The Boris Field Development
Short Cycle Time and High Well Productivity

OTC Paper # 16528

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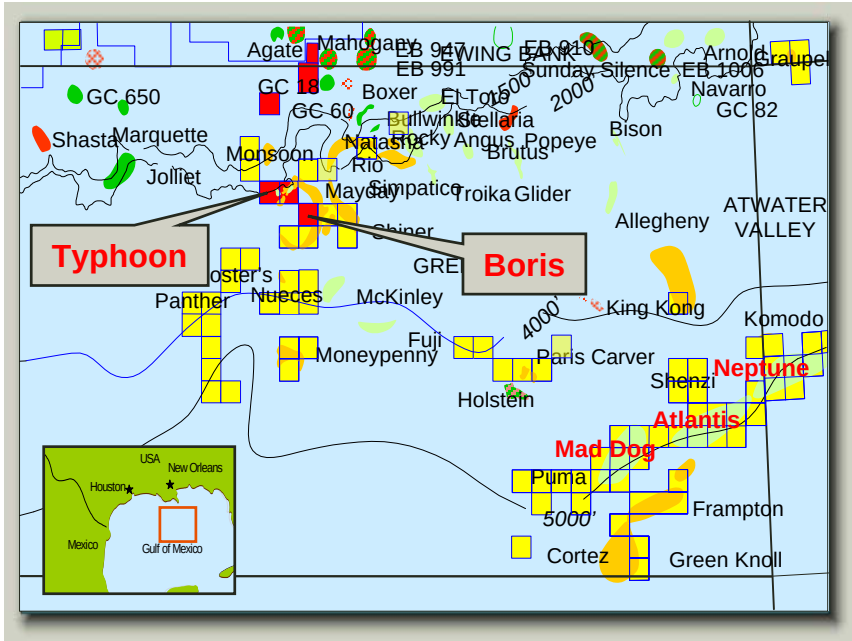
Boris Location

- ~130 Miles SSW of New Orleans
- Green Canyon Block 282
- Water Depth ~ 2400’
- 6 miles SE of Typhoon Host (GC 236/237)
- BHP Billiton’s first operated deepwater project and production



2-Well Subsea Tieback to Typhoon

(6 miles away)

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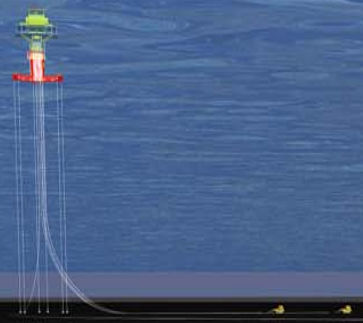
Topsides Modifications



Single Insulated 5” Flowline

Electrohydraulic Control Umbilical

3-Well Production Manifold (includes connection hubs for possible 3rd well, flowline, or subsea pig launcher

SDU/EDU

BORIS

Boris Subsurface Summary

- Seismic amplitudes in GC282, base conforms to structure implying water contact
- Upper Pliocene B4 Sand, high-quality, unconsolidated turbidite sands
- Depth ~ 13,600’ TVDSS
- Undersaturated Oil
- Water-Drive Mechanism

<u>Value-Driven Near-Field Exploration</u>

- Low exploration risk
- High NPV/bbl
- Near-term production
- Exploration wells are producers

Boris Project Drivers

- HSE First
- **Maximize full life-cycle asset value**
  - Minimize cycle time
  - Minimizing cost
  - Maximize reliability
  - Maximize well productivity
- Leverage Typhoon supporting infrastructure
  - “Keep the Facility Full !”
  - Boris #1 spud only one month after Typhoon began producing

Cycle Time – Discovery to Production

	Boris South	Boris North
• Discovery	11/2001	8/2002
• Sanction	3/2002	1/2003
• Production	2/2003	9/2003
	15 months	13 months

Schedule Acceleration

- Use of exploration wells as producers (organizational alignment)
  - Sea-floor location of exploration wells with development in mind
  - Design to accommodate gravel pack completion
  - Sacrifice of appraisal objectives
  - Sacrifice high finding costs for low development costs

- Use of nearby infrastructure (Typhoon)
  - Spare processing capacity
  - Export system and marketing agreements
  - Spare equipment to minimize critical path lead times

- Use of existing trees over new-builds (3 month gain each)
  - Boris #1 - Surplus Cameron tree from CVX Gemini
  - Boris #2 – Surplus Cameron tree from BHP Keith

Schedule Acceleration

- Use of Long-Lead AFEs for critical path items
  - (don't let sanction process slow us down)

- Integrated Project Team
  - JOA/Partner alignment
  - Utilize members of Typhoon project team to capture existing knowledge and lessons learned
  - Capture cumulative experience of partners (ChevronTexaco, Noble Energy) via Integrated Project Team (IPT), Peer Reviews, etc.

Schedule Acceleration

- Drill Boris North and approve Boris North project before Boris South began producing

- Boris #1 completion rig showed up just as Boris #2 drilling rig was leaving

Project Costs ($ million)

	South	North	Total
Exploration	32	20	52
Development (including well completion)	59	29	88
Total	91	49	140

Boris Well Completion Goals - High Productivity, Completion Longevity, no Trainwrecks

- Asphaltene deposition mitigated by
  - Significant fluid testing and ‘recipe’ optimization
  - Tubular coating below CIV
- Aggressive frac-fluid design to achieve frac-pack screenout
- Fines migration mitigated by pre-frac mud acid with diverter
- Post-acid sandface stabilized by minimizing tool movement to reduce swab/sand-influx risk
- Low skin-factor by surging (benefits high kh/μ zones)
  - Reduced risk with low-volume surge with string above perfs
- Post-surge/post-pack fluid loss controlled by using tubing bailer cleanouts to eliminate high ECD’s

Boris Well Completion - Productivity Results

- Productivity Results
  - #1 Initial Skin Flowback to Rig→ 5.
  - #1 Final Cleaned Up Skin→ 3.5 (approx 90,000 kh/μ)
  - #2 Initial Skin Flowback to Rig→ 9.8
  - #2 Final Cleaned Up Skin→0.8 (approx 130,000 kh/μ)
- No 'Trainwreck' Incidents During Sandface Execution

Conclusions

- Total exploration and development cost was ~$140 million
- Both Boris projects have been successfully executed and business objectives have been achieved
- Near-Field exploration can create large value out of small reserves
- Short cycle times were achieved on both Boris projects
  - Discovery to first oil
  - Sanction to first oil
- Well completion techniques used on the Boris wells have generated high-productivity, low-skin completions

Back-up Slides

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Boris Field

- Lease Acquired January 1998
- Partners
  - BHP Billiton 50%
  - ChevronTexaco 25%
  - Noble Energy 25%
- Southeast Offset to Typhoon Field (50/50 CVX & BHPB)
- Boris 1 discovery well and sidetracks drilled Aug-Nov 2001 (Diamond Ocean Quest)
- Boris 2 discovery well drilled Jun-Aug 2002 (Diamond Ocean America)

Boris Subsea System

- Subsea Tieback to Typhoon Mini-TLP
- Single, Insulated Flowline
  - 6 miles, 5” Nominal Diameter
- 3-Well Capable Production Manifold
  - Includes connection hub for contingency flowline or subsea pig launcher
- Electrohydraulic Control Umbilical
  - 6 miles, subsea distribution unit
- Topsides Modifications
  - Inlet Manifold Extension, Waste Heat Recovery Unit, Chemical Injection Skid, Subsea Controls

Subsea Controls

- Subsea controls supplied by ABB
- Electrohydraulic Control System
  - New Equipment
    - MCS, HCP, TUTU, SDU, EDU, UTH, Flying Leads, Pods
  - Existing Shared Equipment
    - HPU, UPS
- SDU/EDU
  - SDU installed with original Boris 1 installation (hydraulic distribution)
  - EDU installed with Boris 2 installation (power/comms distribution)

Subsea Hardware – Boris 1

- Surplus Cameron SpoolTree from CVX Gemini
- Typhoon design approach followed to minimize Total Installed Cost
  - Completion Guidebase (CGB)
  - Stab-and Hingeover (S&HO) Flowline Connector
  - Stab-and Hingeover (S&HO) Umbilical Termination Head
- Tree modified for Boris application at Cameron (Berwick, La)
  - Substantial frame mods for CGB
  - Added downward-sloping flowloop
  - Added 2nd Annulus Wing Valve
  - Added Upper Re-Entry Funnel (Consistent w/ Typhoon field philosophy)

Subsea Hardware – Boris 2

- Surplus Cameron SpoolTree from BHPB Keith
- Air-freighted tree from UK on Russian Antanov
- Tree modified for Boris 2 application at Cameron (Berwick, La)
  - Added one(1) hydraulic penetration in tree and tubing hanger
  - Replaced Cameron tree connector with Vetco H4 connector
  - Machined Vetco H4 Profile in Spool Body Top
  - Added 2nd Annulus Wing Valve
  - Added Upper Re-Entry Funnel (Consistent w/ Typhoon field philosophy)
- Utilized conventional upwards flowline connection hub (CVC) and flying lead umbilical connections
  - Conventional design utilized due to close proximity to production manifold

Subsea Completions

- Boris 1: Transocean Falcon 100
  - 97 Days
- Boris 2: GlobalSantaFe Arctic I
  - 55 Days
- Completion Features
  - Single-Zone Frac-Pack
  - Downhole Venturi Meter
  - Downhole Chemical Injection

Control Umbilical

- Main and Infield Umbilicals supplied by Oceaneering Multiflex (UK)
  - Main = Typhoon to SDU
  - Infield = SDU to Boris 1 UTH
- “Moray” end terminations supplied by Deep Down, Inc.
  - SDU-end of Infield Umbilical
  - Both ends of tree HFL

Production Flowline

- Single, Insulated Flowline
  - 6 miles, 5” Nominal Diameter
- Hard pipe flowline (5” nom) supplied by U.S. Steel (MAOP = 8000#)
- Hard pipe coating (2.3” GsPU) supplied by Bredero-Price
- Flexible flowline (6” ID) supplied by NKT (MAOP = 8000#)
  - First NKT-supplied flexible in the GoM
  - Dynamic Riser
  - Boris 1 manifold pigtail
  - Boris 2 flowline jumper

Production Manifold

- Subsea manifold supplied by Cameron
- 3-well tie-in capability (4”) plus contingency flowline/subsea pig launcher hub (6”)
- Each well flowline hub includes a remotely-actuated gate valve controlled by the adjacent Boris 2 pod
- P/T transducer located on common manifold line downstream of the three flowline tie-in points

Installation

- Contractors
  - Boris 1: Global Industries
  - Boris 2: Oceaneering
- Vessels
  - Boris 1: Chickasaw supported by Sea Cat (diving), GIO Sea Wolf / Sonsub Dominator (ROV by Sonsub)
  - Boris 2: Ocean Intervention
- Timing
  - Boris 1: January 2003
  - Boris 2: September 2003
- Challenge
  - 22 days WOW (Boris 1)