Digital Well Integrity Solution Helps Visualize and Communicate Risk Throughout the Well Lifecycle

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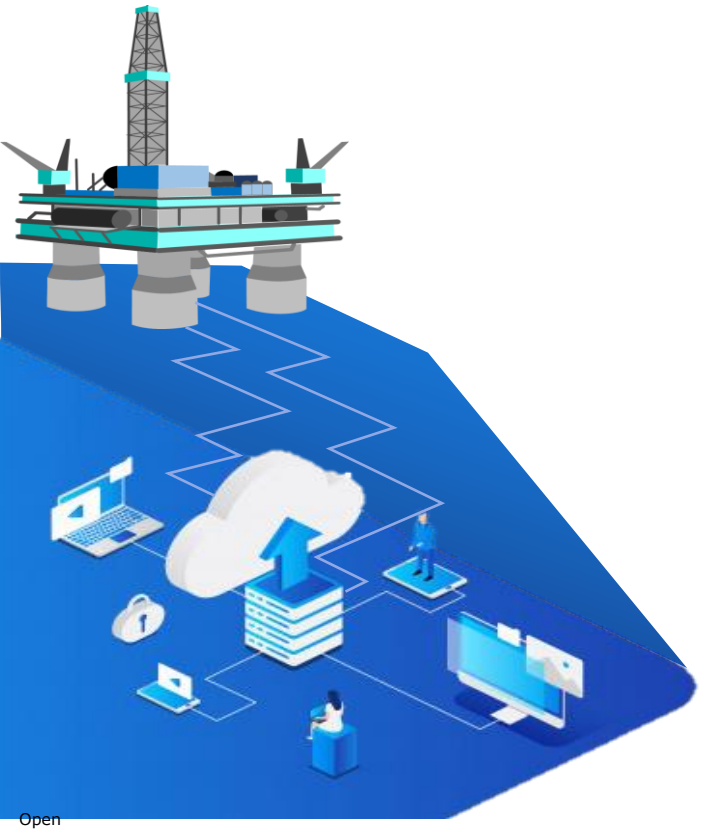
CONTENT

BACKGROUND



- Wells is taking a determined and proactive approach to embrace digital revolution through integrating our digital well integrity processes in providing stakeholders a collaborative platform to manage well integrity risk throughout well lifecycle.

- The Wellbarrier solution has been well adopted within the Wells operating culture since 2016. The solution was initially implemented to help understand vulnerabilities in drilling phase and quickly expanded to cover all phases of the well lifecycle.

PAIN POINTS

The pain points faced by Wells team prior embarking this digital well integrity journey through Wellbarrier were:

1. No centralized database

Well integrity data was residing in respective Asset's database, and was not easily accessible by stakeholders

2. Non-standardized template

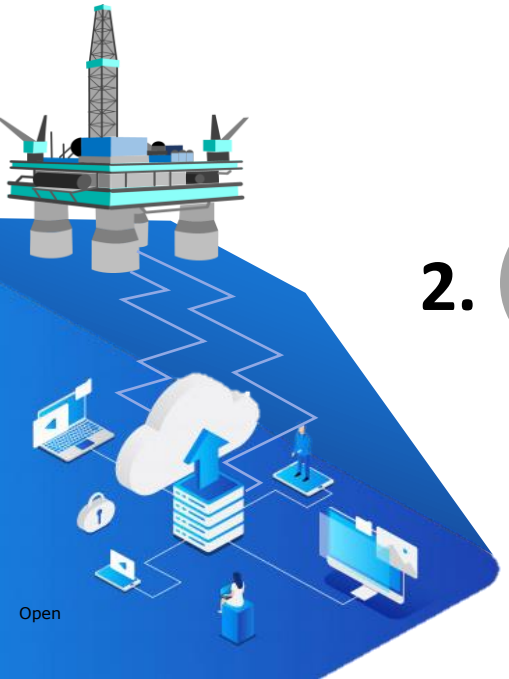
was used across Assets in capturing well integrity information

3. No continuity of database throughout well life cycle

When well is handed over from one phase to the other, often crucial well integrity info are either missing or not updated

4. Physical sitting & review session

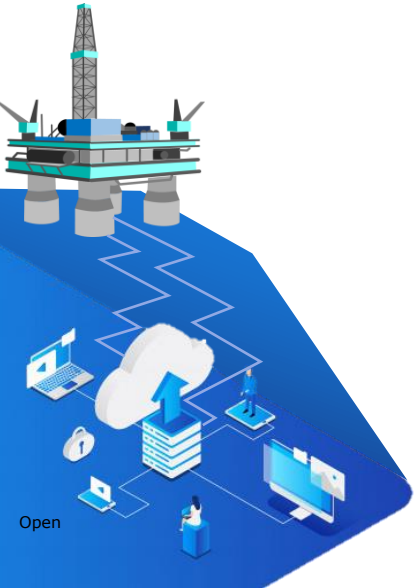
was required to conduct Well Integrity Risk Assessment (WIRA) using manual Excel template



Open

OBJECTIVES

To communicate to the involved parties in drilling, well operations up until plug & abandonment on how to safeguard our well activity in a clear and concise manner throughout the lifecycle of the well.



Implementation in the well integrity value chain includes barrier definition, qualification & monitoring, risk assessment, and anomaly management.

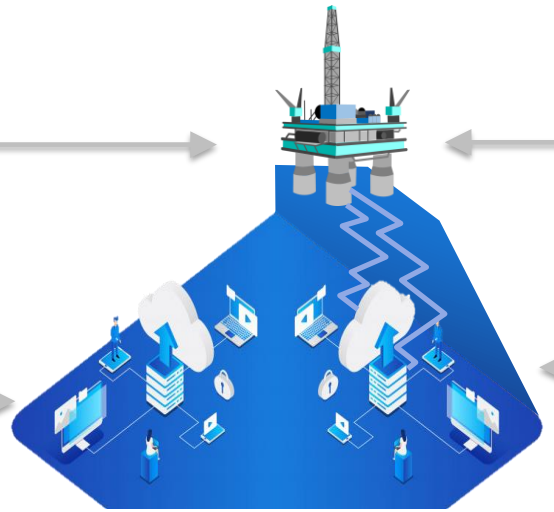
APPROACH

The approach is a step-change away from “traditional” processes, to a more digitally integrated and cohesive solution to well integrity.

This removes subjectivity in the decision-making process, enables consistency and collaboration, and most importantly supports towards the environmental sustainability of our industry.

1. **Accurate Well Barrier Schematic (WBS)**

2. **Cloud Based Solution**



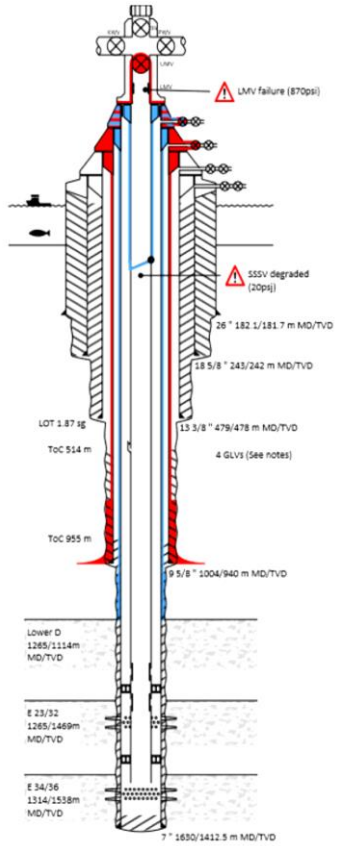
3. **Structured Risk Assessment thru FMECA**

4. **Enabler to WIMS**

APPROACH

1. Accurate Well Barrier Schematic (WBS)

- Existing data is leveraged to prepare Well Barrier Schematics, that are used as the foundation to understand well integrity risk throughout the well lifecycle.
- The WBS provides standardized presentation of graphics and language to all stakeholders.
- Wellbarrier allows users to prepare high quality WBS in a quick and efficient manner.

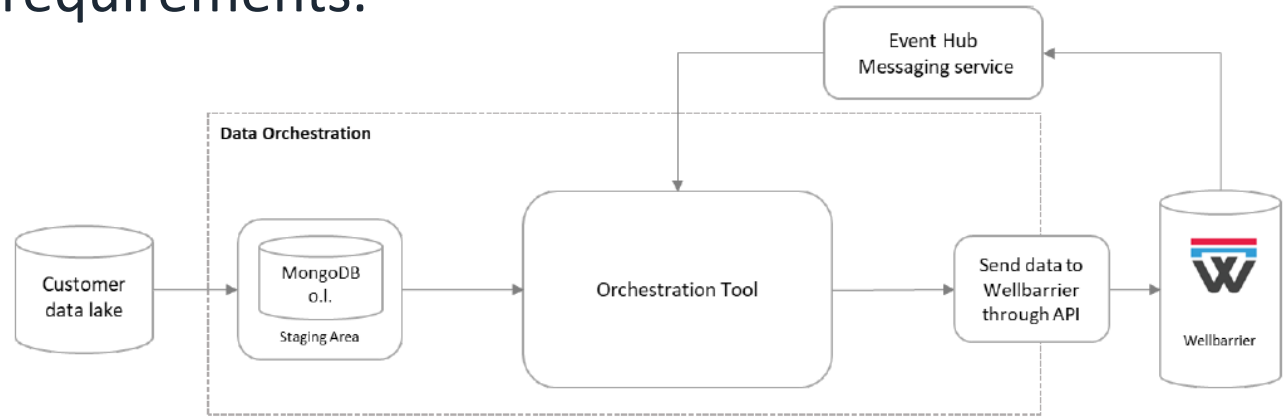


The software incorporates the barrier definitions that embrace the "two-barrier principle" as a core component of establishing well barriers.

APPROACH

2. Cloud Based Solution

- Wellbarrier is a cloud-based solution that helps to visualize our wells and the well barrier elements from well integrity perspective, with related to qualifying and monitoring requirements.



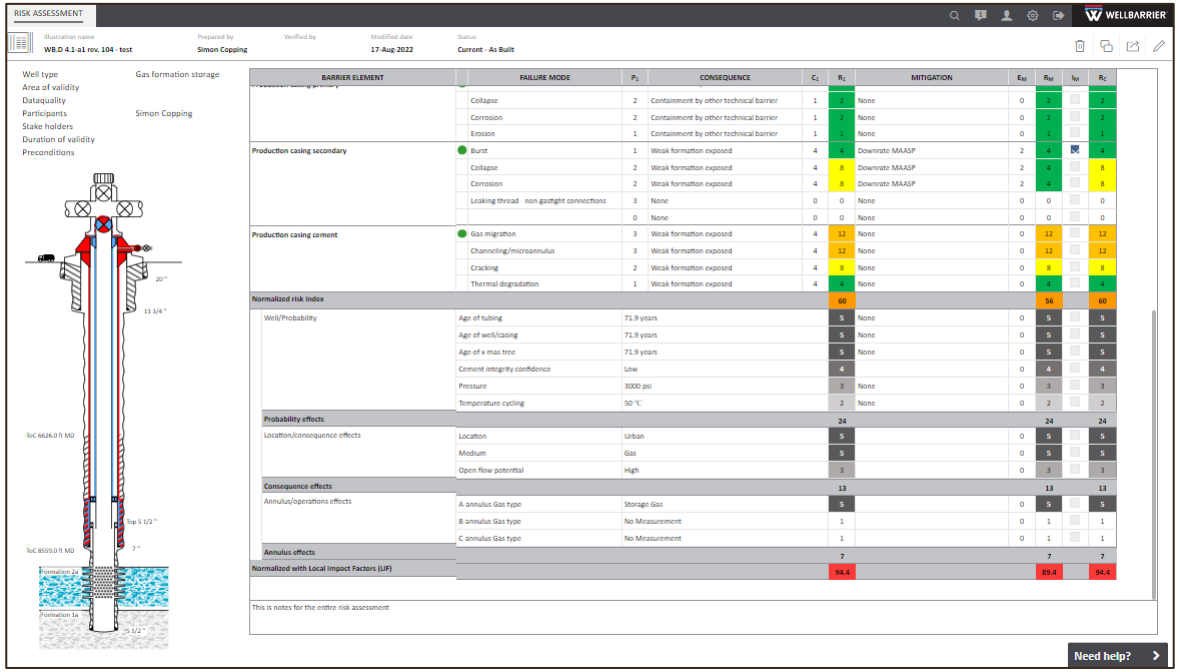
- Results are made available through an Application Programming Interface (API), to augment other digital decision analysis solutions within the organization.
- Having a cloud solution also provides easy access across organization.

APPROACH

3. Structured Risk Assessment thru FMECA

- Risk assessments are performed using Failure Mode Effect and Criticality Analysis (FMECA) techniques to objectively determine the risk of the well.

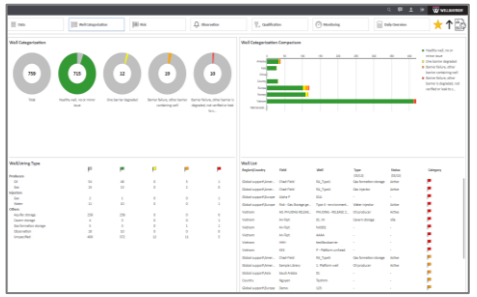
- The probability and consequence of each barrier failing is assessed, and risk mitigations are recorded in a structured way.



12 Elements of WIMS

Wellbarrier workflow is closely aligned with the 12-Elements of PETRONAS WIMS

4. Enabler to PETRONAS WIMS



2. Well Integrity Management

4. Organisational Structure

6. Well Barrier Elements (WBEs)

8. WBEs Verification

10. Continuous Improvement

12. Reporting & Documentation

1. Well Integrity

3. Well Integrity Policy

5. Risk Assessment

7. Performance Standard

9. Management of Change

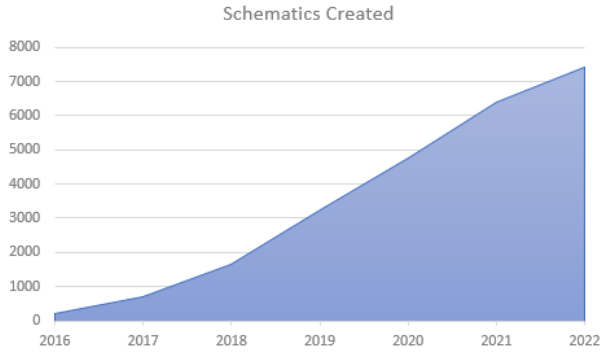
11. Self Assessment, Technical Assurance & Independent Verification

System related supported by Wellbarrier

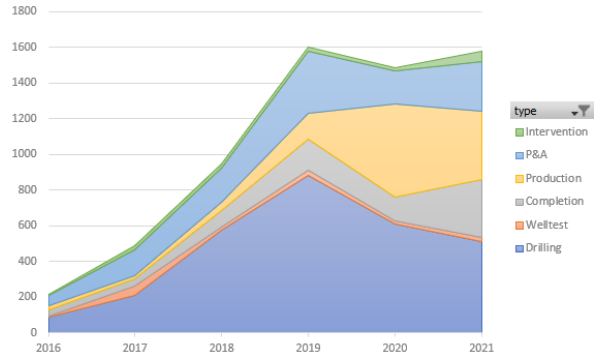
RESULT

The solution provides a robust framework to manage well integrity and is closely aligned with the requirements of industry standards.

1. **Single Repository Platform**
2. **Single Source of Truth**
3. **Interactive Dashboards**
4. **Risk Prioritization**
5. **Reduce manhour in well integrity processes**
6. **Common "language" of well integrity**



7400 schematics = 30,000 hours effort using traditional methods, compared to 2,000 hours using Wellbarrier

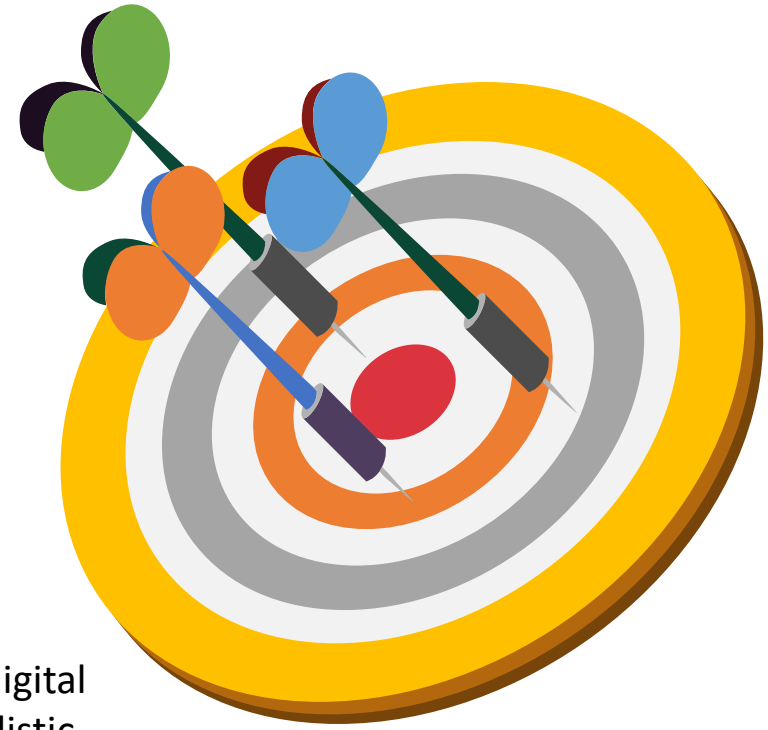


Moving from Drilling to entire Lifecycle perspective

FUTURE POSITIONING

Culture Change

To collaborate with stakeholders to be on board with digital well integrity journey through Wellbarrier through system integration, constant improvements and trainings.



Integration

Integration with other digital initiatives to provide holistic solution and address pain point of engineers having to do manual data entry.

Streamline

Integration with field data coming from Critical Device Function Test (CDFT) results will further streamline the data workflow, and support with condition-based monitoring, production optimization opportunities, data analytics and possible machines learning opportunities.

THANK YOU

FOR YOUR ATTENTION