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October 24, 2008

## Technological Innovation in Thin-film PV Manufacturing Takes Hold in Ohio

by Marsha W. Johnston, Contributor

San Diego, United States [RenewableEnergyWorld.com]

With its abundance of sand and easy river access, northwestern Ohio has attracted glass-makers for 150 years. By the late 19th century, Michael Owens was well on his way to revolutionizing glass-making with his bottle-making machine that could produce 240 bottles per minute, an invention that reduced labor costs by 80%. The region also produced Harold McMaster, who Fortune Magazine dubbed "The Glass Genius" for his invention of Permaglass, the curved and tempered glass used in automotive and consumer markets throughout the 20th century.

"There is not another place in the world that knew as much about glass as Toledo," says Norm Johnston, former director of research for Owens Corning Fiberglass and vice president of technology for Libby Owens Ford now CEO of a thin-film manufacturing company.

While glass itself may have become a commodity, driven by its industrial legacy and focused PV research at its area universities, a little-known 21<sup>st</sup>-century transformation of the region's glass-making tradition is underway that could change all that. Toledo, known as "The Glass City," neighboring Perrysburg, and the surrounding Wood County have together become a mecca for start-up manufacturers of thin-film PV, primarily delivered in a glass panel sandwich.

"I think the regional determinant is the ongoing collective legacy of the physical infrastructure and the human capital of making glass and glass products."

-- Tom Blaha, Executive Director, Wood County Economic Development Commission

"I think the regional determinant is the ongoing collective legacy of the physical infrastructure and the human capital of making glass and glass products," says Tom

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Blaha, executive director of [Wood County Economic Development Commission](#), an organization that has played a key role in identifying industrial sites and tax abatement structures for the startups.

McMaster began the current transformation of the region in 1985 when he founded Glasstech, an ASi (amorphous silicon) solar technology firm. From there McMaster started CdTe (cadmium telluride) company Solar Cells Inc. (SCI) in a [technology incubator at the University of Toledo](#).

Out of Solar Cells Inc. came [First Solar Inc.](#), [Solar Fields](#), which [Q-Cells AG](#), the German-owned number-one global manufacturer of PV cells and thin-film modules, bought in 2007 and merged with Calyxo, and Willard & Kelsey Solar Group LLC.

[Xunlight Corp.](#), led by a researcher from the University of Toledo, also plans to begin production of flexible solar panels this year at a factory in Toledo. Some industry experts say SCI's technology had some strong points, but was maybe not quite as effective as some of the processes developed later on.

As CEO of Solar Fields and vice chairman of Calyxo, Norm Johnston has been integrally involved in the 21<sup>st</sup>-century transformation of the region's glass-making tradition. "[McMaster] ran out of money, invited [Walmart billionaire John] Walton in, and got diluted out of what became First Solar," he recounts. First Solar, the world's 800-pound gorilla of thin-film manufacture, has its sole North American plant located in Cedar Business Park in Perrysburg Township.

Johnston says, "McMaster then came to me, asking if I knew how to do [what First Solar was doing], so I got 6 people with 150 years experience. Where but in Toledo could you find that?" he says, of the founding of Solar Fields, whose technology is being used by Calyxo.

"Calyxo is in start-up to do CdTe on glass panels," Johnston said of his new firm. "The thin film stack is the same as First Solar, but the process is different, it's atmospheric, not vacuum, and continuous, not batch. Without the need for a vacuum chamber, the size of panels can be larger, so we have fewer legs, wires, less hookup time and potentially lower installation costs." He says that once Calyxo has established volume manufacturing, its production costs should be at least as good as First Solar's, which are reported to be the lowest in the world. Calyxo's Perrysburg site contains the original prototype line and R&D center, says Johnston, though initial production will be in Germany, near Q-Cells, and will be cut and pasted all over the world where appropriate.

Largely unknown outside the region, Willard & Kelsey Solar Group LLC is constructing its manufacturing facility for CdTe thin-film glass panels in an old Delafoil cathode ray tube components factory in Perrysburg. The local newspaper reports that W&K intends to produce 1 to 1.5 million panels per year, but general manager Keith Guenther would not confirm exact production targets, saying only that the firm was "fundamentally on schedule."

Another source close to Willard & Kelsey's ramp-up says it has all of the "big pieces" of its equipment in place. "They're just testing the vacuums, and temperatures. They'll start making cadmium plates as soon as they get the rest of the equipment," he said.

Xunlight, whose AsiGe (Amorphous Silicon Germanium) technology also originated at the University of Toledo, is the exception to using glass panels, opting instead for a lighter stainless steel flexible substrate that can be integrated into commercial buildings. "We have completed our pilot line, and we're optimizing and ramping production. We should have small-scale commercial production in early '09," says Todd Armstrong, assistant to CEO and founder Xunming Deng. (See lead image, above) Xunlight already has a subsidiary, Xunlight26, which is still in R&D, looking at CdTe on a flexible substrate.

Norman Stevens is co-director of the 2-year-old, thin-film-focused [Wright Center for Photovoltaics Innovation and Commercialization](#), a joint collaboration between the University of Toledo, Bowling Green University and Ohio State University. Stevens says

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the region's burgeoning "solar technology corridor" should have half a dozen companies before long.

"There is more stuff coming out of the labs all the time. We are set up to support any kind of development or improvements of products and other companies are forming around here to provide materials and support," he says, adding that NASA just joined them to do research and testing certification of terrestrial thin-film PV.

*Marsha Johnston is a freelance writer based in California specializing in renewable energies, conservation and sustainable development.*

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 [jeff-menapace-160593](#) October 24, 2008


One correction: Q-Cells AG is the number-one global manufacturer of PV cells, they don't make panels. Their customers make panels. They are getting into the power generation business (or, are in the power generation business), but their panels are made by one of their cell customers, and I know because I've been in the plant.

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 [jesse-njehu-159984](#) October 25, 2008

This inovation is very good, I wonder how it can be implemented in some African countries for sustainable development.


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 [jesse-njehu-159984](#) October 26, 2008

Good morming, kindly provide me with information on a research institution, on wind Power, on which is willing to research in Africa, Kenya. One who is willin g to implement pilot projects in Kenya on the latest wind Energy.  
Kindly provide him with my contact E-mail, the Wind power should be able to provide upto 1.5mw of Wind power. Thanking you in advance shall appreciate further discussions on the same.  
All the best ,  
Jesse Njehu

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PLEASE LET ME KNOW IF XUNLIGHT WILL LIKE TO SELL THE TECHNOLOGY FOR INDIA

THIS IS AN ESCELLENT DEVELOPMENT

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THIS IS AN EXCELLENT DEVELOPMENT AND HAS HUGE POTENTIAL FOR RURAL INDIA

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There are two technologies which will change the world very much for the better. One is a solar electric panel which produces power which is economically competitive with wind and hydro and the second is a practical electric car. Combined they will stop America's greed for other people's fossil fuels with all the abuse this causes around the world. How great that one of the critical steps in this process is coming from within America.

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Go Ohio!

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