Crushing, Screening and Conveying

Five-Day Online Course for Plant Operators

Course design and delivery plan

DURATION	DELIVERY	AUDIENCE
5 days / 25 hours	Facilitated online learning	Mineral processing, quarrying and aggregate plant operators

Course purpose

Develop operators' ability to monitor crushing, screening and conveying equipment, recognise abnormal conditions, and make safe operating decisions that support product quality and reliable production.

Practical focus

Plant flow • Equipment observation • Fault recognition • Product quality • Shift communication

Training scope

This course develops operating knowledge and decision-making. Equipment operation and workplace competence require separate supervised assessment using site procedures and the relevant original equipment manufacturer (OEM) manuals.

Five learning hours per day, excluding breaks.

Course overview

Audience and entry requirements

For new and experienced plant operators. Learners need basic plant terminology and numeracy and should have completed their employer's safety induction or an equivalent introductory module.

Delivery approach

Facilitated online sessions combine short equipment videos, annotated plant diagrams, group exercises and simulated operating scenarios. Provide downloadable materials for learners with limited internet access.

Course learning outcomes

• Trace material through a crushing, screening and conveying circuit.

• Explain the purpose and basic operating principles of major equipment.

• Identify hazards and select the appropriate response within operating authority.

• Interpret operating trends, alarms and inspection findings.

• Recognise common causes of poor throughput and off-specification product.

• Complete useful inspection records, defect reports and shift handovers.

Daily learning format

SESSION	TIME	METHOD
Opening and knowledge check	20 min	Poll, recap and discussion
Concepts and equipment	60 min	Facilitated lesson with diagrams
Guided observation	50 min	Video, photographs or simulated display
Applied workshop	60 min	Small-group task
Operating scenario	80 min	Decisions, discussion and feedback
Assessment and reflection	30 min	Quiz and individual submission

Schedule breaks between sessions. Total learning time: 300 minutes per day.

DAY 1 / FIVE LEARNING HOURS

Understand the Plant and Operate Safely

How do the three processes work together, and where are the main risks?

Learning outcomes

• Trace feed, intermediate material, final products and recirculating material.

• Distinguish crushing, screening and conveying functions.

• Identify moving equipment, stored energy, falling material and exposure hazards.

• Explain the difference between stopping equipment and isolating hazardous energy.

• Identify when to stop, withdraw and escalate.

Topics

• From feed hopper to product stockpile; primary, secondary and tertiary crushing.

• Open and closed circuits; feeders, chutes, transfer points and surge capacity.

• Operator responsibilities and limits of authority.

• Guarding, access control, emergency stops and communication.

• Dust, noise, mobile equipment interaction and housekeeping.

• Site isolation procedures and stored energy awareness.

Online activities

• **Build the circuit:** Arrange equipment symbols into a simple plant flow diagram.

• **Spot the hazards:** Annotate photographs showing missing guards, material build-up and unsafe access.

Operating scenario

Respond to a blocked transfer chute without approaching or intervening in the equipment.

Assessment and takeaway

A 10-question quiz and an annotated flow diagram identifying at least five hazards and their controls.

Takeaway: Plant flow diagram and hazard recognition checklist.

Emphasis: An emergency stop does not establish safe isolation. Blockages can involve unexpected movement and stored energy; intervention must follow the site's authorised procedure. [1]

DAY 2 / FIVE LEARNING HOURS

Crushing: Control Feed and Recognise Abnormal Conditions

What does a crusher need to operate consistently?

Learning outcomes

• Compare jaw, gyratory, cone and impact crushing principles.

• Explain how feed properties influence crusher performance.

• Interpret basic crusher operating information.

• Recognise abnormal conditions and choose an appropriate response.

• Distinguish operator adjustments from work requiring specialist authorisation.

Topics

• Compression and impact breakage; crusher components and wear parts.

• Feed size, hardness, moisture and distribution.

• Closed-side setting and its relationship to product size.

• Feed control and equipment-specific loading requirements.

• Motor load, lubrication information, temperature, vibration and alarms.

• Bridging, blockages, tramp metal and uneven wear.

• Pre-start checks and approved start-up and shutdown procedures.

Online activities

• **Identify the equipment:** Match crusher diagrams to operating principles.

• **Read the trend:** Review rising motor load alongside changing feed conditions.

• **Troubleshooting workshop:** Compare symptoms of variable feed, restricted discharge and possible lubrication problems.

Operating scenario

Crusher load rises while throughput falls. Learners identify the additional information needed, select actions permitted by the operating procedure, and prepare an escalation report.

Assessment and takeaway

A 10-question quiz and a short troubleshooting response covering evidence, immediate action and escalation.

Takeaway: Crusher observation and fault-reporting sheet.

DAY 3 / FIVE LEARNING HOURS

Screening: Protect Product Quality

Why does material end up in the wrong product stream?

Learning outcomes

• Explain size separation and the purpose of screen decks.

• Distinguish oversize, undersize and misplaced material.

• Recognise blinding, pegging and damaged screening media.

• Explain how feed conditions affect screening.

• Interpret simple product sample results.

Topics

• Scalping, sizing and dewatering applications.

• Aperture size, screening media and deck arrangements.

• Material stratification and passage through openings.

• Feed rate, distribution, moisture and bed depth.

• Blinding, pegging, wear and torn panels.

• Screen observations from approved safe locations.

• Product sampling, contamination and recirculating material.

• Communication with quality-control and maintenance teams.

Online activities

• **Follow the particles:** Predict which product stream receives each size fraction.

• **Inspect the evidence:** Identify possible defects from screen photographs.

• **Quality workshop:** Compare sample results with a supplied product specification.

Operating scenario

Following rainfall, recirculating material increases and saleable product output declines. Learners use feed observations, screen images and operating trends to propose a supported explanation.

Assessment and takeaway

A 10-question quiz and a product-quality investigation worksheet.

Takeaway: Screening performance observation checklist.

Emphasis: Feed distribution, material depth and screening media condition are useful factors to investigate when performance deteriorates. [2]

DAY 4 / FIVE LEARNING HOURS

Conveying: Maintain Reliable Material Flow

How do operators recognise conveyor problems before they interrupt production?

Learning outcomes

• Identify major belt conveyor components.

• Recognise mistracking, spillage, carryback, slipping and chute restrictions.

• Describe safe inspection boundaries.

• Explain how a conveyor interruption affects connected equipment.

• Produce a clear conveyor defect report.

Topics

• Belts, pulleys, idlers, drives and take-up arrangements.

• Loading zones, skirts, cleaners and transfer chutes.

• Belt alignment and loading distribution.

• Speed, slip, alignment and blocked-chute protection, where fitted.

• Pull-wire stops, guards and approved access routes.

• Belt damage, abnormal noise, heat and material accumulation.

• Interface with stockpiles and mobile equipment.

• Inspection and maintenance responsibilities.

Online activities

• **Component identification:** Label a conveyor diagram.

• **Virtual inspection:** Review footage and record observations.

• **Prioritise defects:** Decide which findings require immediate action and which require planned follow-up.

Operating scenario

A transfer chute restriction is reported while material continues arriving from upstream. Learners explain their response using a supplied site procedure and identify the affected equipment.

Assessment and takeaway

A 10-question quiz and a completed inspection and defect report.

Takeaway: Conveyor inspection checklist.

Emphasis: Nip points require guarding. Cleaning, adjustment and intervention must follow authorised procedures; learners must not practise these tasks on running equipment. [3]

DAY 5 / FIVE LEARNING HOURS

Run the Circuit as One System

How do operators balance safe operation, throughput and product quality?

Learning outcomes

• Explain how a restriction in one area affects the rest of the circuit.

• Interpret a basic operating dashboard.

• Apply a structured troubleshooting method.

• Use supplied procedures to plan normal start-up, shutdown and recovery.

• Deliver an effective shift handover.

Topics

• Circuit bottlenecks and upstream/downstream effects.

• Throughput, availability, downtime and product quality.

• Fresh feed versus internal recirculating flow.

• Normal operating ranges and authorised adjustments.

• Alarm response, trips and restart authorisation.

• Recording events and communicating unresolved defects.

Online activities

• **Structured troubleshooting:** Identify the symptom; check evidence; assess immediate risk; act within authority and procedure; verify the result and record the outcome.

Capstone simulation

Operate a simulated closed-circuit plant through four events: feed moisture increases; screen performance deteriorates; crusher load rises; a conveyor protection device trips. Submit a prioritised action log, an explanation linking symptoms, a defect or incident report, and a shift handover covering status, restrictions and outstanding actions.

Assessment and takeaway

A 30-question knowledge examination, individual capstone response, and a written or recorded verbal handover.

Takeaway: Integrated troubleshooting guide and shift handover template.

Assessment and completion

ASSESSMENT COMPONENT	WEIGHT
Daily quizzes, Days 1-4	20%
Applied worksheets, Days 1-4	20%
Final knowledge examination	25%
Capstone decisions and handover	35%
Total	100%

Recommended pass requirements

• At least 80% overall.

• Completion of all required activities.

• Successful response to every designated safety-critical decision. Errors require coaching and reassessment before completion.

Safety-critical decisions should cover isolation, guarding, blockage intervention, emergency response and unauthorised restart.

Certificate wording

Completed online knowledge training in crushing, screening and conveying.

Workplace operating authorisation should follow a separate practical assessment.

Workplace follow-up

Within two to four weeks, a competent site assessor should observe each learner completing a plant inspection, explaining alarms and operating limits, responding to a simulated abnormal condition, and handing over a shift. Record coaching needs before granting or confirming operating authorisation.

Trainer preparation and resources

Obtain before delivery

• A representative plant flow diagram.

• Relevant equipment manuals and site operating procedures.

• Approved isolation, emergency and restart procedures.

• Typical operating ranges, alarms and escalation contacts.

• Equipment photographs or approved videos.

• Example product specifications, sample results and trend data.

Prepare the learning pack

Prepare a learner workbook, daily quizzes with answer explanations, scenario packs, assessment rubrics and the five takeaway job aids listed in the daily plans.

Make learning accessible

Use short lessons, labelled diagrams, plain language and captions. Allow learners to explain decisions verbally where writing ability would otherwise obscure their operating knowledge.

Reference guidance

The sources below support the highlighted technical and safety principles. Apply the relevant local requirements, site procedures and OEM instructions when adapting the course.

[1] HSE - Safe operation and use of mobile jaw crushers

[2] Metso - Ensure your productivity by choosing the right equipment for your screening

[3] HSE - Guarding