

## **Oil-soluble organic polymer driven from aloe vera as drag reducing agent for crude oil flow in pipelines**

*Wafaa K. Mahmood<sup>a</sup>, Samar S. Hussein<sup>a</sup>, Wafaa A. Kadhim<sup>b</sup> and Hayder A. Abdulbari*

<sup>a</sup> Department of Production Engineering and Metallurgy, University of Technology-Iraq, Baghdad, Iraq

<sup>b</sup> Nanotechnology and Advanced Materials Research Center, University of Technology-Iraq, Baghdad, Iraq

<sup>c</sup> Department of Chemical Engineering, Centre of Excellence for Advanced Research in Fluid Flow, College of Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, Gambang, 26300, Pahang, Malaysia

### **ABSTRACT**

In the present work, an organic oil-soluble drag-reducing agent (DRA) is introduced and experimentally tested. The new additive is driven from aloe vera mucilage extracted directly from the aloe vera plant. Polymer grafting process was implemented to change the solubility of the new additives from water-soluble to oil-soluble. Drag reduction solutions are prepared by mixing certain additives concentrations (200 wppm to 600 wppm) with the crude oil. Each solution was rheologically tested to examine the effect of the additives on the viscosity and viscoelastic properties of the crude oil. The drag reduction performance was examined using a closed-loop liquid circulation system specially designed and fabricated for the present work. The experimental results showed that the viscosity of the solutions decreases when the concentration of the additives increases without affecting the crude oil entity (Newtonian behaviour) with noticeable dramatic changes in the viscoelastic properties. A maximum drag reduction percentage of 82% was achieved with an additive concentration of 600 wppm. Finally, the resistance of the new additives to mechanical shear forces was high and increased exponentially with the concentration.

### **KEYWORDS**

Drag reduction; Crude oil; Polymer; Aloe vera; Rheology; Viscoelasticity

