

The heat is on for sensor technology



With the pace of the industry shifting up a gear, new projects and technologies are implemented and PV plants are upgraded much more frequently to optimise energy yields. We were keen to speak to Kees Hoogendijk, Managing Director of EKO Instruments Europe B.V., to find out how manufacturers are able to respond to this demand.

PES: A very warm welcome back to PES Kees. We've spoken before of course, but for readers who may be unfamiliar, can you please give a brief introduction to EKO Instruments?

Kees Hoogendijk: Of course, and thank you. It is always a pleasure to talk with you. At EKO Instruments, we have a nearly 100-year history of designing and developing scientific instruments, systems, and sensors used worldwide for climate and environmental research. Headquartered in Tokyo, with offices in Europe and the US, a strong presence in India and China, EKO continues to grow.

Today, our products play a critical role in the success of large-scale renewable energy projects through continuous innovation, industry-leading turn-key solutions, and an uncompromising commitment to quality.

PES: In previous meetings, we've briefly spoken about Pyranometer Dome Heating and EKO's new flagship MS-80SH which launched in the second half of 2022.

However, the story began with the MS-80, which set new industry standards when it launched back in 2016, didn't it?

KH: Before the launch of the MS-80 in 2016, conventional pyranometers could not accurately capture rapid changes in solar radiation. The MS-80 was our solution, a next-generation 'fast-response' pyranometer. Heating was also not common at the time, and for this we had an external heater/ventilator unit, the MV-01, which we still use for extreme weather conditions.

Subsequently, we introduced the MS-80S in 2019, addressing the need for digital outputs and adding functionality through our proprietary software, and now we've added the MS-80SH, which has low power consumption and integrated solid-state heating, actively resisting dew and frost build-up on the dome.

PES: And now the MS-80SH is award-winning. Can you tell us some more about that?

KH: Yes, we were delighted to get the news at the start of the year that the MS-80SH won the PV Magazine Balance of System (BOS) award. As the award jury noted, the MS-80SH

is packed with features and has the most power-efficient dome heating which can be toggled on/off remotely. In terms of cost, specifications and functionality, it's a game-changing sensor for the industry, and we're excited to add it to our Class A Pyranometer line-up.

PES: In fact, would we be correct in saying that every generation of the EKO Pyranometer has won awards?

KH: That's right, the MS-80, MS-80S, and MS-80SH have all won awards, including the 2018 Invention Grand Prize and the 2021 Minister of Education, Culture, Sports, Science and Technology (MEXT) Science and Technology Award in Japan. In 2022, our President was also awarded the prestigious 'Medal with Yellow Ribbon' by the Japanese Government, recognising the MS-80 and MS-80S for their contributions to society.

And most recently, the MS-80SH won the PV Magazine BOS Award. We set out to make the best Pyranometers available, and it's nice to see that people are noticing.

PES: What do you think this success can be attributed to? Is it all down to the way the design is continually optimised?

KH: With the success of the MS-80, we wanted to keep what worked so well with



that design, but continually add features that solve the problems and needs of customers around the world. In Japan, we also have two PV plants that help our designers, engineers, and salespeople to understand the needs and challenges experienced by many of our customers.

PES: Presumably, customer feedback is an important part of the optimisation process?

KH: Exactly, we are listening at every stage. We heard the concerns of industry professionals about power consumption, offset behaviour, maintenance, and compatibility; we took these all into account when developing the MS-80SH.

PES: It must also impact all areas of your Research & Development, is that right?

KH: Yes, and our R&D team doesn't rest on its laurels. They continuously push the boundaries of what's possible. The new MS-80SH's <1.4W total power consumption has the most efficient dome heating available in any Class A Pyranometer and has been carefully designed to avoid affecting the thermopile sensor characteristics.

Intrinsically due to the low offset characteristics of the MS-80, the body was designed to handle active heating very well, so adding this function is something we've considered for a while, but we took more time and extra care to research, test and develop before introducing the best solution.

It was important to fully understand the phenomenon of condensation on the dome and its impact on measurement accuracy.

We now have more than one tested and validated solution for this, so it's about offering the best one for each use case.

PES: How much of a bearing does the changing landscape of the solar sector also have on how you develop and adapt your products?

KH: As evidenced by the growth of bi-facial PV and agrivoltaics, it's clear that we are learning and implementing new ideas in the solar sector, and the technology needs to keep up, or in our opinion, be one step ahead.

There are also updates to the requirements of international standards like IEC 61724-1. The most recent of which adds dew & frost mitigation as a requirement for 'Class A' monitoring. But again, it's not enough for us to meet the requirements; we aim above and beyond, to anticipate and future-proof our sensors.

PES: How does this differ across the several territories that EKO Instruments covers globally? Is there a noticeable difference in customer demand in Europe as opposed to India and South Asia, for example?

KH: The PV industry is highly dynamic, and changes in the economy and climate of each region play a major factor. We've seen a lot of growth and adoption recently in countries like India and Brazil, but the Middle East is also eager to grow in this field and we saw that enthusiasm at the recent WFES event in Abu Dhabi.

Crucially, there's an urgency now. In the past, PV systems and projects were



Kees Hoogendijk

installed on a 25-year basis, but the pace has really picked up. Today, new projects and technologies are implemented and PV plants are upgraded much more frequently to optimise the energy yield. And we see clear trends; Class A sensors are leading the way, and more people are realizing the best quality measurements are needed to immediately detect PV system performance issues, and act accordingly.

PES: The MS-80SH Pyranometer is particularly suited to complex meteorological networks, hard-to-reach locations and PV monitoring networks with restricted access. How in demand is this

Validating Vs Dew

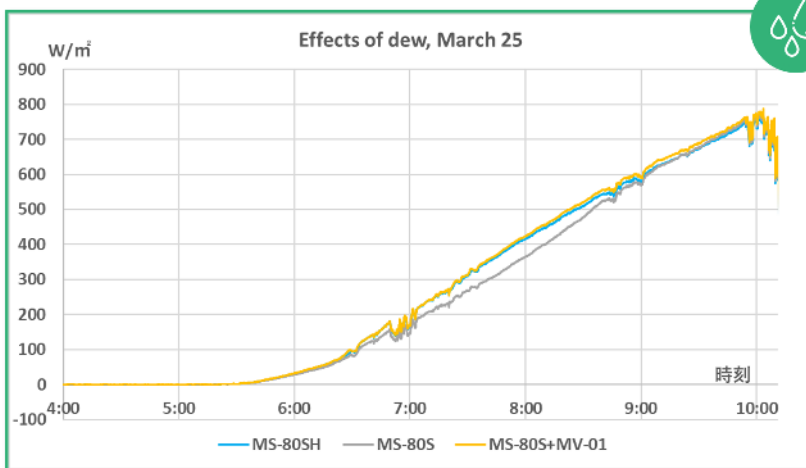


FIGURE 1: Example of solar radiation measurement data when overnight dew occurs

In the example shown in FIG. 1, the MS-80S, with no dew or frost mitigation experienced an error due to the adhesion of dew to the dome overnight.

The maximum value of the observed error, over a 2-hour period in the morning was 14%.

The MS-80SH and MS-80S with MV-01 Ventilator & Heater meanwhile protected the sensor dome from the build-up of dew.



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Validating Performance



MS-80SH w. Integrated dome heating



MS-80S



MS-80S w. MV-01

Experiment location:
EKO Ami Solar Park,
Ibaraki Prefecture, Japan

kind of technology in such situations and how has this changed since the initial launch of the product?

KH: So far the response has been fantastic, and we are continuing to see demand for this solution grow exponentially. Reducing cost, maintenance, and optimizing system integration with the same industry and class-leading specifications were all major goals when we developed the MS-80SH. Without the need for a ventilation unit in most cases, you have fewer components to install and maintain, not only in parts of the world prone to dew and frost but also in desert environments.

When we were in the Middle East recently, we observed many installations using traditional ventilation units to reduce offsets and mitigate condensation and soiling. In a desert, external units with fans can increase problems related to soiling and the limited life span of the motor. When the fan stops, many people don't realize that for most sensors the offset characteristics will change. The MS-80SH has been well received

as a proper solution to be installed in any harsh and challenging environment.

PES: Focusing on the solar industry as a whole now, how has this evolved since you have been involved in the sector?

KH: The emphasis on renewable energy sources has never been more prominent than now, and increasingly people are realizing the vital role that pyranometers play. It's through instruments like the MS-80SH that we can control costs, increase efficiency, and modernize solar PV systems, and all the more so when you're using the highest level of this technology.

PES: What do you think the next advancements in technology may be? Can you let us in on any secrets your R&D department has in store?

KH: There will be new products introduced to the market this year. We are working on an exciting new concept that we believe can create a great advantage for solar resource assessment in bi-facial PV monitoring applications.

PV modules and the surrounding technology must improve if we're to combat climate change, and that includes pyranometers. As you can see with the evolution from the MS-80 to the MS-80SH, we don't stop. Like heated seats and rear-view windows in cars, I think we'll see heating in pyranometers become more common, but the MS-80SH represents a real breakthrough, and when we consider what configurations it can be used in, the possibilities expand greatly.

Like with the MS-80S, we can use two of them to measure albedo in a bifacial PV setup, or in conjunction with DNI sensors to make compact, tracker-less solar monitoring stations like the MS-90 Plus+. When systems are composed of the best sensors, suddenly, you have the most accurate albedometer, solar monitoring station, etc.

I'd keep an eye out for creative solutions like these, and more notches added to EKO's history of firsts.

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