Implementation of PAC Spray and Coating to Hybrid Filter for Hg and PM Removal

Yong-Chil Seo[1*], Jin-Ho Sung[1], Seung-Ki Back[1], Ha-Na Jang[1]

1 Dept. of Environmental Engineering, Yonsei University, Wonju, 26493, Republic of Korea
*Corresponding author:seoyc@yonsei.ac.kr

Elemental mercury (Hg^0) is known to be a predominant constituent in flue gas emitted from coal-fired power plant. Adsorption using powdered activated carbon (PAC) has been considered as one of the best available technologies for removal of Hg^0 from flue gas. In the present study, a hybrid filter (HF) with the combination of fabric filter and ESP in a single chamber was designed and operated with PAC injection and coating on the fabrics to improve Hg^0 removal efficiency with higher collection of fine PM simultaneously in a coal fired power plant.

Comparative tests were conducted by evaluating the variation in the mercury speciation and removal performances of HF using Ontario Hydro method. The removal efficiency of total mercury by HF only was 66.2% before implementing PAC. When the injection rate of PAC increased from 0 to 200 mg/m^3, the speciation fraction of Hg^0 significantly decreased from 85.19% to 3.76% at the inlet of the HF. The speciation fraction of oxidized mercury (Hg^{2+}) did not vary greatly, whereas the particulate mercury (Hg_p) increased from 1.31% to 94.04%. By employing the PAC coated filter, Hg removal efficiency of HF increased to 79.79% from 66.20%. Also, a temporary reduction in Hg removal was seen but this was resolved following a cleaning cycle in which the dust layer was removed.

Key words: Mercury, Hybrid filter, Powdered activated carbon, Coated filter, Coal-fired power plant

Acknowledgement

This work is supported by Korea Ministry of Environment as “The Eco-Innovation Project”, "Advanced Technology Program for Environmental Industry". This work is also supported by Korea Ministry of Environment (MOE) as Knowledge-based Environmental Service (Waste to Energy and Recycling) Human Resource Development Project as well.