GANTTPLAN®

VISUAL COMPONENTS

SOLARLUX®

Industry 4.0 in action: Optimized Production Planning in the Surface Coating Industry

With FUTURESIM Pro, a software solution based on GANTTPLAN's planning optimization technology and VISUAL COMPONENTS 3D product suite.
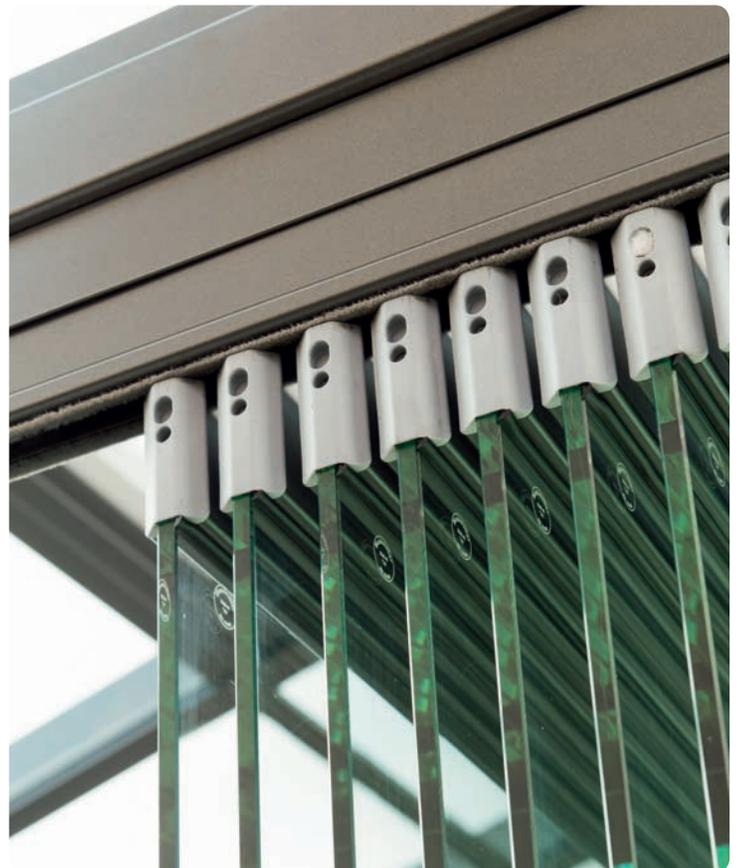
DUALIS®

A practical Industry 4.0 application: optimized production planning for the Solarlux corporation.

FUTURESIM Pro is a purpose built controller for surface coating lines, that is used by the production team to plan, optimize, control and monitor the paint line system. It uses an intelligent combination of 3D technology from VISUAL COMPONENTS and advanced planning and scheduling (APS) software from DUALIS.

Solarlux is the latest company to join the list of satisfied production facilities working with FUTURE-SIM Pro. The company specializes in glazing solutions for conservatories, patio roofs, folding walls and façade solutions. At the end of 2015, Solarlux moved headquarters and production facilities from Bissendorf to a new high-tech facility in Melle, in support of future growth. A key concept for the new plant was to integrate the surface coating process into production instead of handling it off-site with external contractors.

The new paint-line was delivered and installed by "Rippert Anlagentechnik" who are a leader in surface coating systems . The system relies on FUTURESIM Pro to coordinate the flow of components to and from the rest of the facility. The application was developed by DUALIS in cooperation with Rippert to ensure that the output from the paint line, which is often a bottleneck, is optimized for overall production throughput.

The full overview down to detailed planning and control

The first step was to simulate the new plant in 3D using Visual Components software. The simulation is used at the planning stage to optimize the plant configuration for the projected product mix and batch sizes. During this phase Solarlux, DUALIS and Rippert cooperated closely. The next step involved implementing the FUTURESIM Pro planning platform, with specific paint-line optimization logic for optimized process sequencing. For the last step, the detail level of the 3D simulation model was upgraded to include sensors and PLC connectivity so that the plant status is reflected in the simulation

model, and then the model can be used in operational mode for daily planning, optimization and control.

The FUTURESIM Pro paint-line control center manages communications between all automation systems to which it is connected. Solarlux use SAP for their ERP system and new painting orders are received using SAP's iDoc intermediate document format. iDocs are issued for new material supply requests, job orders, production data updates, and job cancellations, and are stored in a local database. Based on the orders received from SAP, FUTURESIM Pro updates a picklist for the automatic storage and retrieval system (ASRS) based on order type and priority. The con-troller makes real-time decisions, depending on the current activity status of the ASRS, and updates the picklist for the current shift when required by a new planning iteration. The controller also sends event updates for orders back to SAP via an iDOC.

"This is the first time we have commissioned a surface coating line as part of our in-house production. It is a large capital investment, so it was important for us to have an experienced partner to help us plan and manage the paint-line as optimally as possible."

Frank Heise
production manager
Solarlux GmbH

Based on requested order delivery dates and available work shifts, FUTURESIM Pro creates an optimized schedule for jobs to start, for outsourced orders to be issued, and for parts to be withdrawn from the stores. When there is not enough capacity for all the orders, FUTURESIM Pro can give the amount of delay to be expected. "There are a lot of parameters to consider for planning the daily operation of the paint-line. The right time to withdraw materials from the ASRS and other stores, the batching of profiles with the same color, and the availability of suitable paint-line carriers. With FUTURESIM Pro it is possible to create a schedule that will actually work with all the parameters for a complete shift period, and it's fast and optimized. It requires good integration with the top-level SAP ERP system and with the paint-line PLC controller to operate effectively", says production manager Frank Heise.
A Power-and-Free overhead conveyor system transports the parts on carriers through the paint-line in a predetermined sequence

"Prior to the commissioning of the plant, we were able to use the 3D simulation from DUALIS to experiment with different parameters for various scenarios to understand their effect on through-put and processing. But the paint-line is just part of a bigger system, so now we plan to extend the scope of the modelling to up-stream and down-stream activities. By balancing the interactions of all other processes we hope to achieve an optimum production in terms of cost, delivery-time and quality for the whole product."

Frank Heise, production manager, Solarlux GmbH

defined by the optimization algorithms before the shift starts. After processing, parts are removed and the empty carrier moves on to be reloaded. PLC events for each carrier are registered and communicated back to FUTURESIM Pro so that the location of all orders can be closely monitored. At the loading stations, a sequence of parts wait to be loaded onto the next suitable carrier. When a part is missing or faulty, the loading station records an event that is fed back to FUTURESIM Pro via a Dualis client terminal.

A DUALIS client terminal is also used for other manual operations in the paint-line. Under normal operation, parts are processed in the paint-line automatically, however workers are needed for color change-overs and for manual painting operations. When a part requires manual coating, the worker at the manual painting station receives the work order from a DUALIS client terminal. A confirmation is returned from the terminal after a manual color change has been processed. The terminals are also used to display the quality tests required at the unloading station. When a part is unloaded, it is returned to a specific trolley tied to the order through the use of wireless scanners.

All data exchange between the ERP system and automation sub-systems is handled by the FUTURESIM host computer in a local database. A challenge for this project was to maintain a high availability system that was not inundated with superfluous data, that only received data required for optimization and monitoring purposes. Often the ERP system would send iDoc messages with erroneous data that needed to be filtered. To ensure that only optimization relevant data was exchanged with FUTURESIM Pro, it was important to coordinate with all the automation suppliers to ensure compliance to an agreed data exchange interface. For this project, suppliers had to work with data in read-only mode, and had restricted write access to specific tables.

Conclusion

For Solarlux, the advantage of an in-house paint-line process was increased production control over quality and flexibility. The DUALIS solution supported the planning of the line in the first stages of the project, and then optimized daily paint-line operations resulting in better production throughput. A challenging part of the project was adapting the GANTTPLAN APS (Advanced Planning and Scheduling) software algorithms, used by FUTURESIM Pro, to paint-line specific processing. Due to the scalability of FUTURESIM Pro and DUALIS's optimization algorthims, Solarlux are planning to implement a similar set of tools with other productions areas in the factory.

Facts - Check:

Goal: Production schedule optimization with minimum color change-overs
Budget: 150,000 €
Year: 2015/2016
Software licenses in use: GANTTPLAN OE
Special features: Operational master control software
Interfaces:
* SAP (IDoc interface)
* ASRS (via SQL)
* Power'n'Free system (S7 connection via OPC)
* Powder coating station (S7 connection via OPC)
* Preparation area (S7 connection via OPC)
Materials: 14,000 individual terms
Personnel: Staff Shift Planning
Work orders: up to 15,000 painting orders per week

Solarlux GmbH
Industriepark 1
49324 Melle
Tel: +49 5422 9271-0
Fax: +49 5422 9271-8200
E-Mail: info@solarlux.de
Internet: www.solarlux.de

Solarlux GmbH

A family business, based in Bissendorf, near Osnabrück, Lower Saxony, that has made a name for itself over the last 30 years, at national and international levels. Solarlux stands for individual glazing solutions to improve quality of life and reinvigorate the living environment. All products – from winter gardens and folding glass doors to glass patios are developed, tested, and produced by Solarlux to meet the highest manufacturing standards. Solarlux products have won many awards nationally and internationally and in 2010, the SL 82 folding glass door received the iF product design award and the internationally renowned Red Dot award for product design. To support future growth, at the end of 2015 Solalux relocated from Bissendorf, and consolidated all manufacturing to a new high-tech facility in nearby Melle. Central to the new production plant was a surface coating line to replace work that was formerly outsourced.

DUALIS GmbH IT Solution

Dualis was founded in 1990 in Dresden, Germany and is specialized in simulation and planning software. Proprietary products GANTTPLAN and the optimization tool ISSOP provide detailed planning and optimization of production and manufacturing processes. In addition the simulation tools from Finnish supplier VISUAL COMPONENTS deliver 3D planning and optimization for production and logistics systems.

Users benefit in multiple ways from the Dualis products: first during strategic planning and then through operational use. By using a 3D simulation platform, realistic models of complex production systems can already be evaluated during the planning stage. The plant simulation saves time and costs and ultimately reduces risk. Then when the facility is operational, software based production planning is used to dramatically increase the efficiency of the entire production process. Orders are optimized based on all planning restrictions and available resources, including personnel, fixtures and tools. The ability to meet delivery dead-lines is greatly improved through accurate delivery date information. By offering production planning and 3D simulation techniques, Dualis can help companies achieve an optimally designed facility running optimized operations.

The realistic 3D visualization from the VISUAL COMPONENTS suite is not only for internal planning processes, it also supports system integrators and machine builders to convincingly demonstrate their systems benefits and communicate new production concepts.

DUALIS GmbH IT Solution
Tiergartenstraße 32, 01219 Dresden
Telefon +49 (0) 351-47791-0
Telefax +49 (0) 351-47791-99
dualis@dualis-it.de

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