# LEAN SIX SIGMA IN THE OIL & GAS INDUSTRY

## BUSINESS CASE

- ❑ Pressure to deliver earnings growth regardless of economy.
- ❑ Expectation earnings will substantially grow year over year.
- ❑ Pressure Exerted by:
  Shareholders • Investors • Board of Directors • Market Analysts

**Goal of Lean Six Sigma**

*Improve business performance in oil and gas operations.*

**Focus Areas**

- Drilling Operations
- Well Testing
- Artificial Lift Rod Pump Repair

## DRILLING OPERATIONS

- ❑ **Field Description**
  - Oilfield off the coast of South Africa.
  - Water depth of 160 feet (49 m).
  - Roughly 15 miles (24 km) off the Angolan coastline.

- ❑ **Lean Six Sigma Objectives**
  - Obtain efficiency improvements in drilling operations.
  - Reduce time required to drill and complete a well.
  - Reduce variation in well delivery times.

### LEAN SIX SIGMA TOOLS

| | | |
|---|---|---|
| Design of Experiment (DOE) | Statistical Process Control (SPC) | Histograms & Historical Data |
| Root Cause Analysis | Value Stream Mapping | Time Studies |
| Quick Changeover | Cause & Effect Matrix | Standardized Work Procedures |

### RESULTS

- ❑ Implementation of 35 out of 40 opportunities.
- ❑ Successful completion of 16 wells.
- ❑ Reduced delivery time through offline operations.
- ❑ ***Financial benefit of $75 million.***
  - Reduction in capital costs
  - Accelerated production

## WELL TESTING

- ❑ **Field Description**
  - Large light crude oilfield in Southeast Asia.

- ❑ **Lean Six Sigma Opportunities**
  - Performed via mass-flow density meter.
  - Most critical factor is water density.
  - Water density manually input into meter.
  - Oil production rates over predicted by 30%.
  - Water densities were old and not valid.

### RESULTS

- ❑ ***22% improved accuracy for oil rate calculations.***
- ❑ Significant changes in measured production.

## ARTIFICAL LIFT ROD PUMP REPAIR

- ❑ **Field Description**
  - Large steam-driven oilfield in North America.
  - Consists of 8,500 active rod pumped wells.

- ❑ **Artificial Lift Requirements**
  - Excess pump inventory and storage locations.
  - Multitude of pump designs.
  - High rig stand-by time.

- ❑ **Lean Six Sigma Improvement**
  - Used statistical and cycle-time tools to improve:
    Rod Pump Design • Pump Repair • Handling Process
  - Redesigned storage facility with:
    First-in First-out System • Visual Controls • Better Safety Design

### RESULTS

- ❑ Lower rig stand-by time.
- ❑ Reduction in pump designs from 36 to 14.
- ❑ Decrease in pump inventory from 320 to 65.
- ❑ Pump storage locations reduced from 9 to 1.

***Financial benefits realized immediately*** through reduction in rig stand-by time and consumption of excess pump inventory.

PREPARED BY:

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