minimising the heat transfer resistance. For a more detailed review of drying see the paper by Kemp.[6]

13.6 Application of These Principles to Continuous Isolation

The principles and methodologies outlined above are useful for gathering data to select isolation conditions using very small quantities of material typically available in early development. The data collected can be used to select processing conditions for batch or continuous processes. Indeed, the conditions experienced by the material being isolated are for the most part comparable whether the processes deployed are batch or continuous.

Combining all these factors to deliver continuous filtration washing and drying at a scale suitable for early pharmaceutical development and extending into small manufacturing scale of a few kilos per hour represents a significant challenge. The classical options for continuous filtration are either to implement a moving filter medium, *i.e.* a belt filter or a drum filter, or to adopt sequential semi batch dead end filtration. A key distinction between typical batch isolation in a pressure Nutsche filter or filter dryer and continuous filtration on a drum or belt filter is the cake thickness which is usually rather thinner on the drum or belt filter, typically ranging from less than 10 mm to 50 mm but in some cases reaching 100 mm. Batch filtration often operates with cake thickness from 100 to 500 mm with 300 mm being typical. Thus the approach outlined above, based on collecting filtration and washing data with around 50 mL of suspension and collecting 10 to 30 mm of cake, provides data which is consistent with the operation of both moving media continuous filter types and allows the duration of cake formation, washing time and deliquoring time to be estimated and the rate of motion of the belt or drum to be set appropriately and hence the likely throughput to be assessed.

13.6.1 Drum Filtration

Large scale commercial drum filters divide the internal volume of the drum such that the filter operates as a series of sectors allowing the pressure driving force to be adjusted for different sectors of the operation *via* a rotary valve; cake formation, initial deliquoring, wash application, deliquoring and discharge; however this is challenging to do at small scales *e.g.* $< 1 g\ s^{-1}$ dry mass. It should be noted that the discharged product will be a damp powder which will need subsequent drying. It is almost inevitable that the wash is applied to a partially deliquored cake, as applying wash to a fully saturated cake will tend to wash the cake off the drum. This is