Integration of Petroleum and Reservoir Engineering Workflows into a Production Database Management System to Increase Operational Efficiency

Asset Optimization- Improving Production Rates, Operational Efficiency & Reservoir Recovery
29th October 2015

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Asset Overview – Breagh

- Located in the SNS
- 8/10 wells drilled from Alpha platform
- 120km Pipeline back to Teesside Gas Processing Plant
- Up to 9 additional wells to drill in Phase II Development
- 60° wells
  - Enhance well PI
  - Multiple producing zones
  - Wireline access
- 2 fracced Wells, future wells to be fracced and some existing wells to be reentered and fracced
Current Challenges

- Volume of data overwhelming (P, T, Q, composition, PCS)
- Data reliability (spreadsheets, changing staff, corporate memory, audit trail)
- Data integrity – data can get corrupted in spreadsheets/have bugs, managing access to the data
- Data accessibility (recording changes, access across departments)
- Consistent models (Eclipse, Petrel, GAP, Prosper, Consistent parameters)
- Efficiency (Saving engineers time to focus on engineering)
Objective

Increase Operational Efficiency

- Implementation of a Production Data Management System (PDMS),
  - Manageable
  - Reliable
  - Accessibility
  - Data integrity – data can get corrupted in spreadsheets, managing access to the data

- Workflows
  - Standardise
  - Automate
  - Integration of multiple work flows and software
  - Operational Efficiency (Saving engineers time to focus on engineering)

- Reporting

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PDMS - Overview

Schematics/Reports

Spreadsheets (Internal and 3rd party)

Data historian (PI/Honeywell)

Models

Avocet

QC Processes

Reports
Forecasts
KPIs

Facilitating active management and informed decision making

Workflows

Analytical

Dynamic

Processes

Input Production Data, Reservoir, Petrophysical & Geo-data

Models

QC Processes

Workflows

Reports
Forecasts
KPIs

Facilitating active management and informed decision making

Workflows
PDMS - Content

- Have direct link to data Honeywell data historian
- Automated input of 3rd party spreadsheets
- Basic QC processes Actual and Allocated Wobbe Index compared, 3rd party data
- Key document database
  - Compositional gas analysis
  - Water analysis
  - Completion diagrams
- Audit trail for every input
PDMS – Access and Visualisation

- Automatic loading of data
- Quick access to historic data
- Visualisation of Data
Workflows - Overview

Analytical
- Input Production Data
- Reservoir, Petrophysical & G&G data
  - Production Performance Monitoring
  - Well Modelling
  - Well Test Analysis
- DCA
  - P/Z
- Material Balance
- RTA
- Connected Volumes
- Connected Volumes & Recovery
- Recovery

Dynamic
- Static Model Glip
  - Simulation Model Initialization
  - Uncertainty Analysis/Proxy Modelling
  - Selection of Deterministic Cases/History Matching
- Network Model
  - Development Scenarios
  - Fracture Modelling
  - Reserves/Profiles/Recovery

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Workflows - Allocation Automation

- Basic calculation and conversions
  - Audit of factors used

- Production Allocation
  - Multiple methodologies used to confirm allocation
  - Time consuming
  - Multiple tools used (spreadsheets, hydraulic modelling & PTA software)

- Three key processes to automate
  - Rate values from IPR curve
  - Daily productivity index (PI) calculation
  - Rate values from wellhead temperature curve
Workflows – Rate from IPR Curves

- Based on initial productivity
- Benchmarked by PBU analysis (changing pressure and skin)
- Interpolation between latest data points
- Main allocation technique
Workflows – Productivity Index Calc.

- Productivity Index calculated on a daily basis, based on a calculated linear decline of pressure between two PBU’s.
- Changes in PI indicate either:
  - Incorrect Allocation
  - Changing wellbore conditions

\[
P_{\text{Flowrate}} = \frac{\text{Flowrate}}{\sqrt{(\text{Reservoir Pressure}^2 - \text{Bottom Hole Pressure}^2)}}
\]
Workflows – Wellhead Temp. Correlation

- Rate based allocation based on Wellhead Temperature correlation
- Previous 6 months allocated rate data plotted against wellhead temperature
- Largest error bar associated with this methodology

![Graph showing relationship between Gas Rate (MMscfd) and THT (ºF)]
Workflows – Integration with other software

- Data automatically fed into third party software:
  - Well Test Analysis
  - Rate Transient Analysis
  - Decline Curve Analysis
  - Reservoir Simulation
Reporting - Overview

› Single auditable source of data for
  ▪ Management reporting
  ▪ Regulator
  ▪ Partners
› Standardised reporting
› On demand access to data
› Live data to feed dashboard KPI
Summary – We have:

- Implanted a robust, auditable database
  - Improved the management and quality of our data
  - One version of truth across the business
  - KPIs visible and accessible to management

- Increased Operational Efficiency through time saving and increased focus on value adding activities
  - Automation of some work flows (and striving to automate more)
  - Controlled transfer of data between applications
  - Management by exception

- Improved data accuracy and reliability without additional work load through work flow automation.

- Already kicked off project to implement Avocet across all out operated and non operated sites
Thank You

Questions?