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Saroj Kumar Samantaray, Bijay Kumar Rout, Soumya Sanjeeb Mohapatra, Basudeb Munshi

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**Newtonian Flow past a Hollow Frustum in Vertical and Inclined Plane:
An Experimental Observation for Terminal Velocity and Drag Coefficient**

*Saroj Kumar Samantaray¹, Bijay Kumar Rout², Soumya Sanjeeb Mohapatra¹ and
Basudeb Munshi^{1*}*

*¹Department of Chemical Engineering, National Institute of Technology Rourkela - 769008,
India.*

²Department of Mechanical Engineering, Birla Institute of Technology and Science Pilani, India

Abstract

This work included the experimental studies of the Newtonian fluid flow over hollow frustum both in the normal and inclined channel. It encompasses terminal velocity and drag coefficient, C_D data for $0.13 \leq Re \leq 8.41$, $0.19 \leq d_o/D \leq 0.33$, $0.22 \leq d_i/d_o \leq 0.83$ and $40^\circ \leq \theta \leq 90^\circ$. The effect of inner diameter to outer diameter ratio, d_i/d_o and the outer diameter to the flow channel diameter ratio, d_o/D on terminal velocity is reported for the specified range of angle of inclination, θ for several hollow frustums in a series of high viscous Newtonian fluids. The terminal velocity shows an increasing trend with increasing and decreasing d_o/D and d_i/d_o ratios, respectively. The terminal velocity also increases with increasing the angle of inclination, θ of the flow channel. Predictive equations are developed for the estimation of C_D as a combined function of Re , d_i/d_o , d_o/D and θ . The statistical sensitivity analysis shows a large variation of the drag coefficient of the hollow frustum with the Reynolds number than with d_i/d_o and d_o/D ratios. The dependency of $C_D Re$ term on the fluid viscosity and θ are expressed in terms of the developed correlations. Linear variation of C_D with $1/Re$ confirms that flow regime is laminar in the present study. The experimental drag coefficients are then predicted excellently through numerical approximation using Reynolds Stress Model (RSM) available in Ansys-15.

Keywords: Hollow frustum, terminal velocity, diameter ratio, drag coefficient, Reynolds number

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