



Industrial Process Simulation and Optimization

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The topic of this issue is dealing with simulations problems in process of environment industrial company. In the beginning are listed methods of simulation business processes and software tools, which are described in those activities. Next chapter is concentrating at current business, mapping their current condition, according to situations in the areas of section repairs and maintenance. Further fit carving instrument and suitably selected business processes (from areas repairs and maintenance) are chosen and described by the help of selected business processes, usefully used as a toll for selected model ARIS Web Designer.

The correct application and functionality of system in concrete company conditions should be used secure consistent fulfillment of all periods of customization Enterprise Resource Planning (ERP) system. However the length of ERP system life cycle is not created only by correct selection of the system and its careful customization, but substantially depends just on concrete company conditions which the system is applied on. Correct formulation of business aims and policy and optimization industrial processes, belongs to the most important of these conditions. The aim of use of information system and information technologies (IS/IT) is not only to automate the current structure of the processes, but to create new quality of more functional processes.

System integrators sufficiently work out processing methodologies of each period of business informative system life cycle. It is not a common practice to use these suppliers fulfill appreciation and optimization of intradepartmental processes before application of their system. This task rests with companies themselves or they can rent an external firm that deals with these problems. In principle it should to find out, what is really happening in the firm, what processes there are under way, pass a judgment on their maintenance-ability

and effectiveness (costs, time and usage of each sources etc.) and on the basis of effected analyses to suggest some effective methods. But and often for ages unchanging work style in firms can lead to the fact that the some processes do not suit to current situation or ingoing conditions existing in present firm conditions. It is clearly showing up that something must be changed but how can we do it? It is evident that it is not possible to try different settings of business processes in practice because possible mistakes can have fatal consequence for the firm. Much more advantageous is to model these processes and check up simultaneously (to accomplish BPM – Business Process Modeling) before implementation of definite changes in processes (BPR – Business Process Reengineering).

The models and simulation are the aids how to investigate some future phenomenon or situations, how to search out the inner rightfulness of real processes of which the direct observation could be unreasonably expensive, risky or even impossible. The simulation is a sort of intellectual imitation or reproduction of real going system by the help of specially designed analogues – models, in which the principles of organization and purpose of this system are reproduced.

Generally speaking, it is fit to approach modeling and simulation of processes, when company management starts to study these kinds of questions:

- How the firm processes support the firm aims?
- Which alternatives are needed and which are unnecessary?
- What parts of processes are the most expensive?
- Where is the biggest profit for customer formed?
- How many sources (workers, tool grinder and sharpener, lines) are needed for achievement of the aims?
- Where are the limiting points (constraints) of the processes?
- How to accelerate respond on the customers' needs?

Industrial processes in LG. Philips Displays Czech Republic, plc.

Manufacturing company LG. Philips Displays Czech Republic was located in Hranice na Morave region. It was founded by the join of two firms dealing with the manufacturing of electronic equipment and instruments, LG and Philips. The company deals with the manufacturing of the TV screens in two production lines, so-called JUMBO line and LARGE line. The scheme of the manufacturing process is represented in Figure 1.

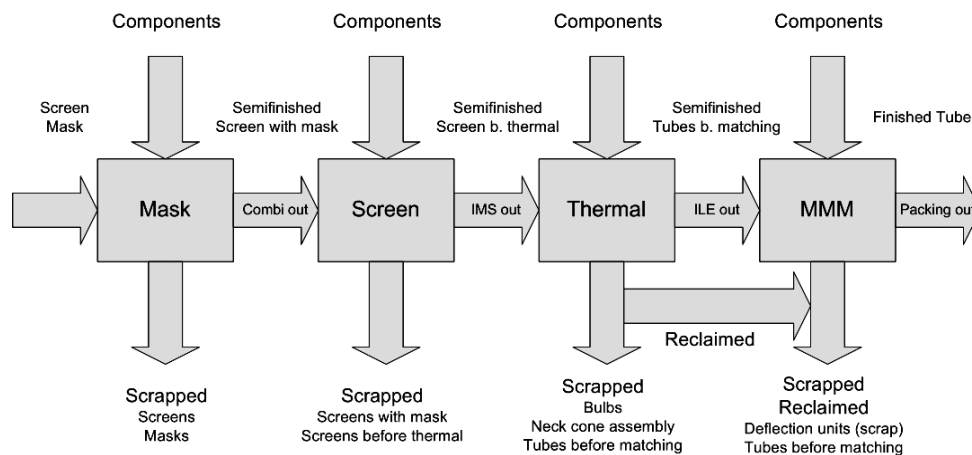


Fig. 1 – Industrial process in LG. Philips Displays – Jumbo and Large lines

Manufacturing concern uses ERP system for control of business processes. For documentation software Microsoft VISIO is used. Company also derives benefit from ISO Pack, which is built on norm ISO 9000 quality control. ISO Pack includes information about all processes in company. E. g. production, purchase, sale, logistics, communication with consumers etc. Described processes are divided into the branches, where they are worked out.

Process of manufacturing consists these periods:

1. First the process Mask is done, where the screen masks are hung on the conveyor (it is a front screens made from glass). The mask is cleaned and prepared for the next process.

2. In process Screen the parts so-called Screen are put in, these are parts from the metal, consists from three parts, in which there are three openings for imagery points of colors. In construction of each part the layer of phosphorus is laid, the washing follows and then the next montage of Screen is done, next the shade is added. This part of industrial process needs a very pure environment.

3. The third process is called Thermal process, there thanks to a special silicic adhesive and high temperature in the furnace the front and back parts of screen are put together.

4. Process MMM consist of three parts:
- Measuring - where the measuring of screen parameters are measured and the quality of the screen is evaluated.

- Matching - in this process deflecting coil and electron-beam gun are placed.

- Magnetization - there the gunray electron ordnance is magnetized and set.

5. In the last process the side of screen is painted and the control is made, if the front side of the screen is not scrapped. If not, it is polished yet and the finished product is dispatched to process of logistics. If the screen is defective, it is sent to the Reclaim Process, where the stage of the fault is evaluated and the screen is taken apart. It goes into washing, cleaning, and then it goes back into the manufacturing process again.

The present situation in Repair and maintenance section

The present situation in area of company processes on the repair and maintenance section are divided according to this structure:

JUMBO line: Mask – Screen – Thermal – MMM,

LARGE line: Mask – Screen – Thermal – MMM,

RECLAIM a CHEMPREP: Reclaim and Chemprep are manufacturing sections are corporated for the JUMBO and LARGE, their activities are not reliant on the concrete manufacturing line. The reclaim processes rejects production from the all lines and tries maximally to recycle the used components and take them back to the manufacturing. Chemprep goes about the preparation of chemicals (e.g. phosphorus) for all

these products and manufacturing lines.

In each section another system of maintenance and reparation is innovated. Different kinds of managing and documentation forms are used, e.g. written documentation or software Excel, Lotus and Access. That is why the company LG. Philips Displays Czech Republic, Plc. decided to make, all these systems unite in one. The System SAP R/3 is used for this purpose.

Repair and maintenance system is divided into:

1. Working maintenance (solving of disorders on the spot). It refers to unplanned upkeep tool grinder and sharpener that the machine fault or his arrangement caused. Mostly it is concerned on exchange of the crank arrangement, correction of the arrangement on the spot (constriction of definite unstrung parts of the machine) and so on.

2. Planned maintenance (regular yearly dead plate). The planned maintenance defines, which work will be done, on which equipment it will be accomplished and how often it will be repeated and what rules of the repetition will be used. In the system these rules can be combine together:

Repeated maintenance – the work will repeat always after a period of engaged time interval. It is used for planning of the checking, regular work on equipment, especially with usage recipes producer, plans skill and so on.



Seasonal maintenance – the work is done every year in given date. This way it is possible to plan line work on chosen group of arrangement.

Maintenance after abrasion – the work is done after overfullfillment of limit, given for tracked period of abrasion (mileage, number of working cycle ...) the abrasion is secured by the inspection, for work accomplishment the attrition is counted from zero.

3. Preventive maintenance (following critical values, delete plan, and so on). Preventive maintenance is done partly according to the given maintenance programmes and partly on the basis of plotting diagnostic signals (in the event of using of diagnosticians at maintenance). E.g. Maintenance and cleaning tool grinder and sharpener, small corrections, cleaning of filters and traps impurities and so on.

Structure of Maintenance and repair process

First we need to create a structure and according to this structure the maintenance will work. In principle it is a flow-chart the next step is to obtain as much as possible information about technical places in detailed sections JUMBO and LARGE, that means to equip these technical places. It was important to definite, how to deal with technical places and their equipment. E.g. technical place, we can not replace somewhere else than where they are just located. Compared to that technical equipment of places is possible to move also on other technical locations, but it has its rules too. Communication with people, who works in maintenance section, is also very important. Problems „how to assign reports to the system SAP as much as effectively and simply“ are solved with them, and also „how to work with these reports next“. Also it was necessary to train and explain the way of operating in system SAP R/3. During this the data about technical places and mainly about their equipments are pasted.

Requirements for maintenance management:

- display a technical reality - equipment, piece list of spare parts,
- reports,
- work processes,
- maintenance plan,
- commissions,
- statistical processing,
- integration IS into the company.

Structure and kinds of maintenance

Maintenance and reparation of technical system includes these proceedings:

- inspection - inquest of the real state,
- maintenance - preservation of the requisite state,
- reparation - restoration of the requisite state.

Organization of maintenance pursues also the next technical maintenances that do not line in maintenances indeed, but they should be done in centralized maintenance system – by scheduling and realization of commissions:

- new construction or reconstruction of equipment,
- cleaning,
- inspection,
- tool - making and preparations,
- aid in production and so on.

Hierarchical structure of division production has this form: Technical place – equipment – constructional unit – spare part.

The maintenance and reparation policy includes these three areas:

1. Root datas – this area includes datas, which stay in system longer time and it creates the processing mainstay of each company processes.
2. Planning – it includes maintenance report, which forms maintenance before order transaction, and further maintenance plans in terms of planned maintenance.
3. Order transaction – amounts of scheduling functions and order transaction, like e. g. Scheduling of materials, capacities, requirements for material and achievements order, as well as following loads.

Planners are defined like planning groups of maintenance in terms of company maintenance planning. Units

of capacity for maintenance are administrated like workplace of maintenance in the maintenance and reparation maintenance. The maintenance workplaces are mostly assigned to the company which plans maintenance, but it is also possible to use maintenance and reparation proceeding from other workplace maintenance. For description of fitting company in process was chosen diagram PM (Plant Maintenance). This diagram shows report establishment and progress of maintenance function.

Model of report process in fault

The Tool ARIS Toolset is used for the modeling of report process in fault. Company policy of LG. Philips Displays Company, plc. does not allow anybody to go direct into SAP system from the outside. That is why this model projected in ARIS is used as a pattern for the customization (setting and adaptation) of PM module (plant maintenance) direct in SAP system. As a matter of fact, the preset modulus PM acclimatized is given requirements and conditions according to the given model.

Figure 2 shows, how the maintenance and reparation system is solved. We can see, how the spare parts run to each section (Mask Screen, Thermal, MMM, Chemprep and Reclaim). Figure 3 shows Requirements for order process creating.

In this contribution are requirements and needs described, needed for development of business mock - up maintenance on the reparation and maintenance section. A suitable modeling tool was chosen – it is a product ARIS Toolset, which was produced by the IDS Scheer Company. The next part includes a model of the process of default report, for which the existing company process was used and the model in the reparation and maintenance section. This model was used for the customization of modulus PM in SAP in LG. Philips Displays Company. The model was created on the ARIS Web Designer server; it has a different graphic interface, than ARIS Toolset.

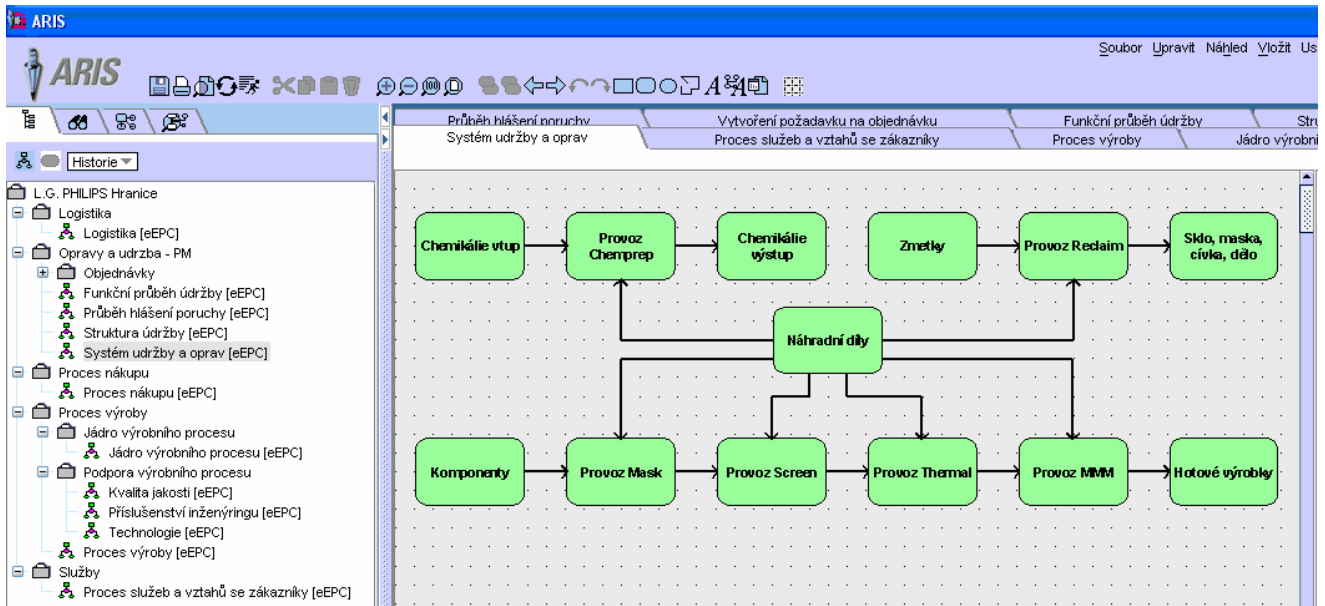


Fig. 2 – Repairs and maintenance system

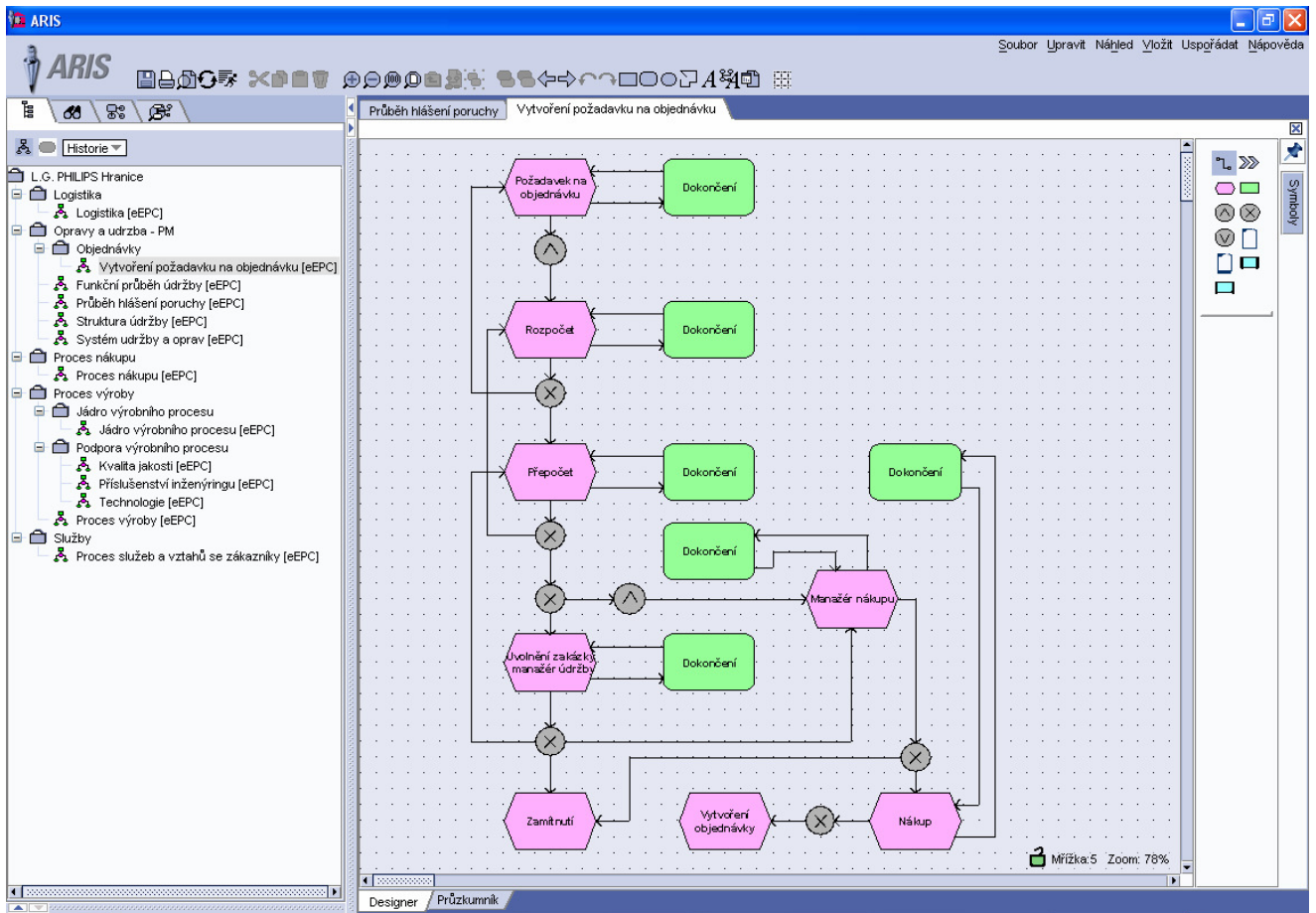


Fig. 3 – Creating of Requirements for order

Anyway, the functions are the same for the both products. For the evaluation of expense and planning of the maintenance in the

company, is useful to use analysis and reports, which we can obtain from the company information system SAP in schedule form. The schedule could be

compiled by e.g. export in Ms Excel, where we can generate different kinds of diagrams. From these diagrams and charts it is possible to evaluate the



state of expenses (cost analyses on several technical places, analysis according to specific order), productivity, maintenance scheduling and so on. In this way it is possible to follow the economy of simulated processes and subsequently to do hits to their textures (their optimization).

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