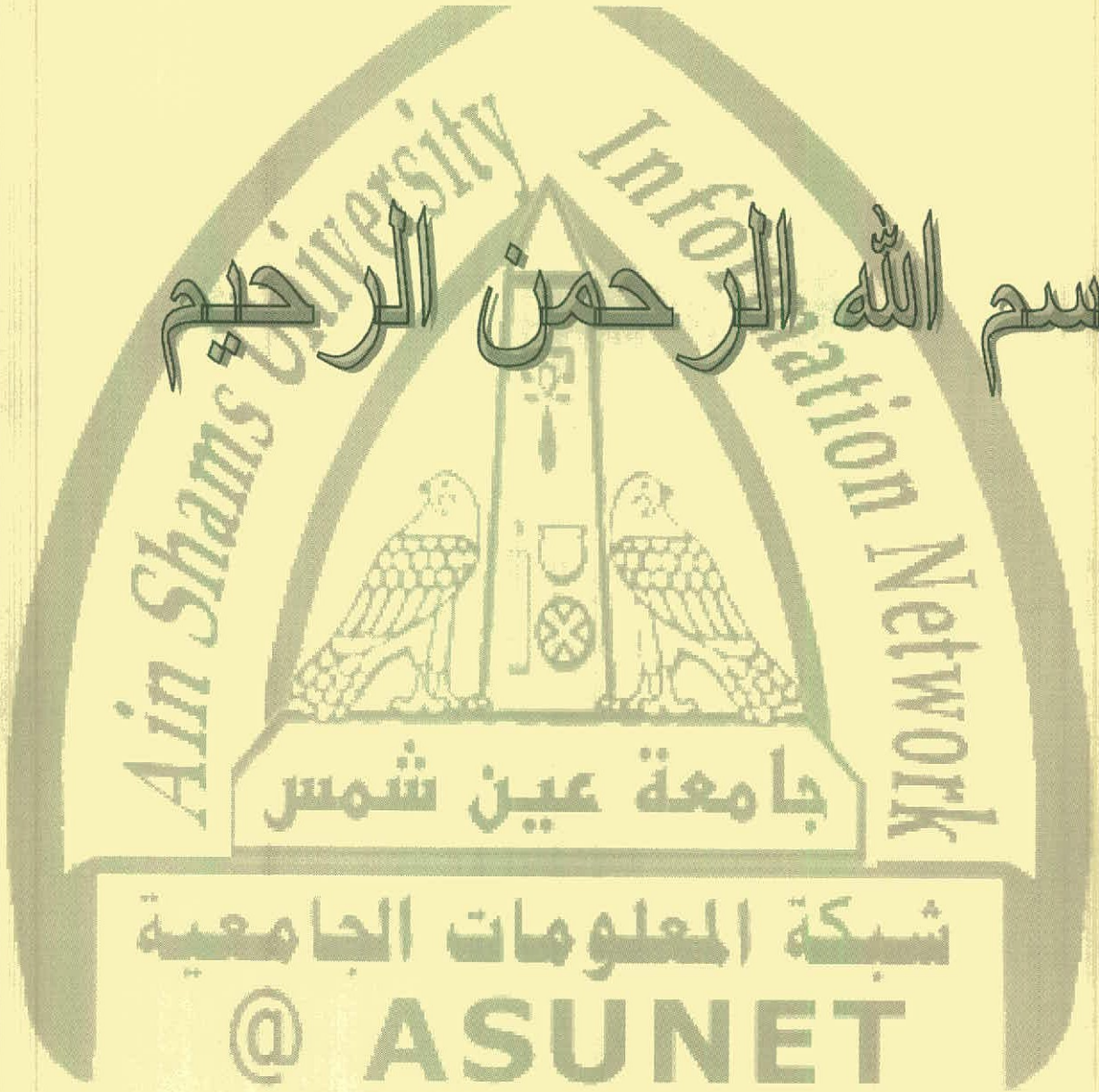
شبكة المعلومات الجامعية



بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بعض الوثائـــــــق الاصليـــــة تالفـــة

بالرسالة صفحات لم ترد بالاصل

A 3-D Optimization Model For Planning Horizontal Wells

Presented By
Khaled Abd El-Fattah Ahmed Mohamed
B.Sc. Petroleum Engineering (1995)

A Thesis Submitted to the
Department of Mining, Petroleum, and Metallurgical Engineering,
Faculty of Engineering, Cairo University
in Partial Fulfillment of the Requirements for the degree of

Master of Science
In Petroleum Engineering

Under Supervision of

Prof. Dr. Abdel Sattar Dahab
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Abstract

Directional drilling and horizontal wells represent an efficient way to achieve special targets that are difficult to be reached with vertical drilling wells. One of the most important drawbacks of horizontal well drilling is its high cost, so it is very important to try to minimize the cost of this type of wells. Cost is dependent on many parameters that are function of drilled depth: casing, cement, tripping, logging, ... to mention just a few of these parameters. Time could be used as an alternative parameter to optimize instead of drilled length. However, time is more difficult to express in objective function because it includes subjective factors such as human performance, idle time, non-drilling operations. One of the factors that affect the cost of a directional or horizontal well is the length drilled to reach the target. The drilling length is one of the most important parameters affecting the drilling cost. Like time, it has a direct proportional to drilling cost and not very difficult to be optimized.

So if it is possible to minimize the drilling length to get the target, then the economy of the horizontal well will be improved. The objective of the present study is to develop a model that gives the optimum design length of a hook-type horizontal well in 3-D space. This study used the theory of nonlinear optimization to develop the 3D well design computer program. This program gives the minimum drilling length to reach the target, and determines the optimum directional parameters which are: kick-off point, true vertical depths of build and drop sections, casing setting depths, build and drop rate of each section, and turn rates of all sections.

The model has four main segments: a) an optimization segment, b) a well survey calculation segment, c) a bit-walk and lead angle calculation segment, and d) a correction run simulation segment. The Sequential Unconstrained Minimization Technique (SUMT) is used to minimize the objective function that gives the total length of the drilling depth and hence gives the optimum design parameters to the well trajectory.

By its nature, the well design model is nonlinear and non-convex. Therefore, the final solution (drilling length) may be a local minimum and is dependent on the search starting point of the optimization routine. In contrast to our case studies, the final solution was improved by selecting a search starting point reflecting minimum design parameters within the design constraints.

The input data to the program are the surface and target coordinates, the target true-vertical depth, the constraint limits, and the bit-walk constants. The output results include the optimum values of the design parameters and the survey data of the optimum design, with and without each of bit-walk calculations, lead angle calculations, and correction run calculations.

The optimized design was compared with the conventional design for five wells (two actual wells, a hook-type well and a horizontal well, drilled in the Gulf of Suez; and three non-optimized wells). Results of the comparison have validated the computer model. In this validation test, the computer model reduced the total drilling length of all five wells (the saving in one of the unoptimized wells reached 800 ft, 7.1% of the total length). It worth noting that this reduction the cost of horizontal, 3-D hook-type wells is achieved while all other operational parameters were kept constant.

Table of Contents

List of Tables