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PLANNING, OPTIMIZATION AND CONTROL OF MODULAR PRODUCTION

The manufacturing process of a product as a group of successive and related operations is extremely complex (Novotny et. al 2011), and requires a considerable amount of time for an independent observer with no previous experience to be able to understand it and to grasp the given contexts resulting from the process (Blažíček and Basl, 2012).

Due to the overall benefits in terms of financial, operator comfort and ensuring the smoothness of production planning and operation (Kráľvenský et al., 2011), the company proposed to fully implement the system within the group. The project currently covers nine plants in six countries and amounts to a total investment of more than half a million euros. The company's financial plan for the coming years also includes an amount for further development and innovation in the area of the production management and planning system described above. The aim for the coming years is to make the processes even more efficient, to extend the software with new modules for quality management, scrap management and, last but not least, to link the system with others to create the complete product history network required by the customer. The thesis focuses on the topic of designing a concept for planning and management of modular production, analyzing the current state of the organization in the field of modular production and its planning, and then defining the design of a software solution for the optimization of the selected processes (Tomek – Vávrová, 2014).

In today's information technology market, there are a large number of companies that develop the necessary software, but many times it happens that it is necessary to elaborate the functions and conditions defined by the user, or the standard package of functions does not contain the necessary solution. The software itself is sold at prices in the order of several hundred thousand euros without additional updates, for which the user has to pay extra. However, this is still not the final amount, which includes all the fees for running the system server-side (Gregor – Košturiak, 1994).

This was one of the main reasons why a solution was adopted to define and program the software in-house. With this solution, the software was precisely tailored to the production and planning processes and the investment was several times less than if the software had been procured from another company. Nowadays, in the age of information technology and progress, it is necessary for companies containing production to follow the trend of innovation and optimize their production processes in order to eliminate indirect work, increase profits, but most importantly to stay in a state of competitiveness in the market.

In the thesis we have dealt with the issue of streamlining production processes, planning and production management. We have described its forms, phases and possible use of known, conventional methods for effective process management in the organization. The types of methods used in organizations depend on factors such as customer-defined requirements, the organization's production program and its qualitative, quantitative goals.

In order to streamline the above processes, we analysed the current state of play, where we came to the following conclusion based on the output values such as efficiency and

the large amount of downtime. Up to 65% of the downtime was due to missing orders. Therefore, we mainly focused on this issue and looked for what is the real root cause of its occurrence. The outcome was the failure of human factor, due to late, inefficient and incorrect distribution of orders by the operator. This was the initial impetus for seeking a solution without direct human factor intervention in the order planning and management process. The result was the design of a software solution that eliminates the above problems.

The thesis is divided into two main parts. The first theoretical part is focused on the theory of modular production and related processes. It presents the basic definitions of management, sorting of processes, but also a description of production operations of the mentioned type of production, information about the ERP system and many others.

In the introduction of the practical part there is a description of the ERP system used in each major company, then the work is oriented to the description and analysis of the current state of the company's processes, focusing on processes and activities that can be considered as underperforming. Subsequently, a proposal is formulated to optimize the selected processes using the software in an effort to reduce production, eliminating indirection time without impacting the smooth running of production in the said organization.

The role of the software solution is to streamline the use of production time and, last but not least, to save costs associated with activities in the background of the production process, which are not directly involved in its implementation, i.e. do not directly produce profit. This task is fully assumed by the proposed software, which, after its classification, defining the classification criteria based on the in-house systems, the logical structures of the ERP system, defining the organization of production, and after full implementation and final integration into the information structures of the systems currently used in the organization.

The concept of the proposed software is on the one hand for analyzing the input data, processing it, transforming it and then interpreting it to the operator at the workplace. On the other hand, the resulting outputs from the workplace, created by the operator, are re-evaluated by the software, processed and based on defined criteria are interpreted by the manager or directly reported to the company management. The aim is to eliminate the human factor and, consequently, the possibility of process failures. Taking into account the optimal solution of production and customer-defined orders within a precisely defined time.

The final part is devoted to the evaluation of the effectiveness of the solution and the expected financial savings associated with the implementation of the software, tied to the optimized processes.

References

1. BLAŽÍČEK, Roman; BASL, Josef. Enterprise information systems - enterprise in the information society. ed. Prague : 3rd, updated and supplemented edition, Grada, 2012. 283s. ISBN 9788024722795
2. NOVOTNÝ, Ota; POUR, Jan; MARIŠKA, Miloš; BASL, Jozef. Performance management in enterprise informatics. ed. Professional Publishing, 2011, 276s. ISBN 9788074310409
3. KRÁLVENSKÝ, Jozef.; GNAP, Jozef; MAJERČÁK, Jozef; ŠULGAN, Marián. The Position of Transport in Logistics, published by the University of Žilina, 2011, 203s. ISBN 8071008885
4. GREGOR, Milan; KOŠTURIÁK, Ján. Just-in-Time : Production philosophy for good management. 1st ed. Elita, 1994, 299 s. ISBN 8085323648
5. TOMEK, Gustav; VÁVROVÁ, Věra. Integrated production management. ed. Prague: Grada, 2014. 368s. ISBN 9788024744865