Example 1:

A counter current dryer is used to dry 500 kg/h of potato slices from 78 to 8% moisture content on wet basis. Temperatures of product entering and leaving the dryer are 45 and 80°C, respectively. Air at 20°C and 30% relative humidity is heated to 90°C before entering the dryer at 28,000 kg/h. The specific heat of the dry product is 1.85 kJ/kgK. Calculate the conditions of the exhaust air.

Example 2:

A food product has to be dried from $M_o = 0.45$ kg water/kg solid to $M_f = 0.12$ kg water/kg solid in a batch dryer. The bulk density of the wet product is $\rho = 1200$ kg/m$^3$. The dryer has 15 trays, 1.5 cm deep and 10 cm apart, of length $L = 0.75$ m by width = 1.2 m. The total blowing capacity for crossflow circulation is 3 m$^3$/s and the incoming air conditions are held constant at $T = 70$°C and $T_{wb} = 30$°C. Estimate the total drying time.

Small-scale experiments show that the drying behavior of the product can be divided into two well-defined periods. Initially, from fresh product to a critical moisture content of $M_{cr} = 0.28$ kg water/kg solid, a constant rate period is observed. In the second and third periods the diffusive model applies, resulting in $D_{eff} = 5 \times 10^{-10}$ m$^2$/s. From sorption isotherms it is found that equilibrium moisture content at air conditions is $M_e = 0.02$ kg water/kg solid. Shrinkage as a function of moisture content can be represented by $(b/b_0) = 0.6 + 0.4(M/M_o)$. 