SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 19EEO305 /Renewable Energy Generation Technology

IV YEAR / VII SEMESTER

UNIT 4- BIOMASS AND HYDRO ENERGY

Topic 3 – Advantages & Drawbacks of Biomass gasifier

SUCCESSFUL STUDENT

Positive Attitude

Professionally Groomed

Socially Interactive

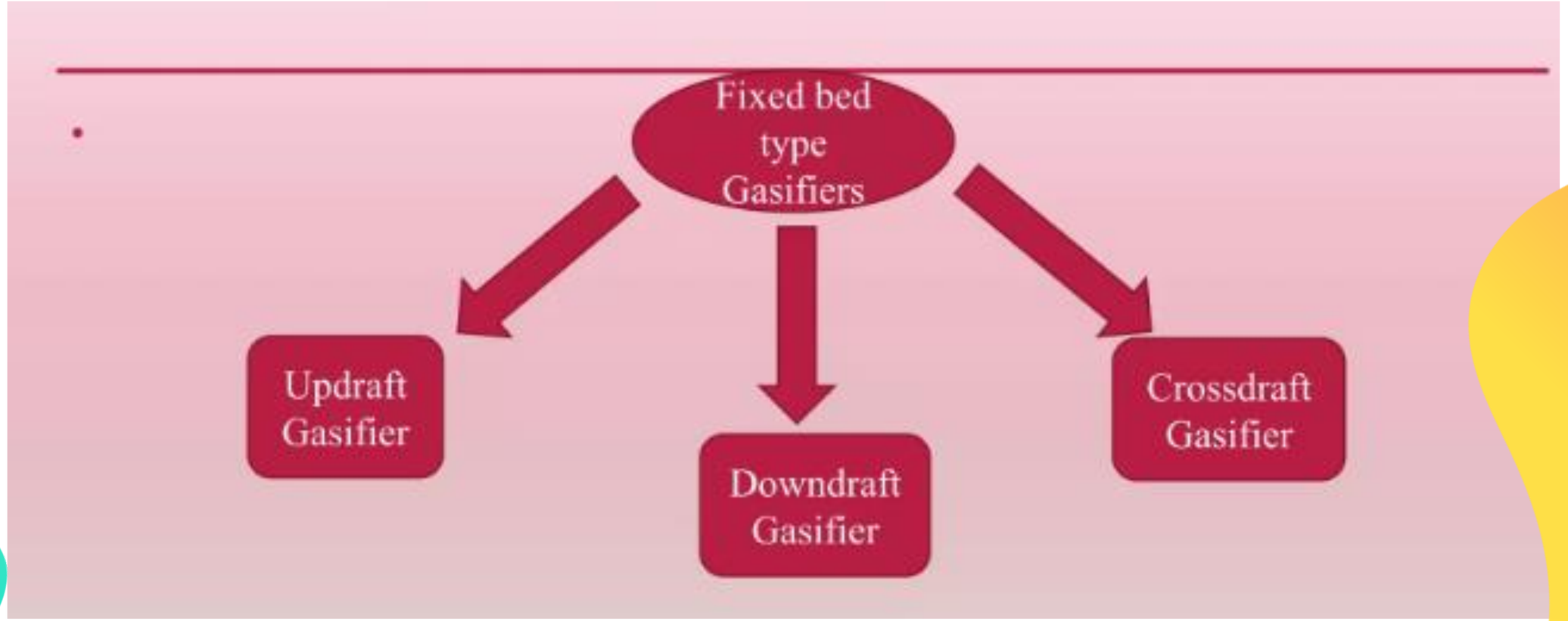
Technically Skillful

INTRODUCTION TO GASIFICATION

- Basic process of gasification is conversion of biomass into combustible gas mixture.
- It is done by partial oxidation of biomass at very high temperatures in a gasification medium.
- Gasification medium could be air, oxygen, steam…etc.
- It is not a single step process like combustion.
- Biomass Gasification occurs through a sequence of complex thermo-chemical reactions.

BASIC CHEMISTRY

- Partial Oxidation : $C + 0.5\ O_2 \longleftrightarrow CO$ (dH = -268 MJ/Kg Mole)
- Complete Oxidation : $C + O_2 \longleftrightarrow CO_2$ (dH = -406 MJ/Kg Mole)
- Water gas reaction : $C + H_2O \longleftrightarrow CO + H_2$ (dH = +118 MJ/Kg Mole)
- Water gas Mixture Shift Reaction : $CO + H_2O \longleftrightarrow CO_2 + H_2$ (dH = -42 MJ/Kg Mole)
- Methane Formation : $CO + 3H_2 \longleftrightarrow CH_4 + H_2O$ (dH = -88 MJ/Kg Mole)
- All above reactions are in equilibrium, can proceed in either direction depending on temperature, pressure, concentration of reactant.
- Product gas from gasification is a mixture of CO, CO_2, CH_4, H_2, $H_2O(g)$..


Fixed bed type Gasifiers
Updraft Gasifier
Downdraft Gasifier
Crossdraft Gasifier

DISADVANTAGES

- Gasification is a complex and sensitive process.
- Gasifiers require at least half an hour or more to start the process.
- Getting the producer gas is not difficult, but obtaining in the proper state is the challenging task. The physical and chemical properties of producer gas such as energy content, gas composition and impurities vary time to time.
- Some amount of tar is released in the gas.
- All the gasifiers have fairly strict requirements for fuel size, moisture and ash content. Inadequate fuel preparation is an important cause of technical problems with gasifiers.

ADVANTAGES

- Provides Sustainable & Affordable alternative to fossil fuel based power plants at low power levels.
- Efficiency of the system is very high when compared to other Renewable energy systems such as Wind and Solar.
- Gasification is Eco-Friendly as it is "CO2 Neutral", generates very little SO2 & Nitrogen Oxides compared to conventional fossil fuel based power plants.
- It is a cost effective solution as it combines 'Low Unit Capital Cost' with 'Low Unit Cost of Production'. Cost of installation per kWe is about the same as for large power levels.
- Economic, Social and Environmental benefits associated with Biomass make it as an attractive renewable energy option.

ASSESSMENT

REFERENCE

Reference Book:

1. S.P. Sukhatme, ‘Solar Energy’, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997. (UNIT II)

2. G.N. Tiwari, ‘Solar Energy – Fundamentals Design, Modelling and applications’, Narosa Publishing House, New Delhi, 2002. (UNIT II)

3. S.M. Muyeen,” Wind Energy Conversion Systems: Technology and Trends”, Springer 2012. [UNIT III]

Text Book:

1. G.D. Rai, ‘Non Conventional Energy Sources’, Khanna Publishers, New Delhi, 2006. (UNIT I - V)

2. D.P.Kothari, K.C.Singal and Rakesh Ranjan,”Renewable energy sources and Emerging Technologies”, PHI Pvt. Ltd., 2009. (UNIT I-V)

THANK YOU!!