Chapter One

Introduction

1.1 Introduction:

The big challenge for the oil industry in Sudan nowadays, especially with the drop in oil prices, is how to reduce the cost of drilling and completion, Drilling and completing of new wells costs account for 30% to 70% of the initial capital costs for oil and gas field developments. If oil and gas development is targeting the mature areas, capital and operating costs should be reduced. Particularly, the current costs of drilling, completing, and working over wells in Sudan.

This project will try to explain how benefits could be obtained from abandoned wells by complementing slim hole technology, which can reduce drilling and well completion costs. Slim hole drilling has the advantages of high drilling speed and low fuel consumption, since it can shorten drilling time and reduce drilling cost, we try to use slim hole to drill into the target zone.

Slim hole provides an opportunity to significantly reduce drilling and completion costs. This can be achieved by using small drilling and work-over rigs, occupying a small location, reducing casing sizes, minimizing cutting volume, less mud and cement, and lower other costs associated with hole size. In addition, slim hole technology provides an opportunity to minimize the effect on the environment and improve working condition. The effect of slim hole drilling on the environment includes minimized drilling waste; reduce noise and air pollution, and less movement for mobilization and demobilization of drilling equipment.

1.1.1 Sidetracking:

The Sidetracking and horizontal drilling has proven to be cost effective and provides a means for improving oil recovery and production, particularly in thin reservoirs, naturally fractured reservoirs, tight reservoir, and reservoir with gas and water coning problems.

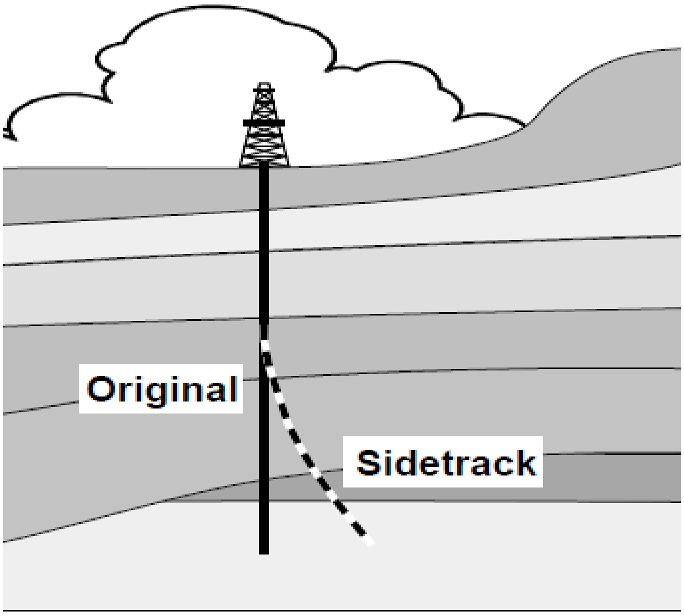

Fig (1.1): Sidetracking (Baker Hughes,1995).

1.1.2 Definition of Slim Hole:

The common definitions of slim hole drilling are: “the borehole smaller than conventional hole”; the borehole’s diameter less than 7in; and the drilling section in 7in casing is more than a certain length (more than 70%); the target layer borehole diameter is completed less than 7in. The following figure explain the different between conventional and slim hole well.

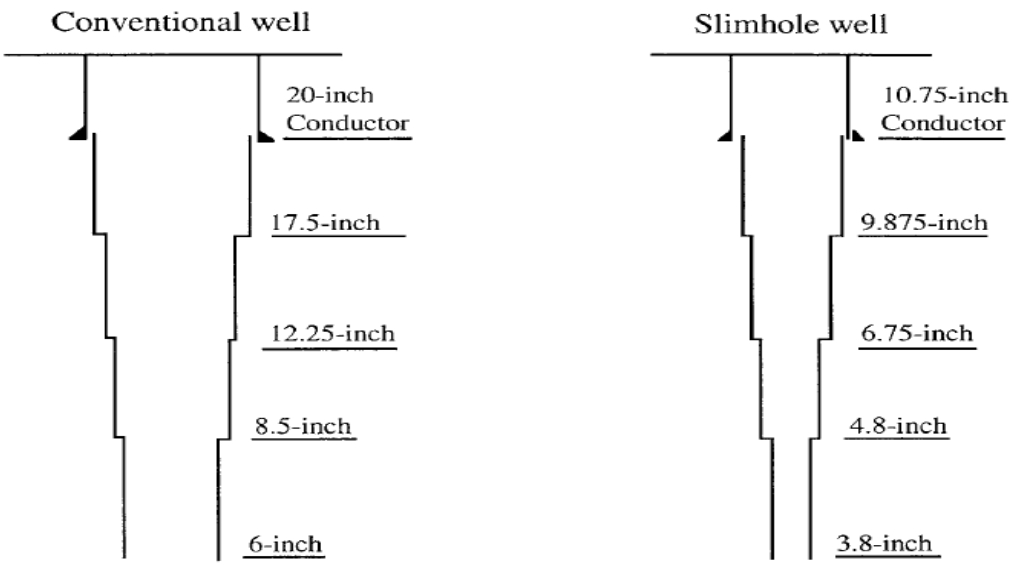

Fig (1.2): Comparison Between Conventional and Slim Hole Well (Slim hole analysis,2015).

1.2 Statement of the Problem:

The challenge facing the petroleum industries is the high drilling cost. This cost comes from the drilling costs include (Equipment cost, Cementing cost, Casing cost, Drilling fluid cost, Fuel cost), Completion cost and preparation for production well, environmental pollution treatment cost, land rent costs, and low oil production because of low reservoir pressure and sand and water productions.

Here in this project, abandon well located in block 2B, Hamra oil field is selected as case study, to construct slim hole sidetrack from abandon well to reduce previous cost because the small diameter of hole and also utilize abandon well instead of drilling new wells close to abandon well.

1.3 Objectives of the Project:

In this research, an effort has been made to study and investigate the possibilities of designing and planning the slim hole well by sidetracking from an abandon well in block 2B (Hamra Oilfield) to hit new target close to abandon well. The major objectives of this research are as follows:

1- construct slim hole sidetrack trajectory from abandon well to target.

2- Simulator milling process to open the production casing.

3- Selection and design bottom hole assembly (BHA) and also make analysis for it.

4- Design and analysis for surge/swab.

5- Analysis for hole cleaning to ensure there is no cutting in the slim hole well.

6- Design software in matlab (GUI) to design and analysis for wellbore stability.

7- Torque and drag analysis to show if there is mechanical fatigue in drilling string.

1.4 Methodology:

1- Gathering abandon well data from final well report and daily drilling report and collecting target data from geological data.

2- Using landmark software to design and analysis for slim hole well trajectory, bottom hole assembly, surge/swab, hole cleaning, wellbore stability and torque & drag.

3- Using abaqus FE software to simulator for casing milling process.

4- Using matlab program (GUI) to design software for wellbore stability.

1.5 Project Lay Out:

- **Chapter One:**

  In this chapter present background of the research, statement of the problem, Objectives of the project and methodology.

- **Chapter Two:**

  This chapter present literature review and theoretical background.

- **Chapter Three:**

  In this chapter present methodology of the slim hole well.

- **Chapter Four:**

  In this chapter, present the result and discussion for design and analysis for slim hole well.

- **Chapter Five:**

  This chapter present conclusions and recommendation.