What Is Shotcrete Pipe Lining?

Shotcrete is an efficient and highly effective trenchless solution for repairing large sewage and stormwater pipelines. Depending upon the pipeline restoration requirements, state and municipalities often find the shotcrete process is a good option because it is both flexible and cost-effective solution.

So, what is shotcrete pipe lining?

Shotcrete pipe lining — or shotcreting — is a procedure of transferring high-performance concrete or mortar through a hose and pneumatically projected at high velocity to line the interior of the structure. The force in which it is sprayed results in the concrete's compaction, and even layers of concrete are formed until the correct thickness is reached.

> …shotcreting is an efficient method of rehabilitating, repairing, and reconstructing compromised pipelines and dilapidated infrastructure.

The application's impact consolidates the concrete onto the damaged surface and is allowed to cure. Shotcrete has qualities similar to most in-site cast concrete when it's hardened. (Shotcrete material usually consists of cement, sand and additives that are resistant to high temperatures and corrosion.) As it settles, it bonds to the underlying substances, sets up quickly, and adheres to the pipeline.

Advantages of the Shotcrete Process

Shotcrete is considered an effective method for repairing or reconstructing large, open, and curved pipeline interiors and can be applied to most material construction – i.e., brick, stone and masonry, reinforced concrete and corrugated metal. Shotcreting is often regarded as an effective way of placing a cementitious lining on various pipeline applications and, since it requires no compaction, it can be applied from a safe distance over large areas.

Other advantages:

- Faster pipeline restoration compared to in-site casting
- Lower labor costs because of the speed of process
- Results in a lining that is less porous, more durable and long-lasting
- Reduces up to 100% of forming material and costs
- Less expensive overall when compared to traditional concrete restoration methods

The Difference between Dry Mix and Wet Mix Shotcrete

The two primary production methods for shotcrete are dry mix and wet mix. The determination is based on when the water is combined with the mortar or concrete mix. In dry mix, water is added to the nozzle, but in the wet mix, the water comes in the concrete or mortar mix. In both processes, the shotcrete mixture adheres to the surface and cures, forming a structurally renewed pipeline or culvert.

Dry-Mix Shotcrete

Before conveying the mix to the device, wet aggregates and cementitious material are mixed in the appropriate ratio. The mixture of ingredients is placed on the hopper of the device. The mixture is directly taken from the hopper to the nozzle using the apparatus' delivery hosepipe. The nozzleman then controls the amount of water combined with the dry mix using a valve.

Some of the advantages of dry mix shotcrete include:

- Excellent bonding strength and ability
- Less waste generated during the process
- Relatively inexpensive
- Control of water can easily be accessed at the nozzle

Wet-Mix Shotcrete

During the wet mix process, all components are combined with the necessary volume of water required to create mortar or concrete. The mix is already prepared before it's placed in the device. Pneumatic equipment is used for the delivery of the mixture.

The wet mix is pushed to the nozzle using a hosepipe connected to compressed air. The mixture is shot at a high velocity onto the interior of the pipe.

Wet mix advantages include:

- Accurate water content management
- Less air consumption
- Easy and convenient spraying process
- Minimal labor necessary
- Cost efficiency

Since so many shotcrete jobs have a low production capacity and are situated in remote areas, mixing is typically done by a small drum mixer on-site.

Equipment Used for Shotcrete Lining

Mixer and Additive Pump. Depending on their qualities and shotcrete process type (dry or wet), admixtures may be added at the nozzle or during mixing.

Dry admixtures are typically utilized during batching for the dry mix process. The dispenser adds them to the gun and hopper for applications where a constant feeder gun is used. The dispenser should be able to vary the ratio of the cement to the admixture and must measure the required quantity in the mixture.

In the wet mix process, liquid or dry additives may be used in the mixture during batching as long as the properties for pumping are not compromised.

Air Compressor. For shotcreting to have a successful operation, a reliable, high-velocity air compressor with adequate capacity is essential. The compressor must maintain a supply of dry, oil-free, and clean air to preserve enough velocity for the nozzle for all sections of the task.

Spraying Arm and Nozzle. The spraying arm and nozzle are used to direct the flow of the shotcrete and can be successfully sprayed vertically and upside down. The high pressure supplied by the compressor and additive pump, which accelerates the hardening process, makes the use of shotcrete highly versatile.

Conclusion

To summarize, shotcreting is an efficient method of rehabilitating, repairing, and reconstructing compromised pipelines and dilapidated infrastructure. Shotcreting is an attractive and practical option that will ultimately extend the service life of the pipeline.

Finding a reliable shotcreting company to do the job is also of equal importance. Experienced contractors, like MCSP, can provide pipeline owners with safe, practical, and lasting solutions that utilize trenchless pipe restoration and rehabilitation methods that include shotcrete.