EMISSION OF MERCURY FROM PC BOILERS UNDER VARIOUS LOADS

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Abstract:

Similar to other developed countries the share of coal in Polish energy mix has been continuously decresing in recent years. Despite the increase in electricity production, from roughly 155 TWh in 2009 to 167 TWh in 2017, the share of solid fossil fuels in the electricity production during that period fell from over 90 % to roughly 80%. Despite such decrease coal still remains the basic fuel for Polish electricity generation sector and significant big investments have been carried out by Polish energy syndicates in recent years resulting in the construction of five pulverized coal (PC) fired boilers for five electricity generating blocks of the capacity of roughly 1000 MW_e each.

The current situation in Poland, as well as more and more tight standards for the emission of pollutants from power plant facilities, including those mentioned in the BAT conclusions, bring about that there is still a need for further research focused on the reduction of gaseous pollutants to the atmosphere. One of the pollutants whose emission from stationary coal burning plants will undergo continuous monitoring and capture is mercury. According to the BAT conclusions the emission of Hg will soon be included in Polish legislation.

The current paper describes the research that was carried out at two Polish PC boilers producing steam for two roughly 220 MW_e blocks. The boilers represent the most frequent series of boilers in Polish power generetion industry. The tests were carried out for boilers operated at some chosen loads between 60% and 100%. The boiler systems were equipped with modern flue gas cleanup facilities consisting of the ESP (electrostatic precipitator) and the wet FGD (flue gas desulfurization).

As results of the measurement campaign, the mercury contents in fuels, flue gases and solid combustion byproducts (slag, gypsum, FGD cake) were determined. As for the flue gases, the measurements were carried out at three locations along the gas path, *i.e.* upstream the ESP, downstream the ESP, and downstream the FGD. The investigations of the gaseous mercury included the determination of the Hg-splitting that was made possible by independent investigation of the elemental mercury, Hg^0, and divalent mercury, Hg^{2+}. The measurements were carried out with the use of the Lumex spectrometer and the Hydro Ontario sampling method. The results indicated that boiler load and hydrodynamics directly affects both mercury splitting in the flue gases, as well as mercury concentration in the combustion byproducts. To a certain extent the emission of Hg can also be controlled by some optimization of boiler hydrodynamics.

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