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Pulse-jet Baghouse Optimization in WTE: Meeting the Challenges of the Future

Jeff Ladwig
Robin Linton
GE Energy
8800 East 63rd Street
Kansas City, Missouri 64133
800-821-2222

Abstract

Like many coal-fired power plants today, the waste-to-energy (WTE) industry is faced with a number of challenges including the need to maximize plant output, lower outlet emissions and increase plant efficiencies. Within WTE, there's also been a move from reverse-air baghouses to pulse-jet collectors due to lower initial capital costs and the ability to operate pulse-jet collectors at higher air-to-cloth ratios (3-4:1), allowing for a smaller housing footprint. However, the majority of today's pulse-jet collectors utilize an off-line cleaning mode where modules are taken out of service and pulsed to lower the differential pressure. There are inherent advantages in switching from an off-line cleaning mode to an on-line cleaning mode. This paper discusses the idea of using the fabric filter as a damper and stabilizing draft through the baghouse and boiler. It also outlines the use of pleated filter element (PFE) technology to address increased production concerns, and the need for lower outlet emissions.

Combustion System Operating Parameters

In the operation of a combustion system, the ID (induced draft) fan is normally controlled with a pressure transducer located in the combustion area. The normal draft used to control the combustion process can be as low as .25" w.c. to as much as 3" w.c. The draft at the inlet is used to control the fan damper position, maintaining constant airflow through the system. Since the system has components that create pressure drop, this draft is fairly constant to airflow volume.

Off Line Pulse-jet Cleaning in a Combustion Dust Collection System

Off line cleaning is the typical mode of cleaning in a pulse-jet collector. This method of cleaning often causes fluctuations in pressure drop in the baghouse, which in turn causes an adverse effect on the draft in the combustion system. When a compartment is removed from service for cleaning, the pressure drop across the baghouse increases and the result is a reduction of negative pressure at the pressure transducer. This causes the fan damper to open to balance the flow to the "set" negative pressure in the control area. Once the compartment is cleaned and returned to service, the lower differential of that compartment causes a lower system differential, resulting in a negative pressure that is too high at the pressure transducer signal. This often causes heat to be removed from the process resulting in higher temperatures and airflows at the baghouse. This change in system pressure causes changes in draft volume until the fan damper reacts to the pressure transducer signal. This fluctuation is a result of the removal of a compartment from service.

Moving to On Line Cleaning

In pulse-jet collectors, the cleaning function rearranges the dustcake and some dust is removed. The result in the rearrangement of the dustcake is a reduction in differential pressure for the most recently cleaned row of filter bags. The displaced dust that falls off the ends of the bags is subject to the internal velocities of the airflow as it approaches the ends of the bags. This is referred to as can velocity, and it affects the dust removal through separation of the finer sub-micron particulate by returning this material back to the filter surface.