



Production Chemical Optimization Congress

Examining How to Cost Efficiently Deliver Chemicals For Paraffin And Corrosion Treatment On Rod Pumps And Success In Reducing Failure Rates



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💧 Data Management

- Artificial lift failure data base
- Infrastructure (Integrity and Flow Assurance) data base
- Well work and treatment records

💧 Continuous Improvements

- Data base migration
- Optimization of chemicals

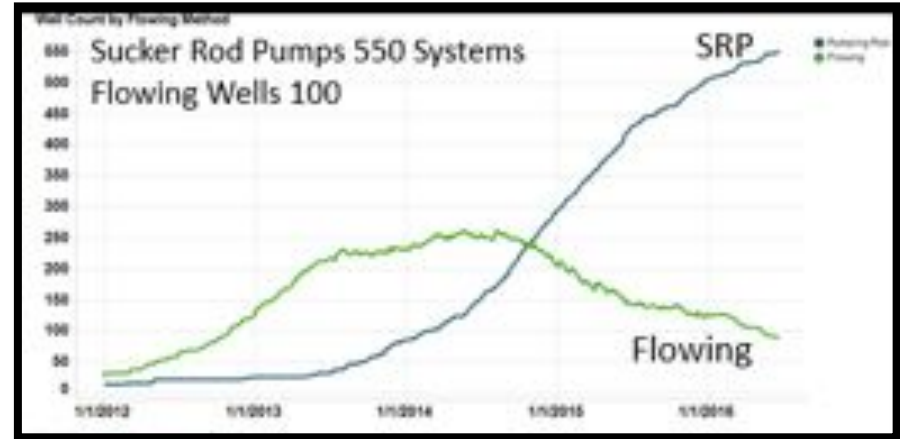
💧 Challenges

- Oil and gas price
- Opex reduction
- Offset Frac's



Murphy Oil-Eagle Ford Operations

- Over 150,000 acres
- 650 producing oil wells
- 550 sucker rod pumps
- H₂S Range 0 to 7%
- CO₂ 0 to 10%
- Geographically dispersed across the Eagle Ford



Rod Pump Challenges in the Eagle Ford

- ◆ **Depth**
- ◆ **Temperature**
- ◆ **Paraffin**
- ◆ **Corrosion**
- ◆ **Solids**
- ◆ **Deviated Vertical Section**
- ◆ **Slug Flow**
- ◆ **Foamy Gassy Fluid**
- ◆ **Offset Fracs**





Artificial Lift Failure Data Base

• Create the data base

- Downhole system
- Sub systems

• Maintain the data base

- Discipline
- Accuracy

• Failure analysis

- Vendors
- Field reports

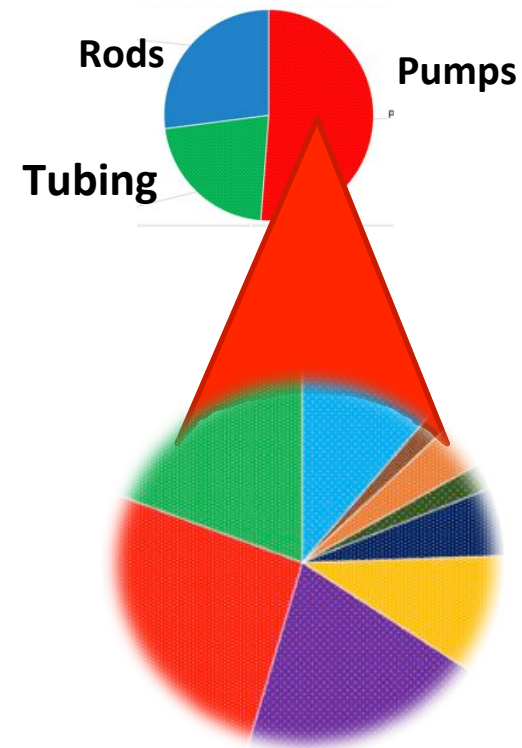
• KPI's

- Failure frequency
- MTBF

• Cross functional

- Reservoir
- Integrity

Downhole System Failures





Corrosion Failures Identified





Corrosion Failures Identified



Root Cause of Failure Documented

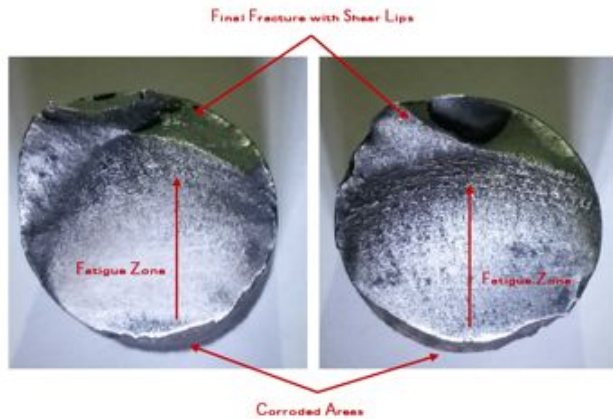


Figure 4. Fracture Surface

Failure analysis report documenting corrosion fatigue failure.

Samples exhibit severe corrosion with deep and sharp pits all over rod surface. (Figures 3).

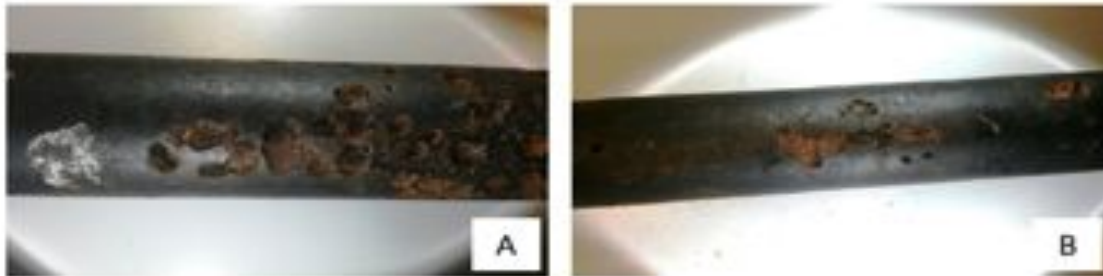
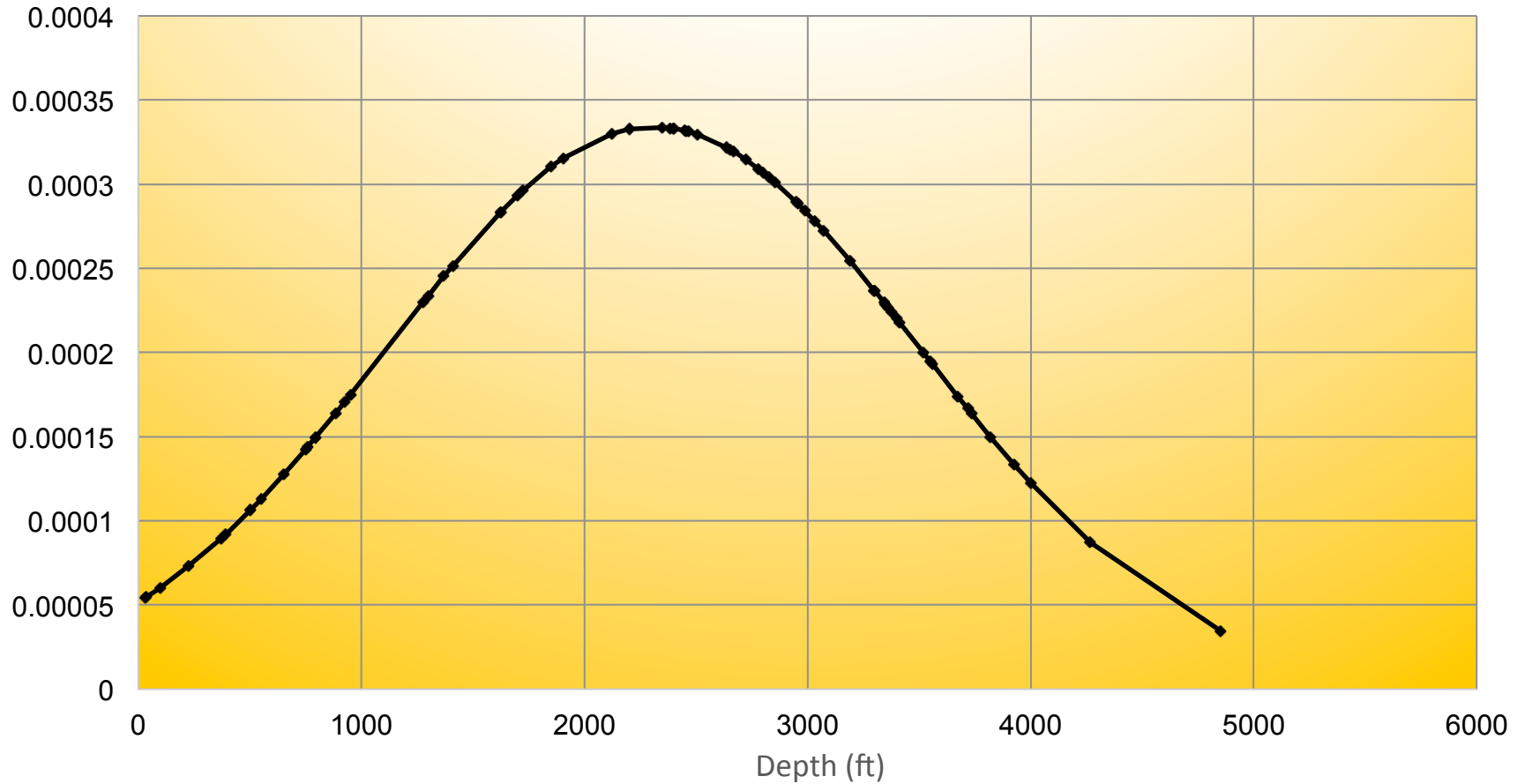


Figure 3. Body Corrosion

Failure was found on 31st 7/8" rod at 2,987'. Figure 4 shows the fracture surface after cleaning. The pattern is characteristic of a fatigue processes which started in the external surface in a severe corroded area (Figure 5). Then, fracture propagated by a fatigue mechanism, to finally crack as a consequence of the lack of section to withstand the load.

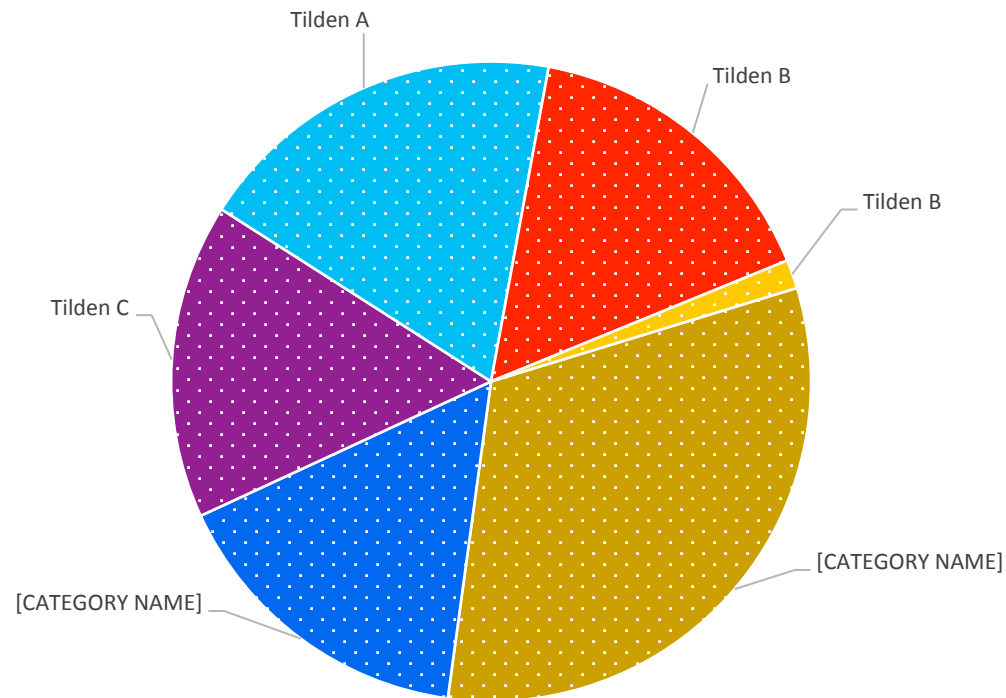


Distribution of Failed Wells Due to Rod Failure



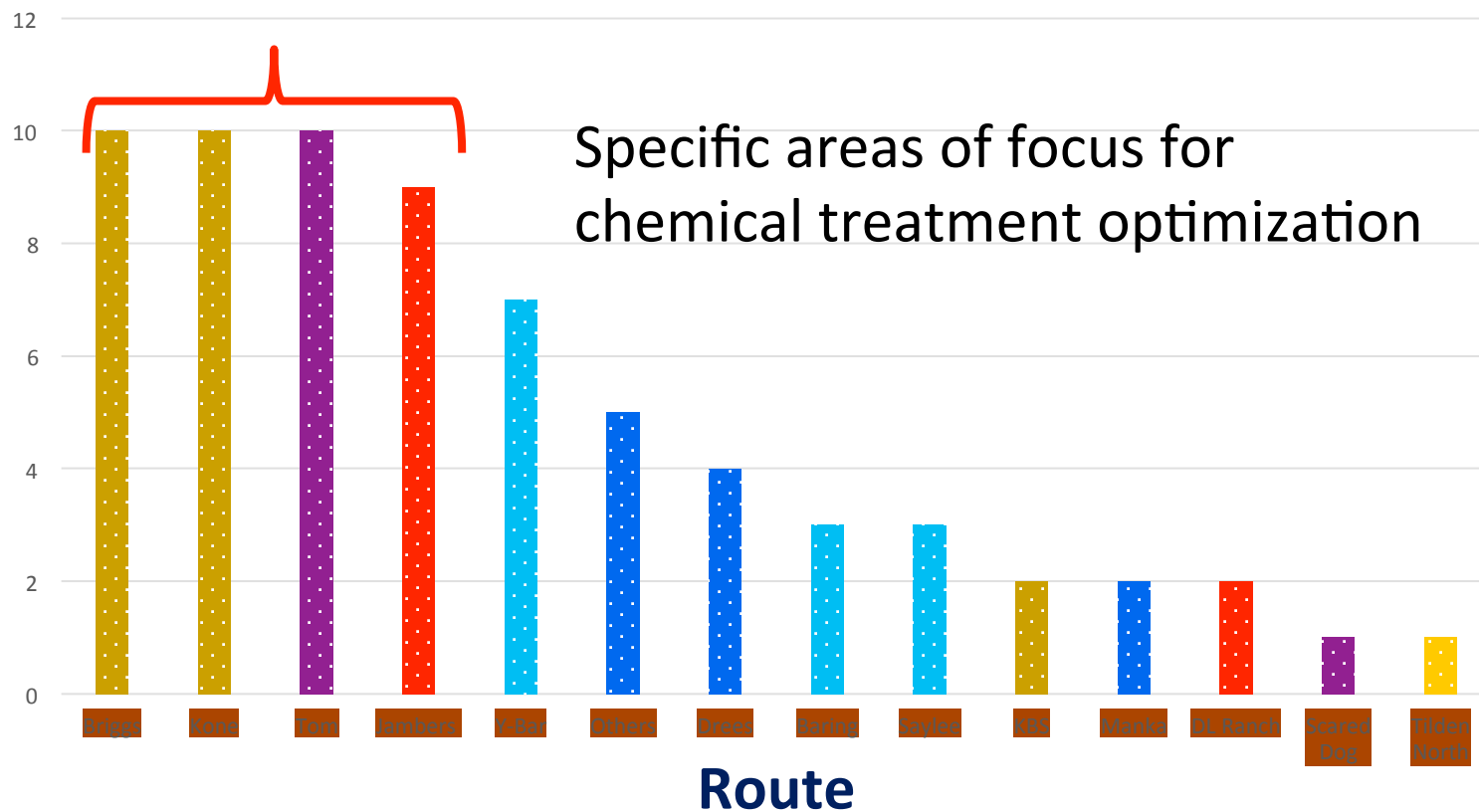


Corrosion & Fatigue Sucker Rod Failures by Field 2012-2016



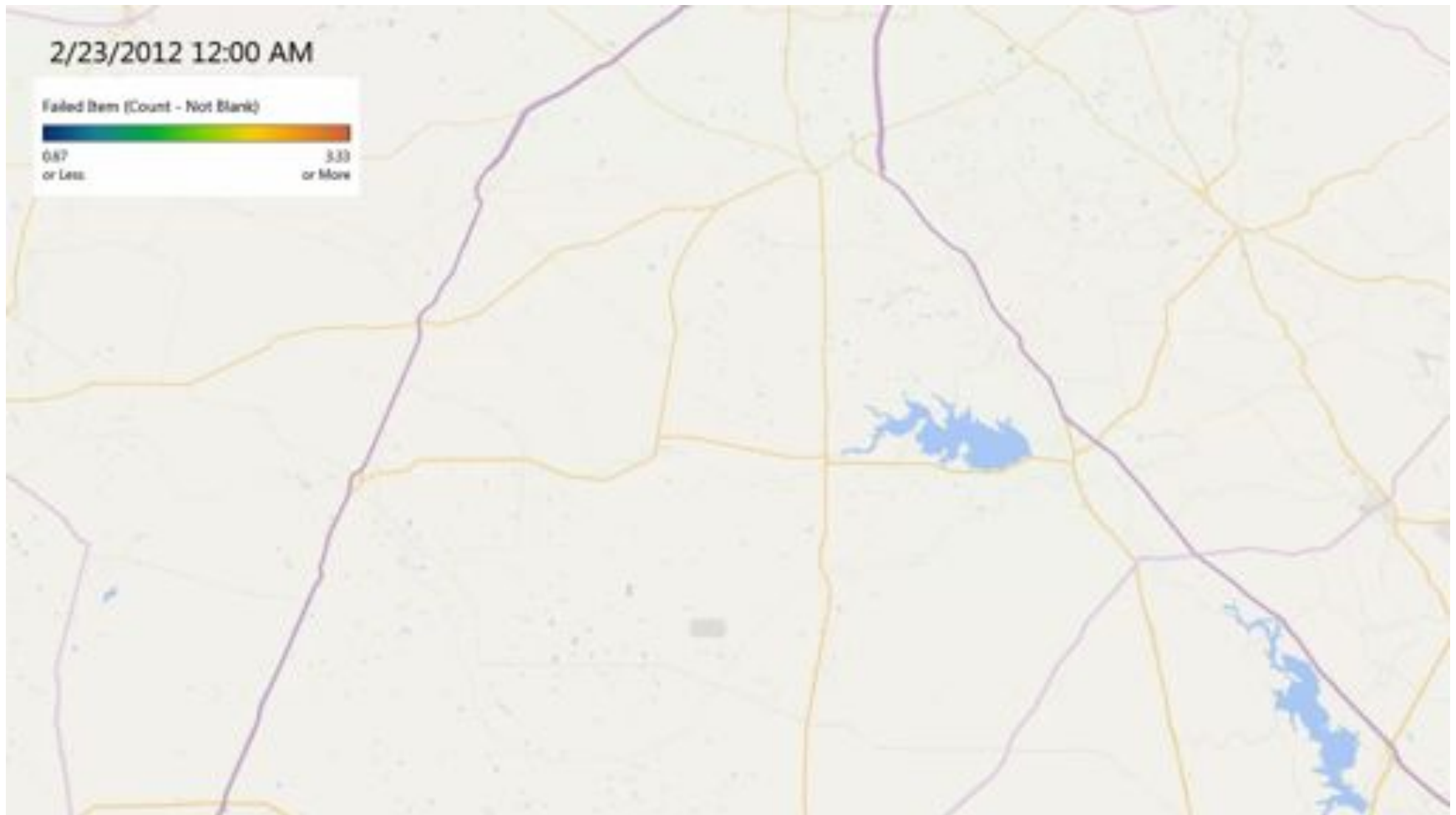


Corrosion & Fatigue Sucker Rod Failures by Route 2012-2016



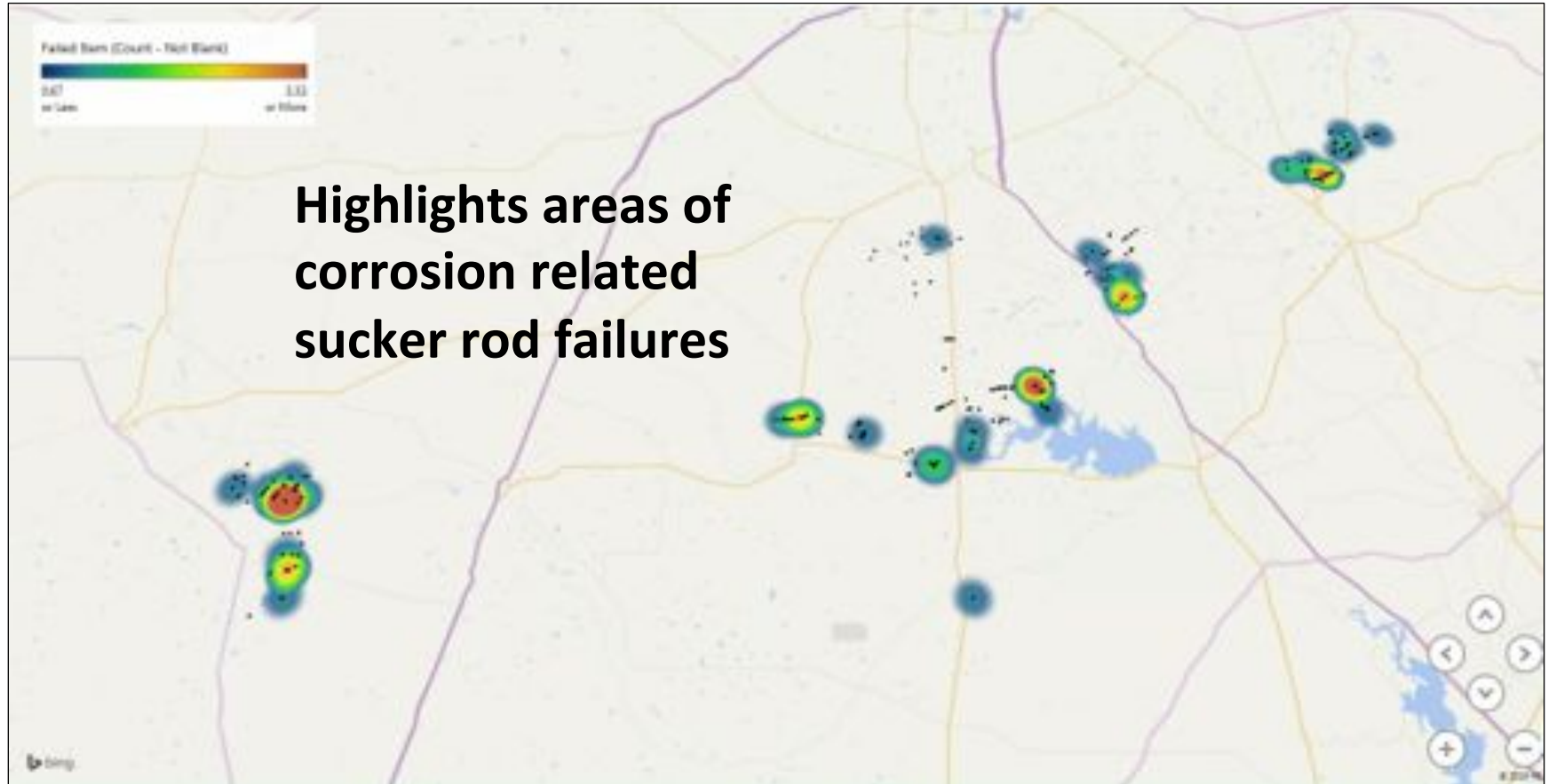


Corrosion Heat Map





Corrosion Heat Map



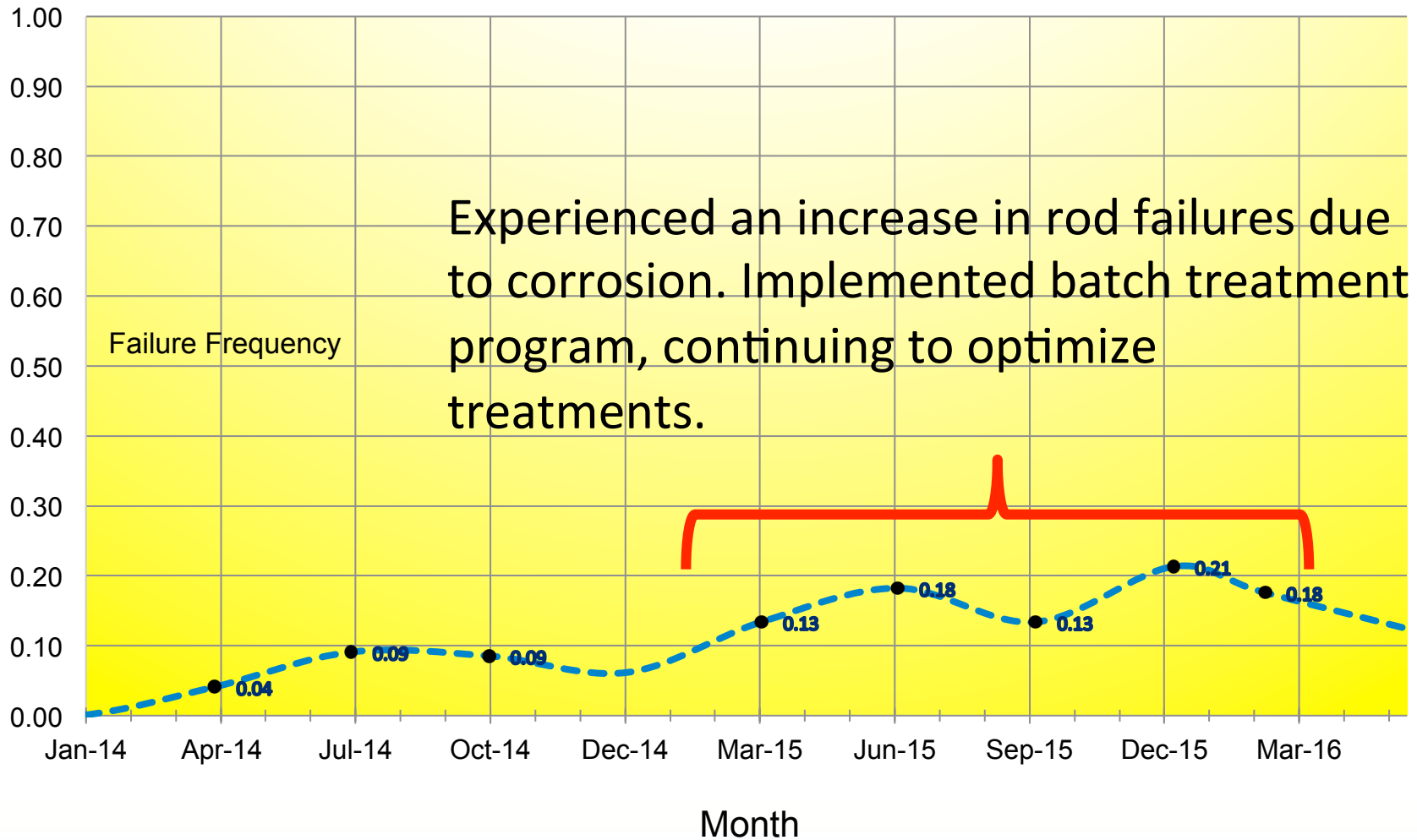


Parrafin Issues Identified





Sucker Rod Failure Frequency by Quarter





Integration of Failure Data

◆ Integrity and Flow Assurance Data Base

- Mapping of pipeline system
- Central facilities
- Centralized treatments

◆ Correlate Downhole and Surface Failures

- Map pipeline failures against downhole failures
- Concentrate preventive efforts

◆ Track and schedule treatments

- Batch Treatments
- Cap String Treatments
- Well Work Treatments



- Uncertain oil and gas prices
- Pressure to reduce Opex dollars
- Vendor services
- Reduced staff
- Offset Frac's





- Thank you to Murphy's Artificial Lift and Integrity Management Teams





Practical Applications

Chemical Pumps

- Fit for purpose
- Maintenance
- Injection Rate

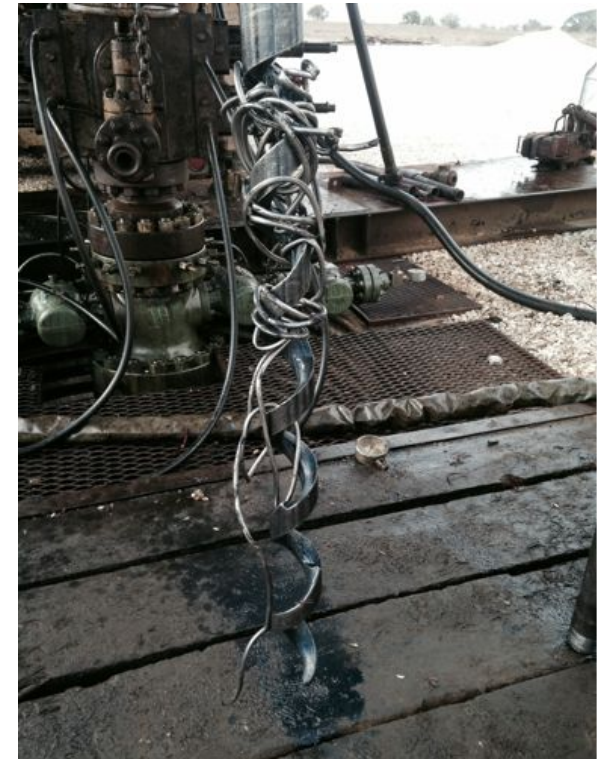




Practical Applications

Cap Strings

- Installed at 5000 ‘
- Connected
- Plugged
- Failures





Practical Applications

Hot Water - Batch Treatments

- Management
- Tracking
- KPI's





Practical Application

Automation of Chemical Pump with VSD

- ◆ VSD to automate injection rate
- ◆ Adjust rate based on production
- ◆ Shut off chemical automatically when well is down



Artificial Lift Production Equals Flowing Production

