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

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Untreated</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDS</td>
<td>12.41 ppt</td>
<td>12.84 ppt</td>
</tr>
<tr>
<td>Conductivity</td>
<td>65.5 mS</td>
<td>65.5 mS</td>
</tr>
<tr>
<td>Suspended solids</td>
<td>6-8% solids</td>
<td>85 ppm</td>
</tr>
</tbody>
</table>
Drilling Mud

Drilling Mud

Filter

Clear Water

6-8% Solids

Untreated

Treated

Dewatered Liquid
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

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Untreated</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDS</td>
<td>9,566 ppm</td>
<td>9,865 ppm</td>
</tr>
<tr>
<td>Conductivity</td>
<td>16.25 mS</td>
<td>16.74 mS</td>
</tr>
<tr>
<td>Suspended solids</td>
<td>1,375 ppm</td>
<td>61 ppm</td>
</tr>
</tbody>
</table>
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 ½ man-day per week
- Net gain of $100,000/month by increased production
Oil/Water Separation

Oil/Water separation in 20 minutes with Floccin J versus 3 hours
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

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Untreated</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDS</td>
<td>9,006 ppm</td>
<td>8,977 ppm</td>
</tr>
<tr>
<td>Conductivity</td>
<td>15.33 mS</td>
<td>15.29 mS</td>
</tr>
<tr>
<td>Suspended solids</td>
<td>353 ppm</td>
<td>&lt;10 ppm</td>
</tr>
</tbody>
</table>
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

- Untreated
- J with settling
- Dewatered Sludge
- Clear Filtrate
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

Filtrate  
Settled floc  
Floc prepress
Oily Sludge Dewatering
Refinery Tank Washout Water

![Images of water samples: Untreated, Ozonated, Ozone/Floccin-J]
Oil Field Treatment System
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
Esmeraldes 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

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