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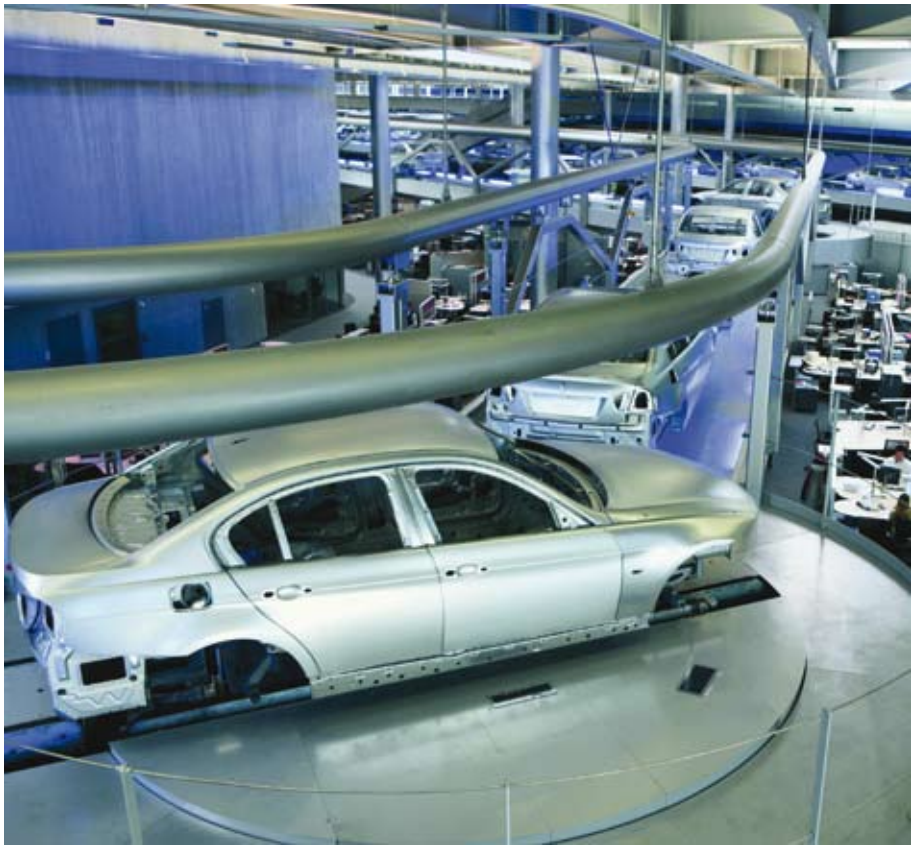
Content



BMW 3 series production in Leipzig Photo: BMW AG

Decision Support Software

Speed up production with Qualicision®

It is of great advantage for any producer to be able to take into consideration customer requests as late as possible when configuring products. Precisely, this can be achieved by using the decision support software Qualicision® from F/L/S Fuzzy Logik Systeme GmbH in Dortmund. The result at BMW: The customer-oriented sales and production process allows customers to change their specification as late as six days before the start of production.

Production and logistics processes in the automobile industry need to be designed efficiently to ensure the shortest throughput and delivery times. This is partially due to the situation in the European car market, which is

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News ticker

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Events

Hannover Messe/ Digital Factory www.hannovermesse.de/digital_factory_e	20/04–24/04/09	**Hanover** Hall 17, Stand B50
The World of Information Systems sis.cvis.cz/eng/	20/04–21/04/09	**Zlin, CR**
Production Systems www.productionsystems.de	05/05/09	**Munich** BMW World
Transport Logistic 2009 www.transportlogistic.de	12/05-15/05/09	**Munich** Hall B2, Stand 624
ITS Spain www.itsspain.com	02/06–04/06/09	**Andorra La Vella, ESP**
UITP - Mobility & City Transport Exhibition www.uitp.org	08/06–11/06/09	**Vienna, AUT** Hall A, Stand 1C310
Aachen ERP Days www.erp-tage.de	16/06–18/06/09	**Aachen**

Editorial

Dear readers,

Qualicision® technology from F/L/S enables implementation of software systems for intelligent decision support and process optimisation across industry sectors and for more efficient handling of production processes and any other business processes. This saves time and money for customers and improves stability and quality.
We will be reporting on Qualicision®-based sequencing at BMW AG, which has been using this solution globally in all its plants for several years. Other automotive manufacturers including Volkswagen, Audi and Volvo are also using Qualicision®.
In the future Qualicision® solutions will complement the PSI *product portfolio in production, energy and infrastructure management with additional unique features. Integration into* PSI *real-time systems clearly improves responsiveness to new situations in customer processes. F/L/S has already developed the first new Qualicision® solution in the* PSI *group for* PSI *Transcom, namely for optimal management of bus and tram depots. Read more in this edition.*

Enjoy reading!

Dr. Rudolf Felix

Managing director
F/L/S Fuzzy Logik Systeme GmbH

characterised by customers configuring their vehicles individually as a rule, additionally demanding quick delivery. By comparison, the range of variants in a car model in Japan is considerably more limited, and in the USA cars are typically sold from the yard. That makes it easy for OEMs to apply a different production and sales strategy than what is the rule in Europe. However, the option of customising a car actually provides an instrument for European manufacturers to differentiate within the global market, an instrument that can also be linked to the market value. The extremely high degree of flexibility in configuration is to some extent a common trademark of Europeans.

The incredible demands on the definition of the company and IT processes for highly flexible production and logistics structures of this nature become clear when one realises that even the penultimate BMW 3 series was assembled in so many variants that in general a maximum of two to three identical vehicles left the plant annually.

Using the Qualicision® tool not only allows granting the customer a reliable delivery date but also the realisation of feasible desired car features at as early a moment as the first consulting session or when the order is placed. Moreover, all BMW customers have the option of reconfiguring practically all possible car variations until six days before the start of production of their personalised vehicle.

Production planning and the entire logistics department know that a car is on its way, but they do not know the final details of its construction. All measures determined after the options freeze must be ensured within six days. That means detailed time planning, internal scheduling and co-ordination of suppliers must be incorporated into this step.

Another element that increases the demand on processes and IT even further is that reoptimisation of planning must be ensured as soon as possible in the event of a problem and its subsequent solution. That is the only way to ensure a return to normal status in production or assembly for the orders that follow after an unforeseen event of this nature. The spectrum of ad -hoc measures ranges from access to an individual component that will not be installed until a later stage right up to the theoretical case where a vehicle must be withdrawn from the sequence at short notice. The system must allow for adaptability in planning and execution that does not conflict with the range of possible variants.

It would be impossible to realise specifications of this nature using conventional mathematical methods or the solution approaches found in measurement and regulation technology, even with the most powerful computers. The reason for this is that the logical contradictions that would be possible due to the theoretical range of variants would have to be defined in advance

BMW 3 series production in Leipzig Photo: BMW AG

and represented with various branches in the programs.

The new flexibility is only possible because the approach to human thinking and action has been adapted in Qualicision® and transferred to the IT and vehicle production processes. Decisions in a situation are made based on fewer general conditions i. e. parameters, but the conditions are always straightforward. This is not based on formulas, but rather heuristics, which then allow flexibility and speed. The logical kernel here is the Qualicision® technology based on fuzzy logic, which - on the basis of fuzzy information - allows for absolutely precise decisions, as for instance sequencing in production planning with tight deadlines.

A suitable analogy is the image of mixing desk in a recording studio. In practice, the recording engineer uses certain slides or controls and sets levels according to his audio input. This is an activity based on direct experience rather than arithmetic logical functions. Some sliders are interconnected in such a way that both a parallel or opposite correlation of individual channels can be achieved.

The Qualicision® system interface used to control the production of cars contains a monitor with slide controls that can be adjusted steplessly between 0 and 1 or 0 and 100 %. Each slide control corresponds to a relevant production parameter. In the case of binary decisions, that is, yes or no, an instruction is stored to the effect that only the values 0 or 1 are permissible for the decision generation. Soft decisions occur most frequently. This can be a condition with a complex structure, in which a specification must be balanced along a continuum from 0 to 1, and where no concrete default exists.

A situation of this type might be related to preventing employees from being overloaded in their jobs, for example. If an assembly worker

deals with three or four fully configured vehicles in succession, a high degree of concentration is required, which is accompanied by fatigue. The aim is therefore to minimise the associated risk of error by means of a more balanced sequence. The requirement could be expressed in words as follows: If a fully configured car is assembled, the system must be optimised in such a manner that the following vehicle has a basic configuration. Another example is the planning of the paint shop for the chassis that will later be incorporated into the assembly via the buffer stock. In this case it is important to ensure that light lacquers are applied first and subsequently those with darker tones. The requirement could be expressed in words to the effect that the colour change must occur from light to dark to prevent excessively long set-up times for cleaning the coating systems.

These two examples alone illustrate that there are different and possibly contrasting objectives for an optimal production sequence in different areas, and that the system must be able to handle both.

When assembling cars, the number of parameters required is around 100 to 120. This allows for a balanced production flow, which controls the preceding and subsequent logistics by means of the pull principle. The intralogistic and warehouse management processes are similarly controlled using the Qualicision® sequencing software, which takes into consideration physical availability of subcomponents when determining sequences. This availability depends on extremely heterogeneous warehouse structures.

Qualicision® sequencing software is already used worldwide by BMW at all its plants, including motorcycle assembly. In addition, the solution is used by other automobile manufacturers and can naturally be adapted to sequencing optimisations in other industrial sectors.

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