"Keeper Wells Solution"
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Introduction

- Producer companies developing fields need to evaluate if a drilled well offers enough well fluids to make it profitable, i.e. if it is a producer or not, if it is then it is then known as a ‘Keeper Well’.

- The current exploration and appraisal cost per well is around $3.5m. This info offers vital well appraisal information. Typically ‘Keeper Wells’ at this stage are capped/cemented and temporarily abandoned. This later incurs a high cost burden when it becomes time to re-establish the well!

- If well is found to be a keeper a ‘Keeper Well’ development concept can be easily applied with a minimal cost add-on and offers a 1st stage completion at the appraisal stage.

- The well is left cased and ready for later final completions when field infrastructure is in place.

- A further development option is to case the well and further modify it in readiness for a ‘Tarpon’ mini platform, a dry tree minimal cost recovery method for small field gas/oil recovery or a satellite for a main hub.
Run-Through of ‘Keeper Wells’ Concept

1. Appraised / viable well is left cased (‘Keeper Well’ prepared) in readiness for a Tarpon dry tree recovery (mini platform)

2. Jack-up & installation barge are utilised for Tarpon installation

3. Tarpon is installed & tied-into local infrastructure
Advantages to Field Developers

Drivers:

Objective:
• To develop a cost effective appraisal well system that allows field development companies to keep viable wells ready for production when required, saving substantial development CAPEX.

Additional Value:
• Typically a reduction in gas resource development cost from existing $1/MSCF to $0.7/MSCF
• CAPEX reduction of 5 - 10 million USD per well / support system and infrastructure.

Deliverables:
• A compatible support structure / jacket system that allows for a seamless drilling and installation operation that meets regulatory and safety standards.
Advantages to Field Developers cont’d

Justification:

• A business interest to developers is to enhance profitability and apply new & safe technologies & ideas when ever practical to do so.
• The current practice of drilling appraisal wells can now be modified to leave the wells cased ready for immediate or later development depending on field infrastructure.
• The extra cost at the drilling stage to apply the ‘Keeper Well’ system would be approx $1,550,000
• The cost burden to re-drill & case the well later, if not using ‘Keeper Well’ system, is around $4,000,000.
• The cost burden (Cost Risk) of applying the ‘Keeper Well’ system over a normal non performance appraisal well is just $800,000.
## Advantages to Field Developers cont’d

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<thead>
<tr>
<th>Description</th>
<th>$M Current Exploration</th>
<th>$M Keeper Well System</th>
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<tbody>
<tr>
<td>1 x Penetration (drill, appraise &amp; abandon)</td>
<td>3.5</td>
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<td>1 x Penetration (drill &amp; appraise)</td>
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<td>Additional Trajectories (each, not included here)</td>
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<td>Re-open, Re-drill Well &amp; Case</td>
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<td>Keeper Well MLS System (per well)</td>
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<td>Additional Well Drilling / Casing</td>
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<td><strong>Total $M</strong></td>
<td><strong>7.5</strong></td>
<td><strong>5.2</strong></td>
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*If negative well appraisal after Keeper Well development applied amount lost over a normal drill & Abandonment ($ Risk)*

0.800k

### Assumptions:
1. Additional side track drilling $1.5M (not included but may be added as pro-rata)*
2. Rig rate at $350,000 / day
3. 10 days rig hire
4. Well Keeper drilling approx 10 days
5. Casing $350,000
6. MLS system per well at $150,000 @ 1.5 days
7. Additional casings used for MLS $75,000
Way Forward

- Brainstorm actual resources, costs & variables involved on a well by well basis.
- Develop a plan & options to preserve the well for later or immediate development.
- Develop a flexible installation plan that can be applied by a SERF platform when a ‘Keeper Well’ is identified.
- Conduct a Risk / Reward and early cost exercise & quickly evaluate ‘Keeper Well’ project worthiness.
- Develop a substantiated proposal document / presentation to Developer company for review.

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*Weeks*
Typical Drill Rig Schedule

[Diagram showing a Gantt chart with various activities and dates]
Base Options

Option 1
• Drill rig installation of one 36/42” x 72” Caisson, along side of a 20” caisson. The Guying System and Production Deck will be installed with a Crane Barge

Option 2
• Crane Barge installation of one 48” x 72” Caisson, along side of a 20” caisson while the Drill rig stays on location. The Guying System and Production deck will be installed after the drill rig de-mobilises
The Tarpon structure is designed using the latest “state-of-the-art” computer software including the industry-standard “SACS” suite of programs by Engineering Dynamics, Inc. of Kenner, Louisiana, USA and Orcaflex by Orcina Ltd of the UK.

- The SACS PSI (pile soil interaction) program is used to model the non-linear soil foundation coupled to the linear elastic structural model.
- The SACS Sea state program is used to generate the wind, current, and wave forces on the platform model.
Base Case Selection

- Tarpon Guyed Caisson System is recommended. Experience has shown that the guyed caisson system offers a reduced capital investment, simple installation and abandonment.

- The guyed caisson system is also totally re-usable for a minimum refit cost.
Experience

- Over 25 Float-Out Installations in Gulf of Mexico since 1993
- Water depths range between 43’ to 221’
- The Float-out Caisson section weighted from 95 to 315 tons
- Designs covered
  - Stab over-type installations over a mudline suspended well adjacent to an existing drive-pipe.
Key Elements

- Planning (rig selection, well/caisson position, future structure/pipeline layouts)
- Design Procedure
- Procedure Review with Operator/Rig Contractor/Installation Contractors
- Mesh Installation Procedure Design with overall Caisson/Platform Structural Design
- Coordination
- Execution
Establish Well/Caisson Orientation

- Evaluate rig suitability to up-ending process. Caisson size, length, water depth, future structure, rig jacking/load limitations are all considered.
- Layout plan for orienting caisson+well to suit rig, future structure, and prevailing seas during installation
Overview of Procedure

Procedure for Installing a Caisson beside an Existing Drive Pipe.
Towing Configuration

Design tow and lift rigging to suit water depth, rig handling capabilities, installation scenario, and cai
Installation Step 1 – Rig Preparation

**Figure 5 – Outboard Profile**

- A. Prep rig for installation.
  - Install Y-brace on 36" conductor.
  - Install work platform on Y-brace.
- B. Jack rig to 155" air gap & skid 12' starboard of 36 #.
Installation Step 2

Docking and Lift Rigging Transfer
Installation Step 2 cont’d

Docking and Lift Rigging Transfer
Installation Step 3

Lift Caisson for Rigging Inspection

Figure 9 - Outboard Profile
Installation Step 4

Upend Caisson with Rig Traveling Block
Installation Step 5

Raise Caisson Through Rig Floor and Set Down

STEP 5
A. CONTINUE RAISING CAISSON ADDITIONAL 36', 10'' ABOVE DRILL FLOOR (HOOK LOAD 181,000 LBS.).
B. INSTALL LANDING LUGS AND RELEASE TAIL LINE.
C. SET CAISSON ON FALSE ROTARY BEAMS.
D. ADD 81 Bbls. SEAWATER TO EJECT FLOATATION PLUG (HOOK LOAD 209,000 LBS.).
E. RETRIEVE FLOATATION PLUG.
F. SKID RIG 3.5' TO PORT TO 8.5' C TO C COND. & CAISSON.

FIGURE 11 - OUTFIELD PROFILE
Installation Step 5

Raise Caisson Through Rig Floor and Set Down
Installation Step 6

Install Ship Loose Sections, Drive Caisson
Installation Step 7

Install Conductor Support and Navigation-Aids

**Figure 13 - Outboard Profile**

- A. REMOVE I-HAMMER
- B. REMOVE TEMPORARY INSTALLATION GUIDE ASSEMBLY
- C. INSTALL CONDUCTOR GUIDE ASSEMBLY
- D. INSTALL NAV-AIDS
Overview Installation of Tarpon Utilizing a SERF and Barge
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

Option 3:
- Drill Vessel Drills Well & Sets Tree
- SERF Installs TARPON, TARPON Topsides & Guyed Mooring System
“Keeper Wells Solution”

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