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Novel Soiling Detection System for Solar Panels

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Kipp & Zonen presents a completely new solution for one of the major problems in the rapidly expanding solar energy market: a unique system for the accurate and cost effective detection of soiling on photovoltaic modules.

The system measures transmission loss thorough the glass of a PV module, so the reduction in generating performance can be easily calculated and cleaning can be scheduled. So far, the market has been dominated by large and expensive systems with reference panels that need cleaning every day. For large solar plants several of these systems are required as the soiling conditions and effects vary across the site.

Wind, rain, ambient temperature and back panel temperature all affect the Performance Ratio; but, in many environments, soiling of PV modules has the biggest impact on electricity generation. By doing cost effective measurements at multiple locations within a solar power plant, one can get reliable insights into the soiling behaviour over the whole production area. This information can be used by an O & M company to agree with stakeholders an optimal cleaning schedule and to trigger action after an event such as a dust or sand storm.

Kipp & Zonen's development of a 'smart' soiling system means that it requires no daily cleaning at all, and that the optical sensor follows the same fouling and cleaning patterns as the PV panels themselves. There are no moving parts and no water is required. A back panel temperature sensor is included, to be mounted on the nearest PV module, making it a complete PV module monitoring system to determine the direct parameters that influence energy production and Performance Ratio.

A unique feature is that the soiling measurement does not use the irradiance of the sun. This enables day and night operation, eliminates seasonal effects and makes the sensor independent of the sun position and sky conditions. It works reliably for all types and colours of soiling; and, like all Kipp & Zonen products, the system is robust and reliable and is designed for operation in extreme climates. It can be installed easily on every type of solar panel or mounting structure.

The transmission loss can be measured to percentage accuracy. Depending on the local conditions (such as fluctuations in the composition of the dust), a specific uncertainty can be applied to the measurement value; for example 10% loss, +/- 1%. Another innovation is that the system is auto-calibrating, using smart internal processes; there is no need to send it back to the manufacturer for re-calibration. This reduces maintenance costs, and ensures a 100% up-time measurement period.

The system communicates via a Modbus® protocol with all Kipp & Zonen smart instruments, with compatible Modbus®-enabled sensors from other manufacturers, and with suitable inverters and data acquisition systems. Connectivity is through a wired connection; Ethernet or two-wire RS-485. The measured data can be easily integrated via an included monitoring software package.