Competences

Automotive OEM

Simulation has become indispensable in the automotive industry

Sequence simulation is of great importance in the automotive industry. It is used to support and verify the planning of production and logistics processes in the the complete spectrum of production, i.e. from the press shop to the body shop, painting to final assembly and from engine and component production.

Simulation pressing plant

The main focus of the simulation in the press shop is on the balancing of the press line, in which several presses often work one after the other, as well as on the supply of the presses with raw material and the acceptance of the finished parts.

The respective batch size determines on the one hand how efficiently a press can be used and on the other hand it has an impact on the stock in the parts warehouse. The larger the production batch, the higher the utilisation of the press, since the number of changeover operations is lower. At the same time, large production batches lead to a high inventory and thus to a large warehouse. The simulation can be used to determine the optimal batch size.

In many cases, raw material is supplied to the presses by gantry cranes, but this can also be done via automated guided vehicles or conveyor systems. With the help of simulation, the uninterrupted presses can be ensured on the basis of an optimised control strategy. In the process interferences can also be taken into account.

Simulated body construction

The body shop is the production area with the highest degree of automation. A multitude of robots interact in production cells to assemble the parts from the floor panel to the roof into a finished car body. With the help of sequence simulation, the necessary decoupling buffers between the cells are determined in the concept planning phase in order to achieve the target throughput. The decoupling buffers ensure that in the event of a malfunction in one or more cells, other production cells are not blocked.

In a further step of planning - layout planning - the simulation is used to optimise the planned conveyor technology. Here, the main focus is on control within storage facilities or intersecting material flows.

Simulation paint shop

The paint shop is characterised by complex conveyor technology, usually over several levels. It not only connects the individual application processes with each other, but also enables e.g. the sequencing of the car bodies according to colour in sorting stores. Decoupling accumulators ensure that the car bodies can always leave an application line, even if the entry into the subsequent process is temporarily not possible.

The fluctuating volume of car bodies to be reworked leads to high dynamics in the system. In order not to jeopardise the targeted throughput, the repair capacities and also the buffers for decoupling the main flow must be suitably designed. In many cases, this results in crossing material flows. The conveyor technology has to cope with these material flows in order to enable a smooth process even in the worst case, i.e. a high rework rate.

The simulation serves to verify the planned layout, shows potential bottlenecks and enables the testing of alternative solutions. The model provides important result key figures, e.g. on throughput, utilisation of the equipment, turnaround time of the car bodies through the painting process as well as the circulation stock. In addition, the optimal number of conveyor aids - skids and hangers - can be determined.

Simulation final assembly

The simulation supports the planners in the design of the conveyor technology, in particular the decoupling of the assembly stations and the door and vehicle assembly, in the planning of the logistical processes and in the design of the test stands.

In addition to determining the required resources such as buffers on the assembly line or the number of tugger trains for the supply of parts, diverse production programmes and their effects on the processes can be examined. In the process, dynamic influencing factors such as technical or logistical disruptions are taken into account.

References

Audi ● BMW ● BMW Brilliance ● FAW Volkswagen ● Ford ● Jaguar Land Rover ● Mercedes Benz Group ● Mini ● Opel ● Porsche ● Rolls-Royce ● Shanghai Volkswagen ● Skoda ● Volkswagen ● Volvo

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