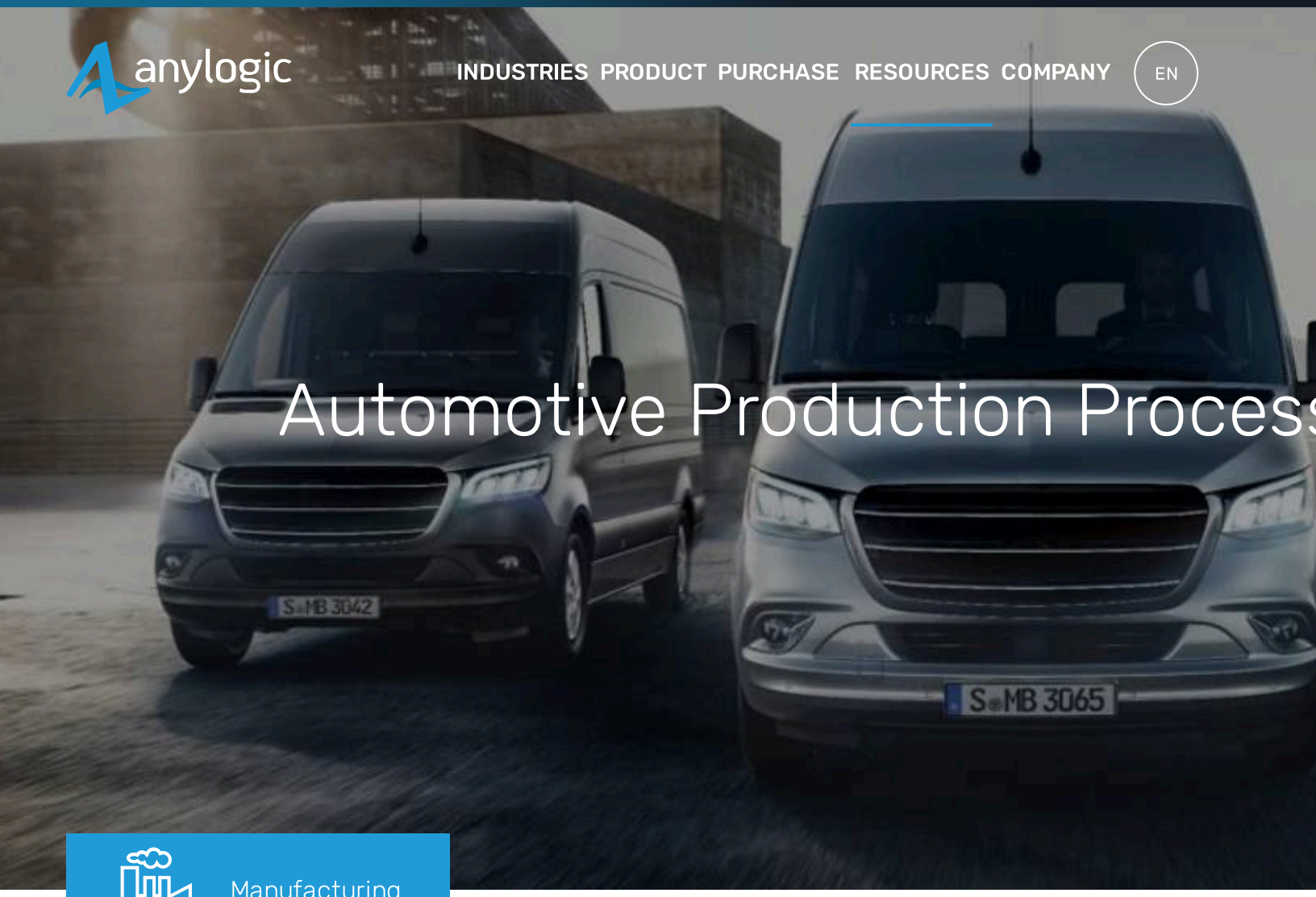


Automotive Production Process

Manufacturing

Engineers at a world-renowned German automotive manufacturer sought a modern and optimized production line for the company's highly successful commercial van. With over 3.4 million deliveries of the commercial vehicle from various production sites, the company wanted an optimization tool with the flexibility to apply at different plants and account for technologies such as autonomous guided vehicles (AGV). The first stage of the project realized an

intralogistics in the context of a large-scale AGV implementation. They wanted to know:

- Equipment utilization
- Workforce pooling (especially for irregular tasks)
- Time lost (due to traffic, waiting, repacking, etc.)
- Distances traveled
- The number of assembly line shortages
- Stock re-order levels
- Delivery tour utilization

Above all, for profitability, there should be no production stoppages caused by assembly line shortages.

While considering the efficiency and optimization of the aspects listed above, planning engineers had to ensure they met the challenges of the commercial van production line:

- Numerous components – tens of thousands of part numbers assembled in the same plant
- Component variability – the van's wing mirror has 130 variants
- Complex transportation – including forklifts and car-set delivering AGVs
- Time and space constraints – shared pathways and time critical activities
- Assembly line policies – quality, numbers at line, 'one touch – one motion', etc.

How to optimize a complex assembly line

Traditional analysis techniques based on spreadsheets cannot consider the complexities of a modern

simulation software, the production process engineers could model their assembly line using the Material Handling Library, connect to external software libraries, and develop custom elements. In addition to the modeling capabilities of AnyLogic, the software's cloud functionality met the collaborative experimentation requirements of the engineering team – speeding up development by shortening feedback and review cycles.

Solution: Modeling for complex automotive production facilities

To maximize the model's applicability and future usage, the developers created the simulation model using several guiding principles:

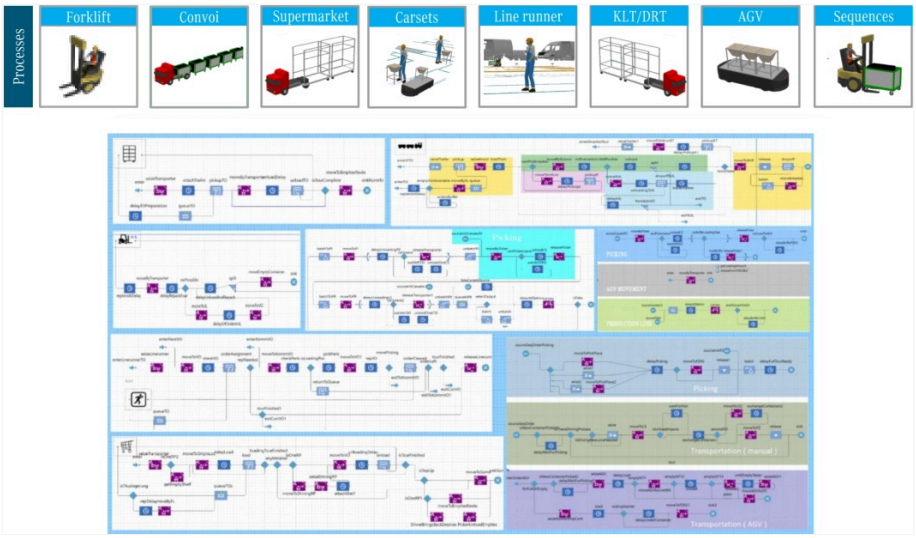
- Flexibility
- Scalability
- Real data sourcing
- Rapidly adaptable

These principles ensure the model will work accurately with layout modifications, for different plants, and with new technologies and process developments.

The model layout is configured as a parameter by parsing a DXF file of the shop floor. This means that a production planner can modify a layout using their shop floor design software, such as AutoCAD, and quickly test it in simulation.

Real data sourcing means that every part, location, transporter, and order is uploaded and set as an agent at the start of a simulation. This granularity ensures a

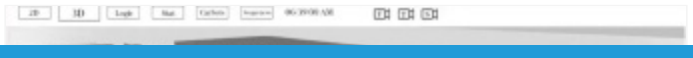
integrated into the overall model for analysis.



Processes in the vehicle production line simulation model (click to enlarge)

Results: Simulation provides detailed analytics

The simulation model of the automotive production facility provides more outputs and more detail than the logistics engineers have ever had before. As an example, multi-cart transporters could visit any of more than 300 possible locations and their behaviors were hard to analyze. Now, their routing is captured. Metrics also show, not only how busy the driver is, but also the level of vehicle utilization, giving insights into efficiency.



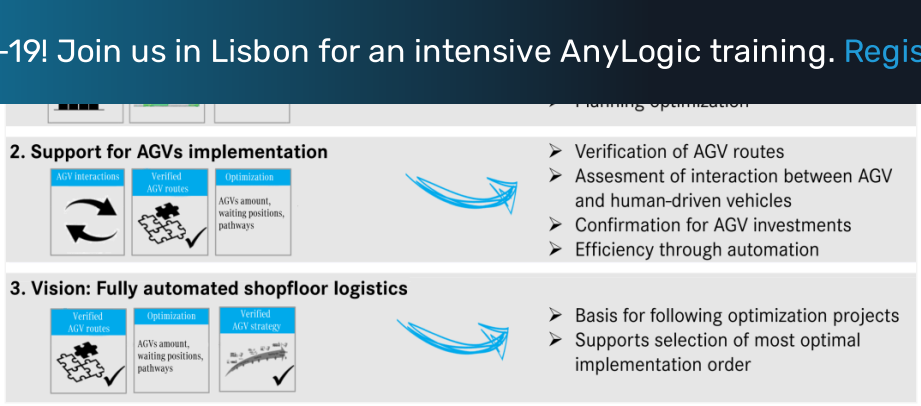
Screenshots from the simulation model interface (click to enlarge)

The model developers were able to provide all the outputs the engineers wanted on a level they did not have before – providing more results and more detail in those results.

Decision support for planning and investment

Initially, the simulation model met success by verifying that everything for a multi-million euro AGV project would work as desired, before committing to the order.

After helping confirm the initial AGV project implementation, the model continues to be used for verifying projects before implementation, as well as for other purposes as well. In all, the model helps assess manual process efficiency, supports AGV implementations, and supports work that is leading towards a fully automated shop floor.



How the automotive vehicle production line optimization tool is being used (click to enlarge)

As an example of how the model is performing, just the first step of assessing a workforce of more than 70 people realized an efficiency gain of 5%, and the second step found another 5% gain that can be made through automation.

With regards to the efficiency assessment purpose, it is worth noting that the simulation now provides 90% of the calculations that a planner previously had to do manually, helping save time and providing additional verification.

Overall, with careful planning and clear aims, the German auto-giant's logistics planners have implemented a tool that supports and helps improve present-day and future operations. Furthermore, the model can be applied to other facilities, increasing the return on investment.

Key to the project were the design decisions around the flexibility and scalability of the model and the capabilities of AnyLogic that enabled their implementation.

A related presentation with a Q&A session at the AnyLogic Conference is available to watch.

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