

system usually reaches a steady state where cell, product, and substrate concentrations remain constant. Continuous culture provides constant environmental conditions for growth and product formation and supplies uniform-quality product. Continuous culture is an important tool to determine the response of microorganisms to their environment and to produce the desired products under optimal environmental conditions. In Chapter 9 we will compare batch and continuous culture in terms of their suitability for large-scale operation.

6.4.2. Some Specific Devices for Continuous Culture

The primary types of continuous cultivation devices are the *chemostat* and *turbidostat*, although plug flow reactors (PFR) are used. In some cases these units are modified by recycle of cells.

Figure 6.16 is a schematic of a continuous culture device (chemostat). Cellular growth is usually limited by one essential nutrient, and other nutrients are in excess. As we will show, when a chemostat is at steady state, the nutrient, product, and cell concentrations are constant. For this reason, the name *chemostat* refers to constant chemical environment.

Figure 6.17 is a schematic of a turbidostat in which the cell concentration in the culture vessel is maintained constant by monitoring the optical density of the culture and controlling the feed flow rate. When the turbidity of the medium exceeds the set point, a

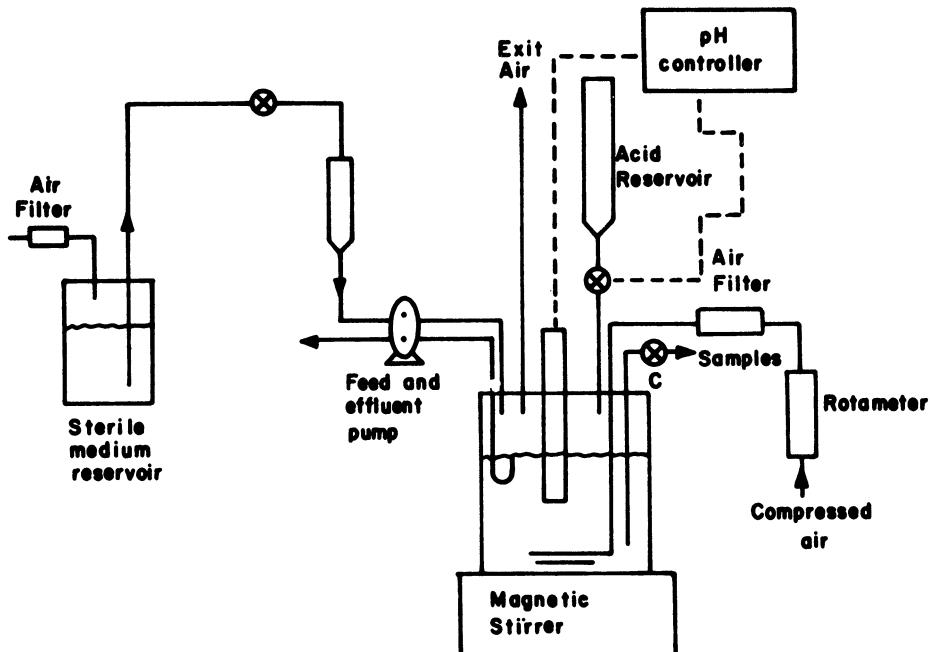


Figure 6.16. A continuous-culture laboratory setup (chemostat). (With permission, from D. I. C. Wang and others, *Fermentation and Enzyme Technology*, John Wiley & Sons, Inc., New York, 1979, p. 99.)