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Buoyancy Based Membrane Filtration Case Study: Produced Water Treatment

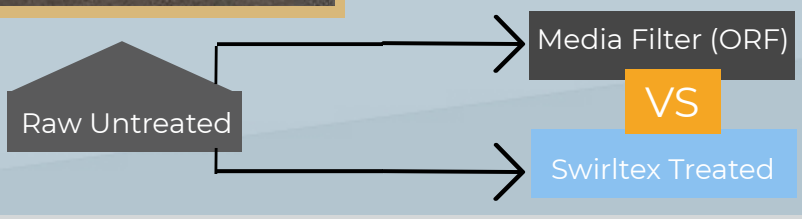
Swirltex is an industrial wastewater technology company serving customers with tough-to-treat wastewater. A 3-month pilot study was conducted on produced water treatment using Swirltex

UNIT CAPACITY: 25M3/DAY OR 160BBL/DAY

Location:
Parkland Water Facility, Montney Formation
Northeast British Columbia, Canada

Feed characteristics:
Total Dissolved Solids 180,000 - 278,000 ppm
Total Suspended Solids 100 - 2,700 mg/L
Iron 14 - 77 mg/L
Oil & Grease 22 - 558 mg/L

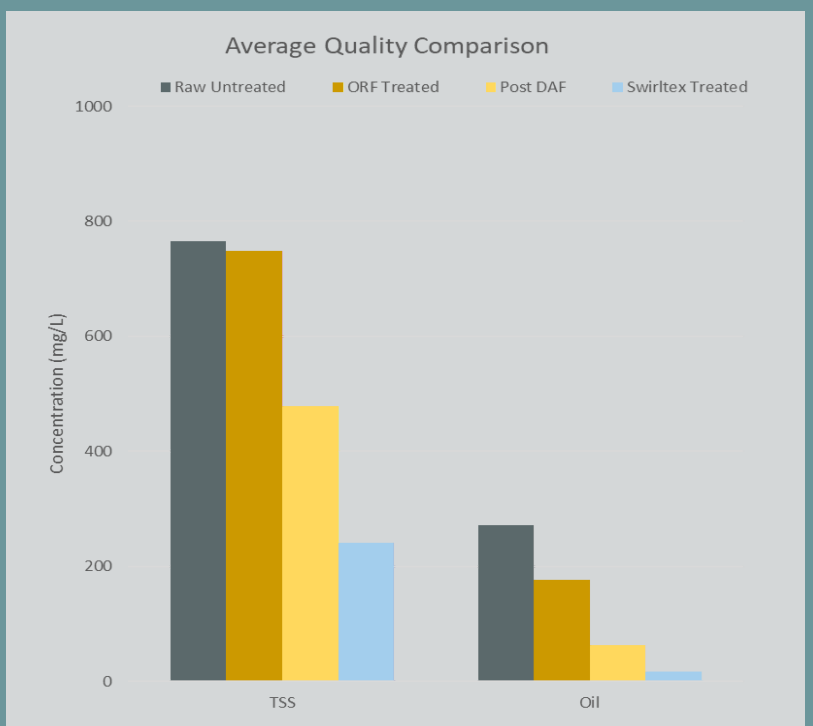
Objective: efficiently remove **oil**, **TSS** and **bacteria** from produced/flowback water feed. Compare performance to oil removal filter (**ORF**) incumbent



PILOT STUDY RESULTS

WATER QUALITY RESULTS

	Average TSS (PPM)	Average Oil (PPM)	Average Iron (PPM)
Inlet	766	272	44
ORF Treated	605	175	Not tested
Swirltex Pre-Treatment	478	63	30
Swirltex Treated	241	17	8



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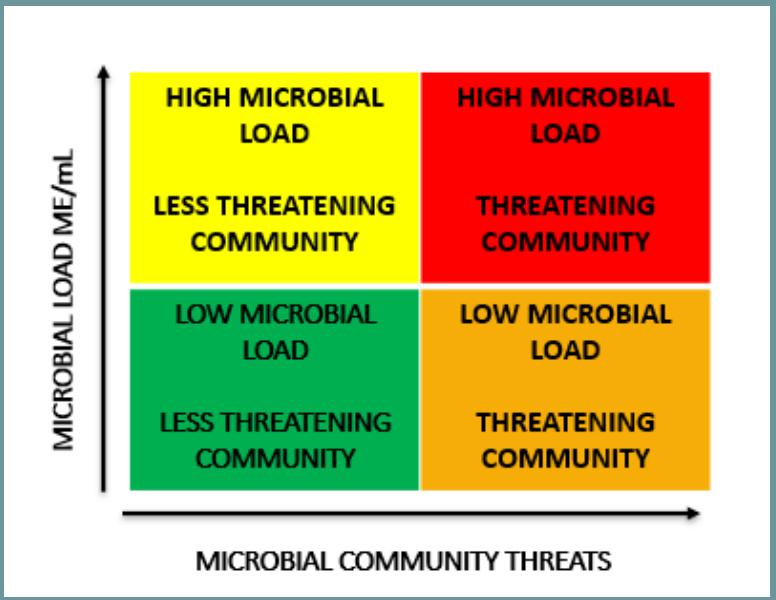
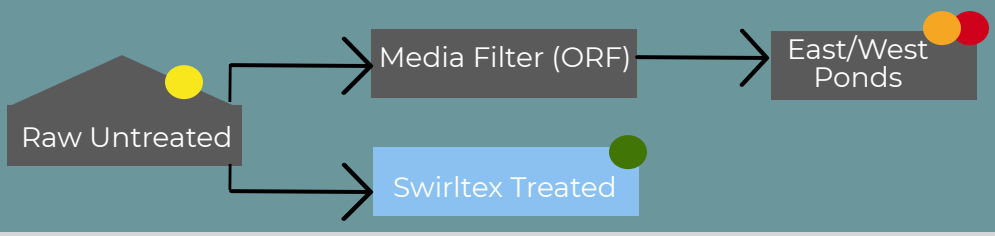
BACTERIA REMOVAL

A microbial survey for samples at of **Raw Untreated** inlet, **East Pond** & **West Pond** & **Swirltex Treated** water were tested

Results showed the Swirltex membranes reduced total bacteria by a factor of **100**, and removed the most threatening bacteria, leaving only **innocuous** bacteria

ATP/AMP testing of live bacteria resulted in significant **reduction of live cells**





MEMBRANE RUN-TIME RESULTS

Performance Criteria	Maximum	Average
Run-Time between Clean-In-Place (CIP)	3 days	1.5 days
Recovery Post-CIP	100%	99.4%
Flux Stabilization	140 L/m2/hr *When not recirculating back to Pre-Treatment tank*	90 L/m2/hr *Note flux limited by Pre-treatment tank sizing*
Daily Flux Decline	80% *Flowback with no pre-treatment*	10% - 30%
Loading on Membrane – Oil	800 ppm	63 ppm
Loading on Membrane – TSS	1,900 ppm	415 ppm

KEY LEARNINGS

Significant fluctuations in feed water quality requires pre-treatment designed for worst case

Flowback water chemistry is quite different from produced water

NEXT STEPS

Scale up design to 3,000m3/day or 19,000bbl/day system