

**Shotcrete Technology and Adaptability of Twoplus Shotcrete Machine**

**Shotcrete Technology**

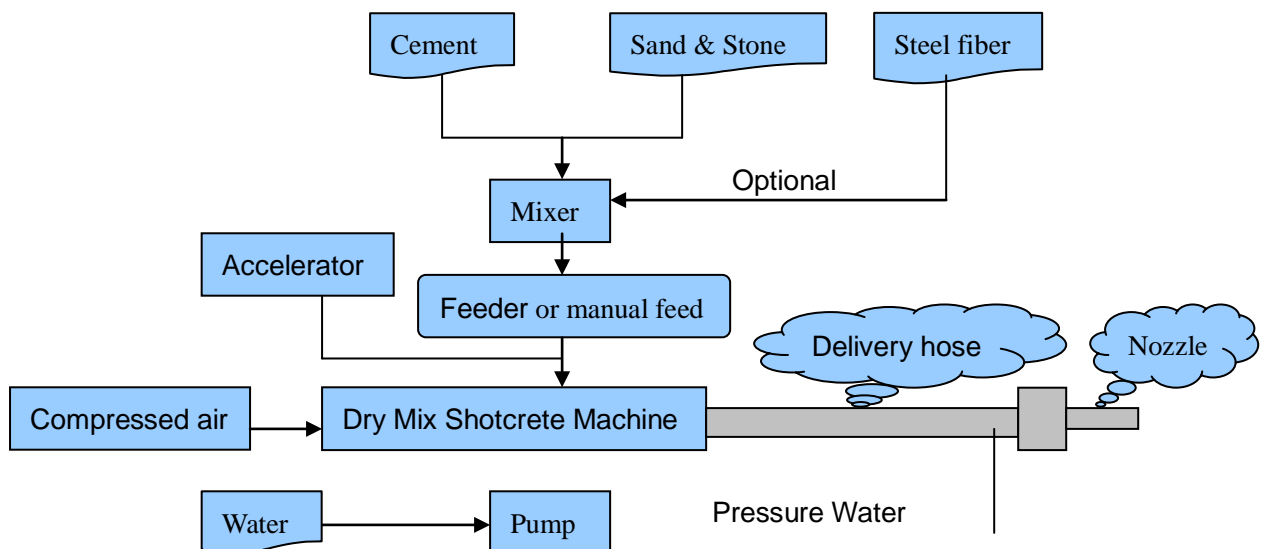
Shotcrete process is to use compressed air to convey the pre-dampened mix through delivery hose to the nozzle to project the material onto the sprayed surface under high velocity, and then to form concrete support layer after the projected material coagulates and hardens. In recent years, with simple technology, special effect, economy cost, flexibility and high construction efficiency, shotcrete technology has widely been applying in construction, railway and super highway engineering, underground engineering, tunneling, mining operations, hydropower projects and slope stabilization, etc. and showing prosperous future. There exists two shotcrete ways: dry mix shotcrete and wet mix shotcrete.

**Shotcreting process**

**1. Dry mix shotcrete**

① Process

Dry mix components (not including water) according to the design ratio ---directly feed the mix into hopper (by hand or by feeder)---compressed air introduced through air compressor conveys the mix to the nozzle through delivery hose---water is added to the mix at the nozzle—project the mix onto the sprayed surface under high velocity.



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Note: Steel fiber is option material.

#### ② Requirement of materials

##### ➤ Aggregate/Grain

In order to incarnate the general economy index of shotcrete, the aggregate diameter shall not be too big. Within 15mm is best. Middle & coarse sand is right, with fineness modulus > 2.5. If necessary, the 5mm screen is used in sifting. Stone diameter is 5~15mm, if necessary, the 5mm and 15mm screens are respectively used in sifting.

##### ➤ Materials ratio

Cement: sand: stone (weight) =1:2:2, to do test on this ratio in early days for constantly adjusting it.

##### ➤ Accelerator

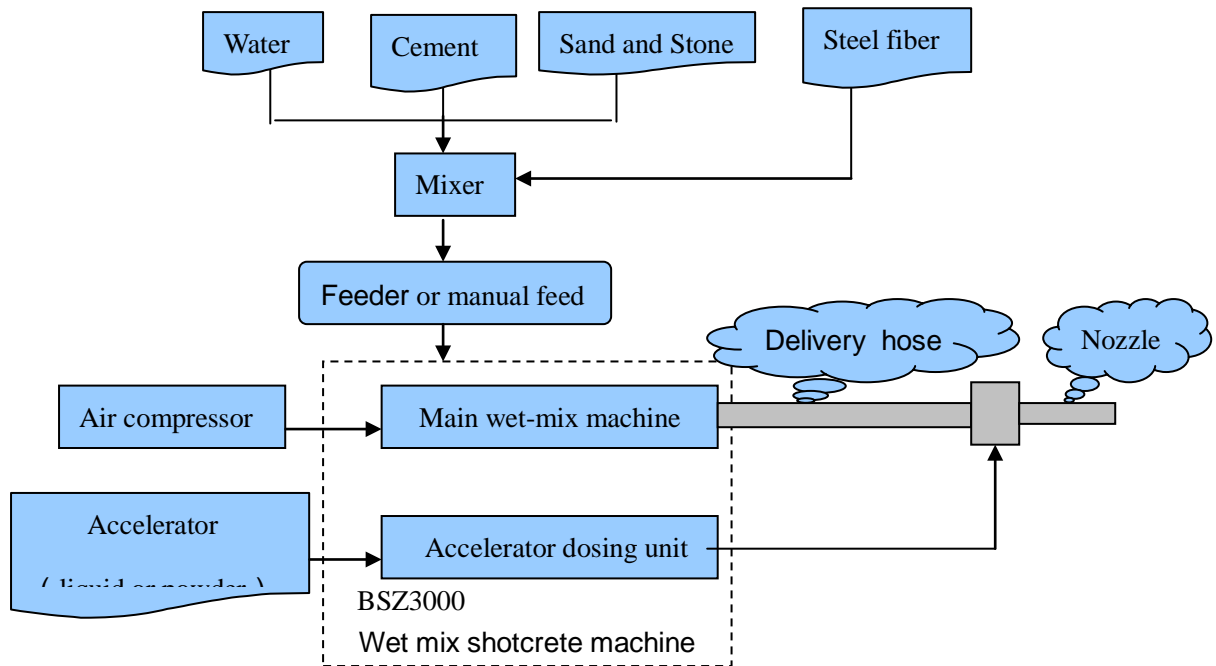
Liquid or powder accelerator is right. The initial coagulating time shall be not beyond 5 minutes. The final coagulating time shall be not beyond 10 minutes. The keep rate of 28-day strength shall be beyond 85%. Adding accelerator must be strictly controlled. Liquid accelerator is 3~4%(by cement) but powder accelerator is 3~5%(by cement). When using liquid accelerator, the dosing unit of accelerator shall be set.

## 2. Wet mix shotcrete

#### ① Process

Shotcrete components (including water) according to the design ratio ---directly feed the mix into hopper (by hand or by feeder)---compressed air introduced through air compressor conveys the mix to the nozzle through delivery hose---accelerator is added to the mix at the nozzle---project the mix onto the sprayed surface under high velocity.

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Note: Steel fiber is option material.

Ø Requirement of materials

➤ Aggregate/Grain

In order to incarnate the general economy index of shotcrete, the aggregate diameter shall not be too big. Within 15mm is best. Middle & coarse sand is right, with fineness modulus > 2.5. If necessary, the 5mm screen is used in sifting. Stone diameter is 5~15mm, if necessary, the 5mm and 15mm screens are respectively used in sifting.

➤ Materials ratio

Cement: sand: stone: water = 1:2:2:0.45, to do test on this ratio in early days for constantly adjusting it, concrete workability and strength are regarded as control index. Water/cement ratio must be strictly controlled in 0.43~0.5. Slump must be controlled in 8~15mm.

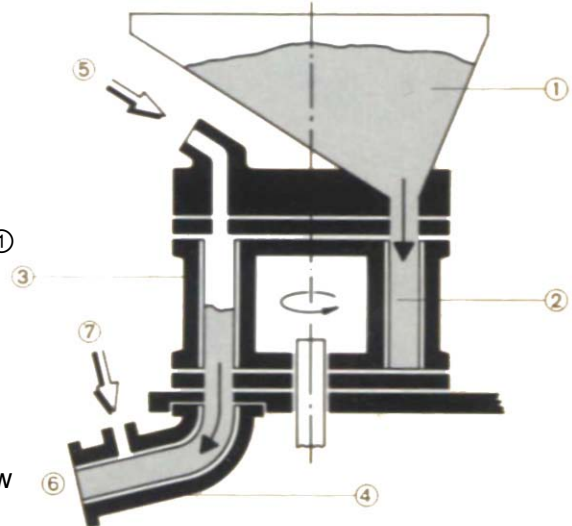
➤ Accelerator

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Liquid or powder accelerator is right. The initial coagulating time shall be not beyond 5 minutes. The final coagulating time shall be not beyond 10 minutes. The keep rate of 28-day strength shall be beyond 85%. Adding accelerator must be strictly controlled. Liquid accelerator is 3~4% but powder accelerator is 3~5%.

### The Elements of Twoplus Concrete Spraying Machines

Twoplus Shotcrete's concrete spraying machines are the rotor spraying machines for processing wet mix and dry mix. The material to be conveyed is fed from a specially designed vibrating hopper ① directly into the rotor chambers ②. The revolving rotor ③ conveys the materials to the air chamber ④. By free fall and a assisted by an upper air flow ⑤ the mix or material to be conveyed is introduced



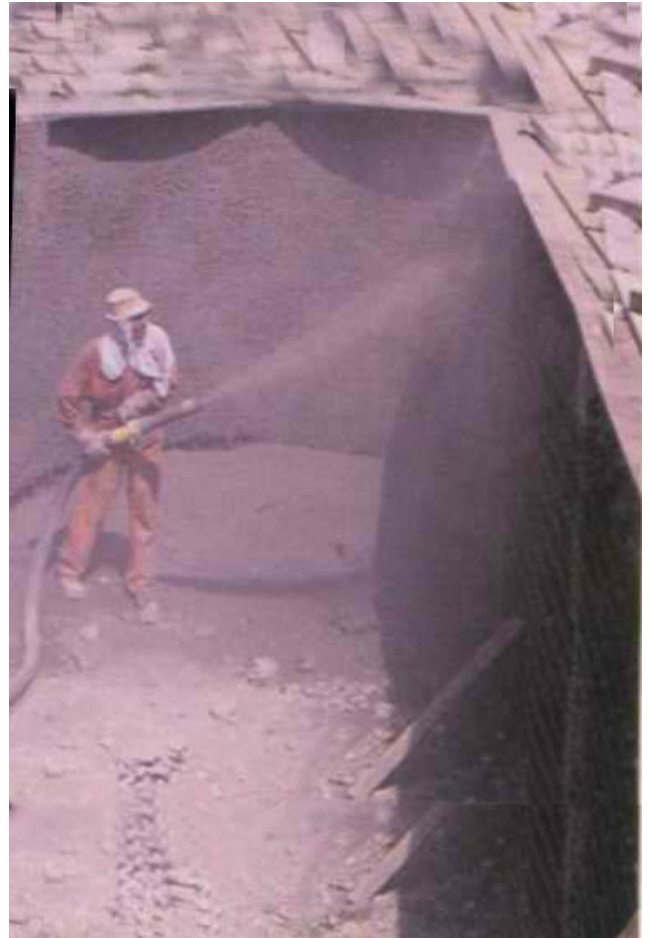
into a conveyance air stream ⑥. Material conveyance through a pipe line is achieved by thin stream method of transportation (air suspended delivery). With help of conveying air ⑦ it is transported to the nozzle. When adopting the dry mix method of application water is metered and added to the mix at the spraying nozzle.

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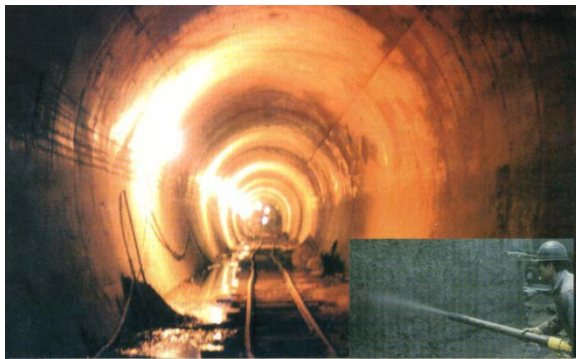
**The application of Twoplus concrete spraying machines**



Highway (railway) tunnel



Swimming pool



Mine tunnel



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Rock and soil slope

Civil engineering



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