Driving conveyor safety in mining

How Australian mines can meet risks with smarter systems

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Introduction

Despite remarkable gains in production and automation, conveyor safety remains stubbornly vulnerable in Australian mining.

This industry paper explores the realities of conveyor safety in Australian mining today. Rising demand, leaner workforces, and tougher operating conditions all place greater pressure on crews and equipment, making early detection and reliable systems more critical than ever. Drawing on regulator reports, industry data, and practical expertise, it examines:

- The economic and labour pressures shaping conveyor risk
- The most common failure modes, including heat build-up, blockages, and misalignment
- The role of non-contact radar, direct condition sensing, and a unified data layer in providing earlier, clearer warnings
- Practical steps sites can take to modernise safety without adding unnecessary complexity.

This paper will demonstrate that with proven, cost-effective technologies and sound design, mining companies can reduce injuries, prevent fires, and protect uptime – despite the challenges they are facing.

The pressures behind today's conveyor risk

Economic demand remains intense, even as prices and inflation normalise. The Australian Government's June 2025 *Resources and Energy Quarterly* forecasts export earnings of A$385 b in 2024–25, moderating to A$352 b by 2026–27 – a plateau driven by prices, not volume, which keeps utilisation high and maintenance windows tight.[1] With the ABS reporting in May 2025 that mining vacancies remain elevated[2], there is the added pressure of talent shortage, thin crews, and lack of experience-gained safety knowledge. With these macro-economic challenges a reality that cannot be avoided or compensated for in the short term, there is a greater onus on technology to remedy negative safety outcomes.

Top 5 risks for conveyor safety in mines

1. Heat-at-pulley fires

In a 2023 safety alert, the NSW Resources Regulator described underground workers who followed a burning smell to a longwall tail pulley and found roughly 300 mm flames while the belt was still running – a "heat before fire" event seeded by a failed bearing.[3] It's a vivid reminder that modest thermal anomalies on critical rollers can become belt fires – and plant-wide downtime – long before anyone sees smoke.

2. Blocked transfer chutes

A NSW investigation into Thuddungra Mine details how a worker slipped, fell into a conveyor entry chute, and was buried to the chest by product while inspecting a suspected blockage – surviving with serious injuries.[4] The lesson is simple: blockages create unstable conditions; if detection comes only after a build-up, people end up in harm's way.

3. Misalignment

In a 2025 information release, the NSW Regulator reported a serious arm entanglement during belt realignment on an unguarded fixed conveyor. A tail adjustment screw sat inside an unguarded section; as the worker tried to reposition the belt, their arm was drawn into belt and rollers.[5] This is a common safety concern where tracking leads to guards off, tools near nips, and injury.

4. Remote, harsh environments

In January 2024, an iron-ore train derailed after a heat buckle on the Pilbara railway, cutting supply into operations and illustrating how extreme heat degrades infrastructure – and complicates safe recovery across the whole materials chain.[6] With major mines operating via Remote Operations Centres in Perth, about 1,500 km from the Pilbara, safety depends on field signals staying reliable when dust and spray obscure vision.[7]

5. The digital execution gap

Australian organisations still struggle to land digital programs end-to-end. The result in mining is familiar: periodic manual conveyor checks, siloed alarms, and spreadsheets – when what crews need is continuous, dust-immune sensing and a plain-English view. A recent study Boston Consulting Group (BCG) found the mining sector to be 30-40% less digitally mature than industries like automotive and chemical.[8] With digitalisation leading to clarity of operations and safer practices – this shortfall must be made up.

How to address these risks

So, what is the best way to address these risks?

Start where the risk is highest, prove what works, then repeat it across similar conveyors. The steps that follow are grounded in regulator guidance and proven Australian practice – simple, practical moves you can roll out without adding unnecessary complexity.

Fix 1: Stop heat becoming fire

Design for "heat before fire". Continuously monitor bearing temperature at critical pulleys (tail, head, take-up) and, where cabling is impractical, extend coverage across high-risk idlers with wireless temperature/vibration nodes. Use rate-of-rise alerts and pre-ignition trips so intervention happens before smoke. NSW's alert on tail-pulley flames points to exactly these controls: abnormal-temperature detection followed by timely isolation.[9]

"On conveyors you've got critical pulleys with bearings that can deteriorate or fail. That failure creates friction at the rotating shaft, generates heat, and can ignite the rubber belt or nearby combustible material. That's why we monitor those bearings – wired on pulleys and often wireless on rollers – so when temperatures start rising you can stop, isolate and change it out before it becomes a fire."

– Sam Rupasinghe, SE Industry Specialist Mining, ifm

Fix 2: See and stop chute build-ups before people are exposed

Instead of sending someone to open a dusty inspection door, build-up can be detected remotely. Overhead radar works reliably in the dust and spray where cameras or ultrasonic sensors often fail. As material levels rise, the system can move from a simple warning to automatically stopping the conveyor, while sending clear, time-stamped alerts to the control room.

"You can mount a non-contact radar above the conveyor and watch the product as it moves. If a rock is larger than normal it raises an alarm, and the same sensor can look at the belt edges and even into the chute to pick up a blockage. That gives maintenance an early signal to check or divert before it turns into a clean-up."

– Sam Rupasinghe, SE Industry Specialist Mining, ifm

Fix 3: Spot belt drift early and act fast at the limit

Catching misalignment early means it can be fixed during normal operations, not in the middle of the night after a breakdown. Use non-contact monitoring to track small belt movements and add misalignment switches that shut the system down if it strays too far. Make sure conveyors cannot restart while guards are off. Safety hardware (like e-stops, pull-cords, and drift switches) and control logic (pre-starts, interlocks, and isolations) should always line up with AS/NZS conveyor safety standards and site rules.

"Belt misalignment switches that run along the sides are still still required, but they only trigger once the belt has pushed the arm quite a bit. With radar on top you can monitor the edges and see it trending even if it moves only a couple of millimetres. That shifts it toward smarter, condition-based monitoring instead of finding out after it happens."

– Sam Rupasinghe, SE Industry Specialist Mining, ifm

Fix 4: Engineer for distance and dust (so remote decisions hold up)

When sites are monitored from far away, the quality of field data becomes a frontline safety control. Remote operation reduces worker exposure, but only if signals stay reliable in harsh mining conditions – dust, spray, glare, and heat. The aforementioned iron ore train derailment caused by a heat-buckled track shows why thermal and speed thresholds need to be tightened during high-temperature seasons.

"Radar can cover a few different scenarios with one device – oversize on the belt, possible splits, edge movement and chute blockages. And with digitalisation over IO-Link we can bring all that information back to a centralised platform. It makes it easier for operators to see what's happening and act earlier."

– Sam Rupasinghe, SE Industry Specialist Mining, ifm

Standardise on non-contact radar at transfers and feeders, direct belt/shaft speed monitoring at drives, and use clear, location-specific alarms that appear the same for both site and control room teams.

Fix 5: Close the execution gap – start small, scale fast

Too many projects stall in "pilot purgatory," never moving beyond trials. The key is to prove value on one conveyor, then replicate the template. Programs in Australia often lose momentum when the scope is too broad or early wins aren't clear. A focused start, simple KPIs, and a clear scale-up plan keep things moving. With production demands staying high, condition-based monitoring that operators actually use is the most practical lever.

"Most sites already monitor conveyor under-speed because it points to a lot of different faults. Where they need help is with specific scenarios – tears, misalignment, blockages – so we tailor the sensing to that problem and build from there. The direction is toward smarter condition-based monitoring: seeing it start to happen and dealing with it earlier."

– Sam Rupasinghe, SE Industry Specialist Mining, ifm

ifm tools in action

- **R2D radar (area distance/velocity)**
  Think of these as "eyes above the conveyor" that can see through dust and spray where cameras and lasers fail. Mounted overhead, they spot problems like rocks piling up in a chute, oversized material landing on the belt, or the belt beginning to drift off track. The R2D scans a customisable area and has multiple adjustable filters that can be used to tune the sensor to these applications. A simple example is the ability of the sensor to filter moving and static objects as well as the direction of travel of these objects. This gives greater flexibility for complex applications such as blocked chute detection. The R2D links easily into control systems using IO-Link, analogue or switched outputs, so operators get clear data without complex setup.

- **Smart inductive speed sensors (DI range)**
  Imagine a speedometer fixed to the conveyor's drive shaft. These smart sensors directly measure how fast the belt is running. If it slows down too much (underspeed) or races too fast (overspeed), they trigger an alarm or shut the line down. Because they handle the speed calculations inside the sensor, they don't need high speed input cards or complicated programming in the control system.

- **IO-Link + moneo**
  This is the "common language" and dashboard that ties everything together. IO-Link makes sure all devices talk the same way, and moneo gives operators one screen to see trends, compare changes, and track alarms. It also has the ability to monitor multiple parameters simultaneously and analyse the relationship between the various parameters to detect anomalies in an asset. Whether you're in the control room or at a Remote Operations Centre hundreds of kilometres away, the information looks the same and is easy to act on.

The radar sensor detects the load height and speed of a conveyor belt.

Conclusion

Mining today pushes conveyors harder than ever – longer hours, heavier loads, hotter conditions. That makes safety not just about compliance, but about building systems that can spot problems early, stand up to dust and heat, and give crews clear information they can act on right away.

The lessons from recent Australian incidents are simple but powerful:

- Catch heat before it turns into fire
- Detect blockages before anyone has to open a chute
- Spot belt drift before it causes damage
- Keep signals clear from the pit to the control room.

The smartest way forward isn't a huge overhaul; it's starting small. Prove the value on one conveyor, then roll it out across the site. That way, you're protecting people and keeping production steady at the same time.

Want to see how ifm can help make your conveyors safer and smarter? Click here for more information or call us on 1300 365 088.

References

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