Kvaerner concrete platform solutions for harsh environments

INTSOK's 13th Annual Russian – Norwegian Oil & Gas Conference
Russia 2015
Saint-Petersburg, Russia

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Four Seasons Hotel Lion Palace
28 January 2015
Global leader in gravity based concrete structures

- Substructures
- CONDEEP™ GBS
- Floating concepts
- LNG terminals

European leader in steel jackets

- Steel jackets
- Other steel structures
- Piping technology

Leading EPC contractor to the North Sea market

- Topsides
- Floating platforms

Leading Norwegian EPC contractor for onshore plants

- Upstream plants
- Treatment facilities
Kvaerner in Russia

Current presence in Russia

- Arkhangelsk
- Moscow
- Nakhoedka
- Kvaerner VOSTCO Contractors
- 50/50 JV Kvaerner and VOSTCO
- Office established by the end of 2012 and officially opened in 2013
- Kvaerner has long term commitment in Russia

- Zvezdochka Engineering
- 50/50 JV Kvaerner and Zvezdochka

Kvaerner EPC experience in Russia

- Sakhalin-1 Arkutun-Dagi GBS, 2009 – 2012

- Kvaerner Contracting Russia AS (Branch)
  - The Sakhalin-1 A-D GBS contractor
  - Established supply chain in Far East Russia

- Kvaerner – Gazprom Bank
  - MoU signed
  - Front End work

Front end and study work in Russia
Advantages and features of concrete substructures

- Robustness to meet Arctic environmental challenges
- Durable material (long life)
- Support large topside weight
  ▪ robust vs. weight increases
- Integrated oil storage
- Protection of risers, j-tubes, pipes
- Minimum maintenance (low lifecycle cost)
- Significant local content
- Installation independent of heavy lift vessel availability
- No requirements for piles and dowels
- Predictable construction execution schedule
Concrete Solutions for the Arctic

- **Canada**
  - Hibernia
  - Hebron

- **Russia**
  - Lun A, Sakhalin 2
  - PA-B, Sakhalin 2
  - Arkutun-Dagi, Sakhalin 1

- **Numerous studies**
  - Norway, Russia, Canada, Alaska, Greenland
  - Concepts for fixed, floating, LNG, drilling

- **No single solution for the Arctic**
- **Concrete solutions fit for purpose!**
## Kvaerner’s range of platforms for year-around operation in the Arctic

<table>
<thead>
<tr>
<th>Water Depth</th>
<th>Exploration</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-20m</td>
<td><strong>Shallow-water MODU</strong> <em>(Mobile Offshore Drilling Unit)</em></td>
<td><strong>WHP</strong> <em>(Well Head Platform)</em></td>
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<tr>
<td></td>
<td></td>
<td><strong>PDQ</strong> <em>(Production, Drilling, Living Quarters)</em></td>
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<tr>
<td>20-70m</td>
<td><strong>CONDRILL™</strong></td>
<td><strong>4-leg GBS</strong></td>
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<td></td>
<td></td>
<td><em>(Sakhalin 1 &amp; 2 in place)</em></td>
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<tr>
<td>70-200m</td>
<td><strong>CONDEEP™ Floater</strong></td>
<td><strong>“Sakhalin-3” type</strong></td>
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<tr>
<td></td>
<td><em>In R&amp;D progress</em></td>
<td><strong>OIL and Gas production</strong></td>
</tr>
<tr>
<td>&gt;200m</td>
<td></td>
<td><strong>CONDEEP™ Floater</strong></td>
</tr>
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<td></td>
<td><em>In R&amp;D progress</em></td>
<td></td>
</tr>
</tbody>
</table>
Exploration drilling solutions for ice infested regions

Patent no: 333296
CONDRILL™ - Arctic Mobile Offshore Drilling Unit (MODU)

- Mobile drilling platform suitable for Arctic areas
- All-year drilling, ice load protection by shaft
- Multiple shallow water locations with water depth ranging 20-60 m
- Wide range of soil conditions
- Ability to be re-located, also during ice season
- Ability to drill and test exploratory wells
- Storage for long term operation without resupply
Concrete floaters

1. Harsh weather.
   No ice.

2. Harsh weather.
   Ice.
   Disconnect.

3. Harsh weather.
   Ice.
   Dis- & reconnect.
CONDEEP™ - Deep Floater production platform
For Arctic environment with oil storage

- Robust – ice resistant
- Riser protection
- Conventional mooring
- Option for quick release or dis- and reconnect buoy
- Large topside 30,000 - 50,000 tonnes
- Favourable topside lay-out
- Local construction
- Oil storage capacity
- Direct offloading
- Substantially maintenance free
Concrete GBS based LNG solutions for the Arctic in shallow water

**Concept advantages:**

- Suitable for remote, Arctic regions (Water depths: 14 - 35m)
- Cost competitiveness (CAPEX and OPEX)
- Competitive project execution schedule
- High execution certainty

- Significantly less regulatory and approval challenges to an onshore plant
- Opportunities for substantial local content
- No piling
The GBS history – Proven technologies and execution methods

Arctic offshore projects

- Hibernia
- Bream B
- West Tuna
- Sakhalin 2 LUN A
- Sakhalin 2 PAB
- Adriatic LNG
- Sakhalin 1
- Hebron

- Ekofisk 2/4T
- Frigg CDPI
- Beryl A
- Brent B
- Brent D
- Frigg 2
- Statfjord A
- Statfjord B
- Statfjord C
- Gullfaks A
- Gullfaks B
- Oseberg A
- Gullfaks C
- Sleipner A
- Troll A
- Heidrun
- Troll B
- Dreugen

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Focus on local content in Russia

Kvaerner perform Concept Design and Detailed Engineering Fit for Purpose to maximize procurement in Russia

Actual data from Sakhalin-1 and Sakhalin-2

~90% of all man hours executed in Russia

~97% procured/manufactured in Russia, only 3% internationally
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