



TORQUE-SEAL™ LCM/LPM PRODUCT BULLETIN

INTRODUCTION

Lost circulation is the most costly mud related drilling problem, and induced fracture lost circulation is probably the most common type faced by the oil and gas industry. Wellbores break down and induced fracture lost circulation occurs when the hydraulic pressure in the wellbore exceeds the breakdown pressure of the weakest formation exposed.

PRODUCT DESCRIPTION

TORQUE-SEAL™ LCM/LPM is a new loss prevention material (LPM) for use with casing drilling operations. Specially formulated this product has a broad range of particles which cover a wide range of loss zone openings. TORQUE-SEAL™ LCM/LPM contains particles in the right size range to achieve both loss prevention material type wellbore strengthening and more traditional loss circulation problems. This makes TORQUE-SEAL™ LCM/LPM a multipurpose LCM/LPM. TORQUE-SEAL™ LCM/LPM first stabilizes the borehole by plugging minute surface flaws and gravel-size pores. If fractures begin to develop, TORQUE-SEAL™ LCM/LPM acts as a fracture propagation inhibitor by screening out at the fracture tip. The low density of TORQUE-SEAL™ LCM/LPM, with a specific gravity between 1.2 – 1.4 means it can be recovered and recycled and still allow drill solids to be discarded using solids control equipment. This low density allows TORQUE-SEAL™ LCM/LPM to be added at lower mud weights than other heavier materials for unweighted drilling fluids. TORQUE-SEAL™ LCM/LPM has a minimal impact on fluid density or rheology even at concentrations of 50 ppb and can be used in either water-based or oil-based systems. TORQUE-SEAL™ LCM/LPM also acts as a torque reducer because it is composed of spherical materials that are hard and act as ball bearings. TORQUE-SEAL™ LCM/LPM has been used in Alaska and the Piceance basin with good success.

ADVANTAGES

- Product is all natural and therefore biodegradable
- Product is a high compressive strength material at >8000 psi
- Product is a resilient material with an Elastic Modulus of 965 kpsi and a Percent Resiliency of 20.0%
- Hardness is 3 on MOHS scale
- Specific Gravity is between 1.2 – 1.4
- Works in drilling fluids of any pH

- Acid solubility in 15% HCl at 150 °F is 41.76% after a 16 hr. soak
- Product is a low crush material and is less brittle than many other LCM's such as calcium carbonate or marble chips
- Product absorbs less water than many other natural LCM's
- Product is granular and packs tighter than fibrous shaped LCM such as cedar fiber or mica
- Product is slightly deformable but not too deformable such that it forms a better seal and has a lower fracture conductivity value than deformable materials
- Maybe used in high concentrations with minimal impact of fluid density
- Maybe used in either water-based or oil-based fluids
- Product has minimal effects on rheology compared to other LCM's such as cedar fiber and cotton seed hulls
- Cost effective compared to other LPM's currently on the market

APPLICATIONS

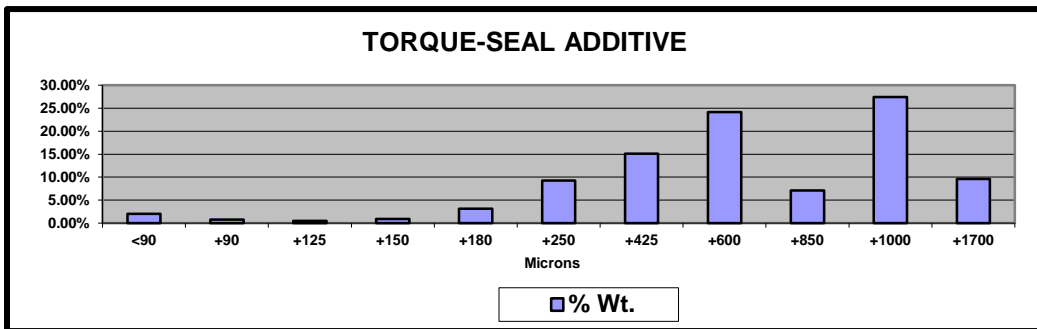
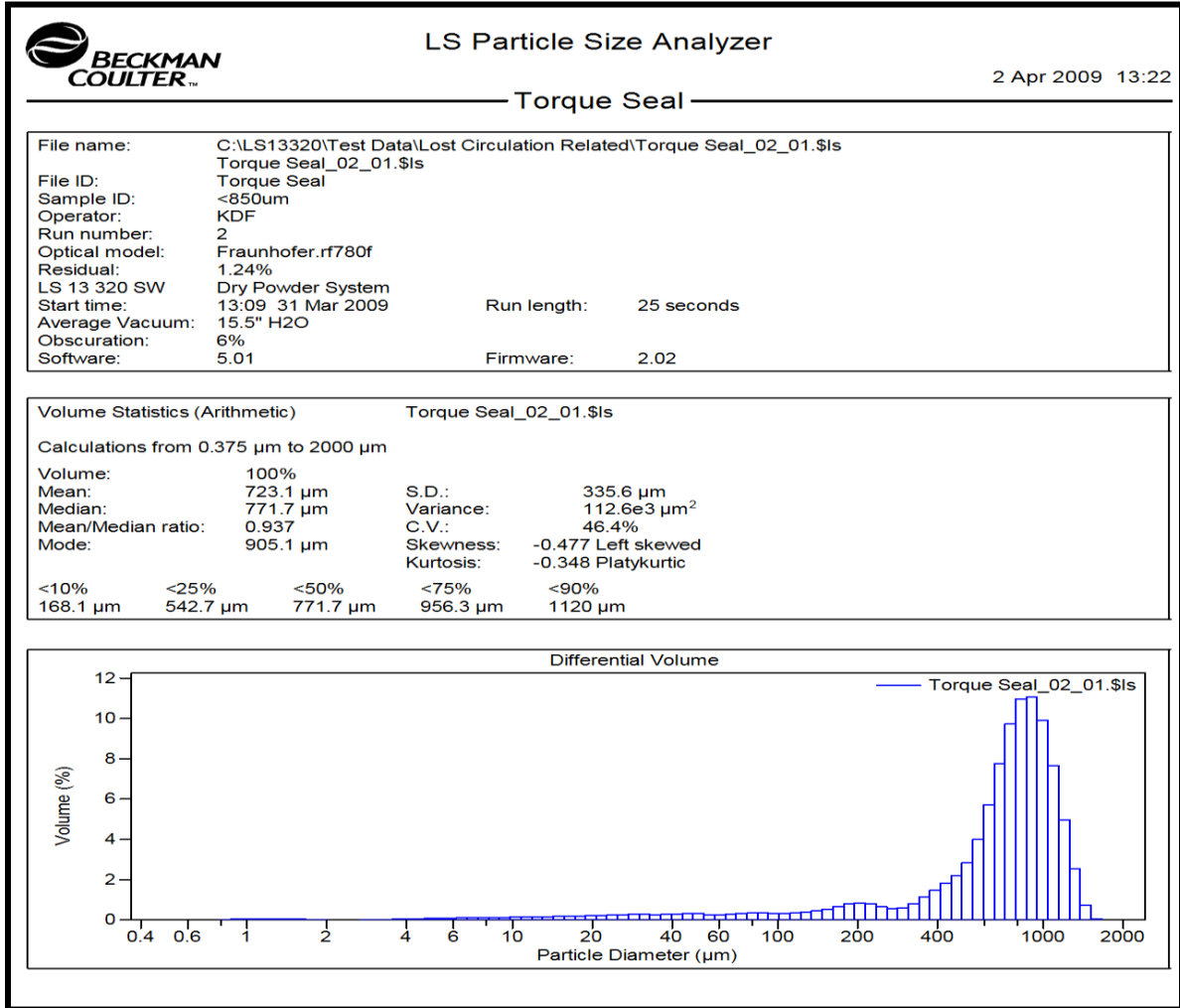
1. As a LPM for casing drilling
2. As a LCM for casing drilling
3. As a LCM for any loss zone in any drilling application
4. As a torque reducer when used at 2ppb or more

APPLICATION PROCEDURE

Constantly cut sacks through the hopper (not through the grate on top of the suction pit!!!) so that a 2 ppb concentration is achieved while circulating. If you are pumping 600 gpm, then you need to mix about one 50 lb sack every 2 minutes. Just let the mud engineer do the math.

In the Piceance, they found that it was still working if they did this for one system circulation, and then stopped for one full circulation, and then cut sacks again on the next circulation. So, alternate full system circulations of cutting the sacks at 2 ppb and holding off a circulation worked. This was done, in part, to save money or you might decide to only cut sacks while drilling ahead. That is OK, too, as long as the LCM is coming out of the bit when you start drilling. Cutting sacks while reaming to bottom is recommended. For the application of reducing torque, TORQUE-SEAL™ LCM/LPM was effective above 60 rpm. These successes were in water-based muds, but we have reason to believe that it will be successful in oil-based muds, too.

TORQUE-SEAL™ LCM/LPM



TORQUE-SEAL™ LCM/LPM'S EFFECT OF RHEOLOGY

Base Mud - Low Salt

2% NaCl Brine	300 ml
Bentonite	5 g
Rev Dust	30 g
Dristemp® Polymer	3 g
Driscal® D Polymer	2 g
Soltex® Additive	6 g
TORQUE-SEAL™ LCM/LPM	0-50ppb
Barite	for 12.5 ppg

Procedure:

Mixed ingredients in order as listed above. Sheared for 10 minutes.

Measured rheology at 120 °F. Measurements performed on FANN 900 with #2 bob.

Rolled for 3 hours at 350 °F.

Cooled for 1 hour.

Measured rheology at 120 °F. Measurements performed on FANN 900 with #2 bob.

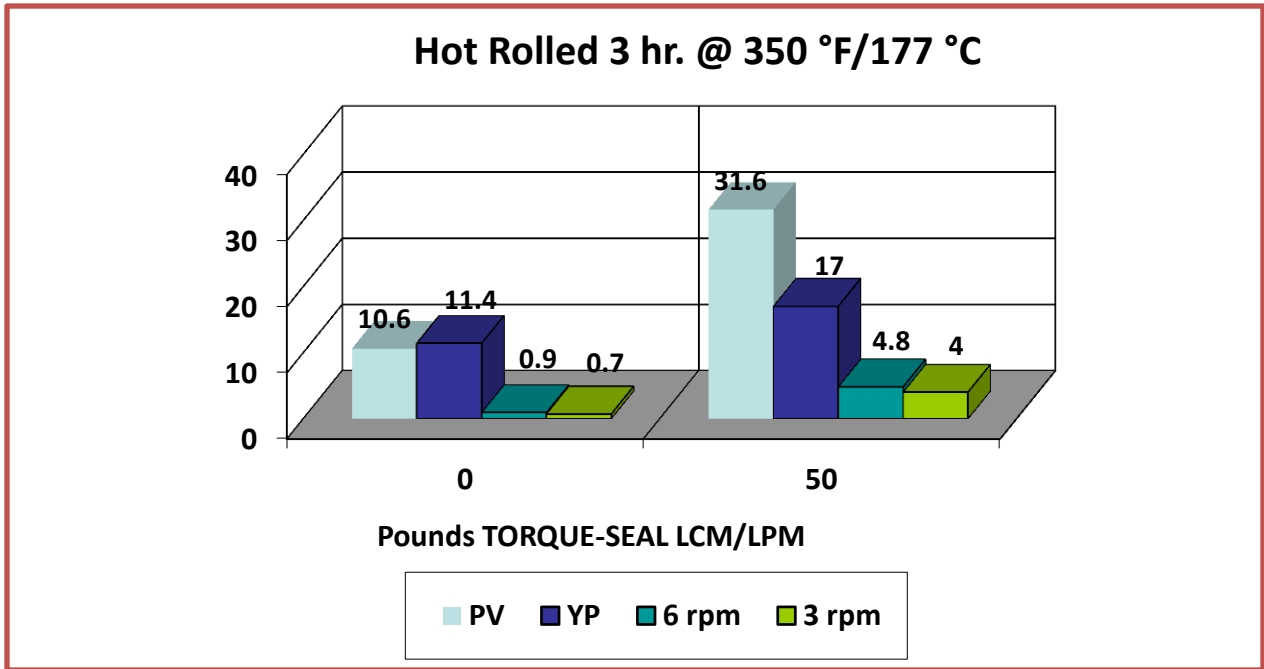
Results:

ppb LCM:	<u>0</u>	<u>50</u>
<u>Initial</u>		
600 rpm	45.9	110.7
300 rpm	32.4	72.1
6 rpm	0.9	6.2
3 rpm	0.7	4.2
PV	13.7	38.6
YP	18.8	33.5
Gels	.8/.8	4.5/6.3

AHR

600 rpm	32.6	80.2
300 rpm	22	48.6
6 rpm	0.9	4.8
3 rpm	0.7	4
PV	10.6	31.6
YP	11.4	17
Gels	.4/1.2	.4/3.8

TORQUE-SEAL™ LCM/LPM'S EFFECT OF RHEOLOGY



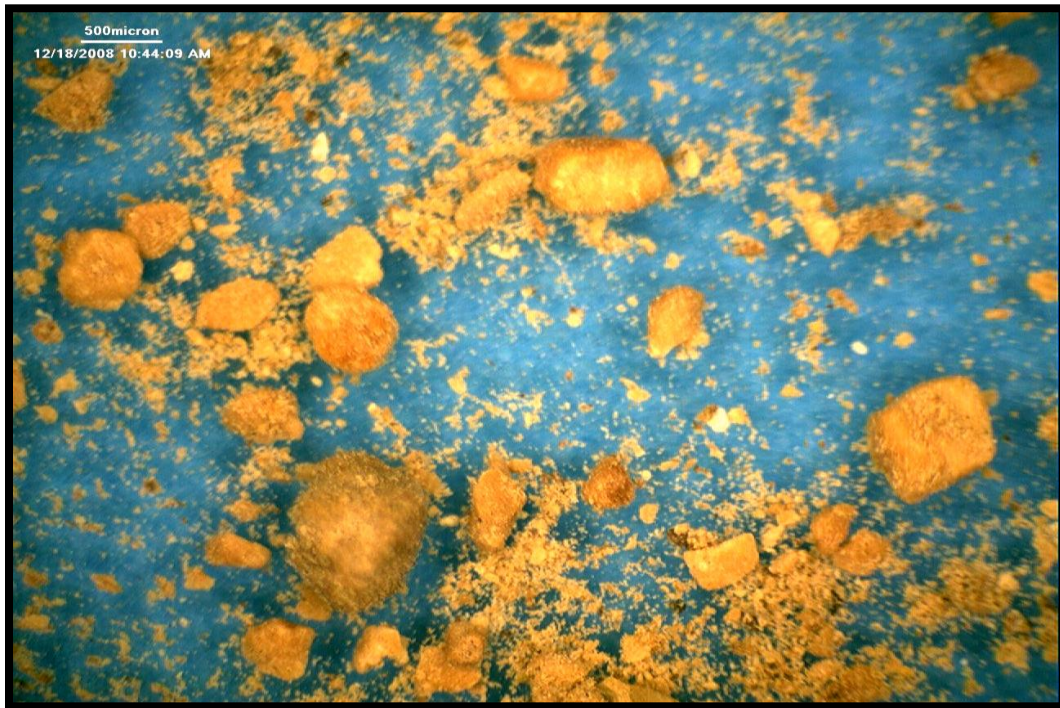
TORQUE-SEAL™ LCM/LPM'S EFFECT OF RHEOLOGY AND ES

Base Mud – Oil Based Diesel

Two aliquots of 10.8 ppg Oil – Based Mud (Diesel) from the field were weighted to 14.0 ppg, and each one was treated with a product as described below in the table below. Each sample was placed in a high temperature cell, pressurized to 100 psi, and hot rolled for 3 hours at 300°F. After cooling, the rheology, ES, and HTHP fluid loss were measured and recorded. Rheology and ES were tested at 120°F. HTHP fluid loss was measured at 250°F and with 500 psi differential pressure.

Property/Sample	Initial Properties	After Hot Rolling	+ Product
OBM ml	350	350	350
TORQUE-SEAL™ LCM/LPM	None	None	30
Barite to 14.0 ppg	As needed	As needed	As needed
600 rpm	24	20	32
300 rpm	20	17	23
6 rpm	8	6.6	6.6
3 rpm	7.8	6.1	6.3
PV	4	3	9
YP	16	14	14
Gels 10sec/10 min	11/24	4/22	11/23
ES	527	531	512
HTHP FL ml	9.2	6.6	9.6

TORQUE-SEAL™ LCM/LPM PHOTO



CASE HISTORIES

TORQUE-SEAL™ LCM/LPM CASE HISTORY

A major oil and gas operator used Drilling Specialties Company TORQUE-SEAL™ LCM/LPM on a well in the Piceance Basin of Colorado. Several different lubrication treatments were applied with these results:

A liquid lubricant was added at 1% concentration to improve the torque with no benefit. Another liquid lubricant was tried as batch treatments and had only a slight impact on the torque. A medium grade nut shell was circulated at 2 ppb concentrations and mixed in alternating two hour stages. Again only a slight benefit was seen.

The Drilling Specialties Company TORQUE-SEAL™ LCM/LPM product designed for Casing while Drilling was circulated at 2 ppb concentrations. The mixing was alternated at two hour intervals and a 20% reduction in torque was achieved.

This operator went on to use TORQUE-SEAL™ LCM/LPM on another project with equal success.

TORQUE-SEAL™ LCM/LPM CASE HISTORY

By Willie Reneau

A major oil and gas operator used TORQUE-SEAL™ LCM/LPM in a casing drilling operation in the Kuparuk Field (Alaska). The well was treated with TORQUE-SEAL™ LCM/LPM at a concentration of 2 ppb with the goal to eliminate a string of pipe. At 300 ft above the weak zone a casing drilling operation was commenced. A leak off test (LOT) was also performed and leak off occurred at a mere 13.4 ppg equivalent. TORQUE-SEAL™ LCM/LPM was added to the mud and drilling resumed. After drilling 200 ft another LOT was performed, a great improvement was noted at 16.6 ppg equivalent. They drilled about 18 more feet, to the top of the “C” sand and did third LOT which read 18.0 ppg equivalent this was where the test was halted, the MW equivalent could have gone higher as the 18.0 ppg reading was really a FIT, since no leak off was noted. The last pipe string was set on bottom and cemented w/o any losses. Apparently this is not a common thing in this field.

A major oil and gas operator used TORQUE-SEAL™ LCM/LPM successfully in both the UK and Norway sector of the North Sea.

PACKAGING AND ORDER INFORMATION

TORQUE-SEAL™ LCM/LPM can be shipped in 50lb sacks/ 40 sacks to the pallet, 2000 lb super sacks or in the U.S. in bulk shipments. Pallet dimensions are 40” X 48” X 46”. Orders may be placed by calling 1-800-423-3985 (Houston, TX) or 832-813-4563 (Houston, TX), or +322-689-1202 (Rotterdam) or 65-6517-3276 (Singapore)

For more information on Drilling Specialties Company products see our web site at www.drillingspecialties.com

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