Steel Pipe Manufacturing Scheduli Software

Manufacturing Mining & Metals

Problem

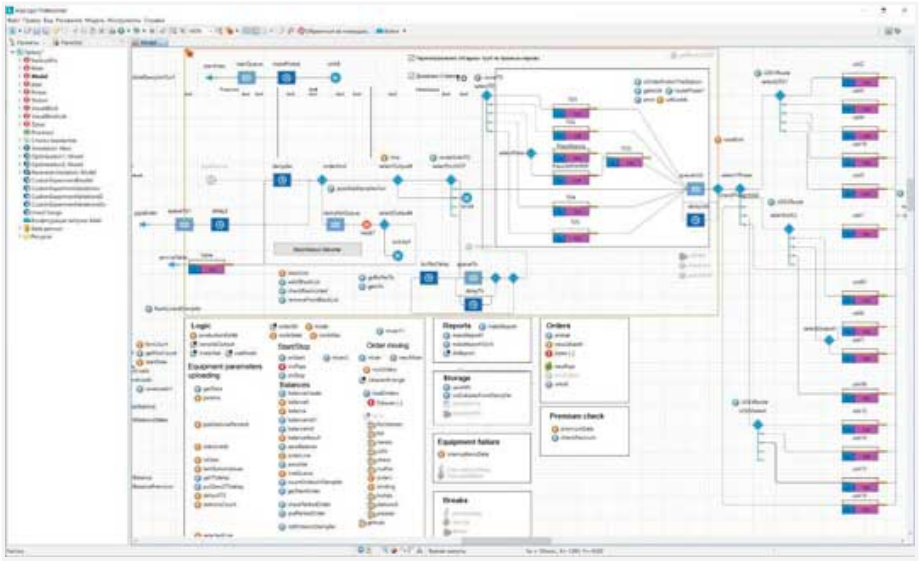
Manufacturing and economic conditions are increasingly complicated and unstable with the result that traditional scheduling methods are becoming ineffective in the face of disruption. A major Eastern European steel pipe manufacturing plant, relied on traditional spreadsheet-based manufacturing scheduling and began facing the following problems:

foremen to make decisions case by case.

- Lack of coordinated production stages resulting in downtime, equipment overloading, and order sequencing disruptions.

The plant's management team opted to improve manufacturing scheduling using simulation software. For this purpose, they approached Focus Group, a company that provides services for implementing simulation-based decision support systems. Focus Group specialists developed a manufacturing simulation model that would help fulfil three main goals:

- Complete manufacturing scheduling automation, to exclude human error.
- Developing a precise specification for pipe production routing through stations.
- Identifying free production capacity to enable additional orders.



1. Elements of the model in AnyLogic

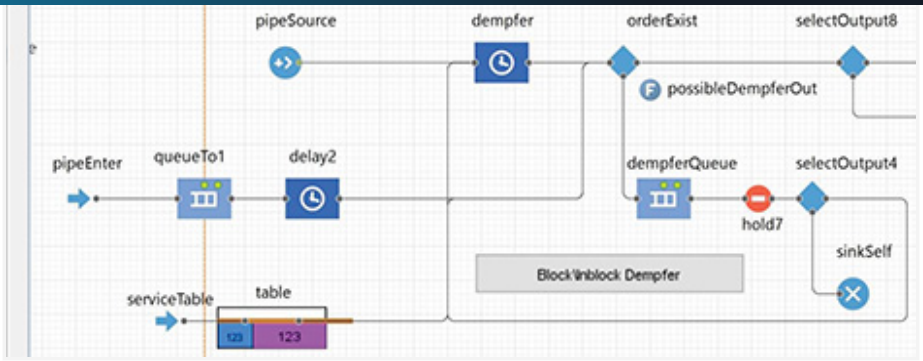
AnyLogic because the software offers several key advantages:

- Discrete event modeling.
- Industry-specific library — the Material Handling Library.
- Model can be exported as a standalone Java-application.
- Data handling capabilities, including input and output.
- Opportunity to create a fully functional digital twin of the manufacturing enterprise that integrates data from actual manufacturing facility operations.

In addition, AnyLogic not only enabled the modeling of processes, but also the ability to set the logic for components in the production line and their rules of interaction.

For the material handling model, the Focus Group team included objects such as *Order*, *Pipe*, *Prokat* (Metal-roll), and *Station*. In the model, they set the logic for the whole production line, from a damper warehouse to finished order release. The input data (weekly order schedule, performance, machine units working hours, etc.) was uploaded into the model via Excel-templates.

The model could test out the feasibility of the weekly manufacturing schedules created by the pipe manufacturing plant specialists. Moreover, the engineers developed a specific algorithm that enabled the model to suggest optimal manufacturing schedules. By applying analytical methods, and testing the results with dynamic modeling, the Focus Group



2. Elements of the model in AnyLogic

Result

The developers created a steel pipe manufacturing model that considered all production stages on the shop floor. The plant's performance improved because, based on the model, the management could:

- Test the reliability of the manufacturing schedule developed by the plant in a risk-free digital environment.
- Safely test if new orders can be integrated into existing schedules.
- Determine the utilization rate of major stations and machine units.

Additionally, the model helped calculate expected order lead times and sequence optimization, provided detailed stage-by-stage order routing, and could develop the weekly manufacturing schedule itself.

As a result of the simulation modeling, the manufacturing enterprise minimized gaps and daily fluctuations in the handover of orders, identified bottlenecks, and refined order routing. They also combined short downtimes into longer intervals and

In the future, there are plans to further extend the model to function as a digital twin of the shop floor by integrating it with the production control systems. Management will then be able to set detailed shifts or daily tasks for each machine unit, as well as connect planning and production. This would enable the plant to adjust its schedules based on a global view of the production site.

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