TECHNICAL REPORT

OPERATOR PROTECTION

CYM MATERIALES S.A.
INDUSTRIAL SOLUTIONS

SAFETY IN BLASTING AND SANDBLASTING WORK

Safety equipment for sandblasting and blasting work is specifically designed to withstand the demands of these operations and is used both by the blast operator and by the support staff working in the area.

To select the right protective equipment for operators working either in enclosed installations (blast rooms) or on site and in open areas, the different work zones involved should first be defined:

1. Primary zone: the area closest to the surface being blasted. It is exposed to the abrasive stream and to rebounding abrasive, with a high level of airborne dust. Work carried out inside a blast room is always considered primary-zone work.

2. Secondary zone: surrounds the primary zone. Airborne dust is high, but the risk of being hit by rebounding abrasive is low.

3. Tertiary zone: dust levels are within admissible limits and there is no risk of contact with the projected abrasive.

In sandblasting and blasting work, operators are exposed to several potential hazards: some directly related to the task itself (airborne dust, abrasive rebounding off the workpiece and the direct abrasive stream) and others common to any site or industrial process (high noise levels, impacts, etc.).

The appropriate equipment for working inside the primary blasting zone, for both blast operators and support staff, is the class CE positive-pressure type, approved in the U.S.A. by OSHA (1) and MSHA (2) and monitored by NIOSH (3).

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(1) OSHA – Occupational Safety and Health Administration (U.S.A.). (2) MSHA – Mine Safety and Health Administration (U.S.A.). (3) NIOSH – National Institute for Occupational Safety and Health (U.S.A.).

Staff working inside the secondary zone must be protected against airborne dust with class C respirators; protection against the abrasive stream is not required.

The need for protection against the abrasive stream is obvious, since the particles are projected at over 300 km/h, but the risk from airborne dust is even greater: no dust should ever be inhaled, and where sand is used, free silica may be breathed in — the cause of an irreversible disease, silicosis.

It should also be borne in mind that the dust produced by the paint being removed is often extremely harmful, or outright toxic in the case of lead-based paints.

In sandblasting and blasting work, face masks are entirely inadequate because they do not provide the two forms of protection the operation requires. In safety terms, class CE positive-pressure respirators have a NIOSH protection factor of 1,000, meaning that for every 1,000 particles outside, 1 is found inside the helmet. For face masks that figure is above 10. This number relates inversely to the likelihood of contracting a blasting-related disease.

When choosing between two blasting protection sets of equal efficiency, visibility is a very important feature. Helmets with a wide field of view not only help with the task itself but also prevent accidents such as impacts or falls caused by poor vision. Visors and tear-off lenses must also be perfectly clear, with no distorted areas, which invariably cause fatigue and dizziness.

The air reaching the operator must be properly filtered, suitable for human breathing and with a maximum of 10 ppm of carbon monoxide at a flow rate of about 0.5 m^3/min. Lower flow rates may allow dust particles in, and higher ones cause eye irritation.

Two systems are used to supply breathing air. The most widespread is a filter specifically designed for human breathing, which takes air from the compressor and delivers it to the positive-pressure protective equipment. This filtration must retain particles larger than 25 µ as well as oil and water aerosols, and must deodorize the air to make it pleasant to breathe. These filters do not remove carbon monoxide, so a CO alarm should be fitted in the air line.

It is preferable to use a small oil-free air compressor to feed this type of filter. In practice, however, the same compressor used to propel the abrasive is normally used. This carries a high potential risk, because such compressors are usually lubricated and CO emission from over-lubrication or overheating is entirely possible. In these cases a CO alarm must always be fitted in the breathing air line.

The other type of equipment is a pump or blower that draws air from the atmosphere, filters it and delivers it to the protective helmet. This system is in principle CO-free, but care must be taken that no vehicle with a combustion engine is running near the air pump, since the CO it produces would be drawn in and, as the filters do not remove it, would reach the operator. This type of filter and air mover must therefore be placed well away from any vehicle traffic.

An accepted requirement for human breathing air is as follows:

- Oxygen 19.5% to 23.5%
- Condensed oil max. 5 µg/m^3
- Carbon monoxide max. 10 ppm
- Carbon dioxide max. 1000 ppm

Finally, operators must work below 80 dB for an average 8-hour working day. This makes hearing protection mandatory at all times for blast operators and support staff.

OPERATOR EQUIPMENT

A basic set of operator protection for sandblasting or blasting work comprises the following items

- Class CE positive-pressure helmet, built with abrasion-resistant, easily replaceable materials and internal air circulation
  - Protective cape
  - Sealed double protective lens
- Non-collapsing air supply tube with noise attenuator
- Belt with regulating valve
- Length of supply hose between the regulating belt and the operator filter
- Breathing-air filter with disposable cartridge, three filtration stages and activated-carbon deodorizing; pressure limiting and regulating valve.
- Protective gloves.
- Protective suit with leather front
- Safety boots

Other safety items used

- CO level monitor
- Safety locks for hose couplings
- Air conditioner (cooler/heater)

Blasting equipment

In Argentina, CYM Materiales designs and manufactures centrifugal wheel and compressed-air blasting equipment: blast rooms and blast cabinets, hanger, table, tumble and belt blast machines, lines for profiles, plates and pipes, and portable units, together with the accessories and consumables each process requires.

The Engineering department surveys the customer's process —part, required output and surface finish— and defines the equipment, the wheel power and the recovery and dust collection system to be used.

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