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An experiment on performance evaluation of particle collection and gas removal of an air washer system for semiconductor manufacturing clean rooms

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In recent semiconductor manufacturing clean rooms, in order to improve clean room air quality, air washers are used to remove airborne gaseous contaminants such as NH_3, SOx and organic gases from the outdoor air introduced into clean room. In the present study, an experiment was conducted to investigate particle collection and gas removal efficiencies for two kinds of air washer systems, direct atomization type and fin-coil type ones, as shown in Fig. 1 and Fig. 2.

The present experimental apparatus for evaluating particle collection and gas removal efficiencies of the air washer was used with DOS aerosols and Ammonia gas, respectively. The efficiencies are determined by the following equation.

$$\eta = \frac{C_{inlet} - C_{outlet}}{C_{inlet}} \qquad (1)$$

where C_{inlet} is the total particle number (or gas volume) concentration at the inlet of the air washer and C_{outlet} is that at the outlet of the air washer, respectively.

Figure 3 shows the variation of gas removal efficiency with respect to L/G. It is seen that the removal efficiencies for two kinds of air washer systems become more than 80% for L/G of greater than about 0.3. Figure 4 shows the variations of collection efficiencies of air washer systems for both direct atomization type and fin-coil type with respect to particle size for various L/G. The particle sizes on the abscissas are the geometric mean diameters of the DOS aerosols at the inlet of the air washer. It can be seen that when L/G and particle size are increased the collection efficiencies increase significantly.

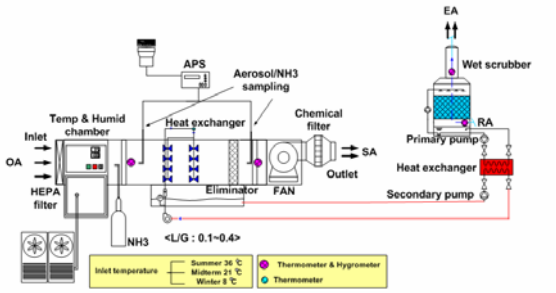

Fig. 1. Schematic diagram of the experimental apparatus for the present heat recovery direct atomization type air washer.

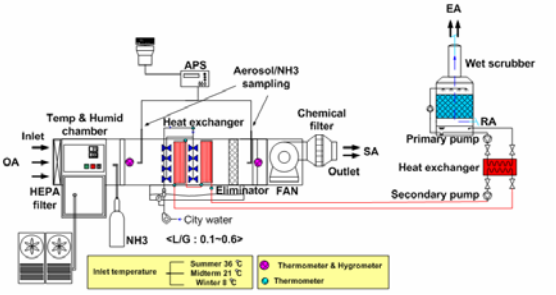

Fig. 2. Schematic diagram of the experimental apparatus for heat recovery fin-coil type air washer.

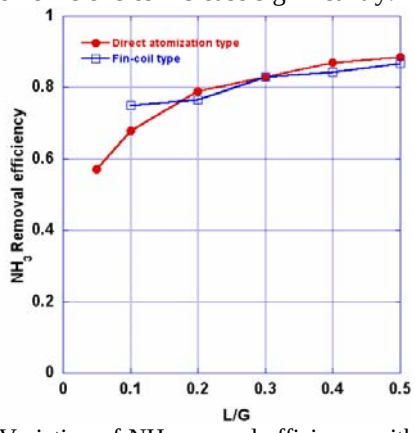

Fig. 3. Variation of NH_3 removal efficiency with respect to L/G.

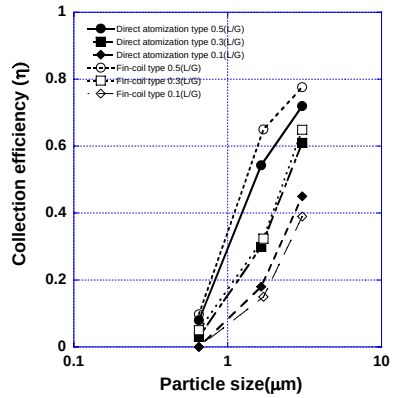

Fig. 4. Variations of the collection efficiencies with respect to particle size for various L/G.

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Fujisawa, S., Moriya, M., Yosa, K., Nishiwaki, S., Yamamoto, H., Katsuki, T., Nabeshima, Y., & Oda, H.(2002)., in *Proc. 20 th Annual Technical Meeting on Air Cleaning and Contamination Control*, Tokyo, 162-165(in Japanese).