

THE WORLD'S LARGEST SOLAR ARRAY

in Use by a
Rotational Molder

by Bill Spenceley, Flexahopper Plastics Ltd.

The sun is shining these days in Western Canada and Flexahopper Plastics Ltd. has decided to not let it go to waste with the recent installation of the world's largest solar array in use by a rotational molder. The massive 167kW system was built in late August as part of our corporate sustainability program and to mark our 50th year of business. With this investment in clean energy we've endeavored to showcase, to our industry, that green sourced power is both environmentally friendly and economically viable.

Corporations all over the world are discovering that "sustainability" has become the new catchphrase with consumers. This trend has placed new demands on producers, manufacturers, and retailers to green their products. However, all too often business leaders



paint green technologies as too costly and unnecessary. We disagree and believe that it's simply good business practice to reduce waste and strive for increased efficiency. We're also demonstrating that it is possible to be a profitable, growing company, while including the environment on the balance sheet. I've spoken at many industry events to deliver this message and have been encouraged by the large numbers of molders who share my view and are acting on it.

Our action began in 2006 when we started purchasing 100% of our facility's electricity from a green sourced provider (Bullfrog Power). Our region has an abundance of wind, so it was a great way to support more development in local wind farms. We also thought of producing wind power more locally however, it didn't take long to discover that it wouldn't be practical to install a wind turbine on our property. There were too many barriers because of city restrictions, bureaucratic trepidation, and high installation/maintenance costs. I had also

looked briefly at the possibility of solar, including visiting some installations in our province, but I was turned off with the quality of product and skills/experience of the people putting the deals together. I decided to take a "time out" on solar.

That all changed this year when we took a second look and discovered some surprising facts. Most people assume the greatest sunlight would be in the deep south, but in Western Canada, despite our challenging winters, we receive some of the highest reliable sunlight in North America. Another factor is the simplicity of this technology. No moving parts, simple wiring, and proven durability. Solar panel costs have also dropped remarkably in the last decade with new advances in efficiency and manufacture. This year the economics have even reached the level where this year utility-scale solar generation became more affordable than that produced by conventional sources like coal. These numbers are based on U.S Department of Energy (DOE) data and don't include the influence of government



Province officials attend Flexahopper "Flip the Switch" event. (L-R): Agriculture Minister, Economic Development and Trade Minister, Environment Minister, and Lethbridge City Councillor.



subsidies. The DOE also predicts that power from commercial and residential solar will become more affordable than by other sources within the next couple of years.

The downside to all this is that the cost of solar has become so low that governments, that have tried to spur on the industry, will begin to withdraw their support from the marketplace. If you are considering a solar installation, you might want to look at the timing to take advantage of the programs still available. We were fortunate to have 20% of our system's cost covered by a contribution from our provincial carbon levy fund, which was established just two years prior. Like many similar programs, this carbon levy places a dollar rate based on the amount of carbon pollution released by fuels that emit greenhouse gases. Electricity is exempt from this tax.

When we looked at placement of the solar array, we had two options; roof mounted or ground mounted. Ground mounting is the easiest to build and service, but it takes up valuable yard space and some shading could interfere with the layout. We decided to go with roof-mounted where there was little shading, and the panels would have an insulating effect in the winter and reduce heat buildup in the facility during the summer. Another plus was the fact that in 2003 we added an additional 50,000 square feet to our building and tried to anticipate any future requirements of the structure. We also thought that it might be interesting to consider what extra construction details would be

required if solar panels were added later. There really wasn't an extra cost so we proceeded to go with that enhanced design. Fast forward 14 years and the engineering approval was simple and inexpensive. If you are building a new facility or addition, consider solar panel loading into the design. In addition, I would suggest you have a good look at your roof before installing a solar array. Inspect any fasteners (we had 7900 self tapping screws) and reseal them to reduce the chances of leaks caused by the installation.

The next consideration for our solar project was financing and ROI. Most solar contractors don't get to quote on many projects of this scale, so we were able to leverage that advantage to obtain a very attractive price/watt and secure a government levy contribution approval. We expect this solar array to pay for itself in 7.5-8 years (depending on the future price of electricity). Again, this is a grid-connected installation, so we are not concerned about storage of our power. Based on our early billings since we took the solar array onstream and predictive modeling for power production, we expect to have savings on our electrical bill matching the loan payments; essentially a cash neutral proposition. Flexhopper will also be producing a significant portion of its electricity for free after that timeline.

Another option with solar is off-grid systems. They are much more expensive and have payback terms of 12-15 years using the current technology. However there are some "game changers"

entering that market. Tesla has ventured into this electrical storage market in a big way with a recent installation in Southern Australia of the largest (100-megawatt) battery system. Elon Musk's company also has a wide range of offerings in smaller battery systems and we might consider some level of electrical storage in our long-term plans. While our electrical grid is very reliable, there are other parts of the world that have many challenges with consistent, reliable supply. Off-grid solar might be a viable alternative in those cases.

I also want to point out that there are some very attractive financing solutions for renewable energy projects. I recall attending an energy conference in Niagara Falls 5 years ago where I spoke with an American presenter who had shared his experience financing green technologies for his injection molding facility. He devised a business plan to install a large wind turbine onsite, but he did not receive a warm reception from his corporate banker. As he recounted it, "They laughed me out of the bank and thought I was crazy". Still, he was persistent and tried sourcing from other banks. From his search he finally connected with one of the few banks mandated to support a certain number of green capital projects. At that time there were not many business people in that market, and generous terms included the creation of a separate credit facility secured only by the renewable equipment. I visited him two years ago and found he has paid off the first turbine and is now financing a second at

his facility. Not only has the project been successful but a local business park has been built around his site to purchase excess power from him. From this example consider that many banks are also trying to associate their brand with sustainability. So there is attractive financing available for similar renewable projects.

The construction of our 167kW system was well-planned and took about a month to complete with minimal "surprises". The technology really is quite advanced today with brackets, fasteners, and electronics well-proven and tested in the field. Our installer/contractor had been involved in many projects including some large utility-sized systems. So we were confident they could handle our project. Speaking of this, it's very important to work with certified, experienced contractors on these solar projects. Our system is a significant investment and must be reliable or the economics fall into question. Further, most government incentive programs place conditions on applicants to only use certified installers who are registered with their office. Be wary of fast talking contractors who might overstate their capabilities or experience. Ask for lots of references and even reach out to some of their past clients to build confidence. Most solar customers are proud of their systems and happy to share their success with the technology.

Production from the panels was immediate once the inverters (which convert the DC volt output to a usable AC voltage) were

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switched on and it was really a cool moment when we started up the system. I think there's a real cognitive disconnect when you see these silicone panels sitting on the roof, silent and motionless, start producing over 100,000 watts. The other key components of the solar system are the inverters which play a critical role in how the electricity is managed and conditioned to power the plant equipment. Solar panels produce DC power and there are some losses during the inversion to AC power. These losses can be as high as 40% but this is an area where the technology will continue to improve. Although we are now producing electrons onsite, our system only provides about 25% of our current electrical draw. We plan to grow that contribution through advances in process technologies, replacement of less efficient equipment, and finally, by growing the size of our PV system.

As I mentioned before, our system is grid connected which allows our surplus electrons to flow out of the plant for credit from our power provider (net metering). One caution when you are considering a solar system is to make sure your power provider will pay for your excess power and under what conditions. Most companies do this, but you need to know before you commit.

With regard to the economics of this project, at the time of this writing the system is brand new. So I'm cautious to comment that everything is working perfectly. Our installation went very well, although there were some hiccups when our city regulators started requiring extra safety disconnects and wiring changes. We also

had some optimizer units fail. These devices allow panels to still produce limited power when areas are shaded. The failed units were replaced at no cost (25-year warranty). The system is also connected to our computer network, and it provides data and information on the status of the system, power output, and alerts. We also monitor the amount of electricity our facility is using, how much our solar array is providing, and the net flow of the power in or out of our plant. Incidentally, we were puzzled why we were using a significant amount of power on the weekends when we are shut down. This monitoring system helped us identify that source of waste and address our shut-down procedures. We're also amazed that the solar panels still produce power regardless of cloud cover, smoke, and even a light dusting of snow! I'll be speaking to specifics about our system at several international ARMO conferences this year and I can share more of our experiences and lessons learned.

Was it worth it? Absolutely! We are pleased with the new solar array and expect it to help significantly with our sustainability goals. We've also seen a surprising amount of interest from the media, government, business, and clients wanting to hear our story. I'm hopeful we've helped start a trend in sustainability for our industry.

For more information on this article you can contact Bill Spenceley, Flexahopper Plastics at bspenceley@flexahopper.com 

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