# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-1
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 10/16/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.98 | 20.0 | 15.6 | 11.0 | 0.0000 | 11.000 |
| 2 | 5 - 10 | 5.04 | 20.0 | 5.0 | 37.5 | 0.0000 | 37.500 |
| 3 | 10 - 15 | 5.30 | 20.0 | 19.0 | 2.5 | 0.0000 | 2.500 |
| 4 | 15 - 20 | 5.36 | 20.0 | 10.0 | 25.0 | 0.0000 | 25.000 |
| 5 | 20 - 25 | 5.29 | 20.0 | 18.0 | 5.0 | 0.0000 | 5.000 |
| 6 | 25 - 30 | 6.27 | 20.0 | 16.0 | 10.0 | 0.0000 | 10.000 |
| 7 | 30 - 35 | 6.93 | 20.0 | 18.6 | 3.5 | 0.0000 | 3.500 |
| 8 | 35 - 40 | 7.08 | 20.0 | 16.4 | 9.0 | 0.0000 | 9.000 |
| 9 | 40 - 45 | 7.36 | 20.0 | 18.4 | 4.0 | 0.0000 | 4.000 |
| 10 | 45 - 50 | 7.32 | 20.0 | 17.2 | 7.0 | 0.0000 | 7.000 |
| 11 | 50 - 55 | 7.47 | 20.0 | 15.0 | 12.5 | 0.0000 | 12.500 |
| 12 | 55 - 60 | 7.65 | 20.0 | 18.2 | 4.5 | 0.0000 | 4.500 |
| 13 | 60 - 65 | 8.01 | 20.0 | 14.2 | 14.5 | 0.0000 | 14.500 |
| 14 | 65 - 70 | 4.04 | 20.0 | 17.6 | 6.0 | 0.3930 | -6.282 |
| 15 | 71.8 - 76.8 | 6.36 | 20.0 | 14.4 | 14.0 | 0.0000 | 14.000 |
| 16 | 76.8 - 81.8 | 7.79 | 20.0 | 18.0 | 5.0 | 0.0000 | 5.000 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-1
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 10/16/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.8328 | 0.7 | 3.8 | 0.0000 |
| 2 | 5 - 10 | 1.9104 | 0.3 | 1.6 | 0.0000 |
| 3 | 10 - 15 | 1.7632 | 0.3 | 1.7 | 0.0000 |
| 4 | 15 - 20 | 1.8416 | 0.4 | 2.2 | 0.0000 |
| 5 | 20 - 25 | 1.8774 | 0.4 | 2.1 | 0.0000 |
| 6 | 25 - 30 | 1.8355 | 0.1 | 0.5 | 0.0000 |
| 7 | 30 - 35 | 1.7869 | 0.3 | 1.7 | 0.0000 |
| 8 | 35 - 40 | 1.8311 | 0.1 | 0.5 | 0.0000 |
| 9 | 40 - 45 | 1.9533 | 0.1 | 0.5 | 0.0000 |
| 10 | 45 - 50 | 1.9071 | 0.2 | 1.0 | 0.0000 |
| 11 | 50 - 55 | 1.9963 | 0.2 | 1.0 | 0.0000 |
| 12 | 55 - 60 | 2.0102 | 0.1 | 0.5 | 0.0000 |
| 13 | 60 - 65 | 1.8257 | 0.3 | 1.6 | 0.0000 |
| 14 | 65 - 70 | 1.8359 | 4.7 | 25.6 | 0.3930 |
| 15 | 71.8 - 76.8 | 1.7284 | 0.6 | 3.5 | 0.0000 |
| 16 | 76.8 - 81.8 | 1.8551 | 0.2 | 1.1 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-2
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 10/23/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.89 | 20.0 | 21.0 | -2.5 | 0.0368 | -3.650 |
| 2 | 5 - 10 | 4.93 | 20.0 | 19.1 | 2.3 | 0.0359 | 1.129 |
| 3 | 10 - 15 | 6.43 | 20.0 | 21.3 | -3.3 | 0.0000 | -3.250 |
| 4 | 15 - 20 | 4.73 | 20.0 | 15.6 | 11.0 | 0.3222 | 0.930 |
| 5 | 20 - 25 | 7.60 | 20.0 | 16.0 | 10.0 | 0.0000 | 10.000 |
| 6 | 25 - 30 | 7.78 | 20.0 | 16.8 | 8.0 | 0.0000 | 8.000 |
| 7 | 30 - 35 | 7.92 | 20.0 | 13.2 | 17.0 | 0.0000 | 17.000 |
| 8 | 35 - 40 | 8.07 | 20.0 | 12.0 | 20.0 | 0.0000 | 20.000 |
| 9 | 40 - 45 | 8.19 | 20.0 | 11.6 | 21.0 | 0.0000 | 21.000 |
| 10 | 45 - 50 | 8.11 | 20.0 | 13.0 | 17.5 | 0.0000 | 17.500 |
| 11 | 50 - 55 | 8.06 | 20.0 | 14.6 | 13.5 | 0.0000 | 13.500 |
| 12 | 56.8 - 61.8 | 7.15 | 20.0 | 20.0 | 0.0 | 0.1237 | -3.865 |
| 13 | 61.8 - 66.8 | 7.77 | 20.0 | 18.4 | 4.0 | 0.0000 | 4.000 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-2
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 10/23/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.8912 | 1.2 | 6.3 | 0.0368 |
| 2 | 5 - 10 | 1.7470 | 1.1 | 6.3 | 0.0359 |
| 3 | 10 - 15 | 1.8829 | 0.3 | 1.6 | 0.0000 |
| 4 | 15 - 20 | 1.9288 | 4.2 | 21.8 | 0.3222 |
| 5 | 20 - 25 | 1.8605 | 0.6 | 3.2 | 0.0000 |
| 6 | 25 - 30 | 2.0490 | 0.3 | 1.5 | 0.0000 |
| 7 | 30 - 35 | 1.8450 | 0.3 | 1.6 | 0.0000 |
| 8 | 35 - 40 | 1.8176 | 0.5 | 2.8 | 0.0000 |
| 9 | 40 - 45 | 1.8959 | 0.6 | 3.2 | 0.0000 |
| 10 | 45 - 50 | 1.8439 | 0.7 | 3.8 | 0.0000 |
| 11 | 50 - 55 | 1.7512 | 0.6 | 3.4 | 0.0000 |
| 12 | 56.8 - 61.8 | 1.9925 | 2.2 | 11.0 | 0.1237 |
| 13 | 61.8 - 66.8 | 1.8676 | 0.3 | 1.6 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: DH-2
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 10/23/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.17 | 20.0 | 19.8 | 0.5 | 0.0000 | 0.500 |
| 2 | 5 - 10 | 5.68 | 20.0 | 19.0 | 2.5 | 0.0000 | 2.500 |
| 3 | 10 - 15 | 6.02 | 20.0 | 16.0 | 10.0 | 0.0000 | 10.000 |
| 4 | 15 - 20 | 7.09 | 20.0 | 12.0 | 20.0 | 0.0000 | 20.000 |
| 5 | 20 - 25 | 7.48 | 20.0 | 13.4 | 16.5 | 0.0000 | 16.500 |
| 6 | 25 - 30 | 7.39 | 20.0 | 10.4 | 24.0 | 0.0000 | 24.000 |
| 7 | 30 - 35 | 7.47 | 20.0 | 13.6 | 16.0 | 0.0000 | 16.000 |
| 8 | 35 - 38.8 | 7.39 | 20.0 | 5.0 | 37.5 | 0.0000 | 37.500 |
| 9 | 38.8 - 43.8 | 6.37 | 20.0 | 18.0 | 5.0 | 0.1049 | 1.722 |
| 10 | 43.8 - 48.8 | 7.10 | 20.0 | 15.4 | 11.5 | 0.0000 | 11.500 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: DH-2
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 10/23/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.6293 | 0.7 | 4.3 | 0.0000 |
| 2 | 5 - 10 | 1.8536 | 0.7 | 3.8 | 0.0000 |
| 3 | 10 - 15 | 1.8647 | 0.6 | 3.2 | 0.0000 |
| 4 | 15 - 20 | 1.8675 | 0.4 | 2.1 | 0.0000 |
| 5 | 20 - 25 | 1.7439 | 0.2 | 1.1 | 0.0000 |
| 6 | 25 - 30 | 1.7391 | 0.3 | 1.7 | 0.0000 |
| 7 | 30 - 35 | 1.8079 | 0.2 | 1.1 | 0.0000 |
| 8 | 35 - 38.8 | 1.8112 | 0.2 | 1.1 | 0.0000 |
| 9 | 38.8 - 43.8 | 1.7951 | 1.8 | 10.0 | 0.1049 |
| 10 | 43.8 - 48.8 | 1.7242 | 0.3 | 1.7 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-3
Sample Date: 07/15/09



Analyzed By: KF/GA
Date Analyzed: 10/27/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 5.00 | 20.0 | 21.0 | -2.5 | 0.0242 | -3.256 |
| 2 | 5 - 10 | 4.86 | 20.0 | 20.6 | -1.5 | 0.0000 | -1.500 |
| 3 | 10 - 15 | 5.00 | 20.0 | 19.0 | 2.5 | 0.0000 | 2.500 |
| 4 | 15 - 20 | 4.98 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 5 | 20 - 25 | 5.14 | 20.0 | 19.6 | 1.0 | 0.0083 | 0.740 |
| 6 | 25 - 30 | 5.45 | 20.0 | 21.4 | -3.5 | 0.0000 | -3.500 |
| 7 | 30 - 35 | 5.61 | 20.0 | 20.0 | 0.0 | 0.0051 | -0.159 |
| 8 | 35 - 40 | 5.76 | 20.0 | 19.6 | 1.0 | 0.0000 | 1.000 |
| 9 | 40 - 45 | 4.78 | 20.0 | 19.2 | 2.0 | 0.0561 | 0.245 |
| 10 | 45 - 50 | 7.37 | 20.0 | 12.2 | 19.5 | 0.0000 | 19.500 |
| 11 | 50 - 55 | 7.79 | 20.0 | 13.0 | 17.5 | 0.0000 | 17.500 |
| 12 | 55 - 60 | 7.86 | 20.0 | 15.2 | 12.0 | 0.0000 | 12.000 |
| 13 | 60 - 65 | 7.91 | 20.0 | 13.4 | 16.5 | 0.0000 | 16.500 |
| 14 | 65 - 70 | 7.81 | 20.0 | 13.2 | 17.0 | 0.0000 | 17.000 |
| 15 | 70 - 75 | 7.39 | 20.0 | 13.8 | 15.5 | 0.0000 | 15.500 |
| 16 | 75 - 76 | 7.40 | 20.0 | 14.4 | 14.0 | 0.0000 | 14.000 |
| 17 | 79.8 - 82.8 | 6.86 | 20.0 | 16.4 | 9.0 | 0.0000 | 9.000 |
| 18 | 82.8 - 87.8 | 6.83 | 20.0 | 17.6 | 6.0 | 0.0000 | 6.000 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-3
Sample Date: 07/15/09



Analyzed By: KF/GA
Date Analyzed: 10/27/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.7655 | 1.0 | 5.7 | 0.0242 |
| 2 | 5 - 10 | 1.9785 | 0.7 | 3.5 | 0.0000 |
| 3 | 10 - 15 | 1.7499 | 0.5 | 2.9 | 0.0000 |
| 4 | 15 - 20 | 1.8991 | 0.5 | 2.6 | 0.0000 |
| 5 | 20 - 25 | 1.6646 | 0.8 | 4.8 | 0.0083 |
| 6 | 25 - 30 | 1.5984 | 0.5 | 3.1 | 0.0000 |
| 7 | 30 - 35 | 1.9430 | 0.9 | 4.6 | 0.0051 |
| 8 | 35 - 40 | 1.8514 | 0.8 | 4.3 | 0.0000 |
| 9 | 40 - 45 | 2.0293 | 1.5 | 7.4 | 0.0561 |
| 10 | 45 - 50 | 1.7422 | 0.2 | 1.1 | 0.0000 |
| 11 | 50 - 55 | 2.1116 | 0.5 | 2.4 | 0.0000 |
| 12 | 55 - 60 | 2.0036 | 0.4 | 2.0 | 0.0000 |
| 13 | 60 - 65 | 1.8684 | 0.2 | 1.1 | 0.0000 |
| 14 | 65 - 70 | 1.9076 | 0.5 | 2.6 | 0.0000 |
| 15 | 70 - 75 | 1.7949 | 0.6 | 3.3 | 0.0000 |
| 16 | 75 - 76 | 2.1424 | 0.2 | 0.9 | 0.0000 |
| 17 | 79.8 - 82.8 | 1.9012 | 0.7 | 3.7 | 0.0000 |
| 18 | 82.8 - 87.8 | 2.0902 | 0.3 | 1.4 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-4
Sample Date: 07/15/09



Analyzed By: KF/GA
Date Analyzed: 11/02/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 5.02 | 20.0 | 21.2 | -3.0 | 0.0563 | -4.761 |
| 2 | 5 - 10 | 5.35 | 20.0 | 21.8 | -4.5 | 0.0132 | -4.912 |
| 3 | 10 - 15 | 5.31 | 20.0 | 21.0 | -2.5 | 0.0000 | -2.500 |
| 4 | 15 - 20 | 5.38 | 20.0 | 21.0 | -2.5 | 0.0000 | -2.500 |
| 5 | 20 - 25 | 5.31 | 20.0 | 20.0 | 0.0 | 0.1072 | -3.351 |
| 6 | 25 - 30 | 4.47 | 20.0 | 17.6 | 6.0 | 0.0000 | 6.000 |
| 7 | 30 - 35 | 6.08 | 20.0 | 16.0 | 10.0 | 0.0000 | 10.000 |
| 8 | 35 - 40 | 6.50 | 20.0 | 17.8 | 5.5 | 0.0000 | 5.500 |
| 9 | 40 - 45 | 6.91 | 20.0 | 16.8 | 8.0 | 0.0000 | 8.000 |
| 10 | 45 - 50 | 7.18 | 20.0 | 12.4 | 19.0 | 0.0000 | 19.000 |
| 11 | 50 - 55 | 7.60 | 20.0 | 14.8 | 13.0 | 0.0600 | 11.125 |
| 12 | 55 - 60 | 7.67 | 20.0 | 10.2 | 24.5 | 0.0000 | 24.500 |
| 13 | 60 - 61 | 6.90 | 20.0 | 12.0 | 20.0 | 0.1727 | 14.604 |
| 14 | 63 - 68 | 7.32 | 20.0 | 13.0 | 17.5 | 0.0000 | 17.500 |
| 15 | 68 - 73 | 7.50 | 20.0 | 19.0 | 2.5 | 0.0216 | 1.825 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-4
Sample Date: 07/15/09



Analyzed By: KF/GA
Date Analyzed: 11/02/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.8913 | 1.4 | 7.4 | 0.0563 |
| 2 | 5 - 10 | 1.9725 | 1.0 | 5.1 | 0.0132 |
| 3 | 10 - 15 | 2.2038 | 0.6 | 2.7 | 0.0000 |
| 4 | 15 - 20 | 1.8677 | 0.4 | 2.1 | 0.0000 |
| 5 | 20 - 25 | 1.6743 | 1.7 | 10.2 | 0.1072 |
| 6 | 25 - 30 | 1.9983 | 0.4 | 2.0 | 0.0000 |
| 7 | 30 - 35 | 2.0570 | 0.1 | 0.5 | 0.0000 |
| 8 | 35 - 40 | 1.7926 | 0.2 | 1.1 | 0.0000 |
| 9 | 40 - 45 | 1.9555 | 0.3 | 1.5 | 0.0000 |
| 10 | 45 - 50 | 1.7241 | 0.4 | 2.3 | 0.0000 |
| 11 | 50 - 55 | 1.4473 | 1.1 | 7.6 | 0.0600 |
| 12 | 55 - 60 | 2.1182 | 0.4 | 1.9 | 0.0000 |
| 13 | 60 - 61 | 1.7531 | 2.4 | 13.7 | 0.1727 |
| 14 | 63 - 68 | 1.8697 | 0.2 | 1.1 | 0.0000 |
| 15 | 68 - 73 | 1.8100 | 1.0 | 5.5 | 0.0216 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-5
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 11/02/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.86 | 20.0 | 20.0 | 0.0 | 0.0131 | -0.409 |
| 2 | 5 - 10 | 4.86 | 20.0 | 18.0 | 5.0 | 0.0000 | 5.000 |
| 3 | 10 - 15 | 5.10 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 4 | 15 - 20 | 5.43 | 20.0 | 19.2 | 2.0 | 0.0000 | 2.000 |
| 5 | 20 - 25 | 6.48 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 6 | 25 - 30 | 7.01 | 20.0 | 18.2 | 4.5 | 0.0000 | 4.500 |
| 7 | 30 - 35 | 7.25 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 8 | 35 - 39.3 | 7.27 | 20.0 | 13.6 | 16.0 | 0.0000 | 16.000 |
| 9 | 41.3 - 46.3 | 6.06 | 20.0 | 22.2 | -5.5 | 0.0000 | -5.500 |
| 10 | 46.3 - 51.3 | 6.65 | 20.0 | 12.0 | 20.0 | 0.0000 | 20.000 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-5
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 11/02/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.7770 | 0.9 | 5.1 | 0.0131 |
| 2 | 5 - 10 | 1.8235 | 0.6 | 3.3 | 0.0000 |
| 3 | 10 - 15 | 1.8966 | 0.7 | 3.7 | 0.0000 |
| 4 | 15 - 20 | 1.8772 | 0.8 | 4.3 | 0.0000 |
| 5 | 20 - 25 | 1.8376 | 0.5 | 2.7 | 0.0000 |
| 6 | 25 - 30 | 1.8524 | 0.1 | 0.5 | 0.0000 |
| 7 | 30 - 35 | 2.1015 | 0.2 | 1.0 | 0.0000 |
| 8 | 35 - 39.3 | 1.4978 | 0.3 | 2.0 | 0.0000 |
| 9 | 41.3 - 46.3 | 2.0760 | 0.5 | 2.4 | 0.0000 |
| 10 | 46.3 - 51.3 | 1.7083 | 0.2 | 1.2 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-6
Sample Date: 07/25/09



Analyzed By: KF
Date Analyzed: 10/06/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.79 | 20.0 | 21.0 | -2.5 | 0.0022 | -2.570 |
| 2 | 5 - 10 | 5.08 | 20.0 | 19.0 | 2.5 | 0.0000 | 2.500 |
| 3 | 10 - 15 | 5.26 | 20.0 | 18.0 | 5.0 | 0.0000 | 5.000 |
| 4 | 15 - 20 | 5.28 | 20.0 | 8.0 | 30.0 | 0.0000 | 30.000 |
| 5 | 20 - 25 | 5.35 | 20.0 | 17.0 | 7.5 | 0.0000 | 7.500 |
| 6 | 25 - 30 | 5.43 | 20.0 | 19.6 | 1.0 | 0.0000 | 1.000 |
| 7 | 30 - 35 | 5.59 | 20.0 | 20.2 | -0.5 | 0.0000 | -0.500 |
| 8 | 35 - 40 | 5.75 | 20.0 | 19.8 | 0.5 | 0.0043 | 0.367 |
| 9 | 40 - 45 | 5.77 | 20.0 | 19.4 | 1.5 | 0.0000 | 1.500 |
| 10 | 45 - 50 | 5.46 | 20.0 | 20.0 | 0.0 | 0.0277 | -0.865 |
| 11 | 50 - 55 | 5.87 | 20.0 | 18.0 | 5.0 | 0.0000 | 5.000 |
| 12 | 55 - 60 | 5.98 | 20.0 | 19.2 | 2.0 | 0.0000 | 2.000 |
| 13 | 60 - 65 | 6.05 | 20.0 | 19.2 | 2.0 | 0.0000 | 2.000 |
| 14 | 65 - 70 | 5.89 | 20.0 | 19.0 | 2.5 | 0.0000 | 2.500 |
| 15 | 70 - 74 | 5.94 | 20.0 | 17.8 | 5.5 | 0.0000 | 5.500 |
| 16 | 77 - 82 | 5.08 | 20.0 | 14.4 | 14.0 | 0.0000 | 14.000 |
| 17 | 82 - 87 | 5.13 | 20.0 | 18.2 | 4.5 | 0.0035 | 4.391 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-6
Sample Date: 07/25/09



Analyzed By: KF
Date Analyzed: 10/06/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.7866 | 0.8 | 4.5 | 0.0022 |
| 2 | 5 - 10 | 1.9785 | 0.5 | 2.5 | 0.0000 |
| 3 | 10 - 15 | 1.7184 | 0.4 | 2.3 | 0.0000 |
| 4 | 15 - 20 | 1.6584 | 0.6 | 3.6 | 0.0000 |
| 5 | 20 - 25 | 2.0734 | 0.5 | 2.4 | 0.0000 |
| 6 | 25 - 30 | 1.8076 | 0.7 | 3.9 | 0.0000 |
| 7 | 30 - 35 | 1.5257 | 0.5 | 3.3 | 0.0000 |
| 8 | 35 - 40 | 1.7439 | 0.8 | 4.6 | 0.0043 |
| 9 | 40 - 45 | 1.3148 | 0.4 | 3.0 | 0.0000 |
| 10 | 45 - 50 | 1.7087 | 1.0 | 5.9 | 0.0277 |
| 11 | 50 - 55 | 1.6513 | 0.4 | 2.4 | 0.0000 |
| 12 | 55 - 60 | 1.8031 | 0.5 | 2.8 | 0.0000 |
| 13 | 60 - 65 | 1.5676 | 0.5 | 3.2 | 0.0000 |
| 14 | 65 - 70 | 1.6139 | 0.6 | 3.7 | 0.0000 |
| 15 | 70 - 74 | 1.2045 | 0.5 | 4.2 | 0.0000 |
| 16 | 77 - 82 | 1.7476 | 0.5 | 2.9 | 0.0000 |
| 17 | 82 - 87 | 1.7603 | 0.8 | 4.5 | 0.0035 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-7
Sample Date: 07/29/09



Analyzed By: KF/GA
Date Analyzed: 12/02/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.73 | 20.0 | 20.4 | -1.0 | 0.0000 | -1.000 |
| 2 | 5 - 10 | 5.13 | 20.0 | 19.8 | 0.5 | 0.0000 | 0.500 |
| 3 | 10 - 15 | 5.38 | 20.0 | 20.6 | -1.5 | 0.0000 | -1.500 |
| 4 | 15 - 20 | 5.60 | 20.0 | 18.8 | 3.0 | 0.0000 | 3.000 |
| 5 | 20 - 25 | 5.53 | 20.0 | 19.6 | 1.0 | 0.0000 | 1.000 |
| 6 | 25 - 30 | 5.97 | 20.0 | 19.8 | 0.5 | 0.0241 | -0.253 |
| 7 | 30 - 35 | 6.32 | 20.0 | 19.0 | 2.5 | 0.0047 | 2.353 |
| 8 | 35 - 40 | 6.55 | 20.0 | 19.8 | 0.5 | 0.0015 | 0.453 |
| 9 | 40 - 45 | 6.62 | 20.0 | 19.6 | 1.0 | 0.0031 | 0.903 |
| 10 | 45 - 50 | 6.69 | 20.0 | 19.0 | 2.5 | 0.0000 | 2.500 |
| 11 | 50 - 55 | 6.51 | 20.0 | 20.1 | -0.3 | 0.0000 | -0.250 |
| 12 | 55 - 60 | 6.80 | 20.0 | 19.8 | 0.5 | 0.0000 | 0.500 |
| 13 | 60 - 65 | 6.75 | 20.0 | 19.1 | 2.3 | 0.0000 | 2.250 |
| 14 | 65 - 70 | 5.10 | 20.0 | 18.6 | 3.5 | 0.0000 | 3.500 |
| 15 | 70 - 73 | 5.35 | 20.0 | 15.0 | 12.5 | 0.0828 | 9.911 |
| 16 | 75 - 80 | 6.57 | 20.0 | 19.1 | 2.3 | 0.0163 | 1.739 |
| 17 | 80 - 85 | 7.23 | 20.0 | 16.0 | 10.0 | 0.0000 | 10.000 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-7
Sample Date: 07/29/09



Analyzed By: KF/GA
Date Analyzed: 12/02/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.8016 | 0.5 | 2.8 | 0.0000 |
| 2 | 5 - 10 | 1.6359 | 0.5 | 3.1 | 0.0000 |
| 3 | 10 - 15 | 1.5346 | 0.6 | 3.9 | 0.0000 |
| 4 | 15 - 20 | 1.3739 | 0.5 | 3.6 | 0.0000 |
| 5 | 20 - 25 | 1.7229 | 0.4 | 2.3 | 0.0000 |
| 6 | 25 - 30 | 1.7669 | 1.0 | 5.7 | 0.0241 |
| 7 | 30 - 35 | 1.7347 | 0.8 | 4.6 | 0.0047 |
| 8 | 35 - 40 | 1.5770 | 0.7 | 4.4 | 0.0015 |
| 9 | 40 - 45 | 1.5473 | 0.7 | 4.5 | 0.0031 |
| 10 | 45 - 50 | 1.6272 | 0.6 | 3.7 | 0.0000 |
| 11 | 50 - 55 | 1.5126 | 0.5 | 3.3 | 0.0000 |
| 12 | 55 - 60 | 1.6996 | 0.1 | 0.6 | 0.0000 |
| 13 | 60 - 65 | 1.6394 | 0.3 | 1.8 | 0.0000 |
| 14 | 65 - 70 | 1.6220 | 0.6 | 3.7 | 0.0000 |
| 15 | 70 - 73 | 1.0187 | 0.9 | 8.8 | 0.0828 |
| 16 | 75 - 80 | 1.9084 | 1.0 | 5.2 | 0.0163 |
| 17 | 80 - 85 | 1.7705 | 0.6 | 3.4 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-8
Sample Date: 07/29/09



Analyzed By: KF/GA
Date Analyzed: 12/07/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.23 | 20.0 | 20.8 | -2.0 | 0.0358 | -3.119 |
| 2 | 5 - 10 | 4.18 | 20.0 | 20.2 | -0.5 | 0.0000 | -0.500 |
| 3 | 10 - 15 | 4.39 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 4 | 15 - 20 | 4.71 | 20.0 | 19.6 | 1.0 | 0.0000 | 1.000 |
| 5 | 20 - 25 | 4.89 | 20.0 | 19.4 | 1.5 | 0.0000 | 1.500 |
| 6 | 25 - 30 | 4.94 | 20.0 | 19.8 | 0.5 | 0.0000 | 0.500 |
| 7 | 30 - 35 | 4.90 | 20.0 | 19.2 | 2.0 | 0.0000 | 2.000 |
| 8 | 35 - 40 | 4.56 | 20.0 | 19.8 | 0.5 | 0.0000 | 0.500 |
| 9 | 40 - 45 | 5.37 | 20.0 | 19.8 | 0.5 | 0.0000 | 0.500 |
| 10 | 45 - 50 | 5.03 | 20.0 | 19.4 | 1.5 | 0.0000 | 1.500 |
| 11 | 50 - 52.5 | 5.52 | 20.0 | 19.0 | 2.5 | 0.0000 | 2.500 |
| 12 | 54.5 - 59.5 | 6.16 | 20.0 | 15.0 | 12.5 | 0.0000 | 12.500 |
| 13 | 59.5 - 64.5 | 6.69 | 20.0 | 15.0 | 12.5 | 0.0000 | 12.500 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-8
Sample Date: 07/29/09



Analyzed By: KF/GA
Date Analyzed: 12/07/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.9070 | 1.2 | 6.3 | 0.0358 |
| 2 | 5 - 10 | 1.7835 | 0.3 | 1.7 | 0.0000 |
| 3 | 10 - 15 | 2.0342 | 0.6 | 2.9 | 0.0000 |
| 4 | 15 - 20 | 1.9152 | 0.4 | 2.1 | 0.0000 |
| 5 | 20 - 25 | 1.9779 | 0.4 | 2.0 | 0.0000 |
| 6 | 25 - 30 | 1.8123 | 0.5 | 2.8 | 0.0000 |
| 7 | 30 - 35 | 1.9103 | 0.5 | 2.6 | 0.0000 |
| 8 | 35 - 40 | 1.7895 | 0.6 | 3.4 | 0.0000 |
| 9 | 40 - 45 | 1.6781 | 0.4 | 2.4 | 0.0000 |
| 10 | 45 - 50 | 1.7584 | 0.5 | 2.8 | 0.0000 |
| 11 | 50 - 52.5 | 2.1064 | 0.8 | 3.8 | 0.0000 |
| 12 | 54.5 - 59.5 | 1.8930 | 0.3 | 1.6 | 0.0000 |
| 13 | 59.5 - 64.5 | 1.8441 | 0.2 | 1.1 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-9
Sample Date: 07/29/09



Analyzed By: KF/GA
Date Analyzed: 12/07/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 5.10 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 2 | 5 - 10 | 5.11 | 20.0 | 19.2 | 2.0 | 0.0000 | 2.000 |
| 3 | 10 - 15 | 4.89 | 20.0 | 20.4 | -1.0 | 0.0000 | -1.000 |
| 4 | 15 - 20 | 4.85 | 20.0 | 20.6 | -1.5 | 0.0000 | -1.500 |
| 5 | 20 - 25 | 4.90 | 20.0 | 18.6 | 3.5 | 0.0000 | 3.500 |
| 6 | 25 - 30 | 5.00 | 20.0 | 19.2 | 2.0 | 0.0000 | 2.000 |
| 7 | 30 - 35 | 6.24 | 20.0 | 18.2 | 4.5 | 0.0000 | 4.500 |
| 8 | 35 - 40 | 6.77 | 20.0 | 14.6 | 13.5 | 0.0000 | 13.500 |
| 9 | 40 - 45 | 6.94 | 20.0 | 13.4 | 16.5 | 0.0000 | 16.500 |
| 10 | 45 - 50 | 7.06 | 20.0 | 15.4 | 11.5 | 0.0000 | 11.500 |
| 11 | 50 - 55 | 7.16 | 20.0 | 17.2 | 7.0 | 0.0000 | 7.000 |
| 12 | 55 - 60 | 7.46 | 20.0 | 14.8 | 13.0 | 0.0000 | 13.000 |
| 13 | 60 - 65 | 7.33 | 20.0 | 19.2 | 2.0 | 0.0000 | 2.000 |
| 14 | 65 - 70 | 8.30 | 20.0 | 10.2 | 24.5 | 0.0000 | 24.500 |
| 15 | 70 - 75 | 8.34 | 20.0 | 18.6 | 3.5 | 0.0000 | 3.500 |
| 16 | 75 - 80 | 8.27 | 20.0 | 16.4 | 9.0 | 0.0000 | 9.000 |
| 17 | 80 - 85 | 8.18 | 20.0 | 14.2 | 14.5 | 0.0000 | 14.500 |
| 18 | 86.8 - 91.8 | 8.26 | 20.0 | 18.0 | 5.0 | 0.0000 | 5.000 |
| 19 | 91.8 - 96.8 | 8.16 | 20.0 | 15.8 | 10.5 | 0.0000 | 10.500 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB-9
Sample Date: 07/29/09



Analyzed By: KF/GA
Date Analyzed: 12/07/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.6451 | 0.5 | 3.0 | 0.0000 |
| 2 | 5 - 10 | 1.4187 | 0.4 | 2.8 | 0.0000 |
| 3 | 10 - 15 | 1.6475 | 0.6 | 3.6 | 0.0000 |
| 4 | 15 - 20 | 1.8656 | 0.3 | 1.6 | 0.0000 |
| 5 | 20 - 25 | 1.5739 | 0.5 | 3.2 | 0.0000 |
| 6 | 25 - 30 | 1.4231 | 0.3 | 2.1 | 0.0000 |
| 7 | 30 - 35 | 1.7641 | 0.3 | 1.7 | 0.0000 |
| 8 | 35 - 40 | 1.5916 | 0.1 | 0.6 | 0.0000 |
| 9 | 40 - 45 | 1.0640 | 0.2 | 1.9 | 0.0000 |
| 10 | 45 - 50 | 1.4398 | 0.1 | 0.7 | 0.0000 |
| 11 | 50 - 55 | 2.1914 | 0.2 | 0.9 | 0.0000 |
| 12 | 55 - 60 | 1.4686 | 0.3 | 2.0 | 0.0000 |
| 13 | 60 - 65 | 1.8124 | 0.2 | 1.1 | 0.0000 |
| 14 | 65 - 70 | 1.8856 | 0.1 | 0.5 | 0.0000 |
| 15 | 70 - 75 | 1.8430 | 0.2 | 1.1 | 0.0000 |
| 16 | 75 - 80 | 1.6753 | 0.2 | 1.2 | 0.0000 |
| 17 | 80 - 85 | 1.7340 | 0.1 | 0.6 | 0.0000 |
| 18 | 86.8 - 91.8 | 1.7579 | 0.6 | 3.4 | 0.0000 |
| 19 | 91.8 - 96.8 | 1.5253 | 0.3 | 2.0 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).

# DSM Design Group, LLC

**NEUTRALIZATION POTENTIAL AND ACID-BASE ACCOUNT**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-10
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 12/08/09

| Test I.D. | Sample Interval | pH (s.u.) | HCl (ml) | NaOH (ml) | Neuralization Potential | Sulfur (%) | Acid-Base Account |
|---|---|---|---|---|---|---|---|
| 1 | 0 - 5 | 4.37 | 20.0 | 19.8 | 0.5 | 0.0035 | 0.390 |
| 2 | 5 - 10 | 4.39 | 20.0 | 20.6 | -1.5 | 0.0000 | -1.500 |
| 3 | 10 - 15 | 4.72 | 20.0 | 20.4 | -1.0 | 0.0000 | -1.000 |
| 4 | 15 - 20 | 4.98 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 5 | 20 - 25 | 5.57 | 20.0 | 17.0 | 7.5 | 0.0000 | 7.500 |
| 6 | 25 - 30 | 4.99 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 7 | 30 - 35 | 6.30 | 20.0 | 18.8 | 3.0 | 0.0000 | 3.000 |
| 8 | 35 - 40 | 6.55 | 20.0 | 19.6 | 1.0 | 0.0000 | 1.000 |
| 9 | 40 - 45 | 6.69 | 20.0 | 19.4 | 1.5 | 0.0000 | 1.500 |
| 10 | 45 - 50 | 6.88 | 20.0 | 16.8 | 8.0 | 0.0000 | 8.000 |
| 11 | 50 - 55 | 6.96 | 20.0 | 15.6 | 11.0 | 0.0000 | 11.000 |
| 12 | 55 - 60 | 6.70 | 20.0 | 16.0 | 10.0 | 0.0000 | 10.000 |
| 13 | 60 - 65 | 6.88 | 20.0 | 19.8 | 0.5 | 0.0000 | 0.500 |
| 14 | 65 - 70 | 6.94 | 20.0 | 18.8 | 3.0 | 0.0000 | 3.000 |
| 15 | 70 - 75 | 6.92 | 20.0 | 18.4 | 4.0 | 0.0000 | 4.000 |
| 16 | 75 - 78 | 6.48 | 20.0 | 20.0 | 0.0 | 0.0000 | 0.000 |
| 17 | 79.8 - 84.8 | 6.76 | 20.0 | 18.8 | 3.0 | 0.0000 | 3.000 |
| 18 | 84.8 - 89.8 | 6.50 | 20.0 | 17.6 | 6.0 | 0.0000 | 6.000 |

Constant (C) = (ml acid added in blank)/(ml base added in blank
ml acid consumed = (ml acid added) - (ml base added x C
Tons CaCO3 equiv./1000 tons of mat. = acid consumed x 25.0 x (N of acid)
Acid-Base Account = (%Sulfur x -31.25) + Neutralization Potentia

# DSM Design Group, LLC

**TOTAL SULFUR**

Company Name: Birmingham Coal & Coke
Mine Name: Old Union #2
Sample I.D.: OB/MW-10
Sample Date: 07/13/09



Analyzed By: KF/GA
Date Analyzed: 12/08/09

| Test I.D. | Sample Interval | Weight (g) | NaOH (ml) | meq H+/100g (meq) | Sulfur (%) |
|---|---|---|---|---|---|
| 1 | 0 - 5 | 1.9791 | 0.9 | 4.5 | 0.0035 |
| 2 | 5 - 10 | 1.5785 | 0.6 | 3.8 | 0.0000 |
| 3 | 10 - 15 | 1.7303 | 0.5 | 2.9 | 0.0000 |
| 4 | 15 - 20 | 1.5622 | 0.5 | 3.2 | 0.0000 |
| 5 | 20 - 25 | 1.5711 | 0.4 | 2.5 | 0.0000 |
| 6 | 25 - 30 | 0.9347 | 0.4 | 4.3 | 0.0000 |
| 7 | 30 - 35 | 1.7884 | 0.2 | 1.1 | 0.0000 |
| 8 | 35 - 40 | 1.6744 | 0.4 | 2.4 | 0.0000 |
| 9 | 40 - 45 | 1.7368 | 0.4 | 2.3 | 0.0000 |
| 10 | 45 - 50 | 1.8528 | 0.3 | 1.6 | 0.0000 |
| 11 | 50 - 55 | 0.9617 | 0.2 | 2.1 | 0.0000 |
| 12 | 55 - 60 | 1.6098 | 0.2 | 1.2 | 0.0000 |
| 13 | 60 - 65 | 1.5165 | 0.4 | 2.6 | 0.0000 |
| 14 | 65 - 70 | 1.7452 | 0.1 | 0.6 | 0.0000 |
| 15 | 70 - 75 | 1.7737 | 0.2 | 1.1 | 0.0000 |
| 16 | 75 - 78 | 1.8176 | 0.6 | 3.3 | 0.0000 |
| 17 | 79.8 - 84.8 | 1.7985 | 0.5 | 2.8 | 0.0000 |
| 18 | 84.8 - 89.8 | 1.7773 | 0.3 | 1.7 | 0.0000 |

meq H+/100g = (ml NaOH) x (N NaOH) x (100g/weight of sample)
% S = 0.0185 (meq H+/100g) - 0.0806 (Grube, et al., 1973).