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LIGHT SLURRIES FOR COILED TUBING OILWELL CEMENTING

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Abstract - This study aimed at preparing and characterizing light slurries for oilwell cementing operations using coiled tubing. Vermiculite or an air entrainment admixture was used to reduce the weight of the slurries. Vermiculite is a lightweighted hydrated aluminosilicate containing iron and magnesium. Alternatively, the density of the slurries was reduced by adding an air entrainment surfactant responsible for creating air bubbles in the hardened slurry. The results showed that slurries with densities ranging from 1.55 and 1.79 g/cm³ and adequate mechanical strength could be produced. Moreover, the rheological behavior of the slurries was consistent with the pumping and adherence required for coiled tubing cementing operations.

Light cementing slurries are used in coiled tubing operations to provide zonal isolation and mechanical stability of wells with high inclination. The use of conventional slurries in cementing operations is ineffective in this scenario, since gravitational segregation commonly results in hydraulic isolation failure. Coiled tubing cementing is an interesting solution to improve cementing quality at reduced costs. It can be applied to both onshore and offshore wells with different geometries [1]. The density of oilwell slurries can be reduced either by adding light clay minerals or air entrainment admixtures. In this study, light oilwell cement slurries were prepared using vermiculite and/or a surfactant. Vermiculite is a lamellar lightweighted hydrated aluminosilicate containing iron and magnesium [2]. Air entrainment admixtures are surfactants that reduce the air/water surface tension and trap air bubbles in the hardened slurry. Light cement slurries were prepared and characterized according to guidelines proposed by API and ABNT for oilwell cementing materials, including rheological and mechanical analyses. Different concentrations of vermiculite or air entrainment admixture were used. The results revealed that light slurries (density varying from 1.55 and 1.79 g/cm³) could be prepared. The addition of either vermiculite and air entrainment admixture increased the viscosity of the slurries (Fig.1) compared to a standard composition, especially in the latter case (Fig.1). The increase in viscosity was increasingly pronounced as the density of the slurry increased from 1.55 to 1.79 g/cm^3. However, the values obtained are compatible with field applications. Slurries 1.79 g/cm^3 dense formulated with vermiculite depicted an increase in mechanical strength, contrary to what was observed with the addition of the admixture only (Fig.2). A slight increase in strength was also noticed in the slurries with 1.55 and 1.67 g/cm^3. Therefore, vermiculite is a promising candidate to be used in the formulation of Portland-based oilwell slurries for coiled tubing operations.

Keywords: Cement, Light Slurries, Coiled Tubing, Rheology, Mechanical Strength.

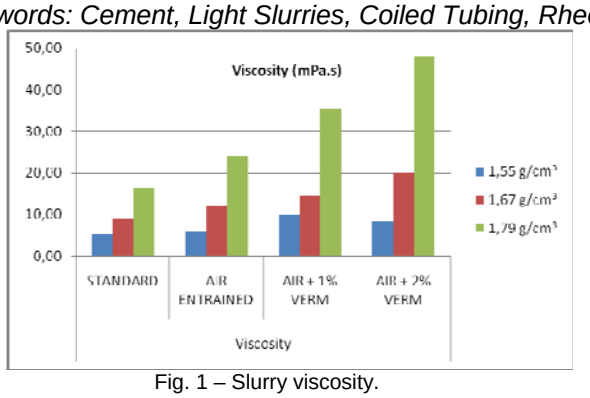

Fig. 1 – Slurry viscosity.

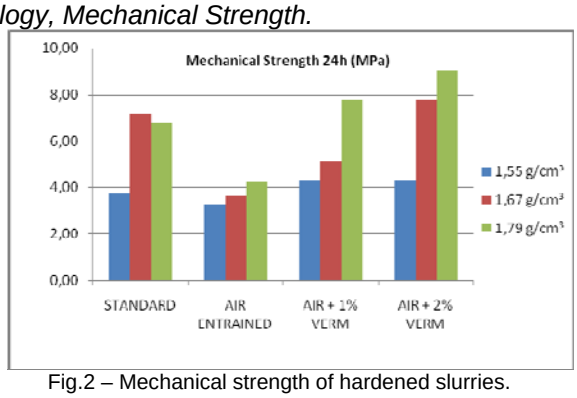

Fig.2 – Mechanical strength of hardened slurries.

[1] ICoTA (International Coiled Tubing Association). *An Introduction to Coiled Tubing – History, Applications and Benefits. TX, USA, 2005.*
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