Co-combustion
- a summary of technology

Co-combustion of biomass or waste together with a base fuel in a boiler is a simple and economically suitable way to replace fossil fuels by biomass and to utilise waste.

On the utilisation

Co-combustion in a high-efficiency power station means utilisation of biomass and waste with a higher thermal efficiency than what otherwise had been possible. Due to transport limitations, the additional fuel will only supply a minor part (less than a few hundreds MWfuel) of the energy in a plant. There are several options: Co-combustion with coal in pulverised or fluidised bed boilers, combustion on added grates inserted in pulverised coal boilers, combustors for added fuel coupled in parallel to the steam circuit of a power plant, external gas producers delivering its gas to replace an oil, gas or pulverised fuel burner. Furthermore biomass can be used for reburning in order to reduce NO emissions or for afterburning to reduce N_2O emissions in fluidised bed boilers. Combination of fuels can give rise to positive or negative synergy effects, of which the best known are the interactions between S, Cl, K, Al and Si.

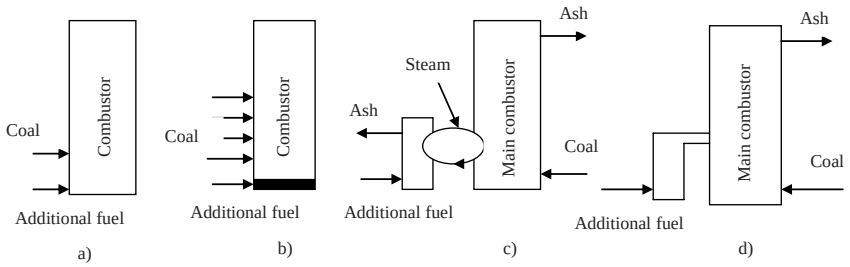

Figure: Four arrangements of co-combustion. a) Direct feed of an additional fuel together with the main fuel in a suspension firing or fluidised bed, b) Bed combustion of additional fuel in a suspension fired boiler c) Separate combustor for the additional fuel, coupled to the main combustor on the steam side d) Additional gas producing unit, coupled to the main combustor on the flue-gas side

Combustion device

Co-combustion can be carried out in most combustion devices in conventional boilers but there are several additional arrangements possible. Co-combustion in fluidised bed is uncomplicated and in most cases limited only by the heat balance of the bed.

Co-combustion in pulverised coal utility boilers can be performed with premixed fuels without any particular arrangements up to replacement of a few percent (energy) of the base fuel, limited by the inability of normal pulverisers to handle greater quantities of woody biomasses in a reasonable way. With dedicated handling and comminuition systems the contribution of co-firing in pulverised fuel boilers could be up to ten or even twenty energy percent.

Combustion

In a pulverised coal fired flame the addition of a high-volatile fuel promotes ignition. Otherwise, the minor fractions of co-fuel concerned do not play a great role for the progress of combustion. In a fluidised bed there are no particular restrictions for combustion, except that the heat balance of the bed should be such that the bed temperature can be maintained at the desired level.

Emissions

There is a mixing effect noticed when fuels with significantly different sulphur contents are burned together; otherwise the emissions of NOx and SO_2 are not significantly affected by the fuel mix.

The report "Co-combustion : a summary of technology" can be ordered from:

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