Transformed!

Ordering goods on-line is not new. But ordering a transformer to be built from scratch, and on the same day, via the Internet, is. Combining the best in e-commerce and advanced robotics, ABB has embarked on an ambitious global plan to create for its transformer unit a seamless, fully automated, integrated manufacturing system.

The showcase of this plan is the TXF-21, or Transformer Factory of the 21st century, located in Athens, Georgia, USA. Here, a fully automated tank manufacturing cell, automated coil winding equipment and a fast assembly line have reduced labor costs by half, cycle times by 90 percent, and manufacturing floor space by 60 percent.

Q&A time

The process begins with a salesman or customer entering the product specification on-line. He is helped by a 'product configurator', linked to the Internet, which allows potential customers to access ABB's product range anywhere in the world. The products are priced, quotation documentation is selected, and the order is entered in one simple, on-line operation. The system uses pre-loaded customer specifications and puts questions to the user on-screen in order to arrive more rapidly at an accurate description of the desired product.

Within seconds of the order being placed, it is scheduled into the manufacturing process at one of the company's most advanced factories.

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Dedicated to work

The jewel in the crown of this plant is the highly-automated manufacturing cell which makes the casings (tanks) for the active parts of distribution transformers. Seeing the cell's seven robots, two press brakes, laser cutting system and various welding machines in operation is like watching a team of dedicated workers completely absorbed in their task: robots pick up heavy-gauge sheet steel, use lasers to cut holes for connections, bend the metal into sections to form the tank sides and bottom, and weld the sections together. One robot holds the sections while the other does the welding. (These welded seams are important, because the tank will finally be filled with oil to absorb heat and insulate the copper-wound transformer core.)

This is the first cell in the United States to use a robot rather than a human to manage the press brake and laser system in the handling of large steel sheet.

The robot at the next workstation is even more dexterous. It has to fit 15 threaded studs to which other parts will be attached. Typically, this has to be done by a human since the weld must be very strong and it is necessary to use a ceramic ferrule at the stud base to protect the metal from being weakened by the intense heat during welding.

ABB automation experts found a way for a robot, working with great care and

precision, to make the weld without using the ferrule, saving many hundreds of dollars per day.

On a different line, building pole-mounted transformers, a team of robots makes replacement tanks for use in residential areas. Reaching in to manually weld the seam inside the cylindrical tank is tricky and tiring – especially if you've been doing it all day – as well as potentially dangerous. So the use of a welding robot here is a welcome relief and ensures every weld displays perfect workmanship.

The magic combination

The assembly line, where the intricate parts of the transformer are put together, is also highly automated. So, too, are the test cells, which carry out a series of rigorous checks in just 90 seconds under the control of the factory's production system. And the winding machines download design data from the network and produce entire windings without operator intervention.

Other robots will soon be added to the assembly and paint lines. The result will be a transformer built from scratch solely by robots.

Reaching for this high level of automation was a very high-risk venture, but it was essential to stay competitive in the future. As the most dramatic productivity improvements come through accelerating the order process and reducing order-to-delivery times, the magic combination of advanced business systems and sophisticated automation provided the ideal solution.

Although a lot of technology has been invented to run the plant, and it is already one of the most highly automated in the world, hundreds of people work there – they just do other jobs now!