Petroleum Technology Development Journal

Editor's Comment

This issue, 2014 Vol. 4 No. 1 PTDJ is the sixth issue of Petroleum Technology Development Journal (PTDJ). We have seven articles here, beginning with Dr Francis Idachaba in the paper *Remote Operations Implementation: A Tool for Improved HSE Management* where he argues that the security challenges and hazards associated with petroleum operations especially in the Nigerian Niger Delta calls for an innovative approach to managing the operations to reduce the exposure of staff to those hazards and risks without compromising the asset integrity and operations philosophy. He argues a case for "Remote Operations" which he defines as "*…the remote monitoring and control of the field based production systems from an offsite location with the aim of optimizing the entire production process."* According to Idachaba, remote operation involves the continuous collation of operational data using smart instruments, the transmission of these data using a robust and secure communication link and the integration of these data to the company's IT infrastructure comprised mainly of a data historian and production optimization tools. It provides the relevant personnel with information on the field performance and also provides an avenue for intervention while minimizing the exposure of the staff to the Health Safety and Environment (HSE) hazards associated with the fields. He demonstrates how remote operation has been shown to also reduce the Operational Expenses (OPEX) by reducing the number of field visits and the associated logistics and security costs and enhancing the field performance in terms of faster and more accurate interventions thereby enabling a better HSE management and ultimately optimizing the entire production process.

Idachaba concludes that the deployment of Remote Operations supported by robust control algorithms has the potential of minimizing the HSE exposure of personnel to hazards associated with moving and staying at remote sites as well as the ability of minimizing accidents due to human error.

Odumodu and Anor in the article *Present Day Geothermal Regime In Parts Of The Eastern Niger Delta, Nigeria* explains asserts that geothermal gradient, temperature and surface heat flow are key parameters that can portray the thermal regime of a sedimentary basin and are essential to understanding the tectono-thermal history and associated hydrocarbon potential assessment of a petroliferous basin. They present the distribution pattern of the present-day geothermal gradient, temperature variations, heat flow and isotherms using well data sourced from 71 wells. Their results show that in the eastern Niger Delta, geothermal gradient varied between 12 to 24 °C/Km with a mean of 17.6 °C/Km in the Coastal Swamp, 14 to 30 °C/Km with a mean of 19.3 °C/Km in the Central Swamp, and 14 to 26 °C/Km with a mean of 20.4 °C/Km in the Shallow Offshore. The surface heat flow ranged from 29 to 55 mWm^{-2} with a mean of 42.5 mWm^{-2}. The results show that geothermal gradients are systematically high in the eastern parts of the Coastal Swamp and Shallow Offshore, and western parts of the Central Swamp. Isotherms suggest shallow depth to the oil generative window in areas with high thermal gradients and vice versa. In summary, they conclude that factors that influence the thermal regime in the Niger Delta include tectonic evolution, depth to basement, sedimentary thickness and hydrothermal convection.

In the article *A Study of Modeling and Optimization of Jatropha Oil Biodiesel Synthesis and Its Fuel Quality Characterization,* Betiku et al explained how they employed statistical modelling approach to optimize biodiesel production from Jatropha oil. They employed response surface methodology, and the effects of four variables of reaction temperature, catalyst amount, reaction time, and methanol/oil molar ratio, and their attendant interactions were determined in the first step. They also used central composite rotatable design (CCRD) to generate a total of 30 individual experiments, which were designed to study the effects of these variables during acid-catalyzed esterification step of

Jatropha oil. The research result shows that a statistically significant quadratic model i.e. $p<0.05$, predicted the lowest acid value of the Jatropha oil to be 1.02 mgKOH g^{-1} with reaction temperature of 60°C, catalyst amount of 1.05 wt.%, and methanol/oil molar ratio of 30 with a reaction time of 60 min. For the alkali-catalyzed transesterification step, the effect of three variables (methanol/oil molar ratio, reaction time and catalyst amount) and their attendant interactions were also determined in the research. CCRD was used to generate a total of 21 individual experiments, which were designed to study the effects of these variables during alkali-catalyzed methanolysis of the pre-treated Jatropha oil. A statistically significant quadratic model ($p<0.05$) predicted the highest Jatropha Oil Biodiesel (JOB) yield to be 93.76% at reaction time of 30 min, catalyst amount of 0.56 wt.%, and methanol/oil molar ratio of 0.25. Betiku et al report that using these variables under experimental condition in four independent replicates, an actual biodiesel yield of 93.03% was achieved. They found that fuel properties of biodiesel produced were within the ASTM D6751 and DIN EN 14214 biodiesel standard specifications.

In the article "*Investigation of Sucker Rod Pumping Wells Performance using Total Well Management Software"* Said Kamel Elsayed Salem notes that the most popular artificial lift system applied is sucker rod pumping. And that Analysis of the performance of sucker rod pumping wells is needed to decrease operating costs, improve oil production and increase profit. He identifies Total Well Management (TWM) as the most widely used software for the analysis and investigation the performance of an artificially produced well. He recommends the use of the TWM version for the personal computer (PC) for its cost effectiveness. The software can be downloaded for installation and use on several numbers of PCs. He used the TWM software to evaluate the performance of sucker rod pumping wells in this paper and he presents field examples of sucker rod pumping wells analyses.

His analyses show that the producing performance (Production efficiency) is satisfactory. The analysis also shows that the effective plunger stroke was much lower. This he says could be a result of gas or unwanted contaminants entering the pump. He attributes the much lower power system efficiency for the two wells to unbalanced counter weights, undersized motors, etc. His economic analysis of the result shows that oil production cost was too high. Further study he concludes may show increase of the power system efficiency and reduction of the cost per barrel of production.

Adetoun Mustapha, et al in the paper *Improving Efficiency of Hydrocarbon Development and Production through Lean Concept* remind us that population and economy are two key factors considered in global energy demand projections and that with rapidly growing world population, energy security has become of global concern. They assert that with hydrocarbons no longer easily accessible, success in the future of oil and gas will require meeting various challenges. They also warn that it is imperative to make the most use of resources and improve operational efficiency. *Lean*, they explain is a business improvement technique with a collection of tools to eliminate ''waste'' in an operation and reduce cycle time. The paper demonstrates application of Lean methodology in hydrocarbon development and production to eliminate wastes, improve operational efficiency and bring about a culture change.

In the paper *Transesterification of Jatropha seeds oil by vegetative sponge-immobilized lipase of Alternaria sp. MGGP 06 for fatty acid methyl ester production under optimized conditions,* M. B. Osho, et al show how they produced Fatty acid methyl ester (FAME) from Jatropha seeds oil, a feedstock with high potential feedstock with relatively low cost and non-edible plant oil through transesterification using lipase catalyzed process. Vegetative sponge (*Luffa aegyptiaca)* was used to immobilize *Alternaria sp.* MGGP 06 lipase by direct incorporation of the vegetative sponge (VS) on rice bran-physic nut medium and incubated at 30 °C for 72 h. The VS-immobilized lipase was used for the production of FAME from Jatropha seeds oil. Response surface methodology (RSM) in conjunction with the Central Composite Design (CCD) was statistically used to evaluate and optimize the biodiesel production process. The optimized predicted conditions obtained at oil-to-methanol ratio of (4.38:1); enzyme concentration (30% wt); reaction temperature of 38.7 °C at 242 rpm for 24 h

yielded 87.7% wt biodiesel. Cross-linked immobilized lipase was stable repeatedly for nine times with 90% initial lipase activity. They found the fuel properties of jatropha fatty acid methyl ester so obtained to conform to the American and European standards and comparable to those of diesel.

Nkemakolam. C. Izuwa et al remind us that Gas condensate reservoirs in Niger Delta and around the world are becoming increasingly important as a result of additional liquid recovery and increasing demand for light oil and natural gas. In their research paper titled *Optimal Recovery of Condensate in Gas Condensate Reservoir through Gas Cycling*, they note that during reservoir depletion, liquid condense out of the gas as pressure drop below dew point pressure resulting in the loss of most of the condensed liquid to the reservoir. Recovery of lost condensate from gas condensate reservoirs they say requires careful reservoir analysis and technology with which to exploit the great resource. They combined technical and economic techniques in the study to select the best production strategy that optimizes recovery of condensate which could have been lost in the reservoir. In the technical aspect design expert, fluid characterization and compositional simulation were integrated to develop a model which predicts total field production of condensate. They used Net-present-value (NPV) in economic evaluation to optimize the profit from the different production strategies used.

PTDF and PTDJ continue to be leading major advancement in petroleum technology development in Africa. We remain grateful to researchers who continue to send us their papers for publication. Also, we acknowledge the invaluable contributions of our anonymous external assessors and technical advisers.

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