

RESULTS AND FURTHER RESEARCH AND DEVELOPMENT IN MAINTENANCE

Assoc. Prof. Meng Josef Novák, Ph.D.
VŠB-Technical University of Ostrava
Ostrava
Czech Republic

ABSTRACT

Supposed trends of maintenance systems, further development. Creating of database for maintenance. Increasing of serviceability of fiscal assets. Increasing demands on exploitation of production machines and devices. Integration of computer support. CIM, TIM. Information systems and technology are a necessary requirement for the economic prosperity of enterprises. Information technology has become a strategic factor in determining the prosperity and competitiveness of enterprises. Training of staff (education, cooperation with servicemen, implementation of services and maintenance to their workload, adequate increasing of their wages)- operational maintenance.

Keywords: Maintenance, TPM, TIM, Maintenance Management System, Digital Factory.

1. RESULTS AND FURTHER RESEARCH AND DEVELOPMENT IN MAINTENANCE

Stating a forecast of further development of maintenance systems we can start from:

- Current level of engineering, technologies, management system and other equipments.
- Worldwide level of science and engineering development.
- Practical experience gained in our companies during realizations of various labour-saving studies, technology audits or others

The further research and development must be realized and continued with the support of research activities, need to be realized toward CIM, TIM applications, alternatively toward digital factories.

Our research and development was focused on creating databases with computer aid, integrating information and management systems and developing some other supports.

The outputs of research tasks can be applied both in the field of production, and in the field of maintenance. In the field of production management they provide information for technological and working procedure of assemblies and other auxiliary and service works. The field of maintenance is the main objective of our research and development activities.

In addition to technological and work processes, it is possible to determine costs of labor input, coordination and coherence of individual activities, or other necessary objective information. From the brief description of research results a considerable extent of their use is evident. For detailed image, I will practice their application of TIM (total integrated maintenance).

The following brief description shows new principle of managing maintenance.

Developed application:- CAS (computer support of standardization)

- GTS (graphic sorting system)

For complex solutions, and TPM integration into the system, the following proceedings were already developed and widely used systems:

- IFS

- SolidEdge.

2. CHARACTERISTICS OF TIM APPLICATION

- Files of all machines and devices stored in a computer - **IFS and graphic sorting system and SolidEdge.**
- Acquisition of „resumes“ of all the machines and devices - **IFS, eventually graphic sorting system**
- Repairs planning with studied preparation – **CAS – computer support of standardization**
- Planning of purchase, watching and decreasing resources - **IFS, eventually other applications**
- Training of staff (education, cooperation with servicemen, implementation of services and maintenance to their workload, adequate increasing of their wages) – **operational maintenance.**
- Regular analysis of results from different viewpoints (operational, supply, financial, preparation and qualification of workers, management) – **CAS, IFS.**
- Drawing general conclusions (for organization of maintenance, repair work, co-operation with outer repair services) – **IFS, CAS, graphic sorting system, operational maintenance.**
- Projecting changes into database and other systems - **IFS, CAS, graphic sorting system, operation maintenance.**

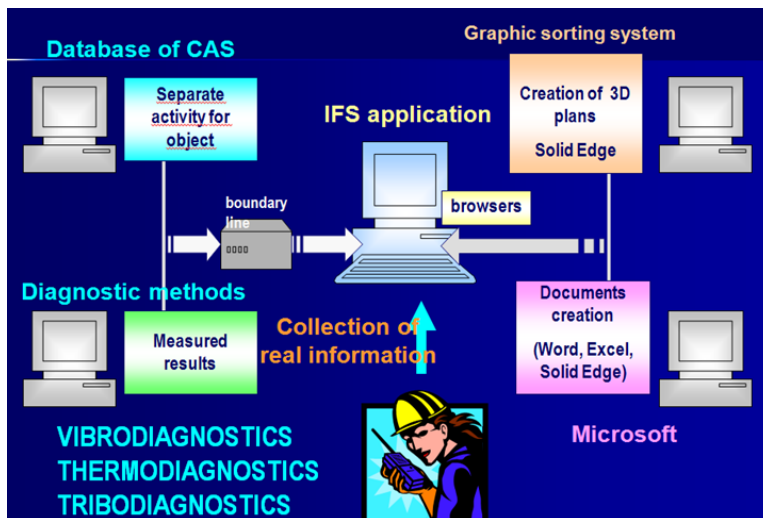
3. COMPONENTS USED DURING RESEARCH AND DEVELOPMENT OF COMPLEX MAINTENANCE SYSTEM

3.1. Diagnostic methods

- Vibrodiagnostics
 - Thermodiagnosics
 - Tribodiagnosics
 - Other diagnostics systems
- **Graphic sorting system** – use of current 2D system, purchase and implementation of a new, 3D system **SolidEdge**
 - **IFS** – Information and management system
 - **CAS** – computer support for standardization – instalment, solving and guarantee of VŠB–TU Ostrava.

3.2. Developed maintenance management system and relationships between softwares

The following illustration shows the proposed comprehensive maintenance management system and the implied relationships and integration between these system.



Picture 1. Relationships between softwares

3.3. Diagnostic methods - significance and position in task solving

- **Diagnostics** – base for transformation to maintenance according to real technical state.
- Measurement and evaluation of separate components.
- Appointing and modifying terms of replacing the measured components.
- Shut-down of device in case of component replacement.

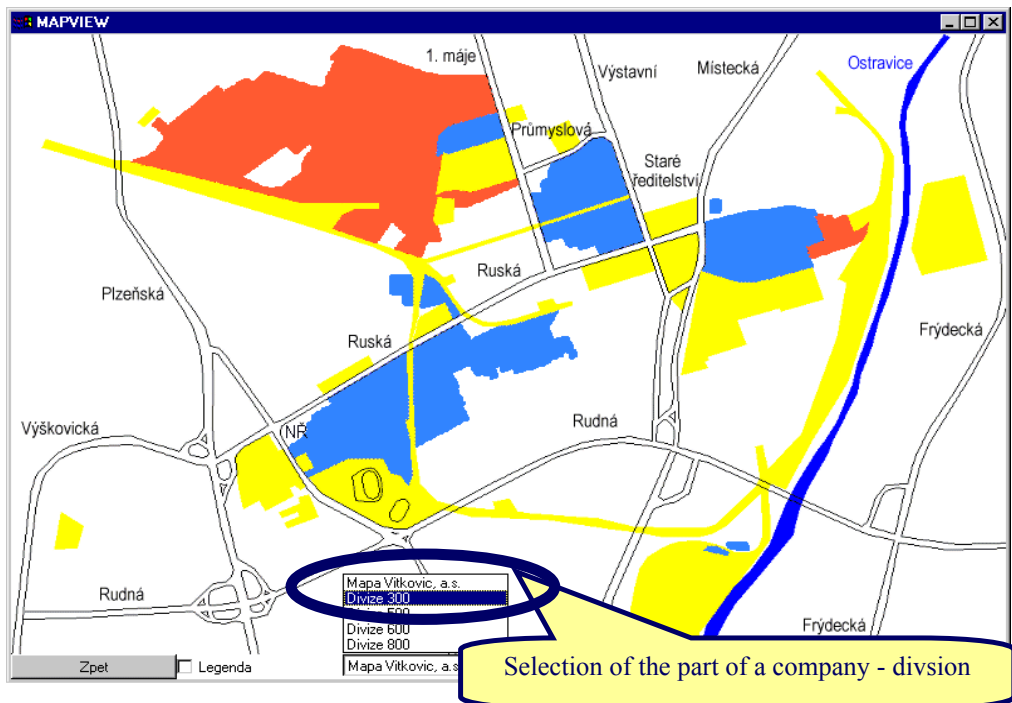
- Avoiding failures and breakdowns.
- Maintenance cost cutting
- Source of information for further procedure

3.4. Graphic sorting system significance and position in task solving

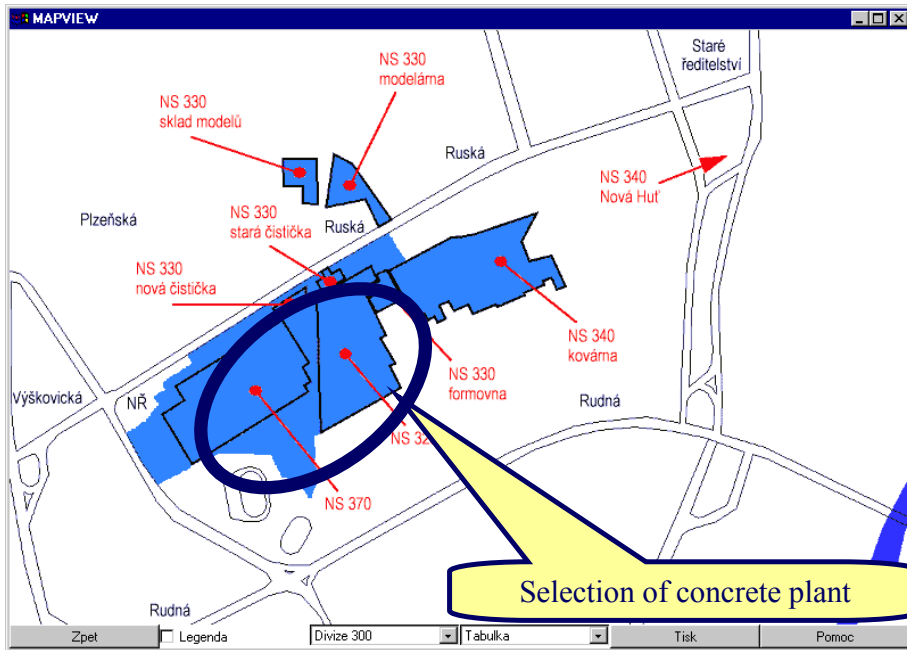
- Holding knowledge database in a company.
- Immediate access to plans, designs and piece lists of wanted objects
- Modification of any technical documentation.
- Integration with PPS module, or PM module

4. BRIEF DESCRIPTION AND USE OF THE GRAPHIC SORTING SYSTEM IN MAINTENANCE

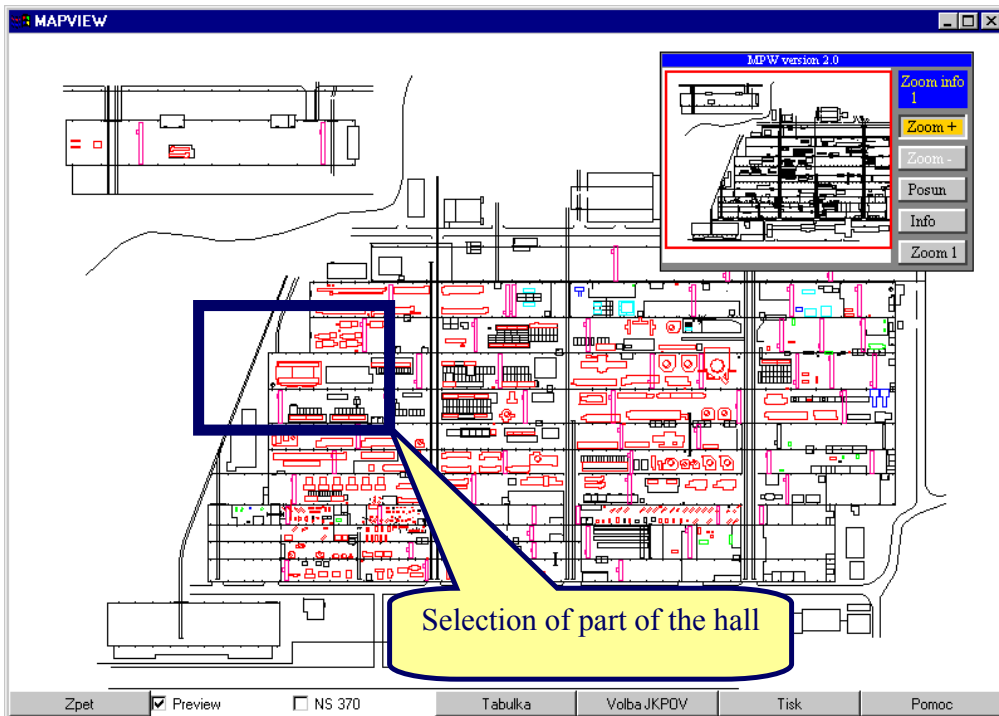
The following pictures show the use of a graphic sorting system for obtaining information on spare parts and either produced and standardized (bearings, screws, gaskets, etc.)



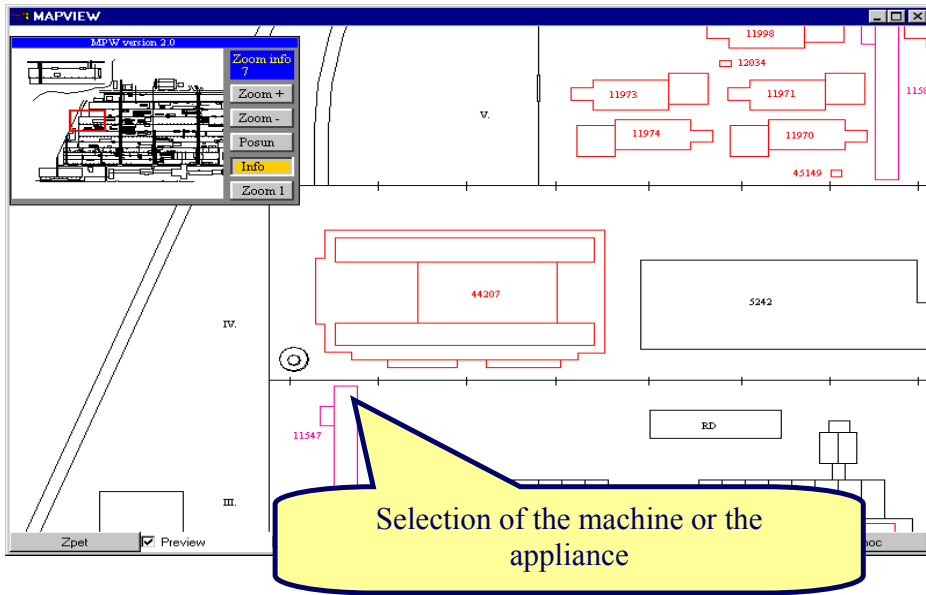
Picture 2. Approach to classification through maps and plans of objects



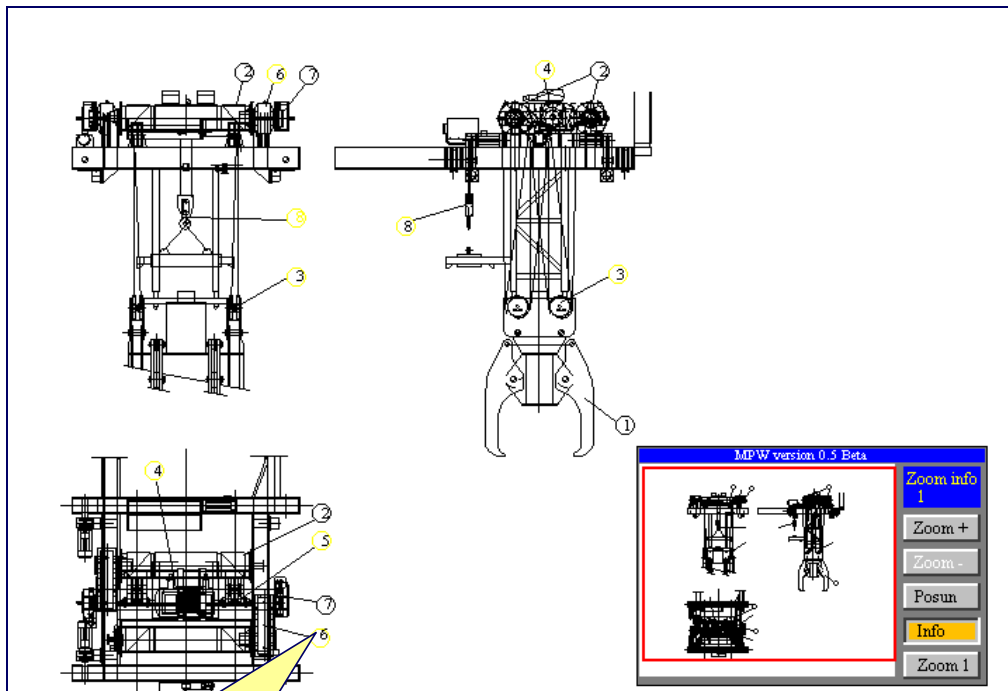
Picture 3. Selected part of the company – division



Picture 4. Selection part of the factory



Picture 5. Magnified part of the hall



Picture 6. Design of a part of the crane

5. DATABASE CREATION ACCORDING TO MOTION STANDARDS (CAS SYSTEM)

Scientific approach to database creation designed to be easily applied in maintenance preparation and not to put considerable time and administrative demands on preparation staff.

- Motion normative (studies) are the basis,
- Creation of basic data of generally repeated activities,
- Higher levels of associations being created like building blocs
- Operations may be compiled into technological procedures
- Proceedings for concrete machines, devices and constructional units are created from technological procedures of assemblies or repairs.

Computer aided standard system (CAS) was created with computer support in this system we can very quickly and easily create technological standards for maintenance.

6. REFERENCES

- [1] NOVÁK, J.: Supposed Development of the System of Management in Industrial Companies in the 3rd Millennium, IEEE 17th International Conference, IEEE PRESS, 29-30 October 2010, Xiamen China, 1956p,ISBN 978-1-4244-6481-4.
- [2] NOVÁK, J., Datová základna pro řízení montážních prací, údržby pomocných a obslužných činností. Plzeň: Západočeská univerzita v Plzni, 2005.130s. Habilitační práce.
- [3] NOVÁK, J. a kolektiv: Řízení inovací a transfer technologií. 1.vyd. VŠB Ostrava:Tisk PrintHouse Morava, s.r.o. 2010.137 s. ISBN:978-80-248-2194-8.
- [4] KAVAN, M., Výrobní a provozní management,Grada Publishing 2002, 424P, ISBN 80-247-0199-5,
- [5] Consulting point[online]. 2012 [cit. 2014-05-16]. Available from: cp.forever.cz