



maxoil

Utilization of Process Diagnostics for Oil/Water Separation In Mature Fields



John Clelland

**Produced Water Society Conference
Houston January 2011**

Produced Water

- Does not generate revenue
- Considered a waste stream
- Why care?:
 - Unless handled effectively it can impact on productivity and Integrity
 - Certain environmental criteria is required prior to discharge.

The “Oil” Business?

- Water production rates in the Gulf on the rise
- To maximize oil recovery, produced water eventually becomes the dominant produced fluid phase
- Gulf of Mexico shallow water area already into mature phase

What are Mature Fields?

- Drivers for Sustaining Production:
 - Oil Price
 - Decommissioning Costs
 - Increasingly Smaller Finds
- Challenges associated with Mature Fields:
 - Original design vs. Current operational criteria
 - Ageing hardware
 - Meeting OIW spec for discharge
 - **Increase in PW production**

What is Produced Water?

- **Produced Water Consists of:**
 - Formation Water
 - Drilling and Completion Fluids
 - Solid content and Sand Production
 - Production Chemicals
 - Production fluids

Factors Influencing PW Handling

- Optimum Oil & Gas Separation.
- Operability of the Facilities.
- Produced Water Facilities.
 - Suitability
 - Efficiency
 - Integrity
 - Sustainability
- Technology and Configuration
- Management of Production Chemicals

The Problems

- Facilities not designed for current fluid properties
- Chemical management strategy may be out of date
- Operation of facilities for increased water may not be optimum
- Sand/Solids management not in place.
- Slugging

A Holistic Approach

- Increased water production requires the full assessment of process systems in order to:
 - Achieve the optimum solution technically both for the short and long term
 - Achieve the most cost effective solution
 - Achieve the most practical environmental solution for today's and tomorrow's requirements

Process Diagnostics

- Process Diagnostic Toolkit:
 - Assessing Plant Performance (Mapping)
 - Design Evaluation
 - Chemical Management Strategy
 - Process Simulation
 - Separation Modeling
 - Evaluate the Mapping data and the Modeling

The Problem!

Patient X

- Feeling ill and is missing time off work
- Patient employers losing money as result
- Knows symptoms but does not know the cause
- Seeks help from local Doctor.

Process Y

- Problems meeting Oil Export and OIW overboard quality
- Production cut back to meet specs
- Knows oil/water separation is not being met – cause unknown
- Seeks Process consultant advice

Diagnosis: Stage 1

Patient X

- Doctor interviews patient:
 - Ascertains symptoms from patient point of view.
 - Inquires about family medical history.
 - Establishes any recent events that might contribute.
 - Observe patients direct environment for clues.
 - Takes various fluid samples for quick analysis.

Process Y

- **Process Consultant Assesses Plant Performance:**
 - Interviews operators to establish how well plant is operating.
 - Asks about historic plant performance.
 - Obtains live trend data to analysis of significant events.
 - Plant walk to detect any obvious anomalies
 - Fluid sampling for visual analysis.

Diagnosis: Stage 2

Patient X

- Doctor performs medical examination:
 - Checks patients physical condition.
 - Measures heat rate and blood pressure.

Process Y

- Process Consultant performs **Design Evaluation**:
 - Paper based exercise.
 - Various process calculations performed.
 - Assessment of fluid routing.
 - Suitability of equipment established.

Diagnosis: Stage 3

Patient X

- Doctor ascertains current medical treatment:
 - Doctor analyses patients diet
 - Reviews current medication if any
 - Suggests different/new medical trial

Process Y

- Process Consultant reviews **Chemical Management Strategy:**
 - Review of current chemicals used if any
 - Suitability of chemicals
 - Compatibility.
 - Suggestion of alternatives.

Diagnosis: Stage 4

Patient X

- Doctor performs initiate more research
 - Lab trials
 - Pathogenic modeling to recreate scenario in the lab
 - Experimental treatment

Process Y

- Process Consultant conducts **Process Simulations:**
 - Create process model of current system.
 - Benchmark system against current operating conditions.
 - Make changes in order to optimize and debottleneck facilities

Diagnosis: Stage 5

Patient X

- Doctor send patient to utilize more diagnostic facilities:
 - From previous work establish Image Modality i.e. X-Rays, CAT scans etc
 - Analyze results form images in conjunction with previous work.

Process Y

- Process Consultant conducts **Vessel Mapping:**
 - Determine, from previous diagnostics, degree of further mapping required i.e. CFD, Nucleonic methods.
 - Analysis of data in conjunction with all previous diagnostic tools.

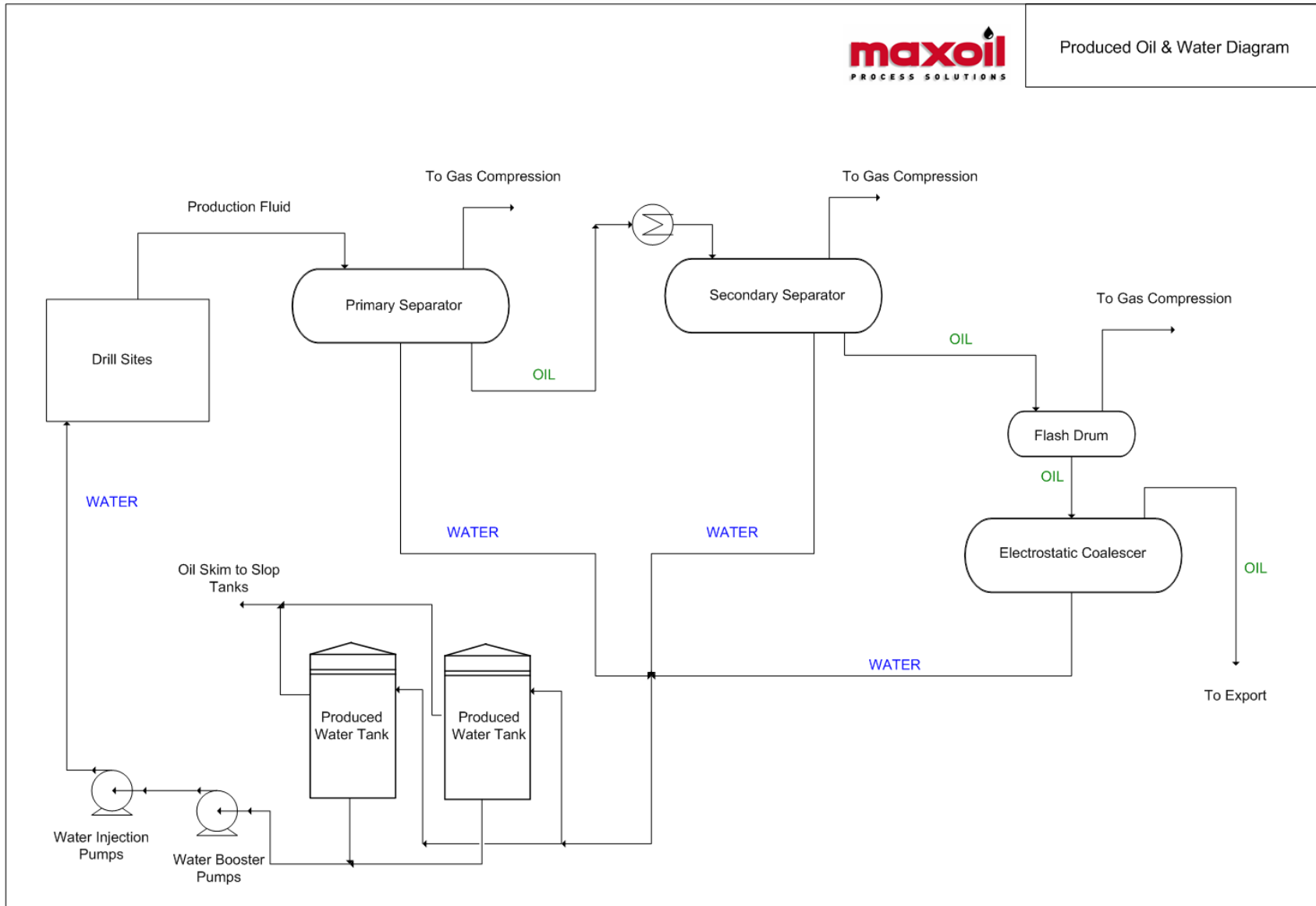
Final Diagnosis

Patient X

- Doctor utilizes all stages of the diagnosis process in order to determine the most optimum course of treatment
- By using the results of just one stage could result in the wrong diagnosis and hence the wrong course of treatment
- The life of the patient can be prolonged.

Process Y

- Process Consultant uses the **Process Diagnostic Toolkit** in order to see the “bigger picture”. This way the most optimal solution can be found
- Assessing the problem from a holistic point of view ensures a cost effective solution is found
- The life of the facility can be prolonged.



Process Diagnostics: A Solution

- Holistic approach ensures everything is covered
- Most practical options for produced water handling systems.
- Full characterization of produced fluid
- Establishing full understanding of production chemistry issues
- Determine potential improvements
- Avoid unnecessary sub-optimal improvements
- Save on CAPEX and OPEX.

maxoil

Questions

