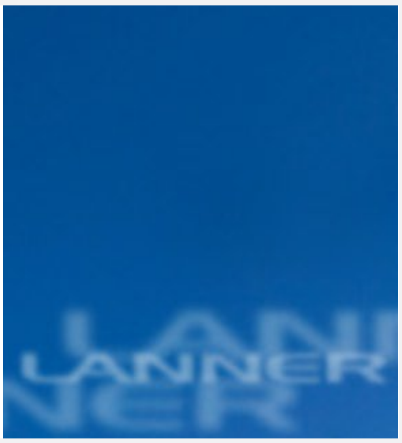
Airbus Speeds CAD Design with WITNESS



Airbus uses WITNESS simulation software to develop a new GBP21 million surface treatment plant

Background

Airbus has used WITNESS simulation software to play a key role in the development of a massive GBP21 million surface treatment plant at its Broughton factory in the U.K. The plant is believed to be the biggest fully automated facility of its kind in the world. WITNESS was used to provide more than traditional “what if” simulation. An evolving sequence of models was built to optimise the layout and operation of the proposed plant. The software was used in effect as an animated event-based CAD tool, and the contractor's working drawings were derived directly from the final model. According to Airbus, this is driving manufacturing simulation “to the limits.”

Airbus’s plant at Broughton near Chester manufactures wings for the Airbus family of airliners, which is currently enjoying remarkable success. Every wing for every variant of the expanding Airbus family is built at Broughton. Faced with an accelerating demand for the current range, together with new models under development, Airbus decided to install a new anodic treatment plant to prevent the process from becoming a bottleneck to production. The anodising process is used to prevent corrosion in wing components such as spars, ribs, stringers, skins, and a variety of smaller components. The components are immersed in tanks of chromic acid and heavy electric currents are passed through them. This causes a protective oxide coating to be artificially grown onto the metal surface, sealing the underlying material against corrosion.

Related Product

“We’re not simulating already designed objects. We're doing the first draft design within WITNESS, then passing it to the CAD guys saying, ‘we know this will work, now go flesh it out to produce the working drawings.’ ”

-Jim Cruise, Airbus

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The parts are prepared for anodising by a sequence of pre-treatments interspersed with water rinses before they go into the chromic acid. The duration of immersion and the density of the current are variable. Following this step, there is a sequence of rinses to remove the acid and final drying by hot air. Twelve tanks are involved and each component goes through the sequence twice: once immediately after machining to provide temporary protection and to assist in flaw detection, and again immediately prior to painting. The largest wing skins are 34 meters long, which dictated the length of the tanks. The complete plant is more than 100 metres long, 50 metres wide and 23 metres high.

Jim Cruise, simulation specialist at Airbus, developed the sequence of WITNESS models. Starting with the sequence of dips and the number of loads to be processed each day and taking inputs from engineering, operations, facilities and potential suppliers, Cruise developed an animated, interactive WITNESS model that became the focus for a series of brainstorming meetings. This cross-company and cross-discipline dialogue was extremely effective, claims Cruise. He believes that the understanding gained could scarcely have been obtained in any other way, and certainly nowhere near as quickly and with such a high degree of confidence. For example, although the utilisation of the overhead crane servicing the tank line is quite low, it rapidly became apparent that two cranes would be needed. Much discussion centred on the area of the tank line to be traversed by each crane and the mode of handshaking and load transference between them. These cranes then had to be linked to the existing system of overhead cranes in the main factory building, which operate at a lower elevation.

Further issues concerned the handling of the flightbars (girders from which the components to be treated are suspended, and which in the final design also serve as lids to the active tanks), the jigging operation (whereby electrically conductive suspension media are clamped to the components) and the elaborate control system that had to ensure the cooperation of various cranes and other elements of the system. This had to incorporate a "look-ahead" feature to ensure components were not blocked in acid tanks due to cranes being busy elsewhere. The control system was developed by actually modelling the control computers within WITNESS and developing programs for them that produced the required model operation. These programs were then taken out of WITNESS and handed to the programmers who were to write the control software in the real world.

Jim Cruise sees this as a crucial part of the process and refers to it as “closing the link” between concept and reality. It gives grounds for optimism that the facility really will perform as intended. A final benefit comes from the continued use of the finished model as a module that can be incorporated into other simulations.

Results

The treatment plant is only one of a number of major developments at Airbus Broughton; heavy investment in advanced long bed machining centres, for example, is also taking place. When developing support systems and loading strategies for these, Airbus found it extremely useful to have on hand a model of the portal into which their output would be directed.