Casing and Completion Technologies

Run casing strings & completions
- without string rotation
- without wiper trips
- without risk
Completion Engineering Applications

Objective: Land the completion on depth

- Complete longer horizontals including OH packer completions in shale
- Land near gauge ICDs and near gauge swellable packers
- Get cost reduction through lightweight tubulars & low-torque connections
- Optimize production with intelligent completions on depth
- Eliminate liner hanger setting off depth, and damage to completion
Turbine Technology

Key Point
Torque $\alpha$ Radius x Density x #n x Q^2

Key Point
Pressure Drops on Stall
7” Turborunners successfully land liners & predrilled liners

**Petrocanada – North Sea**

Previous 8 1/2” section lost due to hole collapse
Deployed in sidetrack to recover collapsed hole and land 3000ft of 7 5/8” pre-drilled liner, using **washpipe**.

Accessed 1700ft of net pay and $200MM NPV.
Reaming time 12 hours.

**Nautical – North Sea**

Risks of borehole collapse.
Ran 7 5/8” pre-drilled liner to depth in critical sidetrack with 7” Turborunner in 8 1/2” hole.

**KOC- Kuwait**

OH horizontal completions with 24 swell packers in 8½” hole. Landed 2100ft 7” completion first time on two wells.
5” Turborunners successfully land liners and OH packer completions

CNR- North Sea

Risks of borehole collapse
5000ft 4 ½” liner landed on depth
Liner cemented normally through tool.

Anadarko

Landed 4 ½” liner with 5000ft OH stepout.
Reamed the liner through two tight sections to TD
Niobrara horizontal shale section, 6 1/8” hole.

KOC- Kuwait

OH horizontal completions with 26 swell packers
Landed 1500ft of 4 ½” completion in 6” hole on two wells. Required to ream last stand to TD
North Dakota: 5” Shalerunner eliminates wiper trips in three horizontal Bakken shale wells to land 10,000 ft completions.

**Objectives**
Run 4 ½” completions (25+ mechanical packers and frac sleeves) to 10,000 feet. Eliminate wiper trips

**Challenges**
Offset wells required wiper trips
Reduce cost of operation

**Results**
No wiper trips needed
Providing confidence to land completions

**Value to Client**
Eliminated need for wiper trips
Reached TD first time
Proven technology for standard adoption and longer stepouts
Oman: 5” Turborunner landed 4 ½” liner through zone of wellbore collapse.

Objectives
Land liner in problem well.

Well Challenges
Well had two drilling fish
Well had two liner miss-runs & wiper trips
Known difficult formation
Vertical well, but dogleg around fishes.

Results
Ran liner to holdup depth 14222’.
Held up and reamed many sections to TD
Landed liner at 14701’-16 hours.
Cemented successfully thru Turborunner 5”

Value to Client
Landed liner on depth
Proven technology for future projects
Value to Client
- Eliminate dedicated wiper or reamer trip
- Reduce risk
- Land any type of completion system on depth thru obstructions
- Proven technology for field development
Wellbore Construction

Objective: Land the casing

- Reduce risks of casing operations
- Optimise well integrity with casing at planned depth
- Manage excessive mudcake, salt, tar and well instability
- Ream casing to TD without casing rotation
- Eliminate wiper trips
Operation

- Circulate to ream through obstruction
- No need to rotate casing
- Reach target depth, land casing
- Cement casing as normal
- Rapid Drill thru with next BHA
Turbocaser Express Technology

9 5/8” Performance Data

[Graph showing performance data with lines representing different conditions and parameters such as speed, pressure, and torque.]
Saudi Arabia: 9 5/8” Turbocaser™ Express reams through trouble zones, lands casing at depth and motor drills out in 15 minutes with PDC bit

**Objectives**
- Run 9 5/8” casing in a Qatif well through the problematic Biyadh shale
- Cement as per program
- Achieve rapid drill out

**Challenges**
- Offset well reports indicated sloughing shale & two casing strings set high
- Drilling reported tight spots: back reaming & extra circulation highlighted difficulties

**Results**
- Reamed & back reamed for 2 hrs
- Landed casing & cemented as planned
- Drilled out with PDC in 15 minutes

**Value to Client**
- Avoided stuck casing & tripping casing
- Avoided extra clean out trip
- Minimal drill out time
- Proven technology for future projects

“One technology that seems to be very promising is the Turbocaser Express.”
Aramco VP Drilling
Saudi Arabia: 7” Turbocaser Express reams for 5 hours through tight spots & filter cake, lands casing and motor drills out in <30 minutes.

Objectives
Land 7" liner in Abu Hadriya well through under-pressured & unstable zones
Cement as per program
Achieve rapid drill out

Challenges
Offset wells had stuck casing & BHAs
Current sidetrack with stuck 7" & BHAs
Overbalance up to 2,500 psi

Results
Turbocaser reamed last 730ft to TD
Drilled out motor and shoe in <30 minutes

Value to Client
Allows laterals to be drilled as planned
Minimal drill out time
Proven technology for field development
Value to Client
- Avoids tripping casing & wiper trips
- Reams casing to target depth
- Ensures well integrity
- Reduces risk
- Proven technology for field development
Completion Tools
- Turborunner
- Shalerunner

Casing Tools
- Turbocaser Express
- Turbocaser Deepwater

Questions