ABB robotics help to achieve world-beating productivity

Case Study: Automation in the solar module industry

Applications
- Automation of the module assembly

ABB Robotics is helping Hamburg-based Conergy AG, a global leader in solar integration achieve industry-leading productivity by introducing robots to its solar module factory in Frankfurt.

The advanced solar module factory in Frankfurt is set to achieve world-leading productivity with the introduction of four ABB IRB 1600 robots along with an IRB 4400 and an IRB 6600 to the production line. The robots are part of an unparalleled level of automation in the solar module industry. Automating labor-intensive tasks also allows manpower to be deployed elsewhere.

Since May 2007, about 370 employees have produced crystalline photovoltaic modules in various sizes. With the factory scheduled to be at full capacity by the second half of 2009, around 1.2 million solar modules per year with a total output of 250 MW will roll off the production line. The introduction of ABB robots has been key in Conergy increasing its output.

The starting point
The production line begins with an ABB IRB4400 robot, lifting glass panes from a palette. The robot then cleans and dries the module, giving it a matrix code by inkjet printers for stock traceability. A machine then lays a first transparent EVA film on the pane. In the so-called “stringer”, the individual solar cells are next attached with up to ten cells and finally attached to the glass pane to which the film has been applied.

Precision in transverse connection
The next production step involves installing the transverse connections across the strings. This involves applying an insulation strip and a wafer-thin solder tape that connects the transverse connections across the solar cells. Here Conergy has installed four ABB IRB 1600 robots to service its five production lines. The ABB 1600s have been installed because this part of the production process is traditionally very labor intensive, typically involving between 30 and 40 machine operators in a multi-shift operation performing repetitive tasks. By introducing the robots Conergy has been able to significantly improve the quality of the product.

The IRB 1600 IDs have been fitted with integrated cameras which recognize the positions of the solder tapes and allows the robot to accurately solder the solder tape to the solar cell connections. The finished modules drop out of
the robot cell where they are manually given a second layer of EVA and back lamination.

“Through automation we can not only hold our own in a highly competitive market, but also fabricate higher quality modules through the precision and repetitive accuracy of robots.” Stresses Sönke Scholl, Project leader for Conergy AG, who conceived and realized the project at Conergy, with experts from Gebr. Schmid (Schmid Brothers) GmbH, Freudenstadt.

Automatic edge cutters and frames
After lamination, an IRB 6600 robot shapes the module using a laser cutter. It then crops the edges and transfers the unit to a second IRB 6600 which lays the module on a rotating workbench to be sealed manually. The robot then takes the module back and inserts it in a frame press

A third robot inserts the frame profile. The IRB 6600 bolts the unit into the frame and lays it on a conveyer belt where it is then manually checked.

An IRB 4400 robot with built-in redundancy bonds the wiring box to the unit while an IRB 1600 with inductive soldering head forges the components together. Next, an IRB 4400 holds the module while it is exposed to light flashes of 1,000 and 200 W to measure the output and functionality. Finally the power output label is attached and protective corners are fitted, the wiring box is manually sealed and palletizing takes place.

“Automation of the module assembly was no easy task”, Conergy project leader Scholl sums up. “Together with the experts from Schmid and ABB we had to solve a lot of user-specific problems. We have strong partners and our collaboration with ABB has stood up from the outset. Apart from service contracts and spare parts supply, we still see interesting potential for further use of robots, particularly in quality assurance and packing.”