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Safe confined space entry for chutes, silos and hoppers

ABHR explores some of the ways conveyor operators and designers can prevent serious injuries and save lives when working in confined spaces on site.

THERE ARE MANY FACTORS THAT cause bulk materials to adhere to the sides of chutes, silos and hoppers – including humidity, moisture content, size/texture of the raw material or increased production volume – resulting in lost capacity or clogging.

If this material builds up for too long, it can reduce flow and eventually means production must stop in order to address the issue. This can cause expensive downtime and require labour to clear the obstruction.

This is a dangerous task. According to the Mine Safety and Health Administration, around seven per cent of fatalities in the United States, recorded between 1995 and 2011, occurred in a confined space.

Daniel Marshall, Product Engineer for Martin Engineering, says clearing extensive build-up often involves confined space entry, but the consequences of untrained staff entering a chute, silo or hopper can be disastrous, including physical injury, burial and asphyxiation.

"Without proper testing, ventilation and safety measures, entering vessels containing combustible dust could even result in a deadly explosion," he says.

What is confined space entry?

Safe Work Australia defines "confined space" as an enclosed or partially enclosed space that is not designed or intended to be occupied by a person, is a risk to health and safety from an atmosphere that doesn't have safe oxygen levels or contaminants like airborne gasses and dusts, and presents risks of engulfment.

Confined spaces are commonly found in vats, tanks, pits, pipes, ducts, flues, chimneys, silos, containers, pressure vessels, underground sewers, wet or dry wells, shafts, trenches, tunnels or other similar enclosed or partially enclosed structures.

Safe Work Australia also warns that these spaces are not usually designed for people to work in and the hazards are not always obvious, potentially changing from one entry point to the next.

The organisation advises to eliminate the need for people to enter a confined space if at all possible.

When not, working in a confined space typically requires special personnel training, safety harnesses and rigging, extensive preparation and added personnel as part of a buddy system.

"Systems designed to minimise permit-required confined spaces can provide a significant return on investment, and the best time to reduce the amount of confined-space entry for component maintenance and replacement is during the specification and design stages of a project," Marshall says.

Some manufacturers offer products and systems to reduce the need for confined space entry. Some examples include:

- Modular chute designs with abrasion-resistant liners
- Chutes that hinge open and lay down for liner replacement
- Skirtboards with external liners
- Belt cleaners that can be serviced without confined space entry
- Flow aids such as air cannons and vibrators to reduce buildup
- Modular air cleaners for specific locations rather than centralised dust collection

Never do this: confined space entry by untrained personnel is a formula for serious injury.

Best practices

Rules regarding confined space entry vary greatly depending on the country, however, general rules can be drawn from regulations established in major industrial markets such as Australia, New Zealand, Canada and the US.

Commonalities between governmental regulations provide employers with a measured approach to safety. These procedures include:

Prior to starting the job

- Review the permit and the job-specific

work procedures

- Gather and inspect all necessary personal protective equipment
- Test and/or calibrate any safety gear, test instrumentation or communication tools.
- If a current Job Safety Analysis or safety check list does not exist, perform a risk assessment
- Hold a pre-job meeting making sure all workers are aware of the hazards and safe work practices
- Conduct proper tests for toxins, vapour, dust levels, oxygen levels and material-specific hazards
- Perform as much cleaning and maintenance as possible outside of the vessel.
- Post completed confined space entry permit outside of the vessel
- Isolate contaminants and moving parts to prevent the accidental introduction of materials
- Proper lock-out/tag-out/block-out/test-out procedures must be completed and documented prior to entry.

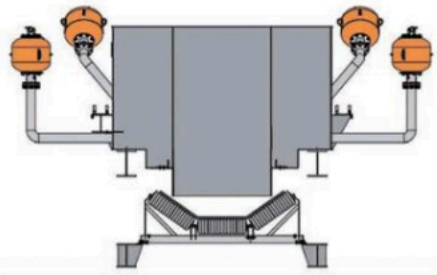
During procedure

- Perform maintenance/cleaning using non-toxic substances such as water and avoid using heat/fire in the confined space. Never use oxygen to purge a confined space, as this can create a fire and explosion hazard
- Provide ventilation if possible
- Select personal protective/safety equipment such as safety helmet, gloves, hearing protectors, safety harness and lifeline and breathing apparatus
- Assign a trained observer to monitor the procedure and internal conditions, and provide escape assistance if needed
- Practice fast evacuation of the confined space

Covering your access

"Over time, well-designed access improves safety and saves money," Marshall says.

"Safe access that is carefully located and adequately sized will increase dependability and also reduce the downtime and associated labor required for maintenance."



Proper air cannon placement in chutes and silos can reduce ongoing buildup.

Marshall says companies should consider equipment designs that minimise the need for confined space entry, including improved access doors, vibrators, air cannons or silo cleaning services.

"Conveyor systems that are properly outfitted with appropriate cleaning and material discharge equipment create a safer workplace, while experiencing longer life and less downtime," he says. B