## ALTERNATIVE FUELS

# (712) - MITIGATION OF POLLUTANT EMISSIONS FROM RESIDENTIAL BIOMASS BOILERS

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The Ecodesign and Energy Labelling Regulations for solid fuel boilers was published in 2015. The regulations establish minimum requirements and an energy labelling scheme. In particular, the regulations foresee the achievement of higher energy conversion efficiency and stringent limits about the emissions of particulate matter, carbon monoxide, organic gaseous carbon and NOx. The main novelty of the regulations is that also small size biomass boilers are covered. So, residential biomass boilers need to be redesigned, adapted and implemented to reach the ambitious target set by the European Commission.

Due to the inhomogeneous, anisotropic and morphologically irregular characteristics of biomass, the combustion temperature is a difficult parameter to be controlled in biomass boilers, especially in residential systems, which are usually equipped with no or poor control devices. The result is a real combustion condition that is locally different from the theoretical one identified in the design phase.

The paper focuses into two different approaches that can be applied to comply with the higher performances and lower emissions requested for residential biomass boilers. The first approach involves the combustion process: a simplified model for the combustion process of solid biomass is described to analyze and to compare the effect of different options for combustion efficiency increasing. The second approach addresses the loading procedure into a residential biomass boiler in order to avoid the risk of dioxins formation.

The model application clearly shows that the size and shape of the biomass pellet can be used as a parameter to better control the combustion process over the time. A further study is needed to evaluate how the adoption of non-invasive plant re-vamping (like partial flue gas recirculation) can impact on the temperature and the air-to-biomass distribution in the combustion chamber.

**Palavras-chave : biomass boiler, combustion efficiency, dioxin**