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If you have a news item for the newsletter or want to share your experiences with Kipp & Zonen applications and contribute to our next issues, please e-mail the editor: kelly.dalu@kippzonen.com

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Kipp & Zonen B.V. - 2016



The Clean Energy Race - Full Speed Ahead

In The Netherlands, days have more and more daylight as I write at the end of February. Everybody is desperately longing for spring after a mild winter with cold and wet weather. At the same time, our Campbell distributor in South-Africa just experienced an intense heat wave last week, and is ready to go into the cooler days of the approaching autumn. Doing worldwide business is just as cool as the sun is hot. Winter or summer, day or night, the one physical reality that all our Kipp & Zonen partners experience at any time is our atmosphere.

Less and less is this atmosphere the exclusive hobby or specific interest of a small group of scientists, instrument engineers and meteorological institutes. The atmosphere belongs to us all, and nowadays many of us have an opinion on its health and future. 2015 was the hottest year in recorded history and there was no ice-skating on Dutch canals.

Oscar winner Leonardo DiCaprio explained in his speech at the awards, that the production team of The Revenant needed to move to the southern tip of our planet just to be able to find snow. "Climate change is real, it is happening right now and it's the most urgent threat facing our entire species, and we need to work collectively together and stop procrastinating". Awareness is growing rapidly, and many important people are claiming ambassadorial roles.

Next to that, renewable energy technology is improving day after day; governments dare to take firm measures and grid price parity rapidly turns from a vision into reality. Calculations show that for the significant US solar market, solar energy could outperform fossil fuel prices within 3 years. On the 18th of December 2015, US legislation was signed into law to extend the Solar Investment Tax Credit (ITC), thereby giving another boost to the solar industry until the end of 2019 and leading the way to grid price parity.

Kipp & Zonen is a modest company and has not the potential power of celebrities or multi-nationals, but we take our responsibilities seriously, where we can, to support the transition to renewable energy. Product innovation and product quality are our natural pillars, but in 2015 we also started to implement local calibration facilities worldwide in order to save transport costs and data outages for our customers.

We introduced a 5 year warranty for most of our radiometers in January 2016, not only to emphasize the importance of good measurements and the value of sustainable quality products to existing customers, but also to help upcoming markets in their learning curve that typically starts with low-end measurements.

Finally, Kipp & Zonen is a sponsor of business-related events and research, and we are proud of the Technical University of Delft team, who won the 2015 Bridgestone World Solar Challenge, a prestigious 3000 kilometer race between solar cars. Read all about the challenge in this newsletter, and get inspired to join, or further accelerate, the 'Clean Race' of Solar Energy and Atmospheric Science in 2016.

Xander van Mechelen - CCO of Kipp & Zonen B.V.

Warranty Extension to 5 Years for Solar Radiation Measurement Instruments



We are proud to offer our customers a free extension of our standard 2-year warranty to 5 years on the majority of our solar radiation measurement instruments! Our unparalleled history of almost 100 years of quality and reliability supports this insurance for our customers.

Unparalleled proven quality

Kipp & Zonen has been manufacturing pyranometers since 1924 and this experience makes our instruments the very best available for solar radiation measurement. Although we have continuously been improving our instruments, and bringing new versions to the market, our service records tell the story of outstanding quality and reliability throughout all those years.

"We wouldn't offer a guarantee of this magnitude if we weren't completely confident that our instruments are the most reliable available today," explains Jan-Willem Sips, Business Developer Services at Kipp & Zonen. "Our passion for precision results in the high quality and stability of our products. Our extended warranty completely supports that focus and offering it for the industry's favourite pyranometers was not a difficult decision."

Michael van Alebeek from our support teams adds: "For recalibration, we often receive products more than 20 years old that are still performing within the original specifications! The other day we calibrated for a well-known research institute in Germany a CM11 pyranometer made in 1992.

Thanks to ongoing good maintenance we only had to inspect it, clean the dome, calibrate it and send it back to the customer as good as new."

Our instruments are deployed in a variety of climates around the world; from harsh and extremely cold Arctic regions to hot, dry and dusty desert areas. But, when well taken care of and properly maintained, we are confident that we can offer a 5-year warranty to our customers

Calibration required

Good care and maintenance will ensure a reliable operating life for your instruments; such as cleaning the dome or window, regularly checking and replacing the desiccant (of instruments that require it). But also, a bi-annual recalibration is strongly recommended to maintain the accuracy of the measurements.

For the warranty extension to 5 years to be valid we do require that a recalibration is carried out within the third year after purchase at a facility approved by Kipp & Zonen. We will help you to keep your Kipp & Zonen instrument performing at a high level and you can always contact our support team for questions and advice on maintenance.

Register to activate your warranty extension!

In order to obtain the 5 year warranty extension you only have to register your instrument within 6 months of purchase. Go to www.kippzonen.com/register ■

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Instruments available with warranty extension to 5 years

We offer a free warranty extension for the following instruments, purchased from January 2016 onwards:

- All our CMP series pyranometers; CMP3, CMP6, CMP10, CMP11, CMP21 and CMP22
- All our SMP Smart pyranometers; SMP3, SMP6, SMP10, SMP11, SMP21 and SMP22
- All our pyrhemeters; CHP1 and SHP1
- All our pyrgeometers; CGR3, SGR3, CGR4 and SGR4
- Our total UV radiometers; CUV5 and SUV5



Passion for Precision

Victory in Australia for the TU Delft Nuon Solar team

By Emiel Lorist, responsible for Strategy, Nuon Solar Team - The Nuon Solar Team from Delft University of Technology builds solar powered cars for the bi-annual Bridgestone World Solar Challenge, a race of 3000 km through the Australian Outback from Darwin to Adelaide using purely solar energy.



The Nuon Solar Team with Nuna8

For the race in 2015 the 15-member team again partnered with Kipp & Zonen. Driving on solar power requires precise measurements of PV panel efficiency and solar irradiance. In the past we had access to CMP6 pyranometers, but for the most recent race Kipp & Zonen supplied us with brand new SMP10 Smart pyranometers to optimise the performance of the car, Nuna8

Telemetry

New sensors are always fun to play around with, but in order to be useful for us during the preparation for the race, and during the race itself, they need to be integrated into our Mission Control App. This is a Java® application that runs in the support vehicle driving behind Nuna8. It combines the data from all the sensors in Nuna, sent over WiFi, with data from sensors mounted on the support vehicle; such as an anemometer, GPS receiver and a pyranometer.

The Mission Control App combines and visualises all the received data, enabling us to monitor the performance of Nuna8 and compare it to the strategy predictions.

Our previous Kipp & Zonen CMP6 pyranometers, connected to a laptop with a LabJack analogue-to-digital converter, were already integrated into this application. However, our brand new SMP10 pyranometers could be connected directly to a computer using the RS-485 Modbus® interface. This eliminates the need for a converter, providing better accuracy and more information on the measurements made by the pyranometer.



Mission Control App data visualisation



Pointing a SMP10 at the sun near the horizon

Because of the extensive documentation of the Modbus® implementation in the SMP10 provided by Kipp & Zonen, integrating it into our Mission Control App was quite easy. Before we knew it we had solar irradiance readings in the app from our new SMP10 pyranometers through the Modbus® interface!

Testing

With the pyranometers working in our App we headed to Australia ready for some testing. We first flew to Adelaide, the finish of the Bridgestone World Solar Challenge. From there we made our way up to Darwin, to prepare the convoy and experience the route the other way around.

During this trip up, the SMP10's were already in use. In the middle of the desert we collected morning and evening solar irradiance data. With one SMP10 pyranometer pointed at the sun and the other at the zenith, we gathered data on the diffuse fraction of the solar irradiance in the morning and evening.

During the day, under a clear sky, the difference between global horizontal radiation and the direct incoming radiation from the sun is a relatively easy sinusoidal calculation, as the fraction of diffuse sky radiation is relatively small compared to the direct radiation. But, in the early morning and late evening the radiation has to travel a longer path through the atmosphere before it reaches the surface, thus increasing the amount of diffuse radiation, which makes this diffuse fraction relevant for predicting the power generated by our PV panels.

This pyranometer data was very valuable information, as Nuna8 is stationary between 5pm and 8am and during this period we aim our charging solar panels at the sun.

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Cleaning the PV panels during an overnight stop

During our stay in Darwin in preparation for the Bridgestone World Solar Challenge one of our CMP6 pyranometers was placed stationary on the roof of our workshop. The data that we gathered in this fashion was compared to the weather predictions of various meteorological bureaus and this provided us with some new insights in terms of reliability and bias of these weather predictions.

These weeks before the race were designated for performance tests of Nuna8. The power usage of the car driving at various speeds and with both head and tail winds was extensively measured by driving on the Cox Peninsula Road, near our workshop in Darwin. The performance of the solar array on Nuna8 was measured as well, using an SMP10 pyranometer to calculate the efficiency of the PV panels. Both in static tests at our workshop and while driving on the Cox Peninsula Road these pyranometers provided us with accurate measurements of the solar irradiance.

While driving, the fast response time of the SMP10 provided accurate measurements, even when trees or small clouds would partially shade the road. Together with the excellent temperature compensation this was a huge improvement over our older CMP6 pyranometers. This accuracy enabled us to map the temperature dependence of the solar panels, and even the efficiency increase after cleaning the panels was measurable.

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The race

To calculate the speed that we can drive during the race we take the models from our testing trajectory and combine these with weather predictions for the route that we will be driving. This gives us an optimal speed profile, if the models of Nuna8 and the weather predictions are correct. If our car model turns out to be incorrect, we will notice this quite easily in the data that we get from Nuna8, visualized in our Mission Control App, and we can adjust the model with new data.

To validate if the weather predictions are correct, we use an anemometer for the wind and our two SMP10 pyranometers for the solar irradiance. With these sensors mounted on three vehicles, we have real-time data from moving weather stations. Combining this data gives us insights into the performance of the weather models and enables us to correct them in real-time and, if necessary, correct the Nuna8 speed accordingly.

In the end our strategy proved to be very successful, as we won the Bridgestone World Solar Challenge 2015 and our Smart Kipp & Zonen pyranometers certainly contributed to this result! ■

Pictures by Hans-Peter van Velthoven



Support vehicle with anemometer and SMP10 pyranometer

Arkema's Smart House

Yohan Boulenouar - Upstream R&D - Projet Smart House - Bostik is a leading global adhesive specialist in industrial manufacturing, construction and consumer markets. For more than a century, it has been developing innovative adhesive solutions that are smarter and more adaptive to the forces that shape daily lives. From cradle to grave, from home to office, Bostik's smart adhesives can be found everywhere. With annual sales of €1.5 billion, the company employs 4,800 people and has a presence in more than 50 countries. Bostik is an Arkema company.



The Smart House PV roof with solar monitoring station to left

In October 2015 Bostik's 'Smart House' was inaugurated at their Smart Technology Centre in l'Oise, 50 km from Paris. Initiated in 2013, this unique 'Laboratory-House' project for sustainable building is designed to test, validate and develop new solutions for construction. Arkema & Bostik achieved a life-sized demonstration of their expertise in materials and energy efficiency incorporated into one house that functions as a showroom featuring the group's innovative materials dedicated to building.

The Smart House is the first and only house in the world to be in the process of obtaining four international sustainable building awards: Leed® and Breeam® environmental certification and Passivhaus® and Bepos® thermal certification.

The Smart House is a laboratory where many projects are conducted. The southern roof slope is equipped with 63 solar panels, capable of producing more than 14 kilowatts and, in front of this, a SOLYS2 sun tracker equipped with pyranometers and a pyrliometer is installed. An all-in-one weather station supplements the Kipp & Zonen solar radiation monitoring equipment.

The numerous data, measured in real time, monitor the balance between solar energy received and the energy produced by the solar panels from sunrise to sunset every day of the year. This valuable information is used for design calculations, mainly for Total SunPower the provider of the panels and a project partner.

The SOLYS2 sun position information is used as an input to algorithms to regulate the positions of the adjustable window blinds and the internal environmental and efficiency control systems for comfort; noise, temperature, humidity, smell and light.

Arkema takes all the necessary measures to ensure that its products do not have a negative impact on people's health or safety or on the environment.

The Group is also committed to developing innovative technologies and services that raise standards and sustainability levels in the building industry while adapting it to people's ever-changing needs.

The Smart House will unlock concrete solutions for partner customers and address the challenges facing the buildings of tomorrow.

Go to smarthouse-arkema.com/en to find out more about the Smart House ■

Fairs & Events

SNEC PV Power Expo • Shanghai • China	23 - 25 May 2016
ASEAN Sustainable Energy Week • Bangkok • Thailand	01 - 04 June 2016
Solar Asset Management Asia • Tokyo • Japan	02 - 03 June 2016
Intersolar Europe • Munich • Germany	22 - 24 June 2016
Meteorological Technology World Expo • Madrid • Spain	27 - 29 Sept 2016

Passion for Precision

Kipp & Zonen is the leading company in measuring solar radiation and atmospheric properties. Our passion for precision has led to the development of a large range of high quality instruments, from all weather radiometers to complete measurement systems.

We promise our customers guaranteed performance and quality in; Meteorology, Climatology, Hydrology, Industry, Renewable Energy, Agriculture and Public Health.

We hope you will join our passion for precision.

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