



Membrane Method and its Roles in Refining the Oily Waste Water

Mahmood Keshtkar

Pars Petro Zagros (PPZ)

Email: m.keshtkar_ep@yahoo.com

Alireza Fard

Islamic Azad University, Lamerd Branch

Email: Fard135370@yahoo.com

Mohammad Bagher Dakami

Petro Govhar Fara Sahel Kish

Email: ghadami.saeed@gmail.com

Abstract

According to the development of human civilization & developing different process & enhancing production in every day, nowadays our world force with a lot of problem in pollution environment and result of this occur, May fall our life in danger. This occur is one of the most basic industry in cause of our environment nature population and this happen in a several stage of discovery & producing so we will dropping a lot of waste water in environment. Always with production oil, we can observe a huge volume of water & the notice is here that water is so poisonous & includes many different materials such as Cations, Anions, total dissolved solids (TDS) and total suspended solids (TSS).nowadays the laws of environment force to companies to refine or expulsion these wastes in order to prevent or minimizing the dangers of that. One of the most successful methods in refining the waste water that had been done in Canada is membrane method.

As a matter of fact, Iran is one of the basic productions of oil in the world that always force with the problems of producing water. In this project the result of experiment of produced water with oil in several oil field in Iran have been presented and in comparison of the type & deal of material in Canada, we received to this conclusion that with the use of membrane method we can observed decreasing of that in a huge amount.

Keywords: Membrane Method, Oily Waste Water, Environment, oil production, water Pollution



Introduction

On the one hand the daily activity of the industrial development and on other hand the abuse and neglectful on rules without sufficient management has been caused the oil polluted residue in the last decades. It affected our environment life. The oil polluted residue affect us in many different ways. Like discovery of oil field and drilling and exploration of oil and finally of oil's production.

Therefore we have to concern and find a solution for these problems. Otherwise in future we could have many incompensation damages for our negligence. In regarding daily industrial and technological development compare with our time we will be seriously affected. For example during the water coning in the reservoir the amount of produced water will be increased. The importance considering the necessary arrangement for decreasing prevention of damages would be clearer.[1]

Oil production and environmental pollution

In many levels for oil production also it has been so much water production in comparison with the depth of oil reservoir, particularity of the geology regions. The measurement is different to practical of cementation and diagenesis of their circumstances. But usually under any condition including oil production some water will be produced. In different level or different way with separation and analysis of high heating oil will be separated. As so much produced water than usual would cause decreasing price of oil production. In following total system will be decreased by procedure. This problem indirect from added the spend cost of oil production and in following cases the price of oil production will increase. It cases also the price of prevention of water production. By so much water production it would bring a lot of problems. The following points are explained clearly:[2]

- The rate of decreasing oil production.
- The rate of decreasing of total oil production.
- The measurement of decreasing rate for profit of oil production.
- The amounts of measurement of water by the separation of oil refine.
- The increasing amount of transient sand around the well.
- The decreasing ability of oil refines.

It is also mentioned that the produced water from oil wells including many of materials that can threat the environment and consequently the human's health.

This water usually includes of hydrocarbon and grease and some toxic materials like mercury, calcium, potassium, magnesium and etc. each one can create lot of different danger. With this polluted water or weakest water witch it is very dangerous poison, it has following behavior.

Or it is deposited in old wells so that it would be oil advance. And with help of water it can be used as needs for boilers. It can inject into oil reservoirs. In regarding to depth of each of polluted water it changes to poison. Because it can inter to circular life of animals and humanism.

Before we do any activity on it, we have to change and clean the water into soluble and insoluble without any poison. After separation the oil from water this water enters into different stage which we have mentioned. Separation and transportation of water will be done in other places. Usually through transportation it would be done, therefore if these not any possibility to do transportation of water, we have to think and find a water system in order to decrease this filtrated water. With help of this systematic way the different stage of polluted water would reach the least measurement's degree or least scale. According to this procedure not only the clearing but also the grease of oil and also solid materials in water would be less than amount expected. [3]

The procedures for separation of existence of productive polluted materials in water

These are several procedures for separation of poisonous water which each one has own advantages and disadvantages. In regarding to possibility and dominated conditions each one of these procedure can be used for polluted environment. In the table1 some of these problems has been explained, including their advantages and disadvantages. [4]

Table1: some procedure for separation of existence of productive polluted water. [5]

	advantage	Disadvantage
Adsorption of carbon	<ul style="list-style-type: none"> - Elimination of the hydrocarbon and national acids. - Need of low energy. - High activity of power with other methods. 	<ul style="list-style-type: none"> - Floating small eruption of carbon. - Product of floating polluted with needs of refine for currents in carbon. - Need to refine for productive current of water.
Infrared rays	<ul style="list-style-type: none"> - Elimination of the vaporized materials. - Need less of extra process on polluted current. 	<ul style="list-style-type: none"> - Needs to high level of energy. - Need to other procedure for the polluted currents.
Chemical oxidations	<ul style="list-style-type: none"> - Elimination of H₂s. - Need of low energy. 	<ul style="list-style-type: none"> - Probability of product of the surficial poison. - Need to other procedures for polluted currents

Membrane method

Recently membrane methods are used more than other methods, in this system membrane method differentiates to the various stages. Of course the real mechanism for the separation is according to its different particles. But regarding to motivated power the membrane will be organized. Membrane methods have been shown in table2: [6]

Table2: organization categorization of membrane methods. [6]

Membrane method	Motivated power	Feed	Product
Micro filtration	Various pressure	Liquid	Liquid
Ultra filtration	Various pressure	Liquid	Liquid
Nano filtration	Various pressure	Liquid	Liquid
Reversed osmosis	Various pressure	Liquid	Liquid
Gas separation	Various pressure	Gas	Gas

Membrane methods are used for the motivate power by the differentiated pressures. It can be used for separation of insoluble particles and also floating particles with its different sizes. These processes could be organized for the hole of Reversed osmosis it will be called nano filtration and ultra filtration and micro filtration. The reverse osmosis is one of the processes of membrane which is used for separation of liquid. In the process of membrane only the water can pass through the membrane placed in the concentrated phase of liquid of course sometimes the reversed osmosis membrane taken as the nano filtration membrane. One load ion can pass through membrane but in this condition the ion with more than one load can not pass through the membrane like sulphate and phosphate. Also these membranes do not allow passing materials without any load. They do not let pass also the ion with positive load with the same size and the same shape. [6]

Productive water oil field in western regions in Iran

In Iran, there is following difficulties witch has been explained, for example were in the regions in Asmari and Bangestan formation the Ahwaz field in year 2004, equal to 118, 57 million barrel oil, 1.8,75 million barrel water has been produced. In regarding to existence of underground water in some reservoir in the Iran, there are difficulties to product water of these wells also in regarding to economical prices of each barrel oil production, if the water production is reduced, it will be more economical than enhanced oil recovery (EOR). [7] Necessity of studying and using the best method for prevention of water product and supporting the environment areas is really important. Also the produced water has a high degree of poison that each one can bring a lot of irreparable damages to the environment. Table1 has shown out come of testing the sample of produced water in the western regions of Iran. [8]

Table1: the amount of wastes in the produced water of a western oil field of Iran. [8]

parameters	TDS	TSS	Oil	Ca ²⁺	Mg ²⁺	Na ⁺ ,K ⁺	SO ₄ ²⁻	CL ⁻	NO ₃ ⁻	H ₂ S
Amount(mg/L)	18555	150	1000	13605	1593	44309	386	95578	29	38

An example of using the membrane methods

The most oil reservoirs of Canada have placed in low depth and low strength formations. This becomes the water coning water sooner, so it will produce lots of water to accompany with oil. Therefore instead of spending too much money for the transportation of polluted water into disposal wells or other less degree places, contractors tried to use the membrane for refining the produced water to minimize the environmental pollution. After founding these materials inside water the result in table 3 has been gotten and the sample of the site 3 has passed though membrane, Witch the result of the experiment were satisfactory and these result are sown in table4.[3]

Table3: the result of analyzing the waste of three different sites in Canada. [3]

Parameters		CCME Criteria ² for drinking water	Site 1	Site 2	Site 3
Conductivity, μ S/cm		-	36,210	14,650	2,570
Total Dissolved Solids		500	15,541	7,054	1,482
Total Hardness as CaCO ₃		500	1,161	-	164
Total Suspended Solids		-	79	264	154
Oil and Grease		-	71	-	1,760
Anions:	Chloride	250	9,020	4,430	814
	Fluoride	1.5	-	2.2	14
	Nitrite	4.5	30	21.4	< 0.4
	Nitrate	45	-	-	< 0.4
	Sulphate	500	22	<10	< 2
Cations:	Sodium	200	5,775	2,400	423
	Calcium	-	357	50	81
	Magnesium	-	115	22	22
	Potassium	-	124	65	25
	Total Iron	0.3	0.6	2.0	95
	Manganese	50	-	0.25	2
	Silica	-	98	50	2
Aluminum	-	-	1.5	2	

Table4: the result of the membrane experiment. [3]



Parameters	CCME Criteria ² for drinking water	Site 3 Water Sample
		Post-RO (Run #11) Membrane ST-10
Conductivity, $\mu\text{S/cm}$	-	< 10
Total Dissolved Solids	500	94
Total Suspended Solids	-	< 1
Oil and Grease	-	< 1
Anions:		
Chloride	250	48
Fluoride	1.5	0.5
Nitrite	4.5	< 0.4
Nitrate	45	< 0.4
Sulphate	500	< 2
Cations:		
Sodium	200	33
Calcium	-	2
Magnesium	-	0.6
Potassium	-	5
Total Iron	0.3	1
Manganese	50	0.01
Silica	-	0.6

The figure 1 has compared the amount of wastes of produced water in Iran with the amount in Canada, the figure has shown that the amount of wastes of produced water in Iran is more than the amount in Canada. [8]

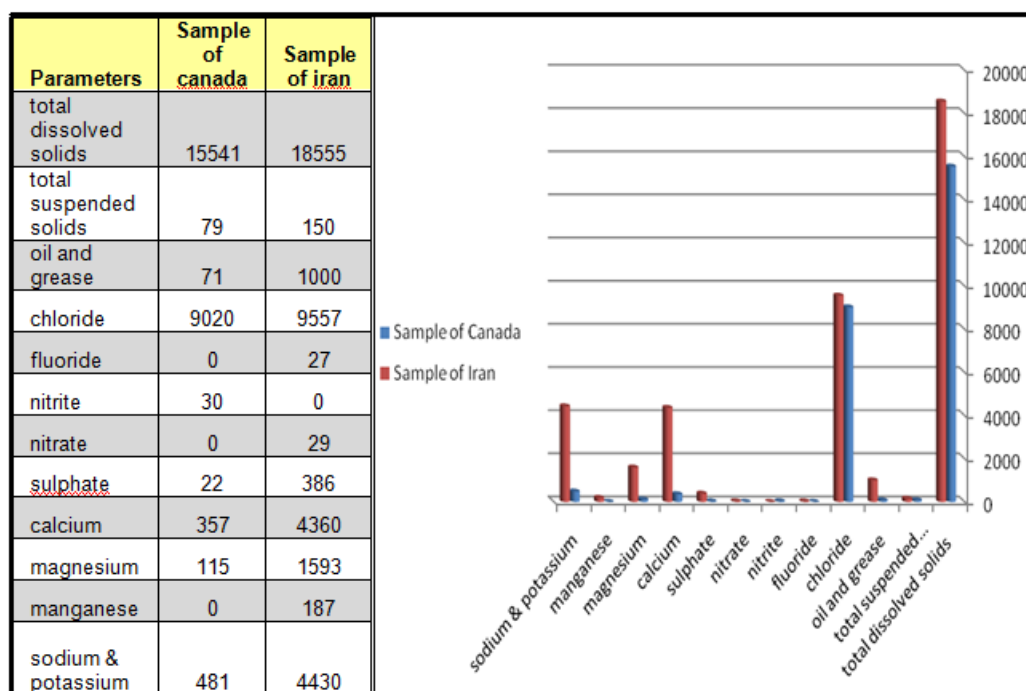


Figure1: amount of wastes in produced water in Iran and Canada. [8]

Results

- Nowadays pollution in the environmental areas of life is one of the most important challenges in the world.
- Damaging the environmental areas in oil industry is unavoidable but by using better tools and different equipments we can minimize the environmental damages.
- Membrane methods are good choice for refining the produced water.
- According to the proof of technical feasibility, we have to consider the economic feasibility.
- Since the amount of wastes of produced water in Iran is more than the amount in Canada, it is necessary to use the membrane and offer technologies to reduce the amount of environmental pollution.

1- References

- 1- Ghadami Jegarluei.S, Moazzeni.A.R, Nabaei.M,” produced water and their pollutions” 2nd national convention on fuel, energy and environment, presented in 2010.
- 2- Dovlat Abadi.M, Mosavat.N, Por Afshar.P, Azimi.S,“ solve the problem of the oil wells” The national conference of chemistry, 2009.
- 3- A.K.M. Jamaluddin and L.M. Vandamme, Noranda Technology Centre: "produced waste management in the Canadian petroleum industry", SPE 27133.
- 4- K. Shams Ashaghi, M. Ebrahimi, and P. Czermak,” Ceramic Ultra and Nanofiltration Membranes for Oilfield Produced Water Treatment: A Mini Review”the open environmental jornal,2007,1,1 8.
- 5- American Petroleum Institute, a special two-day meeting. op. cit. See also:OSPAR. 1992b. PARCOM Recommendation 92/6 on the best available technology for produced water management on offshore gas and oil.Madaeni.S.S, Rahimpour.A,” membrane methods” Publish by razi university, 2005.
- 6- Mehraki.A, Hashemi.B, Moradi.B, Masihi.M,” water coning and its problems in the oil and gas reservoirs” The national conference of chemistry, 2009.
- 7- Ghadami Jegarluei.S, Espargham.M,” smart wells and their rolls in prevent of environmental