Thermodynamics

notes

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Contents

1 Energy

1.1 Special esoteric energy

$$\bar{u} = \frac{U}{m}\ [\frac{J}{kg}], \quad m = mass \quad U = energy \tag{1}$$

2 density

$$p = \frac{m}{V} \tag{2}$$

3 Special Volume

Opposite of density

$$\bar{v} = \frac{m}{V} \tag{3}$$

4 properties of clean solutions in thermodynamix by Katsap

4.1 hydrated/dehydrated steam EXAMPLE1

4.1.1 Υδρατμοι 20 %

4.1.2 Πιεση

150 kPa

1. solution EXAMPLE1

   Απο πίνακες πρεπει να τα βρίσκω όλα ...

   για να μπορέσω να τα βρώ θέλω τον σωστό πίνακα.....

Ο ειδικός όγκος υπολογίζεται ως εξής:

$$υ=(1-x)\cdot υ_f+x\cdot υ_g \Leftrightarrow υ=(1-0,20)\cdot 0,001053\ \frac{m^3}{kg}+0,20\cdot 1,1594\ \frac{m^3}{kg} \Leftrightarrow υ= 0,2327\ \frac{m^3}{kg}$$

Ομοίως, η ειδική ενθαλπία υπολογίζεται από τη σχέση:

$$h=(1-x)\cdot h_f+x\cdot h_g \Leftrightarrow υ=(1-0,20)\cdot 467,13\ \frac{kJ}{kg}+0,20\cdot 2.693,1\ \frac{kJ}{kg} \Leftrightarrow h= 912,32\ \frac{kJ}{kg}$$

4.2 coolant enthalpy EXAMPLE2

4.2.1 20 kg (R134a)

4.2.2 air composition 85%

4.2.3 heated at 90 °C

4.2.4 constant pressure 1MPa

1. solution EXAMPLE2
   (a) go to tables
   (b) find all needed stuff $u_f, ..., h_f$
   (c) solve the God damn thing by:
      i. plugin the values
      ii. u and h have the same general equation. (see example1)
   (d) x is always the (%) given in the known states of the system.
   (e) go in the P/H diagram and cross-find special enthalpy h_2
   (f) solve the easyest equation $\Delta(H) = \Delta(h) \cdot m$

4.3 overheated steam EXAMPLE3

4.3.1 Pressure $P_g = \mathbf{1,5}$ $[(MNt)/m^2] = [MPa]$

4.3.2 degrees Of Heating $\Theta = \mathbf{76,7}$ °C

1. solution EXAMPLE3
   (a) degrees Of Heating $==$ Θ °C $\uparrow +$ T_{sat}(°C) at 1,5 MPa
   (b) Linear interpolation for T1 and T2 at P_g, where $P_g \in \{P1<P<P2\}$ (γραμμική παρεμβολή)
   (c) find the mean value T $(T_n - T_{n-1})/n$
   (d) for h
      i. calculate h for P1 and P2 in the respective for T
         Where T1< T=°C $\uparrow +$ T(°C) 1,5 MPa <T2
      ii. compute the lin. interpolation for h at T (see (1.))

$$h_g = h_{g1} - \frac{p - p_1}{p_2 - p_1} \cdot (h_{g1} - h_{g2}) \Rightarrow$$

5 1st law of thermodynamix by Katsap

5.1 dencity and special volume

$$\begin{aligned} d &= \frac{1}{u} \\ where\ u &= \frac{V}{m} \\ &= \frac{\dot{V}}{\dot{m}} \end{aligned} \tag{4}$$

5.2 mass/volume supply

$$\dot{V} = v \cdot A$$

$$\dot{m} = \rho \cdot v \cdot A$$