T.C.
ISTANBUL EDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

DESIGN DRILLING REPORT SYSTEM TO INCREASE EFFECIENCY AND REDUCE DRILLING TIME CYCLE

MASTER THESIS

Hawraa Ahmed ALI

Engineering Management Department

Engineering Management Master in English Program

AUGUST 2022

T.C.
ISTANBUL EDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

DESIGN DRILLING REPORT SYSTEM TO INCREASE EFFECIENCY AND REDUCE DRILLING TIME CYCLE

MASTER THESIS

Hawraa Ahmed ALI
(181281009)

Engineering Management Department

Engineering Management Master in English Program

Thesis Advisor: Assist. Prof. Dr. Bozkurt NAZILLI

AUGUST 2022

T.C
İSTANBUL GEDİK ÜNİVERSİTESİ
LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ MÜDÜRLÜĞÜ

Yüksek Lisans Tez Onay Belgesi

Enstitümüz, Engineering Management Department İngilizce Tezli Yüksek Lisans Programı (181281009) Hawraa Ahmed ALI"nin "Design Drilling Report System to Increase Effeciency and Reduce Drilling Time Cycle" adlı tez çalışması Enstitümüz Yönetim Kurulunun 31.08.2022 tarihinde oluşturulan jüri tarafından *Oy Birliği* ile Yüksek Lisans tezi olarak *Kabul* edilmiştir.

Öğretim Üyesi Adı Soyadı

Tez Savunma Tarihi: (31/08/2022)

1) Tez Danışmanı: Dr. Öğr. Üyesi Hasan Bozkurt NAZİLLİ

2) Jüri Üyesi: Doç. Dr. Redvan GHASEMLOUNIA

3) Jüri Üyesi: Doç. Dr. Babak VAHEDDOOST

DECLARATION

I, Hawraa Ahmed ALI, do hereby declare that this thesis titled as “Design Drilling Report System to Increase Effeciency and Reduce Drilling Time Cycle” is original work done by me for the award of the master's degree in the faculty of Engineering Management. I also declare that this thesis or any part of it has not been submitted and presented for any other degree or research paper in any other university or institution. (31/08/2022)

Hawraa Ahmed ALI

DEDICATION

To my family and other loved one’s

To my parents who have gave me invaluable education opportunities and support for my entire life.

To anyone that has shown me friendship and kindness during my research

To my mentors my greatest professors who were there the whole time to support and guide me through the way.

PREFACE

I would really be presenting my appreciation to everyone supported me all through study and searching period of this voyage. I would like to present my thank to my advisor, Assist. Prof. Dr. Hasan Bozkurt NAZİLLİ, for being my guide whenever I thought I was lost myself during research work and being in extraordinary role to haulage the culmination in this significant result. Addition to that, l would like to thank my supervisor for all the supportive and perfect advices that greatly enhanced my steps in the optimization of this work. To Mr. Ahmed TALIB who has been with me since the first step thank you for the support and believing since the first day at university and you have teaching us a valuable lessons thank you for always being there when ever your students need you. I would like also to thank Assist. Prof. Dr. Mert TOLON for the support and advice. Finally, thanks to my university and especially the institution for hosting me during these wonderful years. I am very thankful to my mother, my father, my brother and all my friends, whose instructions motivated me to keep on my aim. To my family, to everyone and to my country all the appreciation and love.

August 2022 Hawraa Ahmed ALI

TABLE OF CONTENT

Page

ABBREVIATIONS

AFE	: Authorizations for Expenditure
Dcn	: dc-Exponent Normal and Supposed At A Specific Depth
Dco	: Observed dc-Exponent At the Same Depth
GL TO RKB	: Ground Level to Rotary Kelly Bushing
KB ELEVATİON	: Kelly Bushing Height
MWD	: Measurement While Drilling
PN	: Normal Pressure
POVB:	: Over Burden Pressure
PP	: Pore Pressure
RKB	: Rotary Kelly Bushing
TD Date	: Total Depth Date

LIST OF TABLES

Page

LIST OF FIGURES

Page

DESIGN DRILLING REPORT SYSTEM TO INCREASE EFFECIENCY AND REDUCE DRILLING TIME CYCLE

ABSTRACT

The petroleum industry has a rich history of developing innovative technology; in today's world, it is all about the digital distribution era. When digital is embraced, the reporting system helps to realize thousands of dollars impact to the operations, the world of business needs a strategic response, the research is an integration that combines three systems in one place, technology, petroleum, and management.

Embracing digital is a profound change that creates significantly higher value; this value can be seen clearly by increasing production to faster, providing a safe environment, lower cost, and creating a better experience for all crew team members.

It can be applied to all business functions of the drilling operation; it is a track record that helps to track the operations.

With the long history of technology and engineering, starting from 1859 with the first oil discovery followed by wire line 1927, seismic survey 1928, deep water 1949, shale 2010, and till our day, innovation is ingrained into the DNA of the oil and gas industry.

This research deals with the complete design of an engineering program from scratch and management for managing projects in the oil fields. In addition to solving problems related to drilling. Most fields suffer from different types of problems; for this study, abnormal and lost circulation problems exist for the formation under study. It also represents fast communication and approves decisions to make regarding unexpected issues. With the improvement of artificial intelligence, the software will be able to help the field crew to work on drilling operations in a simple way; the system has a high-security level regarding data.

It provides protection and specific data transformation among the crew members; it provides more efficiency with a high percentage of detection problems and also reduces the nonproductive time with creating fast reports and analyzing to give the full image of the operations.

Also, it shows the process of reading and saving field data for two different fields to a cloud to help reflect the analysis and reporting process of the system.

The set of data used for this study is from Iraqi petroleum fields to solve the gaps that have been found in the fields.

The data is a set of various drilling data such as depth, density, viscosity, cementing, casing, mud type, daily mud cost, total mud cost, time of operations, safety, and mud losses. Basic information includes well name, location, type of information type of well, rig type, drilling capacity, and contractor.

Keywords: *Management, Petroleum, Technology, Prediction, Software*

VERİMLİLİĞİ ARTIRMAK VE SONDAJ ZAMAN DÖNGÜSÜNÜ AZALTMAK İÇİN SONDAJ RAPOR SİSTEMİ TASARLANMASI

ÖZET

Petrol endüstrisi, yenilikçi teknoloji geliştirme konusunda zengin bir geçmişe sahiptir; günümüz dünyasında, her şey dijital dağıtım çağıyla ilgili. Dijital benimsendiğinde, raporlama sistemi operasyonlar üzerindeki binlerce dolarlık etkinin farkına varılmasına yardımcı olur, iş dünyasının stratejik bir yanıta ihtiyacı vardır, araştırma üç sistemi, teknoloji, petrol ve yönetimi tek bir yerde birleştiren bir entegrasyondur.

Dijitali kucaklamak, önemli ölçüde daha yüksek değer yaratan derin bir değişikliktir; Bu değer, üretimi daha hızlı artırarak, güvenli bir ortam sağlayarak, maliyeti düşürerek ve tüm ekip üyeleri için daha iyi bir deneyim yaratarak açıkça görülebilir.

Sondaj operasyonunun tüm iş fonksiyonlarına uygulanabilir; operasyonları takip etmeye yardımcı olan bir geçmiş performans kaydıdır.

1859'dan ilk petrol keşfiyle başlayıp ardından 1927'de kablolu hat, 1928'de sismik araştırma, 1949'da derin su, 2010'da şist ile başlayan uzun teknoloji ve mühendislik tarihi ve günümüze kadar, yenilik petrol ve gaz endüstrisinin DNA'sına işlemiştir. .

Bu araştırma, petrol sahalarındaki projelerin yönetimi için sıfırdan bir mühendislik programının eksiksiz tasarımı ve yönetimi ile ilgilidir. Sondajla ilgili sorunları çözmenin yanı sıra. Çoğu alan farklı türde sorunlardan muzdariptir; Bu çalışma için, incelenen formasyon için anormal ve kayıp sirkülasyon sorunları mevcuttur. Aynı zamanda hızlı iletişimi temsil eder ve beklenmeyen konularda alınacak kararları onaylar. Yapay zekanın gelişmesiyle yazılım, saha ekibinin sondaj operasyonlarında basit bir şekilde çalışmasına yardımcı olabilecek; Sistem, verilerle ilgili olarak yüksek güvenlik düzeyine sahiptir.

Mürettebat üyeleri arasında koruma ve özel veri dönüşümü sağlar; tespit sorunlarının yüksek yüzdesi ile daha fazla verimlilik sağlarken, operasyonların tam görüntüsünü vermek için hızlı raporlar ve analizler oluşturarak verimsiz geçen zamanı da azaltır.

Ayrıca, sistemin analiz ve raporlama sürecini yansıtmaya yardımcı olmak için iki farklı alan için saha verilerinin okunması ve bir buluta kaydedilmesi sürecini gösterir.

Bu çalışma için kullanılan veri seti, sahalarda bulunan boşlukları çözmek için Irak petrol sahalarından alınmıştır.

Veriler, derinlik, yoğunluk, viskozite, çimentolama, kaplama, çamur türü, günlük çamur maliyeti, toplam çamur maliyeti, çalışma süresi, güvenlik ve çamur kayıpları gibi çeşitli sondaj verileri kümesidir. Temel bilgiler arasında kuyu adı, konumu, bilgi türü, kuyu türü, teçhizat türü, sondaj kapasitesi ve yüklenici yer alır.

Anahtar Kelimeler: *Yönetim, Petrol, Teknoloji, Tahmin, Yazılım*

1. INTRODUCTION

A blend of technology required to run a successful petroleum operations, this will include technology, and software development has the effect in amplify it is effectiveness with applied management techniques , managing a project with the right principles makes the best business decision which will lead to lowest project cost while meeting all project goals , defining a project scoop , creating project schedule , managing team and delivering updated information fast , continuous proving the project are the main points for todays and future petroleum projects. The research aim is to create software using programming languages for petroleum engineering industry especially drilling engineering to reduce nonproductive time and increase efficiency of drilling and to predict problems for the well. helps to gather, track, and analyze data to help making the right decisions. it is a software of reporting directly from fields to office, detailed reports will be built in a very fast time, helps to track teamwork through the project, helps to a proper planning and controlling a different type of projects, monitor the progress, prevent burn out by sending the facts to the right people at the right time. The study emphasize on filling the obstacles that facies petroleum industry by creating a high accuracy reports, accurate data transfer which is mean minimizing personal exposure and human error which consider one of the main problems that the software will be solving , many of petroleum reports has a wrong data and that’s because it has been created manually and because technology drives todays and according to the big data base of the industry and to simulate evaluation , the software focuses on automotive reading and recording for data , also adding geological reports to predict problems which leads to high efficiency because in petroleum wells the problem is almost certain to be occurred which is going to save cost (drilling consider one of the most costly operations) this study will enhance the working field life and gives high accuracy to work and the most important thing in this software is the type of entering the industry in to the world of artificial intelligence.1.2 General Information about the Area of Study.

The area of the study represented by two fields located in Iraq , one of them located in the southern-east of Iraqi- Iranian borders while the other allocated in the central of Iraq in the Mesopotamian basin.

1.2.1 Fields under Study

Abu Ghirab oilfield is considered one of the important fields located in the Missan governorate in southeastern Iraq and close to the Iraq-Iran border about 175km north to the Basra city. It ranges about 30km x 6km with north and south domes structurally. From top to bottom, the strata drilled in Abu Ghirab oilfield include Tertiary Upper Fars formation, Lower Fars formation, Tertiary Jeribe formation to Cretaceous NahrUmer Formation. The Lower Fars has 5 lithological members. Tertiary Asmari is the mainly reservoir in Abu Ghirab oilfield, it has the geothermal gradient of 2.3 ℃/100m, The initial formation pressure for Asmari reservoir is 4730psi which is equivalent to pressure gradient of (Figure 1.1). The reservoirs belong to the normal pressure system (Hussain, n.d.)The reservoir pressure drop due to the production and currently the pressurecoefficient is 1.03gm/cc.(Castolin Eutectic, 2000) and (Report Approved Procedure, 2015).

Ahdeb oil field is located in the Mesopotamian basin in central Iraq within an anticline running from northwest to southeast,seven oil-bearing layers exists in the eastern part of the field but with only one oil-bearing layer in the western part, the oil production and migration process and the formation of the structural trap. Most of the oils in the area, with pristane/phytane < 1 and a high relative abundance of hopanes above C30, are from the Upper Jurassic and Lower Cretaceous Chia Gara Formation, while some oils are from the Lower Cretaceous Ratawi and Zubair Formations. The Middle-Upper Cretaceous deposits in the area consist of limestone cherts, packstones, and wackestones. ((Hemmati-Sarapardeh et al., 2020).

The field produced over 52.93% of its total recoverable surplus, with its peak production in 2015, which was approximately 133.42 thousand BPD of crude oil and condensate, Based on the economic assumptions, production will continue until the field reaches its economic limit in 2046. The field currently accounts for about 1% of the country's daily production (Deng et al., 2018).

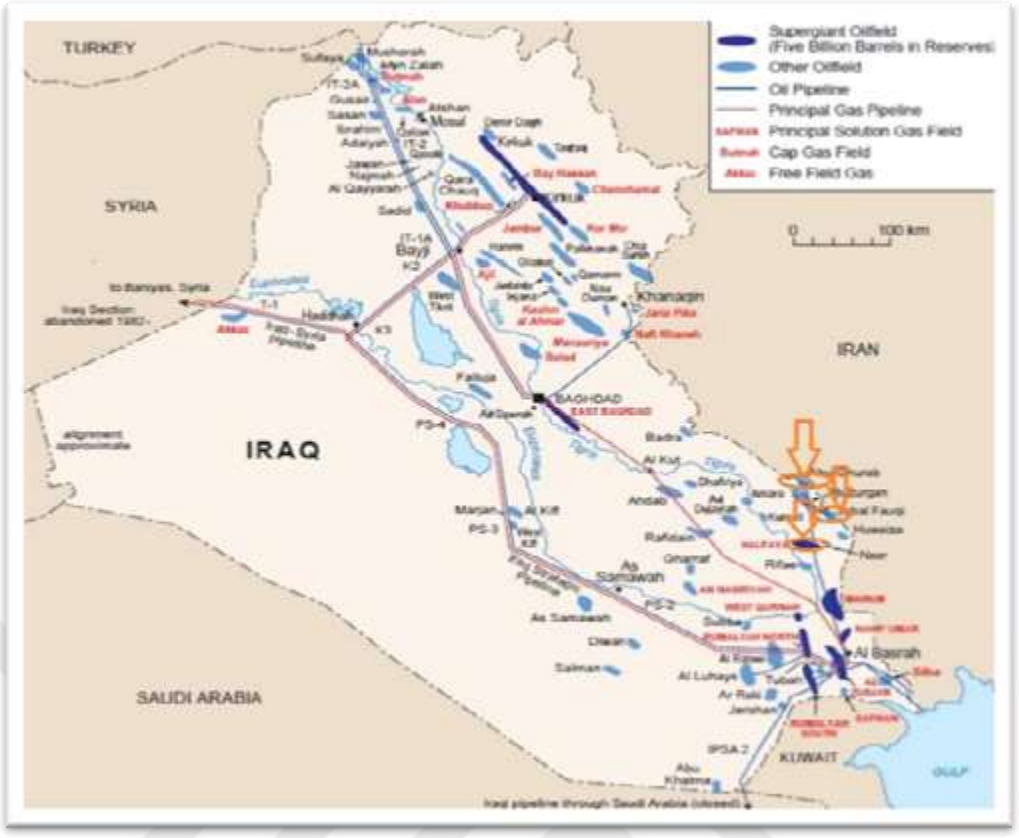


Figure 1.1: Iraqi Oil Fields Map and Location of Abu Ghirab

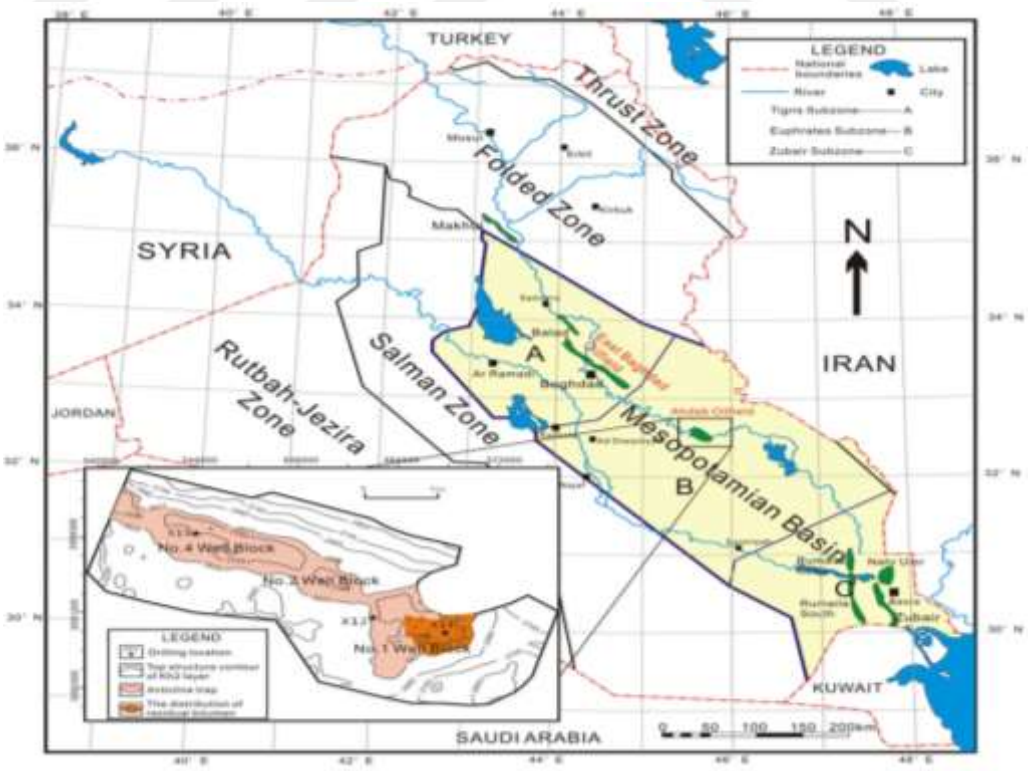


Figure 1.2: Map of Al-Ahdeb Oil Field in the Mesopotamian Basin with Boundaries of the Major Tectonic

1.2.2 Formations under study

1.2.2.1 Abu GhirabOil field

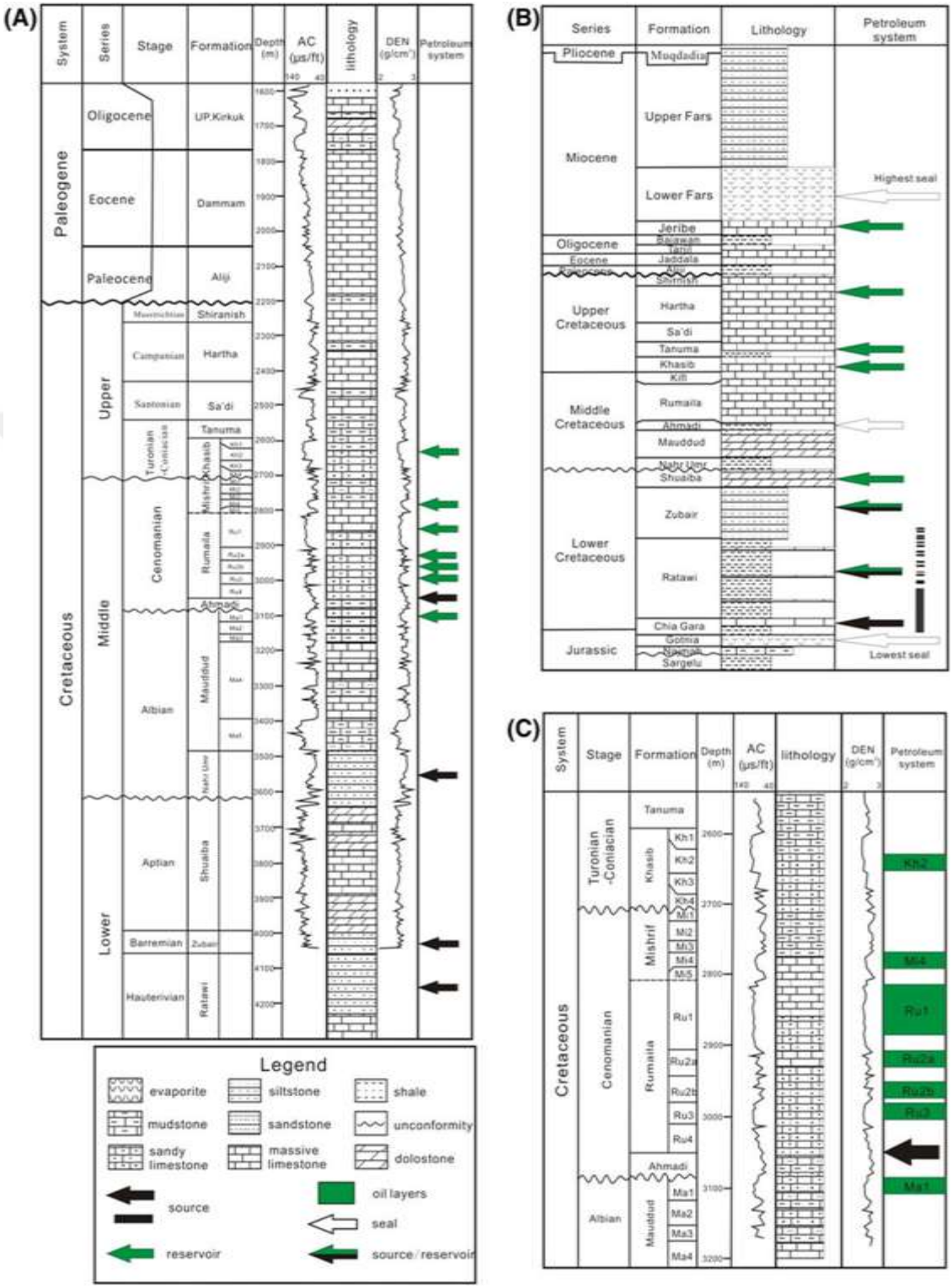
Table 1.1: Geological Formation and Lithological Description for the Well AGCS-42

Stratum		Top Depth (m)	Thickness (m)	Lithology description
Upper Fars		2201	/	The upper and middle parts consist mainly of massive claystone intercalated with thin to moderately thicksandstone and siltstone. The lower part is massive claystone intercalated with thin Anhydrit and siltstone. The lithology on the bottom is moderate reddish brown and bluish gray claystone divided by offwhite anhydrite overlap on Lower Fars
Lower Fars	Mb5	2201	345	Mainly consists of thin and massive anhydrite and shale interbed.
	Mb4	2546	213	Mainly consists of thin to thick and massives shale, anhydrite and Salt.
	Mb3	2759	117	Mainly consists of thin to thick and massives Anhydrite, Shale, and Salt.
	Mb2	2876	28.3	Mainly consists of massives Salt.
	Mb1	2904.3	41.7	Mainly consists of thin to thick and massives Anhydrite, Shale and Dolomite.
Asmari	Jeribe /Eup	2946	91	The lithology consist mainly of Dolomite, Anhydrite interbedded with Shale and Siltstone.
	Upper Kirkuk	3037	109	The lithology consist of Limestone Interbedded with Shale, Dolomite, and Argillaceous Limestone.
	Middle-Low Kirkuk	3146	80	The lithology consist of Shale Interbedded with Limestone and Sandstone.
TD		3226		

Source: (Deng et al., 2018)

1.2.2.2 AhdebOil field

Table 1.2: Stratigraphic Section of the Targeted Oilfield



1.2.3 Oil wells

1.2.3.1 Abu Ghirab oilfield

AGCS-42

Table 1.3: Well Basic Data

(1) Well Name	: AGCS-42						
(2) Rig No.	: BHDC-43						
(3) Location	:						
Geographic Location	:	Missan oilfields locate in the Missan province in southeastern of Iraq and close to the Iraq-Iran border					
Structure Location	:						
Platform Coordinates	: X:	728426m	Latitude:				
	Y:	3582951m	Longitude:				
(4) Well Profile	: Vertical well						
(5) Well Type	: Development well						
(6) Well Depth	:						
Basic 0	Depth	RKB	RKB Elevation:	168.00	m		
Proposed Well Depth:	3223.00	m	Vertical Depth:	3223.00	m		
Actual Well Depth:	3226.00	m	Vertical Depth:	3226.00	m		
(7) G.L. Elevation:	10.70	m					
(8) Operating Time:							
Spud Time :	Spud 1:	2015-Mar-15 09:00	Spud 2:	2015-Mar-16 05:00			
	Spud 3:	2015-Mar-19 17:45	Spud 4:	2015-Apr-09 21:30			
	Spud 5:	2015-Apr-28 20:00					
Drilling to TD&POOH:	2015-May-13 02:00						
Finish Drilling Date:	2015-Jun-02 13:00						
Testing Time :							
Abandoning Time :							
Removing Time :							
Drilling Duration:	1900.00	hours or:	79.17	days			
Whole Well Duration:		hours or:		days			

Source: (Deng et al., 2018).

1.2.3.2 Ahdeb oilfield

Well AD4-X4H(AD-407)

Table 1.4: Well basic data for ahdeb oil field.

Well Name	Well Class	Well Type	Report for: year-month-day	AL WAHA				Rpt no.	Days fr. Spud	Date & time report	AFE NO.
AD4-X4H(AD-407)	Development	Horizontal	2019/7/23	DAILY DRILLING REPORT				91	80	2019/7/24 0:00	2019/4/ AD4-X4H
Location & Area	Block	Contractor	Rig number	Rig Type	Drilling Capacity	Hook load	Rig Class	RKB	Daily well cost	$7,080.00	Authorized Depth	AFE Cost
AHDEB	4	DCE	DQ008	ZJ50D	5000	350	Land	9.20	Accumulated well cost	$2,598,090.00	4444 mKB	$5,028,209.00
Country / Province / County	BOP size and WP	Hole Size	Ground elevation (masl)		K.B elevation	Accumulated rotating hours		Moving Date	2019/4/24 0:00	Spud date/tim	2019/5/5 23:00	
IRAQ / WASIT / KUT	13 5/8" 70MPa	6"	17.86		27.06	822.98		TD Date	2019/7/9 17:00	Rig rel. date/time	2019/7/23 18:00	
Last casing size (mm)	Casing Shoe @ mkb (MD)		Top mkr jt mkb	Cement top mkb	PBTD mkb	Last BOP test	Csg test MPa	Next casing size & set depth		GL to RKB		
114.30	4435.50		8.53	1927.4	2915	35	21			9.20		
Depth mkb (MD)	TVD mkb		Progress m	Rot hours	R.O.P.	Deviation Survey		drift angle	Sldepth	drift angle	Sldepth	
4439.00	2949.98					MWD		89.69	4372.62	89.91	4426.35	
Total Fuel	10	Fuel used	1	Formation	Khasib-2	Target Formation	Khasib-2	Depth of Top	2809	Kill speed & Pressure :		

Source: (Gharbi & Mansoori, 2005)

1.3 Statement of Problem and Solution

1.3.1Problem definition

After gathering data and analyzing them, problems allocated in the wells are stated clearly. Problem definition states what problems need to be solved by Defining the project scope, Keeping the team focused, and keeping the project on track.

Before designing the system, a solution to the problem at hand must be found.

The first thing to remember when designing the system is that the analyst may initially find more than one solution. Nevertheless, the final solution or product can only be one. A thorough analysis of the data collected in the data collection phase can help arrive at a unique solution. The proper definition of the problem is also critical to solving the drilling problems.

1.4 Objectives and the Aim of the Study

It is a fully integrated and automated workflow that streamlines planning for future petroleum wells to be drilled.

Avoiding drilling problems, predicting, creating a complete report analysis, shifting the work to dedicated software to help drill performance, creating a controlled management plane, and enhancing decision making.

The system provides fast and secure access to data and information, brings flexibility and versatility, and leverages data to document and identify best sharing across the team.

Empowering teams to create technically and economically feasible drilling programs in hours with a cloud solution; unleash the full potential of an engineer's skills with a web-based, interactive, standardized, and automated solution built on proven to ensure increased efficiency, reduce npt and cost.

Allows to bring all the relevant information in one place and helps provide the flexibility for the team to co-innovate alongside the plan, design, and deliver safe, cost-effective. Analyze the time and resources spent on each step of the well drilling process (business process management) and use the lessons learned to optimize future wells.

Adaptive & Reliable analysis of the data.

The aims of the study:

- Construct a solution to save companies from drilling problems.
- Develop it to an automation level to be instead of the classic work.
- Enables to find out the best solution in the future planning.

As a result, we will gain the below benefits:

1. Reducing the cost.
2. Increase efficiency.
3. reducing non-productive time.
4. minimizing personal exposure and human error.
5. predicting some of the drilling problems.
6. tracking the project.
7. emphasizes filling the obstacles that facies the petroleum industry by creating a high-accuracy report.

2. LITERATURE REVIEW

One of the oldest technologies on earth is drilling engineering, and the technological advancement in the area is recognized by engineers, scientists, researchers, and the petroleum industry. The success key to the drilling industry has been the results of the utilization of technological advancement.

Because of the challenges that face petroleum companies in the exploration of petroleum in areas which is remote, deepand challenging to reach, whether on land or offshore areas, gaps have been found in drilling technologies the scientific and technological advancement could not reduce the risks and data uncertainties in drilling operations to the desired level since sustainably performing drilling operations don’t have priority in an era of continuously increasing demand for oil and gas and increasing costs of projects. Unfortunately, for the petroleum industry still perceived as one of the expensive branches of modern industries (Hojageldiyev, 2018).

In today's world of increasing speed, competitiveness, and complexity, technicians and managers face a need to achieve absolute efficiency. While they exceed one goal, another sets the bar even higher and requires additional improvements. This efficiency usually results from leveraging experience and knowledge and transforming it into an improved method at the most competitive cost. NAP Staff January 20, 2016 (Sabri et al., 2015).

For efficient and safe drilling operation, the knowledge of pore pressure and fracture pressure gradient for the formation is the primary step in avoiding drilling problems, Wellbore instability, kick, and loss of circulation through fractures are the most significant problems observed during petroleum drilling (Wickrama& Ratnayake, 2016).

Formation pore pressure can be determined with information from several sources, all these sources should be utilized during planning, executing, and analyzing drilling efforts, reservoir engineers, geologists, and geophysicists can make significant

contributions, particularly regarding stratigraphic correlations. Shale is fine-grainedclastic mineral especially quartz and calcite.1Shale is the predominant lithology found in petroleum basins. Most drilling and seismic travel times take place in shale, mechanically shale remains the least understood rock type because lack of reliable pressure measurements (Baker,1995).

In 1975, Eaton found a method for calculating pore pressure using the empirical parameter for many inputs. It shows a good correlation because the empirical parameter can be calibrated with real well data (Chen et al., n.d.).

Most of the fields in world suffer from mud losses during drilling operations, therefore, lost circulation is a complex problem to prevent or mitigate during drilling, treatments for lost circulation can be applied to reduce losses through a corrective approach or to prevent losses through preventive approaches, also known as.

"Wellbore reinforcement" Therefore, it is essential to explore and find alternative techniques in order to avoid or mitigate the troublesome problem, as this will positively impact the oil industry, especially on the time and cost of drilling operations (Mud et al., n.d.).

The Oil and gas industry contributes toeconomy as one of itssignificant sectors ,by taking advantage of the most challenging, demanding and exciting engineering, As the O&G industry has become financially attractive yetto risky to be implemented. It’s essential to look into the effective way of managing the O&G projects (Rahman et al., 2017).

The value for the accurate drilling data cannot be overemphasized, actual data is the foundation of the post well project evaluation and review, all the collected information becomes extremely useful, from its analyzation until the time it can be relied upon as a planning tool, well site information is used by all levels within the industry sectors , from the morning tour driller through the drilling engineering sections of the operator and service companies (Development, 2004).

Improving project performance in the petroleum industry by embracing automation, project production and digital technologies, advanced analytics, and agile way of working (Practice, 2019).

Projects drive change which means a step into the future with a fully controlled management perspective. Projects drive the changes in the petroleum companies.

From a business perspectivea project aims to move a company from a state to another to achieve specific goal. The desired outcome of the change brought about by the project is called the future state for the project . For some projectsthis may mean creating a transitional state where multiple steps are taken along a continuum to reach the future state. Successful completion of a project results in the company transitioning to the future state and achieving the specific goal.PMBOK® GUIDE.

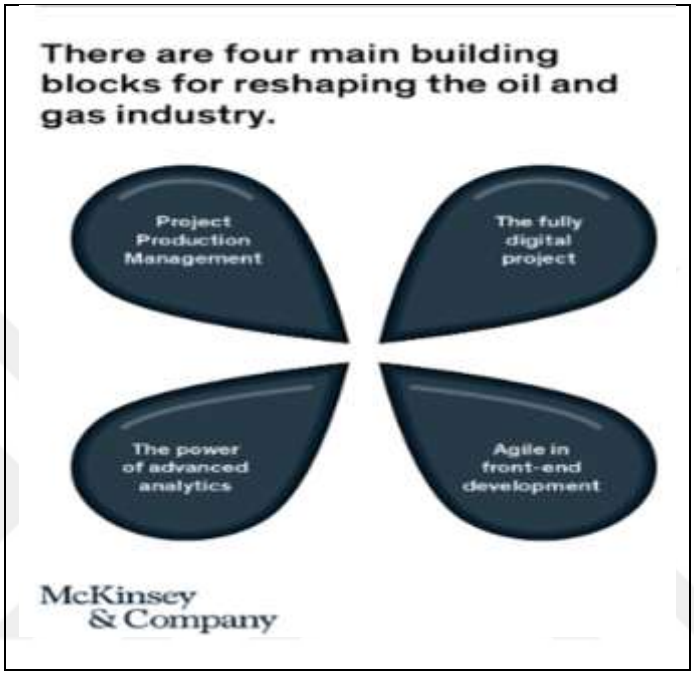


Figure 2.1: The Four Main Building Blocks For Re-Shaping The Industry

Source: (Reinventing Construction : A Route To Higher Productivity, 2017)

The Oil and gas industry takes a vital role in nation-building, even though each facility has unique requirements. With millions of dollars needed to get an O&G project off the ground, appropriate initiatives are essential to ensure the success of a given project (Al-Ali, 2017).

Artificial intelligence;

In the early 1990s, artificial intelligence and machine learning started to be used in thesolving of engineering-related problems, engineers and scientists started wondering how this technology achieves its predictive goals. The reason behind the fact that engineering application of AI and ML, to a large extent, quite clearly has to do with the historical problems of the application of traditional statistics in solving engineering related problems (jpt).

Over the past two decades, the petroleum industry worldwide has seen a rapid increased for the using of artificial intelligence (AI) applications.

This increase the number of applications of AI , due to the greater availability of human experts and the publication of a more significant number of case studies.

Artificial intelligence (AI) is the technology and scienceof developing intelligent machines. AI is dedicated to developing ways to have computers perform tasks previously thought to require human intelligence (Hossain, 2016).

Artificial intelligence is controversial because it involves issues such as the architecture of the brain and human intelligence; artificial intelligent is generally used in computer system that use programs with appropriate computer hardware,Therefore, it generally looks like a scientific illusion story for unknowns. Artificial intelligence is sometimes referred to as machine intelligence (Solanki et al., 2022).

3. THEORETICAL BACKGROUND

3.1 Drilling Engineering

3.1.1 Preface

Drilling engineering is one of the branches of petroleum engineering that deals with drilling different types of wells to develop the reservoir using incompatible techniques. Several formulas used in drilling engineering to determine essential parameters such as mud weight, mud rheology ,weight on the drill bit, pumping rate, and rock and drilling fluid properties (Outline, 2019).

Through petroleum engineering, society has discovered alternative energy sources, including heavy oils. Petroleum engineering is closely related to many other engineering fields and geology.

What does a petroleum engineer do?

Petroleum engineers focus on studying and evaluating gas and oil deposits to analyze their viability. They may examine maps of these deposits to find the best and most efficient ways to develop these energy resources and determine where to drill wells. The primary goal is to ensure the most economical production from a reservoir while maintaining environmental and safety standards.

3.2 Programming Languages

3.2.1 Preface

Many programming languages have existed in today's world; technology is constantly evolving. As technology advances, more tools will be needed to make software for these technologies.

Each project Has Different Needs and Goals.

There are so many programming languages that not all of them will meet a company's goals. Some programming languages are better for certain types of tasks than others.

Which programming language to use?

There is a straightforward answer: instead of searching for the programming languages themselves, thinking about the project's end goals will lead to that decision; the main reason there are many programming languages is that different tools are required to solve different problems. Each programming language has certain features and characteristics that make it suitable for specific tasks.

3.2.2 SQL

SQL stands for Structured Query Language; used to manage and organize data in databases. SQL consists of declarative and commands statementsacts as instructions to the database in order toperform tasks.

Database in SQL Server consists of a wide range of tables that store a particular set of structured data, a table contains a set of collectionas a rows called records or tuples and columns called attributes, each column in the table designed to storespecific type of information, such as names, dates, dollar amounts, and numbers.

SQL is designed to manage an extensive set of data stored in a database system; with today's development of data, it has significantly extended for the projects run in today's business world that requires processing for an extensive set of data.

3.2.3 Visual basic or vb.net

VB.net is a simple, object-oriented, and modern programming language developed by Microsoft to combine the net framework,power and Language Runtime with productivity benefits.

Visual Basic runs on the. NET framework, it has full access to the.net libraries also it's a very productive tool for quickly building a wide range of Windows, office, web, and mobile applications.

Visual basic is not case-sensitive language it treats everything as an object, Easy multithreading that allows applications to perform multiple tasks at the same time.

3.2.4 Python

Python considered as an object-oriented, interpreted, high-level programming language with a dynamic semantics. Its highly built-in data structures combined with dynamic binding and dynamic typing, the use as a scripting language in order to

connect existing components. Python's easy to learn, simple syntax emphasizes readability, it reduces the cost of program maintenances and supports modules, which encourages program modularity.

Many Python interpreters and an extensive standard library are available.

3.2.5 HTML

HTML is defined as an acronym for Hyper Text Markup Language used to create web applications and web pages.

Hypertext: Hypertext means "text within the text." Text that contains a link is hypertext. Hypertext is the way of linking two or more web pages together.

A markup language defined as a computer language that applies formatting and layout conventions to a text document. A Markup language makes the text more interactive and dynamic. It can transform the text into images, tables, and links.

3.2.6 Java

Java is one of the popular programming languages developed in 1995.

Oracle owns it and more than 3 billion devices running Java.

Java used for:- Desktop applications, Mobile applications, Web applications, Web servers, application servers, and Database connection

The usage of Java comes with it is the ability to work on various platforms (Windows, Linux and Mac)

Java is an object-oriented programming language that gives programs a clear structure and allows code reuse, which reduces development costs (w3schools.com).

3.3 AI in Petroleum Fields

3.3.1 Preface

Improving oil and gas industry performance using artificial intelligence for data analytics. Data analysis is one of the most important and solid applications of technology in the petroleum industry. It uses artificial intelligence based on facts such as field measurements and data to model a physical phenomenon. The goal of

the technology is to avoid simplifications, assumptions, bias, and preconceived opinions,

the incorporation of explainable artificial intelligence is the key for petroleum data analysis . While petroleum data analysis uses actual field measurements as amain building blocks for modeling the physical phenomena.

The main application of artificial intelligence and machine learning is to define how this technology achieves its predictive goals in the petroleum industry in solving engineering problems,

Oil field is already timed expected to tap 125 billion barrels of oiland this trend could affect 20,000 companies associated withoil business. Therefore, almost all will need data analytics to integrate technologies throughout the oil and gas lifecycle to gain a competitive advantage. With Big Data, companies can save costs and capture large amounts of data in real-time. the use of analytics can help increase production by 6-8%. (Satavisa June 22, 2021)

This study sheds light on how an intelligent model will bring improvements to solve many problems related to the petroleum fields from different standing points of viewincluding robustness, accuracy, and generalization.

3.3.2 Benefits from AI

Improving decision making;

Artificial intelligence enables speed and accuracy. The ability to highlight nonobvious correlations in the data sets through rapid data analysis and processing dramatically improves decision-making at scale.AI helps companies plan for the future by allowing them to learn from past problems and act in real-time.

Automated learning enables not only analysis of hidden patterns and better predictive models but also hyper-personalization.

For Business process optimization it is Increase productivity and operational efficiency are the main reasons for using AI. Using AI could reduce headcount, while the time saved leads to significant cost savings ,as a result of AI investments frees up employees to focus on being more creative.

3.3.3 The prediction technique

In today's world's powerful transformation of the petroleum industry, data is considered to be the new oil; Data Drilling is a basic , simple analysis technique helps to uncover the root causes of trends, used to analyze data in the reports, charts and spreadsheets. Drilldowns are the most common type of data drilling. Drilldowns provides detailed view of the data behind summary information in the reports.

Data Drilling is a business intelligence technique for analyzing information by providing a different view of the data in the charts and reports. It is a valuable and simple tactic that can help uncover the root cause of trends. Often, drilldowns can provide organizations with incrementally more detailed views of information that allow determining the exact factors causing trends or anomalies (Andy Morris, 2021).

3.3.4 Drilling data analysis to improve drilling performance

Drilling performance usually refers to the efficiency of the drill bit, drill string, and drilling rig in achieving the total depth of the hole. Whenever drilling engineers look for the insights leading to improve drilling performance, drill data analysis is used, these insights must come from drilling data that reflects a realistic picture for the subsurface conditions and steers.

Drilling data analyzation used to improve drilling performance for a long time but technological advances simplified the process. Technology has allowed petroleum professionals to measure, store and collect more significant amount of data-often called "Big Data" From the exploration to decommissioning nearly all disciplines involved in the oil and gas industry can benefit from Big Data analytics to improve the quality of decisions, avoid errors, and optimize production (Andy Morris, 2021).

3.4 Common Drilling Problems

The prediction of abnormal pressure zones and the estimation of the pore pressure gradient considered as one of the main factors for designing a well; pore pressure can be measured in permeable formations using a repeat formation test (RFT), drill stem test (DST), or estimating by using several methods, depending on the period of obtaining specific data.

The first step to building any drilling problem is to estimate the overburden pressure gradient for the targeted formation (Hussain, n.d.) (Heriot-Watt University, 2005).

3.4.1 Preface

The drilling crew uses drilling mud, casing, and cementing to manage the pressure inside a well during drilling, fluids contained within the pores of a rock formation exert pressure on the well bore that known as pore pressure; as rig crews drill ahead, they use drilling mud to balance pore pressure, the mud circulates down through the drill string and back up the casing to the rig, the weight of the mud balances the pore pressure, and the mud circulation carries away cutting if pore pressure exceeds mud pressure fluids from the well formation can flow into the well bore causing a kick as the crew drills deeper, the pore pressure typically increases at some point the drilling crew can no longer use mud to balance this pressure without fracturing the formation above.

3.4.2 Method of Prediction Pore Pressure and Detection Abnormal Pressure Zones

The surface survey is the primary source of data for predicting the abnormal pressures in the area or from the data of previous wells drilled in oil fields. Analysis of the geophysical data provides a comprehensive idea of the subsurface geologic conditions that could indicate the presence of an anomalous pressure zone. Completion reports from previous wells provide information on the weight of drilling fluid, problems such as sticking of pipes, loss of circulation, or the occurrence of a wellbore. Well log data or information from the mud log is also important in predicting anomalous pressure formations (Hussain, n.d.).

$$\frac{P}{D} = \frac{\sigma}{D} - \left[\frac{\sigma}{D} - \left(\frac{P}{D}\right)_n\right]\left(\frac{dco}{dcn}\right)^{1.2} \quad \textbf{(3.1)}$$

Where:

$\frac{P}{D}$: Pore pressure gradient (psi/ft).

$\frac{\sigma}{D}$: overburden pressure gradient (psi/ft).

dcn: dc-exponent normal and supposed at a specific depth.

dco : observed dc-exponent at the same depth.

3.4.3Abnormal pressure zone identification using dcExponent method and etalons equation

Eaton (1975) has developed an equation to predict over pressure zones and he has developed the calculations of pore pressure gradient using dc-exponent (Eaton, 1975).

3.4.4 Pore pressure gradient

In drilling operations kicks needs to be avoided, borehole instabilityand circulation loss due to fractures as much as possible by choosing the mud weight. The information about formation pore pressure and fracture gradient very essential for selecting a safe range of a mud weight.

When the pressure of the mud (mud weight times vertical depth) in a highly permeable formation below the pore pressure, a kick will be initiated; if this occurs in an essentially impermeable formation, the well might collapse. This provides a lower limit for the mud weight in the terms of safety, in many cases drilling is underbalanced to increase the rate of penetration (ROP).

Pressure will exceed the local drawdown with formation pressure (fracture gradient times the vertical depth) and a fracture forms. With the loss of circulation, the fracture increases when mud pressure exceeds the minimum horizontal earth stress (the lowest principal stress),this operation represents the upper limit on the weight of the drilling mud, horizontal stresses can be much higher than pore pressures, in that case a suitable safe range for mud weight can be calculated. However, possible downhole shear failure imposes other constraints on the mud weight, especially in a

very highly deviated well. Of course, unusually the high pore pressures or the presents of a weak formations causes potential problems for drillers, a high or low earth stresses can also cause unexpected difficulties. Moreover, pore pressure prediction is particularly important for drilling operations. It can improve the quality of decisions and the economics of drilling (Lesage; et all, 1991).

3.4.5 Formation pore pressure

Usually, the pore fluids are considered to be in hydrostatic equilibrium from the surface to the depth reached; this will provide a simple prediction for the pore pressure.

For the water density of 9 Ibm/galthe gradient equals 0.47 psi/ft), which is less than the realistic pressure gradient for the mud (Drilling manual, 2020).

3.4.6 Abnormal pressure

Formation pressures that exceed hydrostatic pressure (Pr>PHy) in a given geologic setting are defined as abnormally high formation pressures.

Abnormal high pore fluid pressures are encountered worldwide in formations that range in age from the Cenozoic era Pleistocene age to the Paleozoic era (Cambrian age). (Walter H. Fertl).

3.4.7 Subnormal pressure

Subnormal pressure usually occurs naturally in formations that have experienced a drop in pressure due to deeper burial by tectonic movement or often due to the production of formation fluids in an old field that contributed to the depletion of a formation. Subnormal pressure is the formation pore pressureproportional to the depthwhich is less than the hydrostatic pressure gradient of .465 psi/ft. (Oklahoma Administrative, 2013)

3.4.8 Over burden pressure

The overburden pressure defined as the vertical pressure that exerted on a zone by rock the total weight of the rock grains and trapped fluids' weight. The depositional Pressure at a specific point is a function of the mass of rock and fluid above that point. Thus, the fluid's and rock's average density above pointofinterest must be determined in order to calculate over burden pressure at any depth, for the average

density of (fluids & rock) in the pore is called(bulk density of the rock). In addition, over burden pressure varies in different formations and regions due to the different densities of the formation (Khoshnaw, et all, 2020).

3.4.9 Fracture pressure (FP)

It is known as the downhole pressure the formation can withstand before it cracks or fails. It can also be represented as the pressure at which circulating fluid is lost. As reservoir pressure decreases, fracture pressure decreases. Therefore, the fracture pressure gradient must know before drilling the wells to avoid losing circulation because the formation fractures by choosing the wrong mud weight. Consequently, it is necessary to determine the relationship between the fracture gradient of the formation and the bottom (Hossain, 2016) and (Khoshnaw, et all, 2020).

3.4.10 Drilling fluid

Drilling muds are a combination of synthetic and natural chemical assemblies used to cool and lubricate drill bit and cleaning the bottom of the hole, transport the cuttings that resulted from drilling process to the surface, control the formation pressure, and improving the function of drill pipe and downhole tools. Drilling muds usually divided into two types: -Waterbased drilling muds and oil-based drilling muds, each type requires specific additives. mud base type used depends on the well and formation requirements, and the requirements for the disposal for the fluid when it’s no longer needed (Petroleum Engineer's Guide 2021).

3.4.11 Kick

A kick is the unwanted flow of fluids inside the formation into the wellbore. The consequences of a kick include lost operating time, hazardous high pressure and gas operations, and possible equipment losses (ranging from stuck tubular to loss of the drilling rig) while attempting to regain control of the well. If the blowback is detected and brought under control promptly, it can be managed and safely removed from the well. If the blowback continues, it may not be able to be brought under control. This is referred to as a blowout or an uncontrolled kick.

Since a kick can occur at any time, it must be recognized, identified, and responded to any warning signs of a kick. These signs either indicate that blowout conditions

exist or that the well may be causing blowouts. It is prudent that all possible means are employed to prevent blowouts (Wickrama & Ratnayake, 2016).

3.4.12 Lost circulation

The process of controlling and preventing the loss of the drilling fluid circulation is a problem that is often encountered during the drilling process.

The loss of the drilling fluid cycle is defined as the amount of drilling fluid or cement slurry used in drilling lost rotation within the cavities of rock formations. The amount of loss ranges from a gradual drop in the drilling fluid level in surface reservoirs to a complete loss of the fluid—the return from the well.

The loss of drilling fluid and its expensive compounds represent one of the harmful effects suffered by the oil industry when checking the drilling fluid cycle. It considers the loss during drilling, the blockage of drilling pipes, the problem of wells breaking out, and cavitation. The excess of rock formations is another important influence that makes the process of controlling the loss of fluid circulation. Drilling and preventing its occurrence are one of the oil industry's challenges. Loss of circulation can occur in all types of rocks, but fragile and cavitated rocks. The loss usually occurs in soft formations such as sandstone. The loss also occurs due to its high permeability on the one hand and its ease of cracking on the other hand. However, in hard rocks such as stone Lime and dolomite, loss occurs due to cavities, caverns, natural fissures, and fungi (Husam, nd.).

3.5 Petroleum Project Management

3.5.1 Preface

The oil and gas industry projects are one of the most significant running projects that use the concept of project management, which is using tools, processes and techniques that put a sound foundation for the organizations to achieve specific objectives and goals, different projects may be needed to accomplish different goals and objectives for the project or the company.

Projects can be grouped into one program, a program is the definition of group subsidiary programs, related projects and program activities that are managed in a coordinated specific manner to obtain benefits.

As mentioned by Eduardo and Sergio (2010) (Lima Peru, 1-3 December 2010).

project management is a combination of sciencewhich follows a systematized processand art, requires creativity to convert human ideas into actual realities,on the other hand, as defined by PMI (2013), project management is the application of skills, knowledge, techniques, and tools to project activities to meet the project requirement (PMI, 2013) and (PMBOK)((Sabri et al., 2015).

Project progress and achievement are made by properly managing and controlling the problem, followed by the next steps (JN Dunster, drilling manual).

Stage 1- planning.

Stage 2- contracts management.

Stage 3-site supervision.

Stage 4- closeout.

3.5.2 Cost of drilling sector or cost management

Cost is an important Factor for determining the feasibility of power generation from geothermal sources, accounting for 42%-92% of total power plant costs and 30%-70% of initial capital costs (hussianrabia).

Factors affecting the cost of a completed well include: - Final well depth - Well diameter -Type of rock formation to be drilled - Casing program- Remoteness of well site - Chad Augustine, J. W. (2006). A comparison of geothermal drilling costs with oil and gas drilling costs. The final sheet that summarizes the drilling costs is usually referred to as the AFE, The AFE sheet also includes: a summary, project description, and breakdown of expenditures, partner shares, and breakdown of well costs (hussianrabia).

4. METHODOLOGY

4.1 Preface

Methods and technique

The first step of the research is to collect the data from petroleum fields, the collection of the data will be about drilling sector as it consider one of the most dangerous and high costly one , also for the importance of the drilling data , the data should be collected from the rigs that has problems encountered during drilling to include in the research and provide the best solutions to solve it by software and avoid it in the future with creating all types of reports especially that the system of reports in the field has lacking at some points , the next step will be analyzing and studying all types of drilling data especially the mistakes that happened and the losses resulted from that to create an organized plan for data usages , reaching to the step of creating the software and According to the big explosion of data and programming methodology and automotive evolution ,The method used in this research considered to be the programming languages which is focusing on SQL , python ,visual basic. By creating a database at first using SQL program, then using python and visual basic and according to the importance and progress of these languages in the primary time, they are the world's most popular programming languages and are commonly used by major companies.

By creating the servers to send, read and save data, then to begin to analyze, create reports, and predict problems, of course adding equations, options, and other further adding. By that, time will be minimized; the cost will also be minimized and provide a more comfortable workflow for the environment in the field.

This project uses a software development methodology/process, also known as the software development lifecycle, to set the rules for a successful completion of the project. The decision for a methodology depended on the project requirements and time frame. The development work is divided into different phases depending on the chosen development methodology.

The problem is divided into procedures or code blocks, each of which performs a task. All procedures taken together form the entire program. The solution revolves around entities or objects that are part of the problem. The solution deals with how the data associated with the entities are stored, how it behaves, and how they interchange with each other to provide a cohesive solution. Each entity performs its task and is self-sufficient. These entities are then combined to form the complete solution. A combination of more than one of these methods is chosen in software development. Note that the problem must be divided into smaller units for each method discussed.

4.2 Model Development

The model developed primarily used a standard data science process, enabling flexibility, quality, and simplicity in the model development and deployment phases.

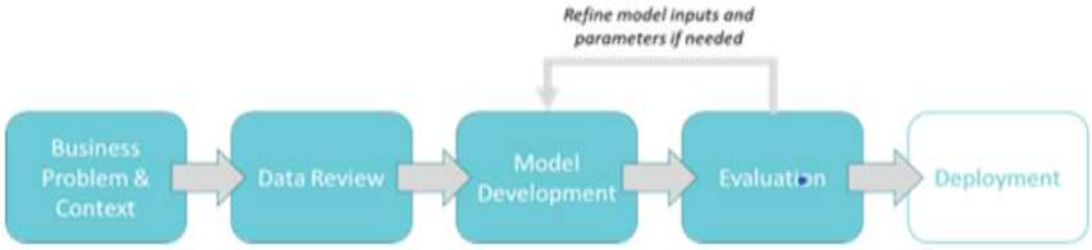


Figure 4.1: Getting Started

The data that has been collected from fields are two types:

1-the data set taken from Al-Ahdab field was used to show the program's ability to read the data accurately and upload it to the site; this data can be considered theoretically as the actual data during the drilling, but for the difficulty of obtaining the actual data from the companies during the drilling.

The Excel sheet report is equipped with different data related to the drilling process; the program was made in an artificial intelligence way to read the daily files of drilling wells in the same sequence. The program also allows the feature to change variables via the Internet. The program has been prepared to read Excel according to the lines and columns of the available sheet. It is possible to increase a specific feature, change the values for this feature, and then control its appearance on the page to display data.

Why machine learning method has been adopted to read, save, and analyze data to create reports instead of human checking and manual creation for reports in the 5th chapter.

As for the data collected from the Abu, Gharb field will be presented in the program in the prediction method part, which means that drilling problems that occurred in previous wells for specific layers will be predicted. This will lead to a stop in the drilling process, increasing the cost and exposing the drilling process to potential danger. This method will prevent drilling Problems and avoid them for future wells, increasing the drilling process's efficiency and reducing human errors.

The data was adopted to analyze and create a special report related to the drilling process for the well.

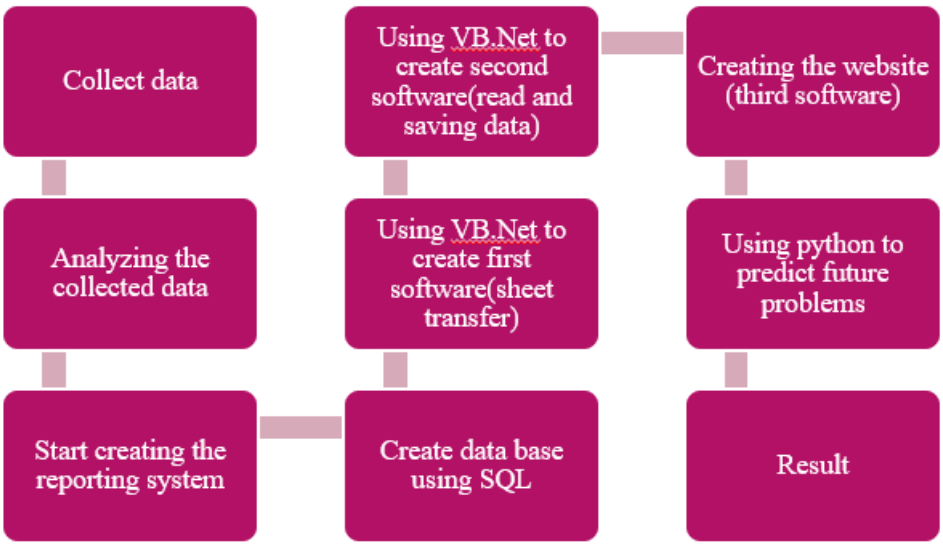


Figure 4.2: Diagram to Describe the Used Methods and Techniques

4.3 Reporting System Description

The system is divided into three software. For the first one, it is the main job to read the data and upload it to the server. This software is available to the client or drilling company during or after the drilling process, depending on the company or client's goal of how to use the program as we described previously. For the research case, it can show its ability to read data and analyze the data to create reports and make important decisions, as will be explained later.

The second software's main job is to read the data in the database and upload it to the cloud.

FTP is the data transformation method from the first software to the second. FTP (file transfer protocol) refers to the rules governing how computers transfer files from one system to another all over the Internet. FTP is used to send files between computers; FTP works by opening two connections that link the computers, trying to have a connection in between.

One connection is designed for the commands and replies sent between the two clients, and the other channel handles data transfer.

4.4 Data Base Creation Using SQL

The first step is creating the database using SQL.

SQL Server database diagram is a powerful tool, The tables in the database diagram are not independent. Any change to the tables with this tool directly affects the table architecture in the database. The table's geometry depends on the basic principles and points dealt with in the project, which consists of a specific company, followed by a specific project in a specific field and site. Each field consists of several wells, and each well consists of several measurement points; besides the controlling user who has the authority to manage the project.

Each table contains a unique ID; using IDs to key tables means changing the content as needed without having to repoint things, connected through The Primary Key constraint uniquely identifies each record in a table.

The second step starts working on vb.net by going to create a new project and start by designing the form which represents the first software, Windows Forms, or what can be called a smart-client component of the .NET Framework.

It has a range of sets from managed libraries that enable typical applications for different tasks. These tasks are reading and writing to the file system, using this development environment of vb.net to create it. Windows Forms applications that can display information.

Forms are visual displaying surfaces where information can be displayed. A variety of controls placed in the form that can be display buttons, text boxes, and list boxes and to give actions to form or to give the main job to be acted and seen on the form will be through writing the specific codes that deals with the first or the second software main job.

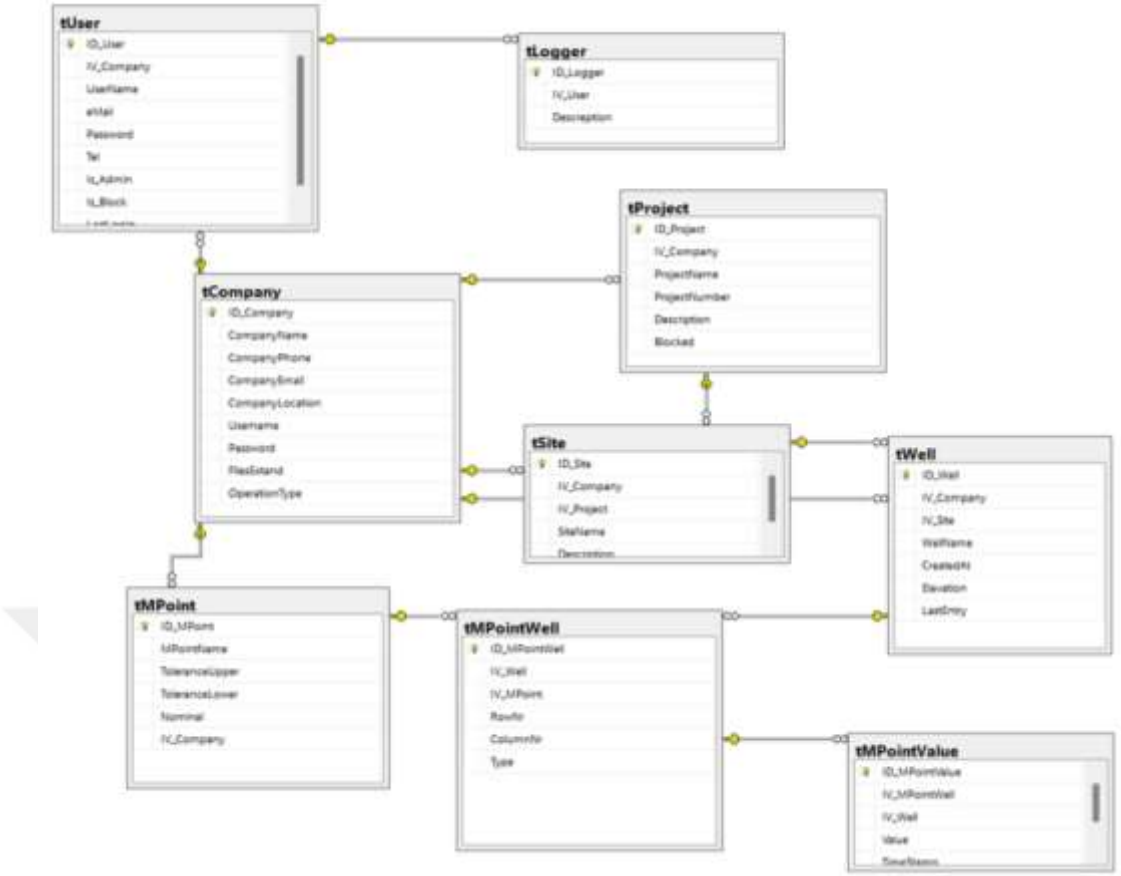


Figure 4.3: Data Base Relational Diagram

For the second software same principle will be used for windows forms; it will only differ. In the essential work principle for the second one and different code writing related to what needs to be seen in the form.

4.5 Sheet Transfer

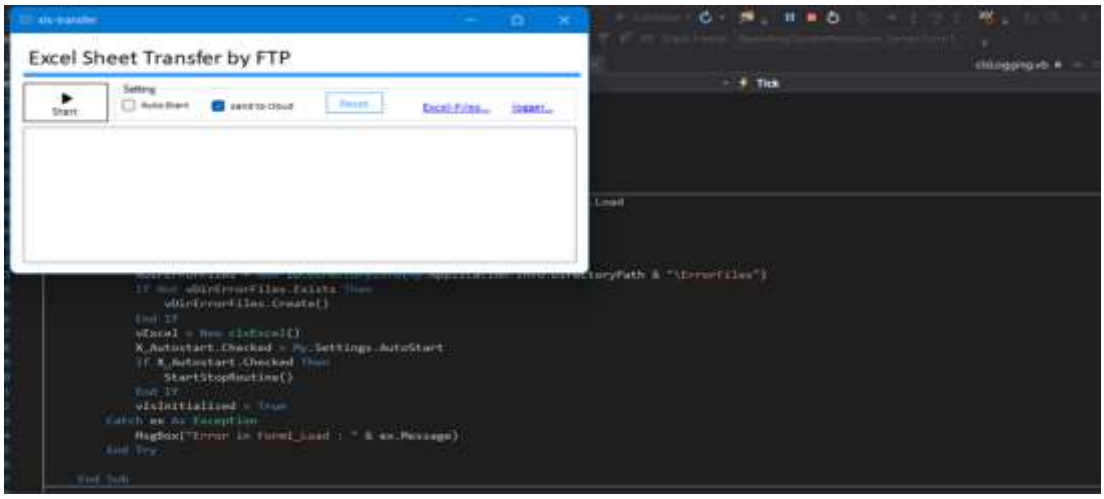


Figure 4.4: First Software As Shown In a Windows Form Application Using FTP Method

4.6 Reading and Saving data to Data Base

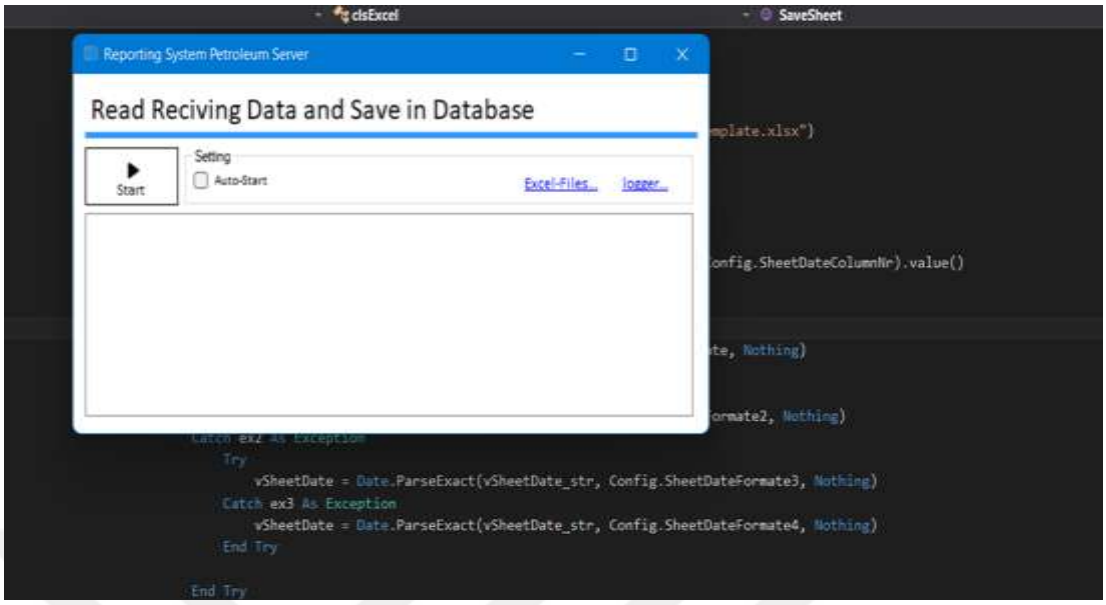


Figure 4.5: Second Software As Shown In Windows Form Application

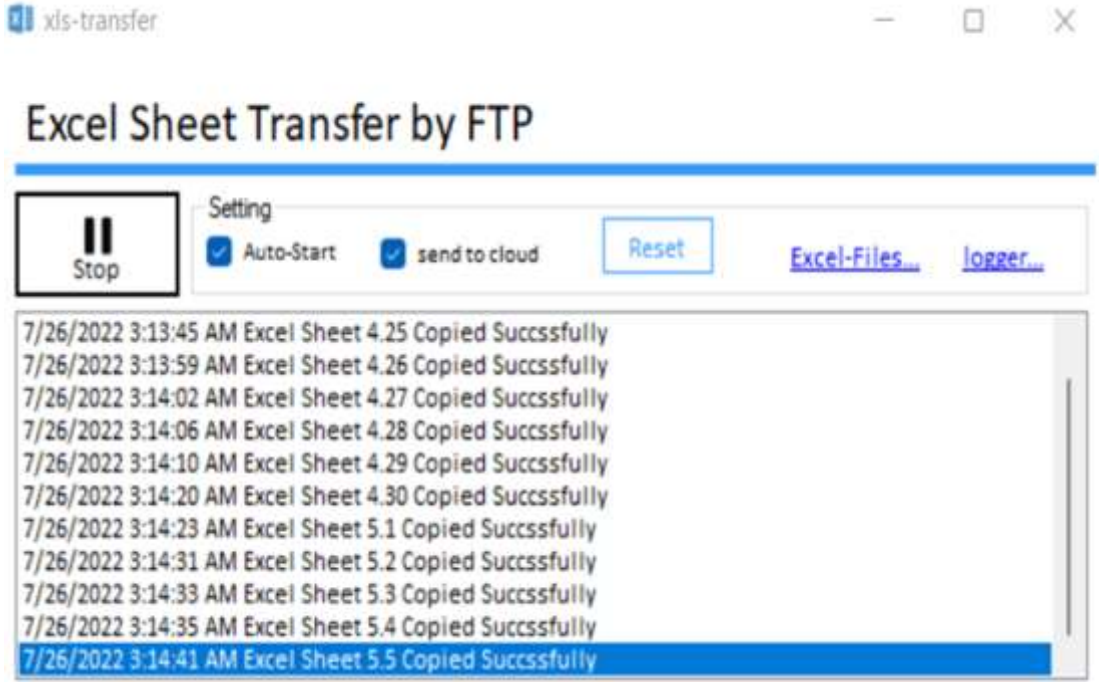


Figure 4.6: Process of Reading the Data

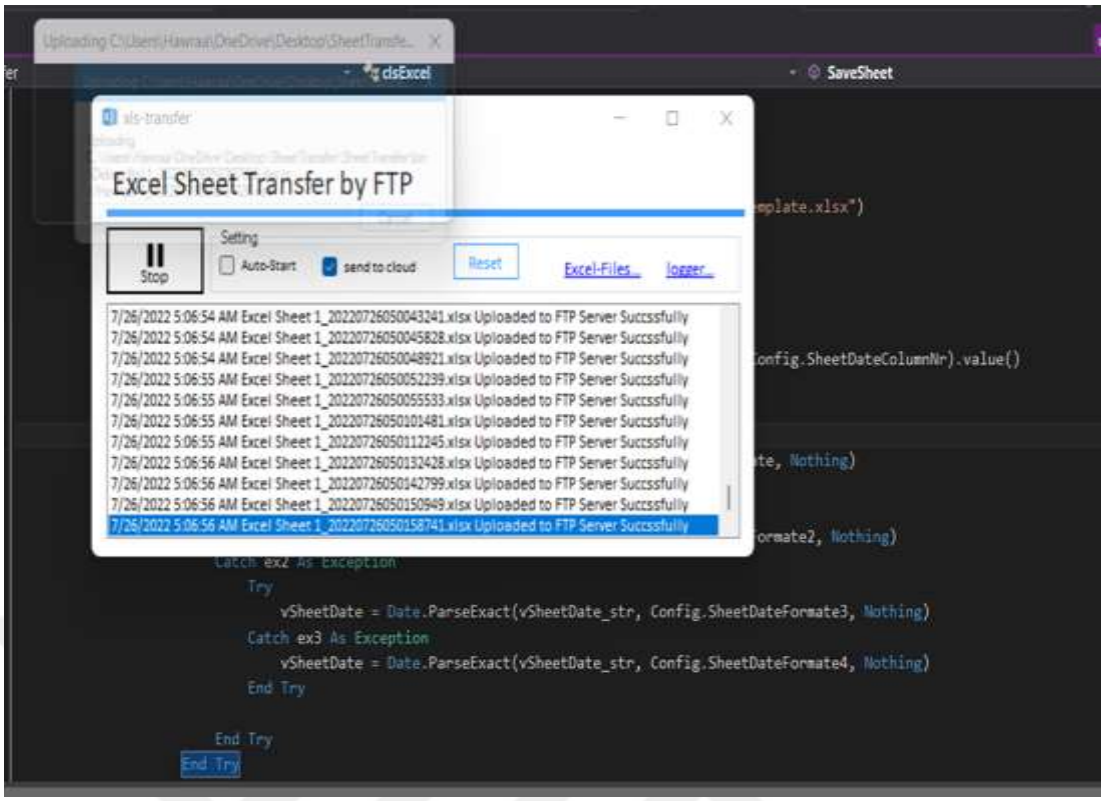


Figure 4.7: The Process of Reading the Data Form the Excel Sheet to Send It after Process Complete

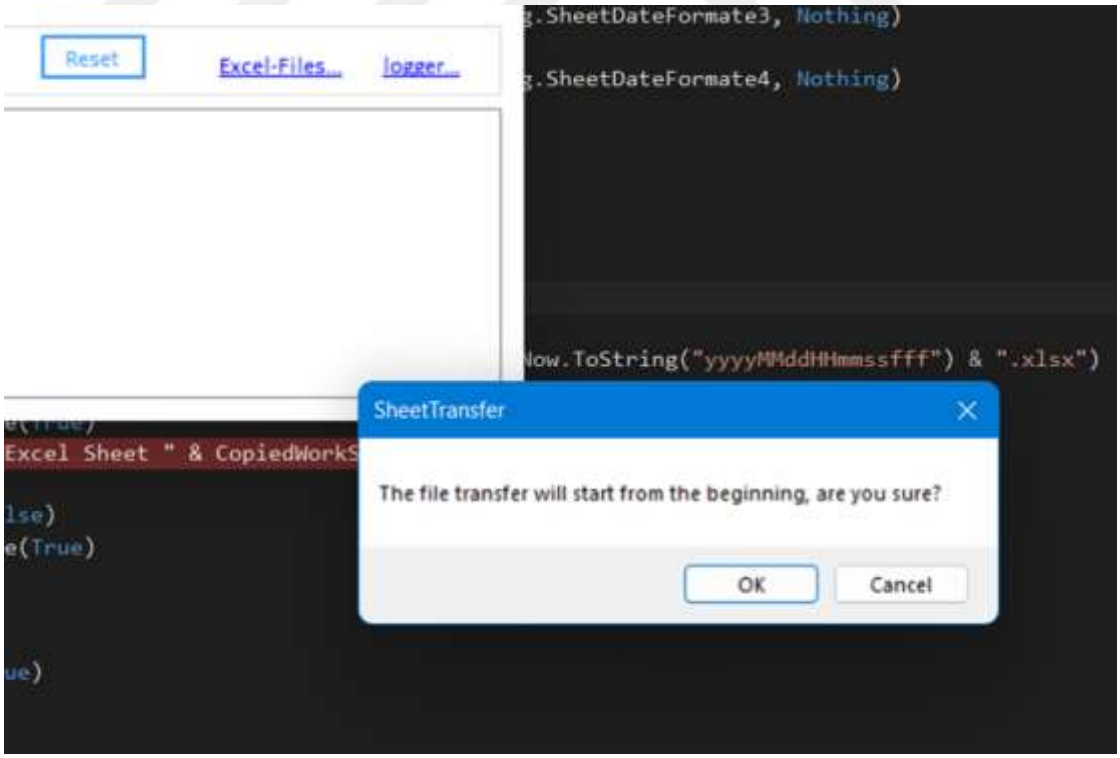


Figure 4.8: Represents the Logs While Reading and Uploading Data, In Case of Any Error, It Can Be Saved On Logs File

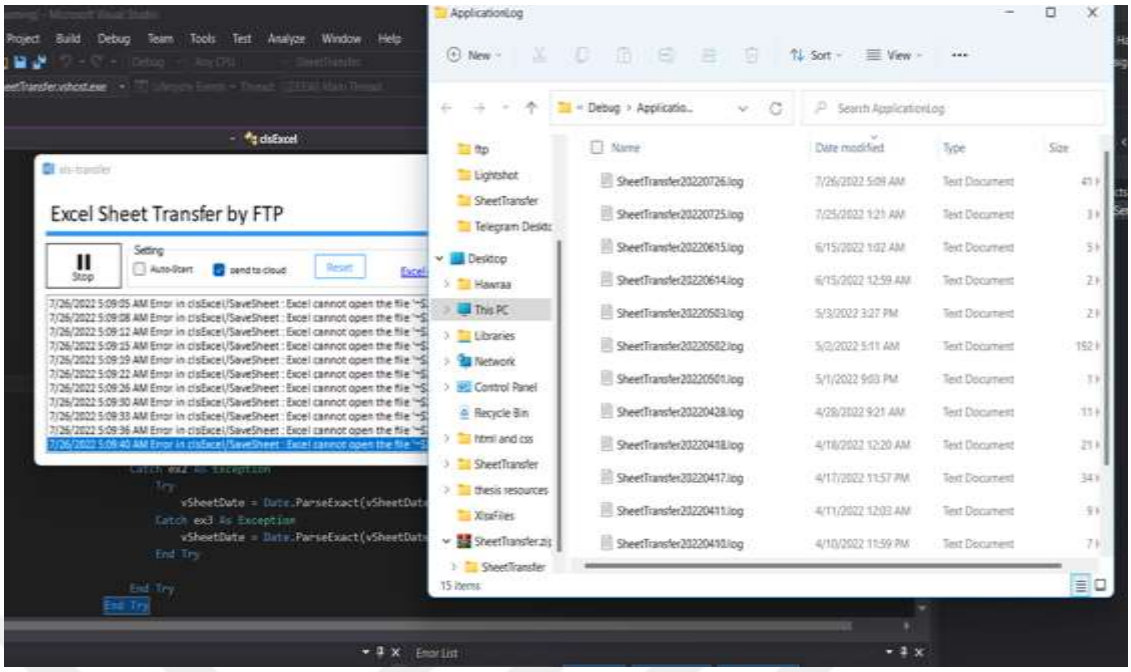


Figure 4.9: Shows the Reset Button and Its Ability to Re-Starting the Reading and Uploading Information from the Beginning (Re-Run the Software)

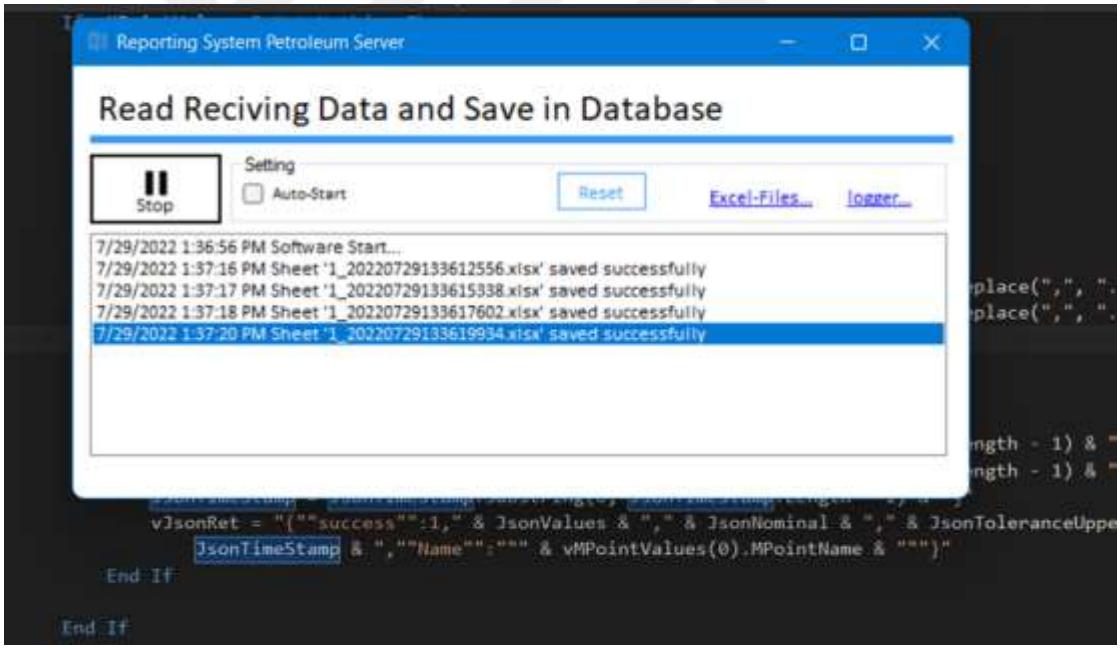


Figure 4.10: The Second Software Working Principle

If files successfully saved in data base and end of software is the final step depends on the amount of the data provided every day.

The re-set button is to clear the data base from old data uploading

For the codes used to create the system it can be found in appendix.

4.7 Web Results

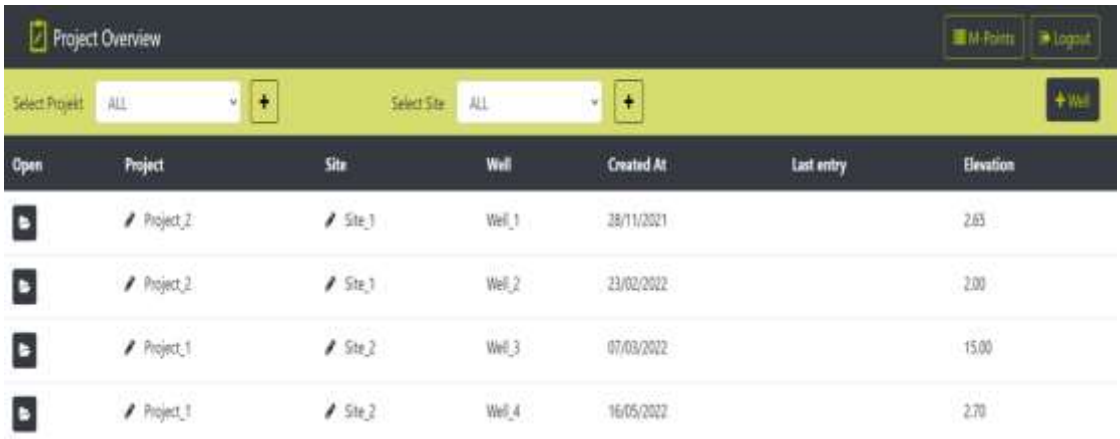


Figure 4.11: Represents the First Web Page That Shows the Main Projects For the Field, Each Project Has a Site and Each Site Has a Well

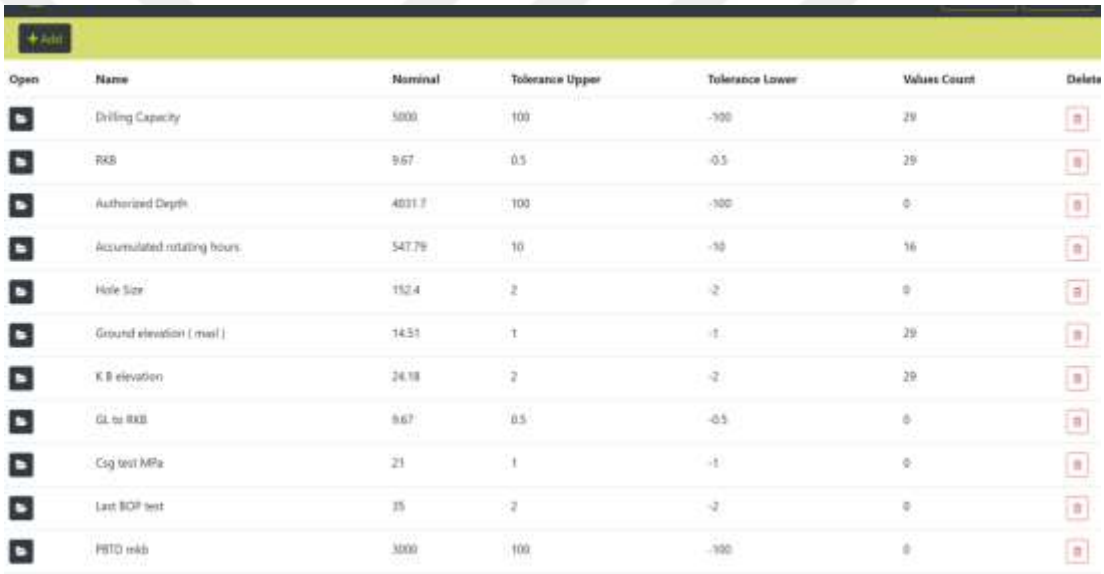


Figure 4.12: The Measurement Points of the Well

Figure 4.13: Represents the Measurement Points of the Well

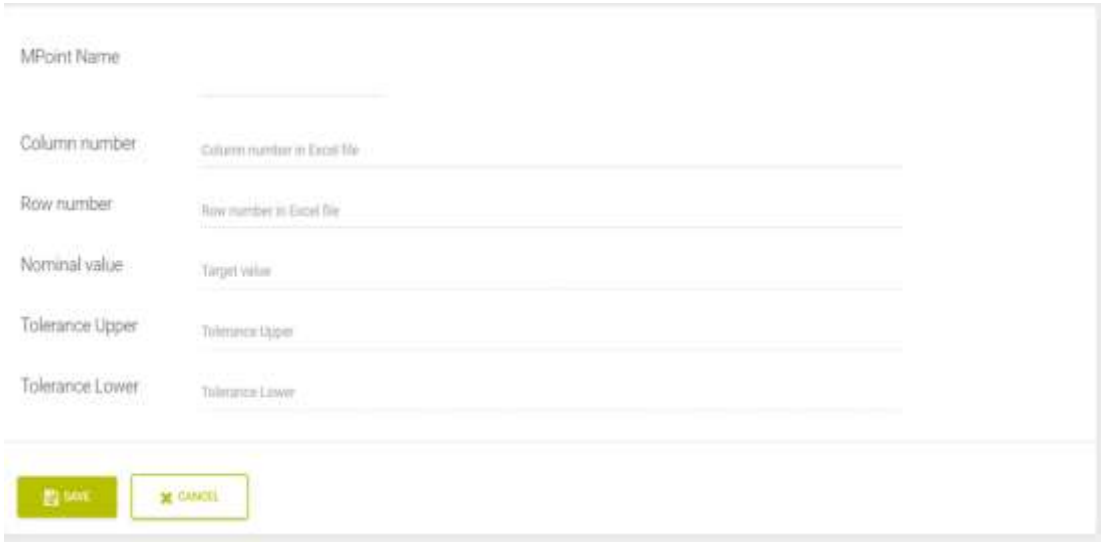


Figure 4.14: Editing Measurement Point

Data uploaded to the server and connected in a specific diagram related to the scope of a project through the database represented here can be edited, or we can add a new point, and the system will automatically read it.

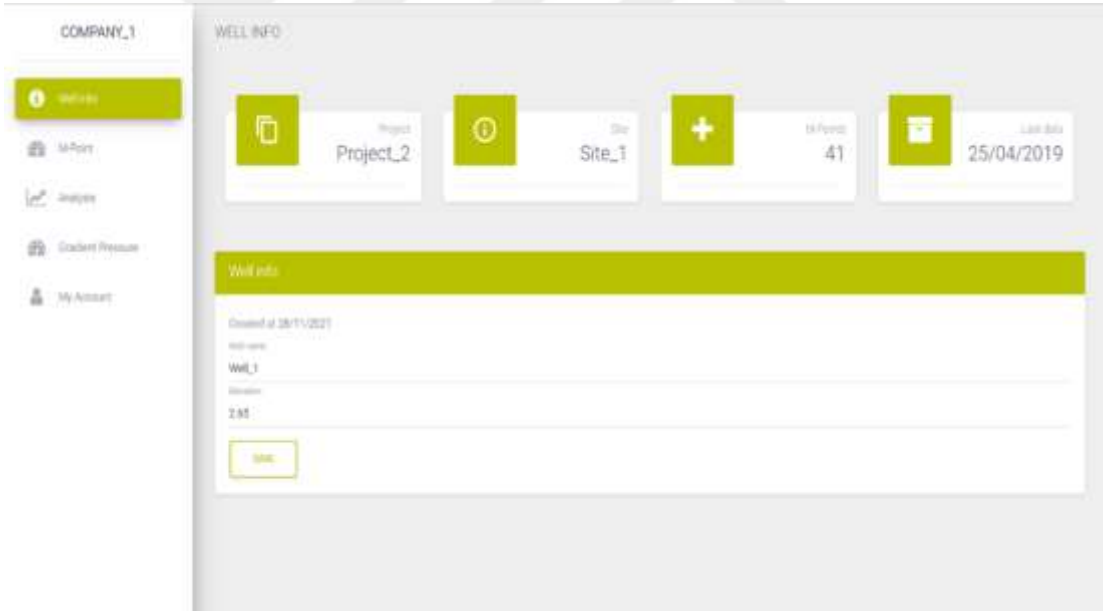


Figure 4.15: Shows Different Options That Can Be Used In the Web Page, It Also Shows Detailed Well Information

Figure 4.16: Represents the Analysis Section

A report can be generated to a specific email address to provide all necessary information about the well; it also shows the ability to define if operations go well or not by the status, according to tolerances upper and lower that the field worker can include in the system, in case of any error above or below that, it will be clear and noticeable by status field, as shown above, it can also create a chart to represent value.

Figure 4.17: The Prediction Method Using Python to Perform the Activity

The prediction method used python coding to perform the activity on the web.

Several python codes were used to predict the abnormal formation pressure and layers that might have lost circulation, this prediction for the Abu-Garib oil field to prevent problems drilling for future wells to be drilled. Data from the field was collected, and the Eatons equation was used to perform to pore pressure gradient to predict unsatiable pressure, .as shown above.

Upper Fars and Middle-Low Kirkuk formations are normal pore pressure zones about (0.46) psi/ft. Chapter five results and discussion 95, Lower Fars formation begins from Mb5, a transition zone; Mb4, Mb3, and Mb2 are abnormal high-pressure zones about (0.7- 0.8) psi/ft, and Mb1 is a transition zone. 3. Jeribe-Euphrate and Upper Kirkuk formations represent abnormal low-pressure zones.

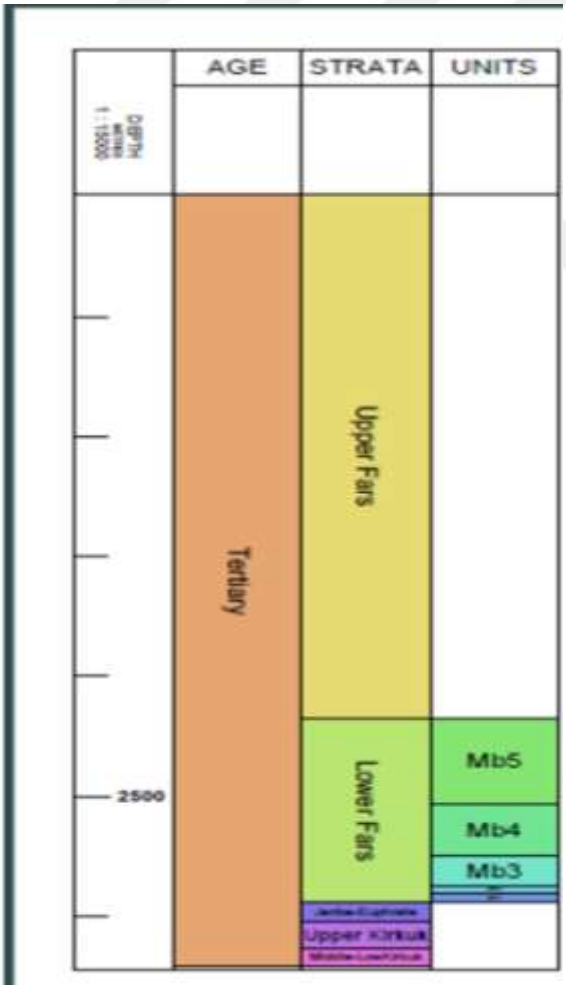


Figure 4.18: Longitudinal Section Showing Depth with It Units for the Formations

Table 4.1: Eaton's Result for Gradient Pore Pressure

Table

depth	povb	pn	dc	dcn	pp	Status
200	758.6	305	0.7	0.74	334.26	OK
201	762.39	306.52	0.79	0.74	269.31	OK
202	766.19	308.05	0.79	0.74	270.66	OK
203	769.98	309.58	0.85	0.74	226.28	OK
204	773.77	311.1	0.77	0.74	288.5	OK
205	777.56	312.62	0.81	0.74	259.36	OK
206	781.36	314.15	0.78	0.74	283.68	OK
207	785.15	315.67	0.81	0.74	261.89	OK
208	788.94	317.2	0.77	0.74	294.16	OK
209	792.74	318.72	0.78	0.74	287.61	OK
210	796.53	320.25	0.8	0.74	273.54	OK

The result from the Eatons equation will be gradient pore pressure as gradient pressure is needed to predict; a simple step was taken, which is the division of the final result of pore pressure on depth. For example, for depth 200, the pore pressure was calculated as 334.26. For that case, we need to divide 334.26/200 to have pore gradient pressure.

As seen above, for these depths, the status is ok, the pore pressure is normal, and no problems have occurred.

Table 4.2: Prediction Results

212	804.12	323.3	0.79	0.74	284.06	OK
213	807.91	324.82	0.77	0.74	301.22	OK
214	811.7	326.35	0.75	0.74	318.47	OK
215	815.5	327.88	0.81	0.74	272.02	OK
216	819.29	329.4	0.78	0.74	287.45	OK
217	823.08	330.92	0.79	0.74	290.75	OK
218	826.87	332.45	0.82	0.74	267.63	OK
219	830.67	333.98	0.78	0.74	301.59	OK
220	834.46	335.5	0.79	0.74	294.78	OK
221	838.25	337.02	0.79	0.74	296.11	OK
222	842.05	338.55	0.79	0.74	297.45	OK
223	845.84	340.08	0.78	0.74	307.1	OK
224	849.63	341.6	0.78	0.74	308.47	OK
225	853.42	343.12	0.76	0.74	326.53	OK

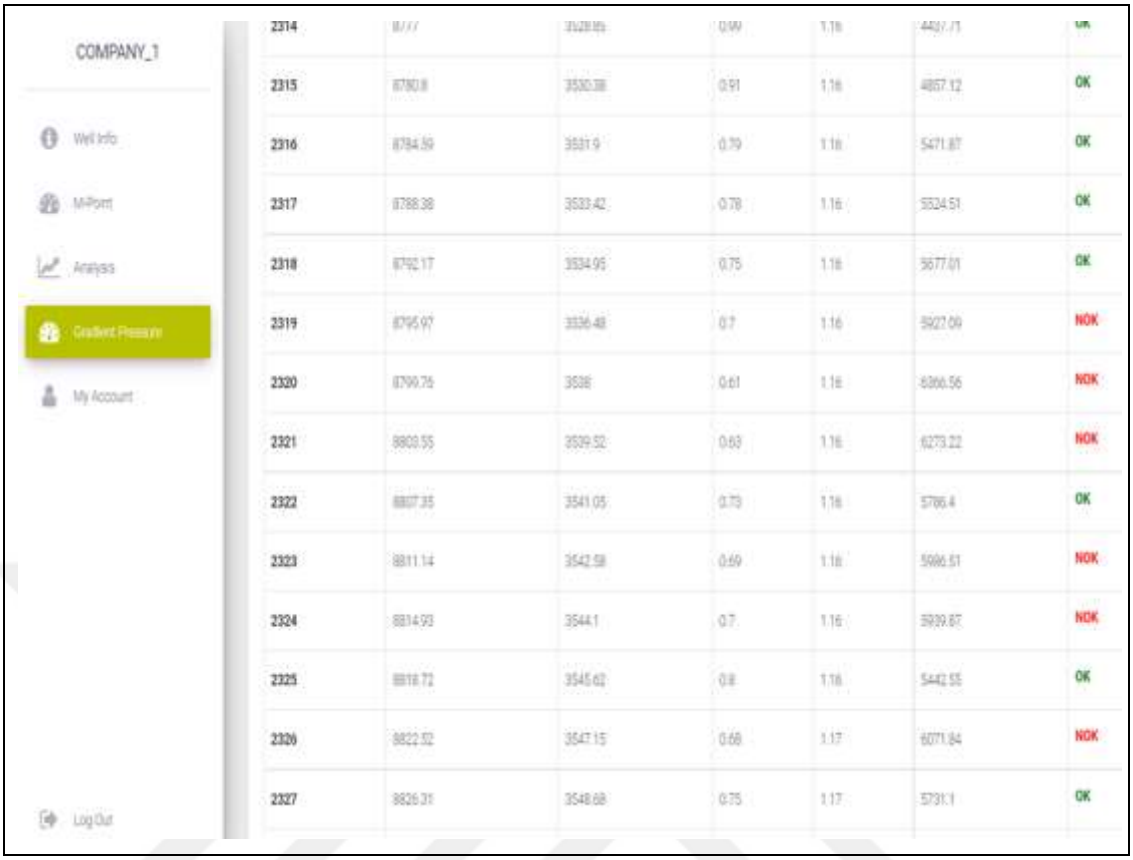
Table 4.3: Prediction Results Show Stable Status

223	845.84	340.08	0.78	0.74	307.1	OK
224	849.63	341.6	0.78	0.74	308.47	OK
225	853.42	343.12	0.76	0.74	326.53	OK
226	857.22	344.65	0.68	0.75	401.51	OK
227	861.01	346.17	0.76	0.75	337.92	OK
228	864.8	347.7	0.67	0.75	413.16	OK
229	868.6	349.22	0.63	0.75	447.27	OK
230	872.39	350.75	0.64	0.75	441.16	OK
231	876.18	352.28	0.68	0.75	410.39	OK
232	879.98	353.8	0.76	0.75	345.37	OK
233	883.77	355.32	0.79	0.75	321.32	OK
234	887.56	356.85	0.69	0.75	407.38	OK
235	891.36	358.38	0.78	0.75	332.7	OK
236	895.15	359.9	0.77	0.75	342.73	OK

Table 4.4: The Rest of Values for Deeper Depth

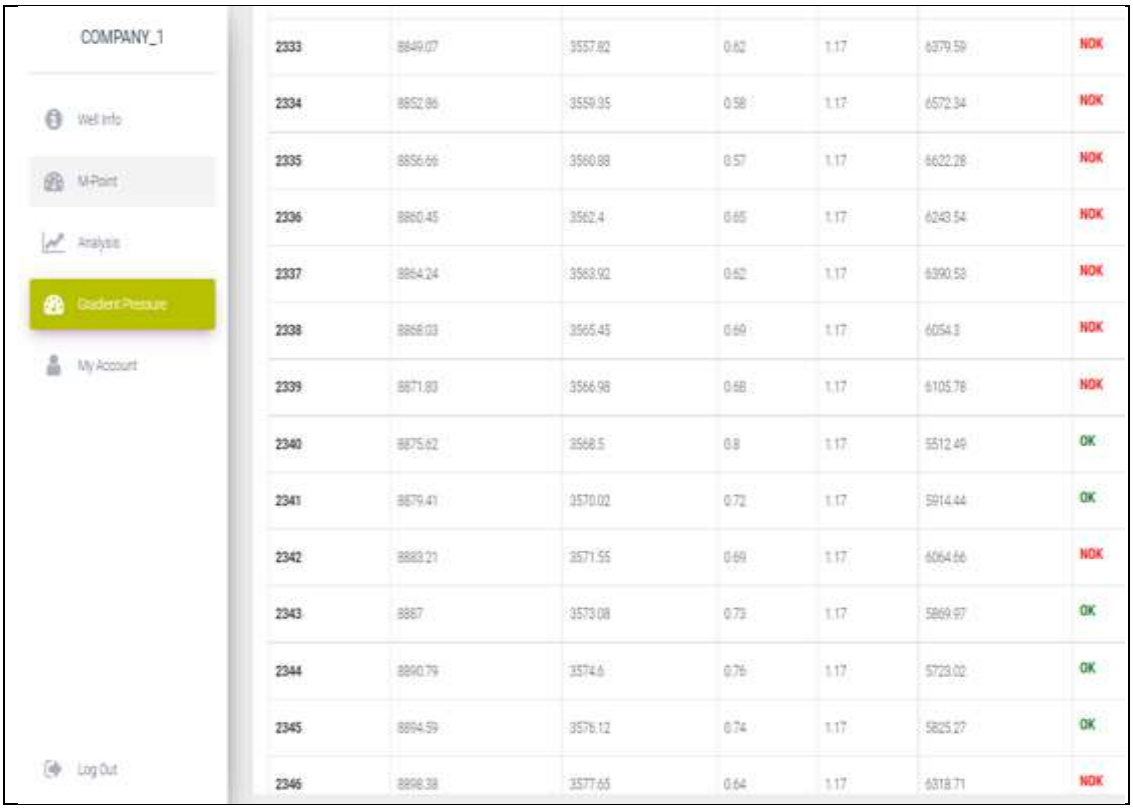
247	936.87	376.67	0.99	0.75	155.18	OK
248	940.66	378.2	0.75	0.75	378.2	OK
249	944.46	379.72	0.78	0.75	352.51	OK
250	948.25	381.25	0.79	0.75	344.77	OK
251	952.04	382.78	0.8	0.75	336.94	OK
252	955.84	384.3	0.75	0.75	384.3	OK
253	959.63	385.82	0.76	0.75	376.63	OK
254	963.42	387.35	0.71	0.75	424.02	OK
255	967.22	388.88	0.71	0.75	425.69	OK
256	971.01	390.4	0.61	0.75	517.9	OK
257	974.8	391.92	0.79	0.75	354.42	OK
258	978.59	393.45	0.77	0.75	374.68	OK
259	982.39	394.98	0.65	0.75	487.67	OK
260	986.19	396.5	0.77	0.75	377.59	OK

Table 4.5: Some Depth Starts to Read NOK Status



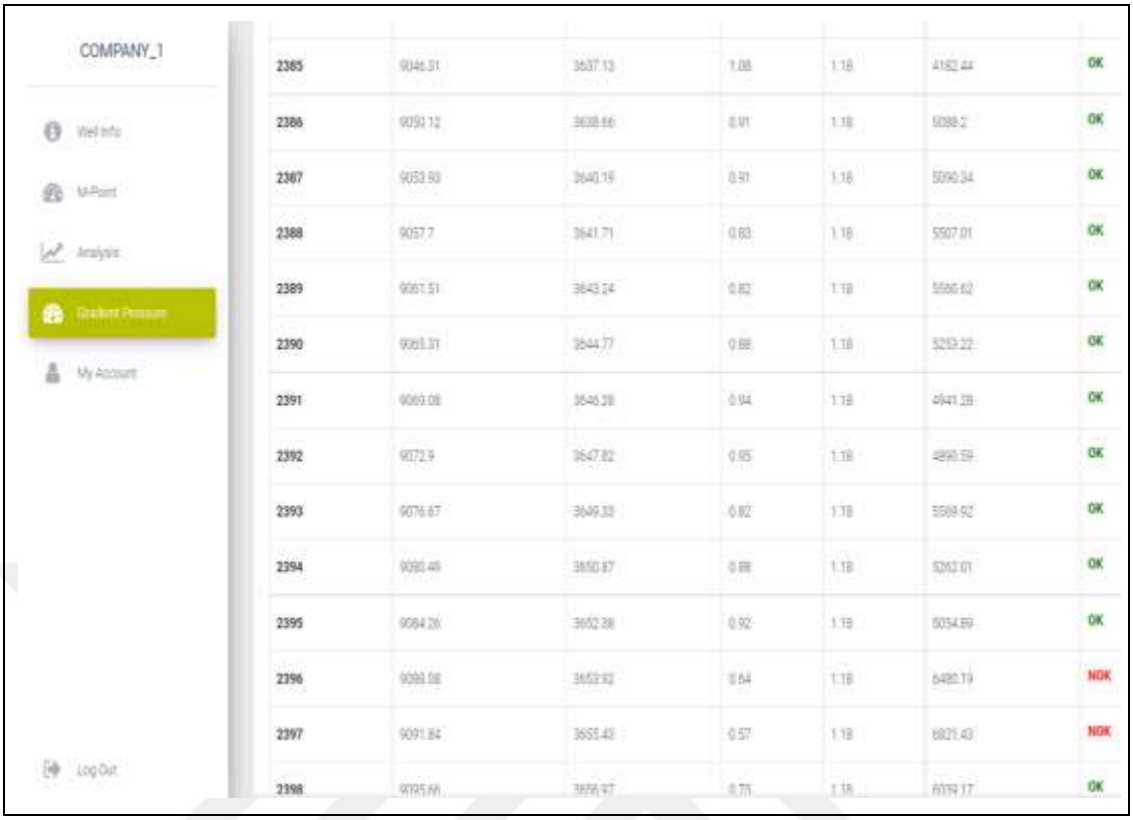
2314	8777	3528.85	0.69	1.16	4497.71	OK
2315	8780.8	3530.38	0.91	1.16	4857.12	OK
2316	8784.59	3531.9	0.79	1.16	5471.87	OK
2317	8788.38	3533.42	0.78	1.16	5524.51	OK
2318	8792.17	3534.95	0.75	1.16	5677.01	OK
2319	8795.97	3536.48	0.7	1.16	5927.09	NOK
2320	8799.76	3538	0.61	1.16	6866.56	NOK
2321	8803.55	3539.52	0.63	1.16	6273.22	NOK
2322	8807.35	3541.05	0.73	1.16	5786.4	OK
2323	8811.14	3542.58	0.69	1.16	5986.51	NOK
2324	8814.93	3544.1	0.7	1.16	5939.67	NOK
2325	8818.72	3545.62	0.8	1.16	5442.55	OK
2326	8822.52	3547.15	0.68	1.17	6071.84	NOK
2327	8826.31	3548.68	0.75	1.17	5731.1	OK

Table 4.6: Status for Depths



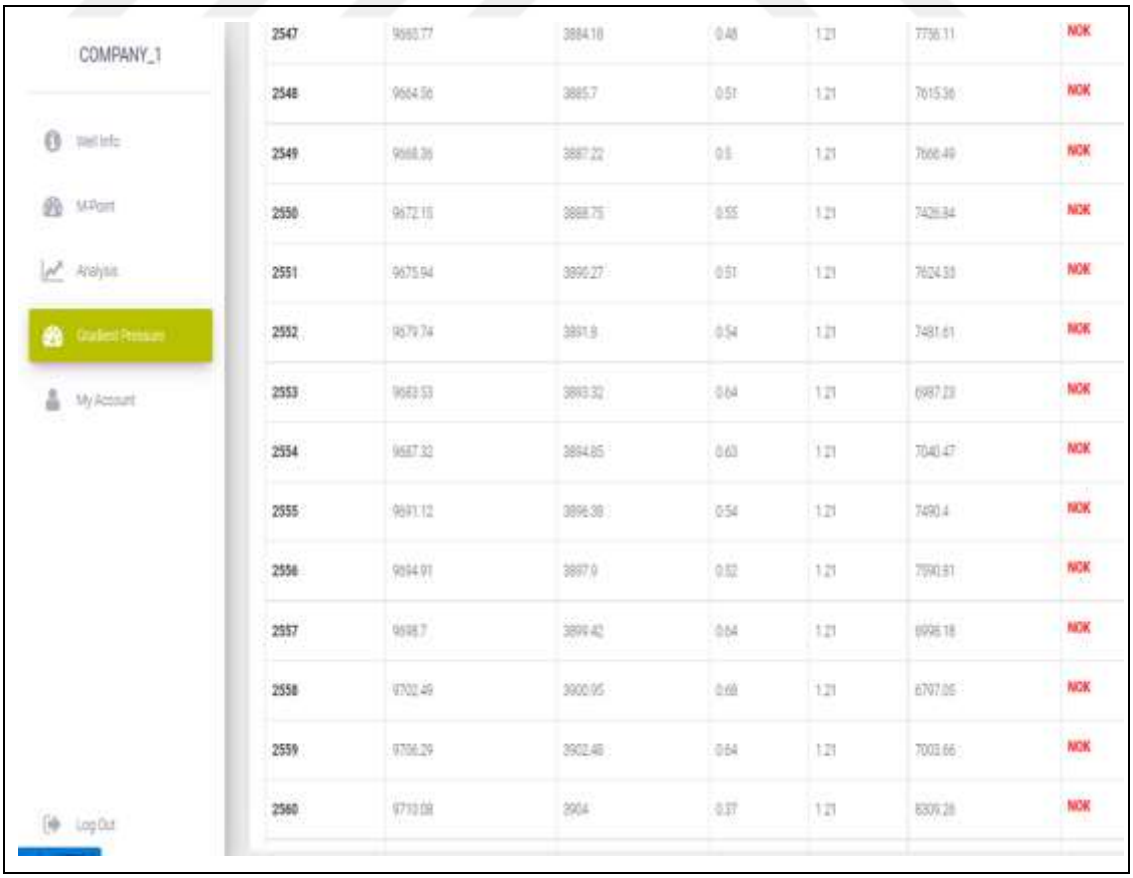
2333	8849.07	3557.82	0.62	1.17	6379.59	NOK
2334	8852.86	3559.35	0.58	1.17	6572.34	NOK
2335	8856.66	3560.88	0.57	1.17	6622.28	NOK
2336	8860.45	3562.4	0.65	1.17	6243.54	NOK
2337	8864.24	3563.92	0.62	1.17	6390.53	NOK
2338	8868.03	3565.45	0.69	1.17	6054.3	NOK
2339	8871.83	3566.98	0.68	1.17	6105.78	NOK
2340	8875.62	3568.5	0.8	1.17	5512.49	OK
2341	8879.41	3570.02	0.72	1.17	5914.44	OK
2342	8883.21	3571.55	0.69	1.17	6064.66	NOK
2343	8887	3573.08	0.73	1.17	5869.97	OK
2344	8890.79	3574.6	0.76	1.17	5723.02	OK
2345	8894.59	3576.12	0.74	1.17	5825.27	OK
2346	8898.38	3577.65	0.64	1.17	6318.71	NOK

Table 4.7: Different Readings for Pressure Status



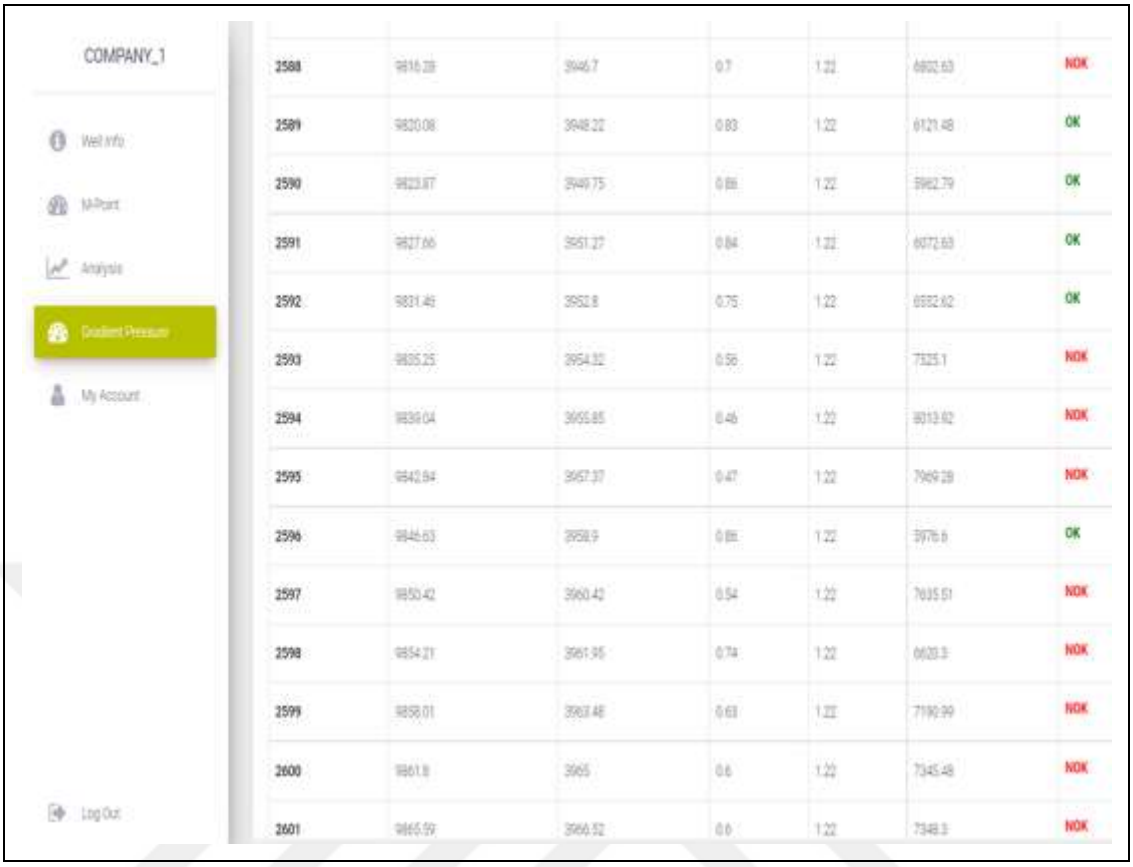
2385	9046.31	3637.13	1.08	1.18	4162.44	OK
2386	9050.12	3638.66	0.91	1.18	5088.2	OK
2387	9053.93	3640.19	0.91	1.18	5090.24	OK
2388	9057.7	3641.71	0.83	1.18	5507.01	OK
2389	9061.51	3643.24	0.82	1.18	5566.62	OK
2390	9065.31	3644.77	0.88	1.18	5253.22	OK
2391	9069.08	3646.28	0.94	1.18	4941.28	OK
2392	9072.9	3647.82	0.95	1.18	4890.59	OK
2393	9076.67	3649.33	0.82	1.18	5569.92	OK
2394	9080.48	3650.87	0.88	1.18	5262.01	OK
2395	9084.26	3652.38	0.92	1.18	5054.89	OK
2396	9088.08	3653.92	0.64	1.18	6480.19	NOK
2397	9091.84	3655.43	0.57	1.18	6821.43	NOK
2398	9095.66	3656.97	0.73	1.18	6019.17	OK

Table 4.8: NOK Pressure Status



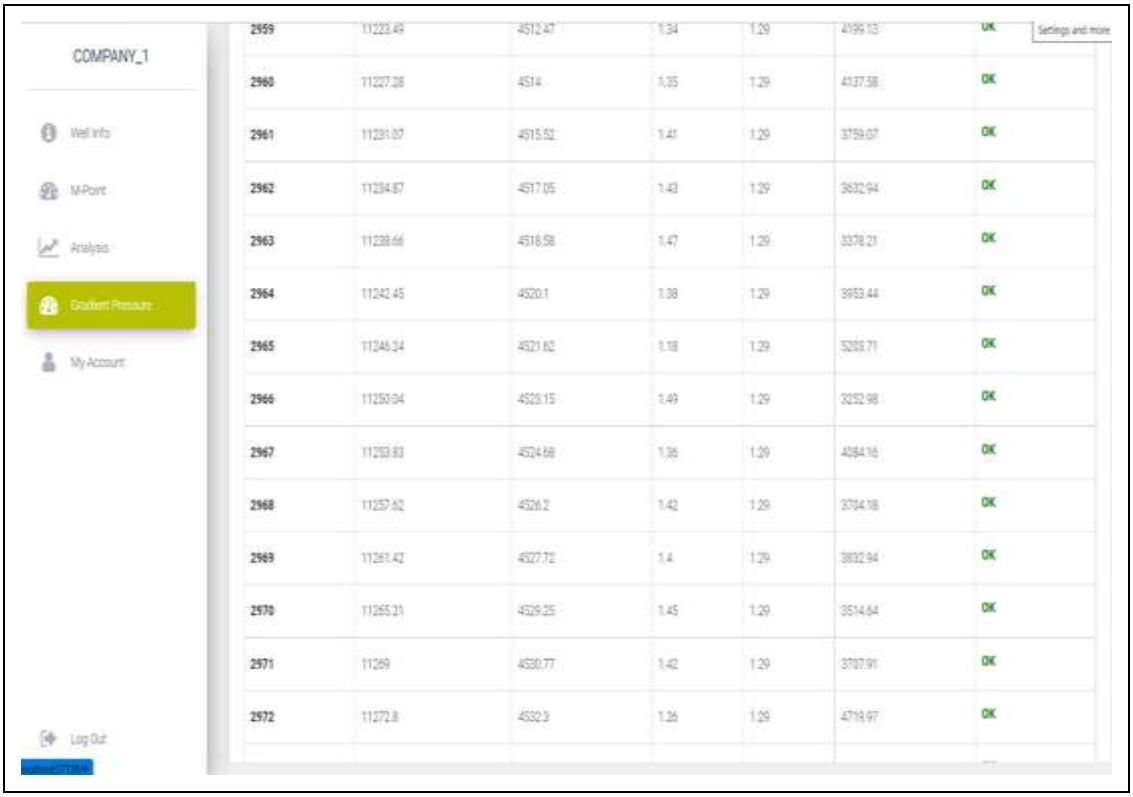
2547	9660.77	3884.18	0.48	1.21	7756.11	NOK
2548	9664.56	3885.7	0.51	1.21	7615.36	NOK
2549	9668.36	3887.22	0.5	1.21	7666.49	NOK
2550	9672.15	3888.75	0.55	1.21	7426.84	NOK
2551	9675.94	3890.27	0.51	1.21	7624.33	NOK
2552	9679.74	3891.8	0.54	1.21	7481.61	NOK
2553	9683.53	3893.32	0.64	1.21	6987.23	NOK
2554	9687.32	3894.85	0.63	1.21	7040.47	NOK
2555	9691.12	3896.38	0.54	1.21	7490.4	NOK
2556	9694.91	3897.9	0.52	1.21	7590.51	NOK
2557	9698.7	3899.42	0.64	1.21	6996.18	NOK
2558	9702.49	3900.95	0.68	1.21	6797.05	NOK
2559	9706.29	3902.48	0.64	1.21	7003.66	NOK
2560	9710.08	3904	0.37	1.21	8309.28	NOK

Table 4.9: Different Readings for Pressure



2588	9816.28	3946.7	0.7	1.22	6802.63	NOK
2589	9820.08	3948.22	0.83	1.22	6121.48	OK
2590	9823.87	3949.75	0.88	1.22	5962.79	OK
2591	9827.66	3951.27	0.84	1.22	6072.63	OK
2592	9831.46	3952.8	0.75	1.22	6552.62	OK
2593	9835.25	3954.32	0.56	1.22	7325.1	NOK
2594	9839.04	3955.85	0.46	1.22	8013.62	NOK
2595	9842.84	3957.37	0.47	1.22	7969.28	NOK
2596	9846.63	3958.9	0.88	1.22	5976.8	OK
2597	9850.42	3960.42	0.54	1.22	7835.51	NOK
2598	9854.21	3961.95	0.74	1.22	6620.3	NOK
2599	9858.01	3963.48	0.63	1.22	7190.99	NOK
2600	9861.8	3965	0.6	1.22	7345.48	NOK
2601	9865.59	3966.52	0.6	1.22	7348.3	NOK

Table 4.10: Normal Reading for Pressure



2959	11223.49	4512.47	1.34	1.29	4199.13	OK
2960	11227.28	4514	1.35	1.29	4137.58	OK
2961	11231.07	4515.52	1.41	1.29	3759.07	OK
2962	11234.87	4517.05	1.43	1.29	3632.94	OK
2963	11238.66	4518.58	1.47	1.29	3378.21	OK
2964	11242.45	4520.1	1.38	1.29	3953.44	OK
2965	11246.24	4521.62	1.18	1.29	5269.71	OK
2966	11250.04	4523.15	1.49	1.29	3252.98	OK
2967	11253.83	4524.68	1.36	1.29	4084.16	OK
2968	11257.62	4526.2	1.42	1.29	3794.18	OK
2969	11261.42	4527.72	1.4	1.29	3892.94	OK
2970	11265.21	4529.25	1.45	1.29	3514.64	OK
2971	11269	4530.77	1.42	1.29	3707.91	OK
2972	11272.8	4532.3	1.26	1.29	4719.97	OK

There is an abnormal pressure occurs in the formation, which is considered as a red alarm for drilling operation; abnormal pressure leads to causes a kick which will lead to a blowout if not also controlled we notice in the rest of the formation after abnormal pressure occurs lost circulation noticed which means the leaking of the drilling fluid inside the layers of the formation.

5. CONCLUSION

5.1 Conclusion

This chapter summarizes the results of the calculations that have been used for the prediction method and summarizes the importance of analysis that can be used in the reporting software.

Significant reduction in the losses of drilling sector is possible, can predict any event regarding the petroleum sector.

- The result of calculating pore pressure using Eaton's equation will be divided by Its corresponding depth to calculate gradient pore pressure. Pore pressure gradient used to predict insatiable pressure zones.

For this research and according to the available data, the pore gradient pressure was estimated.

For the prediction of the abnormal pressure and abnormal lower formation pressure zones, Eaton equation used to estimate pore pressure gradient by applying d-exponent method.

The depth of the calculated zones from 200 to 3226

- According to geological reports, it was proved that from 200 ft to almost 2000ft are normal pressure zones.
- gradient pressure consider as a fixed number which equals 0.46 psi/ft for normal pressure zones and to predict abnormal or subnormal pressure zones a minimum and maximum pressure rang has been taken from (200-2000 ft)
- The gradient pore pressure for depths from 2000 ft 3176 ft was automatically compared to normal gradient pressure to predict

As can be noticed from the prediction chart in chapter four that upper Fars and lower Kirkuk formations are normal pressure formation as for lower Fars formation for the MB5 unit it considered as transition zone.

Lower Fars formation. Pore pressure gradient value of this formation varies from one location to another. The causes of abnormally increasing in pore pressure at Lower Fars formation are the nature of sedimentation layers in this formation and the external pressures applied from the vertical and lateral directions. The lateral stresses are the results of the movement of Arabian plate and its shock with the Eurasian plate.

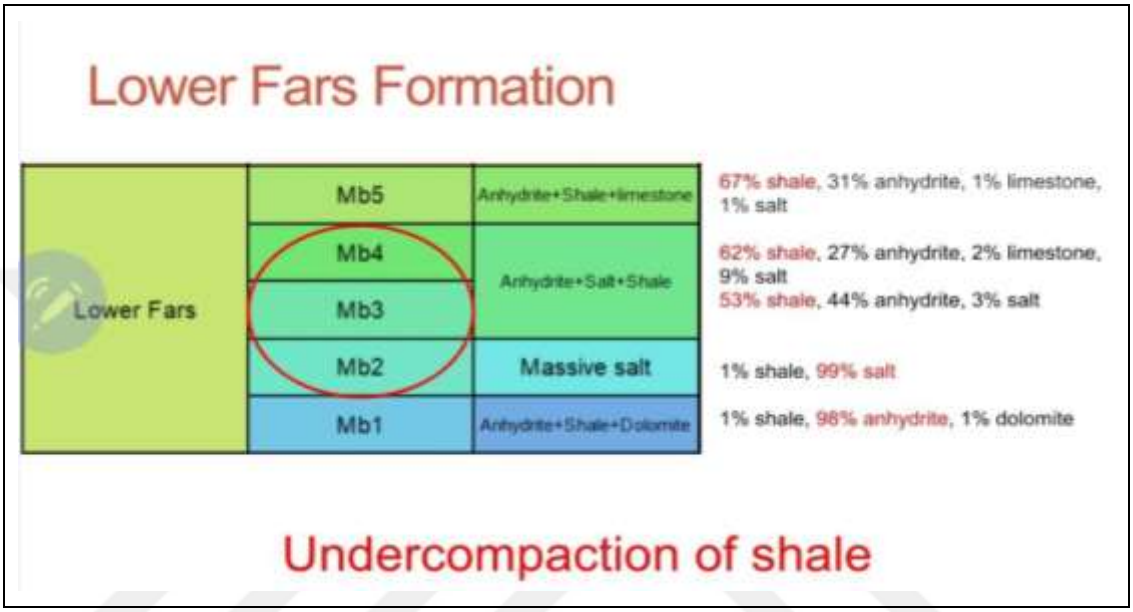


Figure 5.1: Lower Fars formation under Compaction of Shale

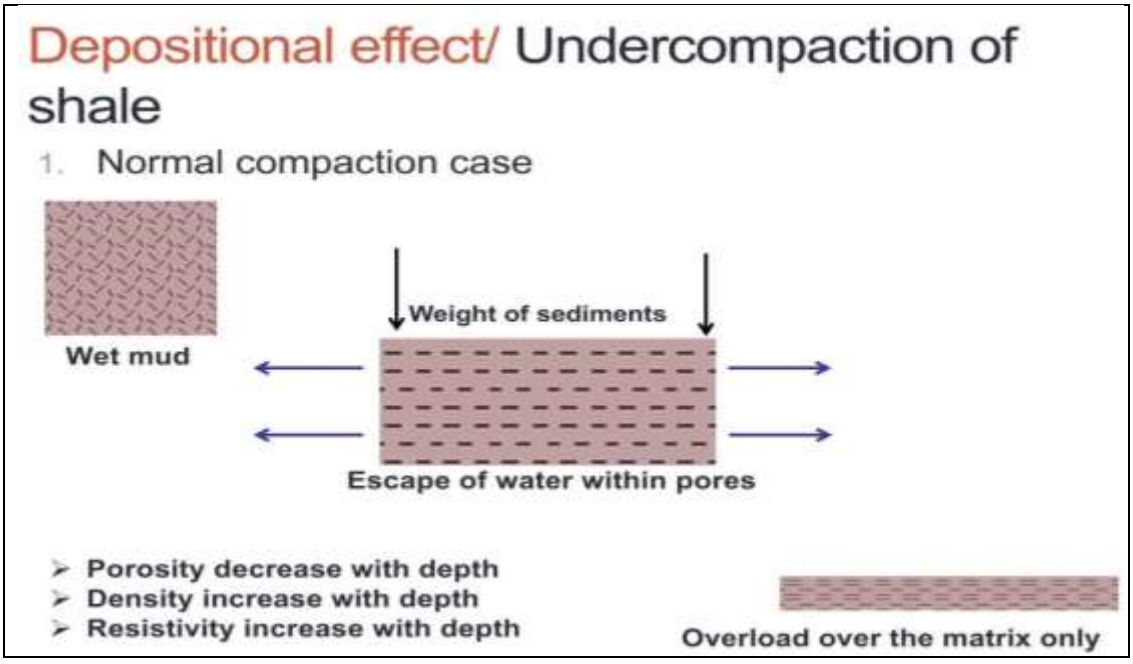


Figure 5.2: Depositional Effect/ Under Compaction of Shale

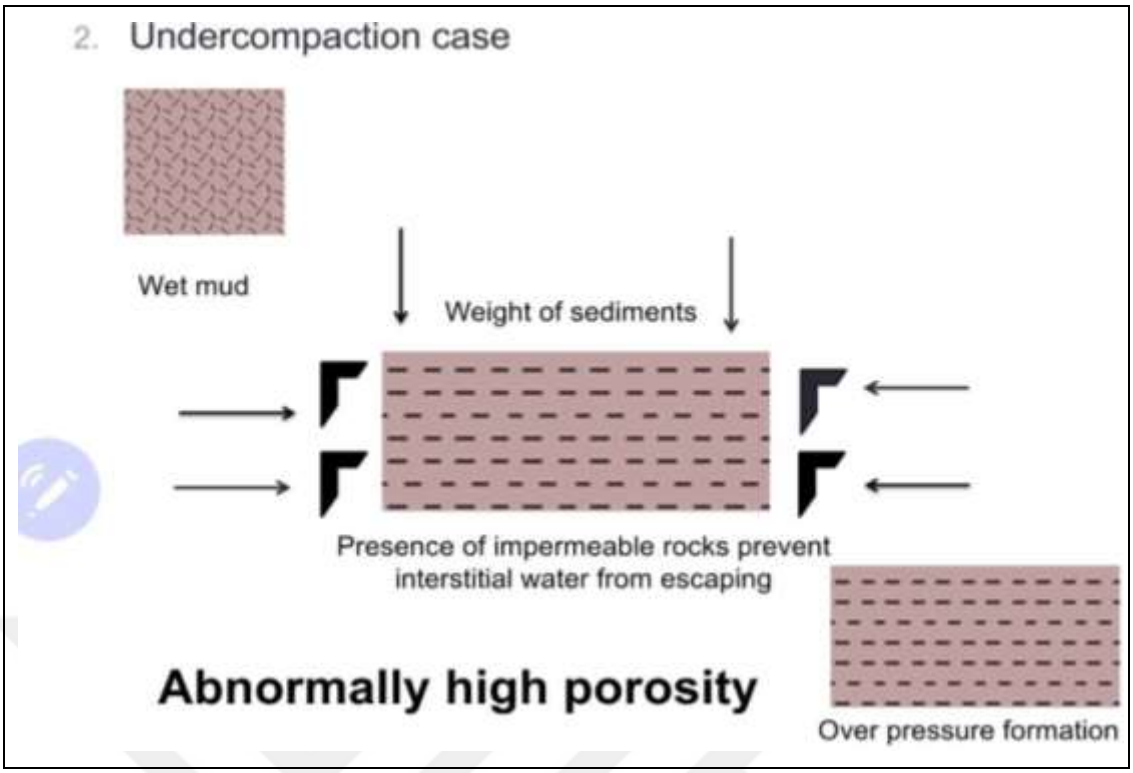


Figure 5.3: Under Compaction Case: Abnormally High Porosity

For MB4, MB3 AND MB2 lower Fars formation it is represented as abnormal pressure formation.

Also, can be noticed from the chart that jeribleeuphrate and upper Kirkuk formation considered as abnormal lower pressure zone.

For the middle low Kirkuk formation, the pressure will be normal again.

The steps that are taken to reduce nonproductive time and where to make the biggest improvement?

The NPT that comes with the planning and execution between well work scope, saving time and reducing the total duration of the well is critical in today's market a slight deviation from plans has tremendous impact on the overall cost of the well.

The reporting system is a drilling analytic solution for applying continuous improvement, cycle in real time to address a wild variety of problems so optimization the drilling operation can be done easily.

By proactively optimizing drilling operations problems can be tracked to lower well cost.

A powerful analytic tool for visualizing deep insight to the operations, to better define invisible lost time and reduce NPT.

The reporting system solution is engineered to help predict a head of the bit continuously optimizing the operations.

The program designed to deal with all kinds of potential errors during data entry such as time and date, usually in oil fields, data is entered in different formats, because of the code programming it became easy to deal with these errors to obtain a correct data flow.

Achieving greater operational efficiency relies on evaluating everyday performance against agreed benchmarks, this calls for operational monitoring to obtain quality data across the entire drilling operation , all the digital data can be supported by daily reports and contextual analysis to capture downhole and time flat , by the reporting system operational performance can be evaluated with automated analysis and that's when the AI has a big impact on drilling efficiency.

Using the reporting system will help preventing blow outs which will save well cost from 10,000,000$ to 15,000,000$ lost.

Pressure prediction helps to identify changes needed for primary well control (drilling mud) density for future well drilling to prevent unstable pressure problems.

Saving almost 9 days from NPT increase of kick

Helps to prevent human losses on drilling fields in case of blow out

Automatically analysis and results at the same time(no need for manually data entry)

Fast and secure reporting analysis

The prediction of abnormal pressure at lower fars zones provided a solution to well control by changing mud density for the formation in future wells to be drilled for same field.

Increase the efficiency by using AI methods to prevent human error

A report can be generated to a specific email address to provide all necessary information about the well

5.2 Recommendation and Future Work

- It’s recommended to use the software by drilling crew to avoid drilling problems and to create best solution for future planning
- Applying the study on more fields with complex problems
- Using the system from the starting of planning the well till well shut down
- Connecting the software with sensors to read and calculate real time data for each log parameter in order to maximize the ability of prediction
- Using the system not only to drilling sector but for all petroleum fields industry

REFERENCES

Castolin Eutectic. (2000). Technical Data Book. 219.

Chen, Z., Deng, J., Ricard, L. P., Macbeth, C., Liu, K., & Sun, J. (n.d.). Pore Pressure Prediction Using Eaton and Neural Network Method in Carbonate Field " X " Based on Seismic Data Pore Pressure Prediction Using Eaton and Neural Network Method in Carbonate Field " X " Based on Seismic Data. https://doi.org/10.1088/1757-899X/546/3/032017

Deng, H., Fu, M., Huang, T., Gluyas, J. G., Tong, M., Wang, X., Zhou, W., & Liu, F. (2018). Ahdeb oil field, Mesopotamian Basin, Iraq: Reservoir architecture and oil charge history. AAPG Bulletin, 102(12), 2447–2480. https://doi.org/10.1306/0424181617217089

Development, R. (2004). Record 2004-003 Summary of results . Joint NTGS-GA geochronology project : southern Arunta Region A Cross JC Claoué-Long IR Scrimgeour DF Close.

Gharbi, R. B. C., & Mansoori, G. A. (2005). An introduction to artificial intelligence applications in petroleum exploration and production. Journal of Petroleum Science and Engineering, 49(3–4), 93–96. https://doi.org/10.1016/j.petrol.2005.09.001

Hemmati-Sarapardeh, A., Larestani, A., Nait Amar, M., & Hajirezaie, S. (2020). Application of intelligent models in drilling engineering. In Applications of Artificial Intelligence Techniques in the Petroleum Industry. https://doi.org/10.1016/b978-0-12-818680-0.00005-9

Hojageldiyev, D. (2018). SPE-192820-MS Artificial Intelligence in HSE. November, 12–15.

Hossain, M. E. (2016). Fundamentals of Drilling Engineering. In Fundamentals of Drilling Engineering. https://doi.org/10.1002/9781119083931

Hussain, N. F. (n.d.). Estimation the Effect of Abnormal Pore Pressure on Drilling Operations/ Case study: Eastern Missan Oil Fields. The Requirements For The Degree Of Master Of Scince In Petroleum Engineering.

Mud, L. C., Pipe, S., St, S., & Cake, M. (n.d.). Outline, C. (2019). Drilling engineering formulas and calculations. https://doi.org/10.1016/B978-0-12-816508-9.00002-0

Practice, G. (2019). How the oil and gas industry can improve capital-project performance. March.

Rahman, A., Rahim, A., & Ismail, S. (2017). Project Management in Oil and Gas Industry : A Review Project Management in Oil and Gas Industry : A Review. November.

Reinventing Construction : A Route To Higher Productivity. (2017). FebruaryReport Approved Procedure. (2015).

Sabri, H. A. R., Rahim, A. R. A., Yew, W. K., & Ismail, S. (2015). Project management in oil and gas industry: A review. Proceedings of the 26th International Business Information Management Association Conference - Innovation Management and Sustainable Economic Competitive Advantage: From Regional Development to Global Growth, IBIMA 2015, November, 1823–1832.

Solanki, P., Baldaniya, D., Jogani, D., Chaudhary, B., Shah, M., & Kshirsagar, A. (2022). Artificial intelligence: New age of transformation in petroleum upstream. Petroleum Research, 7(1), 106–114. https://doi.org/10.1016/j.ptlrs.2021.07.002

Wickrama, M., & Ratnayake, N. P. (2016). Pore-Pressure and Fracture Pressure Gradient Prediction Model for Few Exploration Blocks in Mannar and Cauvery ...October.

A Guide to the Project Management, (November 2017). Body Of Knowledge (PMBOK® GUIDE). Project Management in Oil and Gas Industry: A Review Conference Paper 10-jpt

54- By Indeed Editorial Team, (February 25, 2020). What Is Petroleum Engineering? Definition, Branches and Requirements, Updated September 30, 2021, Published

Heriot-Watt University, (2005). Formation pressure," in Drilling Engineering, Department of Petroleum Engineering,

Eaton, B. A., (1975). "The Equation for Geopressure Prediction from Well Logs," Fall Meet. Soc. Pet. Eng. AIME.

Khoshnaw , F, Jaf, P. and Farkha, S. (2014). "Pore, abnormal formation and fracture pressure prediction," WIT Trans. Ecol. Environ., vol. 186, no. December, pp. 579–593, doi: 10.2495/ESUS140511

Batool Abdullah Dhayea (2020). Managed pressure drilling (MPD) technique to solve low pressure formation problems.

Marc Lesage; Peter Hall; John R.A. Pearson; Marc J. Thiercelin, (June 01.1991), Pore-Pressure and Fracture-Gradient Predictions .

Causes Of Abnormal Pressure While Drilling, (2020). Drilling Manual. Abnormal Formation Pressures Implications to Exploration, Drilling, and Production of Oil and Gas Resources Walter H. Fertl Director of Interpretation and Field Development,Dresser Atlas Division, Dresser Industries, Inc., Houston, Texas, U.S.A. with a contribution by George V. Chilingarian Professor Petroleum Engineering, University o f Southern California, Los Angeles,

Calif., U. S. A. and Herman H. Rieke, I, (nd). School of Mines, West Virginia University, Morgantown, W. Va., U.S.A.

B.S. Eduardo and B.A. Sergio, (December 2010). Integrated Project Management Applied in World Class Gas Field Development Projects: From Theory to Practise, Proceedings of Society of Petroleum Engineers. SPE 139369, Lima Peru, 1-3

Project Management Institute (PMI), (2004). Project Management Book of Knowledge (PMBOK). Northern Territory Department Of Business,Industry And Resource Developmentgeological Survey Record2004-007Drilling manualJNDunster.

Chad Augustine, J. W. (2006). A comparison of Geothermal with Oil and Gas well Drilling Costs.

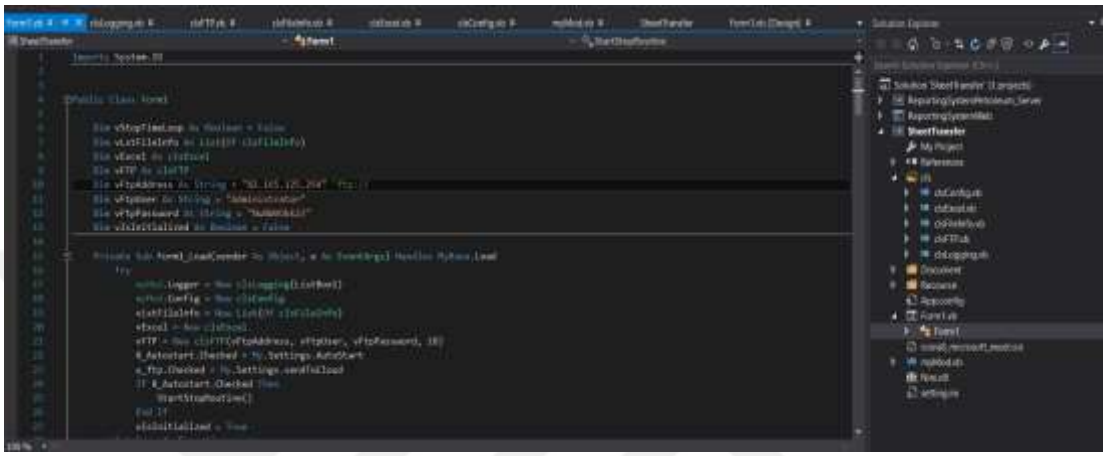
An Introduction to Petroleum Drilling Methods, (October 2018). DOI:10.13140/RG.2.2.10702.51523 well engineering and consitration,hussianrabia

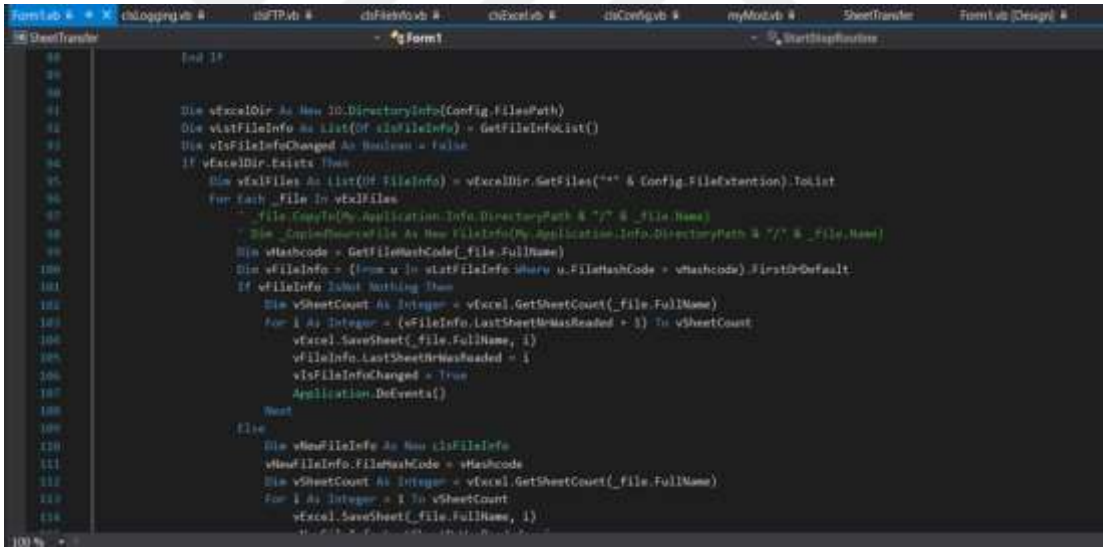
Satavisa (June 22, 2021). Application of Artificial Intelligence in Petroleum Data AnalyticsArtificial Intelligence, Latest News, Tech.

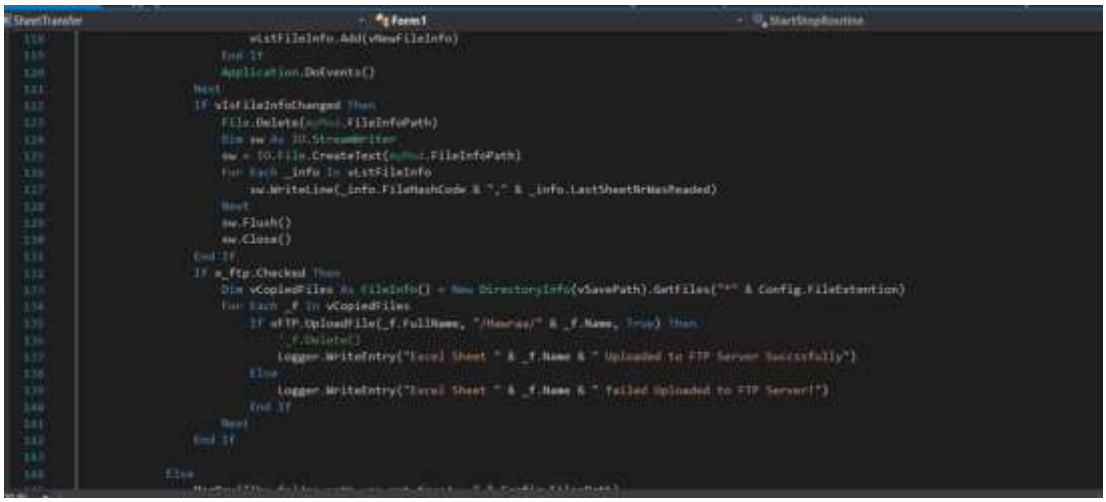
Data Drilling Defined, (November 9, 2021). Drill Down Analysis for Business Andy Morris | Principal Product Marketing Specialist,. Introduction to Java (w3schools.com).

APPENDIX

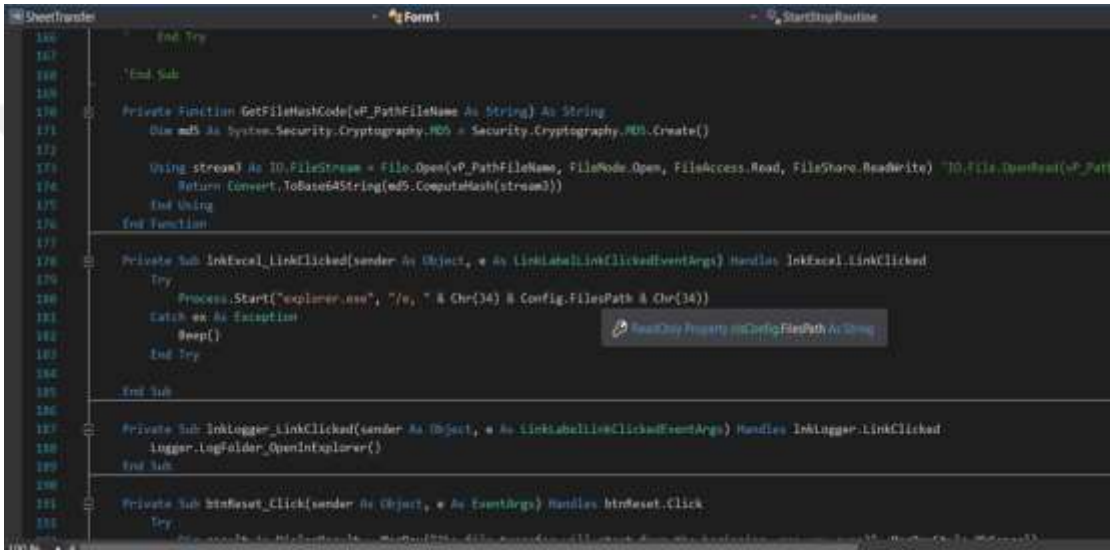
Appendices -1: A Few Examples of the Codes Used for the Project



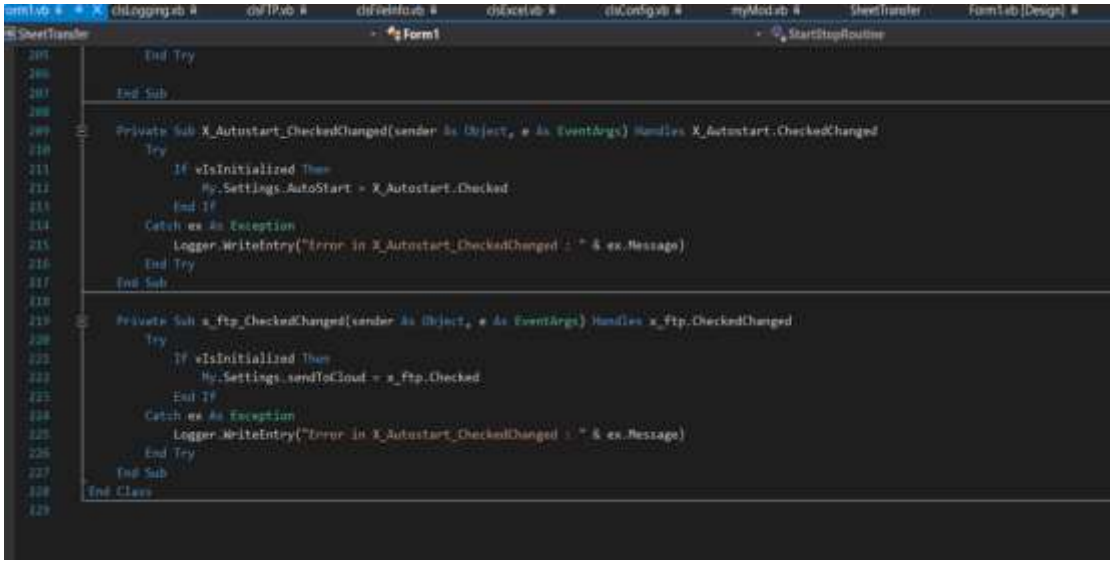




```
                    vListFileInfo.Add(vNewFileInfo)
                End If
                Application.DoEvents()
            Next
            If vIsFileInfoChanged Then
                File.Delete(myMod.FileInfoPath)
                Dim sw As IO.StreamWriter
                sw = IO.File.CreateText(myMod.FileInfoPath)
                For Each _info In vListFileInfo
                    sw.WriteLine(_info.FileHashCode & "," & _info.LastSheetNrWasReaded)
                Next
                sw.Flush()
                sw.Close()
            End If
            If x_ftp.Checked Then
                Dim vCopiedFiles As FileInfo() = New DirectoryInfo(vSavePath).GetFiles("*" & Config.FileExtention)
                For Each _f In vCopiedFiles
                    If sFTP.UploadFile(_f.FullName, "/Heuraa/" & _f.Name, True) Then
                        '_f.Delete()
                        Logger.WriteEntry("Excel Sheet " & _f.Name & " Uploaded to FTP Server Successfully")
                    Else
                        Logger.WriteEntry("Excel Sheet " & _f.Name & " failed Uploaded to FTP Server!")
                    End If
                Next
            End If

        Else
```

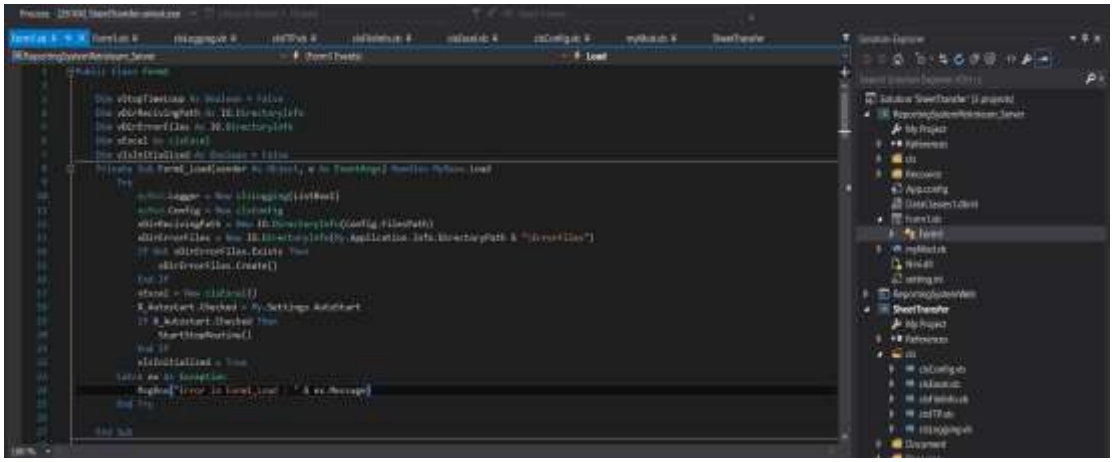


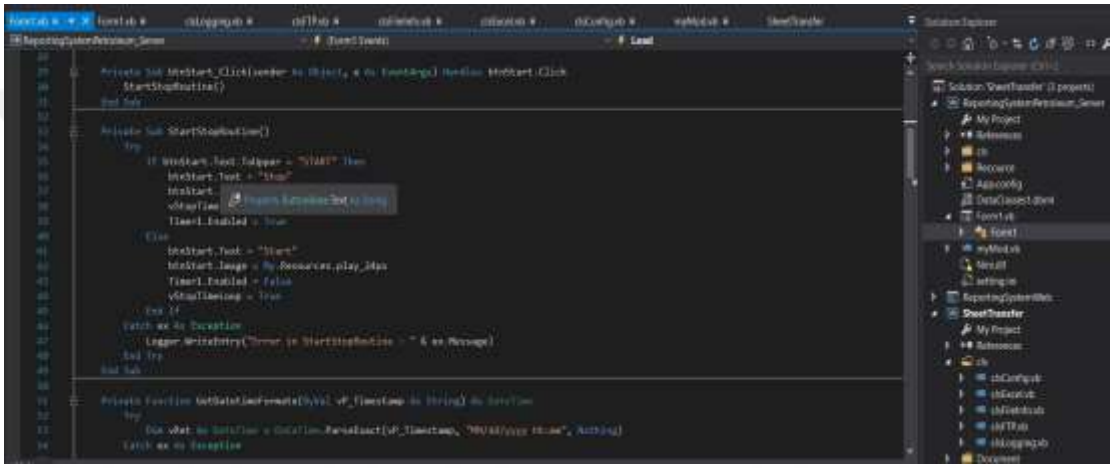
```
        End Try

    'End Sub

    Private Function GetFileHashCode(vP_PathFileName As String) As String
        Dim md5 As System.Security.Cryptography.MD5 = Security.Cryptography.MD5.Create()

        Using stream3 As IO.FileStream = File.Open(vP_PathFileName, FileMode.Open, FileAccess.Read, FileShare.ReadWrite) 'IO.File.OpenRead(vP_Path
            Return Convert.ToBase64String(md5.ComputeHash(stream3))
        End Using
    End Function

    Private Sub lnkExcel_LinkClicked(sender As Object, e As LinkLabelLinkClickedEventArgs) Handles lnkExcel.LinkClicked
        Try
            Process.Start("explorer.exe", "/e, " & Chr(34) & Config.FilesPath & Chr(34))
        Catch ex As Exception
            Beep()
        End Try

    End Sub

    Private Sub lnkLogger_LinkClicked(sender As Object, e As LinkLabelLinkClickedEventArgs) Handles lnkLogger.LinkClicked
        Logger.LogFolder_OpenInExplorer()
    End Sub

    Private Sub btnReset_Click(sender As Object, e As EventArgs) Handles btnReset.Click
        Try
```

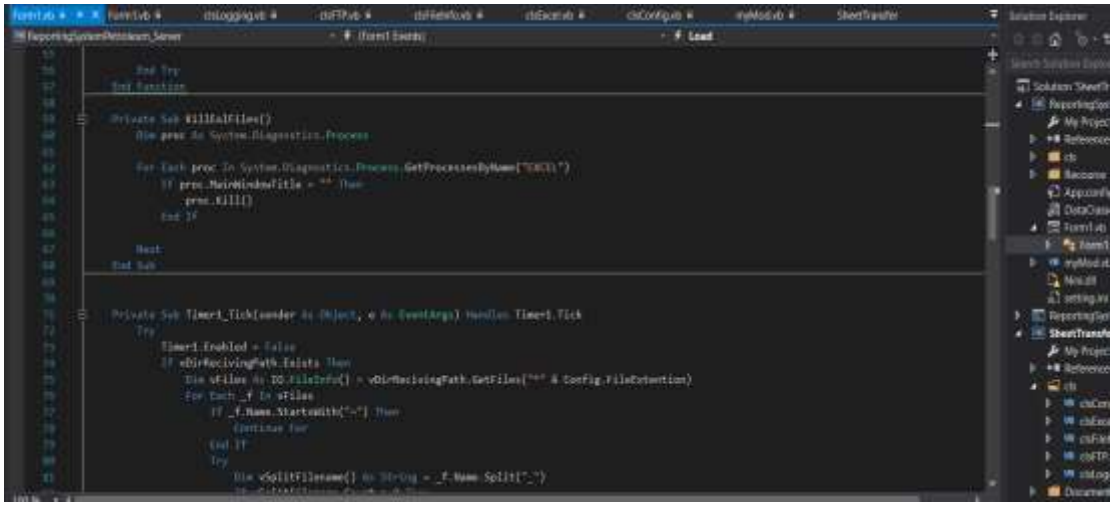


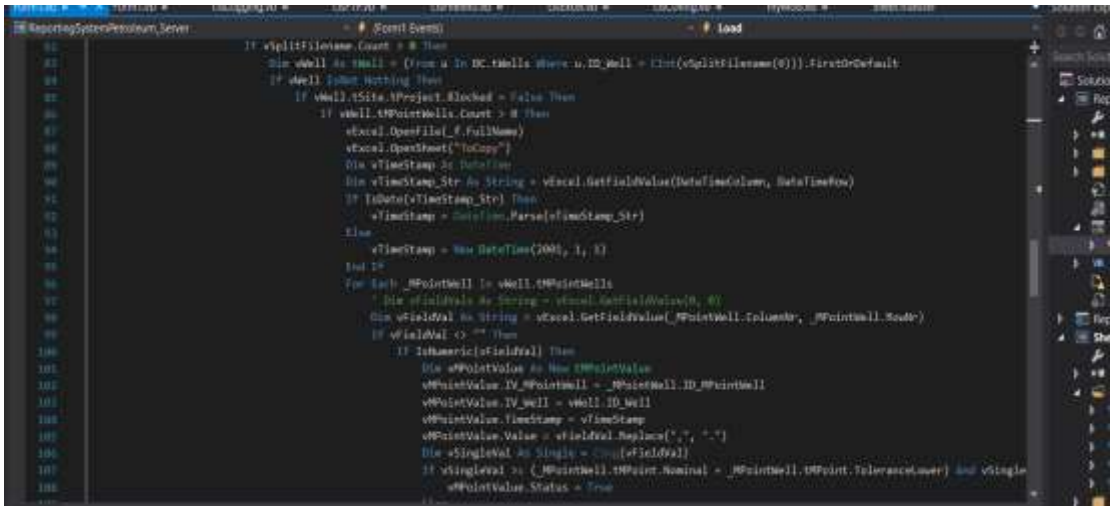
```
        End Try

    End Sub

    Private Sub X_Autostart_CheckedChanged(sender As Object, e As EventArgs) Handles X_Autostart.CheckedChanged
        Try
            If vIsInitialized Then
                My.Settings.AutoStart = X_Autostart.Checked
            End If
        Catch ex As Exception
            Logger.WriteEntry("Error in X_Autostart_CheckedChanged : " & ex.Message)
        End Try
    End Sub

    Private Sub x_ftp_CheckedChanged(sender As Object, e As EventArgs) Handles x_ftp.CheckedChanged
        Try
            If vIsInitialized Then
                My.Settings.sendToCloud = x_ftp.Checked
            End If
        Catch ex As Exception
            Logger.WriteEntry("Error in X_Autostart_CheckedChanged : " & ex.Message)
        End Try
    End Sub
End Class
```

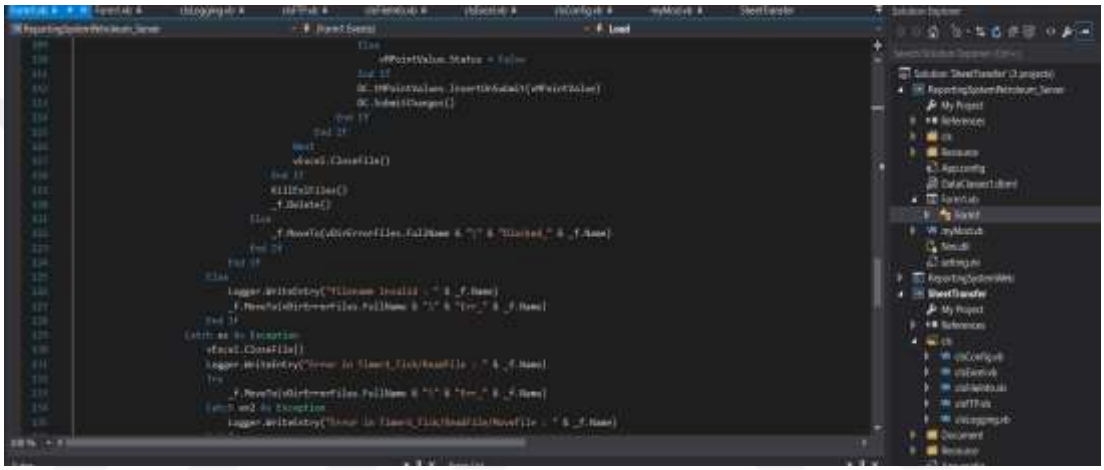
The above codes represents first software

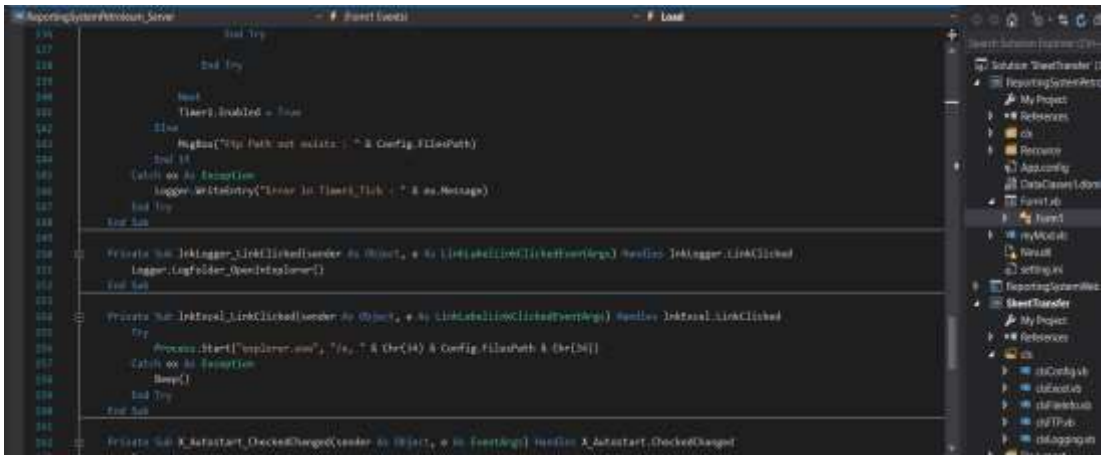


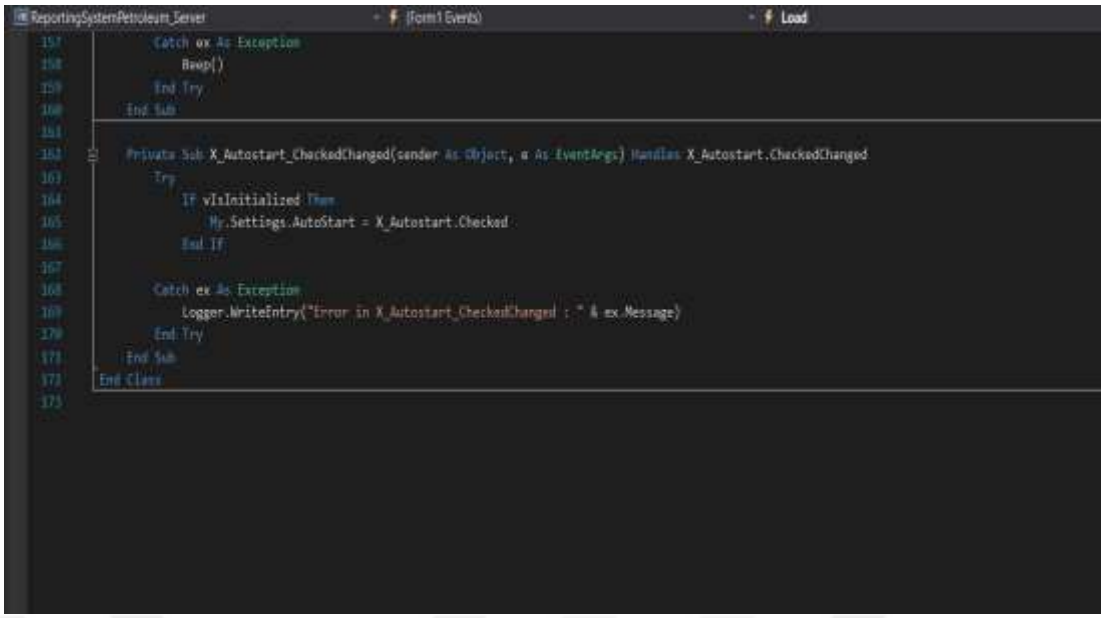




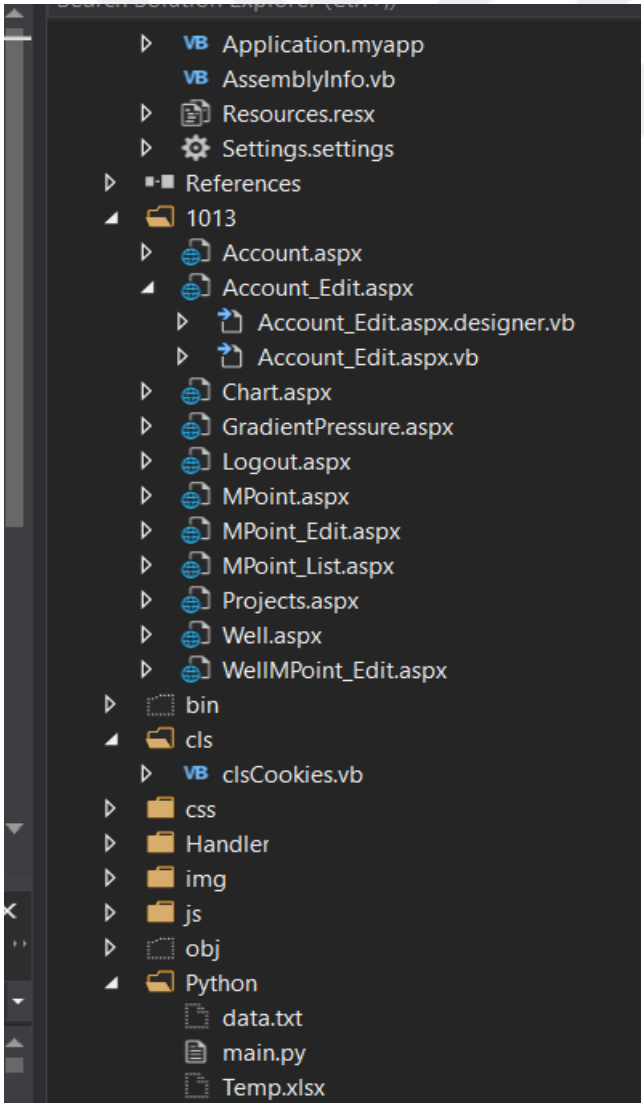


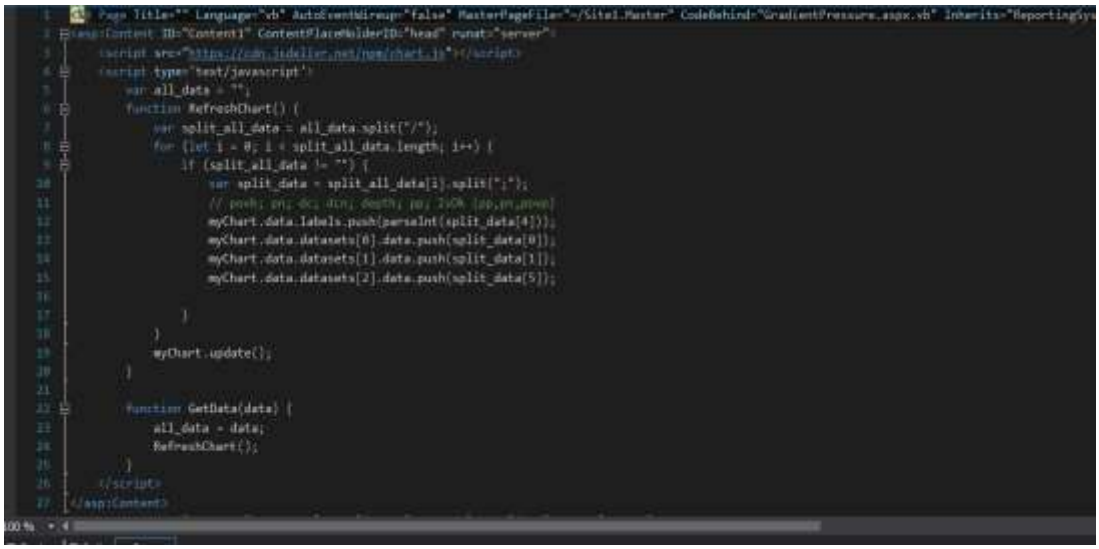






The above coding explains second software



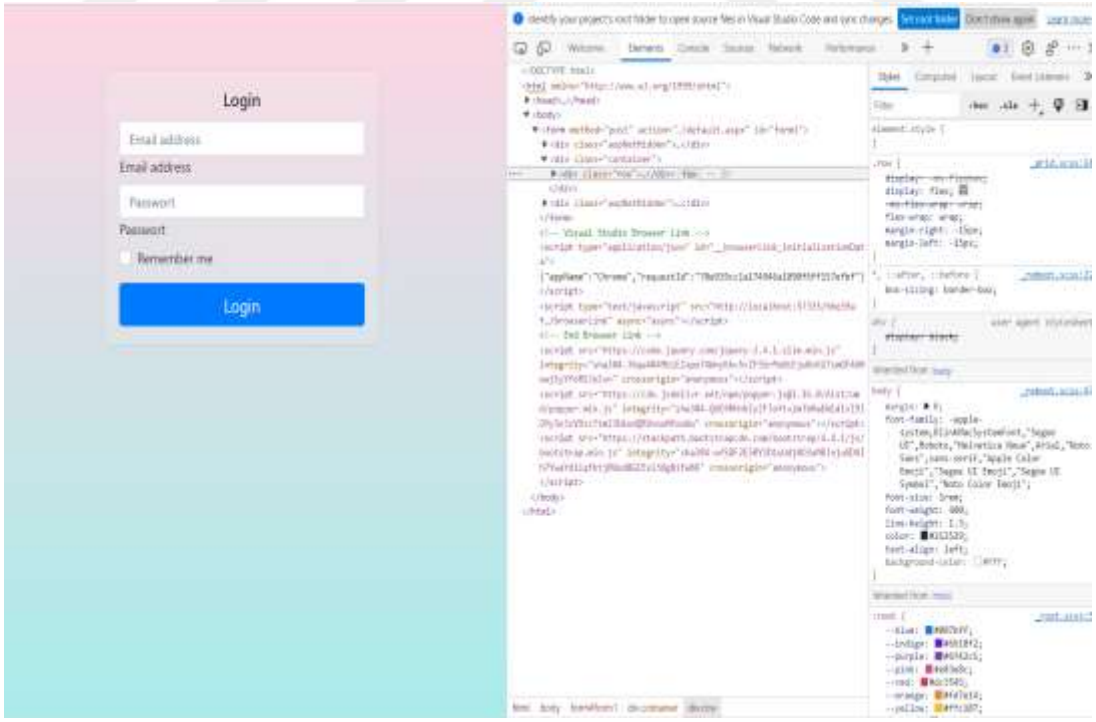


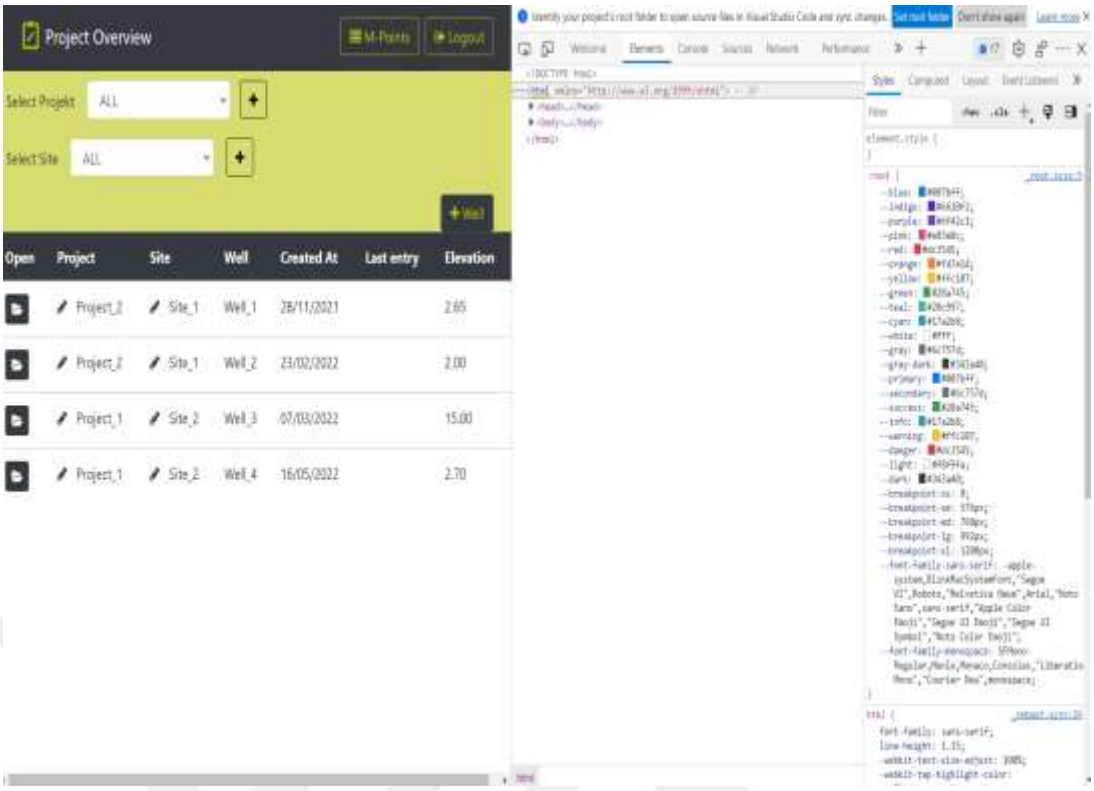
```
<%@ Page Title="" Language="vb" AutoEventWireup="false" MasterPageFile="~/Site1.Master" CodeBehind="GradientPressure.aspx.vb" Inherits="ReportingSy
<asp:Content ID="Content1" ContentPlaceHolderID="head" runat="server">
    <script src="https://cdn.jsdelivr.net/npm/chart.js"></script>
    <script type="text/javascript">
        var all_data = "";
        function RefreshChart() {
            var split_all_data = all_data.split("/");
            for (let i = 0; i < split_all_data.length; i++) {
                if (split_all_data != "") {
                    var split_data = split_all_data[i].split(",");
                    // push( pn, dcs, dcn, depth, po, lvl% [pp,en,pnum]
                    myChart.data.labels.push(parseInt(split_data[4]));
                    myChart.data.datasets[0].data.push(split_data[0]);
                    myChart.data.datasets[1].data.push(split_data[1]);
                    myChart.data.datasets[2].data.push(split_data[5]);

                }
            }
            myChart.update();
        }

        function GetData(data) {
            all_data = data;
            RefreshChart();
        }
    </script>
</asp:Content>
```

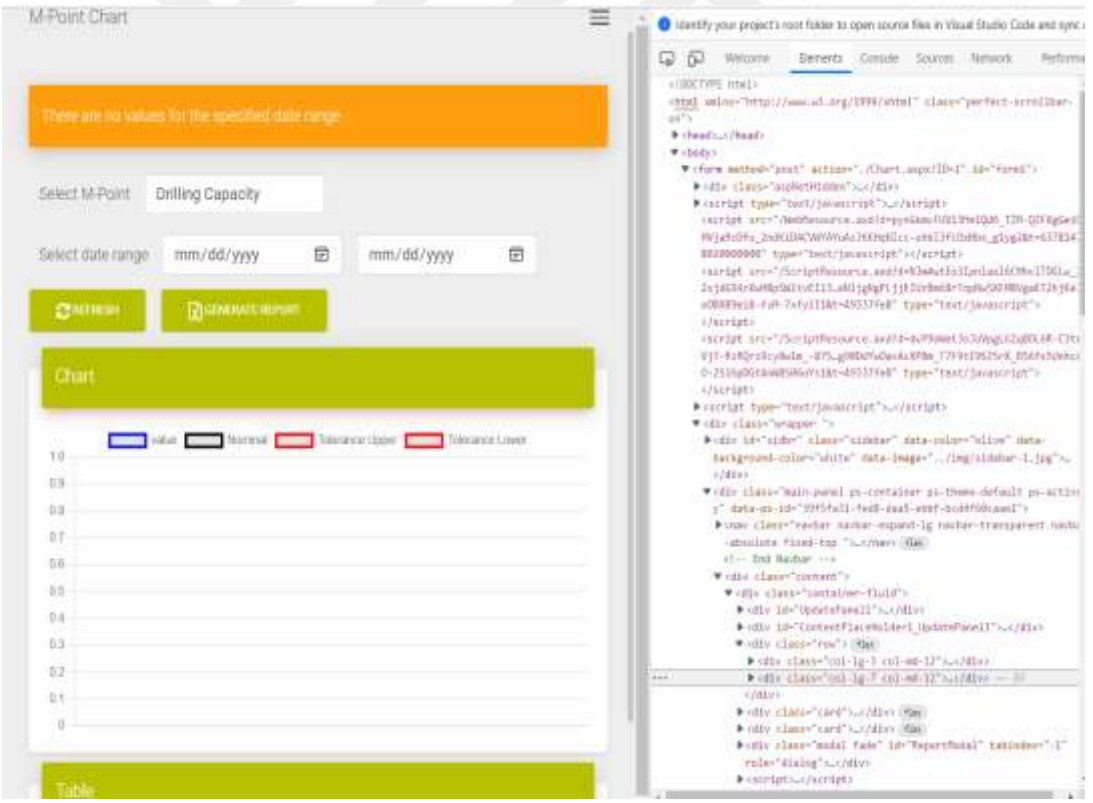
```
<%@ Page Language="vb" AutoEventWireup="false" CodeBehind="MPoint_List.aspx.vb" Inherits="ReportingSystemWeb.MPoint_List" %>

<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">
<head runat="server">
    <title>M-Points</title>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no" />
    <link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/bootstrap@4.5.3/dist/css/bootstrap.min.css" integrity="sha384-TX8t27EcRE3e/ihU7zmQxVncD
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css" />
    <script src="<%= ResolveUrl("~/js/core/jquery.min.js") %>" type="text/javascript"></script>
    <script src="<%= ResolveUrl("~/js/plugins/perfect-scrollbar.jquery.min.js") %>" type="text/javascript"></script>
    <style>
        .card .card-header-olive .card-icon, .card .card-header-olive .card-text, .card .card-header-olive:not(.card-header-icon):not(.card-header-te
            background: linear-gradient(60deg, #88C100, #88C100);
        }

        .card .card-header-olive .card-icon, .card .card-header-olive:not(.card-header-icon):not(.card-header-text), .card .card-header-olive .card-t
            box-shadow: 0 4px 20px 0px rgb(0 0 0 / 14%), 0 7px 10px -5px rgb(244 67 54 / 40%);
        }
    </style>
</head>
<body>
    <form id="form1" runat="server">
        <nav class="navbar navbar-dark bg-dark">
            <a class="navbar-brand">  
```

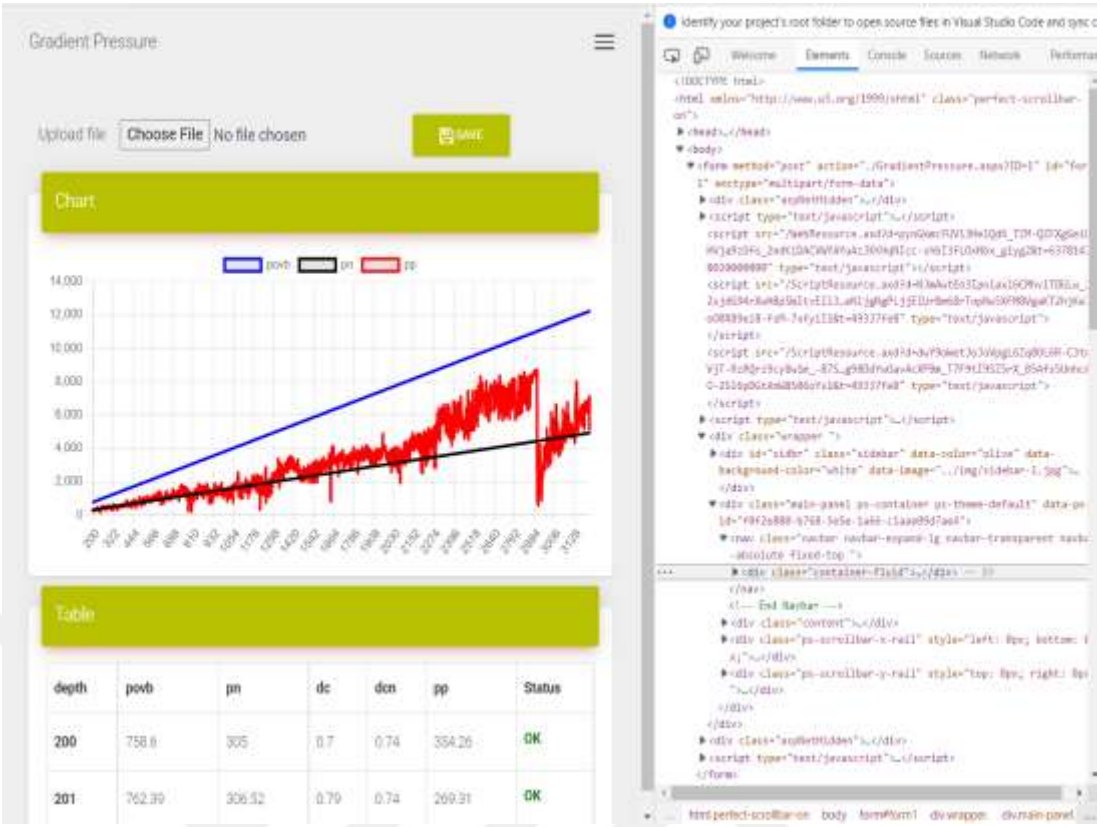
Some of the codes used in creating the web:

```
<%@ Page Language="vb" AutoEventWireup="false" CodeBehind="Logout.aspx.vb" Inherits="ReportingSystemWeb.Logout" %>

<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">
<head runat="server">
    <title></title>
</head>
<body>
    <form id="form1" runat="server">
    <div>

    </div>
    </form>
</body>
</html>
```




Project Overview
M-Points
Logout
Select Project
ALL
Select Site
ALL
Open
Project
Site
Well
Created At
Last entry
Elevation
Project_2
Site_1
Well_1
28/11/2021
2.65
Project_2
Site_1
Well_2
23/02/2022
2.00
Project_1
Site_2
Well_3
07/03/2022
15.00
Project_1
Site_2
Well_4
16/05/2022
2.70


M-Point Chart
There are no values for the specified date range
Select M-Point
Drilling Capacity
Select date range
mm/dd/yyyy
mm/dd/yyyy
Chart
Table



Above some of the codes used in designing the project for designing the web HTML and java script programming languages were also used for the design.

RESUME

Hawraa Ahmed ALI

EDUCATION

- **Master** 2019 – 2022 : Istanbul Gedik University - Engineering management master's degree.
- **Bachelor** 2013 – 2016 : Baghdad University - Baghdad \Iraq Petroleum Engineering BSC Full B.sc in this field

LANGUGES:

- Arabic : Mother Tongue
- English: Proficient in Speaking and Writing.
- Turkish: Beginners' Level.

SKILLS

Ability to work under pressure, work with a team, positive attitude, self- directed and confident decision maker, strong work ethic, ability to prioritize, multitasked and exceptional management.

COMPUTER SKILLS:

- Computer Use
- Internet User
- Emails
- Microsoft Word
- Microsoft access
- Microsoft PowerPoint
- Basic of Adobe Photoshop

ADDITIONAL INFORMATION:

Took a course in PMP (Professional project management) and in Global Disaster Risk Reduction and Management Pathway

- •Took a course in human behavior from Stanford University by Professor Robert Sapolsky lectures on the biology of behavior evolution.
- Get a course in a Communications Skills and presentations
- Online Courses in " Management and Leadership: Leading a team " which is develop business plan and build a team with one of two courses in the Management and Leadership program.

- Volunteered in refugee camps for local organizations during the presence of ISIS in Iraq.
- Took an advanced English course at British language center (Birmingham College) in 2017.
- FIELD Training under the supervision of Iraqi Drilling Company (IDC) at the south of Iraq (BASRA) which was about drilling, production, logging, safety and included a workshop.
- Course Training in Reservoir Management at the University of Baghdad which was about computer programs related to that subject and the study of the reservoir.