

# Numerical analysis on annual energy consumption in semiconductor manufacturing cleanrooms with different types of humidification techniques

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Keywords: semiconductor cleanroom, humidification technique, annual energy consumption

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Because of continuous operation nature all the year round and enormous conditioned make-up air input, semiconductor manufacturing cleanrooms consume huge amounts of energy. In order to reduce the energy consumption in the cleanrooms, humidifying techniques are also needed to be examined closely. Therefore, it is necessary to select an effective humidification technique in terms of saving energy. But it is very difficult to measure and compare the actual annual energy consumption in the cleanrooms because it requires a large amounts of cost and time. In the present study, we conducted numerical simulation to assess annual energy consumption in cleanrooms with respect to three types of humidification systems. The cleanroom considered here was assumed to have class 1,000 and 100,000 m<sup>3</sup>/h outdoor air input, and be located in Kiheung, Kyunggi-do, South Korea in 2015.

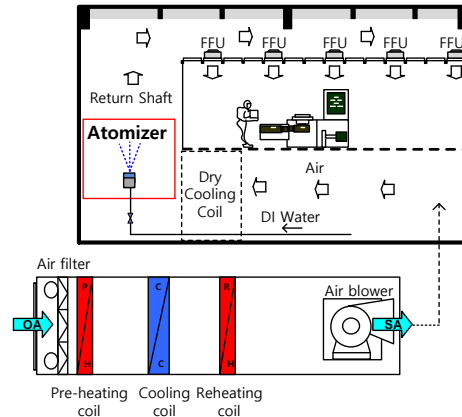


Figure 3. Schematic diagram of a cleanroom with indoor water spray humidification.

Table 1. Numerical result of annual energy consumption.

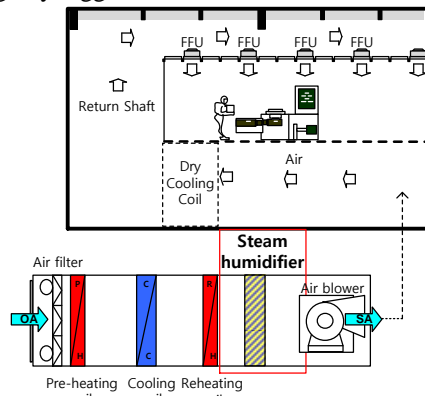


Figure 1. Schematic diagram of a cleanroom with steam humidification.

Month	Steam	Air Washer	Indoor spray
Jan	3.09	2.32	1.85
Feb	2.43	1.86	1.51
Mar	2.47	1.92	1.56
Apr	2.07	1.64	1.42
May	1.63	1.53	1.51
Jun	1.65	1.64	1.64
Jul	1.87	1.87	1.87
Aug	1.93	1.93	1.93
Sep	1.69	1.67	1.67
Oct	1.74	1.58	1.50
Nov	2.24	1.76	1.48
Dec	2.84	2.16	1.73
Total [GWh]	25.65	21.88	19.67
Proportion [%]	100	85.3	76.7

This work was supported by the MOSF, MOTIE of Korea, KETEP and KITECH.

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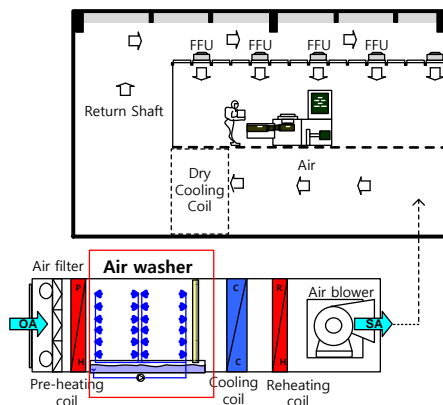


Figure 2. Schematic diagram of a cleanroom with air washer.