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PRODUCTION DATA MANAGEMENT IN CIM AREA

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ABSTRACT
Efficient productions control is condition for high productivity and short productions time. In this article are presented CIM components for one productions system which enables flexible information-technical connection of automated and manual working places. It is described production-information's technique and possibility of connection with upper planning system.
Keywords: Data management, industrial data, working data.

1. INTRODUCTION

Production automation project in HI "RD" factory in Podgorica the computer-based computer management, based on work orders, starting with production planning and control (PPC), all the way to control and supervision of processing machines and equipment. Management system in the area of management and monitoring is applied and tested on flexible production system (FPS) for production of drivetrain parts [1]. Based on this system as one segment of CIM concept analyzed in this paper, and analysis of needed information and its flows, we perform next steps of data management system in CIM area.

2. PRODUCTION DATA MANAGEMENT

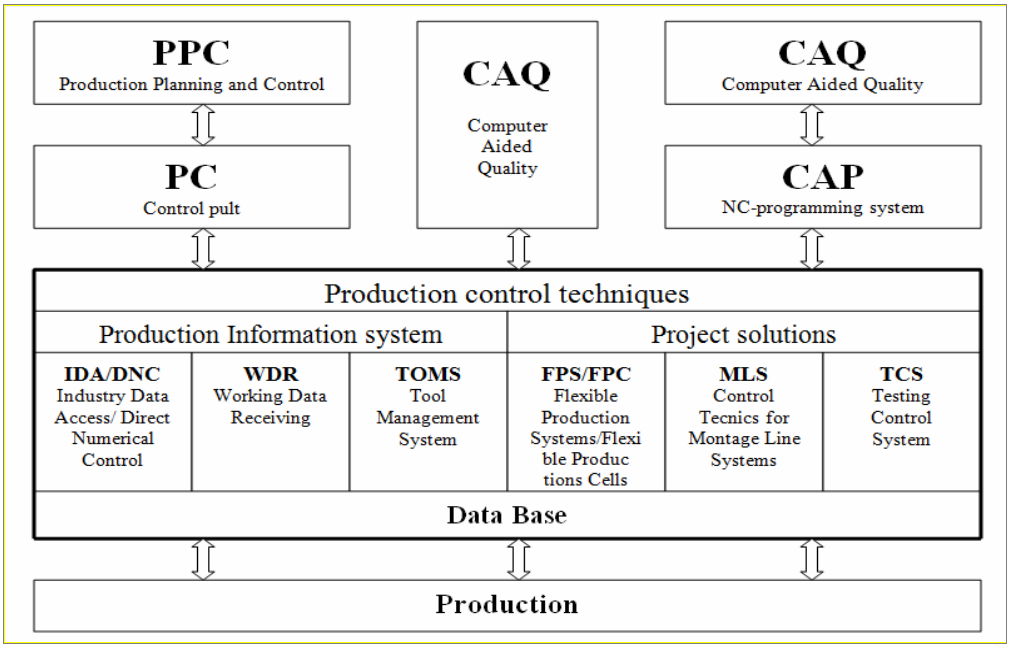

Figure 1. Location of productions control techniques and integrations lines.

For processing of raw piece into made piece we need, apart from flow of material, planning and timely preparation of significant quantity of various data and information. Fig. 1 shows internal flows of information in organization that outcome from organizational and technological orders.

3. INFORMATION SYSTEM IN PRODUCTION

Structure of information system is shown in Fig. 2. Relation database in real time with appropriate software tools allow generating, analysis, distribution and providing of information, which are transferred via the Ethernet network. Interfaces to production are terminals with monitors for obtaining work data or for loading information from planning, as well as DNC/WDR (Direct Numerical Control / Working Data Receiving) segments for connecting machines and tools to CNC, PLC (Programmable Logic Controller) or robotic management.

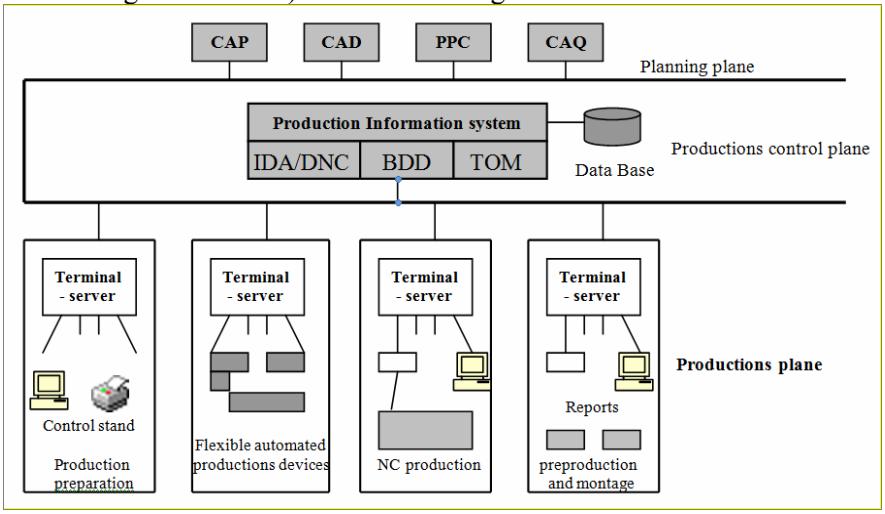

Figure 2. Structure of production information system.

3.1. DNC-system

DNC system allows transfer of NC programs, recording and NC data management in database, as well as connecting to CNC controls on tool machines. Managerial function of database, apart from loading recorded programs is the loading of reports on condition of program, blocking and unblocking, presentation and alteration of program code as well as transfer of program to external archive for long-term storing.

Management devices on machines are connected via Ethernet network, the solution which has several advantages: necessary communication between several computers and with CAD, PPC, NC-programming, WSC (Workshop Control) and DNC. Peripheral devices (terminals, printers and plotters) can be placed at any needed location and connect to all superior systems. Managerial components of flexible production devices, such as FPS, assembly lines and control lines are connected to the network. User can abort dialogical program using the terminal and then give work and control data. Installation of equipment such as WDR-terminals on conventional machines and manual workplaces provides the unified service menu at the company level. Safety memory (in case of power break or computer malfunction or during computer maintenance) forms the reserve level and allows program inter-storing with storage capacity exceed the capacity of existing management.

3.2. Management of industrial data

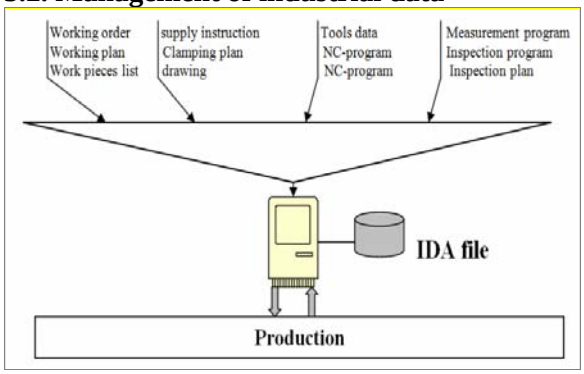

Figure 3. Management of industrial data

For total management and preparation of all data and information needed for production, IDA, system for management of industrial data is used, Fig.3. Apart from NC–program and data on tools, level of planning accepts, and prepare for production, control plans and programs, work operations and work lists, as well as graphical data (diagrams, organizational lists, pressing plans and supply plans). Management of industrial data is performed in accordance to the hierarchical filing system. This concept of storing top

information into database, while operating data is stored in sequential database, provides data consistency, allows appropriate and flexible search and analysis function and gradual introduction of system to work.

3.3. Receiving working data

BDE-system should perform in real time in order to realize production management with short reaction time. Obtained results are uniformly modeled for every workplace in the company, while the data flow between planning and production is performed both ways. Fig. 4 shows structure of WDR module for analyzed system. Configuration system allows description of topology of installed

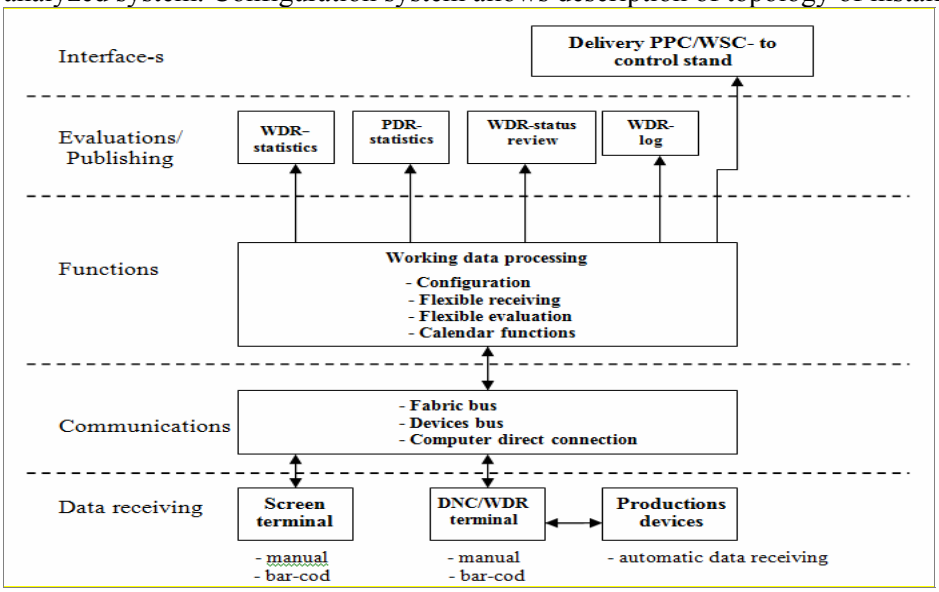

Figure 4. Structure of working data receiving.

terminals, user manuals, defining type of data and default values, assigning messages to desired action on system of evaluation and forming of WDR terminals or group or group of machines. System for received is applying these previously provided border values and records the information with date and hours in WDR-logbook. Calendar function allows determining and registration of standard amount of working days in week, daily shifts with start and end time, and working days and time with discrepancies. MDR (Machine Data Receiving) system differentiates technically conditioned (bottlenecks) and organizationally conditioned (interruptions) of standby time. Statistical evaluation of bottlenecks gives the data for preventive maintenance measures. Analysis of interruptions provides locating of weak spots in work organization.

Review of machine utilization (for one machine or station for group or for all machines) is presented for selected interval (shift, day, week, month or year), for which it provides absolute and proportional duration of utilization and duration of interruptions depending from the planned working activities, as well as total time and degree of utilization. Apart from numerical, statistical data can be graphically presented as well, on screen or printed in the form of the report. We can give for example the report presenting the actual number of working orders in production, or report with information on machine utilization, compared to the number of work orders. It is possible to have the current review of condition of all stations and work orders together with presentation of status of stations. Apart from information on work orders, user group and current working information, the information of machine condition is provided, and, in case of bottleneck, also the cause for bottleneck or interruption. BDE logbook for referred time period and production area can be provided as well, allowing farther detailed analysis of production occurrences.

Interfaces allow transfer of data to PPC, WSC or to management spots in defined point in time.

3.4. Tool and equipment management

For extensive computer-assisted tool and equipment management with support of flow organization serves the Tool-Management-System (TOMS). Fig. 5 shows workplaces which are supported by the system, equipped with graphical screens and printers. Additionally, sharpening and washing place can

be added to the flow, without need for terminals. Fig. 6 shows connection of tools management to already existing systems in the company. In order to follow the flow of tools and working equipment, they are provided with the information system. Its identification can be done manually at workplaces as well. Core of the system is central management of tools and working equipment flows. The account of gross tolls needs needed for processing of referred number of pieces, is kept for every input work order. The next step is comparison with already existing tools, and defining of net needs. Afterwards the work order is created for assembly of individual parts and tool adapters which have to be taken from the storehouse. Assembled tools are measured before preparation, where the management system in advance prepares the requested data and receives actual data.

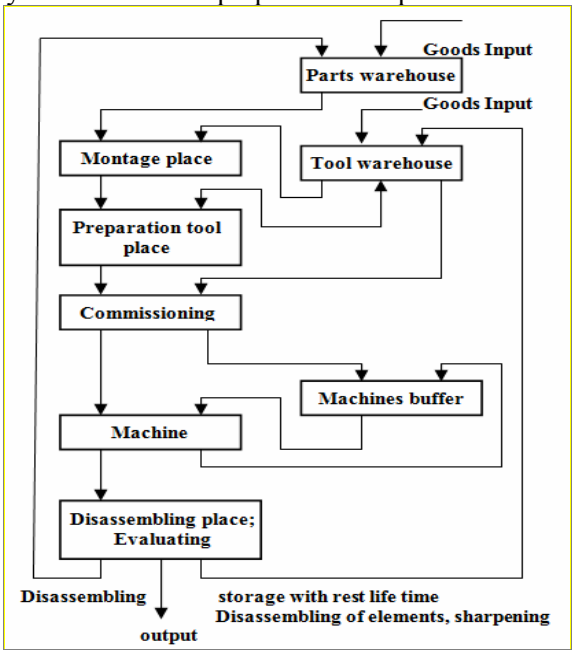

Figure 5. Tool flow in production.

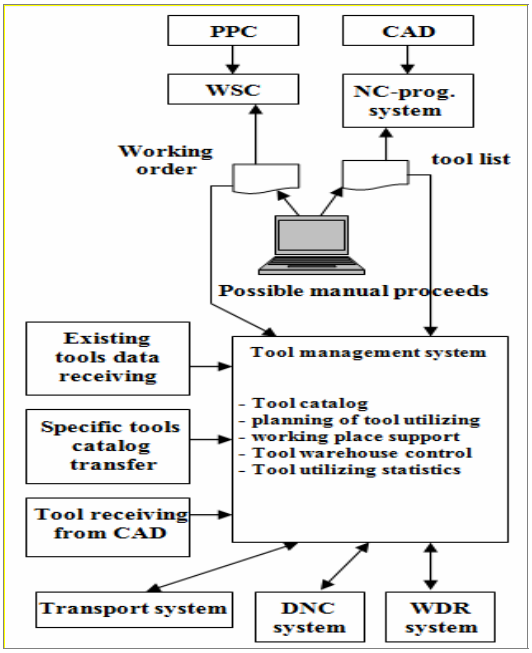

Figure 6. Links to tool management system.

Next step is commissioning with existing previously set tools and transport to tool machine. After the completion of processing time is recorded, and the toolset that is not needed anymore is transported for checking. At that time, decision is made whether the tools or working equipment should be used in following work order (when it will be stored) or to disassemble it.

Key advantages to application of management system of this type are fast and transparent planning of needs and usage of tools at every workplace using dialogues, guarantying in that way correct preparation of tools, reduction of quantity of needed spare tools (also through identifying similar or redundant tools), time saving and increase of data reliability at assembly, preparation and disassembly of tools using the computer-assisted information flow, as well as full usage of standby time of a machine.

4. CONCLUSION

Having in mind that the efficient production data management techniques demand in practice tested solutions in the field of DNC, management of industrial data, flexible receipt of work data, as well as tool and equipment management, realization of goals given by the project will be implemented step-by-step. Adopted open CIM concept allows flexible and simple integration of company data into processing. At that point we have in mind special request of software tools, which must provide for adaptation of different setup of orders, as well as realization of interface. Therefore the software is compiled on modular concept, with aim that the modules to be either standardized or easily adjustable to special requirements.

5. REFERENCES

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