



Ignition of municipal solid waste on a grate



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Introduction

The goal of this project is to investigate the ignition behavior of a packed bed of municipal solid waste (MSW) on a moving grate (figure 1). The effect of several parameters like primary air flow and calorific value of the waste particles on the ignition are investigated.

When the ignition mechanism is understood better, the fire in the furnace of MSW incineration plants can be controlled better and the waste can be incinerated more efficiently.

A theoretical as well as an experimental approach is used.

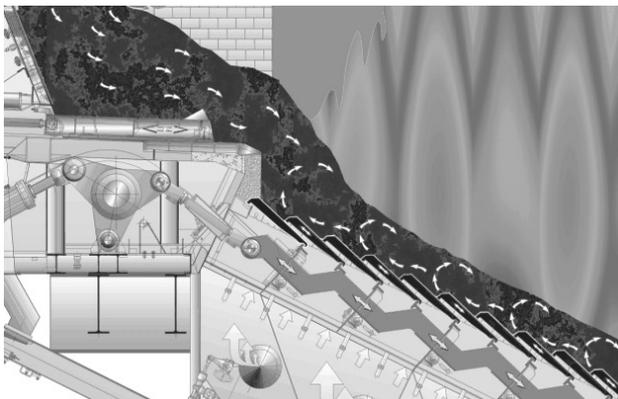


Figure 1. Waste combustion on a moving grate.
Source: www.martingmbh.de

Overview and Results

Four different subjects are considered to investigate ignition in a packed bed of a solid fuel:

- *Gas phase combustion in an inert packed bed.* A combustible gas mixture is fed through a packed bed of alumina spheres. The gas mixture is ignited at the bottom of the bed. The location of the flame is measured. Experiments and modeling show that a premixed gas flame inside an inert packed bed is likely to travel

downstream. Close to stoichiometric combustion, flashback might occur.

- *Auto-ignition of a packed bed by an hot air stream.* Preheated air is fed through a packed bed of a solid fuel (wood for example). The time needed for ignition and the critical air temperature for ignition are measured. An air temperature of only 230°C is needed to ignite wood. Char can be ignited with an air temperature of even 180°C.

- *Piloted ignition of a solid fuel.* A slab of either wood or a plastic is radiatively heated. A spark is created above the sample to ignite the evolving gases. The time to ignition as a function of radiative heat flux is measured. For heat fluxes below 30kW/m² ignition times increase dramatically. Also moisture content has a large influence on the ignition time.

- *Ignition front movement within a burning packed bed.* A packed bed of wood is ignited from the top. The air needed for the combustion is fed from below. The location of the ignition and combustion are measured by thermocouples. Modeling showed that radiation from the burning wood char is the main heat transfer mechanism responsible for the movement of the ignition front. It appears that the gas flame on top of the packed bed does not influence the front movement.

Acknowledgment

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