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PROTECTION AGAINST DUST HAZARDS IN AIR-PRESSURE ABRASIVE BLASTING

Recent studies have indicated various methods by which air-pressure abrasive blasting can be carried on without exposing workers to danger from inhalation of harmful dusts, the chief of which is silica. Some of these methods are applicable in certain processes, some in others; and there may be additional procedures not here listed which will ensure safety.

1. Choice of Abrasive. The use of metallic abrasives instead of sand abrasives where feasible will cut down the amount of silica in the dust to very low proportions - so low that no danger need be anticipated under satisfactory working conditions. Steel abrasive comes in two forms - "shot" which consists of rounded pellets, and "grit" which has rough edges. In many processes, however, such a substitution cannot be made without sacrifice of economy and efficiency. Hard steel particles, caught in angles of castings or otherwise retained, may damage machine tools if the castings are to be later machined. For cleaning aluminum and alloy castings sand abrasive gives a better finish and with aluminum it produces a given result in a much shorter period of time. Surfaces are said to hold paints or enamels better after sand treatment (although certain companies employ metallic abrasives with success), and discolored surfaces are more effectively cleaned by hand. Hydraulic blasting, applying a water stream after the use of siliceous or non-siliceous abrasives, has, in some instances, proven practical. Subsequent drying may be necessary to avoid rusting.

2. Sandblast Barrels. Blasting medium sized and small castings in properly designed sandblast barrels can be conducted soas to keep the dust concentration in the workroom air so low as to avoid any serious hazard with any type of abrasive. Such a barrel consists of a drum made of heavy sheet plate, mounted as a rule on trunnions and capable of rotation. The rotation serves to bring the objects treated under the sandblast streams located in the barrel. In the process of blasting dust escapes from the barrel into the room air unless the apparatus is completely enclosed. Each barrel should therefore be tightly constructed and kept under exhaust pressure by special ventilation during the blasting process and also while the barrel is being emptied after blasting. A complete outer housing which encloses the barrel while in operation and which is provided with a door for filling and emptying the barrel is advantageous. The housing space should also be provided with exhaust ventilation. Barrels and housing should be kept tight and in good repair and the doors of barrel and housing should fit tightly. It is important too, that care should be exercised in the loading and unloading process to avoid getting dust into the air. All small castings should come from the foundry as clean and free from sand as possible. In loading castings covered with adherent foundry sand, the evolution of dust may be reduced by the use of chain-hoist loading skips. The interference of workers with the machinery (as, for example, by tampering with the abrasive separator mechanism) should be strictly prohibited. Barrels should not be set above the head of the worker so that sand may rain down on him.

3. Sand Blast Tables. The rotating sand blast table can be used with certain kinds of work with similar success. These tables are of heavy metal construction, circular in shape and ordinarily 6 or 7 feet or more in diameter. They are ordinarily set about 3 feet above the floor and rotate slowly at a speed of perhaps 1-1/2 revolutions per minute. The table is divided into halves by a series of flexible, split rubber curtains. One side of the apparatus is completely enclosed (by housing and by these curtains) and is provided with nozzles for

discharging the abrasive on to the work which lies on the rotating table below. A worker stationed at the opposite side removes finished objects, turns over those which require treatment on the other side and feeds in new material. The chief essential in the use of this device is the proper design and upkeep of the split curtains upon whose efficiency its whole success depends. The closed side of the apparatus should be provided with efficient exhaust. Where large parts are treated, dust is likely to escape when the curtains are lifted and under such conditions protection is inadequate.

4. Sandblast Cabinets. Where small objects are to be cleaned with high air pressure (60 pounds or more) the sandblast cabinet, often called the "hygienic cabinet" will meet all health needs. Such a cabinet is of steel plate construction, usually 5 feet wide, 3 feet deep and 7 feet in height. It is ordinarily provided with a single pressure nozzle. The front of the cabinet is provided with two hand holes through which the worker's hands and arms pass in order to manipulate the objects treated and with a window of heavy plate glass through which he may view the progress of the work. The material to be cleaned is placed inside the cabinet through a hinged door at the front or side of the cabinet. The operator then turns on the abrasive jet by means of a foot treadle, passes his arms through the hand holes and exposes all surfaces of the object to the action of the blast. The cabinet is provided with an exhaust system for the removal of the fine dust produced in the process of blasting.

The efficiency of this device obviously depends on the tightness of doors and handholes and on the efficiency of the internal exhaust. Where the handholes for the operator are too large, the apparatus will obviously fail to give protection. Handholes should be small and provided with gauntlets and a separate opening at back or side should be provided for introducing the work.

5. Automatically Fed Blasting Rooms. For treating large castings it is possible under certain conditions to employ closed sandblast rooms through which the material to be treated is conveyed by automatic machinery. The objects are placed on a suitable conveyor by a loader, the conveyor carries it through the room where it is exposed to the blast and delivers it cleaned on the opposite side of the blast chamber. The tight housing of the rooms and their inlet and outlet tunnels, the upkeep of the curtains guarding the exit and entrance to these tunnels and the degree of exhaust ventilation maintained within the chamber are the conditions which determine success.

For treating small castings, completely automatic machines are available which have proved highly satisfactory.

6. Use of Positive Pressure Helmets. Where none of the foregoing measures can be used, that is, where any abrasive must be used in the open in a sandblast room occupied by the worker, adequate protection can be assured by the use of a properly designed and operated positive-pressure helmet. The helmet must, however, have glass and not screen eye shields alone and must be provided with a clean fresh air supply of 6 cubic feet per minute. The condition of helmets must be subject to regular inspection to maintain high efficiency. The worker should continue to wear his helmet while in the sandblast room even after the blast is turned off since even the best system of ventilation will take some time to remove the fine dust.

It should be noted that all sand blast rooms should be kept dust-tight so that workers at adjacent operations shall not be endangered.

7. Factory Housekeeping. Whatever special devices may be employed, protection can be assured only through constant care and supervision. The following elements in factory housekeeping deserve special emphasis:

a. Accumulations of abrasive should be removed each night from the workroom.

b. Floors, tables, etc., should be thoroughly cleaned and swept each evening after the regular working staff has left and with proper protection of the cleaner by an efficient mask or respirator. Unless vacuum methods of cleaning are employed the dust should be thoroughly wet down before sweeping.

c. Oiling of floors with ordinary fuel oil (one gallon to 100 square feet) has been found useful in certain foundry cleaning rooms.

d. Care in loading and unloading castings is essential in order to avoid unnecessary dust.

e. Dust collecting screens should be kept thoroughly clean.

f. It should be the duty of some one individual in each factory to make regular periodic inspections of all apparatus to ensure tightness and good upkeep in other respects.

g. In particular exhaust ventilation apparatus should be tested at frequent and regular intervals by some satisfactory means.