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Sustainable Sand Management Control and Solutions - Balancing Performance, Costs, and Environment

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Evolving Sand Control Selection: Maximizing Deepwater Well Cost Efficiency with Standalone Screens

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Table of Content

- Objectives
- Success Criteria for Sand Control Optimization
- Methodology – Netool Modelling
- Conclusion

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Objectives

- **Cost Reduction Assessment:** The Field L team explored methods to lower project costs & enhancing economic viability.
- **Sand Control Optimization:** Evaluated the transition from Open Hole Gravel Pack (OHGP) to Open Hole Stand Alone Screen (OHSAS) as alternative to OHGP in high fines, high Uc & High Sc environment.

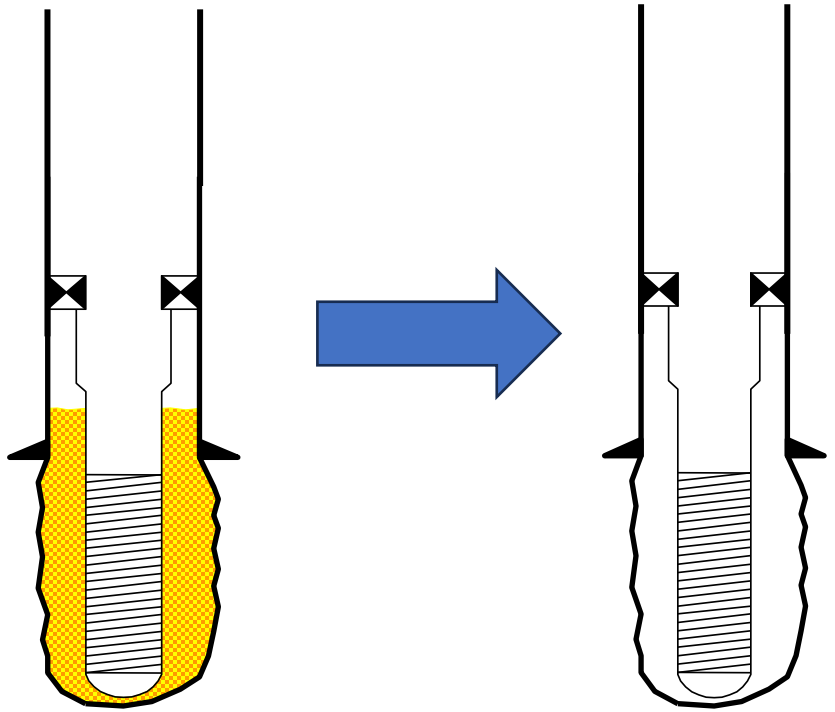

Image 1: Field L sand control conversion from OHGP to OHSAS

*Uc : Uniformity Coefficient
*Sc : Sorting Coefficient

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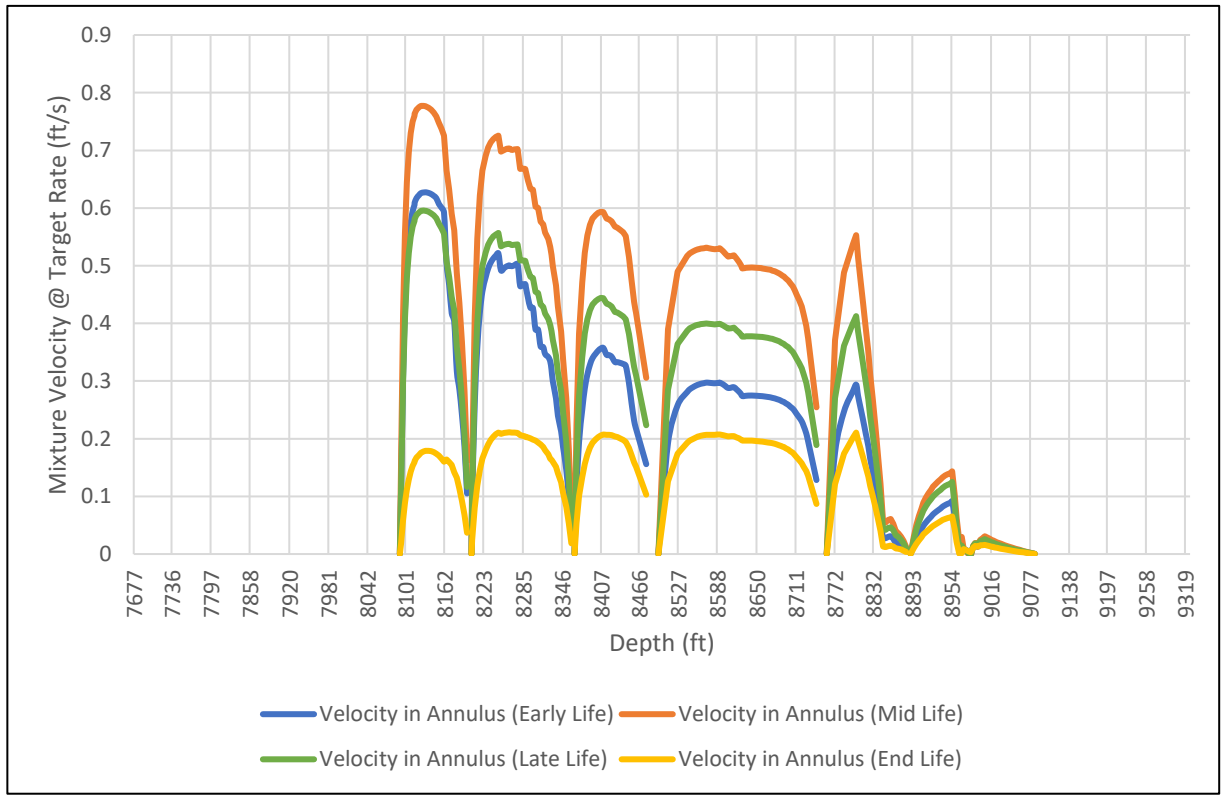
Success Criteria for Sand Control Optimization

5 main criteria were evaluated as the acceptance criteria for team to confidently proceed with the sand control optimization.

Criteria	Results
#1 SRT criteria	**Pass**, met the acceptable values
#2 Longer open hole to ensure lower drawdown	**Pass**, proposed well completion is designed with longer open hole section
#3 High deviation to ensure lower drawdown	**Pass**, revision to well trajectory
#4 Segmentizing the open hole to reduce Annular velocity below limit	**Pass**
#5 Production control to limit Velocity across screen	**Pass**

Criteria #4 & #5 will be discussed in the following slides.

Netool Modelling: Annular Velocity with Segmentizers



Graph 4: Annulus velocity at different time regime

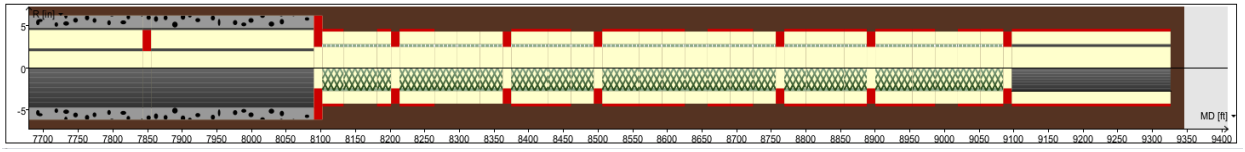


Image 2: L field well schematic in Netool

Case Study Selection:

- L-4 well is chosen as case study due to the highest mixture velocity among other wells.

Packer Placement:

- Segmentization is achieved by placing swell packers along the open hole section.
- Initial placement is based on permeability contrast, shale sections, and water saturation to isolate low permeability/shale sections.

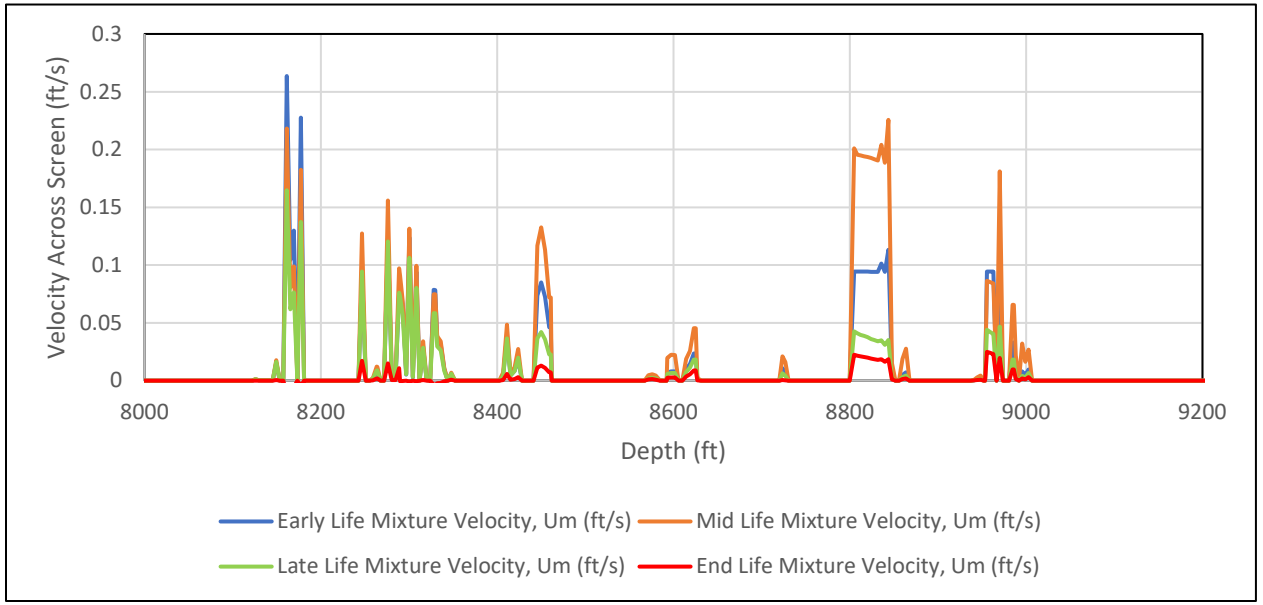
Annular Velocity Limit:

- Recommended limit: 10 ft/s.

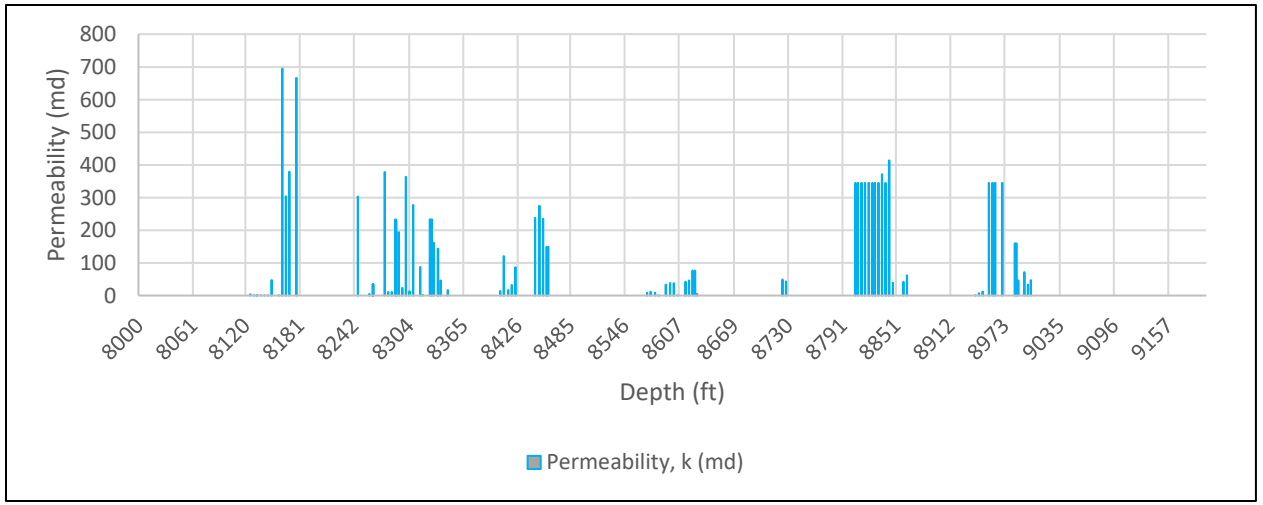
L-4 well Annular Velocity:

- Less than 1 ft/s.

Netool Modelling: Velocity Across Screen



Graph 5: Velocity across screen (ft/s) at different depth



Graph 6: Permeability (mD) at different depth

Mixture Velocity Calculation:

- Based on liquid and gas influx rates.

Flow Area:

- Taken from vendor's catalogue (213 in^2/ft).

Velocity Across Screen limit:

- Recommended limit: 1 ft/s.

L-4 well Mixture Velocity:

- Less than 0.25 ft/s.

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Modelling Summary

Year	Highest Annular Velocity (limit 10 ft/s)	Highest Velocity Across Screen (limit 1 ft/s)
2022 (early life)	0.62/1.24	0.26/0.52
2032 (mid-life)	0.77/1.54	0.22/0.44
2040 (late life)	0.59/1.18	0.16/0.32
2042 (end life)	0.19/0.38	0.02/0.04

Table 6: Annular velocity & velocity across screen at different time regime

- Given that the Netool input relies on prognosed and simulation data, this conservative approach includes a 100% uncertainty factor for all calculated velocities.
- Despite this, the velocities remain within acceptable limits when using OHSAS with segmentizers and Draw-down limitations.

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Conclusion

- **Successful application of OHSAS** in neighboring assets formulated the basis to optimize the sand control in Field L.
- 5 main criteria which include **lab tests, well designs & modelling** were evaluated for optimization.
- Although OHSAS reduces cost, it also comes with **higher risk** (compared to OHGP which is more erosion resistant).
- Hence, OHSAS is proposed as an alternative to OHGP (initial design) with emphasis on **proper risk and mitigation strategies.**
- Optimization of sand control selection resulted to **22% CAPEX** reduction for multiple wells in Field L.

Thank you

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