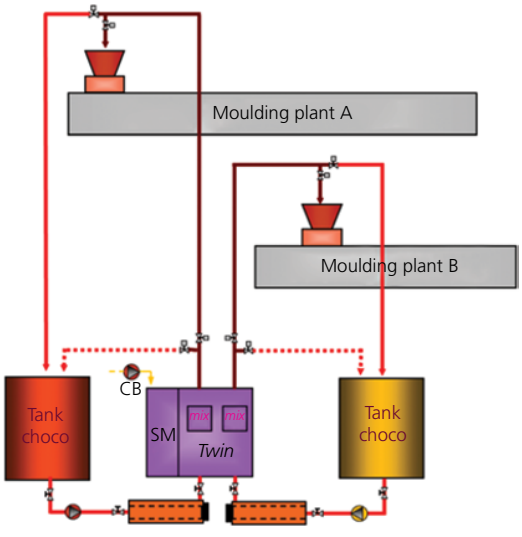

Figure 13.29 Process layout for SeedMaster Compact® twin version in two moulding lines. Reproduced with permission of Bühler AG, Switzerland.

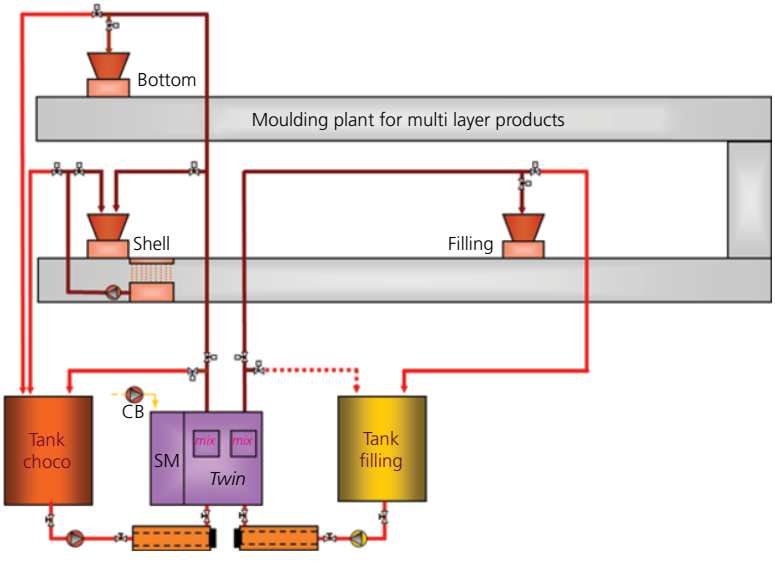

Figure 13.30 Process layout for SeedMaster Compact® twin version for filled products. Reproduced with permission of Bühler AG, Switzerland.

to the confectionery filling (Figure 13.30).This concept is strongly dependent on the size of the moulding line, length of pipings, distance to depositors and so on. Often the combination of a single with a twin SeedMaster Compact® unit is applied to provide even greater flexibility.

The Seedmaster Compact® Triple and Quattro versions are also commercially available. The Quattro model has four different chocolate process streams seeded by a single crystalliser unit.

13.8 Other methods of tempering

There is a variety of other tempering methods and machines found, particularly in patent literature. Many are of historical interest and no longer relevant for modern industrial production of chocolates and it is not possible to mention them all here. Some types of these "historical" tempering systems described by Beckett (1995) are listed below:

1. *Cooling drum.* Multiple or single layouts condition chocolate before it is trickle-fed to the enrobers.
2. *Drip feeding of untempered chocolate*, where the material already in the enrober tank seeds new incoming chocolate.
3. *Screw-type tempering machines*, some horizontal, some vertical with different screw geometries and arrangements.
4. *Lehmann Multi-Roller* for cooling and tempering highly viscous paste systems and delivering it into suitable trays at the end of the machine.
5. *Bauermeister pressure tempering*, a high-efficiency, scraped cylindrical, horizontally disposed, heat exchanger, fitted with an adjustable relief valve at the exit to maintain a cylinder pressure of between 1.7 and 10.5 bar.
6. *Thermocyclic/cyclothermic tempering* with four or five subsequent cooling–heating steps to stepwise generate highly stable seed, but long residence time and large volume equipment are required.

Conclusion

There are many types of tempering machines available to the chocolate manufacturer, each having its own advantages and disadvantages. To obtain good processing and a high-quality product however requires accurate control of the mechanical and thermal history of the fat crystals generated in the chocolate. This can in principle be done by precisely adjusting the temperature, shear rate and residence time. This requires homogeneous shear flow fields, good heat transfer and frequent detachment of material from wall boundary layers. In addition, an understanding of the processing and final product from the molecular via the macroscopic/micro-crystalline to the macro-disperse level is very helpful in optimising the tempering process, particularly with respect to raw material variations, new product developments/optimisations and process scaling. It is expected that new analytical methodologies, such as those based on x-ray and neutron scattering, as well as on improved in-line instrumentation to monitor the