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Life Cycle Assessment of Activities, Products and Services is a Priority for Achieving Sustainable Oil and Gas Company

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Life Cycle Assessment of Activities, Products and Services is a Priority for Achieving Sustainable Oil and Gas Company

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Abstract

Oil and gas business is a strategic activity that has the potential impact to the environment. Life cycle assessment (LCA) should be carried out to save the environment. The LCA analysis therefore includes the entire life cycle of the product, process or activity. It also allows for the extraction and processing of raw materials, production, transport and distribution, use, maintenance, and end of life.

The discussion of the importance of conducting LCA of the activities, products and services of the organization as indicated in ISO standards on Environmental Management System ISO 14001: 2015 and Occupational Health & Safety Management System ISO 45001: 2018.

Stages of oil and gas activities from upstream to downstream will be conducted LCA in order to achieve intended outcome that enhanced environmental performance and fulfillment of compliance obligations in implementation of both ISO Standard above.

In order to achieve expected the outcome, the integration of ISO 14001: 2015 and ISO 45001: 2018 into Operational Excellence Management System (OEMS), by using ISO high level structures (context the organization, leadership, planning, support, operation, performance evaluation and improvement) is expected to be achieved reliability operation of oil and gas sustainably.

In the implementation of OEMS must be supported by facilities improvement, reliable management system based on risk assessment and human behavior based on human characteristic and culture.

The important factor in implementation of Operational Excellence Management System are corporate-wide commitment with a high level of management involvement and ownership, direction is "top-down" and detailed implementation, execution, and improvement is "bottom-up".

The Environmental, Occupational Safety and Health Policy should reflect the commitment of Top Management supported by all the workers involved. Manual, standard operation procedure and work permit forms are integrated between operational procedures and environmental, occupational safety and health procedures.

How operational excellence management system can work effectively, it can be done with five steps, namely: 1) Identify what we are doing (to determine scope & objective); 2) Identify who does what (Accountable resources); 3) Identify how it is done (Procedures, guides, checklist); 4) Determine how well we are doing it (Verification & Measurement); and 5) Improve with experience (Feedback Mechanism).

By applying operational excellence management system, is expected to be achieved towards environmentally sound oil and gas activities. LCA of activities, products and services is a priority for achieving sustainable oil and gas company.

Key words: Life Cycle Assessment; Oil & Gas Business; Sustainable Development

Introduction.

In 2015, the new ISO 14001 international standard concerning the implementation process of environmental management systems (EMSs) was announced, replacing ISO 14001: 2004, become ISO 14001:2015 Environmental Management Systems. One of the main changes in the revised version is life cycle perspective. Life cycle perspective requires organisations to control or influence the way their activities are prepare and execution, products and services are designed, manufactures, distributed, consumed, and end-of-life treated as to prevent environmental impacts from being shifted within the life cycle.

10 major areas of impact of the EMS ISO 14001:2015 revision:

1) Expansion in EMS coverage and scope
2) Required interactions with external parties
3) New requirements for leadership engagement
4) Expanded legal compliance requirements
5) Need for risk-based planning and controls
6) New documentation requirements
7) Expanded operational control requirements
8) Changes in competence and awareness requirements
9) Impacts on the internal audit program
10) Increased certification costs.

Sustainable oil and gas activities can be achieved through the implementation of Life Cycle Assessment of activities, products and services at each stage of oil and gas activities:

1) upstream;
2) midstream; and
3) downstream.

In this discussion, implementation of Life Cycle Assessment will focus on upstream oil and gas business activities, which starts from activities:
1) pre bid working area up to acquire concession activities;
2) exploration and appraisal up to prove commercial hydrocarbon;
3) development up to start production;
4) operation up to end production; and
5) decommissioning up to restoration.
Sustainability oil and gas business consists three aspect of sustainable development: environmental aspect, economic aspect and social aspect.

Problem Statement

The problems that will be discussed in this case is how oil and gas company develop New Operation Excellence Management System (NOEMS) thru three ways:

1) Carry out Life Cycle Assessment (LCA) of oil and gas activities, products and services as a priority;

2) Implementing ISO 14001:2015 Standarad; and

3) Integrate the High Level Structures (HLS) of ISO 14001:2015 to Operational Management System become New Operations Excellence Management System (NOEMS) to achieve sustainable oil and gas company.

ISO 14040:2006 describes the principles and framework for life cycle assessment (LCA) including definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements.

The ISO 14001 standard does not recommend a single method for determining environmental aspects considering life cycle perspective, however, it obligates organizations to take into account “the inputs and outputs that are associated with its current and relevant past activities, products and services; planned or new developments; and new or modified activities, products and services”

Methodology

Lesson learn to establish the new Standard System of New OEMS (NOEMS), start from LCA.

1. Life Cycle Assessment, Methodology and Framework.
   a. Goal and scope definition
   b. Life cycle inventory analysis
   c. Life cycle impact assessment
   d. Life cycle interpretation

2. Implementation of EMS ISO 14001:2015

3. Adoption Best Practices of Operational Excellence Management System (OEMS) of International Oil Companies:
   a. Chevron
   b. ExxonMobil

4. Establish New OEMS (NOEMS)
   a. Using HLS of ISO 14001:2015
   b. Integrate OEMS (and OIMS) of International Oil Companies (Chevron and Exxon) into NOEMS

Results and Analysis

1. Implementation of LCA.
   Implementation of LCA is carried out in the following Upstream Oil and Gas activities, product and service:
   a. Exploration Phase
      Start from Exploration and appraisal up to prove commercial hydrocarbon:
      1) Seismic
      2) Exploration Drilling
   b. Development Phase
      Start from Development up to start production:
      1) Exploitation Drilling
      2) Construction.

c. Oparation Phase
Start from operation up to end production:
1) Production
2) Maintenance
3) Transportation

d. Abandonment & Site Restoration
Start from decommissioning up to site restoration:
1) Abandonment
2) Site Closure & Remediation

2. Implementation High Level Structure (HLS) of ISO 14001:2015 to the New OEMS (NOEMS):
1) Scope
2) Normative references
3) Terms and definitions
4) Context of the organization
5) Leadership
(a) Leadership and Commitment
(b) Environmental Policy
(c) Organizational Roles, Responsibilities and Authorities
6) Planning
(a) Actions to Address Risks and Opportunities
(b) Environmental Objectives & Planning to Achieve Them
7) Support
(a) Resources
(b) Competence
(c) Awareness
(d) Communication
(e) Documented Information
8) Operations
(a) Operational Planning and Control
(b) Emergency Preparedness & Response
9) Performance Operations
(a) Monitoring, Measurement, Analysis and Evaluation
(b) Internal Audit
(c) Management Review
10) Improvement
(a) General
(b) Nonconformity and Corrective Action
(c) Continual Improvement

3. Adopted Element of System Operational Excellence Management System of International Oil Companies:
a. OEMS of Chevron (12 Elements)
1) Element 1: Security of Personnel and Assets.
2) Element 2: Facilities Design and Construction
3) Element 3: Safe Operations
4) Element 4: Management of Change
5) Element 5: Reliability and Efficiency
6) Element 6: Third Party Services
7) Element 7: Environmental Stewardship
8) Element 8: Product Stewardship
9) Element 9: Incident Investigation
10) Element 10: Community Awareness and Outreach
11) Element 11: Emergency Management
12) Element 12: Compliance Assurance.

b) OIMS of ExxonMobil (11 Elements).
1) Element 1: Management Leadership, Commitment and Accountability
2) Element 2: Risk Assessment and Management
3) Element 3: Facilities Design and Construction
4) Element 4: Information/ Documentation
5) Element 5: Personnel and Training
6) Element 6: Operations and Maintenance

7) Element 7: Management of Change
8) Element 8: Third-Party Services
9) Element 9: Incident Investigation and Analysis
10) Element 10: Community Awareness and Emergency Preparedness.
11) Element 11: Operations Integrity Assessment and Improvement

Discussion

To establish the New OEMS (NOEMS), need to integrate of three elements: 1) EMS ISO 14001:2015 Elements; 2) Chevron OEMS Elements; 3) ExxonMobil OIMS Elements, to become New OEMS (NOEMS) Elements.

The New OEMS (NOEMS) Elements, as shown in Table 1: Establishing Element of New OEMS (NOEMS).

Table 1: Establishing Elements of New OEMS (NOEMS)

No.	ISO 14001:2015 ELEMENTS	CHEVRON OEMS ELEMENTS	EXXONMOBIL OIMS ELEMENTS
(1)	(2)	(3)	(4)
1.	**Leadership** a. Leadership and Commitment b. Environmental Policy c. Organizational Roles, Responsibilities & Authorities	**Leadership** 1. Security of Personnel and Assets (1) 2. Environmental Stewardship (7)	**Leadership** 1. Management Leadership, Commitment and Accountability (1)
2.	**Planning** a. Actions to Address Risks and Opportunities b. Environmental Objectives & Planning to Achieve Them	**Planning** 3. Facilities Design and Construction (2) 4. Management of Change (4)	**Planning** 2 Risk Assessment and Management (2) 3 Facilities Design & Construction (3)
3.	**Support** a. Resources b. Competence c. Awareness d. Communication e. Documented Information	**Support** 5. Third Party Services (6) 6. Community and Stakeholder Engagement (10) 7. Legislative and Regulatory Advocacy (13)	**Support** 4 Information/Documentation (4) 5 Personnel and Training (5) 6 Third-Party Services (8)
4.	**Operations** a. Operational Planning and Control b. Emergency Preparedness & Response	**Operations** 8. Safe Operations (3) 9. Product Stewardship (8) 10. Incident Investigation (9) 11. Emergency Management (11)	**Operations** 7. Operations and Maintenance (6) 8. Management of Change (7) 9. Community Awareness and Emergency Preparedness (10) 10. Incident Investigation and Analysis (9)
5.	**Performance Evaluation** a. Monitoring, Measurement, Analysis and Evaluation b. Internal Audit c. Management Review	**Performance Operations** 12. Reliability and Efficiency (5) 13. Compliance Assurance (12)	**Performance Operations** 11.Operations Integrity Assessment and Improvement (11)

From the results obtained in Table 1, there were additional 5 (five) operational elements (HLS Planning & Operations) that entered the Element New OEMS (NOEMS), namely:

1. **Engineering Design, Construction & Project Management** (Planning)
2. **Environmental Protection & Sustainability** (Operations)
3. **Management of Change** (Operations)
4. **Contractor Service** (Operations)
5. **Community Awareness (Operations)**

Thus, the results obtained as many as 12 elements as Elements of New OEMS (NOEMS) that will be applied are as follows:

1. Management Policy, Leadership, Commitment & Accountability
2. Risk Management & HSSE Objectives
3. Engineering Design, Construction & Project Management
4. Communication, Information & Documented Information
5. Personnel Resources, Awareness & Competence
6. Operation & Maintenance
7. Environmental Protection & Sustainability
8. Management of Change
9. Contractor Service
10. Incident Reporting, Investigation & Analysis
11. Community Awareness & Emergency Preparedness
12. Operational Excellence Performance Management
13. Continual Improvement

The four reasons tips to make effective Implementation New OEMS (NOEMS):

1. In the implementation of New OEMS (NOEMS) must be supported by facilities integrity improvement, reliable management system based on risk assessment and human behaviour based on human characteristic and culture.
2. The important factor in implementation of Operational Excellence Management System are corporate-wide commitment with a high level of management involvement and ownership, direction is “top-down” and detailed implementation, execution, and improvement is “bottom-up”.
3. The Environmental, Occupational Safety and Health Policy should reflect the commitment of Top Management supported by all the workers involved.
4. Manual, standard operation procedure and work permit forms are integrated between operational procedures and environmental, occupational safety and health procedures.

How New OEMS (NOEMS) Can Work Effectively

How operational excellence management system can work effectively, it can be done thru five steps:
1) Identify what we are doing (to determine scope & objective);
2) Identify who does what (Accountable & Responsible resources);
3) Identify how it is done (Procedures, guides, checklist);
4) Determine how well we are doing it (Verification & Measurement); and
5) Improve with experience (Feedback Mechanism.

Conclusions and recommendations

Thinking carefully about the life cycle (LCA) stages that can be controlled or influenced by the organization will reduce impact to the environment and improve company performance.

To reach operational excellence as a sustainable oil and gas company, it is necessary to implement EMS ISO 14001: 2015 which is integrated with Operations Management, by considering the application of accountable party and responsible party for compliance efforts supported by top management.

How operational excellence management system can work effectively, it can be done thru five steps: 1) Identify what we are doing; 2) Identify who does what; 3) Identify how it is done; 4) Determine how well we are doing it; and 5) Improve with experience.

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Attachments

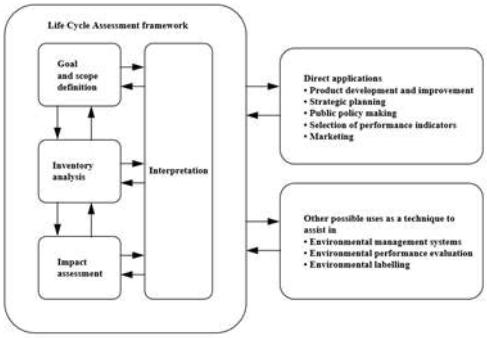
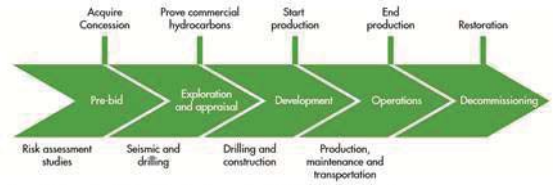


Figure 1. The LCA methodology and framework (Source: ISO 14040:1997)

Figure 2.1 – Oil and gas E&P project cycle



Source: EBI, Integrating Biodiversity into Environmental and Social Impact Assessment Processes.

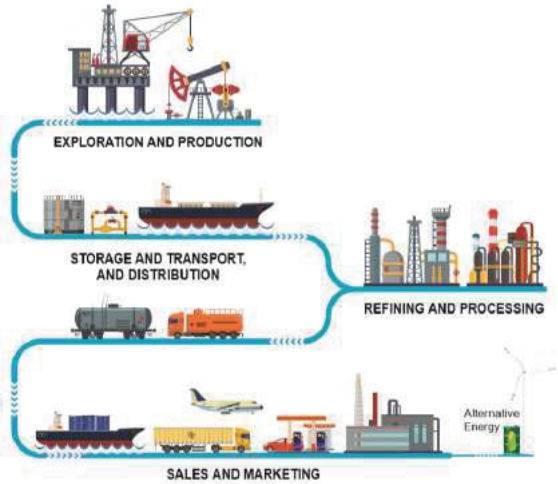


Figure 2.2 - oil and gas activities: 1) upstream; 2) midstream; and 3) downstream.

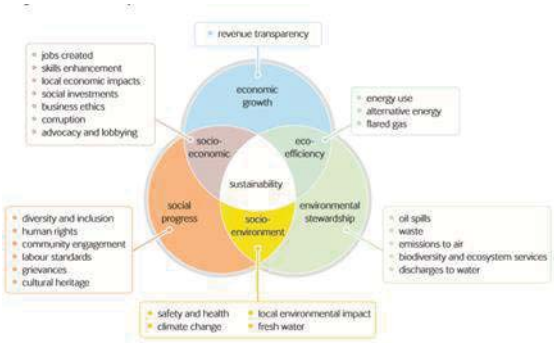


Figure 3: Sustainability Management System (IPIECA, 2015)

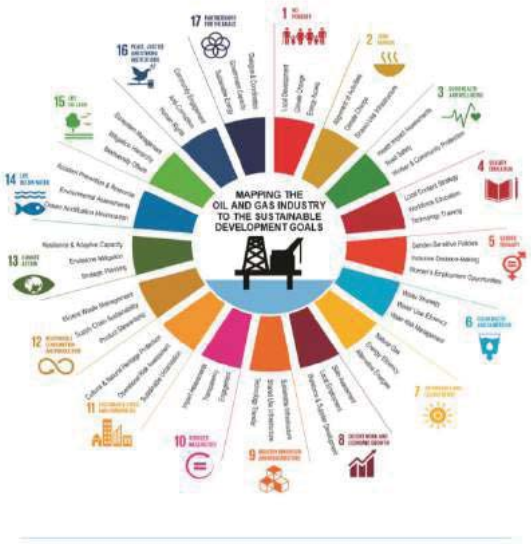


Figure 4: UNDP, IFC, IPIECA; 2018