The Matterhorn project
Presentation at the Marine Technology Society Luncheon April 22, 2004
Agenda

• General Project Overview

• Development architecture

• Key challenges

• Execution highlights

• Conclusions
General overview
Key Time line

• Discovery early 1999: 2800 ft water-depth, Multi-layered reservoir

• Decision to develop: July 2001

• Start development drilling: December 2001

• Installation: August 2003

• Start well completion: September 2003

• First oil: November 2003
The platform: a SeaStar® TLP

- Surface piercing structure (TLP or SPAR) w/dry tree chosen due to reservoir complexity (Multi-levels).
- Atlantia chosen after design competition with an EPCI Lump Sum Contract.
- Hull: draft 104’, height 125’, dia. 84’ weight 5,500 T.
- 9 slots for production risers and dry trees (spacing 10’x10’)
- Mooring: 6 x 32” tendons, 6 x 96” piles (tension 2,800 klbs per tendon).
- 1,000 HP W/O rig (separate contract).
- 10” Gas and 8” Oil Export SCR’s, WI flexible
- Provisions for future subsea tie-backs
- ABS Class FOI
Topsides general Overview

- 140’x140’, 3 decks
- 11,000kips dry, 12,600 kips operating
- 33,000 bopd, 55 MMscfd, 20,000 bwpd
- 100 MMscfd gas drying, WI 30,000 bwpd
- 2 Cranes: 45 t and 75t
- 2x 4.5 MW turbines (2x50%); 1.2 MW e-gen
- Gas engine driven recip. compressors
- 3 survival capsules, 50 pax each
- LQ: 22 pax permanent, 78 temporary
- Blast & fire wall

- Helideck: 56’x56’ for Bell 412, Sik 76
Risers and pipelines

• Export by two 16 miles pipelines (8” and 10”), 8” owned by Chevron.
• Hot-tap tie-in points to trunklines
10" GAS EXPORT (SCR)
10.75" O.D x 0.625" W.T PIPE

HANG-OFF ANGLE 15°
WD @ TLP = 2811 ft.

1300' STRAKE LENGTH
MUDLINE EL. (-) 2706 ft.
SCR TOUCH DOWN (MEAN)
3° SEA BED SLOPE

1499'
HORIZONTAL DISTANCE TO TDP (NEAR)

1955'
HORIZONTAL DISTANCE TO TDP (MEAN)

2464'
HORIZONTAL DISTANCE TO TDP (FAR)

MUDLINE @ CL TLP
SCR TOUCH DOWN (NEAR)
SCR TOUCH DOWN (FAR)

NOT TO SCALE

MATTERHORN DETAILED DESIGN OF STEEL CATENARY RISERS
10" GAS EXPORT SCR
Development architecture screening process

PHASE I: SCREENING STUDY
DRILLING/COMPLETION COST

PRE-SIZING AND COST OF 12 CONCEPTS
(Summer 1999)

PHASE II: DEVELOPMENT OPTIONS

DRY TREE OR SUBSEA?
CONCEPTS SELECTION

PHASE III: TOPSIDES DESIGN

PROCESS DESIGN LAYOUT DRAWINGS
(Nov 1999 April 2000)

PHASE IV: CONCEPT COMPETITION

FINAL PROPOSALS / SELECT ONE
CONCEPT (March 2000 to June 2001)

PHASE V: PROJECT

July 2001 - November 2003 (FIRST OIL)
Concepts Considered in Phase I (Screening Study)

• Dry Tree
  - Atlantia Sea Star ®
  - Modec Moses
  - ABB TLP and Mini-TLP
  - Spars Classic Spar and Truss Spar
  - Kvaerner DDF
  - Technip TPG 3300
  - Mustang Compliant Tower
  - Hutton TLP

• Sub-Sea
  - Atlantia Sea Star ®
  - Cal Dive EGB Semi-Submersible
  - Oceaneering Converted Semi-Submersible
  - Intec Remote Subsea (Taylor MC 20 Platform)
The retained concepts
Key Project Technical Challenges

• Drilling: Deviated wells with shallow kick-off and shallow water flow

• Biggest mono-hull TLP and first with dry risers

• Met-Ocean: consideration of Cold core current profile

• Production risers with Surface Xmas trees: Keel joint development

• Reeled SCR’s
Challenge: biggest mono-hull TLP + dry trees

MORPETH

ALLEGHENY

TYPHOON

MATTERHORN
Challenges: Drilling of High Angle wells

- MC199#1
- MC243#1
- MC243#2
- MC243#3
- Conoco #1
- 7 Dry Tree
- 1 Wet Tree (A6)

- A1
- A2
- A3
- A4
- A5
- A6
- A7
- A9

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000

- 2000'
- 4000'
- 6000'

- 7 Dry Tree
- 1 Wet Tree (A6)
Challenges: Consideration of Cold Core Current (CCE)

- **Fatigue:**
  - design life at 10 x recorded event
  - Need fairings to 1500’
- **Platform offset**
- **Riser/tendon interference**
Challenges: Production riser keel joint
Project Highlights

• Drilling
• Construction
• Installation
• Production risers
• SCR’s
Drilling: pre-drilling of 7 wells, seabed spacing 25ft

ENSCO 7500

Tropical Storm Hanna
Hull construction by Keppel/Fels - Singapore
Topsides Construction by Gulf Marine Fabricators
Tendons fabrication by Kiewitt Offshore

Tendon main body sections with fairings

Bottom connector
Hull transport on the Tai an Kou
HULL Load-on Transportship
Installation by HMC Hermod

- Installed piles in March 03.
- Tendon Installation started on June 3, 03.
- Went on Stand by during tendon installation on June 10 due to high current (Eddie Current >1.5 knts) and two tropical storms.
- Resumed work on July 16 after 34 days stand-by
- Deck was set on August 3.
- Platform was habitable on Aug 5.
Eddy Currents

Legend

2-4 June 2003
Eddy Sargassum Survey
R/V Pelican

Horizon Marine, Inc.
15 Cook Road
Marion, MA 02738
Pile and tendon Installation

Buoyancy cans

Tendon spacer
Hull Installation
Topsides lift: 5800 t
Production risers

PRT's

Well bay

C.Van der Linden
07/05/2004
Pipelines & sub sea

- Multi-contract &PO approach
- Pipelines were installed in April May 2003 by the reel-ship Deep Blue (Technip) before platform installation and picked up by the crane barge Hermod.
- Commissioning by Stolt
- Subsea injection well completion and connection to be performed in May-June 2004.
SCR Results

• Installed Within Tolerance

• Both Lines Have Been Pigged

• CP Inspection Results OK

• Touchdown Point Trenching As Predicted
Conclusions

• 3.2 Million manhours

• LTIF <1

• 24 months between sanction and deck mating

• 27 months to first oil

• 4 wells producing to-date