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PHARMACEUTICAL BIOTECHNOLOGY

UNIT 5

TOPIC :

- b) Large scale production fermenter design and its various controls.



Large-Scale Fermenter (Bioreactor)

- A large-scale fermenter is a closed vessel used for industrial production of antibiotics, enzymes, vaccines, alcohol, vitamins, and organic acids using microorganisms under controlled conditions.
- It is also known as a Bioreactor.

Fermenter Design And Parts

1. Fermenter Tank

Functions

- Main vessel where fermentation occurs.
- Usually made of stainless steel.
- Cylindrical with a rounded bottom.

Advantages

- Corrosion resistant.
- Easy sterilization.
- Durable.

2. Agitation System

Components

- Motor
- Shaft
- Impellers

Functions

- Uniform mixing of medium.
- Distribution of nutrients.
- Improves oxygen transfer.

3. Aeration System

Functions

- Supplies sterile air.
- Maintains oxygen concentration.

Components

- Air compressor
- Air filter
- Sparger

Importance

- Essential for aerobic fermentation.

4. Feeding Pump

Functions

- Supplies nutrients during fermentation.
- Maintains nutrient concentration.

Importance

- Used mainly in fed-batch and continuous fermentation.

5. Sensors and Probes

Measure

- Temperature
- pH
- Dissolved oxygen
- Foam level

Importance

- Continuous monitoring and process control.

6. Temperature Control System

Components

- Cooling jacket
- Cooling coils

Functions

- Maintains optimum temperature.
- Removes excess heat generated by microorganisms.

7. Foam Control System

Functions

- Prevents excessive foam formation.
- Improves process efficiency.

Methods

- Addition of antifoam agents.
- Mechanical foam breakers.

8. Effluent Outlet

Functions

- Removes fermented broth.
- Helps product recovery.
- Removes waste materials.

Location

- Bottom portion of fermenter.

Characteristics of An Ideal Fermenter

An ideal fermenter should:

1. Be sterile and contamination-free.
2. Provide efficient aeration.
3. Ensure proper mixing and agitation.
4. Allow easy cleaning and sterilization.
5. Withstand high temperature and pressure.
6. Support automatic monitoring and control.

Advantages of Large-Scale Fermenters

- High production capacity.
- Better process control.
- Reduced contamination.
- Continuous production possible.
- Cost-effective industrial manufacturing.

Applications of Large-Scale Fermenters

Pharmaceutical Industry

- Antibiotic production
- Vaccine production
- Enzyme production
- Hormone production

Food Industry

- Yogurt production
- Cheese production
- Vinegar production

Alcohol Industry

- Beer production
- Wine production
- Ethanol production

Biotechnology Industry

- Recombinant protein production
- Biopharmaceutical manufacturing

Chemical Industry

- Organic acid production