

A clear target of improving yield and throughput while maintaining quality

As Director of Sales and Marketing of the Optical Sensor Systems Group for Carl Zeiss Microlmaging GmbH, Jürgen Gobel is at the beating heart of the PV industry. Having witnessed several revolutionary changes, he's upbeat about the future of the industry and the technical progress his company continues to make.

PES: Welcome back to PES. How has your business been progressing in the PV market since we last spoke?

Jürgen Gobel: With the increase of the requirements on the product quality and the production process, the demand for our solutions is of course growing too.

Today solar cell manufacturers are confronted with an enormous cost pressure, increasingly stringent quality standards and the necessity to optimise efficiency. This requires not only the identification of disruptions in the production process at an early stage, but also an improved understanding of processes in general. That's where our systems come into play.

The inline spectrometer systems from Carl Zeiss for the non contact measurement of transmission, reflection and other optical parameters supports the solar cell manufacturers in reaching their ambitious goals.

PES: When we last spoke, you identified North America as a strategic region for growth. Is this still the case and are you beginning to capitalise on this?

JG: There is certainly no doubt that North America has a very big potential of growth in fields which are related to new sources of energy and protection of environment.

Quite a few investments have been announced – and some of this investment has reached the industry and research. Watching the current disaster in front of the southern coast won't leave anyone in any doubt that the US government will spend additional efforts and money for



In-Line process measurement system

supporting alternate sources of energy. We receive more and more requests for offering and presenting metrology solutions for the photovoltaic and glass industry from North America. There have been the first successful installations since we last spoke and now we are looking forward to work on the next projects.

PES: In general, Carl Zeiss is well known for its swift development of products. Why does this work so well for PV production, too?

JG: It is true, it took us, for example, only a few months to develop a new generation of measurement tools providing the quality

parameters which are crucial for optimising coating processes in the thin-film solar cell production.

Carl Zeiss has almost 20 years of experience in the development and manufacturing of in-line solutions integrated in production lines for coated glass. This allows us to also very quickly adapt well-proven systems for photovoltaic production lines.

The glass and the solar cell manufacturers have a large common-ground regarding the demands for measurement systems. A number of solar cell manufacturers even use exactly the same inline-systems

100% Future

Solutions for the glass and solar industry



The implementation of complex measuring systems for advanced technologies requires in-depth process knowledge and extremely short development times. To achieve this, the entire innovation potential of Carl Zeiss is available to our customers.



We offer

- High-speed measurement of spectral transmittance/reflectance, color values and sheet resistance: In-line or At-line
- Extremely robust: non-contact / non-destructive measurements
- Easy integration into existing process lines

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We make it visible.

as we use for glass coating lines for the measurement of transmission, reflection and colour to gain information about their products.

The special demands of the PV industry – such as the measurements of haze or layer thicknesses – are already implemented in our at-line systems and we sell them very successfully.

The next step is to integrate additional features in our in-line systems: i.e. the analysis of single layers and layer stacks. With these new functionalities, the manufacturers are able to monitor the production of silicon based, CdTe, CIGS or even the next generation thin-film solar cells. No matter if we talk about coating of flat substrates or Roll-to-Roll applications, all those new features enable the solar cell manufacturers to gain a deeper view into their products and processes with an established and well-proved measurement technology.

PES: Increasing yield while maintaining quality is of paramount importance to your clients. How do your products facilitate this?

JG: There is a clear target of improving yield and throughput while maintaining or even improving the quality of the finished goods. In order to reach this goal, the industry has to understand all the production processes in detail and find the right parameters for improvements in efficiency and quality. Zeiss products help them learn about the processes and improve them at the same time.

Our Inline-systems are designed for high throughput production lines and are also future proof. Data is available in real time and is displayed in several easy-to-read graphical modes. Outstanding measurement speed, excellent data reproducibility and high reliability, even under vacuum or rough ambient conditions, make our solutions the first choice for process control.

PES: What measures do you have in place to ensure maximum 'uptime' for your technology?

JG: It is obvious that reliability is a crucial factor for production lines. Any downtime costs the manufacturers a lot of money.

Therefore reliability is built into the design phase of a spectrometer and is one of the most important design principles.

A classic spectrometer typically consists of a dispersive medium, entrance and exit slit, and imaging components which produce a parallel beam path. To record a spectrum, a detector located behind the exit slit must sequentially record the incident light, while the dispersive component or the exit slit is moved.

This mechanical movement requires time and is prone for failure. In industrial applications, short measurement times and insensitivity to external influences are a major advantage. This is why Carl Zeiss uses diode array spectrometers, which simultaneously record a complete spectrum within a fraction of a second and hence make moving components superfluous. All the spectrometer components are permanently attached to each other. This results in a very high level of isolation from mechanical vibrations and also therefore to a high degree of reliability – i.e. recalibration is not necessary.

The basic system design and product quality, together with a complete service portfolio including installation of the systems, professional remote or on-site repair services, retrofit programs, customer training, and of course preventative service and maintenance, lead to maximized uptimes.

PES: R&D must be a major (yet necessary) expense for your business. Does this investment reap as much of a reward as you would like?

JG: Absolutely! To succeed in serving the future markets with their complex and rapidly advancing technologies, it is important for us to always offer state-of-the-art technology focused on market needs.

The fast-paced development processes you encounter at Carl Zeiss brings us, of course, new contracts. Additionally it also results in a large number of highly-innovative product solutions for which patent applications are filed. We are therefore in a very good position to expand our portfolio further for this sector in the near future.



CORONA PLUS REMOTE Diode Array Spectrometer

PES: Yours is a sizeable corporation, but does that make it difficult to react quickly to market conditions and opportunities?

JG: You are right, Zeiss is certainly not a small enterprise. However, the organisation and structure of Carl Zeiss has been installed in a way that allows the different business units to react flexibly and quickly to changes in market conditions. Furthermore, the entire organisation and our business unit specifically have been optimised over the last few years to become one of the most flexible companies offering solutions for the fast-growing but also quickly-changing solar and glass markets.

PES: We've been noticing a great deal of collaboration within the industry (either to share costs or knowledge). Is this an approach that you embrace?

JG: We have been establishing collaborations within the glass and photovoltaic industry already for many years. There are close relationships with academic partners like universities and institutes but also with a lot of industrial partners all over the world.

You can't become a leading company in this complex field without having close and successful collaborations with other leading suppliers who can add value to the products you offer. ■

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