Robert Becker, robecco GmbH

Monitoring and control in coal and alternative fuel silos

Dust explosions in cement industry fuel silos represent a significant danger. The presence of combustible dust air mixtures in different areas of the plant give the potential for an explosion, a situation that must be avoided through careful implementation of explosion control and monitoring equipment.

Whereas dust concentrations cannot be controlled inside fuel silos, the oxygen concentration *can* be altered. Apart from constructive explosion protection equipment and pressure-resistant construction methods in accordance with relevant guidelines, measuring and control equipment is necessary for the safe operation of a storage silo.

Why monitoring and control?

When we monitor and control conditions inside fuel silos, we can maintain an inert atmosphere, gain early indications of potentially-explosive atmospheres, document sudden and abnormal events and take appropriate preventative action if necessary. To prevent explosions the following is required.

- Gas measurement equipment for CO, CH_4, O_2 and other explosive gases;
- An automatic central control system that can guarantee an inert atmosphere.
- Control of the safety equipment used;
- Operator friendly systems and monitoring of correct maintenance procedures, and;
- ATEX conformity and certification.

How to measure?

Smouldering fires will be predominantly detected by the CO and CH_4 detectors. According to the relevant guidelines (e.g. TRBS 2152, VDI 2263, CEN 15281) it is necessary to maintain and supervise the limiting oxygen concentration (LOC) for different fuels. Regarding the preventive explosion protection and process monitoring, installation of an automatic central control system that guarantees the inert atmosphere during chemical and physical processes is required. Operation, monitoring and control can be performed automatically or manually. Temperature sensors, inerting systems and valves and flaps must be installed in addition to the gas analysers. The control system, for example a Safe Automatic Control Unit robecco secure center® (RSC), has to connect safety systems and provide effective protection against hazardous situations in the system.

What to adjust?

The O_2 and CO limit concentrations must be adjusted in relation to the volatiles present and the process temperature. The evaluation of the measured values and an alignment with typical trial processes has to be guaranteed. This makes operating reactions possible, including, for example, sealing leaks to prevent additional oxygen entering the silo. A safe switch over from automatic to manual control during different process conditions, (e.g.: like test runs and maintenance periods), to avoid accidents must be guaranteed. A slave system must also be able to take over the system functions in case of master system failure.

The monitoring of all system-relevant functions of the sensor system and the inerting plant with dosing station is necessary. Accurate inert gas dosing that will be effective at removing explosive conditions must be considered. Maintenance of the existing inert gas stock and the future procurement of storage must also be performed on an ongoing basis.

The functionality of the components has to be supervised and relevant errors or failures must be signalled clear alarms. Automatic determination of the maintenance intervals, the maintenance dates and maintenance work of individual components depending on the actual working time and operating frequency guarantees operability and thus a safe and productive process.