Bentonite Contamination on the Fluid Loss in a Oil Well Cement

A. Zomorrodian[1], C. Vipulanandan[1] and D. Richardson[2]
[1]Center for Innovative Grouting Material and Technology (CIGMAT)
University of Houston, Houston, Texas 77204-4003
Tel: 713-743-4278: E-mail: cvipulanandan@uh.edu
[2]Program Manager – RPSEA, Sugar Land, Texas 77478

Abstract
The effect of bentonite contamination on the fluid loss of an oil well cement was investigated at various pressures. The bentonite content in the oil well cement and the pressure were varied up to 2.5% and 400 psi respectively. The bentonite in the oil well cement reduced the total and rate of fluid loss and increased the blowout time.

1. Introduction

Based on the installation operation, there is greater potential for contamination of the cement with bentonite drilling mud. Hence there is a need to quantify the effect of bentonite on the performance on the oil well cement. Oil well cement fluid loss has always been considered as one major issue in well cementing (Samsuri 2001). Fluid loss is the leakage of the liquid from the cement slurry into the formation matrix which causes forming of cement filter cake round the well bore. Filter cake affects the performance of cement by changing the water-to-cement ratio. Also the built up filter cake might not be desirable for the long-term performance of the well.

2. Objective

The objectives of this study investigate effect of bentonite contamination on the total and rate of fluid loss in the cement at different pressures.

3. Materials and Methods`

In order to investigate the effect of bentonite on filter loss of oil well cement slurries different percentages of bentonite were added to cement slurries during the mixing procedure. The bentonite content was varied up to 2.5%. API class H oil well cement was used in this study. The HPHT filter press was used to perform modified API standard fluid loss tests on the oil well cement slurries at four different pressures, 100, 200, 300 and 400 psi immediately after mixing. Fluid loss was measured after 30s, 1 min, 5 min, 10 min, 15 min, 20 min and 30 minutes. The test was stopped if gas blow out was observed from the bottle part of the cell. Gas blow out is determined by increment in the pressure level in the bottom cell indicating that the gas was flowing through the cement slurry to the bottom the test cylinder. Fluid loss amount, blow out time and fluid loss rate were measured and compared at different pressures.

4. Discussion and Results

Test results showed that increasing the pressure reduced the blowout time and increased the rate of fluid loss. As shown in the figs 1, 2 and 3, cement contamination with 0.5% of bentonite reduced the fluid loss rate by 69% to 48% when the pressure was increased from 100 to 400 psi. Increasing the bentonite contamination increased the blow out time and decreased the fluid loss rate. Contamination with 2.5% bentonite reduced the fluid loss rate by 76% at pressures of 300 and 400 psi, 81% at 200 psi and 86% at 100 psi. 2.5% bentonite contamination increased the blow out time by about 200% at all pressures.

5. Conclusion

Tests results indicated that bentonite contamination of up to 2.5% reduced the total and rate of fluid loss and increased the blow out time depending on the applied pressure.

6. Acknowledgement
This study was supported by the Center for Innovative Grouting Materials and Technology (CIGMAT) with funding from DOE/NETL/RPSEA (Project 10121-4501-01).

7. Reference

Samsuri A., Junin R., Osman A.M. (2001). The utilization of Malaysian local bentonite as an extender and free water controller in oil-well cement technology, Society of Petroleum Engineers. Doi: 10.2118/68674-MS

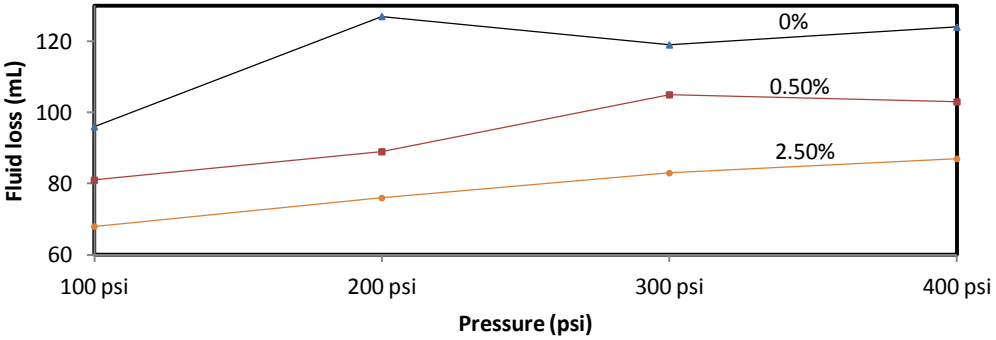

Figure 1. Total fluid loss with varying amounts of bentonite and pressure

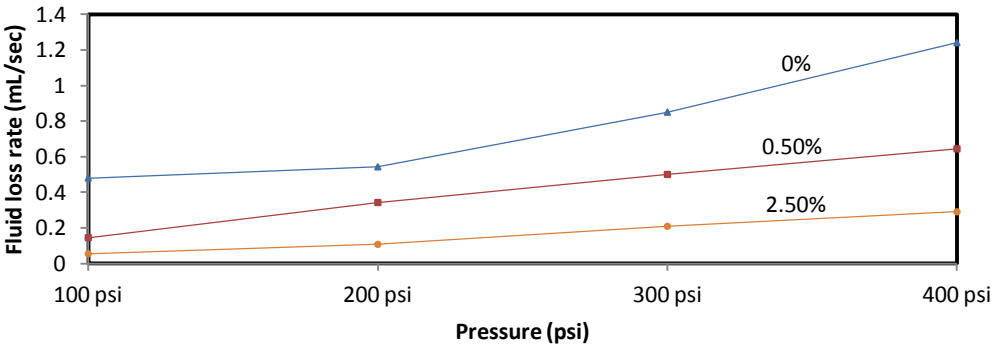

Figure 2. Fluid loss rates based on varying amount of bentonite and pressure

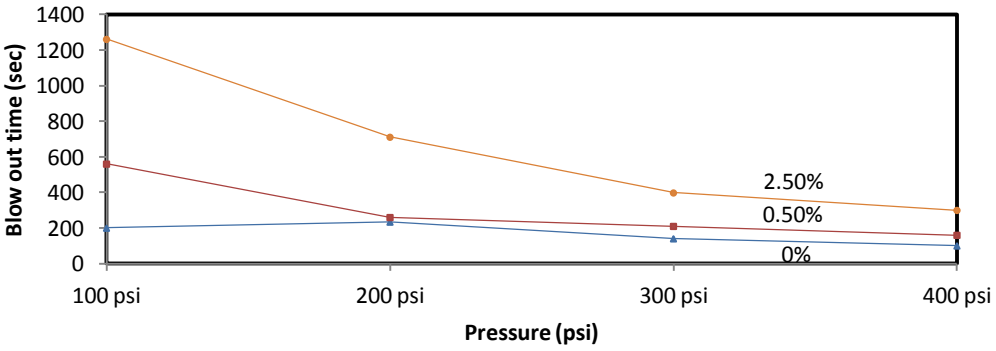

Figure 3. Blow out time with varying amount of bentonite and pressure