Filter Cleaning Performance of a Cyclone-Baghouse Dust Collector

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Baghouse is one of the most efficient dust removal devices. The dust collection efficiency of baghouse is related to the properties of bag filter media, air to cloth ratio (filtration velocity), filter cleaning method, and others. Among them, the filter cleaning process is the key parameter having a great influence on filtration efficiency and filter life time. For a baghouse with a pulse-jet cleaning, most of dust particles are emitted at the instant of or in a few minutes after filter cleaning. Therefore, the elongation of filter cleaning interval decreases the emitted dust amount, consequently enhancing filtration efficiency. Smaller dust loading to bag filters is the best way to increasing filter cleaning interval and filter life time.

A hybrid dust collector combining a modified cyclone and a cylindrical baghouse has been developed. The cyclone-baghouse is aimed at reducing dust loading to bag filters, thus increasing filter cleaning interval and filtration efficiency, and elongating filter life time (Park et al., 2000). In this study, we have tried to examine the filter cleaning performance of the cyclone-baghouse, further to find out the effect of flow field introducing to bag filters (at the outlet of cyclone).

Fig. 1 shows the schematic diagram of the cyclone-baghouse. The outer diameter of the cylindrical collector was 520mm, the cyclone outlet diameter was 195/316 mm, and the bag filter was φ130 and 600 mm in length. The flow rates were 3.5 and 7.0 m³/min. A lattice flow distributor was installed inside the cyclone outlet for changing the flow pattern.

Filter cleaning interval with cleaning cycles, which is the elapsed time between pulse-jet cleanings, is plotted in Fig. 2. The residual pressure drop, which is the pressure drop across bag filters right after filter cleaning, is shown in Fig. 3. The flow rate is linearly proportional to the pressure drop, and higher flow rate means higher dust amount collected on filters, thus the residual pressure drop and cleaning interval were increased with flow rate. The lattice flow distributor breaks up the rotational flow, and changes it into somewhat straight upward flow. Our results show that the less rotational flow in the cyclone outlet gives higher cleaning efficiency (lower residual pressure drop) and longer cleaning frequency, which denotes the enhanced filtration performance of the cyclone-baghouse dust collector with a flow distributor.

Figure 1. The cyclone-baghouse dust collector.

Figure 2. Filter cleaning intervals

Figure 3. Residual pressure drop