ANALYSIS OF LOGISTIC PROCESSES USING THE SOFTWARE TECNOMATIX PLANT SIMULATION

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Abstract:
Application of the simulation tools within the framework of a large spectrum of various logistic processes is becoming a common obvisuity on the present. The simulation tool enables to obtain such information, which is unidentifiable in the current practice, however this information is a valuable informational source for a following evaluation of the logistic processes. This article presents analysis of a logistic system using the simulation model created by means of the software product Tecnomatix Plant Simulation.

Keywords: simulation, transport, technology, sorting

1. INTRODUCTION

A massive wave of innovation in Germany is known as the fourth industrial revolution for the last 260 years, is based on the use of advanced information and communications technologies in all industrial areas of material handling through its processing to delivery of products to customers[1]. The ability to obtain the amount of data on actual processes and their treatment, giving researchers the opportunity to create a virtual image of industrial processes. This virtual image of reality provided by experimenting with real system in a virtual environment without the risks that would jeopardize the operation of real systems. If the real environment and the virtual world to spread the digital models and techniques that provide tools for dynamic analysis such as simulation, emulation, meta-modeling, there is a completely new type of environment. This type of environment has become a basic idea of Industry 4.0. 4.0 Industry philosophy became a hit the German economy. Part of such a philosophy is also a digital enterprise. It is a computer information technology, which replaces the real world model. Industry 4.0 is the theme of the future of digital businesses [2].

At present, the production companies must adapt to the changing demands of customers, causing problems at the planning stage of production and material flow logistics. Internal information systems often cannot predict the exact needs and utilization of personnel, inventory, number
of vehicles, the floor space required and other parameters if there is a change in conditions. From the perspective of the company it is due to the need to have a planning tool which takes into account changes and provide outputs that indicate how he should behave logistics system [3].

In the background are developed planning tool consumption standards work time analysis or other studies. The task is to define the user input parameters, eg. production program, batch size, etc., and will result in the desired outcomes (eg. the need and utilization of personnel, shift calendar, ...) [4,5].

2. SOFTWARE TECNOMATIX PLANT SIMULATION

Plant Simulation is one from among the available software tools for logistics, developed by Siemens PLM Software for modeling, simulation, analysis, visualization and optimization of production systems and processes, material flow and logistics operations. Using Tecnomatix Plant Simulation, users can optimize material flow, use of resources and logistics for all levels of planning production facilities. This software tool allows a comparison of complex production alternatives, including process logic, computer simulation [6]. It is used for simulation of production and logistics systems. It contains a large number of specialized modules. Field of simulation software developed by Plant Simulation:

➤ Simulation of logistics activities,
➤ Simulation of human resources,
➤ Simulation of production and assembly processes.

Figure 1 – Example graphical environment Tecnomatix Plant Simulation [1]

2.1. Simulation of logistics – Transportation and warehousing

The advantage of the dynamic simulation modeling and implementation dynamics in the proposed static activity. Observation of movement is important in the transport of material and in both
senses, whether internal or external transport. Plant Simulation enables simulation model to assemble logistics systems and internal or external dynamic systems check before putting the system into operation. The use may be in the following fields [7–10]:

- testing of different systems of delivery of goods (direct supply to demand filling circuits, etc.) and their evaluation,
- testing changes the types of transport facilities and their capacity to the system,
- testing of changes in the priorities of transport tasks in the system’s ability to provide the required products,
- testing of changes in the system of transport and their impact on production / assembly systems,
- the impact of shift work on-site at different parts of the production / assembly / logistics system to the maximum level stores.

3. MODEL IN THE PROGRAM SORTING LINE TECNOMATIX PLANT SIMULATION MODEL IN THE PROGRAMME SORTING LINE TECNOMATIX PLANT SIMULATION

3.1. Function Description sorting line

To verify the possibility of analysis of logistics processes in Tecnomatix Plant Simulation model was created a sorting line. Sorting lines are nowadays widely used in various industries. Created simulation model is intended for sorting waste according to the scheme Figure 2.

![Figure 2 – Scheme sorting line [1]](image)

After receipt of the waste, the said waste spills onto the conveyor, which reaches the sensor. Using the method (Figure 3) is set alternate allocation in sorting packages for two different directions. Municipal waste on line 1 and hazardous waste at the end of Line 2. Line 2 is a machine that can pick up and move the package to another conveyor and continue to the next activity. Tray on top of a tree – a position no. 4 is used for temporary storage of sorted materials. Subsequently, the posted worker who takes over the package garbage and pressing moves it to
the garbage – a position no. 5 because of the reduction of storage space. Waste then continues along the conveyor to the other work activities. Acceptance machine, position no. 6, was used due to the hazardous waste. Output at position no. 7 simulation model serves as a warehouse, but also it can be used as a terminal station.

![Figure 3 – Example of use sorting methods](image)

### 3.2. 2D simulation model sorting line and 3D visualization

The simulation begins with object “source” – receiving unsorted material. The model is a truck that will bring the material to the processing plant. Subsequently, at set intervals to the feed conveyor. Set were two types of packages – municipal and hazardous waste, which is color resolution. As a tray on top of a tree was used “buffer” with the set capacity. V upper run at the end of the process output was used as object “Store”. In the lower branch of the end of the output was used as object “drain”.

Within the simulation model it is also considered the impact of human error. Use the Worker Pool simulates the operation of operators providing the operator sorting line. Thanks gomu can monitor the performance of individual employees and subsequently also evaluated.

![Figure 4 – 2D simulation model sorting line](image)
To better understand the operation of the process was performed and the overall visualization in 3D using standard tools Tecnomatix program, which is presented in Figure 6.

3.3. The usage of the simulation model

Presented simulation model has broad application. It can be used to collect different types of information for analysis during the different activities. Another important possibility of applying simulation model validation and verification of various changes within the real operation and overall optimization of individual activities. It can be used to verify the capacity of and support decision-making processes. The company is also useful such a model at a time when the company going to change especially in expanding production. Company using such models can potentially change without large financial investments to simulate and determine whether it will be this extension of production effective or not. Using models can determine how many workers will be needed to hire or storage capacity currently to satisfy the expansion of production, or what will be the return on investment.

4. CONCLUSION

Analysis of any logistics process is very difficult. This requires detailed knowledge of the good, the use of appropriate methodologies and tools. Among the currently most used methods
for the analysis of logistics processes include methods of computer simulation. For its implementation it is possible to use a broad portfolio of simulation software. It should be borne in mind, however, that not all the simulation software are suitable for use in logistics [11]. Among the most useful programs now include software Tecnomatix Plant Simulation. Using that software can analyze any logistics processes to the smallest detail, then implement their evaluation and optimization.

5. REFERENCES