Simultaneous Synchronized Hydraulic Jacking System
Lima Subsidence Remediation Project - PHE ONWJ, Indonesia

Asia Offshore Energy Conference (AOEC)
Bali, 23-24 October 2013
AGENDA

• Introduction of PHE ONWJ
• Project Overview
• Project Risks and Assurance Process
• Offshore Campaign Program
• Key Success Factors
ASSET INFO:
- Geographic size: ~250 km x 100 km
- Number of structures: 221
- Subsea pipelines: 375 (>1,600 kms)
- Age of facilities: 20 – 35 years

PARTNERSHIP:
- PHE ONWJ (Operator): 58.28%
- EMP ONWJ Ltd.: 36.72%
- Risco ONWJ BV (Kufpec): 5.00%

Key facts:
- ONWJ PSC is one of the oldest producing PSCs in Indonesia, and in the world
- At present, ONWJ is the 4th-5th biggest oil producer PSC in Indonesia

ONWJ HSSE Performance

PHE ONWJ Key Objective

**Safe and Reliable Operations**

**Grow Production Efficiently & Commercially**

**Focus on Reserves Adding Activities**

**People Development**
Subsidence occurred due to compaction on production reservoir

- Subsidence continuously occurs with a rate of 15 cm/yr.
- Lima F/S is unsafe operation from 2013 onward
- Lima field can be commercialized until 2026

- Agreed on Subsidence Study Results by LAPI-ITB
- Deck raising height by 4 meter to sustain production till 2026
Lima Flow Station Data

- Lima Flow-station built in 1973
- Lima F/S consists of L-Compression; L-Process, L-Service, LA, Bridges, and Flare Bridged
- Four legged type platforms at water depth of currently 30m (original 27m)
- Monsoon period Nov-Feb
- L-COM weight 1,210 tones  L-SER weight 847 tones, LPRO weight 931 tones
- Facility be raised-up LCOM, LSER, LPRO, Bridges, Flare Bridge with total weight of 3,300 tones
- Total 14 risers (Oil & Gas) and 6 caissons tied-in to Lima Flow-Station
- Numbers of existing pipelines laid seabed around flow station
- Lima field produces 10% of total ONWJ Production
- Lima Flow Station has been subsided about 3m
What’s cost effective method to remedy Lima F/S?

Simultaneous Synchronized Hydraulic Jacking System
Objective:
Maximize value of remaining reserves at Lima Field until PSC live and beyond by providing a cost effective, economically viable, and technically and operationally feasible within ONWJ business.

LIMA F/S DECK RAISING:
Scope of Work
• Synchronized Deck raising by 4m (LCOM, LSER, LPRO, Flare Tripods & Bridges)
• Extension of Risers and caissons @LPRO, LCOM and LSER
• Boat landing removal & Install new boat protection @LPRO, LCOM and LSER
• Bridge support Including stair way @LA
• Access/ walk way LPRO, LCOM and LSER

Schedule: Target completion Nov 2013
Project Risks

Identified Risks:

- Simultaneous Synchronized Hydraulic Jacking System as the 1st application
- Old existing platforms relates to its integrity & weight control,
- Limited air gap below cellar deck (1.5 m)
- Working at lower level (0.5m above sea-level)
- Clash conflict with existing facilities (access for Jacking equipt)
- Limited Personnel on Board (PoB) working at existing platforms
- Hot works at Live platforms
- Sea-state during raising operation
- Lifting Operation (personnel & material/equipment)
- Marine spreads operation
1. Subsidence modelling & prediction and actual monitoring/measurement (by LAPI-ITB)
2. Shared learning with Devon Project Manager
3. Platform weight verification e.g. PDMS, site visits, engineering estimate (by Tripatra)
4. Structural Integrity calculation for both condition ‘deck raising’ and ‘as raised in operation’
   (FEED by Singgar Mulia/Trident, Detail engineering by Synergy)
5. Structural Integrity at deck legs, jackets, and piles (FEED by Singgar Mulia/Trident, Detail
   engineering by Synergy)
6. Decision Support Package (DSP) for each stage
7. Design assurance by Independent Verification Body (Germany Lloyd)
8. Qualitative Risk Assessment –QRA (by Lloyd Register Perth)
9. Versabuild Hydraulic Jacking Equip’s design and function test were witnessed by ABS
10. Versabuild Hydraulic Jacking Equip’s function test were randomly witnessed by SGS on
    behalf Company
11. Versabuild Hydraulic Jacking Equip. is designed with redundant system
12. System Integration Test (SIT) with mock-up Lima platform & bridge (scale 1:1)
13. Project Safety Review (PSR) for each stage
14. Hazop & Hazid upon completion of FEED and Detail Engineering
15. Mock-up leg sleeves & padeyes for construction crew
16. Deck raising executor by Versabuild team who has previous similar experience
Risk Matrix - Initial Risks

Major Risk Matrix – Sanction Stage

- Weather during Raising
- Gol Approval for deck raising
- New Technology Application
- Integrity Existing P/Fs
- Insurance Coverage
- Risks Level of Deck Raising
- Hot Work @live plant
- Contractor Experiences
- Shutdown Period Commitment
- Partners Commitment

Manageability

- Initial Risk
- Residual Risk
What has been done:

- Identify Risks & mitigation
- Assurance process
- SIT Mock-up
- Partnership & Collaboration
- Well control of fabrication
- Well offshore plan
- Open communication
## Offshore Campaign Program

### High Level Offshore Program

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<tr>
<th>MAY</th>
<th>JUNE</th>
<th>JULY</th>
<th>AUGUST</th>
<th>SEPTEMBER</th>
<th>OCTOBER</th>
<th>NOVEMBER</th>
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- **PRE SHUTDOWN, HABITAT - 83 days**
- **SHUTDOWN - 66 days**
- **POST SD, HABITAT - 46d**

### Activities

- **SLEEVES/PADEYES/BUSHING/VB EQUIP**
- **ISOLATION**
- **MOD & VB EQP LCQM**
- **MOD & VB EQP LPRO**
- **MOD & VB EQP LSER**
- **MOD & VB EQP FL**
- **RAISING STG1**
- **SLEEVES STAGE-2**
- **SLEEVE STAGE 2**
- **SLEEVE STAGE-2**
- **RAISING STG2**
- **HOOK-UP LCQM**
- **HOOK-UP LPRO**
- **HOOK-UP LSER**
- **HOOK-UP FL**
- **COMM & SU**

### Equipment Spread

- **MARINE SPREAD DLB#01**
- **MARINE SPREAD AWB SS3**

### Equipment Details

- **AT PLATFORM (POB D&N) - 205 prs**
- **AT PF (POB D&N) - 385 prs**
- **AT PF (POB D&N) - 178 prs**
- **AT AWBs (D&N) - 248 prs**
- **AT AWBs (D&N) - 479 prs**
- **AT AWBs (D&N) - 234 prs**
Lima F/S Deck Raising - Photos

1st Raising
2nd Raising
Project Clips 6 mnt
Key Success Factors

• Taking Challenges
• Identify Risks and mitigation
• Contractor as partners
• Power of collaboration
• Perform thorough assurance process
• Close communication to all stake holders
• Close control Contractor performance
• Close Interface and communication among executors
• Project Target owned by all executor teams
• Continuous Management support
Thank You