

NOMENCLATURE

A the cross-sectional area of the pipe, m^2 ;
 S the wetted perimeter, m ;
 D the hydraulic diameter, m ;
 τ the shear stress, N / m^2 ;
 α the inclination angle of the pipe;
 U the in-situ velocity, m / s ;
 f the friction coefficient;
 μ the dynamic viscosity, cp ;
 R the pipe radius, m ;
 η_w the water fraction, %;
 η_{wm} the water fraction of the mixture layer, %;
 Q the volume velocity, m^3 / s ;
 Q_T the volume velocity of the total flow, m^3 / s ,

$U_{SWinput}$ the input surface velocity of the water layer, m / s ;
 $U_{SOinput}$ the input surface velocity of the oil layer, m / s ;
 U_{SW} the surface velocity of the water layer, m / s ;
 U_{SO} the surface velocity of the oil layer, m / s ;
 U_{SM} the surface velocity of the mixture layer, m / s ;
 h_w the water holdup, %.

Subscripts

o The oil layer
w The water layer
m The mixture layer
i The oil-water interface
 i_1 The water-mixture interface
 i_2 The mixture-oil interface