



















The correlation of Sarma et al., valid only for water, returns results which differ by 21.6 % from those supplied by CFD analysis.

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## NOMENCLATURE

$C_{pinc}$	specific heat of Incoloy-825, J. kg-1. K-1
$C_{pco}$	specific heat of crude oil, J. kg-1. K-1
D	width of tape, mm
h	convective heat transfer coefficient, W.m-2.K-1
$\bar{h}$	average convective heat transfer coefficient, W.m-2.K-1
$k_{inc}$	thermal conductivity of Incoloy-825, W.m-1.K-1
$k_{co}$	thermal conductivity of crude oil, W.m-1.K-1
l	pipe length, m
L	tape length, mm
L/D	twist ratio, dimensionless
$\dot{m}$	water flow rate, g.s-1
Nu	Nusselt number, dimensionless
Pr	Prandtl number, dimensionless
$Q_{ext}$	external heat power, W
$Q_{in}$	input heat power, W
$Q_{out}$	output heat power, W
Re	Reynolds number, dimensionless
RMSEP	root mean squared percentage error, %
s	thickness of the pipe, mm
$T_{in}$	temperature in the inlet section, °C
$T_{out}$	temperature in the outlet section, °C
$\bar{T}_w$	average temperature of the wall, °C

## Greek symbols

$\delta$	thickness of the tape, mm
$\Delta p$	pressure drop per unit length, Pa.m-1
$\mu_{co}$	dynamic viscosity of crude oil, N.s.m-2
$\rho_{inc}$	density of Incoloy-825, kg.m-3
$\rho_{co}$	density of crude oil, kg.m-3
$J_{ext}$	external diameter of the pipe, mm
$\Phi_{ext}$	external heat flux, W.m-2

## Subscripts

co	crude oil
ext	external
in	inlet
inc	Incoloy-825
out	outlet
w	wall