

# Dry-Mix Shotcrete Equipment

## A Nontechnical Description of Equipment Used in the Industry Today

By Tom Norman

In the beginning, man created the dry-mix process...and it was good. Today, both the dry- and the wet-mix processes are in use. The choice of either the wet- or dry-mix process is a decision based on preference, familiarity, application, and equipment. First, you may have a preference based on what you have been told or your personal experience. Second, you may be more familiar with either the wet-mix or dry-mix process based on your exposure from coworkers, mentors, or family. The most important factor in choosing the dry- or wet-mix process is the application involved. Are you placing material in the Arizona desert where high temperatures and setup time are concerns? Are you in a confined area where dust could be a concern? The project requirements could even vary enough to create the need to use both processes. Lastly, available equipment is a factor in the decision to use one process over the other. Maybe you already have access to a perfect air compressor for a dry-mix setup or you have a good used swing tube pump just waiting to be put to use.

### Dry-Mix Shotcrete Equipment

The main categories of dry-mix shotcrete equipment are as follows:

- Pressure vessels;
- Dry-mix shotcrete guns;
- Batch plants; and
- Predampeners.

### Pressure Vessels and Dry-Mix Shotcrete Guns

The key piece of equipment for any dry-mix shotcrete application is the machine, primarily a dry-mix shotcrete gun. The first dry-mix shotcrete machine (known as the “Cement Gun”) was a single-chamber pressure vessel, basically a steel tank affixed with plumbing for air to flow throughout. Dry materials were fed into this steel vessel, which was then sealed and pressurized by feeding air into the vessel from a valve connection. A material hose was connected to an outlet valve and, when opened, material was projected into a hose and conveyed to the nozzle. The double-chamber gun was also developed for increased versatility. The addition of water at the nozzle—the

most distinguishing feature of the dry-mix process—was key to this equipment use and technique. Modern rotary guns work on an entirely different principle, yet the fact that water is added at the nozzle still remains the same. The rotary gun includes a hopper where dry or predampened material can be added. These machines are typically powered by an air motor, although hydraulic-powered machines are also available. The motor serves to rotate the gun’s material feed system. Feed systems are designed to continuously direct material from the hopper to the outlet where the material is conveyed by air to the hose and nozzle. Material drops into cavities or cylinders, which are then injected with compressed air. Feed system designs for rotary guns include the “bowl” type system and the “barrel” type system (refer to photos of each).

A note on terminology: Contractors and project teams use many variations of terms to describe dry-mix shotcrete equipment. You may hear gun, dry gun, shotcrete or gunite pump, bowl gun, rotary gun, cement gun, concrete sprayer, bowl type, rotary type, and so on. The next time you don’t agree with the names that a contractor or purchasing agent uses to describe a piece of machinery, you might want to just play along even though they might not be technically correct. Of course, a gunite machine is not a “pump.” Language has a life of its own and cannot be controlled.

### Batch Plants and Predampeners

Materials used in the dry-mix process can be dry, preblended products, or mixed on site. Dry, preblended, or “prebagged” materials are available from several suppliers (please visit [www.shotcrete.org/buyersguide](http://www.shotcrete.org/buyersguide)). Dry, preblended products can be designed to meet virtually any job requirement. Prebagged materials may offer proprietary mixture designs that could provide an advantage for a particular application. To manage the costs, delivery, and control of your mixture proportions, use a batch plant or combination batch plant/predampener. Batch plants are essentially mixers that combine cement and aggregate used in the dry-mix process. Batch plants are available for any job size, from low-volume units to high-volume batch plant truck, trailer, or stationary units. The addition of a spray



*Combination batch plant/  
predampener with  
bowl-type rotary gun*



*Rotor-type or  
barrel-type  
dry-mix  
shotcrete  
machine*



*Water-pressure  
booster pump*

bar system to the batch plant gives the ability to predampen materials before they are fed into the dry-mix shotcrete/gunite machine. Predampening can reduce static electricity, dust, and rebound that are common when conveying completely “bone-dry” materials.

## **Other Equipment**

Another popular piece of equipment for the dry-mix shotcrete contractor is a water-pressure booster pump. This pump, fairly small and portable, is used to increase the pressure of the water being delivered to the nozzle.

A variety of hoses and nozzles for the dry-mix process are readily available to meet the needs of low- to high-volume project requirements. The most common setups in the dry-mix process are 1.5 or 2 in. (38 or 51 mm) material hose and nozzle designs. Various nozzle tips can be used to control the spread of material as it is placed on the surface by an American Concrete Institute (ACI) certified nozzleman.

A fully self-contained dry-mix shotcrete operation consists of a batch plant with a built-in predampening system; heavy-duty air compressor; a reliable source for dry, bulk materials; material hose; air and water hose; nozzle; water-pressure booster pump; and an ACI certified nozzleman.



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*eastern region based in Cincinnati, OH. Airplaco and Gunit's shotcrete equipment, including dry-mix gunite machines, batch plants, and shotcrete pumps, is manufactured at this Northeast location and also distributed through Houston, TX, and Monrovia, CA, sales locations. Norman is involved in product development for Airplaco's line of shotcrete equipment, which has been produced since 1946. He served 6 years in the U.S. Army and earned an associate degree in business from the University of Wisconsin, Milwaukee, WI. In addition to being a member of ASA and Chair of ASA's Pool and Recreational Shotcrete Committee, Norman is a member of the International Concrete Repair Institute (ICRI) and the Association of Pool and Spa Professionals (APSP).*