The role of technology and knowhow in the sector

Japan-Norway Maritime Offshore Technology Seminar

Henrik O. Madsen
2 November 2012
Numerous drivers for new and improved technology in the Maritime Offshore sector…

- Developments in the Arctic
  - Exploitation of fisheries, oil and gas, and rare-earth minerals
  - Significantly reduce the distance between Asia and Europe
  - Increased volume of tourist traffic

- Maximum exploitation of existing equipment in new technology settings

- Increased safety following Deepwater Horizon

- Deeper operations

- Challenging reservoirs and well control; High pressure high temperature, deepwater

- More sub sea intervention
Numerous drivers for new and improved technology in the Maritime Offshore sector

- Offshore wind
- Reducing local and global air pollution and emissions, with related regulations
- Floating LNG
- Better energy efficient operation
The Arctic - Winterization needed due to cold climate

- Vessels and rigs need to be winterized for safe and reliable operation in cold climate
  - Low air temperature $\rightarrow$ brittle materials
  - Sea spray icing $\rightarrow$ equipment & systems malfunction

**WINTERIZATION CLASS**

- Material requirements
- Two engine rooms
- Helicopter landing facilities
- Life saving and navigation equipment

**RESEARCH AND DEVELOPMENT**

- DNV is developing numerical models and science based guidelines for sea spray icing
The Arctic - Ice management vessels

- Drilling operations in ice needs to be supported with highly specialized multi-purpose ice management vessels capable of:
  - Evacuation and rescue of personnel
  - Ice breaking
  - Supply operations
  - Oil spill response
Jack-ups for Norwegian sector

- Most of the current drilling plants on fixed installations are old and worn out (>20 years)
- An upgrade/modernization will include huge costs, including interruption of the existing daily production.
- More economical to invest in specially adaptable Jack-Up’s, moving from platform to platform, for the new well programme (Increased Oil Recovery & Reduced cost)
Drill ships and semi’s

- New generation of ships initiated by deepwater discoveries
- Need for bigger capacity units and larger Blow Out Preventers (BOP’s)
- More challenging reservoirs and more challenging well control, High Pressure High Temperature (HPHT)
Subsea intervention

- Development from large construction vessels to new designs and more specialised and tailor made vessels
- Cost-efficient drilling and production of smaller reservoirs nearby through existing production tubing.
- Typical units for light well intervention (wireline, riserless well intervention) and ROV services
Pipelay vessel: Deep Energy 195 m (2013) Technip, STX
X-Stream: Deep- and ultra-deep water pipe laying concept

- To reduce the **wall thickness** and thereby the costs of long distance deep-water gas pipelines by controlling the differential pressure, DNV introduces X-stream and
  - i-HIPPS (Inverted-HIPPS)
  - i-DBB (Inverted-Double Block and Bleed)
Offshore wind installation vessels – ideas coming to life

November 2010 – A Concept

November 2012 – A Vessel

- Vessels finished in 2012 – reducing bottleneck problems with installation capacity.
- New technology will reduce costs, improve efficiency, and increase safety.
- Next bottleneck could be cable laying vessels and O&M vessels.
- DNV is driving the industry forward with Standards, Classification and Advisory Services.
Floating liquefied natural gas (FLNG) and Floating storage & regasification Unit (FSRU)

- 2011: Established state of the art standard
- DNV Offshore Technical Guidance - Floating Liquefied Gas Terminals
- incorporating DNV and industry lessons learned on tackling design and construction issues for floating terminals.
LNG as fuel is a new, but proven technology

- DNV Rules for Gas Fuelled Engine Installations since July 2001
- 31 ships with DNV Class notation GASFUELLED
- 32 gas fuelled ships to DNV class on order
LNG as fuel: And other ship types will follow
Offshore supply vessel: hull innovation and system flexibility
The major benefits of the fuel cell over an internal combustion engine are:
- Up to 30% increase in energy efficiency
- Up to 50% reduction in CO2 emissions
-Eliminates NOx, SOx and particulate matter emissions

The fuel cell has been operating successfully for close to 20,000 hours.
FellowShip III: Hybrid ship – gateway to the future

The major benefits of the hybrid system over a traditional energy system are:
- Up to 20% increase in energy efficiency
- Up to 30% reduction in CO2, SOx and PM emissions
- Up to 50% reduction in NOx emissions
- Up to 60% reduction in CO emissions
- Elimination of noise and emissions in harbour

Less than 2 years return on investment due to fuel savings

Energy efficiency over time: Conventional vs. Hybrid
Safeguarding life, property and the environment