Ultrasonic Nozzle Cleaner Evaluation July 25 2007

Purpose:

To detail the performance of the “Ultra-Cleaner” ultrasonic cleaner on a Cloos tandem torch.

Equipment:

Ultracleaner Model 1 and Trigaskiss anti spatter solution. The welding equipment is the Cloos tandem wire welding system. (Cloos power supplies, wire feeders and torch.) The comparison machine is an identical process using a retrofitted Intertech model 110 tandem torch reamer.

Scope:

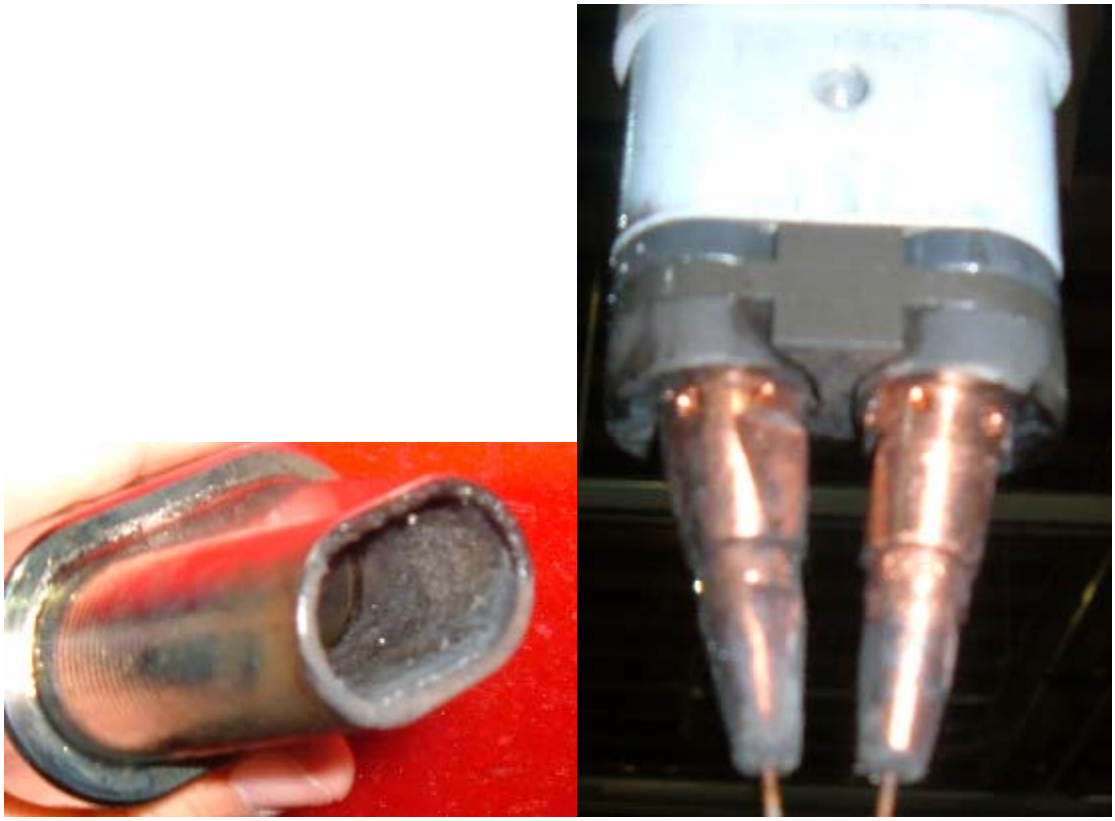
Comparison of the advantages and disadvantages of the Ultracleaner when cleaning the Cloos tandem wire torch and nozzle on a Genesis wrap welder.

The Ultracleaner is basically a stainless steel reservoir filled with anti-spatter solution that uses an electric motor to generate an ultrasonic vibration into the tank which is transmitted to the torch via the anti-spatter solution. This ultrasonic vibration, although very small is sufficient to remove most spatter from the nozzle and tips. Preliminary tests determined that the ultra cleaner is more effective when a new nozzle and tips are used. Nozzles and tips which have been used in a mechanical reamer usually have some scratches and rough areas that spatter sticks to more than the polished and/or nickel coated surfaces. For this reason, I have decided to install new consumables for this study.

The demo model I have been provided has a replenishing pump, a drain and a manual activation switch. The installation of the unit is simple, just plug it in to 110vac and the pump comes on automatically. The pump will fill the unit but it is very slow. I ended up just pouring the solution into the reservoir until I heard the pump turn off. I also determined that the ultrasonic feature of the cleaner will not activate if the pump is running. I am checking the unit periodically to make sure the reservoir stays full. When the solution level is low enough to trigger the pump, it takes the unit 10-15 minutes to refill the reservoir. During this time, the unit will not function. I have also learned that there are two other models of the ultra cleaner. Model 2 has a robot digital-IO fired activation and model 3 has an output to alert the robot if the cleaner is pumping and not ready to clean.

The robot program is simple; the robot is directed to a point above the reservoir at full speed and then slows to 50ipm and lowers into the solution. Once in the solution, the robot travels at 35ipm about 1 inch and triggers the activation switch. The robot remains in this position with the ultra cleaner activated for 5 seconds and then repeats the above steps in reverse to exit the cleaner. After the robot is at least 15 inches from the reservoir, it fires an output which turns on its air blast function. This causes 100 PSI of shop air to pulse through BOTH diffusers for 6 seconds evacuating any excess anti-spatter solution from the diffusers and nozzle. The air blast is essential; weld porosity will result if the air blast does not function on both diffusers. We originally placed the program for the ultra cleaner at the end of the weld programs so that the nozzle would have more time to dry and porosity caused by a wet nozzle would not be as likely. We later determined that an operator, following his procedures may remove the nozzle to clean it and wipe all of the anti-spatter solution from part. The robot would then complete the next weld without the protection of the anti spatter solution. Because of this, we decided to place the ultra cleaner program at the beginning of the weld cycle.

I have selected our Wrap welder #6 (SO822) for this study because of its high output. This machine averages 20 wrap welded parts per hour with 2 minutes of tandem wire “arc-on” time and 30 seconds of single wire “arc-on” time per part. As I mentioned above, we started with all new consumables. The pictures below were taken after having welded 115 parts on the same nozzle, tips and diffusers.



Cloos Nozzle, tips and diffusers after <u>115 parts</u> with ultra cleaner.

For a comparison, I have installed a new nozzle and diffusers on our Wrap welder #4 (SO2000). This welder has a slightly slower cycle time and uses an Intertech model 110 tandem torch reamer. This particular reamer has been retrofitted by Hendrickson R&D with PLC controls and remote IO fired wire cutting.

Cloos Nozzle, tips and diffusers after <u>120 parts</u> with Intertech reamer.

July 26, 2007 8:30 a.m. 250 Parts

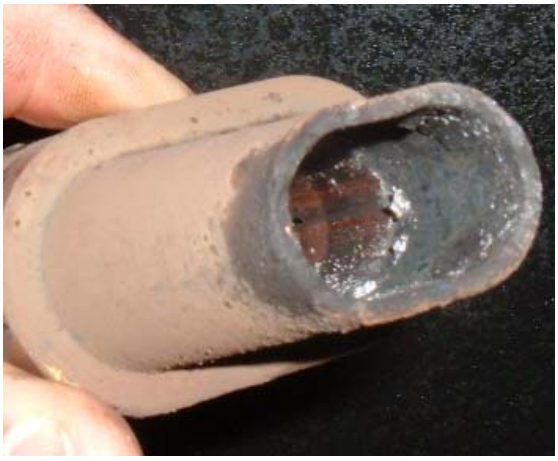
The machine has welded 250 parts using only the ultra cleaner. The nozzle is not exhibiting any change in overall appearance. The insulator material is now beginning to darken a little more but the diffusers are still in perfect condition. We have had several occurrences of porosity at different times during the shift(s). Some of the operators feel that the nozzle may be submerging too far into the anti-spatter solution and is continuing to drip from the outside surfaces while the part is welding. Because of the placement of the ultra cleaner program, it is possible that the air blast function is causing the porosity and not the excess fluid. I theorize that the air blast may be evacuating the weld shield gas from the lines and the shield gas may not have sufficient time to return to the nozzle before the first weld is initiated. To test this theory I have increased the gas pre-flow time on both Cloos power supplies from .30 of a second to one full second. This change does not adversely effect the cycle time because the ultra cleaner program takes 10 seconds less than the original reamer program. At this time, I have the nozzle dipping into the solution until about 1/8" of the cooling ring is completely submerged. I plan to stop the machine to re-examine and take pictures of the nozzle and diffusers at 350 parts. If there have been any occurrences of porosity since the 250 part inspection, I will modify the program so that the cooling ring does not submerge at all.

July 26, 2007 4:30 p.m. 350 Parts

At this time, the anti-spatter solution has lost most of its original jade green color and is now a brown/gray color. The one gallon container of Trigaskiss tough guard that we originally filled the reservoir with has been connected to the cleaners replenishing pump and has about 10% remaining. The manufacturer did not recommend a fluid change interval for the cleaner but I feel that based on the appearance, we will probably need to completely empty and refill the cleaner at about 500 parts. There have been no occurrences of porosity since my last inspection.

The torch and nozzle from the ultra cleaner show little to no change in overall appearance.

There is some noticeable change in the appearance of the nozzle cleaned with the Intertech reamer. It appears as if some of the nickel coating on the nozzle has been discolored or removed. This is normal with torch nozzles. My theory would be that the ultra cleaner is also introducing some additional cooling to the nozzle by submerging it into the anti-spatter solution. It may also be that with the Intertech reamer, there are no provisions for coating the exterior surfaces. Either way, the appearance of the nozzle or the presence of its nickel coating is inconsequential to the performance of the machine.



For a final comparison, I have thoroughly cleaned (using only a rag moistened with penetrating oil) and partially disassembled the torch to better show the details of each cleaner.

This picture shows the nozzle cleaned with the Intertech torch reamer.

Note the abrasion cause by the reamer being slightly out of adjustment.

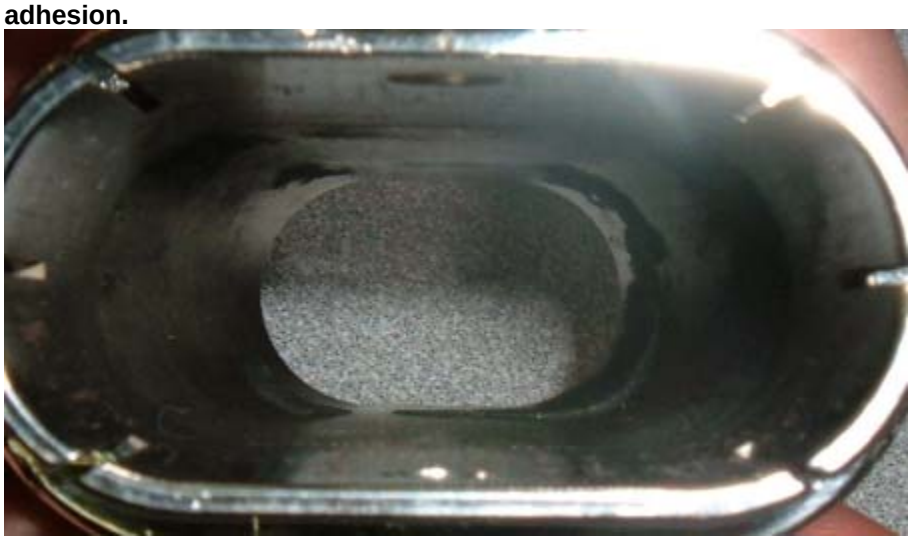
This picture shows the nozzle cleaned with the Ultra cleaner.

Some discoloration and coating damage from the heat of welding.

This picture may require some additional investigation to better explain. This is the nozzle cleaned by the Intertech torch reamer.

Notice the spatter adhesion to the inside surface. This spatter is affixed to a point just above the insulators. This made the nozzle difficult to remove.

This is the nozzle cleaned with the Ultra Cleaner. It does not exhibit any interior spatter adhesion.



This is the diffuser from the torch which was cleaned by the Intertech reamer.

This is the diffuser from the torch cleaned by the Ultra Cleaner.

In conclusion, I feel that the results of this short term study are sufficient to conduct a long term study of the benefits of the Ultra Cleaner on other Hendrickson processes. The Ultra Cleaner has no moving parts, is relatively inexpensive compared to an Intertech torch reamer and is very easy to maintain. I do feel it would be very beneficial to purchase the model #3 Ultra Cleaner as it has the ability to respond to a robot input for activation of the ultrasonic cleaning function and could also signal the robot when the pump is replenishing the cleaner and therefore unable to clean.

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