PETRONAS

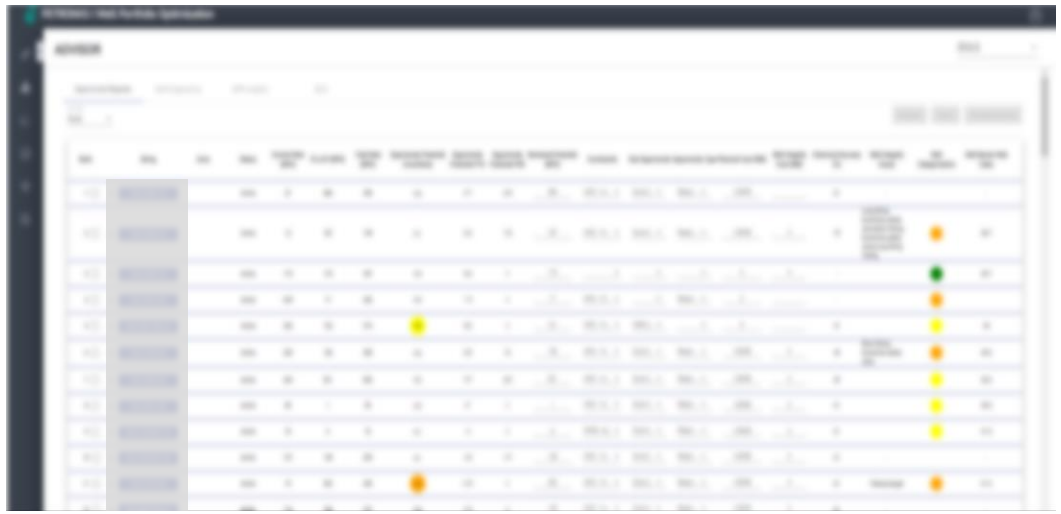
Accelerating PETRONAS' Production Enhancement (PE) Candidates Generation Through Data Analytics Solution

07.09.22

PETRONAS Group adopts zero tolerance against all forms of bribery and corruption. As an employee, it is incumbent upon each and everyone of us to internalise and abide by the PETRONAS Code of Conduct and Business Ethics (CoBE) & Anti-Bribery and Corruption (ABC) Manual while remain guided by our shared values of loyalty, integrity, professionalism and cohesiveness.

We need to maximize every opportunities and improve the rate of success in sustaining our production safely at the lowest cost

PE Candidate Generation solution, is an ***AI/ML solution*** that provides an automated and integrated system to support PETRONAS with Production Enhancement (PE) P* well candidate selection process driven by data analytics.

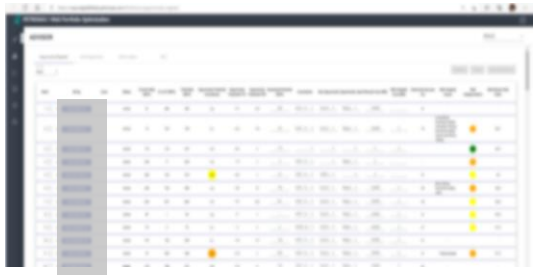


Protecting the base: Bringing additional PE P candidates*

Process Improvement: Improving well-by-well review using AI/ML & automation.

The solution has improved the way we work. PE P* candidates being ranked automatically for our engineers to validate and mature

Well PE Candidate Generation



P funnel by AI/ML engine based on ranking (e.g. potential gain, chance of success) + well integrity (barrier).*

Automated daily execution.

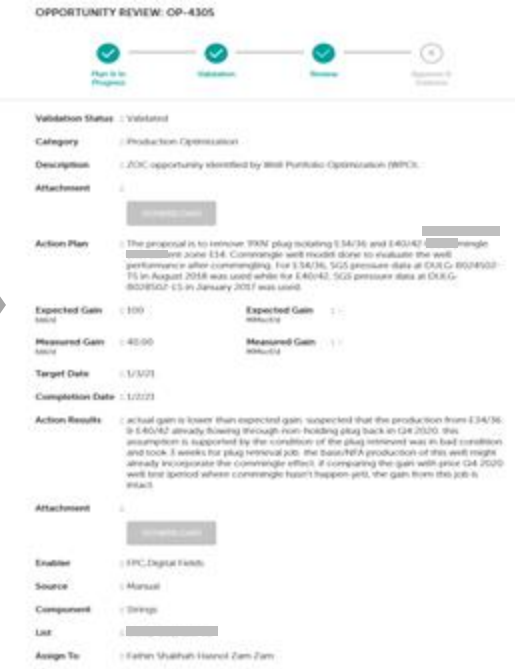
Opportunity Maturation

Data feedback loop for next execution

P*

	ACCOUNTABILITY					
Non-Routine	SE & PAE	PE/TAG		WIS		PE/TAG
Routine		SE				WIS/SE
PE Proposal Status	P0	P1	P2	P3	P4	P5

Value Tracking & Approval

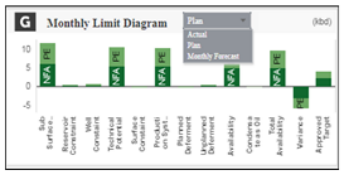


PE BPW

Integrated Well Review Process

PE Routine & Non-Routine

Limit Diagram



Croc Chart

The 'engine' leveraged good data hygiene and data science methods to propose PE proposal, estimate gain and chance of success

Data Extraction, Conditioning & QC

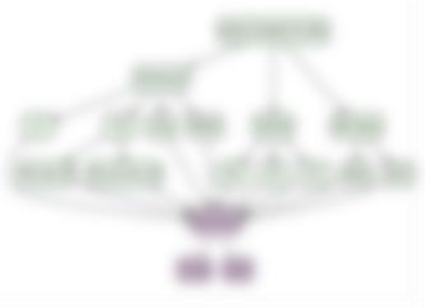
Extraction of data is performed from numerous data sources & consolidated into one central datastore.

Following ingestion, various calculations & data validation are performed.

Screen & Rank

Wells are screened & ranked based on a set of production & petrophysical KPIs using a Multi-Criteria-Decision-Making-Process (MCDMP) called AHP (Analytic Hierarchy Process).

Higher the rank of a well, the better the candidate it is from a technical analysis standpoint.



Diagnose & Recommend

Based on Petronas guidelines & workflow processes, well data is screened to determine constraints & appropriate remedial interventions are provided.

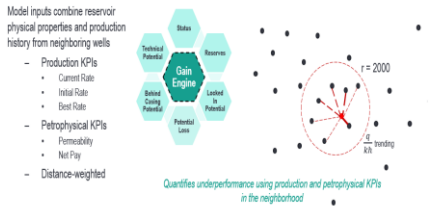
Constraints:

- Water Prod
- Gas Lift / Sand
- Well Integrity

Estimate Gain & BCO

Data based models were developed to probabilistically quantify post-intervention production. Based on status, potential loss or locked in-potential is estimated via a set of production & petrophysical KPIs.

If applicable, find the deliverability of new zones (BCO's) that could be opened in a well (e.g. PL, LIP, BCO).



Chance of Success & Loopbacks

Probability of success is estimated for each intervention using a continuously-enriched look-back knowledge base.

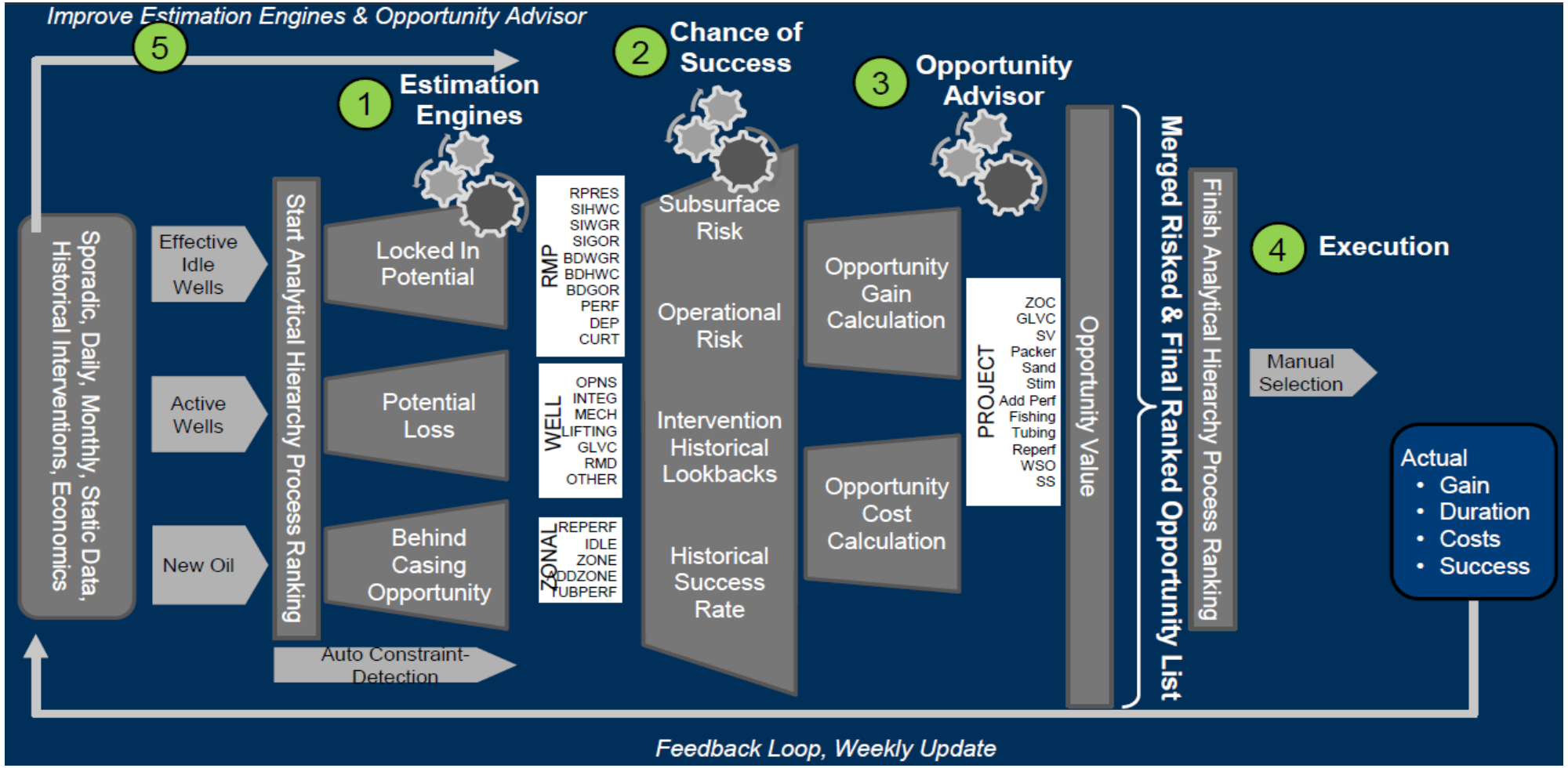
The historical success module utilizes Bayesian Belief Network (BBN) to capture the probability of success from historical intervention data.

Economic Analysis

Using Petronas standard practices, economic model was integrated with the analytics engines.

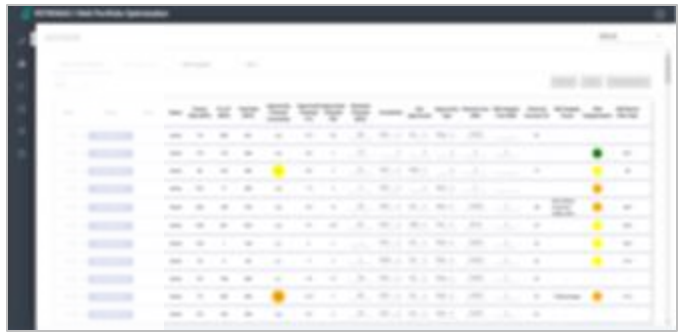
- Total Gain Calculation
- Total Cost Calculation
- Cash Flow vs UEC

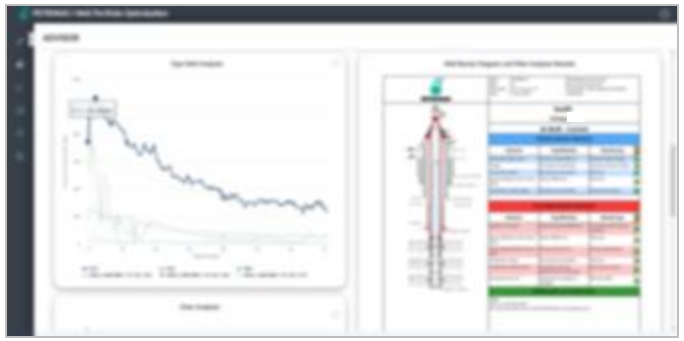
It automates Potential Loss (PL), Lock-In-Potential (LiP) & Behind Casing Opportunities (BCO) candidates through rigorous work processes



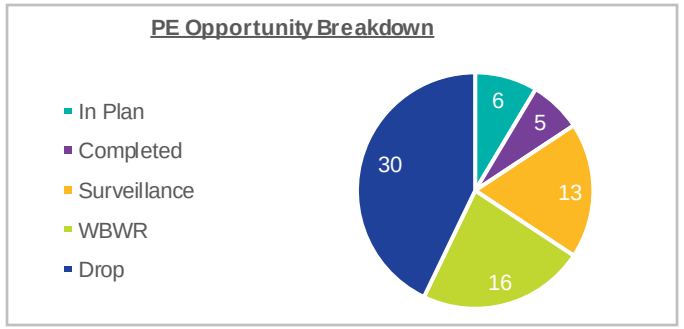
An example of PE Candidate Generation solution in action that resulted to successful Zone Change (ZOC) job execution with approved recorded gain

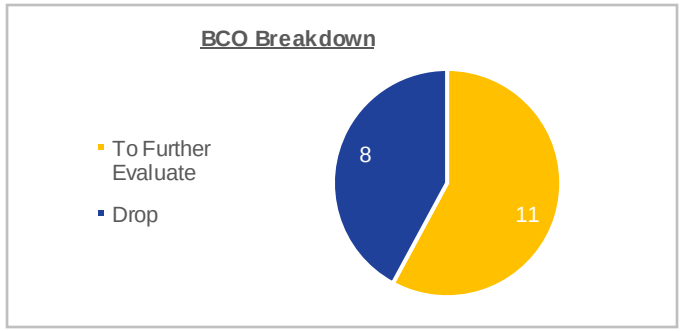
Opportunity Identification





Opportunity Screening

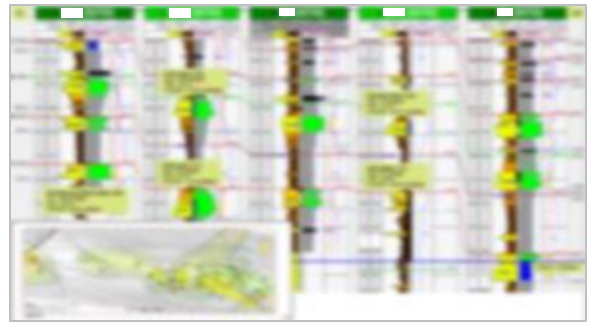




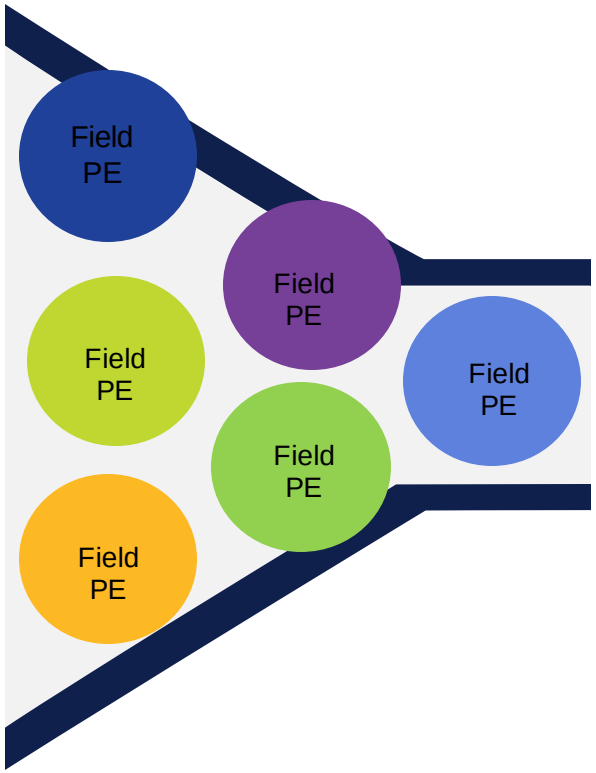
Some opportunities were dropped due to:

1. Integrity issue
2. High H2S well
3. Zone watered out
4. No/thin shale barrier for WSO
5. BCO validity based on reservoir understanding

Proposal Maturation & Approval



PE Candidate Generation solution has scaled to 42 assets in accelerating PETRONAS' Production Enhancement (PE) candidates generation through Data Analytics



Enrichment of validated & approved PE P* candidates from Assets

- Substantially decrease time & effort for well reviews
- Automate current manual well opportunity maturation process, in particular the initial candidate screening
- Increase decision accuracy & quality
- Allow PETRONAS to go from reactive mode to a more proactive approach
- Allow PETRONAS team to focus efficiently on high value Petro-technical efforts (do more with less)

Automated PE candidates screening & ranking via AI/ML

PETRONAS

THANK YOU FOR YOUR PASSION