

OIL and GAS DIVISION

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PE905628

HYDROCARBON REPORT

REPORT

ON TESTS OF CHEMICAL AND TECHNOLOGICAL PROPERTIES OF CRUDE OIL & CONDENSATE SAMPLES FROM ESSO - MARLIN - 1.

BY

J. PUCHELL

HYDROCARBON REPORT

ATTACHMENT TO WCR  
MARLIN-1  
(W496)

**OIL and GAS DIVISION**

REPORT

ON TESTS OF

CHEMICAL AND TECHNOLOGICAL PROPERTIES OF CRUDE OIL SAMPLES

ES89 - MARLIN NO. 3-1

(Formerly Esso - Cleveland Shelf No. 4)

% CONDENSATE

INTRODUCTION

Two samples of crude oils from the above mentioned well were tested for their chemical composition and technological properties. One sample was from the interval 5122' - 37' while the other from the intervals 7406' - 66' and 7514' - 74'. In the case of the composite sample, derived from the two lower intervals, the relative contribution, by each interval, to the composition of the crude is not known.

The volume of each sample received, about half a gallon, was too small for a thorough investigation. The combined sample from the two deeper intervals, contained about 40% of aqueous phase, a large proportion of which consisted of Triethylene glycol. Furthermore, this report is based on experimental evidence derived from tests on two samples which, when received, were somewhat weathered.

EXPERIMENTAL RESULTS

L.V. C.M. (Crude Oil)

U. Crct. (Condensate)

SAMPLE:		E.G.S. No. 4, G-5, Zone (2), Test (1), Interval: 5122'-37'	E.G.S. No. 4, G-6, Rate (2), Test (1), Interval: 7406'-66' and 7514'-74'
TEST:		Sep. Press: 100 psi Date: 14.3.66, 19.30 hrs.	Sep. Press: 900 psi Date: 7.3.66, 13.00 hrs.
Odeur		Sweet	Sweet
C. REF.	Reflected light	Dark green	Colourless
	Transmitted light	Blood red	Very pale gold
	U.V. (3650 Å) light	Blue	Blue
Density at 60°F (I.P. 52)	Specific	0.7784	0.7476
	A.P.I.	50.28	57.78
Ash, (% w/w)		0.072	N.D.
Sediment (I.P. 53), (% w/w)		0.042	0.38
Water (I.P. 74), (% Vol.)		0.140	37.0
Sulphur (I.P. 63), (% w/w)		0.15	N.D.
Kinematic Viscosity, at 100°F (I.P. 77)	As received	1.2148	N.D.
	Suspension-and- water-free	1.2052	0.8451
Aniline Point (I.P. 2/56)		67.4°C	68.4°C
Salt Content (I.P. 77) (% w/w)		Less than 0.0005	N.D.

Asphaltenes (I.P. 143) (% w/w)		Less than 0.05	N.D.
Distillation (I.P. 24)	I.B.P.	42°C	42°C
	5%	82°C	78°C
	10%	97°C	90°C
	20%	123°C	110°C
	30%	150°C	124°C
	40%	178°C	144°C
	50%	203°C	166°C
	60%	227°C	194°C
	70%	247°C	232°C
	80%	268°C	264°C
	90%	295°C	310°C
		At 320°C-96.5%	At 330°C-95%
	Residue	2.5%	2%
Loss	1%	3%	
Total	100%	100%	
F.I.A. (I.P. 156)	Saturates, (% Vol.)	N.D.	98.6
	Olefins, (% Vol.)	N.D.	Nil
	Aromatics, (% Vol.)	N.D.	1.4
A.P.I. (A)ty of Fractions	Gasoline (below 200°C)	56.98	N.D.
	Kerosene (200° - 280°C)	44.38	N.D.
	Distillate (280-330°C)	40.64	N.D.
	Lubricating oil and Residue (above 330°C)	37 Approx.	N.D.
Aniline Point (I.P.2), Kerosene		75.2°C	N.D.
Aromatics plus olefins, (% Vol.) (sulphonation)		21	N.D.

**NOTES ON TESTS ABOVE:**

1. N.D. - not determined.
2. Colour by visual (unaided) estimation, but see absorption curves, figs. 2, 3 and 6.
3. Distillation results, for the Rate 2, Test 1, sample were obtained with a semi-micro apparatus (not covered by I.P. methods).
4. Ash determined by wet ashing and quoted as oxides (see 6 below).
5. Because of a pre-treatment the Rate 2, Test 1 sample had, (see 7 below) some tests were not carried out.

6. Metals in the ash derived from the Zone 2, Test 1, sample (in the order of decreasing abundance) are: Na, Ca, Sr, rare earth, Fe, V, Ni and traces of others.

7. Composition of the aqueous phase from the Rate 2, Test 1, sample:  
Water: 63.8% w/w, Non-aqueous matter: 36.2% w/w.

(a) Inorganic content of the aqueous phase:

Chloride: 555 ppm	Metals (in order of decreasing abundance);
Sulphate: NIL	Na, Ca, Fe, rare earth and traces of others.
Phosphate: NIL	
Carbonate: NIL	

(b) Composition of the non-aqueous matter:

Triethylene glycol: 90-95%  
Matter derived from the crude: 5-10% - consisting chiefly of phenols, aromatics, organic compounds containing sulphur, oxygen and nitrogen and organometallic compounds.

8. Spectrophotometry:

(a) Absorption spectra:

Characteristic bands of crude from the Rate 2, Test 1 sample and of kerosene fraction from the Zone 2, Test 1 sample are very similar in the two regions used, U.V. and visible (see figs. 2, 3, 4 and 5). In the U.V. region the crude from the Rate 2, Test 1 sample absorbs intermediately between that of the crude from the Zone 2, Test 1 sample and its gasoline fraction. The U.V. absorption bands are suggestive to be due to either biphenyls or symmetrically disubstituted aromatics or non-fused, symmetrical, non- or poly-substituted polynuclear hydrocarbons whose complexity increases with boiling ranges of fractions (as evident from the progressive shift of absorption bands). The near I.R. spectrum of the Zone 2, Test 1 sample (fig. 6) shows strong aromatic and phenolic bands.

(b) Fluorescence spectra:

Distribution of some of the matter that is capable to fluoresce, in both crudes, is striking. The crude from the Rate 2, Test 1 sample has bands corresponding almost exactly to those of the kerosene fraction derived from the Zone 2, Test 1 sample although the former sample has also a large amount of fluorescent material that is present in the gasoline fraction of the later sample (figs. 7 and 9).

The spectral bands of residues, derived from each crude, are not related. However, the fluorescence band of the residuum from the Rate 2, Test 1 sample is almost a duplicate of that obtained from the gasoline fraction of the Zone 2, Test 1 crude.

9. Gas chromatography (figs. 10 and 11):

A noteworthy feature is that gasoline fractions of both crudes are almost entirely paraffinic, being particularly rich in normal paraffins. Estimates place the ratio of iso- to normal paraffins between 0.7-0.8 for both samples.

The sample from the Zone 2, Test 1 contains considerably larger amounts of cycloparaffins than the Rate 2, Test 1 sample; also, the former sample contains polysubstituted cycloparaffins which are absent in the later sample. The relative decrease in the amount of components above C<sub>9</sub> is higher for the Rate 2, Test 1 sample; this, of course, is analogous to the pattern evident from distillation curves. The proportion of C<sub>5</sub>-C<sub>9</sub> components is higher in the Rate 2, Test 1 sample than in the Zone

2, Test 1 sample; this, again, is analogous with the results obtained from distillation.

The presence of substantial amounts of ethane and propane in the Zone 2, Test 1 sample indicates inefficient separation of gaseous components from this crude.

#### 10. Distillation:

Distillation curves for the two samples, (fig. 1), appear to be complementary in respect of certain groups of compounds. This can be seen more clearly from the differential distillation curves, (fig. 1A).

Because of the large proportion and complex composition of the aqueous phase in the Rate 2, Test 1 sample, numerous aqueous washings and separations had to be performed to prepare the hydrocarbon phase for distillation. As only small sample quantities could be handled in purification and also because the quantity of the original sample was small the distillation was performed on a semi-micro scale (20 ml).

A semi-micro distillation of Zone 2, Test 1 sample yielded the same results as the I.P. 24 method.

#### DISCUSSION

Results of tests show that both samples have a paraffinic base although spectrophotometric evidence shows that the Zone 2, Test 1 sample has a higher aromatic content (between 15-20%) than the Rate 2, Test 1 sample; no benzene or toluene were detected in either sample. In both cases paraffinic increases rapidly with A.P.I. gravity of fractions. However, the proportion of naphthenic hydrocarbons is much higher in the Zone 2 Test 1 sample than in the Rate 2, Test 1 sample. Distillate fractions of both samples are waxy. Distillation residue content of each sample is low; it is a petrolatum-like substance, the colours being:

Zone 2, Test 1 sample - black  
Rate 2, Test 1 sample - amber

Both crudes are considered to be an excellent stock for the production of jet fuels and of specialized types of solvents and lubricants.

Both samples are somewhat weathered and their ash content is high.

Aromatics, in the Zone 2, Test 1 sample are distributed chiefly between kerosene and heavier cuts.

*J. Puchell*  
(J. PUCHELL)  
Chemist

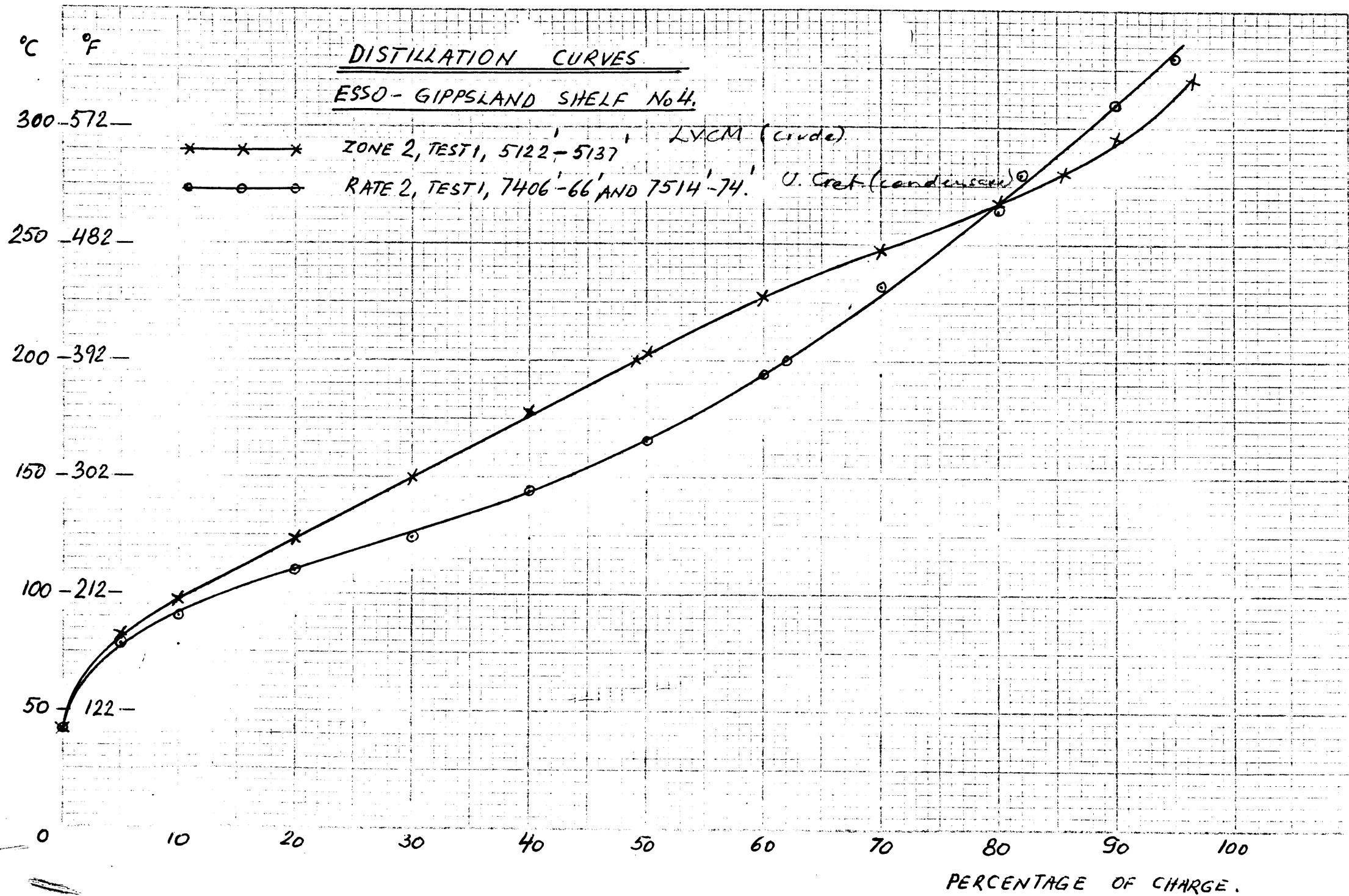


FIG. ①

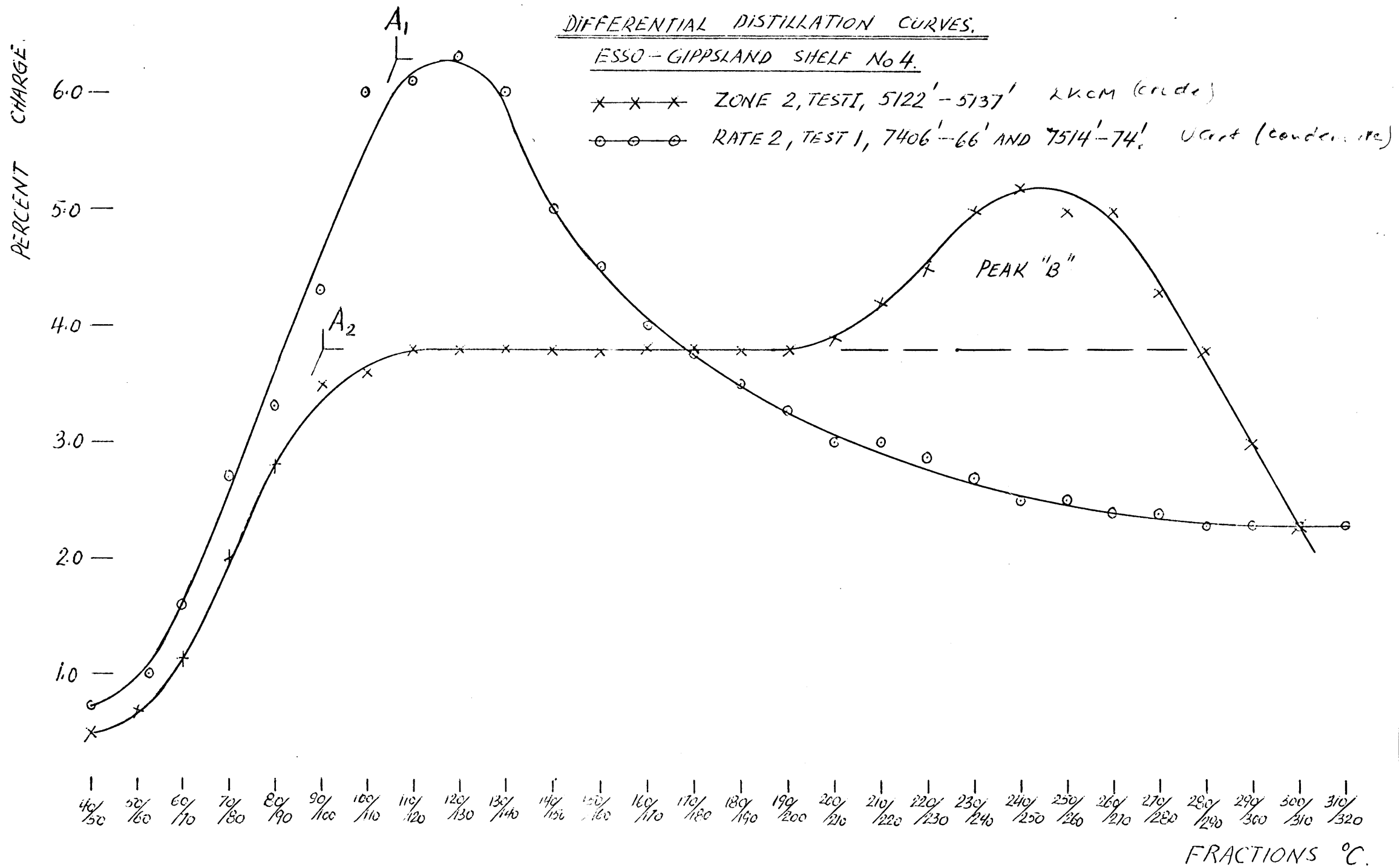


FIG. 1A

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DATE\_RECEIVED =  
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CONTRACTOR =  
CLIENT\_OP\_CO = ESSO EXPLORATION AUSTRALIA INC..

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WELL\_NAME = MARLIN-1  
CONTRACTOR =  
CLIENT\_OP\_CO = ESSO EXPLORATION AUSTRALIA INC..

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