



Society of Petroleum Engineers

SPE Virtual Regional Student Paper Contest

Middle East and North Africa Region



SPE is grateful to Chevron for their
global support of the Student Paper Contest Program

2022 Virtual Student Paper Contest

BSc Division



Overview

Student Paper Contest (SPC)

SPE coordinates 14 regional student paper contests at the undergraduate, master's, and PhD levels. Students compete against other students in their region for the opportunity to advance to the International Student Paper Contest held during [ATCE](#). Contestants enter an abstract of their paper and present it on the day of the competition. The papers of the winners who proceed to the International Student Paper Contest at ATCE will be published in the conference proceedings and on [OnePetro](#).

Currently, the 14 regional contests recognized by SPE are Africa, Asia Pacific, Canadian, Eastern North America, Europe, Gulf Coast North America, Latin America and the Caribbean, Middle East, Mid-Continent North America, Rocky Mountain North America, Russia and Caspian, Western North America, South Asia, and Southwestern North America.

International Student Paper Contest at ATCE

The SPE International Student Paper Contest takes place during the SPE Annual Technical Conference and Exhibition. The winners of the 14 regional student paper contests are invited to participate in the international contest by submitting the winning regional paper to be included in the conference proceedings at ATCE. The winners should follow the submission format of the conference and judges will select winners based on the same procedures used in the regional contests. A [map of SPC Regions](#) can also be found on our website.





BSc Division Agenda | 2 July 2022

Platform: Microsoft Teams

Dates: Saturday, 2 July 2022 – Contest Presentations & Awards Announcement

Timing: The agenda will use **Gulf Standard Time (UTC +4)**. All participants must ensure they adjust the time mentioned to the time zone they reside in.

Presentations 11:00 – 16:15

Awards 17:15 – 17:45

Participants: Seven (7) contestants

Important Note: Student presentations will play for the 15-minute time slot followed by a 10 to 15 minute Q&A from the judges. There will be a 5-minute buffer after each time slot in case Q&A goes over, as well as to allow judges time to mark their judging forms before the next student starts. The student must remain on the call for the entirety of their time slot or until the moderator instructs them to leave. Students must only enter the meeting at the beginning of their timeslot and no earlier.

Time	Name	University	Title of Paper
10:45 – 11:00	Judges Briefing <i>All Judges to join meeting for Judges only briefing</i>		
11:00 – 11:40	All Judges and Students Welcome and Introduction <i>All students to join meeting for Virtual SPC welcome and introduction. Note: all students must leave this meeting once the Intro is complete. Only the first contestant will remain online.</i>		
11:40 – 12:10	Maryam Ali	The American University of Cairo	Asphaltene Damage Mitigation Using Unconventional Chemical Agents: An Experimental Investigation
<i>5 minute buffer</i>			
12:15 – 12:45	Yaseen Riyadh Bandar	University of Basrah	Pilot project for Using Fog Computing in Drill Operations
<i>5 minute buffer</i>			
12:50 – 13:20	Afsha Shaikh	Texas A&M University at Qatar	Study on The Enhancement of Completion Fluids Corrosion Properties in Petroleum Production System
13:20 – 14:00	Lunch Break <i>all judges may break for lunch and prayers</i>		



14:00 – 14:30	Ghulam Haider	NED University of Engineering and Technology, Karachi	Development of Novel Correlation for the Prediction of oil recovery in water-drive sandstone reservoirs using Artificial Neural Network
<i>5-minute buffer</i>			
14:35 – 15:05	Ali Ahmed Mohsen	University of Basrah	Incorporation of experts' experience into machine learning models to predict ESP failures
<i>5-minute buffer</i>			
15:10 – 15:40	Fatema Al Farsi	Sultan Qaboos University	Optimization of pore pressure prediction model for sour oil replacement well in miscible gas injection pattern
<i>5-minute buffer</i>			
15:45 – 16:15	Hanine Lanabi	Universite Kasdi Merbah Ouargla	Carbon Dioxide footprints reduction: Carbon Capture and Storage technique with the CO ₂ - Enhanced Oil Recovery
16:15	Close of Presentations Judges to complete their ratings and submit to moderator		



Judges Confirmation Call and Award Ceremony Agenda | 2 July 2022

Time	Event
16:45 – 17:15	Judges Confirmation Call <i>Only judges join meeting to discuss and confirm final results.</i>
17:15 – 17:45	Virtual Awards Ceremony <i>All Judges and students to join the meeting. Top students will be announced and first place in the division will proceed to the International Competition to represent the region.</i>
Close of Contest – Congratulations to all participants!	



Awards Announcement Call

Awards Announcement Call

At a pre-decided time all students and judges will be asked to join the Contest Meeting again. The moderator / SPE staff will open up the call once all participants have joined and will then call upon the judges individually to self-introduce themselves to the group and say a few words if they would like. Either the judges, moderator or SPE staff will announce the winner and runners-up for the competition.

Based on the number of contestants the following rankings will be announced and given a certificate indicating their place:

- Three contestants: only 1st place
- Four to five contestants: 1st and 2nd place
- Six contestants and over: 1st, 2nd, and 3rd place

The winner of the Regional Student Paper Contests will receive the opportunity to present at the International Student Paper Contest, a chance to publish their work alongside the 2022 ATCE conference proceedings, and a certificate indicating their place in the Regional Contest.

In the case of a combined Masters's and Doctoral divisions, the winning contestant will participate in the division associated with the educational level in the Virtual International Student Paper Contest. For example, if a Masters's student wins the combined division, they will participate in the Master's division in the International competition.

All participating students will receive a certificate of participation either electronically or a physical copy mailed at a later date.



Conference Call Etiquette

It is important to remember, that everyone participating in the Virtual Student Paper Contest has worked very hard to participate in this program. To ensure that we have a respectful, and professional competition, please follow these simple steps for the competition.

When you're setting up to join the call, please make sure you're in a quiet room with only yourself. Microphones will pick up with sounds of music playing, dogs barking, and children playing. You should also not join the call from a patio or balcony, as we will hear birds, cars, and other noises.

Judges are strongly suggested to join via a computer to view the presentations easily. Contestants can join on any Microsoft Teams supported device.

Joining the Call

- **Please join the call with your microphone muted**, and video off. If other contestants are still speaking we want to ensure that they are not interrupted.



- When the moderator calls upon you, unmute your microphone to answer, and then mute when finished.

During the Presentation

- **Please ensure that your microphone is always muted**, unless speaking.
- Do not interrupt your video; everyone was given ample time to work on their video to ensure accuracy; during the competition it is not appropriate to make edits.

After the Presentation / Question Period

- There may be a period of silence while the judges write notes
- Judges will ask questions with one question and one follow up.
 - Other judges may ask a follow question
 - There is only 10 minutes for questions.
- **When answering questions, please turn on your video**, and don't forget to unmute your microphone

Leaving the Call

- Don't forget to thank the judges, and say good-bye
 - Leaving abruptly, we will think there is a connection issue.



The Judges

Ahsan Qadir, Schlumberger



Ahsan Qadir is currently working as Digital Drilling Engineer in Schlumberger. In his current role, he is responsible for drilling interpretation and performance monitoring. He has graduated in Petroleum Engineering from University of Engineering and Technology, Pakistan and has 07 years of experience in oil & gas industry. Ahsan has contributed to multiple SPE papers which were presented in international oil and gas conferences.

Ahmed Gamal, GUPCO



Ahmed Gamal is a senior reservoir engineer with ten years of experience working for engineering operations department in GUPCO oil company in Egypt. Ahmed specializes in reservoir management and reservoir simulation and is responsible for integrated studies with exploration team and work in developing new wells and opportunities in such offshore fields in Gulf of Suez. Ahmed has a solid experience using majority of reservoir engineering software like Petrel, Eclipse, OFM, Pipesim and Kappa Sapphire. He coaches subordinate employees on using progressive systems and applications, including reservoir engineering software, new well delivery procedures and reservoir analysis techniques. Ahmed is a powerful force in the workplace and uses her positive attitude and

tireless energy to encourage others to work hard and succeed. He is a masters degree candidate working on a thesis in reservoir simulation in tight oil reservoirs.



The Judges

Khaled Alsunny, Saudi Aramco - SAOO



Khaled Alsunny is a senior production engineer at Southern Area Production Engineering Department in Saudi Aramco. He acquired his bachelor's degree from West Virginia University in Petroleum and Natural Gas Engineering. He joined Khurais field as production engineer in 2012. His work in Khurais field in Saudi Arabia for more than 7 years has reflected positively on his experience with the I-field and Electrical Submersible Pumps (ESP). Moreover, his work with Gas production division and Gas Well completion department which had a great impact on his development and career. He has been a member of the society of petroleum Engineers (SPE) for 10 years. Khaled published multiple papers in SPE conferences around the world, and disclosed 1 patent, and filed 2 patents.

Maissa Souayeh, Sultan Qaboos University



Maissa Souayeh holds an MSc and PhD degree in petroleum engineering from Sultan Qaboos University. Currently, she is working as a postdoctoral researcher at Sultan Qaboos University. Her research interests are in the area of chemical EOR."



The Judges

Saeed Alshahrani, Saudi Aramco PE&D



Saeed Alshahrani is a Researcher Scientist at the Advance Research Center in Saudi Aramco. He obtained his master degree in geology from Bowling Green State University, Ohio, USA in 2013, and a bachelor degree of geophysics from King Abdulaziz University in Saudi Arabia in 2001.

He worked as a geologist, in Suhaimi Fugro Company as a geologist from 2002 to 2009 before he got a scholarship from the Kingdom of Saudi Arabia for a Master degree. He is currently working as geologists, sedimentologists, and sequence stratigrapher. His research focuses on the Paleozoic clastics reservoirs in Saudi Arabia. He is currently adding another research aspect by working on machine learning in petrophysics for

petroleum reservoir characterization. He has published over 30 papers in conferences and journals and disclosed 2 patients and 1 field patient. He is a professional member at Society of Petroleum Engineers (SPE), American Association of Petroleum Geologists (AAPG), International Association of Sedimentology (IAS) and Geological Society of America GSA. He is volunteering as a chairperson for Annual Technology Conference and Exhibition ATCE for the last three years and a judge for the Middle East and North Africa Student Paper Contest.

Shahvir Pooniwala, Saudi Aramco PE&D



Shahvir Pooniwala is a Subject Matter Expert for Production Enhancement within the Gas Reservoir Management Department in Saudi Aramco. In his role, he is responsible for hydraulic fracturing, well completions, well interventions and implementation of new technologies, along with training and developing young engineers. Shahvir has close to 15 years of industry experience.

Before joining Saudi Aramco, he worked with Baker Hughes globally in various regional roles such as Middle East Technical, Sales and Commercial Manager and Production Enhancement Business Unit Manager.

Shahvir is well recognized in the energy industry as an active SPE member having authored various publications. He is also currently serving on the Journal of Petroleum Technology (JPT) Editorial Review Committee as well as on the Completions Optimization & Technology Award Subcommittee. He has been nominated and served as session chair and committee member at numerous technical conference



The Contestants

BSc Abstracts



Name: Afsha Shaikh

University: Texas A&M University at Qatar

Abstract Title: Study on The Enhancement of Completion Fluids Corrosion Properties in Petroleum Production System

Abstract:

Objectives/Scope

Corrosion has remained a worldwide challenge in petroleum production systems and still prevails. The focus of this research is to use corrosion inhibitors to treat completion fluids to minimize the effects of corrosion. In this research, the properties of completion fluids and the factors affecting corrosion will be studied in detail. Through this study, we aim to demonstrate the relation of temperature and pressure at different ranges in the effectiveness of corrosion inhibitors and completion fluids. Corrosion is the natural degradation of materials caused due to the presence of electrolytes, oxygen, and impurities on metallic surfaces or mechanical reactions. Hence, the need for appropriate corrosion inhibitors must be addressed that will also consider its efficiency and assist the company in monetary profits.

Methods, Procedures, Process

The completion fluids prepared for this study are Potassium Chloride (KCl), Sodium Chloride (NaCl), Sodium Bromide (NaBr), Calcium Chloride (CaCl₂), and Calcium Bromide (CaBr₂). Corrosion inhibitor treatments were performed at different temperature conditions of 180°F and 280°F. Potassium and sulfite-based corrosion inhibitors were added to completion fluids in small concentrations of 1.5%, 3%, and 4.5% and left to mature for about 100 hours in OFITE Corrosion Tester. The corrosion plates were removed and cleaned to determine the corrosion rate. The same process was then repeated for an equal mixture of phosphate and sulfite-based inhibitors amounting to the same total concentration.

Results, Observations, Conclusions

The results showed that adding an equal amount of phosphate and sulfite-based inhibitors in the completion fluid was more economical and effective than individual inhibitors in lower temperatures. While comparing the efficiency of phosphate and sulfite-based inhibitors individually, the former was a better option at both High Temperature and High Pressure (HTHP) conditions and Low Temperature and Low Pressure (LTLP) conditions. Out of the five completion fluids, divalent brines are identified as better completion fluids at higher concentrations for both temperature conditions. This is because they reduce corrosion rate and conditions as compared to the monovalent brines. NaBr had a very similar performance to that of the divalent brines when sulfite-based inhibitors were used under LTLP conditions.

Novel/Additive Information

This research facilitates the understanding of inhibiting corrosion effectively in an economically feasible manner. Another novel aspect is that materials used for this study are also used in real petroleum production field operations making the findings of this study more realistic, beneficial, and incorporative in the industry. These protective inhibitors may grant more access to reaching deeper reservoirs successfully. Furthermore, this research will positively impact the economy as formation damage is likely to reduce and hence the need to shut the well due to failure in tackling corrosion issues



Name: Ali Ahmed Mohsen

University: University of Basrah

Abstract Title: Incorporation of experts' experience into machine learning models to predict ESP failures

Abstract:

ESP is one of the artificial lift methods and an efficient way of increasing the production but there is a problem that will reduce its efficiency and increase the downtime. so there must be a system that can deduce that effect. That system is what is known as predictive maintenance. The session will be about how to use machine learning for the predictive maintenance of ESP. so it will be about how to decide what kind of algorithms fit the model requirement. by splitting data into train and test data and then using the model for predictive maintenance and determining the time at which harsh and fault conditions can occur. The maintenance system that should be made, must learn from the accumulated experiences. we built a supervised regression ML model to predict the time for maintenance using SPOTFIRE. which is a platform containing all ML algorithms with an excellent way for result visualization. The first step in building an ML model is data cleaning, our case study has many missing data which is the main challenge. SPOTFIRE provides many methods for data cleaning. The second step is splitting data into train data for training and test data for testing and evaluating our model. Finally, make a prediction for upcoming data. Our case study is about conditions that would lead to failure in ESP in the Iraqi north field. The conditions were water-cut and GOR ratio. the higher increase in Water-cut would lead to overloading failure, a lower increase in Water-cut would lead to Emulsion failure and the increasing the GOR more than what the ESP is designed for would lead to gas locking and down thrust failure and all of that will lead to increasing the downtime of the ESP. in our model we split data into train data with 70 percent of the total data and 30 percent for testing. we tested all algorithms to find the appropriate algorithm for our data and we found the tree algorithm is the most appropriate one with R square (0.9-0.95). To deploy the model another software must be used for that. It should be noted large data and more ESPs data leads to higher accuracy and of course fewer error values. As a result of the Covid19 pandemic, remote dealing has become a top priority and this is reflected in the energy field, like in other fields. Therefore, a person was able to share the results of any software system by designing applications for mobile devices and websites as well. After completing our model, we found that it was necessary to create a website to display our results

**Name:** Fatema Al Farsi**University:** Sultan Qaboos University**Abstract Title:** Optimization of pore pressure prediction model for sour oil replacement well in miscible gas injection pattern**Abstract:**

The increasing demand of crude oil nationally and internationally is pushing the operation companies to invest in EOR projects and drilling in deep and high complex reservoirs. Drilling with high precise technologies of well planning tools is cost effective. Pore pressure prediction (PPP) is a reliable tool that provides the low, base and high expected pressure values to the well engineer for all the encountered formations to be drilled. PPP requires considering all potential hazards that might occur by addressing the uncertainties and challenges learnt from drilling history in the field.

The objective of this study is to optimize the PPP model to replace an oil producer of Al Noor (ALNR) field in Oman. The well was planned to be drilled as a replacement well ALNR-A which is part of ALNR miscible gas injection (MGI) pattern. This study was initiated by analyzing the drilling history, pressure performance and the injectivity impact on the production profiles of MGI five producers, one abandoned well and two injectors. Firstly, the high complexity of the field geological structure was considered in the analogy analysis, the selection process of the offset and the location of the new well. The well was located within the MGI pattern 200–300m away from the two injectors. One of the nearby wells was encountered with overpressure floater which required precise controlling plan of any kick, H₂S release and risks associated with the drilling. Studying the Challenges associated with the drilling of the nearby wells has a significant impact on the drilling design of the proposed well. One of the nearby wells is abandoned due to drilling issues. Secondly, the pressure profile of the MGI pattern and the field indicated a high depletion in production. The proposed well might encounter depleted layers due to the long production history of the filed. The pressure data available weren't enough and most of them were old due to the lack of pressure tests for the nearby wells. As a result, the closed in tubing head pressure- CITHP and PLT of the nearby wells were used for this analysis instead of static pressure gages-SPG or other pressure test tools. The third aspect of this study is the injectivity impact on the pressure profile; the MGI performance was detected recently, hence, the impact might be detected in PPP results simultaneously. As a result, the PPP values need to be revised before drilling the new well. The action of shutting in the injectors might be required. Taking into account all of the above factors as well as the related uncertainties, a fit for purpose pore pressure model was chosen. The study explains how all difficulties were addressed to reduce the uncertainty, and it proposes three pressure scenario for the well design.



Name: Ghulam Haider

University: NED University of Engineering and Technology, Karachi

Abstract Title: Development of Novel Correlation for the Prediction of oil recovery in water-drive sandstone reservoirs using Artificial Neural Network

Abstract:

Recovery factor is very important for Petroleum operating companies for their hydrocarbon reserve evaluation. One of the main challenges for reservoir engineer is the prediction of the oil recovery factor. Presently there are several methods available but each method has some limitation. The methods which provide better performance needs large volume of production data and on the other hand the methods which are used in early stages predict recovery factor less accurately. In this study, artificial neural network (ANN) model has been employed to predict the oil recovery from water-drive sandstone reservoirs. This study aims to reveal the potential of ANN method for the prediction of oil recovery in water-drive sandstone reservoirs utilizing data that are easily available in early stages of reservoir. 150 data points were collected from open literature and used in training and testing of the ANN model. The model outputs were analyzed by performance indices such as root mean square error (RMSE), mean absolute error (MAE) and coefficient of determination (R^2).

Parameters like Original oil in place, initial water saturation, reservoir pressure, porosity, permeability, oil viscosity, oil API gravity and net pay thickness affects oil recovery from water-drive projects and hence used as inputs in predicting oil recovery in developing the ANN model. 77% of data was used for training and 23% of the data was utilized for testing of the ANN model. The results showed that ANN is an effective tool in predicting the expected oil recovery from water-drive sandstone reservoir with high accuracy. On test data values of R^2 , MAE, RMSE and MAPE are 0.914, 2.49, 3.75, and 6.7% respectively. A novel correlation has also been developed from this study to predict oil recovery. The accuracy of the developed correlation has also been compared with three most common available correlations.



Name: Hanine Lanabi

University: Universite Kasdi Merbah Ouargla

Abstract Title: Carbon Dioxide footprints reduction: Carbon Capture and Storage technique with the CO₂-Enhanced Oil Recovery

Abstract:

Carbon Dioxide footprints reduction: Carbon Capture and Storage technique with the CO₂-Enhanced Oil Recovery.

The abstract:

The 2020 Energy Transition Outlook estimates that oil and gas will account for 74% of world energy-related carbon dioxide (CO₂) emissions in mid-century. This is why it is imperative that the oil and gas industry reduces its emissions especially because the future of the industry depends on its ability to control these emissions. The Carbon Capture and Storage is a versatile technology that can support the oil and gas industry's low-carbon transition.

The oil and gas industry is one of the earliest adopters of The Carbon Capture and Storage (CCS) technology, this technology is an important geoengineering solution to control the CO₂ emissions. It consists on capturing the carbon dioxide (before it gets into the atmosphere) produced by large oil refineries ; transporting it; and then storing it deep underground in geological formations. The stored CO₂ could be used to increase oil production (also known as enhanced oil recovery (EoR) technique) ; the process of this type of technique (miscible displacement) involves injecting CO₂ into partially depleted oilfields to force out additional volumes of oil, with CO₂ being residually trapped and permanently stored. Usually the CO₂ used in this technique (up to 70%) comes from naturally occurring CO₂ deposits underground.

This paper discusses the Carbon Capture and Storage (CCS) projects in the petroleum industry and the potential to replace naturally occurring CO₂ used in the Enhanced Oil Recovery technology with CO₂ that is captured from large emissions sources (Refineries) or from the atmosphere.

Keywords: Carbon dioxide , CO₂ emissions, low-carbon transition, Carbon Capture and Storage, CO₂-Enhanced Oil Recovery.



Name: Maryam Ali

University: The American University of Cairo

Abstract Title: Asphaltene Damage Mitigation Using Unconventional Chemical Agents: An Experimental Investigation

Abstract:

Objectives/Scope:

Asphaltene is a solid component of crude oil that can cause severe operation problems during oil production and transportation. Asphaltene deposition can result in permeability reduction, downhole equipment damage, and pipeline plugging. This research investigates the use of alkaline chemical agents and low cost surfactants for the reduction of asphaltene damage and compares their performance to high-cost and volatile aromatic compounds that are used conventionally for asphaltene treatment.

Methods, Procedures, Process:

Crude oil with an initial viscosity of 700 cp was used to conduct the experiments. The crude oil was analyzed for asphaltene content using chromatography. Asphaltene precipitation was then induced using heptane solutions. The asphaltene was then filtered using a 1 micron filter screen. Asphaltene phase behavior was then tested using filtration experiments, and precipitation experiments. The asphaltene saturated filter membranes were subjected to different chemicals including heptane, xylene, toluene, sodium hydroxide solutions, and sodium lauryl sulfate (SLS). The ability of each chemical to dissolve the asphaltene was then tested at different time periods and different concentrations.

Results, Observations, Conclusions:

The gas chromatography results, along with the asphaltene component analysis showed that the crude oil used had an initial asphaltene concentration of 12.33% by weight. All asphaltene solutions were prepared using the same crude oil dissolved in the same volume of heptane to ensure that the filter membranes all had the same percentage of asphaltene. The filter membranes placed in a heptane solution resulted in two significant observations. Although some of the asphaltene on the surface of the membrane was removed, all the asphaltene in the pores remained. This showed that heptane is a very poor chemical for asphaltene mitigation. Xylene and toluene managed to remove up to 90 and 77% of the asphaltene respectively, however these chemicals are both high in cost and highly volatile. The sodium hydroxide solution interacted with the asphaltene and managed to reduce damage by 85% using the 5 Molarity solution. After further investigation, it was found that the asphaltene had a slightly acidic pH. When the sodium hydroxide reacted with it, it generated a surfactant which helped reduce the surface tension. The SLS was therefore investigated, and reduced asphaltene damage by 70%.

Novel/Additive Information:

Asphaltene mitigation can be a costly procedure especially if high cost chemicals are used. By integrating the use of alkaline and low cost surfactant and investigating their ability to mitigate asphaltene, this research opens the door for the investigation of alternative chemicals that may prove efficient in reducing, or mitigating, asphaltene damage in wellbores and pipelines.



Name: Yaseen Riyadh Bandar

University: University of Basrah

Abstract Title: Pilot project for Using Fog Computing in Drill Operations

Abstract:

One of the most essential and critical parameters influencing drilling efficiency is the ROP. To improve overall drilling efficiency, reduce non-productive time (NPT), and lower costs, necessary to predict ROP before drilling operations. Fog computing can provide a rapid response for applications through preprocessing and filtering data. Trimmed data can

then be transferred to the cloud for further analysis. The project's goal is to develop a real-time system for selecting the optimal ROP during drilling operations.

Generally, two types of ROP prediction models can be classified into (1) traditional models (Maurer, Bourgoyne-Young's, ...) and (2) data-driven models (Neural Network, SVM, ...). In this work, to predict ROP, Bourgoyne-Young's model and Neural Network model are applied in terms of ROP modeling based on drilling data that has been taken from the fields of southern Iraq. The two models are then compared to see which one is the most accurate in predicting ROP. As a result, understanding the behavior of drilling data is a crucial part of developing an optimal ROP prediction model in real-time. All computations were made in the MATLAB program using various calculation methods.

The Neural Network model and Bourgoyne-Young's Drilling model are applied to drilling parameters obtained from the fields of southern Iraq, which are used to predict the ROP. Then a comparison is made between the two models for the same data. The result proved that the prediction of the Neural Network model is better than that of Bourgoyne-Young's drilling model. The purpose of this project is to demonstrate how data models and learning methodologies can be applied to drilling engineering. Machine learning algorithms are being developed to predict ROP across a well. This model was expanded to maximize ROP for a given section by optimizing parameters (WOB, RPM, pressure standpipe, and flow rate). Therefore, this model can be extended for real-time prediction and optimization on the drilling rig surface without relying on down-hole parameters because such a model is easy to implement.

The use of fog computing can introduce Internet services such as cloud computing to advanced technology, providing control, computation, storage, communication, and service capacity. Prediction and optimization of ROP will be done in real-time data using machine learning algorithms in a MATLAB program, then converted to a web page. So, we can monitor these results by using smart devices (watch, phone, and PC).

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