

Conference, Madrid, Spain.
<https://doi.org/10.2118/94097-MS>

- [13] Hasan AR, Kabir CS, Wang XW. (2009). A robust steady-state model for flowing-fluid temperature in complex wells. SPE Production & Operations 24(2): 269-276. <https://doi.org/10.2118/109765-PA>
- [14] Gilbert P, Peysson Y, Vincke O. (2009). Numerical computation of a circulating drilling fluid. SPE-125697-MS. <https://doi.org/10.2118/125697-MS>

NOMENCLATURE

A	the cross-sectional area, m ²
C	specific heat of the material, J/(kg · K)
h	heat transfer coefficient, W/(m ² · K)
k	thermal conductivity, W/(m ² · K)
M	the molar mass of gas, g. mol ⁻¹
p	pressure, Pa
r	the radial length, m
R	the molar gas constant, 8.314 J/(mol.K)
t	time, s
T	temperature, K
v	flow velocity of drilling fluids, m. s ⁻¹
W	mass flow rate, kg.s ⁻¹

z	depth, m
Z	Gas compression factor, dimensionless

Greek symbols

ρ	fluid density, kg.m ⁻³
---	-----------------------------------

Subscripts

d	drill pipe
e	external boundary
f	mud fluid
g	gas fluid
i	1,2,3,4,5 region
m	mud
r	the radial direction
m	mud
s	solid material
w	water
z	in the vertical direction
ef	effective value
int	initial condition
rg	relative permeability of gas
rw	relative permeability of water