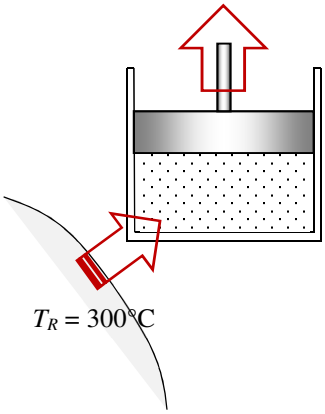
EXAMPLE: Closed system finite time exergy analysis

A mass of 0.25 kg of air (c_p = 1.005 kJ/kg·K, c_v = 0.718 kJ/kg·K) is contained in a piston cylinder initially at P_1 = 200 kPa and T_1 = 35°C. The air undergoes a two-step process consisting of a constant pressure process until the temperature reaches 175°C followed by a constant volume process until the temperature reaches 250°C. All heat transfer to the air occurs from contact with a thermal reservoir at T_R = 300°C. The surroundings are at 100 kPa and 300 K.



(a) Sketch the two-step process on *T*-*s* and *P*-*v* diagrams.
(b) Using an energy conservation/entropy accounting approach, find
    1. the total useful work *out* of the air and
    2. the maximum possible useful work out of the air.
(c) Repeat (b) using an accounting of exergy approach.