Design for Life of Well –
Is Well Integrity The Key Common Denominator?

Hans-Christian Freitag, VP Integrated Technology, Baker Hughes
8 JUNE 2016
History and Perspective – Oil Price and Drilling Activity since 1980

Source: Bloomberg, Baker Hughes Rig Count, January 2016
Wellbore Integrity – A Global Problem

- Second Wellbore Integrity Network Meeting September 2006
  - “There is clearly a problem with well bore integrity in existing oil and gas production wells, worldwide …..”

% of wells with integrity issues 2011

- Gulf of Mexico: 45% (6,650 wells)
- North Sea, UK: 34% (1,600 wells)
- North Sea, Norway: 18% (462 wells)

Damage Mechanisms
Well Integrity

- NORSOK D-010:
  - “Application of technical, operational and organizational solutions
  - to reduce risk of uncontrolled release of formation fluids
  - throughout the life cycle of a well”
OPERATIONAL AND ORGANIZATIONAL SOLUTIONS
OPERATIONAL EXCELLENCE

HSE
DESIGN FOR RELIABILITY / QUALITY
LEAN SIX SIGMA / STANDARDIZATION
WELLSITE EXECUTION
REMOTE OPERATIONS
Technology Design for Life of Field – Well Integrity Assurance

EFFICIENT WELLS

OPTIMIZED PRODUCTION

IMPROVED RECOVERY

SECURE ABANDONMENT
EFFICIENT WELLS

**DRILLING**
- Reservoir navigation services
- Steerable drilling liner service
- Wired pipe

**AUTOMATION**
- Self-adjusting bit
- Automated drilling rig

**WELL INTEGRITY**
WELL INTEGRITY

- Effective, efficient foam cementing
- Reliable, accurate cement evaluation
- Intelligent self-healing cement
- Fail-safe deepwater subsurface safety valves
- Durable mechanical barrier valves
- High-rate, frac-stack completions
- V0-rated well barriers
OPTIMIZED PRODUCTION

INTELLIGENT PRODUCTION SYSTEMS
All-electrical intelligent well system

FLOW ASSURANCE
Subsea-qualified chemicals

ARTIFICIAL LIFT
- Adaptive production system
- Remote ESP monitoring service
IMPROVED RECOVERY

DEEP WATER
Ultra-deepwater integrated completion and production system

HYDRAULIC FRACTURING
- Unconventional perforating system
- High-side fracturing service
- Straddle packer restimulation system

SUBSEA BOOSTING
Flowline booster system
ARE WE READY FOR THE FUTURE?
MONITORING AND MODELING
Big Data – Data Driven Analytics
STREAMLINED WORKFLOW

- Accurate well integrity evaluation
- Efficient completion removal and well preparation
- Reliable barrier installation
- Effective wellhead and conductor removal
Technology Design for Life of Field – Well Integrity Assurance

“Application of technical, operational and organizational solutions to reduce risk of uncontrolled release of formation fluids throughout the life cycle of a well”