Pressure Profile in GC-proxy static fluid column @model

Motivation

Proxy model of Pressure Profile in Homogeneous Steady-State Pipe Flow @model in the form of algebraic equation for fast computation.

Outputs

$p(l)$	Pressure distribution along the pipe

Inputs

T_0	Intake temperature	$T(l)$	Along-pipe temperature profile
p_0	Intake pressure	$\rho(T,p)$	Fluid density
$z(l)$	Pipeline trajectory TVDss	$\mu(T,p)$	Fluid viscosity
$\theta(l)$	Pipeline trajectory inclination, $\cos\theta(l) = \frac{dz}{dl}$	A	Pipe cross-section area

Assumptions

Steady-State flow	Quasi-isothermal flow
$\frac{\partial p}{\partial t} = 0$	$\frac{\partial T}{\partial t} = 0 \rightarrow T(t,l) = T(l)$
Homogenous flow	Constant cross-section pipe area A along hole
$\frac{\partial p}{\partial \tau_x} = \frac{\partial p}{\partial \tau_y} = 0 \rightarrow p(t,\tau_x,\tau_y,l) = p(l)$	$A(l) = A = \text{const}$
Constant inclination	Linear density
$\theta(l) = \theta = \text{const} \rightarrow \cos\theta = \frac{dz}{dl} = \text{const}$	$\rho = \rho^* \cdot (1 + c^* \cdot p)$

Equation

Pressure profile in static fluid column, no flow: $\dot{m} = 0, \; q_0 = 0$	(1) $p(L) = \frac{1}{c^*} \cdot \left[-1 + (1 + c^* \, p_0) \cdot \exp(c^* \, \rho^* \, G \, L) \right]$	(2) $p(L) = p_0 + \frac{1}{c_0} \cdot \left[-1 + \exp(c_0 \, \rho_0 \, G \, L) \right]$

where

$G = g \cdot \cos \theta$	gravity acceleration along pipe

See ...

See also

Physics / Fluid Dynamics / Pipe Flow Dynamics / Pipe Flow Simulation / Pressure Profile in Homogeneous Quasi-Isothermal Steady-State Pipe Flow @model

[Pressure Profile in G-Proxy Pipe Flow @model / Pressure Profile in GF-Proxy Pipe Flow @model]

References