**ENTROPY CALCULATION WITH REAL FLUID MODEL**A rigid tank with a volume of 18 ft3 contains superheated steam at 600 psia and 1000°F. A valve on the tank is suddenly opened and steam is allowed to escape until the pressure in the tank becomes 180 psia. While the steam is escaping, heat is simultaneously added to the tank in a manner that causes the specific enthalpy inside the tank to remain constant throughout the process. Determine the the *specific* and *total* entropy change of the steam in the tank.

Strategy: State 1 is fully specified. State 2 can be found knowing the final pressure (given) and the enthalpy.

State 1:  

State 2:   (Interpolation in Table C.3a)

The *specific* entropy change of the steam is,



The *total* entropy change of the steam is,



We need to find the masses at states 1 and 2. This can be done because the volume of the tank is known along with the specific volumes …



Then,



**ENTROPY CALCULATION WITH INCOMPRESSIBLE SUBSTANCE MODEL**A sample of liquid water exists at room temperature and pressure (14.7 psia, 70°F). The water is now put into a freezer until it is completely frozen. Determine the change of specific entropy of the water for this process.

Using the incompressible substance model for the water,



It’s OK to have a negative change of entropy! This is consistent with what we know about entropy being a measure of molecular chaos. Solids are more organized and will have a lower entropy compared to liquids.

**ENTROPY CALCULATION WITH IDEAL GAS MODEL**  
  
Three kilograms of argon are initially at 300 kPa, 500 K. Heat is now added to the argon until is pressure and temperature become 400 kPa, 700 K. For this process, determine the change of *specific* and *total* entropy of the argon for this heating process.

Using the ideal gas model for argon,



**Note**: Argon is an ideal gas with constant heat capacity (it is an inert gas … inert gases have a constant heat capacity!).