Annular Flow Heat Transfer Coefficient @model

Mathematical model of Heat Transfer Coefficient through the annulus gap between concentric pipes filled with fluid:

(1) $$U = \frac{\lambda_{ann}}{d_h} \mathrm{Nu}_{ann}$$

where

λ_{ann}	thermal conductivity of fluid in the annulus
d_{ann}	annular hydraulic diameter
Nu_{ann}	dimensionless Nusselt number (Nu)

The Nusselt number (Nu) correlations are:

Stagnant fluid	Natural Convection		Forced Convection	
OEIS sequence A282581			J. DIRKER & J. P. MEYER	
(2) $\mathrm{Nu} = 3.6568$	(3) $\mathrm{Nu} = \frac{2 \cdot \epsilon(\mathrm{Ra})}{\ln(r_{out}/r_{in})}$		(4) $\mathrm{Nu} = c \cdot \mathrm{Re}_D^p \cdot \mathrm{Pr}^{0.4} \cdot \left(\frac{\mu}{\mu_w} \right)^{0.14}$	
	where		where	
			Re	Reynolds number
	$\epsilon(\mathrm{Ra})$	Natural Convection Heat Transfer Multiplier	$\mathrm{Pr} = \nu / a$	Prandtl number
	Ra	Rayleigh number	ν	kinematic viscosity
			a	thermal diffusivity
			r_{out}	inner radius of outer pipe
			r_{in}	outer radius of inner pipe
			$\zeta = r_{out}/r_{in}$	
			$p = 1.013 \cdot \exp[-0.067 \cdot \zeta]$	
			$c = \frac{0.03\, \zeta^{1.86}}{0.063\, \zeta^3 - 0.674\, \zeta^2 + 2.225\, \zeta - 1.157}$	

See also

Physics / Thermodynamics / Heat Transfer / Heat Transfer Coefficient (HTC) / Heat Transfer Coefficient (HTC) @model

[Thermal conductivity] [Nusselt number (Nu)]

Reference

J. DIRKER & J. P. MEYER (2005) Convective Heat Transfer Coefficients in Concentric Annuli, Heat Transfer Engineering, 26:2, 38-44, DOI: 10.1080/01457630590897097