Process Solutions

Who we are...

- Leader in On-site Refinery Waste Processing with 28 Long-term DBOOM Projects
- Veolia Environment has >250,000 Employees Worldwide
  - With >28,000 Employees in North America
- Revenues Exceeding $33.6 billion
- Publicly-traded on the NYSE
Process Solutions

Refinery Oily Sludges
- K048 – 052
- F037 – 038
- K169 – 170
- Desalter Emulsions (Brine Emulsions)
- Tank Cleanout (In-process Capacity Restore)
- Spill Clean-up
- WAS (Bio-sludge)

Chemical Plant Sludges
- Ethylene Plant Sludge
- Catalyst Recycle
- Product Recovery
Process Solutions

First Stage Waste Reduction

Oily Sludge → 3 Phase Centrifuge → Cake → Further Processing

- Oil Return <3% BS&W
- Water to WWTU 1,500 ppm TSS

Process Solutions

Cake Process

- Basis: 1000 bbl Feed
  - Solids Capture = 90%
  - Feed Density = 8.3 lb/gallon
  - Oil Density = 7.5 lb/gallon

Feed Composition:
- 5% Solids = 17,430 pounds
- 15% Oil = 52,290 pounds
- 80% Water = 278,880 pounds

Solids Captured = 15,687 pounds

Centrifuge to Produce Cake
- Cake Produced = 39,218 pounds

Cake Composition:
- 40% Solids = 15,687 pounds
- 10% Oil = 3,922 pounds
- 50% Water = 19,609 pounds

Oil returned = 48,368 pounds or 154 bbl
Process Solutions

Coker Quench Process

- Oily Sludge
  - 3 Phase Centrifuge
    - Cake
  - Mix Tank
  - Water to WWTU ≤ 1,500 ppm TSS
  - Clean Oil < 3% BS&W

- Particle Size Reduction
- Coker Quench System

Process Solutions

Coker Quench Process

**Basis:** 1,000 bbl Feed

Cake Produced = 39,218 pounds

Cake Composition:
- 40% Solids: 15,687 pounds
- 10% Oil: 3,922 pounds
- 50% Water: 19,609 pounds

Coke Produced = 2,000 tons per day

Allowable solids addition = 1% of coke made = 20 tons of solids per day

Quench Slurry Composition:
- 15% Solids: 15,687 pounds
- 4% Oil: 3,922 pounds
- 81% Water: 84,971 pounds

Quench Slurry Density = 8.8 lb/gal

Total Quench Slurry = 104,580 pounds = 12,160 gallons = 290 bbl
Process Solutions

- Coker Quench Process
  - Summary Points
    - Injecting In-place of a Portion of the Quench Water
    - Quench-side Injection
      - Started Immediately After Drum Steaming
      - Has to be Discontinued when Overhead Temperatures Decreases to 550°F - 600°F
    - Particle Sizing to An Average of <100 Microns, for Even Distribution Through the Coke Bed
    - Slightly Lower Processing Cost than Feed-side Injection without the Addition of a Slurry Dryer

- Coker Feed - Scalfeed™
  - Oily Sludge → 3 Phase Centrifuge → Cake → High Energy Mix Tank → Patentied Slurry Dryer
  - Clean Oil <3% BS&W
  - Water to WWTU <1,500 ppm TSS
  - Oil
  - Coker Feed Patented Process and Composition
Process Solutions

Coker Feed - Scalfeed™

Basis: 1000 bbl Feed

Cake Produced = 39,218 pounds

Cake Composition:
- 40% Solids 15,687 pounds
- 10% Oil 3,922 pounds
- 50% Water 19,609 pounds

Adjust oil to solids ratio to produce dry fuel

Scalfeed Composition:
- 45% Solids 15,687 pounds
- 52% Oil 18,127 pounds
- 3% Water 1,046 pounds

Scalfeed Produced = 34,860 pounds = 83 bbl (recycled in coker)

Oil to add:
- 18,127 pounds oil required
- 3,922 pounds oil in cake
- 14,205 pounds oil to add
- 45 bbl oil to add

Oil returned = 34,163 pounds or 108 bbl

Process Solutions

Scalfeed Process

- Summary Points
  - Scalfeed is Added during the Coking Cycle at a rate of 30- to 70-gpm
  - Scalfeed is Either Introduced through a Quill in the Upper 1/3 of the Drum, or it May be Mixed Directly to the Coker Feed
  - Scalfeed is Introduced at a Low Feed Rate and Low Water (3%)
  - Ash Increases of 0.2% to 0.7% are to be Expected
  - There is No Chance of Odors or Hotspots when the Drum is Deheaded.
  - Wide Timing Window for Introduction of Scalfeed.
    - It may be added at any time after 1 hour of starting the coking cycle to 1 hour prior to ending the coking cycle.
  - Scalfeed Allows for 35%-45% Solids Loading
    - Greater solids loading translates into less waste volume going to the coker than quench side injection.
## Comparison of Coker Quench Injection & Scalfeed

<table>
<thead>
<tr>
<th>Process</th>
<th>Oil Used (bbls)</th>
<th>Oil Returned (bbls)</th>
<th>Solids to Coker (lbs.)</th>
<th>Total Volume Sent to Coker (bbls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coker Quench</td>
<td>12 (mostly entrained)</td>
<td>154</td>
<td>15,687</td>
<td>290</td>
</tr>
<tr>
<td>Scalfeed</td>
<td>58</td>
<td>108</td>
<td>15,687</td>
<td>83</td>
</tr>
</tbody>
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VEOLIA WATER