FDPLAN
An Enabler to transform decision making in late life producing assets

Brendan McMullan | 2022 Digital Forum
INTRODUCTION

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Overview

• FDPlan as a collaboration tool at Woodside
• Proven Minimum Viable Product (MVP)
• Demonstrated Integration with Petex IPM

• Challenges of mature assets

• Phased implementation of FDPlan to mature assets – three use cases

• What have we learnt?

FDPlan principles

Collaborative Framework

Openness – 3rd Party Apps

Cloud Architecture

Unlimited Hardware

Data Ecosystem

Automation

FDPlan as an enabler to transform decision making
FDPlan as a Minimum Viable Product

**FDPlan as an enabler to transform decision making**

- **Case Maps**
  - Study > Scenario > Decisions & Choices

- **Integrated Analytics and immediate visualisation**

- **Evaluation**

- **Custom script**

- **Resolve Model Gen Decisions & Choices**
- **Run Resolve & IX**
- **Ingest to Data Ecosystem**

- **Direct analytical products**
  - Connect to interfacing spreadsheets for facility engineers, commercial analysts etc

- **DELFI Store**

- **Woodside Energy**

- **FDPlan**

- **FDPlan as a Minimum Viable Product**

- **Schlumberger-Private**
Mature Asset Decision Making

Key Drivers
- Maximise production
- Minimise costs
- Increase efficiency
- Minimise disruption to current workflows

Developments
- Relatively small incremental volumes can justify additional development CAPEX
- Impacts of new projects on the existing production must be understood

Challenges
- Multiple phases of past development and brownfield modifications increase system complexity
- Requires input from a broad range of expertise

FDPlan Implementation
A three-phase process was used to integrate the FDPlan MVP into a producing asset workflow:
1. Standardise
2. Visualise
3. Automate

FDPlan: Automated and open to 3rd Party apps
Fast analytics and intuitive user analysis
Collaborative and accessible
FDPLAN AS THE ENABLER

Phase 1: Standardise

Standardise IPSM workflows

- Provide systematic instruction to Resolve models to execute forecasts consistent with the decisions and choices defined in FDPlan
- Take advantage of Petex Openserver commands and custom workflows within Resolve to execute changes in the IPSM consistent with a given scenario
- Instructions are provided by users, not FDPlan

Payoffs

- Improved the productivity of teams via an innovative and systematic approach to forecast case construction
- Built in a concept of decisions and choices that can be consistently applied across different assets – allows for collaboration
- Test the functionality of the workflows within Resolve independently of FDPlan → Allows for simpler troubleshooting and testing

Resolve Model Gen Decisions & Choices

Run Resolve & IX

Phase 1 focus

Decisions

Choices

Constraint Name | Value
--- | ---
Reservoir | Mid
LNGPlantRate | 1000
CutOff | Early
Downtime | Mid
W5rfill | 1/1/2021
Enable visualisation and output computes

- A historical workflow was created in FDPlan.
- Enables reservoir engineers to use the visualisation features in FDPlan for forecast models that had been executed prior to FDPlan being used to run cases.

Payoffs

- Displace existing spreadsheet based comparison tools, which are time consuming to maintain and use.
- Familiarise engineers with the enhanced capability in analysis, quickly compare multiple scenarios and multiple vectors to determine cause and effect.
- Enhance existing workflows with minimal impact or change risk
FDPLAN AS THE ENABLER
Phase 3: Automate

**FDPlan standalone compute**
- Enable the communication between the scenarios and decisions in FDPlan to the resolve model
- A custom compute is used to provide the instruction from FDPlan to the IPSM for each of the required cases

**Payoffs**
- Realise automated casemapping and forecast modelling
- Visualisation of results with cases
- Automated outputs for use in the next step in the workflow
CASE STUDY 1
Gas Platform Compression design

Background
- Concept select study for installing additional compression on an existing platform within a multi-platform development
- Options test compression configuration, for e.g. number of stages, size and power
- Resolve model running a Mbal-GAP IPSM. Simplified compression model in GAP

FDPlan enables
Improved case management, visualisation and accelerated quality checking
- Immediate and repeated distribution of results from forecasts to customized post processing calculations built by process engineers
- IPSM license/software isn’t required to access the data, removes barriers to collaboration
- Auditability of data is maintained
- Data handling errors and QC eliminated

Outcome
For each scenario: overall data handling time reduced from 2-4 hours to <30min once the workflow was in place
Time saving repeated across all iterations of scenarios
CASE STUDY 2

FPSO oil development: Waterflood Optimisation

Background

- Oil fields require waterflood for pressure maintenance and sweep
- Study to investigate impact of water injection capacity, optimum waterflooding strategy in event of reduced water injection capacity
- Resolve model running a IX-GAP IPSM

FDPlan Enables

- Easily set up, run and compare cases – no manual exports and copy/paste to spreadsheets
- Assess cases on range of parameters w/ different drivers
  - E.g., UR vs oil rate vs fuel gas deficiency
- Auditable inputs/assumptions, which can be easily updated
- Connection to economics tool

Outcome

- Provide value-based recommendations to the decision makers
- Improved understanding and communication of risk and uncertainty.
- Investigate broader solution space and tested production strategies on both facility and subsurface outcomes
CASE STUDY 3
FPSO oil development: Improve Reserves Understanding

Background

- Forecasting requires an Intersect connected Integrated Production System Models (IPSM) due to combined constraints and interdependencies of water disposal, and water injection
- To understand the total range of reservoir uncertainty, a significant number of forecasts were required
- Resolve model running an IX-GAP IPSM, runtimes >3h and require manual data transfer to initiate

FDPlan Enables

- Multi-way parallel forecast simulation on the cloud
  - ~80 forecasts run in 2 days to support the Reserves study
  - Significant time saving in forecast runtime
- On-demand visualisation of results directly from the cloud
  - Significant time saving from a reduction in data handling and assurance.
  - Clear, auditable trail of inputs for comparison to other deliverables

Outcome

- Reduction in time taken to deliver forecasts
- Improved technical understanding of the asset through simulating multiple scenarios
- Improved the quality of the insights provided to the business

Probabilistic Result

Simulation Results
Key Messages and Learnings

Implementation of FDPlan has helped to:

- Increase the speed of forecasts leading to faster decision making
- Increase the envelope of what parameters can be tested, driving new insights
- Share data collaboratively across multiple disciplines and removing barriers between teams

Learnings

- Significant value and improved user experience came from organising our data and workflows for FDPlan
- The improvements in visualisation provided by FDPlan became a driver for increased uptake of FDPlan.
- The Historical Workflow step wasn’t in the original plan, however it became one of the most used workflows.
- Incremental changes minimized downtime impacts during roll out.
- Greater success and outcomes were realized in assets that had a stable IPSM and a repetitive workflow
QUESTIONS?

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