

PLM Systems and Tecnomatix Plant Simulation, a Description of the Environment, Control Elements, Creation Simulations and Models

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Abstract Presented paper is oriented to the modeling, simulation, design of business processes and their optimization through Tecnomatix software portfolio (Siemens PLM) and its modules. Application products created through these modules are in use sectors of the business process, from creating models of parts tools and products to develop a complete simulation of manufacturing processes in the production of so-called digital manufacturing. It addresses the particular module for creating dynamic simulation Plant Simulation.

Keywords: *Tecnomatix sw, Plant Simulation, modeling, projecting, simulation, optimization*

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1. Introduction

If we are looking for saving financial sources to the development, manufacturing and testing of new or innovative products or businesses we can use different tools. One suitable means for these activities is the application of PLM systems and their modules. Currently, a large number of enterprises in the various industrial areas not only engineering, automotive and aerospace uses for this activity products provided by Siemens platform Tecnomatix and its modules [1,3,6].

2. What is PLM (Product Lifecycle Management?)

Around 1980 engineers in manufacturing industries and construction industry recognized the need to keep track of the growing volumes of project files. These were generated by CAD systems. They began to manage data using first EDM (Engineering Data Management) and later PLM systems. These systems include PDM, which permits standardized items to store and manage product data and their publication. Subsequent check in items in bills of material and perform review of individual items. They are seen relationships between parts in assemblies. This feature allows quick access to the structures of these assemblies. It also allows individual parts of their reuse and to derive new sets of products and innovations. It also reduces the risk of creating new versions of incorrect assembly and also this version of the report allows for

further use. This will facilitate the publication of information about the product, they have created, verified information is used several times in a row [9].

Benefits of using PLM systems several times outweigh the costs of its implementation. Behind increase in yields not worth only fully setting performance and technology tools. occurs mainly at radical change in business processes, the procedures for exercising control. These steps significantly affecting the well established corporate values but ways to increase profitability and market share and streamline business processes. Help speed up the process of product innovation. These products improve the quality and brand image. This will allow faster penetration of new or innovative products on the market. This will allow the manufacturer to obtain more evidence-based information directly from market perform and objective decisions on the way forward in the life cycle of all products in its portfolio [8].

PLM is a holistic business concept developed for data management and product lifecycle. It includes not only entry, documents, bills of materials, but also analyzes the results of the test specifications of the product, information on the environmental impact, quality standards, technical requirements, statements based on changes in production, manufacturing techniques, information about suppliers, customers, supply sizes, locations where the goods supplied under etc.. It also manages the functions of the workflow. Includes the functions of design and modeling and standardizing these activities for their automatic use in the future.

The processes in which they engage, and accelerate development of new projects. Into the PLM systems is also included WEB database. This allows companies to

easily connect their devices globally dispersed staff each other. Manage their activities as needed throughout the organization. Allows you to engage suppliers, partners, or customers directly to production and product development. PLM forms the backbone for effective cooperation, planning, management and control of all organs related to the manufacturing organizations as well as individual products it produces. The use is not currently no longer only in large manufacturing companies, but also for smaller manufacturers producing their products in different markets. Also in various service providers. Progressively expanding PLM trends raises its necessity for successful business and its planning, management and control of the results.



Figure 1. PLM and basic categories to coverage [8]

3. PLM and Its Application in Practice and in Everyday Life

PLM systems used today not only in the field of engineering, aviation, automotive industry, but also in many other areas. For example, in the field of motorsport. PLM systems and reliable long-term used teams Formula 1 Through these software planning and simulating pit stops, also the production and treatment of aerodynamics the cars separate, for each race in the series World Championship .Another important area where they were used PLM systems, as for example development of interplanetary vehicles Curiosity, which explores the surface of Mars. Throughout the development of this vehicle scientists from NASA used PLM software. Thereby saved the cost and amount of time when making and testing prototypes and adapt his possible errors. The system ensures that all necessary components are correctly made and properly fit into one another. By ensuring the correct operation of the vehicle in difficult conditions in which it is used. Software could help to model and simulate the processes of vehicle parts production of . Also, his activity carried out by the Martian surface, allowing its virtual testing before starting the operation in space.



Figure 2. Use of PLM systems in practice (vehicle NASA Mars Curiosity)

4. Plant Simulation, a Tool for Creating Dynamic Simulations

The paper deals with a separate Plant Simulation module, which deals with the field of dynamic simulation, used to optimize production and its performance also correcting logistic flows and creating their digital models [2]. These enable to perform various experiments and scenarios in production, still in the planning phase of production, before the real start of construction of a factory or production unit. It provides extensive analytical tools to analyze obstacles, statistics and graphs, enabling to assess profitability of individual experiments in the scenarios of production planning and optimize them in the most appropriate form. This module can help in the planning of production lines, their parts, as well as the planning of global manufacturing plants.



Figure 3. The opening screen of Plant Simulation module

The working environment consists of 5 main parts in (Figure 3)

- 1st part: Master control bar, which serves to control the program and allows you to store and set all parameters in the program. There is a basic menu in which the user selects and describes the various requirements, such as language, extent, tools,

insights, assistance and other attributes necessary for basic settings.

2nd part: The basic structure of the model that is created when you open a new document, where are all items of a model. It has a tree structure for better transparency in dealing with complex models. Area is called class library, in which the icons, used as elements of the process creates the simulation. In options there is possibility of selecting the icons of material flow, resource, information flows, user interface objects, models and frames. Last mentioned elements are essential in addressing the simulation itself. Frame is an area into which is inserted a simulation, and can be the basis for a complex process. By creating and by connecting of multiple Frames we creates a complex process.

3rd For user is the most important this part. We can find there the necessary elements to establish the simulation, layout drawing of halls and setting of the simulation. The zone contains the same elements as Class Library, but in a visually different form. Processes commonly used in the simulation of simple and complex production processes, inputs and outputs in the production, simple and parallel process, assembly and disassembly, transfer stations, conveyors, access roads and connectors of all processes .

4th The area in which is plotted the manufacturing process looks like this: we can choose between two basic areas, or with a simple grid. Of course there is also setting a custom wallpaper that can match the footprint of buildings drawn with CAD system, it often works like AutoCAD sw. This area can be called essential. It is necessary to pay attention in the moment of loading some layouts (floor plans) buildings into the field . There it is necessary to select new models by the Tools icon and choose Scaling Factor and set its value to desktop size, which must be identical to the dimensions of the layout. Otherwise we get distorted data of a model, which will be unusable for us. Simply we can say that, it is necessary to set the correct scale in floor plan to create a usable layout of production that we are going to create.

5th Console for recording a change in a simulation and easy control of these changes.

5. To Work with the Icons We Can Use Keyboard Shortcuts

Some auxiliary controls button in the software:

- Click the icon of the machine + F6 - statistics of the element.
- Click the icon of the machine + F8 - the methods used forthis element.
- CTRL + T – rotating icons.
- CTRL + * - enlarging icons.
- CTRL + / - reduction of icons.
- Submit comments and its signing - CTRL + Left Arrow or Down - increase your desktop.

According to this brief (short) guide we can create simulations and models of production shown in [Figure 4](#).

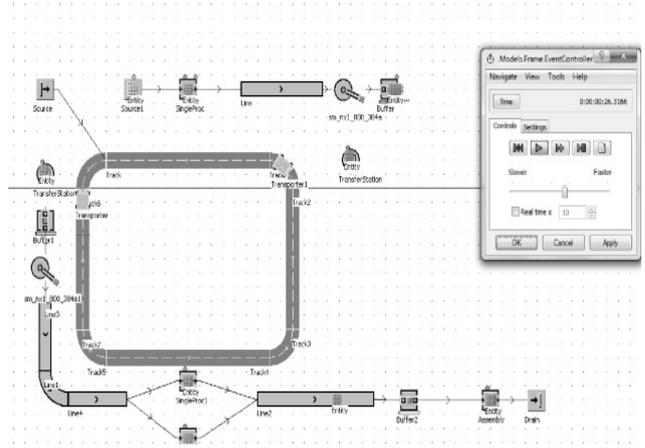


Figure 4. Simple 2D simulation in Plant Simulation module

When we switch to 3D mode on the desktop No.1 we create simple model of simulation shown on [Figure 5](#), [Figure 6](#).

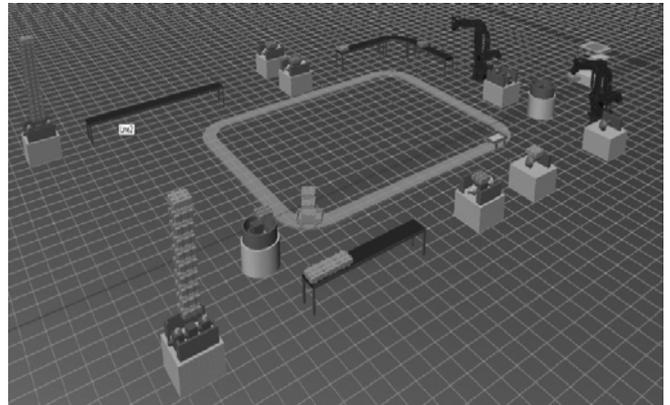


Figure 5. 3D Simulation in Platin Simulation

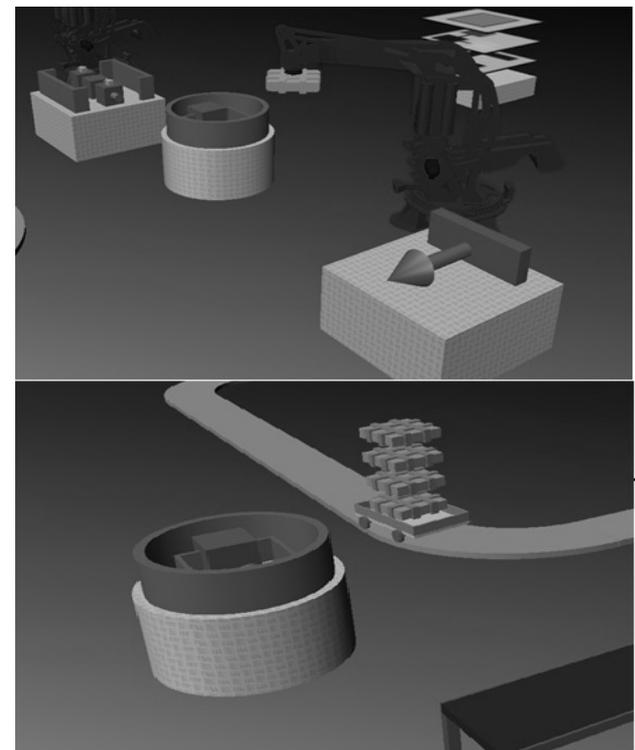


Figure 6. Simulation in 3D mode – Detail of inter area mode of transport and handling activities robots

In this way it is possible to create a similar simple simulation and the use of other methods and programming options offered by the program can be designed in any production line and production process (Figure 6). By Plant Simulation module we can generate a large amount of statistics and data to help optimize production for each item inserted into the model.



Figure 7. complex 3D simulation of the production hall

6. Conclusion

Plant Simulation Module is suitable for creating a dynamic modeling and simulation, and can assist in the optimization and planning of new production processes to create new lines of product types and thus conserving resources and businesses to design production so as not in the best of complications and risks and minimize losses possible mistakes and errors in manufacturing. Statistics generated with the program provide a lot of information

about the upcoming production, or also allow you to optimize existing production lines [4,5,7]. It is often possible to generate error rate and occupancy of workplaces and possibly eliminate downtime and bottlenecks, which are in production. It is the best tool for saving resources in production processes.

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