

Requirements for Specialised Inhibitor Tests

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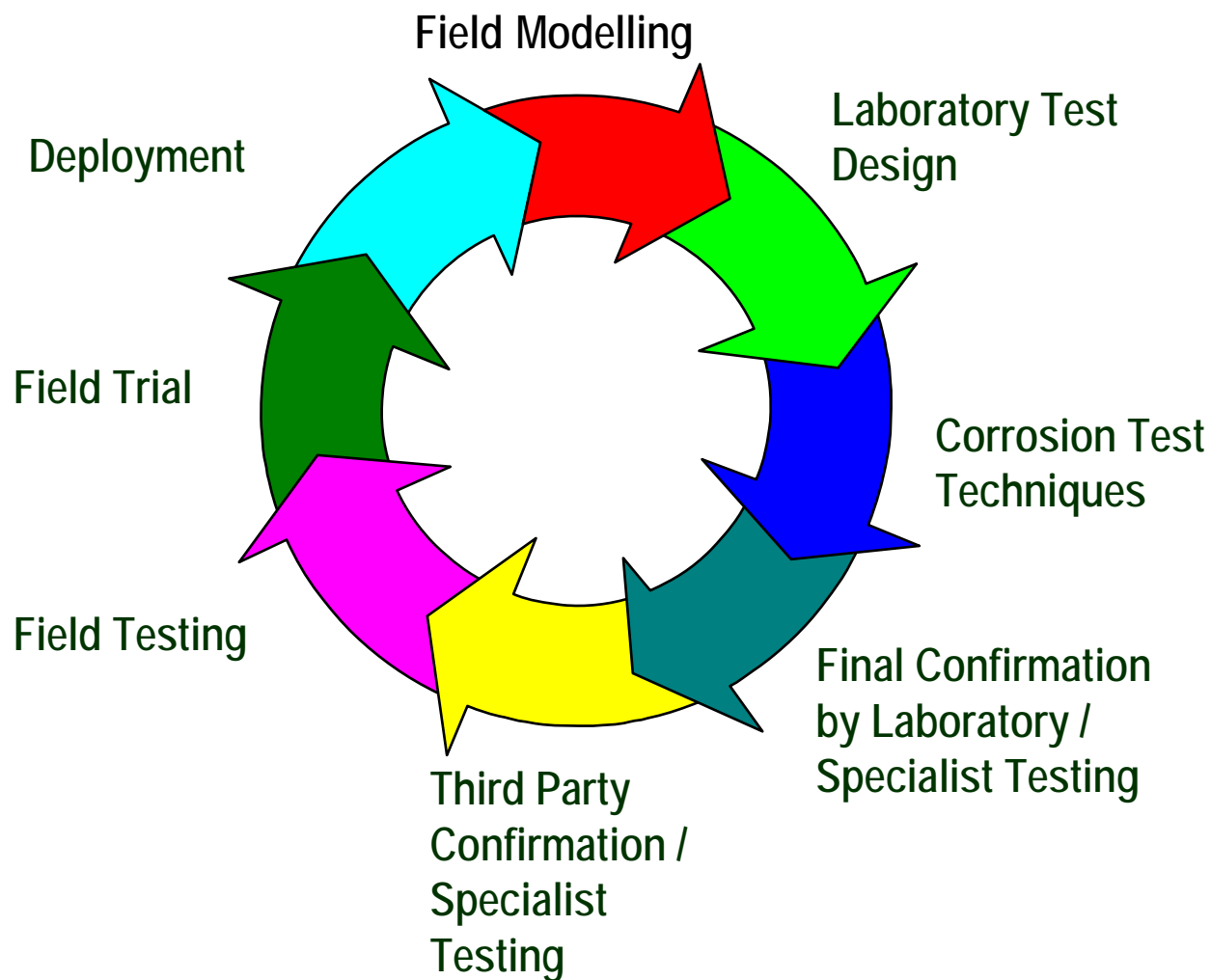


Exactly your chemistry.

Content

- Philosophy
- 'Simple' Techniques
- Specialised Techniques
- Applicability
- Summary

Philosophy



'Simple' Techniques – Low Shear

■ Wheel test

- Inhibitor screening
- Partitioning
- Batch treatment
- Persistency
- Weight loss (some electrochemical)



■ Bubble test

- Inhibitor screening
- Partitioning
- Persistency
- Weight loss and electrochemical



'Simple' Techniques - Dynamic

■ Rotating Cylinder Electrode (RCE)

- Shear conditions (<80 Pa)
- Partitioning
- Persistency
- Low partial pressure



'Simple' Techniques – High Pressure/Temperature

■ Autoclaves

- High partial pressure (CO₂/H₂S)
- Low shear
- Partitioned
- High temperature
- Long duration testing
- Coupons (Sour systems)



Specialised Techniques

- High shear / high pressure
 - Flow loops
 - Autoclaves
 - Jet impingement
- Segmented weld testing
 - Partitioned
- Under deposit testing
 - Partitioned
 - High pressure
 - Initiation
 - Propagation
- Galvanic testing
 - Clad risers, metallurgical considerations



Applicability

■ Water Injection

- Bubble tests
- Aqueous
- Pressure (high use autoclaves)
- Shear dependent upon system (RCE, RCA, Jet, Loops)
- Solids (Under deposit)
- Weld (Segmented weld testing)
- Compatibility (PWRI)

Applicability

■ Wet Oil Production

- Bubble tests
- Partitioned
- Shear dependent upon system
- Pressure Some High Partial pressures
- Solids (Under deposit)
- Weld (Segmented weld test)
- Subsea (SCR Galvanic test on cladding)
- Compatibility Testing
 - Foaming
 - Emulsification

Applicability

■ Dry Oil Production

- Bubble tests
- Coupons (sour systems)
- Partitioned
- Shear dependent upon system
- Pressure low partial pressures (Degassed oil)
- Solids (Under deposit)
- Weld (Segmented weld test)
- Compatibility Testing
 - Foaming
 - Emulsification
 - Other chemicals

Applicability

■ Wet Gas Production

- Continuous Treatment
- Bubble tests
- Partitioned
- Shear dependent upon system
- Pressure high partial pressures (Autoclaves)
- Coupons (sour systems)
- Solids (Under deposit)
- Weld (Segmented weld test)
- Compatibility Testing
 - Foaming
 - Emulsification
 - Other chemicals (hydrate Inhibitors)

Applicability

■ Wet Gas Production

- Batch Treatment
- Bubble tests persistency
- Wheel tests persistency
- Partitioned
- Shear dependent upon system
- Pressure high partial pressures (Autoclaves if possible)
- Weld (Segmented weld test)
- Compatibility Testing
 - Foaming
 - Emulsification

Applicability

- Dry Gas Production
 - Continuous Treatment
 - Bubble tests
 - Partitioned
 - Shear dependent upon system
 - Pressure high partial pressures (Autoclaves)
 - Coupons (sour systems)
 - Solids (Under deposit)
 - Weld (Segmented weld test)
 - Compatibility Testing
 - Foaming
 - Emulsification
 - Other chemicals (hydrate Inhibitors)

Applicability

- **Dry Gas Production**
 - Batch Treatment
 - Bubble tests persistency
 - Wheel tests persistency
 - Partitioned
 - Shear dependent upon system
 - Pressure high partial pressures (Autoclaves if possible)
 - Weld (Segmented weld test)
 - Compatibility Testing
 - Foaming
 - Emulsification

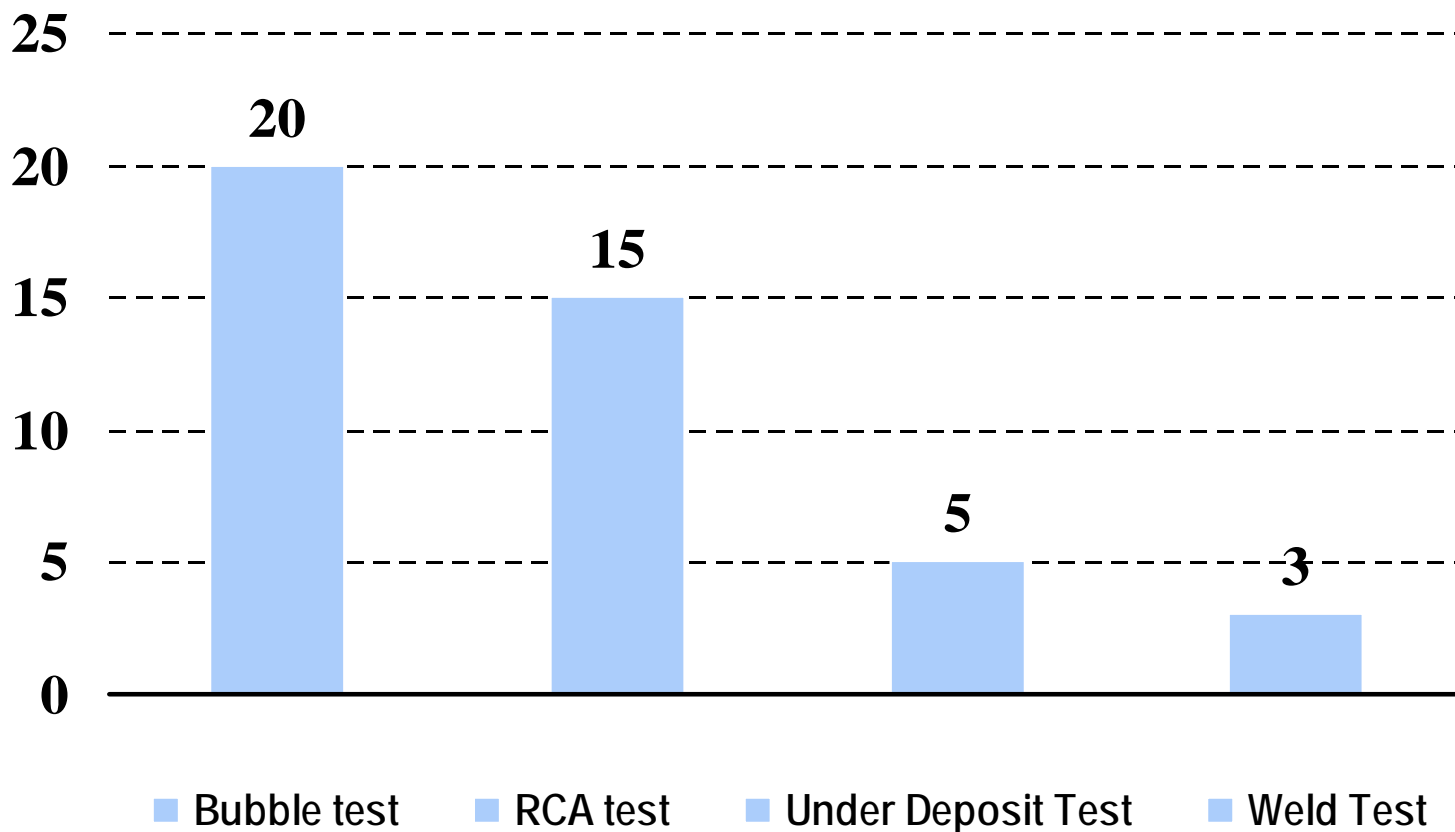
Applicability

■ Closed cooling/heating systems

- Pressure high partial pressures (Autoclaves)
- High temperature (Autoclaves)
- Oxygenated systems
- Weld (Segmented weld test)
- Metallurgical compatibility
- Microbial
- Deposits
- Compatibility Testing
 - Foaming

Importance of Correct Test Matrix

Products Passing Routine and Specialist Tests



Test Matrix

| | Bubble Test | RCA Test | Under Deposit Test | Weld Test | Sour weld Test | Methanol compatibility | Viscosity |
|-----------|------------------------------|----------|--------------------|-----------|----------------|------------------------|-----------|
| Product 1 | Green | Green | Red | Red | Green | Green | Green |
| Product 2 | One Suitable Product from 10 | | | | | | |
| Product 3 | Green | Green | Green | Green | Red | Green | Red |
| Product 4 | Green | Red | Yellow | Yellow | Red | Green | Green |
| Product 5 | Green | Green | Yellow | Red | Yellow | Yellow | Red |
| Product 6 | Green | Green | Red | Green | Red | Green | Red |
| Product 7 | Green | Yellow | Green | Red | Red | Green | Red |
| Product 8 | Green | Green | Red | Red | Red | Green | Green |
| Product 9 | Green | Green | Red | Red | Green | Green | Green |

Summary

- Modeling essential
- Information on system essential
- Simulate the best we can
- Many tests available
- Specialised tests
- Choice dependent upon system
- Correct choice of methodology