photovoltaik 04

SOLARTECHNIK FÜR INSTALLATEURE | PLANER | ARCHITEKTEN

TECHNOLOGY

The return of the trackers – solar tracking systems

REPRINT FROM
PHOTOVOLTAIK 04/2017

Picture: Deger

Tracking system at a wastewater treatment plant in Birsfelden in Switzerland: Degertracker 3000 HDs fitted with 12 panels each were installed.

THE RETURN OF THE TRACKERS

Solar tracking systems — Generate significantly more electricity thanks to panels tracking by light sensor. The generation curve is better adapted to energy usage and the battery. This opens up new self-consumption applications to this support system. *Herbert Grab*

With the international boom in photovoltaics, and particularly with the growing importance of self-consumption systems, demand for solar trackers is also rising. "We are getting more and more enquiries from business owners and private individuals who would like to cover at least the majority of their own electricity demand," Steffen Bahlinger, head of sales for the German-speaking markets at Deger in Horb am Neckar, says. He is also responsible for customer support in Hungary and Italy.

Successful thanks to MLD

Deger is among the key suppliers of panel systems with sensor-controlled tracking. Deger has been active in this segment right from the start. Founder Artur Deger initially developed a specialised light sensor: Maximum Light Detection, or MLD for short. This helps to automatically orient the panel array towards the brightest and thus most energy rich part of the sky. Since then, Deger sold the company to a new owner, but the famous brand name has remained. Other companies use a different tack: For example, they track the position of the sun in the sky using astronomical data.

So far, Deger has sold thousands of trackers all over the world. The operation data has been showing that dual-axis tracking systems are able to generate 42.9 percent more electricity from the same area of panels than a static array – at the same location and given identical irradiation conditions. The Fraunhofer Institute for Solar Energy Systems (ISE) in Freiburg has evaluated such tracking systems for over a year. Several operators even achieve an additional yield of more than 50 percent.

Generation and loads match

Along with the increased yields, one other effect of the rise in demand is beneficial: The yield curve of Deger's MLD tracking systems much more closely matches the load profile of private residences and commercial enterprises: While static panels generate less electricity in the mornings and evenings, tracking systems provide solar electricity more evenly throughout

Picture: Deger

This factory in South Africa has 20 S70 trackers mounted to the steel roof.

the day. This makes it possible to self-consume much of the generated power – without the use of storage systems. Which in turn increases the overall economy of the system.

If a storage battery is charged using solar electricity, the uneven yield curve of static panels with their high midday peaks can have a detrimental effect on the service life of the batteries. On the other hand, the fact that the tracking systems generate power evenly is quite beneficial for the storage unit and helps to extend its service life. During the course of the day, the yield goes through a flat plateau rather than a distinct peak around noon.

Hand in hand with the storage unit

And that is all the more important, because systems for electricity storage can significantly enhance the efficiency of a solar installation. "For private households in Germany, tracking systems like ours only start making sense in combination with storage," Steffen Bahlinger notes. "Recently, end customers have almost exclusively been purchasing installations together with storage systems."

But there might also be commercial applications, given that the load profile matches, where just the base load is sufficient without storage. In a situation like that and with an intelligent energy management, covering 80 percent of the electricity demand is possible – or even more, depending on the application and the demand.

Over 85 percent self-sufficiency

As early as 2012, the reference facility near the company headquarters in Horb am Neckar has provided 85.5 percent of the demand of a family home including an office space and several electric vehicles. The 18 Sanyo 240 solar panels with a combined total output of 4,320 watts generated a handsome 7,525 kilowatt hours of solar power within 12 months – significantly more than a static array would have been able to achieve.

About half of this – 3,476 kilowatt hours, to be exact – went directly to the consumers in the house and the office. 1,756 kilowatt hours were fed by the system into the battery during that time. Of those, 1,602 kilowatt hours were again consumed by the house and the office as well as by the EVs. The system took as little as 862 kilowatt hours from the grid – just about 14.5 percent of the overall electricity demand of 5,941 kilowatt hours. December and January were the only months when the self-generated solar power did not completely meet the demand. The rest of the year, generation actually exceeded demand. On 280 days of the year, no electricity was taken from the public grid whatsoever. In other words, the building and the office were completely self-sufficient.

Start small – and then grow

Many users favour starting out with a tracking system and a relatively small battery, as Steffen Bahlinger explains: "Customers prefer to test out how the system as a whole operates, and then adding more batteries – also in the hope that the cost of storage will quickly fall." This approach is well-supported for example by Varta, in that their storage systems Varta Home and Varta Family can be extended from 2.8 kilowatt hours all the way up to 13.8 kilowatt hours – in half-kilowatt increments. Also, it is possible to combine a number of storage units in a cascade. Such a system is utilised by the photo market Xalino in Herrenberg-Gültstein. Dominik Zahlen, his brother Marcel and his father Carlo, are the managing partners of the company.

DEGERTRACKER S100

Single-axis tracking system with a new gearbox

Deger have expanded their S series and brought out a new single-axis tracking system. The Degertracker S100 with pile-driven foundations and intelligent tracking achieves about 30 percent higher yields than static systems.

At a surface area of 78.6 square metres, the S100 with pile-driven foundations has a lot of space for solar panels. The wide panel substructure has been designed to withstand wind speeds of up to 110 kilometres per hour. The rotational angle of 50 degrees in either direction and the MLD sensor allows the single axis tracking system to automatically orient the array towards the most energy dense point in the sky.

A new development has been a worm gearbox that reduces the own power demand of the tracker. With the wind warning system that is available as an optional extra, the panel substructure automatically goes into a horizontal safety position in case of high winds. The construction is very slim and the controls are pre-wired very compactly, which save time in the installation.

www.deger.biz

Picture: Deger

Picture: Deger

The photography market Xalino in Herrenberg-Gültstein advertises the fact that they generate their own solar electricity.

"We specialise in photographic printing and produce advertising media, leaflets, posters and the like for companies and photography shops all over Germany," Dominik Zahlen explains. "We want to produce the required energy as environmentally friendly as possible."

As he explains, there were many good reasons why they chose a tracking system. For one, installing a static array on a flat roof always carries the risk of leakage. "Years ago we had a leaking roof," he recalls. "Fixing that was difficult and expensive, and we definitely wanted to avoid that." The second reason was the even load profile. "In the morning when production starts, the tracker is already generating – except maybe in the depth of winter. And this power can then go straight into the production." Yet again, there is the cooling effect that adds to the efficiency of the solar cells: While temperatures on a roof can rise up to 80 or 90 degrees Celsius in summer, panels in free-standing tracking arrays will remain relatively cool and efficient.

Shading saves thousands of euros

And last but not least, the tracker that is positioned to the south of the office windows has a beneficial effect: The translucent glass-glass panels provide cooling shade, but still allow some light in. "The shading alone has saved us several thousand euros," Zahlen shows. "After all, we do not need blinds for our offices." The installation was set up by the Herrenberg-Kuppingen-based company Elektrohaus Brenner. Jürgen Brenner (CEO), who is also an evaluator for photovoltaic installations with the TÜV Rheinland, has designed and fitted many PV installations in the last few years.

Double-glass panels from Wismar

And it is particularly for tracking arrays that he prefers well-engineered and well-built technology and likes to choose proven products 'made in Germany'. "For optical reasons and to get the desired soft shading effect, we decided to employ glass-glass panels made by the Wismar-based manufacturer CS Solar," he explains. "After all, Deger's tracking systems are designed in such a way that they can be fitted with a variety of common panels. The high-end panels look very good, give shade yet are also quite translucent." The tracker at Xalino actually generates extraordinarily high yields even with cloudy skies, as Dominik Zahlen recounts: "When the sky is overcast, my ten-kilowatt array will still generate seven to eight kilowatt hours of power. My neighbour has a static south-facing array and will often struggle to achieve half of that." The snow sensor that Deger offers as an optional extra also brings a big benefit. Here in the foothills of the Black Forrest heavy snowfall is not uncommon in the winter. The snow sensor ensures that when the tracking system is covered in snow, it will tilt the array to vertical until the snow has been cleared off. Once that is the case, the tracker will immediately go back to doing its job, i.e. generating solar power. Xalino's installation has been there since early 2014. It generates about 17,000 kilowatt hours per year. The company currently self-consumes 11,800 of these and feeds the rest into the grid, because the storage system still is not dimensioned to cope with actual yields and consumption.

It feels great

But that is supposed to change soon, as the production floor is to be extended and another self-generation facility installed. "Feeding into

the grid is simply not economical," Dominik Zahlen judges. "Self-consumption, on the other hand, is and also feels great."

For Kraushaar Metallverarbeitung, based in Neuenstein (between Heilbronn and Crailsheim) choosing a tracking system was simply a practical decision: All of the roof space was already covered in static solar panels, and there was not enough land available for a greenfield installation. In order to generate more solar electricity for self-consumption, it was decided to go for a solution involving trackers. It was planned and installed by Blank Electro & Energietechnik in Schöntal-Bieringen.

Pylons eight metres high

In order to design the installation most efficient in terms of space and not to disrupt the lorry traffic on the site, the trackers were placed on eight-metre high pylons. This allows 4.5 metres of clearance even if the arrays are at maximum inclination. The pylons are fixed to the ground using what is known as a Steelroot – a steel construction specifically designed for this application, which made it possible to do without concrete foundations, in spite of the high stresses. By now, Kraushaar is operating four Deger tracking systems, each equipped with 41 high-performance panels by Ben-Q (mono panels, 330 watts). The total output of the entire installation is just over 54 kilowatts. Martin Blank has calculated a yearly output of 80,000 kilowatt hours, three quarters of which are consumed by the company. The Ara Birs wastewater treatment plant in the Swiss town of Birsfelden near Basel also gets some of their electricity directly from the sun. As of January 2014, 20 Deger tracking systems with a total output of about 80 kilowatts generate the power for the treatment plant. The trackers are mounted directly to the concrete walls of the clarification tanks. Each of the Degertracker 3000 HDs is equipped with 12 Sunpower panels. At the same time, Ara Birsfelden generate solar power from static solar panels with a total output of 300 kilowatts. Matthias Ermuth is the project manager and IT expert for Ara Birsfelden. He is in charge of the solar project there. "We have installed five different systems in various parts of the installation, for which we collect the yield data and process it separately." One thing is clear by now: "Trackers consistently produce 40 percent higher yields than static systems. The yield curve for the trackers rises early in the day and we reach 100 percent much earlier than with the static systems."

Trackers bring electricity and heat

Currently, Ara Birsfelden almost completely consume the solar power generated on site. "We feed almost no surplusses into the grid," Matthias Ermuth confirms. "All of the solar electricity goes into our local grid. With this, we cover an average of 15 percent of our yearly energy demand." One private project currently under development in the Bavarian part of Swabia is particularly innovative. It is being initiated by Bernd Vogl, member of the executive board at Grünbeck in Höchstädt an der Donau. The company specialises in wastewater treatment. Now Vogl is seeking to equip his own house with an efficient energy and water management system. A key element is the dual-axis tracking system by Deger, fitted with hybrid panels by Res GmbH from Dinkelsbühl. They combine the generation of solar power and solar-thermal energy. The reverse side has a copper heat exchanger. It draws off heat energy and simultaneously cools the panels – which also increases the electricity yield. The drawn-off heat goes directly into a heat exchanger that then turns it into hot water and heating.

The goal: full self-sufficiency

Because the hybrid panels cool down in the summer, this radiation can be used for cooling using the hydraulic circulation. "I am expecting that this cooling will increase the PV yields by about 20 percent," Bernd Vogl explains. "This gives me a high energy yield for a relatively small surface area. I also like that the trackers involve movement." The system would always remind him of future scenarios from Star Trek, he admits with a smile. For storage, he relies on a Varta unit of 12 kilowatt hours. "I am aiming for 100 percent self-sufficiency," Vogl says. "We will not get there immediately, but I am determined to slowly but surely come ever closer to that goal." ●

CASA AGUILA IN CALIFORNIA

Three Degertracker D60H for a passive house

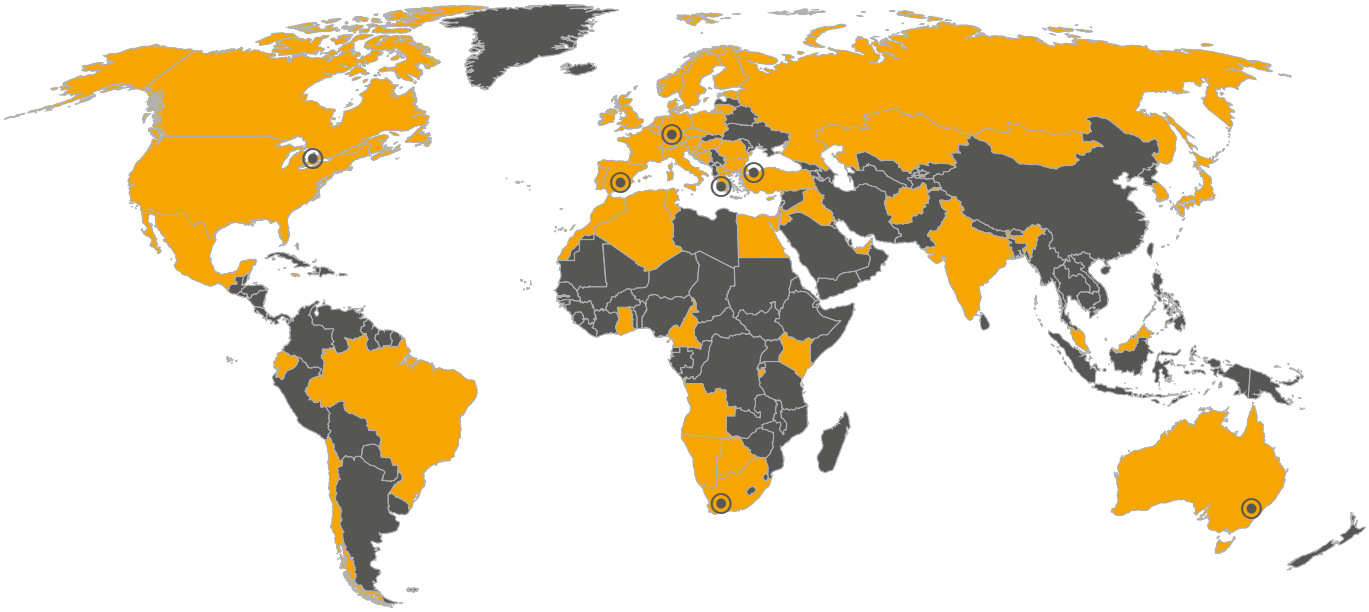
Amy McQuillan and Pete Beauregard lost their home in a devastating fire that raged in California in 2007. They saw this terrible event as a great opportunity and built up a sustainable estate in its place. Casa Aquila, located in the hills of San Diego, is impressive both for its stylish design and modern technology. This modern house is the first certified passive house in California. The greatest challenge was to set up the off-grid power supply for such a luxurious house.

Three Degertrackers D60H with 22 kilowatts in solar panels provide the power for the building. About 44,000 kilowatt hours can be harvested per year. The estate's electricity supply is further provided by a 3.2 kilowatt wind turbine. By combining solar and wind, the house is supplied with their own ecological power for 12 hours per day. Electricity that is not used immediately is stored in a (40 kilowatt hour) battery.

Although it was deemed important to only use electrical appliances that use very little power, the swimming pool system consumes a major part of the generated electricity. Due to the low capacity of the battery, additional electricity still has to be taken from the public grid. But this is very little. Installing a larger battery system (100 kilowatt hours) will allow the amount of power taken from the grid to be reduced to an absolute minimum.

Picture: Deger

WE ARE AT YOUR SERVICE. WORLDWIDE.



- Sales and production locations
- Installed DEGER systems

DEGERenergie GmbH & Co. KG
Industriestraße 70
72160 Horb am Neckar
Germany

Phone: +49 7451 53914-0
Fax: +49 7451 53914-10

info@DEGERenergie.com
www.DEGER.biz