



## Foundry machinery guarding: Sand handling equipment

### Foundries Sheet No 4

#### Introduction

This information sheet is one of four prepared by the Foundries Industry Advisory Committee's Working Group on foundry machinery guarding. It should be read in conjunction with the essential introductory information on Sheet 2.

Sand is predominantly conveyed to and from sand plant equipment by belt conveyors. There are established standards of guarding for such systems (eg see BS 7300:1990). This information sheet concentrates only on the particular problems which arise in foundries. However, the satisfactory guarding of head and tail end pulleys and belt tension units etc is clearly equally important. Sand mills and sand mixers are covered in Foundries Sheet 5.

#### Hazards and remedies

- (a) The sheer length of conveyor systems present in most foundries places an onus on management to ensure that guards are maintained in place. Many lengths of conveyor are relatively inaccessible or out of sight (eg underground), but can still necessitate activity and attention when spillages or blockages occur. The basic guarding system - physical guards at tail end; trip wires; fixed guards on return rolls - should always be supplemented by appropriate systems of work.
- (b) Much work around conveyors can be performed safely by designing guards so that spillages can be cleared, and belts can be tracked without the need to remove guards, eg by leaving space below the tail drum guards for insertion of specially designed tools or scrapers. NB: Any such gaps should still prevent access to the dangerous parts, eg see BS EN 294:1992 and BS EN 349:1993.
- (c) Underground conveyor systems should be provided with safe access and should be adequately lit.
- (d) Particular attention should be paid to the guarding of return rollers on elevated conveyors. There are often recognised walkways beneath these conveyors and suitable guards should always be in place.
- (e) In addition to the mechanical hazards associated with conveyor systems there can be a significant dust problem, especially if spillages occur regularly.

#### Control

The main control to be exercised in conveyor systems is the initiation of formal regular checks on the whole system to:

- (a) ensure all guards are in place and, where appropriate, operative.
- (b) identify spillage points and remedy them.

- (c) avoid unnecessary build up of sand which will lead to high levels of dust.

Example: An interlock switch and cam came out of alignment when a door became distorted. This led to failure of the safety device and subsequently to severe injuries to the hand of an operator.

The following equipment associated with belt conveyors requires attention:

#### Magnet belts

These consist of short endless rubber belts with iron studs which magnetise as they pass under an electro magnet. The belts are invariably positioned at 90° to the main sand-carrying conveyor belt. Tramp metal is removed from the sand by the magnetised iron studs; as these studs leave the proximity of the electro magnet so they demagnetise and the tramp metal falls off.

#### Hazards

Trapping points can be created between the rubber belt, drums and electro magnets.

#### Common problems encountered

The close proximity of the magnet belt to the sand conveyor belt makes effective guarding difficult. They are usually 'safe by position' but will require systems of work (ie including proper isolation procedures) for maintenance and cleaning activities.

#### Aerators

These machines consist of metal paddle blades or combing belts rotating at high speed and located on top of the sand conveyor belt. The sand passes through the paddle blades allowing air to mix in with the sand.

Hazards: Dust and flying particles of sand caused by the severe agitation of the sand and machinery dangers are the main hazards.

#### Common problems encountered

- (a) The moving parts should be secured in an interlocking enclosure. Proper systems of work are required for cleaning with rods or bars.
- (b) Wear on the side wipers causes dust and sand particles to be emitted. Maintain wipers adequately.
- (c) If the sand being aerated is dry, local exhaust ventilation will be required to control dust emissions.

### Roll crushers:

Two hardened steel drums rotate in opposite directions with a very small gap between the drums. Knocked out sand, with tramp metal removed, passes between the two drums and any lumps of sand are broken down to grain size.

#### Hazards

- (a) The two drums form a 'drawing in' hazard; fixed guards will prevent access.
- (b) Any tramped metal remaining in the sand can be trapped between the drums, and on occasions fly out; suitable protective screens are required.

#### Common problems encountered

- (a) Guards or inspection covers are often removed for observation purposes;
- (b) The construction of the covers is often inadequate to restrain particles of flying metal.

#### Vibratory conveyors and coolers

These consist of a steel bed connected by spring steel leafs or coils to a base frame. An electric motor having eccentric weights provides a vibratory action. The principle is to throw the sand up and along the conveyor in very small increments. Coolers incorporate a perforated bed through which air is blown.

#### Hazards

- (a) Pinch points in the spring area should be fitted with fixed guards. Motor and eccentric weights tend to operate at high speeds.
- (b) Vibration is deliberately severe; on no account should anyone 'walk' the bed.
- (iii) Dust can be generated when dry sand is cooled, and exhausted air should be extracted through suitable arrestment plant.

#### Common problems encountered

- (a) Guards are removed from the eccentric weights and not replaced. Damaged or broken springs destabilise the units and tend to increase the amplitude of the vibrators;
- (b) The nature of the operation can create noise and dust problems, but since these units are normally enclosed, suitable sound-proofing and appropriate LEV are relatively easy to install.

### Elevators and belt coolers

Elevators transfer sand to a higher level. They incorporate an endless belt to which a series of buckets is bolted or moulded. The whole is encased in a steel plated framework provided with access points for cleaning and maintenance purposes, and a lower discharge point.

Sand is discharged into the bottom access point and the buckets collect the sand and elevate it. As the belt and buckets pass over the top drum, the sand is thrown out of the bucket and into a strategically placed discharge in the elevator casing.

There are variants on this principle, eg pivoted buckets for horizontal elements; belt coolers.

#### Hazards

Access points should be interlocked so that opening a hatch arrests the movements of the conveyor. When dry sand is being conveyed excessive dust can be generated.

#### Common problems encountered

- (a) As the belt cannot normally be seen in operation, tracking problems can occur, which in time wear away the steel casing of the elevator leaving trap points.
- (b) Access is required to clear buildup of sand and to repair loose buckets.

### Disc feeders

A circular plate mounted directly underneath the storage hopper revolves at slow speed. A hole in the side of the hopper, directly above the disc feeder, permits material being stored in the hopper to be discharged off the disc feeder underneath.

#### Hazards

- (a) Access via the hopper; bars should be fitted to prevent access to the disc.
- (b) The trap points between the circular plate and the hopper wall.
- (c) Snagging points on the edge of the disc feeder, which is usually exposed.

### Further information

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS  
Tel: 01787 881165 Fax: 01787 313995.

For other enquiries ring HSE's InfoLine Tel: 0541 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

HSE home page on the World Wide Web:  
<http://www.open.gov.uk/hse/hsehome.htm>

This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

This publication may be freely reproduced, except for advertising, endorsement or commercial purposes. The information it contains is current at 9/95. Please acknowledge the source as HSE.