Expertise

Automotive OEM

Simulation 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 complete spectrum of production, i.e. from the press shop to body shop, paint shop paint shop to final assembly as well as engine and component production.

Simulation press shop

The main focus of the simulation in the press shop is on the balancing of the press line, in which often several presses are working 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 inventory in the parts store. The larger the production lot, the higher the utilization of the press, since the number of changeover operations is lower. At the same time, large production lots lead to a high inventory and thus a large warehouse. The simulation can be used to determine the optimum batch size. In many cases, raw material is supplied to the presses by gantry cranes, but this can also be done using automated guided vehicles or conveyor systems. With the aid of simulation, the uninterrupted presses can be ensured on the basis of an optimized control strategy. In the process can also take into account disturbing influences.

Body shop simulation

The body shop is the production area with the highest degree of automation. A large number of robots interact in production cells to assemble the parts from the floor panel to the roof into a finished body from the floor panel to the roof. With the aid of sequence simulation, the concept planning phase determines the 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 the planning - layout planning - the simulation is used to optimize the planned conveyor technology. Here, the main focus is on control within stores or intersecting material flows.

Simulation paint shop

The paint shop is characterized by complex conveyor technology, usually over several levels. It not only connects the individual application processes with each other, but also enables the car bodies to be sequenced by color in sorting accumulators, for example. Decoupling accumulators ensure that the car bodies can always leave an application line, even if it is temporarily not possible for them to enter the subsequent process. The fluctuating volume of car bodies to be reworked leads to high dynamics in the line. In order not to jeopardize 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 material handling system has to cope with these material flows in order to ensure a smooth process even in the worst case, i.e. a high rework rate. Simulation is used to verify the planned layout, highlight potential bottlenecks and allow alternative solutions to be tested. The model provides important key performance indicators, e.g., on throughput, equipment utilization, turnaround time of car bodies through painting, and circulation inventory. In addition, the optimum number of conveying 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, various production programs and their effects on the processes can be examined. In the process, dynamic technical or logistical disturbances are taken into account.

References

Audi • BMW • BMW Brilliance • Daimler • FAW Volkswagen • Ford • Jaguar Land Rover • Mini • Opel • Porsche • Rolls-Royce • Shanghai Volkswagen • Skoda • Volkswagen • Volvo

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