ACADEMY / TECHNICAL TRAINING SERIES

CONVEYOR BELT FUNDAMENTALS

MODULE 01 / STUDENT TRAINING WORKBOOK

LEARNER NAME _____

DATE _____ TRAINER / ASSESSOR _____

ONLINE TRAINING / VIDEO LINK

_____

TRAINING SCOPE This introductory learning resource supports theoretical knowledge. Online completion alone does not demonstrate practical competence or authorise unsupervised vulcanising work.

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Module Overview

This module introduces the basic principles of conveyor belts and conveyor systems. Before anyone starts cutting, joining, clipping, vulcanising or replacing a belt, they need to understand how a conveyor works, what the main components do, and why belts fail.

A good belt splice starts long before the belt is joined. It starts with understanding the conveyor, the belt, the tension, the pulleys, the rollers, the loading area and the working conditions.

This module is designed for engineers, fitters, maintenance teams, apprentices, site operatives and companies wanting to improve their in-house conveyor belt knowledge.

This module can be used as a classroom training guide, toolbox talk, apprentice handout or self-training document.

Learning Objectives

By the end of this module, the learner should be able to:

1. Understand the basic layout of a conveyor system.
2. Identify the main conveyor components.
3. Explain the difference between the carrying side and return side of a conveyor belt.
4. Understand why belt tension, tracking and alignment are important.
5. Recognise common causes of belt damage and failure.
6. Understand why correct belt selection and preparation are important before splicing or repair work begins.

1. What Is a Conveyor Belt?

A conveyor belt is a continuous moving belt used to transport materials from one point to another. Conveyor belts are used across many industries, including quarrying, recycling, mining, agriculture, manufacturing, ports, construction and bulk material handling.

A conveyor system may look simple, but it relies on many parts working together correctly. If the belt, rollers, pulleys, tracking, loading or tension are wrong, the conveyor will not run properly and the belt may fail early.

A conveyor belt is not just a piece of rubber. It is a working component that carries load, transfers drive force, handles tension and runs over pulleys and rollers every time the conveyor operates.

A conveyor belt should always be treated as part of a complete system. Many belt failures are caused by problems with the conveyor, not just the belt itself.

2. Basic Conveyor Layout

Most belt conveyors include the following key areas:

Drive End

The drive end is where the motor and gearbox turn the drive pulley. The drive pulley transfers power into the belt and makes it move.

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Tail End

The tail end is normally at the opposite end of the conveyor from the drive. This is where the belt turns around and starts its journey back along the conveyor.

Carrying Side

The carrying side is the top side of the belt that carries the material.

Return Side

The return side is the underside of the conveyor where the belt travels back after discharging the material.

Loading Area

The loading area is where material is placed onto the belt. This area often includes impact rollers, impact beds, skirting and sealing systems.

Discharge Area

The discharge area is where material leaves the conveyor, usually over the head pulley or drive pulley.

3. Main Conveyor Components

Conveyor Belt

The belt carries the material and transmits movement around the conveyor. Belts are available in many different types, strengths, covers and constructions.

Common belt types include:

- EP fabric belt
- Chevron belt
- Heat-resistant belt
- Oil-resistant belt
- Rip-resistant belt
- Steel cord belt
- PVC or PU light-duty belt
- Sidewall belt
- Modular plastic belt

The correct belt depends on the material being carried, conveyor length, incline, speed, loading conditions and working environment.

Drive Pulley

The drive pulley provides the traction needed to move the belt. It is connected to the motor and gearbox.

A drive pulley may be:

- Plain steel
- Rubber lagged
- Ceramic lagged

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- Crowned
- Drum motor type

If the drive pulley has poor grip, contamination or incorrect lagging, the belt may slip.

Tail Pulley

The tail pulley allows the belt to turn around at the opposite end of the conveyor. It may also help guide and tension the belt.

Tail pulleys must be clean, square and correctly aligned. Build-up around the tail pulley can cause belt tracking problems and damage.

Rollers and Idlers

Rollers support the belt and allow it to move smoothly.

Common roller types include:

- Troughing rollers
- Return rollers
- Impact rollers
- Guide rollers
- Disc return rollers
- Spiral rollers
- Training idlers

Poor rollers can cause belt wear, tracking issues, noise, vibration and increased power draw.

Impact Bed or Impact Rollers

Impact beds and impact rollers are used under loading points to support the belt where material drops onto it.

If the belt is not properly supported in the loading area, the belt can be damaged by impact, trapped material or excessive flexing.

Scrapers and Cleaners

Belt scrapers remove carry-back material from the belt after discharge.

Poor belt cleaning can cause:

- Material build-up
- Roller seizure
- Tracking problems
- Belt wear
- Spillage
- Extra maintenance

Skirting and Sealing

Skirting helps keep material on the belt at the loading area. It must be adjusted correctly.

If skirting is too tight, it can damage the belt.

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If skirting is too loose, material can escape and cause spillage.

Take-Up or Tensioning System

The take-up system controls belt tension.

Common take-up systems include:

- Screw take-up
- Gravity take-up
- Hydraulic take-up
- Winch take-up

Correct tension is important. Too little tension can cause belt slip. Too much tension can damage the belt, pulleys, bearings and splice.

4. Carry Side and Return Side

The carrying side is the side of the belt that transports material. This side usually has the most contact with material, impact, abrasion and contamination.

The return side is the side of the belt that travels back underneath the conveyor. It runs over return rollers and may contact snub pulleys, bend pulleys and tracking devices.

When inspecting a belt, always check both sides. Damage on the return side can be just as important as damage on the carrying side.

5. Why Belt Tracking Matters

Belt tracking means how well the belt runs centrally along the conveyor.

A correctly tracked belt should run straight and stay within the conveyor structure. A badly tracked belt may run to one side, rub against the frame, damage the belt edge, spill material or damage the splice.

Common causes of tracking problems include:

- Conveyor frame not square
- Pulleys not aligned
- Rollers seized or missing
- Material build-up
- Incorrect loading
- Belt damage
- Poor splice alignment
- Incorrect tension
- Uneven belt wear

Never assume tracking is only a belt problem. Very often, tracking problems are caused by the conveyor structure, pulleys, rollers or loading conditions.

6. Why Belt Tension Matters

Belt tension allows the conveyor to transfer drive force and carry material correctly.

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If the belt is too loose, it may:

- Slip on the drive pulley
- Fail to start under load
- Track poorly
- Sag between rollers
- Cause material spillage
- Damage the splice

If the belt is too tight, it may:

- Overload bearings
- Damage pulleys
- Stretch the belt
- Damage the splice
- Increase power usage
- Cause premature belt failure

Before cutting or joining a belt, always consider the available take-up movement. If there is not enough adjustment left, the belt length or splice position may need to be reviewed.

7. Common Causes of Belt Damage

Conveyor belts can fail for many reasons. Some failures are caused by the belt itself, but many are caused by the conveyor system or working conditions.

Common causes include:

Impact Damage

Heavy material dropping onto the belt can damage the top cover, carcass or splice area.

Abrasion

Sharp or abrasive material can wear the belt cover over time.

Belt Slip

A slipping drive pulley can burn or damage the underside of the belt.

Tracking Problems

A belt running off-centre can damage the edges and reduce belt life.

Trapped Material

Material trapped between the belt and pulley can cause cuts, holes or pulley build-up.

Poor Cleaning

Carry-back material can build up on rollers and pulleys, causing belt vibration, tracking issues and extra wear.

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Incorrect Splicing

A badly prepared or misaligned splice can fail early.

Incorrect Belt Selection

Using the wrong belt for the application can lead to fast wear, poor tracking or splice failure.

8. Basic Belt Construction

Many rubber conveyor belts are made from several layers.

A typical fabric belt may include:

Top Cover

The rubber layer on the carrying side of the belt. It protects the belt carcass from wear, impact and material damage.

Carcass

The strength layer of the belt. This may be made from fabric plies or steel cords. The carcass gives the belt its tensile strength.

Bottom Cover

The rubber layer on the pulley side or return side of the belt. It protects the carcass and provides contact with pulleys and rollers.

Edges

The sides of the belt. Belt edges may be moulded or cut. Edge damage should always be checked before splicing or repair work.

Understanding belt construction is important because different belts require different splicing methods.

9. Introduction to Belt Splicing

Belt splicing is the process of joining two ends of a conveyor belt together.

Common joining methods include:

Mechanical Fasteners

Mechanical fasteners are clips or hinges fitted to the belt ends. They are often used for fast repairs, temporary joints or where vulcanising is not practical.

Cold Bonding

Cold bonding uses adhesives and rubber materials to join or repair a belt without heat.

Hot Vulcanising

Hot vulcanising uses pressure, heat and uncured rubber to create a strong permanent splice.

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Finger Splicing

Finger splicing uses interlocking fingers cut into the belt ends. It is often used on certain belt types where flexibility and smooth running are important.

Steel Cord Splicing

Steel cord splicing is used on steel cord belts and requires specialist training, correct materials and experienced supervision.

The correct splice method depends on the belt type, conveyor duty, working environment, available equipment and site requirements.

10. Good Working Practice

Before any belt work begins, always check:

- Has the conveyor been isolated and locked off?
- Is the belt safely supported?
- Is stored tension released or controlled?
- Is there enough take-up movement?
- Has the belt type been identified?
- Is the splice method suitable?
- Are the correct materials available?
- Are the tools clean and safe?
- Has the splice area been measured and marked correctly?
- Is the working area clean and dry?
- Is the team clear on the method and sequence of work?

Good belt work is about preparation. A rushed splice or repair often costs more time later.

Practical Exercise

Inspect a conveyor, conveyor drawing, photograph or training diagram and identify the following parts.

1. Drive Pulley

Response / identification: _____

_____

2. Tail Pulley

Response / identification: _____

_____

3. Carrying Side

Response / identification: _____

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_____

4. Return Side

Response / identification: _____

_____

5. Loading Area

Response / identification: _____

_____

6. Discharge Area

Response / identification: _____

_____

7. Rollers

Response / identification: _____

_____

8. Belt Cleaner or Scraper

Response / identification: _____

_____

9. Take-Up System

Response / identification: _____

_____

10. Possible Areas Where Belt Damage Could Happen

Response / identification: _____

_____

Knowledge Check

Question 1

What is the purpose of the drive pulley?

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_____

_____

_____

Question 2

What is the difference between the carrying side and return side of a conveyor belt?

_____

_____

_____

Question 3

Name three common causes of belt tracking problems.

_____

_____

_____

Question 4

Why is belt tension important?

_____

_____

_____

Question 5

Why should belt construction be understood before splicing?

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_____

_____

Question 6

What can happen if the belt is too loose?

_____

_____

_____

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Question 7

What can happen if the belt is too tight?

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Question 8

Why are impact beds or impact rollers used?

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_____

_____

Question 9

Why is good belt cleaning important?

_____

_____

_____

Question 10

What is belt splicing?

_____

_____

_____

Self-Assessment

Tick each statement once you understand it.

- I can identify the drive pulley.
- I can identify the tail pulley.
- I understand the carrying side and return side of a belt.
- I understand why belt tracking matters.
- I understand why belt tension matters.
- I can name common causes of belt damage.
- I understand basic belt construction.
- I can name common belt splicing methods.

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- I understand why preparation is important before belt work starts.

Module Summary

A conveyor belt system is made up of many parts working together. Before carrying out belt splicing, repairs or maintenance, it is important to understand the conveyor layout, belt construction, tension, tracking and common causes of belt damage.

Correct preparation and good working practice improve safety, reduce downtime and help create better, longer-lasting belt repairs and splices.

This module is the foundation for the rest of the Conveyor Shop Academy belt training course.

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