VOLATILE ORGANIC COMPOUNDS TREATMENT BY ELECTRON BEAM

RESEARCH TEAM
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Last years brought new regulation and international obligations considering emission of organic compounds, there is a need to look for new, effective methods to control these pollutants. The electron beam flue gas treatment technology after in pilot plant scale came into industrial applications for \( \text{SO}_2 \) and \( \text{NO}_x \) removal. The Polish industrial installation is examined for continuous operation. In this installation 270,000 \( \text{Nm}^3/\text{h} \) will be purified with the efficiencies: 70% of \( \text{SO}_2 \) will be removed and 80% of \( \text{NO}_x \) simultaneously. The technology is dedicated for energy sector, especially coal-fired power stations. The coal combustion process is temporarily one of the biggest source of VOCs. Theses compounds are emitted with various concentrations, polynuclear aromatic hydrocarbons are known as the most dangerous among them, e.g. Benzo[a]pyrene \( \text{C}_{20}\text{H}_{12} \), benzo[ghi]perylene \( \text{C}_{22}\text{H}_{12} \) or dibenzo[a,h]antracene \( \text{C}_{22}\text{H}_{14} \) are the most toxic according to EPA list. Recent years have brought new regulations concerning their emission, European countries signed the international treaty covering PAHs emission in 1998 in Denmark. Tests at the pilot plant constructed at coal fired power station were performed with the purpose to estimate the influence of electron beam on organic compounds present in flue gas, during \( \text{SO}_2 \) and \( \text{NO}_x \) removal. The influence of electron beam on the global toxicity factor of flue gas has been analyzed. It has been demonstrated that in the presence of ammonia, the concentrations of some PAHs were lower than without ammonia. The removal efficiencies have been ranged from 40 up to 98%.

In this field, following research is carried out:
- Pilot plant (EPS Kawęczyn) experiments
- Laboratory scale experiment in a flow installation
- Theoretical modeling

RESEARCH GRANTS

EC 5. Framework Programme R&D project, contract No ICA2-CT-2000-10005: Electron beam for processing of flue gases, emitted in metallurgical processes, for volatile organic compounds removal. INCT is a co-coordinator of this project. The project partners:

- Pohjois-Savo Polytechnic, School of Engineering in Kuopio, FINLAND, http://www.pspt.fi/teku
- The Joint Institute for Power and Nuclear Research of the National Academy of Sciences of Belarus, Minsk-Sosny, BELARUS
Research grant of Polish Committee of Science No 3 T09B 061 19: Decomposition of organic compounds, emitted from coal combustion, by electron beam.

PUBLICATIONS


POSTERS AWARDED

A. Ostapczuk, A.G. Chmielewski, Y. Sun „Electron beam flue gases treatment as an integrated methods of SO₂, NOₓ an volatile organic compounds (VOCs) control”, 5th International Symposium And Exhibition on Environmental Contamination in Central and Eastern Europe, Prague, 12-14 September 2000.