Newsletter 34

The Winterlight Greenhouse

Real-world Yield Measurements of Solar Modules

How a University Serves its Island

Using the Sun to Cool Down

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Content

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Contact

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

Stretching Possibilities of Solar Energy

The other day, when my wife and I woke up, the curtains still closed, she asked if the sun was shining. As a physicist I was confused and I answered "The sun is always shining and it will continue to do so for a few more billion years to come". Of course she just wanted to know what the weather was like, but the fact is that the sun is always shining (even though it was a cloudy and rainy day), radiating such a lot of energy towards our tiny planet, energy that we are hardly using.

In the beginning of July, pilot André Borschberg from the Swiss Solar Impulse project landed at Kalaeloa Airport, Hawaii. He travelled in his plane, the Solar Impulse 2, from Japan to Hawaii, non-stop for 4 days, 21 hours and 52 minutes, over a distance of approximately 7,200 km. This doesn't sound very impressive (a modern jet plane can do this in 8 hours) until one realizes that the Solar Impulse 2 is a one-person plane, fully and only powered by solar energy, and that it is not equipped with the luxury of modern jet planes. That makes this achievement remarkable. Yes, the long flight duration and long distance are world records, but the fact that this flight was done with a solar powered plane is showing the capabilities of solar energy and smart engineering.

Nowadays you can find hybrid cars everywhere. The plug-in versions still mainly use petrol as a fuel and in the Netherlands they are popular because of tax benefits. This is of course the wrong reason to get a hybrid car, and probably not the real reason car manufacturers are making hybrid cars. Fully electric cars are better, not using any fossil fuel at all. However, it is not always easy to drive an electric car. For example, sometimes it is impossible to get a charging point installed at one's home! Local municipality regulations may prohibit the installation of charging points. Incredible, isn't it?

Technology and engineering can really achieve great things, as shown above. Solar energy is abundant, now we just have to wait for the politicians world-wide to create opportunities, possibilities and conditions to broadly apply this beautiful source of clean energy.

Foeke Kuik - C.E.O.
Kipp & Zonen B.V.

You can now have a completely Smart solar and sky radiation monitoring station at all performance levels. Thanks to the expansion of our range of instruments with the new SMP6, SMP21 and SMP22 pyranometers, the SGR3 and SGR4 pyrgeometers, and the SUV5 total UV radiometer.

Our Smart range has as the main benefit a RS-485 Modbus® interface, combined with an amplified analogue output. You can now connect instruments directly to your digital data acquisition system for live radiation measurements, to monitor the status and power supply and to keep track of the calibration history.

Both digital and amplified analogue outputs can be run through hundreds of meters of cable. Moreover, multiple Smart instruments (up to 247) can be digitally connected to one network cable, saving a significant amount of cabling costs.

Reprogramming data loggers after recalibration is history with the Smart range because all our Smart instruments have standardised output ranges. This makes them easily exchangeable, saving time and cost. Another time saving development is that all new Smart instruments will have the internal desiccant with a guaranteed lifespan of 10 years. No need to inspect drying cartridges and change desiccant anymore.

In climatology we aim for the highest accuracy and this is also becoming a requirement at the top of the solar energy market. Kipp & Zonen has now combined the research-grade CMP21 and CMP22 with our Smart features to provide even better performance, in the new SMP21 and SMP22 models. All of our Smart instruments have active temperature correction but in these pyranometers it is individually optimised, making measurements even more accurate. Smart pyranometers are also faster. The response time of the secondary standard models provides a good match with PV requirements.

Pyrgeometer detectors produce a ‘net’ output signal that represents the difference between the temperature of the detector and the temperature of the sky. It is necessary to measure the pyrgeometer temperature and apply an equation to calculate the actual downward long-wave far infrared irradiance. SGR3 and SGR4 perform this calculation internally, accurately and in real-time, avoiding possible external processing errors. The digital output includes net radiation, downward radiation and temperature.

SUV5 improves on the CUV5 by adding temperature correction and linearisation. This makes it ideal for use with high power UV lamps in environmental testing.

The new, free, and easy to use, SmartExplorer computer software allows configuration of the instrument communication settings, monitoring of the measurements and status parameters, and logging of the data. Even if the communication parameters are lost, or unknown, the software is able to establish communication and set the instrument back to a defined state.

With this expansion of the Smart range you can now pick from a wide selection of Smart instruments and build your choice of completely Smart solar and sky monitoring station ■

The Winterlight Greenhouse: How to Effectively Use Natural Light in Higher Latitudes

By Dr. Silke Hemming, Wageningen UR Greenhouse Horticulture, the Netherlands - Wageningen UR Greenhouse Horticulture is a contract research institute for innovations, for and together with, the greenhouse horticultural sector. We carry out research in the fields of greenhouse systems, operational management and cultivation techniques in collaboration with business, scientific or public partners, and translate relevant results to innovations for the horticultural sector in the Netherlands and worldwide.

In a current research project we are developing a new greenhouse and growing concept. The goal of the project is to develop a greenhouse for use in higher latitudes that will increase crop production during winter periods by at least 10 %. This will largely result from technical innovations in the greenhouse construction, coverings and screens; optimised for maximum light transmission during the winter period with low irradiation.

Alongside that, crop variety and crop management have to be adapted in such a way that the crop uses the natural available light during winter more efficiently. A feasibility and pre-study has been carried out over recent months. Currently, the new greenhouse and growing concept is under development. We expect to build a 'proof of principle' greenhouse of 500 m^2 in 2016 at the Innovation and Demonstration Centrum of Energy in Bleiswijk.

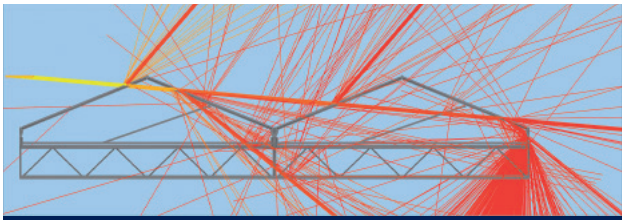
The project is financed by the research programme 'Kas als Energiebron', the innovation programme of LTO Glaskracht Nederland, and the Dutch Ministry of Economic Affairs. Various companies collaborate in the project; Bom Group (greenhouse builder), Glascom Tuinbouw (glass distributer), Ludvig Svensson (screen producer) and Nunhems (seed supplier).

In a feasibility study, different greenhouse constructions and glass and screen parameters were calculated with a ray-tracing model in order to determine the effect on light transmission during the winter months. Ray-tracing calculations show a very realistic simulation of the transmission of (sun) light through a greenhouse. On a greenhouse roof with a diffuse covering the light is much more scattered to the outside than on a greenhouse roof with a clear covering.

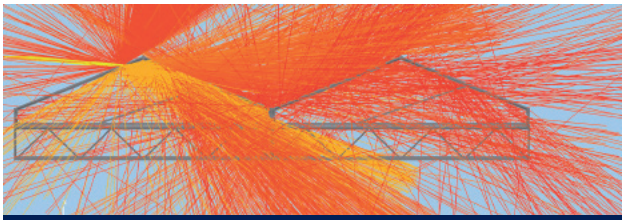
First results show that an East-West roof orientation of a Venlo-type greenhouse provides 2 to 4 % more light inside the greenhouse for the crop during winter months, compared to a North-South orientation. In an East-West orientation a roof angle between 20 to 25° is optimal, both for clear and diffuse glass coverings. Changes in the greenhouse construction are possible and can lead to 2 to 4 % light increase and a new transparent screen material gives 2 to 4 % extra light. Highly reflective structural profiles used in the greenhouse roof construction give 4 to 6 % light increase.

Glass is available with anti-reflection coatings in order to minimise reflection losses and these increase the light transmission by 4 to 8 %. With angle-dependent optimisation of coatings even more light can be gained in the future.

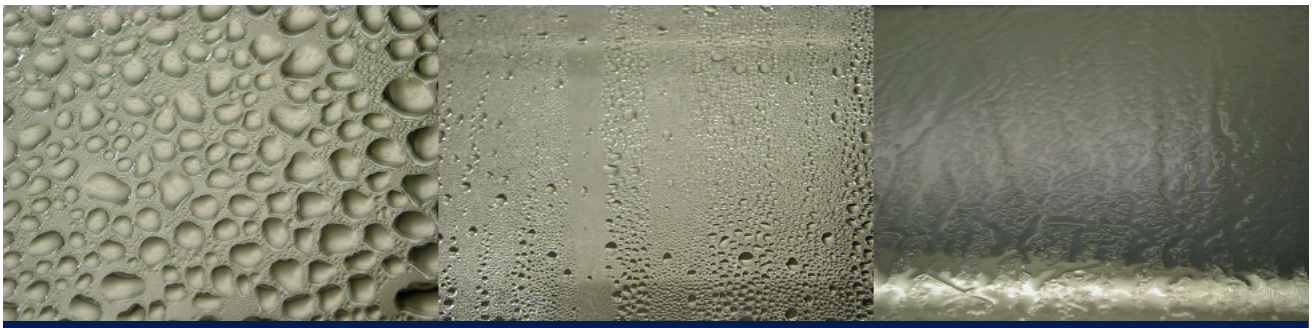
In order to validate the ray-tracing modelling results summarised above, different pre-studies have been carried



A narrow light beam incident on a clear glass greenhouse roof



A narrow light beam incident on a diffuse greenhouse roof



Condensation on glass surfaces with different hydrophobic or hydrophilic surface properties

out in which practical experiments and measurements have been conducted. One of these was the measurement of the effect of condensation on the inside surface of glass in a greenhouse roof on the amount of light available in the greenhouse. Crops always transpire water and the water vapour content in the greenhouse increases and it will condense on the inner surfaces of a cold roof. When droplets occur, the light transmission decreases.

Since the inner side of a greenhouse roof is almost always wet during winter months in the Netherlands, the effect on light transmission is important. We carried out an experiment in which glasses with different condensation properties were mounted in the roof. Parts of the glasses were kept dry by blowing dry air towards the surface, on other parts condensation was allowed to occur.

In the experiment the amount of Photosynthetically Active Radiation was measured under the dry and the wet surfaces with Kipp & Zonen PAR Lite (PQS1) quantum sensors mounted parallel to the roof. In the experiment we found comparable values of light decrease on several wet materials compared to dry materials, as we already had predicted by the ray-tracing model simulation. Therefore, hydrophilic glass coatings are needed to reduce condensation and are able to increase the amount of light inside the greenhouse by up to 8 %.

The next step will be the realisation of the proof of principle greenhouse and research on the performance of all the system parameters. Interactions between the individual effects occur and these will be quantified during the coming period ■

Kipp & Zonen PAR sensors under wet and dry greenhouse roof sections

Real-world Yield Measurements of Solar Modules

By Koen de Groot, ECN Solar Energy - ECN is a research institute dedicated to renewable energy, located in the west of the Netherlands. The company has four main topics of research; Solar Energy, Wind Energy, Biomass & Energy Efficiency, of which Solar Energy is the department that I work for. Because meteorological measurements play a big role in our field of work we have quite some experience with Kipp & Zonen instruments. We use the meteorological data (mainly light measurements) for verification of the energy production of novel and prototype solar panels, as well as for specific tests requested by other companies.

PV panels under test on the roof at ECN

I've been working for ECN since the beginning of 2014, after finishing my Bachelor thesis here. I'm a technical analyst doing various kinds of jobs, including measurements and managing the outside 'laboratory', with all the uncontrollable consequences of an outdoors environment. This measurement roof was renewed at the beginning of 2014 as ECN needed more space for real-life performance tests of solar panels and the flat roof of our office building was an ideal location, with almost no shading.

The measurement setup was designed and installed with several Kipp & Zonen instruments because of the required specifications and quality standard compliance. The decision for the type of instruments was taken easily because of our experience with outdoor measurements. A sun tracker with a shading assembly is equipped with a pyrheliometer, and 2 pyranometers to provide direct, global and diffuse solar radiation measurements (DNI, GHI and DHI). There is an additional pyranometer for plane of array (POA) radiation and for comparison with silicon reference cells. There is also a weather station on the roof.

A Kipp & Zonen pyranometer

An example of what we do is creating and building new solar panels with various internal technologies. On the outside you may or may not see any difference, but from the inside (with x-rays) and in the energy yield of the modules you'll see it.

The process of designing starts in software, where the panel is modelled and simulated with many assumptions. Then the development process starts, with a small prototype of the panel, followed by a scaled-up version and, finally, a full size module. Thorough testing is carried out between each step and in outdoor conditions, similar to the integration test of a fully engineered product. The analysed data from the newly developed panel or module is compared to the solar radiation measurements from the Kipp & Zonen instruments to estimate the real-world performance and yield, which closes the development cycle.

ECN often performs real-world measurements on solar panels developed in collaboration with industrial partners. The performance of the panels is important to them and helps them to market their products. With the stored measurement data you can go back in time to verify what may be the cause of, for example, a remarkable value from your device under test conditions. This is what we happily use because scientists will always try to find new trends and patterns in the data.

Koen de Groot with the SOLYS2 sun tracker

Find out more at **www.ecn.nl** and **www.twitter.com/ecn**

Plane of Array pyranometer and reference cells

How a University Serves its Island of Malta with Solar Radiation Measurements

By Eur Ing. Dr. Charles Yousif, Institute for Sustainable Energy, University of Malta - In 1993, the Institute for Sustainable Energy of the University of Malta started using Kipp & Zonen solar pyranometers for monitoring solar radiation on the Island and has by this stage created a continuous record of more than twenty years.

The complete solar and meteorological monitoring station on the roof of the Institute for Sustainable Energy

Eur Ing. Dr. Charles Yousif started a data monitoring campaign that has since grown to encompass more instruments from Kipp & Zonen. Besides monitoring global and diffuse solar radiation (with a shadow ring) on the horizontal, the Institute has also acquired through University of Malta research funds, pyranometers for measuring inclined solar radiation (36° being the latitude of Malta and 45° being the optimum angle for thermal solar energy applications).

More recently, two radiometers have also been added to monitor the UVA, UVB and Erythermal (UVE) radiation on site. A pyrheliometer was finally added together with a SOLYS2 GPS tracking system, thanks to co-financing from the Renewable Energy Scenarios in Islands (R.E.S.I.) project of the Italia-Malta 2007-2013 cross-border funds of the EU.

For many years, the Institute has been the only entity in Malta that monitors global solar radiation on a long-term basis. It is now the only place where actual data on UV radiation and direct normal radiation are being collected.

The Kipp & Zonen UVS-E-T UV Radiometer

From our experience, the performance of the Kipp & Zonen pyranometers has always been satisfactory. In the early years, the instruments had continued working, even when the strong solar radiation of Malta had managed to deteriorate the protective cable sheathing. Nowadays, we pass all cables through flexible conduits to avoid such deterioration, although this is not necessary with the current yellow cable.

The collected data has been used for a plethora of purposes including general solar and UV radiation monitoring studies, as well as specific applications for building design and the effect of UV radiation on health. More recently, the data has been used in the weather file for Malta in the national energy performance rating software for non-dwellings (iSBEM-mt).

Re-calibration of instruments is of utmost importance for a quality database collection. Our experience with the services department of Kipp and Zonen was positive. Our intention is to complement our newly acquired weather station (co-financed by the European Regional Development Fund, ERDF, under Operational Programme 1, 2007-2013 - Priority Axis 4 Project Ref. No. 335) with solar energy data, to be able to offer a one-stop shop for weather data on the Island of Malta.

Our project will focus on preparing a typical meteorological year (TMY) for Malta, which is still lacking. It has been consistently noted that existing international software that requires weather databases often uses simulated data or data from nearby stations to represent the weather file for Malta. In many cases, this approach is not sufficiently accurate because the climate is peculiar to the Island and is not similar to nearby stations from the Island of Sicily (Italy), or nearby countries such as the coastal regions of Libya or Tunisia.

Find out more about the Institute for Sustainable Energy at **www.um.edu.mt/ise**

The SOLYS2 with CHP1 pyrheliometer on the roof of the Institute for Sustainable Energy

New Technology by Helioclim, Using the Sun to Cool Down

By Marie Nghiem, Co-founder of Helioclim and project chief - Cooling a building with sunshine? French company Helioclim has developed a solar collector and power absorption technology that can save up to 80 % of the energy costs in a building by using the energy coming from the sun for the internal climate management. In their research they use Kipp & Zonen instruments to optimize the system for maximum cost savings.

The solar collectors with a Kipp & Zonen pyranometer

Helioclim manufactures and sells a unique system of reversible solar air conditioning. This solar cooling and heating technology enables high energy efficiency through a single system that meets all the thermal needs of buildings over a wide temperature range, between -60 °C and +200 °C. Thus, industrial and commercial buildings or collective dwellings may, through free energy from the sun, reduce by up to 80 % their energy costs related to air conditioning and heating, hot water, and energy for heating or cooling processes.

The technology has been validated on a pilot site created at the headquarters of Helioclim, near Cannes in the south of France.

The prototype consists of three solar collectors and a power absorption machine of smaller size than the eventual market goals. Helioclim targets facilities and installations with more than 100 kW of cooling capacity.

This facility was instrumented to measure its performance in operation. Several Kipp & Zonen instruments allow the measurement of global and direct solar radiation, and take part in measuring the performance of the Helioclim solar collectors.

During 2015-2016 a full-scale installation will be carried out consisting of several hundreds of collectors and an absorption chiller with a cooling capacity of several hundred kW. Again, this installation will be instrumented with Kipp & Zonen pyranometers that will play a role in monitoring the performance of solar collectors.

More information can be found at **en.helioclim.fr**

The power absorption system

Welcome to Jan-Willem Sips

We are happy to introduce you to our new team member Jan-Willem Sips. He will join the Customer Services Department as the Business Developer for Services. Customer service is one of our core activities and developing rapidly within our organisation. Therefore we have appointed Jan-Willem to bring our service products and performance to a higher level in quality, efficiency and range.

Jan-Willem was originally educated in informatics and spent a great part of his career in project and portfolio management, sales and international business for KPN Research in the Netherlands.

In 2011 he started his own consultancy in solar energy for businesses when he noticed that there was a demand for knowledge and quality. A great background to further improve our services to our customers worldwide.

“I was excited to work with Kipp & Zonen right away because it is closely linked with my experiences: quality, portfolio development and a personal passion for solar energy. Since I live relatively nearby and am very active in athletics, I will keep it green and use my mountain bike to get to work as often as possible. I hope to be of service to you soon!”

Jan-Willem Sips

Next, Newsletter 35

In the next newsletter you can read more about the Summer’s fieldwork in the Ak-Shyrak massif in Central Tien Shan by Dr. Dmitry Petrakov, Cryolithology & Glaciology Dept., Faculty of Geography, Moscow State University.

Portable albedo measurement in the Ak-Shyrak massif

“I would like to say many thanks to Kipp & Zonen staff for the best portable solution how to measure albedo at high altitude and at points over a large area. The SP Lite2 albedometer with two METEON data loggers is really great for our project and I feel we'll use it again next summer”

Fairs & Events

Meteorological Technology World Expo Brussels • Belgium	13 - 15 October
Intersolar India • Mumbai • India	18 - 20 November
AGU Fall Meeting • San Francisco • USA	12 - 16 December
AMS Annual Meeting • New Orleans • USA	10 - 14 January 2016
WFES • Abu Dhabi • UAE	18 - 21 January 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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