Study on design optimization of HI-FILTER SYSTEM by using CFD

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Among existing dust removal technologies, dust collector of filter bag is the most efficient one. But, it needs to be replaced filter bag periodically so, the maintenance cost is excessive, also problem such as the increase of operational costs occurs as air pulsing cycle becomes short.

In order to solve this problem, by reducing the dust load that inflows to dust collector of filter bag, so the pressure loss stays low, and the number of cleaning and intensity should be reduced. So, by combining an electrostatic precipitator with filter bag into one-equipment, study on the development of HI-FILTER system which minimizes the problems such as the emission of fine dust and reattachment of dust secession from filter bag, short replacement cycle of filter bag etc. and its characteristics are conducted.

In order to review the problem of pressure loss which can happen in dust collector of HI-FILTER, by using computing fluid analysis, this study examined the structure of gas inflow distributor.

Gas distributor which deals the gas flowing in the dust collector generally uses a fixed size plate. However, according to this study, if the perforated plates are used to deal the gas that flows in through the duct with 90° in the sub, there is a tendency of the air leaning to one side, so we could confirm that high pressure down happened. In order to disperse this biased flow as evenly as possible, we assumed 2 forms: one is a perforated plate structure with many holes of reduced upper size and enlarged lower opening port, the other is the duct with guide vane and then we performed CFD. We confirmed that remodelled perforated plate could improve biased gas a little but the pressure loss was still strong. Yet, in guide vane (case4), we could solve the problems of biased gas flow and pressure down. (See the Table 1. and Figure 1.)

Table 1. Pressure drop according to gas distribution plate structure.

NO.	Models.	Inlet (m^3/min)	Pressure Loss (mmH_2O)
1	Case1	1,100	41.6
2	Case1	1,000	41.4
3	Case2	1,100	41.0
4	Case3	1,100	39.8
5	Case3	1,000	32.9
6	Case4	1,000	31.8

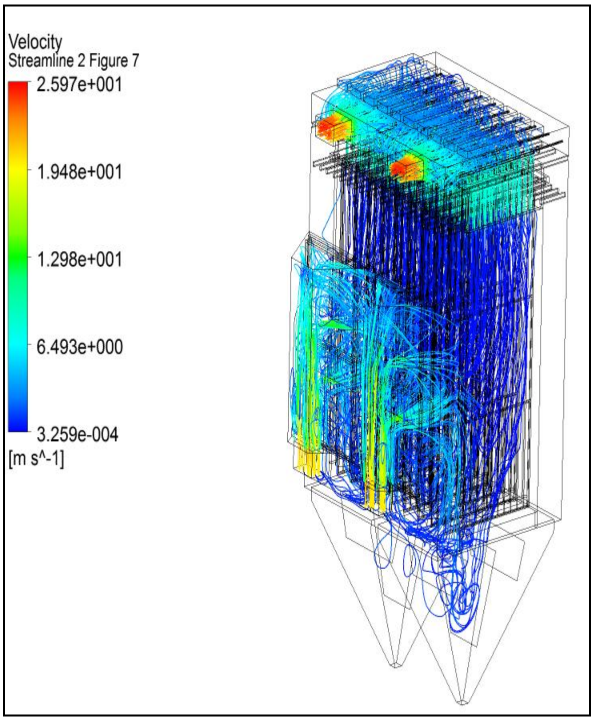

Figure 1. Velocity streamline of Case 4.
(Inlet air: 1000 Sm^3/min, without filter)

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Fluent Inc., FLUENT v6.1 User`s Guide.

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