



Loss Control TIPS

Technical Information Paper Series

Innovative Safety and Health SolutionsSM

The Common Grinder

Introduction

One of the most common pieces of equipment used by industry is the grinder. Though there are many variations, the most common type is typically mounted on a bench or pedestal. Of course, industries that have metal fabrication processes will use grinders. But the use of grinders is so extensive that a grinder can be found in the maintenance area of just about any business. When an OSHA compliance officer encounters a grinder during an inspection, there is a good chance a citation will be issued. Typically, the citation is rated “serious,” though it could easily be assessed as “willful serious” (that is, the company should have known better), which carries a higher penalty.

Many considerations contribute to OSHA’s assessment of fines for grinder violations (e.g., the condition of the equipment, was the operator using the equipment at the time of discovery, the frequency of use, use of PPE, size of the grinder). Dollar amounts of the fines will vary. Fines can range from many hundreds or thousands of dollars for small companies with less than 250 employees, to many thousands of dollars for larger companies with more than 250 employees. Each serious citation can incur fines of thousands of dollars.

So common has this sort of citation been over the years, that it has floated at about fourth or fifth most common among OSHA’s most frequently cited violations. Why is it that for all these years industry has failed to eliminate this target from the sights of compliance officers? Here is information about an area commonly reviewed by OSHA compliance officers: bench or pedestal mounted grinders.

Background

The fundamental concern with grinders is failure when operating at designated revolutions per minute (RPM). If the wheel has been compromised through mistreatment, or if it has been damaged, it will lose its integrity. All safeguards must be in place and properly set. If not, then when the grinding wheel fails, it will fly apart, sending shrapnel-like projectiles into the workplace. For an operator standing close to the grinder, this could result in serious abdominal wounds. For someone standing a little farther away, the location of impact (or miss) is simply the luck of the draw. Though not usual, fatalities do result from failed grinding wheels.

Compliance is governed primarily by OSHA’s regulation for “Abrasive Wheel Machinery” (29 CFR 1910.215). Specific ANSI standards are referenced in 29 CFR 1910.215, and are used by OSHA compliance officers as guidance. These standards apply only to bonded abrasive wheels (usually of aluminum oxide composition) that mount on a threaded arbor or spindle. Sandstone and wire wheels, sanders, and buffers are not covered under this standard.



Points Of Compliance

Tongue Guards

A properly adjusted tongue guard will help contain a failing wheel. The tongue guard must be set *within one quarter inch of the surface of the wheel*. As the wheel is worn from use (and the diameter decreases), the tongue guard must be readjusted accordingly. It is the responsibility of the employer to provide instruction and to ensure the proper application and adjustment of the tongue guard. This is the most common OSHA citation for grinders.

Work Rests

To assure a stable work platform, work rest fixtures are required for mounted grinders (bench or pedestal). When using the grinder, the operator rests the workpiece on the fixture rather than attempting to hold the workpiece free-hand against the rotating wheel. *No more than one eighth of an inch* is allowed between the work rest and the surface of the abrasive wheel. This will prevent the wheel from grabbing the workpiece (and the operator's hand or fingers) and pulling it into the surface of the wheel. (Bear in mind that the wheel rotates out the topside toward the operator.) This is the second most common OSHA citation for grinders.

Enclosure

To be adequately contained in the event of failure, the wheel must be enclosed. A grinding *wheel must never be operated without a protective enclosure*. There are variations (specified in 29 CFR 1910.215) in this requirement, depending on the use of the grinder (cylindrical, surface, swing frame, etc.). Enclosure requirements for bench and pedestal models specify 270° of covering. That means the enclosure opening can be no more than 90°. Located within that opening are (1) the tongue guard at the topmost part of the opening and (2) the work rest, specifically placed at 65° from the tongue guard and on the horizontal centerline of the spindle (parallel with the floor). The enclosure must also completely cover the threaded spindle and nut, in which clothing, hair, etc., could become entangled. Never attempt to fabricate a "home made" enclosure. Use only enclosures that are supplied by the original equipment manufacturer. They will have been designed specifically for containment.

Ventilation

Grinder dust must be directed away from operators. Dust masks or respirators may be necessary, depending on the nature of the material being ground. An assisted exhaust system is the best practice for keeping contaminants out of the workplace. Never presume that the material being ground poses no health risks. (See OSHA ventilation regulation at 29 CFR 1910.94(b))

Inspection

At the start of each shift, operators should check the settings of the tongue guard and work rest fixtures. Any adjustments to these fixtures must be made by knowledgeable persons. The grinding wheel must not be in motion when the adjustments are made. The face of the grinding surface must be perpendicular to the sides of the wheel. It must not have ridges, grooves, rounded corners, or be missing chunks from the surface, or have side grinding damage. Such signs indicate the need for dressing or wheel replacement. Following the success of these checks, the best practice is to turn the grinder on (while standing to the side) and allow it to run at speed for about a minute before using it. No vibration should be observed during this time. Vibration indicates a wheel that is out of balance. Unbalanced wheels will fail.

Dressing the Wheel

A wheel that has ridges or grooves can be salvaged, using dressing tools. A well-dressed wheel will have extended life and reduced risk of failure. Dressing a grinding wheel is a skill that most operators do not have; this should be left to those who have appropriate training and experience.

Usually, the wheel is removed from the grinder for dressing. The wheel dressing tool operates from a rigid base (not the work rest) set close to the grinding wheel. The wheel dressing tool is moved back and forth in small increments across the face of the wheel. This gradual truing process will produce small particles flying from the rotating wheel's surface. *Appropriate PPE (eye and face protection) is necessary during all grinding operations.*

Wheel Replacement

Replace any wheel which cannot be corrected or salvaged through dressing, or one that demonstrates potential for failure (i.e., visible cracks, severe surface damage, out of balance due to absorbed fluids).

The replacement wheel should have been stored vertically in a dry room at the temperature of area it will be used. Wheels which contain moisture or which are stored in below-freezing temperatures can crack. Transport requires caution. The wheel must not be dropped while being carried, nor should it ever be rolled on its edge to the destination (more likely with a large wheel).

The wheel that is selected for replacement must match the grinder. Specifically, the RPM that is identified on the information plate of the grinder must match the RPM specified by the manufacturer of the wheel. Placing an underrated wheel on a grinder of greater RPM is certain to result in a failure. The wheel must also be properly sized for the spindle. A hole too large for the spindle will produce imbalance and vibration. Use adapters when they are provided.

Prior to placement of the wheel on the spindle, a *ring test* must be performed. While standing vertical (for a heavy wheel) or suspended on a rod (for a lighter wheel), the wheel is tapped for tone. This is accomplished with a wooden mallet or the plastic end of a screwdriver. The wheel is lightly tapped on its sides (a couple of inches in from the edge of the wheel) at the four points that are 45° on either side of the vertical centerline position of the wheel. A good wheel will literally ring with a suspended tone if no cracks are present. A crack prevents the resonance of the whole wheel, causing a thud, rather than a tone, to be produced. Any wheel that responds in this way should be taken out of service and labeled for return to the manufacturer (if appropriate) or destroyed immediately.

There is a specific order of assembly for placing the wheel on the spindle. The wheel must be sandwiched between two blotters (compressible washers) and two flanges. The flanges (and blotters) must be the same size. The two flanges must also be at least one third of the wheel's diameter (i.e., a 9" wheel must have 3" flanges). A washer is placed against the flange on the threaded side of the spindle and a nut is used to tighten and secure the assembly. The flanges must fit snugly and evenly against the wheel. This arrangement spreads forces across the surface of the flanges (against the sides of the wheel) and minimizes the chances of cracking the wheel. When this is complete, the grinder is plugged back in and turned on (again, standing to the side) and allowed to run for a few minutes to test for failure.

Training

It is the employer's responsibility to ensure initial and continuing competence of personnel who use, care for, inspect, and maintain grinding equipment. Employers must provide adequate supervision and correct, standardized operating procedures. Employees must be trained in safe work methods. The training in all phases of grinder operations, capabilities and limitations should cover, at minimum:

1. Pre-use inspection of the grinder and required adjustments; reporting of discrepancies.
2. Hazards of the grinder.
3. How to use the grinder.
4. Use of appropriate personal protective equipment.
5. Storage and treatment of wheels
6. Wheel dressing and replacement.

Summary

Because the grinder is so common, people may treat it with too much familiarity. Usually, inconsistent practices (no standardization) are at the root of accidents and non-compliance problems. Operators may also discount the significance of hazards that attend the use of a grinder. If an employer fails to maintain employee awareness, risk is increased. OSHA's General Duty Clause admonishes employers to "furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm to his employees." Standard practices that are refreshed and enforced will help meet the requirements of the General Duty Clause. Help to keep the humble grinder from causing serious injury or death

References

United States Department of Labor, Occupational Safety and Health Administration. "Abrasive Wheel Machinery" 29 CFR 1910.215

United States Department of Labor, Occupational Safety and Health Administration. "Ventilation" 29 CFR 1910.94(b)

The Use, Care and Protection of Abrasive Wheels. ANSI B7.1-1988.

For more information, contact your local Hartford agent or your Hartford Loss Control Consultant. Visit The Hartford's Loss Control web site at <http://www.thehartford.com/corporate/losscontrol/>

This document is provided for information purposes only. It is not intended to be a substitute for individual legal counsel or advice on issues discussed within. Readers seeking resolution of specific legal issues or business concerns related to the captioned topic should consult their attorneys and/or insurance representatives.