Problem 3.2: A tank is at 0.5 atm and T=298. Atmosphere at P0 and T=298. Calculate the final temp. inside the tank if valve is open and air is let in. The tank is insulated.

The system is solved by taking into account the total number of moles of gas in the tank, and considering the work that the atmosphere does to push "new" gas inside the tank.

Remember that for an ideal gas the internal energy is only a function of temperature. The initial temperature for the gas inside and outside the tank is the same. This is why we take into account the total number of moles to calculate the total energy change in the system.

Now, in order to calculate this change in energy, we have to write the first law, and since the heat transfer from the tank to the environment is zero (Q=0) then the only possible energy transfer done to the system is through PV work. The atmosphere, which always remains at constant pressure pushes an amount of gas equivalent to Vc inside the tank and this gas transfers energy in turn to the gas inside the tank.

From the thermodynamic point of view, this energy transfer from the gas entering the tank to the gas already there is inconsequential.

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