

On-line and Off-line Pulse-jet Filter Cleaning of Long Filter Bags

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Bag filter is one of the most widespread industrial air cleaning systems for removal of dust particles emitted from various industrial processes. Bag filter are subjected to clogging and cleaning cycles. During filtration, solid aerosol filtration causes particle deposits, called dust cake, to build up on the filter media, resulting in a linear increase in pressure drop. Therefore, filter elements must be periodically regenerated, usually by pulse-jet cleaning. Pulse jet is the most common cleaning method for bag filter dust collectors. A blast of compressed air is injected into a filter bag, so that dust cake formed on filter bag is detached and the filter becomes cleaned. The cleaning effectiveness of pulse jet type bag filter is influenced by cleaning air pressure, filtration velocity, and type of injection nozzle.

In this study we investigated and compared the cleaning effectiveness and dust emission of long filter bags for on-line and off-line cleaning methods. Bag filters of 10m long and 0.156m in diameter were used for the test. 3 long bags were installed for each test and 80A blow tube having a 10mm hole was positioned above each bag. Fly ash from coal fired power plant was used as test dust and inlet concentration was fixed as $20\text{g}/\text{m}^3$, and air pressures for filter cleaning were regulated as 3 and $5\text{kg}_f/\text{cm}^2$. Dust emission was measured by an optical particle counter (GRIMM 1109) in the exhaust duct of bag filter test unit, and filter cleaning performance was monitored by measuring pressure drops of each filter. Filter cleaning was triggered when the pressure drop of bag filter reached $100\text{mmH}_2\text{O}$.

Figure 1 shows the results of 10m filter bag cleaning and dust emission measurement for on-line and off-line cleaning types at pulsing air pressure of $3\text{kg}_f/\text{cm}^2$. Figure 2 is for the case of $5\text{kg}_f/\text{cm}^2$. For both cases off-line cleaning was more effective than on-line, but at higher air pressure filter cleaning interval becomes longer. As for dust emission, peak values of emission for on-line and off-line cleaning methods were almost same, but at air pressure of $5\text{kg}_f/\text{cm}^2$ the emission was much higher than at $3\text{kg}_f/\text{cm}^2$.

In this work only one bag was cleaned using one 80A diaphragm valve while in the real world over 10 bags must be cleaned by a single valve. Therefore it can be concluded that pulse jet cleaning using hole-type nozzles is not that effective for 10m long filter bags.

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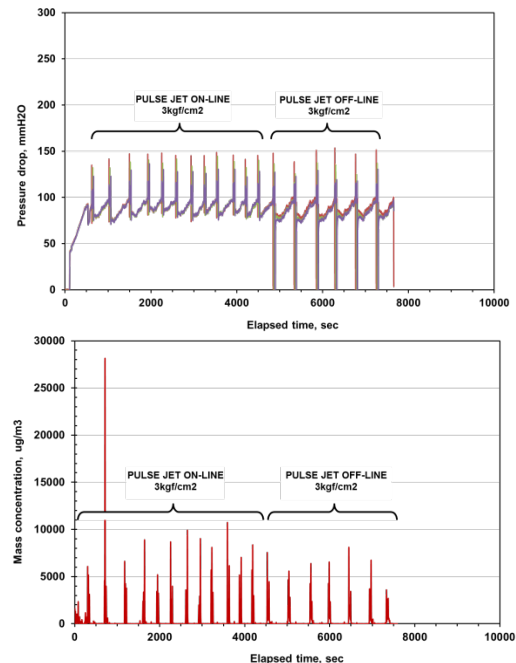


Figure 1. Filter cleaning result (upper) and dust emission (lower) at $2.0\text{m}/\text{min}$ of filtration velocity and $3\text{kg}_f/\text{cm}^2$ of cleaning air pressure for 10M filter bags.

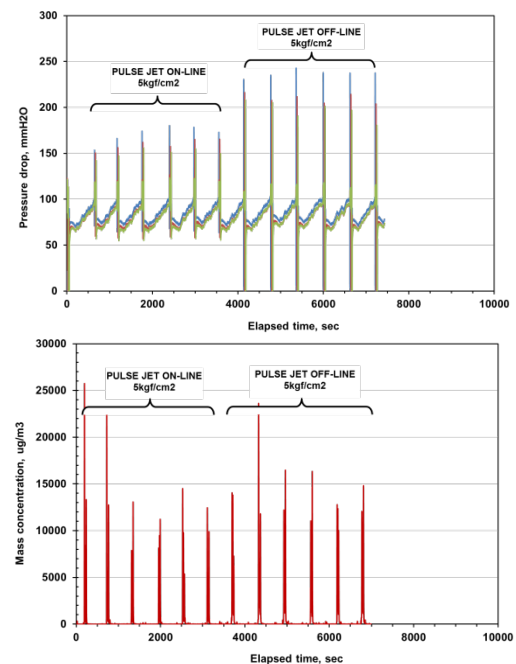


Figure 2. Filter cleaning result (upper) and dust emission (lower) at $2.0\text{m}/\text{min}$ of filtration velocity and $5\text{kg}_f/\text{cm}^2$ of cleaning air pressure for 10M filter bags.