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CHAPTER 1
INTRODUCTION

1.0Background of Study

Oil and Gas isconsidered to be one of the major sources of energy in the world due to itshigh energy density, easy transportability, and relative abundance. It is avital factor in every country's economy. Almost all items that we buy, use, andconsume are products of oil. The EIA (Energy Information Administration) statedthat the world consumption of crude oil daily is 85.64 million barrels, whichis equivalent to 2 liters of oil per day per person.

Generally, oilcan be produced from the reservoir by the stored energy of the oil in thereservoir. This energy is obtained by the difference between the reservoir andwellbore pressures. If this difference is high, the well will be capable ofproducing naturally. Most oil wells worldwide produce naturally in their earlylives until there is a decrease in the reservoir pressure which leads us toenhanced oil recovery.

When a well hasbeen producing for a period of time, there will be decrease in reservoirpressure and as a result the difference between reservoir and wellbore pressurewill decline. So, the energy in the well will not be able to lift oil up tosurface, or it might lift oil to the surface but in less than economic volume.At this stage, artificial lift is introduced and it can be utilized to overcomethis issue by reducing the wellbore pressure. This reduction will bring backthe essential difference between the reservoir and wellbore pressure so oil canbe extracted and lifted up to the surface.

One of the mostimportant roles of artificial lift is to maximize the production rate fromflowing wells. Artificial lift can be divided into two types, based on liftingmechanism: gas lifting and pumps. Thegas lifting method makes use of a compressed gas that is injected from thesurface to certain points in the tubing. This gas will lower the density of thefluid column in the tubing causing a reduction in the wellbore pressure andtherefore increasing production. The pumping method, on the other hand,involves setting the pump at a certain depth inside the tubing that will causeit to be submerged below the liquid level. This pump will lower the wellborepressure and hence increase the drawdown, thereby boosting production. The mostcommon artificial lift methods used are as follows:

·Electrical Submersible Pump (ESP)
·Sucker Rod Pumps (SRP)
·GasLift (GL)
·Plunger Lift Pumps (PLNG)
·Progressive Cavity Pumps (PCP)
·Hydraulic Pumps (HP)

Bearden (2007),stated that ESP is the most competent and consistent method of artificial liftwhen moderate to high volume of oil needs to be lifted from the well. He alsoestimated the lifting capacity of ESPs to be as low as 150 barrels per day andas high as 150,000 barrels per day. Fig 1.1 below shows the various types ofartificial lifts and their utilization worldwide.

Fig1.1 Artificial lift types and their utilization.

1.1Statementof Problem

A majorchallenge faced in lifting oil and gas from the reservoir through theproduction tubing to the surface

facilities is an unnecessary productiondecline which is as a result of low reservoir pressure and it is a seriousproblem in the petroleum industry today. This decline may be as a result ofmismanagement of wells, excessive pressure drops along the production system,oversized or undersized tubing, and improper perforation method etc. A changein any component of the production system may lead to a change in the pressuredrop behavior of the other components since the various components areinteractive.

This study showsthe design of an ESP artificial lift system and production optimization of WellJ-50 is a new horizontal well in a Niger Delta field. In other to optimizeproduction and produce about 10,000bopd as the desired rate of production, ESPwas recommended to be designed for the well to achieve optimum production by.

1.2Methodology

The method to beused for this work is the analytical method of ESP design and using thesoftware PROSPER. In the analytical method the following steps will be taken todesign the ESP design;

·Collection of basic data
·Calculation of production capacity
·Gas calculations
·Determination of Total Dynamic Head(TDH)
·Pump-type selection and calculation ofpump stages
·Optimum size of components
·Electric cable selection

In using PROSPER(Production System Performance Analysis Software) to design the ESP system thefollowing steps will be followed;

·Using existing PVT and VLP data has abasis of new analysis.
·Calculating pump intake and outletpressures.
·Designing an ESP system
·Evaluating pump operating pointsensitivities.
·Calculate a flowing gradient for an ESPequipped well.

1.3Aim and Objectives

The major aim ofcarrying out this research is to optimize production for well J-50 by designing an artificial lift system whileits objectives are as follows;

·To design an artificial lift system(ESP) for a well that the production rate has declined.
·To boost production for a producing welland increase revenue.
·To describe and design an operation ofESP for a given well.

1.4Significance of study.

The significanceof this study in the petroleum industry is to show the importance of designingESP for a new well and also the use of artificial lift in maximizing oilproduction.

1.5Scope and limitations of Research

The scope ofthis research is limited to the use of manual method and PROSPER in designingan ESP for artificial lift so as to optimize production. There are othersoftwares that can also be used in designing an ESP System but for this projectPROSPER is used due to availability**.**The study is conducted in a Niger Delta reservoir and a suitable ESP designwill be done to increase the well production potential.

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