Inspection of SF6 Distribution System performed at Chicago White Metal Casting, Inc by Equipment Imaging and Solutions, Inc.

Presented by:

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On July 26, 2004 Equipment Imaging and Solutions, Inc. performed a thorough inspection of Chicago White Metal's SF6 mixing and distribution system to determine if there were any leakage points.

Chicago White Metal operates with a central mixing SF6 system using air, dried to a dew point of –100 degrees F. The SF6 is mixed with air at a ratio of only .4% SF6 and 99.6% air. From the mixing station, one central line carries the gas mixture at 90 psi, through a service corridor located behind the die casting machines. At each point adjacent to a furnace, a line branches off from the central line to feed that furnace. These lines branch off and the gas passes through pressure reducing regulators set at 20 psi.

After the regulators, flow meters are located on each branch line, feeding at a rate of 6-10 cubic feet/hr., depending on the capacity/size of the furnace.

Beyond the flow meters are pulse valves which release SF6 to the furnace at timed intervals

The inspection began at the central mixing station. No leaks were found. However, during our 2002 inspection, we did find leaking at a regulator flange and a solenoid valve.

Next we inspected the central distribution line as well as all the branch lines in our service corridor. All lines and valves were meticulously inspected. We found that pulse valves we had installed were exhausting a small amount of SF6 with each pulse cycle.

We coated the threads with Teflon tape and then installed a threaded cap on each pulse valve. Moving forward, we have started installing a new valve design that does not have an external exhaust. Our pulsing system is on its 3rd revision since we initially began experimentation.

We also replaced one flare fitting on the distribution line for #22 furnace.

Identical to our 2002 inspection, we did find one common leak point that was evident on every machine. Leakage was consistently found where the plunger submerges into the gooseneck. The fit between these two is intentionally loose so the plunger travels freely. We have experimented with several different methods to reduce the loss of SF6 gas at this point but to date we have not been successful. I suspect this is a common leak point for all hot chamber magnesium die casters so I recommend that we review this collectively to help develop a solution.

We found additional leakage points during the inspection as follows:

#14 – Gas line above floor @ crimp point of steel fitting and braided stainless steel jacket of Teflon tubing. A new Teflon tube was installed.

#21 – Leak at the coupling/gas line connection. Disassembled the coupling, applied new thread compound and re-assembled.

#24 – Identical to leak at #14

#27 – Leak at copper gas line. Joint was re-soldered.

During 2003 – July/2004, we have reduced our SF6 consumption by 1,934 Kg of SF6 per metric ton of magnesium processed, in comparison to 2002 usage. This equals $24,190 in savings.

In May, 2002 we submitted a reduction goal of 10% per year. We have actually reduced our usage by 72% in just over two years.

We have invested approximately $4,500 in modified gas delivery equipment, performed two inspections with EI&S and we dedicate approximately 65 man-hours per year to monitoring and reduction efforts.

It is our opinion that this inspection was worthwhile for Chicago White Metal, EIS, the SF6 emission reduction partnership and the environment. We know that we have reduced SF6 emissions to the atmosphere as a result of this inspection.