



CONTROL OF BIOPROCESS PARAMETERS

By

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Introduction

- There are a large number of Physical, Chemical and Biological parameters that can be measure during fermentation.

Physical	Chemical	Biological
Temperature	pH	Protein concentration
Pressure	Substrate Concentration	ATP concentration
Flow Rate	O ₂ Concentration	Activity of Specific enzyme
Viscosity	Waste Gas Concentration	DNA/RNA content
Turbidity	Ionic strength	
Power consumption		

Temperature

Thermocoupled

- Rapid, Cheap temperature sensor
- Measure low and high temp.
- Accuracy $0.5\pm$ - $2.2 \pm$ °C
- Need to calibrate periodically
- Consist two wires of different metal attach to circuits.
- Sensor classify according to metal used –
- J –iron constantan, T – Copper constantan, K- Chromel alumel

Resistant Temperature Detector (RTD)

- More precise – $0.1 \pm ^\circ\text{C}$
- Do not need to regular calibration
- More expensive
- Needed for narrow range of temperature
- Electric resistant of metal due to change in temp.
- Pt 100 base RTD commonly used.

Gas flow-rate

Turbine anemometer

- Rotating device placed over the path of fluid
- Rotational velocity is proportional to the fluid velocity generated by gas flow
- Provide accurate flow-rate over wide range



Thermal anemometer

- Thin wire immersed in fluid heated by electric current
- The velocity of fluid is related to heat dissipated from wire

pH

- pH electrodes uses to measure pH.
- This electrode function even in high temperature, pressure and other mechanical stress.
- Give rise to accurate pH.
- Combination of several electrodes may used
 - Reference electrode and glass electrodes contact with liquid sample.

O₂ and CO₂ Measurement

- O₂ and CO₂ electrodes can be used to measure O₂ and CO₂.
- These electrodes work based on sensor and amperometric in nature.

ATP assay

- Luciferase based ATP bioluminescence assay was utilized.
- Recently, a protein transduction domain-conjugated luciferase (PTD-Luc) a signalling based enzyme was used for detection of intracellular ATP in HeLa cell.



Thankyou