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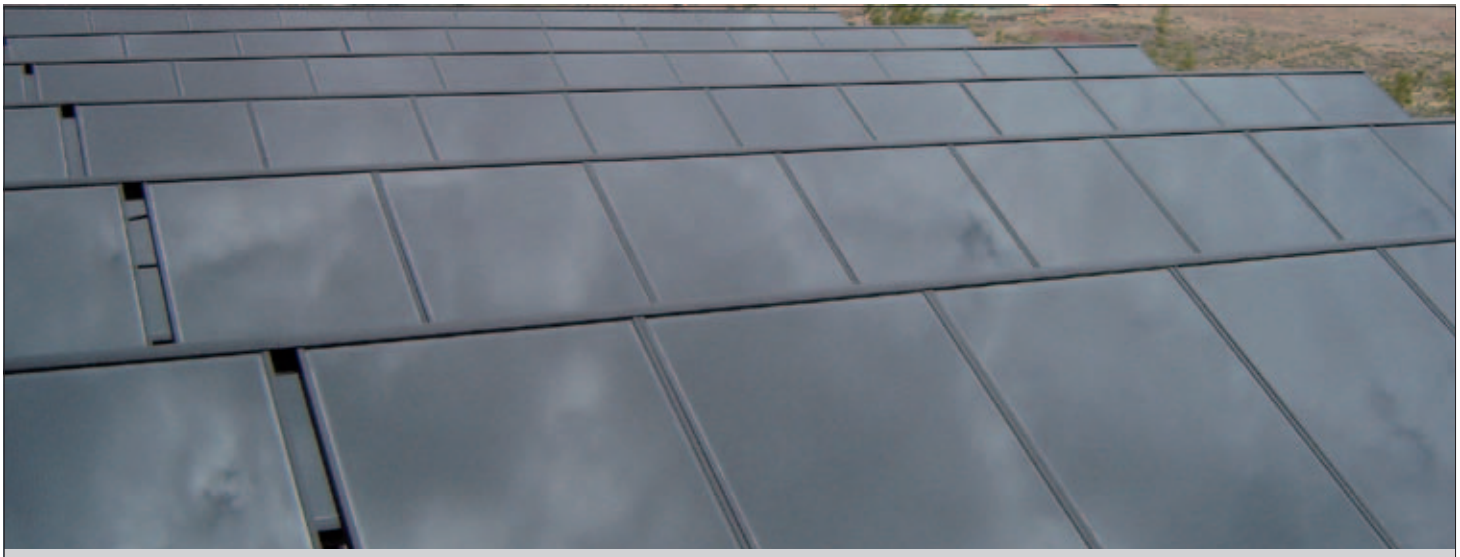
Optical Inspection for PV Modules



Best quality – higher energy efficiency: Thin-film solar modules in use

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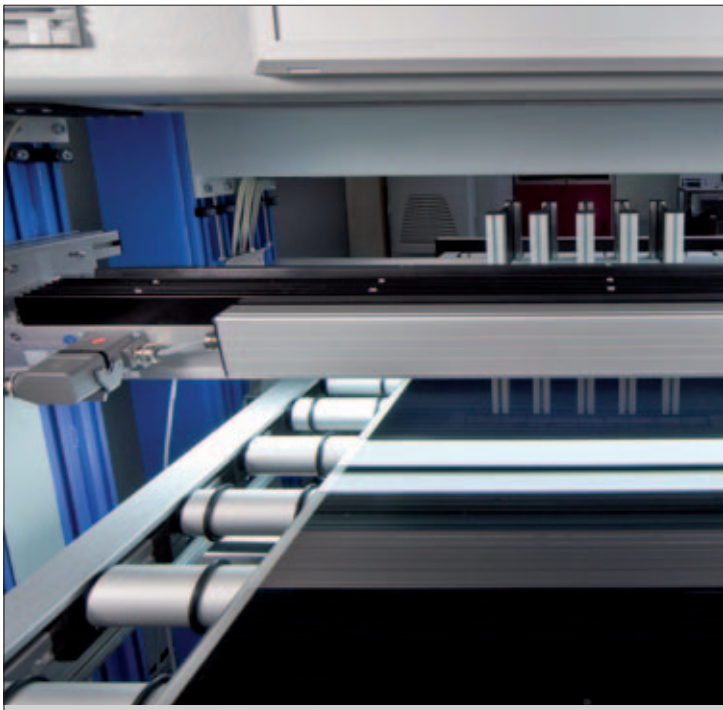
The thin-film solar technology plays an increasingly important role in the photovoltaic industry. Even though the availability of the needed material used for these kinds of solar modules is nearly unlimited. The processing steps during the manufacturing of thin-film solar cells are still quite complex and require that the quality process be monitored 100% of the time.



To be on the winning side:

Exact and 100% inspection at all processing stages in thin-film photovoltaic module production – from front to back end - assures higher yield, higher energy efficiency, better customer acceptance and detailed process data.

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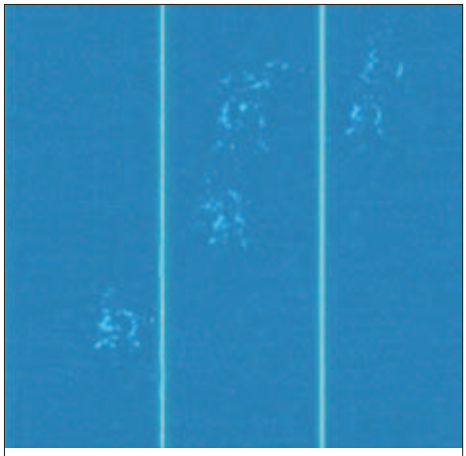
Thus it is an important decision to make use of a camera-based, in-line inspection system after important production steps. So, it is assured that only completely inspected base materials that have been found to meet standards continue onto the next processing step. In doing so, the fully automated inspection with 100% defect recognition, combined with tools for process optimization, will maximise the rate of return of the production equipment.



Typical defect, reliably detected by POWERSCAN: pinholes

The thin-film solar technology is becoming more important within the photovoltaic industry. Solar cells or photovoltaic cells are electrical components that make use of the photoelectrical effect to convert the radiation energy of sunlight directly into electric energy. Contributing to the growing use of this technology is the fact that the availability of the materials used, such as silicon, is practically unlimited. Solar modules are made of component parts that are harmless to the environment. The manufacturing process itself can be carried out at low temperatures.

Efficient and precise automatic inspection

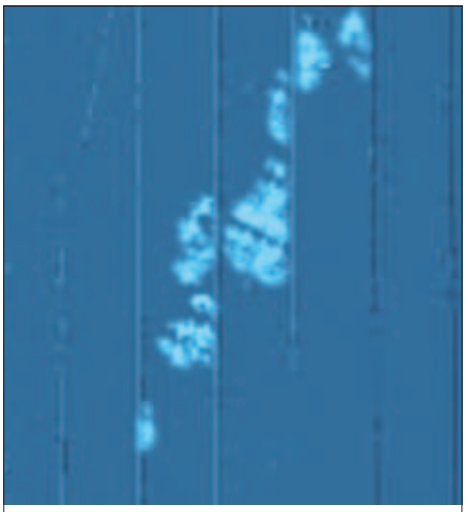
The latest developments in this process allow special coatings made of zinc oxide to be used for thin solar glass. These transparent and conductive layers – also known as TCO – increase the efficiency of photovoltaic systems by nearly 5%. The size of the glass surfaces being produced is becoming larger and with generation 8.5 are reaching sizes of 2.2 m x 2.6 m. In the process, quality inspection requires particular attention to ensure that the high demands placed on the photovoltaic industry are met.

Inspection systems can be integrated into a variety of different processing steps within the process chain. Directly after the washing sequences for the raw materials and before high-quality coating sequences, the optical inspection systems reliably detect typical glass defects and specific defects such as shells and breakouts on the edges. Defective material can be discharged immediately and never reach the high-quality coating process.

After the coating process, the system inspects whether the coating was applied properly. This is typically followed by edge processing of the substrates, which also involves an inspection process of corners and edges. Further steps include the scribing, chemical vapor deposition (CVD), cutting and lamination processes. Each of these steps can conclude with an inspection process so that at each step only 100% inspected merchandise arrives for further processing throughout the entire front and back end area. This assures that costs for the production of thin film modules are reduced considerably.

Because of the extremely high resolution in the µm range, even the smallest defects are detected reliably at a maximum sheet width and at highest production speeds. High-resolution high speed cameras provide crystal clear images of any defects. State-of-the-art teaching classification software processes the inspection data in real-time.

Data and images of all significant defects are stored to be analysed at a later time and can be called up during the processes with just one mouse-click. The information determined in this way can be used for optimizing the production process. This makes it possible to ideally configure the production processes.



A big problem for quality, not for POWERSCAN: patches

Maximise the rate of return of production systems

Quality control and process optimization need to be integrated in the production processes of thin-film solar, such as CIS, CIGS, CSG and CdTe, and also of solar wafers for inspecting defects in the coating, structure, edges and other typical glass defects. It is also the product of choice for inspecting solar modules (inspecting for completeness, position, size, geometry) and cover glass (inspecting for glass and edge defects as well as size/dimension errors).

Inspection systems - like POWERSCAN - increase processing reliability and productivity. The fully automated inspection combined with 100% defect recognition, in addition to tools for processing optimisation, maximises the rate of return of production equipment and ensures that its users are ahead of their competition in a global market.