**FLUIDISED BED COMBUSTION BOILER**

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**Introduction:**  
The major portion of the coal available in India is of low quality, high ash content and low calorific value. The traditional grate fuel firing systems have got limitations and are techno-economically unviable to meet the challenges of future. Fluidized bed combustion has emerged as a viable alternative and has significant advantages over conventional firing system and offers multiple benefits – compact boiler design, fuel flexibility, higher combustion efficiency and reduced emission of noxious pollutants such as SOx and NOx. The fuels burnt in these boilers include coal, washer rejects, rice husk, biogases & other agricultural wastes. The fluidized bed boilers have a wide capacity range- 0.5 T/hr to over 100 T/hr.  
  
**principal, operation and feature of technology:**

 In the fluidized bed combustion (FBC) coal boiler, milled coal is charged and burned in a fluidized bed consisting of silica sand, limestone, or some other sorbent for desulfurization. Forms of fluidized beds are the bubbling type and circulating type; classified by furnace pressurization method, types comprise the atmospheric type (AFBC), which operates at atmospheric pressure, and the pressurized type (PFBC). Because the bubbling type normally operates with an empty-tower velocity of 1-2 m/sec, the fluid medium is not scattered out of the boiler furnace With the circulating type, the empty-tower velocity is 4-10 m/sec, and the fluid medium and some fuel are scattered out of the furnace top

**The features of this boiler are as follows:** (1) Good combustion of coal is possible even with coarse coal. Accordingly, fine coal pulverizing is not necessary. (2) There are no restrictions on fuel residence time. (3) Because heat transfer between the fluid medium and the fuel particles is rapid, quick heating up and ignition and smoke-free combustion are possible. (4) Because heat transfer coefficient with the heating surface is extremely large, operation with a small heat transfer area in the fluidized bed is possible

**Mechanism of Fluidised Bed Combustion:** When an evenly distributed air or gas based upward through a finely divided bed of solid particles such as sand supported on a fine mesh, the particles are undisturbed at low velocity. As air velocity is gradually increased, a stage is reached when the individual particles are suspended in the air stream – the bed is called “fluidized”.  
With further increase in air velocity, there is bubble formation, vigorous turbulence, rapid mixing and formation of dense defined bed surface. The bed of solid particles exhibits the properties of a boiling liquid and assumes the appearance of a fluid–

“Bubbling fluidized bed”.

**Types of Fluidised Bed Combustion Boilers**  
There are three basic types of fluidised bed combustion boilers:  
1. Atmospheric classic Fluidised Bed Combustion System (AFBC)  
2. Atmospheric circulating (fast) Fluidised Bed Combustion system (CFBC)  
3 . Pressurised Fluidised Bed Combustion System (PFBC).  
**Atmospheric classic Fluidised Bed Combustion System (AFBC)**

In AFBC, coal is crushed to a size of 1 – 10 mm depending on the rank of coal, type of fuel feed and fed into the combustion chamber. The atmospheric air, which acts as both the fluidization air and combustion air, is delivered at a pressure and flows through the bed after being preheated by the exhaust flue gases. The velocity of fluidising air is in the range of 1.2 to 3.7 m /sec. The rate at which air is blown through the bed determines the amount of fuel that can be reacted.

**Circulating Fluidised Bed Combustion system**The CFBC boiler is capable of burning fuel with volatile content as low as 8 to 9 percent (e.g. anthracite coke, petroleum etc. with minimal carbon loss). Fuels with low ash-melting temperature such as wood, and bio-mass have been proved to be feedstock’s in CFBC due to the low operating temperature of 850-9000 C. CFBC boiler is not bound by the tight restrictions on ash content either. It can effectively burn fuels with ash content up to 70 percent.

**Pressurised Fluidised Bed Combustion Combined**

A new type of fluidised bed design, the pressurised bed, was developed in the late The Pressurized Fluidised Bed Combustion Systems employ a combination of Rankin Cycle and Brayton Cycle with the objective of achieving high cycle eighties to further improve the efficiency levels in coal-fired power plants efficiency and also lower emissions

**Advantages of FBC Boilers**

1. High Efficiency:

2. Reduction in Boiler Size:

3. Fuel Flexibility

4. Ability to Burn Low Grade Fuel

5. Ability to Burn Fines:

6. Pollution Control

**Conclusion**:Hence the result shows that When an evenly distributed air or gas based upward through a finely divided bed of solid particles such as sand supported on a fine mesh, the particles are undisturbed at low velocity.