

## Ignition of waste/biomass mixtures deposited as dust layers

Nieves Fernandez-Anez<sup>1</sup>, Nicolas Dameto de Espana<sup>1</sup>, Javier Garcia Torrent<sup>1,2</sup>, Ljiljana Medic Pejic<sup>1</sup>

<sup>1</sup> Department of Energy and Fuels, UPM Technical University of Madrid  
Madrid, Spain

<sup>2</sup> Laboratorio Oficial Madariaga, UPM Technical University of Madrid  
Madrid, Spain

### Abstract

Recovery of energy from biomass and non-recyclable waste products by combustion has become important. One of the most used techniques for this proposal is the co-firing of waste and biomass mixtures, which results not only in the recovery of energy, but also in a substantial reduction of the disposed volume and in a safe destruction of toxic organic residues. The main benefit of co-firing is that it is a conventional technique and already existing boilers can be applied to reduce the waste disposal problem.

With this new technology, mixtures of different materials have appeared in the industrial facilities and they have to be treated as new fuels, due to their properties are unknown. These properties include the energetic properties that are the objective of the mixing process, and also the ignitability properties. Waste and biomass dusts have ignition properties that have to take into account when designing the prevention and protection measures on an industrial facility.

Looking at these ignition properties, it is well-known that one of the most common hazardous situations in all kind of industrial facilities are dust layers. A dust layer deposited on a hot surface may ignite if the surface temperature is high enough, and it can generate a fire and then an explosion. Hot surfaces can be produced both electrically and mechanically and both types of equipment intended for use in potentially explosive atmospheres are subjected to these practical dangers.

The main objective of this research is to determine the risk of ignition of waste / biomass mixtures layers and how by adding different quantities of these materials this risk may change. To develop this, the minimum ignition temperature on layer is used. Minimum ignition temperature on layer is the lowest temperature at which a layer of dust of specific thickness ignites on a heated surface and it is determined according to EN 50281-2-1.

Three different samples have been analyzed, thermally dried sewage sludge, wheat straw and wood chips, and 28 different mixtures have been studied, 18 of them with 2 components (sewage sludge with wood chips or wheat straw) and 10 mixtures of the 3 components with different quantities of each one. Sewage sludge presents lower minimum ignition temperature on layer values as compared to both biomass samples, i.e. the ignition tendency of sewage sludge is higher.

Results of the study show that mixtures present ignition temperatures in the range of the single samples and that synergistic or antagonist effects have not been observed.