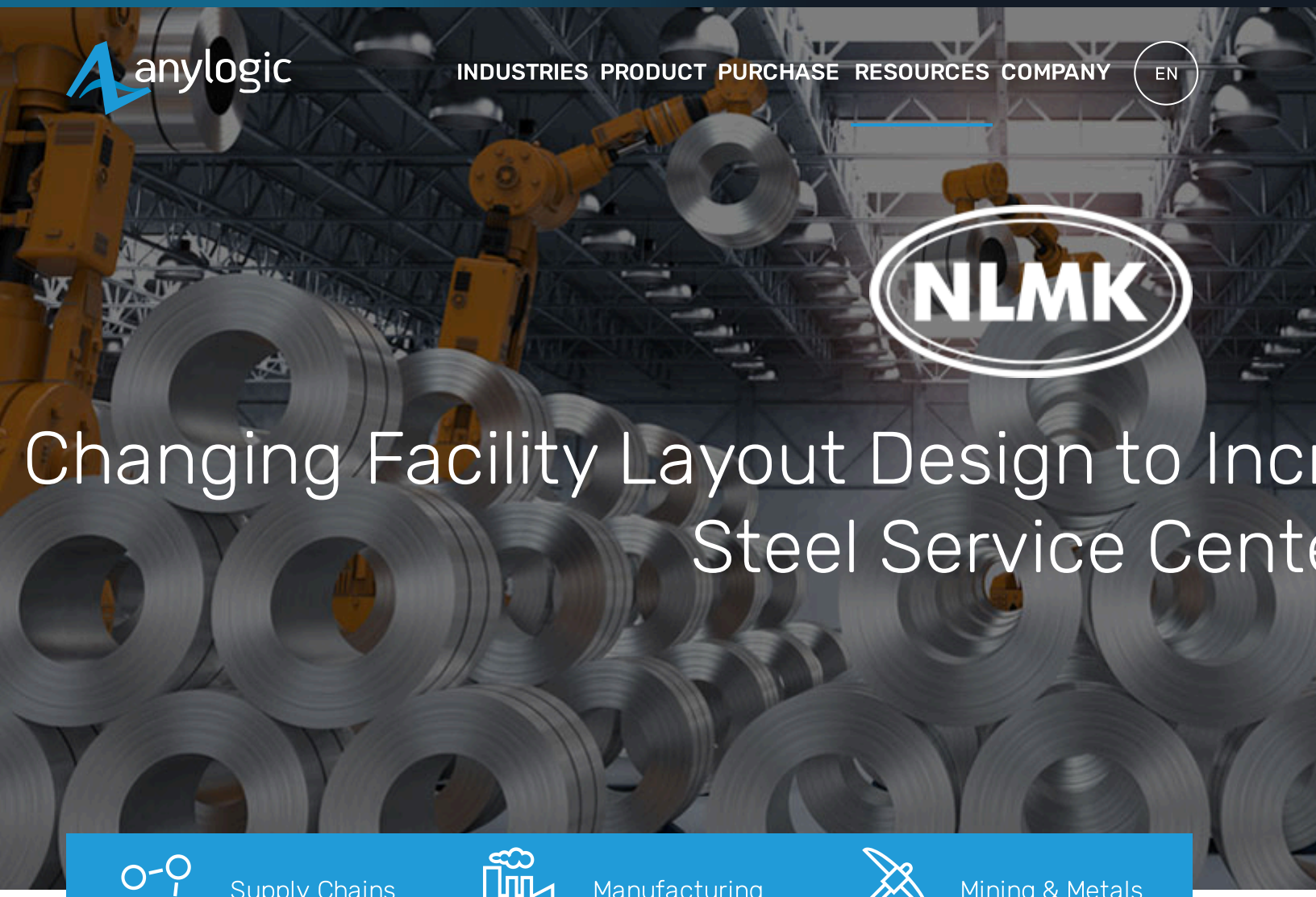


Changing Facility Layout Design to Incr
Steel Service Cente

Supply Chains | Manufacturing | Mining & Metals

Overview

TBS Consulting helped to increase steel service center throughput by 1.5x at NLMK's Steel Center in Manage, Belgium. The throughput increase resulted from using a simulation model to analyze facility layout and modifications. This case study details how the companies worked together on the solution.

NLMK Manage Steel Center (MSC) provides a wide range of strip steel services in Europe. They focus on hot-rolled steels, pickled steels, cold-rolled steels, and galvanized steels for furniture, heavy & light metallic frames, and the automotive industries. Most of the steel is supplied by road with just-in-time deliveries. The center processes over 200,000 tons per year.

Problem

MSC planned to implement a set of modernization activities to increase throughput at their facility by 1.5x. Changing the layout of the facility could increase throughput, and engineers identified several considerations for analysis:

- The installation or relocation of production lines
- Crane additions
- Scale locations
- Conveyor installations
- The opening of additional gates

Many interrelated factors might affect throughput performance, but any reconfiguration should fit the facility's constraints and provide the desired throughput.

The facility's territory is limited by a railway, a canal, and private property, leaving little space to fit a new production line. Limited space is also a problem for trucks arriving for finished goods, which must take special precautions to avoid collisions.

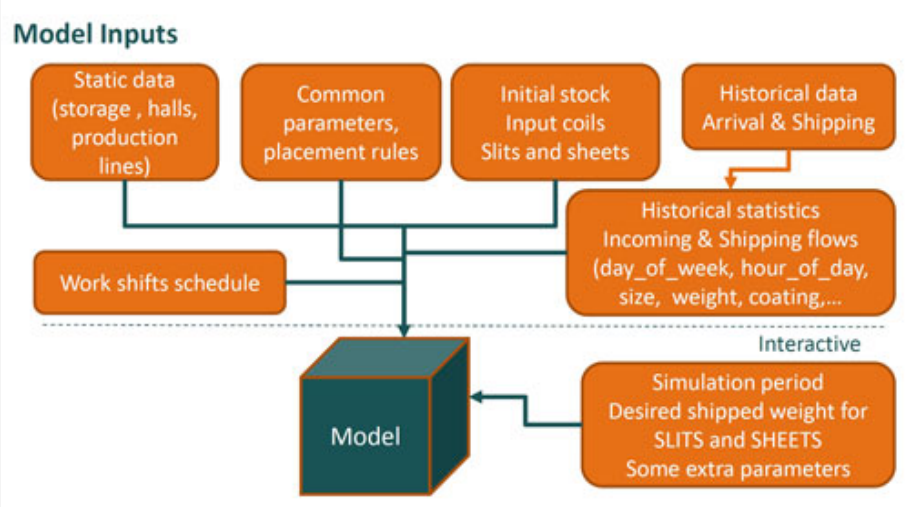
The loading of coils onto the production line requires

Any solution should also consider seasonal variations in client demand and the supply of coils, as well as high levels of variability in daily truck arrivals.

Solution

In the first phase of the project, TBS and MSC agreed on a detailed technical specification for a model that covered the whole production cycle. Activities captured by the model ranged from the arrival of coils at the facility, through production and storage, to the shipping of finished products. The model would provide an overall site view, as well as detailed operational data, such as for operators, cranes, and production lines.

The technical specification was very important because it formed the foundation of the project development, determining the inputs, outputs, and statistical distributions for use in the model, as well as the agreed user requirements.



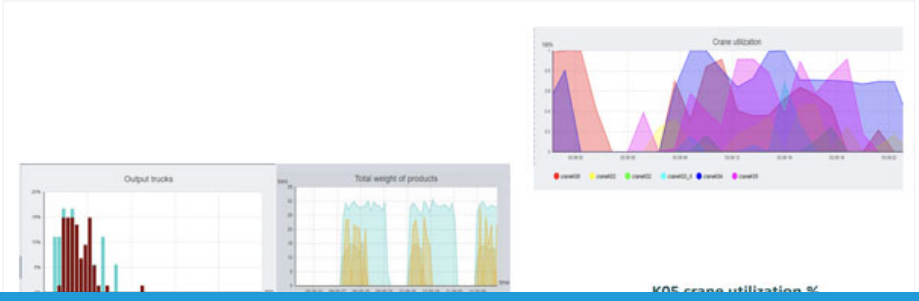
The model accepted static, historical, and interactive data inputs (click to enlarge)

The as-is model represented the facility as it was, and its accuracy was verified by running simulations with historical data. The model could then be used to test various scenarios and compare their results. Finally, by implementing easy user input, the tool could be used for planning, such as for organizing day-to-day operations or analyzing year-long scheduling.

The simulation model supported analysis and helped build insight by allowing various experiment types. For example, the 2D and 3D visualizations let engineers verify that the model was accounting for considerations that may have not been captured in the model logic.

In the case of crane control, the standard overhead crane included in Material Handling Library does not account for operator movement – an operator controls an overhead crane from a mobile remote control. AnyLogic's customizability meant the designers could easily specify that a crane's operator must follow certain paths to comply with safety regulations, while the crane load would move according to its own operational path.

Accounting for differences in the crane operator and crane paths gave time constraint information critical in helping identify bottlenecks.



steel service center (click to enlarge)

Experiments without visualization, however, permitted faster experiments, such as mass runs using parameter variation.

Overall, the model collected detailed data on each operation, such as coil or sheet movements, truck arrival and departure, coil processing, and operator actions.

Performance indicators included data for total weight produced, total weight shipped, resource utilization, and more. All the information from simulation runs could also be exported for further analysis in Excel.

TBS implemented the model for MSC using AnyLogic simulation software. Simulation modeling provides an important method of analysis that is easily verified, communicated, and understood. It gives all stakeholders in a project clear insights into complex systems.

Results

The model helps to identify most critical resources and affiliated risks and can check the effectiveness of decisions (e.g. different placement policy or adding a new crane). Also, it enables finding bottlenecks for truck operations.

Simulation modeling helped the MSC management team to select optimal configurations for the facility and confirm their productivity. Their analysis showed that the installation of the new CTL production line will significantly improve the ecological factors in line with NLMK's general strategy.

helping identify bottlenecks.

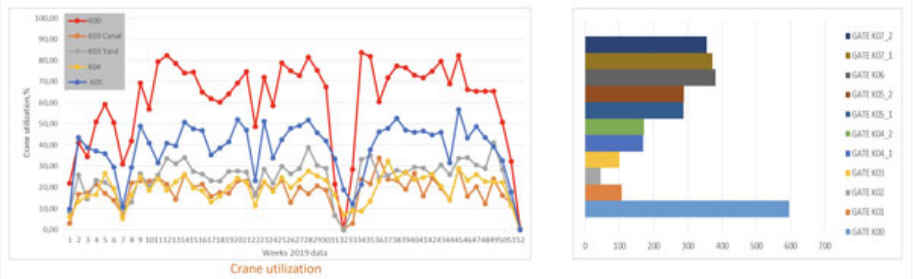


Chart illustrating crane and gate utilization. Results identified a bottleneck with gate number K00 (click to enlarge)

Due to seasonal variations, steel service center bottlenecks were shown to cause a small percentage of incoming trucks to wait so long that they would miss their next scheduled appointment. Although only a small number, these delays would have knock-on effects that could cause further disruption.

Example of truck data analysis (click to enlarge)

After the initial results, management is now looking to use the model for daily operations planning, as well as optimizing arrival plans and coil storage to decrease the number of extra reshuffling operations.

In the future, the intention is to fine-tune the storage policies, work schedules, and equipment selection. And finally, the model is available for experiments and analysis in the case of extreme conditions.

You can learn more about the project in the presentation video from the AnyLogic Conference 2021.

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