Drill Safe Forum
1Q 2006

Cooper Basin Casing Drilling Step Change in Performance Target

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Agenda

1. Santos Onshore Operations Overview
2. Performance Step Change Challenge
3. Automated Rigs
4. Why Casing Drilling
5. Trial Summary
   - Equipment
   - Results
   - Lessons Learned
6. Next Steps

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Santos – Historical Drilling Operations

- Gas Wells
  - Approx. 50 wells / year
  - 3,000 m depth
- Oil Wells
  - Approx. 40 oil wells / year
  - 2,000 m depth
- Drilling Design
  - Mechanical, kelly drive rigs
  - Two casing strings
  - Multi bit operations
  - 3 – 4 days on bottom drilling oil wells
  - 10 – 15 days on bottom drilling gas wells
  - Extensive evaluation programs

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Santos – Planned Drilling Operations

- Gas Wells
  - Approx. 50 wells / year
  - 3,000 m depth
- Oil Wells
  - 200 oil wells/ year
  - < 2,000 m depth
  - Infill drilling in existing fields
  - Low cost development targets
  - Minimal evaluation

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Performance Step Change Challenge

- Drivers for step change
  - Improved environmental and safety performance
  - Reduction in flat time
  - Lower total well costs
  - Increased wells drilled per year
- Solution
  - Automated Drilling Rigs
  - Easily transition into other technologies (e.g. Casing Drilling)

Automated Drilling Rigs – Environmental Improvements

- Move towards ‘minimum disturbance’ for lease building
  - Automated levelling
- Reduction in lease footprint
- Ability to drill ‘sump-less’
  - No cuttings sump
  - No water storage pit
  - No flare pit

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Automated Drilling Rigs – Safety Improvements

- Hands off operation
- Fully automated pipe handling system
- Climate controlled driller's cabin
- Reduced manual work required for rig moves
- Reduced working at heights requirement for rig moves

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Automated Drilling Rigs – Operational Improvements

- Rig Moving;
  - Large amount of rig down / rig up is hydraulically operated;
  - ‘Modularised’ rig for easy rig moving
  - Quick connections.

- Integral Top Drive System
- Drill pipe is all 45ft lengths
- Improved solids control systems
- Ability to transition into other technologies
  - Oil Based Mud
  - Casing Drilling

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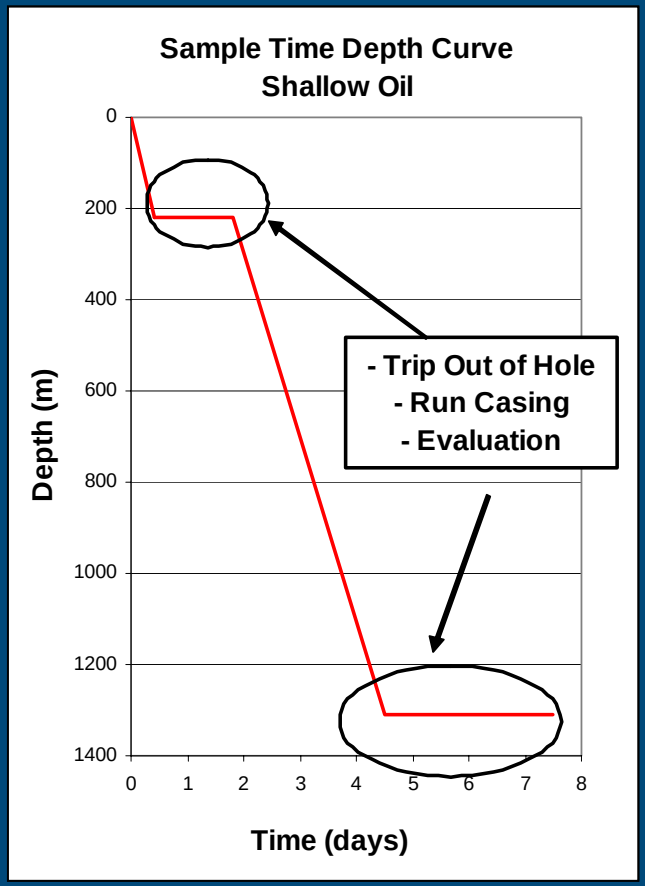
Why consider Casing Drilling?

- Cooper Shallow Oil Drilling
  - Depths less than 2,000 m
  - Need to increase well count per rig
  - Infill / Pattern drilling
    - Reduced evaluation requirements
  - Single bit runs
  - On bottom time 2 – 3 days
  - Flat time becomes major component of total rig time



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Objective of 2005 Casing Drilling Trials

- Prove up ability to casing drill in Cooper Basin environment
  - Equipment requirements
  - Drilling parameters
  - 'Real' flat time reduction
- Trial Timing
  - Set up plan for transition into Oil Drilling Campaign with Automated Rigs
  - Firm up expected long lead casing and equipment requirements

Trial Challenges

- Use of existing rig with Kelly drive
- Test technology with minimum capital outlay
- Identify wells with zero evaluation
- Requirement to cut casings to 30ft for Kelly handling
- Increased manual handling compared to automated rigs

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Trial Summary

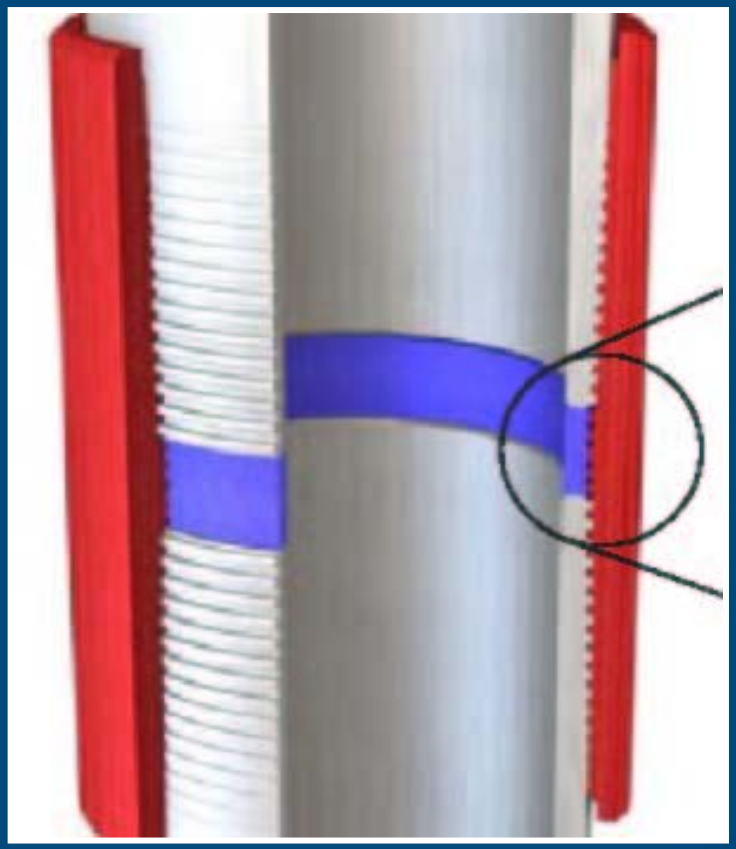
TRIAL 1 Jena 20	TRIAL 2 Merrimelia 57
Casing Drill Surface Casing to 300m - Crimp on Stabilisers - Drill Shoe - Conventional Floats	Surface Hole Drilled on Drill Pipe to 760m - Drill Shoe
Drill out Shoe Track on Drill Pipe - PDC drill bit	Drill out Shoe Track with Casing - PDC drill bit
Casing Drill Production Casing to1,300m - Crimp on Centralisers and Stabilisers - Conventional PDC - Conventional Floats	Casing Drill Production Casing to 1,650m - Crimp on Centralisers and Stabilisers - Conventional PDC - Conventional Floats

Casing Drilling Equipment

- Casing Drilling Equipment
  - Torque Rings
  - Crimp on Stabilisers and Centralisers
  - Drill Shoe
  - Kelly Drive Subs

Torque Rings

- Designed to increase torque rating of casing connection
- Buttress Casing 2 – 3 times increase in torque rating



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Crimp on Stabilisers and Centralisers

- Stability
- Buckling containment
- Cementing stand off

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Drill Shoe

- Special Alloy construction
- Drill through capability
- PDC cutters
- Integral Blow-Out port

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Casing Drive Subs

- Basic Casing Drive Subs – crossover
- Alternative to commercial drive systems

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Trial Results – Jena 20 (Oct 05)

- Surface Hole
  - Drilled with casing and cemented to 300m
  - Drill shoe drilled with equivalent on bottom ROPs
  - Drilling Parameters
    - WOB 4 – 8klb
    - Flowrate ~ 220gpm
    - Torque max. 1,500 ft-lb
  - Cementing floats held on bleed back
  - Drill shoe successfully drilled out with PDC bit

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Trial Results – Jena 20 (Oct 05)

- Production Hole
  - Drilled with casing and cemented to 1,300m
  - Equivalent on bottom ROPs
  - Drilling Parameters
    - WOB 3 – 7 klb
    - Flowrate ~ 175 gpm
    - Torque max. 3,200 ft-lb
  - Cementing floats held on bleed back

- General
  - Longer connection time due to Kelly drive rig
  - Nil casing drilling related trouble time

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Trial Results – Merrimelia 57 (Nov 05)

- Surface Hole
  - Drilled with Drill shoe on drill pipe to 760m at equivalent ROPs
- Production Hole
  - Drilled out shoe track with casing
  - Drilled with casing and to 1,650m
  - Single run conventional PDC
  - Equivalent ROPs to conventional drilling
  - Cementing Floats held on bleed back
- General
  - Longer connection time due to Kelly drive rig
  - Maximum deviation 13 deg
  - Nil casing drilling related trouble time

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Overall Casing Drilling Lessons Learned

1. Improved Safety / Work loads on crew
   - No handling of drill pipe
   - One way trip (no POOH or wiper tripping)
   - Reduced rig floor and tong handling
   - No sustained period of physical work (e.g. tripping)
   - Huge impact on managing of personnel Heat Stress

Overall Casing Drilling Lessons Learned

2. Improved Hole Conditions and Drilling Fluid Parameters
   - Reduced flow rates and operating pressures
     - Less wear and tear on rig equipment
   - Shakers run with finer screens
     - Assists in reducing LGS in mud
     - Better quality mud
   - Better cuttings observed over shakers

Long Term Casing Drilling Potential

3. Potential reduction of 30 – 50% rig time per well
4. Reduce trips in / out of hole
   - At least 4 less trips per well
5. Less loads for Rig Moving
   - No transport of drill pipe, drill collars etc.
     - Crossovers, handling tools etc.
   - Greatly reduced inventory of drilling tools required
6. Reduced Fuel Consumption

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2005 Casing Drilling Trials Summary

1. Casing drilling has potential in our Cooper Basin operations
2. Casing Drilling can result in a time efficiency
3. We need to focus on casing drilling products for long term cost efficiencies
4. Casing Drilling may improve with a “Fit for Purpose Rig”

Next Steps

1. Drill Shoe Development
   - Drill through ability
2. Casing Review
   - Torque rings versus connection type
3. Production Hole Bit Optimisation
   - Disposable bits
   - Capable of drilling through Drill Shoe
4. Casing Accessories
   - Stabilisers / Centralisers requirements

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Questions

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