



Foundry machinery guarding: Shakeouts, sand mixers and shotblasts

Foundries Sheet No 5

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.

Vibratory shakeout

The vibratory action of a static open grid supported by springs is created by the rotation of an eccentric shaft, or by eccentric weights mounted directly to the driver motor. These units are used for breaking down moulds or sand lumps.

Hazards and remedies

- (a) The eccentric shaft or motor rotates at high speed and can cause trapping; this should therefore be fitted with suitable fixed guarding.
- (b) The shakeout vibrates with a coarse amplitude which is exaggerated during startup and shut-off of power; pinch points between the vibratory deck and surrounding steelwork can occur.
- (c) The practice of 'walking' the vibrating part should be prohibited; the amplitude of vibration can lead to serious injury.
- (d) Guards should be fitted at drive components.
- (e) Trip hazards occur around the perimeter of these units.
- (f) The most common problem encountered is that of dust and noise. Metal or metal contact creates particularly high noise levels (see Noise control at foundry shakeouts reference given on Sheet 2).

Rotary drum coolers/knockouts

A large cylindrical barrel with flights or guides located on the inside perimeter of the barrel creates an axial movement of returned sand or sand and castings along the barrel as it rotates.

Hazards and remedies

- (a) Pinch points on the support and drive rollers onto which the barrel is laid should be fitted with suitable fixed guards;
- (b) In the case of the rotary drum knockout, the tumbling action of the castings in the drum generates high noise levels, although the nature of the process makes noise and dust suppression relatively straightforward by the fitting of appropriate enclosures.

Sand mills

Whether continuous or batch mills are used, the basic process is the same; paddles or mullers rotate in a substantial body and break down the sand as it is mixed with water, clay and other additives.

Hazards and remedies

- (a) Access to the rotating paddles or mullers should be prevented by suitable interlocking guards
- (b) Access via discharge chutes to moving parts should be prevented by 'swan neck' arrangements and bars across the openings
- (c) Particular attention is required to isolation during cleaning operations; reliance should not be placed solely upon the interlocking devices.
- (d) Unless significant spillage occurs, dust should not be a problem since mixing is usually done with additions of moisture.

Sand mixers/conditioners

Rotary screw

This equipment is used to mix new sand with measured amounts of chemicals, binders, resins etc. Mixing is performed by a rotating spiral screw in a trough. This equipment can either be 'stand alone' or an integral part of core-making machines.

Hazards and remedies

- (a) Access to rotating blade: inspection covers should be interlocked to stop movement of the screw when they are opened.
- (b) Fumes created by the addition of chemicals should be contained by fitting appropriate LEV at the discharge point. The hood needs to be attached to articulated ducting to allow for the movement of the head during the process.
- (c) During cleaning and maintenance operations isolation of mechanical movement and feeding of chemicals should be achieved. Protective clothing may also be required.
- (d) Normal operations and maintenance and cleaning operations should be subject to COSHH assessments and control.

Shotblast equipment

Within the foundry industry there is a wide range of shotblast machinery used for cleaning castings and foundry raw materials. These machines can be categorised as follows:

Continuous overhead multi-wheel type conveyor units:

Continuously operated conveyor shotblast machines comprise a large blast cabinet through which work passes on a suspended overhead monorail in front of shotblast wheels. These fire the shotblast medium at the workpiece. All-round blast effect is created either by rotation of the workpiece in front of the blast wheel or wheels, or by the siting of various wheels to ensure total surface treatment.

Hazards and remedies

- (a) Suitably lined (eg rubber) entrance and discharge vestibules help prevent operator exposure to the shot medium.
- (b) Interlocking of mechanical handling equipment together with elevators and shot return/screw conveyor feed should be achieved in order to prevent access to dangerous moving parts.
- (c) All drive mechanisms for shot wheels and conveyor mechanisms will require guarding to the appropriate British Standard.
- (d) Safe access to work suspended from moving conveyors should be prevented by means of suitable perimeter guard fencing.
- (e) Access doors to the interior of the cabinet should be interlocked for maintenance purposes. This will usually be achieved by a key exchange system to ensure complete isolation of the shotblast machine and the shot wheel system, together with a safe system of work/isolation during maintenance work.

Barrel blast units and table blast machines

Barrel blasts are individual machines which are fed on a batch basis from a skip loader. Work is placed either directly into the skip or into the bucket by means of removable skips. The whole bucket and contents are then elevated and tipped into the barrel cavity.

On closure of the barrel door, the work is then subjected to a period of shotblasting from a suitably positioned (usually overhead) wheel as the work rotates on a sealed internal conveyor or table. Shot is normally recycled through the machine with the dust and waste material being taken away by the unit extraction plant.

Hazards and remedies

- (i) The bucket loader will require a fully fenced and interlocked system such that operators cannot gain access to the enclosure while the bucket is in operation.

Oscillating drum machines

These are large rotating or vibratory oscillating drums which transfer components from the feed to discharge while they are bombarded by blasting medium from shot wheels.

Hazards and remedies

- (a) Mechanical hazards arise from moving parts. Fixed guards are required for drive mechanisms.
- (b) Fugitive shot should be captured by appropriate seals.
- (c) Dust arising from the process should be captured by suitable extraction and arrestment equipment.

Hand-operated machines: The blasting operation takes place in a small cabinet inside which either the component is manipulated using integral 'sleeves', or the shot 'guns' are themselves manipulated. Larger 'walk-in' versions enable the operator to stand inside the cabinet and manually operate the gun.

Hazards and remedies

- (a) Noise levels are generally high at these machines; suitable noise enclosure together with the use of hearing protection is required.
- (b) Mechanical hazards arise from drives to the conveyors; suitable fixed guards should be fitted.
- (c) Dust levels are high. Regardless of the size of the enclosure, dust should be captured and arrested. Particular attention should be paid to breathing apparatus. Suitable hoods and protective clothing should be worn in the 'walk-in' units.
- (d) Fugitive shot requires the regular maintenance of seals.

Further information

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