

SpiroFlo and Concrete Restoration

Though concrete is the most used man-made material, it often has the tendency to crack. Up until now, the options have been replace the concrete in lengthy and costly projects or to ignore the damage. However, cracks in concrete are not simply aesthetically unappealing, they often indicate structural damage. Everyday examples include cracked driveways, potholes and foundation damage in houses; extreme examples include falling bridges and the demolishing of structurally unsound skyscrapers.

SpiroFlo, LLC (SpiroFlo) is partnering with Surtreat to restore concrete. Concrete deterioration is chemically induced and accelerated, so Surtreat has patented formulations to chemically inhibit and reverse that deterioration. The SpiroFlo device is used in the application of Surtreat formulations. The patented SpiroFlo technology applies liquids at a wider spray pattern, higher impact coverage, and lower psi than spray nozzles. Unlike spray nozzles, the SpiroFlo device has no problem with clogging and maintaining efficiency with higher viscosity liquids (oil, condensates, etc.). When used in conjunction with the SpiroFlo vacuum head, the SpiroFlo device also removes air pockets from concrete at an increased rate, making room for the Surtreat formulations to work more effectively.

SpiroFlo and Surtreat are used when success matters.

U.S. military roads in Iraq take a beating due to heavy traffic with heavy vehicles (Hummers, tanks, etc.). SpiroFlo and Surtreat have been contracted to help restore these important roads to workable order.

SpiroFlo technology

The SpiroFlo device shapes turbulent liquid flow into a spiraling flow with very stable characteristics and operational efficiencies. Most easily described as a “tornado in a pipe,” the SpiroFlo technology initially develops a spiraling helix causing the entire flow to spin. Fluids twist around the outside of the pipe and any other phase of the flow (solid, air, etc.) separates and (usually) travels in the center of the spinning vortex.

As the flow becomes fully organized, a visible “rope” develops in the center. On discharge to atmosphere, the spiral expands to deliver a solid stream in a hollow cone (with a ring-shaped impact area). Since the water droplets are swirling on discharge, impact and coverage are maximized.

Velocities increase the spiral flow, but the system typically operates at lower pressures than spray nozzles (less than 5 psi).

Benefits in liquid spraying

Unlike hollow cone nozzles, the SpiroFlo device delivers the coverage and penetration needed for concrete restoration. Hollow cone nozzles typically deliver a small volume of material at high pressures in a mist (drop size typically is 3400 VMD microns at 20 psi*). SpiroFlo delivers a higher spray impact in a full cone pattern with almost no flow constriction at low pressures. No VMD micron equivalent is available for SpiroFlo, but actual drop sizes are substantially greater.

To assist in the understanding of the SpiroFlo benefits, we offer the following comparison between SpiroFlo and both a hollow cone and full cone nozzle (source: *Industrial Spray Products*, A1-12, B39 & D41):

- A 0.5” hollow-cone nozzle will deliver 3.5 gallons/minute of liquid at 20 psi.
- A 0.5” full-cone nozzle will deliver up to 7.5 gallons/minute of liquid at 20 psi.

- A 0.5” SpiroFlo device can deliver ~10 gallons/minute at less than 20 psi (SpiroFlo devices can efficiently operate at pressures as low as 5 psi while maintaining a uniform coverage)

Since the material is passing through a small opening, hollow cone nozzles (like all nozzles) are prone to clogging as unwanted solid particles can block the inside of the orifice. Surface tension and specific gravity does influence spray nozzle performance. Higher viscosity liquids require a higher minimum pressure to begin formation of a spray pattern and provide narrower spray angles when compared to those of water.

The SpiroFlo device is not a constricted nozzle and does not have any known problem with liquid clogging. When used with higher viscosity liquids, there is minimal additional pressure and little change in terms of the spray angles.

It is in the area of impact that SpiroFlo offers the greatest benefit.

Impact (or the impingement) of a spray onto the target surface, can be expressed in several different ways. The most useful impact value (with regard to spray nozzle performance) is the impact per square inch**. The spray pattern distribution and spray angle are factors in determining the “theoretical total impact” of a particular nozzle, with the highest unit impact typically provided by solid stream nozzles. The unit impact of all typical spray nozzles decreases as the distance from the nozzle increases (source: *Industrial Spray Products*, A1-12, B39 & D41):

- A flat fan spray pattern at an 80° spray angle has a theoretical total impact of 30% (at 12” distance from the nozzle).
- A hollow cone pattern at the same 80° spray angle has a theoretical total impact of only 1-2% (at 12” distance from the nozzle).
- The SpiroFlo device is delivering a constant liquid flow as opposed to a constricted “mist” flow. The spray angle is over 120°. In order to ensure maximum impact, the SpiroFlo devices are strategically placed in the spray bar to ensure that there is modest overlap in total coverage.

The benefit of the spinning vortex flow ensures that the impact is maximized.

Summary

SpiroFlo and Surtreat are providing an effective solution against the damaging effects of concrete deterioration.

Using the SpiroFlo device to apply the Surtreat chemical solution offers enhanced penetration (impact), at optimal coverage rates in a single pass, eliminating the need for multiple applications. There are no moving parts in the SpiroFlo device and wear issues are expected to be minimal with the Surtreat product application. The device is virtually maintenance free, offering clog-free spraying, low energy costs and simple operation.

* VMD microns refers to the Volume median Diameter – a means of expressing drop size in terms of the volume of liquid sprayed). Smallest drop sizes are achieved by air atomizing nozzles while the largest drops are produced with the full cone hydraulic spray nozzles (source: *Industrial Spray Products*, pp A6).

** Comparison rates are calculated using water. Since the specific gravity of liquid affects its flow-rate, the actual flow-rates would need to be adjusted to the specific gravity of the process liquid.

Sources

Industrial Spray Products, Catalog 70, 2007. Spraying Systems Co.: A1-12, B39, & D41.