Cloud Native Collaborative Well Construction Planning Using Big-Data From Offset Wells to Maximize Results

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OMV Pilot

- Robust evaluation of DrillPlan
  - Engineering
  - Report Generation
  - AFE
  - Offset Well Analysis
- Defined use cases created for evaluation
- Evaluation of ability import offset well data from IDS DataNet to DrillPlan
- Working with real data from OMV International asset
Customisation

- OMV Workflow mapped out
- DrillPlan workflow created in-line with OMV Stage Gate process
- Report templates created
- OMV Load cases created
- Casing catalogue items added
- MSD replicated
High Level Process Map

**Corporate Custom Tasks**
Tasks that contain templates for contextual information for Well Delivery requirements
- Standardised Templates for Data Input that will feed Stage Gate reports or the Final Drilling Programme.
- E.g. Data Acquisition Plan
- BOP & Wellhead schematics
- Liner Programmes
- Cementing Programme

**Computation Engines**
- Casing Design
- Hydraulics
- Torque & Drag
- Automated Trajectory Design ( & Expert Mode)
- Anti-collisions
- Estimated Drilling Interference
- Master Survey Database Management
- Wellbore Stability Assessment from Geomechanics MEM Input
- BHA Tendency
- Jar Placement Analysis
- Automatic Activity Sequence
- Probabilistic & Deterministic Time & Cost Estimates
- Offset Well Risk Analysis

**INPUTS**
- Report templates
  - AFE & Cost Estimates
  - Deterministic and Probabilistic Stage Gate 1, 2 & 3 Documents
  - Final Drilling Program

**OUTPUTS**
- Digital Drilling Programme
  - Digital Drilling Envelope to feed DrillOps and Automation Systems

**Engineering tasks**
- Design Wellbore Geometry
- Define Surface Location
- Define Mud Weight Window (PPFG)
- Define Target
- Define Formation Tops
- Design Trajectory
- Prepare AFE
- Design Casing

**Per Section/Bit Run**
- Define Cement Job
- Define Drilling Fluid Programme
- Design BHA & Drillstring
- Drilling Parameters
- Jar Placement

**Corporate Settings**
- (Controlled Access)
- DrillPlan Environment Settings
- Casing Design Rulesets
- Project templates
- Pricebooks for Cost Estimation
- Minimum Causing Design Factors
- Mud Program Report Templates
- Standard Operation Procedures (Rig Action Plans)
- Equipment Catalogues

**MSD**
- (Controlled Access)
- Survey Management

**Petrel**
- Target Points
- Surfaces
- Faults
- Initial Trajectories

**Geomechanics**
- PPFG
- Mechanical Earth Model
- Jewelsuite via TL

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Robust evaluation of DrillPlan

OMV Casing Design Loads Applied as Corporate Rule Sets

Custom catalogues for OMV Specific Casings & Tubulars

AEA allows for instantaneous update of engineering calculations, quick and easy to see impact of changes made

Drillability checked automatically by analysing expected load in worst case scenario and checked against well or rig limitations (PPFG, Surface & Downhole equipment)

Unlimited Cloud computing power allows DrillPlan to calculate every possible combination of each parameter range, every 100ft, along the wellbore
Petrel & Geomechanics Link

- Ability to push geological context information to DrillPlan from Petrel
  - Surfaces, faults, targets and trajectories
  - Plan wells in context
- Ability to push MEM for well/Field to DrillPlan
  - Provides WBS analysis for trajectory design
Offset Well Data Transformation

![Diagram of Offset Well Data Transformation]

- **Historical well data**
- **IDS Data Net**
- **DrillPlan**
Offset Well Analysis

- Robust evaluation of DrillPlan
- Use of offset well data in meaningful way
- Time reduction from paper copies
- Information used in activity plan and AFE calculation
- Automatic Analysis of NPT data in Offset Wells, categorized and presented to the user for incorporation into their well timings and cost
- Automated Performance analysis of offset well timings for use in probabilistic well time analysis
Risk Analysis

- Offset well risks imported into DrillPlan
- Probabilistic distribution of risk NPT calculated
## Risk Analysis

- Export of risk analysis in DrillPlan fed into OMV Risk Register
- Use of Macro
- Boston Square populated

### Table: Risk Severity and Mitigation Actions

<table>
<thead>
<tr>
<th>Pre-Mitigation</th>
<th>Post-Mitigation</th>
<th>Place Title</th>
<th>Risk Manager</th>
<th>Risk Occur</th>
<th>Mitigating Action</th>
<th>MA Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk No.</strong></td>
<td><strong>Risk Description</strong></td>
<td><strong>Effect</strong></td>
<td><strong>Prob'y of Occurrence (1-5) hit</strong></td>
<td><strong>Impact of Occurrence (1-5) hit</strong></td>
<td><strong>Initial Risk Grade (RMA)</strong></td>
<td><strong>Final Risk Grade (RMA)</strong></td>
<td><strong>Operational Risks - INSTALLATION OF 9 5/8” RIG &amp; INSTALLATION OF 13 3/8” CONDUCTOR</strong></td>
</tr>
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<td>1</td>
<td>Mechanical-tight hole or overspill-Mechnical-tight hole or overspill</td>
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<td>2</td>
<td>2</td>
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<td>L</td>
<td>Design &amp; Planning</td>
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<td>Mechanical-Check Pipe Mechanical-Check Pipe</td>
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<td>4</td>
<td>M</td>
<td>3</td>
<td>4</td>
<td>M</td>
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<tr>
<td>3</td>
<td>Well-Collar/Wellbore stability/Wellbore stability</td>
<td>4</td>
<td>4</td>
<td>R</td>
<td>4</td>
<td>4</td>
<td>M</td>
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<tr>
<td>4</td>
<td>Wellbore stability/Wellbore stability/Wellbore stability</td>
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<td>2</td>
<td>M</td>
<td>5</td>
<td>2</td>
<td>M</td>
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<tr>
<td>5</td>
<td>N22 in the reservoir</td>
<td>1</td>
<td>4</td>
<td>M</td>
<td>1</td>
<td>4</td>
<td>M</td>
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</tbody>
</table>

### Operational Risk Summary

- **Operational Risks - INSTALLATION OF 9 5/8” RIG & INSTALLATION OF 13 3/8” CONDUCTOR**
  - Attempted to FLU rigging and operated overpull. Viper Trip to close the hole.
- **Operational Risks - DRILLING 12 3/4” RIG & INSTALLATION OF 10 3/4” CASING**
  - Attempted to FLU rigging and operated overpull. Pulled to a max of 20,000lb ensnared and worked rigging. For and trip, etc.
  - Well Control Valve, breaker MV and monitor well.
- **Operational Risks - DRILLING 3 5/8” RIG & INSTALLATION OF 15 7/8” CASING**
  - Well Control Valve, breaker MV and monitor well.
- **Operational Risks - FLUSH & INSTALLATION OF 1 1/2” LINER**
  - Old Reports indicate that the gas in the reservoir may contain H2S.
  - N22 detection to be tested and calibrated with H2S generation to be corrected during 5 5/8” section. Driller method to be sized on core based when monitoring gas.
Activity Plan and AFE

- Automatic Activity List built from Wellbore Geometry and Engineering Tasks
- Automated AFE, updates automatically based on new offset well data or changes to well activity.
- Controlled Access to AFE & Price Book
- Probabilistic or Deterministic Time & Cost automatically updates with new offset data or changes to proposed Schedule
- Manual adjustments possible if required
Standardised Reporting

- Ability to create all stage gate documentation, G&G and Final drilling program in one place in one-click
- OMV Stage Gate reports replicated as well as Geological Work Program
- DrillPlan workflow allows for reports to be updated simultaneously and for content to be shared across reports reducing manual input
Current Limitations & Future Developments

- Casing running & cementation
- Wellbarrier diagrams
- Completions
- Digital Visualisation cube
- Notifications
- API gateway – link to project planning
- Data residency – Azure stack
Conclusion

- User friendly application
- Customisable
- Project management tool
- Potential to replace multiple applications
- Extracted real value from offset well data
- Efficiency gains
  - Instant validation of engineering
  - Workflow and report templates
- Potential to include more engineering
- Multi-disciplinary access

"I was able to create a new well and fill in all the required information to pass over to my colleague to work on the trajectory design in around 15 minutes"