Chapter 4

Types of UHT Processing Plant

The purpose of an ultra-high-temperature sterilizing plant must be, as we have shown, to heat the product to a temperature of the order of 135–150°C, hold it at that temperature for a few seconds, and then cool it to a suitable temperature for filling. Since the chemical changes in the product are minimized by using the highest possible temperature for the shortest time needed to give the required sterilizing effect, it follows that the best overall processing effects on the product will be obtained if the rate of heating to the final temperature is as rapid as possible, and the cooling after the holding period also as rapid as possible.

However, in commercial practice many other factors are important, in addition to the theoretical requirement for the most rapid heating and cooling. Most of these factors are economic, either directly or indirectly. For example, the buyer and user of a UHT plant will want to have a plant which will meet his processing needs at the lowest overall cost. He will aim for the lowest first or capital cost of the UHT plant and of any other associated equipment such as boilers, water treatment plant and equipment for steam treatment. He will wish to minimize running costs, such as the costs of energy, water, detergents and sterilants. He will be interested in staff requirements and in the type of staff that will be required to operate and maintain the equipment, including ancillary equipment such as services and instrumentation. He will want to know whether the plant will operate continuously without the need for cleaning for the type of product he wishes to process, and for the total volume of product that he may want to process at one time. If cleaning may be necessary during a processing run, will it be better and less costly overall to accept this rather than use a different type of plant to avoid the difficulty?
There are many different types of UHT processing plant, all of which aim to give a satisfactory product, but which may differ in other characteristics so that one type of plant is more appropriate for a given process and application than another.

The principles of operation and construction of the main types of UHT sterilizing equipment are summarized in Fig. 4.1. The heating medium in most equipment is steam or hot water, produced from the combustion of solid fuel, oil or gas. In a few cases, the steam or hot water may be obtained from an electrically heated boiler, but this is an exceptional situation because of the relatively high cost of thermally generated electricity used merely as a source of heat, which itself arises from the low efficiency of a central thermal power station and distribution system (about 30%) as compared with that of a gas, oil or solid fuel boiler of the type that might be used in a processing plant (perhaps 70–80%). An electrically heated boiler is only likely to be economic where, for example, cheap electricity from hydroelectric sources is available at a site where other fuels cannot be obtained easily.

In a few types of sterilizer, not at present widely used, electricity is

Fig. 4.1. Types of UHT plant and heating energy source.