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APPENDICES

Appendix A Determination of Wax Content

Table A-1 Amount of wax content as obtained from standard UOP46-64 method in both Lankrabue and U-Thong crude oil samples

Sample	Weight (g)						Percent wax content
	crude oil sample dissolved in solvent, n-pentane 40 ml	Bottle	Filter paper	Bottle + filter paper + wax crystal	wax crystal in solution 5 ml	wax crystal in solution 40 ml	
Lankrabue crude oil	1.0104	163.5023	0.9314	164.4637	0.0300	0.2400	23.75
	1.0211	163.6112	0.9345	164.5769	0.0312	0.2496	24.44
	1.0030	163.4989	0.9478	164.4765	0.0298	0.2384	23.77
	1.0117	163.5165	0.9423	164.4908	0.0320	0.2560	25.30
Average							24.32
U-Thong crude oil	1.0202	163.5215	0.9465	164.4942	0.0262	0.2096	20.54
	1.0112	163.5245	0.9612	164.5124	0.0267	0.2136	21.12
	1.0019	163.5058	0.9578	164.4909	0.0273	0.2184	21.80
	1.0094	163.5134	0.9561	164.4964	0.0269	0.2152	21.32
Average							21.20

Appendix B Calculation of the *N*-paraffins Containing in Crude Oil

Example: the calculation of the amount of C₅H₁₂ containing in Lankrabue crude oil 1.0012 g

Standard

The certified hydrocarbon solution contains C₅H₁₂ 0.1948 wt.%

In the standard 1 g, it will contain C₅H₁₂ = $(0.1948 \times 100) / 1$
 $= 1.948 \times 10^{-3} \text{ g}$

The whole standard solution, 1 g, was dissolved in 25 ml of CS₂.

In 25 ml or $25 \times 10^{-3} \text{ ml}$ of CS₂ solution contained C₅H₁₂ = $1.948 \times 10^{-3} \text{ g}$

The standard solution 1 μl was injected

so it contained C₅H₁₂ = $(1.948 \times 10^{-3} \times 1) / 25 \times 10^{-3}$
 $= 7.792 \times 10^{-8} \text{ g}$ or $7.792 \times 10^{-2} \mu\text{g}$.

From GC chromatogram of the standard, it was found that

C₅H₁₂ peak area = 5572.6 units $\equiv 7.792 \times 10^{-2} \mu\text{g}$

If C₅H₁₂ peak area = 1 unit $\equiv (7.792 \times 10^{-2} \times 1) / (5572.6)$
 $\equiv 1.3982 \times 10^{-5} \mu\text{g}$

Crude Oil Sample

Crude oil 1.0012 g was dissolved in CS₂ 100 ml.

The solution 100 ml or $100 \times 10^3 \mu\text{l}$ $\equiv 1.0012 \text{ g}$ of crude oil

The solution, 1 μl , was injected so it is equivalent to

$$(1.0012 \text{ g} \times 1 \mu\text{l} \times 10^6 \mu\text{g}) / (100 \times 10^3 \mu\text{l}) = 10.012 \mu\text{g} \text{ of crude oil}$$

From the GC chromatogram of Lankrabue crude oil sample solution

C₅H₁₂ having peak area 1436 units $\equiv (1.3982 \times 10^{-5} \times 1436) / 1$
 $\equiv 0.020078 \mu\text{g}$

Therefore, in crude oil 10.012 μg , it contained C₅H₁₂ = 0.020078 μg

Crude oil 1 μg will contain C₅H₁₂ = $(1 \mu\text{g} \times 0.020078 \mu\text{g}) / (10.012 \mu\text{g})$
 $= 0.0020054 \mu\text{g}$

So if crude oil is 100 μg , it will contain C₅H₁₂

$$= (0.0020054 \times 100) / 1 = 0.20054 \mu\text{g} \text{ or } 0.20054 \%$$

For the calculating result of other hydrocarbons of Lankrabue and U-Thong crude oil were shown in Tables B-1, and B-2, respectively. Also, the chromatogram of the standard *n*-paraffins is shown in Figure A-1.

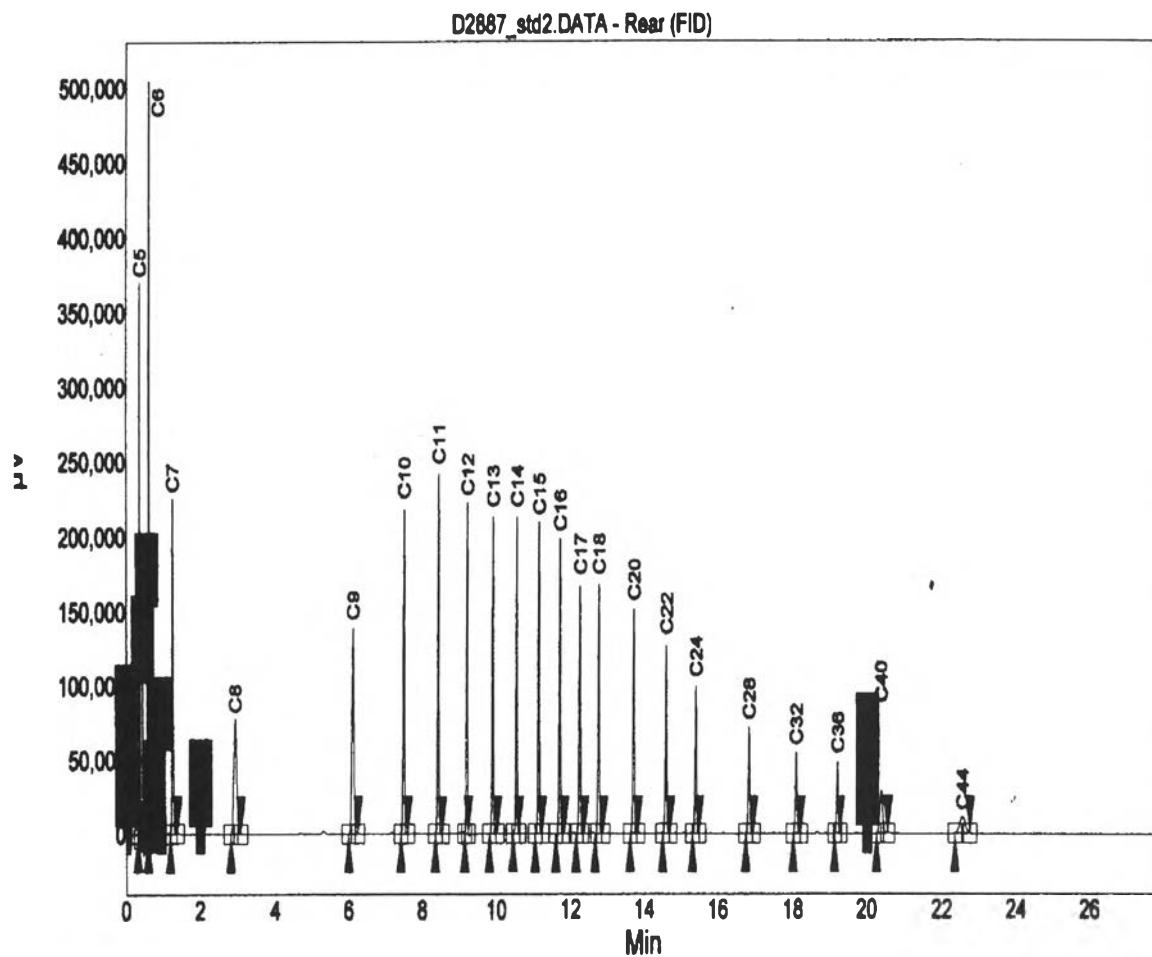


Figure B-1 GC chromatogram of the standard *n*-paraffins.

Table B-1 The concentration of *n*-paraffins in Lankrabue crude oil

Formular	Peak area			Percent by weight of <i>n</i> -paraffins in the standard	Percent <i>n</i> -paraffins in crude oil (wt %)		
	Standard	Test No.1	Test No.2		Test No.1	Test No.2	Average
C ₅ H ₁₂	5572.6	1436.0	906.4	0.1948	0.2006	0.1266	0.1636
C ₆ H ₁₄	9465.9	-	-	0.1782	-	-	-
C ₇ H ₁₆	8580.1	-	-	0.1945	-	-	-
C ₈ H ₁₈	6895.2	-	-	0.1982	-	-	-
C ₉ H ₂₀	9055.4	909.9	914.6	0.1981	0.0795	0.0800	0.0797
C ₁₀ H ₂₂	9132.4	2436.0	2451.1	0.2183	0.2326	0.2342	0.2334
C ₁₁ H ₂₄	9215.8	4038.1	4057.3	0.2091	0.3660	0.3679	0.3670
C ₁₂ H ₂₆	8179.7	4617.1	4532.6	0.2127	0.4797	0.4710	0.4753
C ₁₃ H ₂₈	7974.8	5974.4	5840.3	0.2126	0.6363	0.6222	0.6293
C ₁₄ H ₃₀	8271.3	7956.4	7756.3	0.2226	0.8555	0.8342	0.8448
C ₁₅ H ₃₂	8205.2	8289.0	8023.0	0.2263	0.9133	0.8843	0.8988
C ₁₆ H ₃₄	8070.6	7936.2	7667.3	0.2213	0.8694	0.8402	0.8548
C ₁₇ H ₃₆	6934.1	10439.5	10048.8	0.2322	1.3967	1.3448	1.3707
C ₁₈ H ₃₈	7123.4	8304.0	8164.8	0.2203	1.0260	1.0091	1.0176
C ₂₀ H ₄₂	6633.0	8081.4	7934.6	0.2205	1.0733	1.0541	1.0637
C ₂₂ H ₄₄	5759.9	6988.3	6867.3	0.1984	0.9617	0.9453	0.9535
C ₂₄ H ₅₀	4607.2	5928.6	5825.1	0.2297	1.1809	1.1606	1.1708
C ₂₈ H ₅₈	3506.8	3956.9	3733.3	0.2236	1.0080	0.9513	0.9796
C ₃₂ H ₆₆	2831.0	2334.9	1907.8	0.2043	0.6732	0.5502	0.6117
C ₃₆ H ₇₄	2632.6	-	-	0.2147	-	-	-
C ₄₀ H ₈₂	2613.2	4014.5	3183.9	0.2108	1.2938	1.0264	1.1601
C ₄₄ H ₉₀	1995.3	-	-	0.2049	-	-	-
Total							12.8746

Table B-2 The concentration of *n*-paraffins in U-Thong crude oil

Formular	Peak area			Percent by weight of <i>n</i> -paraffins in the standard	Percent <i>n</i> -paraffins in crude oil (wt %)		
	Standard	Test No.1	Test No.2		Test No.1	Test No.2	Average
C ₅ H ₁₂	5572.6	1235.6	1171.7	0.1948	0.1725	0.1634	0.1680
C ₆ H ₁₄	9465.9	282.5	274.2	0.1782	0.0212	0.0206	0.0209
C ₇ H ₁₆	8580.1	296.0	281.1	0.1945	0.0268	0.0254	0.0261
C ₈ H ₁₈	6895.2	-	-	0.1982	-	-	-
C ₉ H ₂₀	9055.4	984.1	903.9	0.1981	0.0860	0.0789	0.0824
C ₁₀ H ₂₂	9132.4	2711.7	2533.0	0.2183	0.2588	0.2416	0.2502
C ₁₁ H ₂₄	9215.8	4501.3	4177.3	0.2091	0.4078	0.3782	0.3930
C ₁₂ H ₂₆	8179.7	5344.3	4633.9	0.2127	0.5549	0.4808	0.5179
C ₁₃ H ₂₈	7974.8	6649.7	6106.1	0.2126	0.7079	0.6496	0.6787
C ₁₄ H ₃₀	8271.3	8696.4	8026.5	0.2226	0.9346	0.8620	0.8983
C ₁₅ H ₃₂	8205.2	8733.0	8171.1	0.2263	0.9618	0.8993	0.9305
C ₁₆ H ₃₄	8070.6	8460.4	7946.6	0.2213	0.9264	0.8695	0.8979
C ₁₇ H ₃₆	6934.1	7651.0	7138.2	0.2322	1.0231	0.9538	0.9885
C ₁₈ H ₃₈	7123.4	6780.5	6379.1	0.2203	0.8374	0.7872	0.8123
C ₂₀ H ₄₂	6633.0	8419.5	8245.1	0.2205	1.1177	1.0937	1.1057
C ₂₂ H ₄₄	5759.9	7193.1	7621.9	0.1984	0.9894	1.0476	1.0185
C ₂₄ H ₅₀	4607.2	5650.7	6250.7	0.2297	1.1250	1.2436	1.1843
C ₂₈ H ₅₈	3506.8	3372.5	3677.4	0.2236	0.8587	0.9357	0.8972
C ₃₂ H ₆₆	2831.0	1632.7	1797.4	0.2043	0.4705	0.5176	0.4940
C ₃₆ H ₇₄	2632.6	-	-	0.2147	-	-	-
C ₄₀ H ₈₂	2613.2	506.2	755.7	0.2108	0.1631	0.2433	0.2032
C ₄₄ H ₉₀	1995.3	-	-	0.2049	-	-	-
Total							11.5677

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