

# Preparation of Iran Oil-Rich Zones; Emphasizing Environmental Issues

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**Abstract-**Oil industry has a very old history in world. The oldest civilization has been in Nile Valley, Tigris and Euphrates, and in China. Historical documents and explorations of archeologists indicate that, mentioned people have been familiar to oil from ancient times. 4000 years BC, people of Tigris and Euphrates used to apply asphalt as the mortar in building. They used to also apply the asphalt to prevent water influence; coating ship and boats; as fuel; and to treat some diseases. Among treatment applications of oil one can mention skin diseases, Rheumatism, and other diseases. In Iran, explorations have indicated that, Iranian society used to apply asphalt as mortar in buildings since 5 or 6000 years ago. They used to also apply asphalt for installing and connecting jewelries and ceramic dishes; and coating boats and so on. The main objective of the present study is to preparing Iran oil-rich zones, emphasizing environmental issues. Necessity of considering environmental issues in oil industry and relevant industry would become clearer, when people find that achieving industrial sustainable development would be impossible without considering environmental issues. Problems of environmental pollution, induced by oil and its products, have gained special position in environmental issues at the world currently. Negative pressure of the problem has made critics to attend different discussions in this regard.

**Index terms-** oil, environment, preparation, the nature, ecology

## 1 INTRODUCTION

Importance of oil industry in Iran is clear to everyone. Over the 10 years, the mentioned industry and financial resources of producing and exporting crude oil has not only been effective in national economic of Iran, but also it has been effective in different social and political domains. In some historical periods, when the industry has followed proper planning and management, it has not only provided sufficient resources to implement government's investment plans, but also it has provided wide range employment, along with thousands industrial units and consulting and contracting companies in different sizes. in this regard, the industry has caused motivation for industrial investment and producing value added in other sections. [20]

After exploring oil in Masjed Soleiman city Iran on 1908, management center of Iran oil activities was established under management of British experts in the mentioned city. However, since many years ago human has become aware of importance of environment, last decades of 20<sup>th</sup> century should be considered as peak

times of attending environmental issues. Today dangers of environment have not only disturbed human security and calm, but also they have endangered human's existence. Therefore, along with current problems, environmental destroying disasters would be one of the most important challenges of human.

Environmental pollution problem in current world is not limited to a certain country or territory, but also it is a worldwide problem, which includes different issues such as water and air pollution, warming of earth, sea water rise, extinction of plant and animal species, erosion of Ozone layer, destruction of jungles, acid rains, noise pollutions, nuclear tests, etc. [11][13]

These are all results of human performances. However, impact of human on environment is as old as human lifecycle, extinction and destruction of the environment has been accelerated after industrial revolution and population enhancement. Development of sciences and technologies has enabled people to overcome natural environment and destroy environment gradually and constantly. [3]

Scientific studies have indicated that, different members of environment such as seas, lakes, rivers, air, soil, animals, and plants are all depended on each other. Hence, due to the integration and unity of environment, any kind of pollution can lead to destruction of environmental balance. Thus, to preserve natural environment, thought of regulating environment rules and principles has been developed and has been completed in regard with international conferences and organizations. The regulations have been focused on protecting environment against pollution and some common universal indices have been provided to regulate activities of environment. However, measures in regard with natural environment have not been limited to this, the issue has enter a new situation after considering issues of human rights through publishing universal announcement of human rights in 1948 and also publishing international treaties in 1966. Finally, in 1972, through Stockholm treaty, peace and relationship was developed between human rights and environment. [19][27]

It should be mentioned that, oil-rich cities follow an unsustainable development pattern because of crude extractions and dependence of economics on non-renewable resources. This is because; assuming expiration of resources, continuing social and economic life would face some serious challenges. A clear example of such landscape is Masjed Soleiman city, which is the first oil-rich zone of Iran. The city, which has been considered a legendary city and one of the most modern cities of Iran for a while, has lost its fame and validity since 70s through evolutionary reduction of oil reservoirs. As a result, urban life faced severe loss. So that, now the city has changed into a poor and unequipped city. [2][8]

Problem of pollutions by oil and its products has been a challenging problem over the decades. Negative charge of the problem has forced critics to attend various discussions. [2][13]

Entrance of million liters of crude oil to seas as a result of different marine events; discharge of thousand liters of oil waste materials by earth, air, and marine transportation; induced pollution by activity of thousands oil refineries and relevant industrial centers; high volume of waste waters of industries; and other various issues are some warnings for wide range of The Global Village. This would clear necessity of taking into account environmental issues and demonstrates that it can't be ignored. Additionally, some challenges

would be existed for natural environment of Iran as a result of oil and petro-chemistry industry activities as follows: development plans for oil, gas, and petro-chemistry industries such as developing different oil fields; developing south Pars zone; developing petro-chemistry in specific zones of MahShahr and Assaluyeh; developing petro-chemistry industry in east and west part of Iran through Ethylene lines of east and west; along with weakness of choosing and transferring technologies of the industries; e.g. bad experience of Uremia Petro-chemistry industry. [28][23][2]

Despite efforts of officials to reduce side effects of the pollutions over the years and despite cooperation of Oil Company with Environmental Protection Agency (EPA), the efforts have been ineffective and inefficient, in viewpoint of most experts and critics and even some officials. [1]

The problems would not be related to one of the relevant institutions, since through observing some problems in this regard, it would be clear that most of the problems could be involved in both institutions of Oil Ministry and EPA. However, since many years ago some offices and organizations have been established under title of HSE in oil and relevant industries, many actions would be still required to implement the management system desirably. Additionally, achieving required standards in this regard would require also strong intention and strategic programming. [2]

### **Preparation of oil-rich zones**

Today, many advanced methods are being applied such as artificial satellite imaging for oil detecting. Advanced computers help geologists in exploration actions and interpretation of different data; although, the last stage is influencing drill to reservoir rock, which shows existence or lack of existence of oil under the ground. The oil can be extracted through excavation process. Naturally, oil includes solvent gases in it and is under pressure of underground fluids. Oil's pressure can be reduced gradually. Where ever there are some fractions, oil can rise on the ground through them. During the process, a portion of organic material would be captured after composition and would then change into underground oil reservoir. Oil eruption would damage environment and would also cause fire and wastage of hydrocarbons. Supervisor of excavation group can predict such eruption from long distances. [13][9]

Through observing signal of oil in aggregates of well or observing pressure enhancement of well environment in

switches of well bottom diagrams, excavator can pump more amount of heavy excavation clay into the well or place some valves above the well, which are for preventing well eruption. Today, because of low level of oil reservoirs, deep excavation operations would be required for oil extraction. Relevant issues of deep excavation, especially excavation of oil wells, have different dimensions. The dimensions would include issues related to angling excavation gradually in depth and changing excavation into horizontal excavation, which is today the most developed method for excavation or better recycling of oil from underground layers or oil formations. In platforms of Soroush and Norouz, in which oil extraction would be done in sea, some issues should be considered including induced pressure by water on wells and walls of platforms; then the pressure should be reduced through proper cementing and piping. Clearly, because of existence of specific structures in different geological and petrology formations in real conditions, some differences would be appeared in proposed condition in practical case. [25][24]

Most large oil reservoirs of Iran have been located in Zagros foothills and Persian Gulf Offshore in anticline traps and limestone reservoirs, which have been covered by anhydrite and plaster. Oil can be found in places with an impervious layer and until now, people have not able to claim that there is an oil-rich place with only impervious rock; although people have had many advances in this regard. However, oil existence can clear the layer. Hence, before starting excavation, some actions should be considered to detect zone as follows.

### **Process of oil preparation in Iran**

#### **1- Aerial photography**

Some images would be captured by special airplanes from desired zones. Then the images would be evaluated by stereoscope to determine all ups and downs on the ground. One of the main features of the method is that, the airplane would pass all ups and downs of desired zone and take photos from surface of ground. [3][4]

#### **2- Geology**

Geology administration would investigate desired place according to prepared aerial map and then would sample from ups and rocks. The geologists would then determine rock age by special devices. If rocks are impervious and hard, some holes about 15m would be

created on them and then sampling would be done from the holes. If the sample is similarly hard and impervious, it would be transferred to laboratory and paleontology test would be conducted on it. If remained part of plants and animals, especially microorganisms (planktons), is observed on it, they could be the best sign for existence of oil. Since oil is not static in a certain location, now underground reservoir may be in oil-free zone. Hence, next exploration operations would be done to recognize the issue. [5][26]

#### **3- Geophysical operations**

Different methods would be applied to perform geophysical operations as follows:

- 1) Gravimetric method
- 2) Magnetic method
- 3) Seismic survey

However, the first method, which would be applicable prior to others, is seismic survey method. On a point of desired zone, a hole would be created with depth of 15-20m and then it would be filled by dynamites. About 20-30 geophones with about 30m in length would be placed on the surface of ground. When all equipments and devices are ready, dynamites would be exploded from long distance using electricity flow. Through this, artificial earthquake would be provided and its blast wave would be then influence different layers of ground. While encountering impervious rock, the waves would be reflected upward. On the surface, the waves would be captured by geophones and then converted to electricity. Next, the waves would be transferred to specific device and would be recorded on certain charts. Reception time and record time of waves on the chart would be different because of near and far distances of impervious rock from ground surface. [3][14]

#### **4- Geophysical operations**

- 1) Presence of impervious rock
- 2) Physic of cap rock
- 3) Depth of layer up to surface
- 4) Determining best location for excavation operations

### **ifferent types of oil reservoirs**

In general, position of gas, oil, and sure water in different layers of the earth would be in 4 forms as follows:

- Anticline oil trap

- Stratigraphic trap
- Fault oil trap
- Salt dome trap

Regardless specific physics of oil traps, until the time that oil and water are existed in sedimentary layers, no common reason would be existed between them. However, after migration and placement in oil traps, they would be separated based on their weights and sure water would be placed lower and oil would be placed in upper part. Different types of oil extraction wells include oil wells and gas wells.

#### Research wells

- Gas observation well
- Gas and oil observation wells
- Oil and water observation wells
- Water observation wells

#### Abundant wells

- Commercially Inapplicable wells
- Oil extraction wells

Installed devices on the wells bottom-up are as follows:

- 1) Annulus valve
- 2) Bottom main valve
- 3) Top main valve
- 4) Surface safety valve
- 5) Swept bend
- 6) Dipping valve
- 7) Stone trap
- 8) Production valve
- 9) Burning valve
- 10) Pressure gauge and pressure recorder
- 11) Sampling valve

#### Description and mechanism of well's devices

##### Annulus valve

The valves would be applied for reading and discharging probable pressure in gauges among wall pipes of well.

##### Bottom main valve

The valves should be never used in normal mode and without permission. Using the valves should be under control of manager of exploring oil-rich zones, since if the mentioned valve is been closed for any reason, the well would be useless forever; unless, paying high costs

for this purpose. In this case, excavation administration should close the well and then change the mentioned valve and make well exploitable again. [24]

##### Top main valve

The valve has been installed on the bottom valve and would be applied mostly for opening and blocking well. When well's pipe is damaged in upper part of top main valve, the valve could be applied for blocking well. Hence, handle of the valve and bottom valve has been placed outside of the well, so that well can be blocked by them in emergencies. These kinds of valves are known as remote valves.

Note: most wells are without such handles.

##### Surface safety valve

The safety valve has been placed in some wells following top main valve and in others, it has been installed following swept bend of oil and gas. Surface safety valve would not be suitable for those wells, which are not under separation operations. The valves would be applicable, when pressure of oil flow from well to factory is high because of producing abundant gas. In this case, the valve would be blocked automatically and prevents influence of high pressure in oil pipe. When oil pipeline is damaged or pressure is lower than normal rate, the valve would be blocked automatically and prevents oil streaming toward outside. [18][11]

##### Swept bend

The swept bend would be just applicable for deviating outlet oil flow, so that it can't affect pressure of rate of well exploitation significantly. The bend would also prevent direct taps on inside wall of oil pipe and damaging it.

##### Dipping valve

The mentioned valve has been placed on swept bend of oil and would be mostly applicable for different tests inside the well by Oil Engineering Administration.

##### Stone trap

Stone trap is a device for trapping small stones, which have been extracted while exploiting the oil. Stone trap has been placed after swept bend and oil pipeline is just in the middle part of the device. Following the stone trap, burning valve has been installed. [13][25]

### **Production valve**

The valve has been placed on the oil pipe in top of the well. In normal condition, to block well, production valve should be applied. However, surface safety valve can be also applied for blocking well, but while opening, for balancing pressure of two sides of safety valve, production valve should be applied. Hence, a lot of energy and time should be consumed for opening and exploiting oil well.

### **Burning valve**

When a lot of pebbles have been extracted from well and prevented flow of oil from going to factory and if difference of pressure before and after stone trap is so much, it would be highlighted that, filter of stone trap has been blocked and should be cleaned. For this purpose, production valve should be blocked completely and then burning valve should be opened gradually. As a result, any waste material and pebbles would get out of stone trap. To clean the stone trap in another manner, first, surface safety valve or top main valve should be blocked and then production valve should be also blocked. Next, burning valve should be opened, so that air pressure inside the stone trap can be escaped. Cleaning the valve would be also required, when the well has covered by acid for burning purpose. [14][4]

### **Pressure gauge**

On each oil well, usually 3 pressure gauges have been installed. One of them has been placed on the dipping valve; another before stone trap; and other one has been installed after production valve.

Note: typically, after measuring pressure, underground pressure gauge valve should be blocked, since the pressure could gradually cause cracks on the pressure gauge.

### **Sampling valve**

Sampling valve would be applied for sampling purpose in oil wells for laboratory purposes. The valve would be usually installed after production valve or after swept bend. [9][17]

### **Environmental issues**

Some authors have presented no clear and comprehensive definition of environment, since local law of Iran and many other countries are silent on defining the term "environment" and most of them have applied environment in regard with defining natural elements, natural resources, urban landscapes, and other views. Hence, concept of environment is different from country to country, due to attention of every society to the issue. In order to present a comprehensive definition about environment, some concepts should be described in regard with environment and finally, desired definition of environment would be presented. [7]

#### **a) The nature**

Among ambiguous and meaningful words, one can name the term "nature", since nature refers to all living things and creatures of Holy God. In other words, anything in the world, which is not manmade, can be nature and natural.

#### **b) Ecology**

Ecology is knowledge of studying relations of animals with their living environment. Due to unclear content of environment, public thoughts would not consider any significant difference between ecology and environment. [5]

It should be noted that, oil carbohydrates in Iran have been applied since many years or have been bunt as waste materials. Based on scientific and industrial principles, they have been exploited and survived from wasting [4][2]. Today, control and reduction of effects of induced pollution by petrochemical industries has become a significant global concern in order to protect natural environment. Main environmental problems of the mentioned industries, especially in condition of lack of observing environmental standards, would lead to hazardous results. It would also make disorders and problems in human society and wild life. [9][23]

The industries, due to nature of desired activities and processes and through producing waste waters; pollutant gases emission and hazardous waste materials would lead to bad effects on environment [5]. Additionally, discharging wastewater of petrochemical industries, due to nature of their compounds against acceptor nature of waters, can be able to destroy considerable part of environmental elements. The pollutants would provide situations directly or indirectly for gradual extinction of aquatic species including animal and plant species. Hence, after

reduction of number and diversity of the spices, food chain would be simplified and water resources would change into dead water resource, especially in coastal areas [4]. Results of the pollution, especially heavy metals, are not limited to vital elements of ecosystem, but also it would be involved in use of water resources by people and would affect also human's health. [11][4]

According to principle of sustainable development and modern management, ignoring environment and endangering its vital elements would be considered as ignoring health of human, which could lead to certain social, economic, and health results [12]. In this regard, discharging wastewaters of different oil industries to Persian Gulf waters has endangered natural life of living things in the sea and has also threatened people's lives as a result of feeding from water food resources. Persian Gulf is a semi-blocked sea with 40000km<sup>2</sup> in area, which includes unique environmental diversity. In fact, about 400-450 species of fish live in the mentioned sea. Persian Gulf is located in a tropical and dry region, in which tolerance of aquatics has been reduced through environmental changes and existence of pollutants has damaged the living things. [24][10]

## 2 Research methodology

Applied method in the present study has been a combination of documentary, descriptive, analytical, and reasoning methods. Due to subject of the study, first documents, geographical maps, and required books have been collected and categorized. Through analyzing and deducting the collected data, required issues and contents has been provided and regulated.

## 3 Data collection tools

Library method is applicable in all kinds of studies; although, in some of them, the method would be applied just in a unit part of the research and in others, nature of study is related to library method and is based on library method findings and data from beginning to end.

In studies, which physically have no library nature, researchers should apply library method in their studies. In the research categories of descriptive, reasoning, correlative, and empirical studies, researchers should first study literature and background of the desired subject. As a result, researchers should save their obtained results and findings in adequate tools such as drafts, tables, and forms. Finally, the data and findings should be categorized and exploited at the end of work.

The present study has applied library method for data collection purpose. Data collection tools in this part included some printed documents such as books, encyclopedias, dictionaries, journals, newspapers, weekly magazines, monthly magazines, calendars, published interviews, papers, books of scientific conferences, indexed published texts in databases, internet, and intranet or any printed resource. After completing library investigations, the present study has started field method and has measured and evaluated effects of each parameter, based on variables of the study.

## 4 Data analysis method

When talking of data analysis, it would be imagined that the aim by data analysis is just statistical analysis; although, the method is just one of the important data analysis methods, which can be applied for those studies with statistical dimensions. There are many studies, which have no statistical dimension and are mostly based on documents, evidences, and inferential analysis. These kinds of studies follow perfect process of scientific study and include analysis stage. Therefore, the present study has been generally analyzed through applying descriptive-analytical method.

## 5 Discussion and results

Since today programming and short-term decision making processes are responsible for environmental problems, induced by industries and in developed countries all environmental actions are being followed in form of long-term environmental strategies, all effective and involved institutions should regulate certain environmental strategies in oil, gas, and petro-chemistry industries, in addition to conducting group works under observation of president. The mentioned institutions and organizations are as follows: Environment Protection Organization; Oil Ministry; Ministry of Agriculture; Ministry of Public Health; Ministry of Transportation (Ports and Shipping Organization PSO and Meteorological Organization); Parliament; and Ministry of Interior. The strategy can be the main factor for solving environmental problems of oil and relevant industries through exact and proper observation of officials. The strategy would be also able to be considered as a successful model and pattern for other industries.

Operations of preparing, exploiting, and transporting of oil has been one of the most threats for marine environment; although, there is not still a proper

mechanism to prevent oil spill in waters. Additionally, researchers are constantly following achieving proper solutions to prevent oil spill to marine ecosystems. In 2010, while entering of oil to waters of Mexican gulf, officials decided to use chemical dispersants for flowing oil in depth of 1500m as an effective solution in this regard. Advocates believe that, mixing solvents and detergents can accelerate isolation of entered oil to deep waters. However, critics are still worry about hazards for deep waters ecosystem.

Researchers in scientific conference of ecosystem and oil spill to Mexican Gulf, which was held 21-23 of Jan 2013 in Neoerliance city Louisiana, was focused on evaluation of obtained results from assessing very few data. In the mentioned conference, it was announced that, about 3million liters of underwater dispersants have acted desirably and have minimized environmental damages.

However, provided aerial photos by Meteorological Organization and Oceanography Ministry of U.S suggest that, spilled oil rate in Mexican Gulf has been decreased after applying dispersants. In provided report by BP Company, which is owner of mentioned oil well, has confirmed that, quality of measured air by ships has been enhanced and it shows reduction of floating oil rate.

#### 6 Research limitations

In general, scientific research needs logical and regular doubts. In fact, researchers should consider obtained results from their own and other's studies in viewpoint of a critic. In other words, applied population in the studies is not a true or false population for hundred percent. Moving toward any goal would slow down because of existed limitations. Research is a process for solving a problem or answering a certain question. In providing reports about scientific studies, researchers try to describe limitations of the study and make readers able to judge about the studies. The present study is not also an exception and has certain limitations, which cause announcing its results carefully. The limitations are as follows:

- 1) Insufficient cost and time for developing research dimensions
- 2) Lack of useful internal and foreign sites
- 3) Time consuming nature of relevant calculations
- 4) Lack of sufficient resources for further studies and comparing the study with others

- 5) Unavailability of Iran oil-rich regions

#### 7 Suggestions

- 1- To consider geographical and locating studies
- 2- To consider proper and comprehensive statistical and field data
- 3- To consider compatible technologies with environment
- 4- To consider and reinforce expertise body of EPO and Oil Ministry
- 5- To design strong mechanism in order to regulate interactions
- 6- To make regulations, standards, and instructions local and adopted
- 7- To provide strategy of environment assessment in oil, gas, and petrochemical industries
- 8- To evaluate risk of oil industrial activities and its costs
- 9- To hold training courses and promotional activities
- 10- To manage environmental crisis
- 11- To provide adjustment actions for old units
- 12- To provide a center for research decision and policy making

#### 8 Suggestions for preventing environmental damages

- 1- To eliminate defects and reinforce wastewater treatment systems
- 2- To implement periodic control programs in short periods
- 3- To consider pre-treatment systems in petrochemical complexes with high range of wastewater pollution
- 4- No to discharge blow down eaters and coolants to surrounding estuaries and conducting them toward wastewater treatment systems
- 5- To vacuum outlet of blow down waters by oil products
- 6- To prevent distraction of connection between limited areas of Zangi and Jafari estuaries and surrounding waters.

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