



Making the right choice

Hawk Measurement Systems (HAWK), provides an overview of different point level devices that are used to detect and prevent blockages on coal transfer chutes at power plants.

Common fuel handling problems in the power industry often result in production downtime, costing the operator perhaps up to US\$200,000/hr. There are many areas within a coal-fired power plant where mishaps can cause stoppage of material flow.

This article will discuss how to select the best switch technology which will reduce the possibility of coal flow stoppages.

Blocked Chute & Build Up Detection

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Generation 3 Microwave



Efficient coal handling

The coal handling systems within a coal-fired power plant are designed to process coal, from large pieces to powdered particulates. Raw coal is delivered from the yard to the boiler island's coal feed silos usually by a dispensing system, such as a tripper car. The tripper car is filled by a conveyor from the fuel pile and then moves from one silo to the next dispensing coal. It is very important for reliable plant operations that a continuous and accurate coal level is measured within these silos. When the fuel silos are kept fully stocked, the boiler's appetite for coal can be satisfied and the plant can operate reliably at rated capacity.

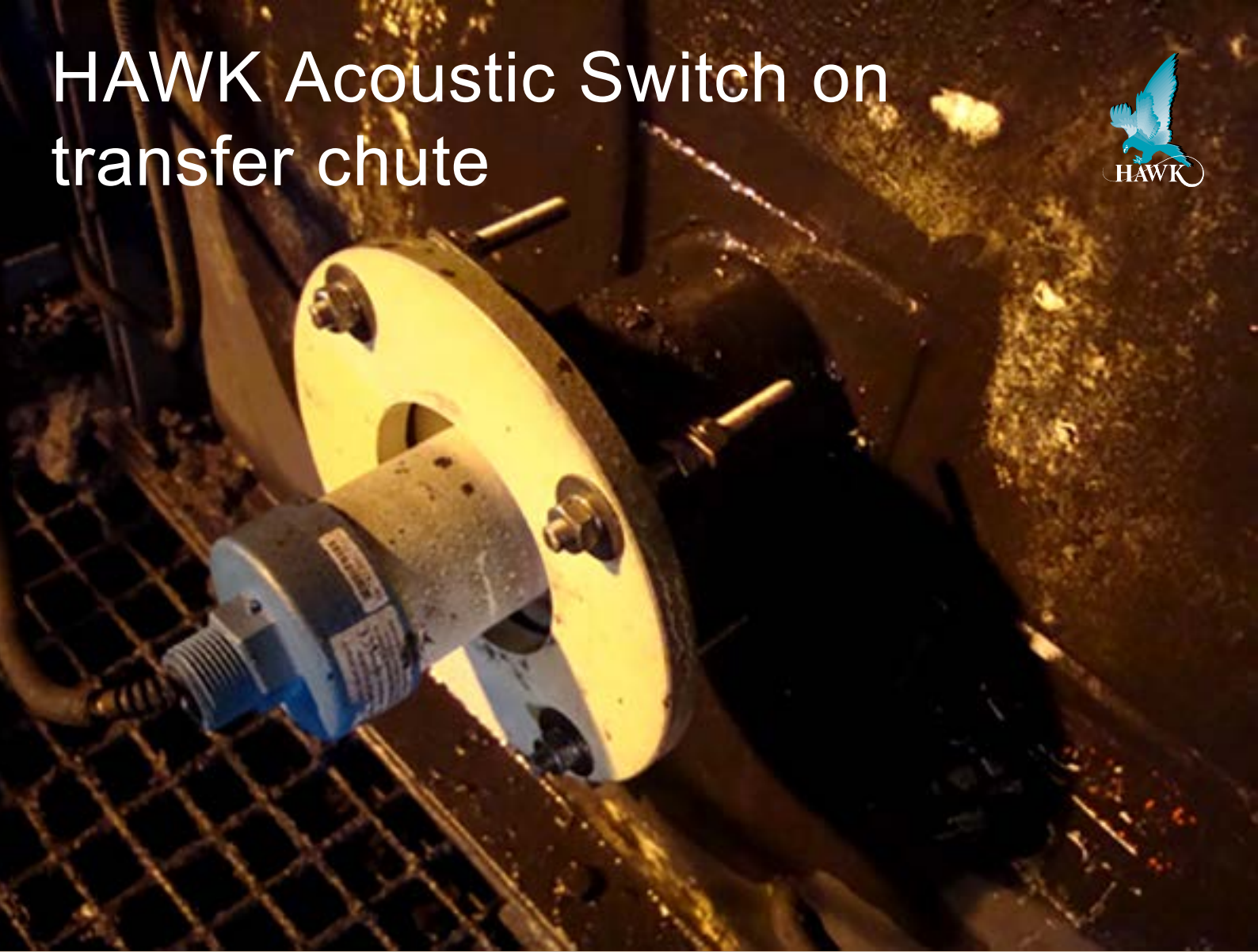
A good operating practice is to have some type of point detection devices that will give operators early notice of silo levels becoming depleted in order to prevent either an overflow of material or provide an indication that material is no longer flowing out of the silo, an indicator of a stoppage. If the level of coal in the silos gets low before the blockage can be repaired, then the plant must either reduce load or shut down to repair.

Another problem when handling dusty and dirty coal is its affinity to absorb moisture. Once coal becomes wet or moist, a coating and build-up by a film of coal on the surface of the chutes will eventually block the flow through the silo transport chutes.

When this chute blockage occurs, it can create an overflow of coal from the conveyor belts. Not only is the blocked chute stopping production, it also has the potential to cause severe injury to plant personnel as well as incur fines by the state regulatory agencies.

Damage has also been caused by plugged chutes and the resulting overflow of coal from conveyors to other process equipment.

HAWK Acoustic Switch on transfer chute



Pick the best switch technology

With the potential for generation failure and equipment damage caused by blockages in the fuel handling systems, it is surprising that more plants do not have the instrumentation to sense impending blockages. There are many different types of point level devices on the market today that are used for blockage detection and prevention on coal transfer chutes, including switch, microwave and acoustic wave technologies.

Switch technology

Favourites in the industry are the few switches that are sufficiently robust to operate in these solids handling applications that operate 24/7. Whether the switch technology is capacitance, vibratory, rotating paddle or tilt switches, all are exposed to heavy, abrasive raw materials that cause excessive wear and tear to contacting switches, or the coating from the wet, moist coal dust will adhere to the contact probes causing a false trip. Even though the costs of these switches are fairly inexpensive, the reliability for this plug chute detection application is rather low, and the cost of downtime is too high to rely on an exposed switch.

In Hawk Measurement Systems' experience, the remaining two technologies provide the most reliable operation in solids applications, such as plugged chutes: microwave or acoustic wave point detection. Either of these technologies can be used for point level detection or flow/no flow in a process chute.

Microwave technology

Microwave technology has been in existence for many years. With 25 years of experience and knowledge gained in the Australian and world block chute applications, HAWK has designed a new and highly sensitive Microwave switch. It has 50 times more sensitivity than the older existing units.



The new system is built with the latest advances in Microwave technical knowledge and it also uses a high-power digital micro controller technology to achieve the highest sensitivity and reliable output under adverse conditions.

Microwave & Acoustic Switch

Digital processing allows for simple setup, ability to detect build-up and automatically compensates, ability to raise a maintenance alarm well before failure (if an unusual build up should occur), and digital diagnosis over MODBUS or GPRS modem for factory help. HAWK's latest software has very advance filters and receives signal identification, which allows the unit to detect a signal even with build-up and in an acoustic and electrically noisy environment. Even with moisture and dust build-up, the New Generation (Circular Polarized) Microwave device is able to overcome some of the coating issues associated with microwave switches from the past.

Acoustic wave technology

Acoustic wave technology relies on a very low frequency (15 kHz), high-powered transducer pair that creates a pressure wave on the sensor face of each transducer.

This technology requires a pair of transducers to be located apart but aligned with each other.

The transducers both pulse and receive signals from each another and as soon as the signal is blocked by wet or dry solids material, the attenuated acoustic signal is amplified and sent to the plant monitoring system.



The low frequency, high power applied to the sensors also has a self-cleaning feature when the pressure wave is created. This pulsing pressure wave keeps material from adhering to the face and provides for maintenance-free operation in critical applications.

By installing the transducer system in the optimal location, plant personnel will get an early detection of chute plugging in order to take corrective action. Prevention is the best method for ensuring that flow continues unhindered through the power generation process.

Beam Blockage Detection Circular Polarisation

Choosing the right switch

If an operator is looking for a reliable point level detection device for a transfer chute that is going to be immersed in a moist, dusty coal environment and reliability is very important, [acoustic wave technology](#) may be the best measurement option. But if the process material is dry, the [microwave detection switch](#) may be the best choice.

Regardless of the application, it is important to thoroughly understand the process conditions of a site before picking a switch technology. Be cautious, explore all the available technologies and their track record in these harsh coal-fired plant applications, and then make an educated decision.