



Oil Field Wastewater

Application of FloccinAgents™ in
Treating Oily Wastewater From Drilling
and Refining Operations





FloccinAgent™ Applications

- Drilling Mud
- Produce Water Oil Mixture
- Oil/Water Separation
- Oil Field Drilling Equipment
- Oily Sludge Dewatering
- Refinery Tank Washout Water
- Refinery Wastewater





Drilling Mud

- Mud was received at pH of 7.0
- Mud required a dose of 1.2 g per 100 ml
- Treated water is fairly clear with TSS @ 85 ppm
- Sludge dewatered with slight pressure



Drilling Mud

Constituent	Untreated	Treated
TDS	12.41 ppt	12.84 ppt
Conductivity	65.5 mS	65.5 mS
Suspended solids	6-8% solids	85 ppm



Drilling Mud





Produce Water Oil Mixture

- Mixture was received at pH of 6.5
- Mixture required a dose of 0.1 g per 100 ml
- Treated water is visibly clean
- Sludge separates readily





Produce Water Oil Mixture

Constituent	Untreated	Treated
TDS	9,566 ppm	9,865 ppm
Conductivity	16.25 mS	16.74 mS
Suspended solids	1,375 ppm	61 ppm



Produce Water Oil Mixture

Cutting Oils & Mud ratio 5:1



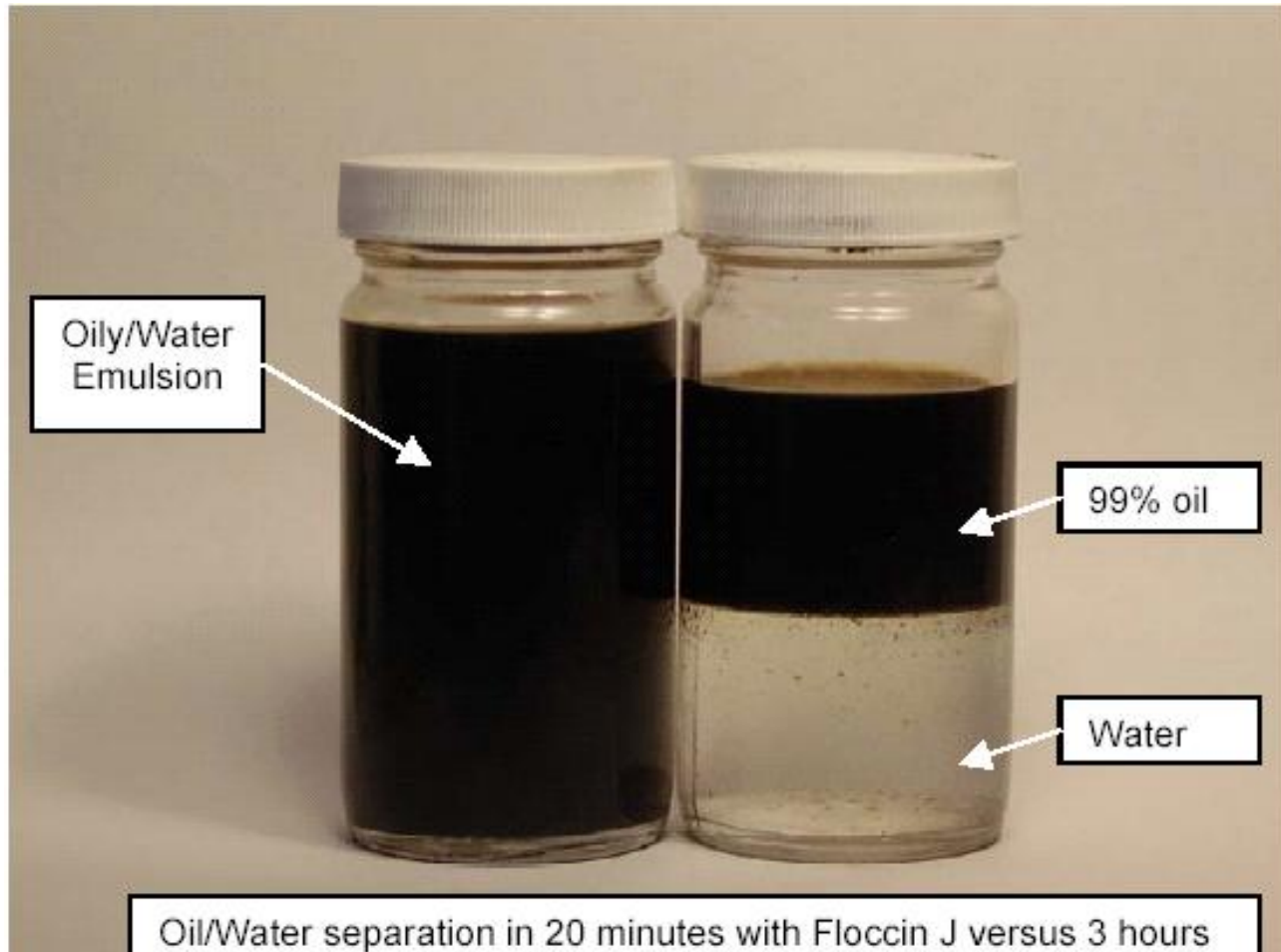


Oil/Water Separation

- Facility imports oily wastewater and separates oil using thermal separation
- Previous process required 2-3 mandays per week maintenance to remove solids buildup in HX
- Floccin-J treated with 45 kg (100 lb) for 68,000 L (18,000 Gal)
- Separation is in 20 minutes vs. 3 hours
- Maintenance now $\frac{1}{2}$ man-day per week
- Net gain of \$100,000/month by increased production



Oil/Water Separation





Oil/Water Separation

- Sample received at pH of 8.5
- Treated with 0.1 g for 100 mL
- Minimal impact on electro conductivity and dissolved solids (TDS)



Oil/Water Separation

Constituent	Untreated	Treated
TDS	9,006 ppm	8,977 ppm
Conductivity	15.33 mS	15.29 mS
Suspended solids	353 ppm	<10 ppm



Oil/Water Separation



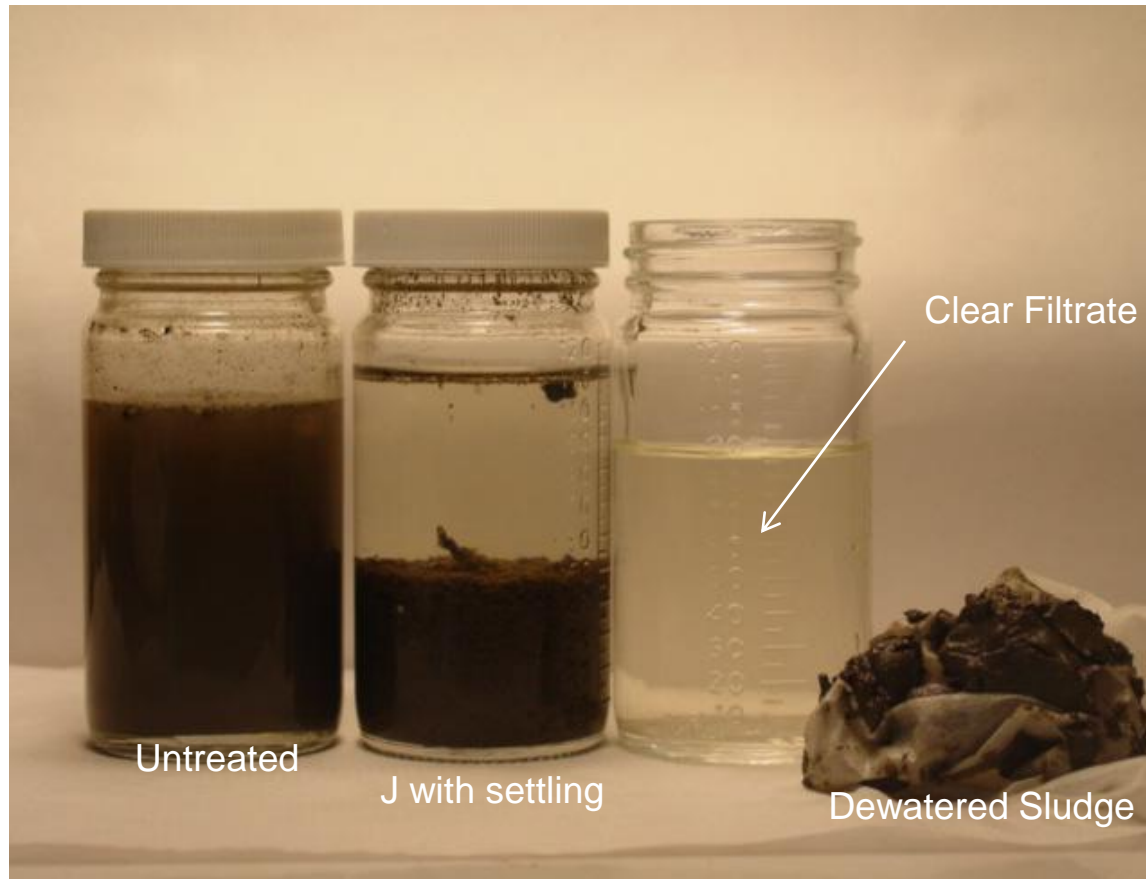


Oil Drilling Equipment

- Washwater from oil drilling equipment
- Sample pH was at 6.8
- Dosage with Floccin™ J @ 0.4 grams/100 ml
- Clear treated water
- Dewatered easily with low filtrate TSS



Oil Drilling Equipment





Oily Sludge Dewatering

- Conventional cationic polymer chemistry had problems blinding belt press
- Three months to treat 58,000 L (15,000 Gal)
- Used 227 kg (500 lb) Floccin-HP
- Treated remaining 132,000 L (35,000 Gal) in 8 hours, no blinding of the belt press



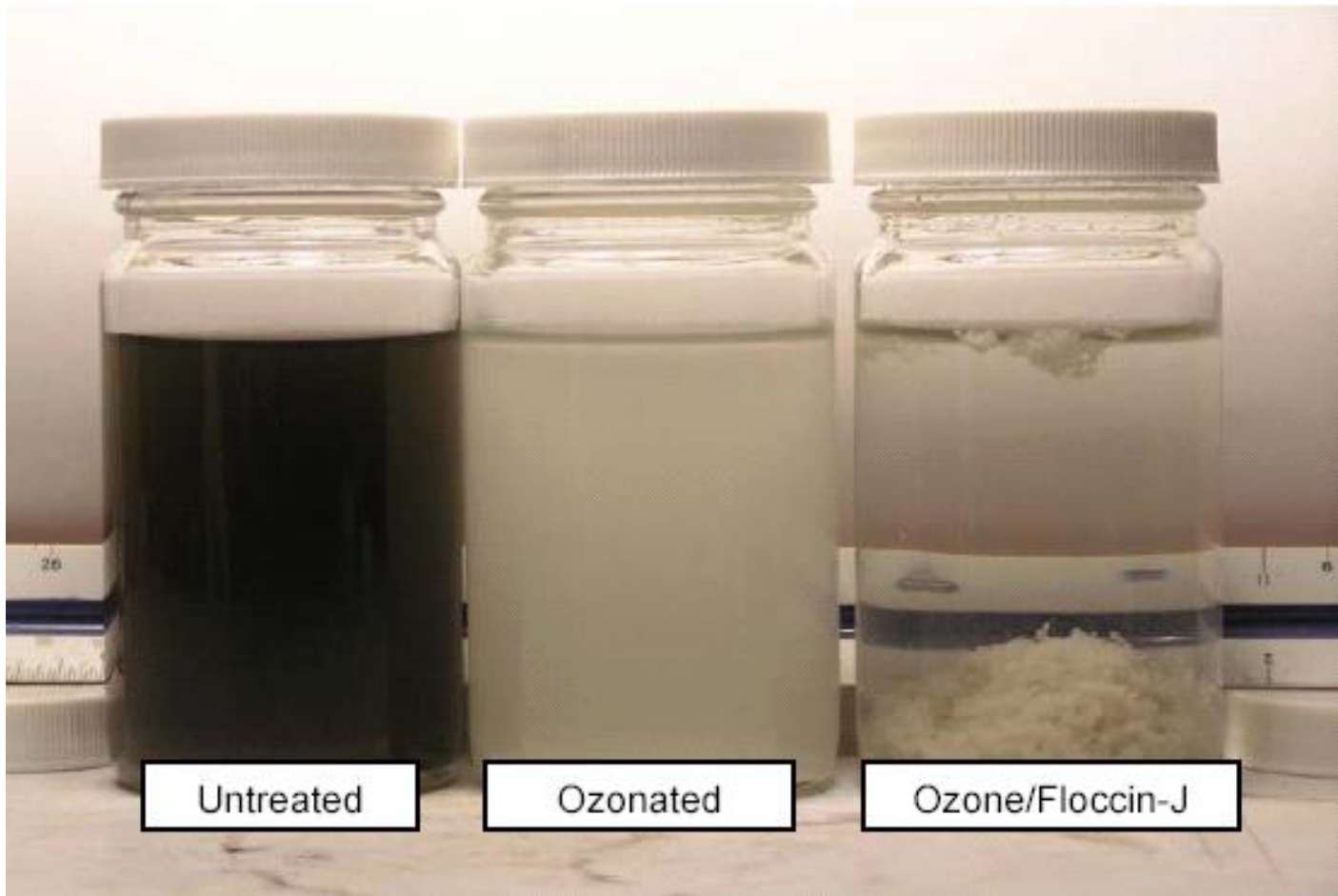
Oily Sludge Dewatering



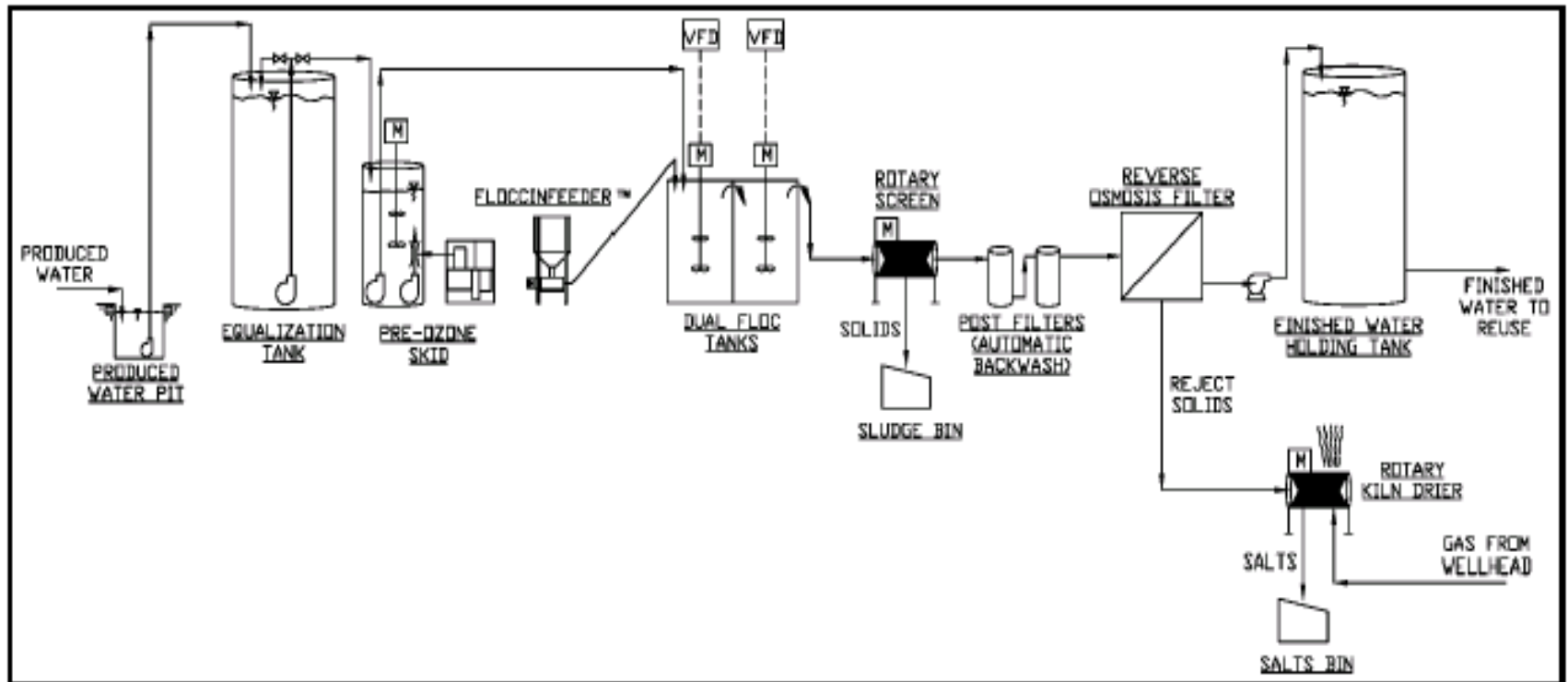
Oily Sludge Dewatering



Refinery Tank Washout Water



Oil Field Treatment System



OFTS Process Diagram



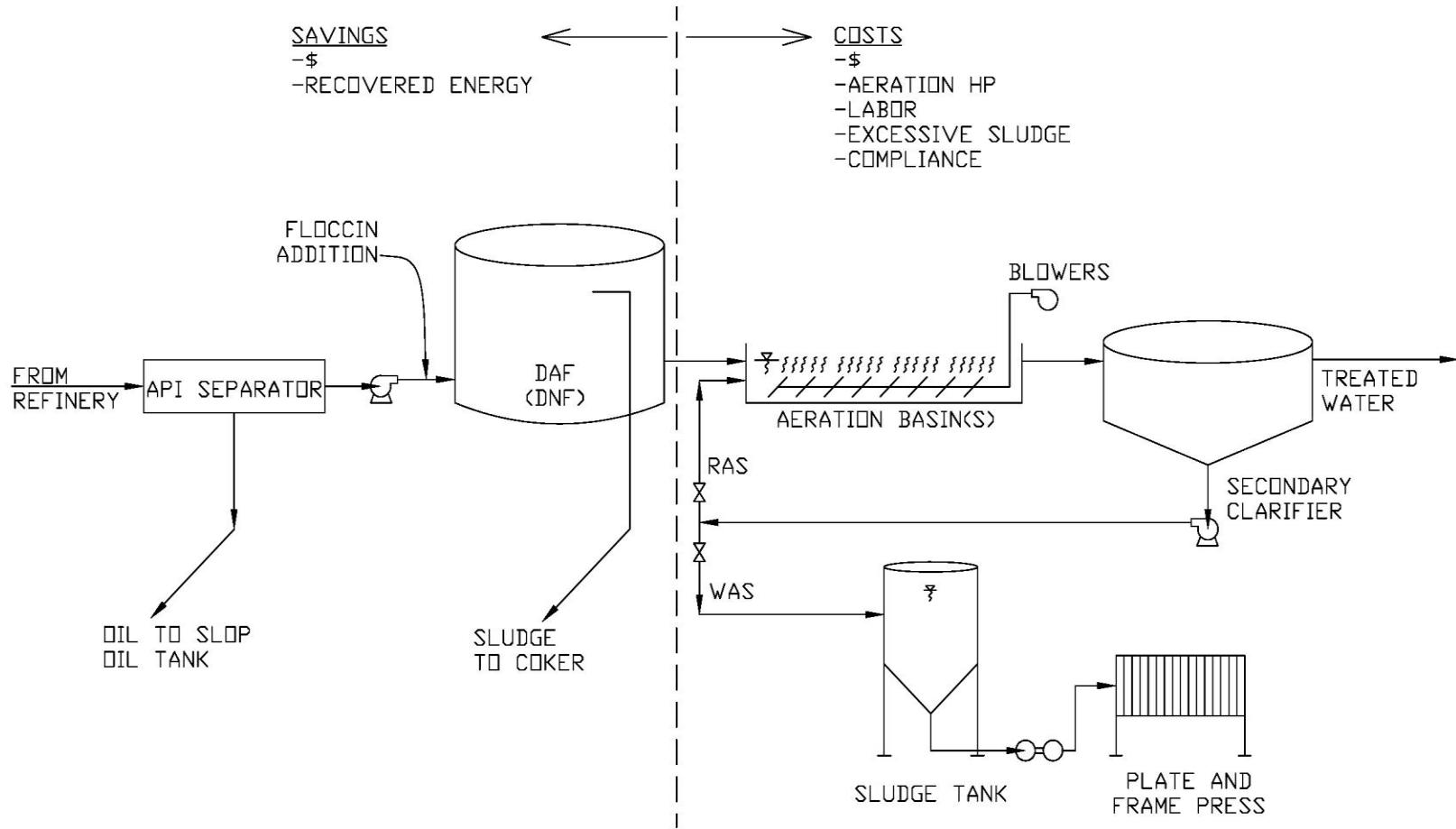


Oil Field Treatment System

- Installed in two enclosed truck trailers for portability
- FloccinAgents™ allow system to handle highly variable contaminants
- Treat up to 380 L/min (100 Gal/min)
- 100 kW generator supplies electrical power for use in remote locations



Refinery Waste Water System





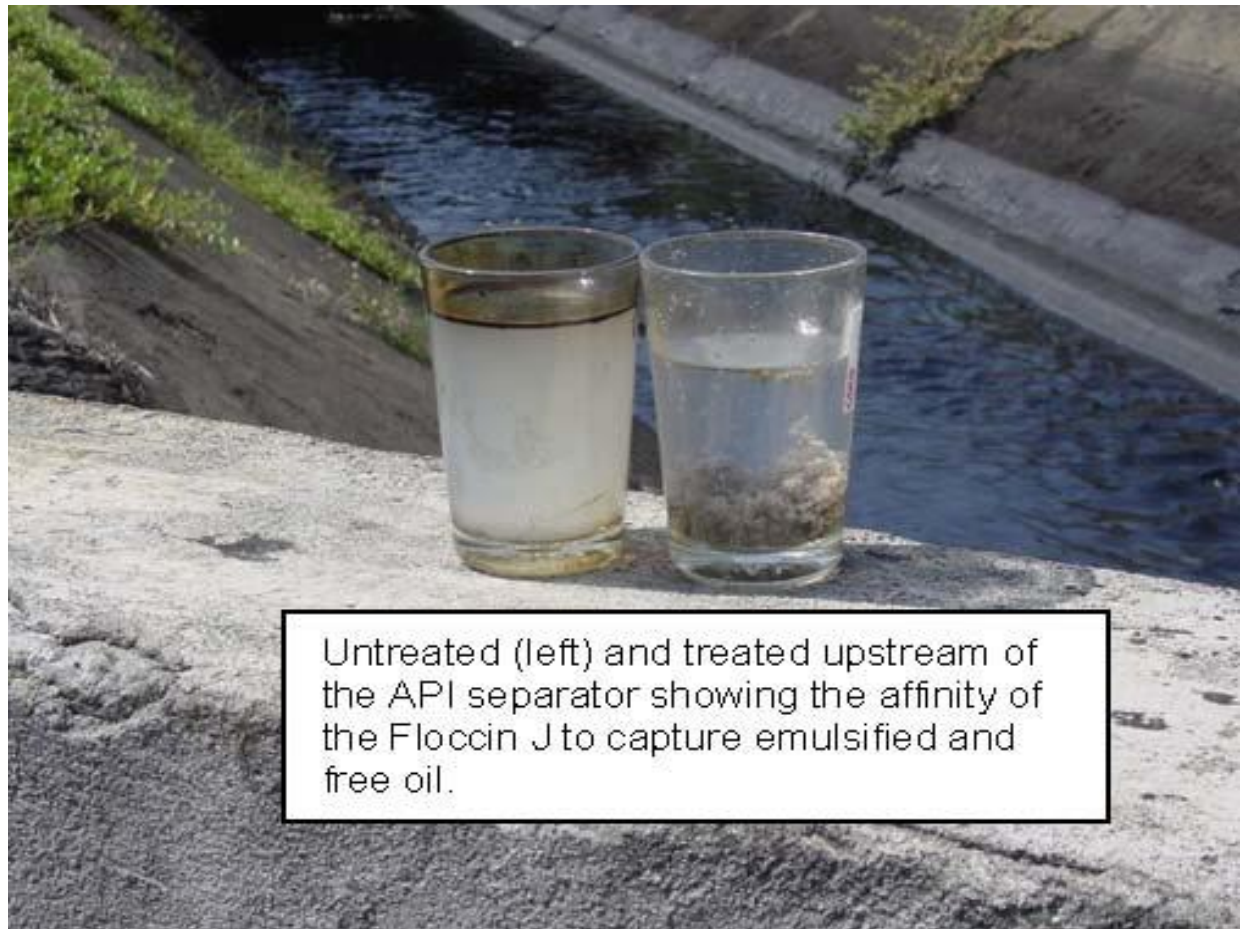
Refinery Waste Water System

- Recoverable Oil before secondary treatment
- FloccinAgents™ increases DAF/DNF throughput
- Tolerant of variations in influent flow and oil contaminants



Refinery Waste Water System

Esmeraldas
Refinery, Ecuador



Untreated (left) and treated upstream of the API separator showing the affinity of the Floccin J to capture emulsified and free oil.





FloccinAgent™

Advantages

- Lower cost than conventional chemistry
- More forgiving of variation in pH and oil/dirt contaminant loading
- Minimal addition to TDS/Cond vs. Traditional
- Non-hazardous
- Ease of use
- Ease of dewatering/high quality sludge

