

# **DYNAMIC LUBRICITY TESTING**

## **FINAL REPORT**

Prepared for

**BOSS-CHEM CORPORATION**

By

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## **LUBRICITY TESTING**

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## **INTRODUCTION**

The Intertek Westport Technology Center was contracted by Boss-Chem Corporation to determine the metal-to-metal and metal-to-Texas Cream Limestone coefficients of friction of a 10 ppg water based drilling fluid with and without lubricant at three concentrations (1% by volume, 3% by volume, and 5% by volume) at 140 °F under dynamic conditions using a Temco Inc. LEM-II Lubricity Evaluation Monitor.

## **EXPERIMENTAL PROCEDURES**

### **WATER BASED DRILLING FLUID PREPARATION**

A 10 ppg water based drilling fluid was prepared for dynamic lubricity testing following the instructions given in Table 3.

### **COEFFICIENT OF FRICTION DETERMINATION**

Limestone wedges were cut from a piece of Texas Cream Limestone and used to conduct the LEM II Lubricity Evaluation Monitor testing.

The metal-to-metal coefficients of friction of the 10 ppg water based drilling fluid with and without lubricant at three concentrations (1% by volume, 3% by volume, and 5% by volume) at 140°F under dynamic conditions using a Temco Inc. LEM-II Lubricity Evaluation Monitor were determined using stainless steel wedges.

The metal-to-Texas Cream Limestone coefficients of friction of the 10 ppg water based drilling fluid with and without lubricant at three concentrations (1% by volume, 3% by volume, and 5% by volume) at 140°F under dynamic conditions using a Temco Inc. LEM-II Lubricity Evaluation Monitor were determined using Texas Cream Limestone wedges.

## **RESULTS AND DISCUSSION**

The metal-to-metal and metal-to-Texas Cream Limestone coefficients of friction of the 10 ppg water based drilling fluid with and without lubricant at three concentrations (1% by volume, 3% by volume, and 5% by volume) at 140°F under dynamic conditions are presented in Tables 1-2.

TABLE 1

METAL TO METAL COEFFICIENTS OF FRICTION OF 10.0 PPG WATER BASED DRILLING WITH AND WITHOUT LUBRICANT DETERMINED USING THE LEM II

Sample	Concentration of Lubricant (% by volume)	Average Torque without weight (in-lbs)	Average Torque with weight (in- lbs)	Metal Bob radius (in)	Weight (lbs)	Coefficient of Friction ( $\mu$ )
De-ionized Water Calibration		0.18	6.32	0.75	22	0.37
10.0 ppg Water Based Drilling Fluid		0.15	7.10	0.75	22	0.42
10.0 ppg Water Based Drilling Fluid with Boss-156 lubricant	1	0.11	2.42	0.75	22	0.14
10.0 ppg Water Based Drilling Fluid with Boss-156 lubricant	3	0.11	2.59	0.75	22	0.15
10.0 ppg Water Based Drilling Fluid with Boss-156 lubricant	5	0.13	2.65	0.75	22	0.15

TABLE 2

METAL TO TEXAS CREAM LIMESTONE COEFFICIENTS OF FRICTION OF 10.0 PPG WATER BASED DRILLING WITH AND WITHOUT LUBRICANT DETERMINED

Sample	Concentration of Lubricant (% by volume)	Average Torque without weight (in-lbs)	Average Torque with weight (in- lbs)	Metal Bob radius (in)	Weight (lbs)	Coefficient of Friction ( $\mu$ )
De-ionized Water Calibration		0.19	10.09	0.75	22	0.60
10.0 ppg Water Based Drilling Fluid		0.18	6.58	0.75	22	0.39
10.0 ppg Water Based Drilling Fluid with Boss-156 lubricant	1	0.17	4.80	0.75	22	0.28
10.0 ppg Water Based Drilling Fluid with Boss-156 lubricant	3	0.17	4.21	0.75	22	0.24
10.0 ppg Water Based Drilling Fluid with Boss-156 lubricant	5	0.19	4.07	0.75	22	0.24

**TABLE 3**  
**INSTRUCTIONS FOR PREPARATION OF 10 PPG WATER BASED DRILLING FLUID**

Material	Amount Added	Comments
Water	325 grams	Add 325 grams of water to the mixing container
Bentonite	10 grams	Slowly add the bentonite and let mix for 5 minutes
PAC-LV	2 grams	Slowly add the PAC-LV and let mix for 5 minutes
Soda Ash	0.5 grams	Slowly add the soda ash and let mix for 5 minutes
Caustic Soda	0.5 grams	Slowly add the caustic soda and let mix for 5 minutes
Barite	Add to MW of 10 ppg	Slowly add the Barite and let mix for 30 minutes