

elf - r. e.

Date : 1 Nos. A 0250

NOTE du LABORATOIRE CENTRAL PRODUCTION - 2051

ELF NORGE Service Exploitation 311E

N° : 2051 - 6/4/44
JS/ES/cp

Attention M. CARRE

~~REDACTED~~

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OBJECT : Analysis of FIT 2 and 3 from 25/1-5 and FIT 5 and 6 from 10/1-3.

Please find attached the result of the analyses carried out on the fluids contained in FIT 2 and 3 (25/1-5) and 5 and 6 (10/1-3).

The compositions found on the 2 wells, both as regards gas and oil, confirm the compositions already encountered at Frigg, and they give rise to no particular comments.


J. SAVELLI

ELF AQUITAINE NORGE A/S
RESERVOIR DEPARTMENT
FILING COPY
A SHADOW COPY
COPY WHEN REMOVED FROM FILES
Receiption & dispatching Date: 05.06.81
Loaded in Bibgis: TFL U 111
Filing Code: TFL U 111
ACC. No: 6642
210782

WELL : 25 / 1 - 5

FIT NUMBER	2
DATE	8/9/75
TESTING DEPTH (meters)	1981
FORMATION	Frigg sand
PRESSURE FLOWING START (absolute bars)	198,5
PRESSURE FLOWING END (absolute bars)	2090
BOTTOM HOLE PRESSURE (absolute bars)	198,5
BOTTOM HOLE TEMPERATURE (°C)	63,3
TOTAL HYDROCARBON VOLUME AT BOTTOM HOLE CONDITIONS (cm ³)	240,05
WATER AND MUD VOLUME (cm ³)	130

After purging the water that was in the bottle, the whole of the gas and oil, after compression to 200 bars, was transferred into a study cell.

Volume of fluids at 200 bars and 63.3°C 238,579 cm³

An initial measurement of the bubble point pressure gave a value of 300 bars.

In order to adjust to bottom hole pressure it was necessary to liberate 4174.7 cm³ of gas at 15/750.

The volume of adjusted complex was brought to 217.290 cm³ for 200 b and 63.3°C.
217.363 cm³ for 197.5 b and 63.3°C.

After a pressure - volume study of the complex, part of this was flashed to AP/30°C.

The total GOR in relation to the volume of oil degassed at 30° and brought to 15° was 54.3 m³/m³.

COUNTRY: NORWAY

FIELD: FRIGG

WELL: 25/1-5

RESERVOIR: FRIGG SAND

PRESSURE - VOLUME RELATION
OF RESERVOIR FLUID

TEMPERATURE °C				
PRESSURE BARS (absolute)	RELATIVE VOLUME m ³ /m ³		COMPRESSIBILITY FACTOR m ³ /m ³ /bars 10 ⁻⁵	CALCULATED SPECIFIC GRAVITY Kg/m ³
	WITH REGARD TO OIL AT SATURATION PRESSURE	WITH REGARD TO RESERVOIR FLUID FLASHED AT 15°C		
351	0,9875	0,8913	845,921	
281	0,9932	0,8862	841,067	8,197
211	0,9989	0,8812	836,268	8,151
197,5	1,0000	0,8802	835,349	8,142
193	1,0045	0,8762		
182	1,0134	0,8685		
167	1,0269	0,8572		

RESERVOIR OIL VOLUME AT SP: 217,363 cm³

COUNTRY: NORWAY FIELD: FRIGG

WELL: 25/1-5

RESERVOIR: FRIGG SAND

SEPARATION TEST

I SEPARATION CONDITIONS

STAGES	PRESSURES BARS	TEMP. °C	OIL VOL AT P AND T	VOLUME FACTOR		GOR WITH REGARD TO OIL	
						STAGE	15°C
BOTTOM HOLE COND. SEPARATOR	198,5	63,3	217,363	0,8797	0,8802		
TANK	PA PA	30°C 15°C	191,222 191,330	1	1	54,31	54,29

TOTAL GOR :

II - FLUID ANALYSIS - COMPOSITIONS MOLAR %

Components	Shrinkage gas	Shrinkage	liquid	Reservoir
	molar %	Liquid %	Molar %	fluid molar %
N2	0,80			0,370
CO2	0,49			0,227
C1	87,14			40,336
C2	11,37	0,073	0,344	5,448
C3	0,14	0,006	0,028	0,080
1C4	0,03	0,004	0,014	0,021
NC4	0,02	0,007	0,025	0,023
1C5	0,01	0,003	0,011	0,011
NC5	TR	0,008	0,027	0,015
C6	TR	0,047	0,138	0,074
C7+	TR	99,852	99,414	53,395
Total density at 15/750	0,752	918,0		
Total molecular weight 15/750	17,93	349,0		195,45
Density of C7 + 15/750		918,6		918,6
Molecular weight of C7 +		350,77		350,77

WELL : 25 / 1 - 5

FIT NUMBER	3
DATE	8/9/75
TESTING DEPTH (meters)	1937
FORMATION	▪ Frigg sand"
PRESSURE FLOWING START (absolute bars)	196,4
PRESSURE FLOWING END (absolute bars)	196,9
BOTTOM HOLE PRESSURE (absolute bars)	197,8
BOTTOM HOLE TEMPERATURE (°C)	62,6
GAS VOLUME AT 15°C/750 mm Hg (liters)	2087
GASOLINE VOLUME	0
WATER AND MUD VOLUME (cm3)	5

GAS ANALYSIS

Components	Molar %
N2	0,940
CO2	0,300
C1	95,080
C2	3,630
C3	0,040
1 C4	0,010
N C4 +	T
<hr/>	
Total density at 15/750	0,702
Total molecular weight 15/750	16,76
<hr/>	
Content in g/m3 at 15/750	
C3 +	0,98
C4 +	0,24

WELL : 10 / 1-3

FIT NUMBER	5
DATE	1/11/75
TESTING DEPTH (meters)	1992,60
FORMATION	"Frigg sand"
PRESSURE FLOWING START (absolute bars)	192,0
PRESSURE FLOWING END (absolute bars)	} unindicated
BOTTOM HOLE PRESSURE (absolute bars)	
BOTTOM HOLE TEMPERATURE (°C)	61,6°C
TOTAL HYDROCARBON VOLUME	0
WATER AND MUD VOLUME (liters)	20,100

WELL : 10/1 - 3

FIT NUMBER	6
DATE	1/11/75
TESTING DEPTH (meters)	1967
FORMATION	"Frigg sand"
PRESSURE FLOWING START (absolute bars)	198,8
PRESSURE FLOWING END (absolute bars)	199,0
BOTTOM HOLE PRESSURE	} unindicated
BOTTOM HOLE TEMPERATURE	
GAS VOLUME AT 15°C/750 mm Hg	154 1
GASOLINE VOLUME	0
WATER AND MUD VOLUME (cm3)	10

10 / 1 - 3

FIT 6

GAS ANALYSIS

Components	Gas molar %
N2	0,47
CO2	0,24
C1	95,69
C2	3,55
C3	0,04
1C4	0,01
NC4	T
1C5	
NC5	
C6	
C7 +	
Total density at 15/750	0,699
Total molecular weight 15/750	16,68
Content in g/m ³ at 15/750	
C3 +	0,98
C4 +	0,24

ANALYSIS OF AQUEOUS EFFLUENTS FROM 10/1-3REF : FIT N°5

Further to receiving the above-referenced sample, we have undertaken its analysis and obtained the attached results (see appendix).

The main characteristics of the samples analysed are as follows :

Characteristics	FIT N° 5
Chlorine content	Very high
Sulphate content	high
Ca SO ₄ saturation $K_r = \frac{(r SO_4)(r Ca)}{2}$ 70	17,1
Carbonate content	Very high
Ca CO ₃ saturation $K_r = \frac{(r CO_3^{--} + r CO_3 H^-)^2}{3} (r Ca)$	27,81

The position of the water on the Rogers diagram is as follows : water modified by the action of hydrocarbons.

It is to be noted that the pH of this water is a bit high (8.35) and that the Mg and Ca contents are very similar. Sea water with a pH that has been slightly high may have such features.

Given these results, the representativity of this sample does not appear to us to be very good, the fluid analysed apparently being derived from drilling mud.

P. COUJET

P. Coujet

EAU / WATER CHAMP / FIELD 10/1 SONDE / WELL 10/1-3 ANALYSE TYPE II / ANALYSIS STANDARD II

DATE / Date _____ Z tr _____ m (1)
 TYPE DU TEST / Standard of test N° DU TEST / Test N° FIT N° 5 COTE ABSOLUE / Absolute depth _____ m
 MODE DE PRELEVEMENT / Sampling method PVT COTE : / Producing depth de / from _____ à / at _____ m
 PRESSION (Kg / cm2) / Pressure Estimée / Rated _____ K TEMPERATURE (°C) / TEMPERATURE (°C) estimée / rated _____
 Mesurée / Measured _____ K TEMPERATURE (°C) / TEMPERATURE (°C) mesurée / measured _____

I - ANALYSE - ANALYSIS

Densité à C / Specific gravity C 1027 Résistivité 18°C / Resistivity 18°C 0,323 Ω/m²/m
 Extrait sec 105°C / Dry extract 105°C 35 g/l pH 8,35 Salinité 29,23g/l

	g/l	Milliequivalents	R, %
NH ⁴⁺			
Ca ⁺⁺	0,198	9,88	0,86
Mg ⁺⁺	0,096	7,89	0,69
K ⁺	0,260	6,65	0,58
Na ⁺	12,533	544,98	47,56
Li ⁺	Traces	-	
Fe ⁺⁺⁺	-	-	
Ba ⁺⁺			
Sr ⁺⁺			
Cations			
Total	13,087	569,40	49,69
Cl ⁻	17,728	499,98	43,63
Br ⁻			
I ⁻			
SO ₄ ⁻⁻	1,437	29,92	2,61
CO ₃ ⁻⁻	0,200	6,66	0,58
CO ₃ H ⁻	2,441	40,00	3,49
Anions			
Total	21,896	576,56	50,31

Concentration C/10 114,596 E 0,62 %

II - PROPRIETES DE REACTION / II - REACTION PROPERTIES

a = 48,44 A1° = 4,98 c = _____
 b = 1,56 A2° = 3,12 S₃ = _____
 d = 45,93 S1° = 91,90
 e = 4,05 S2° = _____
 Type = I

III - INDICES / III - NUMBERS

Sulfurique / Sulphuric 5,64 Alc./Alc. terreux / Alkaline/Alkaline-earth 31,06
 Ech. de base / Base exchange 0,67 Alcalins / Alkaline 0,012
 Alcalino-terreux / Alkaline-earth 0,80 Iode / Iodine

OBSERVATIONS

NOTE : Cotes de la table de rotation par rapport au niveau de la mer.
 Height of rotary table from the sea level.

Fait le / In order _____

ELF - R.E.
 DIRECTION EXPLOITATION - D.R.T.E.N.

IV - DIAGRAMME D'ANALYSE - ANALYSIS LOG

Ions en milliequivalents C/10 = Cations + Anions / Ions in milliequivalents C/10 = Cations + Anions / 10

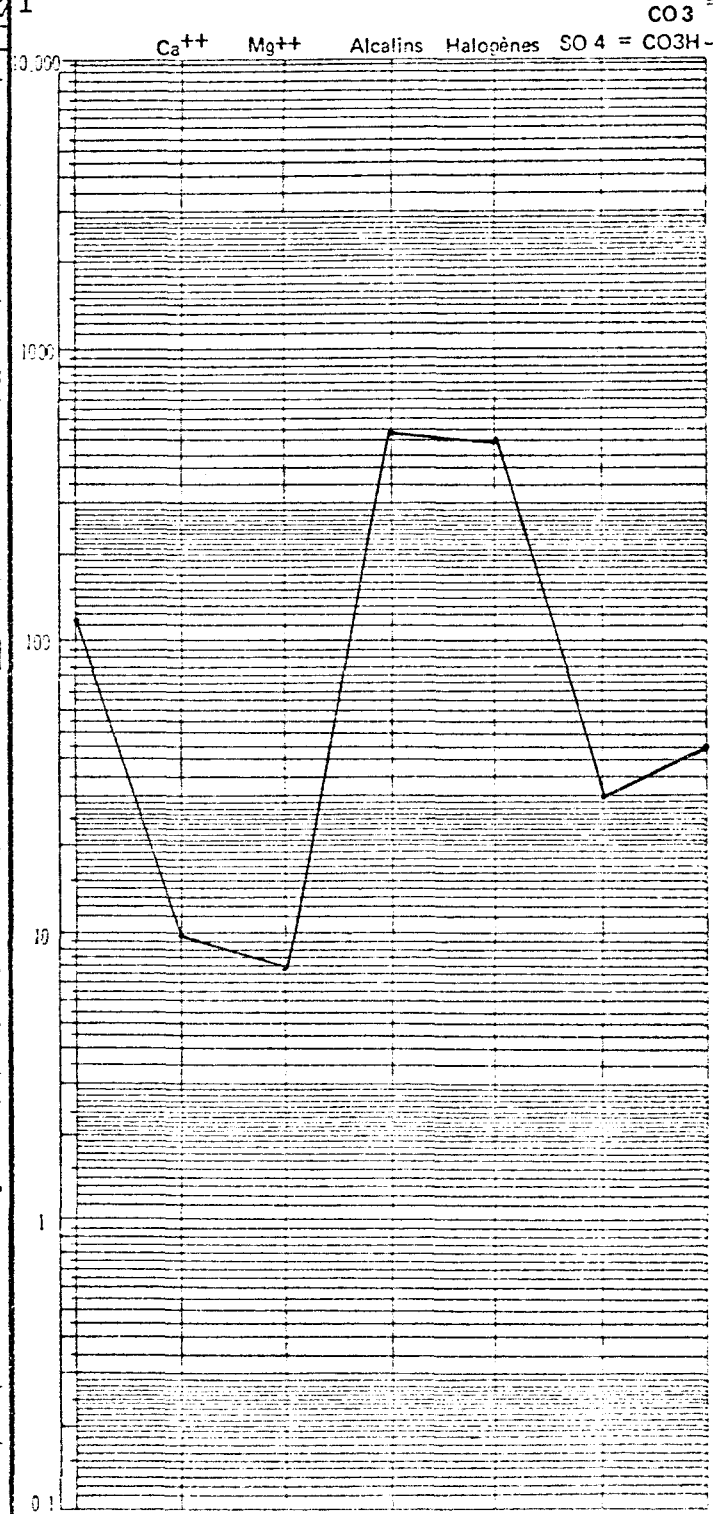
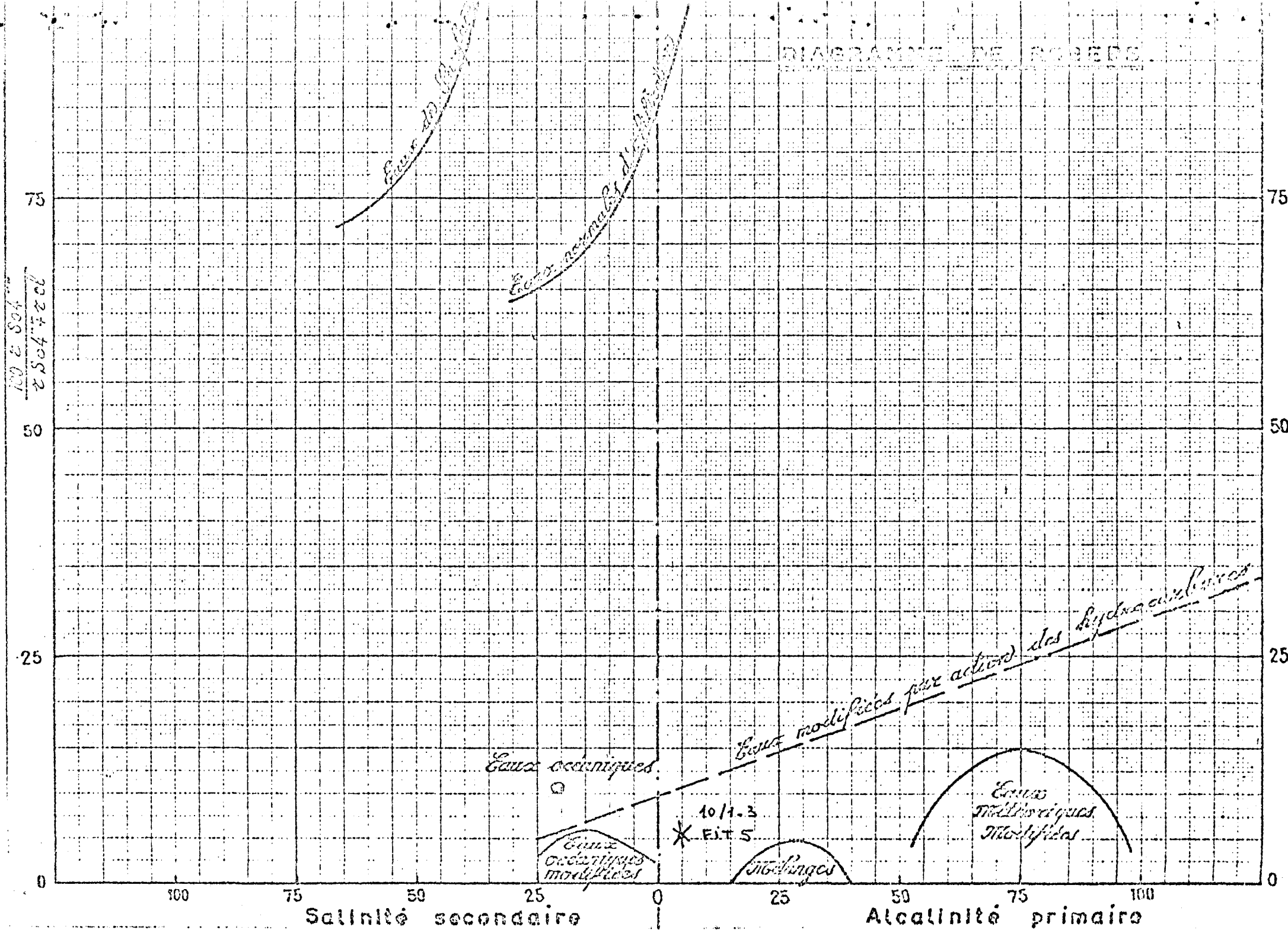


DIAGRAMME DE BORELS



100
250
400
550
700

100 75 50 25 0 25 50 75 100
Salinité secondaire Alcalinité primaire

Eaux océaniques

Eaux modifiées par action des hydrocarbures

Eaux océaniques

Mélanges

Eaux modifiées par action des hydrocarbures

Eaux océaniques modifiées

Eaux Modifiées

10/1.3
* EIT 5