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Treesph Simulations of Choked Flow Systems Using Smoothed Particle Hydrodynamics

Jaime Klapp[(1)], Leonardo Di G. Sigalotti[(2)], Eloy Sira[(2)], Gonzalo Mendoza[(1)]

(1) *ININ, Mexico*
(2) *IVIC, Venezuela*

Here we present exploratory two-dimensional calculations of the flow of a viscous, single-phase fluid through a wellhead choke of real dimensions using the method of Smoothed Particle Hydrodynamics coupled with a simple isothermal equation of state for description of the flow. The results indicate that an approximate stationary flow pattern is rapidly established across the entire tube, with the density and pressure dropping and the flow velocity rising within the choke throat. If the downstream flow is inhibited at the outlet extreme of the tube, a pressure drop of about 20% occurs across the choke when the flow reaches an approximate steady state. If, on the other hand, the flow is not inhibited downstream, the pressure drop reduces to about 13% or less. The flow across the choke throat remains subsonic. We compare the results with experimental data.

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