Managing Drilling Software Platform Migration to Ensure Smooth Block Transition

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BANGKITKAN ENERGI NEGERI

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Presentation Outline

- PHM Introduction
- Challenge & Expected Outcome
- Migration Methodology
- Bridging Previous Software Vs LANDMARK
  a) Comparison
  b) New Assumption/Standard
  c) New Workflow
  d) Issue and Differences
  e) Work Around
- Conclusion
Mahakam Block History

- **2018** - taken over by Pertamina
  - Current production at around 890 MMSCFD
- **2017** – Block Transition from Total to Pertamina
- **2008** – Reached Peak Production at around ~2,577 MMSCFD
- **1974** - Operated by Total E&P Indonesie
Drilling Performance

- Performance drilling with fastest well 4.5 days;
- 1680m @ 24 hours;
- Drilled wells around 2,500 wells YTD with around 100 wells/year drilled

Challenge & Expected Outcome
Challenges & Outcome

**Different Platform**
- Previously used Total’s in house Drilling Apps (T-DESK). Apps can’t be transfer to Pertamina
- Users has no experience in using other apps outside T-Dek

**Limited Migration Time Frame**
- Effective migration window provided was only 7 months
- Around 2500 wells needs to be migrated and QC’ed
- Need to bring users up to speed in using Landmark EDT

**Expected Outcome**
- Around 40 Wells to drill in 2018
- Ensure no Change in EOU (Tool Error Code)
- Casing Load Case – No casing design Discrepancy
- User’s familiarity on new system

Migration Methodology
Database Migration Workflow

- Determine cut-off date
- Ensure no missing well
- QA/QC check on whole TOTAL well (1889 branches* + 529 branches)
- Reference using ICON, FWR & WIN database

- Developed mini software to automatically export initial database
- Export file will be on agreed-excel-format

- Import was done manually
- Will maintain all T-DESK attachment, including T-DESK export file and service company report (DSSOS)

- Implemented to all field (Surface data, TD northing easting, etc)
- Direct comparison to T-DESK export file

Survey Toolcode Bridging Methodology

1. List EOU size at each type of trajectories for each toolcodes
2. Define Toolcode bridging rule
3. Perform benchmarking on real well case with combination toolcodes based on bridging rule
4. Select toolcodes for each of 3 trajectories (Vertical, 2D, 3D)
5. Simulate each survey toolcodes along trajectory
6. HLA - Length of uncertainty

**Goal**

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**TEC Initial Software vs COMPASS Bridging Methodology**

- Comparison parameter between old and new software
- A good match will show lower percentage

**HLA T-Desk > HLA Compass:**
Delta Major or Minor % = \(\frac{\text{HLA T-Desk} - \text{HLA Compass}}{\text{HLA Compass}}\) x 100%

**HLA T-Desk < HLA Compass:**
Delta Major or Minor % = \(\frac{\text{HLA T-Desk} - \text{HLA Compass}}{\text{T-Desk}}\) x 100%

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**Data Entry in COMPASS**

- Project
- Site
- Well
- Wellbore
- Actual Design
- Survey (MD, INC, AZM)
- Casing
QA/QC Parameter
List of Parameter:

<table>
<thead>
<tr>
<th>DATA</th>
<th>TOLERANCE</th>
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<tbody>
<tr>
<td>Datum Elevation (m)</td>
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<tr>
<td>Water Depth (m)</td>
<td>0 m</td>
</tr>
<tr>
<td>Wellhead Elevation (m)</td>
<td>0 m</td>
</tr>
<tr>
<td>BHA Northing and Easting (m)</td>
<td>0.5 m</td>
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<td>BHA TVD (m)</td>
<td>0.1 m</td>
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<tr>
<td>BHA MD (m)</td>
<td>0 m</td>
</tr>
<tr>
<td>BHA Inclination (°)</td>
<td>±0° and 0°</td>
</tr>
<tr>
<td>Casing Depth (m)</td>
<td>0 m</td>
</tr>
<tr>
<td>Casing Alas (m)</td>
<td>0 m</td>
</tr>
<tr>
<td>Survey Tool Name at each survey station</td>
<td>As per EDU Benchmarking</td>
</tr>
<tr>
<td>HLA Minor and Major</td>
<td>As per Delta % defined (± 100 %)</td>
</tr>
</tbody>
</table>

**WELLBORE NAME** | **WELL EASTING** | **WELL NORTING** | **WELLHEAD ELEV** | **DATUM ELEV** | **WATER DEPTH** | **GRID CONVERGENCE** | **MAG DECLINATION** | **MD** | **INC** |
<table>
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**StressCheck & WellPlan Comparison**

<table>
<thead>
<tr>
<th>T-DESK</th>
<th>STRESSCHECK</th>
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<tbody>
<tr>
<td>BLC (1a) Full of Gas</td>
<td>Displacement to Gas</td>
</tr>
<tr>
<td>BLC (2) Tubing Leak</td>
<td>Injection down casing</td>
</tr>
<tr>
<td>BLC (3) Gas Lift</td>
<td>Injection down casing</td>
</tr>
<tr>
<td>BLC (4a) Cement Pressure Test (Green Cement)</td>
<td>Green Cement Test</td>
</tr>
<tr>
<td>BLC (4b) Cement Pressure Test (Hard Cement)</td>
<td>Pressure Test</td>
</tr>
<tr>
<td>BLC (5) APB during Pressure Test</td>
<td>Injection down casing</td>
</tr>
</tbody>
</table>

**T-DESK**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>T-DESK</th>
<th>WELLPLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Hydraulics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Rheology Model</td>
<td>Herschel Buckley</td>
<td>Herschel Buckley</td>
</tr>
<tr>
<td>2 Torque &amp; Drag</td>
<td>Increase on Weight &amp; TQ</td>
<td>Decrease on Weight and TQ</td>
</tr>
<tr>
<td>3 Model</td>
<td>Soft string</td>
<td>Soft string</td>
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</tbody>
</table>

**StressCheck** is capable to customize in various specific load case

**WellPlan** provide rigid drilling simulation that adaptable

- StressCheck is capable to customize in various specific load case
- Able to maintain similar load case – casing design
- WellPlan provide rigid drilling simulation that adaptable
Conclusion:

More than 2500 directional data transfer was performed successfully.

Improvement in data quality during migration

Minimizing AC risk within congested field

TEC bridging methodology provide accurate comparison between various TEC to COMPASS TEC

StressCheck and WellPlan has various feature that able to accommodate most of assumption in other casing design software
Thank You

Your feedback is very important to us. Please open the LIFE2019 app to answer a few short questions on this presentation.
Project Timeframe

- Transfer trajectory database to ensure no AC data missing
  - Accurate data transfer
  - Contains similar EOU!!
  - Possibly improve database quality
- TEC Bridging document is required to have accurate data transfer
- StressCheck & WellPlan bridging to ensure accuracy in well architecture design