



Smooth operation for solar module factory

Sensor technology from **Leuze Electronic** is being used to provide reliable material flow in a modern solar module factory in Germany



When Frankfurt-based Conergy decided to merge together the three production processes involved in the creation of solar modules, to enable gentler transportation of the sensitive wafers and cells, it decided to use optical sensor systems from Leuze Electronic on its automatic factory transport system.

Instead of considering the highly developed process steps individually and refining them further, as has been the standard practice in the industry, Conergy decided to use a newly developed production monitoring system to bring overlapping expertise together under one roof, ensuring traceability in each individual production step. As a result, it is possible to examine various parameters of the production process for each module component at any time.

Handle with care

The technological level and intense cost pressures involved with the creation of solar modules are apparent even at the start of the process, during wafer production. Extremely thin wafers are produced from so-called silicon ingots, which are rectangular blocks. Aside from the pure raw material value, the cutting times and the materials necessary for performing the cutting of these ingots are also considerable. A block is sawed into approximately 1,000 slices - each just 200 micrometres (0.2mm) thin. This takes approximately five hours. Per ingot, 250km of wire and 5,000 litres of fluid and coolant are required. Furthermore, the wire, which has a diameter of 140 micrometres, results in a very high level of material consumption with respect to the wafer thickness.

The very valuable, extremely thin blanks are, due to the material proper-

ties, sensitive to damage and breakage. Handling and transport from process to process must be performed with appropriate care. "The merging of all production steps, from wafer production to cell manufacture to module assembly, has opened the door to installing a fully automatic, inter-factory transport system," explained Dieter W. Krause who, together with his team, Förster & Krause, undertook planning and implementation of the transport system.

The objective was to reduce the otherwise typical breakage rates through gentle transport and simultaneously link all production steps into a fully integrated mass production system.

Special transport boxes were developed for this purpose that satisfied the requirements of multiple machines and were appropriate for transport and storage. Leuze Electronic's sensors are used everywhere to detect the positions of transport boxes and supply various signals for travel or steering functions.

Reliable detection

More than 80 vertical conveyors connect the machines with the conveyor belts. Before the cell production stage, the wafer boxes are temporarily stored in automatic small parts stores according to quality. From here, they are called up by the downstream processes. Two 12m high vertical conveyors connect the system between the building storeys.

At each decision station, Leuze Electronic use its PRK 3B retro-reflective photo electric sensors or, if space constraints dictate that no reflector can be mounted, HRTR 3B diffuse reflection light scanners, to ensure reliable detection of the wafer boxes. Krause commented, "In the modern, well lit rooms, strong sunshine can, at times, result in a very bright environ-

ment. The Leuze electronic sensors reliably master this requirement, even at high production speeds."

Contactless data transmission

In addition to position detection on the conveyor belts and space monitoring at the transfer interfaces and turning stations, optical data transceivers from Leuze Electronic are also used. They are used to communicate between the high bay storage devices of the small parts stores and the store management system from Förster & Krause.

Optical data transmission with infrared laser light, to and from the



Above: Frankfurt-based Conergy has merged together all three solar module production steps, from wafer to cell to module

moving high bay storage devices, occurs free of both contact and wear. The DDL S 200 optical data transceivers are likewise characterised by low interference susceptibility to noise and light sources.

Optical data transceivers communicate bi-directionally, with each device functioning as a combined transmitter and receiver unit. Network data is transmitted over a distance of up to 500m and is resistant to electrical interference as well as being contact-free and therefore wear-free.

Light curtains

Any linked system designed for fully automatic operation must have a means for manual intervention, to allow employees to manually load or remove products, even if only for removing samples for quality control purposes. Therefore, on some of the process systems, the short conveyor belts at the transfer heads to the vertical conveyors are not fully enclosed but are instead open on one side and equipped with Leuze's SOLID-2E safety light curtains. "Due to the narrow conveyor belts, the safety light curtains are necessary in order to prevent employees reaching across into the vertical conveyors located on the other side," explained Krause.

Leuze Electronic
www.leuze.co.uk
T: 01480 408 500

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