Fluidized bed conversion of biomass and biomass waste in Austria

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Introduction:

At the moment eleven fluidized bed combustors (FBC) and three fluidized bed gasifiers (FBG) utilizing biomass or biomass waste operate with a thermal capacity of around 640 megawatts (MW) and 33 MW, respectively. These fluidized bed plants can be assigned to the electricity and heat producing industry and the pulp and paper industry. The three biomass gasifiers can be related to the electricity and heat producing industry.

Fluidized bed plants utilizing biomass fuels:

Figure 1 shows the location of the investigated fluidized bed plants. The FBC plants related to the pulp and paper industry are indicated by green stars and the FBC and FBG plants related to the heat and power industry are indicated by red triangles and red circles, respectively.

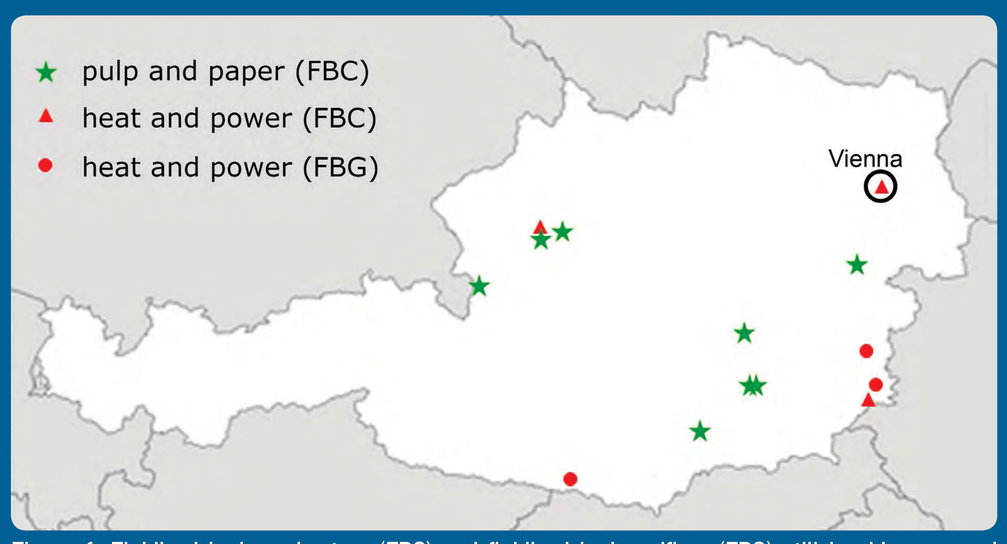

Figure 1: Fluidized bed combustors (FBC) and fluidized bed gasifiers (FBG) utilizing biomass and biomass waste fuels in Austria; Map: http://www.d-maps.com

Utilized biomass and biomass waste fuels:

Figure 2 shows the utilized biomass and biomass waste fuels.

Figure 2: Biomass and biomass waste fuels utilized by Austrian fluidized bed plants

The impurity concentrations in the different fuels vary widely. Thus, Figure 3 tries gives an insight in the variation for the three most crucial impurities for the flue gas treatment design: nitrogen, sulfur and chlorine.

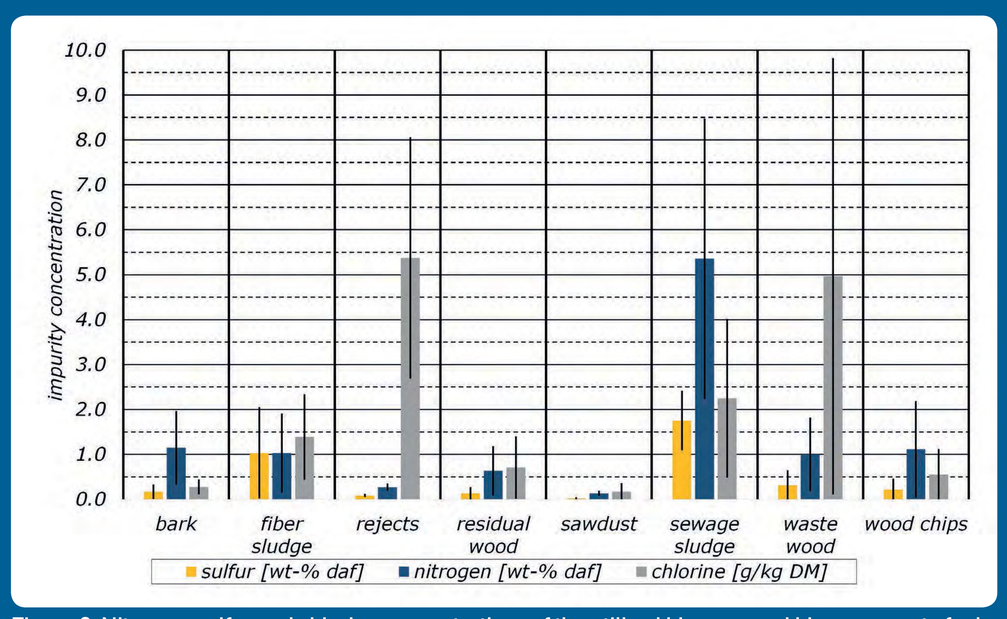

Figure 3: Nitrogen, sulfur and chlorine concentrations of the utilized biomass and biomass waste fuels, Sources: [1, 2]

Fuel pre-processing systems:

In order to characterize fuel pre-processing systems, the fuels from Figure 2 are categorized to three categories: solid fuels, sludges and production waste. Solid fuels are residual wood, waste wood and wood chips; sludges are fiber sludge and sewage sludge; production wastes are bark, rejects and saw dust. Figure 4 shows the stat-of-the-art pre-processing steps for the three categories. However, not all investigated plants employ all steps.

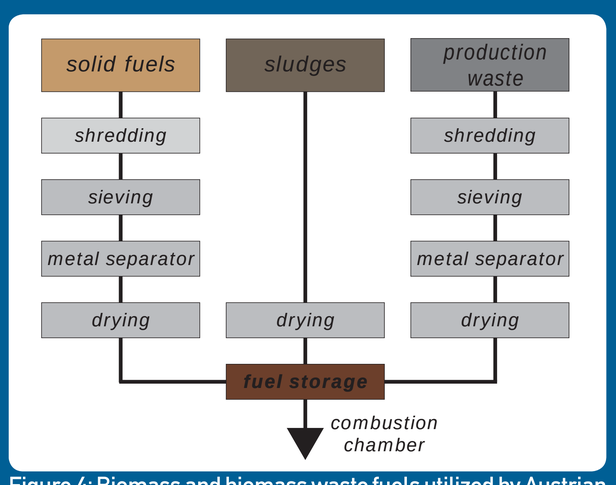

Figure 4: Biomass and biomass waste fuels utilized by Austrian fluidized bed plants

Flue gas treatment systems:

Figure 5 shows the general system assembly of the flue gas treatment systems in the pulp and paper and heat and power industries including the common flue gas cleaning actions. Not all investigated FBC and FBG plants employ all of the treatment system components.

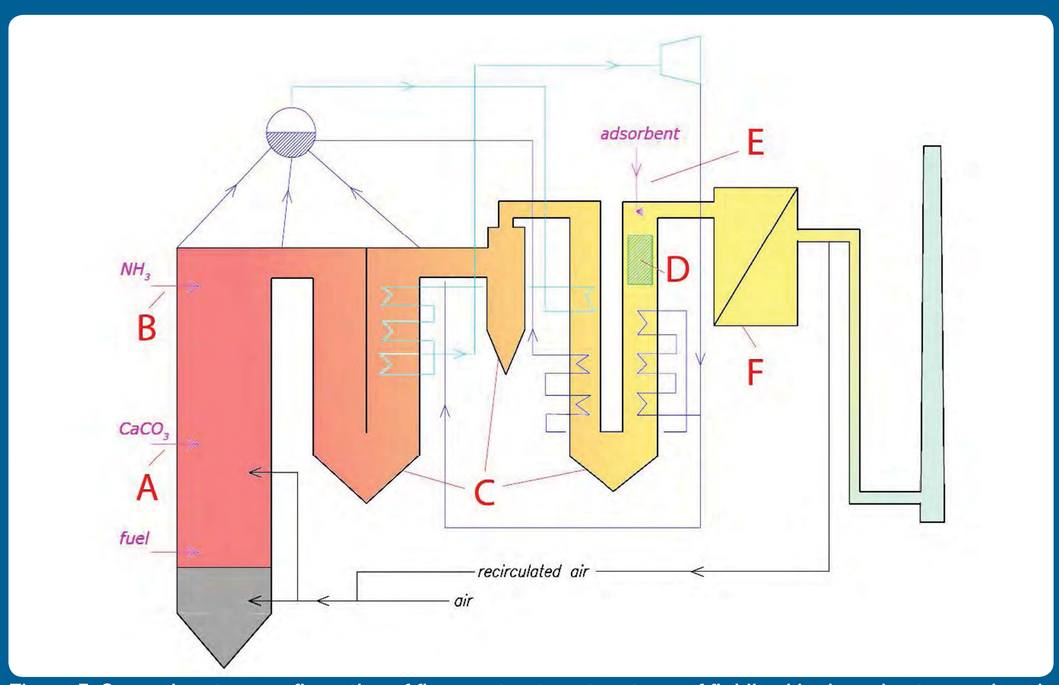

Figure 5: General system configuration of flue gas treatment systems of fluidized bed combustors and gasifiers. A) de acidification B) selective non-catalytic reduction (SNCR) C) gravity and optional centrifugal separator D) selective catalytic reduction (SCR) in high dust mode E) dry flue gas cleaning system F) electrostatic and/or fabric filter, based on [3]

Conclusion:

Austrian FBC plants utilize various biomass and biomass waste fuels. The impurity contents vary widely among the different fuels. The stat-of-the-art for fuel pre-processing includes measures to ensure a certain size distribution and calorific value. The stat-of-the-art flue gas treatment systems employ all components depicted in Figure 5; the denitrification is either performed by SNCR or SCR.

Acknowledgements:

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References:

[1] Phyllis2: database for biomass and waste, 2012.
[2] K. Reisinger, C. Haslinger, M. Herger, H. Hofbauer, BIOBIB: A database for biofuels.
[3] A. Purgar, F. Winter, Chemie Ingenieur Technik 85 (2013) 303–307.