Energy Meets Quality

Prestress of the glass panes requires extremely careful handling and a high level of precision in the transfer system. Stops with air nozzles installed on the belt sections and lift transverse units briefly raise the film on the top of the glass, making it possible to reliably and precisely position the fragile panes at any time.

At Heckert Solar, based in Chemnitz, Germany, energy and quality come together to enable modern environmental protection through sophisticated production and product know-how. The photovoltaic specialist uses the Rexroth [1] TSsolar transfer system to transport powerful, yet fragile, modules. The exact positioning afforded by the system was the main reason for choosing Rexroth.

Slightly curved glass panes prestressed with a tolerance of up to two millimeters and seven direction changes in the system let you predict the high demands that this transfer system must fulfill. Broken glass and the associated cleaning and production disruption is the worst-case scenario for the mass production of photovoltaic modules.

This is why Heckert-B.X.T. Solar GmbH in Chemnitz requires the highest quality – starting with the incoming material inspection and covering everything in the process from the system technology to shipment of the modules. With a nominal capacity of 90 megawatts per year, 125 employees work around the clock in four shifts to ensure the success of this continually growing company.

“We concentrate on the production of high-quality, powerful polycrystalline and monocrystalline photovoltaic modules,” explains Till Uhle, head of Marketing and

Sales at Heckert Solar.

The company mainly manufactures modules with 54 solar cells that are encapsulated with film, a super-transparent 4-mm thick solar glass pane, and a warp-resistant aluminum frame.

Installation of the cells on the glass pane and connection are performed on a fully-automated production line with a pane washing station, as well as soldering and laminating machines. The Rexroth TSsolar transfer system is in charge of safely transporting the glass panes.

No Touching Allowed

The high quality demands become more apparent when the cells are delivered. Here, employees shake every single cell, since microcracks are audible when the cell rattles. Visual and technical inspections follow this process.

Meanwhile, the glass panes are washed, placed on the TSsolar, and covered with film. The panes may not come into contact with each other or the system, accumulate on the transfer system, or be stopped quickly under any circumstances, since the prestress would cause them to break immediately into a thousand shards.

Jens Bonitz, Technical Manager at Heckert Solar, points out the specific hazards of working with glass panes: “If anything breaks after the cells have been installed, costs shoot up due to damaged cells, the time required to carefully clean up, possible damage to the transfer belts and laminating machines, as well as the resulting production downtime. This is why, after consultation with the system builder Mondragon Assembly, we decided to go with Rexroth and its proven TSsolar transfer system. The system was delivered and commissioned just six weeks after design approval.”

All section elements are equipped with their own drive; frequency converters ensure gentle acceleration and deceleration. Even the low-wear and low-friction toothed belts have been adapted to the specific requirements of the solar industry to include a

dense textile coating.

An Industry-Specific Solution

Based on the proven technology of the TS 2plus, Rexroth has developed a custom solution for the specific demands in the solar industry. As a result, each section element is equipped with its own drive.
Frequency converters ensure soft starts and stops and the toothed belts used have a closed surface and exhibit low wear and friction thanks to a densely woven textile coating. Lift transverse units adapted to the sections ensure a smooth change in direction when transporting parts.

The system is silicone-free, which rules out contamination by silicone, grease, or oil. An ESD-compatible version also prevents electrostatic charging, which attracts dust particles that could cause problems when the cells are interconnected.

The Technical Manager emphasizes that the required degree of utilization for the entire system is 80 percent. “System automation would not work at all without this transfer system.” This is why Mondragon Assembly, located in Stockach, set great store by the precise design and programming of the TSsolar.

“We visualized all of the belt sections, so users can call them up individually, activate them, and even operate them manually during an emergency,” adds Victor Maurer, Project Manager at Mondragon Assembly.

An Air-Cushioned Stop

Installed fixed stops with air nozzles are just one more feature in the transfer system. An air cushion quickly raises the film that just protrudes beyond the glass pane, enabling the stops to only grip the pane and properly align it.

After soldering in the stringer and interconnection of the individual cells on the solar glass pane, the modules are conveyed via belt sections and lift transverse units to the laminating machines. Laminating is done

simultaneously in two different machines, since this step requires a longer processing time.

“This helps us to attain the required precision of five tenths of a millimeter with the stops and prevents the film from sliding or being pulled off the glass,” explains the Technical Manager. “This precise positioning is especially essential before the panes reach the laminating machines, where the cells are laminated on the module.” This solution is the result of a cooperation between Heckert Solar, Mondragon Assembly, and Rexroth's technicians.

The shock-absorbing lift transverse units must also work with the same high level of precision. “The cells are placed on the glass at distances accurate down to the last millimeter, interconnected, and then laminated. Sliding of the individual cells due to imprecise stops or jerky movements in the lift transverse units would be immediately visible to the naked eye in the finished modules,” points out Till Uhle.

As a result, the seven changes in direction in the system present a special challenge. The TSsolar deals with this task through optimum synchronization of the two belts used per section/lift transverse unit that directly support the glass panes.

In addition, the maximum speed of twelve meters per minute is slowed down to approximately 30 percent before the stops. Work processes on two levels also require that the glass panes be raised and lowered and soft decelerations are preferred here to any sort of jerking.

At the beginning of the process, six individual belt sections carefully transport the glass panes between the washing station and the two soldering machines, which are also called stringers. Here, the solar cells are soldered to each other in single rows and exactly positioned on the prepared glass pane.
Two lift transverse units distribute the panes to the stringers. Differences in the transport levels and glass pane deflection are compensated for by two roller sections used in addition to the toothed belts. Further belt sections and lift transverse units then move the glass panes from the stringers to the interconnection unit.

After passing through a preparation section where the modules are inspected, they are then transported to two laminating machines working in parallel, due to the longer processing time required.

Satisfying Customer Demands

“For mass production of these modules, we need a reliable transfer system that can be easily adjusted to the machines,” explains Bonitz and adds: “This is the only way to ensure high production quality and the strong performance of the solar modules that make Heckert Solar such a success.”

The efficiency of the modules – which is, in this case, the energy output by the sun and the amount of energy generated from it – reaches 15 percent and is higher than the industry average of 13 percent. In addition, a handy module size of 1485 x 995 millimeters meets technician demands, allowing them to lift the modules onto a roof without the need for an elevator.

“Our complete system, consisting of the module, inverter, cabling, and assembly system, provides customers with an all-round package,” summarizes Till Uhle and points out “Nevertheless, the high demand for this type of environmentally-friendly power generation can only be fulfilled with a faultless production technology that includes safe transfer of the modules.”

For more information, visit www.boschrexroth-us.com *[1].*

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