Effect of the addition of biopolymer on the rheological behavior of Portland oilwell cement slurries

A. K. C. Nóbrega[(1)*], A. E. Martinelli[(1)], D. M. Melo[(1)], M. A. F. Melo[(1)], E. B. Dantas[(1)], U. T. Bezerra [(2)]

(1) UFRN, Universidade Federal do Rio Grande do Norte, email: akcn123@hotmail.com
(2) IFPB, Instituto Federal da Paraíba, email: dartarios@yahoo.com.br
* Corresponding author

Abstract – Polymeric admixtures can be added to Portland slurries to improve their mechanical properties aiming at superior performance in oilwell cementing applications. However, polymers usually increase the viscosity of slurries, impairing their mixing and pumping ability. In this study, an environmentally friendly biopolymer was added to Portland slurries in combination with alcohol or silicone based dispersants. The overall effect on the rheological parameters on the slurry was studied.

The behavior of hardened Portland-based oilwell slurries can be improved by the addition of a number of chemical admixtures, including polymers to increase fracture energy [1-2]. In this study, a biopolymeric admixture was prepared in the laboratory and added to oilwell cement slurries. Biopolymeric solutions were diluted in acid at different concentrations (0.25 and 2.0 M). Previous studies showed that even slight additions of the biopolymeric solution significantly affected the rheological behavior of the slurry, especially by increasing their plastic viscosity. To counteract such effect, dispersants must be added to the composition of the slurries. Whenever different admixtures are added to cement slurries, their chemical nature can have beneficial or deleterious synergic effects that determine the final properties of the material.

Composite slurries containing a biopolymeric solution in combination with alcohol or silicone based antifoamings were prepared and evaluated by rheological tests. The plastic viscosity and yield strength of the materials were plotted. The plastic viscosity of the slurries increased with the concentration of biopolymer in solution (Fig.1) as a consequence of the formation of a polymeric net in the hardened slurry. The alcohol-based dispersant reduced the viscosity of the slurry (Fig. 2). Therefore, it could be established that an environmentally friendly biopolymeric solution can be used in oilwell cement slurries as long as an adequate additive is added to counteract the deleterious effect on the rheological behavior of the slurry.

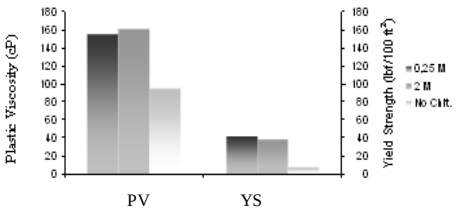

Figure 1: Plastic viscosity and yield strength of 0.25 M, 2 M and plain slurry.

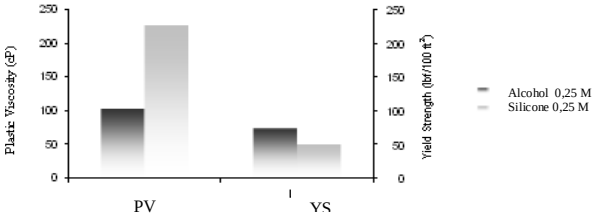

Figure 2: Plastic viscosity and yield strength of 0,25 M cement slurries containing alcohol or silicone based admixture.

REFERENCES

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