

Simatic technology used to control solar cell tools at DayStar

Nothing like the sun

DayStar Technologies, based in Halfmoon, New York, specializes in developing and manufacturing inexpensive, lightweight, highly flexible photovoltaic products made of Photovoltaic Foil. Well positioned to become the lowest cost producer of non-silicon, CIGS thin-film solar cells, used to convert sunlight into electricity, the company recently chose to implement Simatic S7 315 PN controllers for use with its next generation solar cell tools.

While traditional silicon-based solar cells still make up more than 90% of the cells produced by solar panel manufacturers today, there is growing interest within the industry for more cost competitive alternatives. As a result, thin-film solar cells made of copper indium gallium selenide (CIGS), along other technologies, are increasingly gaining and expanding market share.

Converting sunlight into electricity

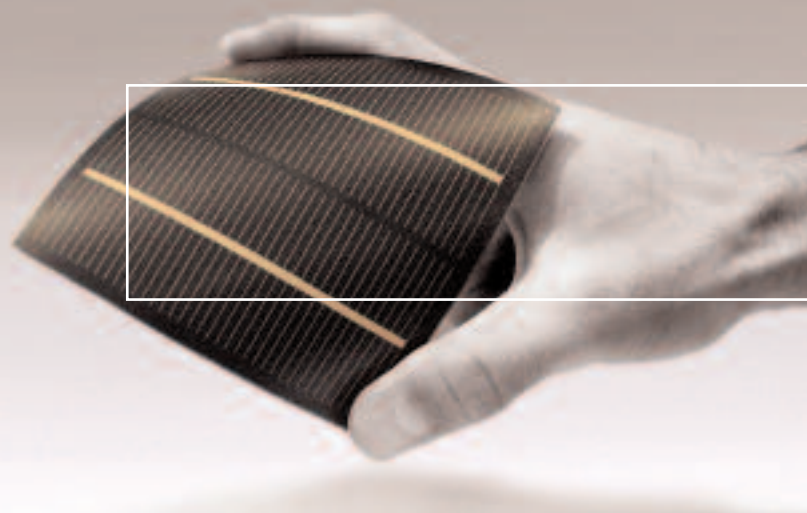
The Photovoltaic Foil manufactured by DayStar acts as the sunlight-to-electricity conversion engine of next generation photovoltaic modules and systems, a promising technology with the potential to compete with traditional power generation options in the growing global electricity market. DayStar's market strategy and key differentiator is to manufacture CIGS thin-film solar cells as a cost-effective alternative to conventional silicon solar panel technology. The company has a vision of producing PV energy at costs competitive with fossil fuel energy.

Positively impacting tool yield

Thanks to manufacturing advancements, the commercial viability of CIGS technology continues to grow. DayStar engineers its tools in-house to best meet its own specific needs. A unique new generation of tools incorporates physical vapor deposition (PVD) and evaporation processes to coat a stainless steel foil substrate in pro-

ducing a specific DayStar CIGS-based solar cell known as TerraFoil.

DayStar recently introduced a Simatic S7 315 PN controller connected to an ET200M I/O subsystem via Profibus to manage the thin-film stainless steel web of the heated PVD and evaporation processes used to manufacture the CIGS thin-film solar cells in a continuous roll-to-roll process. The controller handles the high perform-



Thin-film solar cells made of copper indium gallium selenide (CIGS) are increasingly gaining and expanding market share as a cost-effective alternative to conventional silicon solar panel technology

ance PID loop requirements to control the critical process parameters that directly affect tool yield and throughput.

Tremendous market flexibility

The solar thin-film market is rapidly expanding. Lead times for the required capital equipment are a significant cost factor, lengthening product time-to-market. This prompted DayStar to execute an aggressive manufacturing deployment plan, one that mitigates risks by utilizing lessons learned from early phase development stages. The approach allows the company to employ key process technologies such as that of the Simatic PLC to construct an efficient, large-scale, roll-to-roll manufacturing platform.

DayStar operates two production lines at its Halfmoon facility, each of which employs a different thin-film deposition method. The first line (Gen 1) is a batch process used for low-volume development and production of high-efficiency cells, as well as specialty products. The second manufacturing line (Gen II) involves both continuous in-line and batch processing. In

March 2006, the company created the Equipment Development Group in Santa Clara, CA to accelerate and support the development of its proprietary Gen III™ roll-to-roll continuous production platform.

Thanks to the Simatic S7 315 PN controller technology, DayStar is now able to modify its TerraFoil product early in the product development cycle. Each new manufacturing stage builds on know-how gained from previous generations, thereby reducing technology-, product- and cost-related risks associated with deploying an unproven, large-scale, roll-to-roll cell line.

Supporting the company plan

The incremental development plan of DayStar is directed at cost-controlled product build up. The Simatic PLC solution allows DayStar to control engineering and equipment resources while decreasing the development time for process modifications. Moreover, the Simatic controllers offer the necessary performance, reliability and adaptability that DayStar needs to manufacture its high product yields as the com-

pany continues to grow. Dennis Palsgaard, electrical engineering manager at DayStar Technologies, observes “The Siemens S7300 controller implemented on our chain drive sputtering system is used to develop the CIGS window layer. We selected Siemens for the fact that many of the engineers have years of experience with Siemens control solutions, and product support and reliability is one of the best in the industry.”

Further, because the modularity and expandability of the Simatic architecture greatly reduces the number of wires between tool devices and the controller, it also significantly minimizes machine production costs. “We also wanted a highly modular automation platform we could implement and modify easily and still be able to expand,” Palsgaard concludes. ■

Steve Scholey, EandM

E-mail:

steve.scholey@eandm.com