Development of NORM Management Strategy for Oil & Gas Industry

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NORM is an unwanted by-product of oil & gas production
We could detect NORM
So we could manage NORM
In the beginning……

- All efforts focused on monitoring
- No storage facilities for waste & equipment
- No NORM decontamination available
- No available disposal route for NORM
- No NORM Standard/Procedure
Our reaction was

- Review Applicable Standards & Guidance
  - Not user friendly
  - Did not provide guidance
  - Inconsistencies
  - Not readily helpful
We developed a process cycle.
We required to detail the core components to enable management of NORM.

A strategy was required to deliver the process cycle objectives:

- Prioritize Tasks
- Manage Resources
- Develop Guidance
Action Level

Indication of double background level = NORM contaminated

Isotope Specific Exemption Levels

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Exemption Level (Bq/g)</th>
<th>Exemption Level (pCi/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ra-226</td>
<td>1.1</td>
<td>30</td>
</tr>
<tr>
<td>Ra-228</td>
<td>1.1</td>
<td>30</td>
</tr>
<tr>
<td>Pb-210</td>
<td>0.2</td>
<td>5</td>
</tr>
<tr>
<td>Po-210</td>
<td>0.2</td>
<td>5</td>
</tr>
<tr>
<td>U-238</td>
<td>5.5</td>
<td>150</td>
</tr>
<tr>
<td>Uranium (Nat)</td>
<td>3.0</td>
<td>80</td>
</tr>
</tbody>
</table>
Corporate NORM Standard

### Engineering Procedure

**SAEP-358** 8 December 2010

Management of Technologically Enhanced Naturally Occurring Radioactive Material (NORM)

Document Responsibility: Environmental Standards Committee

#### Table of Contents

1. **Scope**
2. **Definitions and Abbreviations**
3. **Responsibilities**
4. **NORM Surveys**
5. **Storage of NORM Waste**
6. **Disposal of NORM Waste**
7. **NORM Contaminated Equipment**
8. **Workers' Protection**
9. **Contamination Control**
10. **Confined Space Entry**
11. **Transportation**
12. **Decontamination**
13. **NORM Contamination Limits**
14. **Contingency Plans**

#### Appendixes

- **Appendix 1** – Example of Suitable Containers for NORM Waste
- **Appendix 2** – SAP EHS Waste Manifest System
- **Appendix 3** – Examples of Radiation Warning Labels

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**Previous Issue: 30 March 2005**  **Next Planned Update: 8 December 2015**

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Enabled SA to achieve workers, public, and environmental Protection without impacting operational productivity
NORM Monitoring

- Baseline Surveys
- Pre-T&I Surveys
- Routine Assessments
- Legacy Contamination Surveys

Control of Contaminated Equipment

- Offshore platforms
- Onshore platforms
- GOSPs
- Gas Plants
- Seawater Injection System
- Pits

Control of NORM Waste

Workers Protection & Training

Enhancing Performance
NORM Monitoring

Control of Contaminated Equipment

Control of NORM Waste

Workers Protection & Training

Enhancing Performance

Norm Waste Storage → Norm Waste stored in controlled manner

Permanent Disposal → Detailed Risk Assessment

Sand and water waste
SFI disposal well
formation fracturing
‘waste pod’ development
deep disposal formation
(325m - 2000m)
NORM Monitoring

Control of Contaminated Equipment

Control of NORM Waste

Workers Protection & Training

Enhancing Performance

Protect Workers

Enhance Awareness

NORM Training

Procedures

Personal Protective Equipment

Formal Training Established

Presentations

Tool Box Talks

Formal Training Established

Established

Presentations

Tool Box Talks

Established

Formal Training Established

Established

Formal Training Established

Established
OGP
Guidelines for the management of Naturally Occurring Radioactive Material (NORM) in the oil & gas industry
Report No: 412
September 2008

Workshop on NORM Management in the Oil & Gas Industry
Michael Lewis, Khalid Mousry, Ozeno Nagecha, Badr Nassar

Workshop on NORM Management in Oil & Gas Facilities
Sharing Best Practices in Petroleum Industry
May 22-24, 2006, Dhahran, Saudi Arabia

EARLY REGISTRATION IS HIGHLY ENCOURAGED

Looking forward to seeing you in Dhahran, Saudi Arabia.
A.F. Alnajub
Chairman NORM Environmental Working Committee
Saudi Aramco
Summary

NORM is a global issue for oil & gas industry

Analyze process to identify NORM impacts

NORM Management Strategy aids planning

Prioritize tasks to enable control and optimize available resource

NORM can be managed in the absence of International & National Regulation
Thank You