

Making 'construction 4.0' work for solar

AI Digital tools are increasingly used throughout all stages of construction projects. Greencells Group has adapted this principle for use on solar plant worksites - with an Augmented Reality support solution developed in-house.



Credit: Greencells

In terms of digitalisation, the construction sector is still being considered one of the least-developed industries, and solar construction is no exception. But change is underway - construction now sees a surge of new information technology emerging. Tools such as robotics, 3D printing and AI are being adapted to the sector, and some experts predict that 'Construction 4.0', blending traditional and new, digitised ways of working, will be a reality soon.

German developer-EPC Greencells Group has made tech and innovation a focus since its early beginnings. Searching to stay on top of the latest technological developments, Greencells has been among early adopters and forerunners of new technologies in this field. The in-house R&D team developed the company's own customisable mounting

structures and devised more efficient installation techniques for these. The O&M arm generates analytics for predictive and preventive maintenance services in-house, extracting and modelling data from operating plants. Innovation such as single-axis trackers and bifacial modules were speedily adopted and implemented for clients soon after their emergence on the market, at times introducing these new technologies as early movers, for example in projects in South East Asia.

Thanks to this company mindset and its dedicated R&D team, Greencells is now exploring a new playing field when it comes to bringing new technological concepts to the solar sector – Augmented Reality (AR).

"With our remote monitoring and predictive maintenance services, we employ the latest technology in opera-

The use of augmented reality tools can be used to serve various purposes on the site of a solar farm.

tions and maintenance, making the plants serviced by us run stable and generate higher yield by avoiding unnecessary downtime," says COO Patrick Clemens. Coming from a research background at module manufacturer Q CELLS, Clemens also holds the role of CTO. "So while we already employ state-of-the-art technology in aftercare, we realised that we could also push the cursor further in the actual building process of our plants and benefit from digital technology there. With the global scope of our projects, the need for technological support is steadily increasing."

AR soon caught the eye of the R&D team as a possible solution for new challenges. The working principle of Augmented Reality (AR) is to combine camera-captured, real-time images with computer-generated information. With the use of a visor or other AR-compatible device, individuals using an AR solution can overlay information coming from a central database on the actual surface they see in front of them.

Troubleshooting in an instant

Andreas Gisch, head of R&D at Greencells, sees big potential in AR's ability to help when the gap between planning information and operational reality becomes apparent: "We can see many uses for AR from sharing of project documentation to running through checklists, hands-free working, or giving support for critical decision-making.

"But the starting point for us was really the idea of remote assistance for troubleshooting. Most projects run into situations where senior engineer advice is needed, and usually it is needed fast. Working on frequently changing, often remote sites but headquartered in Germany, we wanted to find a better way of supporting our teams and site managers, especially



Credit: Greencells

One of Greencells' on-site engineers using the AR device.

on sites more difficult to reach, usually outside Europe. The question was: How can we solve technical issues in real-time, without having to fly engineers out to the actual site or spending a lot of time sending mails or photo footage back and forth? AR seemed to solve many questions here."

In recent years, AR technology has become more affordable, making the use of AR tools more broadly accessible. Via its AR solution, Greencells can make senior engineer assistance available almost instantaneously. Remote worksites will be equipped with an AR vizor, and integrated in the vizor display is a camera which shows the exact perspective of the team member on site to the engineering colleague in the headquarters. Senior engineers can assess and assist in real-time, giving graphic and audio feedback via the vizor. Ultimately, this means instant troubleshooting, assuring smooth project progress and quality monitoring.

The first trial of the solution was at one of the Group's current worksites in Malaysia, the 43MWp Pekan plant, which is currently nearing the end of construction. At the outbreak of the COVID-19 pandemic, works at Pekan were in full swing, so having the solution there gave this test run an unexpected edge. With lockdown measures coming in as an unplanned challenge in the construction

of the actual plant, the trial soon turned into a communication lifeline.

"Malaysia closed its borders to foreigners in March and suspended works on construction sites for two months. After worksites were allowed to resume operations in May, we were able to give remote assistance to our colleagues on the worksite, making sure works could progress though we did not have the possibility to fly in engineers as scheduled. It was a tough but very realistic test for our solution, and we were glad to have it on site right at that point in time," says Gisch.

The next destination is Europe – the solution is currently being used in a new Greencells worksite in Hungary. Here, further usage will be explored, for example in quality management.

Holger Killian, head of quality management at Greencells, says: "During the lifecycle of our projects, quality management (QM) has different touchpoints with each site. We visit all sites on a regular basis, both securing our internal quality standards and supporting the construction teams with their questions.

"Within our team we rotate between the different sites, making sure that all projects are assessed by several quality managers which in turn gives us a shared panel view on all sites. The Coronavirus crisis and all the changes it brought in a way forced us to re-invent ourselves. Not only is travelling to sites by far not as easy as before the crisis and will stay disrupted for a certain time, we also began to see which types of visits could be dealt with remotely. What we have found is that AR can be very helpful for checks for which the time window to conduct them is very narrow within the construction process.

"A good example are cable trenches. Usually, the aim is to close the trenches as soon as possible to assure stability. While it is a simple check in itself, it is obviously vital to have it done before trenches are closed and should not bring construction work to a halt if the quality manager is still on the way to the site. AR is a very helpful tool here to do a quick and efficient remote check.

"The solution will make us more independent of travelling and less exposed to sudden changes in travel regulations. Timings are assured. But for sure, AR will not replace QM site visits completely. To be personally present is important and will remain part of our quality procedure. This is also true for

the final site visit with our clients and Technical Advisors. But where it makes sense, this solution will help us reduce costs and time, and give us the possibility to react very quickly when needed. And after all – less travelling also means less CO2 emissions, the ultimate goal of renewables."

Further usage is foreseen in O&M. Greencells currently manages an O&M portfolio of over 260MWp worldwide. The company's approach to O&M spans preventative, predictive and corrective maintenance. Analyses for preventive and predicative maintenance already leverage extensive data mining from running plants, with considerable manpower and technology employed in the German headquarters to steer these activities. The road ahead using AR promises to bring advantages here as well, especially when it comes to scheduled reviews or repairs of running plants. In this context, the new technology can also enable the company to work with local technicians for repair and replacement of defective components by guiding them remotely with support from an expert. This will help to intervene fast when needed and further increase plant availability.

"Using AR solutions is a big opportunity for us to be present globally while assuring our working standards, even in the most remote worksites. The rule of thumb would be – as long as there is an internet connection, we can give support on site in real-time despite distance or time difference," says Clemens. "This is very important for us as we want to deliver our high-quality results equally in all projects, no matter the geography. It will also help in promoting our efforts in employing local workforce in the countries we operate in. Depending on the region, finding technically trained personnel still remains a challenge. This is why we are looking into a scheme of giving local workforce specific technical training for skills required in the construction and maintenance of solar plants. Using our solution, we would be able to have senior technical staff conduct training sequences remotely from their desk in Germany."

What might have still sounded futuristic about a year ago now is a welcome tool to tackle current and future challenges for Greencells in their construction projects. Another example of technological acceleration rapidly changing the status quo.