Enthalpy

Enthalpy Calculation

120 kg of steam at $p = 1000$ kPa and $T = 200^{\circ}$C has internal energy $u = 2623$ kJ/kg and specific volume ($v = 0.2061$ m^3/kg Calculate the specific enthalpy (h) and the total enthalpy for the 120-kg mass.

Given for steam:

- mass $m = 120$ kg
- pressure $P = 1000$ kPa
- temperature $T = 200^{\circ}$C (not needed for calculation)
- internal energy $u = 2623$ kJ/kg
- specific volume $v = 0.2061$ m^3/kg

The specific enthalpy is

$$h = u + Pv \tag{1}$$

Note: with (P) in kPa and (v) in m(^3)/kg, the product (Pv) has units kJ/kg (since (1 kPa m^3 = 1 kJ)).

Compute (Pv):

$$Pv = 1000 \times 0.2061 = 206.1 \text{ kJ/kg}$$

So the specific enthalpy is:

$$h = 2623 + 206.1 = 2829.1 \text{ kJ/kg}$$

Total enthalpy for the 120 kg of steam:

$$H = m\,h = 120 \times 2829.1 = 339{,}492 \text{ kJ}$$

Answers

- Specific enthalpy: $\boxed{h = 2829.1 \text{ kJ/kg}}$
- Total enthalpy for 120 kg: $\boxed{H = 339{,}492 \text{ kJ}}$

Code

```
# Given data
m = 120           # kg
P = 1000          # kPa
u = 2623          # kJ/kg
v = 0.2061        # m³/kg

# Enthalpy calculation
h = u + P * v           # kJ/kg
H_total = m * h         # kJ

print(f"Specific enthalpy h = {h:.1f} kJ/kg")
print(f"Total enthalpy H = {H_total:,.0f} kJ")
```