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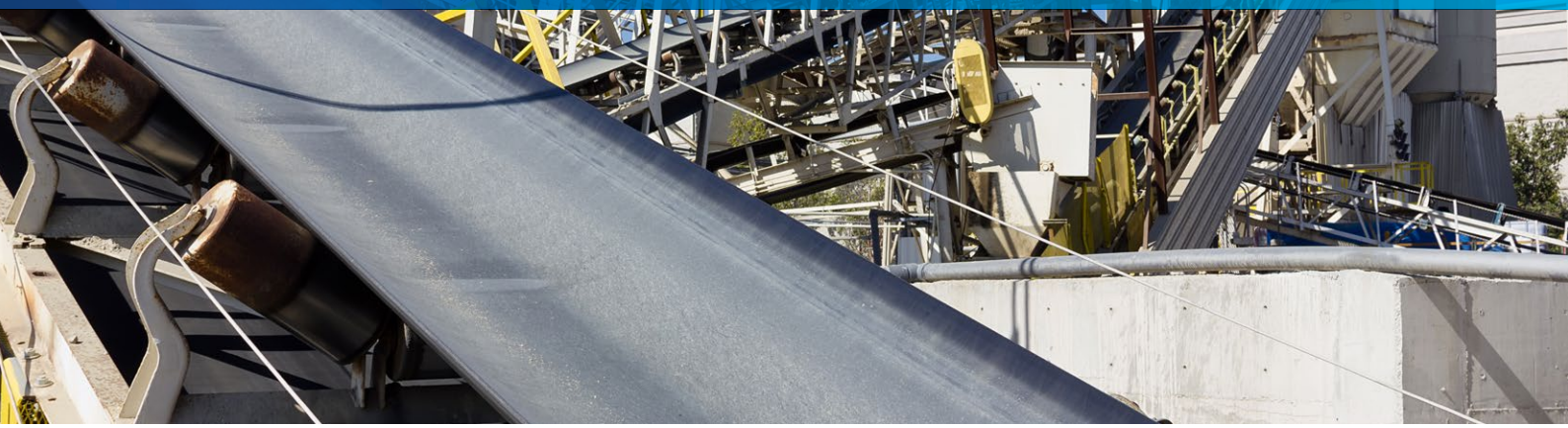
Corporate Solutions

Risk Engineering Services

# Fire Resistant Anti Static (FRAS) Conveyors Belts



Major mining losses from the last few years have shown that conveyor fires can cause significant damage and have a large impact to client's supply chain. Over the past seven years the industry has seen individual losses as high as USD 125m.(1) Sites must prioritize the protection of critical conveyors as only a short outage can generate very large Business Interruption impacts. FRAS conveyors belts can help reduce this risk but it is not the only means of protection.

## FRAS conveyor belts – what are they?

Fire Resistant Anti Static (FRAS) conveyor belts are engineered so that the top and bottom covers of the conveyor belt meet local fire retardancy standards. This means these belts are difficult to ignite and should never be the cause of a fire. Additionally, if ignited by an external fire source, they should minimize the propagation of the fire. These conveyor belts are also Anti Static, meaning they provide electrical resistance to avoid the build-up of static electricity.

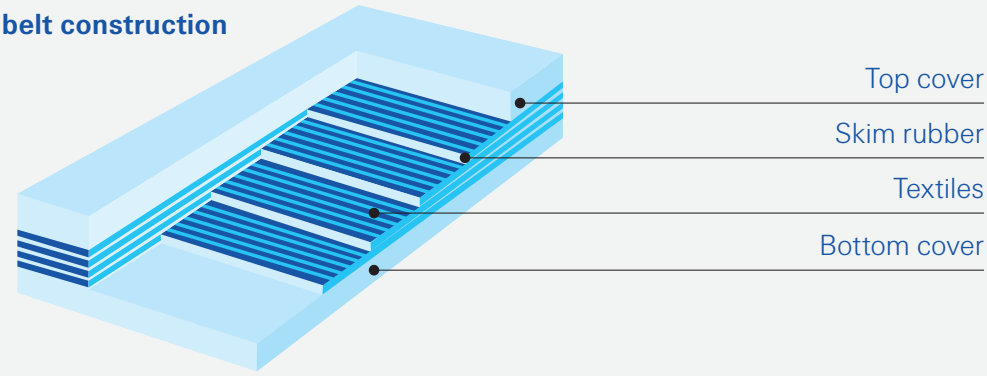
FRAS conveyors belts allow more time for an existing protection system (fire detection/fire sprinklers) to respond. Flame spread can be reduced therefore increasing the effectiveness of the protection system. While FRAS belting can reduce fire exposure, it should not be relied on as the sole means of fire protection.

"Fire Resistant" not fire proof. The top and bottom covers of the conveyor belt can be engineered to meet local fire retardancy standards.

"Anti Static" provides electrical resistance to avoid the build-up of static electricity. Internationally recognised acceptance criteria is $3.0 \times 10^8$ Ohms.

There are a wide range of standards, so careful consideration must be taken when selecting a FRAS belt for your application.

### Typical conveyor belt construction



## Know your risks

Conveyors are designed to transport material, so they can also transport a flame. A conveyor can travel more than 40m in 15 seconds which coincides with the flammability test (EN/ISO 340) for FRAS conveyors.

Smoke detection can have a slow response time especially when air velocity is increased. A fire can then be transported a considerable distance before being detected.

Burning rubber can produce large amounts of black toxic smoke which can be particularly hazardous in underground environments.

Loss of a critical conveyor can have a large impact on a business due to the replacement time.

Intervention time is very important in controlling conveyor fires as high heat can quickly lead to conveyor structural collapse. As mentioned FRAS will buy you more time but will still ultimately burn.

FRAS can allow more time for an existing protection system (detection/sprinklers) to respond. Flame spread can be reduced therefore increasing the effectiveness of the protection system.

## Ignition Sources

Restrict hot work and smoking. Use a formal hot work permit system when this activity is absolutely necessary.

Mechanical failure of drives, pulleys, scrapers, belt alignment and tracking can lead to localised heating and ignition.

## Types of FRAS

There are many FRAS standards available to meet country standards and regulation. This paper refers to the European Norms (EN) as it is widely accepted but local requirements should always be adhered to.

Under EN12882 (for above ground belts) there are 10 FRAS categories offering a different degree of protection according to their application.

Under EN14973 (for underground installations) there are 5 categories available. For further information refer to Appendix 1 and 2.

FRAS belts used for underground coal are typically the highest standard C1 (EN14973).

## A guide when considering a FRAS conveyor belt.

1. Its application will depend on the material conveyed, conveyor structure, control interlocks in place and fire protection installed to control and therefore reduce the inherent risk to an acceptable level. Regulation and safety codes will also dictate how the use of FRAS conveyor belting is applied.

2. Is your material abrasive? As the belt cover wears so does the fire-resistant cover. ISO340 standard makes the distinction between fire resistance with covers (EN12882 Class 2A) and fire resistance with and without covers (EN12882 Class 2B). In the case of Class 2B grade (fire resistant without covers), the rubber skim should be thicker than the skim used for Class 2A grade belts.

3. Using the highest-grade FRAS is always preferred for added protection however this needs to be balanced with cost and wear characteristics.

4. All sites should consider conducting a risk assessment on their conveyor infrastructure and determine the necessary controls to put in place. The risk assessment should assess risk not only to people but also infrastructure. Controls should lower the residual risk to acceptable levels in accordance with company guidance and regulation.

5. Do you have the required mechanical protection (slippage, friction, misalignment, belt rip detection and pulley RTD's). And is it regularly checked and tested?

6. Are conveyors accessible for fire fighting and if not should more protection be added? FRAS conveyor belt when combined with fire protection can assist in lowering the risk.

7. Is the conveyor difficult to access – greater than 10 m from the ground or enclosed? The correct grade of FRAS conveyor belt when combined with fire protection can assist in lowering the risk.

8. Is the conveyor a production bottleneck with a production impact greater than 30 days? If so FRAS should be considered if fire protection is not provided to the length of the conveyor.

9. Retrofitting existing conveyor structures with FRAS must take into consideration the change in properties of the belt to ensure the structure is fit for purpose. FRAS belting can be higher in weight and have varying mechanical properties.

## Testing

There are many standards but the basis of most tests for belting used in normal industrial application is EN/ISO340.

### Gallery Test

Designed to replicate an enclosed conveyor and requires the belt to remain undamaged over a specified length.

### Drum Friction Test

This is one of the most important tests designed to show how friction can ignite a belt. The test simulates a stalled belt and a driven rotating drum or pulley resulting in friction and heat build-up:

- Measured over a set time period
- Drum temperature is monitored
- Presence or absence of flame and glow is noted

### Laboratory Flame Test

Testing to see if a mass of conveyor belt is ignited with a small ignition source (Bunsen burner). The time taken for all flame or glow to self-extinguish is noted.

### Electrical Resistance Test

Possible build up and discharge of static electrical charge on moving conveyors. 3.0 x $10^8$ Ohms.

This information is intended for guidance only. Please confirm with your conveyor supplier and local standards and regulations for more information.

## Concerns

FRAS belts can wear faster and as they wear their resistance to fire also decreases. Abrasion resistance is therefore an important consideration when selecting a FRAS belt. In operation sites need to ensure maintenance plans are consistent with the wear properties of the belt to ensure that the required FRAS properties are maintained for which it was installed.

FRAS specification can vary greatly. Be diligent and don't be afraid to test your supplier. Manufacturers are required to test every 800m of conveyor belt by removing a sample. This means that the belt you receive onsite may have not been tested. You can therefore test your own belt prior to use through accredited laboratories.

## Housekeeping

Conveyor spillage should be reduced and daily belt walks should be used to address poor housekeeping and to prevent against rapid deterioration of the building structure or contents.

Heating systems should be routinely inspected. Consider monitoring temperature remotely.

## Appendix 1

EN12882 is the standard for safety requirements for conveyor belts for general purpose (above ground).
Under EN12882 there are 10 classifications depending on the hazards.

| Category | Application according to EN12882 for general use and above ground conveyors |
|---|---|
| 1 | General use, risk only through electrostatic discharge |
| 2A | As for category 1, additional hazards from small open flames on the cover stock (additional causes of fire) |
| 2B | As for category 2A, the additional risk is smaller open flames on the carcass |
| 3A | As for category 2A, however with the additional risk of heating due to localised friction |
| 3B | Same as category 2B with the additional risk of heating due local friction |
| 4A | Same test as category 1 however with a fire propagation test |
| 4B | Same as category 4A however with additional risk of heating due to local friction |
| 5A | Same as category 4B however there is an increased risk of frictional ignition (no secondary safety device) |
| 5B | Same as category 5A however there is an additional risk if the belt is glowing |
| 5C | Same as category 5B however there is an additional risk if the conveyor is in a combustible atmosphere |

## Appendix 2

EN14973 is the standard for safety requirements for conveyor belts for underground installations. There are 5 classifications that take into consideration the material being conveyed. FRAS belts used for underground coal are typically the highest standard. C1 (EN14973).

| Category | Application according to EN14973 for use underground |
|---|---|
| A | General use, only hazards being limited access and means of escape. |
| B1 | as class A, but potentially flammable atmosphere.No secondary safety device. |
| B2 | as Class A, but potentially flammable atmosphere. With secondary safety device. |
| C1 | as Class B1 plus combustible dust or material conveyed. No secondary devices. |
| C2 | as Class B1, plus combustible dust or material conveyed and additional fuel sources. With secondary safety devices. |

## Reference Data

EN12882 standard for safety requirements for conveyor belts for general purpose.
EN14973 is the standard for safety requirements for conveyor belts for underground installations.
Note 1: Major mining losses 2013-19 from Willis Towers Watson, WTW-Mining-Risk-Review-2019