



FIRE HAZARDS OF BELT CONVEYORS

In 1985, a conveyor fire caused a R100 000 loss on a Canadian mine. Workers were carrying out maintenance on the inclined conveyor carrying iron ore from a transfer house to a 20 m high stockpile. The conveyor enclosure was mostly of non-combustible construction. Sparks from cutting and welding operations ignited the conveyor belt resulting in a fire which spread rapidly. Despite manual fire-fighting efforts, the fire damaged the enclosure, motors and 150 m of conveyor belting.

While the fire hazard of belt conveyors is often under-estimated, knowledge of the components will reveal that they can be a major fire risk.

Belt conveyors are used extensively in industry for the bulk transportation of various materials. Associated equipment includes motors, support structures, rollers and belting. Belts may be several metres wide and vary in length from a few to several hundred metres.

Fire hazards

Conveyor enclosures and supporting structures are normally of non-combustible construction. However any large fire in the enclosure may damage, or in the case of inclined conveyors cause collapse of, the structural elements. The principal fire load includes the material being conveyed and the belt itself.

- Both combustible and non-combustible materials are transported in bulk on conveyors. Combustibles include wood chips, scrap wood, grain, sugar and coal. Non-combustible products include sand, asbestos, iron ore and metal components. If the product is packaged, the fire load increases. Burning product may also be passed from one belt to the next, thereby spreading the fire.
- Conveyor belts are made of plies of rubber and fabric of natural or man-made fibres. Conventional belts are easily ignited, spread fire rapidly and liberate large quantities of smoke. Inclined conveyors may cause a flue effect thereby increasing the fire's spread. An unusual occurrence is if the belt should part under tension: the burning ends will fly apart causing two remote fires. The fire hazard increases with the age of the belt; older belts may become coated or impregnated with oils or combustible residue.

Causes of fire

Data from various sources shows that the most common causes of fire are:

- Friction due to a belt losing traction and slipping on the drive roller, or due to a misaligned belt slipping off the rollers and jamming. This may generate sufficient heat to ignite the belt or product.



- Cutting and welding activities generate hot molten metal particles which can ignite the belt or accumulations of waste below.
- Overheated material from ovens, kilns or dryers that have not been cooled sufficiently before being placed on the belt may also cause belt ignition.

Fire protection

The extent of fire protection measures necessary can only be decided once the risk has been thoroughly evaluated. Suitable recommendations include:

Siting

Consideration should be given to accessibility for emergency vehicles, and there should be no exposure hazard to or from buildings or installations immediately adjacent or below conveyors. Gantries for inclined conveyors should be well clear of buildings, flammable liquid and gas tanks, or transformers.

Design and installation

Belt loading systems should discharge onto the belt with a minimum of spillage. An emergency trip wire to switch off the conveyor motor should be provided along its length; its position should preclude its activation by spillage from the conveyor. Where one conveyor is fed by others, precautions should be taken to prevent a build-up of material when one is stopped.]

Automatic trips should be incorporated in the design to stop the conveyor in the event of undue misalignment or slowing of the belt.

Wiring and motors should be protected and be suitable for the environmental and service conditions.

Belt tensions should be sufficient to avoid slippage, abnormal wear and strain on drive components. The use of non-fire propagating belt, or fire resistant belting, should also be considered. While these are combustible, they are more difficult to ignite.

Non-combustible materials should be used for the structure and cladding of conveyor gantries. Using the gantry as a support bridge for other services, such as cables and piped gases, should be avoided to reduce additional damage if the structure collapses.

Static electricity

All parts of the conveyor system should be bonded and earthed if the conveyed material is readily ignitable.

Fire detection and suppression

It is difficult to detect and suppress a small fire on a moving belt, but effective systems do exist. They do not always prevent belt damage, but will prevent structure collapse. Detection takes the form of heat sensing. Heat sensors will detect:

- fires on moving or stationary belts
- fires involving spillages and waste accumulations beneath the conveyor
- overheated bearings and drive machinery
- heat build-up due to friction between the belt and structure or supports



Suppression is achieved using sprinklers or water sprays. These systems may be omitted where the conveyor is partially or totally open and where well trained and equipped personnel are available for fire-fighting. In most cases, however, protection is vital over head and tail sections of conveyors, drive motors and important drive or transfer components.

Hose-reels can be provided at suitable locations so that all parts of the conveyor can be reached. Alternatively hydrants, equipment, manpower and suitable access should be provided to facilitate manual suppression. Where the length of the conveyors precludes the provision of hydrants, pumps and water carriers are necessary.

Protection of openings

Conveyor openings in fire walls can be protected by doors and shutters. A break in the conveyor as near as the wall as possible, forms a gap sufficient for the passage of a fire door. A sensor device monitors the spacing of stock and prevents any obstruction to closure of the door. Interlock switches automatically stop the conveyor on operation of the door. Where doors or shutters cannot be used and suitable quantities of water are available, small openings have been protected by a water curtain. This is not the ideal situation, however.

General fire precautions

Simple fire prevention measures include:

- a high standard of housekeeping in and around conveyors to prevent accumulations of spillages and waste
- strict control over contractors. An effective hot work permit system is a must. Flammable liquids and gases should not be permitted in the enclosure.
- provision of means for raising the alarm and suitable escape routes for exits
- the marking of individual conveyors and associated machinery to assist fire-fighters
- planned maintenance to ensure correct belt tension and lubrication of mechanical components
- regular fire prevention inspections following suitable check lists.

References:

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Line Heat Detection, Fire Prevention 184, November 1985 FPA(UK)

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