UTILIZATION OF COMBINED THERMAL DESORPTION AND CATALYTIC OXIDATION METHODS FOR SOLID WASTE DECONTAMINATION

DEKONTAMINACE ODPADŮ KOMBINACÍ METOD TERMICKÉ DESORPCE A KATALYTICKÉHO SPALOVÁNÍ „THECAT“

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Abstract:

TheCat is a new technology for decontamination of wastes contaminated mainly by petroleum hydrocarbons and oil products. The new technology combines thermal desorption and catalytic oxidation. The research consisted of laboratory tests of catalysts and laboratory and pilot thermal desorption trials with model and real samples. After the laboratory research the model unit of the TheCat technology was assembled. The model unit consists of: thermal desorption pilot unit, catalytic oxidation pilot unit and ejector which is placed between desorption and catalytic units. As the air for combustion is going through the nozzle of the ejector the desorbed vapors are sucked into to the catalytic oxidizer. The new technology and the model unit were tested by processing of several model and real samples of contaminated soils. The efficiency of removing C_6-C_9, C_{10}-C_{40} and BTEX from the model samples was higher than 97 %. The efficiency in removal of TOC from the vapor stream of the model samples was higher than 96 %. The efficiency of removing C_6-C_9 and C_{10}-C_{40} from the real samples was higher than 87 %, the efficiency in PAH removal was around 80 % except one sample where the efficiency was only 25 %. The efficiency in removal of TOC from the vapor stream of the real samples was higher than 80 %. The trials were conducted under these conditions: pressure 730 – 800 mbar abs., maximal temperature 150 – 317 °C according to the main contaminant. Concentrations of the contaminants were around 5 g/kg d.m. BTEX and 6,7 – 42 g/kg d.m. C_{10}-C_{40} in the model samples. In the real samples the contaminations were 33 – 152 g/kg d.m. of C_{10}-C_{40} and 0,12 - 7,7 g/kg d.m. for PAH.

Keywords:

Thermal desorption, catalytic oxidative decomposition, waste decontamination, TheCat, petroleum hydrocarbons