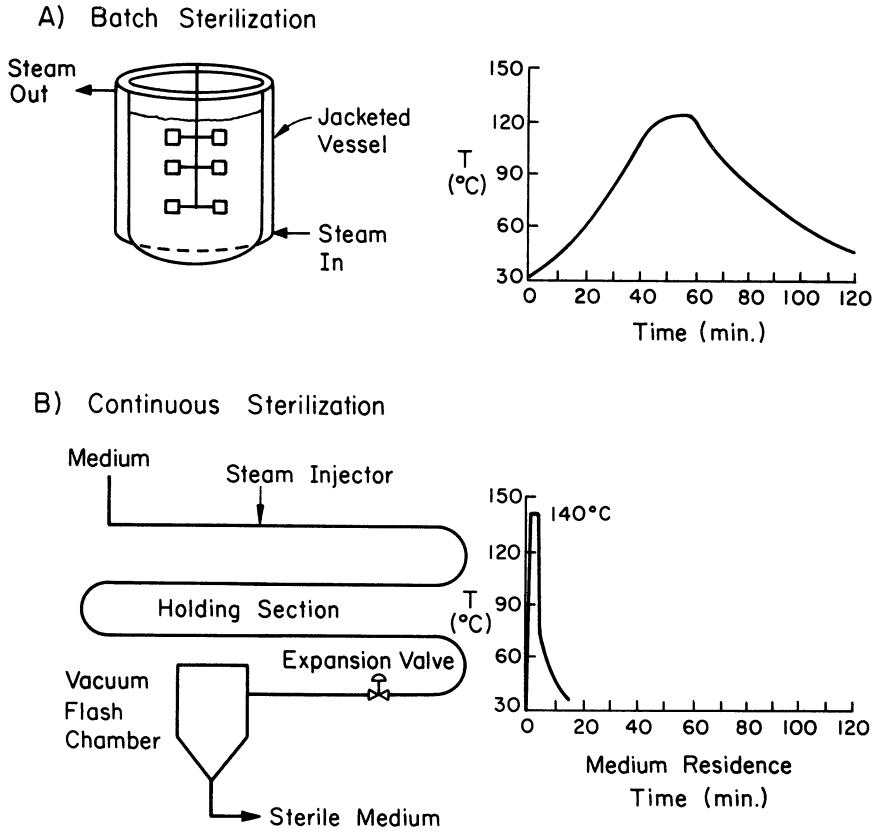

Figure 10.15. Comparison of a batch (A) with a continuous sterilization strategy (B) for the temperature profile of the medium sterilized. The continuous unit allows short-time, high-temperature sterilization.

to allow any contaminants to multiply to a detectable number. Clearly, a period of quarantine will detect only vegetative cells and not host-dependent contaminants (e.g., viruses).

Filter sterilization is used not only to filter medium, but also to sterilize process air.

10.4.3. Sterilization of Gases

Aerobic fermentations require huge volumes of air. At 0.1 to 1 volume of gas per volume of liquid per minute, a 50,000-l fermenter requires $7 \cdot 10^6$ l to $7 \cdot 10^7$ l per day of air. Many fermentations are several days in duration. For a five-day fermentation, as much as $2 \cdot 10^8$ l of air may be required. This volume of air must be absolutely sterile. Typically, the concentration of microbes in air is 10^3 to $10^4/m^3$ or 1 to 10 microbes/l. Fed-batch or continuous culture systems place even more stringent demands on air sterilization, since air filters cannot be replaced during the run period.

An air supply of this magnitude requires sizable air compressors. Adiabatic compression of air can increase the air temperature (typically 150° to 220°C). Dry heat is less