$S(\lambda)$, and on the probability that the λ crystal will form an L size fragment $b(L/\lambda)$. The more λ size crystals in the system, the more L will be produced $n(\lambda,t)$. D_{bre} is expressed in terms of breakage probability of L size crystals ($S(L)$) and their actual number within the population $n(L,t)$.

2.3 Modeling the MSMPR Crystallizer

The continuous tank crystallizer is an important unit operation in food, pharmaceutical and chemical industries. The continuous mixed suspension mixed product removal (MSMPR) crystallizer is a widely used modeling approximation to describe continuous crystallization processes with unclassified product removal. The MSMPR concept is the analogue of the continuous stirrer tank reactor (CSTR) from chemical reactor engineering, with similar modeling assumptions:

- the crystallizer is perfectly mixed in all three (micro, meso and macro) scales,
- the temperature field is homogeneous in the slurry,
- the product removal is unclassified and the product stream has identical thermodynamic properties with the crystallizer slurry.

This section presents and discusses the derivation of a cooling MSMPR model-equation system, although the model can be easily adapted to other types of crystallization process. The scheme of a continuous jacketed MSMPR crystallizer is illustrated in Figure 2.6.

Considering a jacketed crystallizer, which is the typical cooling strategy for this equipment, the state variables to be modeled are the system volume (mass), solute concentration, crystallizer temperature, coolant temperature

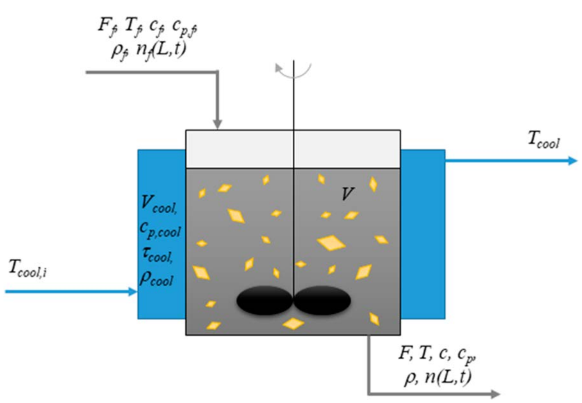

Figure 2.6 Scheme of a continuous jacketed MSMPR crystallizer with the most important process variables.