Production Asset Integrity and Corrosion Management: Best Practices and Innovations

29 – 30 April 2025 | BANGKOK, THAILAND

Maximising Production with High-CO_2 Wells: A Comprehensive Re-Qualification of Existing Wellhead Platforms and Pipelines

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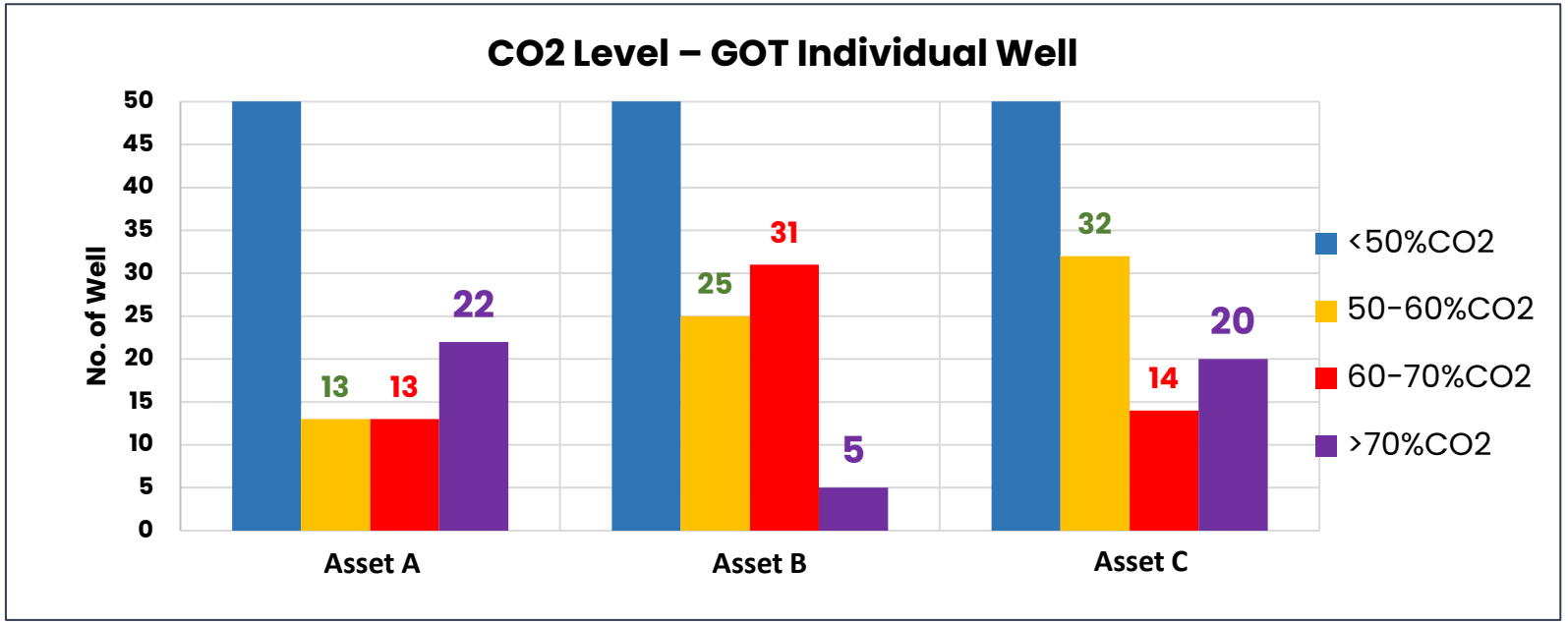
Outline

- Project Challenges
- Main corrosion concerns and mitigations
- Other aspects to High CO2 operation
- Conclusions

Project Challenges

To maximize the production, high CO2 reservoir zone need to be unlocked.

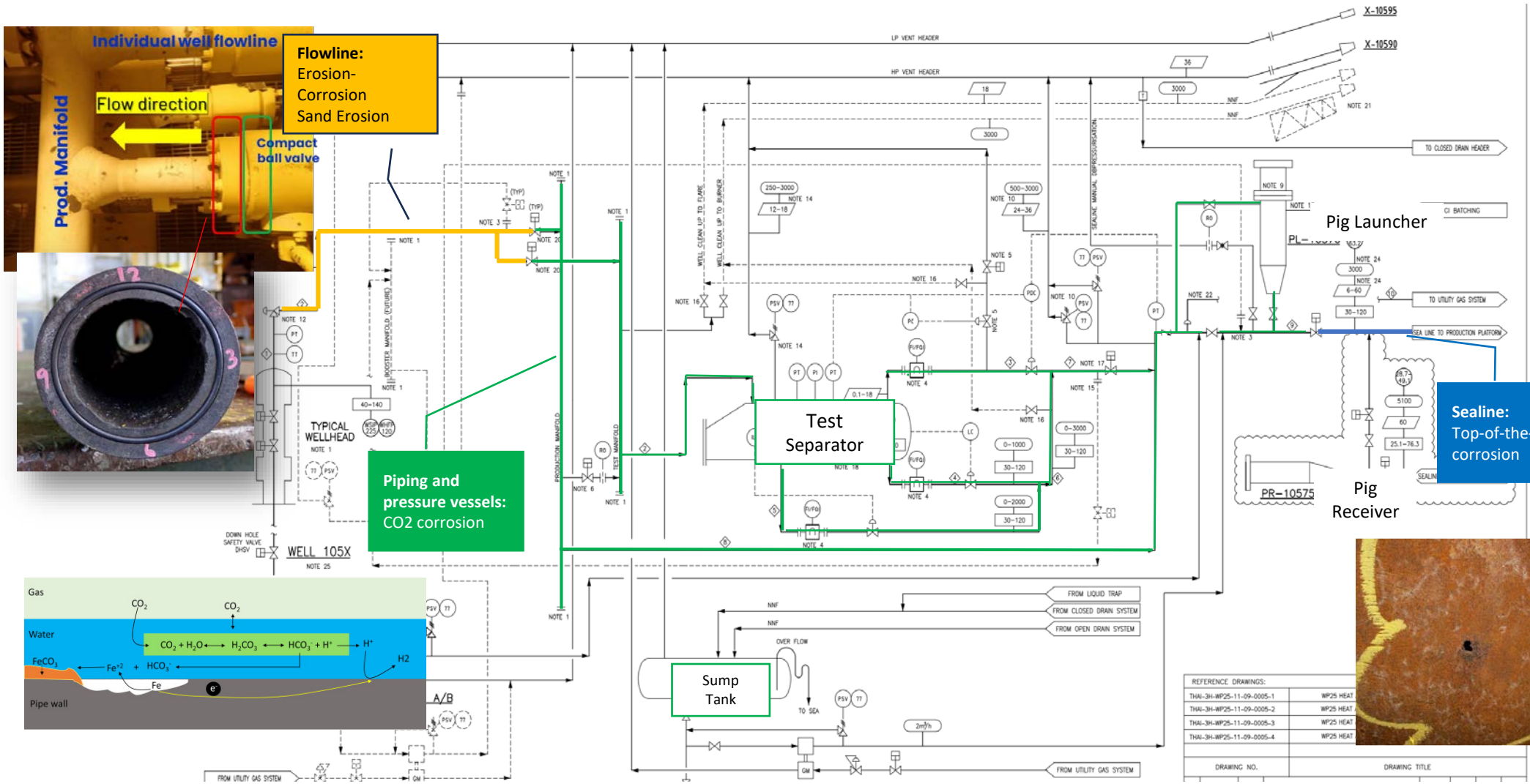
Existing facilities design need to be re-visited as original design with CO2 of 30%mol while new operating envelop will be 50%mol CO2



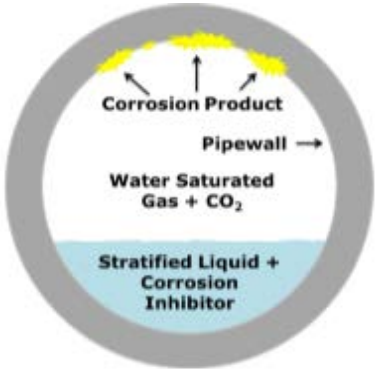
Main corrosion concerns

Flowline:
Erosion-Corrosion
Sand Erosion

Piping and pressure vessels:
CO2 corrosion

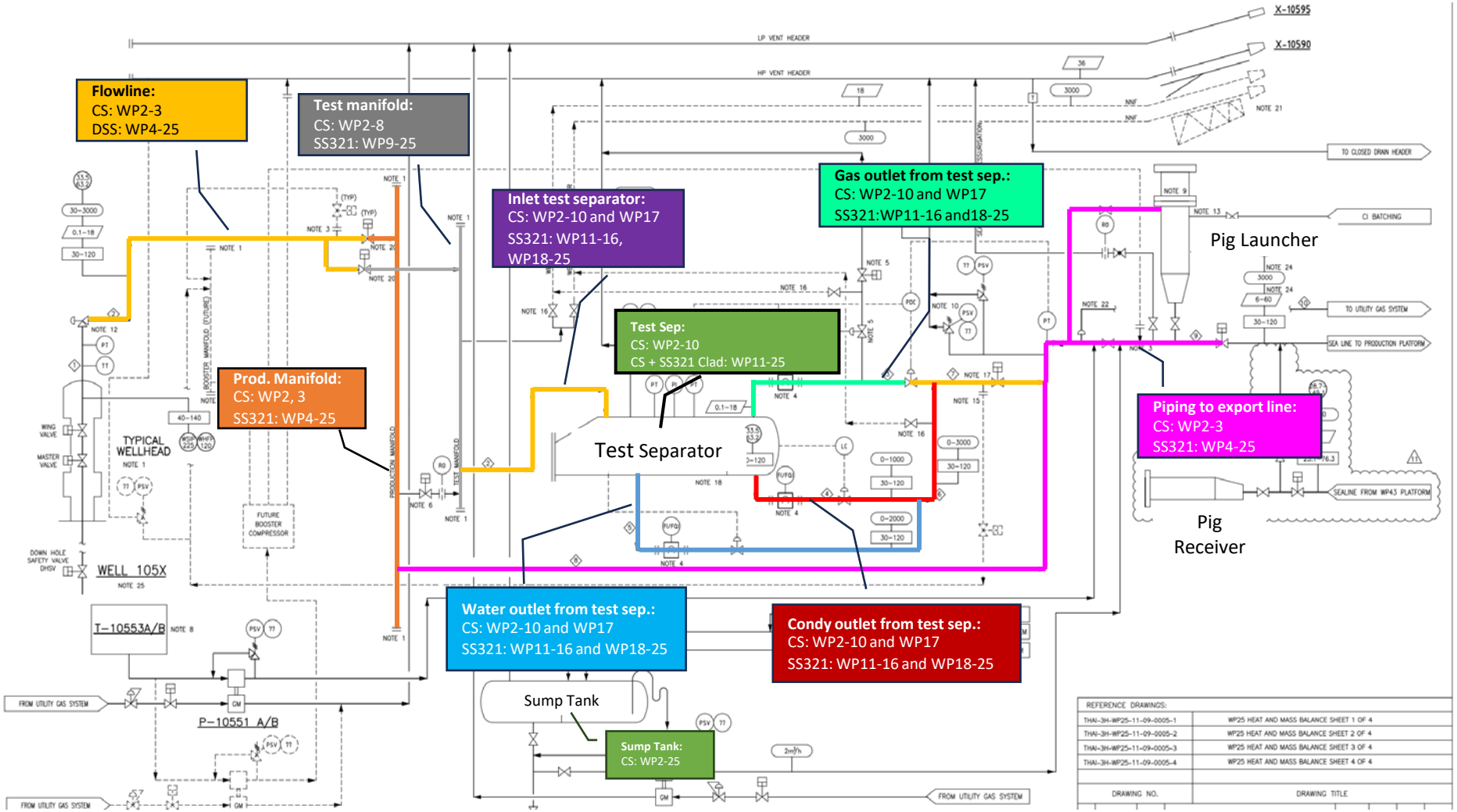


Sealine:
Top-of-the-line corrosion



Top of the line corrosion scheme

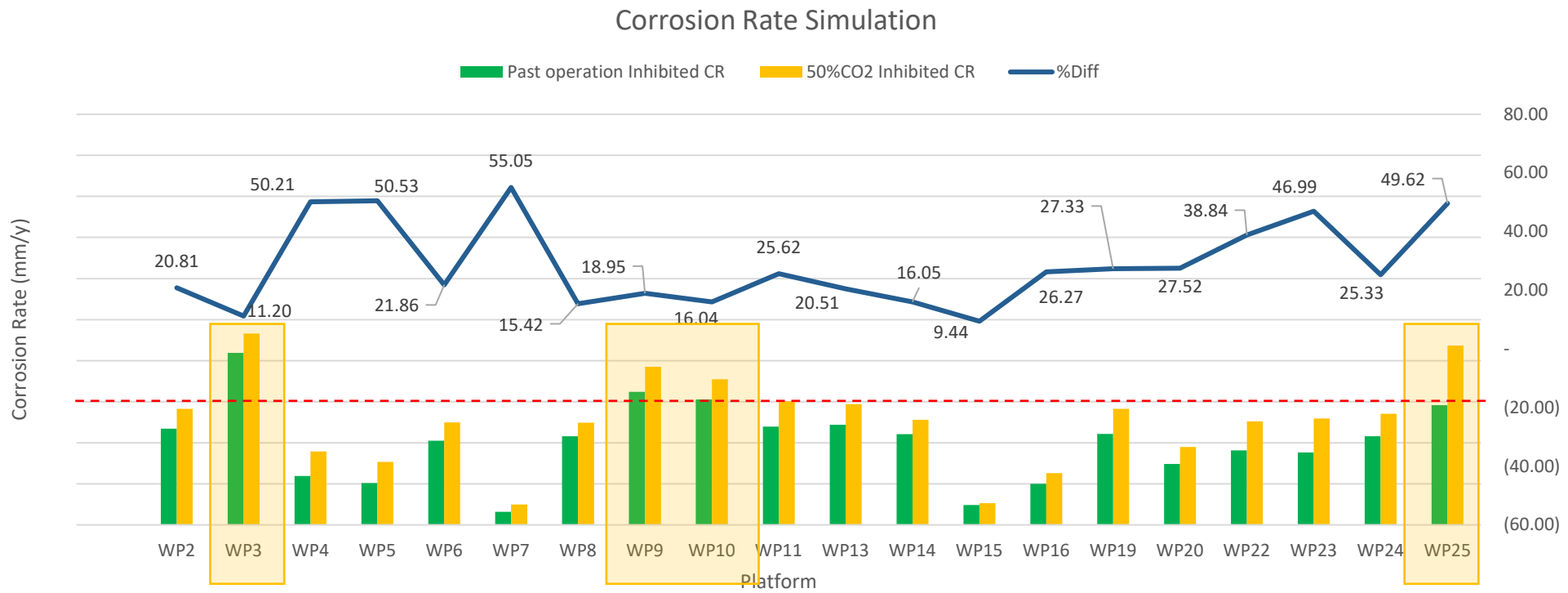
Material Selection Diagram



- Most of critical section were design with CRA material.
- Carbon steel section will be further evaluated.
- Inspection data e.g., thickness measurement is considered.
- Corrosion simulation based on historical operating condition.

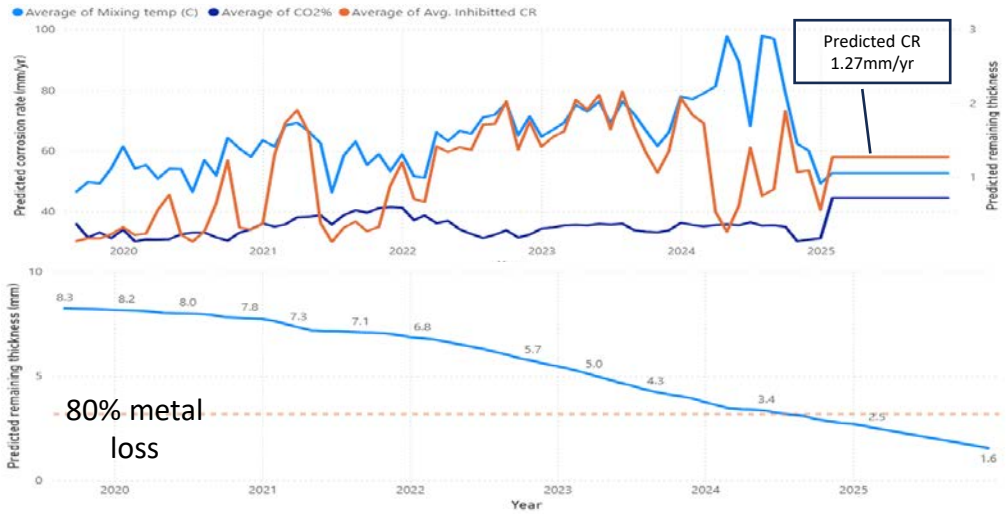
Topside Corrosion Assessment

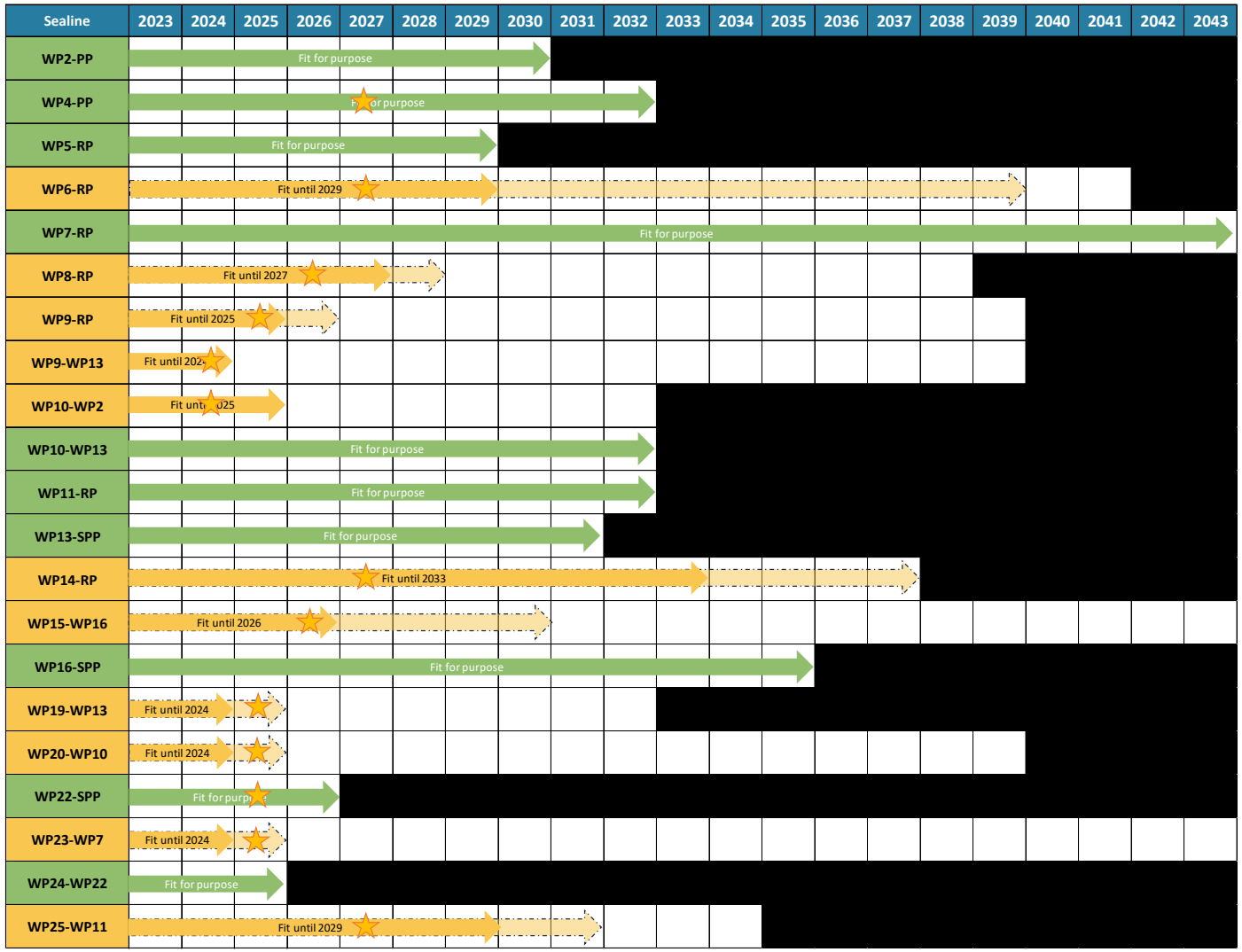
- Assessment conducted on Flowline, process piping and pressure vessel affected by higher %CO2 fluid
- Comparison of corrosion rate between past operation and 50%CO2 is used to indicate the degree of corrosion severity only.
- Prioritize corrosion monitoring program to the high corrosion rate



Pipeline Corrosion Assessment

- 50% CO2 is used for **MultiCorp** Top-of-line corrosion simulation
- Historical operating condition extracted from PDMS for simulation.
- Actual CI/VCI availability has been considered.
- Conservative result from simulation is noticed at the time of study

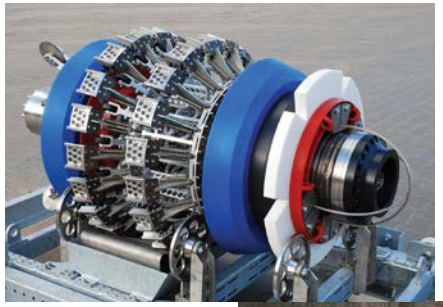




Or — 80%Metal loss @ 50%CO2 — In-line inspection plan — 80%Metal loss @ Current operation

Corrosion Mitigation

Routinely sealine batch treatment for critical pipeline



In-line inspection (MFL, UT,)
External Inspection

Continuous chemical injection (CI, VCI)
Dosage optimization

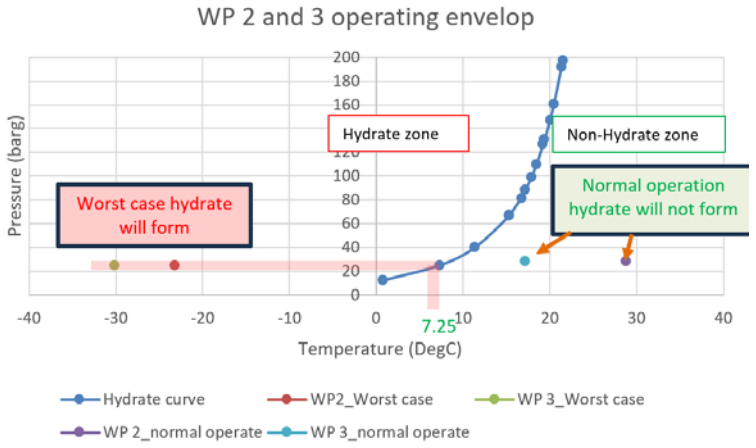
Corrosion control and mitigation program

Online process monitoring
Corrosion rate determination
Integrity assessment
Inspection – Treatment optimization

Other aspects to High CO2 operation

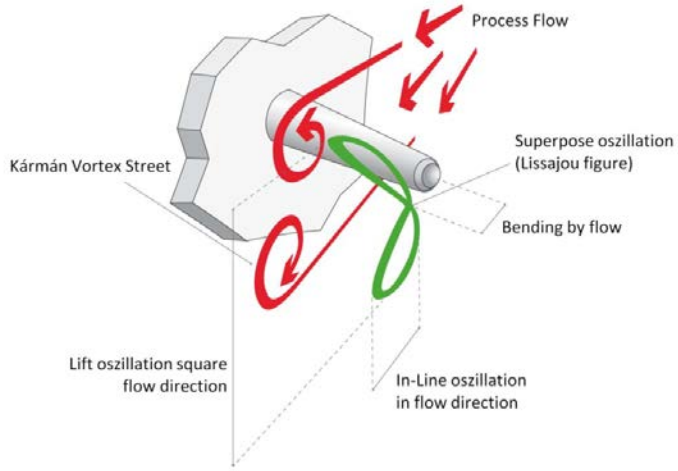
Process

- PSV adequacy check
- Flowline and piping capacity check
- Hydrate formation study



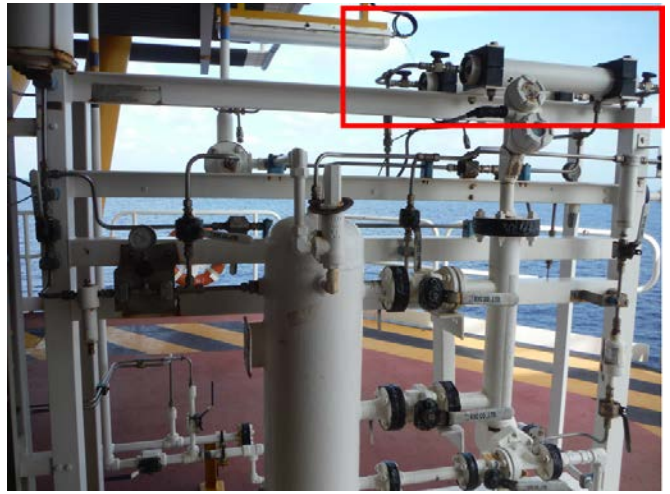
Instrument

- Thermowell Wake Frequency Calculation
- Compliance with ASME PTC19.3 TW-2016



Electrical

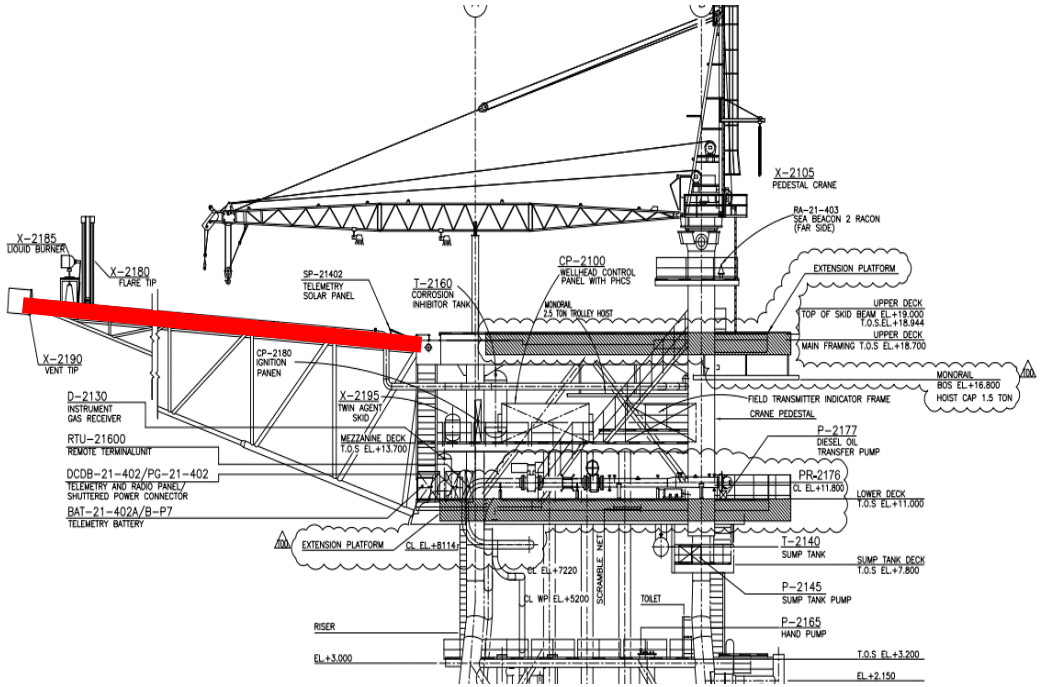
- Power Supply Verification
- Power consumption validation
- Modification requirement

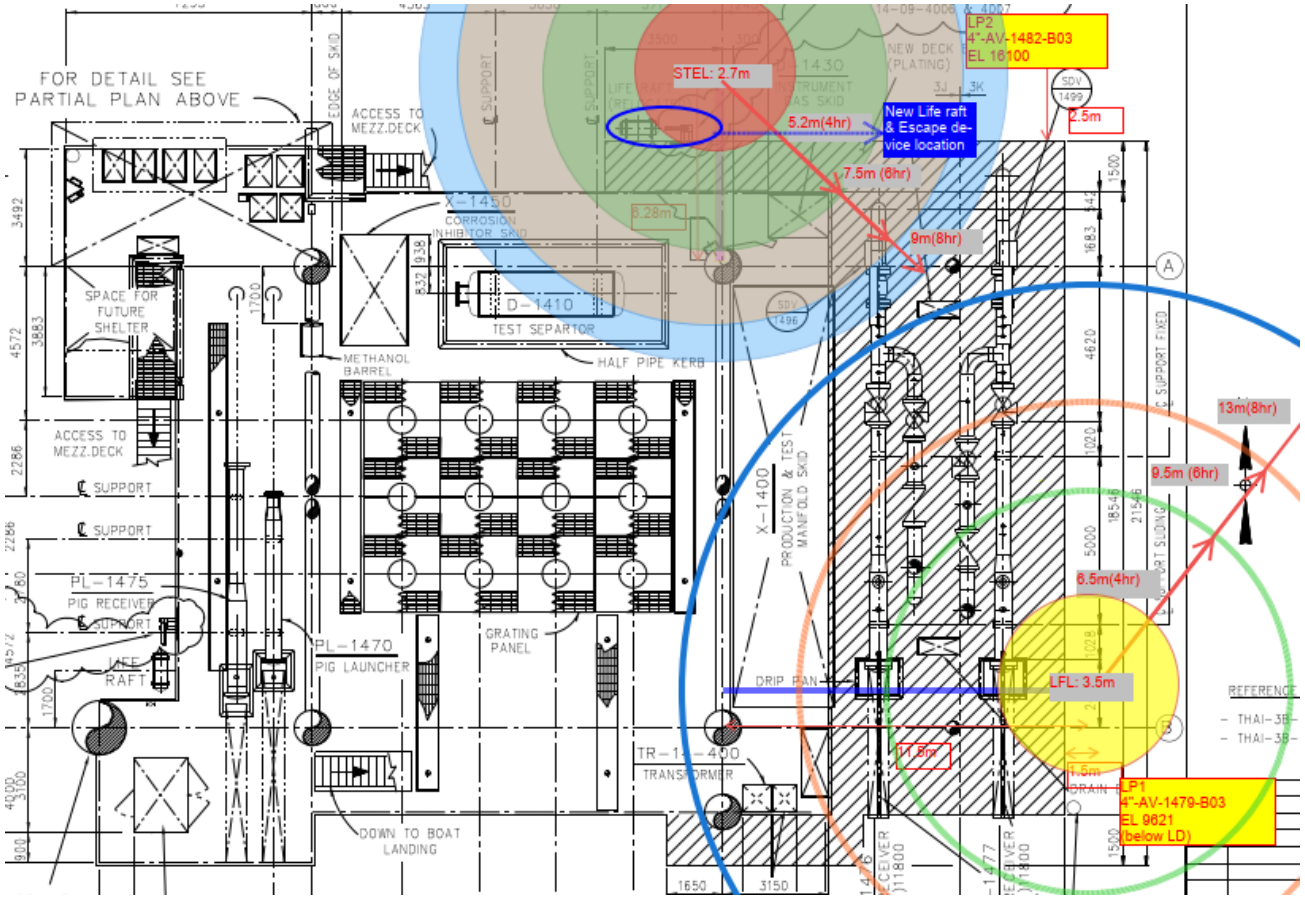


Other aspects to High CO2 operation

Technical Safety

- CO2 dispersion study
- Define mitigation measures and modification requirement





Conclusion

- Corrosion simulations and inspection data were used to assess severity and guide mitigation strategies.
- Mitigation includes continuous chemical injection, inspection programs combination with digitalization supporting treatment optimization without compromising asset integrity.
- Technical assessments ensure safe and reliable operation across disciplines related

Thank you
Q&A