

## BASE OIL COMPARISON FOR INVERT MUDS

System	Versaclean	Versadril 822		Versadril D
Base Oil	HT 40N	Distilate 822	Diesel	Cutter D
Density (kg/m3)	845	884	848	890
Viscosity (cSt) @ 20°C				
Viscosity (cSt) @ 40°C				
Viscosity (cSt) @ 100°C				
API Gravity	35.95	28.56	35.36	
Reid Vapour Pressure (Kpa)	3	4	9	
Flash Point °C (Closed Cup) <span style="color: red;">&gt;= 61°C</span>	116	77	47	114
Surface Tension (Dyne/cm*cm)		29	32	
Aniline Point °C <span style="color: red;">&gt; 65°C</span>	77	59.2	53	59.8
Sulphur % by wt				
Total % Aromatics	0	0.09	1.88	0.00943
Total % BTEX <span style="color: red;">&lt;= 0.1%</span>	0	0.06	0.87	0.00943
C6H6 Benzenes <span style="color: red;">&lt;= 0.01%</span>	0	0	0.01	0.00172
C7H8 Toluene	0	0.01	0.09	0.00352
C8H10 Ethyl Benzene	0	0.01	0.15	0.00044
C8H10 Xylene	0	0.04	0.62	0.00375
C9H12 TriMethylBenzene <span style="color: red;">&lt;= 0.3%</span>	0	0.03	1.01	
Total % Aliphatics	100	98.9	97.9	99
C5H10 CycloPentane	0	0	0.02	
C6H12 MethylCycloPentane	0	0	0.02	
C6H12 CycloHexane	0	0	0.02	
C7H14 MethylCycloHexane	0	0.01	0.15	
C6 Hexanes	0	0.01	0.05	
C7 Heptanes	0	0.02	0.26	
C8 Octanes	0	0.08	0.99	
C9 Nonanes	0	0.16	4.63	
C10 Decanes	0.01	0.32	8.38	
C11 Undecanes	0.1	0.69	8.18	
C12 Dodecanes	0.52	1.6	7.99	0.7
C13 Tridecanes	1.79	4.1	8.91	1.6
C14 Tetradecanes	9.1	7.18	8.71	3.1
C15+ C15+	88.48	84.74	49.8	93.6

**BASE OILS**

Rheology and ES at 50°C

Base Oil	600	300	200	100	6	3	Gels	PV	YP	ES
Diesel	3	1	1	0	0	0	-	2	0	>2000
HT 40N	5	3	2	1	0	0	-	2	0.5	>2000
Distillate 822	7	3	2	1	0	0	-	4	0.5	>2000
Cutter D	11	6	3	1	0	0		5	0.5	>2000

**Product Addition**

The following specs are as follows:

Mud Density: 1150 kg/m<sup>3</sup>AW = 0.75 with CaCl<sub>2</sub> (97%)

ES @ 50°C = 500-1000

PV @ 50°C = 12

YP @ 50°C = 4.0

Gels @ 50°C = 4.0/7.0

HTHP @ 100°C = 6mls

**DIESEL (sg=0.845)**

Products	90/10	
Diesel	658.8 kg/m <sup>3</sup>	-
Truvis	30 kg/m <sup>3</sup>	-
Versamul	15 kg/m <sup>3</sup>	-
Versacoat	15 kg/m <sup>3</sup>	-
Hot Lime	10 kg/m <sup>3</sup>	-
CaCl <sub>2</sub> (97%)	31.5 kg/m <sup>3</sup>	-
Water	90.7 kg/m <sup>3</sup>	-
Barite	315.5 kg/m <sup>3</sup>	-

**VERSACLEAN (sg=0.829)**

Products	90/10	
HT-40	643.6 kg/m <sup>3</sup>	-
Truvis	32 kg/m <sup>3</sup>	-
Versamul	15 kg/m <sup>3</sup>	-
Versacoat	15 kg/m <sup>3</sup>	-
Hot Lime	10 kg/m <sup>3</sup>	-
CaCl <sub>2</sub> (97%)	31.4 kg/m <sup>3</sup>	-
Water	90.4 kg/m <sup>3</sup>	-
Barite	331.52 kg/m <sup>3</sup>	-

**VERSADRIL 822 (sg=0.883)**

<b>Products</b>	<b>90/10</b>	
Distillate 822	694.2 kg/m <sup>3</sup>	-
Truvis	18 kg/m <sup>3</sup>	20 kg/m <sup>3</sup>
Versamul	15 kg/m <sup>3</sup>	-
Versacoat	15 kg/m <sup>3</sup>	-
Hot Lime	10 kg/m <sup>3</sup>	-
CaCl <sub>2</sub> (97%)	30.1 kg/m <sup>3</sup>	-
Water	86.7 kg/m <sup>3</sup>	-
Barite	281.1 kg/m <sup>3</sup>	-

**Versadril D (sg=0.894)**

<b>Products</b>	<b>90/10</b>	
Cutter D	708.5 kg/m <sup>3</sup>	
Truvis	16.4 kg/m <sup>3</sup>	
Versamul	15 kg/m <sup>3</sup>	
Versacoat	15 kg/m <sup>3</sup>	
Hot Lime	10 kg/m <sup>3</sup>	
CaCl <sub>2</sub> (97%)	30.3 kg/m <sup>3</sup>	
Water	87.2 kg/m <sup>3</sup>	
Barite	267.8 kg/m <sup>3</sup>	

## MUD BEFORE HOT ROLLING

Oil Base Muds - Rheology and ES at 50°C.

Before Hot Rolling	600	300	200	100	6	3	Gels	PV	YP	ES	HTHP (100°C)
Diesel Mud	38	23	17	12	6	5	5/11	15	4	950	7
Versaclean	50	29	20	13	4	4	4/11	22	3	1317	6
Versadril 822 Mud	40	23	16	10	3	3	3/7.5	17	3	1435	7.8
Versadril D Mud	58	33	23	14	4	3	3/7	25	4	1993	6.4

## MUD AFTER HOT ROLLING

Oil Base Muds - Rheology and ES at 50°C.

After Hot Rolling	600	300	200	100	6	3	Gels	PV	YP	ES	HTHP (100°C)
Diesel Mud	37	22	16	10	4	4	5/8.5	15	3.5	1275	4
Versaclean	59	35	25	15	6	6	8/18.5	24	5.5	>2000	5
Versadril 822	37	21	14	8	2	1	3/7	16	2.5	1385	6
Versadril 822 Mud + 2kg/m <sup>3</sup> Truvis	41	24	15	9	2	1	2/7	17	3.5	1450	-
Versadril D	49	28	18	10	2	1	2/7	21	3.5	1260	5.4

## QUICK FACTS

- Versadril 822 Mud is the closest to Diesel as far as basic mud properties go.
- The addition of 2.0 kg/m<sup>3</sup> of Truvis to the Versadril 822 based mud aided in raising the rheological properties. The additional Truvis is still 10 kg/m<sup>3</sup> lower than that needed for Diesel-based.
- The other fluids showed little sign of change after the hot rolling procedure – however overall, their properties (especially PV) are a lot higher than that of Diesel-based or Versadril 822-based.

## PRODUCT CONSUMPTION

- Diesel vs. Versadril 822

Products	90/10 Formulation	
	Diesel-Based After Hot Rolling	Versadril 822 After Hot Rolling
Distillate 822	658.8 kg/m <sup>3</sup>	694.2 kg/m <sup>3</sup>
Truvis	30 kg/m <sup>3</sup>	18 kg/m <sup>3</sup>
Versamul	15 kg/m <sup>3</sup>	15 kg/m <sup>3</sup>
Versacoat	15 kg/m <sup>3</sup>	15 kg/m <sup>3</sup>
Hot Lime	10 kg/m <sup>3</sup>	10 kg/m <sup>3</sup>
CaCl <sub>2</sub> (97%)	31.5 kg/m <sup>3</sup>	30.1 kg/m <sup>3</sup>
Water	90.7 kg/m <sup>3</sup>	86.7 kg/m <sup>3</sup>
Barite	315.5 kg/m <sup>3</sup>	281.1 kg/m <sup>3</sup>

**DIESEL (sg=0.845)**

**DISTILLATE 822 (sg=0.883)**

- Diesel vs. Versaclean

Products	90/10 Formulation	
	Diesel-Based After Hot Rolling	Versaclean After Hot Rolling
HT-40	658.8 kg/m <sup>3</sup>	643.6kg/m <sup>3</sup>
Truvis	30 kg/m <sup>3</sup>	32 kg/m <sup>3</sup>
Versamul	15 kg/m <sup>3</sup>	15 kg/m <sup>3</sup>
Versacoat	15 kg/m <sup>3</sup>	15 kg/m <sup>3</sup>
Hot Lime	10 kg/m <sup>3</sup>	10 kg/m <sup>3</sup>
CaCl <sub>2</sub> (97%)	31.5 kg/m <sup>3</sup>	31.4 kg/m <sup>3</sup>
Water	90.7 kg/m <sup>3</sup>	90.4 kg/m <sup>3</sup>
Barite	315.5 kg/m <sup>3</sup>	331.52 kg/m <sup>3</sup>

**DIESEL (sg=0.845)**

**HT 40N (sg=0.829)**

- Diesel vs. Versadril D

Products	90/10 Formulation	
	Diesel-Based After Hot Rolling	Versadril D-Based After Hot Rolling
Cutter D	658.8 kg/m <sup>3</sup>	708.5 kg/m <sup>3</sup>
Truvis	30 kg/m <sup>3</sup>	16.4 kg/m <sup>3</sup>
Versamul	15 kg/m <sup>3</sup>	15 kg/m <sup>3</sup>
Versacoat	15 kg/m <sup>3</sup>	15 kg/m <sup>3</sup>
Hot Lime	10 kg/m <sup>3</sup>	10 kg/m <sup>3</sup>
CaCl <sub>2</sub> (97%)	31.5 kg/m <sup>3</sup>	30.3 kg/m <sup>3</sup>
Water	90.7 kg/m <sup>3</sup>	87.2 kg/m <sup>3</sup>
Barite	315.5 kg/m <sup>3</sup>	267.8 kg/m <sup>3</sup>

**DIESEL (sg=0.845)**  
**CUTTER D (sg=0.894)**

## HEALTH & SAFETY ISSUES

Presently the long-term effects of inhalation of Diesel fumes is unknown, however, short-term, it is known that contact with this type of mud system has ill effects.

Several factors determine the relative toxicity of the base oil:

- Flash Point – Lowest temperature that a flame causes ignition of vapours.
- Aniline Point – Point at which the hydrocarbon mixture and aniline form one phase. Used to determine the hydrocarbon content of a mixture.
- Total % Aromatics
- Total % BTEX
- Total % Benzene and total % Trimethyl Benzene

## QUICK FACTS

- Diesel has the lowest Flash Point and Aniline Point
- Diesel has the highest percentage of Aromatics and BTEX – also the highest percentage of Benzene and Trimethyl Benzene.
- High Flash Point belong to HT 40N and Cutter-D
- Lowest percentage of Aromatics and BTEX is in HT 40N
- Distillate 822, HT 40N and Cutter D all have low concentrations of Trimethyl Benzene