

## Product Information

Thuslick is a patented field proven drilling mud additive which will improve any drilling/completion operation regardless of location or well program. Compatible with all known drilling fluid systems, the use of Thuslick in each of the various operations that make up a well program results in less time on the well, thus lowering total operation cost.

Packaged in 40 lb., 50 lb., and 55 lb. sacks, Thuslick is a specialty treated encapsulated high carbon material, which when added to a mud system exhibits plastic adhesive and adhesive properties, effectively coating the borehole and downhole tubulars with a water repellent, silicon-like film. Friction is dramatically reduced at all downhole contact points. The microfine Thuslick particles impregnate formation pore spaces, effectively blocking mud liquid loss to the formation.

When Thuslick is added to water base muds, the surface tension of the fluid is reduced to that of oil base muds, thus dramatically reducing the problems associated with bit/BHA balling. Long life diamond and PDC bits can be run in Thuslick treated water base muds with the same effectiveness as in oil muds.

It is known that although oil base muds exhibit a degree of lubricity at surface temperatures, lubricity is drastically reduced as downhole temperature increases. Thuslick is inert; it retains beneficial properties at temperatures in excess of 500°C. Thuslick improves the performance and lowers the maintenance cost of oil base muds by increasing lubricity and reducing expensive seepage to the formation.

Thuslick is non-toxic and 100% environmentally safe. It has passed all of the mandatory environmental certification tests required of drilling fluids by North Sea/European agencies as well as the U.S. EPA static sheen and LC50 drilling fluid toxicity tests.

### Thuslick Casing Wear Tests

A series of casing wear tests were conducted at the Drilling Research Center (D.R.C.-D.E.A.-42) using water base mud containing Thuslick mud additive (5.0 ppb.). Baseline tests without Thuslick were also conducted. These tests were conducted by rotating uncoated steel tool joints and tool joints coated with Arnco-200XT in N-80 casing.

With steel tool joints, Thuslick reduced the casing wear from 21% to 7% and the friction from 0.18 to 0.13.

With Arnco-200XT tool joints, Thuslick reduced the casing wear from 7% to 6% and reduced the friction from 0.14 to 0.06.

These tests show that Thuslick can significantly reduce casing wear and friction with both steel and Arnco-200XT tool joints and therefore significantly reduce torque and drag in extended-reach and horizontal wells.

## Executive Summary of Test Conditions and Results

48 hour Range-Finder and 96 hour definitive *Mysidopsis bahia* Toxicity Tests.

<b>Test Title:</b>	Toxicity evaluation of Thuslick to <i>Mysidopsis bahia</i>
<b>Test Dates:</b>	48-hour Range-finder: 20-22 December 1994
<b>Test Material:</b>	GM #7 with 8 ppb of Thuslick
<b>Test Species:</b>	<i>M. bahia</i> ; (6 days old)
<b>Source:</b>	48-hour Range-Finder: Laboratory Stock 96-hour Definitive: BMC
<b>Type of Test:</b>	48-hour Range-Finder 96-hour Definitive
<b>Type Concentrations:</b>	48-hour Range-Finder: 3, 10, 25, 50, and 100% SPP 96-hour Definitive: 10, 25, 50, 75, and 100% SSP
<b>Test Results:</b>	48-hour LC50 (SPP): > 1,000,000 ppm SPP 96-hour LC50 (SSP) : > 1,000,000 ppm SSP



## Case Histories

**Grady County, Oklahoma:** Operator was drilling a directional well below 16,000 ft. The drilling rate was one foot per hour and the operator found steel in the cuttings indicating severe casing wear. Thuslick was added to the water based mud system with the following results; the casing wear was eliminated and the drilling rate increased to 3 to 4 feet per hour. The operator was very happy with the lack of damage to the casing and the considerable savings in time.

**Newton County, Texas:** Operator was drilling a horizontal well and experiencing very high rotary torque and also having great difficulty sliding. Thuslick was added to the water based mud system and rotary torque decreased to acceptable levels. Sliding rates continued to be slow (about one foot per hour), so a seventy barrel pill was mixed using 11.7 pounds per barrel Thuslick and three barrels of diesel. The slide rate increased to ten feet per hour and the well was drilled to a T.D. of 17,629 feet with no further problems.

**Mexico:** Operator was drilling a six inch hole at 13,750 feet with a bottom hole temperature of 175°C. Logging was impossible, as the tools would run to bottom, but drag was so severe coming out that it was impossible to log. A pill with Thuslick was added and spotted in the open hole and drag was eliminated. The well was then logged successfully and with no problems.

**Angola:** Operator used Thuslick in a water based mud in 8 1/2" and the 6" hole sections to replace oil muds. Prior to adding Thuslick, the penetration rate was eighteen feet per hour. After Thuslick was added, the rate of penetration was twenty-two – twenty-three feet per hour. Torque before adding Thuslick was 450 to 475 amps. After adding Thuslick, the torque went to 450 amps, even with the increased penetration rates. The penetration rates gradually increased to forty plus feet per hour through the 8 1/2" hole section with torque at 500 amps. This well was trouble free and the operator planned to cease using oil muds on this project and standardize on water based muds.

**Offshore Louisiana:** Operator was drilling offshore Louisiana with shallow surface casing set. The well was deviated to thirty degrees when serious problems were encountered with torque, drag and shale sloughing. Penetration rates were thirty feet per hour. The pipe was stuck and a spotting fluid was used to free the pipe. After freeing the pipe, four pounds per barrel of Thuslick was added to the water based mud. The problems with torque, drag and shale stabilization were solved. The penetration rate increased to one hundred feet per hour and the well was drilled to T.D. without further problems. The operator was extremely pleased and has included Thuslick in their next well program.

**Danish North Sea:** Operator was drilling a horizontal section in a North Sea development project. With about three hundred meters of horizontal hole drilled, the operator began to experience severe drag and torque. Also, metal shavings appeared in the cuttings. Thuslick was added to the water based mud system at this point. Torque came down immediately and stabilized at a figure 15 K ft.lbs for the rest of the well. Metal shavings disappeared at once and the cuttings have remained free of metal shavings since. The well was drilled to T.D. (and additional 1600 meters) without further problems. The operator was very pleased with the performance and has included Thuslick in future mud programs for the development program.

**Venezuela:** Operator was drilling a highly deviated well and experiencing very high rotary torque and also heaving shale. T.D. was 9700 feet. The mud system was being treated with glass beads and Soltex. Thuslick was added to the mud and the glass bead/Soltex treatment was suspended. At that point drilling rate was between seven to twelve feet per hour. After adding Thuslick, the drilling rate increased to nine to twenty feet per hour. The heaving shale ceased and the torque was reduced. At T.D. there was over 10,000 feet of open hole. The operator expressed the opinion that Thuslick had saved them a string of casing.

## General Treatment Rate

Thuslick may be added at 3 minutes per 50 lb. sack. The product is easily dispersed and may be added via a hopper directly into the active system or through pre-mixing.

Recommended concentration may vary depending on mud type, density, well path design (anticipated torque and drag) and formation type.

Treatment	Mud Density		THUSLICK Concentration	
	PPB (lb. / gal.)	SG (kg./l.)	PPB (lb. / gal.)	Kg. / m
	8.5 - 10.0	1.0 - 1.2	3 - 4	8.5 - 11.4
	10.0 - 11.7	1.2 - 1.4	4	11.4
	11.7 - 12.5	1.4 - 1.5	5	14.3
	12.5 - 14.5	1.5 - 1.7	6	17.1
	14.5 - 16.5	1.7 - 2.0	7	19.9
16.5 - 18.0	2.0 - 2.2+	8	22.8	