

The Suction Side Introduction Method Maximizes Ozone's Effectiveness for Pools

(By Barry Nelson, BSA in Microbiology & President of UltraPure Water Quality Inc. (UWQ) – August 2008)

Recent Trade articles have not only mis-stated the role of Ozone for pools and spas, they have left the impression that the only and preferred installation method for an Ozone generator on a residential pool or spa is after all the equipment on the return line. Ozone injection using a venturi (or spa wall jet) on the pressure side of the pump, after all the equipment is in fact less effective than introducing it on the suction side of the pump. While this pressure side injection method is mandated by UL for portable spas it is a less effective alternative for residential pools and pool-like spas. Up until the late 80's UWQ used compressors and then pressure side venturis to introduce Ozone into pool water. While we were willing to spend the time and effort required to 'tune' a venturi system to make it work properly, not many builders or startup people were. In '87 – '88, while unsuccessfully trying to get a venturi system to work with in floor cleaner returns, I discovered that a prominent Phoenix pool company, with input from their in floor cleaner manufacturing arm, were introducing gas Chlorine, from a pool side 'tank' Chlorine generator, directly into the pump drain plug in the hair and lint pot on the suction side of the pump. They were doing this because the Chlorine generator's sophisticated venturi system would not work with their in floor returns. The in floors caused too much back pressure for any venturi to work. My first reaction was the acid gas Chlorine would destroy the pump seals and potentially the filter. "Been doing it with no problems for four years" was the response to my question. If you can introduce gas Chlorine on the suction side of the pump we should be able to introduce Ozone the same way if there is enough air draw – and there was. So we started using this method in the Arizona markets for 5 years until 1993. We then, after careful testing, incorporated this method out with all our pool Ozone generators. In the past 15 years we have used, improved and exclusively promoted our suction side introduction of Ozone for pools. We worked through early 'growing pains' and today there are very few problems with the method. Its effectiveness and simplicity have been instrumental in UWQ becoming the market leader and number one residential pool Ozone Generator Company in North America. Today we enjoy a warranty rate below 2% and can look to the future where a growing percentage of pools use Ozone. Our assessment of the venturi, pressure injection method and the suction side introduction method, as a result of extensive field experience and laboratory work with them, is as follows:

1) *Disadvantages of Pressure Side Injection of Ozone Using a Compressor or a Venturi System for Pools*

Compressors can be dismissed as being too noisy, expensive and maintenance-intensive.

Venturis, in a Spring-loaded or Valved Bypass form, as the last thing in the return line, on the pressure side of the pump: **i)** Add a significant, often hidden cost to the Ozone generator; **ii)** Must be 'cut into' the plumbing and require additional space on an already crowded equipment pad; **iii)** Require an additional 7 - 10 PSI back pressure to operate and cause a slow down of water flow; **iv)** Usually need the wall returns enlarged for efficient operation – a mini-engineering job for each installation; **v)** Result in only 30 to 40% absorption of the Ozone, due to lower pressures from their last-in-line position; **vi)** Suffer as the filter blinds. As the pressure further increases - water flow decreases and air draw can be lost; **vii)** Cause air & Ozone to 'glurck' into the pool; run up the walls; and, stain the finish if minerals such as iron are present, due to lower water flow; **viii)** Have a short run to the pool which does not allow reaction time and further decreases Ozone's effectiveness; **ix)** Will not operate with an in floor cleaning system, due to too much back pressure on the venturi; **x)** Require removal and acid washing periodically to de-calcify the orifice inside the venturi; and, **xi)** Can cause water to flood back up into and ruin the Ozone generator if the check valve fails.

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2) *Advantages of Introducing Ozone into the Suction Side of the Pump*

A Suction Side Installation, with a check valve in the drain plug hole at the bottom of the pump (our retrofit method) or a straight fitting into a builder installed pipe, attached to the main drain or skimmer line below the water level (our builder stand pipe method): **i)** Adds no extra cost to the Ozone generator as the Suction Side Part Package, with a dial flowmeter (DFSSPP) and the External Safety Air Bleed Kit (ESABK) are included with the unit; **ii)** Requires no cutting of plumbing and does not use up pad space; **iii)** Lowers pressure at the filter by 1 PSI; has no effect on water flow; and, causes no harm to the pump as the air-Ozone mix introduced is less than 1% of the water flow rate; **iv)** Never needs altering of the wall or in floor returns making it a simple cost effective method; **v)** Results in 95 to 99% absorption of Ozone due to the pump impeller producing small bubbles and the high pressures in the pipe between the pump and the filter – 10+ PSI for wall returns and 20+PSI for in floor returns. Also, as the air and the small remaining amount of unabsorbed Ozone exits the filter through its internal bleed line and/or through our ESABK it receives a 'second hit' in the return lines to complete the Ozone absorption; **vi)** Gives the added benefit of a very slow pressure build in the filter as the 'greasy gunk' build up is removed by Ozone oxidation. Often season long, very efficient filter runs are experienced, due to the degreasing; and, if the air-Ozone flow rate gradually drops it can be reset using our exclusive 'DIAL-A-FLO' meter. **The filter is in fact a primary reaction chamber**, giving the Ozone time to work and sending oxidized water back to the pool along with 'debris free' water from the filter. **vii)** Bubbles enter the pool as a 'champagne mist' with very little Ozone left in it. The Ozone is in the water and working – not lost to the atmosphere or 'running up the walls. Therefore there is no wall staining due to oxidized minerals nor is there any cover damage; **viii)** Provides Ozone with the longest possible run back to the pool, while also giving Ozone the most time to do it's Oxidation work. In most cases virtually all the Ozone we produce gets into the water to remove or alter non-living bather wastes. **ix)** Works extremely well with all in floor cleaning systems. In fact the manufacturing arms of the two largest builders in Phoenix, who offer in floor systems, now produce their own UV Ozone generators and use our suction side method. **x)** Requires very little maintenance. Air flow is kept within the desired range using the dial flow meter supplied. Weaknesses of the system are that condensation and 'grit' will collect in the flow meter and can cause the ball to stick. Condensation is mainly an aesthetic issue and does not affect performance. In most cases a stuck ball can be freed by tapping. If the ball 'freezes' the meter is warranted for two years. The check valve used in the retrofit method will fail in two to three years. The stand pipe method does not require a check valve and is therefore greatly preferred. **xi)** Will not cause water to 'back up into' the Ozone generator. The check valve used in the retrofit method is to stop air from entering the pump when it is shut off, not to stop water from going back into the unit. **xii)** In addition to long filter runs, a second 'side benefit' is greatly enhanced performance of 'salt' Chlorine generators. Because oxidized water is being delivered to the generator cell its capacity and cell-life are doubled, while acid addition is halved.

Hopefully the information contained in this write up will convince you that the use of venturis is an antiquated and inefficient method of injecting Ozone into pool water. We believe our suction side introduction method to be far superior introduction method. With 150,000 systems in the field; two in floor systems manufacturers copying us; virtually no pump or filter problems; and, warranty running below 2% we know you will be pleased with the performance of UWQ's suction side installation for pool Ozone generators.