

MACHINERY SAFETY INFORMATION TROMMEL SCREENS

This WISH information document is aimed at health and safety improvements in the waste management industry. The Health and Safety Executive (HSE) provided support to WISH in producing this guidance. This guidance may go further than the minimum you need to do to comply with the law with regard to health and safety

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Introduction and scope

This is one of a series of information sheets covering specific items of machinery in common use at recycling plants/MRFs. All are available as free downloads from the WISH website (<https://www.wishforum.org.uk/information/>). General guidance on recycling plant safety is also available (<https://www.wishforum.org.uk/wish-guidance/>), and on isolation and lock-off (<https://www.wishforum.org.uk/wp-content/uploads/2021/10/WISH-WASTE-29-Practical-isolation-and-lock-off-guidance-October-2021.pdf>). This sheet does not aim to be comprehensive – you should also seek further guidance, such as that available on the HSE’s website, and where required obtain competent advice. This sheet covers trommel screens.

Case studies – the case studies in this information document are based on real accidents. However, they have been anonymised by the removal of names, company names, dates etc to prevent any distress to relatives, friends etc of the injured person/s.

Introduction

Contact with moving machinery, including trommel screens, has been the cause of multiple serious and fatal accidents at recycling plants. The latest HSE statistics available show that machinery safety is the most common cause of fatal accidents at recycling plants (<https://www.hse.gov.uk/statistics/industry/waste-recycling.pdf>). The safe design, use and maintenance of trommel screens is essential if we are to reduce this unacceptable toll of serious, life-changing, and fatal accidents.

Case study – two workers at a recycling plant entered a trommel screen to clear a blockage. The machine had not been securely isolated and locked-off. A third person was unaware that the two workers were in the trommel (interior of the trommel not visible from the control panel) and started the machine, resulting in fatal injuries to both of the two workers in the trommel.

Dangerous parts of trommel screens

In general, the dangerous parts of trommels screens include:

Drive systems – trommel screens can be driven by friction wheels, chain drives, belts, cogged drives or similar. All pose serious machinery safety hazards and typically drive systems should be enclosed by suitably robust fixed, close guarding. If close guarding is not practical, the use of perimeter (machine) fencing may need to be considered.

Upstream and downstream conveyors - trommel screens are commonly fed via conveyor and have other conveyors to take the sized wastes away from the screen. The design of guarding, perimeter fencing etc should account for potential access into the trommel via these conveyors during normal operation and maintenance activities (such as belt tracking). The conveyors themselves also pose risks. For more information on conveyor machine safety see WISH INFO 20 available at <https://www.wishforum.org.uk/information/>.

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Rotating drums – trommel screens rotate. Where any protrusion or similar on the rotating drum or perforations in the drum passes-by a fixed structure there is the hazard of potential trap and/or shear points. Many trommel screens are completely enclosed by fixed or moveable guards to avoid this type of hazard. If this is not the case, and unless the screen is safe by position' (well away from any access) the use of perimeter fencing will need to be considered. As with all perimeter fencing access via gates for cleaning, blockage clearance and maintenance needs considering. If access is frequent, the use of interlocked access gates, moveable panels etc may be required.

Interior of the trommel – blockage clearance and similar tasks usually requires access into the trommel screen itself. The interiors of trommel screens include perforations, support structures and in some cases 'teeth' and similar elements. Accidental activation of a trommel screen while a person/s is inside the drum is likely to have very serious consequences and secure isolation and lock-off needs to be in place (see guidance at: <https://www.wishforum.org.uk/wp-content/uploads/2021/10/WISH-WASTE-29-Practical-isolation-and-lock-off-guidance-October-2021.pdf>).

Other hazards which may also need to be considered include:

- Ejecta such as ejected wastes at the feed point to the trommel or its output/s. Walkways, access points etc running close to trommels may need suitable meshing/fencing or similar to protect workers from ejecta
- Entanglement in wastes being fed into a trommel resulting in a person being drawn-into the trommel screen interior or rotating external part
- Most trommel screens are fixed in place. However, some are mobile to allow their transport from site-to-site or around the same site. Movement and transport may involve the removal of guards, folding of parts of the structure of the machine etc. Each time a trommel screen is erected it must be checked to ensure that all parts have been secured in their operational position and all guards and similar have been replaced. The trommel screen should be operated on a secure, firm and level base



Left to right: large fully enclosed trommel screen with walkway access, interior of a trommel screen, example mobile/transportable trommel screen, interior of a trommel screen during installation

Safeguarding of trommel screens

As for any machinery hazard, safeguarding of trommel screens should follow the hierarchy given in PUWER (Provision and Use of Work Equipment regulations). In brief, use of close fixed guards should be considered first and if not practical use of interlocked and similar guards, then if also not practical other safeguarding such as perimeter (machine) fencing.

The majority of accidents involving trommels occur during 'interventions' such as maintenance, cleaning, and blockage clearance. Before considering safeguarding you should first consider eliminating or reducing the need for such interventions, such as:

- Use of automatic or remote oiling/greasing systems to eliminate any need to remove guards to perform routine maintenance
- Are you using the right machine for the right job? Is your trommel of a sufficient size and adequate design for the waste you are processing? Is the aperture size and design in the screen drum correct for the types of waste you are processing?
- Removal of large or 'sheet' type materials which can 'blind' the screen before wastes are fed into a trommel, such as by use of a mechanical pre-sort. If your trommel screen blocks and/or blinds frequently you should consider why this is the case rather than simply accept a need for excessive interventions

Fixed close guards – should be the first option considered, in particular for trommel drive systems, and should be fitted wherever practical.

Interlocked guards - may be required if frequent access for cleaning, blockage clearance is needed (once other measures such as above have been taken to reduce the need for interventions). For example, the interlocking of access hatches to trommel screen interiors. Note that isolation and lock-off would still be required for access (see guidance at: <https://www.wishforum.org.uk/wp-content/uploads/2021/10/WISH-WASTE-29-Practical-isolation-and-lock-off-guidance-October-2021.pdf>).

Perimeter (machine) fencing – should only be considered if fixed and interlocked guards are not practical. However, the use of fencing can be effective provided that the fencing is of an adequate design and effectively prevents access to any dangerous parts.

Whatever safeguarding approach is taken, guards and similar need to be suitable robust and designed to the required standards. You may need to seek competent advice.

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Mobile trommel screens can include an integrated discharge conveyor, where the pivot point between trommel discharge and conveyor infeed is variable depending on the angle of conveyor discharge. The integrated conveyor discharge may also include reach access to the head drum/roller, depending on the angle of discharge, and consequently the height above ground (or point of easy climbing such as on the pile of wastes discharged under the head roller) can vary. It is important for users of such machines to assess the additional risks of such mobile machines through discussion with the machine supplier. In summary:

- Access to trommel via discharge conveyor pivot area – fit or retrofit guard rails or other guarding at the discharge point
- Contact with in-running nips (trommel drive) – review foreseeable hazard areas and fit suitable guarding
- Conveyor head drum/roller position (trapping/nip points) – ensure suitable guards are fitted at the head roller

Note – it is foreseeable during normal operations that a pile/stack of waste will accumulate under the head roller of a discharge conveyor (or a skip or similar placed to contain the waste). In these circumstances the ‘reaching-up’ distance to the head roller starts at the skip or easy-to-climb height on the pile and not at ground level.



Left to right: view of unguarded mobile trommel discharge, additional guarding installed to deter access at the conveyor pivot, general view of a mobile trommel screen in use – conveyor head roller/drum is only safe when in the elevated position and/or the pile of waste under it does not allow easy climbing access

Emergency stop provision

Emergency stops, typically of the 'button' type should at least be installed at the control panel, at the feed and output openings of trommel screens and at any access points such as interlocked hatches and similar where workers enter the screen to clean, clear blockages etc. Emergency stop checks should be part of routine daily/weekly check systems.

Safe access and blockage clearance

Even after any need for interventions has been reduced, experience is that entry into trommel screen interiors for blockage clearance etc is still likely to be required.

Case study – workers had entered a trommel screen to clear a blockage. The interior of the screen was fitted with 'teeth' elements. While in the trommel the screen started moving under their body weight (rotating as the workers moved around in the trommel drum). One worker slipped and fell partially into the output chute at the lower end of the trommel and onto the 'teeth' elements sustaining serious soft tissue damage, a fractured leg and puncture wounds.

Any access into trommel screens or other waste and recycling machinery poses hazards such as cuts, contact with contaminated materials etc. These risks should be included in your risk assessment.

Safe access should be provided for entry into trommel screens. Unless there is no other practical alternative, access via input conveyor or similar is not acceptable. If no other practical method of access can be arranged, workers should not be expected to climb-over railings and fencing, the risks of slips and trips on a conveyor need to be assessed (for example, the fitting of plates under the conveyor belt to provide firm footing), and adequate fall protection must be provided.



Left to right: CCTV installed in one end of a trommel screen to provide operatives with a view of what a problem might be before entry is attempted, large enclosed trommel with access door at one end, access hatch into a trommel screen, winch mechanism for a 'drawbridge' system allowing safer access across the output chute of a trommel

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If access into a trommel is via the output end of the screen, there may be a risk of workers falling down the output chute. In these cases fall protection should be provided. This may be temporary, such as the use of crawler boards across the chute or more permanent systems such as a winch-down drawbridge which can be lowered across the output chute.

The drums of trommel screens include holes/apertures. Other elements such as 'teeth' and structural parts may also be present. When combined with the drum shape of trommel screens, the risk of slips and trips is foreseeable. The use of crawler boards or similar when inside a trommel drum can help to reduce these risks.

Dependent on the drive system used, some trommel screens can self-rotate under the weight of workers when in the drum. In these cases braking of at least one drive component, such as a drive wheel, or the use of a locking mechanism should be in place to prevent such unwanted movement.

Adequate lighting should be in place for access into trommel screens. This may be by ambient lighting if the trommel is not enclosed, the provision of work lights, or the installation of fixed lighting high-up at one or both ends of the trommel interior. CCTV systems can sometimes also be installed in trommel screens to allow workers to assess the nature of any blockage before entry, although such CCTV systems often require protection to prevent frequent damage.

Disclaimer and WISH

This information document has been prepared by health and safety practitioners to assist health and safety improvements in the waste management industry. It is endorsed by the WISH (Waste Industry Safety and Health) Forum. This information document is not formal guidance and represents good practice, which typically goes beyond the strict requirements of health and safety law.

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The Waste Industry Safety and Health (WISH) Forum exists to communicate and consult with key stakeholders, including local and national government bodies, equipment manufacturers, trade associations, professional associations, and trade unions. The aim of WISH is to identify, devise and promote activities to improve industry health and safety performance.

Useful links and further reading

WISH website: <https://www.wishforum.org.uk/>

HSE waste and recycling webpages: www.hse.gov.uk/waste/index.htm