



The simple missing link



Xander van Mechelen, CTO, Kipp & Zonen

Xander van Mechelen, CTO of Kipp & Zonen, dropped in to tell PES about the DustIQ, the simple missing link in a mature solar energy industry. It has been quite a year and 2018 is also full of promise.

PES: We are pleased to welcome you back to PES Solar/PV magazine. For our new readers would you like to begin by explaining a little about the background of your organisation and how you currently serve the solar/PV industry?

Xander van Mechelen: Kipp & Zonen is an instrument manufacturer founded in 1830 and in the last few decades the business and R&D have mainly focused on meteorological instruments, based on the measurement of solar radiation.

In recent years solar energy has become a significant market for Kipp & Zonen; initially with traditional 'passive' analogue pyranometers and later we set the

standard for digital, smart instruments.

PES: We have been reading and hearing about your new DustIQ. Could you explain to us what it is? What motivated Kipp & Zonen to develop such a project?

XvM: Sometimes it happens that in large industries like solar power there is still an opportunity to develop an instrument that is not there, but for which there is a need. This is extremely exciting. It all started in 2015, when Kipp & Zonen felt the urge not to sell only solar radiation sensors, but to understand the exact needs of solar energy customers.

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The need for DustIQ struck at a very specific moment in 2015, while talking to Xavier Daval, CEO-President of kiloWattsol. He told us that we have undisputedly the best instruments, but these instruments are mostly 'laboratory' instruments. He then took his phone out of his pocket to show us all kinds of pictures of badly installed instruments and soiled pyranometers. We also saw photos showing solar plants with soiled PV modules.

It was at that moment that I realised the solar industry was reaching maturity and needed to add cleaning maintenance. So the concept of DustIQ was born and we took on the technical challenge to make it happen.

PES: Is it suitable for use in all climates, cold and hot, wet and dry and how does it work?

XvM: DustIQ can be used in all conditions. Normally solar plants are located in temperate or hot climates and all the components in DustIQ are designed for operation at high temperatures.

In moderate climates with regular rain showers, such as France or the Netherlands, cleaning of solar panels is not always necessary. In these situations however, we found out that it is not O&M companies driving the procurement decision, but investors; they like to know the breakdown of effects on the Performance Ratio. Knowing the exact effect of soiling on yield is important to them, apart from cleaning schedules.

DustIQ is based on blue LED light emitted to the bottom of a glass plate and measuring the reflection back from it with a photodiode. The DustIQ plate is mounted at the same tilt angle and with similar glass and coating to the adjacent PV panels. When the plate is 100% clean, no light is scattered back to the photodiode that is placed outside of the 'clean' reflected beam. With increasing soiling, there's more back-scatter and an increasing signal at the photodiode.

This can be translated directly to the yield/power loss of a PV module, both theoretically and in practice – we've tested it of course. The measurement



does not depend on sunshine, it works day and night.

We found that the response curve of the measurement is only dependent on the colour of the dust, not on the chemical composition or grain size. Also, the DustIQ detects snow and dew in the morning.

This is very useful for scheduling cleaning; clean too early is no good because it smears out wet depositions over the PV panels. When waiting too long however, the particles can be cemented to the glass due to the heat of the sun. Cleaning is a just-in-time business between dew and morning sun.

DustIQ information can also be used as the trigger for automatic cleaning systems.

PES: What sort of installations is it suitable for – domestic, industrial, etc?

XvM: Due to the size and price and communication technology, the instrument is most suitable for industrial and utility-scale PV plants, particularly for a network of instruments, which monitor the variations in soiling rates across large sites. We are working on business models for commercial rooftop applications as well. Residential applications are not really in

our scope yet.

PES: Could you tell us about some of the feedback you have received since it has been in use?

XvM: DustIQ was launched at Intersolar 2017 in Munich and the reactions were overwhelming. The word 'super' was mentioned frequently and some visitors simply stood there with their thumbs up to show their surprise and appreciation for the simplicity of the idea behind this missing device, in the quite mature solar energy market.

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PES: What are the advantages of this system to the end user and is it cost effective? What makes your product stand out amidst the competition and how do you intend to stay one step ahead?

XvM: DustIQ has many advantages. The price is only a fraction of incumbent technologies and it is much smaller and easier to install.



DustIQ can be simply mounted to the top or side, or between, PV panels in an array and it is economic to place units at several locations across a large solar plant. It's not always necessary to clean the whole plant, as soiling rates vary over the site. DustIQ helps you to decide when and where to clean.

Another advantage, not covered by incumbent technology, is that the DustIQ gives representative measurements, since wind conditions on the instrument are the same as experienced by all the adjacent PV panels, especially when placed amidst an array.

The most important feature from a customer perspective however, is that the instrument has no moving parts and does not need daily cleaning. DustIQ experiences the same soiling patterns as PV panels and should only be cleaned at the same time as the panels.

DustIQ is Smart with Modbus® RS-485 digital communication. To make life really easy for a user, we also include a PV module temperature sensor that connects to the DustIQ. Our Smart digital SMP pyranometers can also be connected to it, for GHI and POA irradiance measurements.

All the data; soiling, irradiance and module temperature can be accessed through a single cable. DustIQ can thus be easily retrofitted at locations where customers already have a SMP pyranometer installed.

The business case for O&M is really straightforward and is a function of costs: cleaning costs, intervals of cleaning, number of DustIQ instruments purchased and benefits: more yield in MWh. For investors, the information helps to inform and optimise the Performance Ratio, which is a driver in itself.

PES: How easy is it to use and is specific training needed?

XvM: There really is no training required. The instrument uses the same data format as our SMP Smart pyranometers. Its plug and play, the instrument comes with simple mounting clips and fits onto standard panel frames and mounting structures.

The output is the Soiling Ratio (100% = clean, 0% = completely dark and covered by dust), which directly translates to power loss. All a customer has to do, is select the local dust colour that matches a type on the colour card supplied with the instrument. The appropriate 'sensitivity value' from the colour chart is entered into the DustIQ memory and you are ready to go.

PES: What are the next steps to be taken? Has DustIQ been tested and validated?

XvM: The instrument has been tested for more than half a year, with many different natural and artificial soiling samples, on the roof of the factory in Delft. The test results are convincing, but we are also doing field tests at three independent research institutes in different locations.

PES: Do you have many orders and in view of this revolutionary technology, will you be able to keep up with the demand?

XvM: Over 100 pre-orders came in after the launch at Intersolar. Delivery of the first batch is expected to be in early November, mainly due to optimisation of some of the product parts with suppliers and the summer holiday season.

We have expanded the production area at the factory and are right now arranging a dedicated facility for the DustIQ. Capacity will be at least 100 instruments per week.

PES: Do you have any other projects on the horizon?

XvM: At Intersolar we also launched our new Smart RT1 rooftop sensor for POA irradiance and module temperature. Right now we are finalising this as a plug and play hardware and software solution, along with other companies.

PES: It seems that 2017 has been a good year so far for Kipp & Zonen, how are things looking to the end of the year?

XvM: 2017 will enter the books as a historic 'innovation year' for Kipp & Zonen. Along with DustIQ and RT1, we will launch a new product for the meteorology market at MTX in Amsterdam in October and we are already testing the prototype of an exciting new solar product to be launched at Intersolar 2018.

The solar energy business has our full attention, and with the continuing market growth, the second half of 2017 and the years to come look very promising indeed.

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