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MATERIAL FLOW STRATEGY BY SOFTWARE WITNESS

■ **ABSTRACT:**

Any proposal for a perfect relocation of production lines and the subsequent operation of the production system is still subject to further change. They are caused by innovation of products on the market, qualitative and quantitative requirements of the customer etc.

Resolving of material flows is actual term in present. It brings a lot of problems with layout of particular devices as elements of manufacturing process according to required and defined technology. In present time are suitable software tools for improving of transport, manipulation and storage systems. The simulation of these three systems relation is realized support CA systems to optimal whole technological processes. In this case this problem is solved by simulation software Witness used in Institute of Manufacturing Systems and Applied Mechanics of our faculty.

■ **KEYWORDS:**

production system, manufacturing, material flow, layout optimizing

INTRODUCTION

Predictive simulation technology is attracted of specialists in many fields. Competitiveness retention and raising the level of services required by organizations constantly change.

It is necessary to verify the possibility of planned systems and find successful solutions under conditions of strict monitoring costs. Requirements to change technology or business processes, however, entail some risk.

INTRODUCTION

The simulation model is a dynamic model in which there are phenomena of the same order as the system modeling. Simulation methods obtain solutions to some transformation of values that have been learned from observing the model run (run program). The simulation model provides results based on information collected from the changes in the model over time.

Contribution of simulation methods in the field of operational research is particularly in facilitating the work of dynamic and complicated probability ties. As far as the achievement of the goal to create an analytically solvable model, it is necessary to prioritize. Such a model adequately reflects the essential reality site.

This model is usually more general (simulation methods provide results only in numerical form) and to construct and less expensive solutions. In addition, simulation methods are appropriate for assessing the number option than to solve problems that lie in finding optimal solutions to large sets or even an infinite number of elements. With the growing complexity of systems that need to be rationally designed and managed will need to increase the use of simulation methods.

SIMULATION MODELS AS TOOL TO OPTIMIZE THE MATERIAL FLOW

There are mostly used in practice following types of simulation:

- ❖ dynamic simulation and physical systems (differential equations, finite element method, etc.)
- ❖ discrete event simulation systems (network theory front, etc.)
- ❖ simulation aimed at training people (air simulators and trainers, simulators and other operator).

Using simulation to solve the various proposals for optimization of production lines and several systems in different industries to track:

- ❖ verification of the new designed production line operations, a comparison of the old organization to the proposed production control system based on KANBAN,
- ❖ the design of optimal production batch subject to a lot of clock and production of products,
- ❖ the optimization of the number of workers in the system, the allocation of operations jobs.

PROCESS SIMULATION SOFTWARE

WITNESS - is successful program to simulate the production, maintenance and logistics processes. It is used for interactive model creation, creation of modular structures, interactive experimentation, working with CAD / CAM applications and information systems, creating a single optimization module, 3D visualization - virtual reality module. Other administration routes of the Witness:

- *modern methods implementation of production management,*
- *the identification and removal of bottlenecks,*
- *optimal allocation of production and logistics units, material flow analysis,*
- *the prediction of the operational interventions consequences.*

Application Witness simulation program can be realized in the order:

- *the choice of components,*
- *manufacturing process technology,*
- *the choice of machines,*
- *making production variations,*
- *comparison of the designed variations,*
- *selecting of an acceptable variant.*

Technological process of production

In the technological process of product manufacture is necessary to ensure selection of appropriate means of production, namely:

- *products production and production volume,*
- *determination of the technological processing structures and methods,*
- *technology and organizational structure of production, especially mass, production specified, degree of automation and flexibility,*
- *technology equipment - machines and devices, tools and products,*
- *handling equipment,*
- *control equipment. [3]*

The choice of machine

The most important factor in machines classification is a kind of manufacturing plant production. This classification determined the concept of machine technology and automation. [2]

Classification systems of production machines recognize:

- *universal production machines,*
- *specialized production machinery,*
- *special-purpose ,*
- *numerically controlled machine,*
- *numerically controlled manufacturing centers,*
- *numerically controlled machines for automated manufacturing systems.[1, 4]*

Development of production variants

At this stage, to shape the overall concept of technology production. Detail degree of technology depends on whether the choice of production facilities does:

- *for the compilation of the existing technological process in production,*
- *technological solutions to project a new or upgraded, respectively modernized production,*
- *reconstruction of production facilities.*

It is possible to proceed in various ways to create proposals for production. One is the analysis of material flow in production. In Fig. 1 shows the analysis of material flow through production line graphical display.

Symbol	classification activities
O	technological operation
□	control
⇨	transport, handling of material
D	break, downtime sorting
▽	storage
X	loading, unloading
⊥	weighing
⌂	packaging

Fig. 1 Symbols illustrated activities

Different variants of the production lines can be designed using the following symbols, depending on the technological process of manufacturing the product.

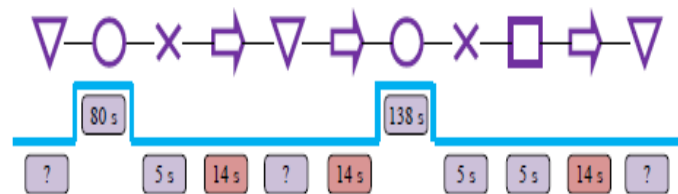*Comparison of original and newly proposed material flow in production:*

Fig.2 Production line variant by symbols

GRAPHICAL SIMULATION OUTPUT OF MACHINERY AND DEVICES

The simulation software generates statistics on the performance of machines and devices after a simulation of the production line. In this case, the witness was used.

Based on the above chart it is possible to achieve productivity gains and to address the increasing efficiency of machines. The solution is to reduce downtime and streamlining manufacturing process technology for finishing. It is necessary to increase the number of inspectors who would ensure the continuity of material flow in quality control. This eliminates the accumulation of technology stocks.

SIMULATION OF THE VARIANTS

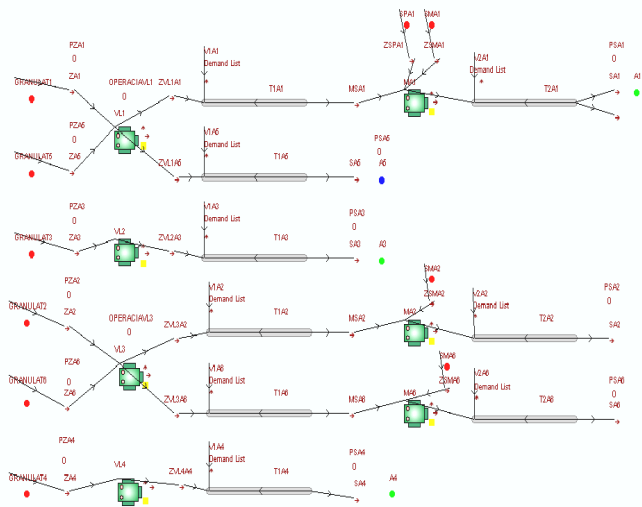Simulation of material flow production lines is shown in Fig. 3.

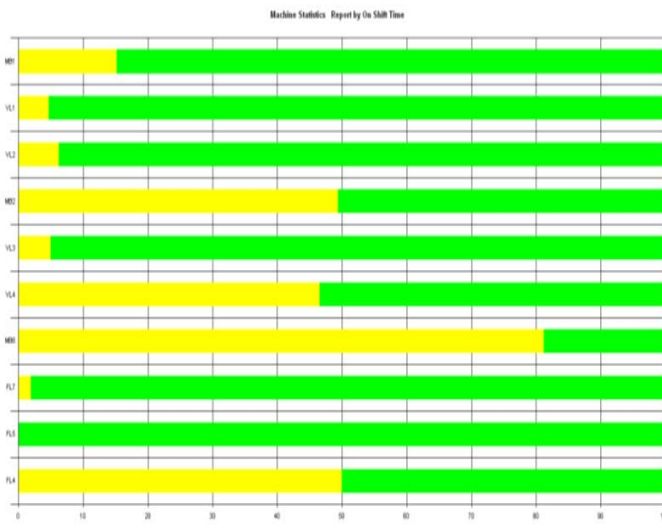Fig. 3 Example of production lines simulation

Fig. 4 Graph operation of machines and devices during the simulation

CONCLUSION

Any proposal for a perfect relocation of production lines and the subsequent operation of the production system is still subject to further change. They are caused by innovation of products on the market, qualitative and quantitative requirements of the customer etc. Therefore, the production system in operation there may be changes in the parameters of the production system, which, depending on time may decrease, unchanged, or rise. Simulation of the production system is a tool to select from a large number of possible solutions. The simulation is to select the optimal variant. By choosing this option should be to optimize the production system. An appropriate choice of the optimal solution and the result of a rationalization of the project are dependent primarily on a thorough analysis of the production system and production program.

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