[PS]Building a Static Model During Exploration: Enabler for Fast Track Field Development Plan*

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Abstract

Traditionally, exploration program and field development phases are detached. The exploration team concentrates on scanning leads, screening promising prospects and understanding the size of the prize (the hydrocarbon in place) and the POS (probability of success) based on key criteria such as the presence of source rock, migration, charge and seal. If the exploration program is successfully realized by confirming hydrocarbon presence in an economical quantity, field development planning can start. A transition between a preliminary regional-based knowledge and a more local, field-specific effort operates. At that point of time, a first static reservoir model is constructed mainly to support and assist the subsurface team to design drilling plans, understanding reservoir properties distribution across the reservoir and forecasting the future performance of the field.

Often, some discrepancies between the initial exploration picture and the development reservoir model arise mostly due to the difference of workflow: screening the potential of a region for exploration (large covered area, simplistic model) versus understanding the reservoir at field scale for development (small area, detailed model). Those discrepancies can later materialize as risks or threat to the success of the development.

Building a static model at the exploration stage represents a potential work around to tackle the discrepancies between exploration and development. While it does not substitute for the classical exploration screening workflow, it presents multiple benefits:

- Early awareness on potential subsurface challenges encountered during the exploration program (example: presence of loss prone features, geohazards) from nearby developed fields
- Knowledge transfer from nearby fields on reservoir specificities (both static and dynamic)
- Possibility to generate meaningful volumetrics uncertainty range at the reservoir unit level
- Harmonization of reservoir modelling workflow through the basin
- In a case of several exploration prospects, prioritization can take into account other criteria than hydrocarbon in place and POS

- In the event of exploration success, speed up the maturation work to enable fast track field development. Instead of creating a static model from scratch, the work scope becomes an update of the exploration static model with the successful well data
- Better integration and cross fertilization between the exploration and the development teams

Availability of nearby field data to constrain the static model is critical. This method yields the best results in mature basin settings where the explorations targets are surrounded by well-known fields.

Building a Static Model During Exploration: Enabler for Fast Track Field Development Plan

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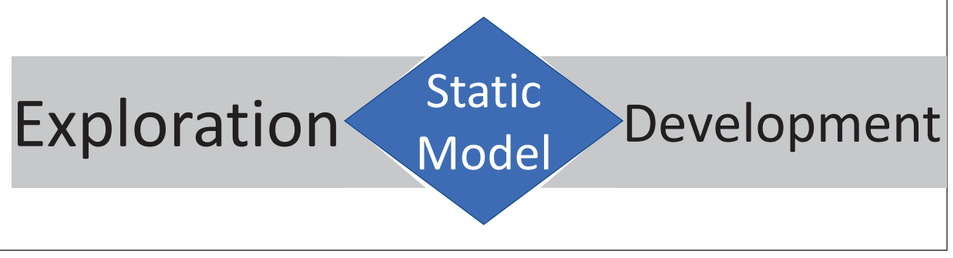
The Problem:

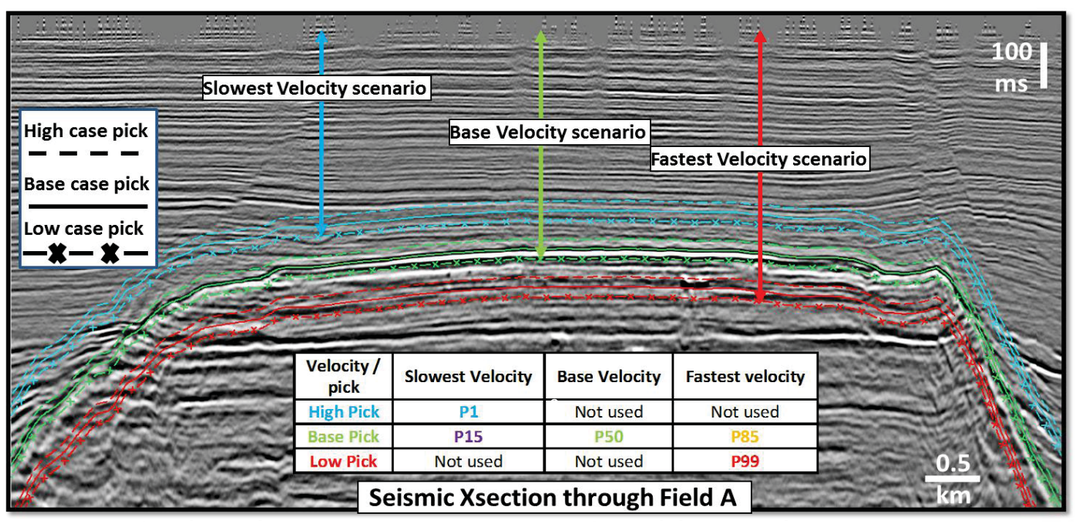
Exploration program and field development phases are detached. Some discrepancies occur between the initial exploration picture and the development reservoir model due to the difference of workflow: screening the potential of a prospect versus understanding the reservoir. **These can later materialize as risks and threats to the development.**

The Solution:

Building a static model at the exploration stage represents a good work around to tackle the disconnect between exploration and development. Cross fertilization is reflected in this simplistic static model. This ensures that the experience from the development team is taken into account during exploration. Vice versa, the exploration regional knowledge is later leveraged when building detailed reservoir models.



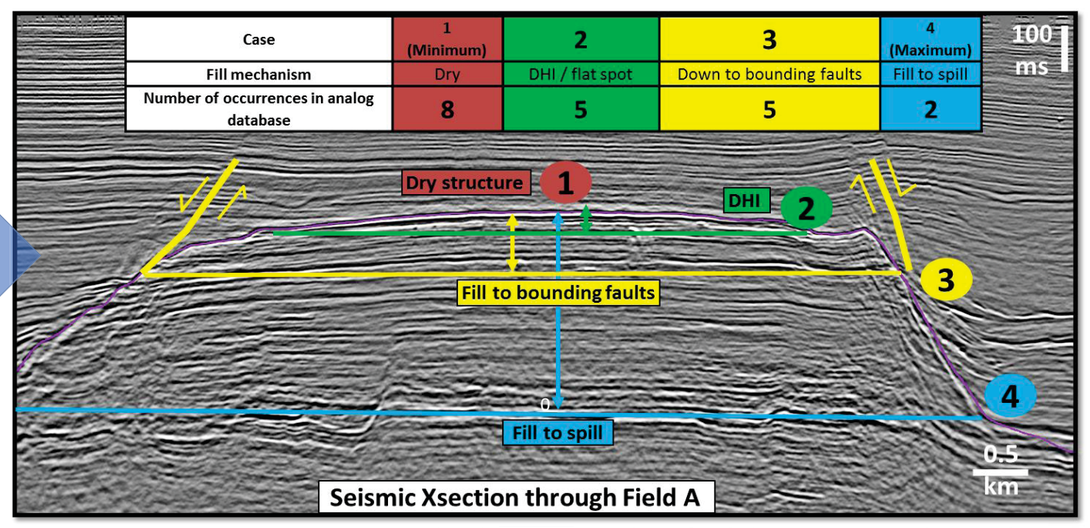
Workflow and Example: The A field, offshore Malaysia



Velocity / pick	Slowest Velocity	Base Velocity	Fastest velocity
High Pick	P1	Not used	Not used
Base Pick	P15	P50	P85
Low Pick	Not used	Not used	P99

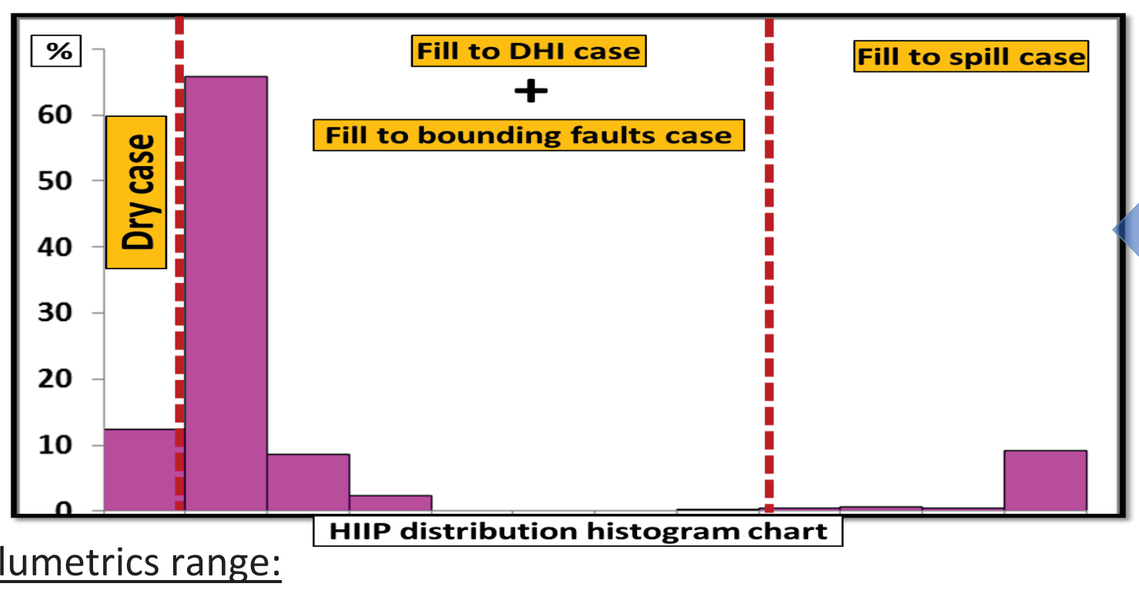
Top reservoir depth structure constrained by 2 elements:

1) Regional Time to Depth conversion with 3 cases for the overburden velocity from the slowest (shallower realization) to the fastest (deeper realization).
2) The uncertainty on the top reservoir seismic pick based on the quality of seismic dataset and the Top reservoir reflection.



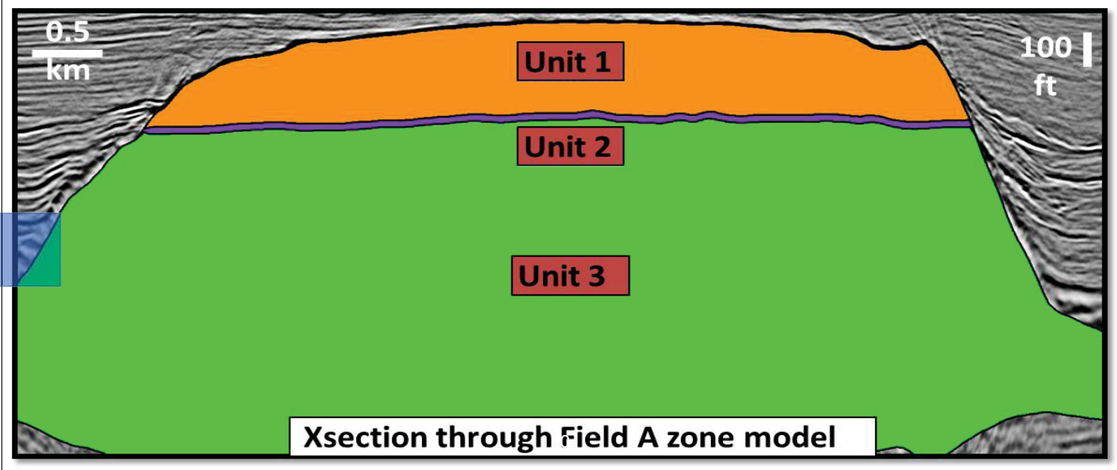
FWL scenarios grounded by nearby field statistical analysis:

1) Dry structure (minimum case / failure)
2) Seismic DHI
3) Lateral bounding faults depth
4) Fill to spill (Maximum case)



Volumetrics range:

1) Reservoir property uncertainty ranges are defined from the spread observed in the Depth / Properties relationship at a given depth in the basin
2) Probabilistic approach to quantify HIIP: range = Base value +/- S.D.
3) Final HIIP range reflects the prospect probability of success (POS)



Reservoir Properties:

1) 3 most logical reservoir units based on nearby analogs.
2) Single value reservoir property per unit (NTG / Porosity)
3) Hydrocarbon saturation: saturation height relationship from the nearest analog producing field.
4) Expansion factor: scenarios range from hydrostatic (low case) to nearby fields overpressure (base case) to maximum observed overpressure (high case)

Benefits:

- Early awareness on potential subsurface challenges (example: presence of loss prone features, geohazards)
- Knowledge transfer from nearby fields on reservoir specificities (both static and dynamic)
- Possibility to generate meaningful Volumetrics uncertainty range at the reservoir unit level
- Harmonization of reservoir modelling workflow through the basin
- Prospect prioritization can take into account other criteria than Volumetrics and POS
- **If success, speed up the maturation work to enable fast track field development. Instead of creating a static model from scratch, the work scope becomes an update of the exploration static model with the successful well data**

Challenges:

- Learnings from one case study in offshore East Malaysia shows that **availability of nearby field data to constrain the static model is critical**. This method yields the best results in mature basin settings where the explorations targets are surrounded by well-known fields. Analogue learnings can be drawn from and directly applied to the exploration target.
- In wild cat exploration, new and frontier basins settings, the challenge resides in constraining the pre exploration static model with relevant data to provide meaningful range of outcomes and ultimately take better decision