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Computer Based Shop Floor Control Systems

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Abstract:-- **The Production Manage systems are concerned with planning, and control of the manufacturing operations. The function of production planning, development of the master schedule, capacity planning, and MRP all deal with the planning objective. Systems that accomplish the control objective are often referred to as 'Shop Floor Control'. This paper deals with computer based SFC, Factory data Collection system and Automated Data Collection System**

Keywords: **shop floor control system, Factory data collection system, Automatic data collection**

I. INTRODUCTION

Nowadays, the traditional machinery manufacturing technology is becoming mature, and at the same time the globally dramatic competition makes birth to many advanced manufacturing technologies and new creative ideas. From the developing course of manufacturing industry informatics, we can see that information technology and computing technology make the time become shorter from knowledge to real application than before. To some sense, the future manufacturing industry is a kind of information industry. Enterprises with e-intelligence will have a unique position in bringing about innovative products, manufacturing to support their clients and sustain leadership in future competitive business [1].

There are many middle and small sized manufacturing enterprises and institutes. On one hand, they are accomplished in their own bounds: some of them are skilled at products' designing, others are experienced in manufacturing; on the other hand, they have no enough money and manufacturing capabilities to do the whole manufacturing. How to integrate these resources and to achieve a higher efficiency is a problem we must resolve. By using information and communication technologies, dispersed networked manufacturing mode can break the constraint of space and make full use of their specialties [2], just as some isolated nodes are connected to shape a more efficient net. The topological relation of this dispersed networked manufacturing mode can be indicated.

II. FUNCTIONS OF COMPUTER BASED SHOP FLOOR CONTROL SYSTEM

The functions of SFC systems are:

1. Priority control and assignment of shop orders.
2. Maintain information on work-in-process for MRP.
3. Monitor shop order status information.
4. Provide production output data for capacity control purposes

SFC is sometimes defined as a method of controlling the work-in-process in the factory. Information relating to quantities and completion dates for the various steps in the production sequence are compared against the plan generated in MRP and discrepancies met with. This is termed dispatching. Capacity control is concerned with making adjustments in labor and equipment usage to meet the production schedule. To make these adjustments effectively, the capacity control function must have up-to-date information on production rates and order status from the factory data collection system.

III.COMPUTER BASED SHOP FLOOR CONTROL SYSTEM

The factory-wide information control system is shown in fig.2 The input to the SFC system is the collection of production plans (e.g. results of process Planning,MRP, capacity lanning,etc.).

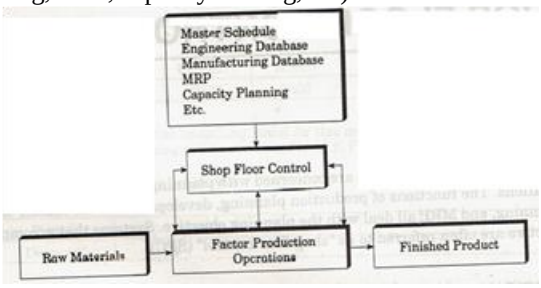

Fig. 1

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A typical SFC system consists of three phases : order release,order scheduling and order progress.In Networked Manufacturing,these phases are augmented by computer.The three phases and their connections to other functions in the production managament system are illusyrated in fig 3.

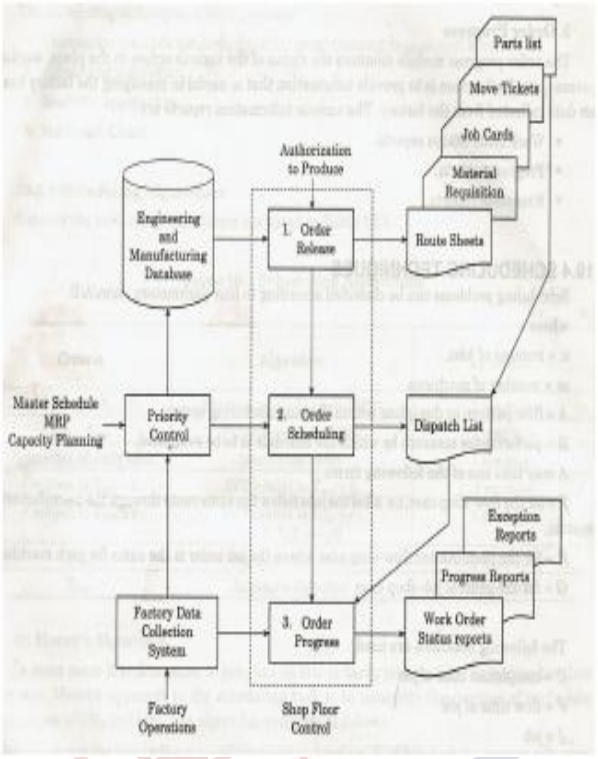

Fig. 3

A.Order Release

The order release phase of SFC provides the documentation needed to process a production order through the factory.It consists of :

- Route sheet
- Material requisitions
- Job cards
- Move tickets
- Part lists

For automated methods,these documents are unnecessary.The order release is driven by authorization to produce and engineering/manufacturing data base.

B.Order Scheduling

The order schedulin module assigns the production orders to the various work centres in the plant.It executes the dispatching function in production planning and control.It is used to solve two problems in production control : Machine loading and sequencing. Allocating the orders to the work centres is termed as machine loading or shop loading.Job sequencing involves determining the order in which the jobs will be processed through a given work centers. To determine the sequence,priorities has to be fixed.some of the priority rules are:

- Earlist due date (higher priority)
- Shortest processing time (higher priority)
- Least slack time (higher priority)
- Critical ratio (higher priority for lowest critical ratio)

Slack time is defined as the difference between the time remaining until due date and the process time remaining. Critial ratio is defined as the ratio of the time remaining until due date divided by the process time remaining.

C.Order progress

The order progress module moniters the status of the various orders in the plant,work-in-process,etc.Its function is to provide information that is useful in managing the factory based on data collected from the factory.The various information reports are :

- Work order status reports
- Progress reports
- Exception reports.

IV. SCHEDULING TECHNIQUES

The scheduling techniques widely used are:

- Operations research methods-dynamic programming, branch and bound.
- Scheduling algorithms
- Heuristic approaches
- The Gantt Chart

V.FACTORY DATA COLLECTION SYSTEM

The factory data collection (FDC) system consists of the various paper documents, terminals, and automated devices located throughout the plant for collecting data on shop floor operations, plus the means of compiling and processing the data, usually by a computer. The data

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collected include piece counts completed at a certain work center, direct labor time expended on each order, parts that are scrapped, parts requiring rework, and equipment downtime. It may also include the time clocks used by employees to punch in out of work.

The purpose of FDC system is two-fold:-

- To supply data to the order progress module in the SFC system
- To provide current information to production foreman, plant management, and production control personnel.

This can be done in either an on-line or off-line mode. In an on-line system, the data are entered directly into the pant computer system. Whereas in the off-line data collection system, the data are temporarily stored in either a storage device or a stand-alone computer system to be entered and processed subsequently by the plant computer in a batch made.

VI.DATA INPUT TECHNIQUES FOR FACTORY DATA COLLECTION SYSTEM

The techniques for FDC are:

1. Manual techniques

- Job traveler-log sheet data includes data, piece counts, etc.
- Employee time sheets-data entered include order number, operation number, number of pieces completed, time spent, etc.
- Operation tear strips-carry preprinted data including order number, route sheet details etc.
- Prepunched cards

2. Data collection terminals

- Push button key pads
- Type writer like key boards

3. Automated input technique

- Magnetic card readers
- Optical bar code readers
- Magnetized or bar-coded cards

The keyboard-based terminals include:

- One centralized terminal
- Satellite terminals
- Workstation terminals.

VII.AUTOMATIC IDENTIFICATION METHODS

Automatic identification is a term that refers to various technologies used in automatic or semiautomatic acquisition of product data for entry into a computer system. The technologies available for automatic identification system are: bar codes, radio frequency systems, magnetic stripes, optical character recognition, and machine vision.

1. Radio frequency (RF)

In these identification systems consists of the identification tags on the items to be identified. A 'tag' is a small box like container that houses the electronics for data storage and RF communication. A tag is a device that is capable of emitting a signal of its own when it receives a signal from an external source. It is attached to the product to transmit data to the data collection computer system.

2. Magnetic stripes

Stripes are attached to the product can be used for item identification in factory. They cannot be scanned remotely.

3. Optical character recognition techniques

These techniques are specially designed alphanumeric character set that is machine readable by an optical sensor device.

4. Machine vision systems are used principally for automated inspection.

5. Bar Code technology

The bar code consists of a sequence of thick and narrow coloured bars separated by thick and narrow spaces separating the bars. The pattern of bars and spaces is coded to represent alphanumeric characters. Bar code readers interpret the code by scanning and decoding the sequence of bars. The scanner emits a beam of light that is swept past the bar code and senses light reflection to distinguish between the bars and spaces. The light reflections are sensed by a photo detector that converts the spaces into an electrical signal and bars into absence of an electric signal.

VIII.AUTOMATED DATA COLLECTION SYSTEM

1. Data acquisition systems

A data acquisition system (DAS) is a computer system used to automatically collect data from a process or piece of equipment. They either perform an analysis of the

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data or transmit the data to another computer for processing and analysis

2. Data logger

It is device that automatically collects and stores data for later off-line (batch) analysis. Data analysis capability is not available on the data logger

3. Multilevel Scanning

In a multilevel scanning, there are two levels of process scanning performed by the computer system, a high-level scan and a low –level scan. High-level scanning is used to monitor the key variables and status data. If the process is operating abnormally, then the computer switches to low-level scan for the affected operation and equipment.

IX.CONCLUSION

This paper presented an advanced manufacturing technology - dispersed computer based manufacturing mode. According to this manufacturing mode, products designing unit finishes the product's modeling and structure analysis and sends them to the manufacturing unit. Based on the Internet transferring protocol, the information above could be accepted by the manufacturing unit. The manufacturing unit then does the work of manufacturing process simulation with respect to desired product features and programming by the computer, once it has got the information. When the computer gets the programs from the manufacturing engineer, products with high quality could be produced. The greatest advantage of this manufacturing mode is that a lot of useful resources are integrated onto one platform, which lowers the product's cost, shortens the product's manufacturing cycle, provides higher efficiency and satisfies the clients better.

The successful application of this manufacturing mode is, high efficiency and low cost. To make this manufacturing mode more perfect, more enterprises, institutes and advanced information transferring technologies are required to participate in it.

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