

PROBLEM 12-7N QUESTION

Computation Of The Axial Distribution Of Thermal And Hydraulic Characteristics Of A Horizontal Steam Generator

- 1) Operating conditions: see Table 1
- 2) Properties: determine using the given operating conditions
- 3) Material and geometry: see Table 1
- 4) Questions: compute the axial distribution of the following parameters on the secondary side:
 - a) Temperature
 - b) Enthalpy
 - c) Quality
 - d) Void fraction
 - e) Mass flux (liquid, vapor, total)
 - f) Volume flux (liquid, vapor, total)
- 5) Assumptions:
 - 1 dimension flow
 - Thermodynamic equilibrium
 - Slip ratio = 1.5
 - Once-through steam generator

Table 1

	Geometry	Thermal	Hydrodynamic
Primary: Horizontal U-Tube (Full-Power Conditions)	Tube O.D. = 0.687 in Tube thickness = 0.050 in Average tube length = 23.78 ft Number of tubes = 13856 Heat transfer area = 59,260 ft ²	Inlet temp. = 619.2°F Outlet temp. = 555.0°F Power = 900 MW h = 950 Btu/hr·ft ² °F	Flow rate = 34.1 x 10 ⁶ lbm/hr Pressure = 2250 psia
Secondary		Steam temp. = 540.2°F Feedwater temp. = 440.0°F	Steam pressure = 964.2 psia Flow rate = 3.96 x 10 ⁶ lbm/hr
Overall	Tube bundle height = 12.25 ft Tube bundle cross-sectional area (for axial secondary flow) = 471.75 ft ² Shell I.D. = 19.5 ft Shell length = 39.0 ft Collector I.D. = 48 in.		