

“Crude Oil Recovery from Seawater Emulsion by Means of Molecular Electromagnetic Polarization”

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ABSTRACT

The objective of this study was to develop a new process for recovery crude oil from the seawater emulsion captured by means of traditional methods. The crude oil was precipitated from the seawater emulsion using low frequency electromagnetic waves. The electromagnetic waves, through the emulsion seawater oil, developed a strong electrolytic field that the molecule oil principally was polarized and precipitated. It was used a 1. % and 10. % crude oil concentration on seawater. On 10. % crude oil concentration after 3 hours of excitation the crude oil was precipitated from the seawater.

KEY WORDS: Molecular electromagnetic polarization, crude oil recovery, seawater emulsion and crude oil precipitation from seawater.

I- INTRODUCTION

The seawater is being contaminated by several spills all around the world. The last on Luisiana of USA was very dangerous because it has been contaminated the seawater on several states of USA.

The objective of this study was to develop a new process for recovery crude oil from the seawater emulsion captured by means of traditional methods. For this purpose, we used a low frequency (55kHz) electromagnetic waves in order to generate a strong electric field for to polarize the molecule oil principally and then, to promote the precipitation of the oil molecule from the seawater emulsion surface.

The experiments were developed using 1.% and 10. % concentration of crude oil from Miguel Hidalgo Refinery (18/05/98) on seawater from Veracruz Port, (16/05/2009).

This is a novel research developed in my Doctoral Thesis named “EL ULTRASONIDO COMO UNA RADIACIÓN IONIZANTE”, Instituto Politécnico Nacional (Centro de Investigación en Ciencia Aplicada y Tecnología Avanzada), Agosto del 2006.

On this method, it was promoted the precipitation of crude oil from the crude oil seawater emulsion. On this process we used 1. % and 10. % crude oil seawater concentration. The precipitation was controlled using a refractometer.

II- MATERIALS

The experiment is very simple and the materials are common and they were:

- Crude Oil from Miguel Hidalgo Refinery of 18/05/1998.
- Seawater from Veracruz Port, MÉXICO, 16/05/2009.

The original seawater analysis sample Veracruz, Port was:

Cl = 19,650. mg/l

Na = 11,009. mg/l

SO₄ = 2,730. mg/l

Mg = 1,760. mg/l

CaCO₃ = 6,200. mg/l

Ca = 405. mg/l

pH = 8.22

Conductivity = 49.2 ms/cm

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- The excitation was done with a generator of 60 Hz, 117 Volts, 100 Watts and 55 kHz.
- Refractometer IFT 10 HP Industrial Fluid Tester. Catalog No. 138551000

III- THEORETICAL CONSIDERATIONS

On this method, we are going to modify the physical properties of the surface oil film in order to promote the precipitation of the crude oil from the seawater emulsion.

All the mater has vibrational modes (1) and they are transitional, rotational and vibrational. On this case, vibrations are induced by low electromagnetic frequency.

When a microwave passes through a mixture other than a vacuum, its frequency stays the same, but its velocity wavelength, and amplitude are reduced. Any mixture contains components that can be polarized an electromagnetic wave (2).

When a microwave is in resonance with an asphaltene molecule (5 Nm) (3), it is elongated and then polarized. These polar elements include electron orbit distortions, ionic bond stretching, polar molecule rotation, and interfacial polarization of changes in an emulsion (2).

When we are on the case of a crude oil, the molecular polarization, for the translational, rotational and vibrational modes, in some transient time, the molecular positive pole is opposite of a molecular negative pole, and then, they attract each other. When the crude oil cluster is bigger enough, it becomes heavier than seawater molecule and, we have the crude oil precipitation.

On this research, on seawater surface, every time the crude oil is less concentrated because the heavier crude oil cluster than seawater molecule is precipitated as mud to the barrel bottom.

IV- METHODS

The crude oil seawater emulsion was prepared approximately on one seawater liter and crude oil to form 1. % and 10. % concentration.

The excitation was done using a low frequency wave. On this process, every five minutes a sample was taken in order to detect the emulsion concentration.

We developed two tests. On the first one the emulsion was with 1. % crude oil and in the second one it was 10. % crude oil concentration. The results are on tables 1 and 2.

Seawater concentration without crude oil is = $3.5 \times 0.6667 = 2.335 \%$ = Seawater natural or pure from Veracruz, Port, México.

Pure crude oil concentration = Diffuse

The emulsion samples were taken with a 6. mm diameter small glass rod.

Table No. 1.- Crude oil 1. % determination on seawater surface

Test No.	Time Sample	Refractometer reading	% Seawater conc. On surface
2010-3 1. % crude oil and 0.6667 factor	10 h 30 min	4.	2.67 %
	10h 35 min	4.	2.67 %
	10h 40 min	Diffuse	
	10h 45 min	4.	2.67 %
	10h 50 min	4.	2.67 %
	10h 55 min	4.	2.67 %
	11h 00 min	Diffuse	
	11h 05 min	Diffuse	
	11h 10 min	3.	2.00 %
	11h 15 min	4.	2.67 %
	11h 20 min	4.	2.67 %
	11h 25 min	4.1	2.73 %
	11h 30 min	4.1	2.73 %
	11h 35 min	4.1	2.73 %
	11h 40 min	4.1	2.73 %
	11h 45 min	4.0	2.67 %
	11h 50 min	4.	2.67 %
	11h 55 min	4.	2.67 %
	12h 00 min	4.	2.67 %
	12h 05 min	4.2	2.80 %

Table No. 2.- Crude oil 10. % determination on seawater surface

Test No.	Time sample	Refractometer reading	% Seawater conc. On surface
2010- 5 10. % crude oil and 0.6667 factor	9h 25 min	Diffuse	
	9h 30 min	Diffuse	
	9h 35 min	Diffuse	
	9h 40 min	Diffuse	
	9h 45 min	Diffuse	
	9h 50min	Diffuse	
	9h 55 min	Diffuse	
	10h 00 min	Diffuse	
	10h 05 min	Diffuse	
	10h 10 min	Diffuse	
	10h 15 min	Diffuse	
	10h 20 min	Diffuse	
	10h 25 min	Diffuse	
	10h 30 min	Diffuse	
	10h 35 min	Diffuse	
	10h 40 min	Diffuse	
	10h 45 min	Diffuse	
	10h 50 min	Diffuse	
	10h 55 min	Diffuse	
	11h 00 min	Diffuse	
	11h 05 min	Diffuse	
	11h 10 min	Diffuse	
	11h 15 min	Diffuse	
	11h 20 min	Diffuse	
	11h 25 min	Diffuse	
	11h 30 min	Diffuse	
	11h 35 min	Diffuse	
	11h 40 min	Diffuse	
	11h 45 min	Diffuse	
	11h 50 min	Diffuse	
11h 55 min	Diffuse		
12h 00 min	Diffuse		
12h 05 min	Diffuse		
12h 10 min	Diffuse		
12h 15 min	Diffuse		
12h 20 min	5.	3.33 % seawater pure	
12h 25 min	5.	3.33 % seawater pure	
12h 30 min	5.	3.33 % seawater pure	

V- DISCUSSION

On the first test, it is important to observe that the 1. % crude oil on seawater concentration, the precipitation of the crude oil was no clear because the crude oil was dispersed on seawater surface.

On the second test, on 10. % crude oil on seawater concentration, after 3 hours of excitation, such crude oil was precipitated from seawater surface and we had a pure seawater concentration. On this process, the crude oil precipitated on the barrel bottom can be eliminated by decantation of seawater or with a siphon and we have almost crude oil as mud and a little of seawater.

This method, can be scaled to an industrial one because the equipment used was according the standards.

It is easy to recovery the crude oil from the seawater surface and to spill the clean seawater again to the sea.

The process for seawater is more difficult than for the potable one. The crude oil on seawater emulsion captured must be concentrated in order to apply the process.

VI- CONCLUSION

It is an efficient, rapid and inexpensive method in order to clean the seawater surface of crude oil.

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