

## Drag Reduction and Velocity Profiles Distribution of Crude Oil Flow in Spiral Pipes

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**Abstract** – One of the main problems that occur in the fluid flow in the pipeline industry is a high consumption on pump power due to high frictional pressure drop in turbulent flow. So many applications that related to fluids transportation in oil and gas industry such as crude oil, oil and gas refinery product, moreover in drilling fluid that contains mud slurry. Therefore it is required to use DRA (Drag Reducing Agent) as method to improve pumping efficiency. Another problem in fluid flow such as crude oil and drilling fluid is the weight concentration of suspension particles, when the speed of flow is not sufficient enough can end with sedimentation in bottom side of pipe so that increased drag. Drag Reducing Agent (DRA) is used as a solution towards reduce the power losses in the piping system. One of the most popular DRA is biopolymer due to its environment friendly and inexpensive. The aims of this study is to investigate the reduction of pressure drop using concentration of additive CMC 250 ppm, 500 ppm and 750 ppm into crude oil flow in the straight spiral pipe with diameter ratio  $P/D_i=3,5; 5,4;$  and  $7,6$ , and circular pipe with diameter  $D_i=17$  mm. The effectiveness of DRA is analyzed by measuring the profile of velocity distributions using pitot tube. The results showed that the maximum DR percentage of 750 ppm for circular pipe is 35,8%, for spiral pipes with ratio  $P/D_i 3,5=20,3\%$ ,  $P/D_i 5,4=25,6\%$ ,  $P/D_i 7,6=32,5\%$ . Increasing of DR is presented by the data of velocity distribution profiles that increased by increasing CMC concentration. The important of this research is the application of spiral pipe offers the best solution for the flow of crude oil containing a heavy concentration of particles in suspension. Certain ratios of spiral pipe and additives CMC can be obtained without sedimentation of crude oil flow and flow with lower drag. Copyright © 2015 Praise Worthy Prize S.r.l. - All rights reserved

**Keywords:** Drag Reduction, CMC, Velocity Distribution Profile, Circular Pipe, Spiral Pipe

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