

Energy and Environmental Engineering

CEME 102



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GLOBAL AND NATIONAL ENERGY SCENARIO. (1 hours)

INTRODUCTION TO ENERGY SOURCES (2 hours)

Classification of Energy Sources in terms of Primary and Secondary Sources, Commercial and Non Commercial Sources of Energy; Renewable and Fossil based Sources of Energy;

INTRODUCTION TO FUELS AND ITS PROPERTIES (1 hours)

INTRODUCTION TO VARIOUS ENERGY CONVERSION SYSTEMS (6 hours)

like Power Plant, Pump, Refrigerator, Air Conditioner, Internal Combustion Engine, Solar PV Cell, Solar Water Heating System, Biogas Plant, Wind Turbine System general functioning including their normal rating specifications.

ASPECTS OF ENERGY CONSERVATION AND MANAGEMENT (4 hours)

Energy Conservation Act, Energy Policy of Company; Need for Energy Standards and Labelling; Energy Building Codes.

ENERGY STORAGE IN BATTERIES (2 hours)

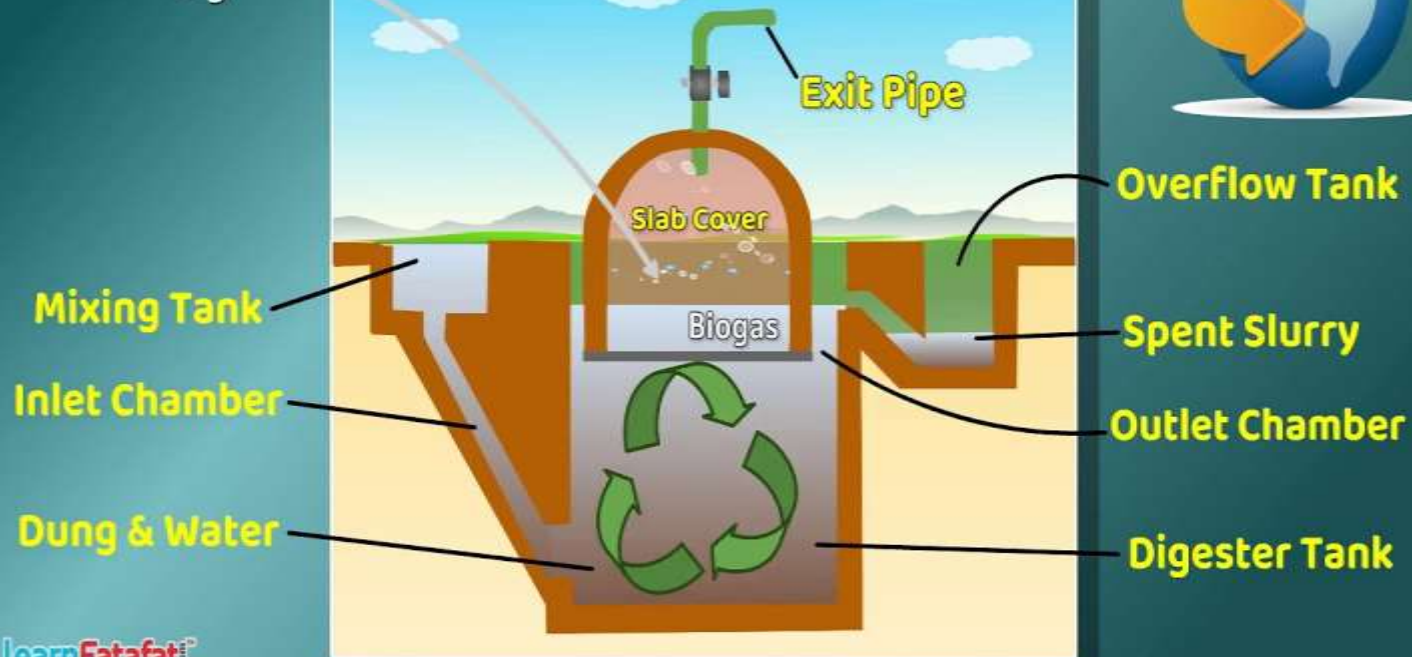
Type of batteries; Electric Vehicles

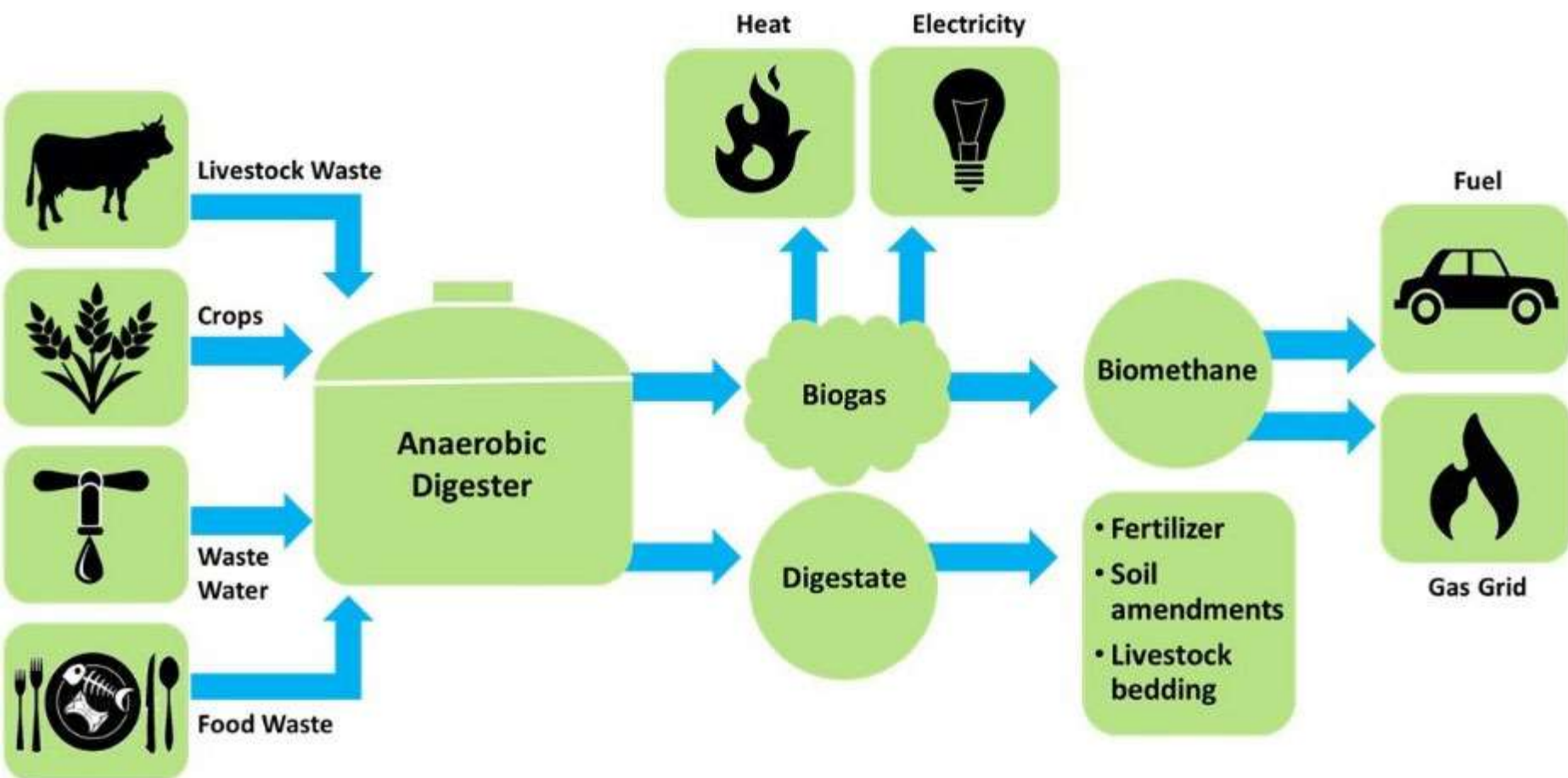
Biogas Plant

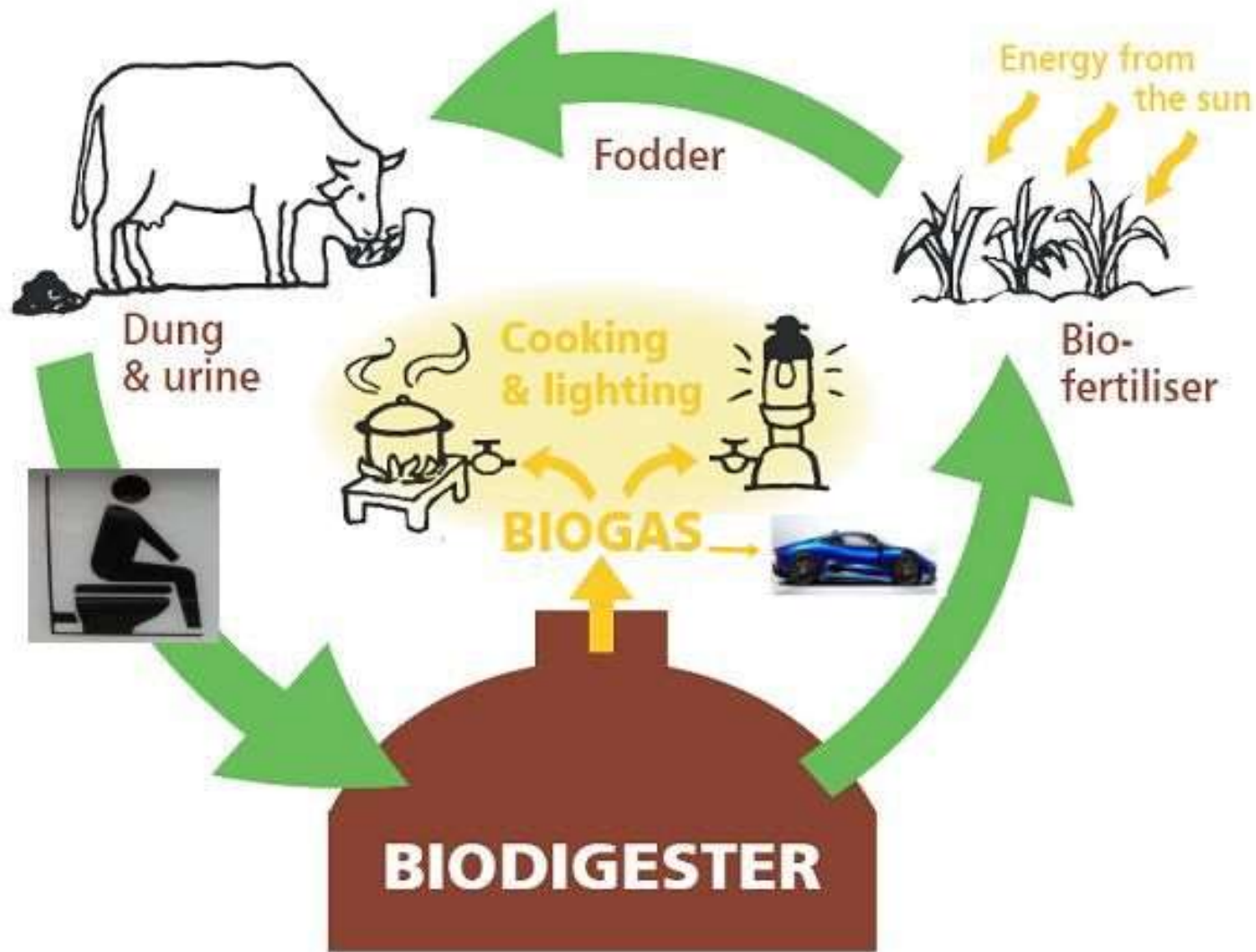
Global Warming



Renewable Source
of Energy^y

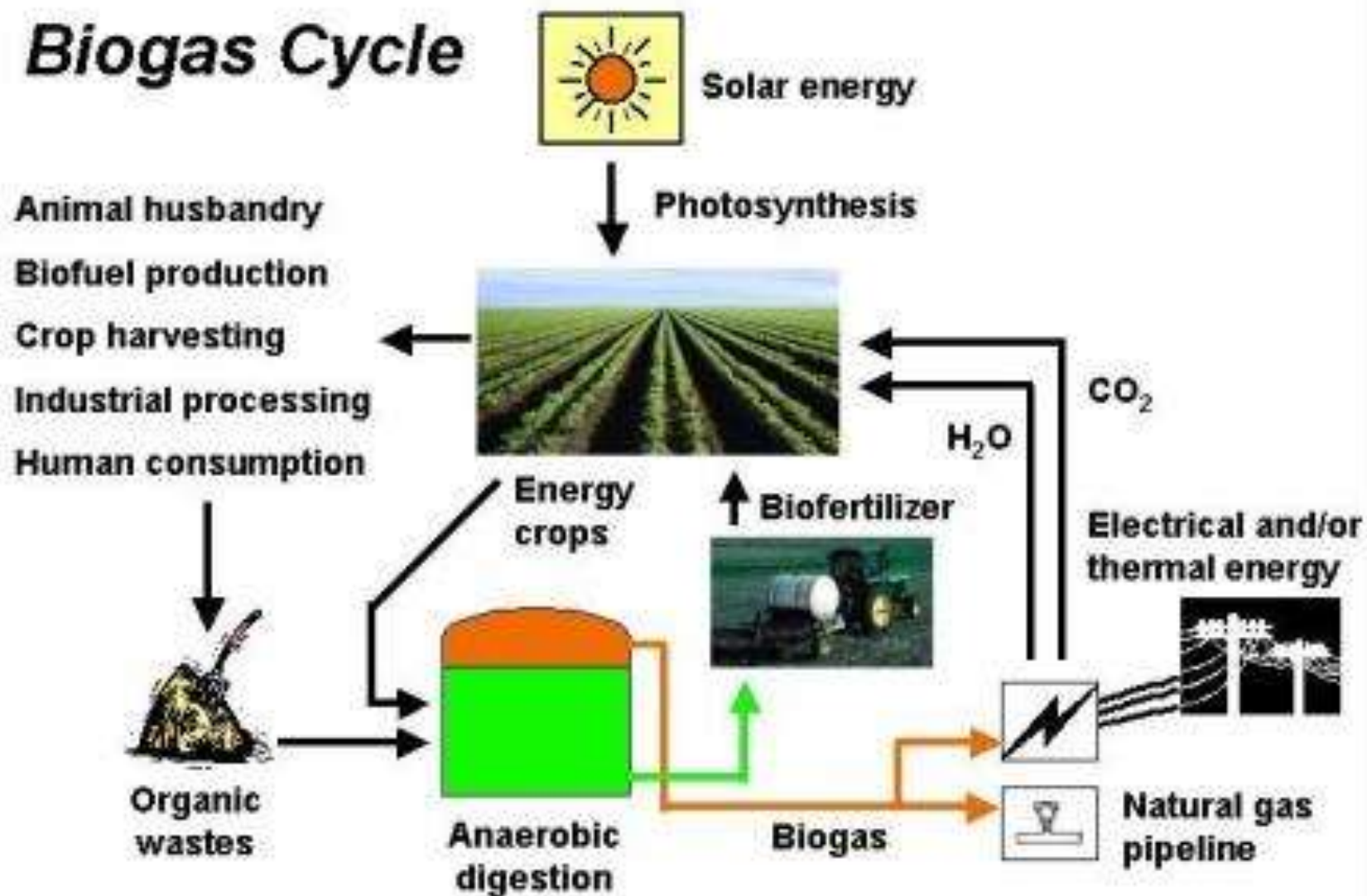






Biogas circular economy

Biogas Cycle





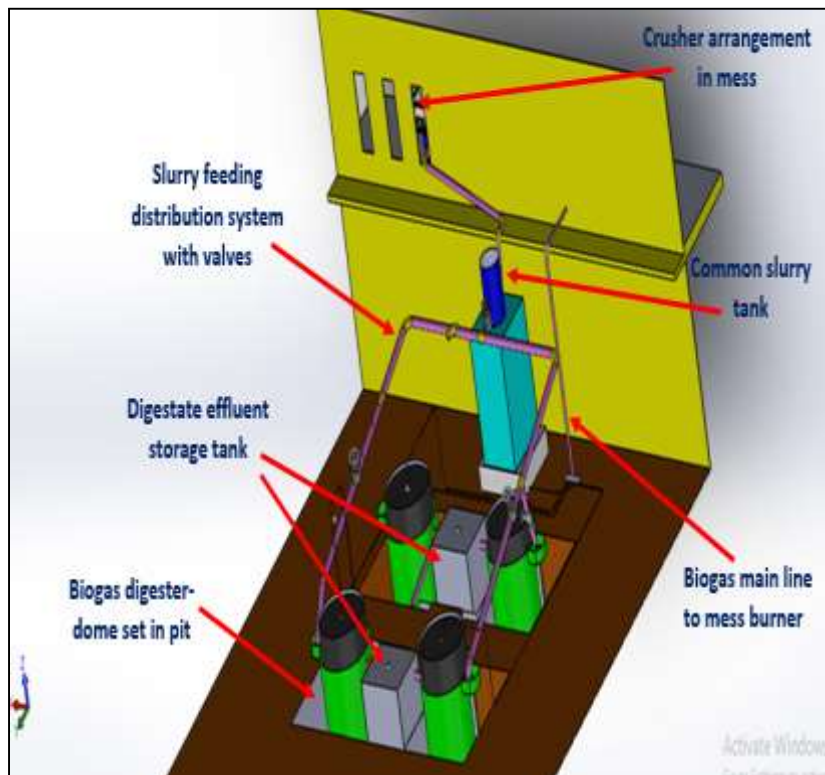
Deoiled cake



Hostel kitchen waste



Biogas plant



Biogas plant, Near H4 Hostel, SVNIT Surat



Biogas generator

BIOGAS

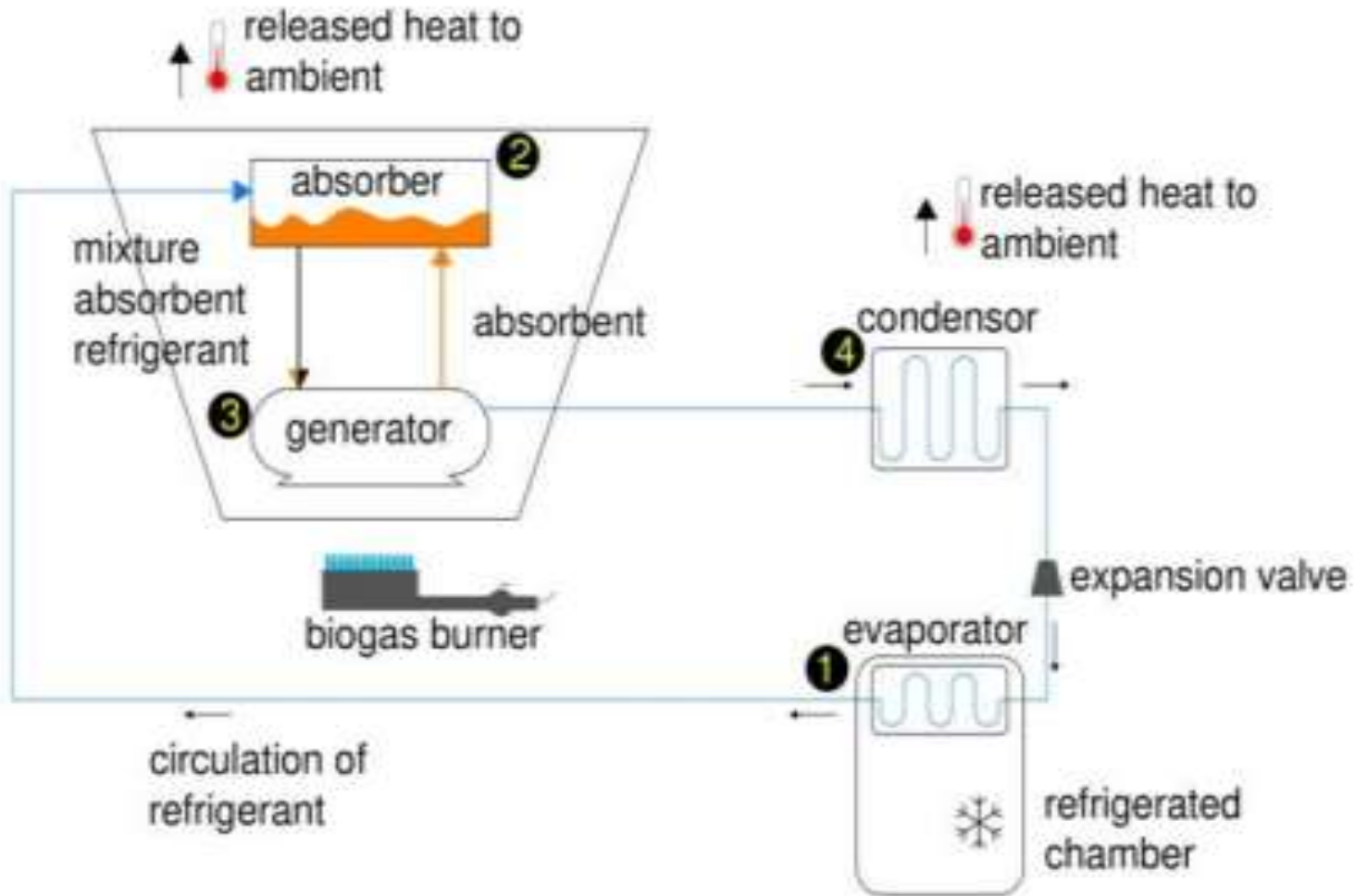
- Mixture of gases.
- Produced by anaerobic digestion of organic matter.
- Consist of CH_4 , CO_2 , traces of H_2 & other gases.

Composition of Biogas

- Raw biogas typically consists of :
 - ✓ **methane (50–75%),**
 - ✓ **carbon dioxide (25–50%),**
 - ✓ **and smaller amounts of nitrogen (2–8%).**
- Trace levels of hydrogen sulfide, ammonia, hydrogen, and various volatile organic compounds are also present in biogas depending on the feedstock

BENEFITS FROM BIOGAS PLANTS

- Used mainly for cooking & lighting purposes.
- Used in internal combustion engines to power water pumps & electric generators.
- Used as fuel in vapour absorption refrigerators.
- Sludge can be used as fertilizers.
- Creates less environmental pollution.



Biogas powered vapor absorption refrigeration system

Reference: <https://www.ijeat.org/wp-content/uploads/papers/v9i1/E7321068519.pdf>

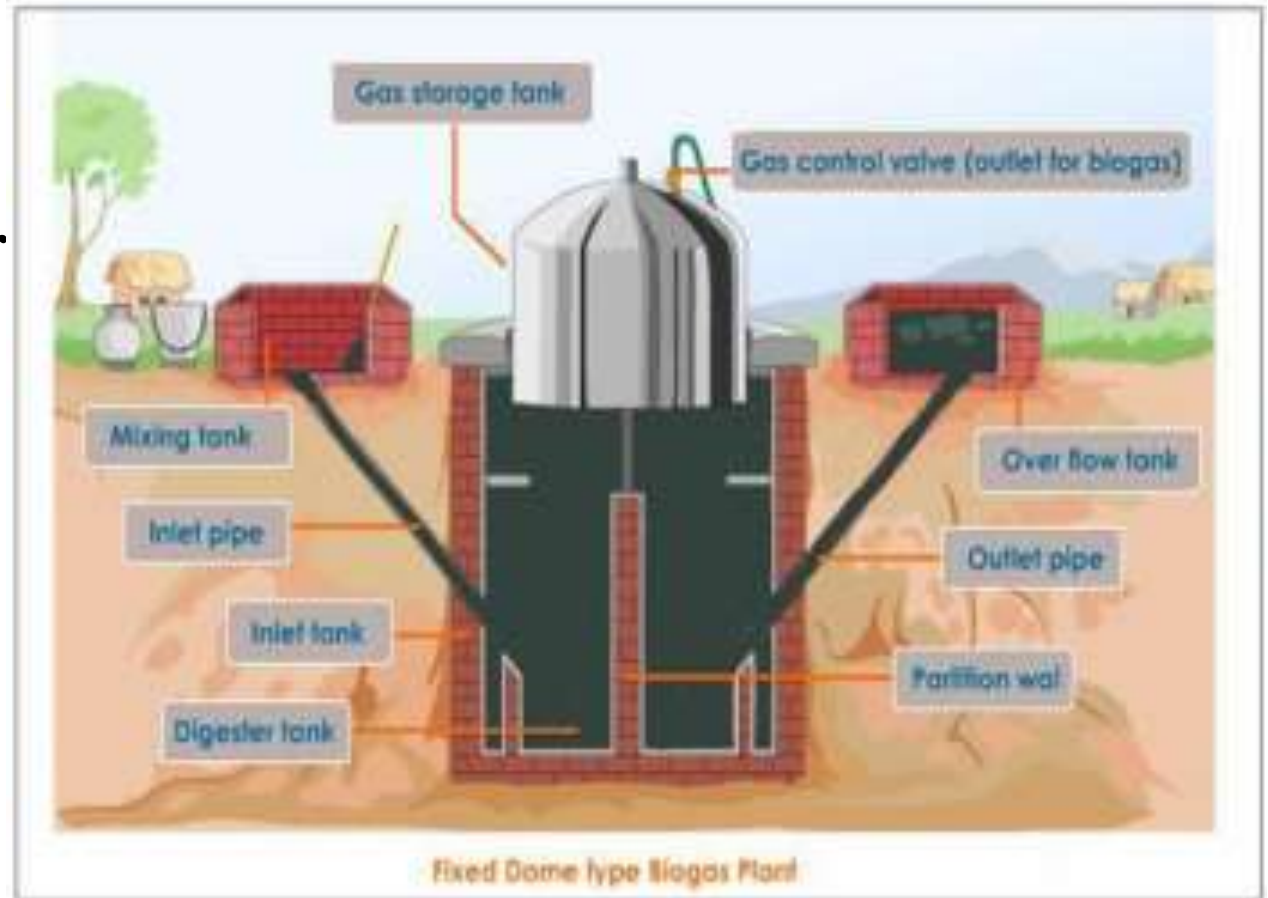
SUBSTRATE

- Plant & animal biomass.
 - Plant biomass –Agricultural wastes.
 - Animal biomass – cattle dung,manure from poultry, goats & sheep slaughter house & fishery wastes.



Parts of biogas plant

- Digester
- Gas holder
- Inlet
- Outlet



Inlet chamber

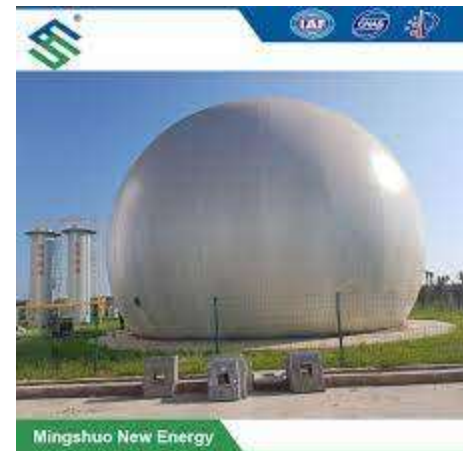
- To supply cow dung to the digester.
- It is made at the ground level so that the cow dung can be poured easily.
- Made up of bricks, cement and sand.
- The outlet wall of the inlet chamber is made inclined so that the cow dung easily flows to the digester.

Digester

- Most important part of biogas plant.
- Fermentation takes place - fermentation tank.
 - Built underground – insulated, airtight
 - Made up of bricks, sand and cement.
- Almost at the middle of the height of digester, two openings are provided on the opposite sides for inflow of fresh cow dung and outflow of used cow dung

Gas holder

- Cylindrical container
- Above digester
- Collect gas
- The gas pipe carries the biogas to the place where it is consumed.



Outlet Chamber

- Digested slurry from which the biogas has been generated is removed from the biogas plant.
- The outlet chamber is also at the ground level.

Types

GAS HOLDER

- Fixed dome type
- Floating drum type

FREQUENCY OF FILLING SUBSTRATE

- Batch type
- Continuous type

Fixed dome type

A fixed-dome plant consists of a digester with a fixed, non-movable gas holder, which sits on top of the digester.

Floating-drum type

- Consist of an underground digester and a moving gas-holder.
- Gas-holder floats either directly on the fermentation slurry or in a separate water jacket.
- The gas is collected in the gas drum, which rises or moves down, according to the amount of gas stored

- **Batch type**
 - Filled once, sealed.
 - Emptied when raw materials stop producing gas.
- **Continuous type**
 - Fed with a definite quantity of wastes at regular intervals
 - Gas production continuous & regular



Community biogas plant



corporation biogas plant



commercial biogas plant



individual biogas plant