Drag reduction efficiency of solid particles in pipelines of two phase flow

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ABSTRACT
Pipe is a common channel to transport fluid from one location to another. Skin frictions formed by turbulent flow in pipe become the main aspect for researchers to explore the field of fluid mechanics. Frictional drag formed in pipelines transporting water can be reduced spectacularly by adding minute amount of drag reducing agents (DRA). Experiments have been conducted to test the performance of titanium dioxide manufacturing wastes (red gypsum) as DRA. The purpose of using an industrial waste is to reduce the amount of waste land filled (waste to wealth) as well as the capability of red gypsum which doesn't influence or change the properties of water. Investigated parameters for this study are solid concentrations (50ppm-200ppm), pipe diameter (0.0127m, 0.0254m and 0.0381m), length of testing section and Reynolds number (Re) or known as fluid flow rate. The results showed that, percentage drag reduction (%DR) increases by increasing the solid concentration at larger pipe with higher water flow rate (Re). A maximum drag reduction of 56.44% has been achieved in 0.0381m pipe diameter at Re=149648.3 and 200 ppm solid concentrations. On the other hand, while testing the effect of pipe length, effective %DR (40.18%) accomplished at 2m (for 200ppm solid concentration). With demonstrated experimental results, it can be concluded that red gypsum regarded as DRA.

KEYWORDS:
Drag reduction; Red gypsum; Concentration; Diameter; Flow rate.

ACKNOWLEDG MENT

I wish to express deepest gratitude to University Malaysia Pahang for providing the grant and facilities to support this research work. Appreciation extended to the supervisor and co-supervisor for their guidance, advice and encouragements. I am very thankful to staff of Faculty of Chemical & Natural Resources Engineering as well who helped in any way.

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