
PROBLEM 13-9N QUESTION

Heat Transfer Problems for a BWR Channel

Consider a channel operating at BWR pressure conditions with a cosine heat flux distribution. Relevant conditions are as follows:

<u>Geometry</u>	<u>Operating Conditions</u>
$D = 17 \text{ mm}$	$\rho = 7.5 \text{ MPa}$
$L = 3.8 \text{ m}$	$T_{\text{in}} = 270^\circ\text{C}$
$L_e = L$	$G = 1700 \text{ kg/m}^2\text{s}$
	$q''_{\text{max}} = 1050 \text{ kW/m}^2$
	$\text{Pr} = 1.0$
	$\mu = 8.7 \times 10^{-5} \text{ kg/m}\cdot\text{s}$

- A) Find the axial position where the equilibrium quality, x_e , is zero.
- B) What is the axial extent of the channel where the actual quality is zero? i.e., this requires finding the axial location of boiling incipience. (*It is sufficient to provide a final equation with all parameters expressed numerically to determine this answer without solving for the final result.*)
- C) Find the axial location of maximum wall temperature assuming the heat transfer coefficient and given by the Thom, et al., correlation for nuclear boiling heat transfer (Eq. 12-28b).
- D) Find the axial location of maximum wall temperature assuming the heat transfer coefficient is not constant but varies as is calculated by relevant correlations. Here you are not asked for the exact location, but whether the location is upstream or downstream from the value from Part C.