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**CREATION OF SIMULATION MODEL OF EXPANSION OF PRODUCTION
IN MANUFACTURING COMPANIES**Peter Trebuňa^a, Marek Kliment^b, Milan Edl^c, Marián Petrik^d^{a,b,d} *Technical University of Košice, Faculty of Mechanical Engineering, Institute of Technologies and Management, Department of industrial engineering and management, Némcovej 32, 042 00 Košice, Slovak republic*^c *University of Western Bohemia, Faculty of mechanical engineering, Czech republic***Abstract**

The aim of this paper is to describe the help of simulation as should look like expansion of production in the manufacturing plant. The establishment of a simulation models, we used a software product from Siemens PLM Software and Tecnomatix Plant Simulation. The paper describes the current production model, which the principle for is the extension of production planning. Using a simulation model is drawn up to include layout work on a planned workforce newly built production line at the company. The introduction is described some basic concepts. When analyzing business processes and developing their models clarified are some procedures work in Plant Simulation software module.

Keywords: modeling, simulation, model, Plant Simulation.

1. Introduction

In the introduction the contribution describes some basic concepts of modelling and simulation of a product whose production is addressed further in the analysis of manufacturing processes. The model is understood as a simplified picture of reality [1]. This term is used to denote the material or non-material object imitation, no matter for what purpose is formed [5]. Modelling is theoretical a cognitive process of that is based on abstract respectively. Ideally thinking. Characterize it as exploring objects through other objects, which are usually artificially created. Through modelling imitate the structure and behavior of real systems [2]. Simulation certain systems is a specific form of knowledge process. The basic principle is drawing conclusions using experiments and simulations under defined systems for objects and their movement and their interaction. Basic distribution simulation (Figure 1) [4].

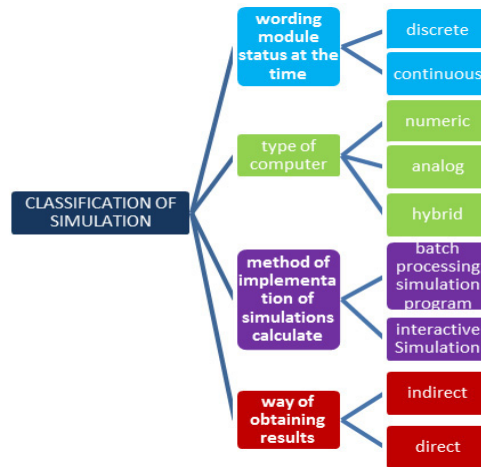


Fig. 1 Classification of simulation

The simulation model can be characterized as a system that mimics the actual idea of the simulated system and its movement. It will define the artificial material objects that you create. An important feature is that the imitation system must maintain the same configuration changes over time. Thus, the sequence of events cannot be changed. We must leave them in the simulation as they are in the original scheme. Otherwise the simulation model denounces the fact [3]. The advantage and disadvantages describe Tab. 1.

Tab. 1 Advantages and disadvantages in the simulations

| Benefits |
|---|
| • replacing the real system experiments, |
| • use in cases where there is no possibility of analytical solutions, |
| • the use of a large number of random effects, |
| • possibility of modeling time, |
| • possibility of verification solutions, which was acquired by another route, |
| • better understanding of the real system. |
| Disadvantages |
| • each simulation is an individual, |
| • correctness of the design needs to be studied, |
| • simulations are costly means to study systems, |
| • creation of simulation models is often lengthy, |
| • simulation are the numerical methods, which means that for any change of parameters are required for new solutions, |

- result of stochastic simulation models are the values of random variables.

2. Analysis of production and description of the products in the selected company

That company is focused on leather processing delivered by the supplier. This skin is in the workplaces in this company, checks, cleans, paints and main production process takes place on a cutting needed for the completion of finished products, which are car seats (Fig. 2) and interior accessories for the automotive industry.



Fig. 2 Final product in company

The final product in this company is the skin is cutting up into desired shapes and dimensions. This skins has been sorted and packaged to the end user.

From this one pack is finished sews car seat covers or steering wheel covers, or other interior part. The simplified production process is shown in Figure 3.

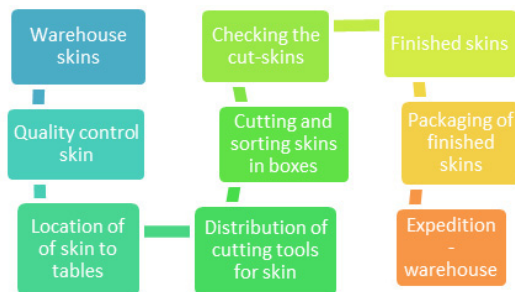


Fig. 3 A simplified diagram of the production process

More illustrative and more transparent, the current manufacturing process shown in the simulation model. This model describes the current status and progress of the production process in both 2D and 3D views (Figure. 4). This model allows us to further serve the drafting of new production in the new hall, built by the company to expand production and build a training center for new employees who will in future be accepted into society. The diagram of the production process is marked number 1 finished products warehouse, which haul roads into it transported with production hall and then further distributed to the customer for further processing. Number 2 shows the input control skin, this control is carried out by workers on the job positions. These positions are in current production and 12 each with one worker, as is also shown in the diagram. Skin inspected visually, so that it should spread out the so-called "horses" and labeled to it for errors or damage. After the input control, the skin distribute and moves on workbenches. Of the tables are stored on it a cutting blade having the shape of finished products. When saving knives need to pay attention to the marked errors. If the knife imposed the defective part skin created by it useless waster. Knives are decomposed so that the yield of the skin was the largest and waste to a minimum. Workplaces decomposed -cutting knives is similar as with to the input control 12, but this post at each work two workers. After distribution of knives leather with table travels along the conveyor belt to in the cutting press, which ensures the

cutting. Tables, conveyors and presses are shown in Fig. 4 shows the number 3. Presses are in current production process 3 and each of them is responsible for one person. Conveyors them must be synchronized and set to them as not great advice and do not constitute the jams with tables. From the tables and presses with Cutting of the skin move to final control and packaging, marked the nuber 4. Clippings approved control are placed on each other according to the desired number of pieces. One package blanks are stored so that it had to put together the finished product, or several products. This means finished seat or steering wheel cover or armrest. Pre-packages are stored on pallets. After filling pallets or size of the order fulfillment products go to the warehouse of finished products. Are transported to the warehouse with the help of trucks on marked roads to the store. In Stock pallets are sorted by time and export orders. Then go from store to export. Most of the production is exported via truck transport, the share is exported with the help of rail freight.

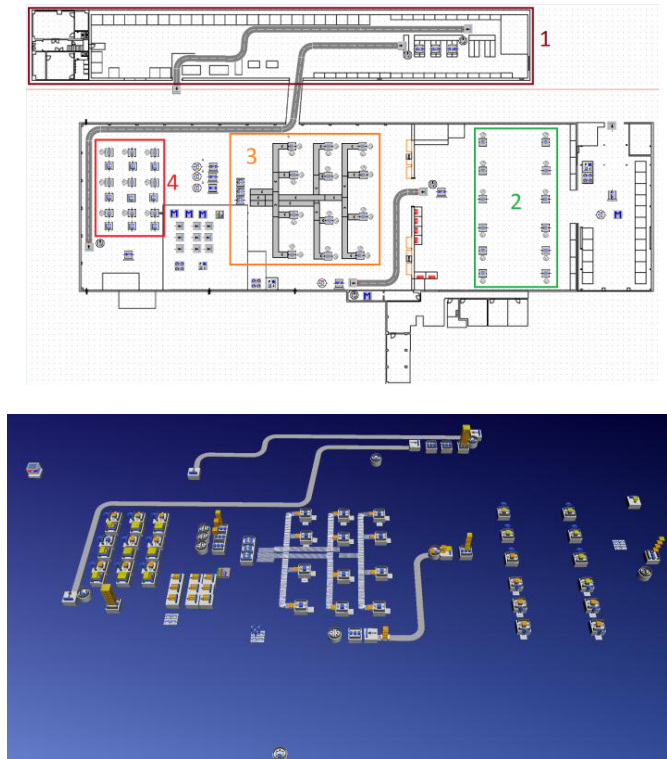


Fig. 4 Simulation model of production originally in 2D and 3D views

3. Creation of production model of the new production hall

As already mentioned, the company has built new premises, which will be located production facility and training centre. Spaces are built near the warehouse of finished products and the old production hall. They are located in a newly built building in the company area. New workplaces in the production hall will have a similar job description as workplaces in the old hall. Nature of the production will be identical as before. The production is likely to be differentiated only in the fact that in one hall will manufacture the products to the customer, and the second one for the other. Proposal deployment machinery and work position was implemented in the proposed floor plan of the new building and its premises. Schema floor plan we put as background in to the Frame in the software Plant Simulation and we have defined the proportions. To the background, we gradually put all models workplaces and jobs and employees. Then we determined the links between work positions, and we determined the sequence of operations. We set the times of operating activities and methods we defined how to take the operations and occupation of each job position. Finally, we defined a path that shows the departure of finished pallets to the warehouse of finished

products, located in the adjacent building. In Figure 5, we see a plan view of the building. In the field labeled number 1 is training workplace and area marked number 2 is the proposal of the production hall in the 2D view.

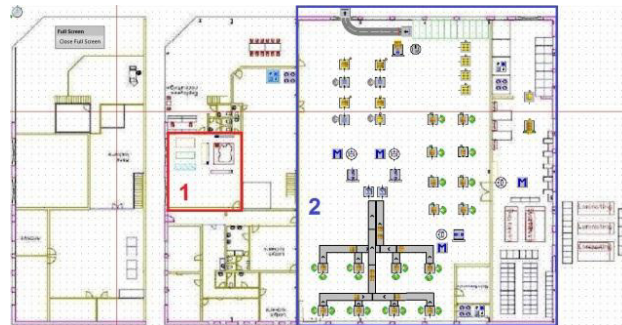


Fig. 5 New hall floor plan layout and design of workplaces

Figure 6 shows the distribution of work in the new hall in 3D resolution in the software Plant Simulation. In this hall there are 8 workplaces input control designated under number 1 in Figure 6. On these work positions working one person at each table. Number 2 are shown workplaces which impose cutting tools, is they also 8 workplace for each table are two workers. There are also stated and 2 cutting presses. Each cutting presses operated by one person. After cutting pressing, tables go to workplaces final control and packaging, these workplaces is 4. They are marked with number 3. For each control table working one person. After packing and palletising, pallet leave the marked route to the warehouse of finished products in the adjacent building. From this place further export goes to customers.

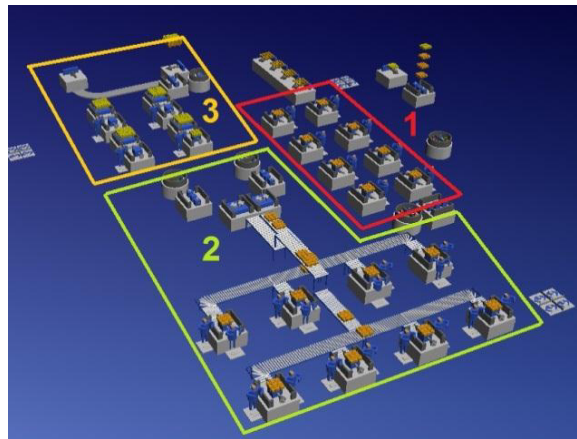


Fig. 6 Workplace in 3D resolution and the designation of individual workplaces

Thanks simulation technologies managed company simple and effective way to design and verify the accuracy of the solutions in the new production before the start of the process into the space itself.

4. Conclusion

In conclusion it can be stated that after reviewing the proposal company to consider the deployment of workstations and layout of machinery and equipment. In addressing the new production hall is going to rely on him. And thanks simulation software in which developed simulation model and verify the correctness of the some

solutions to of the new production unit. The software has helped reveal some problems that are not foreseen at the beginning of the project. These problems occurred mainly in the optimal settings of conveyors to the press. It was necessary to review several variants of settings to them to ease congestion. Software Plant Simulation has served as an appropriate tool to resolve this problem before the actual realization of production in physical form. Plant Simulation can therefore be considered an excellent remedy in the planning stage of production and verification plans in different kinds of production.

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