

continuous operating demand for solid layer melt crystallization. In this part, the continuous melt crystallizers are summarized for both suspension and solid layer crystallization.

11.4.1 Continuous Suspension Crystallization

This section presents several kinds of suspension melt crystallizers which can be operated in continuous mode. They are mainly different in their solid handling methods.

11.4.1.1 MSMPR Crystallizer

The MSMPR crystallizer, usually a tank or column, is one of the basic crystallizers for all crystallization processes.^{7,16} Melt crystallization processes could be continuously operated with indirect contact cooling or direct contact cooling methods. The cooling medium circulates in the jacket to create sub cooling in the crystallizers by an indirect contact method. In this case, crystals tend to nucleate on the cooling surface and decrease the heat transfer coefficient, causing encrustations. Therefore, mechanical scrapers are used to remove the crystal layer on the crystallizer inner surface. As for direct contact cooling, immiscible coolants, like air, water or sodium chloride solution, remove the heat and create sub cooling by contacting the melt directly. In this case, encrustation is avoided and the heat transfer area is increased enormously. However, gas distributors (for gas coolants) or separation apparatus (for liquid coolants) increase the complexity of crystallization setups. Meanwhile, the crystallizer volume will be bigger to hold the coolants. For both cooling methods, the crystal-melt residue separation process is important to guarantee the quality of products. Vacuum filtration, pressure filtration, centrifugation, as well as washing could be applied to further increase the purity of crystal products.

11.4.1.2 Inclined Column Crystallizer

As shown in Figure 11.3, an inclined column crystallizer^{30,31} consists of three sections: crystallization section, purification section and melting section. The crystallization section has a jacket for the coolant to create sub cooling and generate crude crystals, while the melting section includes a melter to produce the uprising washing liquid and molten product. To better control the crystallization process, the purification section also needs circulation utility to prevent heat loss. A scraper with blades is rotated in the crystallization section to prevent encrustation on the column wall and enhance the countercurrent contacts between the crystalline particles and washing liquid. Inclined columns work well for systems which have slow settling velocities, resulting from a small density difference between solid particles and mother liquid and high viscosity of mother liquid, when the crystals settle by gravity force.