

MAKING DEFICIENCY CORRECTIONS CAN IMPROVE PERFORMANCE OF YOUR WESP

BY BOB ALLAN AND ED SPINK

The panel/board industry carries a long history in the use of wet electrostatic precipitators (WESPs). Initially, WESPs were used as the sole emission control device prior to release of process emissions to the atmosphere. With consent decrees and new, more stringent regulations they became the pre-cleaning device of choice to protect regenerative thermal oxidizers (RTOs) from heat exchanger (ceramic media) plugging and degradation (primarily due to salt attack). The WESP can certainly perform this function, potentially even leading to the ability to run the thermal oxidizer catalytically, saving half of the fuel cost.

However, the older WESP designs have not proven up to the task in meeting the new regulations and suitably protecting the RTO: design deficiencies have been responsible for major operating and maintenance problems. TurboSonic offers solutions which correct these deficiencies and address other methods of improving WESP performance.

CORRECTIONS

The first design deficiency is a lack of attention to the quenching and pre-scrubbing function ahead of the WESP. A WESP must operate with a saturated gas stream in order to function effectively. Unsaturated gas streams lead to material drying and buildup on WESP internals, causing performance degradation. In addition, improving pre-scrubber removal efficiency results in a lower loading of material entering the WESP.

Two approaches can be taken to solve this problem:

1) For existing installations, the addi-

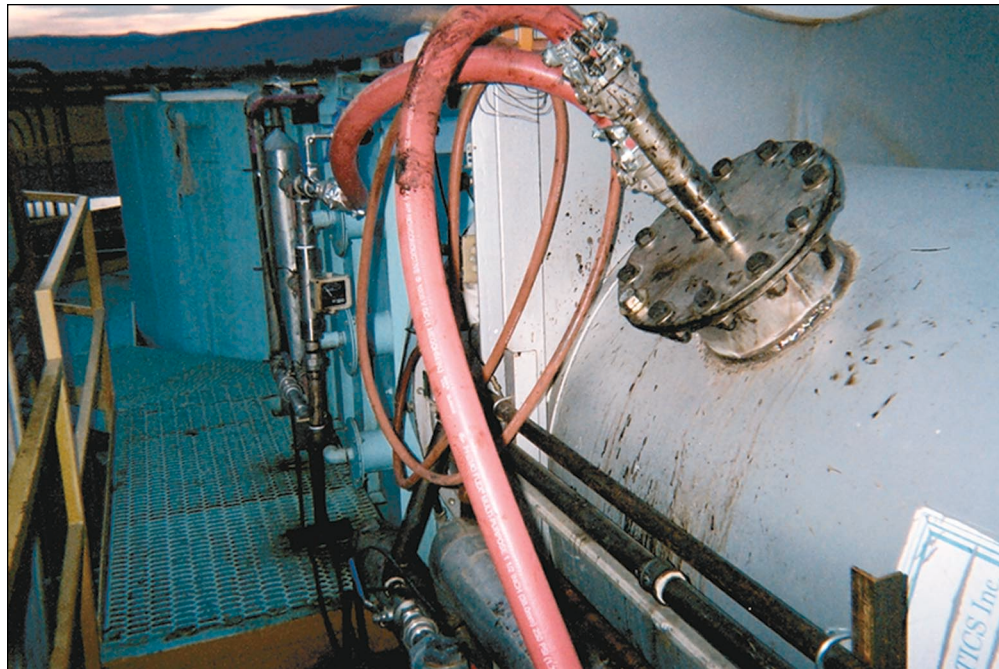


Figure 1: Installation of atomizing nozzles

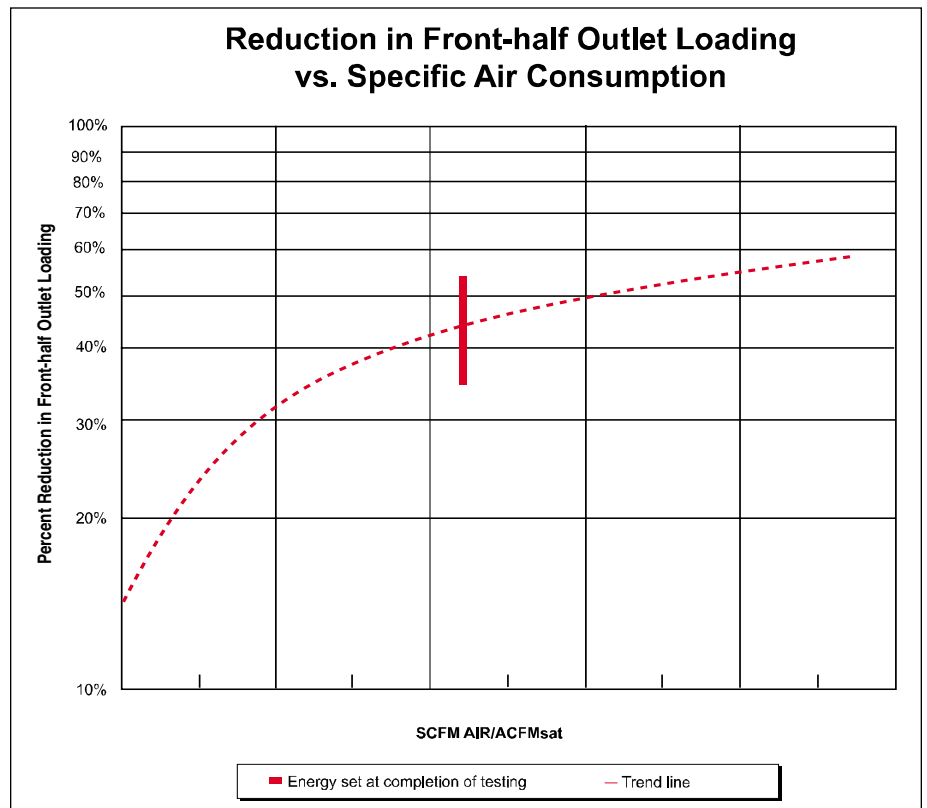


Figure 2: Reduction in outlet emissions is directly related to energy input.

tion of improved liquid atomizers within the pre-scrubber to provide complete humidification of the gas stream and improve the removal efficiency of both front-half particulate as well as back-half, organic and inorganic condensibles; and

2) For new installations, the use of more efficient pre-scrubber designs that incorporate more effective humidifica-

tion, scrubbing and dewatering.

The second design deficiency involves the method of mist elimination. Once the pre-scrubber and WESP have done their job, it is imperative that the collected contaminants entrapped in water are not re-entrained downstream to penetrate the RTO ceramic media. Older designs, such as simple gravity

removal, mesh pads, chevrons and spin vane separators, can work effectively, but they require continual maintenance to avoid deterioration in WESP performance. Over time the practical experience has been that excessive carryover does occur, defeating the purpose of the WESP.

TurboSonic offers a patent-pending, field-tested solution to address both of these design deficiencies. To solve the first deficiency with respect to up-front pre-scrubbing, the installation of the Turbotak Atomizing Nozzle, shown in Figure 1, has proven its resistance to plugging and an ability to completely saturate a gas stream while providing a significant boost in pre-scrubber efficiency.

Based on full-scale trials, the reduction in outlet emissions is directly related to energy input, as shown in Figure 2.

With more material removed in the pre-scrubber, less material enters the WESP, reducing the possibility of buildup on WESP internals. The complete humidification also discourages buildup in that the drying effect caused by incomplete saturation no longer exists, making it far easier to maintain complete irrigation on WESP internal surfaces.

To tackle the second design deficiency regarding mist elimination, TurboSonic has designed a discharge plenum utilizing gravity and inertial impaction that can be easily retrofit within the existing WESP discharge plenum. Actual results from full-scale installations, as well as the retrofit of an existing installation, demonstrate that a non-detect carryover has been achieved from the WESP. This is performed with a truly zero-maintenance design and a pressure drop of less than ¼ in. water column. Results obtained

during EPA Method 5 testing clearly demonstrate the elimination of measurable carryover from the WESP.

IMPROVEMENTS

Another method of improving WESP performance is to improve the quality of the gas flow, as measured by the RMS, to the inlet of the WESP. Properly designed gas distribution devices at the WESP inlet will improve the % RMS of the flow, thus improving efficiency as illustrated in Figure 3.

The performance can also be improved by recirculating the gas flow and using high frequency Transformer/Rectifier sets, such as the Power Plus units supplied by the NWL. In addition, it is important to provide suitably designed rigid emitting electrodes, which provide adequate power and sufficiently high voltage. Maintenance can be reduced by the removal of support insulators from the direct path of the gas flow and flushing nozzles. Other detailed design features have been incorporated to improve reliability.

Figure 4 demonstrates the improvement in performance using a number of the aforementioned upgrade procedures. In close to one year of operation, the Atomizing Nozzle has required cleaning only once, while the mist eliminator plenum design has required no maintenance at all.

TurboSonic has an ongoing program of product improvement and development, the positive results of which have been clearly demonstrated to be beneficial. **PW**

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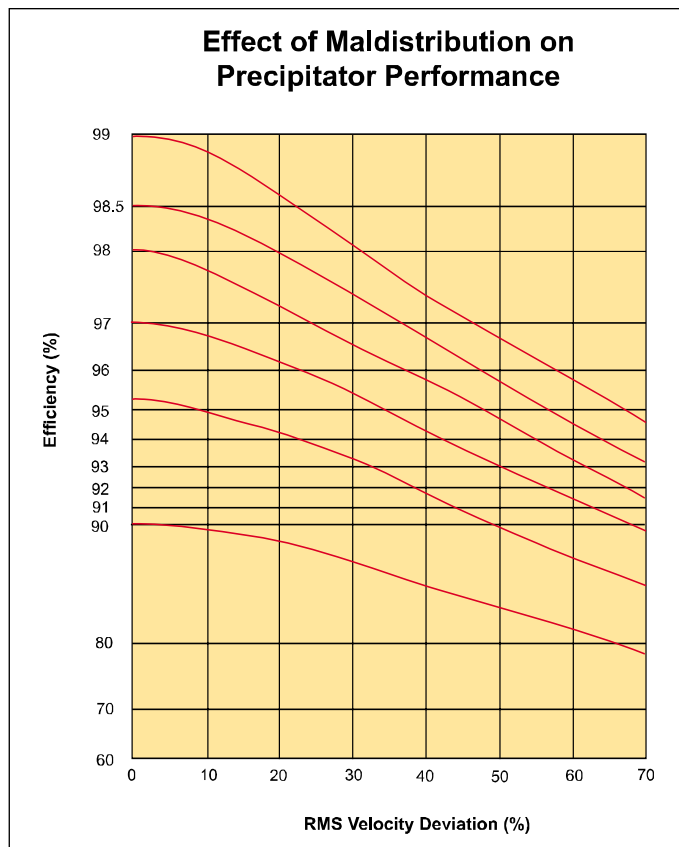


Figure 3: Quality of the gas flow impacts efficiency.

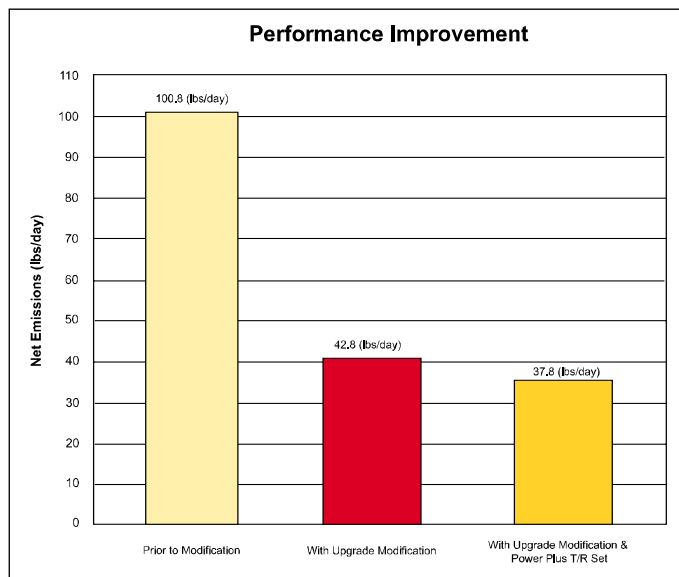


Figure 4: Performance improvements across the board

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