

## Temperature sensor cable protects coal conveyor belts

Conveyor belts are a frequently used method to transport coal from one location to another in power plants, harbours, coal mines. A local fire (even smouldering fire) caused by the transported coal or equipment failures is a high risk because it might lead rapidly to a big accident and damage. Thereby early fire detection is essential. Due to the extension of such facilities, the harsh ambient conditions (dust atmospheres, air flow) linear head sensor installed in the proximity can detect such fire in an early stage and localize it.



**Graphic 1:** Frictional heat of the belt, malfunction of bearings of rollers, coal which fell over a belt can cause a fire. The RedGuard® system offers an optimal monitoring solution.

Conveyor belts are worldwide used to transport coal in mines, loading and storage areas like harbours, and consumption facilities as power plants or steel mills. However there is a continuous fire risk in these facilities and such incident in fact is just a question of time. Several factors can cause a fire: frictional heat of the belt, malfunction of bearings of rollers, coal which fell over a belt. Roller bearings supporting the belt might run hot or in the worst case the rollers block completely and the belt slips along them. In all cases the equipment is heating up locally and initiate a local fire which rapidly can spread along the belt.

In the worst case, as a result of a chain reaction, an explosion of the coal dust might occur. Because of the explosion risk these locations are usually classified in Ex zones 21 or 22.

There are basically two steps to be taken in order to prevent or reduce the risk of such incident:

**The first step** is always good housekeeping practice. Although very labour intensive, continuous cleaning and removing of dust layers is essential to avoid any source for fire and explosion.

**The second step** aims on the risk reduction of a fire by detecting of any local heat sources or smouldering fire and rapid extinguishing.

### Fire detection systems

Ideally local overheating is detected before the fire is starting. This can be done with different types of detectors.

Gas or smoke detectors are very often used for this monitoring task. However in many cases they are unsuited because of the harsh environment or air flow and thereby fail soon or can produce false alarms.

Definitely the fire itself has to be detected as fast as possible to allow its suppression in the facility.

Heat or temperature sensor cables are an optimal choice, as they are robust and resistant to aggressive surroundings and have proven to be sensitive to abnormal temperature increase and thereby to detect a fire in an early stage. However they cannot detect hot spots moving on the belt (moving fires). For this purpose, IR detectors have to be used.



**Graphic 2:** Coal conveyor belts in loading and storage areas are typical installations for linear heat detection sensor cables.

# Temperature Monitoring System RedGuard®

## Application note

# BARTEC

Due to their construction and functional design heat sensor cables are ideal for monitoring of extended constructions like conveyor belts or transport tunnels.

The RedGuard® temperature sensor cable contains single semiconductor sensors installed in defined distance on a flat cable and is protected by two additional covers.

The sensor cable is very robust, insensitive to soiling and highly resistant to mechanical shocks and matches perfect to harsh environments in coal industry.

Easy to install and maintenance free the RedGuard® system also provides an economic solution over the life time.

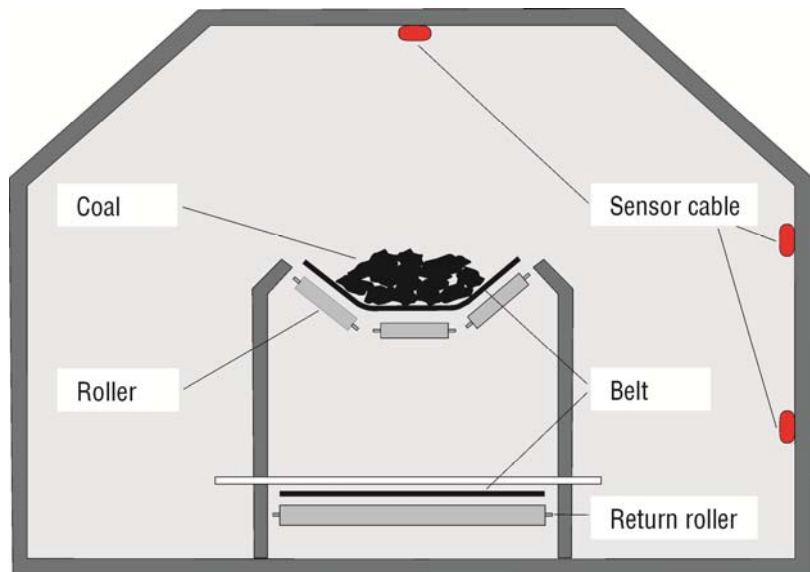
Sensor distances are standardized and selectable: 2, 4, 7, 10 or 20 m.

Essential part of the complete monitoring system is the processor unit. It scans the sensor cable and converts the signals into temperature values. It also acts as interface to a PLC system.

The maximum sensor cable length controlled by a processor unit depends on the sensor distance and varies between 200m and 2000m (see RedGuard® product brochure).



**Graphic 4:** Installation of the RedGuard® sensor cable on the upper side in the centre of a conveyor belt.



**Graphic 3:** Possible installation of the sensor cable in the proximity of the conveyor belt.

For larger installations with long conveyor belts or several conveyor systems, more RedGuard® systems can easily be connected via standard interface to a network.

### Design and installation of the monitoring system

According to desired sensitivity and/or local fire detection system designing rules the sensor distance will be chosen.

For conveyor belt applications a sensor distance of 4m or 7m is applicable and is usually providing the required sensitivity.

Based on the fact that organic materials (coal, food) are flammable and create hazardous areas, a special ATEX approved version of the RedGuard® system (CTU-2 type) has to be applied.

The sensor cable and connection and termination modules (*Marking:* Ex II 2D Ex tD T 80°C / T 95°C / T 120°C / T 140°C IP 65) can be directly installed in zone 21. The control unit however must be installed in the safe area or can be

installed in the Ex area in a certified Ex enclosure.

With the typical sensor distance of 4m or 7m, the maximum length of sensor cable per system varies from 400m to 700m.

To enable highest sensitivity, the sensor cable should be mounted in close proximity to the conveyor belt (1 to 1.5 m).

For detecting a local fire caused by one or different factors the sensor cable should be located in the centre of the conveyor housing and fixed above or on the upper side of the conveyor walls (see Graphic 3).

Installation below/under the conveyor belt or direct on the steel work is not recommended. The cable can be damaged and in many cases it creates a barrier for cleaning and repair work.

### Reference applications (selection):

- Savona harbour (IT)
- Port Coper harbour (SI)
- Coal mine (RU)