipment maintenance and repair of flexible demand is the maintenance of the existing theories, techniques and methods based on the utilization of various maintenance technical advantages. MES-based maintenance management of equipment integration theory can be summarized as follows.

(1) of the MES in the equipment management subsystem functional requirements: the management of equipment failure, equipment failure to achieve the maintenance management, equipment maintenance costs, statistics management, equipment maintenance costs exceed the value of the alarm management; point inspection on equipment management, point inspection for device management functions; to manage the use of devices to achieve device state dynamic view management; have a strong real-time information to meet the plant level and manufacturing level, an enterprise-level interaction between the requirements of real-time information; other should also have the scalability to ensure the workshop and the workshop, different factories can produce a similar workshop close link between the form of resources complementary strengths.

(2) mature fault diagnosis, fault identification to establish a standardized system for product quality and efficiency of real-time tracking of equipment failure, recording and analysis of fault conditions and equipment for device status information, historical data re-use.

(3) is an integrated enterprise information management environment based. Integrated maintenance management to improve competitiveness of enterprises as an important means to the enterprise must be coordinated with other operative, while the implementation of an integrated maintenance management also requires a lot of technology and management information support, and thus the implementation of enterprise information, set up a business integration and sharing of information integration mechanism is the basis for the effective implementation of maintenance management.

Scheme Design

Through the implementation of MES equipment management, integrated search management, basic data management, product quality management functions to predictive maintenance, equipment management, preventive maintenance, maintenance management and maintenance of expert knowledge of process management in a unified data integration platform sharing, the establishment of maintenance information , information and maintenance procedures such as the unified management platform. Real-time maintenance information to establish a database, through continuous running to gradually improve the database, and ultimately the integration of equipment maintenance management, maintenance information, materials and maintenance procedures such as the unified management platform for the implementation of the program shown in Fig.1, which are characterized by information integration the following points:

(1) Construction of a database utility, compared to other database applications, based on the integration of MES equipment maintenance management system data types required by a more diverse, it includes not only the commonly used data, text and pictures, but also for in the database integration and maintenance of equipment, spare parts to run three-dimensional structure and the simulation data and diagnostics, maintenance, equipment maintenance knowledge to support the work carried out at the same time play the role of MES equipment management, establish a basis for building a distributed database.

(2) a distributed database, equipment maintenance and management are required to carry out all aspects of the support of a variety of data, which are different and the distribution of data, such as fault diagnosis is the condition of equipment information, structure information based on the diagnostic knowledge base is called reasoning to arrive at diagnostic conclusions [5-7]. Therefore, the distributed database design and access to information integration is the key to the system.

Decomposition of target

In reality, factory equipment overhaul not only for quantity but also the maintenance device object type, model range. To remove the part or component failure of the misdiagnosis, the use of decomposition to rule out faulty equipment trouble-free pieces, both record and enter the decomposition of pieces of information to prepare for the follow-up maintenance work. Here we focus on the use of the advantages of MES equipment management, maintenance for multi-target

object, the establishment of maintenance of target decomposition model and supporting database, the equipment in time and space, divided into parts, parts from the device to the fault diagnosis and analysis The whole assembly process of repair and replacement parts to improve service, the space in the equipment repair division should be to complete the preparation time, the purpose of segmentation is to make possible the follow-up maintenance work order. Here the main equipment in time and space to establish a comprehensive partition on the main range for the components and structure of complex equipment, the fault diagnosis process will take into account the feasibility of follow-up maintenance, the replacement parts, overhaul or minor repair problems, improve Follow-up maintenance work efficiency and reduce maintenance costs as much as possible. Maintenance of target decomposition model shown in Fig.2.

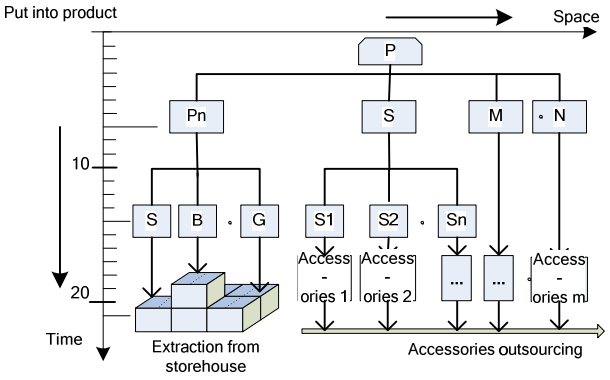

Fig2 Decomposition of maintenance target

Operational framework

Mode operation. Maintenance of the overall operation of device integration framework for decision-making by the maintenance and safeguarding the implementation of layers, which maintain decision-making and management system for ERP upper layer interface, the implementation layer and the underlying maintenance of automatic control systems PCS and other interfaces. In the operational framework of the model, first of all, decision-making by the maintenance of equipment and facilities through the functional analysis, data acquisition, equipment, usage statistics, status monitoring information analysis, resource identification, statistical processing and preparation equipment ledger inventory information analysis components to complete the maintenance of viable analysis and to develop maintenance and repair program. Decision-making in the maintenance of the fault diagnosis expert system consists of database, knowledge base, human-machine interface, inference engine and other components, the stored characteristic value of equipment failure, fault diagnosis algorithm, inference rules, equipment and other design parameters, natural frequency, and to detect real-time device status parameters. MES integrated device management subsystem for the maintenance of equipment maintenance plan reports, allocation of equipment in the factory information, equipment usage data, maintenance of equipment failure, equipment maintenance costs and Statistics, equipment codes, equipment ledger data. Equipment maintenance detection system in the maintenance of the implementation process to strengthen the maintenance of the implementation process of the inspection and maintenance records, run by the state of the data recording device, the status of the equipment real-time monitoring and real-time data has accumulated the necessary resources to maintain for the later provide data to support implementation.

MES-based integration of machinery and equipment maintenance management systems to fault diagnosis and condition based maintenance based on the theory of power plant equipment, machinery and equipment and other critical line condition monitoring networks were established point inspection systems and information management systems, through MES / PDM / ERP and other system information integration and continue to run the debugger, run the debug data will be collected for input, storage and processing, in order to improve the information management system. In addition to the operation of the device predict the trend analysis to continuously improve the equipment's condition monitoring and analysis, when the equipment is found abnormal, fault diagnosis workstation basic information of the device (including device structure, materials, information, etc.), equipment status information on equipment fault diagnosis; for the workstation equipment failure situation cannot be confirmed through the network to the remote diagnostic

center for assistance, if necessary for remote collaborative diagnosis (expert consultation Union), equipment maintenance under the maintenance of effective decision-making level feedback, production scheduling information, diagnosis, product quality and condition, maintenance experience and equipment repair parts information to help decision makers determine the manner and method, based on integration of MES equipment maintenance operational framework shown in Fig. 3.

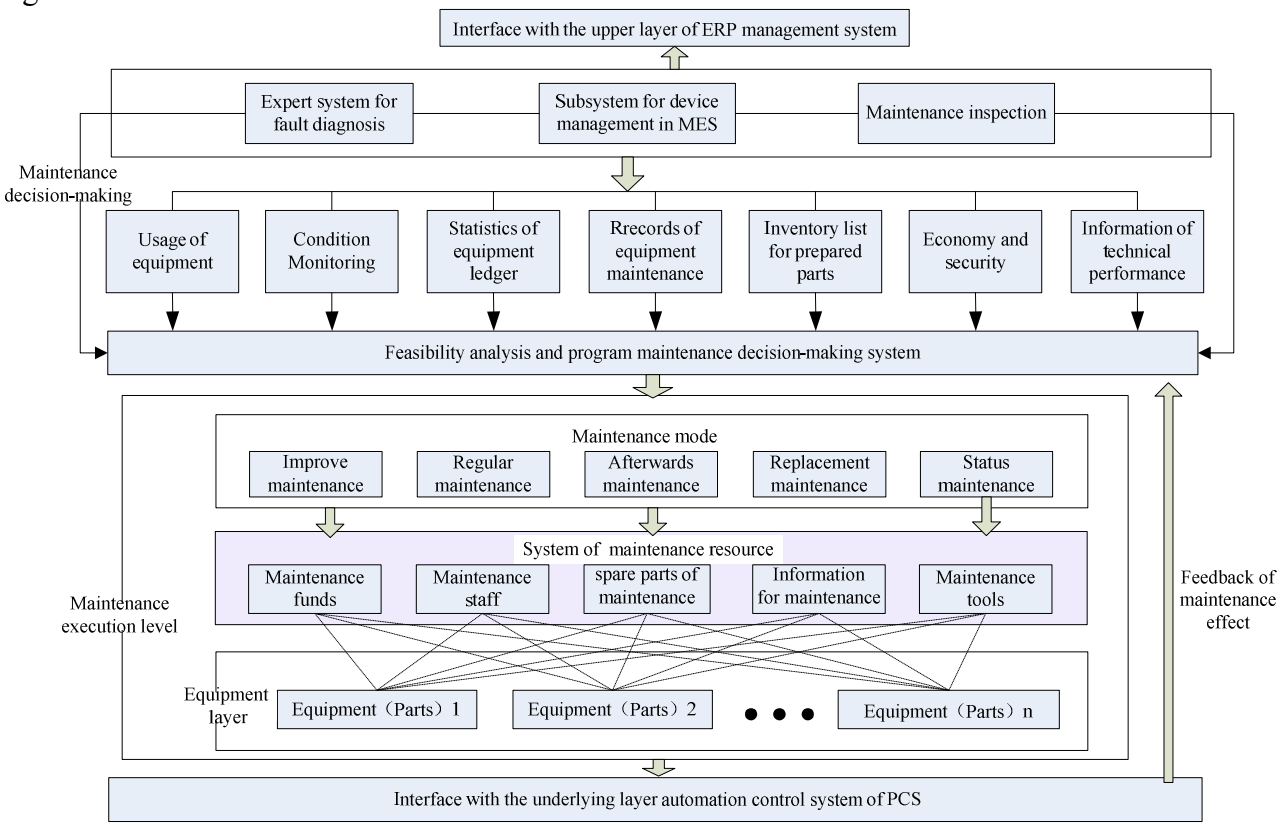

Fig3 Operation framework model for equipment integration maintenance of MES-based

Management process of integration maintenance. Equipment maintenance and management to work flow integration way the whole process of maintenance management. "Workflow is a business process automation of all or part of, in the process, documentation, information or tasks according to certain rules of the process flow, to achieve coordination among members in order to achieve the overall objective of the business"[4]. For equipment maintenance management features, integrated support for the use of computer software tools, in the equipment maintenance management activities (equipment maintenance from condition monitoring to decision-making until the device fails after the maintenance activities) on the basis of planning, through the maintenance activities of the task decomposition, Maintenance activities defined clearly to maintain conditions of export and import activities, activity time, cost and types of resources required for the identification, equipment maintenance management activities to establish the dynamic operation of the process. Efficient, real-time realization of the plants between maintenance activities and the technical application of information, maintenance of resource sharing and collaboration between applications, maintenance activities will be isolated and the application integration technology to form a coordinated enterprise integration maintenance system. Guidance in the workflow and computer-assisted, coordinated, efficient and high quality complete equipment maintenance and management of the work, so as to optimize equipment maintenance management process, improve work efficiency. Maintenance activities to achieve process integration, you can easily coordinate all business functions, the human resources, maintenance activities and manufacturing activities, capital and technology and rational organization together and get the best running efficiency.

Summary

With the machine manufacturing enterprise information environment of continuous improvement and continuous improvement of the level of automation, integration of new equipment maintenance management theory and methods of research, the competitive environment is harsh New business objective requirement is the computer integrated manufacturing environment and business the need for coordination is the integrated development of enterprises to strategic needs, but also the development of maintenance and management of the needs of the technology itself. Based on the integration of MES equipment maintenance management model for processing enterprises to address the power equipment maintenance and management for the constructive ideas, MES equipment management module can be completed before the implementation of a computerized equipment management system integrated all the functions. Model of the device through the integrated management advantages of MES and ERP management system interfaces with the upper guiding ideology, decision-making information to improve the maintenance planning accuracy and real-time sources to help enterprises of processing enterprises to gradually achieve the soft power equipment maintenance and management to achieve various maintenance techniques and the combination of maintenance policies. MES-based device is an integrated maintenance management, including theory, equipment and technology, tools, methods, content management system and many other complex systems, integration of MES-based tools for maintenance management method, management system, etc., have yet to be in further study.

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