

Appendix E

16% NCH Treatability

Combined Pretreatment of 16% DIC NCH (large batch)

DATE: 6/1/05 - 6/6/05
 RUN ID 58
 NCH SAMPLE ID (ARMY) HXVX101404-10-40
 Batch EB05
 NCH SAMPLE ID (JL) 42B

OXIDATION BATCH #1 (ID: 62)

| pH Adjustment Step | Date: 6-1-05 |
|--|-------------------------------------|
| NCH (g) | 199.4 |
| Density of Initial Material (g/mL) | <input type="text" value="1.09"/> |
| Sulfuric Acid Solution (20%) (g) | 103.6 |
| Total pH adjusted Material | 303 |
| Analytical/Archived Sample(s) (g) | 0.796 |
| Final pH Adjusted Material (g) | <input type="text" value="302.20"/> |
| pH Adjustment Dilution | <input type="text" value="1.52"/> |
| Oxidation | Date: 6-1-05 |
| pH adjusted Material for Oxidation (g) | 302.2 |
| Persulfate Solution (g) | 651.6 |
| Persulfate : pH adj. NCH ratio (wt:wt) | 0.72 |
| Persulfate : NCH ratio (wt:wt) (NCH=1) | 1.09 |
| Analytical Samples (g) | 0.5725 |
| Final Mass of Oxidized Material (g) | 937.8 |
| Total Mass Oxidized Material (g) | <input type="text" value="938.37"/> |
| Oxidation Dilution | <input type="text" value="3.11"/> |
| Batch #1 Total Dilution | <input type="text" value="4.72"/> |
| Oxidized Material Sent (g) | 937.8 |

OXIDATION BATCH #2 (ID: -63)

| pH Adjustment Step | Date: 6-2-05 |
|--|-------------------------------------|
| NCH (g) | 200 |
| Density of Initial Material (g/mL) | <input type="text" value="1.09"/> |
| Sulfuric Acid Solution (20%) (g) | 104 |
| Total pH adjusted Material | 304 |
| Analytical/Archived Sample(s) (g) | 0.6925 |
| Final pH Adjusted Material (g) | <input type="text" value="303.31"/> |
| pH Adjustment Dilution | <input type="text" value="1.52"/> |
| Oxidation | Date: 6-2-05 |
| pH adjusted Material for Oxidation (g) | 299.7 |
| Persulfate Solution (g) | 650.8 |
| Persulfate : NCH ratio (wt:wt) (NCH=1) | 1.09 |
| Analytical Samples (g) | 1.0816 |
| Final Mass of Oxidized Material (g) | 937.1 |
| Total Mass Oxidized Material (g) | <input type="text" value="938.18"/> |
| Oxidation Dilution | <input type="text" value="3.13"/> |
| Batch #2 Total Dilution | <input type="text" value="4.76"/> |
| Oxidized Material Sent (g) | 937.1 |
| COMPOSITE OXIDATION DILUTION | <input type="text" value="4.74"/> |

| Precipitation Step | Date: 6-6-05 |
|--------------------------------------|---------------------|
| Oxidized material Treated (mL) | 1,520 |
| Density of Oxidized Material (g/mL) | 1.27 |
| FeCl3 Solution (mL) | 608 |
| Lime Slurry (%) | 17.8 |
| Lime Slurry (mL) | 1,678 |
| DI water (mL) | 0 |
| Precipitated Slurry | 3,806 |
| Slurry Sample Removed (mL) | 210 |
| Precipitated Slurry Filtered (mL) | 3,596 |
| Filtrate from Vacuum Filtration (mL) | 2,567 |
| Analytical Sample(s) (mL) | 9 |
| Dried Solids (g) | 448.6 |
| Solids Generated (mg/L) | 117,867 |
| Precipitation Dilution | 2.50 |

| ANALYTICAL RESULTS | |
|----------------------------|--------------|
| EMPA Concentrations | mg/L |
| NCH | 81,346 |
| Oxidized | <50 |
| Precipitated | <50 |
| MPA Concentrations | mg/L |
| NCH | 6,792 |
| Oxidized | 10,824 |
| Precipitated | 180 |
| PO4 Concentrations | mg/L |
| NCH | 290 |
| Oxidized | <50 |
| Precipitated | <50 |
| % EMPA Conversion | 99.71 |
| % MPA Removal | 95.84 |

| BIOREACTOR FEEDS 16% DIC NCH | |
|-------------------------------------|-------------|
| (mL per 4.2L feed) | |
| 2,500 gpd | 10.7 |
| 5,000 gpd | 21.4 |
| 10,000 gpd | 42.8 |

Combined Pretreatment of 16% DCC NCH (large batch)

DATE: 6/3/05 - 6/7/05

RUN ID 59

NCH SAMPLE ID (ARMY) HXVX1207-04-8-40
Batch EB15

NCH SAMPLE ID (JL) 42E

OXIDATION BATCH #1 (ID: -64)

| pH Adjustment Step | Date: 6-3-05 |
|--|--------------|
| NCH (g) | 200.1 |
| Density of Initial Material (g/mL) | 1.09 |
| Sulfuric Acid Solution (20%) (g) | 98.7 |
| Total pH adjusted Material | 298.8 |
| Analytical/Archived Sample(s) (g) | 0.5702 |
| Final pH Adjusted Material (g) | 298.23 |
| pH Adjustment Dilution | 1.49 |
| Oxidation | Date: 6-3-05 |
| pH adjusted Material for Oxidation (g) | 294.5 |
| Persulfate Solution (g) | 673.1 |
| Persulfate : pH adj. NCH ratio (wt:wt) | 0.76 |
| Persulfate : NCH ratio (wt:wt) (NCH=1) | 1.12 |
| Analytical Samples (g) | 1.1345 |
| Final Mass of Oxidized Material (g) | 955.3 |
| Total Mass Oxidized Material (g) | 956.43 |
| Oxidation Dilution | 3.25 |
| Batch #1 Total Dilution | 4.85 |
| Oxidized Material Sent (g) | 955.3 |

OXIDATION BATCH #2 (ID: -65)

| pH Adjustment Step | Date: 6-4-05 |
|--|--------------|
| NCH (g) | 200 |
| Density of Initial Material (g/mL) | 1.09 |
| Sulfuric Acid Solution (20%) (g) | 98.7 |
| Total pH adjusted Material | 298.7 |
| Analytical/Archived Sample(s) (g) | 0.6925 |
| Final pH Adjusted Material (g) | 298.01 |
| pH Adjustment Dilution | 1.49 |
| Oxidation | Date: 6-4-05 |
| pH adjusted Material for Oxidation (g) | 295.6 |
| Persulfate Solution (g) | 674.4 |
| Persulfate : NCH ratio (wt:wt) (NCH=1) | 1.13 |
| Analytical Samples (g) | 1.1581 |
| Final Mass of Oxidized Material (g) | 955.2 |
| Total Mass Oxidized Material (g) | 956.36 |
| Oxidation Dilution | 3.24 |
| Batch #2 Total Dilution | 4.83 |
| Oxidized Material Sent (g) | 955.2 |
| COMPOSITE OXIDATION DILUTION | 4.84 |

Precipitation Step

Date: 6-7-05

| | |
|--------------------------------------|-------------|
| Oxidized material Treated (mL) | 1,500 |
| Density of Oxidized Material (g/mL) | 1.27 |
| FeCl3 Solution (mL) | 600 |
| Lime Slurry (%) | 17.8 |
| Lime Slurry (mL) | 1,127 |
| DI water (mL) | 0 |
| Precipitated Slurry | 3227 |
| Slurry Sample Removed (mL) | 210 |
| Precipitated Slurry Filtered (mL) | 3017 |
| Filtrate from Vaccum Filtration (mL) | 2225 |
| Analytical Sample (mL) | 8 |
| Dried Solids (g) | 428.3 |
| Solids Generated (mg/L) | 132,724 |
| Precipitation Dilution | 2.15 |

ANALYTICAL RESULTS

| EMPA Concentrations | mg/L |
|----------------------------|--------------|
| NCH | 78,254 |
| Oxidized | <50 |
| Precipitated | <50 |
| MPA Concentrations | mg/L |
| NCH | 6,350 |
| Oxidized | 11,115 |
| Precipitated | 158 |
| PO4 Concentrations | mg/L |
| NCH | 130 |
| Oxidized | <50 |
| Precipitated | <50 |
| % EMPA Conversion | 99.69 |
| % MPA Removal | 96.94 |

BIOREACTOR FEEDS 16% DCC NCH

| | (mL per 4.2L feed) |
|-------------------|--------------------|
| 2,500 gpd | 9.4 |
| 5,000 gpd | 18.8 |
| 10,000 gpd | 37.5 |

Combined Pretreatment of 16% DIC/DCC NCH (large batch)

DATE: 6/7/05 - 6/9/05

RUN ID 60

NCH SAMPLE ID (ARMY) HXVX11803-12-40
Batch EB11

NCH SAMPLE ID (JL) 42C

OXIDATION BATCH #1 (-66)

| pH Adjustment Step | Date: 6-7-05 |
|--|--------------|
| NCH (g) | 402 |
| Density of Initial Material (g/mL) | 1.09 |
| Sulfuric Acid Solution (20%) (g) | 213.2 |
| Total pH adjusted Material | 615.2 |
| Analytical/Archived Sample(s) (g) | 0.8769 |
| Final pH Adjusted Material (g) | 614.32 |
| pH Adjustment Dilution | 1.53 |
| Oxidation | |
| Date: 6-7-05 | |
| pH adjusted Material for Oxidation (g) | 307.1 |
| Persulfate Solution (g) | 660 |
| Persulfate : NCH ratio (wt:wt) (NCH=1) | 1.10 |
| Analytical Samples (g) | 1.1582 |
| Final Mass of Oxidized Material (g) | 950.6 |
| Total Mass Oxidized Material (g) | 951.76 |
| Oxidation Dilution | 3.10 |
| Batch #1 Total Dilution | 4.74 |
| Oxidized Material Sent (g) | 950.6 |

OXIDATION BATCH #2 (-67)

| pH Adjustment Step | Date: 6-7-05 |
|--|--------------|
| NCH (g) | 402 |
| Density of Initial Material (g/mL) | 1.09 |
| Sulfuric Acid Solution (20%) (g) | 213.2 |
| Total pH adjusted Material | 615.2 |
| Analytical/Archived Sample(s) (g) | 0.8769 |
| Final pH Adjusted Material (g) | 614.32 |
| pH Adjustment Dilution | 1.53 |
| Oxidation | |
| Date: 6-8-05 | |
| pH adjusted Material for Oxidation (g) | 307.8 |
| Persulfate Solution (g) | 659.5 |
| Persulfate : pH adj. NCH ratio (wt:wt) | 0.72 |
| Persulfate : NCH ratio (wt:wt) (NCH=1) | 1.09 |
| Analytical Samples (g) | 0.8918 |
| Final Mass of Oxidized Material (g) | 954.7 |
| Total Mass Oxidized Material (g) | 955.59 |
| Oxidation Dilution | 3.10 |
| Batch #2 Total Dilution | 4.75 |
| Oxidized Material Sent (g) | 954.7 |
| COMPOSITE OXIDATION DILUTION | 4.75 |

| Precipitation Step | Date: 6-9-05 |
|--------------------------------------|---------------------|
| Oxidized material Treated (mL) | 1500 |
| Density of Oxidized Material (g/mL) | 1.27 |
| FeCl3 Solution (mL) | 600 |
| Lime Slurry (%) | 17.8 |
| Lime Slurry (mL) | 1240 |
| DI water (mL) | 0 |
| Precipitated Slurry | 3340 |
| Slurry Sample Removed (mL) | 210 |
| Precipitated Slurry Filtered (mL) | 3130 |
| Filtrate from Vaccum Filtration (mL) | 2169 |
| Analytical Sample (mL) | 27 |
| Dried Solids (g) | 440.16 |
| Solids Generated (mg/L) | 131,784 |
| Precipitation Dilution | 2.23 |

| ANALYTICAL RESULTS | |
|----------------------------|--------------|
| EMPA Concentrations | mg/L |
| NCH | 87,810 |
| Oxidized | <50 |
| Precipitated | <50 |
| MPA Concentrations | mg/L |
| NCH | 7,381 |
| Oxidized | 12,301 |
| Precipitated | 182 |
| PO4 Concentrations | mg/L |
| NCH | 205 |
| Oxidized | 245 |
| Precipitated | <50 |
| % EMPA Conversion | 99.73 |
| % MPA Removal | 96.71 |

| BIOREACTOR FEEDS 16% DIC/DCC NCH | |
|---|--------------------|
| | (mL per 4.2L feed) |
| 2,500 gpd | 9.5 |
| 5,000 gpd | 19.1 |
| 10,000 gpd | 38.1 |

Date Submitted: 06/03/2005 Time Submitted: 03:03:51 PM

Sample Description

*Product/Chemical Name: Oxidized 16% NCH
Total Number of Samples: 1
(maximum of 15)
Other Components (>1% or EHS):
*Hazards: Irritants, Inhalation Hazard
*Recommended PPE: Recommended (gloves;NOMEX; safety glasses)
*Sample Disposal: Return
*Analysis Needed by: High Priority (1-2 days)
Special Handling Procedures:
Safety Information (attach MSDS or
other here):
Additional Comments or Information: Sample will arrive Monday AM

Work Requests and Results

| *Sample ID, NB Number, Lot Number | Analysis Requested | Approximate Anticipated Result (if known) | Method Number (if applicable) Refer to guide card | Has RAS Technical been contacted? | Tech # | RAS Result (for RAS use only) |
|---|------------------------|--|--|--|--------|--|
| 58 | IC (EMPA, MPA, PO4) | EMPA <100 MPA ~1500 | | | 7 | EMPA <50 ppm MPA 10,677 ppm PO4 <50 ppm |
| | | | | | 7 | EMPA < 50 ppm MPA 10,981 ppm PO4 <50 ppm |

Specific sample preparation requirements (e.g. solubility, dilution, etc.):

Date Submitted: 06/06/2005

Time Submitted: 05:10:08 PM

Sample Description

***Product/Chemical Name:** Treated 16% NCH
***Total Number of Samples*:** 1
(maximum of 15)
Other Components (>1% or EHS):
***Hazards:** Irritants, Inhalation Hazard
***Recommended PPE:** Recommended (gloves;NOMEX; safety glasses)
***Sample Disposal:** Return
***Analysis Needed by:** Rush (Same Day)
Special Handling Procedures:
Safety Information (attach MSDS or other here):
Additional Comments or Information: Sample will arrive Tuesday AM

Work Requests and Results

| *Sample ID, NB Number, Lot Number | Analysis Requested | Approximate Anticipated Result (if known) | Method Number (if applicable) Refer to guide card | Has RAS Technical been contacted? | Tech # | RAS Result (for RAS use only) |
|--|---------------------------|--|--|--|---------------|--|
| 58P | IC (EMPA, MPA, PO4) | all low | | | 7 | EMPA <50 ppm MPA 193 ppm PO4 <50 ppm EMPA <50 ppm MPA 167 ppm PO4 <50 ppm |

Specific sample preparation requirements (e.g. solubility, dilution, etc.):

Date Submitted: 06/08/2005

Time Submitted: 10:28:13 AM

Sample Description

***Product/Chemical Name:** Treated Hydrolysate
***Total Number of Samples*:** 2
(maximum of 15)
Other Components (>1% or EHS):
***Hazards:** Irritants, Inhalation Hazard
***Recommended PPE:** Recommended (gloves;NOMEX; safety glasses)
***Sample Disposal:** Return
***Analysis Needed by:** High Priority (1-2 days)
Special Handling Procedures:
Safety Information (attach MSDS or other here):
Additional Comments or Information: Results by End of Day Thursday Please

Work Requests and Results

| *Sample ID, NB Number, Lot Number | Analysis Requested | Approximate Anticipated Result (if known) | Method Number (if applicable) Refer to guide card | Has RAS Technical been contacted? | Tech # | RAS Result (for RAS use only) |
|--|---------------------------|--|--|--|---------------|---|
| 59 | IC (EMPA, MPA, PO4) | EMPA <50 MPA ~11,000-15,000 PO4 low | | | 7 | EMPA <50 ppm MPA 11,008 ppm PO4 <50 ppm |
| 59P | IC (EMPA, MPA, PO4) | all low | | | 7 | EMPA <50 ppm MPA 11,221 PO4 <50 ppm EMPA <50 ppm MPA 173 ppm PO4 <50 ppm |
| | | | | | | EMPA <50 ppm MPA 143 ppm PO4 <50 ppm |

Date Submitted: 06/13/2005

Time Submitted: 09:50:39 AM

Sample Description

*Product/Chemical Name: Treated NCH
Total Number of Samples: 2
(maximum of 15)
Other Components (>1% or EHS):
*Hazards: Irritants, Inhalation Hazard
*Recommended PPE: Recommended (gloves;NOMEX; safety glasses)
*Sample Disposal: Return
*Analysis Needed by: High Priority (1-2 days)
Special Handling Procedures:
Safety Information (attach MSDS or other here):
Additional Comments or Information:

Work Requests and Results

| *Sample ID, NB Number, Lot Number | Analysis Requested | Approximate Anticipated Result (if known) | Method Number (if applicable) Refer to guide card | Has RAS Technical been contacted? | Tech # | RAS Result (for RAS use only) |
|---|------------------------|--|---|--|-----------|---|
| 60 | IC (EMPA, MPA, PO4) | EMPA <50 MPA 10000- 15000 PO4 low | | | 8` | EMPA-<50ppm <50ppm MPA-12182ppm 12420ppm PO4-267ppm 223ppm |
| 60P | IC (EMPA, MPA, PO4) | all low | | | 8 | EMPA-<50ppm <50ppm MPA-169ppm 195ppm PO4-<50ppm <50ppm |

Specific sample preparation requirements (e.g. solubility, dilution, etc.):