

Experience of co-firing non-woody fuel in a pilot scale (500kW) pulverized test facility

Manoj Paneru¹, Piotr Plaza¹, Jörg Maier¹

manoj.paneru@ifk.uni-stuttgart.de¹

IFK, University of Stuttgart, Pfaffenwaldring 23, 70569, Stuttgart, Germany

Co-firing biomass is an established and standardized approach for many coal firing power plants to increase the share of renewable fuel in their energy mix and to achieve decrease greenhouse emissions. Woody fuels has primarily been the fuel for co-firing. With growing share of biomass in the energy mix and expansion of co-firing interest worldwide, the need to use non-woody biomass fuel is gaining more and more popular.

The regional and seasonal available agricultural biomass, like wheat/rice straw is one of potential non-woody biomass fuel extensively studied. Additionally, a large fraction of biogenic waste (like municipal waste, animal waste/manure, food industry waste etc.) is potential biomass fuel source. However, the waste derive fuel in many case requires certain pre-treatment steps to upgrade its fuel properties. Hydrothermal carbonatisation converts biomass to carbon rich 'lignite like' product and is a proven pre-treatment techniques for wet biogenic waste. The product is often referred as 'Bio-Coal'.

In this study, two different non-woody biomass fuel, namely straw and 'bio-coal' were co-fired in a 500 kW pilot scale pulverized test facility. Non pre-treated wheat straw was used and the 'bio-coal' made from spent grains (beer industry waste) was used for test at 4 different co-firing share (10%, 20%, 40% and 60%). The mono-firing of both straw and 'bio-coal' was included in the test matrix along with the reference case of coal mono-firing.

The focus of the test was to evaluate the combustion and emission characteristics of these fuels as a co-firing fuel (different shares) with coal. Additionally, the influence of fuel share on deposit/corrosion issues and ash issues (properties/utilisation) were as well evaluated. The aim of these studies was to identify the potential concerns and suitable share of non-woody biomass fuel in pulverized firing boilers. The deposit and corrosion issues were the major concerns for straw fuel while the emission issues owing to its fuel-N content and ash utilisation issues owing to high phosphorous was basic concern for the 'bio-coal' used for this test.