Subsea Lubrication

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Subsea processing applications
Operating regimes and lubricant requirements
Reliability of new technologies
Installation, operation & maintenance
Introduction – Castrol Technology Centre

- Specialises in lubricants and fuels technology
- Castrol Global Marine & Energy Lubricants HQ
- Centre employs over 300 specialist staff – engineers, chemists, tribologists & technicians
- Base for Castrol Offshore Technology team - research, development, product quality and performance, complex chemical analysis, environment, business support

Global Lubricants Technology Headquarters, Berkshire, UK
Introduction – Subsea heritage

- **Subsea Production Control Fluids**
  - Synthetic hydrocarbon based control fluids
  - Aqueous control fluids
  - Subsea booster station fluid

- **Specialist Lubricants**
  - Aviation & industrial turbine oils gas turbine lubricants
  - Compressor lubricants
  - Insulating oils
Castrol products for challenging applications

BAR Americas Cup Team (environmental)
• Hydrofoil hydraulics: Castrol Biobar SWH

NASA Curiosity Mars Rover (remote – 140 million miles)
• All moving parts: Castrol Bracycote 601 EF grease

BLOODHOUND SSC (extreme – 0-1000mph in 55 seconds)
• R-R EJ200 jet engine: Castrol 5000 synthetic turbine oil
• Hydraulics: Castrol Hyspin AWH-M46
• Braking systems: Castrol React SRF
• Wheel bearings: Castrol Alphasyn T32
• HTP rocket: Castrol Inertox Medium 150 grease
• 800hp fuel pump power unit: Castrol EDGE

IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.
Recent subsea developments requiring specialist lubricants are
- Multi-phase pumping
- Gas compression
- Subsea separation

The first two of these generally incorporate rotating equipment, with very different lubrication requirements when compared to subsea production control systems.

Although a subsea control fluid must provide some lubrication performance, the required characteristics of a lubricant in processing equipment can be quite different.
Subsea processing applications

• Plain & rolling-element bearings
  – Differing requirements
• Mechanical face seals
  – Tight viscosity range
  – Sensitive to deposit build-up
• Gears
  – May require Extreme Pressure lubricants if heavily loaded
• Electrical insulation
  – Cannot use aqueous fluids
  – Impact of moisture ingestion
• Heat transfer
  – Thermal stability
  – Specific heat capacity
Specialist lubricants & functional fluids for other applications

- Thrusters
- Subsea BOPs
- Riser Tensioners
- Subsea Electrical Power Distribution
- ROV Hydraulics
- HPHT Platform Wells
- Motion Compensators
- Surface BOPs
Subsea operating regimes and lubricant requirements

- High temperature reservoirs
  - High thermal stability
- High pressure flow
  - Higher contact loads require good anti-wear characteristics
- Long offsets
  - Low viscosity to minimise pressure drops in umbilicals
- Environmentally sensitive areas
  - Requires low persistence and low toxicity
  - Compliance with specific local legislative requirements
  - Additional and evolving criteria

And of course a challenging economic outlook!!!
Castrol’s Environmentally Acceptable Lubricant (EAL) range

• Castrol Transaqua range
  – Aqueous media for Subsea Production Control & Subsea Processing applications

• Castrol Brayco Micronic range
  – Synthetic hydrocarbon media for Subsea Production Control & Subsea Processing applications

• Castrol Bio range
  – Castrol Biobar environmentally acceptable hydraulic fluids
  – Castrol Biostat environmentally acceptable gear oils
  – Castrol Biotac environmentally acceptable greases
Summary

• Subsea processing applications and operating regimes require specialist lubricants
• The lubricant should be treated as a key component of the equipment, not merely a consumable commodity item
• Developing and qualifying a new lubricant for a specific application is a lengthy, complex and resource-intensive process
• It will not always be possible to obtain a single lubricant that will work in all applications and/or under all operating conditions – you may need to change the hardware
• Early engagement with the lubricant vendor and sharing fully the equipment design details and operating regime delivers major benefits