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## DÔVODY PRE INTEGRÁCIU VÝROBNÝCH SYSTÉMOV

## WHY INTEGRATION FOR MANUFACTURING SYSTEMS

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**Abstract:** This paper presents why is integration for manufacturing systems necessity. In the second part are described different types of integration, because, nowadays everyone talks about integration, but only few of them are able to understand it exactly. In the third part are describe areas for integrated maintenance solutions.

**Keywords:** maintenance, manufacturing systems, types of integration, integrated maintenance solutions.

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### Introduction

For a considerable period of time, attempts have been made to combine various standardized management systems, mainly those related to quality, environment, and occupational safety. At present, in view of the development of various management standards, the problem of integrating different systems is of increasing relevance, because in practice, lack of such integration results in wastage, and unnecessary costs. Therefore, it is important to be aware of appropriate methods for the integration of standardized systems and also of how to reduce workload and documentation. In next section will information of types of integration. [3]

### Why integration in manufacturing systems

Integrated production is defined as the use of advanced manufacturing technology (CIM, additive manufacturing, robotics, mechatronics and automation, micro and Nano factories, sustainable and green manufacturing ...), JIT, TQM, human resource management and human capital perspective. Nowadays the companies intend the sentence: the value for the customer is to be created that, to bring value and for their own business. Have not enough to produce products in stock and hope that someone buys them, or forget to introduce new products or forget manage internal processes, and monitor KPIs and under. Today comes Industry 4.0 and this implementation is not possible without knowledge of integrated production management and support processes. [4]

The base value, which is between consumers and businesses is product. Every product, whether tangible or intangible nature should be tailored directly to customer, but not long ago it was not. Enterprises provide products, which they so wanted they, so called PUSH system. In today's modern world, it is not quite possible and businesses passed on to system, what customers ask, so called PULL system. Therefore, must change the management of enterprises. In many enterprises at this stage of transformation has picked up, but many businesses, whether productive or non-productive, it is yet to come. Here I can see problem. Businesses are ourselves engaged in very little. [5]

### Types of integration

In the classical sociological approach applied in management, the following types of integration can be distinguished: normative, functional, communicative and cultural. This division was proposed by Landecker. [8] Of course, sociologists have mainly analysed integration occurring at the macro level: that of larger social groups or the whole of society.



Nevertheless, specialists in the sociology of management, labour and organization have made various attempts to describe the particular types of integration in production or service organizations. In order to better understand the particular types of integration, it is necessary to refer to management processes at the level of an individual business organization. Types of integration with their practical implementation: [8]

- Normative integration.

Creation of normative systems accepted by employees, reviews of applied standards, periodic evaluation of normative systems with respect to their mutual impact (prevention of possible conflicts), implementation of continuously improved socialization and adaptation programmes.

- Functional integration.

Adjustment of functions to available competencies, entrusting employees with new tasks after considering their functions in the organization (prevention of possible conflicts), preparation of employees for new functions, prevention of conflicts occurring among different functions (e. g. those of the department manager and the process supervisor).

- Communicative integration.

Application of diversified (both technical and social) communication methods, periodic evaluation of communication system effectiveness, employee training in communication methods, focus on the legibility of messages, avoidance of slogans or catchphrases; determination of communication methods and scope of access to knowledge.

- Cultural integration.

Determination of behavioural patterns, development of a trust culture (e.g. by influencing aspects such as competence or reliability), periodic audits of organizational culture, combination of culture development objectives with work discipline principles, focus on the specific organizational culture in HR processes such as recruitment and training.

- Operational integration.

Determination of measurable processes allocated to particular functions and levels, periodic evaluation and adjustment of objectives, application of process approach principles (evaluation of process input and output, resource allocation analysis, process monitoring, integration of particular activities, determination of objectives for processes and evaluation of their effectiveness, appointment of process owners, determination of indexes and methods for their assessment).

- Systemic integration.

Decision making with respect to the systemic concept (i.e. taking into consideration relationships among particular systems), selection of suppliers based on the systemic concept, determination of an appropriate hierarchy for particular systems.

- Network integration

Introduction of social network development programmes, periodic evaluation of communication networks. The application of a compelling theory of quality, facilitating the acquisition and cooperation of many participants who will be attracted to a particular project.

- Social integration.

Implementation of socialization, adaptation, empowerment and social participation programmes, organizational value systems management (e.g. attention paid to equal treatment of employees, trust development, etc.).

- Vertical integration.



Evaluation of the effectiveness of integrating activities, evaluation of acquisition risk, development of a quality chain among entities subject to integration.

- Horizontal integration.

Evaluation of strategic risk related to complications resulting from acquisitions or mergers, functioning of the basis of mutual agreements, determination of common objectives and profits (the principles of their allocation).

- Economic integration.

At the meso level, establishment of common undertakings or chambers of commerce. At the macro level, government's proper economic and social policy, development of investor trust and economic trust. [2] Development of policy allowing cooperation among various business entities.

### **Integrated maintenance solution (IMS) as the need for integration manufacturing systems**

Integrated Maintenance Solution should be based on core competencies in machine design and diagnostic engineering to increase machine reliability [1] and improve plant profitability [6] Fig. 1. The following elements are customized to create a comprehensive programme to attain measurable, ongoing improvement goals. To carry out the integration of maintenance must be called consulting company that should elaborate the following areas: [7]

- Assessment.

The programme begins with a detailed assessment of current maintenance practices and a mapping of MRO components usage. Key improvement opportunities are identified that later become the basis for establishing key performance indicators. Upon agreement to the plan, consulting workers are selected and assigned to work on-site, complementing and strengthening existing maintenance and technical skills and providing a link to other consulting organization technical resources.

- Maintenance Strategy Review.

To assure that the appropriate maintenance efforts are focused, we first need to understand your business goals and assess areas of criticality. From these criteria, is necessary jointly select the proper planned and predictive maintenance tasks and operator inspections to mitigate financial, safety and environmental risks. Consulting company also use the strategy review results to analyze spare parts and inventory management requirements.

- Trouble-free supply

A key goal of an IMS contract is to first control and then reduce costs associated with purchasing, supply and inventory management. Working in close partnership with Authorized Distributor, consulting company can manage this function as it applies to equipment maintenance, ensuring availability of parts when needed, without tying up valuable capital in inventory.

- Proactive Reliability Maintenance

Through a defined process including best practice predictive maintenance activities, the root causes of failures are systematically diagnosed and proactive steps are taken to eliminate their recurrence. This process includes setting and using key performance indicators and regular operational reviews to monitor improvements toward benchmarks for industry.

- Technology upgrades

Part of every contract is the utilization of new technologies for improving machine performance and reliability. This may include redesign of machines with latest technology,



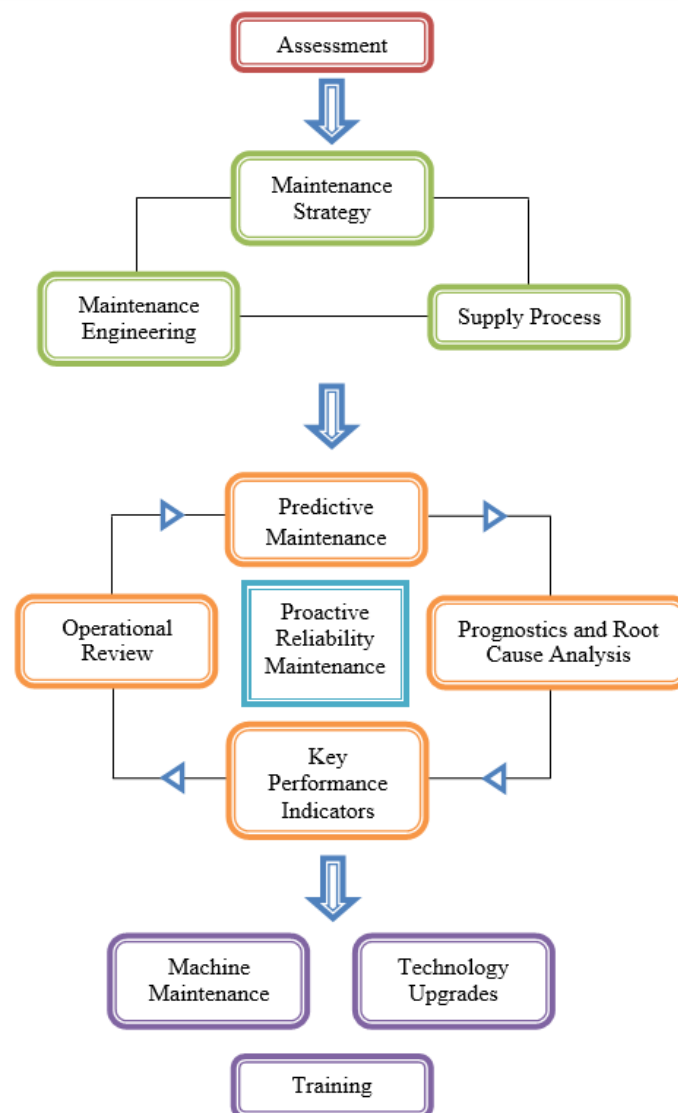
improved lubrication methods and systems, use of the latest periodic and on-line condition monitoring tools and decision support systems, all with low or no capital investment.

- Machine maintenance

Precision maintenance tasks are supervised or performed by experienced consulting companies' engineers to optimize results. Machine repairs are made using proven techniques supported by sophisticated new tools, including precision laser alignment, balancing, expert bearing installation and dismounting and advanced lubrication systems.

- Training

An IMS contract keeps staff current with global best practices. Training courses are customized to the specific needs of team and designed to transfer the knowledge necessary to sustain the improvements. Training includes precision maintenance skills, bearing care,



condition monitoring methods, lubrication practices, root cause failure analysis, maintenance management and more.



Fig. 1 Integrated maintenance model

## Conclusion

Today, advancement of technology leads to the proliferation of data creation and storage. There are evidences to observe this issue in the product life cycle. In particular, multiplicity of data are created, used and archived in product use phase, especially through maintenance of machines. The data encompass knowledge content for improvement of products or services. So that, it is important too maintenance and solve her integration in manufacturing systems.

## Acknowledgment

*This paper was made about research work support: KEGA 043ŽU-4-2014*

## References

- [1] MIČIETA, B. et al.: *Definition of the requirements in order to achieve sustainable production*. In: European international journal of science and technology [elektronický zdroj]. - ISSN 2304-9693. - Vol. 2, No. 4 (2013), online, s. 125-130. [Spoluautori: Gregor, Milan ; Haluška, Michal ; Biňasová, Vladimíra ]
- [2] KRAJČOVIČ, M.: *Integrované logistické reťazce (Supply chain management)*. In: InvEnt 2009 : Priemyselné inžinierstvo v dimenziách EÚ : medzinárodná konferencia doktorandov, Jasná, 24.-26.5.2009 : zborník referátov. - Žilina: Slovenské centrum produktivity, 2009. - ISBN 978-80-89333-07-3. - S. 118-123.
- [3] KOVÁČ, J. – ONOFREJOVÁ, D.: *Trendy a inovatívne prístupy v podnikových procesoch*. In: 17. medzinárodná vedecká konferencia : zborník príspevkov : Košice, 19.12.2014/ - 1. vyd. - Košice : TU - 2014. - 336 s. [CD-ROM]. - ISBN 978-80-553-1864-6.
- [4] ĎURICA, L. – BUBENÍK, P.: *Framework for visualization of maintenance system*. In: Manufacturing systems today and tomorrow 2014 [elektronický zdroj] = [Výrobní systémy dnes a zítra] : 8th annual international conference : Liberec 20-21.11.2014 : peer-reviewed conference proceedings. - Liberec: Technická univerzita, 2014. - ISBN 978-80-7494-150-4. - CD-ROM, [6] s. Poznámka: Abstrakt bol publikovaný aj v zborníku abstraktov s ISBN 978-80-7494-149-8, s. 27.
- [5] PAČAIOVÁ, H.: *Požiadavky na integráciu manažérskych systémov na báze manažérstva rizík*. In: Bezpečnosť a ochrana zdravia pri práci 2015. - Ostrava : Sdružení požárního a bezpečnostního inženýrství, 2015 P. 77-80. - ISBN 978-80-7385-162-0
- [6] DULINA, Ľ. – PLINTA, D.: *Integration of ergonomics into production systems*. In: InvEnt 2014 : industrial engineering - navigating the future : proceedings of the international conference : 18.6.-20.6.2014, Korňa. - Žilina: University of Žilina, 2014. - ISBN 978-80-554-0879-8. - S. 46-49. Poznámka: Zborník vyšiel aj na CD-ROM s ISBN 978-80-971684-0-7.
- [7] BUGDOL, M. – JEDYNAK, P.: *Integrated Management Systems*. Springer Cham Heidelberg New York Dordrecht London, 2015. p. 199. ISBN 978-3-319-10027-2
- [8] Landecker WS (1951) Types of integration and their measurement. Am J Sociol 56(4):332–340

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