New Technology for Treatment of Refinery Chemical Cleaning Waste Water

Perry Roland
Director Water Treatment
Vapor Point

Jeff St. Amant
President/CEO
Vapor Point
Typical Industrial Waste Water Streams

• Chemical Cleaning Operations
• Refractory Exchanges
• Sour Water Stripper Outages/Capacity Limitations
• Pipeline Chemical Fouling
• Storm Water Management
• De-Salter Mudwash & Cleaning Effluent
• Process Waters
Typical Waste Water Treatment Limitations

Internal Plant Systems Limited in Capabilities & Capacity

• Micro-Emulsions
• Surfactants
• Sour Water (Ammonia and H₂S)
• Pipeline Chemicals

Limited Options

• Off Site Disposal → Cost Prohibitive
• Internal Treatment → Make-up > Discharge
The Electrochemical Process

• Flexible application – electrolytic cell can be customized to fit different waste streams

• Used for the enhanced separation of water mixtures
Electrolytic Cell Strengths

• Can be used in separating phases typical in refinery waste streams

• Breaks out TPH, organics, suspended solids, and heavy metals
System Design – Customizable Technology

- Adaptable Footprint
- Solids Management
- Emissions Management
- Highly Adaptable to Changing Water Streams
- Multi-Stage Treatment Process to Ensure Water Meets all Quality Standards
- Staged Filtration Allows for Easy Capture and Disposal of Solids Waste
- On Site Field Testing to Ensure Water Quality
Case Study – Gulf Coast Refinery Chemical Cleaning Effluent

Post Electrochemical Treatment (with Electrolyte and pH Adjustment)

Emulsion Breaking and Flocculent Forming
Filtration and Water Polishing

- Filtration can be necessary at any point during the process
- Type of filtration will change based upon discharge standards
- Filtration media will change based on constituents of water

Case Study – Gulf Coast Refinery Chemical Cleaning Effluent
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Post Electrochemical Treatment - After Solids Separation

Some foam remains after solids separation

After resting for 6 hours foam fully collapsed
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Foaming Test of Process Water

5ppm Surfactant

- Full Foam Column
- All Water Converted

1ppm Surfactant

- Half Foam Column
- Half of Water Converted

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Foaming Test of Process Water
No Measurable Foam

Treated Waste Effluent Sample (0ppm Surfactant)

Bottled Drinking Water
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Foaming Test of Process Water (Gas Chromatograph)

Sample with Surfactant Present

Isolated Surfactant

Based on these results we can measure down to less than 1ppm

Pre-Treatment Surfactant Levels

Post-Treatment Surfactant Levels

We can also correlate these results to a “foam test” that can be done in the field
Case Study – Gulf Coast Refinery Chemical Cleaning Effluent

Sample 1 (BOD, COD, TOC)

Sample 1 = Bottom Tank Draw (Clear, Amber in Color)

Sample 2 (BOD, COD, TOC)

Sample 2 = Top Tank Draw (Milky, Opaque, Khaki in Color)

Benzene Levels
Summary

• Developed process to reliably field measure surfactant levels
• System proved capable of removing surfactants and other contaminants from waste water
• Exceeded all refinery waste water standards
• All waste can be separated and captured
• Expanding capabilities to manage other refinery water challenges