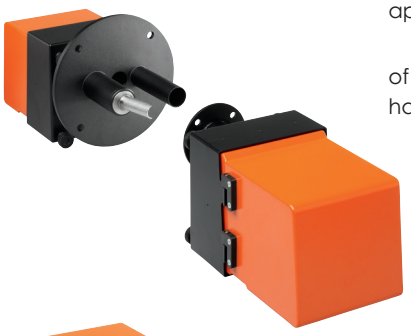
# Continuous Measurement of Dust in Difficult Conditions

**Reliably measuring emissions in industrial plants is often very tricky. SICK has developed devices for use even in difficult conditions. The DUSTHUNTER from SICK Process Automation continuously measures dust/opacity concentrations even in difficult duct shapes and with fluctuating levels of dust concentration. This makes the DUSTHUNTER ideal for effectively and efficiently monitoring electrostatic precipitators in coal-fired power stations.**

Operators of industrial plants are subject to strict directives in relation to emission of harmful airborne substances. Dust was one of the first types of emission that had to be officially recorded. More than 60 years ago, Baden-based engineer Erwin Sick developed and patented the first dust density meter. Based in the Black Forest, Erwin Sick's company now employs over 5,000 staff, is represented around the globe and is regarded as the monitoring equipment leader for many sectors, industries and applications including monitoring dust.



Dust emissions have consistently gone down over the years as a result of improved filtration techniques. Differing dust monitoring technologies have evolved. For the broadest area of application two optical measurement procedures have become established: transmission /opacity and scattered light technology. They perform well, unaffected by the gas velocity, moisture content or charge of the dust particles, and are ideal for use downstream of an electrostatic precipitator. The monitors can be used in diverse applications and are valued for high quality and durability, low maintenance requirements and good cost/benefits ratio.

Transmission/Opacity measurement is the optimum solution for medium to high dust concentrations. This technique measures the amount of light received as a fraction of the amount of light emitted in an optical cross stack monitoring system. Through a regression function, dust concentration in mg/m$^3$ can be outputted. In the case of small to medium levels of concentration, the preferred principle is the physical one of scattering light. When a ray of light hits a particle, it is diffused according to the physical laws of diffraction, refraction, reflection and absorption. The diffused light is recorded by a highly sensitive detector. It is directly proportional to the dust concentration and can be displayed via a regression function as a level of concentration in mg/m$^3$.

The measuring technology must function stably, be easy to use and be as low-maintenance as possible. Device failure or improper handling cause high cost of ownership. "Our top priority has therefore always been that the appliances should be durable and customer friendly. We want our clients to perceive Sick equipment as easy to use," says Dr. Volker Herrmann, CEO of SICK Engineering GmbH.

SICK Process Automation has launched the DUSTHUNTER series as part of a new product line. The modular, in-situ dust monitors are designed to keep on working where other devices find it tough. The DUSTHUNTER series was created for industrial use with different dust concentrations, gas temperatures, wall thicknesses and duct diameters – even where there's a large amount of turbulence in the stack – and can be adapted to extremely varied conditions. For example, innovative comparative reflection measurement enables back-scatter devices to be installed on one side only, thus making the measuring requirement particularly easy and inexpensive. As a system component, the control unit calculates and normalises the measurements and, depending on requirements, can be installed in a modular system. A large LCD display makes the monitor easy to use. Advantages of the DUSTHUNTER include reliability, durability and unusually long maintenance cycles: "DUSTHUNTER. Install it. Then forget about it!"

## Saving Costs Through Intelligent Filter Monitoring

Checking the efficiency and effectiveness of an electric dust arrester is one of the most common tasks for a dust monitor. The DUSTHUNTER C200 proved its worth in a major German coal-fired power station. A series of particularly challenging conditions made this a demanding application.

The flue gas produced in the coal combustion process is cleaned of dust particles in the electric filter. The initially high dust concentration level of up to 20g/m$^3$ is reduced in this process down to an average 20mg/m$^3$. To do this, the particles are charged via an electric field. Due to electromagnetic forces, the particles then stick to collecting electrodes plates. By knocking with a mechanical rapping hammer system, the electrodes are periodically dusted off and the filter gathers up and disposes of the particles. Depending on the electric filter's operating mode, the process can produce both very low dust concentrations, as well as high ones, which need to be reliably monitored.

One particular challenge in the German coal-fired power station was the rectangular construction of the flue duct (steel), which can warp in the event of temperature fluctuation. Cross-duct monitors, as required in this case due to duct shape, need a stable measurement axis in order to deliver reliable results. In the past, whenever the duct warped, the devices had to be readjusted. As the location being monitored is often difficult to reach, the dust monitors should – wherever possible – be extremely low maintenance and capable of being operated by remote control.

The DUSTHUNTER C200 provides measurement using a combination of both the transmission light and the scattered light measuring techniques. This enables the very low to high level of dust concentration (depending on process conditions) to be monitored reliably. If the duct warps due to temperature fluctuations, the monitor is corrected in the process via automatic self-alignment of the optical axis. A four-quadrant element detects the twist and the DUSTHUNTER gets automatically moved to the right measuring position by two motors: one in the X, the other in the Y direction. The level of contamination also gets measured and compensated for on both sides automatically. As part of the application, the monitor was also linked via Ethernet to the central data recording centre. This enables the measurement findings and device status details to be easily read via one single connection. As a result, it was possible to create a reliable solution for the client, while simultaneously reducing capital expenditure and maintenance costs significantly.

## The Whole System at a Glance

Other emission measurements are also relevant in a complete monitoring system. SICK provides solutions using proven technologies for in-situ and extractive gas analysis and measurement instrumentation for dust, opacity and flow. Our product design, technology and software ensure easy to use, cost effective system solutions that require minimum maintenance resulting in support and training cost savings. Plant operators really can 'forget' their monitoring system – and devote all of their energy to strategy and planning.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