

SSPC-TR 2/NACE 6G198

JOINT TECHNICAL REPORT

Wet Abrasive Blast Cleaning

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Foreword

This joint report was prepared by the SSPC/NACE Joint Task Group C on Wet Abrasive Blast Cleaning, which is comprised of members of both the SSPC Surface Preparation Committee and the NACE Unit Committee T6G on Surface Preparation (now STG 04). It is intended to be used primarily by specifiers, owners, painting contractors, inspectors, and others involved in surface preparation of industrial structures.

1. Scope

This document covers procedures, equipment, and materials involved in a variety of air/water/abrasive, water/abrasive, and water-pressurized abrasive blast cleaning systems. Equipment usage and safety are also discussed.

2. Description and Use

2.1 Air/water/abrasive blasting is a cleaning method in which water is injected into the air/abrasive stream generated by conventional air-pressurized abrasive blasting equipment.

2.1.1 Water helps to remove contaminants from the substrate, to wet the abrasive, and to substantially reduce dispersion of fine particulates (dust). Particulates are often caused by the breakup of the abrasives, surface corrosion products, and paint if the surface has been previously painted. Dust suppression is achieved by thoroughly wetting the abrasive and other particles to encapsulate them with a thin film of moisture. The objective is to remove contaminants and suppress the dusting effect caused by the impact of the abrasive on the substrate, while retaining the blasting characteristics of dry abrasive, including creation of anchor profile.

2.1.2 Air/water/abrasive blasting is an alternative to waterjetting, dry blasting, and water blasting with abrasive injection.

2.1.3 Air/water/abrasive blasting is referred to hereafter as "wet blasting."

2.2 Water/abrasive blasting is a cleaning method in which abrasive is injected into the water stream generated by conventional fluid pumps.

2.2.1 Water is the primary agent to remove the contaminants from the substrate. The abrasive is injected to help remove brittle contaminants and create a profile where necessary. Compared to wet blasting methods, water/abrasive blasting has a higher water to abrasive ratio. Dust suppression is achieved by the wetting of the abrasive and other particles. The objective is to remove contaminants with water and impact the abrasive on the substrate to retain the blasting characteristic of dry abrasive, including creation of anchor profile.

2.2.2 Water/abrasive blasting is an alternative to dry blasting, wet blasting, or waterjetting.⁽¹⁾

3. Procedures and Parameters

3.1 Wet blasting is generally considered suitable for use on any substrate for which the use of abrasive is appropriate. Wet blasting can often be adjusted to clean delicate substrates.

3.2 Some wet blasting systems can utilize the same wide variety of available abrasives as conventional dry abrasive blast systems. Wet abrasive is more difficult to recycle than dry abrasive. In some cases, recycling of wet abrasive may not be possible. In some cases, the water may be recycled.

3.3 The water flow rate and the ratio of water to abrasive are usually adjustable so that a wide range of applications, from washing of surface contaminants to white metal blast, can be accomplished.

3.4 After wet blasting, all traces of abrasive and other loose particles are brushed, blown off with clean dry air, vacuumed, washed, or otherwise removed from the surface. Cleanliness of the surface cannot be overemphasized.

3.5 The injection of water to the air/abrasive stream helps to remove contaminants such as dirt and water-soluble salts, including ferrous, chloride, or sulfate salts.⁽²⁾

3.6 Inhibitors can be used to control flash rusting during wet or water/abrasive blasting. Many coating manufacturers prefer that inhibitors not be used in wet or water/abrasive blasting. (See Section 6.)

3.7 Production rates vary due to variations in surfaces being blasted, the type of abrasive used, and the level of fine particulate dust suppression desired. Systems introduced since 1985 claim production rates equal to or higher than conventional dry blasting, but independent studies have not been published as of this publication date.

3.8 Wet blasting is a process that can produce surface cleanliness and anchor profiles (surface roughness) similar to those obtained with dry blasting. The level of surface preparation specified is the same as that specified if dry blasting was the process being used. However, because the visual appearance of wet blasted surfaces is not necessarily the same as the visual appearance of dry blasted surfaces, care and judgment should be exercised by inspectors. It is common to encounter difficulty when visual inspection standards or aids prepared for dry blasting are used as inspection or judgment criteria for wet blasted surfaces. This visual difficulty can be lessened by preparation of a test patch which is agreed upon by the concerned parties during a pre-job conference.

4. Wet Blasting Equipment

4.1 The equipment used for wet blasting generally consists of conventional dry abrasive blasting equipment supplemented with modules to inject water into the abrasive stream. Ideally, the water encapsulates the abrasive particles with a thin film of moisture to suppress and contain the dust generated by the impact of the abrasive with the substrate. Abrasive injection into water blast equipment will also be discussed.

Systems are available that allow the operator to select adjustable rates of air, water, or abrasive as necessary to achieve optimum results. Some systems allow independent adjustment of each of these parameters while the system is in operation. Some systems also allow independent adjustment for each nozzle for multi-nozzle setups.

4.2 TYPES OF WET BLASTING SYSTEMS

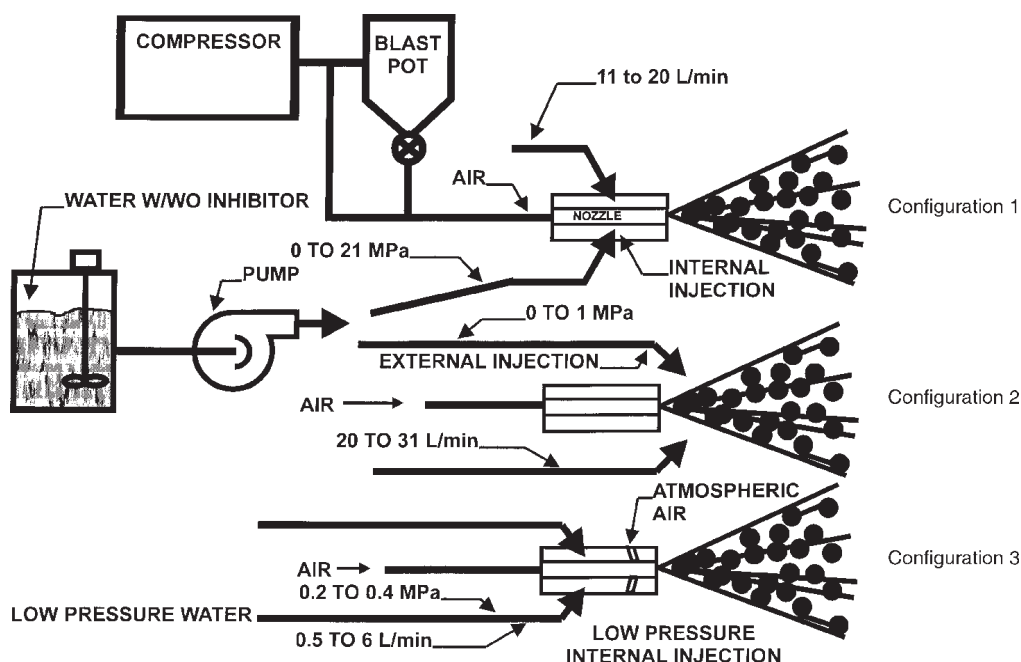
4.2.1 General Requirements of Wet Blast Units: Most systems under the general classification of wet blast units contain a conventional dry abrasive blast pot with OSHA/NIOSH required deadman and other safety features, plus the normal complements of abrasive metering valve(s), compressed air inlet valve(s), blast hose, dry abrasive blast nozzle, etc. With these systems, the compressed air volumes and pressures are the same as for conventional dry abrasive blasting. Each of these systems can clean to SSPC-SP 5/NACE No. 1 (White Metal) and create a suitable anchor pattern for paint adhesion.

4.2.2 Radial Water Injectors: Some of these are commonly referred to as "water rings," and are available in three basic configurations. In the first configuration, water is injected at an angle toward the center of the blast stream as the air/abrasive stream enters the blast nozzle. The water is normally injected at or just above the pressure of the compressed air (see Figure 1). The second configuration is a "donut" that fits over the outside of the dry blast nozzle. Water is injected from around

⁽¹⁾ Waterjetting is defined in NACE No.5/SSPC-SP 12 as "the use of standard jetting water at high or ultrahigh pressure to prepare a surface for recoating using pressures above 70 mPa." Standard jetting water does not contain sediments or abrasive media.

⁽²⁾ See NACE Publication 6G1-86 (latest revision), "Surface Preparation of Contaminated Steel Surfaces," and other items in the Bibliography.

FIGURE 1



the outside of the blast stream radially inward at an angle toward the center of the blast stream as the air/abrasive stream exits the nozzle. The third configuration utilizes a wet blast venturi nozzle which allows water and atmospheric air to be inducted at midpoint in the nozzle behind the bore restriction.

4.2.3 Coaxial Water Injectors: In these systems the water is injected directly into the throat of the blast nozzle. The direction of water injection is parallel to the flow of the air/abrasive stream. The air/abrasive stream and the water stream have the same axis or center line (see Figure 2).

4.2.4 Slurry Blasters: The term “slurry blasting” is commonly used for the systems described in Sections 4.2.4 and 4.2.5. In these devices, the water is injected into the air/abrasive stream at some point substantially upstream from the blast nozzle. This allows the air/abrasive/water mixture to tumble for some distance in the blast hose to mix with and wet the abrasive. Typically, the water is injected at the blast pot abrasive metering valve or at a blast hose connection. Sometimes the water is injected at the connection point of the whip hose to the main blast hose (see Figure 3, Configuration 1).

In Figure 3, Configuration 2, the abrasive is loaded into a pressure vessel and simultaneously mixed with water. The vessel, loaded with the abrasive/water combination, is then pressurized using an integrated pump and the mixture is injected into the air stream. The unencumbered air flow reduces overall

water consumption rates and provides good dust suppression. Wet abrasive can be reused in the configuration 2 system as long as the abrasive has not been crushed during the cleaning process and the material being removed in the blasting process is non-hazardous.

4.2.5 Water Blast with Abrasive Injection: These devices differ from the units described in Sections 4.2.2 through 4.2.4 in that the propelling force is the water stream, not compressed air. This method is commonly referred to as “abrasive wet jet” or “AWJ”, or “slurry blasting.” The typical devices consist of a fluid pump with a venturi nozzle of some type in which the water flow draws the abrasive into the water stream or the abrasive media is injected into the water stream under pressure. Because the fluid stream is well defined, these devices usually cut a narrow blast pattern (see Figure 4).

4.3 WATER DELIVERY SYSTEM

4.3.1 Purity of Water: The purity of the water used for wet abrasive blasting (or any wet cleaning method) can affect the quality of the cleaned substrate. To achieve a clean substrate, demineralized, potable, or other water that will not impose additional contaminants on the surface being cleaned is acceptable. There is no current definitive number for acceptable levels of water purity. The quality contamination of the substrate may be tested and confirmed. Recycled water may contain a buildup of contaminants.