

(13) SAFETY IN THE USE OF ABRASIVE WHEELS-2

SAFETY IN THE USE OF ABRASIVE WHEELS

Introduction

Abrasive wheels are extensively used in industries for various purposes. The use of abrasive wheels in an unsafe way often causes accidents leading to personal injuries and/or damage to properties. The main dangers are —

(1) bursting of wheels as the result of:

- (i) defective wheel
- (ii) over speeding
- (iii) faulty mounting
- (iv) misuse

(2) contact with the wheel;

(3) injury to the eyes from flying particles.

The purpose of this guidebook is to advise readers on the precautions for the prevention of accidents in the use of abrasive wheels. It does not include technical aspects of grinding or operational techniques.

Selection of Wheels

* Consult the manufacturer for the proper type of wheels to suit a particular job. Generally, soft wheels are more suitable for hard materials and hard wheels for soft materials.

* Do not use defective wheels. Check for soundness of wheels by a ‘ring test’.

* Wheels should be kept dry and not exposed to extreme temperatures. If not in use, they should be stored properly in suitable racks.

Operating Speed

* Check that the spindle speed of a machine does not exceed the maximum permissible speed of the wheel as specified by the manufacturer. The spindle speed and the maximum permissible speed of the wheel should be marked in revolutions per minute (rpm). But in case the wheel is marked to give the

peripheral speed in feet per minute(ft/min) or in metres per second (m/sec), the following formula can be used for conversion into rpm:

* The speed of the wheel in rpm may, however, be increased as the diameter of the wheel is reduced through wear as follows:

reduced diameter

* If the spindle is air driven, make sure that there is a governor or other device fitted so as to control the speed of the spindle. Such device should be effectively maintained at all time. A suitable pressure reducing regulator should be fitted between the governor and the air supply outlet if the working pressure of the outlet is greater than that of the grinding machine. Where a filter is incorporated in the air supply system, it should be properly maintained to prevent clogging by dust or grits. To prevent accidents caused by snaking hoses when severed under high pressure of air, it is also recommended that an automatic hose brake valve be fitted to the hose before joining the grinder.

ΔNote: The maximum permissible speed of a wheel may also change upon aging of the bonding material of the wheel after prolonged use. Consult the manufacturer or supplier in case of doubt

Marking System for Abrasive Wheels

Abrasive wheels are marked to identify their characteristics. Persons responsible for wheel mounting should be able to recognise the specifications marked on the wheel.

Mounting

* All mountings shall only be done by competent persons appointed in writing by the proprietors. Competent persons should be well trained and have the practical experience in the mounting job.

* A wheel should not be mounted on a machine for which it is not intended and certainly not on any make-shift apparatus or where there is vibration of the machine.

* Check for soundness of the wheel before it is mounted.

* Do not mount a wheel on a machine the speed of which exceeds the maximum permissible speed of the wheel.

* Washers, either paper or other compressible material, should be used with all bonded abrasive wheels, except tapered wheels, threaded-hole wheels, discs, cylinder wheels, and the hub section of depressed-centre wheels. Washers should be slightly larger than the flanges and there should be no wrinkles in them.

* The bush, if any, should not project beyond the sides of the wheel.

- * The wheel should fit freely but not loosely on the spindle.
- * Flanges should not be less than one-third of the diameter of the wheels and their bearing surfaces should be true and free from burrs.
- * With the exception of the single flange used for threaded-hole wheels, all flanges should be properly recessed or undercut.
- * Flanges on both sides of the wheel should have the same outside diameter and diameter of recess.
- * Clamping nuts and screws should be tightened uniformly in pattern formation (diametrical sequence) and only sufficiently to hold the wheel firmly.
- * Screws for inserted nut for mounting of discs, cylinders or cones should be long enough to engage a sufficient length of thread, but not so long as to contact the abrasive material.
- * When re-mounting factory-mounted wheels and points, the overhang for a particular diameter of mandrel, speed and size of a wheel should not be exceeded. Also there should be sufficient length of the mandrel in the collet or chuck. Consult the manufacturer for details of overhang permissible for a particular wheel.
- * Protection flanges are used on tapered wheels which are not provided with safety guards. Both these flanges and the tapered wheels should be equally tapered to at least 6% and with the following dimensions:

Mounting of Depressed-Centre Wheels

Depressed-Centre wheels should only be mounted with a flange .

Three points should be noted:

1. When the adapter has been tightened, there should be a slight clearance between the flange and the wheel . This ensures that clamping pressure is exerted only at the Centre of the hub section.
2. The outer part of the face of the flange adjacent to the wheel should be tapered. This allows the full width of the flange to support the wheel during the grinding operation.
3. A paper washer should not be used on the hub section of a depressed-centre wheel.

Guards

- * Unless the nature of the work absolutely precludes its use, a guard shall be provided and kept in
-

position at every abrasive wheel for the following purposes:

- (1) to hold the wheel parts in the event of breakage.
- (2) to protect the wheel from accidental damage.
- (3) to prevent the operator from coming into contact with the wheel.
- (4) to prevent an over sized wheel from being fitted.

* Guards must be of rigid construction, proper dimensions and securely anchored to the machine frame. For maximum protection, the guards have to be adjusted to limit the exposure angles.

Work-rests

For bench and floor stand grinders, a work-rest has to be provided and properly adjusted as close as possible, in any case not exceeding 3.2mm (1/8 inch), to the wheel. Lack of adjustment is the cause of many serious accidents in that the workpiece was jammed between the wheel and the work-rest which forced the operator's fingers against the wheel face.

Protection of Eyes

Persons carrying out dry grinding operations and truing or dressing an abrasive wheel should wear properly fitted eye protectors or be protected by suitable transparent screens which are fitted in front of the exposed part of the wheel so as to intercept flying particles. Regulation 5 of the Factories and Industrial Undertakings (Protection of Eyes) Regulations requires that approved eye protectors, shields or fixed shields shall be provided to employees engaged in:

1. Dry grinding of metals or articles of metal applied by hand to a revolving wheel, band or disc driven by mechanical power.
2. Truing or dressing of an abrasive wheel.

Truing and Dressing

* The wheel should be dressed when necessary to remove loading or glazing at the wheel surface, both of which reduce the cutting action. Eccentric force will be created at wheels used for hand grinding rendering them out of balance if they are not trued, and if the force becomes excessive, it may damage the spindle and cause the wheel to burst.

Safety and the Operator

- * Ensure that the floor in the vicinity is in good condition, free from obstruction and not slippery.
- * If there is more than one speed of the machine, choose the one which does not exceed the maximum permissible speed of the wheel.
- * Remember grinding on the sides of straight-sided wheels is dangerous.
- * Before operating a bench or floor stand grinding wheel, ensure the proper provision and adjustment of:
 - (1) the wheel guards with minimum exposure angle
 - (2) the clearance between the work-rest and the wheel should be less than 3.2 mm (1/8")
 - (3) the protective screen (or wear eye protectors)
- * Always report any fault or unusual signs of the machine to your foreman or supervisor.
- * Do not operate a grinding machine unless you have been properly trained in its safe use.
- * Do not mount an abrasive wheel yourself. It is the job for a competent person appointed by the proprietor.
- * Do not apply sudden pressure to the wheel.
- * Do not allow the wheel to revolve unattended. Switch it off before you leave.