

Course Curriculum for Biomass std IX (Work Experience)

Objective: *An average student should be able to understand the processes involved in biomass utilization.*

1. biomass briquetting/compacting
2. Biogas and fermentation/biodegradation
3. Efficient burning practices i. e. improved chulhas and gasification of biomass

Duration : 25 hours

Topics
Introduction <ol style="list-style-type: none">1. Calorie, kilocalorie, joule, inter-conversion of joule to Kcal2. Calorific value of a fuel, types of fuels: liquid, solid gas- information about 10 most common fuels to be covered.3. Combustion phenomenon, efficient burning, inefficient burning and pollution. Air/fuel ratio, fuel gas composition.4. Biodegradation in open and closed environments – aerobic, anaerobic – formation of biogas and slurry – factors affecting the biogas formation.
Briquetting <ol style="list-style-type: none">1. Process of briquetting. Advantages of briquetting.2. Materials used in briquetting, moisture and binding.3. Types of briquettes are available in the market, their calorific values, sizes and shapes.4. Briquette – household or industrial, household burners.5. Designs and construction of efficient and smokeless chullas.6. Briquetting machine – types, operational parameters,7. Practical for burning of briquettes in conventional and energy efficient chullas.
Biogas <ol style="list-style-type: none">1. Types of biogas plants – moving dome, fixed dome and industrial type. Set ups for these types and instrumentation.2. Raw materials for biogas. Salient features of routine operation and maintenance, parameters of operation, expected output of gas and slurry and their disposal.3. Location for biogas plants at a given place, seepage prevention and winter time operations.4. Operation of a MS floating dome5. Operation of a MS fixed dome
Thermal Gasification <ol style="list-style-type: none">1. Concept and basic working of gasifier2. Thermal gasification of biomass, composition of producer gas.3. Construction of burning chamber, output of the gas as fuel4. Controlled flow of air, flow of organic matter, temperature in the furnace, quality control of the gas and its end use.

5. Power generation from the gasifiers, power output in KW types of gasifiers, fixed bed and fluidized bed gasifiers.

Safety aspects

1. Explosion, effect of concentration of gas in air, causes of explosion in biogas plant, producer gas plant.
2. Avoiding explosions, handling of fire hazard.
3. Electrical safety, lightning arresters and maintenance.
4. Fire safety course of one day duration.

Practicals and hand-on experience

1. Visit to briquetting plant, and if possible, 2-day training for each student – can be tied up with plant at Opa.
2. Visit to Gobar gas plant
3. Fuel efficiency experiments on fuel efficient chullas
4. Experiment on gasification setup.

Reference books

1. Wood Pallet heating system, Dilwyn Jenkins, Earthscan Publishing, London, 2010.
2. Notification, Central Electricity Regulatory Commission, New Delhi 2013
3. Energy from Biomass, Chapter 3 from the book “Non-conventional Energy Sources by G. D. Rai, Khanna Publishers, New Delhi, 2008.
4. “Best from Waste”, Pamphlet giving information about Briquetting plant, Shri Khodiyar Engineering Works, Rajkot.