An air abrasive blast equipment system is composed of several major components, including the following.

- Air Compressor
- Blast Pot (Pressure Blast Tank)
- Abrasive (Blast Media)
- Blast Nozzle
- Moisture Trap
- Deadman Switch
- Blast Hood
- Interconnect Hoses

Let’s take a look at each to see how they work together to provide an efficient abrasive blast system.

**Air Compressor**

The air compressor provides high-pressure air for the blasting operation. This machine takes in atmospheric air at 14.7 psi and compresses it to a pressure several times higher, usually about 120 psi. The heat generated through compression is somewhat dissipated by an air intercooler. The air then passes through moisture and oil separators to make it dry and oil-free as it exits the compressor.

Air compressors are generally identified by output capacity, such as 250 CFM, 325 CFM or 750 CFM. CFM means cubic feet per minute, which is how the volume of pressurized air is measured. The power to run a compressor is usually provided by an internal combustion engine (gasoline or diesel) or by an electric motor. Selection of a power unit is generally dictated by the area where blasting is to be done or by the availability of utilities.
Before starting the compressor, remember to:
- check the engine oil level;
- check the coolant level; and
- check the belts and hoses for leaks or defects.

Blast Pot
The blast pot (Fig. 1, p. 17) is a coded pressure vessel generally referred to as a pressure blast tank (PBT). Because it is a pressure vessel, it must have a stamp on it showing that it has been pressure tested.

The PBT is further identified by size. For example, it may be called a 6-ton PBT or a 6-sack pot (based on silica sand), referring to the amount of abrasive it can hold. During operation, the blast pot is pressurized and feeds abrasive into the air stream.

Abrasive (Blast Media)
While not usually thought of as abrasive blast equipment, not much happens to the surface without the abrasive. Abrasives are generally categorized as expendable (one-time use) or recyclable (multiple uses). The type, size, shape and hardness of the abrasive all affect productivity as well as the depth and shape of the surface profile or anchor pattern. The cleanliness of the abrasive is just as important as the cleanliness of the compressed air used to propel the abrasive. A vial test is performed on new or recycled abrasive prior to use. The abrasive

Fig. 2: Multi-colored deadman switches. Courtesy of SAFE Systems, Inc.
is tested for oil according to ASTM D7393 and conductivity according to ASTM D4940. According to the SSPC standards, abrasives cannot contain any visible oil and cannot have a conductivity that exceeds 1,000 µS.

**Blast Nozzle**
The blast nozzle is a small but important piece of the blasting equipment. It is the last item to exert influence on the blast media. Nozzles are identified by their shell composition, their lining composition, the size of the orifice and length (for example, aluminum shell with tungsten lining, size #7, short). The orifice size number relates to the size in \( \frac{1}{16} \)-inch units (#7 = \( \frac{7}{16} \)-inch). The size of the nozzle has a bearing on the amount of air and abrasive used and on the amount of work completed. The larger the size of the nozzle, the greater the consumption of supplies. Nozzles are chosen for the work to be performed.

**Moisture Trap**
The moisture trap is a device that allows the compressed air to shed water. As the air is compressed, heat is generated. As this hot air passes through the heat exchanger to lower the air temperature, water in suspension (humidity) is condensed. Generally, a compressor is fitted with a moisture trap. This first trap catches most of the water. However, as the compressed air continues to cool, additional moisture condenses in the bull hose. This remaining moisture is trapped by the moisture separator just before it enters the PBT. This trapping is done either with a centrifuge-style separator or with a replaceable filter element-style separator. Generally, it is necessary to leave an air bleed valve open in the bottom of the moisture trap when blasting to allow the moisture to be expelled.

**Deadman Switch**
The deadman switch (Fig. 2), either pneumatic or electrical, allows the blaster to have remote control over the pressurization of the blast hose. With pneumatic operation, this is accomplished when pressure through the deadman switch closes the air control valve and opens an escape valve. This prevents air from entering the PBT and at the same time, it depressurizes the PBT. Electrically operated systems use pinch valves to stop the flow in the blast hose. With electrically controlled systems, the PBT is always pressurized when the bull hose is connected and pressurized.

The primary purpose of the deadman switch is safety. It provides a means to stop
the discharge of abrasive from the nozzle when a safety hazard arises. The fact that it allows the blaster to start and stop work at his discretion is a secondary purpose.

Blast Hood

The blast hood (Fig. 3) is a piece of safety gear that provides a degree of comfort to the blaster as well. This hood is generally a reinforced plastic shell with a replaceable skirt that covers the torso of the blaster. It has a double-faced shield of clear plastic for eye protection and an air feed line to provide positive pressure under the hood. The positive air pressure under the hood prevents the entrance of harmful blasting dust and abrasive. Air coolers are also available. If the air is coming from a diesel compressor, an air purifier and carbon monoxide monitor are required.
Hoses
Hoses vary in size depending on the work to be performed, available air capacity, distance to work area and other considerations.

The first in the sequence is the bull hose. This is generally a short hose — less than 50 feet long, with an internal diameter (ID) of approximately 2.5 inches or less that provides passage of air from the compressor to the PBT.

The next hose is an air-line with an approximate ID of 0.75 inches or less that provides air first to a moisture trap and then to the blast hood. The section between the moisture trap and the hood is smaller, down to 0.25-inch ID.

Control hoses can be down to 0.20-inch ID and are generally duplex (dual-line) hoses. They run from the control valve on the PBT to the deadman switch and back to complete the circuit when the blaster is ready to commence work. Included here is the electrical wiring necessary if the deadman is electrically operated. It generally operates from a 12-volt DC source such as the compressor power unit’s DC system.

The last hose in the circuit is the blast hose. It is a thick-wall, wire-reinforced hose designed and constructed to contain the high-pressure air (up to 120 psi) and abrasive mixture that moves from the PBT to the blast nozzle. The blast hose is constructed in three layers: an inner wearing lining, a conductive layer and an outer wrapping. Abrasive passing through a blast hose builds up static electricity. The conductive layer is needed so the whole system can be grounded. As a general rule, the hose should be three times the ID of the nozzle orifice; ideally, 1.25 inches to 1.5 inches for optimum production.

Setting Up the System
With the major sub-assemblies identified, we can now set up our blasting equipment. Position the compressor upwind from the work area so that airborne grit does not enter the cooling or air intake systems. The compressor should be level so that the oil and moisture separators can function efficiently. The power unit’s lubrication system also depends on the compressor being level. After fluid levels (oil, coolant and fuel) have been verified and topped off, the compressor is ready to start.

The bull hose should be laid out with no kinks and a minimum of bends. Prior to making connections at the compressor and PBT, the sealing gaskets should be examined for tears, cracks or other sealing problems. As
soon as the connectors have interlocked, a safety pin or wire should be inserted to prevent accidental separation of the joint. If this separation should occur, there is great potential for personnel or property damage as the hose whips around. The hose should be examined for damaged locking lugs, missing gaskets, soft spots, torn covers or other damage.

If any defects are observed, consideration should be given to replacement of the worn or damaged part. If all appears in good condition, make the connections at the compressor and PBT moisture trap.

The next step is to lay out the blast hose utilizing the same inspection procedures used for the bull hose and fittings. If all is in good shape, connect the selected nozzle and pin all fittings.

When the blast hose connection is complete, you can run the hose for the dead-man switch. The fittings on the ends of this hose are brass, male/female and threaded. It is necessary to use the proper-sized wrench to prevent damage to the brass hex surfaces. As the hose is installed, care should be taken to lay the hose parallel to the blast hose. The control line should also be secured to the blast hose by tape or other means to minimize possible damage to this less durable hose. This is important because air leaks in the control line will not allow the control valve to pressurize the PBT and thus no blasting takes place. The threaded fittings should be tightened securely but not over tightened.

Now, go back to the air source for connection of an air-line to feed the small moisture trap for hood atmosphere. These fittings are usually 0.75-inch crow’s foot, quick-disconnect fittings. Inspection of hose gaskets and locking lugs is once again necessary. Be certain to pin all quick-disconnect crow’s feet.

The hood atmosphere line is the last hose to be hooked up. This hose has brass screwed fittings similar to those on the control line. The same care in hook-up should be exercised, with particular attention to preventing entry of debris.

Now, with all hoses connected to their respective fittings, you are ready for pressurized air. Close all air outlet valves on the compressor. Press the shutdown bypass button as well as the start button. The compressor should start and run. After the temperature moves up to the operating temperature, it is time to press the service air switch. At this time the air pressure gauge should register approximately 110–120 psi. If the reading is higher or lower, adjust-
Adjustments in the amount of abrasive delivered to the nozzle can be made with an abrasive valve located close to the bottom of the PBT. Enough abrasive to do the work should be delivered, but not so much as to slow the impact or choke the blast hose or nozzle.

To assure the quality of cleaning, two important checks should be made. The first is a compressed air cleanliness test, also known as a white rag or blotter test. This test determines if the blast air is free of moisture and oil as it is delivered to the nozzle. The abrasive valve is closed to prevent abrasive from entering the air stream. A white rag or blotter (called an “absorbent collector”) fastened to a rigid backing is then positioned in the air stream within 2 inches of the nozzle. A non-absorbent collector such as rigid transparent plastic may also be used. After a minimum of one minute, the collector is removed and examined for oil or moisture contamination. If evidence of oil is present on the collector, adjustments must be made to the system, possibly by service personnel from the supplier of the compressor.

The second test measures nozzle pressure. This measurement is taken with a needle pressure gauge. The needle is inserted into the blast hose in the direction of air and abrasive flow. Nozzle pressure is read directly on the face of the gauge. Optimum blast nozzle pressure should be approximately 100 psi for productive work. Pressures lower or higher than 100 psi may improve productivity depending on the abrasive being used.

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