



PRODUCED WATER SOCIETY  
**SEMINAR 2018**

# Understanding Produced Water Treatment Issues and Technologies, Theory Versus Practice, Views from Past and Current

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PROCESS SOLUTIONS

MAXIMISING PERFORMANCE THROUGH  
OPERATIONAL **EXCELLENCE**

## Produced Water Treatment Issues and Technology Option

Wally Georgie

## Agenda



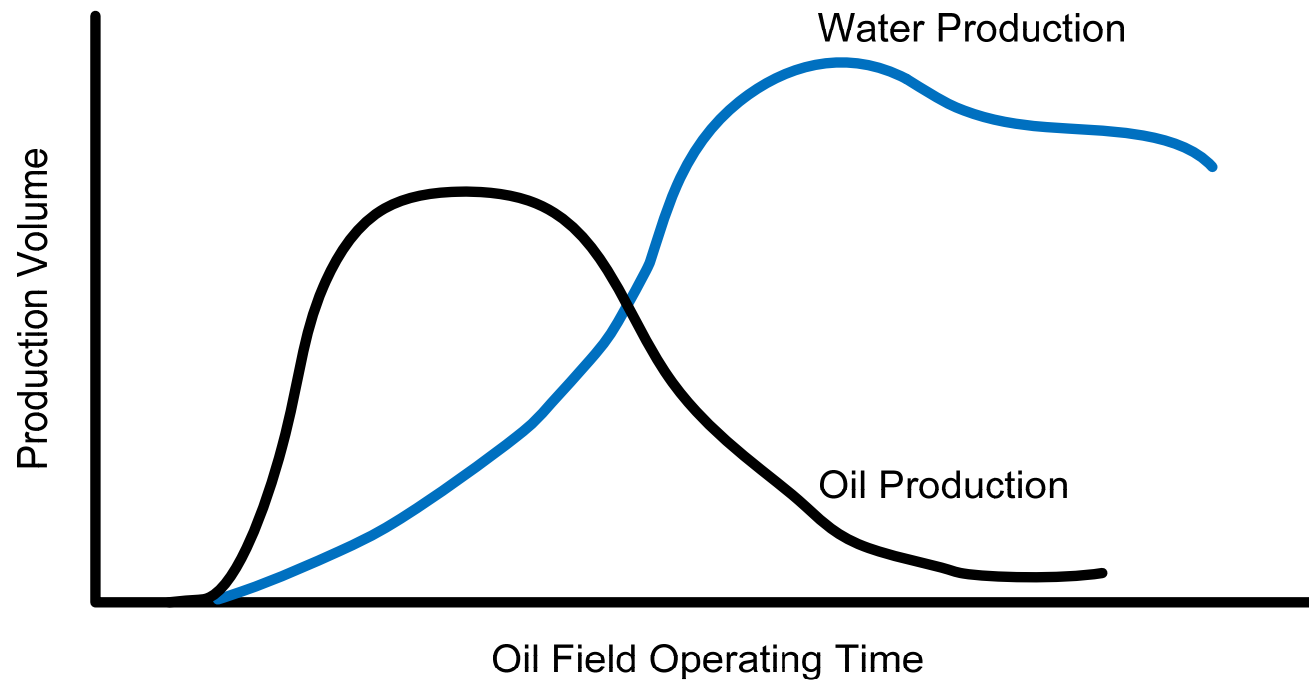
- **Introduction**
- **Produced Water in the Conventional**
- **Treatment Challenges**
- **Technology Selection and Configuration**
- **Examples**
- **Chemical Management**
- **Q&A**

# Produced Water Overview

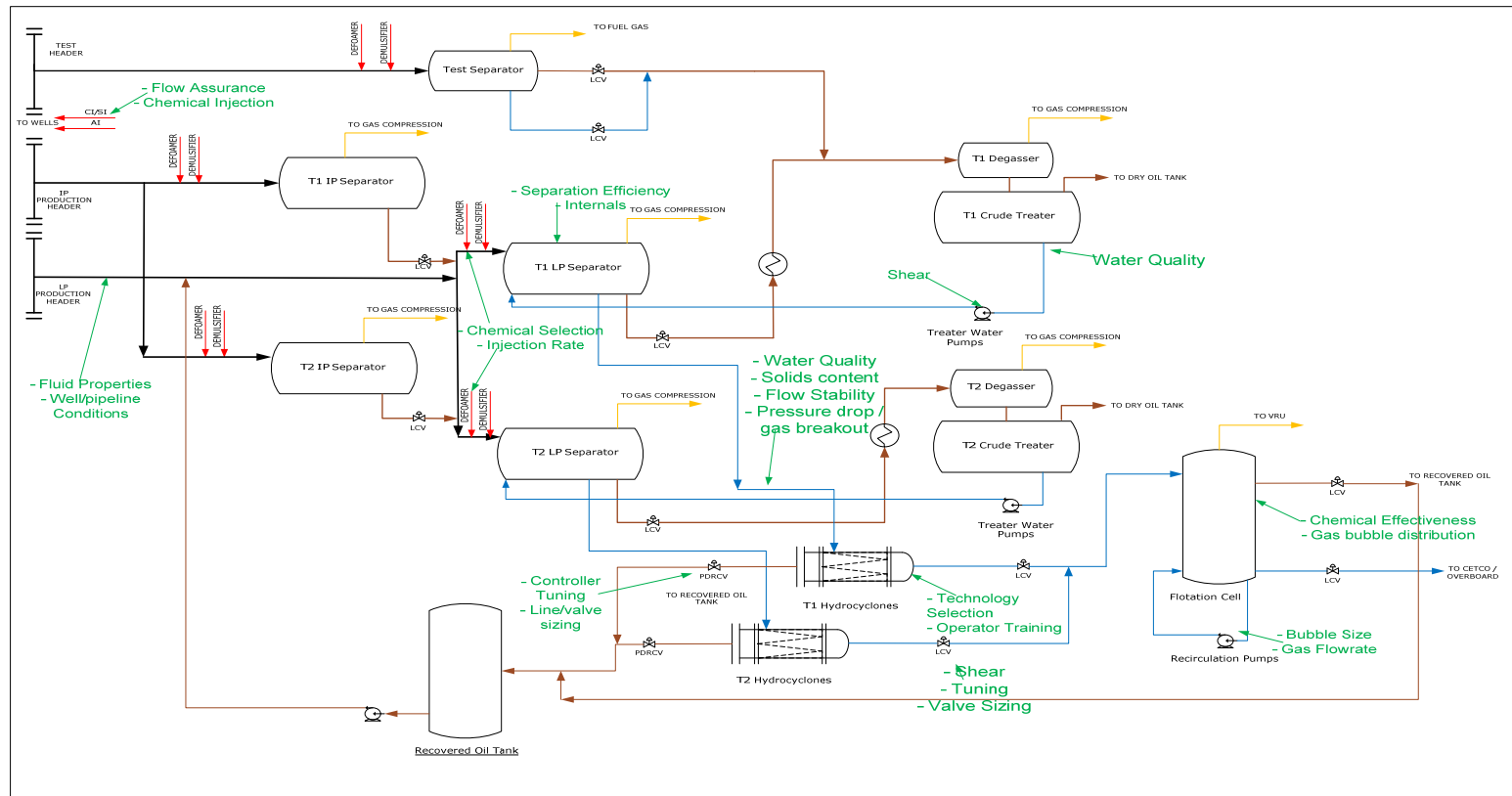


- **Fluid properties influencing treatment**
  - Water Temperature
  - Water Pressure
  - Salinity
  - Oil Content – dissolved, dispersed and free hydrocarbon
  - Oil droplet size
  - Solids content
  - Chemical program
  - Water sources (formation, SW/PW injection)

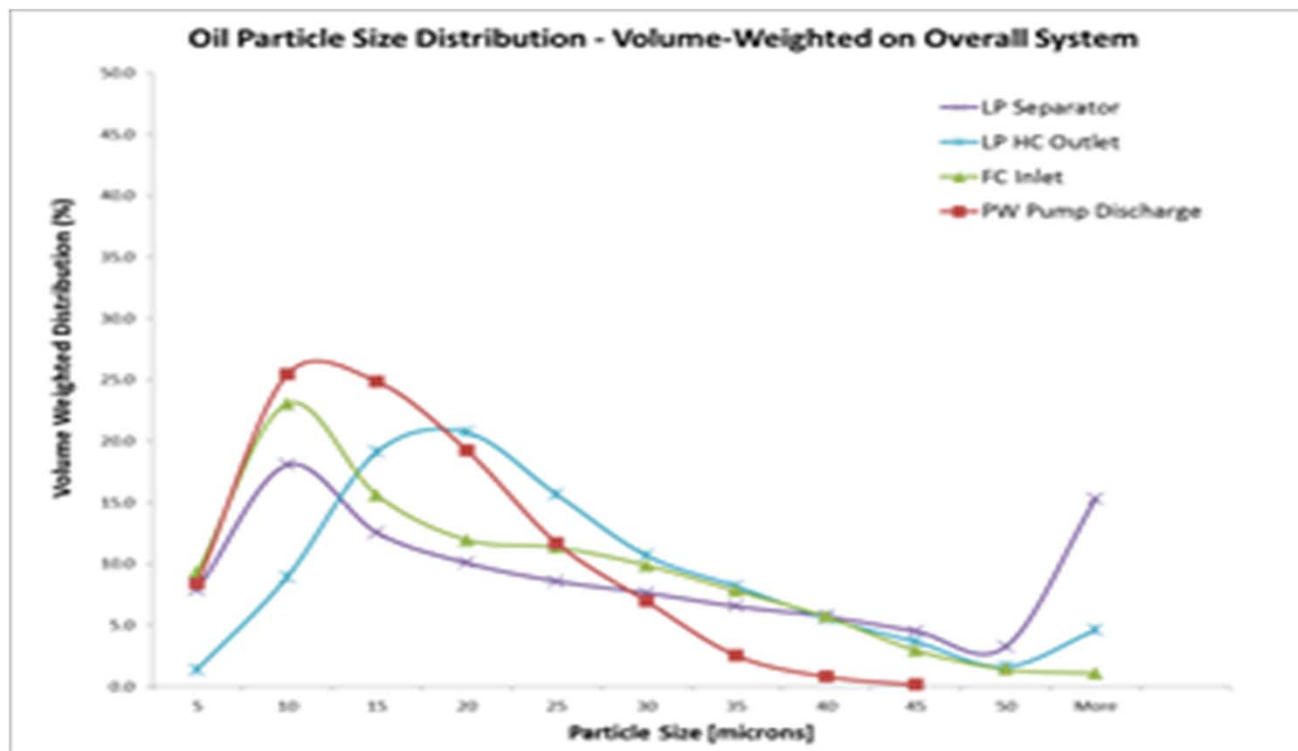
# Produced Water Overview



# Produced Water Overview



# Produced Water Overview



# Treatment Challenges



## Common Problems

- Flow Assurance Chemicals (CI, SI, hydrate inhibitors etc.)
- Water Treatment Chemicals (types, rates, injection locations)
- Solids / Schmoo
- System/Equipment design issues
- Insufficient Operator training and diligence
- Turndown
- Tightening overboard disposal OIW specifications
  - Currently 29-30 mg/L



# Treatment Challenges



# Technology Selection and Configuration



## Stages of PW Treatment

- Primary – oil/water separation
- Secondary
- Tertiary

## Technologies

### Secondary

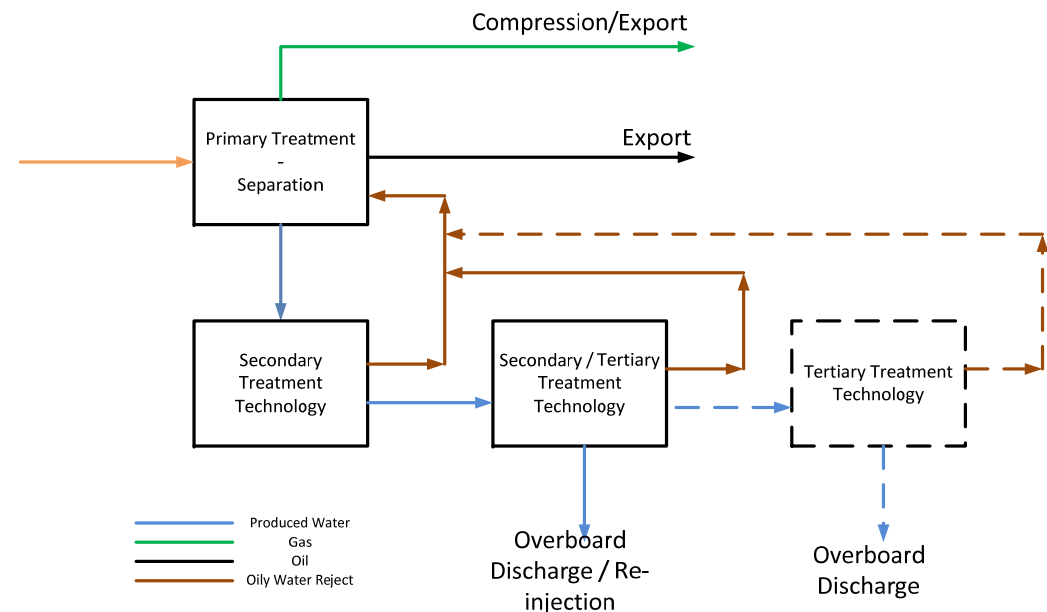
- Hydrocyclones
- CPIs

### Secondary/Tertiary

- Flotation (IGF/DGF)
- Skimming/Degassing
- CFU

### Tertiary

- Media Filters
- Membrane Filters
- Centrifuge
- Absorbents
- Solvent Extraction

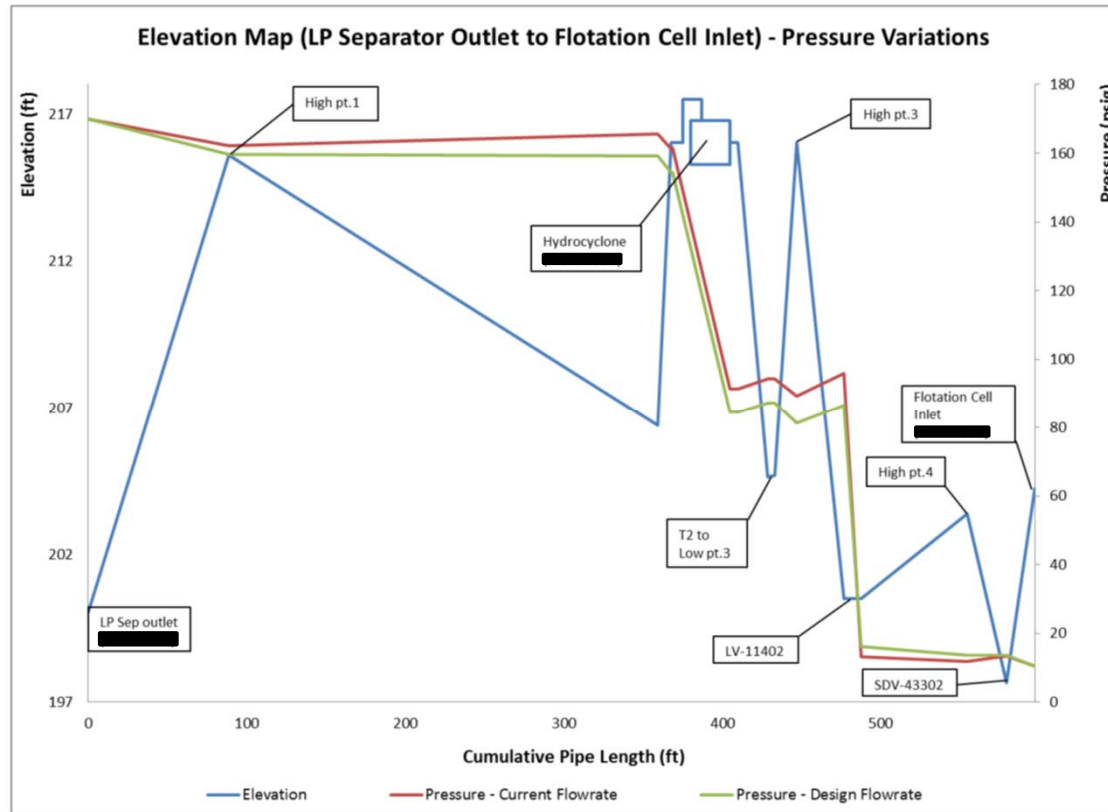


# Examples

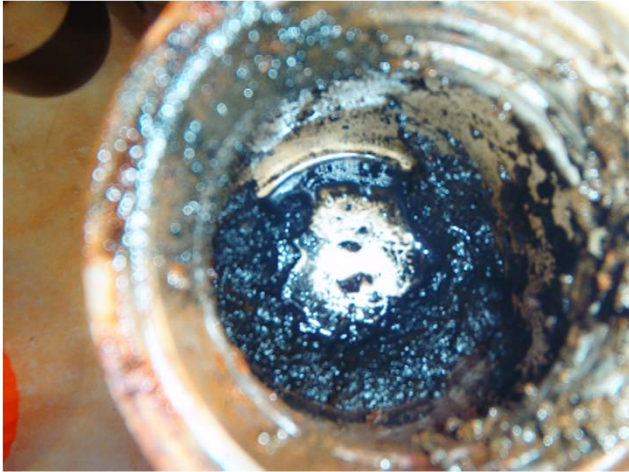


- **Incorrect technology application**
  - Using secondary treatment technology for tertiary treatment (polishing)
  - Overloading of tertiary treatment (high inlet OIW or solids)
- **Gas breakout upstream of Hydrocyclones**
- **Restriction of rejects (pipe size, pipe routing etc.)**
- **Skimming operation too infrequent or wrong controls**
- **Application of treatment chemicals**
  - Necessary for some equipment
  - Can adversely impact some technologies
- **Plugging of educators**
- **Fouling of plate packs/coalescing devices**

# Examples



# Examples

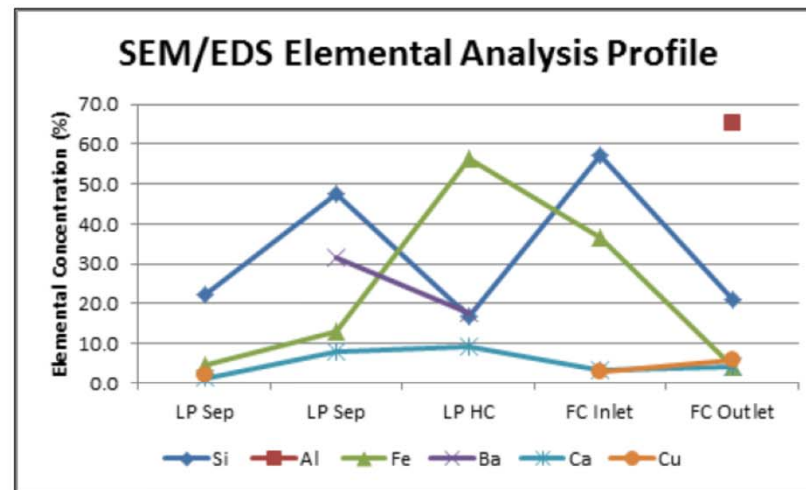


# Chemical Management

## Better holistic understanding

- Fluid properties
- Upstream/downhole chemicals
- Chemical selection and compatibility
- Monitoring
  - Representative samples
  - Frequency
  - Through the process, not just the end

Figure 3-2 - Millipore Elemental Analysis System Profile



GS7

GS8



## Slide 14

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**GS7** scale in PW O/B line  
Graeme Smith, 2/8/2018

**GS8** showing solids through the system, and the Al is build-up of the clarifier in the flotation cell  
Graeme Smith, 2/8/2018

# Summary



- **Understand the fluids**
- **Both selecting the appropriate technology AND the right configuration are key**
- **A good Chemical Management Program is required**
  - **For treatment efficiency**
  - **To maintain plant hygiene**
- **Bigger and more equipment does not always mean better, especially if fouled**
- **Regular monitoring / system mapping must be performed**
  - **To optimize performance**
  - **To identify problems before they limit performance and production**



## Conclusions



- **There is no such thing as Bad Technology**
  - **BUT there is bad system configuration**
  - **And Incorrect application of technology**
- **Need a full understanding of the system before selecting technology and applying modifications**
- **Design and troubleshooting/debottlenecking both rely on having accurate and reliable data**

## Have we got Easy Answer to the Produced Water Issue

