RIGS TO REEF SCENARIO IN MALAYSIA

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Overview of Decommissioning in Malaysia

- 300 fixed platforms (rigs), 60% exceed design life of 25 years
- In shallow water between 50-70m
Options for Decommissioning

- Complete removal
- Partial removal
- Leave in situ

- Weather stations
- Research facilities
- Seastead

Fixed platform

Offshore

Arrival onshore sorting

Other fractions

Clean metals

Weighing registration internal transport

Scrap metal store

Sale

Approved facilities

Interim storage

Sorting

Sale

Sale

Approved facilities

Sale

Approved facilities
Options for Decommissioning

Fixed platform

- Complete removal
- Partial removal
- Leave in-situ

Weather stations
Research facilities
Seastead

RIGS TO REEF
What does it take to do RTR??

- **Materials of Opportunity**
  - Select Materials of Opportunity
  - "Any structure works"
  - "Non-toxic dense materials are good"

- **Pre-fabricated Materials**
  - "Inert structures with profile, holes and voids are better"

- **Engineered Materials**
  - "Materials must be long lasting and stable"
  - "We can design materials to achieve specific biological or intended use goals"

- **Designed Materials**
The rig is submerged and converted into artificial reef
- Cost in towing and cutting
- Divers cutting the jacket legs below the mud line
- Expensive, labor intensive and time consuming

The remaining portion of the platform is completely submerged and converted into artificial reef
- Cost in cutting
- Lower costs and time savings.

Remove a certain portion of the platform
- Remaining part of the platform is completely submerged and left at the drilling site and converted into artificial reefs
- Remains in place and continues to provide beneficial habitat for a large number of pelagic.
- Cost in cutting
- Reduces the removal costs and risks for divers (Jan Culbertson, 2004)
RTR as Sustainable Decommissioning Option

- It has been done!
- Malaysia has done it before!

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Reefed Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas, USA</td>
<td>35 reefed platforms</td>
</tr>
<tr>
<td>Louisiana, USA</td>
<td>83 reefed platforms</td>
</tr>
<tr>
<td>Florida, USA</td>
<td>1st established RTR program. Unknown numbers</td>
</tr>
<tr>
<td>Alabama, USA</td>
<td>Artificial reefs from tanks, barges, bridge rubble, etc.</td>
</tr>
<tr>
<td>California, USA</td>
<td>260 reefed platforms</td>
</tr>
<tr>
<td>Japan</td>
<td>Artificial reefs from concrete, steel, etc.</td>
</tr>
<tr>
<td>Australia</td>
<td>Artificial reefs from ships, tires, geotextile.</td>
</tr>
</tbody>
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Sustainable Decommissioning Options

- Why SD agenda?
- SD for O&G Companies/Operators
- Government’s commitment to SD
Stakeholders of O&G sector

- Host Government
- Employees
- Local community
- Shareholders
- Investors/Financial community
- Business partners
- Pressure groups
- Regulators

Components

<table>
<thead>
<tr>
<th>Economic</th>
<th>Expectations</th>
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<tbody>
<tr>
<td></td>
<td>• Provide higher return</td>
</tr>
<tr>
<td></td>
<td>• Security of investment</td>
</tr>
<tr>
<td></td>
<td>• Development of local capabilities</td>
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<td></td>
<td>• Safe product</td>
</tr>
<tr>
<td></td>
<td>• Prudent use of resources</td>
</tr>
<tr>
<td>Social</td>
<td>• Development of local communities</td>
</tr>
<tr>
<td></td>
<td>• Fair employment</td>
</tr>
<tr>
<td></td>
<td>• Business integrity &amp; transparency</td>
</tr>
<tr>
<td></td>
<td>• Uphold human rights</td>
</tr>
<tr>
<td>Environment</td>
<td>• Green products</td>
</tr>
<tr>
<td></td>
<td>• Minimal impact to HSE</td>
</tr>
</tbody>
</table>

15/11/2013
Government’s commitment to SD

- 17th Dec 2009, Copenhagen
- Up to 40% GHG emission intensity of GDP by 2020
- As national oil company, it's our commitment too!
O&G Company: Moving towards SD

Awareness & compliance → Operational Efficiency → Product Innovation → Influencing Society

2012 → 2017 → 2023
Engage stakeholders to understand their values/needs

Biodiversity and social performance are 2 of the 7 SD focus areas
O&G Company: Moving with SD agenda

- Social performance
  - Align with global indicators i.e. human rights, communities needs
  - Finding ways to co-exist: committed to be a socially responsible business entity

- Biodiversity
  - Responsible management of biodiversity
  - Embark on biodiversity-related CSR
  - RTR as a sustainable decommissioning option
SD Benefits of RTR

- The platform structure and discarded removal steel parts will be fully used (Jiang et al., 2011)
- RTR only incur cost in cutting and/or towing

Comparison: Complete Removal and Conversion to Artificial Reef Using EIO Method (Gorges, Wan Abdullah Zawawi 2013)

- Food security
- Impact of big size ARs to traditional fishers income
- Larger AR, attract more habitat, produce more fish and coral species
Benefits of RTR

- Food security
  - Malaysia has lost 92% of its fishery resources due to overfishing.

- Eco-tourism
  - Malaysia eyes 50 marine parks by 2020. Coral depletion due to bleaching

- Recreational fishing industry

- Savings for both industry and artificial reef

- Removal of platform = removal of marine growth and associated community
Legal Boundaries for RTR in Malaysia?

- International guidelines prescribe a case-by-case approach where the coastal state may allow an offshore installation, or part thereof to remain on the seabed, focusing on impact of decommissioning to maritime navigation, environmental protection and other uses.

- On RTR - IMO Guidelines indicated that where living resources can be enhanced by the placement on the seabed of material from removed installations, such material should be located well away from customary traffic lanes, and other relevant standards for the maintenance of maritime safety (Paragraph 3.3).
Legal Boundaries for RTR in Malaysia (cont..)

- It gives the States the flexibility to find other alternative uses.

- Similarly, regional and industrial guidelines recommends complete removal but allows provision for other alternatives of decommissioning.
Of Course, Not All Platforms Qualify As An Artificial Reef
Criteria for Reefing a Rig

Materials selection
  - Function
  - Compatibility
  - Durability
  - Stability

Construction

Management
  - Monitoring
  - Maintenance

Liability
  - Transfer of liability

Siting
  - Biological
  - Hydrography
  - Water quality
    - Water depth
    - Wave height

Source: (NARP, US)
The States are fully responsible in regulating each phase
Jackets: size and types

- Fixed offshore structures are conventionally constructed from medium grade structural steels, with yield strengths typically in the range of 350MPa. This value covers most fixed offshore structures globally.
- The types of platforms in Malaysia range from manned, unmanned, wellhead and central processing platforms, with the heaviest jacket weighing 9990 MT – mostly X braces for new jackets.
How strong are the jackets?

- Where are the weak parts where fatigue will be first felt?
  - Critical fatigue locations: Weld points / joints – due to geometric parameters, distortion of joint and non-uniform distribution of stress

- Operating experience of platforms has shown that the number of occurrences of fatigue cracks is not as high as would be expected considering the conservatism in the fatigue design process and implicit conservatism in the S-N curves.
Fatigue monitoring

- Fatigue is monitored through visual inspections of fatigue cracks.
- Fatigue cracking may occur in platforms of any vintage due to fabrication defects, installation damage, and at improperly designed appurtenance connections (caissons, sumps, J-tubes, etc).
- Therefore, during the platform design stage, to account for uncertainties, some conservative choices are customarily made, as follows;
  - All joints shall be designed for a nominal fatigue life of twice the design service life of the platform
  - For inaccessible joints, eg. joints enclosed by plates/tanks, the fatigue life shall be designed with safety factor of 4 instead of 2 at the discretion of the client
  - For marginal platforms designed for reuse, safety factor of 4 may be applied at the discretion of the client
Is there a local need?

Following the success of BARAM – 8, Sarawak state department has actively been seeking engagement with stakeholders.

- Department of Marine Fisheries, Sarawak has assumed ownership/liability at new reef site.
- Strong support from key stakeholders; mainly local fishermen
- Keen interest in expanding number of RTR
The effort has to be a multi-partite as it is interdisciplinary in nature.
Initiatives & Enablers

The Government

1. Platform Providers – integration and consolidation of working ministries to provide systematic platform
2. Determination of favorable growth policies
3. Provision of Economic Drivers – i.e. A total of RM24.4 million was earmarked for building artificial reefs under the 9th Malaysia Plan. The Fisheries Department is looking at another RM25 million to build more artificial reefs in Malaysian waters to restore fishery resources.
4. WHO? NOD MOSTI, DOF, DOE, MECC, EPU, etc
The Industry

Standard bearers for Malaysia O&G industry

Achieved by:
• Contractor Database
• Core Competency Training Program

How?
Leverage on existing government & institutional accreditation on technical expertise – ensure competent human resources
Initiatives & Enablers

The Industry

Promotion of new and appropriate use of technology and research in structural steel industry

Achieved by:
• Engaging active steel consultancies
• Engaging stakeholders from the industry & public

How?
Leverage on
• The Government – Policies, stakeholders’ needs
• Institutions – Technical expertise & research
Initiatives & Enablers

The Institution

- **Centers of Excellence**
  - Sustainable Resources MOR
  - Corrosion Research Center
  - Green Technology MOR

- **NGOs**
  - MSSA

- **O&G Organizations**
  - MOGSC CTWG
    - *Industrially-aligned training modules*

- **Institutional Collaboration**
  - CIL NUS
  - KMU

- **Stakeholder Engagement**
  - RTR 2013

- **International Collaboration**
  - South Korea
    - *High End Offshore Engineering Research and Facilities*

- **MSSA**
  - *P33 Transformation Program, Research in Steel Sustainability*

- **OFFSHORE ENGINEERING CENTER UTP (OECU)**
The Institution

Initiatives & Enablers

Stakeholder Engagement
- RTR 2013

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RTR 2013, Malaysia

- The workshop is the first platform that brought together various stakeholders.
- The objective is to explore ideas and concerns with regards to various interests/values by different stakeholders.


RTR’13: 19th Sept 2013, KL jointly organized by OECU UTP, NOD MOSTI & CIL NUS
Identified Way Forward

- Develop policies that recognizes RTR benefits (multiple stakeholders)
- Establish a one stop center for PETRONAS to reach to the RTR program
- Identify research and studies necessary for continuous optimization of design and application of RTR
- Create extensive awareness Among multiple stakeholders

Good opportunity to address food security
CONCLUSION

- There is no law specifically prohibiting RTR. RTR maybe a viable and preferable option in some sea areas. To further explore, focus is needed on:
  - Paradigm Shift on alternative reuse of old offshore platforms
  - Supportive Policy
  - Widespread Awareness
  - Leveraging on collaborative synergies

- RTR could be more economical, environmentally feasible and safer compared to the conventional AR which have to be fabricated first.
- Each RTR should be planned on a case by case basis for fit-for-purpose implementation.
- Public awareness is crucial.
- Cooperative initiatives between the Government, Institutions and private bodies should be initiated immediately.
THANK YOU........

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