

## **CIGS reaches efficiency of poly-crystalline panels for the first time**

- **High-tech engineering firm Manz sets world record for thin-film panels in production conditions with total panel efficiency of 14.6%**
- **Efficient production technology used in Manz CIGSfab cuts manufacturing costs**
- **Solar power now at similar cost level as electricity from fossil fuels, much cheaper than offshore wind, and competitive without subsidies**

**Reutlingen, September 06, 2012.** The German high-tech engineering firm Manz has achieved a technological breakthrough: its integrated production line for CIGS thin-film solar panels, the Manz CIGSfab, can be used to manufacture solar panels that in the future, will supply power costing between 4 euro cents (Spain) and 8 euro cents (Germany) per kilowatt hour, depending on the location. This means the cost of solar power is now at similar level as electricity from fossil power plants and is significantly less expensive than electricity from offshore wind parks. According to Dieter Manz, founder and CEO of Manz AG, "our technology has the potential to revolutionize the solar industry." Manz's CIGS solar panel was manufactured on a mass production line, and with a total panel efficiency of 14.6% and an aperture efficiency of 15.9%, sets a world record for thin-film solar panels. This panel impressively surpassed both the world record for total panel efficiency held by the former cost leader for thin-film panels, First Solar, as well as the record for aperture efficiency held by MiaSolé. In addition, when it comes to efficiency, thin-film solar panels have now pulled even with polycrystalline solar panels.

"As a result, we were able to make up for thin-film technology's only drawback up until now, namely the lower efficiency rates – since when it comes to production costs, thin-film is already much less expensive to produce," explained Dieter Manz. With its fully automated production line, the Manz CIGSfab, the company was able to cut the investment costs for a production line by about 40 percent during the previous two years. This was primarily made possible thanks to new developments related to the systems in the process, such as the CIGS co-evaporator, a significant increase in throughput, and the standardization of the equipment used. "The thin-film panels

manufactured on our systems are competitive everywhere in the world," says Dieter Manz, "and as a result, the solar market's growth will no longer be dependent on national subsidy conditions."

The manufacturing costs possible using a CIGSfab production line with an annual capacity of 200 MW equal only \$0.55 / Wp. In fact, these costs fall to below \$0.40 / Wp in factories producing in the gigawatts. In comparison, Chinese crystalline solar cell manufacturers' production costs are close to \$1 / Wp on average, and the lion's share are sold for less than the production costs.

And what's more, CIGS technology is nowhere near its limit – Manz's exclusive development partner, the Baden-Württemberg Center for Solar Energy and Hydrogen Research (ZSW), has already achieved an efficiency of 20.3 percent in a laboratory. The record-setting cell from First Solar in the CdTe segment only has an efficiency of 17.3%. As a result, out of all thin-film technologies CIGS has the greatest potential to further increase efficiency rates and cut costs.

In an ambitious development roadmap for the coming years, Manz shows potential customers the next steps in the process of transferring the world record set by the laboratory cell to mass production and making further massive cuts in the cost of producing CIGS panels.

### **About CIGS Technology**

In CIGS (chemical term for copper indium gallium selenide) solar panels, a large part of the semiconductor layer, which absorbs sunlight, is comprised of affordable copper and is less than two micrometers thick – one-hundredth of a crystalline solar cell. In addition, when manufacturing thin-film solar panels based on glass, both the complex silicon wafer production process and the need to connect the individual cells together are eliminated. The entire panel can be manufactured on a fully automated production line.

### About the Manz CIGSfab

Manz's own innovation line in Schwäbisch Hall is the incubator of the Manz CIGSfab, a fully integrated production line for manufacturing CIGS thin-film solar panels. Manz acquired the location in Schwäbisch Hall from Würth Solar at the beginning of 2012. As a result, the high-tech engineering firm has the ability to test and implement new materials and production processes under mass production conditions. Manz offers the only turn-key production line for CIGS thin-film solar panels currently available under the name CIGSfab. In doing so, the company draws on its wide-ranging expertise in six different fields of technology: automation, laser processes, vacuum coating, metrology, and wet chemical processes. In this process, Manz uses synergies that result from making advancements to these technologies in its three strategic areas of business: Solar, Display, and Battery.

### Video statement by Dieter Manz, founder and CEO of Manz AG

<http://tinyurl.com/ckc6hmw>



Picture 1: Dieter Manz



Picture 2

Picture 3

**Picture 2 and 3:** High-tech engineering firm Manz achieves breakthrough with world record panel. The photo shows Dieter Manz, founder and CEO of Manz AG and Dr. Kay Orgassa, Head of R&D Manz CIGS technology (Picture source: MANZ AG).

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### **Manz AG – Passion for Efficiency**

Manz AG, headquartered in Reutlingen, Germany, is one of the world's leading high-tech engineering firms. Founded in 1987, in recent years the company has grown from an automation specialist into a supplier of integrated production lines. Manz has expertise in six fields of technology: automation, laser processes, vacuum coating, screen printing, metrology, and wet-chemical processes. These technologies are used and developed in three strategic business areas: Display, Solar, and Battery.

The company, led by founder Dieter Manz, has been listed on the stock exchange in Germany since 2006, and currently develops and manufactures in Germany, China, Taiwan, Israel, Slovakia, and Hungary. Manz also has sales and service offices in the United States, South Korea, and India. At the beginning of 2012, Manz AG had approximately 2,000 employees, 900 of whom in Asia. With its slogan, "Passion for Efficiency," Manz's engineers are making a promise to offer its customers – all companies active in important future markets – increasingly efficient production equipment. As an engineering firm, the company plays a significant role in reducing the cost of manufacturing end products, making these products available to large groups of buyers worldwide.

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