

**REPORT OF PROF. SUNDAY SUNDAY IKIENSIKIMAMA,
THE CHAIR OCCUPANT SHELL-JV ARET ADAM PROFESSORIAL CHAIR IN
PETROLEUM ENGINEERING, UNIVERSITY OF PORT HARCOURT, CHOBA,
RIVERS STATE, NIGERIA.**

ON

THE WORK PLAN AND ACTIVITIES OF THE CHAIR FOR THE YEAR 2023

TO

**STAKEHOLDERS OF THE SHELL-JV ARET ADAMS PROFESSORIAL CHAIR IN
PETROLEUM ENGINEERING**

EXECUTIVE SUMMARY

Some of the activities that the Shell Aret Adams professorial Chair occupant in petroleum Engineering participated in from March 2022- February 2023 and beyond are outlined in this report. Other notable things are the list of projects under supervision and students under mentorship at the post graduates and undergraduate levels. The different teaching engagements of the chair is also emphasized as well as webinars and meetings attended within and outside the university of Port Harcourt. Conferences attended and those to be attended are also mentioned. Other deliverables such as publications are also part of the report. The report also incorporates various research areas and the projects under them. Also of importance are the activities such as quiz competition, technical paper contest and workshop that will bring together students, lecturers and the academia as well as the stakeholders. These activities will aid in equipping students with knowledge of the Oil and Gas Industry in the area of software application, assist students in their academics and also give visibility to the Chair.

REPORT OUTLINE FOR PROFESSORIAL CHAIR WORKPLAN FOR 2023

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1.0

INTRODUCTION

Once again, the Chair uses this opportunity to thank the management and team of SPDC-JV for renewing the Shell-JV Aret Adam professorial Chair in Petroleum and Gas Engineering University of Port Harcourt after five (5) years of inactivity. We sincerely appreciate the confidence reposed on the University.

The Chair since its inauguration has been able to run smoothly after the initial hassles. The chair submitted its initial workplan for 2021 last year August 2021. The 2022 work plan was also submitted in February 2022. The Chair has contributed to human capacity development and mentorship in the Department of Petroleum and Gas Engineering through energy driven and innovative research in University of Port Harcourt and will continue to do so. The Chair also looks forward to assisting good student (This it did by supporting them to attend NAICE 2022) and also collaborate with other research on quality research as well as engage in quality research as a way to moving the Chair forward.

2.0.

MISSION, VISION AND CORE VALUES

. The chair has its mission, vision and core values.

MISSION: To meet the Research & Development (R & D) needs of the Oil and Gas Industry

VISION: Harnessing Available Human Capital Potentials through Quality Research, Innovation and Collaboration

CORE VALUES: DICT (Pillars for the Vision and Mission)

Diligence, Integrity, Commitment and Teamwork

3.0.

RESEARCH INTEREST OF THE CHAIR

With offshore production of oil and gas, there tend to be dominance of flow assurance issues (hydrates, scales, wax, asphaltenes, corrosion etc.). With this in mind, one of the areas of research focus for the chair will be to handle production and flow assurance issues in oil and gas production as well as develop a database for green inhibitors. Other areas of interest will include big data, artificial intelligence and their application to oil and gas problems, reservoir modelling and simulation studies, gas processing, utilization and monetization, CO₂ sequestration for greener environment for oil and gas production, Petroleum Economics and Risk Management in Petroleum Ventures, Petroleum and Environment as well as Enhanced Oil Recovery (EOR) as well as Pressure, Volume and Temperature (PVT) studies.

Assisting the Department/University by Promoting and Advancing the Department both in academics, research and development is one of the duties of the Chair as stated in the deed. The Chair also assists the Department to coordinate and manage regional and international students of Petroleum Engineering background sent to the Department by ICIPE (the regional coordinating unit for PASET) through a Grant Award as African host University (AHU). This Chair has continued to uphold its tenets by fulfilling her mandate to the donors and the university even through the period of the strike which commenced since 14th February 2022 and ended on October 14th 2022 (8 months). Below are some of the activities of the Chair

4.0

Mentorship and Supervision of Post Graduate and Undergraduate Students

As part of supporting the department in the area of human capacity development and mentorship, the Chair took up more mentees and project supervision. Some of these projects and area of research focus and time lines are shown in Tables 1 shows some research focus of the Chair while Table 2 shows list of undergraduate students that have graduated under the tutelage of the Chair.

Table 1: Research Focus and on-Going Projects

S/No.	Research Area/Focus	Project Titles
1	Flow Assurance Issues	<p>A Comparative Analysis between Annular Friction Model.</p> <p>Economic Analysis of Artificial Lift System using Gas Lift and Electric Submersible Pump</p> <p>Geo-mechanical Method for Sand Production Management using Kirsh Model in Oil and Gas Well</p> <p>Comparative Analysis of different Artificial Lift Methods using Simply Arithmetic Weighing (SAW) Model</p> <p>Assessment of Gravel Packing Methods used in the Petroleum Industry.</p>
2	Big Data, Artificial Intelligence and its Application to Oil and Gas	<p>Forecasting of Petroleum Production using Data Driven method (Machine Learning)</p> <p>Application of Artificial Intelligence in the Economic Analysis of Petroleum Ventures</p>
3	Reservoir Modelling and Simulation Studies	<p>Application of Geo-mechanical Properties to Reservoir Evaluation</p> <p>Integrated Approach for Source Rocks Characterization of Niger Delta Basin, Nigeria</p> <p>Seismic Based Artificial Intelligence and Simulation for improved Reservoir Description in a Niger Delta Field</p> <p>Development of a Fingerprint Model to Classify Niger Delta Reservoirs Using OPEC's Auditing Criteria</p> <p>Permeability Modelling Using Core and Well Log Data in the 'XX Field' of Coastal Swamp Depo-bed in the Niger Delta Basin</p>
4	Gas Processing, Utilization and Monetization	<p>Development of Efficient Infrastructure and Interconnecting Network for Gas Pipelines.</p> <p>Reduction of Transmission and Distribution Losses through Efficient Leak Detection and Monitoring (Case Study: Obite-Bonny Gas Pipeline Network)</p>

		<p>Evaluation of Development and Economic Options for Stranded Gas</p> <p>Gas Conversion and Utilization Strategies for Economic and Environmental Benefits</p>
5	Petroleum Economics and Risk Ventures	<p>Metaheuristic Intelligent Systems for Ranking International Fiscal Regimes</p> <p>A Stochastic Approach to Cost Estimation and Economic Evaluation of Oil Well in the Niger Delta</p> <p>Techno-Economic Analysis of Floating Gas to Power (FGTP) for Stranded Gas -Offshore Nigeria</p> <p>Economic Impact of Policies and Infrastructures on Gas Utilization Systems in Nigeria.</p> <p>The Economics of Floating Gas to Liquid Technology</p> <p>Economic Analysis of Gas to Power in Nigeria</p> <p>Impact of Transition to renewable energy on Nigeria's Economic Growth</p>
6	Petroleum and Environment	<p>Production of Biofuels from Lignocellulosic Biomass Resources</p>
7	Enhanced Oil Recovery	<p>Evaluation of Surfactant to Improve Sweep Efficiency of an Oilfield in Niger Delta</p> <p>A New Approach of Controlling the Activities of Sulphate-Reducing Bacteria (SRB) in the Reservoir During Water Injection.</p> <p>Applicability of Polymer Flooding for in-situ Development of Nigeria's Heavy Oil Reservoirs</p> <p>Polymer Flooding for Enhanced Oil Recovery</p>

Table 2: List of Undergraduates that have Graduated

S/No	Names/Matric no.	Project Topic	Relevance to Oil and Gas or Significance of the Study
1	SULE, Victor Joshua U2015/3065029	A Comparative Analysis between Annular Friction Model	To help identify the best annular friction pressure loss models
2	CHUKWUOGO, Nkemakonam S. U2015/3065066	Polymer Flooding for Enhanced Oil Recovery	To find more effective and economical alternatives to currently used conventional polymers so as to improve sweep efficiency and lead to improved oil recovery
3	DILINYE, Chinonso Patrick U2015/3065037	Economic Analysis of Artificial Lift System using Gas Lift and Electric Submersible Pump	Selecting the best artificial lift method that would be viable for a well.
4	AGBALA, Ogheneoke Jenkis U2015/3065064	Geo-mechanical Method for Sand Production Management using Kirsh Model in Oil and Gas Well	Predict the critical parameters of sand production and controlling sand production using production data from geo-mechanical method
5	ESOSUAKPO, Okioghene Mario U2015/3065053	Comparative Analysis of different Artificial Lift Methods using Simply Arithmetic Weighing (SAW) Model	Selecting artificial lift system that will optimize productivity in Niger Delta.
6	CHISOM, Emeto U2015/3065023	The Economics of Floating Gas to Liquid Technology	To provides a means of optimizing gas production in Nigeria and reduce flaring activities.
7	IGBOSI, Tombra Timipre U2015/3065011	Economic Analysis of Gas to Power in Nigeria	To determine the optimal gas price to ensure profitability in a gas to power investment.
8	CHARLES-OKHIDE, Michael Tari U2015/3065061	Impact of Transition to renewable energy on Nigeria's Economic Growth	To help identify the relationship between dynamics of the development of the renewable energy industry and production and consumption of fossil fuel
9	MARCUS, Ruth Leyirah U2015/3065058	Assessment of Gravel Packing Methods used in the Petroleum Industry.	To determine the average formation sand size used to find accurate gravel pack size suitable for completion.

4.1. PhD and Masters Students that have Graduated

Below are some post graduate students that have successfully finished their academic pursuits

1. **Daniel Ocran:** Metaheuristic Intelligent Systems For Ranking International Petroleum Fiscal Regimes (UMAT, Tarkwa Ghana)

2. **Ihejirika Chinenye Vivian:** Economic Analysis on the Impact of Poor Policies and Infrastructures on Gas Utilization Systems in Nigeria. (26/08/2022)
3. **Mogbo Obiekwe Chukwukadibia:** Techno-Economic Analysis of Floating Gas to Power (FGTP) for Stranded Gas -Offshore Nigeria (26/08/2022)
4. **Takyl Botwe :** Gas and Bio-Marker Geo-Chemistry of X and Y Fields of the Niger-Delta, Nigeria (29/08/2022)
5. **Eneota, Chidike Pascal:** Gas Conversion and Utilization Strategies for Economic and Environmental Benefits
6. **Odoi, Noble Ukela:** Computer Aided Design of Pipeline Layout for LPG Delivery to Domestic Users (25/08/2022)
7. **Koaudio, Koffi Eugene:** An Integrated Approach to Source Rocks Characterization of Agbada and Akata Formations in the Niger Delta , Nigeria (29/08/2022)
8. **Babawale Emmanuel Ojedapo:** Forecasting of Petroleum Production using Data Driven method (Machine Learning)-Masters
9. **Ogherohwo Solomon Otega:** A New Approach of Controlling the Activities of Sulphate - Reducing Bacteria (SRB) in the Reservoir During Water Injection. (Masters)

4.2 Undergraduate Students About to Graduate (Done with Internal Defense)

The following students listed below are at the finishing stage of their academic pursuits. They have successfully completed their internal defense and await the external coming soon

1. Nwogu Chinwendu Uzoma
U2016/3065014
Formulation of Local Gas Hydrate Inhibitors from Orange Mesocarp
2. George-Gogo Tari
U2016/3065012
Inhibitive Action of Terminalia Cappa and Musaceae Extract as Corrosion Inhibitors for Mild Steel in Acidic Medium
3. Ikeokwu Chinaza Collins
U2016/3065005
Lithology Classification from Well Logs using Deep Learning Algorithm
4. Ibutontaiema Tamuno Roseline
U201/3065013

Application of Sapphire Software to Analyze Well Test Data for Permeability and Skin Factor Interpretation

5. Ndidi Precious Onyekachi

U2016/3065011

The Use of Red Onion Skin Extract (ROSE) as Inhibitor for Gas Hydrate Formation in Deep Water Operation

Mentorship and supervision is on-going and Table 3 shows the list of post graduate students that are currently working on different research areas with some at the finishing stage.

Table 3: Some Masters and Ph. D Students under Mentorship/Titles of Supervised Research Projects

S/No	Name /matric no	Project topic	Relevance to oil and Gas	Expected time Frame to completion
1	Obashanu Bernard G2018/MENG/PNG/FT/021	Application of Geomechanical Properties to Reservoir Evaluation	Taking into account the dynamic system of the reservoir, as opposed to the conventional static criteria presently used, this study provides the oil and gas with critical insight of geomechanically effects prediction (rate of sand production, well stability, stresses in and around the wellbore as well as avoid NPT which impacts production etc) in the bid to mitigate /eliminate associated cost with their handling	1 year
2	Iriakuma, Erempagamo G2018/PHD/ACE-CEFOR/FT/025	Reduction of Transmission and Distribution Losses through Efficient Leak Detection and Monitoring (Case Study: Obite-Bonny Gas Pipeline Network)		1 year
3	Okon, Christopher Etim G2017/MENG/PNG/FT/004	Evaluation of Surfactant to Improve Sweep Efficiency of an Oilfield in Niger Delta	This work will identify a local surfactant that can be used for chemical enhanced oil recovery	6 months
4	Usiayo, Afoke Victor APPL/2020PHD/PNG/007	Production of Biofuels from Lignocellulosic Biomass Resources	This project will modify the existing acid pretreatment method by modelling and optimizing the process variables (reactor temperature, acid catalyst concentration and residence) of the feedstock, in order to prevent formation of inhibitors which will result to enhanced yield and quality of biobutanol (bio gasoline) production that can be used directly in a gasoline engine.	2 years

5	Ezeh, Okechukwu Chigozirim G2018/PHD/ACE- CEFOR/FT/020	Applicability of Polymer Flooding for in-situ Development of Nigeria's Heavy Oil Reservoirs	This study will provide guidelines to developing heavy crude oil for in country application. proper screening criteria for heavy crude oil fields that will qualify for polymer flooding.	1 year
6	Joseph Adeoluwa Adetuberu G2018/PhD/ACE- CEFOR/PT/031	Application of Artificial Intelligence in the Economic Analysis of Petroleum Ventures	It will help improve decision making for economic analysis before Field Investment Decision (FID) for both investors and stakeholders with a more realistic forecast based on the actual occurrences over time from other fields within the area. It will help companies understand the major drivers for investment, the strength and direction of the cost variables for field development	1 year
7	Onu, Chukwuemeka	Evaluation of Development and Economic Options for Stranded Gas	This study will provide economically promising approaches, make clearer the impact of price optimization on a thriving natural gas market and propose a more dynamic fiscal policies for the domestic gas market in Nigeria	2 years
8	Kamayou Monkam Elise Vianney G2018/PHD/ACE- CEFOR/FT/043	Seismic Based Artificial Intelligence and Simulation for improved Reservoir Description in a Niger Delta Field	This work will help to reduce uncertainty as well as risks in petroleum exploration and production for timely and more accurate reservoir management and decision making.	1 year
9	Anyanwu Chukwuemeka G2019/Ph.D/PNG/009	Development of a Fingerprint Model to Classify Niger Delta Reservoirs Using OPEC's Auditing Criteria	This work will develop model for the proper classification of reservoirs in the Niger Delta, using OPEC criteria as stated in OPEC LXXXIV.286 Resolution. It will also produce source signature for the identification and characterization of reservoirs.	1 years
10	Obiajulu Chukwuezug Ekeh G2019/Ph. D/PNG/PT/002	Permeability Modelling Using Core and Well Log Data in the 'XX Field' of Coastal Swamp Depo-bed in the Niger Delta Basin.	This work will provide a method of deriving rock permeability by correlating multiple well logs with core permeabilities using non-parametric regression in conjunction with multiple variant statistical analysis	1 year

4.3

MENTORSHIP AND SUPERVISION ACTIVITIES

Below are some of the activities the Chair engaged in

- Pre-Gap Analysis presentation for PhD Student Mr. Emeka Anyanwu 2nd March 2022
- Meeting with Undergraduate Students (for Supervision) 22nd March 2022

Nwogu Chinwendu Uzoma (08187369096)

George-Gogo Tari (08156589022)

Ikeokwu Chinaza Collins (07068589388)

Ibutontaiema Tamuno Roseline (08077073376)

Ndidi Precious (08101305599)

- Presentations for PASET Scholars Mr. Udoghadi Uyodhuzhniye and Mr. Okon Effiong Okon 7th April 2022
- Presentations for ACE - CEFOR Scholars Mrs. Tosin Samuel-Idara 7th April 2022
- Presentations for PASET Scholar Mohammed Shaibu and

Mr. Udogadi Uyodhuzhnye 11th - 12th April 2022

- Presentation for Ph.D Students Emeka Anyanwu on Research Questions, Objectives, Proposal by Okon Effiong Okon and Research Questions by Udogadi Uyodhuzhniye 21st April 2022
- Presentation of Literature Review with PASET Scholar, Mohammed Shaibu on

Literature Review for PASET scholar Shuaibu Mohammed and pre-proposal Presentation

(Materials & Methods) with Ph.D. Student Emeka Anyanwu from the Department 30th - 31st May 2022

- Pre-proposal defense for Literature Review with Masters Student from the department, Chukwudi Onwuso, Proposal for PhD Student Emeka Anyanwu and Progress

Report by PASET Scholar Mutadza Itai 7th June 2022

- Pre-proposal Presentations for PhD Students Mohammed Shaibu 30th June 2022
- Presentation for PASET PhD Scholars Mohammed Shaibu 14th July 2022
- Presentations of Research Questions and Objectives for Mohammed Shaibu 11th August, 2022
- Meeting with IPS Students for Project Supervision 17th August 2022

Paul Alex Oluwatosin (08031518301) - Masters

Ifezue David Ikemsinachi (09021671364) - Masters

Ruth Igwe - Chilaka (07038119531) - PGD

Jonathan Stephen (08164173347) – PGD

- Presentation for shaibu and chukwudi onwuaso 22nd September 2022
- Pre-proposal presentation for Shuaibu and Gap Analysis presentation for Chukwudi 29th September 2022
- Presentation for Master Student Chukwudi Onwuaso 7th October 2022
- Presentation with Masters and Undergraduate students 20th October 2022
- External Defense for Daniel Ocran from UMAT Ghana 27th October 2022
- Presentation on Literature Review/Gap for Chukwudi Onwuaso 3rd November 2022
- Presentations with Masters and Undergraduate students 10th November 2022
- Presentation with PhD students 17th November 2022
- Invigilated CHM 240.2 Examination at Mechatronics Department 17th January 2023
- Presentation for two Masters students Chukwuocha and Adenike 26th January 2023
- Presentations for PhD student Oluwasegun and Azubuike and Two masters students Kenneth and Onwuaso Chukwudi 2nd February 2023
- Presentation with PhD and Masters Students 9th February 2023
- Prepared undergraduates for internal defence 15th February 2023
- Attended undergraduate internal defence at the department 16th February 2023
- Attended internal defense for Masters students 21st February, 2023

4.4. CONFERENCES ATTENDED

Attended Pan-African Hybrid RSIF Conference held 28th -29th June 2022 at Ben Guerir Morocco

SPE Nigeria Annual International Conference and Exhibition (NAICE) 2022 (1st – 3rd August, 2022) was attended and five (5) papers were presented two on day one (1) of technical paper presentation, morning and afternoon session. Three (3) papers on day two (2) of the paper presentation session: two (2) in the morning and one (1) in the afternoon.

- 1) Gas Hydrate Formation and Dissociation: Effect of Salinity of Formation Water in Subsea Flow lines. SPE Paper No: SPE-212011-MS @ the 45th SPE NAICE 2022 held at Eko Hotels and Suites, VI, Lagos, Nigeria.
- 2) Prediction of Scale Precipitation by modeling its Thermodynamic Properties using Machine Learning Engineering. SPE Paper No: SPE-212010-MS @ the 45th SPE NAICE 2022 held at Eko Hotels and Suites, VI, Lagos, Nigeria.
- 3) Musaceae Extract (PSJ) as Green Inhibitor in a Gas Dominated System. SPE Paper No:SPE-212017-MS @ the 45th SPE NAICE 2022 held at Eko Hotels and Suites, VI, Lagos, Nigeria.
- 4) Petroleum Production Forecasting using Machine Learning Algorithms. SPE Paper No:SPE-212018-MS @ the 45th SPE NAICE 2022 held at Eko Hotels and Suites, VI, Lagos, Nigeria.
- 5) Evaluation and Comparison of the Hydrate Inhibition Tendency of Hydrogen using UNISM and Towler & Mokhtab's Correlation. SPE Paper No:SPE-212020-MS @ the 45th SPE NAICE 2022 held at Eko Hotels and Suites, VI, Lagos, Nigeria.

Abstract was sent out to ADIPEC in April and it has been accepted for presentation at ADIPEC 2022 holding 31 October - 3 November 2022 at Abu Dhabi National Exhibition Centre, Abu Dhabi, UAE.

Evaluation of Modified Starch (PSMS) From Agro Waste As Methane Gas Hydrate Inhibitor In A High Pressure Apparatus" for presentation as a Knowledge Sharing Technical ePoster for **ADIPEC** to be held on 31 October - 3 November 2022 in Abu Dhabi, UAE.

Your SPE Paper Number: SPE-211183-MS

Author Block: V. U. Wachikwu-Elechi, **S. S. Ikiensikimama**, J. A. Ajienska, University of Port Harcourt

Session 067 - OPERATIONAL EXCELLENCE: Flow Assurance and Water Management.

The conference was not attended due to financial constraints as a result of the inability of the Chair office to sponsor the conference as the available funds couldn't carry the expenses for the international travels as well as logistics involved.

Another abstract was sent out for EGYPS 2023 and accepted for presentation at the Egypt Petroleum Show holding 13 - 15 February 2023 at the Egypt International Exhibition Center, in Cairo Egypt.

Technical Category: Offshore and Marine Production, Technology and Operations (MAR)

Abstract ID: 1330

Abstract Title: Efficacy of a Locally Sourced Natural Extract for Gas Hydrate Inhibition in a Laboratory Mini Flow Loop:

Session Title: New Offshore Technologies Resolving Operational Challenges

Session Date: Day 2, Tuesday 14 February

Speaker Name: Virtue Urunwo Wachikwu - Elechi, Research Fellow

The conference was not attended due to financial constraints as a result of the inability of the Chair office to sponsor the conference as the available funds couldn't carry the expenses for the international travels as well as logistics involved.

4.4.1. SPE We Appreciate You (WAY) Award

At the NAICE 2022 Conference held in Victoria Island, Lagos, Nigeria the Chair Occupant (**Prof. S. S. Ikiensikimama**) was honored in the SPE WAY award as the recipient of the Prof. G. K. Falade and Prof. Chi U. Ikoku Distinguished Achievement Award for Petroleum Engineering Faculty in recognition of an excellent Teaching, Research and/or Significant Contribution to the field of Petroleum Engineering Faculty in Nigeria University (03/08/2022)

4.4.2. Financial Support to SPE NAICE 2022

Financial Support was given to two students and a Faculty member who were to present papers at NAICE 2022 as shown in Table 4.

Table 4: Names of Those Supported during NAICE 2022

S/No.	Names of Students	Conference Registration	Transportation	Accommodation
1	Joseph Emmanuel Akhagbeme	₦30,000.00	₦15,000.00	=
2	Collins Sopuruchuku Ekeowa	₦30,000.00	₦15,000.00	=
3	Emeka Emmanuel Okoro (Faculty Member)	₦30,000.00	=	=
4	Virtue Urunwo Wachikwu-Elechi (Research Fellow @ the Chair)	₦30,000.00	₦20,000.00	₦20,000.00 (2days)

4.5 TEACHING COMMITMENTS TO UNDERGRADUATES AND POST GRADUATE STUDENTS WITHIN AND OUTSIDE UNIORT

- External examination for Undergraduates of Petroleum and Gas Department @ Rivers State University (RSU) 9th - 11th March 2022
- Teaching of Enhanced Oil Recovery (EOR) at Institute of Petroleum Studies (IPS) University of Port Harcourt 14 - 18th March 2022
- Teaching of Enhanced Oil Recovery (EOR) to Petroleum Engineering students of Africa University of Science and Technology, Abuja 28th March - 14th of April 2022
- Ph.D External Examination for Antwi Kwabena Asante of University of Mines and Technology, Tarkwa (UMaT), Ghana 4th April 2022
- Teaching of Petrochemicals @Centre for Gas Refining and Petrochemicals (CGRP), University of Port Harcourt 18th -19th May 2022
- External Examination for Rivers State University (RSU) Final Year Petroleum Engineering students 5th – 7th Dec 2022
- Attended Field Development Planning Assessment for IPS students 9th Dec. 2022
- Attended PGD defense at the Department 12th Dec 2022
- Coordinated PhD admission process/interview at the Department 12th December 2022
- Attended Masters defense at the Department 14th December 2022
- Attended Masters defense at the Department 21st December 2022

4.6 PROFESSORIAL ASSESSMENT

- Examination for Dr. Charles Anyadiegwu from Federal University of Technology Owerri (FUTO) 5th - 8th April 2022
- Examination for Dr. Richard Amorin from University of Mines and Technology (UMaT) Tarkwa, Ghana 4th - 6th May 2022
- Commenced Associate Professor assessment for UNIBEN on 7/02/2023

4.7. SEMINAR PRESENTATIONS AT WORLD BANK ACE-CEFOP), UNIVERSITY OF PORT HARCOURT.

1st March 2022

Ihejirika Chinenye Vivian: Economic Analysis on the Impact of Poor Policies and Infrastructures on Gas Utilization Systems in Nigeria.

Mogbo Obiekwe Chukwukadibia: Techno-Economic Analysis of Floating Gas to Power (FGTP) for Stranded Gas -Offshore Nigeria

Takyl Botwe: Gas and Bio-Marker Geo-Chemistry of “X” and “Y” Fields of the Niger-Delta, Nigeria

Okon Effiong Okon: Investigation of Gas Hydrate Control Using Locally Formulated Inhibitors

Henry Humphrey Harry: Microwave Microscopy of Reservoir Rock and Fluids

2nd March 2022

Eneota, Chidike Pascal: Gas Conversion and Utilization Strategies for Economic and Environmental Benefits

Odoi, Noble Ukela: Computer Aided Design of Pipeline Layout for LPG Delivery to Domestic Users

Koaudio, Koffi Eugene: An Integrated Approach to Source Rocks Characterization of Agbada and Akata Formations in the Niger Delta, Nigeria

Olarinoye, Fawziyah Oyefunke: Hydrate Risk Management Strategies using Amino Acids as Inhibitors

Mutadza, Itai: Effect of Reactive Flow in Porous Media for Carbon Capture and Storage in Depleted Reservoirs

Samuel-Idara, Oluwatosin Adeoti: An Improved Performance Wax Inhibitor from Agro-Waste

Mutadza, Itai: Effect of Reactive Flow in Porous Media for Carbon Capture and Storage in Depleted Reservoirs

4.8

PAPERS PUBLISHED

1. Okon Efion Okon, **Sunday Sunday Ikiensikimama**, Virtue Urunwo Wachikwu-Elechi, Joseph Atubokiki Ajienska and Onyewuchi Akaranta (2022): Gas Hydrate Inhibition: Performance of an Agro waste Based Locally Formulated Inhibitor. Journal of Dispersion Science and Technology. <https://doi.org/10.1080/01932691.2022.2074858>
2. Joseph Emmanuel Akhagbeme, Joseph Atubokiki Ajienska, Virtue Urunwo Wachikwu-Elechi and **Sunday Sunday Ikienskimama** (2022): Gas Hydrate Formation and Dissociation: Effect

of Salinity of Formation Water in Subsea Flow lines. Paper Number: SPE-212011-MS. Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, August 2022.

<https://doi.org/10.2118/212011-MS>

3. Joy Chiekumali Ugoyah, Joseph Aubokiki Ajenka, Virtue Urunwo Wachikwu-Elechi and **Sunday Sunday Ikienskimama** (2022): Prediction of Scale Precipitation by modeling its Thermodynamic Properties using Machine Learning Engineering. Paper Number SPE-212010-MS Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, August 2022. <https://doi.org/10.2118/212010-MS>
4. Virtue Urunwo Wachikwu-Elechi and **Sunday Sunday Ikienskimama** and Joseph Aubokiki Ajenka, (2022): Musaceae Extract (PSJ) as Green Inhibitor in a Gas Dominated System. Paper Number: SPE-212017-MS Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, August 2022. <https://doi.org/10.2118/212017-MS>
5. Babawale Ojedapo, **Sunday Sunday Ikiensikimama** and Virtue Urunwo Wachikwu-Elechi (2022): Petroleum Production Forecasting using Machine Learning Algorithms. Paper Number: SPE-212018-MS. Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, August 2022. <https://doi.org/10.2118/212018-MS>
6. Collins Sopuruchukwu Ekeowa, Joseph Atubokiki Ajenka, Virtue Urunwo Wachikwu-Elechi and **Sunday Sunday Ikienskimama** (2022): Evaluation and Comparison of the Hydrate Inhibition Tendency of Hydrogen using UNISM and Towler & Mokhatab's Correlation. Paper Number: SPE-212020-MS. Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, August 2022. <https://doi.org/10.2118/212020-MS>

4.8.1

PAPERS UNDER REVIEW

1. Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama** and Joseph Atubokiki Ajenka (2023). Inhibition Effect of Brassicales Extract (BPE) On Methane Gas Hydrate Formation In Gas Dominated System Gas Hydrate Formation In Gas Dominated System Paper ID 134 submitted for NAICE 2023 (Under Review)
2. Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Joseph Atubokiki Ajenka, Okon Efiog Okon and Gabriel Ndubuisi Elemuo (2023). Evaluation Of Modified Starch (PPMS) From Agro Waste as Methane Gas Hydrate Inhibitor in A High-Pressure Apparatus. Paper ID 130 submitted for NAICE 2023 (Under Review)
3. Virtue Urunwo Wachikwu-Elechi¹, **Sunday Sunday Ikiensikimama**, Joseph, Atubokiki AJienka, Okon Efiog Okon and Gabriel Ndubuisi Elemuo. Evaluation of A Pristine Bio-Extract for Simulated Offshore Gas Hydrate Mitigation. Abstract ID 547 Accepted for Oral presentation at ICGH 10 2023 holding in Singapore

4. Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Okon Efiong Okon and Gabriel Ndubuisi Elemuo. Modified Starch (PSMS) From Agro Waste as Structure I Gas Hydrate Inhibitor in A High-Pressure Apparatus. Abstract ID: 542 accepted for Poster presentation at ICGH 10 2023 holding in Singapore.
5. Itai Mutadza, **Sunday Sunday Ikiensikimama**, Joel Ogbonna, Virtue Urunwo Wachikwu-Elechi and Humphrey Harry. Preliminary Assessment of the Reservoir Rock in the Niger Delta for Carbon Capture and Storage in Depleted Reservoirs. Paper ID 191 submitted for NAICE 2023 (Under Review)
6. Humphrey Harry, **Sunday Sunday Ikiensikimama**, Virtue Urunwo Wachikwu-Elechi and Itai Mutadza. Suitability and Applicability of Microwave Spectroscopic Systems in Measurements of Oil Reservoir Rock and Fluid Properties. Paper ID 36 submitted for SPE NAICE (Under Review)

4.8.2. PATENTS

4.8.2.1 PATENT GRANTED

1. Flavonoids in Formulation of Gas Hydrate Inhibitors

Virtue Urunwo Wachikwu - Elechi, **Sunday Sunday Ikiensikimama**, Joseph Atubokiki Ajenka and Onyewuchi Akaranta

4.8.2.2 PATENTS UNDER COMPILATION

1. Plant Gums in Formulation of Gas Hydrate Inhibitors

Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Joseph Atubokiki Ajenka and Onyewuchi Akaranta

2. Plant Extracts in Formulation of Gas Hydrate Inhibitors

Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Joseph Atubokiki Ajenka and Onyewuchi Akaranta

4.9. PASET ACTIVITIES

As part of the responsibility of the Chair to the department as stated in the deed which is to assist the Department by promoting and advancing her both in academics, research and development, the Chair also assists the Department to coordinate and manage regional and international student of Petroleum Engineering background sent to us by ICIPE (the regional coordinating unit for PASET) through a Grant Award as African host University (AHU). In line with the afore mentioned, the Chair participated in a number of activities some of which are listed below.

- Participation in PASET-RSIF Research Partnership Workshop held 22nd April, 2022
- Participation in PASET-RSIF Cohort IV Orientation Programme held 25th – 29th April 2022
- Participation in PASET-RSIF Workshop on a transformational Africa - U. S. STEM University Partnership held 14th – 16th March 2022
- Participation in PASET-RSIF information Dissemination Webinar: RSIF PhD Scholarship Call held 18th March 2022

- Participation in PASET-RSIF Capacity Building Activities March 2022: Guest Webinar held 30th March 2022
- Participation in PASET-RSIF Capacity Building Activities May 2022 Monitoring and Evaluation course held 18th -19th May 2022
- Participation in PASET-RSIF Pan African Hybrid Conference, Ben Guerir Morocco held 28th -29th June 2022
- Participation in PASET-RSIF 23rd Student Seminar Series held
- Participation in PASET-RSIF Science Communication Workshop: RSIF Capacity Building Activities, February 2022 held 17th -18th February 2022
- The 24th RSIF Student Seminar of the RSIF Student Seminar Series will held 3rd August 2022
- Participation in presentation by RSIF International Partner Institution – GCUB presentation held 16th August 2022
- Participation in Guest Webinar_ July 2022 RSIF Capacity Building Activities held on 27th July 2022
- Participation in Data Science & Management Training, July 2022 RSIF Capacity Building Activities held 18th – 22nd July 2022
- Participation in PASET-RSIF 23rd RSIF Student Seminar of the RSIF Student Seminar Series held 6th July 2022
- Participation in the August 2022 RSIF Capacity Building Guest Webinar series held on 3rd of August 2022
- Participation by RSIF International Partner Institution (IPI)-GCUB held on 16th August 2022
- Participation in RSIF Training course: Information Literacy Workshop (Mandatory Course for all RSIF Scholars) held 23rd – 25th August 2022
- Participation in presentation by IMT Mines Albi-Camaux held on 6th of September 2022
- Participation in 25th RSIF Students seminar of the RSIF Students Seminar series held on 7th September 2022
- Participation in the orientation training for RSIF Cohort IV PhD Scholars (2022) held 19th-23rd September 2022
- Participation in presentation by University of Lisbon held on 25th October 2022
- Participation in the 27th Students seminar of the RSIF student seminar series held on 2nd November 2022
- Participation in 29th Guest webinar of the RSIF Guest webinar series held on 30th November 2022
- Hosted RSIF Monitoring and Evaluation Team from Kenya on 30th November 2022
- Participation in the presentation by International Partners Institute (IPI)- Rochester Institute of Technology (RIT) on 13th December 2022
- Participation in Research Led Network Formation meetin-Energy including Renewables held on 15th December 2022
- Participation in the 29th RSIF Students seminar held on 4th January, 2023
- Participation in presentation by University of Greenwich Natural Resources Institute (NRI) UK held on 17th January, 2023
- Participation in IBM Research African Nairobi presentation held on 31st January, 2023
- Participation in the 30th RSIF Students Seminar held on 1/02/2023
- Participation in the 31st RSIF Guest webinar 25/01/2023
- Participation in the 32nd RSIF Guest Webinar 22/02/2023
- Participation in the 33rd RSIF Guest Webinar 27/03/2023
- PASET Implementation/Reviewer Presentation online 28/03/2023-31/03/2023
-

4.10. OTHER ACTIVITIES

- Attended meeting of University Relations Annual Workplan Review Session with Shell/JV Professorial Chairs and CoEs 26th May 2022 (Shell RA)
- Submitted report on Formal Commitment that the NNPC/Shell JV Professorial Chair in Petroleum Engineering, Uniport is Actively Working to Justify the Tranche Payments to the University for the Running of the Shell-JV Are Adams Professorial Chair in Petroleum Engineering Within this Period of Prolonged Strike on 25th August 2022
- Attended presentation by NCDMB at the Senate Building 22nd December 2022
- Attended Academic Board meeting at IPS 22nd December 2022
- Attend COREN meeting for CCMAS 12th January 2023
- Attended Departmental CCMAS meeting 19th January 2023
- Attended CCMAS meeting at the Department 20th January 2023
- Attended PhD defence at the Department 24th January 2023
- Attended CCMAS meeting at Senate building (Council chambers) 26th January 2023
- Attended Online CCMAS meeting 31st January, 2023
- Attended Online CCMAS meeting 1st February, 2023
- Grant report for TETFUND IBR 17th February 2023

5.0 Activities to Be Carried Out in 2023 Going Forward

The Chair has planned some programmes for this year 2023. Some of the activities already engaged in are outlined below with others coming up in the near future.

5.1 Mentorship and Supervision of Post Graduate and Undergraduate Students

Mentoring and supervision are key part of human capacity development which is very important in baton change for the future of the oil and gas industry. This the Chair has continued to do. List of postgraduate (Masters and PhD) students under the mentoring and supervision are shown in Table 5.

Table 5: Some Masters and Ph. D Students Newly Assigned and under Mentorship/Titles of Supervised Research Projects

S/No	Name /matric no	Project topic	Expected time Frame to completion
1	Chukwudi Onwuaso G2018/MENG/PNG/FT/034	Optimization Framework for Economic Evaluation of a Natural Gas Distribution Infrastructure in Greater Port Harcourt City	
2	Kenneth Okwor G2018/MENG/PNG/FT/031	Economic Model for Crude Oil Price Dynamic	

		Forecast Using Machine Learning	
3	Elobe-Mbam Theophilus G2019/MENG/PNG/FT/023	Importance of Depositional Environment to History Matching-Niger Delta Case Study	
4	Ogazi Kenechukwu Henry G2019/MEM/ENG/PT/019	The Importance and Applications of Conductor Piling Using Hammers in Nigeria	
5	Chukwuocha Ifeanyi G2019/MENG/PNG/FT/008		
6	Adenike Akinyemi G2019/ MENG/PNG/FT/	Simulation and Optimization of a New LPG Recovery Plant	
7	Shaibu Mohammed G2020/PhD/ACE- CEFOR/FT/001	Local materials-based microemulsion for enhanced oil recovery in a high-salinity high-temperature reservoir	
8	Fawziyah Olufunke Olarinoye G2020/PhD/ACE- CEFOR/FT/002	Agro-waste-based Amino Acids as Kinetic Hydrate Inhibitors	
9	Chukwu Ikemefuna Ekene G2021/Ph.D/ACE- CEFOR/FT/006	Model(s) for the (Early) Prediction of Hydrate formation in Natural gas Pipelines.	
10	Mutadza Itai G2021/Ph.D/ACE- CEFOR/FT/015	Effect of Reactive Flow in Porous Media for Carbon Capture and Storage in Depleted Reservoirs	
11	Humphrey Harry G2021/Ph.D/ACE- CEFOR/FT/011	Suitability and Applicability of Microwave Spectroscopic Systems in Measurement of Oil Reservoir Rock and Fluid Properties	
12	Udoghadi Uyodhuzhiniye G2021/PhD/ACE- CEFOR/FT/013	Investigation of Green Demulsification Strategies in Upstream Flow Assurance	
13	Okon Efiog Okon G2021/PhD/ACE- CEFOR/FT/009	Gas Hydrate Inhibition Using Plant Extract	

14	OluwaTosin Adeoti Samuel-Idara G2021/PhD/ACE-CEFOR/FT/009	Improved Wax Inhibitor from Agrowaste	
15	Sanusi Sherif G2021/PHD/ACE-CEFOR/FT/004	Experimental Determination of Capillary Pressure Using Porous Plate Method	
16	AZUBUIKE, Nyeso Christian G2022/PhD/ACE-CEFOR/FT/007	Global Energy Mix and Economic Development of Different Sub-Regions in Africa.	
17	BOHR, Sorbari Edward G2022/PhD/ACE-CEFOR/FT/008	Gas Monetization Projects and Impact On Industrial Development In Africa	
18	ADJEL, Gloria G2022/PhD/ACE-CEFOR/FT/032	Adsorbents for Carbon Dioxide Capture from Calcium Based Waste Bio-Materials	
19	Omobolanle Oluwasegun Cornelious G2023/PHD/ACE-CEFOR/FT/001	Application of Machine Learning to the Estimation of Flared Volumes	
20	Thomas Odey Magu G2023/PHD/ACE-CEFOR/FT/002	Synthesis and Characterization of Catalysts and their Application in Bio-Renewable Energy	

5.2 TEACHING COMMITMENTS/MENTORING ACTIVITIES

- ✓ Invigilated CHM 240.2 Examination at Mechatronics Department 17th January 2023
- ✓ Presentation for two Masters students Chukwuocha and Adenike 26th January 2023
- ✓ Presentations for PhD student Oluwasegun and Azubuike and Two masters students Kenneth and Onwuaso Chukwudi 2nd February 2023
- ✓ Presentation with PhD and Masters Students 9th February 2023
- ✓ Prepared undergraduates for internal defense 15th February 2023
- ✓

5.3. CONFERENCE ATTENDANCE

As part of the activities of the Chair, Conferences will be attended. Abstracts were sent out last year 2022 ahead of the conferences to hold this year 2023. A number of abstracts have been accepted for presentation at NAICE, EGYPS, and ICGH 10 2023.

5.3.1 EGYPS 2023

Abstract titled Efficacy of a Locally Sourced Natural Extract for Gas Hydrate Inhibition in a Laboratory Mini Flow Loop was sent out for EGYPS 2023 and accepted for presentation at the Egypt Petroleum Show holding 13 - 15 February 2023 at the Egypt International Exhibition Center, in Cairo Egypt.

Technical Category: Offshore and Marine Production, Technology and Operations (MAR)

Abstract ID: 1330

Abstract Title:

Session Title: New Offshore Technologies Resolving Operational Challenges

Session Date: Day 2, Tuesday 14 February

Speaker Name: Virtue Urunwo Wachikwu - Elechi, Research Fellow

The conference was not attended due to financial constraints as a result of the inability of the Chair office to sponsor the conference as the available funds couldn't carry the expenses for the international travels as well as logistics involved.

5.3.2 NAICE 2023

. There will be a paper presentation at Nigerian Annual International Conference and Exhibition (NAICE) taking place in Lagos, Nigeria from July 31st through 2nd August 2023.

Abstracts submitted are listed below

1. Inhibition Effect of Brassicales Extract (BPE) On Methane Gas Hydrate Formation In Gas Dominated System Gas Hydrate Formation In Gas Dominated System Paper ID 134
2. Evaluation Of Modified Starch (PPMS) From Agro Waste as Methane Gas Hydrate Inhibitor in A High-Pressure Apparatus. Paper ID 130
3. Preliminary Assessment of the Reservoir Rock in the Niger Delta for Carbon Capture and Storage in Depleted Reservoirs. Paper ID 191
4. Suitability and Applicability of Microwave Spectroscopic Systems in Measurements of Oil Reservoir Rock and Fluid Properties. Paper ID 36

5.3.3. International Conference on Gas Hydrates (ICGH 10)

Other conferences like ICGH 10 will likely be attended as abstracts submitted were accepted for both oral and poster presentations in Singapore. The accepted papers for presentation at ICGH 10 2023 are

1. Evaluation of A Pristine Bio-Extract for Simulated Offshore Gas Hydrate Mitigation. Abstract ID 547 Accepted for Oral presentation
2. Modified Starch (PSMS) From Agro Waste as Structure I Gas Hydrate Inhibitor in A High-Pressure Apparatus. Abstract ID: 542 accepted for Poster presentation

5.4. PUBLICATIONS

The following publications have been published in reputable journals, and others are under review will be published after NAICE 2023 and ICGH 10 2023

5.4.1 PUBLISHED ARTICLE

1. Wachikwu-Elechi, Virtue Urunwo, Sunday Sunday Ikiensikimama, and Joseph Atubokiki Ajienska. 2023. "The Influence of Plant Extract on the Phase Equilibrium of Structure I Gas Hydrate in a Simulated Offshore Environment" *Thermo* 3, no. 1: 21-37. <https://doi.org/10.3390/thermo3010002>

5.4.2. PAPERS UNDER REVIEW

1. Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama** and Joseph Atubokiki Ajienska (2023). Inhibition Effect of Brassicales Extract (BPE) On Methane Gas Hydrate Formation In Gas Dominated System Gas Hydrate Formation In Gas Dominated System Paper ID 134 submitted for NAICE 2023 (Under Review)
2. Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Joseph Atubokiki Ajienska, Okon Efiong Okon and Gabriel Ndubuisi Elemuo (2023). Evaluation Of Modified Starch (PPMS) From Agro Waste as Methane Gas Hydrate Inhibitor in A High-Pressure Apparatus. Paper ID 130 submitted for NAICE 2023 (Under Review)
3. Virtue Urunwo Wachikwu-Elechi1, **Sunday Sunday Ikiensikimama**, Joseph, Atubokiki AJienka, Okon Efiong Okon and Gabriel Ndubuisi Elemuo. Evaluation of A Pristine Bio-Extract for Simulated Offshore Gas Hydrate Mitigation. Abstract ID 547 Accepted for Oral presentation at ICGH 10 2023 holding in Singapore
4. Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Okon Efiong Okon and Gabriel Ndubuisi Elemuo. Modified Starch (PSMS) From Agro Waste as Structure I Gas Hydrate Inhibitor in A High-Pressure Apparatus. Abstract ID: 542 accepted for Poster presentation at ICGH 10 2023 holding in Singapore.
5. Itai Mutadza, **Sunday Sunday Ikiensikimama**, Joel Ogbonna, Virtue Urunwo Wachikwu-Elechi and Humphrey Harry. Preliminary Assessment of the Reservoir Rock in the Niger Delta for Carbon Capture and Storage in Depleted Reservoirs. Paper ID 191 submitted for NAICE 2023 (Under Review)
6. Humphrey Harry, **Sunday Sunday Ikiensikimama**, Virtue Urunwo Wachikwu-Elechi and Itai Mutadza. Suitability and Applicability of Microwave Spectroscopic Systems in Measurements of Oil Reservoir Rock and Fluid Properties. Paper ID 36 submitted for SPE NAICE (Under Review)

5.5. PROFESSORIAL ASSESSMENT

Associate Professor Assessment for Dr. Igbinere Sunday Agbons
of University of Benin (UNIBEN)

Dec2022-February 2023

5.6. PASET ACTIVITIES

- Participation in 31st Guest webinar of the RSIF Guest webinar series held on 25th January 2023
- Participation in presentation by University of Greenwich, Natural Resources Institute (NRI), UK held on 17th January 2023
- Participation in presentation by IBM Research Africa held on 31st January 2022
- Participation in 30th Student webinar of the RSIF Students webinar series held on 1st February 2023

5.7. PATENTS

As part of mentorship, students are encouraged to research in novel areas and to patent them as a means of security. A patent has been granted in 2022 while one has been filed for and others are being compiled

5.7.1. PATENTS UNDER REVIEW/FILED

- **1. A New Approach of Controlling the Activities of Sulphate-Reducing Bacteria (SRB) in the Reservoir during Water Injection**
Otega Solomon Ogherohwo, **Sunday Sunday Ikiensikimama**, Ohimor, E.O. and Virtue Urunwo Wachikwu-Elechi

5.7.2. PATENTS UNDER COMPILATION

- **1. Plant Gums in Formulation of Gas Hydrate Inhibitors**
Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Joseph Atubokiki Ajienka and Onyewuchi Akaranta
- **2. Plant Extracts in Formulation of Gas Hydrate Inhibitors**
Virtue Urunwo Wachikwu-Elechi, **Sunday Sunday Ikiensikimama**, Joseph Atubokiki Ajienka and Onyewuchi Akaranta

5.8. OTHER ACTIVITIES OF 2023

Going forward the Chair has had approval from the Chairman of Board of Trustees who is also the Vice Chancellor of the university to carry out some activities such as:

1. Workshop on pertinent industry software
2. Students quiz competition
3. Students paper contests.

These programmes have their objectives as

- i. Enhance petroleum Engineering education in the University and beyond
- ii. Enhance the visibility of the Chair
- iii. Assist and encourage students in their academics

Plans are on-going and have been put in place for the take-off of these activities but the strike caused a hitch in this plan. Although the strike has been called off, the students are deeply engrossed in academic work, assignments, examinations and project defense so this activity is yet to take place.

5.9. Development of database for green hydrate inhibitors

This will be done by carrying out experimental runs on some naturally sourced plant materials around to see their effect on gas hydrate formation. This database will help in model and software development in the area of flow assurance. **Table 6** shows a timeline for some of the activities under this project.

Table 6: Time line for Developing Database for Green Hydrate Inhibitors

S/No.	Activities	Time Frame
1	Local sourcing of raw materials	3 Months
2	Preparation of raw materials	1 Month
3	Experimental runs to ascertain effectiveness of raw materials	2 Months
4	Experimental runs for Comparison with commercial inhibitors	2months
5	Experimental runs for blends of raw materials	2 Months
6	Experimental runs of blends for validation with commercial inhibitors	2 months
7	Cost Benefit Analysis	2 Months
8	Collation of results	1 Month
9	Result Analysis	1.5 Months
10	Report Writing	1.5 Months

5.10. Incorporating Holistic Flow Assurance Research (scales, wax, asphaltenes, corrosion, fluid pumpability, components etc.). At present research focus in flow Assurance is on gas hydrate but some students are also looking into wax. The flow assurance lab is being revamped to bring it up to standard. Some equipment needed as a way forward are shown in **Table 7**

Table 7: List of some Equipment Needed for the Flow Assurance Laboratory

S/No.	Flow Assurance Problem	Equipment Required
1	Asphaltenes	<ul style="list-style-type: none"> • Isothermal depressurization equipment for depressurization experiments • Organic solid filters (OSD) • Reservoir Fluid Particle Analyzer (RFP) • High Pressure Flocculation Trimeter • Asphaltene deposition Inhibitor tester (ADIT) • Solid Deposition Flow Loop (SDL) • Automated Asphaltene Extractor • Titration equipment for titration experiments • Particle size distribution and solid onset determination apparatus • Near Infrared Red detection systems for accurate onset determination
2	Waxes or blended water composition	<ul style="list-style-type: none"> • Cross polar microscopy (CPM) or • Differential Scanning Calorimeter (DSC) for stock tank determination of wax appearance temperature (WAT) and wax dissolution temperature. • Near-Infrared Red (NIR) or PFI equipment for live fluid WAT

		<ul style="list-style-type: none"> • High Temperature Gas Chromatography (HTGC) for identification of paraffin distribution in reservoir fluid
3	Hydrates	<ul style="list-style-type: none"> ➤ Hydrates mini flow loops (vertical and inclined) with visual display unit fully automated for ease of data collection to see the effects of elevation on rate of hydrate formation. ➤ Visual synthetic sapphires loops ➤ Rocking Cells ➤ Autoclaves ➤ Hydraeval systems ➤ Fluid Eval for HP-HT Visual studies
4.	Scales	<ul style="list-style-type: none"> ▪ Geochemical software for predicting thermodynamic onset conditions based on water chemistry ▪ Dynamic scale loops ▪ Visual Scale testers
5	Fluid Pumpability	<ul style="list-style-type: none"> ▪ Friction Flow Loop for evaluating Drag Reducing Agents (DRA loop)
6	Components	<ul style="list-style-type: none"> ▪ Flow through SDS Cells ▪ Flow Stand Stirred Pressure Vessel

5.10.1. Revamping the Drilling/Cementing Laboratory: This is very critical as this will help open up and accelerate the research in drilling, drilling fluids and cementing. Some equipment needed for this set up are shown in **Table 8**

Table 8: List of laboratory Equipment for Drilling Fluids/Cementing Laboratory

S/No.	TEST TYPE	EQUIPMENT REQUIRED
1	Fluid /Mud Density	Mud Balance
2	Mud Viscosity	Fann V-G Meter
3	Hydrogen ion Concentration (P ^H)	Hydrion P ^H Dispenser/ P ^H Meter
4	Mud Rheology Test	Variable Speed Rheometer
5	Gel Strength	Rheometer
6	Filtration, all Building and Resistivity	<ul style="list-style-type: none"> • Low- and high-pressure standard Filter Press • Vernier Caliper • Resistivity Meter
7	Solid/Liquid Content and Emulsion Characteristics	<ul style="list-style-type: none"> • Sand content set • Fann Emulsion • Electrical stability Tester
8	Differential Sticking Test	Differential sticking tester
9	Reactive solid determination	Methyl Blue
10	EP/Lubricity tests	Lubricity tester
11	Aging Test	Aging/roller oven

12	Calcite build up Test	Calcimeter
13	Drilling Mud preparation	Blenders/Mixers
14	Particle Size Analysis	Wet sieve analysis Kit
CEMENTING TESTS		
1.	Fineness Test	<ul style="list-style-type: none"> • Sieve or Blaine Air Permeability tester
2	Consistency Test	<ul style="list-style-type: none"> • Viscat Apparatus
3	Cement Setting Time (Initial and Final)	<ul style="list-style-type: none"> • Viscat Apparatus
4	Soundness Test	<ul style="list-style-type: none"> • Chatelier's Apparatus
5	Cement Strength Test/Tensile strength	<ul style="list-style-type: none"> • Compressive strength Tester • Cement- Mortar Briquette in a tensile testing machine
6	Heat of Hydration	<ul style="list-style-type: none"> • Calorimeter
7	Cement Weight	<ul style="list-style-type: none"> • Mud Balance
8	Wettability Test	<ul style="list-style-type: none"> • Wettability tester
9	Ultrasonic Cement Test	<ul style="list-style-type: none"> • Ultrasonic cement tester
10	Cement density/weight	<ul style="list-style-type: none"> • Mud Balance
11	Viscosity	<ul style="list-style-type: none"> • Rheometer
12	Fluid loss	<ul style="list-style-type: none"> • Stirring fluid loss tester • Static fluid loss tester

Thank you for the opportunity to serve.



17th February 2023

Engr. Dr. Sunday S. Ikiensikimama
Professor of Petroleum & Gas Engineering
Chair Occupant, Shell JV- Aret Adams Chair in Petroleum Engineering