



## Bright science taking solar to new heights



Madelon Janssen

The power of the sun is immense. But capturing this power efficiently and turning it into sustainable energy is no easy task. Solar module manufacturers and project developers are therefore always on the lookout for new technologies and materials that amplify the power generated by solar systems. As a renowned materials supplier with a long track record and a strong scientific background, DSM offers several advanced solar solutions that significantly enhance the performance of solar modules and systems. PES meets up with Madelon Janssen, RT&D Director at DSM Advanced Solar, to talk about DSM's contribution to the industry and some exciting new additions to its portfolio.

**PES: Could you briefly introduce DSM and how you currently serve the solar PV industry?**

**Madelon Janssen:** DSM is a globally operating science-based company that focuses on health, nutrition and materials. We have also long been active in the field of renewable energy, including biofuels and material applications for wind and solar energy.

At DSM Advanced Solar, we focus on innovative materials that can be applied in the entire solar value chain. To do this, we challenge every aspect of module and system design to maximize output and returns. We're currently a leading player in anti-reflective coatings, with more than 200 million PV modules using our coating technology worldwide. We also offer an innovative Anti-Soiling coating for PV solar glass, and we manufacture high-performance Endurance backsheets.

**PES: DSM works in many industries. How important is the solar sector to DSM?**

**MJ:** The solar sector is very important to DSM, as solar energy will be one of the major renewable sources in the future energy mix. The solar PV market is growing strongly. In fact, growth is exceeding expectations year after year. This makes it a very interesting global growth market for DSM. We can see its huge potential, and

we aim to contribute to it by developing innovative solutions throughout the value chain. What's more, investing in the solar sector also contributes to DSM's strategic sustainability mission.

In that light, we've recently been broadening our portfolio of solar products and materials, and we've also taken significant steps in terms of global expansion. This means we're getting a better stronghold in the various regions that are leading the way in solar, such as India, China and the USA.

At the same time, we've made good progress in developing our capabilities. With our anti-reflective coatings, we're already the innovation leader worldwide. More than 50 GW of modules produced feature our coating technology. We aim to grow this leadership position by further expanding our portfolio of materials for solar PV. We're accelerating this by investing in new partnerships, for example.

**PES: Your company is a science-based company, what does this mean in practice for solar PV?**

**MJ:** You can view this from two angles. First, if you look at solar PV, we need many more innovations that can further improve the efficiency and returns of solar PV modules. Over the past decade, returns on solar panels have already doubled, but in

practice, efficiency is still at only 20%. There's still a lot to gain, and this can only be achieved if all players in the solar PV field are willing to keep innovating. This innovation drive will not be one 'big bang', but rather the sum of multiple contributions. Our anti-reflective and anti-soiling coatings are good examples of this.

Secondly, DSM has a long track record when it comes to materials for the automotive, electronics and construction markets. All this expertise and all these capabilities that we've built up over the past decades put us in an ideal position to develop new and innovative materials for the solar PV sector.

**PES: We have heard about your new Solar Technology Lab. Could you tell us more?**

**MJ:** The Solar Technology Lab is a newly built lab close to our headquarters in Geleen, the Netherlands. In this lab, which opened its doors in June this year, we can scale up our new products in a realistic application setting to see how they work in practice. We also set up samples for customers here, and we can help customers with research questions and resolve any specific problems they may have.

In addition, we use the lab to test how we can best apply new technologies, such as coatings, to our customers' products. We





have, for instance, a forward and reverse roll coater to apply our anti-reflective coatings on full-size commercially available solar glass, and we possess several in-house developed methods to accurately measure the optics and visuals of these large coated glass plates. We can also perform alternative curing and coating techniques, such as flame curing and slot die coating. We're currently constructing a similar-sized setup for module lamination.

Because everything is done on a solar panel scale, the Solar Technology Lab is a great addition to our research labs, where we test things on a much smaller scale in earlier stages of development.

**PES: Why did you decide to create the lab and how does it benefit the end user?**

**MJ:** The lab is essential for achieving our solar growth ambitions. We keep adding new technologies and new equipment, and it's big enough to support our growth in the future. It's not only a great testing ground for our own products, but it also enables us to help our customers with their specific research questions. To accelerate progress in solar PV technology, collaboration is very important.

There are so many aspects that determine the performance of solar panels: the solar cells, packaging materials, the glass, the way the panels are incorporated into the solar park, and so on. Everything needs to

be taken into account, and that's why you need to work together with all players involved, each with their own expertise and background. The lab enables us, together with customers, partners and knowledge institutes, to make much quicker progress in terms of knowledge and technology development.

Eventually, this will result in new products and technologies that have already reached a certain level of maturity before they're applied in practice. This obviously enhances their chances of success.

Another advantage of the lab is that it enables us to connect theory and practice. For example, over the past few years, we've built up a strong competence in the modelling of PV panels and systems, calculating the impact of minor changes made to a panel. The fact that we can now also validate these results in practice in our lab certainly adds value to the services we deliver, both internally and externally.

**PES: How important is it for DSM to work in partnership with others?**

**MJ:** Very important. As DSM is very strong in materials, we're often the driving force in product development partnerships. Nevertheless, we can't do everything on our own, so if we see start-ups or universities with innovative ideas for new

products, we're always interested in partnering up with them to help them scale up and market their solutions. A good example is our acquisition of a new backsheet technology earlier this year. Together, we're now developing this technology further.

When it comes to new application technologies, we need to be sure that they can be applied at scale by solar panel manufacturers, who are producing panels in huge quantities these days. We therefore work closely with renowned manufacturers, as well as with start-ups with bright ideas in this regard.

In addition, we work together with solar institutes such as ECN, NREL and Fraunhofer Institute for Solar Energy Systems in Germany, a global player in the field of solar panel test parks. Fraunhofer ISE has also helped us set up a world-class test facility on our roof in Geleen, which enables us to measure tiny differences in parameter settings.

Finally, we collaborate with customers and certification institutes to ensure our materials meet the necessary conditions and requirements. For example, in China, we work closely with CPVT, a government institute responsible for testing solar panels. And as new materials keep entering the market, we also develop new testing methods together.

Thanks to all these partnerships, we are now at the forefront of PV solar innovations, with in-depth knowledge of how solar materials function in solar PV installations.

**PES:** Could you tell us more about your advanced test sites? Who uses them, and what tests do you perform?

**MJ:** DSM currently has three test sites where solar panels with our materials are placed outside 'in the field'. These are spread across the globe, so we can test in different climates and circumstances.

In Europe, we have a small research test site at Geleen, where we can measure variations very accurately on solar panel level. In India, we test our materials at a 1 MW PV plant, which produces electricity for our Engineering Plastics production plant. Here we test our materials for the shorter and longer term, often at 'string' level. Our third test site is located in Shanghai, China, at a DSM Nutritional Products plant, which is comparable to our Geleen site. This test site enables us to show the performance of our products close to our Chinese customers.

Besides these three test sites, we also make use of a number of test sites of external parties and institutes, including in different regions, such as the United States and the Middle East.



With regard to the types of tests we carry out, the most important ones are those in which we measure the impact of various parameters on the amount of electricity generated, the impact of weather conditions, and so on. In addition, we use the sites for testing cleaning protocols and application development, such as an anti-reflective coating for existing solar panels, one of our

new aftermarket solutions.

**PES:** Could you tell us more about your current and future projects?

**MJ:** Our Anti-Reflective coating is very successful, and we will continue to develop it to remain innovation leader in this field. In addition, we recently launched our Anti-Soiling coating, which has both anti-reflective and anti-soiling properties. In collaboration with partners and customers, we're now testing this coating on a larger scale. We're also scaling up the market for our new backsheets.

In addition, we have a number of development projects. First of all, we're working on an innovative electro-conductive backsheets, which will help to make back-contacted modules work more efficiently. This project is going well, and we expect a commercial launch in 2018. Finally,

we're working on aftermarket solutions for solar panels that have already been installed, such as an anti-reflective coating for older-type solar panels.

For longer-term research projects, we're working closely with universities and knowledge institutes, including the new MIT DMSE NanoLab in Boston.

*'It's a very dynamic and exciting world to operate in. And there's so much potential!'*

**PES:** What specific benefits will these new developments bring to module manufacturers, project developers and the market in general?

**MJ:** There are multiple benefits. Our Anti-Reflective coating significantly improves the efficiency and returns of solar panels. Anti-Soiling coating has clear benefits for the solar park owner, who will see output go up while saving on cleaning costs. And our Endurance backsheets particularly benefit manufacturers, by combining an efficient production process with excellent durability and recyclability.

**PES:** What do you think makes DSM stand out from the competition?

**MJ:** First and foremost, this is DSM's strong background in polymer materials. Over the past few years, with the help of our partners, we've now also built up a strong expertise in solar PV. This combination makes us unique in the market. In addition, as DSM Advanced Solar, we're strongly supported by the overall DSM strategy, which emphasizes the importance of renewable energy for a sustainable future.

In our product propositions, we always do more than just focus on improving efficiency and returns — we also consider how processes can be optimized and how the product can be made as 'green' as possible.

**PES:** What is your outlook for the coming years?

**MJ:** I see an exciting future ahead of us. Solar PV continues to grow, creating new needs in the market that we can tackle. Our pipeline contains some great new products and technologies that we will work hard to develop further so they can be applied in the field. I'm confident that these solutions will help the market move forward. It's a very dynamic and exciting world to operate in. And there's so much potential! A lot of valuable research is being done worldwide.

DSM will definitely play its part in turning all this bright science into practical implementations and making clean solar energy a reality for all. Same sun. More power.™

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