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Dedication

*Dedicated to
my beloved father
, spirit of my mother
And
my sincere wife.*

ACKNOWLEDGEMENTS

In the name of Allah, the most Merciful, the most Gracious. All praise and glory go to Almighty Allah (Subhanahu Wa Ta'ala) who gave me the courage and patience to carry out this work.

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Abstract

Crude oil emulsions occur in many stages during oil production treatment. The main task in oil and gas production is to separate the gas, oil and water phases and to treat the individual phases in order to meet the product specifications.

Methods currently available for demulsification can be broadly classified as chemical, electrical, thermal and mechanical (gravity separations). Demulsification (emulsion breaking) is necessary in many practical applications such as the petroleum industry. Chemical demulsification is the most widely applied method of treating water-in-crude oil emulsions and involves the use of chemical additives to accelerate the emulsion breaking process. The effect of chemical demulsification operations on the stability and properties of water-in-crude oil emulsions was assessed experimentally. In this regard, demulsifier was used. Mechanical (gravity separations) method also is the most widely applied method of treating crude oil –in- water emulsions and involves the use of CPI separator to accelerate the emulsion breaking process.

In the present work and for Demulsification method, Demulsifier type (KS-5038) was used (injected) for dehydration for Neem Field Processing Facility water in oil emulsion. The experimental work was performed for crude oil samples (daily) after chemical injection. Mechanical method (gravity separation) also was applied to separate the oily water emulsion to enhance the produced water quality according to WHO specification and reduce the oil waste with water.

The present work involved in this thesis by uses two demulsification methods which have been studied, discussed and compared with successful Neem FPF laboratory test results that obtained good and satisfied result.

تجريدة

يكن تواجـ الماء والنفـ الخام كمستحلب في عــ مراحل من انتاج ومعالجة النفـ الخام. وتتمثل المهمة الرئيسية في مجال إنتاج النفـ والغاز في الفصل بين مراحل النفـ والغاز والمياه ومعالجة هذه المراحل فرديا من أجل تلبية مواصفات المنتج . الأساليب أو الطرق المتاحة حاليا لكسر المستحلب يتم تصنيفها للكيميائية , الكهربائية , الحرارية والميكانيكية (الفصل بالجاذبية).

عملية تفكيك المستحلب ضرورية في العديد من التطبيقات العملية مثل صناعة البترول. تفكيك المستحلب كيميائيا هي من أكثر الطرق تطبيقا على نطاق واسع لمعالجة مستحلبات المياه في النفـ الخام ، وتنطوي على استخدام مواد كيميائية مضافة لتسريع عملية كسر المستحلب. وتم تقييم تأثير تفكيك المستحلب كيميائيا على عمليات إستقرار وخصائص مستحلبات المياه في النفـ الخام تجريبا (معمليا). وفي هذا الصدد ، استخدم مفكك الإستحلاب الطريقة الميكانيكية (الفصل بالجاذبية) هي أيضا من الطرق الأكثر تطبيقا لمعالجة مستحلبات النفـ الخام في المياه وتنطوي على استخدام وعاء الفصل ذو الصفائح المعترضة والموجة لتسريع عملية كسر المستحلب.

في العمل الحالي تم إستخدام (حقن) كاسر إستحلاب من نوع (KS-5038) للطريقة الكيميائية لنزع الماء من النفـ الخام لحقل نيم. تم إنجاز العمل تجريبيا (معمليا) لعينات النفـ الخام بعد حقن المادة الكيميائية. الطريقة الميكانيكية (الفصل بالجاذبية) أيضا طبقت لفصل مستحلب النفـ الخام في الماء لتعزيز جودة الماء المنتج طبقا لمواصفات الصحة العالمية وتقليل فاقد النفـ الخام مع الماء.

العمل الحالي في هذه الأطروحة , أستخدمت الطريقتان المذكورتان سابقا درست , نوقشت وقورنت مع نتائج الفحص المعملية (بمعمل حقل نيم), والتي أعطت نتائج جيدة ومرضية.

List of Symbols

Symbol	Name	Designation	Units
ρ	Rho	Density	Kg/m ³
γ	Gamma	Specific weight	N/m ³
τ	Tau	Shearing stress	N/m ²
μ	Mu	Dynamic viscosity	N.s/m ²
ν	Nu	Kinematic viscosity	m ² /s

List of abbreviations

No	Abbreviation	Meaning
1	ml	Milliliter
2	CPI	Corrugated plate interceptor
3	m	Meter
4	mm	Millimeter
5	hr	hour
6	Re	Reynolds Number
7	Fr	Froude Number
8	BOPD	Barrel of oil per day
9	BLPD	Barrel of liquid per day
10	BFPD	Barrel of Fluid per day
11	BWPD	Barrel of Water per day
12	Bbl	Barrel
13	API	American Petroleum Institute
14	SG	Specific gravity
15	°F	Degree Fahrenheit
16	kg/m ³	Kilogram per cubic meter
17	M	Mass
18	L	Length
19	T	Time
20	g	Gravitational
21	N/m ²	Newton per square meter
22	N/m ³	Newton per cubic meter
23	K	Kelvin
24	°C	Degree Celsius
25	H	Hydrogen
26	SI	International System of units
27	N.s/m ²	Newton second per square meter
28	kg/ms	Kilogram per meter second
29	ft/sec	Feet per second
30	m/s	Meter per second
31	m ³ /min	Cubic meter per minute
32	m ³ /hr	Cubic meter per hour
33	g/hr	Gram per hour
34	Pa	Pascal
35	kPa	Kilo Pascal
36	MPa	Mega Pascal

37	psig	Pound per square inch gauge
38	barg	Bar gauge
39	CGS	Centimeter-gram-second
40	P	poise
41	cP	CentiPoise
42	Cst	Centistokes
43	RVP	Reid vapor pressure
44	TVP	True vapor pressure
45	lb	Bound
46	Na	Sodium
47	Cl	Chlorine
48	O	Oxygen
49	S	Sulphur
50	N	Nitrogen
52	Ni	Nickel
52	V	Vanadium
53	V	Volt
54	Fe	Iron
55	Wt	Weight
56	BS&W	Basic Sediment and Water
57	ppm	Part per million
58	WHO	World Health Organization
59	DCS	Distributed control system
60	TEMA	Tubular Exchanger Manufacturers Association
70	FWKO	Free Water knock out
71	FCV	Flow control valve
72	PCV	Pressure control valve
73	PSV	Pressure safety valve
74	kw	Kilowatt
75	Hz	Hertz
76	ac	Alternative current
77	LPG	Liquefied petroleum gas
78	mmscfd	Million standard cubic feed per day
79	MSDS	Material safety data sheets
80	V	Vessel

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