Integrated operations enabling new operational and project concepts

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Integrated Operations – Current Situation

• Many early adopters have made significant gains
  • In large IOC’s not easy to scale and sustain IO

• Most Large IO implementations have concentrated on implementing functional (vertical) capabilities e.g. Smartwell technology
  • Rolling these out around the organisation to add value

• Far fewer implementations that are fully integrated at the asset level (horizontal)
  • Large complicated assets
  • Is this scalable or is it unique to an asset?

• Many companies are trying to define what is next for IO and realise that they have not finished but uncertain where to go next.
  • Still very little ‘true’ penetration into new projects
Next steps for IO

1. **Value chain integration**

2. **Automation and remote control – driven by:**
   - Complicated value chain based assets
   - Lack of skilled resources and remote locations
   - New projects where the old model will not work
   - A realisation that technically this is “not a big deal”

3. **New Operational Models and minimum manning concepts**
   - For discussion today
IO – Value Chain Integration

Value chain and cross functional integration is being driven by:

• Very complicated operational assets
• Gas and LNG operations
• Un-conventionals e.g. SAGD where optimisation is inherently cross functional and very complicated
• New Projects where the old operational model will not work

It is being enabled by:

– Cross functional collaboration
– Integrated value chain processes
– Model and Analytical based approaches eg (IAM)
IO Value chain integration

- Reservoir
- Wells
- Facilities
- Export
- Processing
- Customer

Value Creation
- Decisions and Action
- People and Culture
- Organisation and Alignment
- Collaborative Working
- Information Analysis
- Information Visualisation
- Communications Infrastructure
- Data Capture and Storage

End to end value chain processes
- Reservoir Surveillance
- Well Monitoring
- Rotating Equipment Standardisation
- Pipeline Network Modelling
- Process Plant Monitoring

End to end value chain visualisation
- Information Analysis
- Information Visualisation
- Communications Infrastructure
- Data Capture and Storage
Automation and Remote Control

• Still little closed loop automation – GLOP is an exception
• Some local automation for beam pump control
• Advanced control systems becoming more common
• Remote Control on wells, plant and assets is emerging fast and is being driven by:
  • Complicated value chain based assets moving to a central control philosophy
  • Lack of skilled resources and remote locations
  • New projects where the old model will not work
    • Eg CBM to LNG in Australia
  • A realisation that technically this is ‘not a big deal’
  • A combination of the above
Australia u/s LNG Operations

- Multiple developments
- > $15 Billion projects
- > 5000 wells per development
- > 2000 Compressor Stations
- 5-8 Gas Hubs per development
- All remotely controlled from a single CCR in Brisbane
- Well handover critical
- Commissioning on-going
- Remote Control, Monitoring and management built into the design
- Design aligned with the operations model
- Moving from 1 operator per 20 wells to 1 operator for 100 wells
- 20 years for field development

How do you run this the old way?
Value chain and remote control example

Mining - BHP IROC Level 23 in Perth

Drivers for Change:
- Lack of skilled resources
- Very remote locations
- Value chain integration

Outcome:
- Payback in six months
- Enhanced recruitments
IO input to the Major Project Process

**Concept Generation**

- IO input to Concept generation

**Concept Selection**

- IO Technical and Engineering Input

**Define**

- IO Operations Readiness with New Ops model

**Execute**

- IO Coaching and On-going performance improvement

**Operate**

- IO enabled commissioning And first year operations support

**Collaboration for the Project Delivery Process**

**Project Delivery Process**
IO for new Projects – Current Situation

• Engineering and Technical aspects built into the design
  • e.g. enhanced level of instrumentation and high bandwidth communications
  • ‘Roll back’ by Project is still an issue e.g. scrap the fibre

• IO enabled Operations readiness is still an issue
  • Operations teams on projects often do not know what to do with all the new technology and set up an ‘old organisation’

• Fully IO enabled project concepts yet to emerge
  • Some half way house
  • A few isolated examples where this has been achieved

• Collaboration applied to the Project Process??
Minimum Manning Concepts

Minimum Manning Concepts are common in many Oil and Gas Basins, both onshore and offshore

- Offshore - UK Southern North Sea, Shallow Water GOM, Egypt, Trinidad, Java Sea
- Onshore – USA and Canada, Australia
- Holland – Shell has a single CCR for the entire country

Minimum Manning Operations are getting more complex:

- Enabled by Digital Oilfield e.g. Angel and Malampaya

Some Operators have operated 100’s of unmanned operations worldwide
Operational Model Philosophies

Acronym decoder

NUI - Normally Unattended Installation - Low frequency Day Visits
NNM - Normally Not Manned - Campaign Visits 5 days in 30-60
MMI - Minimally Manned Installation - Continuous Low Manning
FMI - Fully Manned Installation – Traditional staffing and support
Unmanned Operation around the World

BP's APN – Java Sea

Maersk Valdemar - Danish Sector

Cairn Cambay – India

JD Platform – Java Sea

Exxon 696 - GOM

K17 Monopod Dutch Sector
West Sole Bravo and Charlie

- WB & WC Fully manned early 1980’s – POB 50-60
- Early 90’s with POB of approx 20
- Mid-90’s NNM Status with POB 12 – Manned 14 days in 28
- Multiple Attempts to de man
  - ‘Always an Excuse to go back’
- Project to convert to NUI
  - Process Simplification
  - Utilities Simplification
- Stepchange to NUI operational Model
  - 5 days visit in 50-60
BP - Hoton

- Small Greenfield Project – 2001
  - Two Wells
- First BP Platform to use
  - Foundation Field Bus
  - Smart Sensors – Remote Calibration
- Visit Frequency – 4 hrs every 90 days
  - No turn arounds
  - No well intervention
  - No Life Boats – Helicopter on Standby
  - Process Equipment spec’ed for Life
    - Proppant Vessels
  - No Crane – Umbilicals for Chemicals
- Total project delivery for $80 Million, reduced from $350 for traditional project approach
Woodside Angel – NNM The Most Complex Unmanned Platform to date

Gas Condensate Field – NW shelf Australia

High Complexity for NNM

- 800 mmscfd (23 MSm3/d)
- 50,000 bbld (8000 m3/d) Condensate
- Separation, Drying, pumping but no compression
- Highly reliable design e.g. TEG system

NNM Operational Model

- Planned visit frequency of 2-3 days in 45

Temporary Accommodation for Campaign Maintenance and Commissioning

- Lift on Lift off with Platform Crane
- Quarters sized for a POB of 20
Pohokura – Shell Todd

- Gas & Condensate Production – 30% NZ gas
- Remotely Controlled from New Plymouth
- Medium Complexity
  - Separation, Gas Drying, Pumping, Compression,
  - Offshore and onshore wells
  - Power Generation from Grid
- Operational Model – NUI
  - Operator visit 1 day per moth
  - Maintenance Visits 2-3 days per month for a 10 man team
- Production System Availability 99.7%
  - 2012 – 8 shut downs
    - 3 power generation trips - external
    - 5 Production shutdowns – 4 remote restarts
  - Offshore platform as had 1 unplanned shutdown in 4 years
Spectrum of Minimum Manning

Key Requirements
- Engineering Design
- Control and Fire and Gas
- Maintenance Requirements
- Well Intervention
- Emergency Response Philosophy
- Operations and Engineering Support
- Manning Philosophy
- Logistics

Design Process for NUI/NNM Platforms

Traditional Design Process for Fully Manned Platforms
Project Team Mis-alignment

Concept Generation

Concept Selection

Design Freeze

Operations Setup

Operational Asset

Appraise

Select

Define

Execute

Operate

Concept Phase

Delivery Phase

Operate Phase

**Project Delivery Vision**
- Low CAPEX
- On Schedule
- Low Risk
- Same as last time
- Tried and Tested Kit
- No New Technology
- Traditional Concept
- etc..

**Operation/Asset Vision**
- IO Enabled
- IO Operational Model
- High Regularity
- Min Facilities/Manning
- Minimum Manning
- Low Maintenance
- Remote Monitoring
- Whole Life Cost
- New Technology
- etc..
Project Team Full Alignment

Concept Generation
Concept Selection
Design Freeze
Operations Setup
Operational Asset

Appraise
Select
Definine
Execute
Operate

Concept Phase
Delivery Phase
Operate Phase

Generate Shared Vision for the Development and align the organisation

Asset/Operation/Project Shared Delivery Vision

Shared Outcome!
Traditional Projects Approach for a Fully Manned Operation

Project Delivery Process

Concept Generation

Select

Define

Execute

Operate

Operations Input

Digital Oilfield Input

Well intervention strategy

Safety and Risk Study

Maintenance Man hour Study

Manning Philosophy

Operations Support Model

Logistics Input

Traditional Fully Manned Concept

Environmental Input

Equipment & Technology Strategy

Select

Define

Operations Input

Well intervention strategy

Safety and Risk Study

Manning Philosophy

Environmental Input

Stepchange Global
Minimum Manning and IO in Projects
Successful Approach

Limited Manning & Traditional Concept Generation

Concept Selection based on full economic evaluation adjusted for delivery and operational risk

Appraise
Select
Define
Execute
Operate

Project Delivery Process

Front End Loading of Technical Studies as part of concept generation

Simple Minimum Manning Concept
- Minimum Facilities
- Highly Reliable Equipment
- Low Maintenance Equipment
- Shorter Detailed Design
- Shorter Construction Time
- Lower Capex
- Lower Opex
- Fast Track Project due to simple reliable design

Limited Manning Concept

Operations Input
- Digital Oilfield GL Input
- Manning Philosophy
- Well intervention strategy
Safety and Risk Study
Environmental Input
Equipment & Technology Strategy
Maintenance Man hour Study
Operations Support Model
Logistics Input
Design for High Availability

Two Parts

- High Reliability Equipment
  - Equipment selection
  - More Sparing?
- Less/Min Equipment
  - Min Processing Offshore – Subsea Approach
  - Less to Maintain
  - Less Interventions

Characteristics of Successful Unmanned Operations

- Remote Power
- Reliable Comms – Cables
- Simple Equipment – Electric Versus Hydraulic
- Min Processing – Wet Export
- Well Thought out F&G systems
- Simple Philosophy for Manning and Intervention
Benefits from Minimum Manning Models

Min Manning Ops Model = Low Capex + Low Opex + High Deliverability + Improved Safety

- Less Equipment but High Quality
- Little or No Accommodation
- Less F&G and Safety Related Equipment
- Small team on low visit frequency
- Remote Control, Monitoring and Management
- Optimised Maintenance
- Low Logistics Costs
- High Reliability Equipment
- Low Level of Trips and Corrective Maintenance
- Contractual Flexibility
- Low Personal Exposure due to low visit frequency
- Inherently Safe and Reliable Design
- High Integrity Designs
Opportunity for IO in Projects

Opportunity to:

• Combine IO with Minimum Manning Experience
• Reduce Capex – 15-30%
• Reduce Long term Opex – 50-90%
• Increase Reliability and Availability – from 95 to 97+%%1
• Reduce the engineering and construction time and bring forward first gas and oil
• Change the way we deliver the projects with smaller more focussed project teams
• Use Min Manning as a vehicle to challenge all new projects
What’s Next for IO? Projects

• Major projects
  – Inclusion of IO in the Design of New Fields and redevelopments
  – IO not as a ‘Bolt On’ but embedded in the concept
    • Enabling marginal field developments
    • Platforms with no more than 30 POB no matter what the complexity
    • Complex unmanned and low manned operations
    • Reduction in facilities CAPEX
    • Reduction in OPEX
    • Brownfield Redevelopments based on upgrade to DOF
    • IO for Mature Field Life Extension
  – IO Applied to the Major Projects Process
    • Collaborative working for the Project based teams
Conclusions – Min Manning and IO for Projects

- Huge opportunity for new IO enabled Project concepts
  - Lower CAPEX, OPEX
  - Shorter time to first Oil/Gas
  - Inherently safe and reliable
- This is emerging in some companies
  - Marginal or remote projects
- All the technical parts are there
- Challenge is around the People, Process and Organisational resistance
- New organisational and operational models emerging
- Will need to change the way we
  - Run projects
  - The common standards we use for manned platforms
  - The way we specify and procure equipment
IO what’s next - Conclusions

• Combination of:
  • Value Chain integration
    • Processes
    • Models and Analytics
  • Automation and remote control
  • IO enabled Project concepts

• Equals a huge opportunity for the company that takes this on!