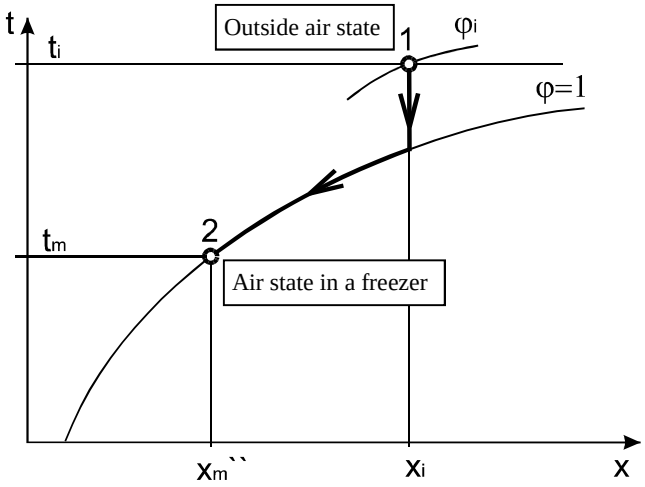
Homework no. 1

Using equations describing moist air processes, Mollier's chart a stream tables solve following examples. Consider constant total air pressure 100 kPa.

Example 1

In a freezer of volume 100 l is maintained temperature -15 °C. Outside air has temperature 20 °C and relative humidity 0.6. Assume complete air exchange when freezer's door is open. Calculate the mass of icing (condensed and frozen water vapor) in the freezer when the number of door openings is 150 in month. Calculate total, sensible and latent heat of freezing process.



Example 2

Cooling water from a power plant condenser having mass flow rate 1100 kg·s^{-1} and temperature 40 °C is cooled in an open cooling tower to temperature 20 °C. Water is cooled by air having inlet temperature 20 °C and relative humidity 0.5, outlet temperature is presumed 33 °C and relative humidity 0.95.

Calculate cooling air mass flow rate and necessary supply rate of water into cooling water which compensate evaporated water in a tower.

a) Use steam tables
b) Use Mollier's chart

(note: start with heat balance of a cooling tower between water and air)