TARPON

“A Minimal Facilities Platform”
Contents

• Introduction
• TARPON Description
• TARPON Features
• TARPON Benefits
• TARPON Proofs
• TARPON Typical Installation Options
• Design Codes & Certification
• Novel Application for TARPON
• Contacts
Introduction

The TARPON is a successful low cost rapid installation stand alone minimal facility & unmanned platform ideally suited for shallow water step-outs requiring well fluids & gas handling assistance. TARPON is a viable solution supporting marginal field economics or where an extra production well is required to gain increased production on new or mature fields.
TARPON Description

Principal Particulars

• Water depths - <30m to 120m
• Topsides weight - Up to 300 tons
• TARPON sized as - Small, Medium & Large (depending on water depth & topsides requirements)
• Maximum number of conductors - 6 (8 for non cyclonic locations)
• No platform drilling rigs (jack-up or snubbing units only)
• No bulk liquid storage or permanent living quarters on platform
• Gas processing up to 70 mmscfd
• Oil production with primary separation and testing (300 ton facility capacity)
TARPON Features

General Features Include:

- Central caisson shaft
- Termination clamp
- Wellhead deck or production equipment deck
- Helideck (optional)
- Boat landing
- Anchor piles (3)
- Guy cables (6)
- Rod and block cable tensioning assemblies (6)
- Delivery of TARPON & Topsides typically 6 – 8 weeks fast tracked
- Delivery time of the Guyed Mooring system is variable & a long lead item
- Installation ranges from 5 – 10 days
TARPON Features (continued)

Deck Facility Features Include:

- Manifold
- Well control panel
- Test / bulk separators
- Flare system
- Sump tanks
- Oil transfer pumps
- Fuel/instrument gas system
- Deck cranes
Deck Facility Features Cont’d:

- Solar powered navigation aides and SCADA
- Emergency personnel shelter
- Portable generator sets
- Hydraulic workover packages (Snubbing Units)
- Electric wireline Units
- Conventional wireline units
- Coil tubing units
TARPON Benefits

Multiple TARPON applications, examples:

- Marginal production
- Stand alone small production facility
- Support for satellite field developments
- Step-outs
- Tail end production (can also replace large platforms maintaining field economics e.g where production has dropped below an acceptable economic limit)
- Oil production
- Sales gas production
- Water / gas re-injection
TARPON Benefits Cont’d

- Simple design
- Minimal IMR
- Certifiable design
- Suitable for varying environmental conditions including water depth, soil conditions and wave conditions
- Uses standardized components
- Minimal cost structure
- Simplicity of fabrication
- Rapid fabrication & Installation
- Multiple installation methods
- Flexible installation methods
- Offers early production opportunities
- Reusability of the structure
- Stocking program available
## Guyed Caisson Installations:

<table>
<thead>
<tr>
<th>Item</th>
<th>Client</th>
<th>Location</th>
<th>Water Depth</th>
<th>Well Slots</th>
<th>Topsides Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AMOCO</td>
<td>Eugene Island 163 &quot;B&quot;</td>
<td>62 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>2 AMOCO</td>
<td>Eugene Island 224 #2</td>
<td>135 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>3 AMOCO</td>
<td>Eugene Island 224 #3</td>
<td>140 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>4 AMOCO</td>
<td>Matagorda Island 519 #2</td>
<td>63 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>5 AMOCO</td>
<td>Matagorda Island 623 #4</td>
<td>85 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>6 AMOCO</td>
<td>Matagorda Island 636</td>
<td>90 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>7 AMOCO</td>
<td>Ship Shoal 137 #7</td>
<td>90 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>8 AMOCO</td>
<td>South Marsh Island 39 #2</td>
<td>65 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>9 AMOCO</td>
<td>West Cameron 293 #3</td>
<td>42 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>10 AMOCO</td>
<td>West Cameron 293 #4</td>
<td>50 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>11 Canadian OXY</td>
<td>Eugene Island 265 H</td>
<td>152 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>12 Canadian OXY</td>
<td>Eugene Island 265 I</td>
<td>152 ft.</td>
<td>1 External</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>13 Canadian OXY</td>
<td>Eugene Island 269 G</td>
<td>155 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>14 Canadian OXY</td>
<td>Eugene Island 268 J</td>
<td>152 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>15 Conquest Exploration</td>
<td>Brazos 440</td>
<td>52 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>16 Conquest Exploration</td>
<td>Vermilion 115 #3 &amp; #4</td>
<td>60 ft.</td>
<td>2 External</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>17 Conquest Exploration</td>
<td>Vermilion 116 #5</td>
<td>60 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>18 Corpus Christi Oil &amp; Gas</td>
<td>Galveston 427 #1</td>
<td>95 ft.</td>
<td>1 Internal</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>19 Corpus Christi Oil &amp; Gas</td>
<td>Mustang Island 818</td>
<td>64 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>20 Corpus Christi Oil &amp; Gas</td>
<td>South Marsh Island 15 Wells #1 &amp; #2</td>
<td>88 ft.</td>
<td>2 External</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>21 Corpus Christi Oil &amp; Gas</td>
<td>Vermilion 153 #1</td>
<td>82 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>22 Corpus Christi Oil &amp; Gas</td>
<td>West Cameron 313</td>
<td>60 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>23 Forcenergy</td>
<td>High Island A-467 &quot;B&quot;</td>
<td>106 ft.</td>
<td>1 Internal</td>
<td>Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>24 GBF Resources</td>
<td>Java Sea, Indonesia</td>
<td>210 ft.</td>
<td>1 Internal</td>
<td>Production Deck</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Client</th>
<th>Location</th>
<th>Water Depth</th>
<th>Well Slots</th>
<th>Topsides Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 Newfield Exploration</td>
<td>West Cameron 401</td>
<td>90 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>26 PENNZOIL</td>
<td>Man Pass 141</td>
<td>188 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>27 PetroQuest Energy</td>
<td>High Island A-944 &quot;C&quot;</td>
<td>221 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>28 Stone Energy</td>
<td>Eugene Island 242 C</td>
<td>141 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>29 Stone Energy</td>
<td>Eugene Island 243 D</td>
<td>144 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>30 United Meridian</td>
<td>Ivory Coast Lion A</td>
<td>230 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>31 United Meridian</td>
<td>Ivory Coast Lion B</td>
<td>245 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>32 United Meridian</td>
<td>Ivory Coast Panthere &quot;C&quot;</td>
<td>265 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>33 United Meridian</td>
<td>Ivory Coast Panthere &quot;D&quot;</td>
<td>174 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>34 UNOCAL</td>
<td>Vermilion 326</td>
<td>217 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>35 Walter International</td>
<td>Equatorial Guinea, West Africa</td>
<td>250 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>36 Walter Oil &amp; Gas</td>
<td>Brazos 583</td>
<td>98 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>37 Walter Oil &amp; Gas</td>
<td>Galveston 460 #2 &amp; #4</td>
<td>106 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
<tr>
<td>38 Walter Oil &amp; Gas</td>
<td>South Marsh Island 123</td>
<td>200 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck</td>
<td></td>
</tr>
<tr>
<td>39 Walter Oil &amp; Gas</td>
<td>East Cameron 275</td>
<td>182 ft.</td>
<td>1 Internal</td>
<td>Minimal Production Deck and Helideck</td>
<td></td>
</tr>
</tbody>
</table>
TARPON Typical Installation Options

Option 1:
- Drill Vessel Drills Well & Sets the Tree
- Installation Barge Installs TARPON & Guyed Mooring System
TARPON Typical Installation Options

Option 2:
- Drill Vessel Drills Well, Sets Tree & TARPON
- Installation Barge Installs TARPON Topsides & Mooring System
TARPON Typical Installation Options

- Drill Vessel Drills Well & Sets Tree
- SERF Installs TARPON, TARPON Topsides & Guyed Mooring System
TARPON Design Codes

Designed to Stringent Safety & Design Codes:

• Fabricated to meet all accepted industry guidelines, codes and recommended practices as outlined below
• Incorporates locally used guidelines, codes, and recommended practices as required

<table>
<thead>
<tr>
<th>Guyed Caisson Structural Component</th>
<th>Applicable Specification</th>
<th>Material</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decks</td>
<td>API RP-2A WSD AISC AWS D1.1 API RP-2L</td>
<td>ASTM A-36 API-2H Grade 50 API 5L Grade B ASTM A-633 Gr. C/D</td>
<td>API RP-2A WSD AISC AWS D1.1</td>
</tr>
<tr>
<td>Cables</td>
<td>API RP-2 SK API 9A</td>
<td>API 9A Level 4</td>
<td>API 9A API 9B</td>
</tr>
<tr>
<td>Studs &amp; Nuts</td>
<td>AISC</td>
<td>ASTM A-325 ASTM A-490 ASTM A-563</td>
<td>AISC SAE Grade 8</td>
</tr>
<tr>
<td>Clamps</td>
<td>AISC</td>
<td>ASTM A-36 API 2H Grade 50</td>
<td>AISC AWS D1.1</td>
</tr>
<tr>
<td>Non-Destructive Testing</td>
<td>AWS D1.1 ASNT TC-1A</td>
<td>AWS D1.1 ASNT TC-1A</td>
<td>AWS D1.1 ASNT TC-1A API RP-2X</td>
</tr>
<tr>
<td>Coatings</td>
<td>NACE RP-01-76 SSPC-SP5</td>
<td>NACE RP-01-76 SSPC-SP5</td>
<td>NACE RP-01-76 SSPC-SP5</td>
</tr>
</tbody>
</table>
TARPON Engineering

Design Codes & Analysis Software:

• Designed to meet the criteria of the API recommended practice 2A
• API RP design criteria is accepted as a consensus standard by the Oil & Gas Industry
• This API RP was also the standard that was utilized in design studies of the Tarpon Guyed Caisson performed for AMOCO Malaysia, IPC Malaysia, The Chinese National Oil Company, MAXUS-SE Asia and Esso-Malaysia
• In all these studies and in a separate review by DNV it was determined that the Tarpon Guyed Caisson design meets or exceeds all design criteria for the locations considered
• The Tarpon Guyed Caisson is a fully certifiable design
The engineering analysis is performed with state of the art PC-based software packages as follows:

- **Structural Analysis** - “SACS” suite of integrated program modules developed by Engineering Dynamics Incorporated of Kenner, L.A. is recognized as a standard for offshore structural analysis and design.
- **SACS** is a 3-dimensional static and dynamic analysis package that includes the following capabilities:
  - Automatic wind and wave force generation
  - Soil/pile analysis Dynamic response
  - Flotation/upending analysis
  - Fatigue analysis
  - Non-linear/linear interaction of soil/structure model
  - Structural code checks - AISC, API, DNV
Mooring Analysis by “ORCAMOOR” program has been developed by Orcina Ltd. Consulting Engineers of Ulverston, Cumbria, UK specifically to analyze static behaviour of arrays of catenary mooring lines. The program uses finite element procedures for cable modelling and consists of the following:

- Mooring arrays modelled as individual lines broken into finite element segments with properties varying along length as required
- Mooring line properties-user defined or from internal library
- Equilibrium analysis to determine equilibrium position of the vessel subjected to wind and current loads
- Catenary analysis to determine shape and tension
TARPON Engineering (continued)

Design Codes & Analysis Software:

- Marine analysis conducted by “MOSES” is an integrated program designed by Ultramarine Inc., Houston, Texas for marine analysis work, the program has the capacity to simulate both the response and structural integrity of the caisson during installation. Its features include:
  - Caisson stability, strength analysis and ballasting requirements
  - Mooring system analysis
  - Time history response of system to environmental conditions
  - Lifting and upending analysis.
  - Launching analysis.
  - Pipe laying analysis
  - Stress analysis available for time domain simulation, static process, or frequency domain process.
  - Code checks to AISC, API, NPD.
Novel Application for TARPON

‘Keeper Wells’ Concept

From well drilling & ‘Keeper Well’ appraisal to . . .

. . . a dry tree minimal cost GCP recovery solution

1. Appraised / viable well is left cased (‘Keeper Well’ prepared) in readiness for a GCP* dry tree support structure (TARPON)
2. Jack-up & installation barge are utilised for GCP installation
3. GCP is installed & tied-into local infrastructure

* GCP Guyed Caisson Platform
‘Keeper Wells’ Concept Description

- ‘Keeper Well’ is the terminology used to take appraisal wells and complete them as development wells if it is found to be economically viable . . . It’s kept!

- TARPON has been evaluated by Murphy Oil and found suitable as a step-out solution to support gas production on their SK field development. Murphy are currently implementing a “Keeper Well” system.

- If reservoir is correct for a mini unmanned facility a GCP platform may be suitable, this would also have been disclosed within the well appraisal economics.

- The Hercules 208 or any Jack-up can be used for drilling & caisson installation operations

- Installation barge or a SERF can be used for installation operations of the Guyed Caisson Platform & mooring installations
Novel Application for TARPON (continued)

Appraisal Well, drilled to sweet spot, cased & left for development as a production well, not abandoned
TARPON
“A Minimal Facilities Platform”

Thank You
For further information on our designs and services please contact:

**Singapore Office:**
39, Pandan Road, Singapore. 609281
Tel.: +65 91093201
+65 68539106

**Malaysia Office:**
11, Jalan 14/2, Taman Tar, Ampang, Salangor, Kuala Lumpur. 68000
Tel.: +60 342665601
Mob.: +60 123210824
+60 178810807

**Dubai Office:**
Jumeirah Lake Towers,
P.O. Box: 643593,
Cluster C, Goldcrest Executive Tower Office 706,
Dubai. UAE.
Tel.: + 971 4 447 0897
Fax: + 971 4 447 0896
Mob.: + 971 567451923
(Main Company Contact)

**Irvine Engineering Pte Ltd - Registered Address:**
60 Paya Lebar Road,
#08-43 Paya Lebar Square,
Singapore. 409051
Tel.: +65 68539106

enquiries@irvineeng.com