



Figure 2.9 Illustration of various MSMPR crystallizer configurations involving (a) one, (b) two and (c) three MSMPR stages with identical combined volumes.

The population and mass balance equations were solved using the HR FVM (see Subsection 2.5), and the steady state CSDs of the product stream of three configurations are plotted in Figure 2.10. According to Figure 2.9 and Table 2.7, the combined volume, mean residence time and yield of all combinations are identical. It worth noting that the one MSMPR produced the expected linear number based density function, but the MSMPR cascades produced a peak in the number based particle density function. The difference between the product CSDs is shown better in the normalized volume based CSD graphs, which demonstrate clearly that the MSMPR cascade produces significantly narrower CSD than a single stage MSMPR.

Practically, the operating conditions as well as the number of required stages are optimized with respect to various quality related, technical and economic objectives.

2.4 Modeling the Tubular Crystallizer

Although MSMPR crystallizers remain the most utilized platform for continuous crystallization, largely due to familiarity in terms of operation and control and availability of equipment, they possess some weaknesses for