



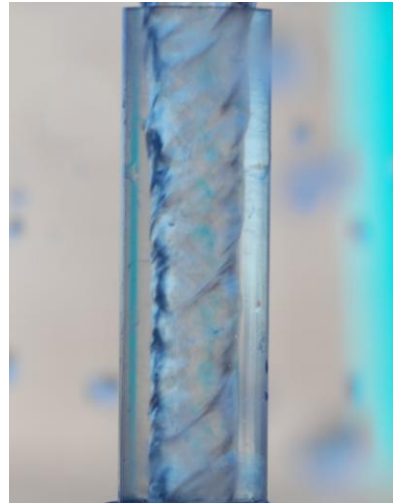
How It Works

If you've heard about the benefits of the patented SpiroFlo device—removing biofilm from pipe walls, delivering a better shower faster with green benefits—you may be curious as to how an in-line device with no moving parts or additional power source can create such a stable flow with so many benefits.

Basically, it's like when you tape a couple of two-liter bottles together at the necks (pictured below left). If you've got liquid in one bottle and you flip it upside down, it'll slowly glug into the other. However, if you swirl the bottles like a tornado, the liquid moves from one to the other much faster. That said, in pipe applications, it wouldn't make sense to have a device that somehow rotates the pipes, especially as flow rates can be uneven. Instead, the SpiroFlo device creates these benefits by shaping the liquid into a spiraling flow as it moves past.



Tornado spun in two-liter bottles



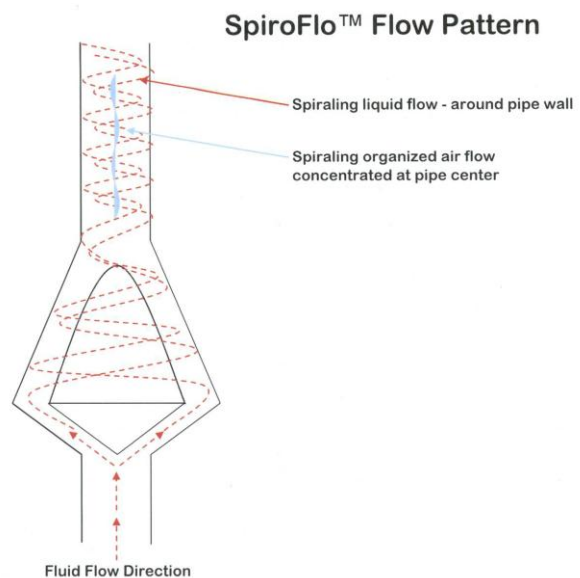
Tornado in a pipe created by SpiroFlo

If you'd like a more scientific approach to the SpiroFlo device, read on:

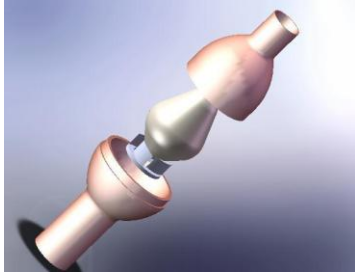
How is the Flow So Stable?

Engineers have debated what exactly the flow set up by SpiroFlo is. They know it's *not* laminar flow—a highly organized flow with a specific Reynolds number—as the Reynolds numbers generated by this flow fall outside the laminar flow envelope. Some engineers argue that the SpiroFlo device creates a “co-flow” that allows multiple phases—a variety of liquids, gas and/or solids—to travel more efficiently. Heavier liquids get slung to the outside whereas gases travel faster in the middle. As the liquids travel in the boundary layer (or the tubing wall) of the pipe, this spinning motion can serve to scrape off biofilm and other bacteria in industrial applications.

With normal, turbulent flow, this boundary layer of the pipe is the problem. Liquids, including bacteria treating chemicals, flow past the very problem areas they're trying to address, as the standard flow of liquid does not actually reach this “no-flow” boundary area.



However, when fluid travels through the SpiroFlo device, it is slung to the outer wall, enabling the fluid to travel in the boundary layer of the pipe. In doing so, this means that chemical treatments are finally hitting the problem areas they're meant to address. Additionally, since the SpiroFlo device helps keep liquids suspended, *less* chemicals are needed to treat problem areas (testing has shown down to 50% of original use), leading to lower treatment costs and better penetration.



Although the exact nature of the flow is debated, the flow set up has been tested and proven to *decrease* friction and *increase* velocities. In doing so, this lowers line pressures. This means that a liquids line on pump can have more flow come through it (testing shows up to 40% more). Like the two-liter bottle example, even with the pipe size (or in the case of the bottles: neck size) remaining the same, if the flow is more efficient, the pipe "allows" for more flow to pass by with lower friction and higher velocity benefits.

Though the visual effects of the SpiroFlo device (exploded diagram pictured left) are brief, the effects of the spiraling flow created are long-lasting, continuing through bends, elbows and changes in elevation (though not through closed valves and Ts, as the stable flow can't travel two different directions).

In oil and gas applications -- where the Vortex Tools trade name is used -- the benefits from a *single* tool were still seen over *six miles* later.

How Does the Device Work?

In simple terms, the patented SpiroFlo device is a "tornado in a pipe" (pictured right). The SpiroFlo device shapes turbulent liquid flow into an organized spiraling flow with very stable characteristics and operational efficiencies.



As fluids (liquids and/or gases) are introduced to the SpiroFlo device, the flow undergoes a rotational shift of 90-degrees from the inlet. Fluid then traverses around a series of helical-shaped "turbines" which cause the fluid to spin and accelerate as it passes across the proprietary device. Any air particles present in the fluid are separated and pulled toward the center of the tornado-like vortex as the flow develops.

Once the flow is fully organized, liquids travel around the pipe in a 45-degree spiraling flow, and the gases concentrate and travel in a spinning rope-shaped flow in the center of the vortex.

SpiroFlo in-line designs have significant benefits for single-phase liquids and multi-phase (liquid and gas) flows. This process offers the potential to use the technology for continuous mixing, as well as the separation of liquid/gas flows during piping transfer. In a two-phase liquid-gas mix, bubbles of gas are drawn to the center of the vortex and travel inside the spinning envelope in a stable and organized flow, essentially separate from the spiraling liquids. In single-phase liquid applications, the fluids travel through the pipeline in a spiral flow, reducing drop-out and residue build-up.

Conclusion

By creating a tornado in a pipe, the SpiroFlo device is simply taking advantage of a flow pattern that nature seems to prefer. In doing so, homeowners get a better, more efficient shower faster, and the industrial sector gets access to better, cost-efficient bacteria treatment processes and lower pumping costs (due to lower friction). In short, the tornado moves from the bottle to a pipe.

More info is available at SpiroFlo.com