Sulfuric Acid Market
Review and Outlook

Fiona Boyd
Director, Acuity Commodities
March 2019
Acuity Commodities

• Independent UK-based publishing company launched in April 2016
• Focuses on the sulfur and sulfuric acid markets
• Over 100 companies using our weekly and fortnightly market analysis and price assessments
  • Briefing: Sulfur
  • Briefing: Sulfuric Acid
  • Regional Briefing: US and Canada
• Offers consultancy work
Poll Question

What is the largest commercial factor that impacts your plant operations?

• Lack of sulfur supply
• Logistical issues – i.e. lack of rail cars or trucks
• Fluctuations in demand from key consumers
• Customer product specifications
Sulfur – Providing the Feedstock
Supply and Demand and North American Focus
Supply

Sulfur supply by Region - '000 metric tonnes

Region | Supply Changes
--- | ---
Oceania | No notable changes
East Asia | Growth in China, southeast Asia
South Asia | India key to watch – 3m t growth by 2023
West Asia | Most significant growth in supply
Africa | Developing countries add capacity – Nigeria
Latin America | Brazil, Mexico, Venezuela outlook poor
North America | Decline from gas offsetting refinery/upgrading
EECA | Ongoing growth from gas and Nornickel
Europe | IMO 2020, Gas Decline
### Demand

#### Sulfur Demand by Region - '000 metric tonnes

<table>
<thead>
<tr>
<th>Region</th>
<th>2013</th>
<th>2017</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oceania</td>
<td>1,500</td>
<td>1,600</td>
<td></td>
</tr>
<tr>
<td>East Asia</td>
<td></td>
<td></td>
<td>17,600</td>
</tr>
<tr>
<td>South Asia</td>
<td>3,300</td>
<td>3,500</td>
<td></td>
</tr>
<tr>
<td>West Asia</td>
<td>2,560</td>
<td>4,600</td>
<td>11,500</td>
</tr>
<tr>
<td>Africa</td>
<td>4,050</td>
<td>5,100</td>
<td>10,473</td>
</tr>
<tr>
<td>Latin America</td>
<td></td>
<td></td>
<td>8,250</td>
</tr>
<tr>
<td>North America</td>
<td>3,350</td>
<td>3,450</td>
<td></td>
</tr>
<tr>
<td>EECA</td>
<td>5,400</td>
<td>5,400</td>
<td></td>
</tr>
<tr>
<td>West/Central Europe</td>
<td>3,450</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Demand Changes

<table>
<thead>
<tr>
<th>Region</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oceania</td>
<td>EV could fuel demand</td>
</tr>
<tr>
<td>East Asia</td>
<td>Potential fluctuation in China</td>
</tr>
<tr>
<td>South Asia</td>
<td>Stable to firmer on agricultural development</td>
</tr>
<tr>
<td>West Asia</td>
<td>Continued growth at Ma’aden</td>
</tr>
<tr>
<td>Africa</td>
<td>Continued growth at OCP</td>
</tr>
<tr>
<td>Latin America</td>
<td>Phosphate production growth</td>
</tr>
<tr>
<td>North America</td>
<td>Decline on phosphate rationalisation</td>
</tr>
<tr>
<td>EECA</td>
<td>Will hinge on phosphate landscape</td>
</tr>
<tr>
<td>Europe</td>
<td>Competition in downstream applications</td>
</tr>
</tbody>
</table>
### US Annual Sulfur Production/Demand

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>1,130</td>
<td>1,040</td>
<td>1,020</td>
<td>1,000</td>
<td>982</td>
<td>808</td>
<td>662</td>
</tr>
<tr>
<td>Oil Refining</td>
<td>7,100</td>
<td>7,370</td>
<td>7,580</td>
<td>8,030</td>
<td>7,910</td>
<td>8,290</td>
<td>8,410</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>8,230</strong></td>
<td><strong>8,410</strong></td>
<td><strong>8,600</strong></td>
<td><strong>9,030</strong></td>
<td><strong>8,892</strong></td>
<td><strong>9,098</strong></td>
<td><strong>9,072</strong></td>
</tr>
<tr>
<td><strong>Y/Y %</strong></td>
<td>2.2</td>
<td>2.3</td>
<td>5.0</td>
<td>-1.5</td>
<td>2.3</td>
<td>-0.3</td>
<td></td>
</tr>
</tbody>
</table>

| DEMAND        | 10,100 | 9,800 | 9,800 | 9,600 | 9,200 | 9,200 | 9,100 |
| **Y/Y %**     | -3.0   | 0.0   | -2.0  | -4.2  | 0.0   | -1.1  |
|-----------|------|------|------|------|------|------|------|
| Natural gas | 3,779 | 3,167 | 3,109 | 2,752 | 2,599 | 2,137 | 2,143 |
| Oil sands/refining | 2,364 | 2,593 | 2,647 | 2,630 | 2,648 | 2,575 | 2,779 |
| **TOTAL** | **6,143** | **5,760** | **5,757** | **5,382** | **5,248** | **4,712** | **4,922** |
| Y/Y %     | -6.2 | -0.1 | -6.5 | -2.5 | -10.2 | 6    |      |
Sulfuric Acid
Supply and Demand, North American Focus
Supply

Sulfuric Acid Supply by Region - '000 metric tonnes

Oceania
- 2013: 6,870
- 2017: 7,000

East Asia
- 2013: 25,505
- 2017: 37,685
- 2022: 98,777

South Asia
- 2013: 10,195
- 2017: 9,845

West Asia
- 2013: 6,920
- 2017: 10,520

Africa
- 2013: 20,690
- 2017: 23,700
- 2022: 37,685

Latin America
- 2013: 16,800
- 2017: 29,025

North America
- 2013: 33,360

EECA
- 2013: 4,480
- 2017: 16,600

Central Europe
- 2013: 4,690
- 2017: 4,690

West Europe
- 2013: 13,874
- 2017: 14,385

West Asia
- 2013: 25,505
- 2017: 37,685
- 2022: 98,777

North America
- 2013: 33,360

EECA
- 2013: 4,480
- 2017: 16,600

Central Europe
- 2013: 4,690
- 2017: 4,690

West Europe
- 2013: 13,874
- 2017: 14,385

Region: West Europe, Central Europe, EECA, North America, Latin America, Africa, West Asia, South Asia, East Asia, Oceania
Supply Focus – Production Issues

Philippines: Exports Dipped in 2018 on Pasar Force Majeure – ‘000 metric tonnes

India: Acid Imports Up on Sterlite Shutdown – ‘000 metric tonnes

*Annualised figures based on Jan-Nov 2018 data for India, Indonesia and Malaysia.

Source: GTIS
Sulfuric Acid Demand by Region - '000 metric tonnes

- **Oceania**
  - 2013: 7,450
  - 2017: 7,350
- **East Asia**
  - 2013: 10,815
  - 2017: 11,215
  - 2022: 90,250
- **South Asia**
  - 2013: 7,775
  - 2017: 13,975
- **West Asia**
  - 2013: 7,775
  - 2017: 13,975
  - 2022: 26,500
- **Africa**
  - 2013: 26,500
  - 2017: 37,000
- **Latin America**
  - 2013: 22,480
  - 2017: 23,400
- **North America**
  - 2013: 37,150
  - 2017: 35,175
- **EECA**
  - 2013: 17,420
  - 2017: 17,420
- **Central Europe**
  - 2013: 2,920
  - 2017: 2,920
- **West Europe**
  - 2013: 12,720
  - 2017: 12,535
Demand Focus – Improved Copper Demand

South Africa: sulfur Imports Up in 2018 on Rising Demand from DRC - ‘000 metric tonnes

Chile: Acid Imports Up in 2018 on Improved Copper Economics - ‘000 metric tonnes

Source: GTIS
### Trend: China the Opportunistic Exporter

<table>
<thead>
<tr>
<th>Year</th>
<th>Sulphur-based Acid Production</th>
<th>Smelter Acid Production</th>
<th>Import</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>44,889 kt</td>
<td>30,221 kt</td>
<td>1,171 kt</td>
<td>1,281 kt</td>
</tr>
<tr>
<td>2016</td>
<td>42,895 kt</td>
<td>33,131 kt</td>
<td>1,433 kt</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>44,210 kt</td>
<td>33,640 kt</td>
<td>1,213 kt</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>44,891 kt</td>
<td>41,640 kt</td>
<td>953 kt</td>
<td></td>
</tr>
</tbody>
</table>

**China Export Points**
- Humon
- Tongling
- Two Lions
- Chinalco?
- Jinchuan
- Nanguo Copper?
US Smelters

- Asarco – Hayden, AZ
- Freeport – Miami, AZ*
- Newmont – Carlin, NV*
- Kennecott – Garfield, UT
- Climax Moly – Fort Madison, IA
- Blue Pearl - Langeloth, PA
- Nyrstar – Clarksville, TN

* uses internally, limited market impact
Canada Smelters

- Teck – Trail, BC
- Vale – Sudbury, ON
- Glencore – Sudbury, ON
- Glencore – Valleyfield and Horne
- Glencore – Belledune, NB
US Sulfuric Acid Import Locations

**Texas**
- Saconix (Martin) – Beaumont
- Glencore – Houston
- PCI – Pasadena

**Louisiana**
- Trammo – Harvey
- Nutrien – Geismar

**East Coast**
- Glencore – Savannah, GA
- Southern States – Savannah, GA
- ADM – Wilmington, NC

**Florida**
- SATCO – Tampa
- Shrieve – Jacksonville
US Imports

2017 Sulphuric Acid Imports - metric tonnes (t)

- Offshore imports: 1,894,441
- Canada - rail: 517,534
- Mexico - rail: 457,906

Canada - rail, Mexico - rail, Offshore imports
US Offshore Imports

Sulfuric Acid - Offshore Imports to US

Germany
Spain
Finland
Sweden
Belgium
Poland
Bulgaria
Chile
Norway
Peru

metric tonnes (t)
European Exports

European Sulfuric Acid Offshore Exports - 2017

- Morocco
- Turkey
- US
- Brazil
- Argentina
- Namibia
- Venezuela
- Algeria
- Chile
- Tunisia
- Cyprus
- Mali
- Dominican Republic
- Burkina Faso
- Ghana

‘000 metric tonnes (t)
US Rail Imports

Sulfuric Acid - Rail Imports to US

- **2015**: 2,068,538 metric tonnes (t) from Canada, 767,510 metric tonnes (t) from Mexico
- **2016**: 2,099,526 metric tonnes (t) from Canada, 639,761 metric tonnes (t) from Mexico
- **2017**: 1,892,716 metric tonnes (t) from Canada, 517,534 metric tonnes (t) from Mexico
US Supply and Demand Changes

Supply
- Loss of supply from Vale’s transition to one furnace at Sudbury – impacts Chemtrade Logistics
- Mosaic’s idles Plant City – captive, limited market impact
- Nutrien’s reduced consumption at Redwater – captive, limited market impact
- No TECO production due to nat gas versus petcoke pricing

Demand
- Henry, Illinois amsul start up – 2017
- Tamra Mining in Utah, firmer consumption – 2018+
- Excelsior Mining in Arizona – 2019
- Taskeo Mines in Arizona – 2019
- Barrick consumption up - 2019
- American Zinc Recycling in North Carolina – 2019
- Evonik in South Carolina – 2019
- Nutrien decrease on Geismar, Louisiana – 2019