



“SHOCK WAVE” IMPULSE CLEANING DEVICE CASE STUDY

Storm Technologies, Inc. has teamed up with PowerPlus Cleaning Systems to provide IMPULSE® cleaning technology to our customers in the utility and industrial industries. The impulse cleaner is an inexpensive, low-maintenance system that generates a “shock wave” by completing the combustion of ethylene gas. The system was originally made to improve the cleaning effectiveness of standard sonic or acoustic horns and has been utilized for cleaning since 2006. From PowerPlus’ experience and what we have seen firsthand during this case study, the system works best in the convection pass versus a radiant section where a molten, sticky, or “runny” slag may be present in many industrial/utility boiler arrangements.

In This Issue:

- PowerPlus Cleaning Systems’ IMPULSE® Cleaning Technology
- A 90-Day Review of “Impulse Cleaner” utilization

Next Issue:

- Automating Flue Gas Sampling

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STORM’s first project utilizing these devices was in 2022 at a North Carolina stoker-fired boiler that fires a blend of biomass and poultry litter. STORM has been involved with this particular plant for over a decade; performing combustion testing and tuning to optimize the unit’s combustion with great success. Even with combustion being addressed on an annual basis, the plant still faces a major challenge. The challenge is the fuel blend contains severe slagging/fouling characteristics that require the plant to come offline every twenty days or so for water washing; which would take approximately three days of around-the-clock cleaning. Since installing the impulse cleaners, the plant has been able to operate for over 90 days with only one forced outage due to a tube leak that was unrelated to slagging/fouling or cleaning of the boiler. The following figure provides a comparison of megawatts over a 90-day period pre and post-installation of the IMPULSE® cleaning technology.



Figure 1: Pre/Post Impulse Cleaner 90-Day Operation to Compare Maintenance Outages

As shown in Figure 1, there were approximately seven outages over a 90-day period compared to one forced outage after the impulse cleaning devices were installed. This is the first operational run for more than 90 days without requiring an outage to water wash the boiler; gaining approximately ten days of additional run time over the 90-day period with these fuels. This resulted in more Mw generation and reduced maintenance/sub-contractor costs to water wash the boiler.

Differential pressure across the generating bank of the boiler has long been a telltale sign of the boiler plugging. This differential impacted fan capacity and was the key indicator when the unit needed to come offline for water washing to regain capacity. Figure 2 illustrates the generating bank differential pressure over the 90-day operation (pre and post-impulse cleaner). The drop on the “Post” impulse cleaner towards the end was an online water cleaning. Overall, the unit was able to maintain acceptable differential pressure over the 90+ day operational run with the impulse cleaners in place.

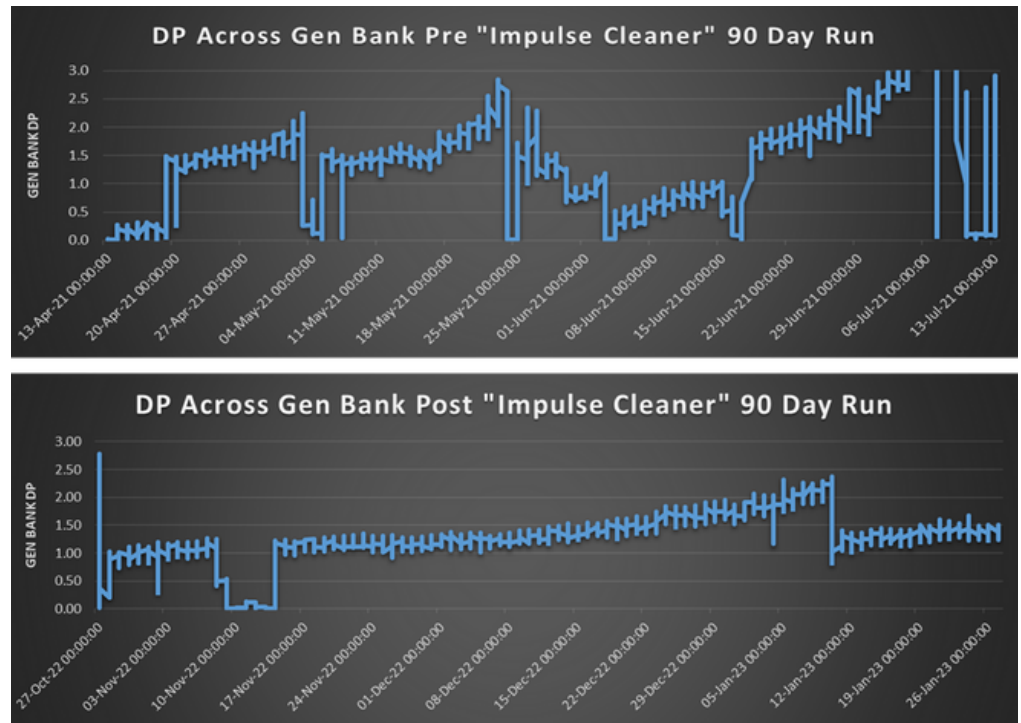


Figure 2: Pre/Post Impulse Cleaner 90-Day Operation to Compare Generation Bank Differential Pressure

Going into the trial of the IMPULSE® cleaning technology at this facility, Storm knew that the unit experienced aggressive slagging and fouling in the superheater and generating bank. Therefore, STORM wanted to maximize our ability to keep these areas clean. So four of these devices were installed. Two devices were located on opposite walls in both the superheater and generating bank. Figure 3 shows the general arrangement of the impulse cleaner located in the generating bank and the inlet to the generating bank. There is a total of four impulse cleaners on opposite sides of the boiler.

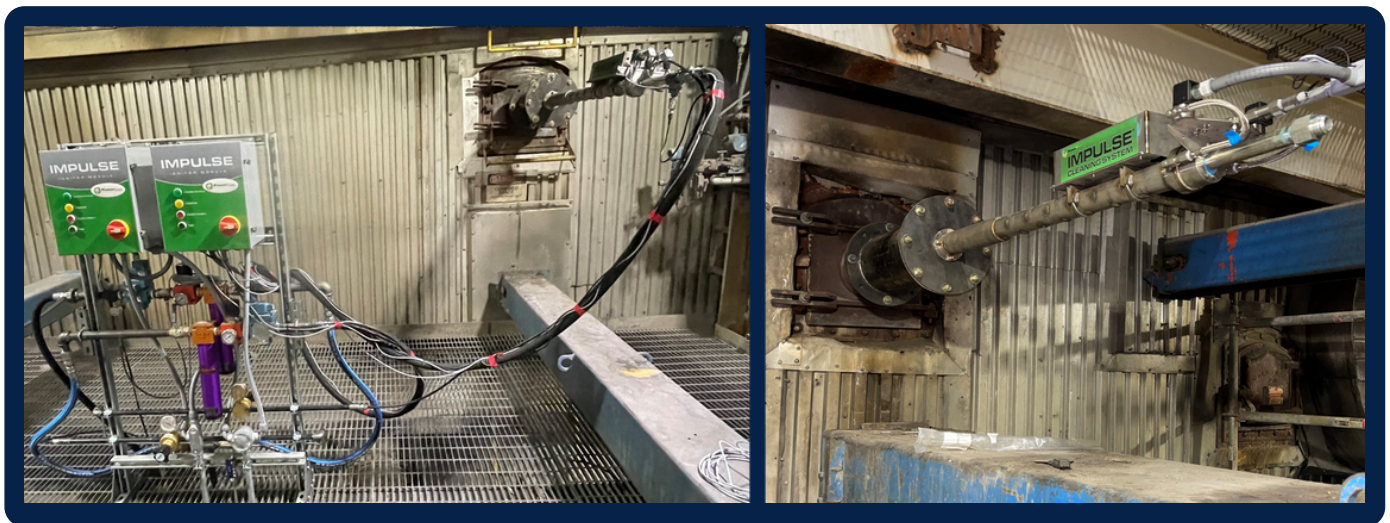


Figure 3: Impulse Cleaner General Arrangement (Typ. 4 Locations)

Based on the initial installation and operating period, over a yearly timeframe, this system should allow for an additional 30 to 40 operational days of Mw generation and provide a significant reduction in maintenance or water washing of the unit over this period. Figure 4 below shows the cleanliness of the generating bank after 90 days of operation.

In addition to increasing the boiler operation to 90+ days with the impulse cleaner and due to reduced draft losses, we have also seen a reduction in economizer exit gas temperatures as a result of the cleaner tubes in the generating bank. Based on the operational data pre/post impulse cleaner for the 90-day period (Figure 5), it is clear that the average economizer outlet temperature is approximately 20°F less (from around 525°F - 545°F to 510°F - 520°F); which is a boiler efficiency improvement. Furthermore, there is no significant upward trend in gas temperature over this 90-day period.

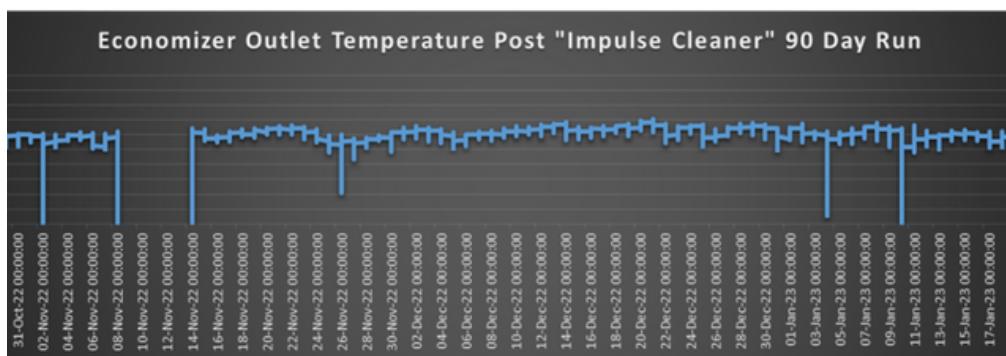
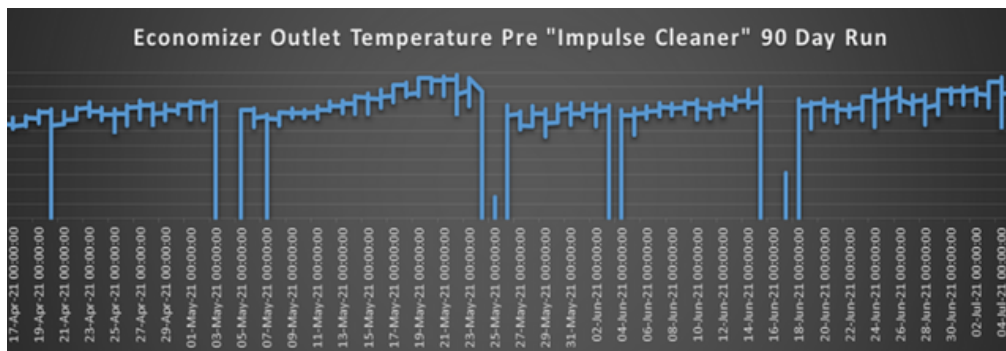


Figure 5: Econ. Outlet temp. reduction after Impulse Cleaner 90+ days of operation



Figure 4: Generating Bank after 90+ days of operation (Much cleaner than before impulse cleaner)

Keep it Clean

The plant and STORM are moving on to Phase II of this study; which includes the installation of two additional impulse cleaners. These two units will be installed in the economizer. Based on the results from the furnace exit, we know that we will be able to keep the economizer clean but are curious to see if the economizer outlet temperatures can be further reduced, leading to further improvements in overall boiler efficiency.

Storm Technologies, Inc. is excited about our involvement with these systems, and we look forward to providing more of these units now that we have firsthand seen the RESULTS that can be achieved with the devices. No matter the fuel type (i.e. coal, biomass, waste to energy) or industry (i.e. utility or industrial) we believe that if your plant requires the surfaces within your boiler or furnace to be clean for efficient operation, these will be a good alternative to both sonic horns and soot blowers in some cases. The primary location for these devices should be placed in the convection pass to assist with improving draft losses, heat absorption, or boiler exit temperatures with a potential added benefit of less soot-blower maintenance; which seems to be an ongoing issue for many of our customers. At this time we have not installed these units on air pre-heaters or other areas that have fouling or ash accumulation issues, but we believe this technology would be a good alternative for these applications.

If your plant has experienced any derates due to draft losses, high boiler exit temperatures, or severe slagging please contact Storm Technologies, Inc. at 704-983-2040 or through our website (www.stormeng.com) to speak with a combustion expert about evaluating the impact these devices could have on the reliability and performance at your facility.

Respectfully,

Danny Storm

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Disclaimer: These suggestions are offered in the spirit of sharing our favorable experiences over many years. Storm Technologies, Inc. does not accept responsibility for the actions of others who may attempt to apply our suggestions without Storm Technologies' involvement.