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Contingency Planning for Oil Spills on Water

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Abstract*: This paper develops the oil spill contingency plan. Two studies in the region of Ataqa - Suez and Red Sea- Egypt have been presented the Oil Spill Trajectory model is applied to predict evaporation, dispersant, skimmer and remaining percentages of oil the effects of the amounts of oil released. Percent time response time , environmental conditions (Wind speed , temperature of water) , and percent of slick sprayed. On the oil spill trajectory model to develop contingency plan the main conclusion is compatibility of the result obtained indicated service options for creating an immediate response model such as detection, assessment and evaluation , management, and clean-up.

Keyword: oil spill, contingency plan , trajectory model.

I. INTRODUCTION

oil spill contingency plan is required for successful combating operation to marine oil spills. The success of combat depends on the rapid response from the time of the oil spill reported until it has been fully combated. The concepts of oil spill contingency planning refer to several activities for creating an immediate response programs such as detection, assessment and evaluation , management, and clean-up.

The following table I-I shows many difference oil spill incidents (1, 2, and 3).

Table- I: Oil spill incident

Incident	Year	Commend	Facts
Torrey Canyon	1967	Supertanker "TORREY CANYON", carrying 120,000 tons of crude oil struck Pollard's Rock in Cornwall in 1967. The mother of oil spills.	Over 100,000 tons spill created an ecological disaster on the coast of Cornwall, extensive use of chemicals. Bombing with firebombs and napalm
Amoco Diaz	1978	VLCC "AMOCO CADIZ", transporting 223,000 tons of crude oil ran aground on Portsall Rocks, on the coast of Brittany (France) in 1978	All of the cargo lost to the sea. Ecologic disaster, 360 km of coast polluted
Exxon Valdez	1989	VLCC "EXXON VALDEZ", laden with 185,000 tons of crude oil ran aground in Alaska, in 1989.	"Only" 38,500 tons spilled but the environmental impact gained notoriety Polluted over 2,000 km of coasts
Sea Empress	1996	"SEA EMPRESS", laden with 130,000 tons of crude oil grounded at the entrance to the Milford Haven,	Misjudgment of tidal currents Port's radar was out of order temporarily Lack of communication Lack of information procedures
Erika	1999	Oil Tanker "ERIKA", laden with 31,000 tons of heavy fuel oil broke in two off the Bay of Biscay (France),	Large scale pollution Difficulties of Heavy Oil Clean-up

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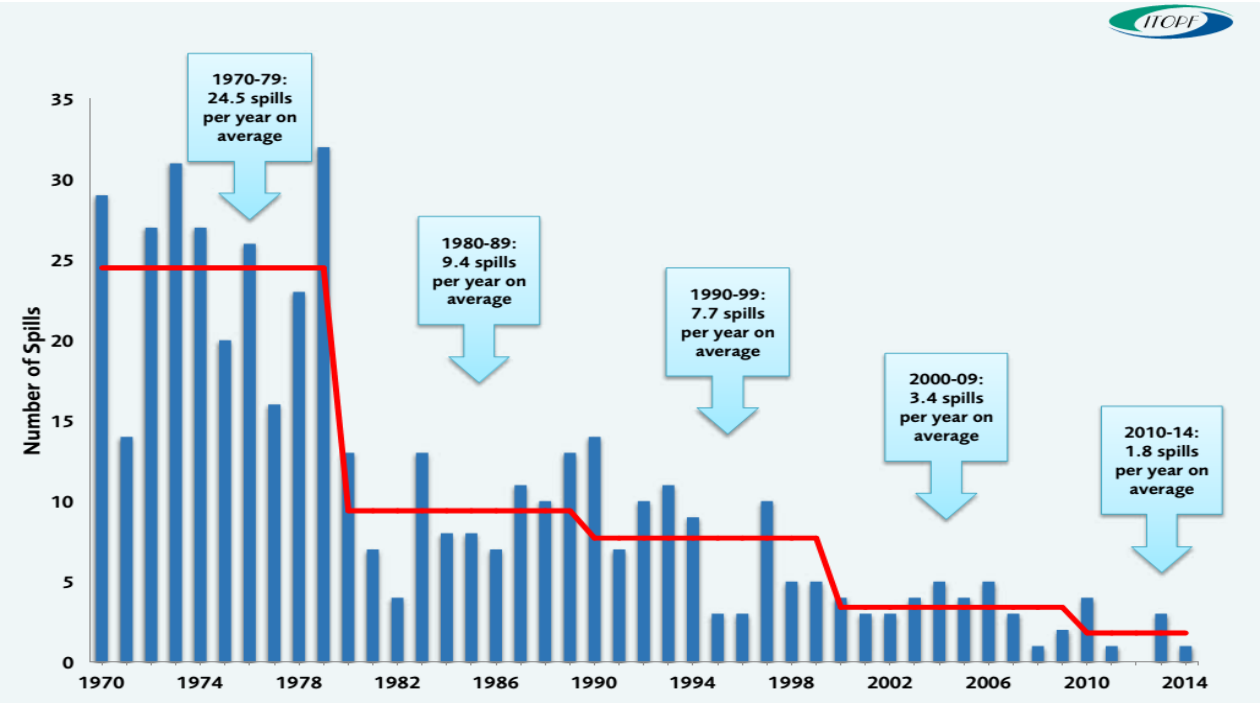
Prestige	2002	PRESTIGE", laden with 77.000 tons of heavy fuel oil broke in two off the shores of Galicia (Spain),	Bad weather, damage and list.French, Spanish and Portuguese governmentsrefused to give permission to enter their waters
DWH	2010	"DEEP WATER HORIZON", one of the deadliest and publicized spills ever resulted in 200 million gallons of crude oil pumped into the Gulf of Mexico for a total of 87 days, the biggest oil spill in U.S. history.	16,000 total miles of coastline have been affected, including the coasts of Texas, Louisiana, Mississippi, Alabama, and Florida. 11 deaths and 17 injuries An explosion caused the rig to sink and fail mechanism did not stop the subsurface well

The static distribution of oil spill along time can be showing in the Fig. 1& Fig. 2



Number of Spills great than 700 TN

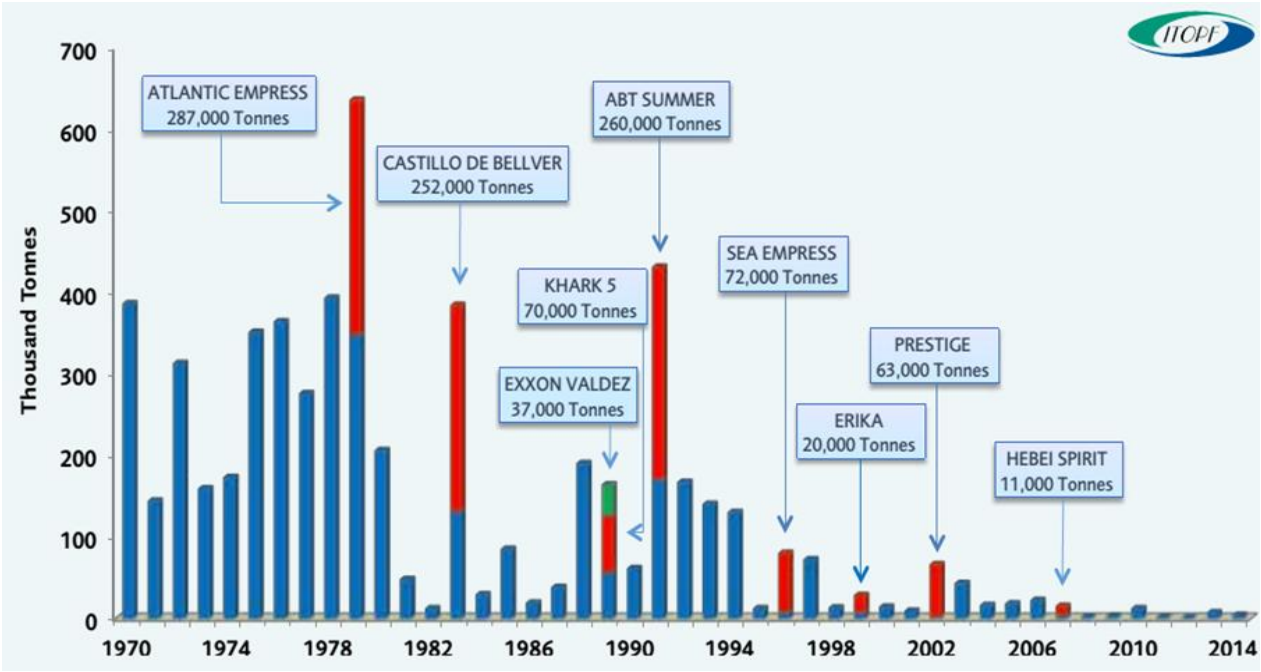


Fig. 1.Quantities of Oil spill statics less than 7 Ton from (1970-2014)

The aim of this work is to carry out in depth study of several oil pollution spill accidents in

preparation for development of an upgraded oil spill contingency plan by using a physical-mathematical model. The present study includes the following issues: a survey of oil spills and models, environmental impacts , clean up techniques and prevention of oil spill.

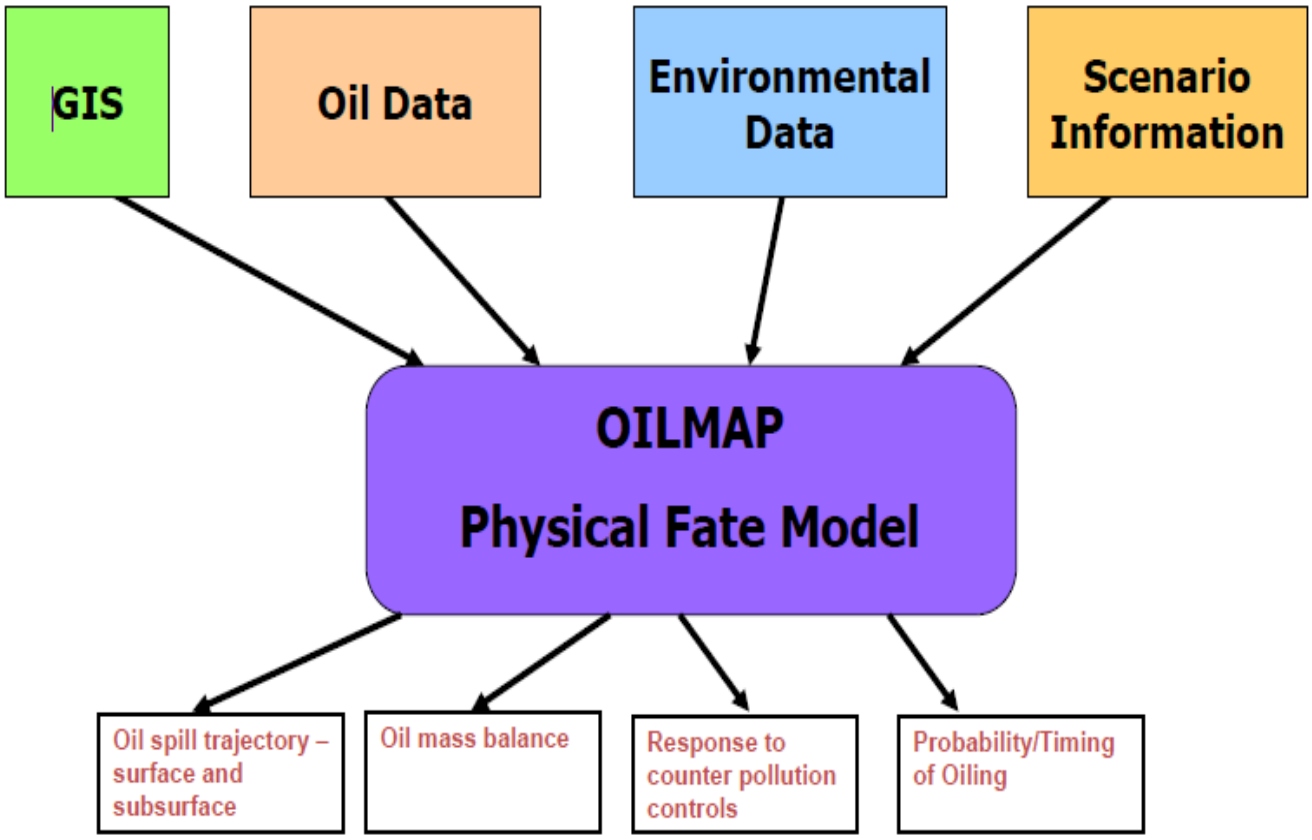


Fig. 2.System Structure

The software program structure and model algorithms, is designed to provide the spill cleanup community with response – oriented answers to questions regarding the behavior of weathering oil and its mass balance at sea. The requirement of input information should be include physical and chemical properties of crude oil and petroleum products, which determine the environmental behavior and fate of spilled oil. Two actual case studies in the region of Ataqa - Suez and Red Sea- Egypt have been presented and RPS ASA OILMAP7 Oil Spill Trajectory model is applied to predict , evaporation, dispersant, skimmer and remaining percentages of oil also, a study is carried out on the effect of the quantity of oil released ,response time , environmental conditions (Wind speed , temperature of water) , and percent of slick sprayed on the outputs to develop a contingency plan.

II. CASE STUDIES

The discussion of output for incident (Hurghada) Spill oil in Gabel Zate to Hurghada City. (4)
Weather forecast:

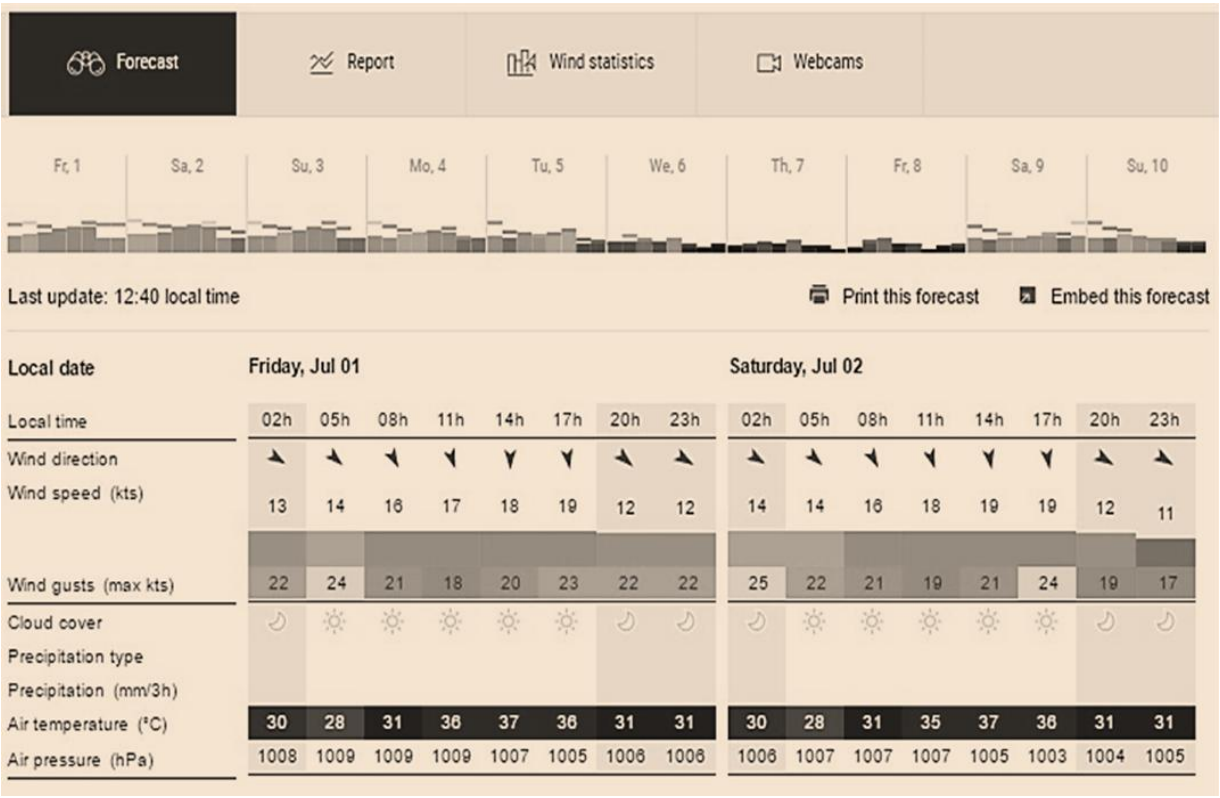


Fig. 3.the effect of wind

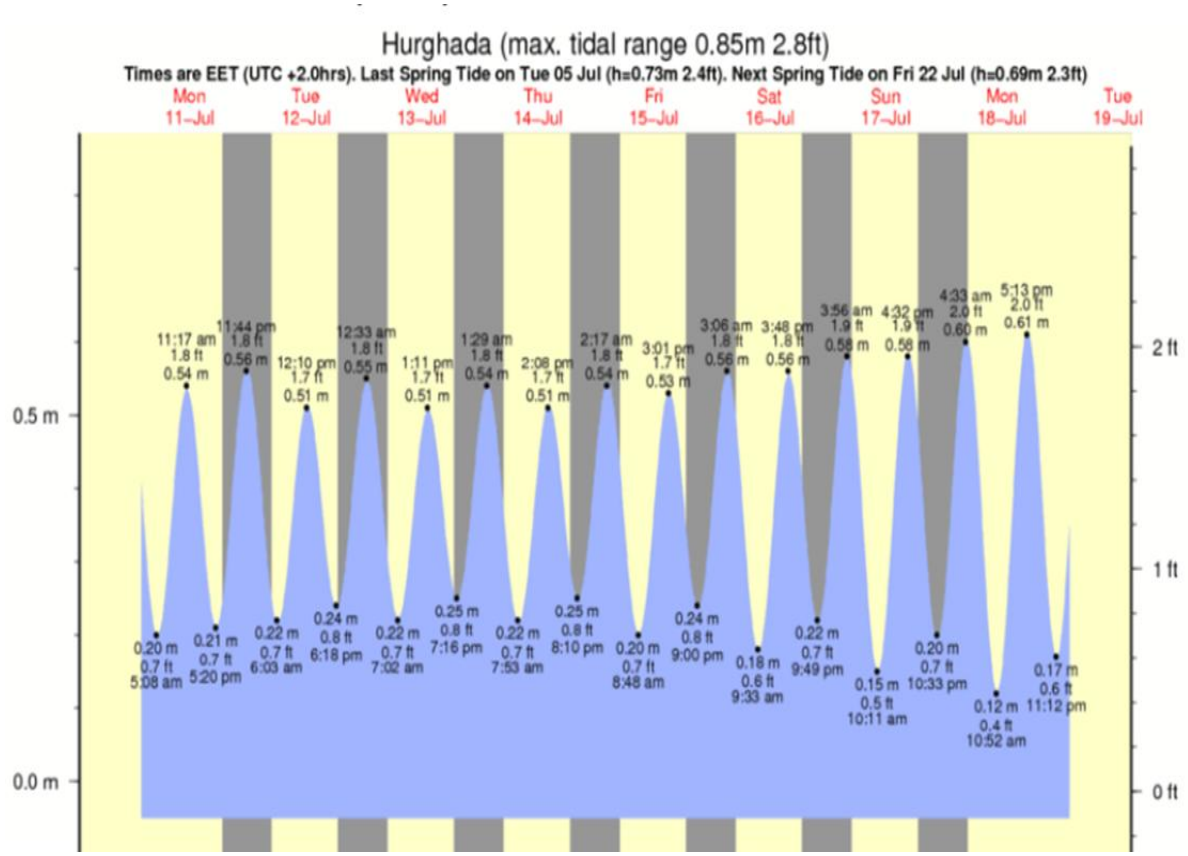


Fig. 4.(a) The sea weather

Sea Conditions	7 Day Tide Table		Live Weather	Tide Station Map	Lo
Tuesday 12 July	4:58 AM	EET			Sunrise
	6:03 AM	EET	0.22 meters	**(0.72 ft)**	**Low Tide**
	12:10 PM	EET	0.51 meters	**(1.67 ft)**	**High Tide**
	12:11 PM	EET			Moonrise
	6:18 PM	EET	0.24 meters	**(0.79 ft)**	**Low Tide**
	6:42 PM	EET			Sunset
Wednesday 13 July	12:01 AM	EET			Moonset
	12:33 AM	EET	0.55 meters	**(1.80 ft)**	**High Tide**
	4:58 AM	EET			Sunrise
	7:02 AM	EET	0.22 meters	**(0.72 ft)**	**Low Tide**
	1:02 PM	EET			Moonrise
	1:11 PM	EET	0.51 meters	**(1.67 ft)**	**High Tide**
	6:42 PM	EET			Sunset
	7:16 PM	EET	0.25 meters	**(0.82 ft)**	**Low Tide**
Thursday 14 July	12:38 AM	EET			Moonset
	1:29 AM	EET	0.54 meters	**(1.77 ft)**	**High Tide**
	4:59 AM	EET			Sunrise
	7:53 AM	EET	0.22 meters	**(0.72 ft)**	**Low Tide**
	1:53 PM	EET			Moonrise
	2:08 PM	EET	0.51 meters	**(1.67 ft)**	**High Tide**
	6:41 PM	EET			Sunset

Fig. 5.(b) The sea weather

The following showing the result by using RPS ASA OILMAP7 Oil Spill Trajectory model

Table- II: Trajectory the Hurghada Incident

Time (Hours)	Surface (%)	Water Column (%)	Ashore (%)	Evaporated (%)	Skimmed (%)	Removed (%)
020.0	157.9	005.0	055.1	080.0	000.0	000.0
040.0	141.0	003.2	066.2	085.8	000.0	000.0
060.0	124.1	003.0	078.7	088.7	000.0	000.0
080.0	118.6	002.7	080.9	090.8	000.0	000.0
100.0	072.7	002.6	124.1	091.9	000.0	000.0
120.0	040.6	002.4	154.3	092.3	000.0	000.0
140.0	027.9	002.4	165.2	092.4	000.0	000.0
160.0	020.9	002.3	170.6	092.5	000.0	000.0

III. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

After performing the present study on oil spill model and studying contingency plan , the following conclusions are presented:

1- Study case number (1) indicates that , the skimmed portion is very small compared to the manual percentage, which represents the main combating. The output of trajectory Model is consistent with the actual results of the red sea Authority report.
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5- The information collection about the accident should be accurate and readily available.
6- Modern or advanced technology such as remote sensing techniques and advanced suitable software play an important role in response options and success of combating.
7- Training of all personnel periodically is necessary to identify gaps.
8- Coordination among administrative and technical authorities is necessary prerequisite for proper operation.

Recommendations

The following recommendations for safer transportation of oil in water ways are

1- Database information system about oil spill accidents must be established to facilitate requirements of combat measures.
2- Egyptian ports should be prepared to face problems originating from oil spill accidents by problems originating from oil spill accidents by proper equipment and well-trained personnel.
3- Early warning systems for the accidents of oil spill must be established to accelerate response and reduce the negative impacts.
4- A contingency plan for protection of sensitive coastal areas and combat oil spills must be approved and updated periodically.
5- Development of environmental awareness for the workers and public against effects of oil spill on the socioeconomic of the region.

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4. Petro-safe company petro environmental service company

AUTHORS PROFILE

Nancy Elsayed was born in Egypt. She got his BSc in Chemical Engineering (El Shrouk Academy), Cairo, Egypt in 2011. She is working in petrosafe Petroleum and service Company in Egypt as a Chemical Process Engineer. She worked oil spill. She has some courses oil spill engineering such as IMO Level 3, crisis management, Advanced Maintenance course & commissioning start up and some safety courses such as OSHA.

Said Ali was born in Suez city, Egypt. He got his BSc in the Chemical Engineering and Petroleum Refining from the Faculty of Petroleum and Mining Engineering (Suez University), Suez, Egypt. He is a professor in the chemical Engineering, specialist in the optimization, modeling and simulation. He is a faculty member in the faculty of petroleum and mining engineering, chemical engineering and petroleum refining department. He taught in several universities in Egypt such as AUC, BUC and Al pharos. He has taught several courses in chemical engineering such as control, optimization, safety, computer applications, phase equilibrium, process synthesis and operational research. He supervised many scientific theses (Master and Doctorate).

Mustafa Awad was born in Egypt. he got his BSc in Chemical Engineering and Petroleum Refining from the Faculty of Petroleum and Mining Engineering (Suez University), Suez, Egypt. he has PhD in the refinery engineering from Suez University, specialist in the lube oil treatment. he is a faculty member in faculty of petroleum and mining engineering, chemical engineering and petroleum refining department. he has taught several courses in chemical engineering such as specifications of petroleum products and test methods, petroleum refinery engineering, plant design and pollution control. She supervised many scientific theses such as enhancing produced water in oil fields using alternative treatment technologies, flared gas recovery and optimum operating conditions of gas dehydration.

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