Float-over presentation

December 2002
Heerema Marine Contractors
Product range

Deepwater Construction

Facility installation

Float-over

Removal
Heerema Marine Contractors

Product range

Deepwater Construction

Float-over

Facility installation

Removal
Contents

- Introduction
- Method statement overview
- Relationship between components
- Float-over components
- Conclusions
Float over product group

- Since 2001
- Jan Groot – Frank Lange
- Objective is to establish Float-over as a Heerema Product Group
- Tendering various prospects
- Product development; Forklift
## Executed float-overs in open seas

<table>
<thead>
<tr>
<th>Year</th>
<th>Project</th>
<th>Topsides weight (T)</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Cobo Pambi</td>
<td>9,500</td>
<td>ETPM/Technip</td>
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<tr>
<td>1996</td>
<td>M3</td>
<td>7,500</td>
<td>Saipem</td>
</tr>
<tr>
<td>1996</td>
<td>M1</td>
<td>6,000</td>
<td>Saipem</td>
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<tr>
<td>1997</td>
<td>EPKI</td>
<td>4,000</td>
<td>ETPM</td>
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<tr>
<td>1997</td>
<td>Wandoo</td>
<td>6,000</td>
<td>B&amp;R</td>
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<td>2001</td>
<td>Malampaya</td>
<td>11,500</td>
<td>B&amp;R/Heerema</td>
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<td>Cakerawala</td>
<td>17,000</td>
<td>Technip/Saipem</td>
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<tr>
<td>2002</td>
<td>Lan Tay/ Lan Do</td>
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<td>Aker Maritime (N)</td>
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## Future Float-overs

<table>
<thead>
<tr>
<th>Year</th>
<th>Project</th>
<th>Topsides weight (T)</th>
<th>Contractor</th>
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</thead>
<tbody>
<tr>
<td>2002</td>
<td>Helang/Layang</td>
<td>8,000</td>
<td>Saipem</td>
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<tr>
<td>2003</td>
<td>Bayu-Undan</td>
<td>10,000</td>
<td>Aker Maritime (N)/ Clough</td>
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<td>Aker Maritime (N)/ Clough</td>
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<td>2003</td>
<td>Amenan</td>
<td>12,000</td>
<td>Saibos/Technip</td>
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<tr>
<td>2003</td>
<td>Bunga Raya</td>
<td>9,000</td>
<td>HHI/Noble Denton</td>
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</tbody>
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## Upcoming Float-overs

<table>
<thead>
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<th>Year</th>
<th>Project</th>
<th>Topsides weight (T)</th>
<th>Contractor</th>
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</thead>
<tbody>
<tr>
<td>2002</td>
<td>Helang/Layang</td>
<td>8,000</td>
<td>Saipem</td>
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<tr>
<td>2003</td>
<td>Bayu-Undan</td>
<td>10,000</td>
<td>Dockwise</td>
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<tr>
<td>2003</td>
<td>Bayu-Undan</td>
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<td>2003</td>
<td>Bunga Raya</td>
<td>9,000</td>
<td>HHI/Noble Denton</td>
</tr>
</tbody>
</table>
Forklift development

- Started off with ExxonMobil Hawkes
- Two phases
- Phase 1 finished
- Working on phase 2
- Learned about catamaran

- No Market at present
Forklift
Contents

- Introduction
- Tender Activities
- Method statement overview
- Relationship between components
- Float-over components
- Conclusions
Contents

- Introduction
- Method statement overview
- Relationship between components
- Float-over components
- Conclusions
Method statement overview

5 phases in float-over sequence

– Stand off
– Docking
– Mating
– Vertical load transfer
– Un-docking
Stand off position

Docking lines

Barge moored with anchors

Tug 1

Tug 2
Docking

Cow horns for entry

Fendering for tight fit
Mating (1)

Load transfer by Ballasting and Leg Mating Units

Mating lines for precise positioning
Mating
Vertical load transfer

Load transfer on jacket
Undocking with tugs and docking lines
Contents

- Introduction
- Method statement overview
- **Relationship between components**
- Float-over components
- Conclusions
Relationship between components

Platform and equipment
- Jacket + foundation
- Deck
- Transportation barge

Float-over concept
- Docking
- Mating
- Vertical load transfer
- Fendering
- Ballasting

Environment
- Swell
- Workability
- Safety

Docking - Mating - Vertical load transfer - Fendering - Ballasting
Relationship between components

Platform and equipment

Float-over concept

Environment
Barges for decks > 10,000 mT

- H-541 42 m
- S45 42 m
- Black Marlin 42 m
- Mighty Servant 3 40 m
400’ Piggy Back on Dockwise
Relationship between components

Platform and equipment

Float-over concept

Environment
Environmental issues

- Workability is governed by
  - Seastate
  - Heave
  - Weather outlook (i.e. window length)
- Accepting lower workability reduces design forces
Relationship between components

Platform and equipment

Float-over concept

Environment
Contents

- Introduction
- Method statement overview
- Relationship between components
- Float-over components
- Conclusions
5 Float-over components

- Docking system
- Mating
- Fendering
- Vertical Load transfer
- Ballasting
Docking

2 systems used on Malampaya

- Tugs
- Anchors/docking lines
2 Docking systems
Anchor/Docking lines
Mating lines

- precise positioning of the deck cones above the jacket guides
- Stiffness of system versus workability
- 8 lines used on Malampaya, 4 proposed in future
Malampaya mating stretchers
Malampaya Fendering

- Loose fit
- Tight fit
Vertical Load transfer

- Hi-deck method – Leg Mating Units
- Uni-deck method - Hydraulics
Leg Mating Units

- Rubber
- Mating Cone
- Receptor
- Sand
Ballasting

- Malampaya 20,000 m³/hr Subcontracted
- Dockwise vessels 12,000 m³/hr internal
Conclusions

- Float-over is complicated, but feasible
- Relationship between components require T&I contractor input in FEED study
- Few vessels available for topsides > 10,000 mT
More information

- [www.heerema.com/marine/float-over](http://www.heerema.com/marine/float-over)

- Jan Groot tel +31 71 5799466 Product Manager