

Large-Scale Microbe Production

Microorganisms like penicillin or microprotein are grown in fermenters.

Causes of Problems?

- Food and oxygen used up in respiration - oxygen + food supplied.
- Temperature rises due to metabolism of respiring microbes - a water-cooled jacket to keep temperature constant
- Poisonous CO_2 levels build up, change pH level and affects enzymes - measuring probes to monitor pH, temperature, etc. so adjustments can be made.
- * Stirrer to mix microorganisms evenly along with oxygen and food supply. This helps to keep temperature even.

Fuel Production

Biogas is mainly methane, can be produced by the anaerobic fermentation of plant products/waste materials that contain carbohydrates. Best at 30°C - enzyme optimum temp.

Floating-drum biogas plant

- easy to construct
- easy to operate
- steady gas pressure produced
- reliable, well-tried technology.
- metal gas holder is expensive and may rust.

Fixed-dome biogas plant

- low initial cost
- long life (no rusting parts)
- well insulated
- sealing isn't always tight
- gas pressures fluctuate.

Batch Generators - higher yields, expensive to restart

Continuous generators - lower yields, continually produces biogas.

Biofuel (carbon neutral)

biodiesel - ethanol produced anaerobically with sugar cane
- mixed with diesel