School of
CIVIL AND ENVIRONMENTAL ENGINEERING AND EARTH SCIENCES
Clemson University

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Understanding and Predicting Temperatures in Municipal Solid Waste Landfills

There are reports of landfills permitted to accept municipal solid waste (MSW) and other non-hazardous wastes exhibiting temperatures in excess of 80 – 100 °C in the U.S. These temperatures are well above values typically associated with MSW landfills, which are reported to range between 40 and 65 °C, and generally below 55 °C. Landfills exhibiting elevated temperatures over a large area are referred to as elevated temperature landfills (ETLFs). ETLFs have unique characteristics and challenges including substantial changes in the composition and quantity of landfill gas (LFG) and leachate, fugitive gas emissions, rapid waste subsidence, and in some cases, elevated liquid and gas pressures. These conditions, alone or in combination, may affect the waste containment system - engineered barriers (liners and covers), gas and leachate collection infrastructure, and the physical stability of the waste mass.

The objective of this research is to develop a mathematical model to predict heat generation, transport and accumulation from biological and chemical reactions that occur in MSW landfills. Initially, a batch reactor model was developed to identify an appropriate mathematical approach for the representation of heat generation sources including aerobic and anaerobic biological reactions, anaerobic metal corrosion, acid-base reactions, ash hydration and carbonation, and pyrolysis. The model predicted a temperature of about 55 °C for MSW only. The inclusion of ash hydration and carbonation, and Al corrosion resulted in temperature rises of 14 and 26 °C in 10 years, respectively. The landfill temperature and reactant concentrations do not vary spatially in a batch reactor model which represents an important limitation in representing landfills.

2:30 PM on Friday, October 28, 2022
Rich Laboratory – Auditorium
Reception will follow in the lobby.