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NEWS

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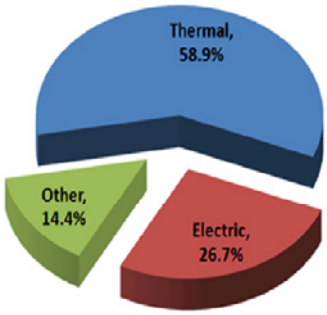
The Future is Here - Building Integrated Solar Thermal Systems
The voice from across the Atlantic - Interview with John Swift

The majority of building's energy needs (on average 60%) is not electrical, but related to heating and cooling. To date, much attention has been paid to photovoltaic panels as a means of supplying the energy demands of buildings, and in the processes, the huge potential of solar thermal technology has been ignored.



2010 U.S. Buildings Energy End-Use

This issue is closely related to at least EU Directive on Energy Performance of Buildings and also to EU Strategic Goals for 2020, 2030 and 2050.

The current "Technology Roadmap for Solar Heating and Cooling" published by The International Energy Agency (IEA) identifies the integration of solar thermal systems in building surfaces as a top priority for the solar thermal industry. The use of alternative materials, technologies and manufacturing techniques for system cost reduction and performance improvement are also listed as major priorities. The IEA suggests that research institutes and the solar thermal industry develop new integrated solar thermal building products by 2020. The document also highlights the importance of addressing information barriers and creating public, business, and professional awareness of the potential of solar heating and cooling.

One Canadian company, Solar Tomorrow Inc., has developed and implemented solar thermal collectors that meet and exceed the recommendations of the IEA Technology Roadmap. I got a chance to interview John Swift, the founder of Solar Tomorrow Inc., to gain an understanding of how they are changing the way we heat and cool our buildings.

"Our company was originally formed as an R&D company to design, build, and test new building integrated solar thermal collectors capable of preserving a buildings' appearance while conserving and generating energy" explains John. All efforts were put towards developing a technology that could replace a buildings envelope with solar thermal collectors that play the role of cladding. "We went through the inventive process, filed patents for the basic features of the collector, and tested our new designs extensively" says John, "and then we started work on designing and proving the collector's manufacturing process."

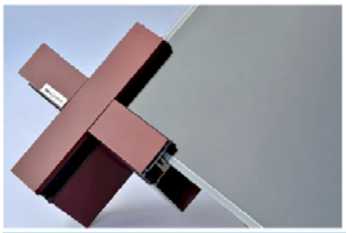
The technology allows architects the freedom to design net zero buildings without having to rely on traditional bulky solar panels cluttering the roof or façade. It is perfect for retrofitting not only contemporary, but also historic buildings, due to the ability to match the collectors with surrounding materials.

"Today we can custom design and manufacture solar thermal collectors to resemble any cladding material in both color and texture," John explained. "It's a dream come true for architects – our collectors blend right into a building's exterior or interior aesthetics. We can design solar thermal collectors resembling everything from stucco, brick, natural stone, asphalt shingles, and even wooden planks."

Solar thermal collectors resembling stucco during tests at the University of Nevada, Las Vegas

Traditional solar thermal systems are relatively expensive because they are treated as a separate element in the building with only one specific function. The new approach reduces the cost of solar thermal systems through a prefabricated multi-functional design; the collectors simultaneously serve as building's cladding, capture thermal energy for hot water, space heating or cooling, and act as a building element that provides additional thermal and acoustic insulation. Cost reductions are further achieved by using an existing curtain wall structure to hold the collectors.

"Our flagship product is a high efficiency glazed flat plate solar collector designed for curtain-wall or window-wall installations" says John. These collectors can be installed into existing curtain wall structures and replace existing spandrel panels or double glass insulated glass units (IGU), without any structural changes to the existing curtain wall frame. After installation the collectors also provide additional thermal and acoustic insulation. The curtain-wall-type solar collector is the first of its kind in North America and is the only one certified by the Solar Rating and Certification Corporation (SRCC) for dual-modes of installation: in a curtain wall frame or on a rack.



The curtain-wall-type solar thermal collector in a curtain-wall frame

The majority of high-rise buildings struggle with limited area suitable for solar thermal collector installation; they are mostly constrained to a relatively small roof space which may already have a photovoltaic installation. The curtain wall façade of most buildings offers the perfect surface for placing solar thermal collectors.

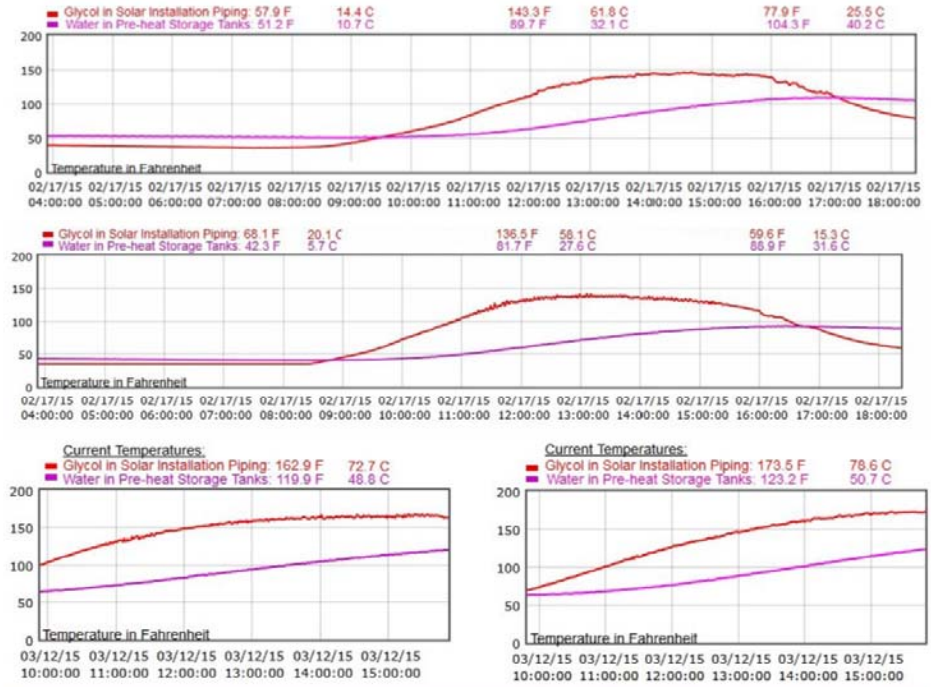
"Almost every contemporary high-rise, office tower, or hotel uses curtain walls. You can go to any office building or commercial establishment that uses a curtain wall structure and swap the spandrels with our solar thermal collectors; no changes to the structure are needed" John explained. "It's the perfect solution for retrofitting existing buildings or integrating solar thermal collectors into new curtain wall designs."

The curtain-wall-type collector is entirely made of aluminum alloy with 70% recycled aluminum content. The collector's innovative design improves heat transfer and flow characteristic; the entirely sealed body ensures a long service life and facilitates the collection of more energy by avoiding daily defogging cycles. The extremely low drop of glycol pressure in the collector translates into a 50% savings in parasitic power needed for pumping. Two generations of this collector were tested by the National Solar Test Facility (NSTF) in Canada and described by the testing team as "the most innovative technology tested there to date."

"In 2010, we partnered with Chatham University in Pittsburgh, Pennsylvania to design and install a building-integrated solar thermal collector demonstration project" John recalls. Façade integrated solar thermal collectors were installed on the Chatham research greenhouse in order to collect thermal energy and supplement space heating, as well as provide cladding for the building and demonstrate the systems performance through a real-time computer display installed alongside the collectors.

Following the success of the demonstration project a solar thermal hot water system was designed and installed to heat 10,000 liters of water a day for two residence buildings at Chatham University. The system used curtain-wall-type collectors installed in regular racks on the roof in order to provide easy access to facilitate research and development activities. Upon its completion in 2011, the project was listed by the U.S. Department of Energy as the largest solar thermal project in Pennsylvania. Chatham University has been awarded numerous prizes for its innovative use of solar thermal energy and receives regular visitors that want to get a first-hand look at the solar thermal technology.

"The curtain-wall-type collectors installed in regular racks; the rooftop installation at Chatham University in Pittsburgh"



"Performance of two solar thermal installations at Chatham University in Pittsburgh, Pennsylvania, on February 17th, 2015. Ambient temperature during the day between -14 and -8 degrees Celsius. Amount of water heated: 10,000 liters."

"Chatham is very pleased with our solar thermal projects and the results they have achieved," John explained. "Last year we delivered another shipment of collectors for another building at the campus, which now provide heating at a new scientific greenhouse."

One of the goals outlined in the IEA Technology Roadmap is training and education in solar heating and cooling technology for architects, engineers, designers, owners, facility managers, consultants and installers. I asked John about his opinion on the existing level of awareness between architects and designers.

"Anyone responsible for the design and construction of new buildings should be aware of the energy conservation and generation benefits of solar thermal technology," John explained. "I strongly believe that education about solar thermal systems should start with architects

"John Swift, of Solar Tomorrow, shows off the curtain-wall-type solar thermal collectors installed at the research greenhouse at Chatham University in Pittsburgh."

and engineers - at the level of colleges and universities."

Convinced of the need to educate architects and engineers about the benefits of solar energy John led development of a classroom teaching and demonstration tool that allows students to experience hands-on learning with topics covering solar thermal, PV, PV-thermal technologies. "You divide a class into four groups, give each group a demonstration kit and let them play! The kit collects all the experiment data so students can just play with the tool – changing the angle of light, changing the load, etc. – the data for future analysis is automatically stored on a computer," explained John. He's witnessed the interaction first-hand; he occasionally teaches classes as a guest lecturer at colleges and universities.

What does the future look like for innovative companies in the field of solar thermal energy? "With more than seven years of research and product development now we have all the elements aligned for entering the market: patents, certification, manufacturing processes, tools, two large demonstration projects with real-time field data, and experience in system design and delivery," John explained. "It is time to take the technology to the next level, time to build more projects and show the world that the future of solar thermal is already here."

Note.

John Swift is the Director of Research at Solar Tomorrow Inc. John is a mechanical engineer with a Master degree in environmental science. After graduation John worked for a district heating company, and later formed and led a number of his own companies ranging from innovative building materials to software development. Before starting Solar Tomorrow he worked ten years managing large software development projects for public sector and financial institutions. You can contact John directly at john.swift@solartomorrow.com.

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