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# Pesticide waste incineration in the wet process cement kiln

Marian Mazur  
Robert Oleniacz  
Marek Bogacki  
Stanisław Słupek

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ABSTRACTS OF WORK-IN-PROGRESS  
POSTER PRESENTATIONS

The Combustion Institute  
5001 Baum Boulevard, Suite 635, Pittsburgh PA 15213-1851  
Phone: 412-687.1366  
Fax: 412-687.0340  
E-MAIL: [office@combustioninstitute.org](mailto:office@combustioninstitute.org)  
Website: <http://www.combustioninstitute.org>

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**M. Mazur\*, R. Oleniacz\*, M. Bogacki\*, S. S. Slupek\*\***

\*Dept. of Management and Protection of Environment

\*\*Dept. of Heat Engineering and Environmental Protection  
University of Mining and Metallurgy, Cracow, Poland

Pesticide wastes (agricultural chemicals with exceeded a prescribed time limit) that have been accumulated underground in concrete graveyards or bunkers, present a big problem in Poland now. They are scattered around the whole country. Their progressive unsealing poses a significant health risk to people due to groundwater, soil and air pollution. Incineration in professional hazardous waste incineration plants is one of methods used for disposal of pesticide wastes. There are not many of incineration plants in Poland as compared to working cement plants whose number amounts to 18. Most of them are interested in utilisation of various wastes (e.g. in the capacity of alternative fuels) in the process connected with the cement clinker production in rotary kilns. High temperatures existing in cement kilns (ca. 1370-1450°C in the burning zone) as well as long gas-residence time (ca. 5-10 s) provide potentially excellent destruction conditions of wastes including hazardous wastes. According to the analysis of thermodynamic and technological conditions the wet process kiln is best suited for the purpose.

The method of pesticide waste wet process cement kiln incineration has been worked out that allows to select such conditions for the process that do not have negative impact on the level of the air pollution, the quality of clinker and technological facilities durability. Analysis of most agricultural chemicals used in the past taking into consideration the type and the quantity of biologically active chemicals in these preparations, let us claim that various pesticide wastes can include for instance up to 50 % Cl, 80 % S, 30 % Cu, 15 % Zn and 2.5 % Hg (in weight). Copper and zinc are almost completely retained in the solid phase and built into the clinker like other probable components of the wastes that are neutral to the process (e.g. Ca, Na, Mn and P). Chlorine and sulphur given off from the wastes in the form of HCl and SO<sub>2</sub> are absorbed by alkaline solid phase (CaO, Na<sub>2</sub>O and K<sub>2</sub>O) resulting in chlorides, sulphates or sulphites, and the efficiency of the reactions considerably increase outside the kiln (in lower temperatures). The major problem is caused by mercury vapours that can only partly condense on the fly ash surface and can be removed from flue gas with the aid of a dust collector.

According to analyses carried out for a standard wet process kiln the most crucial parameters for the method are doses of Cl (for the sake of the process course and cement quality) and Hg (for the sake of emission to the air). Total chlorine input can not exceed 0.16 % with to reference to the clinker mass. In most cases quantity of mercury inserted into the kiln (safe for air quality round the kiln chimney) can not exceed 0.5-1.0 kg/h and should be divided into single doses as small as possible.

The analysis of possibility of pesticide waste thermal utilisation in cement rotary kiln furnace, were carried out for about 200 different kinds of pesticides collected in graveyard. For some pesticides it was possible to determine chemical constitution and their combustion enthalpy. For the other ones combustion enthalpy has been assumed by comparison to similar compounds. Thus, it was estimated that agriculture pesticide wastes can be treated as fuel with average calorific value about 2500 kJ/kg.