

DESIGN OF A FLUIDISED BED COMBUSTOR

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The fluidised bed combustion process has been found to be eminently suitable for the incineration of a wide range of low grade materials. The fluidised bed combustors can be designed to have high thermal efficiency and can treat wastes which have a low combustible content, and/or a high moisture content. The rapid solids mixing keeps the bed at uniform temperature. The gas and solid contacting is excellent so that efficient combustion is achieved at the relatively low temperatures of 800° - 900° C. Because of the high heat transfer rates the combustion equipment can be compact which means a relatively low capital investment. This becomes an important technology for a country like ours as this can be utilised for extracting energy efficiently from low grade fuels like wood waste, paddy husk or imported cheaper grades of coal.

Fluidised bed combustors have the ability to burn low-grade materials (e. g. colliery trailings with 60 and upto 80% water). It also has the flexibility to burn any rank or grade of coal solid liquid or gaseous fuel, provided design incorporates desired feed system.

Higher heat release rates/unit volume of about 1.35 MW/m² could be achieved as compared with 0.21 MW/m² for a pulverised fuel fired boiler (100,000 Btu/ft² Vs. 20,000 Btu/ft²). Due to higher heat transfer rates of about 350 W/m² °C (60 Btu/Hr.ft² °F) compared to about 70 W/m² °C in the convection section of a conventional water tube boiler make it possible to have less steam tubing in a boiler and hence reducing the capital costs.

A bench scale combustor is designed to obtain other necessary parameters for the design of a pilot scale plant. In this bench scale combustor, test runs should be carried out for materials like wood chips, wood pellets or paddy husk for which very little information is available. The overall design objection should be to obtain maximum heat release and heat transfer within the chamber or bed zone, whilst achieving high combustion efficiencies and low levels of pollutant and emissions. The optimum design will be the one that satisfactorily meets these requirements at minimum cost.