

**MARGINAL OILFIELD OPERATORS IN NIGERIA (MOON) AND
THE CHALLENGES OF ENVIRONMENTAL MANAGEMENT**

BY

I. R. UDOTONG*¹ AND J. I. R. UDOTONG²

- 1. UNIVERSITY OF UYO CONSULTANCY LTD; ROOM 215, ASUU ROCK BUILDING,
UNIVERSITY OF UYO, P.M.B. 1017, UYO, AKWA IBOM STATE, NIGERIA**
- 2. DEPT OF BIOCHEMISTRY, FACULTY OF BASIC MEDICAL SCIENCES, UNIVERSITY
OF UYO, P.M.B. 1017, UYO, AKWA IBOM STATE, NIGERIA**

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I. R. UDOTONG*¹ AND J. I. R. UDOTONG²

1. DEPT OF MICROBIOLOGY, UNIVERSITY OF UYO, P.M.B. 1017, UYO, AKWA IBOM STATE, NIGERIA

2. DEPT OF BIOCHEMISTRY, FACULTY OF BASIC MEDICAL SCIENCES, UNIVERSITY OF UYO, P.M.B. 1017, UYO, AKWA IBOM STATE, NIGERIA

ABSTRACT

There are inherent difficulties in arriving at an acceptable or universal definition of marginal oilfield, for the simple reason that technical and economic factors as well as time play a role in determining whether or indeed when an oilfield is considered marginal. The term "marginal oilfield" conveys different meaning to different people. In this paper, six (6) different definitions of marginal oilfield have been presented.

A number of issues, some of which include appropriate technology, tax/fiscal regime and production quota restriction, had limited the involvement of indigenous Oil & Gas companies in Nigeria in the upstream sector of the oil industry, which is exclusively dominated by the international oil companies (IOCs). One major issue that has not been considered is the environmental sustainability of their operations. Although it has been known that Oil & gas exploration and production (E&P) development activities, with all its attendant benefits, can be carried out safely with minimum adverse environmental impact (impact that is as low as reasonably practicable, ALARP), only through strong company commitment to environmental management, experiences also show that impacts of E&P activities can be devastating, if not properly managed.

This paper surveys the Health, Safety and Environment Management System (HSE-MS) in some Marginal Oilfields Operators in Nigeria (MOON) through the use of detailed structured questionnaire and interviews as well as review of the Draft Final EIA Report of their proposed projects. Seven key elements of the HSE-MS were surveyed. The overall objective of this paper is to identify the environmental management competence / capabilities of the MOON that are involved in the upstream sector of the Nigerian Oil industry as well as proffer a way forward.

Our surveys show that the indigenous Oil & Gas Companies who are the MOON are currently facing stiff challenges of environmental management. In an effort for them to cut cost and thus ensure profitability / economic sustainability of E&P activities in their marginal oilfields, they adopt ad-hoc approaches to environmental issues. As in any other oilfield operation, marginal oilfield E&P operations involve a variety of relationships, from the indigenous company and contractor/service providers partnerships, and joint venture or technical/financial partnership to dealing with other stakeholders like government/regulatory agencies and the public. This, coupled with the numerous, complex, inter-connected and dynamic/continuously-evolving nature of environmental issues in the oil industry, ad-hoc approaches to solving environmental problems are no longer considered effective. A systematic approach using a generic Health, Safety and Environment Management System (HSE-MS) with seven (7) key elements has been universally adopted by E&P Forum to manage HSE issues in oil &

gas industry (including personnel, contractors and service providers who support operations in marginal oilfields).

The starting point in the evolution of effective HSE-MS is usually a review of existing regulations and technologies/practices which must be initiated by highest level management to ensure top management commitment. This initial top management commitment and demonstration to continual improvement in environmental performance which would have translated into provision of necessary resources to develop, operate and maintain the HSE-MS is lacking in the MOON. It is necessary that, from the beginning of field activities, the roles, responsibilities, authorities and relationships necessary to implement effective HSE-MS are clearly defined, documented and communicated to all concerned by MOON. This requires appropriate and adequate training and periodic review of staff, contractor/service providers and third parties of MOON. Emphasis should be placed on individual responsibility for environmental performance, summary of relevant legislative requirements, detailed operating procedures and work instructions for key activities and tasks, emergency plans and means of responding to incidents. Although the MOON surveyed conformed to the EIA requirements, they do this largely as a regulatory hurdle; not as a potent tool of evaluating and managing risks in marginal field operations. This was evident by the gaps that existed in the EIA Reports.

This paper highlights the inherent challenges of environmental management in the operations of marginal oilfields in Nigeria and proffers a way forward to environmental sustainability in the operations of marginal oilfields in Nigeria through effective HSE-MS. As a requirement for EIA approval, regulators should demand that the MOON should demonstrate a level of environmental management competence by presenting the environmental management tools / requirements. Regulators should also monitor MOON more closely through regular impact mitigation monitoring (IMM) visits to ensure integration of proffered mitigation measures of the HSE issues into the project design as well as ensure proper environmental plans and procedures, monitoring and compliance programmes. This paper advocates strategic partnering of the MOON with the IOCs for effective environmental management of marginal oilfields in Nigeria.

*** CORRESPONDING AUTHOR'S CURRENT ADDRESS:**

University of Uyo Consultancy ltd; Room 215, ASUU Rock Building, University of Uyo, P.M.B. 1017, Uyo, Akwa Ibom State, Nigeria

E-mail address: ime.udotong@usicltd.com

1.0 INTRODUCTION

1.1 Background Information

Nigeria currently produces about 2.0 million barrels of crude oil per day (2mmbopd). This accounts for about 90% of total government revenue or about 20% of the gross domestic product (GDP)¹. With this high dependence of our economy on oil and at this production rate, Nigeria's current oil reserve is estimated to be exhausted in the next 35 years. It is therefore understandable that the oil & gas producing capabilities of a country like ours are exploited fully and in the most effective and economic manner.

Oil & gas exploration and production (E&P) activities are capital intensive by nature and are therefore carried out exclusively by International Oil Companies (IOCs) that have built up the requisite technical, managerial (including HSE management) and financial capabilities. The IOCs therefore dominate the upstream sector of the Nigerian Oil & Gas industry. With the deliberate policy to increase daily oil production capacity, to maximally exploit her hydrocarbon reserves and to increase indigenous participation in the upstream sector, the Nigerian government had to embark on the programme of unlocking and maximizing the potentials of abandoned oilfields otherwise called marginal oilfields.

1.2 Definitions of Marginal Oilfields

There are inherent difficulties in arriving at an acceptable or universal definition of marginal oilfield, for the simple reason that technical and economic factors as well as time play a role in determining whether or indeed when an oilfield is considered marginal. The term "marginal oilfield" conveys different meaning to different people². In this paper, six (6) different definitions of marginal oilfield have been presented.

- i. Oilfields are generally considered marginal to underscore their limited profitability. They have remained undeveloped within otherwise active blocks or in few cases dormant blocks for one or more of the following reasons:
 - a. Non-profitability of the field in question due to unfavourable price of crude oil or the size of the field or both,
 - b. Distance from existing facilities or locations in difficult terrain, and
 - c. Portfolio rationalization of the companies.
- ii. Marginal Oilfields are those considered by IOCs as oilfields not holding much reserves, and thus are not worth developing. They also include oilfields whose locations make them not profitable, due to high costs associated with such locations. However, the IOCs on their part maintain that there are no marginal fields within their existing concessions and that the reason for the existences of some undeveloped fields in their concession is based on two reasons:
 - a. Production quota allocation for Nigeria by the organisation of Petroleum Exporting Countries (OPEC). They state that their production is restrained by the quota allocated to each company out of the total level of production allocated to Nigeria. Thus, it is not economically reasonable to develop fully a field that cannot be put to immediate commercial production.
 - b. That government's inability to promptly meet its cash call obligations under the joint ventures seriously inhibits the development of these fields. That the delay in

remitting the governments own share of funds for executing the agreed work programme has led to the slow down and in some cases termination of oil exploration and development activities.

iii. According to Agoro², a producer would regard oil and gas field as being marginal on two grounds (both subjective):

a. economic: where the revenue generated from a field is (in the producers opinion) insufficient to justify continued or further investigation in that field, whether in its own right or in comparison to other fields which the producer has interests in as part of a wider production portfolio;

b. strategic: where the field no longer fits into the producer's strategic aspirations; it may be that the field is performing adequately in economic terms, but the producer wishes to divest its interests because the field does not fit with the producer's commercial strategy (for example in the light of the decision of a producer to discontinue operations within a particular country or region).

iv. Another commentator³ defines a field which due to prevailing geologic, geographic, economic and technological constraints may not be considered to be cost effective for development by its owners, but the development of which may be profitable under different or changed set of circumstances.

v. The Petroleum (Amendment) Decree No 23 of 1996 defines a marginal field as such field which the Head of State and Commander-in-Chief of the Armed Forces of Nigeria may from time to time, identify as a marginal field. This can hardly be regarded as a definition. Furthermore there were serious implications attached to this form of definition – that of the arbitrary classification of fields as marginal.

vi. The Department of Petroleum Resources (DPR)⁴, in an attempt to restrict the arbitrary classification of oilfields as marginal, issued guidelines enumerating the features, which must exist before an oilfield can be classified as marginal. They are as follows:

- a. Low stock tank oil initially in place (STOIIP) and therefore low reserves.
- b. Long distance from existing production facilities thereby making them uneconomically viable to put upstream.
3. Fields with crude characteristics that are different from current streams (such as crude with very high viscosity and low API gravity) which cannot be produced through conventional methods.
4. Fields not yet considered for development because of marginal economics under current market and fiscal conditions.
5. Field with one or more wells which have not been developed by the operating companies as a consequence of the company's ranking including unappraised discoveries and undiscovered fields, but excluding fields with high gas and low oil reserves.
6. Producing fields, which have become uneconomical when close to or passed abandonment limits.⁹

Government sources confirmed that there are 183 Marginal oilfields in Nigeria, and are estimated to contain a total of about 2.3 billion barrels of stock tank oil initially in place (STOIP). In December 1999, the Nigerian Government finally identified about 116 Marginal Oilfields which holds an estimated total of about 1.3 billion barrels of STOIP, all located within the Niger Delta. In September 2001, 24 Marginal Oilfields were advertised and farmed-out to indigenous Oil & Gas companies in Nigeria.

1.3 Problems of Involvement of Indigenous Oil Companies in Marginal Oilfield Development

A number of issues had limited the involvement of indigenous Oil & Gas companies in Nigeria in the upstream sector of the oil & gas industry. Some of these include the following:

a. Technology

Using conventional primary recovery equipments and methods, a considerable amount of oil is usually retained in the ground even after being subjected to many years of primary oil recovery. In order to recover a significant amount of the retained oil, special/unconventional equipment and technology (e.g. thermal injection equipment) is required. Since these equipments are special/unconventional and not readily accessible in the oil industry, they are considerably more expensive, with the result that the cost of recovery (operational cost) may be so high as to render the venture unprofitable.

b. Tax

The current fiscal regime² offering a reduction of only 19.25% in petroleum profit tax to MOON is so unattractive. This reduction does not adequately reflect the fact that marginal oilfield operations require the use of special/unconventional equipment /technology, which by nature are more expensive.

c. Quota Restriction

The daily oil production quota imposed by OPEC on Nigeria and subsequently on the IOCs as well as the MOON may be too small for the MOON to generate any significant profit.

1.4 One Problem of Marginal Oilfield Development not considered

One major issue / problem of marginal oilfield development by MOON that has not been considered is the environmental sustainability of the operations of the MOON. From the definitions of marginal oilfields presented, the overwhelming element has been the economic/profitability considerations, with no consideration given to environmental sustainability. Although it has been known that Oil & gas exploration and production (E&P) development activities, with all its attendant benefits, can be carried out safely with minimum adverse environmental impact (impact that is as low as reasonably practicable, ALARP), only through strong company commitment to environmental management, experiences also show that impacts of E&P activities can be devastating, if not properly managed. The indigenous Oil & Gas Companies who are the Marginal Oilfields Operators in Nigeria (MOON) are currently facing stiff challenges of environmental management. In an effort for the MOON to cut cost and thus ensure profitability / economic sustainability of E&P activities in their marginal oilfields, they adopt ad-hoc approaches to environmental issues as against a systematic approach using a generic Health, Safety and Environment Management System (HSE-MS) with seven (7) key elements that has been universally adopted by

the E&P Forum to manage HSE issues in oil & gas industry (including personnel, contractors and service providers who support operations in marginal oilfields).

1.5 Aims & Objectives of this Paper

This paper surveys the Health, Safety and Environment Management System (HSE-MS) in some Marginal Oilfields Operators in Nigeria (MOON) and highlights the inherent challenges of environmental management in the operation of marginal oilfields in Nigeria. As a requirement for approval, regulators should demand that the MOON should demonstrate a level of environmental management competence by presenting the environmental management tools/requirements. This paper advocates strategic partnering of the MOON with the IOCs for effective environmental management of marginal oilfields in Nigeria.

2.0 RESEARCH METHODOLOGY

2.1 MOON Surveyed

HSE-MS in three MOON were surveyed with a view to determining existing gaps in their HSE-MS while identifying the environmental management competence / capabilities of the MOON that are involved in the upstream sector of the Nigerian Oil industry.

2.2 Survey Methodology

HSE-MS in three MOON were surveyed through the use of:

- i. structured questionnaire,
- ii. interview of line / HSE Managers, and
- iii. review of the Draft Final EIA Report of their proposed Field Development Plans (FDP)⁵⁻⁷.

2.3 Key Elements of HSE-MS Surveyed

The following elements of the HSE-MS in the three MOON were surveyed:

- i. Top management involvement and commitment to environmental issues,
- ii. HSE Policies and strategic objectives,
- iii. Organization, Resources and Documentation,
- iv. Environmental Evaluation and Risk Assessment,
- v. Environmental Planning,
- vi. Implementation and Monitoring, and
- vii. Auditing and Review for improved environmental performance.

3.0 FIELD OBSERVATIONS AND DISCUSSIONS

3.1 General

It was generally observed that the three indigenous Oil & Gas Companies surveyed were currently facing stiff challenges of environmental management during their operations.

3.2 Top management involvement and commitment to environmental issues

The most common starting point in the evolution of effective HSE-MS is usually a review of existing regulations and technologies/practices which must be initiated by highest level management to ensure top management commitment. Top management in some of the MOON surveyed do not have a list of regulatory requirements that

must be fulfilled prior to full field development. This initial top management commitment and demonstration to continual improvement in environmental performance which would have translated into provision of necessary resources to develop, operate and maintain the HSE-MS was found to be lacking in the MOON. Specifically, written HSE policies were not signed. Apart from one, all other MOON did not have any personnel with written responsibility to coordinate HSE-MS issues.

3.3 HSE Policies and strategic objectives

In an effective HSE-MS, HSE objectives/goals and targets are set and where necessary, agreed with regulators and other stakeholders and should be regularly reviewed in line with changing environmental regulations. Also, the objectives/goals should contain both short-term and long-term goals/objectives with due consideration to financial realities. Moreover, under effective HSE-MS, a company should commit itself to meet or exceed all relevant regulatory and legislative requirements, and to apply responsible standards where laws and regulations do not exist. It is important to note that realistic and achievable HSE objectives/goals were not set by any of the MOON surveyed, talkless of reviewing the objectives regularly.

3.4 Organization, Resources and Documentation

One key element of the HSE-MS is the organizational structure and allocation of resources. It acknowledges that environmental management is a line responsibility. It is necessary that, from the beginning of field activities, the roles, responsibilities, authorities and relationships necessary to implement effective HSE-MS are clearly defined, documented and communicated to all concerned by MOON. This requires appropriate and adequate training and periodic review of staff, contractor/service providers and third parties of MOON. Emphasis should be placed on individual responsibility for environmental performance, summary of relevant legislative requirements, detailed operating procedures and work instructions for key activities and tasks, emergency plans and means of responding to incidents. In all MOON surveyed, proper organization with equitable allocation of authority and resources to handle HSE issues and effective documentation were lacking. Operational procedures like waste management plan, hazardous materials handling and disposal plans, emergency response/preparedness plans, etc were not available in any of the MOON surveyed.

3.5 Environmental Evaluation and Risk Assessment

One of the basic methods to assess the impacts of the activities of MOON is an environmental impact assessment (EIA). The EIA process has become formalized over time that its full value as a potent environmental management and risk assessment tool is hardly appreciated by MOON. More importantly, its value as a valuable tool is only realized if it is undertaken early in the project cycle. Although the MOON surveyed conformed to the EIA requirements, they do this largely as a regulatory hurdle; not as a potent tool of evaluating and managing risks in their marginal field operations. This was evident by the fact that the EIA process started late and civil works / construction of access roads almost commenced while EIA process is not concluded and the gaps that existed in their Draft Final EIA Reports reviewed.

Correct description of project and hazard identification as well as identification (magnitude and probability) of consequences is necessary for effective risk evaluation and management. It is important to note that all the MOON surveyed lacked proper

project description. In all cases, generic information concerning 3D seismic data as well as oil well locations/profile are still given.

3.6 Environmental Planning

One key element of HSE-MS is environmental planning and below are some of the environmental planning principles that will be necessary for MOON to adopt for effective HSE-MS:

- i. Preparation of environmental profile
- ii. Preparation of EIA Report
- iii. Risk evaluation
- iv. Integration of environmental issues with project design
- v. Formulation of compliance programme
- vi. Establishment of monitoring programme
- vii. Specifying contractor obligations.

Apart from preparing EIA report and specification of contractor obligations, the rest of the other environmental planning principles were not obviously noticed among the MOON surveyed.

3.7 Implementation and Monitoring

HSE-MS implementation responsibility in MOON rests with the line (HSE) Manager who should therefore ensure that he understands and subscribe to the commitment made. These commitments will include legal and statutory controls imposed on the operation as well as other corporate commitment to responsible environmental management. Where the MOON do not have a line (HSE) Manager, this key element of the HSE-MS will suffer. This was the case encountered in two of the three MOON surveyed.

Monitoring as a key element of the HSE-MS confirms that commitments are being met: amounts and concentration of discharges, etc are within statutory limits. Two major aims of monitoring are to:

- i. Ensure that results/conditions are as forecast during the planning stage, and where different, to determine the cause and implement action to remedy the situation; and
- ii. Verify the evaluations made during the planning process, in particular during risk assessment and EIA, and to measure operational efficiency.

Objectives of monitoring include to verify effectiveness of planning decisions, measure effectiveness of operational procedures, confirm statutory and corporate compliance and identify unexpected changes. All the MOON surveyed were at the planning stage.

3.8 Audit and Review for improved environmental performance

Audit and review is basically a management tool. While audit serves to substantiate and verify monitoring programmes and compliance, and to ensure that site environmental plans, procedures and standards are both effective and fit for the purpose, review ensures that environmental performance is improved with time. Again, all the MOON surveyed were at the planning stage.

4.0 CONCLUSION

This paper clearly shows that MOON are facing some inherent challenges of environmental management in the operations of their marginal oilfields in Nigeria. The paper proffers a way forward to environmental sustainability in the operations of marginal oilfields in Nigeria through effective HSE-MS using the seven key elements of:

- i. Top management involvement and commitment to environmental issues,
- ii. HSE Policies and strategic objectives,
- iii. Organization, Resources and Documentation,
- iv. Environmental Evaluation and Risk Assessment,
- v. Environmental Planning,
- vi. Implementation and Monitoring, and
- vii. Auditing and Review for improved environmental performance.

It is important that prospective marginal oilfield operators should be required to demonstrate a level of environmental management competence by presenting the company's HSE policies and strategic objectives for oilfield development plan (FDP) as well as environmental management tools / requirements during the oil block bidding process before a marginal oilfield is farmed-out to them. Moreover, as a requirement for EIA approval, regulators should also demand that the MOON should demonstrate a level of environmental management competence by presenting the environmental management tools / requirements. Regulators should also monitor MOON more closely through regular impact mitigation monitoring (IMM) visits to ensure integration of proffered mitigation measures of the HSE issues into the project design as well as ensure proper environmental plans and procedures, monitoring and compliance programmes. There is the need for MOON to strategically partner with the IOCs for effective environmental management of their marginal oilfields.

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