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**Evaluation of OWB Resources Lost
Circulation Material (LCM) in Cement**

RLS0153

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Objective

OWB Resources asked CSI Technologies to evaluate their specialized lost circulation material (LCM) to determine its sealing capabilities in oilfield cement. Compressive strength testing in cement was also performed.

Conclusions

- The LCM material sealed 1mm slot (using specialized testing procedures) using 16.4 lb /gal cement.
- There is no apparent change in cement compressive strength due to the addition of the LCM material.

Lab Testing Procedures

The following are explanations of the test methods used to analyze the LCM:

UCA Compressive Strength:

This is an API test used to determine the compressive strength of the cement slurry destructively under down-hole temperature and pressure conditions. Sample sizes are 2inch square cubes cured for 12 hours and 24 hours. The compressive strengths are determined with a hydraulic press which applies force at a rate of 16,000 lbf/min. A temperature of 100°F and 3000psi will be utilized for the curing of the samples.

CSI Slot Test:

The setup for the slot test consists of a testing cell placed above a collection vessel with a valve between. In the bottom of the testing cell there is a custom made slot that is 1.5 inches long and 1 mm wide. The material to be tested is placed inside the testing cell and pressurized with nitrogen to a desired pressure of 100psi. The collection vessel is then sealed at zero psi and the valve between the testing cell and collection vessel is opened. The time it takes for the pressure in the collection vessel to equal the initial pressure placed on the testing cell after the valve has been opened is recorded. Since the testing cell is in a vertical position, the time recorded is a measurement of the time it takes for all the fluid in the system being tested to go through the slot. For the tests which successfully seal off the slot at 100psi, an increase in pressure at a rate of 10 psi/second is applied until reaching 1000psi, or until the seal fails and the cylinder empties. The flow rate through or the maximum pressure obtained is recorded. See Figure 1 below for setup details. Due to the lightweight nature of the LCM being tested, the material had a tendency to float on the surface of the fluid being tested. In order to get a successful test, the material had to be first added to the testing cell and then have the fluid poured on top. This allowed the material to have a chance to reach the slot before all the fluid had exited the cell. Under normal pumping conditions, floating should not be an issue due to the turbulent flow experienced while pumping.

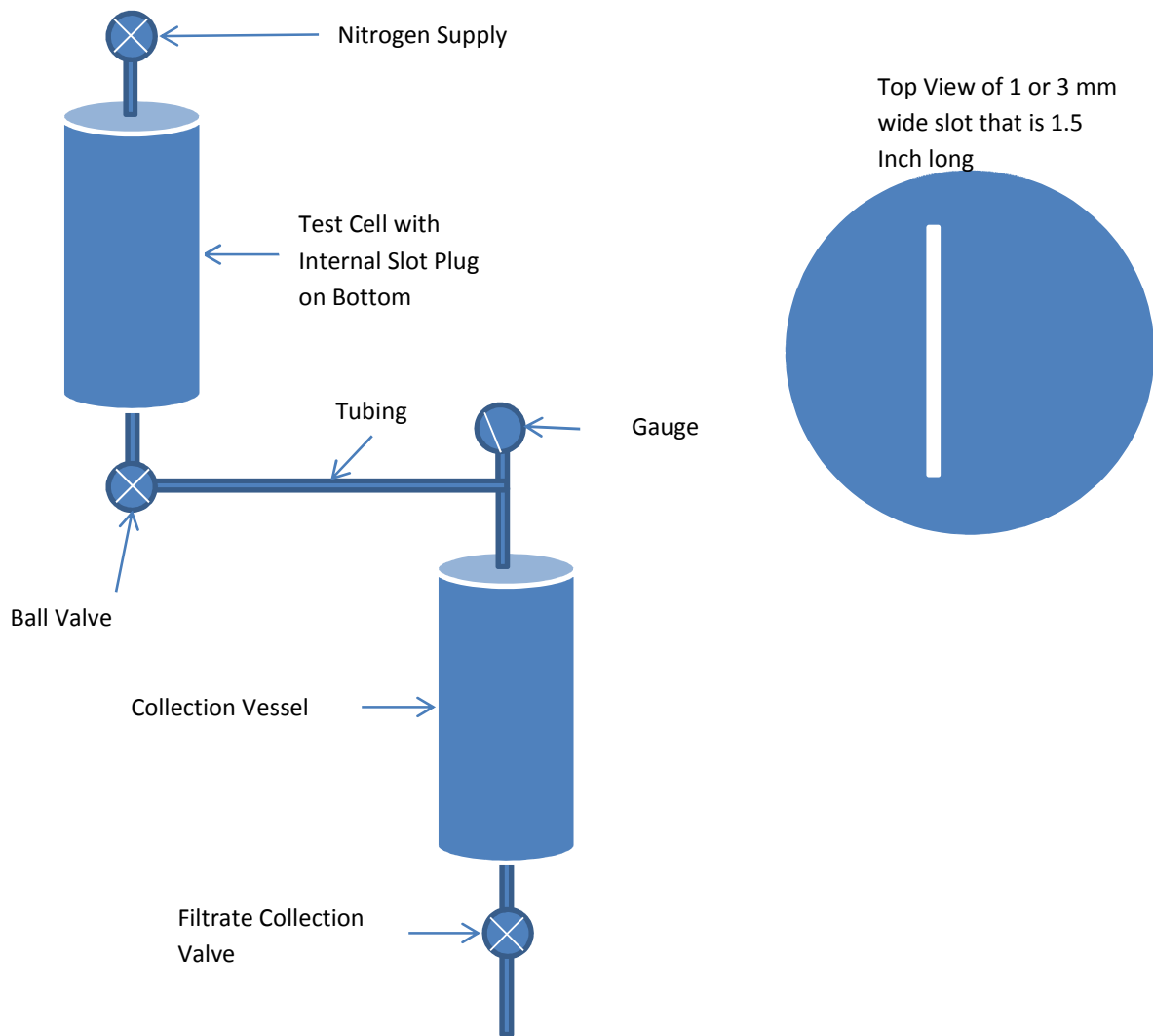


Figure 1: Diagram of Slot Test

Lab Testing Results and Discussion

The following in Table 1 are the compressive strength results for both the baseline slurry and LCM slurry. As can be seen, there is no loss of compressive strength at 12 or 24 hours by adding the LCM. The slurries both consisted of Class H Lafarge cement mixed with fresh water and 5% by weight of water salt at 16.4 lb/gal. The LCM slurry had material mixed in by hand at a concentration of 0.25 lb per sack of cement.

Table 1: Compressive Strength Testing Results

Cure Time	Slurry Name	Average Compressive Strength (psi)
12 Hours at 100°F and 3000 psi	Baseline Cement Slurry	2485
	Cement with LCM	2715
24 Hours at 100°F and 3000 psi	Baseline Cement Slurry	2974
	Cement with LCM	3705

The material was also able to seal a 1mm slot up to 1000 psi. A filter cake was built on top of the LCM material and the fluid released from the slurry to make the filter cake was all that was recovered. On a side note, the filter cake for the cement was quite large, but this is to be expected with no fluid loss additive present.

Table 2: CSI Slot Test Results

System	Density (lb/gal)	Filter Cake Height (in)	1mm Slot Test @ 1000 psi
Cement with LCM	16.4	4.00	Sealed

Sincerely,

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