SUBSEA X.MAS TREE INSTALLATION IN DEEP WATERS

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1. BOURBON OFFSHORE
2. BOURBON SUBSEA ACTIVITIES
3. X MAS TREE INSTALLATION FEEDBACK
4. UPCOMING CHALLENGES
5. CONCLUSION
1. BOURBON OFFSHORE
BOURBON A WORLDWIDE PRESENCE

GLOBAL PRESENCE, LOCAL EXPERTISE

EUROPE MEDITERRANEAN MIDDLE EAST
83% local workforce

AMERICA
89% local workforce

AFRICA
59% local workforce

ASIA
79% local workforce

28 Operating affiliates
15 BOURBON Training Centers
6 BOURBON Repair Centers
Operational areas
BOURBON FLEET

BOURBON offers a standardized fleet in line with client needs

- High maneuverability through dynamic positioning system and unique propulsion
- Fuel savings through diesel-electric propulsion
- Reliable equipments through standardized maintenance

<table>
<thead>
<tr>
<th>105 AHTS</th>
<th>99 PSVs</th>
<th>14 TUGS</th>
<th>265 CREWBOAT</th>
<th>21 MPSVs</th>
<th>15 ROVs</th>
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<tbody>
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<td>Including the Bourbon Liberty 200 and 300 series</td>
<td>Including the Bourbon Liberty 100 and 150 series Bourbon Explorer 500 series</td>
<td></td>
<td>Including the Rastar 3800 and Rampage 5000 series</td>
<td>More than 3,000,000 passengers transported per year</td>
<td>Including the Heavy Duty and Ultra Heavy Duty ROVs</td>
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MAIN CLIENTS

NOCs¹
- Saudi Aramco
- PEMEX
- BR
- PETRONAS

OIOC²
- MURPHY Oil Corporation
- HESS
- saipem
- subsea 7

Supermajors
- bp
- Chevron
- Shell
- Eni
- ConocoPhillips

Contractors
- Technip
- Schlumberger
- Total
2. BOURBON SUBSEA ACTIVITIES
BOURBON SUBSEA SERVICES

• ENGINEERING
• PROJECT MANAGEMENT
• ASSET MAINTENANCE
• PERSONNEL TRAINING

BOURBON SUBSEA SERVICES INVESTMENT S.A.S

IRM VESSELS & MOBILE ASSETS
20 Vessels + 2 in construction

BOURBON SHIP MANAGERS
• Norwegian Flag (BON)
• Far East Flag (BOA)
• French Flag (BOS)
• Internat. Flag (BOG)
• Australian Flag (BO Aust.)

• ROVs (15 unit)
• INSPECTION SERVICES
• SURVEYS
INTEGRATED SERVICE PROVIDER

VEssel

ENGINEERING

ROV
20 SUBSEA VESSELS CURRENTLY IN OPERATION
+ 15 ROV + ENGINEERING
BOURBON EVOLUTION 800 SERIES (10 UNITS)

- **Twin Cranes**
  - 150 t AHC - 2,500 m reach
  - 40 t AHC - 2,500m reach
  - 87t @2500m Main Crane (DAF 1.4)

- **Specifications**
  - Diesel electric engines, DP3
  - Length: 100 m, deck area: 940 m²
  - Accommodation: 105 pax
  - Methanol (capacity-transfer): 2 x 187 m³ - 2x100 m³/h@ 9 bars

- **Particulars**
  - Fire Fighting and Rescue / Oil spill
  - Oil spill response:
    Capping stack installation with AHC + BOP emergency closure with ROV
30% of SUBSEA HARDWARE INSTALLED IN WAF

276 X-mas trees installed - 396 jumper tie-ins
By Bourbon Vessels Update: 31 Dec 2014

- Angola
- Nigeria
- E.G.
3. X.MAS TREE INSTALLATION FEED BACK
X.MAS TREE INSTALLATION BY CRANE

- About 680 subsea lifts in West Africa at end 2014 performed by Field Support IMR Bourbon Vessels
- Reliable method, Zero Incidents
- Cost effectiveness:
  - Deep Water X.mas tree: 2 to 3 Days rig time (including riser recovery and redeployment)
  - Crane vessel + ROV operation time: < 24hrs
X.MAS TREE LIFTING RECORD & ANALYSIS

X.MAS TREE LIFTING SPECIFICATIONS

- Max **computed** DAF: analysis up to 2.0m Hs
  - 1.33 for Hs 1.5m, 1.4m for Hs 2.0m

- Max **recorded** DAF (Dalia, Clov, Akpo)
  - 1.15 for Hs 1.5m
  - Tree weights from 38T to 59T (Agbami & BP block 31)
X.MAS TREE LIFTING RECORD & ANALYSIS

X.MAS TREE LIFTING MODELISATION

- Dedicated Dalia & Rosa X.TREE slaming water interface analysis & records
ACTIVE HEAVE COMPENSATION

Picture 3.2.2: Crane's Log Used to Obtain XT Weight @ 1310 m WD
ACTIVE HEAVE COMPENSATION

Figure 4.10.2: Offloading of XT and ART for Installation
4. UPCOMING CHALLENGES
UPCOMING CHALLENGES

DEEP WATER SUBSEA TREE WEIGHT INCREASE – MORE DUE TO TREE COMPLEXITY
5. CONCLUSION
CONCLUSION

- Bourbon Subsea have developed strong and reliable experience of X – Tree installation engineering & operations in Deepwaters Offshore West Africa
- The added value of detailed Lift analysis and CFD calculation engineering is demonstrated; Specified DAFs in Lift requirements must be challenged in projects to find optimized capacity
- MPSV’s / AHC crane solutions for X tree installation in conjunction with reasonable weather limitations are safe and cost effective
Thank You