

MEASUREMENTS AND INVESTIGATIONS OF EMISSION OF DUST AND GASEOUS POLLUTANTS FROM CIRCULATING FLUIDIZED BED BOILERS

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Summary

Emission of air pollutants from fluidized bed furnaces is not as well known as emission from the traditional technologies of energetic combustion of fuels, the main source of air pollution in Poland. Boilers with circulating fluidized beds (CFB), working in Poland, proved their technical, technological economical and ecological advantages, gaining good perspective for their applications in municipal, industrial and national energetic – the more so, as they may be fueled with coal, coal slime, recycled wastes and bio-fuels. To fulfil the gap in knowledge concerning properties of dust and gases emitted to the atmospheric air from such boilers, measurements, analyses and investigations of emissions from four selected CFB boilers were performed. The examined CFB boilers belonged to the Polish heat generating plants Tychy, Chorzów ELCHO, Katowice and Jaworzno III (Department II). Emission of dust from each of these four CFB boilers was measured, the dust granulometric composition was determined and hazardous substances, such as polycyclic aromatic hydrocarbons (PAHs), compounds of trace elements (including heavy metals), polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF), accumulated on the dust particles, were analysed. Emissions of sulphur dioxide, nitrogen dioxide, carbon monoxide, hydrogen chloride, hydrogen fluoride and volatile organic compounds (VOCs) were measured. The granulometric composition of dust was determined by using a cascade impactor – this allowed avoiding errors due to dust coagulation occurring when measuring filters are used. The investigations, with their approach and methodology, are continuation of the authors' earlier investigations of emissions from combustion of coal. They present actual information on gas and dust emissions from the CBF boilers, allowing for complete evaluation of these emissions from the perspective of the environmental hazard. A synthetic result of the work is the factors for emission of total dust, PM_{2.5}, PM₁₀, sulphur dioxide, nitrogen dioxide, carbon monoxide, hydrogen chloride, hydrogen fluoride, PAHs, VOCs, dioxins and furans from the CFB boilers, expressed in grams of emitted substance per 1 Mg of combusted fuel. All received results confirmed ecological advantages of combusting coal and coal slime in the CFB boilers – particularly, the low emissions of sulphur dioxide and nitrogen dioxide as well as minimal emissions of hydrogen fluoride, dioxins and heavy metals. Also, due to application of highly efficient electro-filters, the dust emission is low. The results revealed the effect of conditions of fuel combustion on emissions of some pollutants, especially PAHs and carbon monoxide.