Gasification of powdery biomass/coal/industrial wastes through Entrained mode (30 KWe Capacity)

Product/Process Profile

A 30kW$_e$ capacity entrained flow biomass gasifier for thermal application has been successfully developed at IMMT, Bhubaneswar to gasify efficiently the powdery biomass such as rice husks, saw dusts, coir dusts etc. A L/D ratio (Length to Diameter of gasifier) of 10 has been adopted to improvise the mixed flow and plug flow reactor characteristics to ensure full suspension of powdery biomass in a vigorous radial mixing condition in the reactor and to achieve high intensity reaction and gasification which are essential for entrained flow gasification. Based on the simple plug flow characteristics, a gas residence time of about 2 second has been adopted for the gasifier.The gasifier-reactor attains a temperature in the range of 900-1200^{o}C to take the advantages of the kinetics of the process and produce low tar and char formation. By maintaining a pre-estimated Equivalent Ratio (ER) of 0.27, temperature of the partial oxidation can be varied as per requirement. The endothermic steam induced reactions with a steam injection at a rate of 10-15 kg/hr coupled with the gasification reactions conserves the sensible process heat in the form of more hydrogen and carbon monoxide.

Application Area

- Rice Mills, Coir industries, Saw Mills & other agro-processing industries

Advantage

- Capable of handling feed stocks with wide range of particle sizes
- Renewable source of energy generation
- Reduction in carbon emission
- Value addition to huge agro-wastes/industrial wastes

Major Raw Materials/Plant Equipments/ Machinery/Gadgets

- The various system elements of the gasifier are; Gasifier shells with internal refractory lining, Oil Ignition System, Powdery Biomass Feeding System, Venturi Mixer, Steam Injection System, Secondary Combustor, Dilution Chamber and a Chimney.

Scale of Development

- Pilot Scale with 40 kg/hr. biomass feeding rate

Validation Level

- Pilot plant experiments, Producer Gas Composition: CO-20-22%, H_2-25-28%, CO_2-6-8% with producer gas analyzer

Commercialization Status

- Technology with lab.

Techno-economics

- Conservation of fossil fuels

IP Status

- Know-how with the institute

Technology Package

- Engineering drawings& demonstration of the technology