CHAPTER (1)

INTRODUCTION

1.1 STATEMENT OF THE PROBLEM

Traditional petroleum exploration costs by various measures (e.g., lease costs, drilling costs, geological and geophysical costs, etc.) have tripled. Thus it is evident that with a continuation of the current world economic situation and the finite amount of oil, exploration costs will likely increase in the future (API, 1982). Present petroleum exploration involves five principle steps:

1) Regional geologic reconnaissance.

2) Geochemical analyses of basins.

3) Geophysical surveys.

4) Detailed geologic mapping.

5) Drilling operations.

All these steps are expensive. The use of traditional methods of geologic mapping for the first two steps is a contributing factor that increases the costs of locating a producing well. In order to remain competitive, exploration companies will need to develop and adopt a more cost-effective method of regional geologic mapping.

The use of remotely sensed data has been suggested for mapping the geology of large areas rapidly and economically (Saunders, 1973). Surface indications of oil and gas seepage have been noted for thousands of years. Historically, such seeps have led to the discovery of many important oil-producing areas. The surface expression of hydrocarbon (HC) migration and seepage can take many forms, including (1) Anomalous hydrocarbon concentration in soil, sediment, water and even atmosphere; (2) Microbiological anomalies and the formation of "paraffin dirt"; (3) Mineralogical

changes such as formation of calcite, pyrite, uranium, elemental sulfur, and certain magnetic iron oxides and sulfides; (4) Electrochemical changes; (5) Radiation anomalies; and (6) Biogeochemical and geobotanical anomalies.

Bacteria and other microbes play a profound role in the oxidation of migrating hydrocarbons, and their activities are directly or indirectly responsible for many of the surface manifestations of the hydrocarbon seepage. These activities, coupled with long-term migration of hydrocarbons, lead to the development oil exploration process. (AVCIOGLU, 2010).

1.2 PURPOSE OF STUDY

The purpose of this investigation is to introduce an effective method of petroleum exploration by integrating remote sensing data with other available concession data to provide a data set to guide the evaluation of oil accumulations existence in specific area. The study is designed to provide tools and information that are practical and useful for decision making for oil exploration using remotely sensed data by:

- Assessment of the role of remote sensing in oil exploration versus traditional methods.
- Study Factors affecting oil exploration using remotely sensed data.
- Evaluate the value for each factor versus other factors.
- Create options for each factor and introduce a complete evaluation for each case before starting.
- Develop and test software to manage different data types extracted from projects.
- Introduce a solution for the user including best suitable satellites and get a rank for the project.
- Link between oil industry and research by making a questionnaire about the use of satellite images for oil exploration, collecting and analyzing feedbacks.

This will be achieved through the study of traditional oil exploration methods advantages and disadvantages recorded by oil exploration industry feedback and to

study different projects that used satellite images with the aid of some auxiliary datasets to provide a real complete solution for the user recovering different cases varied from desert, sea and offshore projects to the rugged terrains which hardly can be reached by traditional methods of exploration. The main factors that influence the use of satellite images for oil exploration are:

- Study Area topography.
- Geological structure.
- Existing auxiliary data.
- Selected Satellite images.

Different projects are studied to evaluate the value for all studied factors that affect the probability of oil existence, and this is a great issue in oil industry.

1.3 THESIS OUTLINE

Chapter (1) is an introductory section outlining the framework of this research. It introduces the problems associated with the use of traditional methods for oil exploration and introduces the solution of the use of remote sensing data. Then, the objectives behind this work are explained and the outlines of the dissertation are described.

Chapter (2) presents the previous researches about the use of remote sensing data for oil exploration through the literature review section, and then describes the components of remote sensing systems focusing on the basics of interpretation process and elements. Also chapter (2) includes a section that explains the petroleum system describing how oil is accumulated under specific condition. The final section of chapter (2) presents the methodology of thesis work with the study of different various cases of using satellite images for finding oil and the extraction of factors that affects the process of exploration.

Chapter (3) explains the details of the selected researches for this study using some attributes about the used satellite images with descriptive data about the study areas, and then summarizes the cases to prepare data for ranking. The final section of chapter

(3) introduces a detailed description for projects ranking using previous studies and researches.

Chapter (4) divided to two parts: part (1) introduces smart oil exploration software for data management to help the user getting best suitable satellite images and have a rank for projects as a primary evaluation for cases. Part (2) is composed of a questionnaire that has been sent to about 150 persons in different exploration, production, petrochemical and pipeline companies to get their feedback about the use of remote sensing data for oil exploration. The feedback was collected, analyzed, presented in pie charts for statistical view and results were concluded.

Chapter (5) is conclusions and recommendations, based on the results obtained from analysis of cases, factors data extraction. Finally the appendices A and B are followed which contains questionnaire and data collection tables, respectively.