BELT CONVEYOR SYSTEMS - FIRE DETECTION USING DISTRIBUTED TEMPERATURE SENSORS

The fire hazard of belt conveyors is often under estimated but knowledge of the components and applications reveals that they can be a significant fire risk. Belt conveyors are used extensively in industry for the bulk transportation for various materials. Associated equipment includes motors, support structures, rollers and belting. Belts can be several meters wide and vary in length from a few to several hundred meters. Both combustible and non-combustible materials are transported on conveyors. Combustibles include coal, wood chips, cement, grain and sugar. Non-combustibles products include various metal ores, limestone, shale, cement and packaged materials e.g. production line goods and passenger baggage.

Example of opencast coal mine conveyer belt

The main fire risks associated with belt type conveyors are as follows:

- Friction due to loose of belt traction and slipping on the drive roller
- Welding activities can generate hot molten material
- Overheated materials placed on the belt
- Build up of materials that have fallen off the belt and dust cloud generation
- Static electricity

Generally there are two main characteristic fires that need to be detected at the earliest opportunity on belt type conveyors, a) moving and b) static fires.

Moving fires are most commonly detected by infrared type technology, coupled sometimes with CO_2 detection, located at strategic fixed point locations along the conveyor system. This strategy alone does not provide detection coverage over the entire belt length, and so it is common to introduce a linear heat detection solution to provide detection of the static fires and also the relatively large moving fires that can occur.

Static fires can occur in close proximity to the belt and also to the electrical drive equipment associated with providing energy to the belt conveyor system.

FireLaser distributed temperature sensing (DTS) technology, a fiber optic based linear heat detection system, provides a technically superior solution when compared to the other conventional technologies. Advantages include:

- System uses a robust cable construction, where the temperature measurements can be made over very long lengths of conveyor
- Minimal need to site control equipment in remote locations
- Provides actual temperature measurement continuously along the conveyor length and can predict before ignition occurs
- Quality of measurement is not affected by RFI
- The sensing cable in inherently Intrinsically Safe (EEx ia) and is therefore suitable for use in Hazardous Areas

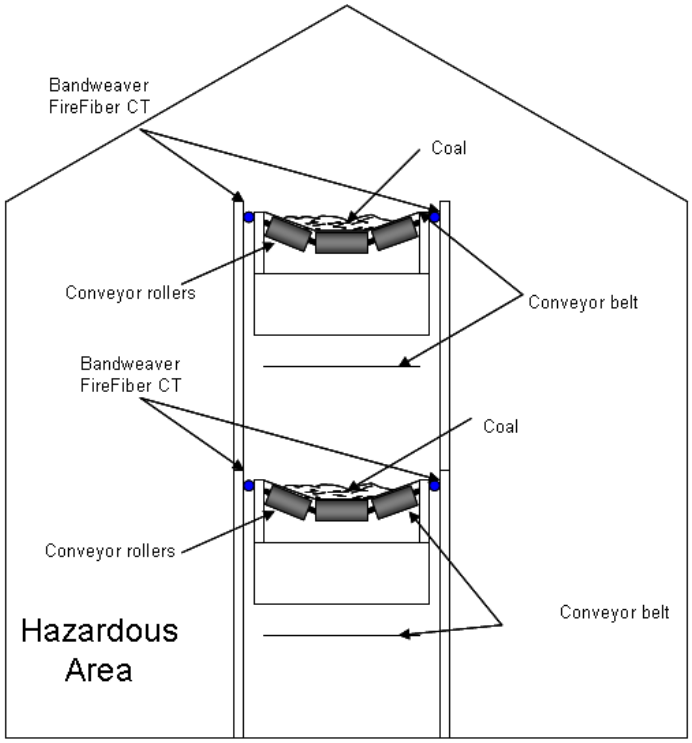
A combination of detection technologies including FireLaser DTS technology can be used for the activation of sprinkler or water spray systems to help suppress or extinguish a fire event. The FireLaser DTS system interfaces directly to the Agent Release Panel (ARP) through a system of monitored zonal relay contacts. Normally each conveyor line is subdivided into fire detection zones, which shall be at least a subset of the system extinguishing zones. The system extinguishing zones are normally defined by site parameters relating to the hydraulic limitations on water delivery, quantity of water available, the type of water spray/deluge system and to some extent the clean up activities associated with a system release.

DTS Linear heat systems seamlessly integrate with fire control panel

For this particular type of application Bandweaver recommends the use of the FireFiber CT sensing cable product. This is a HDP coated steel tube, for the best balance between strength and quick system response, and it is suitable for use in harsh environments. The sensor bale should be located on either side of the conveyor so as to maximize the detectors ability to detect heat increase from the main sources of static and large moving fires.

Care should be taken to ensure that the sensor cable location in relation to the conveyor should not hinder access to the roller bearings, nor should it be located in an area when it may be prone to interference with system wash-down apparatus.

An example of the application of sensor cable is illustrated below, in the figure below. The sensing cable is located in close proximity to the belt conveyor, thereby providing “local” fire protection.



An example of distributed temperature sensor cable placement

There are cases where Linear Heat Detection technology may be positioned directly above and also below the conveyor belt, particularly in cases where the engineers deem that locating the sensor cable on either side is not practical. In such cases, especially in enclosed spaces, the location of the sensor cable may have to be closer to the conveyor ceiling height.

This type of application is a so called “room protection” application, where the sensor cable is located at a distance away from the main fire risk. “Room Protection” is defined within EN54 part 22 para 3.1.12. The heat classification A1N, indicates a normal operating temperature within the local environment of between 25C to 50C, and the alarm activation temperature between 54C and 65C.

Approvals

The DTS system is approved to EN54 part 22, heat classification BN, which is a fire detection product standard classification, which uniquely stipulates a specific test criteria for this “local” application (refer to EN54 part 22 para 3.1.7). The heat classification BN, indicates a normally operating temperature within the local environment of between 40C to 65C, and the alarm activation temperature between 69C to 85C.

About Bandweaver Technologies

Bandweaver has been providing advanced fiber optic monitoring sensors and integrated technologies since 2002.Our knowledge regarding the application of distributed temperature sensing technology within the fire industry is second to none. We focus on the safe integration of FireLaser DTS technologies into clients proprietary systems and provide exceptional systems design support, product support during installation and provide long term maintenance packages.

For further information and system design support please contact our global team at www.bandweaver.com