Answer on Question #45385, Physics, Molecular Physics | Thermodynamics

Task: A certain fluid at 10bar is contained in a cylinder behind a piston, the initial volume being 0.05m^3. Calculate the work done by the fluid when it expands reversibly: 1. According to a linear law to a final volume of 0.2m^3 and a final pressure of 2 bar. 2 according to a law, p=(A/V^2)-(B/V), to a final volume of 0.1m^3 and a final pressure of 1bar, where A and B are constants. Sketch the processes on a P-V diagram.

Solution:

W = Pdv = P(V2-V1) = 1000 kPa * (.2 - .05) = 150 kJ

W = area under curve so = P2*dv + .5*dv*dp = 200*.15 + .5*.15*800 = 90 kJ

W = P1V1*ln(V2/V1) = 1000*.05 * ln(.1/.05) = 34.7 kJ

W = (p2v2 - p1v1) / 1-n when p2 = p1*(V1/V2)^3 = 1.25 bar

W = (125*.1 - 1000*.05) / -2 = 18.75 kJ