Webinars

Welcome!

The program will begin soon.

You will not hear audio until we begin.

SPE International

Savvy Separator Series
Operational Troubleshooting of Separators

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21st Nov 2022

Presenter's company Logo.
It is not mandatory. However, this is the only slide where their logo is allowed.

Webinars

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Topics

- You want it to do what now?
- What could possibly go wrong?
- Where to start?
- Back to basics
- A little help goes a long way
- Bringing in the cavalry
- Putting it all together

You want it to do what now?

Performance Targets

- Gas spec
  - Industry ‘standard’ 0.1gal/MMSCF
  - Is that realistic and what does it actually need to be?

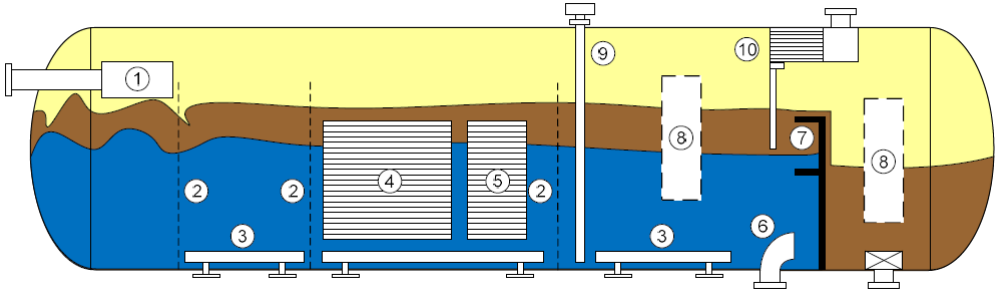
  Ref. - Savvy Separator article: A Century of Carry-Over – 0.1 gal/MMSCF
- Oil spec
  - BS&W
  - Gas carry-under
- Water spec
  - Oil in Water aka Oil and Grease
- Solids removal

What could possibly go wrong?

Common Causes of Separator Issues

- Changing conditions: pressure, temperature, water cut, GOR, new fluids
- Solids/fouling
  - Solids i.e. sand accumulation
  - Buoyant solids such as asphaltenes, napthenate salts, scale
- Over and under treatment of chemicals
- Wrong internals
- Inadequate controls
  - Valves – sizing, tuning
  - Level instruments

Where to Start?



Know your system

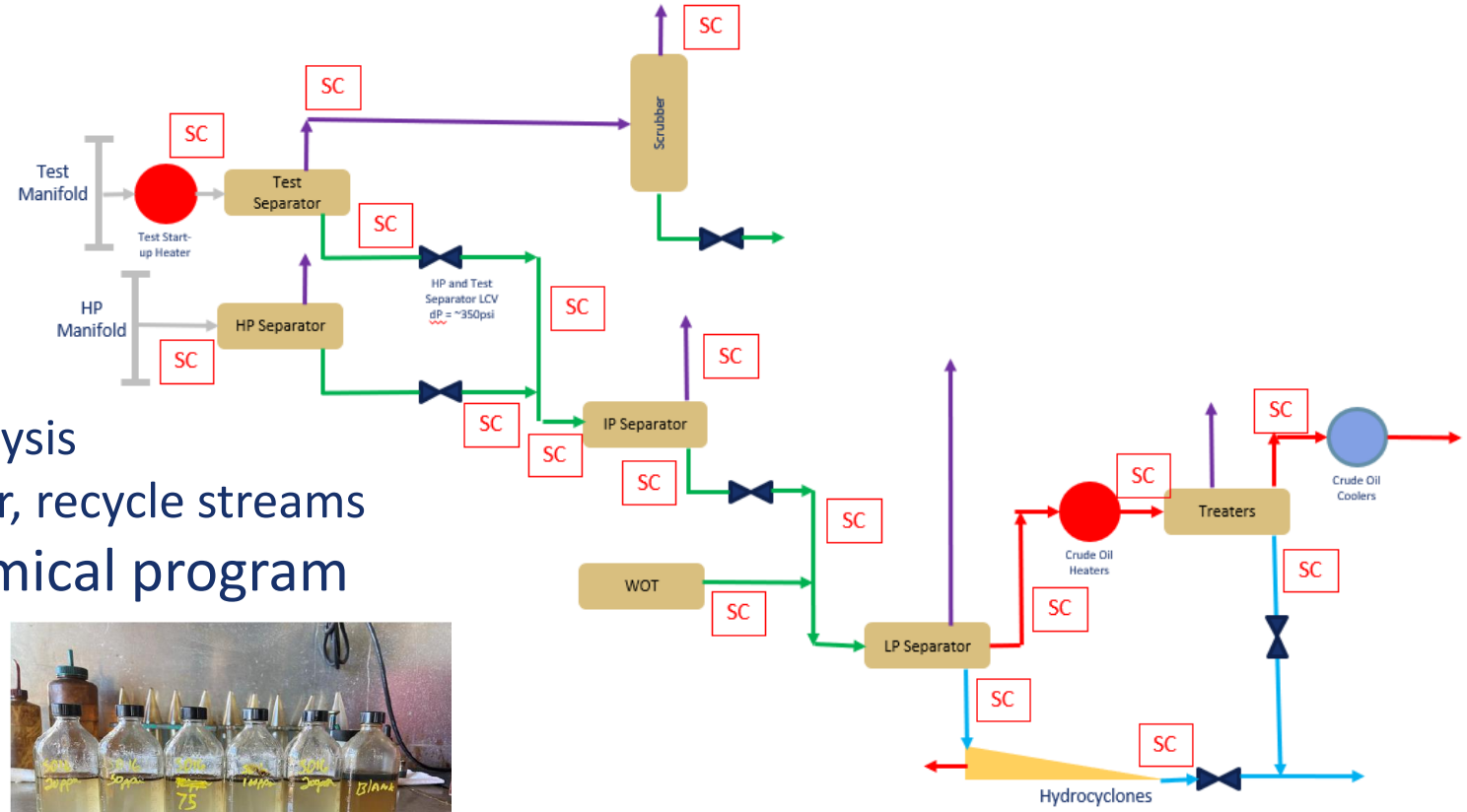
- Fluid properties
  - Oil characterization
  - Water characterization
  - Single field or multiple fields – test for compatibilities
- Separator Design
  - Where does the separator fit into the process?
  - Inlet pipework geometry
  - Installed internals
  - Expected conditions – e.g. last inspection/clean?
  - Design flowrates/cases – e.g. residence times, level setpoints and hold-up times

Ref. - Savvy Separators Webinar: Separation Design and Operation Factors and Their Impact on Produced Water System Performance in Onshore and Offshore Facilities

Where to Start? – cont.

System Mapping

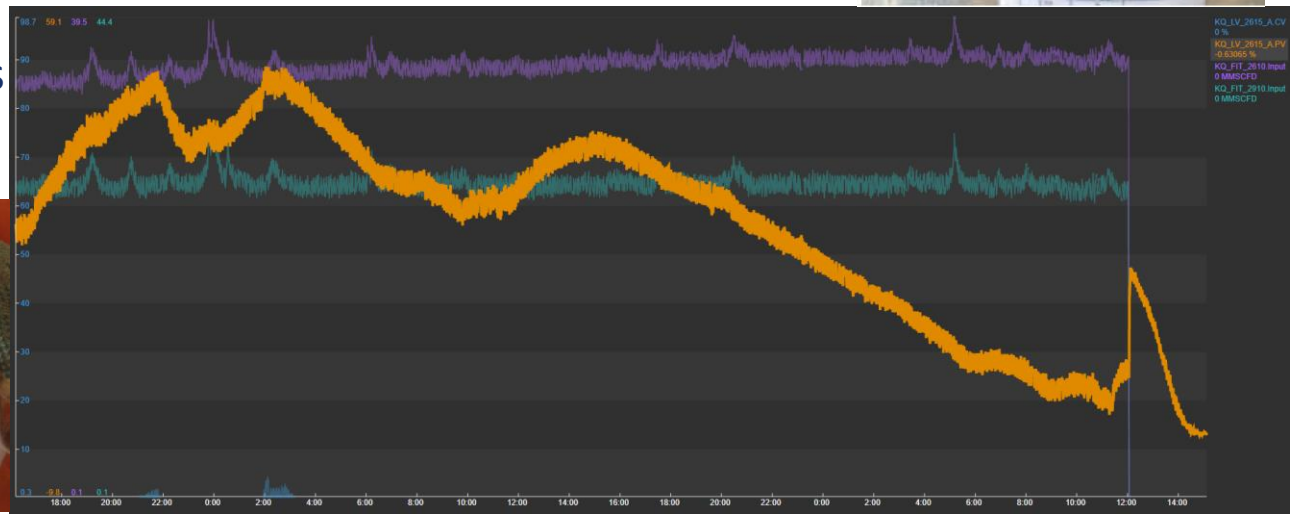
- Performance mapping
  - Inlet and outlet BS&W
  - Outlet OIW
  - Level trends
  - Solids collection and analysis
  - Flowrates – gas, oil, water, recycle streams
- Current and historic chemical program
  - Types of chemicals
  - Injection locations
  - Dose rates



Back to Basics

Simple troubleshooting techniques

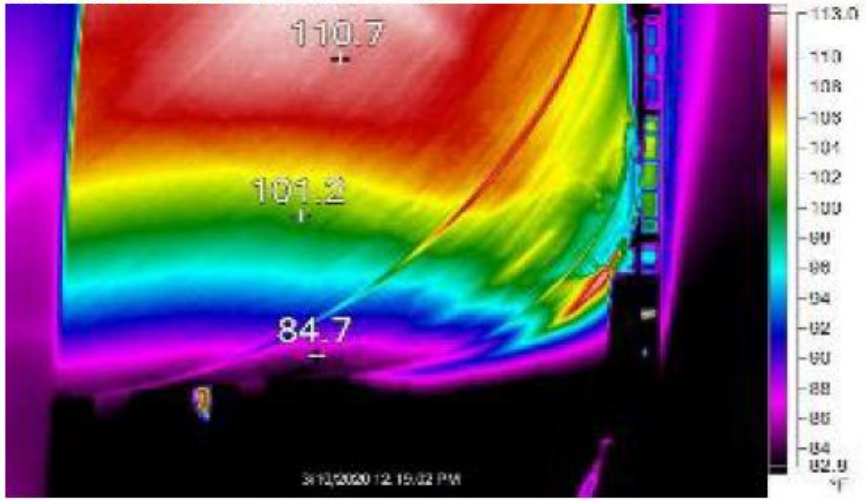
- Vessel and pipe temperatures - look for deviations in temperature along vessel walls/base and pipework
  - Hand or temperature gun
  - Thermal cameras
- Samples – vessel performance
  - Inlets/outlets
  - Vessel profilers/taps/tri-cocks
  - Millipore filters
- White Rag – liquid carryover in gas phase
- Flowmeters – looking for maldistribution
- Pressure drop – evidence of fouling/restrictions
- System condition trending
  - Levels, dPs, dTs



Back to Basics – cont.

MBD 1055 L. P. SEPARATOR

Sediment



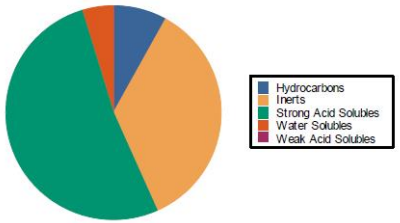
IR-MBD-1055.jpg

Priority : 3

VIS-MBD-1055.jpg

Comment: This vessel is showing signs of possible sediment.

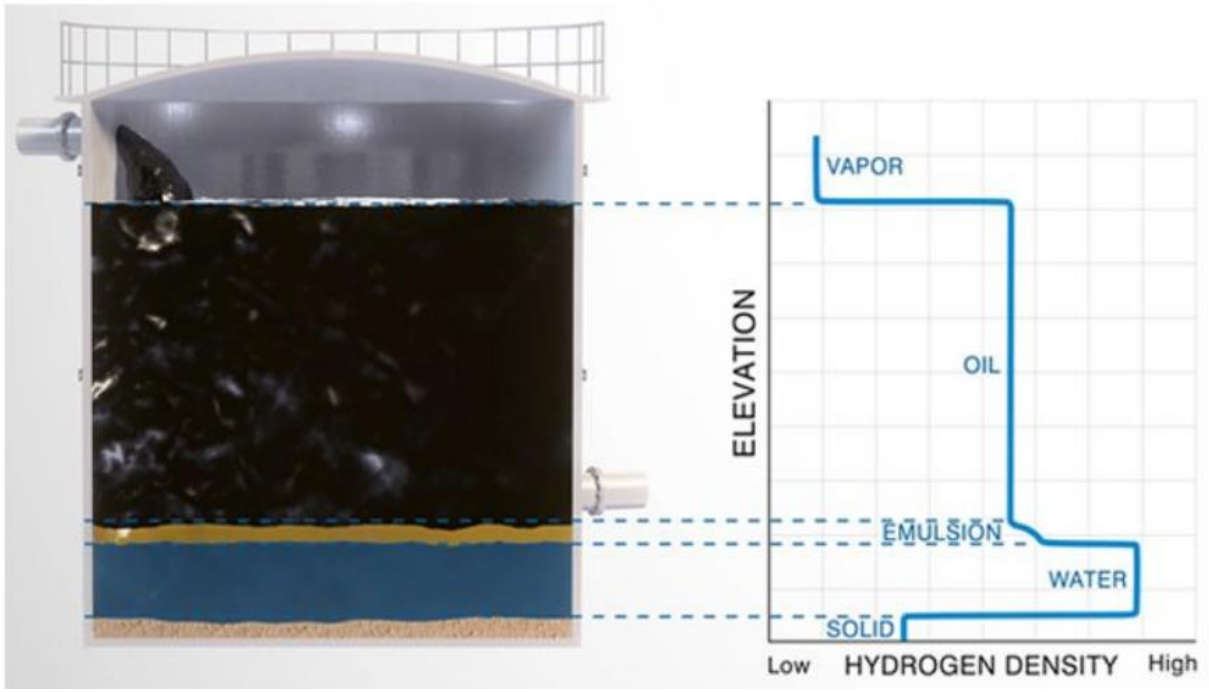
Hydrocarbons	8.14 %
Water Solubles	4.81 %
Strong Acid Solubles	51.77 %
Inerts	35.28 %
Total	100 %



A Little Help Goes a Long Way

Moderate troubleshooting techniques

- Neutron backscatter scans
  - Determine liquid and solids layers/levels in the vessel
  - Near vessel wall
- Gamma scans
  - Determine gas, foam, liquid and solids layers/levels in the vessel
  - Sees further into the vessel
- Dyes
  - Primarily used for water treatment
  - Useful to determine actual residence time and if there is mizing



Ref: Tracerco (https://www.tracerco.com/services/refineries-and-petrochemical/tanks/)

Note: Be aware of environmental and regulatory aspects with the use of dyes, tracers, radiation etc.

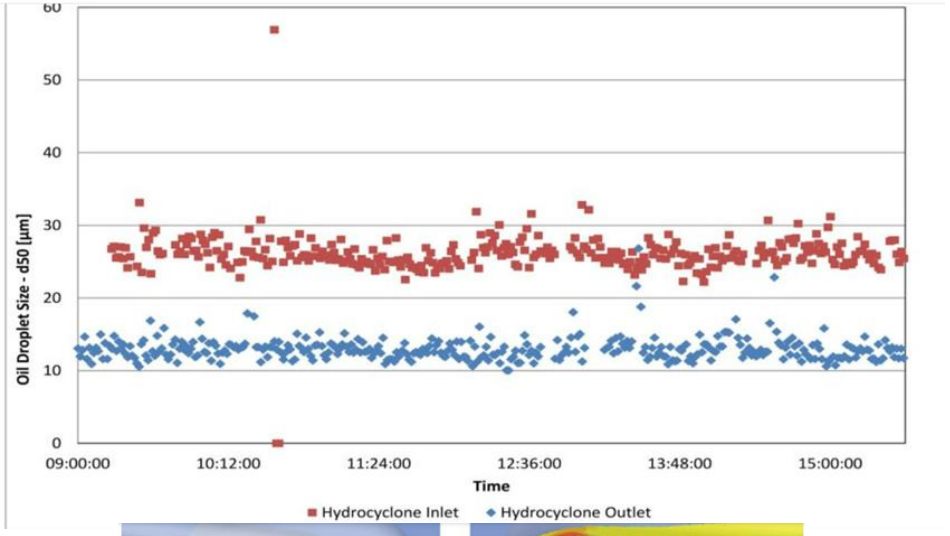
A Little Help Goes a Long Way

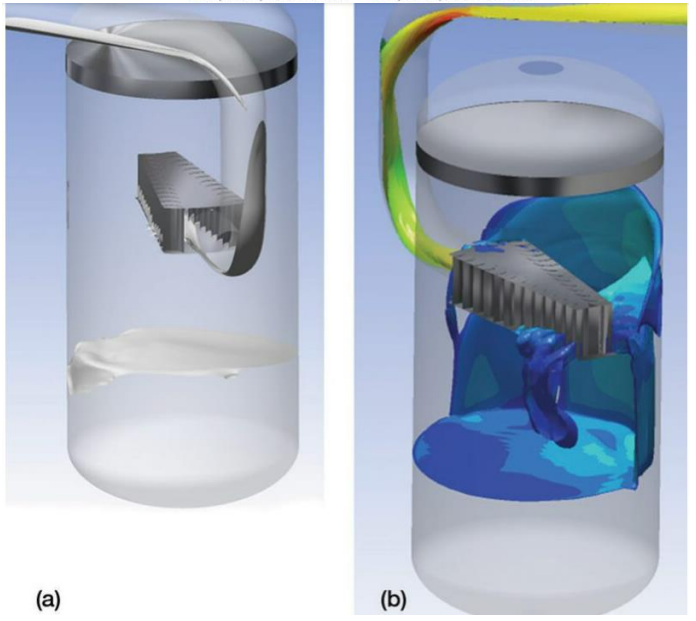
Moderate troubleshooting techniques

- Online measurements
  - Measure BS&W, OIW, particle count and particle size distribution
  - Temporary and permanent setups available
- Chemical trials
  - Optimize incumbent chemicals – identify if under or over treatment
  - Trial new chemicals
  - Often done in conjunction with other moderate techniques
- CFD Modelling
  - Allows us to ‘see inside’ the piping and vessel
  - Look for anomalies such as maldistribution, remixing, incorrect level setpoints etc.

Ref. - Savvy Separators Article: The Effect of Inlet Geometries on Flow Distribution

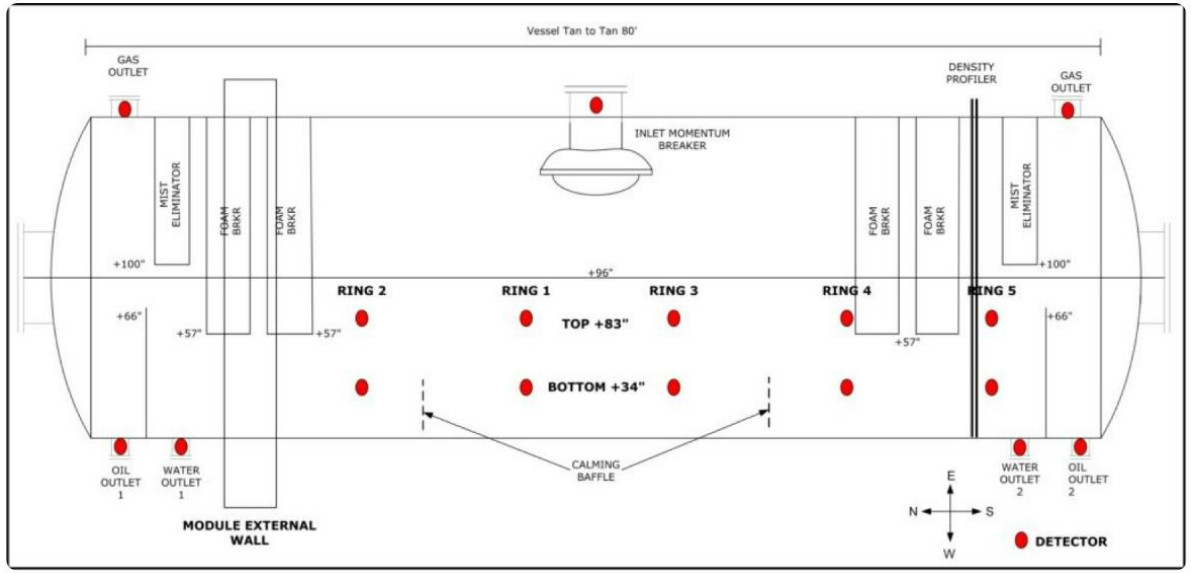
Ref. - Savvy Separators Article: Introduction to CFD for Separator Design

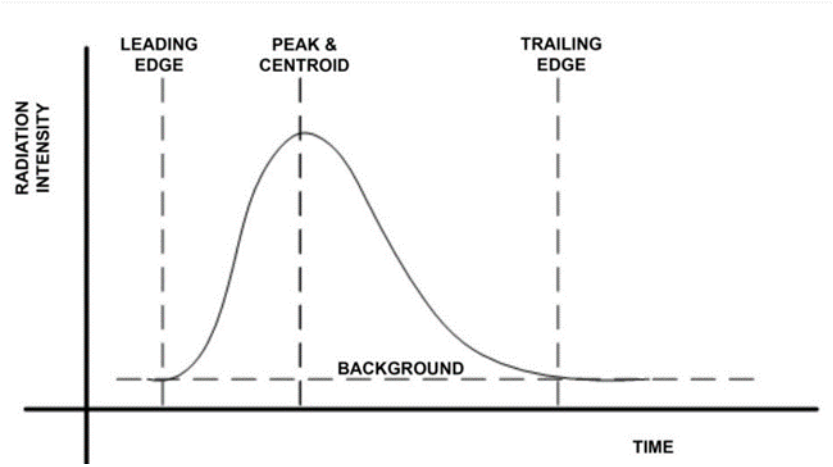


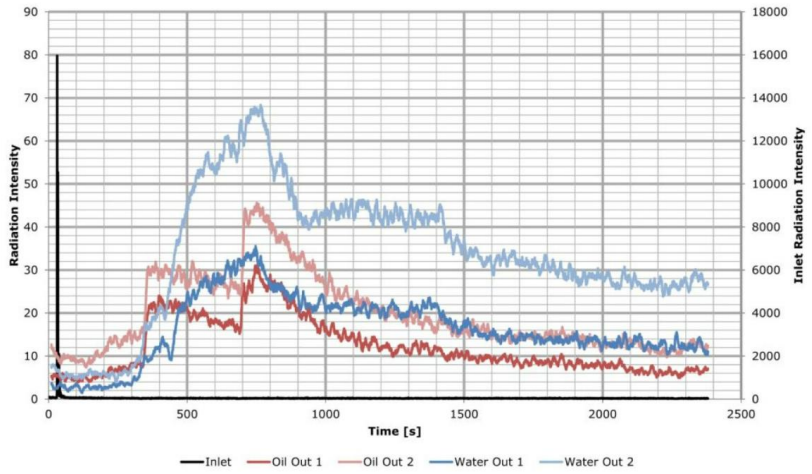


Bringing in the Cavalry

- Advanced methods
  - Tracers

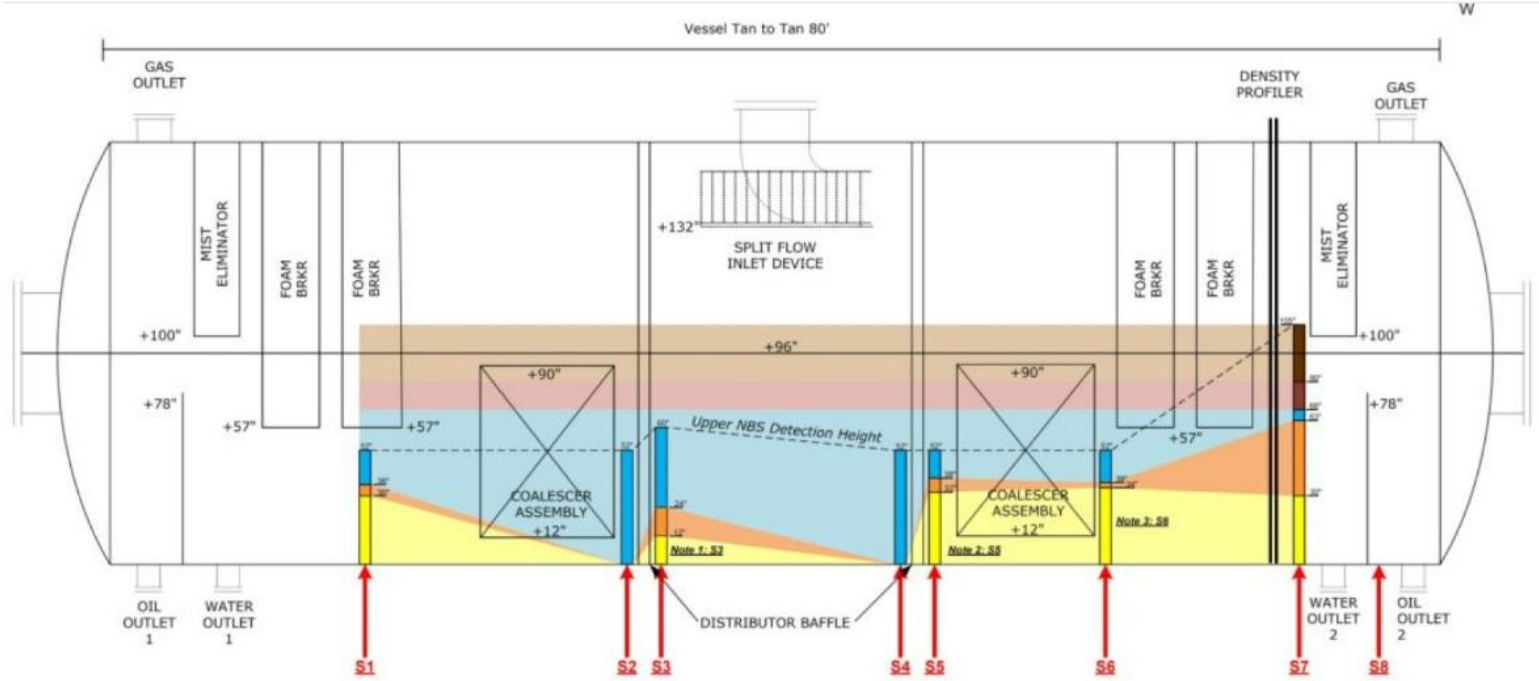






Bringing in the Cavalry – cont.

- Interpretation and Assessment



Putting it all Together

- Complete the initial review
- Start with the basics
  - Mapping and basic techniques often sufficient
  - Where is the issue – equipment, fluids, solids, chemical, upstream?
- Moderate and advanced methods
  - Develop a strategy if the issues are still not clear
  - More expensive as 3rd parties are usually required
- Determine and Implement the solution(s)

Ref. - Savvy Separators Article: Underperforming Gas Scrubbers and How to Fix Them and How to Avoid Them
Ref. - Savvy Separators Article: The Code Implications of Retrofitting Separators
Ref. - Savvy Separators Article: 5 Lessons To Simplify Separator Troubleshooting
Ref. - Savvy Separators Article: Lessons for Installation of Separator Internals

What's Next?

- Identified potential source(s) of the problem?
  - Conduct additional diagnostic tests to confirm or pinpoint
  - Evaluate solutions (quick fixes or long term)
- Some potential actions, depending on cost, timing, feasibility etc.:
  - Different Chemicals/dosage
  - Move chemical injection point(s)
  - Change levels
  - Lower flow rates
  - Tune controls (levels, Pressure, Temperature)
  - Adjust slugging chokes
  - Different mix of well streams / alignment
  - Isolate / shut-in suspected trouble wells
  - Remove restrictions
  - Change piping (ID, bends)
  - Flow straighteners
  - Clean the vessel/internals/pipework
  - Repair internals
  - New internals/inline
  - New vessel

Closing Comments

- If system conditions will or have changed, go back to the start, don't just assume it will work
- Inspections and cleaning – cleanliness is next to godliness
- Help is out there
  - https://connect.spe.org/separationstechnology/home
  - Read the Savvy Separator series - https://jpt.spe.org/savvy-separator-series