Conveyors in the forest industry

What are the hazards?

The forest industry uses different types of conveyors to transport single items as well as bulk materials, including wood chips, saw dust, and bark, within mill sites. The most typical conveyor types in the forest industry are belt conveyors, scraper or chain conveyors, pneumatic conveyors, tubular conveyors, and vibrating conveyors. Transport distances vary from a couple of metres to kilometres long.

In a belt conveyor, a belt moves around a head pulley which is connected to a gear box and an electric motor. A tail pulley is at the receiving end of the conveyor. The belt is supported and steered by idlers or rollers and is typically a layered structure where the surface is made of a special type of rubber mix, depending on the operating environment. The surface can be either smooth or patterned to improve grip and traction, enhancing the belt's transporting features.

The fire and occupational safety of a belt conveyor are closely linked to the housekeeping need of the conveyor area. A well-fitted conveyor system that minimises the need for cleaning enhances user safety and reduces the overall fire load.

Belt conveyor systems generally have scrapers or brushes to keep the belt clean. However, a typical challenge of a belt conveyor is that material sticks onto the belt's surface and drops off only on the return end of the belt, generating piles of material under the conveyor.

The costliest fires in conveyor systems start from electric or bearing failures, or friction caused by the moving belt or transported material. Another source of fire is glowing or burning material loaded onto the conveyor, frictional heat from a bearing failure, or belts jamming or slipping.

How to reduce risks

Sprinkler protection is required under any of these conditions:

- The conveyor is fully enclosed or elevated above ground with limited access.
- The conveyor gallery is constructed, entirely or partially, of combustible materials such as wood.
- The conveyor transports combustible materials.
- The risk of business interruption is significant.

To minimise fire risks, avoid placing conveyors above stacks, buildings, or essential machinery. Maintain a clear space of ten metres on each side of the belt conveyor, including ground vegetation, goods storage, and vehicle parking.

Here are further guidelines to mitigate the risk of fires:

1. Utilise non-combustible materials in the conveyor galleries
2. Consider using grated steel walkways and open mesh nets below the conveyor where applicable
3. Consider fire-retardant belt materials
4. Use only IP-classified devices and device enclosures for all electrical installations with respect to water and dust.
5. Provide speed switch sensors and belt alignment sensors.
6. Place warning or clearance signs on elevated galleries where traffic can be expected below.
7. If a de-icing system is needed, only use indirect hot air systems.
8. If there is no sprinkler system, material must be quickly offloaded from the conveyor to a safe location, not to another downstream conveyor.
9. A manually operated sprinkler system can be installed below conveyors positioned above large piles of combustible material, such as chip piles. The system's purpose is to delay the fire from spreading from the pile to the conveyor or, conversely, to wet the material beneath the conveyor and delay the fire from spreading from the conveyor to the pile.

10. Enforce a strict smoking policy.
11. Implement a hot work policy that requires emptying the conveyor and covering exposed areas with non-combustible blankets or similar and water the environment whenever it is possible before any hot work begins. Hot work should not be performed while the conveyor system is in operation.
12. Do not allow vehicle parking closer than 10 metres from conveyors and never directly underneath them.
13. Regularly ensure that fire water is not utilised for process or cleaning purposes. Sprinkler systems and fire water sources are typically not designed to accommodate excessive consumption.
14. Do not design/build/place ignition sources underneath the conveyors, such as fuel, LNG or chemical tanks.

For new conveyors or modifications to old conveyor sprinklers, consult your Risk Engineer at If during the planning phase.

Fire protection – sprinkler system

Belt conveyors in the forest industry should by default be protected by automatic sprinkler systems. The exact design of the systems depends on a multitude of factors. If a conveyor is partially or fully enclosed, making it hard to reach from the outside, sprinkler protection covering the entire enclosure is required. Also, tububelt conveyors can be equipped with sprinklers for fire protection. Consult your Risk Engineer at If for guidance and support.

Design – system types

If there is a risk of freezing, use a dry, pre-action, or deluge sprinkler system. Without freezing risks, use a wet system or deluge system.

- A deluge sprinkler system with open nozzles is the preferred fire protection solution for all conveyor systems. It is particularly critical for fast-moving or inclined conveyors, where the risk of rapid fire spread, or the chimney effect is higher. Conveyors inclined at more than 30° must be equipped with deluge sprinkler protection using open nozzles.
- The deluge system should be activated by linear heat or optical fibre detection (thermal or optical fibre cables), pilot sprinklers, or flame detection. For the deluge sprinkler system, select the most reliable mechanical releasing system. Smoke activation can fail in high air movement or ventilation, and complex electrical triggering systems are more prone to failure than simpler, mechanical systems.

Design – design density

A design density of at least 12,5 mm/min/m^2 should be applied for chip, sawdust, and bark conveyors.

Design – zones

There is often more than one deluge system or zone for fire protection of belt conveyors. In the deluge sprinkler system, water is discharged when the system receives a triggering signal from the fire detection device nearest or close to the ignition point. This signal may also trigger additional deluge systems to release in the conveyor belt's direction of travel, if the conveyor cannot be stopped.

- In dry pipe installation, there is a delay caused by the air outflow. This delay, lasting up to maximum of 60 seconds, needs to be considered in design, as the belt moves continuously and may carry burning material.
- Deluge system zones must be properly sized. If the zones are too small, they can create uncertainty or delay in effectively controlling fire spread. Conversely, overly large zones may result in excessive activation time or water demand, potentially depleting the available water supply.
- If there is manual release for conveyor deluge sprinklers in the control room, organise regular trainings for the operators. It is crucial that only the correct zones are released. Camera surveillance system together with signposting showing the conveyor's deluge system zones can be helpful if manual release is used.

Installation

At least one row of sprinklers should be installed above the delivery belt. If the conveyor belt is wider than 800 mm, sprinklers under the return belt are also needed. If there are 2 - 4 conveyors in the same gallery, additional sprinkler rows might be needed also on the lower level and under the return belt.

Maintenance and testing

Conduct release tests for challenging conveyor deluge sprinklers during the annual maintenance shutdown period.

- Follow the manufacturer's testing procedures for each fire detection system including the release of a fire extinguishing system.
- Test smoke detectors with smoke, heat detectors and flame detectors in accordance with OEM instructions.
- Test the operation of each extinguishing system by activating the detector of the release system.
- Document the delay of the dry pipe system. Water should be released within 60 seconds in the most remote area after activation.
- Ensure that there is sufficient pressure at the highest or most remote point of the sprinkler system when all sprinkler groups are activated according to the design in the conveyor.
- Determine how many fire hydrants can be opened without affecting the sprinkler system if both use the same water supply.
- Ensure all sprinkler pumps start automatically.
- During entire pump testing period it is crucial to monitor the operation of the pumps in accordance with the OEM's instructions. Sprinkler systems shall be tested in accordance with the sprinkler standards.

Interlocks

Provide sufficient manual emergency stops for the conveyor system. Note that shutting down one conveyor might interfere with other conveyors in the system or loading/unloading operations. Evaluate the potential consequences for the entire system when implementing interlocks. Usually, conveyors upstream of a stopped conveyor should also be interlocked to stop.

An alarm of the emergency stop shall be sent to the control room at least in the following situations:

- Manual conveyor shutdown
- Belt misalignment
- Belt speed reduction greater than 20%
- Extinguishing system activation

Ensure that interlocks are in place to shut down the conveyor system if there is no deluge sprinkler system installed. When applicable, creeper gear mode can be beneficial. A cold and wet belt may help cool down a broken bearing inside the roller if the belt is run on creeper mode.

Maintenance programme

Conduct regular inspections of belt conveyors, monitoring at least the following:

- Condition of the belt
- Unusual sounds and abnormal vibrations
- Rollers are running normally
- Housekeeping: remove dirt, material build-ups and vegetation if needed
- Verify belt alignment

- If the belt has been stopped, an inspection round should be carried out.
- On a weekly basis, inspect all bearings for overheating using an IR camera or a thermometer. Bearings that are inaccessible and located in hazardous positions should be monitored using fixed thermal sensors. Inspect motors and gears regularly and check for any vibrations.
- Check de-icing and heating systems at least before the summer and winter seasons. Heating systems operating in manual mode may pose a fire hazard in the summer. Never use direct flame heating systems.
- Perform a spare parts analysis and ensure availability of spares for equipment with long lead times. It is advisable to stock one belt for the longest conveyor of each width used at the site, as the belt can be shortened if necessary.

Emergency planning and response

Develop a firefighting plan that includes the conveyor system in collaboration with the local fire brigade, including detailed guidance on appropriate fire-fighting tactics. The fire brigade should be invited to the site regularly to increase their awareness of the location.

- Train the local emergency response team to manage incidents at the conveyor system. The team must be proficient in operating the conveyor in an emergency and accessing all areas of the conveyor system. They should also be familiar with the locations of the emergency equipment and how to use it.
- Make sure adequate water is available for firefighting purposes and discuss this with the local fire brigade. There should be an adequate number of hydrants on site – as a rule of thumb, 2,700 l/min and a maximum distance of 150 metres between hydrants.
- Place initial extinguishers no more than 30 metres apart in the galleries' walkways.
- Install hose reels in the gallery walkways to ensure all parts of the conveyor are accessible. Clearly visible signage should be provided for hose reels along the conveyors.

2500138 05/2025