Factories of the Future

Europe’s Best Factory

Precise facility planning (below), 100 percent quality achievement (center), and continual process control (right) helped ensure that the Ambberg plant was named Europe’s Best Factory.

large machines and even entire factories. Schwarzlose introduced this tool at PG in 2003, at a time when the 340-MW high performance turbine for the Irsching power plant was still at an early development stage. In 2005, a further element was added: a VR system for gas turbine final assembly. Since it takes weeks to assemble a giant turbine, and the process is almost as complex as building an aircraft, VR technology has accelerated the assembly process. The technology allows specialized mechanics to practice manual assembly maneuvers in advance using virtual final assembly programs — something that would have been inconceivable just a few years ago. Schwarzlose recalls how things used to work during the early stages of work on the Irsching turbine. Back then, in order to test assembly operations, a full-scale model of a turbine combustion chamber had to be built in Berlin. What’s more, it took months from the moment an order was placed until a model could be fully assembled. And, of course, it wasn’t possible to test the assembly process at that stage.

Tremendous Savings. The amount of time gained through the use of new virtual tools is tremendous. Depending on the complexity of individual turbine components, it used to sometimes take weeks or even months before researchers could determine whether it would even be possible to install or manufacture certain components. “While it’s true that virtual reality can’t replace a real operation in every single case, the fact remains that an actual model cannot depict or make noticeable the smallest tolerances,” Schwarzlose explains. All in all, the virtual planning process can reduce development times by several months, according to Schwarzlose. The inscribing turbine will be operational next year after only seven years of planning and construction. Projects in the past took much longer to complete.

VR is set to become a key part of product lifecycle management at PG. A roadmap for establishing a PLM process is currently being worked out. The goal here is to permanently incorporate all development processes, combine various development platforms, and simplify the exchange of data. New simulation tools, such as those made by UGS (a major PLM solutions provider) and Siemens, will further develop virtual reality into a key development component whose depiction of reality will become increasingly exact. Such precision has long since moved beyond individual products to include entire factories that are developed and manufactured as virtual factories in order to reduce the time and money spent by industrial companies to save oceans of time and money. — Tim Schröder

Siemens is — by a wide margin — the world market leader in electronic controls for industrial automation. What’s more, its market share has been growing by one percentage point per year for some time. This achievement is in no small part due to the Ambberg plant’s 870 employees, who produced 11 million Simatic modules last year. “And this year, we plan to build more than 12 million,” says plant manager Hans Schneider. Ambberg’s factory hall is as tall as a two-story building and covers an area the size of one-and-a-half soccer fields. A gallery offers a view of the production floor, which is as clear as a whistle.Wide aisles can easily accommodate three workers walking side by side, and with most machines no higher than 1.4 meters there’s no problem making eye contact.

Cost Effective. The EMP is living proof that it’s possible to manufacture products at the same low cost as at a sister factory in Nanjing, China on a daily basis. What’s more, this year the facility captured first prize in Germany’s Best Factory/Industrial Excellence Award 2007. The two organizations that present the award — the INSAD Business School in Fontainebleau, France, and the Department of Production Management at the Otto Bösch School of Management in Vallendar, Germany, also named the plant Europe’s Best Factory.

The awards jury assessed operational strategy, product development, supply chain management, organization, human resources, service, partner management, and continual improvement and awarded the EMP top marks in nearly all categories. The plant’s success is partly due to its use of the best machines available, its low-cost procurement sources, and its mastery of the production process. Still, other downtime, and inventories. Our flexible order logistics system also ensures that the material logistics and production departments are not negatively affected by fluctuations in order volume. This supports efficient capacity planning and high machine-capacity utilization.”

The EMP, which produces exclusively on a make-to-order basis, has an amazing delivery reliability rate of 99 percent, meaning that 99 out of 100 customers receive their exact number of ordered units within 24 hours at the requisite quality.

Flawless from the Furnace. Production processes at the EMP are synchronized and perfectly aligned with one another. Practically nothing is done by hand at the plant, with the exception of machine setups and repair and maintenance work. Men and women in blue overalls at the facility plan production, make decisions, and coordinate monitor activities.

Snapshot: A worker carefully examines a module under a magnifying glass. The module has just emerged from a soldering furnace, where printed components are mounted on circuit boards at a temperature of 250 degrees Celsius. The worker is responsible for ensuring that the circuit board is stable, and that nothing is missing or incorrectly mounted.

Precise facility planning (below), 100 percent quality achievement (center), and continual process control (right) helped ensure that the Ambberg plant was named Europe’s Best Factory.

Factories of the Future

Simply the Best

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Each employee submits an average of 15 implemented improvement suggestions per year; the norm is one.

In order to plan and build such a vast facility in such a short time, a team of engineers from Siemens Industrial Solutions & Services (SACS) in Offenbach, Germany had to dig deep into their virtual reality toolkit. Long before the first component was manufactured, these experts built and tested the entire baggage handling system using 3D software. Indeed, they utilized some of the same procedures they had developed in designing similar facilities in Seoul and Madrid.

Virtual Luggage on the Move. The engineers downloaded key data on the airport’s catacombs to their PCs and utilized software modules from the Seoul and Madrid projects that had been stored in digital libraries. Their 3D simulation and optimization software allowed them to examine even the smallest aspect of the baggage handling system and its building in order to determine if planned systems would fit into the available space, and to ensure that sub-systems would not interfere with one another.

A simulation of the initial conveyor belt setup revealed areas of congestion. A second test indicated that the distance between some junctions was so tight that it could lead to delays and slowdowns — problems that would make it impossible to achieve the target of a maximum 25 minutes of travel time for any given bag. Ultimately, the planners were able to eliminate all of the errors in the huge system before construction began.

This virtual planning and simulation led to huge cost benefits, as changes could be made and tests carried out without expensive prototypes. Planners knew at each process stage which components (and how many of them) would be needed for a given solution. After planning was completed, the software produced assembly lists containing everything that needed to be procured.

Before the facility could be built, the control software responsible for smooth operation of the actual system had to be extensively tested. To ensure smooth interaction between soft- ware and hardware, Siemens experts tested the software at the Siemens Airport Center (SAC) in Fürth, Germany, which serves as the company’s simulated airport. SAC actually has the largest baggage handling facility in Ger- many, after Beijing and Munich. It’s a complete airport — the only things missing are the control tower and planes. SAC also serves as a training center, which is why Chinese staff from Terminal 3 were sent there to learn to use the sophisticated system.

BOCA gave its preliminary approval of the baggage facility in July 2007, two years after the project was launched and eight months before the new terminal was scheduled to open, at which time Beijing Airport will become one of the world’s busiest destinations. The city will then be ready for the Olympic Games, and the last thing visitors will have to worry about will be their luggage.

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