Setting Up and Operating Wet Blasting Equipment

by BURKE BENNETT, Clemex, Inc.

Wet blast cleaning involves the use of both water and abrasive in combination to remove rust, mill scale, and other material from steel surfaces in preparation for painting. Wet blast cleaning is used as an alternative to dry abrasive blasting for 2 main reasons: to minimize the dust created by the blasting process, and/or, through the cleaning action of the water to remove chemical contaminants that may not be removed by abrasive alone.

This Bulletin will describe the basics of operating 2 main types of wet blast equipment. They are air abrasive wet blasting and pressurized water jetting with abrasive injection. Slurry blasting and ultrahigh pressure water jetting will not be considered here.

Fig. 1: (above) Abrasive blasting operation with water injection behind the nozzle. Courtesy of Clemex Industries.

Fig. 2: (left) Abrasive blasting operation with water injection around the nozzle. Watering. Courtesy of Clemex, Inc.
Air Abrasive Blasting with Water Injection

Air abrasive blasting with water injection is a kind of wet blast system that employs air pressure rather than water pressure as the cleaning force. This system consists of a conventional air abrasive blast vessel, air compressor, and associated hoses and controls, together with a device to inject water around or into the abrasive stream.

There are 2 main types of air abrasive blasting units with water injection, depending upon the point where the water is injected. One unit injects the water into the abrasive stream before it reaches the blast nozzle (Fig. 1). The second unit injects the water into the abrasive stream after it leaves the nozzle (Fig. 2).

Pressurized Water Abrasive Jetting

Pressurized water abrasive jetting is a wet blast system that uses water pressure as the cleaning force. The system consists of a pump to pressurize the water and force it through a specially designed nozzle with an orifice large enough to accommodate the abrasive, which is either suctioned into the water stream inside the nozzle (Fig. 3) or forced by air pressure into the nozzle.

Pressurized water abrasive blast units are normally classified as low pressure (2000-4000 psi; 133-

267 bar) or high pressure 7000-10,000 psi; 467-667 bar.

Operation of Wet Abrasive Blasting Units

When you operate wet abrasive blasting units, there are several factors you must consider in addition to those you deal with when operating a dry air abrasive blast unit.

These factors involve use of an inhibitor to prevent flash rusting, assuring cleanliness in system components, visibility, cleaning the substrate of wet sand or grit following blasting, and removal of wet spent abrasive.

Use of Inhibitor

Inhibitors are specific chemicals added to the blasting water that act to prevent flash rusting of the steel substrate. Most cleaning specifications will require that you use inhibitors of a specific kind, or a specific commercial product.

Check with the coating manufacturer to make sure that the inhibitor is compatible with the coating to be used on the cleaned surface. Some inhibitor residues left on the surface may cause blistering of certain coating types applied over them.

Make sure that the inhibitor is suited for the job you are doing. For instance, if you are pumping the inhibitor into the flow of water, make sure that the components of the pump can withstand the corrosivity of the inhibitor chemicals. Also check to see that the inhibitor is suited for use with the type of water in the water supply at the job site. If the water is very “hard,” for instance, it may neutralize the inhibiting effect of the chemicals.

There are 2 ways to mix the inhibitor with the water, either in a bulk unit such as a 55-gallon drum,
or by pumping it into the water stream (Fig. 4). In either case, the inhibitor must be proportioned properly with the water, according to the inhibitor supplier's instructions. If a mixture of inhibitor and water in a bulk container has been sitting for 24 hours or more, do not use it. It may have lost its effectiveness.

Proper proportioning of the inhibitor is essential. Too little inhibitor may not control flash rusting, and too much inhibitor may cause blistering or adhesion problems. In addition, using an excess of inhibitor is expensive as well as unnecessary.

Assuring Cleanliness of Components
When you set up the system components for wet blasting, make sure that they are clean. Do not use old paint hoses to convey water. Bulk water containers must be cleaned before they are used. And always filter the water before it reaches the pump used to convey it.

Visibility
When you are operating wet blast equipment, you will need to use a face shield or helmet with a visor for protection. The shield or visor will quickly become splattered with water and wet abrasive, especially when you are working overhead or in confined spaces. You cannot achieve quality work when your vision is impaired, so you must wipe the visor as often as necessary to maintain good visibility. It may be possible to rig a small water hose to the top of your helmet so that water flows constantly over the visor. This is one solution to the problem of visibility.

Removing Surface Residue
Once you have achieved the proper degree of cleanliness on a steel surface, some damp or wet abrasive will remain stuck to the surface. Thus, a second cleaning step is required to remove the residue. This can be accomplished by stopping the supply of abrasive to the nozzle so that only air and/or water are emitted to wash the debris off the surface.

Clean-Up
After wet abrasive blasting work is completed, clean-up of spent abrasive is complicated by its dampness, which prevents the effective use of a vacuum. Two alternatives are shovelling or attaching a water hose to the vacuum head so that abrasive suspended in a slurry is able to be vacuumed. In either case, the work is very slow.

Safety
With pressurized water jetting with abrasives, general safety requirements include deadman controls on pressurized units, operation within the recommended limits of pumps and air compressors, properly reinforced hoses, properly tightened connections, an obstruction-free work area, and proper training of operators.

Ear protection is very important because noise levels will be high—averaging in the range of 90 decibels.

Eye and head protection must be provided, either by face shields and goggles or by a full blast hood and helmet. Steel-toed shoes are also necessary for safe operation.

High pressure water jetting creates a substantial amount of thrust. Thus, you will experience fatigue after extended operation. Be aware that fatigue can lead to careless operation and creates a greater than normal chance of an accident occurring.

If you are water jetting on a scaffold or work platform, the thrust of the wet blast unit can cause you to lose your balance. You need to pay particular attention to the thrust when you first start blasting and when you move the water-abrasive stream off a surface to the air, thus lowering the amount of thrust by removing resistance to the stream. A useful guide to safety can be found in "Recommended Practices for the Use of Manually Operated High Pressure Water Jetting Equipment," published by the Water Jet Technology Association.

With air abrasive wet blasting, the suppression of dust is not complete, and, therefore, you will be subject to inhaling micron-sized particles. Thus, it is advisable to wear a NIOSH-approved respirator during blasting operations.

It is necessary to have a Manufacturer's Safety Data Sheet (MSDS) on the inhibitor chemicals you are using and to observe the precautions outlined on the MSDS.

Summary
Wet blast cleaning can be very useful in suppressing dust and in removing chemical contaminants from steel substrates. If you set up and operate these systems properly and observe the proper safety precautions, you can achieve good productivity at the same time you take advantage of their special capabilities. ATB