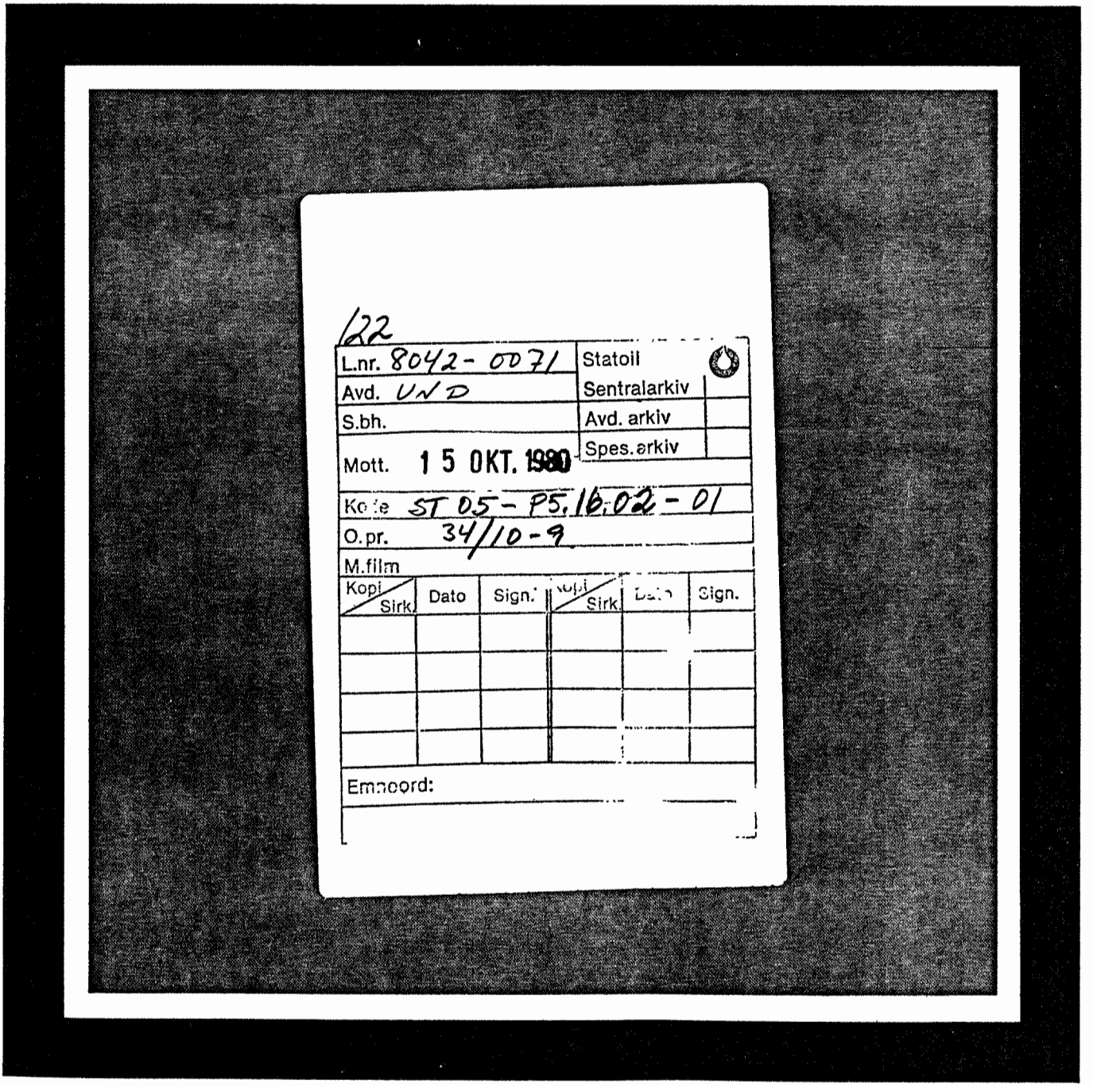
ESSO CHEMICALS

Evaluation of Wet Crude
from Block 34/10 (BRENT FM)
Well No. 9 - Demulsifier



ESSO CHEMICAL LIMITED

Evaluation of Wet Crude from Block 34/10 (BRENT FM) Well No. 9 - Demulsifier

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SUMMARY AND CONCLUSIONS

- Synthetic emulsions made from crude oil from Block 34/10, Well 9 and formation water can be treated effectively with BREAXIT 8375.

- Two other general purpose demulsifiers treated the emulsion also but not as well as BREAXTI 8375. This may mean that the synthetic emulsion is relatively easy to treat or that under the treat conditions the crude does not give 'difficult' emulsions. This point should be checked as soon as possible on emulsion(s) produced in the field.

- All emulsions made were stable up to 2 1/2 hours at 60°C and for up to 48 hours at room temperature.

- Some free water breaks from the emulsions at 75°C.

- Most of the water can be broken out in 5 minutes at 75°C.

- After 9 minutes treat max BSW (all water) was 0.7%.

- Care should be taken in any future experimental work to avoid the use of 'aged' emulsions since there was evidence that these were more difficult to treat.

BACKGROUND

A request was received to check the performance of demulsifiers on crude oil emulsions from Block 34/10 under the conditions proposed in a current design for treating. These are:

	Temp. °C	Time, mins	Comments
First Stage	41.2	3	Bulk water separates
Second Stage	85.6	7	<5% water
Third Stage	77.9	2	-
Coalescer	-	Total 28 for both phases	-
Storage	35.0	-	<0.3% for loading

Design basis for peak water rate is 15%.

Dry crude only was available along with formation water.

Particular interest was shown in the possibility of reducing second stage size (and therefore residence time).

EXPERIMENTAL AND DISCUSSION

Wet crude was not available so that 400-500 ml batches of synthetic emulsions were made from dry crude and formation water as indicated in the tables. Fresh emulsion was made for each test using dry crude stored in a 20 litre pressure container. The quantities used for various emulsions were:

	10%	15%	20%	50%
Dry crude ml	405	378	400	250
Formation water ml	45	67	100	250

Initially a Hamilton Beach Blendor was used with mixing time reduced finally to 3 minutes. The water was added slowly to the oil at low speed initially. Later a Waring Blendor,

also for 3 minutes. Emulsions were stable at 60°C with no free water after 2 1/2 hours and also after an additional 24 hours at room temperature. Some free water was apparent on heating emulsions at 75°C, e.g. 0.4% in 10 minutes (15% water emulsion) and 1% in 10 minutes (50% water emulsion).

The Hamilton Beach is probably preferably for ease of cleaning but the energy input from the Waring is higher and it may be necessary under some circumstances to use this. However, excessive times should be avoided with the Waring due to heat evolution. 15% water was chosen for most experiments, from the initial design rate.

Demulsifier treat rate is recorded as parts per million by volume (ppm) of demulsifier as normally supplied. Demulsifier was added by Pipettman P20 as a 10% solution in xylene. The standard demulsifier used throughout (except Table 7) was BREAXIT 8375.

Table 1 - This was a check on emulsion preparation. Temperature 60°C was chosen for ease of handling and to give somewhat more difficult conditions than design (75°C) to establish sorting procedures.

Table 2 - This was a simple check on emulsion preparation and treat rate.

Table 3 - As for Table 2.

Table 4 - As for Table 2 but using 10% water emulsion.

Table 5 - As for Table 2 but using 20% water emulsion. It was observed that the oil colour was not as good as with the lower water content emulsions. This point was not followed further except in Table 11 (which see).

Table 6 - Change of emulsion preparation of Waring Blendor. Some evidence of overheating of emulsion during preparation with consequent 'ageing' making treating more difficult.

Table 7 - Milder emulsion preparation conditions with comparison with two other general purpose demulsifiers. Neither was as good as BREAXIT 8375.

Table 8 - Milder emulsion preparation conditions. Various demulsifier treat rates at increased temperature (75°C). Some evidence that ageing emulsion at 75°C gives more difficulty in treating - slower water drop and poorer water/oil interface. Centrifuge tubes used for this and all subsequent tests. BSW - 0.7% max (centrifuged 1 1/2 min/1000 rpm/20°C).

Table 9 - Check on ageing - i.e. order of treating tubes after standing at 75°C, otherwise as Table 8. Ageing seemed to be apparent with water drop rate and interface affected. Check on BSW - 0.65% max water only in all cases.

Table 10 - Check on ageing. Centrifuge tubes and oil heated only when needed and not left to age in bath. Technique seems to eliminate ageing.

Table 11 - Check on possibility of treating 50% water emulsion. Very fast and complete water break but oil colour still not as good as with 15% water emulsion.

TABLE 1

Preparation of Emulsions - Hamilton Beach Blendor with External Controller

Time	Low Speed 8 for:- 1 min	3 min	5 min
30 secs	Water break	-	-
2 min	13	-	-
4 min	13	-	-
9 min	16	15	16

Emulsion with 15% water.

Bottles containing 100 ml emulsion heated at 60°C for 15 minutes then shaken 50 times and 10 ppm demulsifier added.

Further 100 shakes and returned to water bath. Water drop etc. observed.

Figures are approx percentages water broken out.

TABLE 2

Preparation of Emulsions/Demulsifier Treat Rate - Hamilton Beach Blendor - High Speed 10 for 5 mins

Time, mins	10 ppm	5 ppm	
1	5	Tr	
2	9	10 R	
3	11	14 R)	
4	12	14 R)	Some emulsion pad
5	12	14 R)	
9	15	16 SR	

Emulsion with 15% water.

Bottles containing 100 ml emulsion heated at 60°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Colour change of the oil was immediate. Water drop etc. observed.

Figures are approx percentages water broken out.
R = ragged, SR = sl. ragged

TABLE 3

Preparation of Emulsions/Demulsifier Treat Rate - Hamilton Beach Blend - High Speed 10 for 15 mins

Time, mins	10 ppm	7.5 ppm	5 ppm
1	6	Tr	Tr
2	11	3	1
3	13	7 R	5 R
4	-	8 R	7 R
5	14	11 R	9 R
6	-	13 R	12 R
7	-	14 R	12 R
9	14	14 R	13 R
15	*0.9% BSW on decanted oil	-	-

Emulsion with 15% water.

Bottles containing 100 ml emulsion heated at 60°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Colour change of the oil was immediate. Water drop etc. observed.

Figures are approx percentages water broken out.
R = ragged

* 12 ml water drawn off and BSW done on 50 ml of decanted oil.

TABLE 4

Preparation of Emulsions/Demulsifier Treat Rate - Hamilton Beach Blendor - High Speed 10 for 15 mins

Time, mins	10 ppm	7.5 ppm	5 ppm
1	Tr	Tr	Tr
2	4	Tr	2 SR
3	5	5	5 SR
4	6	6	6 SR
5	6	6	7 SR
9	7	7	7 SR

Emulsion with 10% water.

Bottles containing 100 ml emulsion heated at 60°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Colour change of the oil was immediate. Water drop etc. observed.

Figures are approx percentages water broken out.
SR = slightly ragged

TABLE 5

Preparation of Emulsions/Demulsifier Treat Rate - Hamilton Beach Blendor - High Speed 10 for 15 mins

Time, mins	10 ppm	7.5 ppm	5 ppm
1	5 SR	3 SR	1 R
2	10 C	14 C	12 SR
3	14	15	15 L
4	14	15	15 L
5	14*	15*	15*L
9	14	16	16 L

Emulsion with 20% water.

Bottles containing 100 ml emulsion heated at 60°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Colour change of the oil was immediate. Water drop etc. was observed.

Figures are approx percentages water broken out.
SR = slightly ragged
R = ragged
C = clean
L = lace
* = upper oil not completely clean

TABLE 6

Preparation of Emulsions/Demulsifier Treat Rate - Waring Blendor - Regavolt Speed 110 for 10 mins

Time, mins	10 ppm	7.5 ppm	5 ppm
1	6 R	4 R	tr
2	12 R	9 R	6 R
3	13 SR	10 R	-
4	13 C	-	9 R
5	13	11 SR	10 R
9	13	11 SR	11 SR

Emulsion with 15% water - different blendor with higher energy input. Resultant emulsion was quite warm.

Bottles containing 100 ml emulsion heated at 60°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Colour change of the oil was immediate. Water drop etc. was observed.

Figures are approx percentages water broken out.
SR = slightly ragged
R = ragged
C = clean

TABLE 7

Other Demulsifier Check - Waring Blendor - Regavolt Speed 110 for 4 mins

Demulsifiers added at 10 ppm

Time, mins	B 8275	A	B
1	Tr	Tr	-
2	5	2	Tr
3	10	6	Tr
4	10	7	3 R
5	12	9	4 R
9	13	10	10 C
Oil Quality	Clean	Sl cloudy	Sl cloudy

Emulsion with 15% water - reduced time on Waring Blendor to cut emulsion preparation temperature.

Bottles containing 100 ml emulsion heated at 60°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Colour change of the oil was immediate. Water drop etc. was observed.
R = ragged
C = clean

TABLE 8

More Precise Water Drop Rate/Demulsifier Treat Rate, with Increased Temperature - Waring Blendor - Regavolt Speed 110 for 3 mins

	(4)	(1)	(2)	(3)
Time, mins	15 ppm	10 ppm	7.5 ppm	5 ppm
1	1	0.6	0.5	0.4
2	5 R	5.0 SR	3.5 R	1.5 R
3	10 R	13 C	9 R	3 R
4	12 R	14	13 R	5 R
5	14.5 R	14	14 R	8 R
6	14.5 R	14.5	14 R	10 R
9	14.5 R	14.5	14.5 SR	14.5 SR
BSW % x 100/85	0.45	0.6	0.55	0.55

Emulsion with 15% water - reduced time on Waring Blendor - now standardised on 3 mins.

Centrifuge tubes containing 100 ml emulsion heated at 75°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Water drop etc. was observed.

BSW's were determined directly in the centrifuge tube on the approx 85 ml left after removing the free water in the bottom of the tube.
SR = slightly ragged
R = ragged
C = clean

Tubes shaken singly in order (1) (2) (3) (4), i.e. tube (4) heated approx 45 mins before treating. Blank separated 0.4 ml in 1 hour at 75°C.

TABLE 9

Repeat Table 8 - changed order of treating tubes

	(1)	(4)	(3)	(2)
Time, mins	15 ppm	10 ppm	7.5 ppm	5 ppm
1	2 R	0.8	0.6	0.2
2	9 R	2 R	1.5	1.8 R
3	13 R	5.5 R	4 R	5 R
4	14.5 R	8 R	9 R	9 R
5	15 SR	10 R	10 R	12 R
6	15	12 R	12 R	14.5 R
7	-	14 R	14.5 R	-
9	15 R	15 R	14.5 R	14.5 SR
BSW % x 100/85	0.55	0.5	0.55	0.55

Emulsion with 15% water - reduced time on Waring Blendor - now standardised on 3 mins.

Centrifuge tubes containing 100 ml emulsion heated at 75°C for 15 minutes then shaken 50 times and demulsifier added.

Further 100 shakes and returned to water bath. Water drop etc. was observed.

BSW's were determined directly in the centrifuge tube on the approx 85 ml left after removing the free water in the bottom of the tube.
SR = slightly ragged
R = ragged

TABLE 10

Water Drop Rate/Demulsifier Treat Rate
with Short and Constent Preheat Time -
Waring Blendor - Regavolt Speed 110 for 3 mins

	(3)	(2)	(1)	(4)
Time, mins	10 ppm	7.5 ppm	5 ppm	5 ppm
1	0.35	0.2	0.2	0.15
2	3.5 R	3.5	2	1.2
3	12 R	12	8	3
4	14.5 C	14.5	14	8
5	-	-	-	12
6	-	-	-	14
7	-	-	-	-

Emulsion with 15% water.

Centrifuge tubes containing 100 ml emulsion heated at 75°C for 10 minutes then shaken 50 times and demulsifier added. Each tube treated separately and identically in order (1) (2) (3) (4) for heat up stage.

Further 100 shakes and returned to water bath. Water drop rate etc. was observed.
R = ragged
C = clean

TABLE 11

Water Drop Rate/Demulsifier Treat Rate -
Waring Blendor - Regavolt Speed 110 for 3 mins

Time, mins	5 ppm	10 ppm
1	20	40
2	47	50
3	48	-
Oil quality	Sl cloudy	Sl cloudy

Emulsion with 50% water.

Centrifuge tubes containing 100 ml emulsion heated at 75°C for 10 minutes then shaken 50 times and demulsifier added. Each tube treated separately and identically for heat up stage.

Further 100 shakes and returned to water bath. Water drop rate was observed.