

## The Sulfuric Acid Market

### The Economic Recovery and Sulfuric Acid Demand

Since the last NorFalco newsletter, the economic data has generally been positive and the fears of a 'double dip' or a 'W-shaped' recovery have diminished. Led by manufacturing, the US economy has continued to grow, and by the end of last year quarterly real GDP had essentially recovered above the pre-recession peak, despite a slowing of the rate of growth in GDP in the second quarter of last year before it accelerated again in the second half. After falling 2.6 percent in 2009, real GDP increased 2.8 percent in 2010 to nearly \$13,250 billion thanks to positive contributions from private inventory investment, exports, personal consumption expenditures, non-residential fixed investment, and federal government spending.

However, for many it does not feel like the economy has recovered to pre-recession levels. Construction remains at very low levels, especially in the residential sector where the aftermath of the sub-prime debacle continues to play out as a glut of unsold homes overhangs the market while yet more properties threaten to come onto the market as they move into foreclosure. Unemployment has remained at high levels as private employers have been reluctant to take on new hires, while state and local governments have been forced to slash

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## Message from the President: Paul Shaw, NorFalco Inc.

NorFalco is approaching the ten year anniversary of the company this year. Many of you have been NorFalco customers from the very beginning and we truly appreciate the opportunity to work with you and continue to build strong relationships.

Over the last ten years, NorFalco has focused on a path of continuous improvement offering innovations like our on-line safety training and E-Business tools. We have also maintained a strong focus on safety, including industry-leading tank car design and providing a high level of product stewardship at all levels of our supply chain.

Looking back it is amazing how quickly the time has passed and the many changes and challenges we have seen in the marketplace. We have witnessed dramatic shifts in the supply/demand balance over the years and throughout NorFalco has attempted to provide a reliable supply of acid and maintain stability of supply wherever possible. It seems in the sulfuric market, as with many things, the only constant is change.

As the economic recovery moves forward it appears that the supply/demand balance is tightening once again. As always, strong communication will be the key to balancing the available supply of acid with your needs.

Thank you for choosing NorFalco as your supplier and we look forward to maintaining our relationships for many years to come.

### NorFalco's Product Stewardship Means:

- Pre-delivery safety checks and assistance
- Rigorous carrier and terminal qualification and management training
- Industry-leading tank car design and quality
- Customer outreach and proactive technical visits
- On-Line Product and Safety Training – available from anywhere anytime
- On-site safety and technical training sessions
- Best practice safety, handling and technical reference materials
- Extensive emergency response system and incident management
- Regional safety and technical seminars

### Did you know?

In 2008 NorFalco's acid supply helped produce:

- 39 million lead-acid batteries or one third of all US lead-acid battery shipments - enough to supply batteries to 247 million total registered vehicles in the US!
- 1.07 million tons of aluminum sulfate ('alum') which can treat over 10 trillion gallons of drinking water. Equal to over half the US population's annual drinking water needs!
- Over 25,000 tons Magnesium sulfate,, also known as Epsom Salt, which is used as bath salts, foot baths, restoring lava lamps, and even used for making tofu.

## NorFalco Safety and Technical Seminars

As part of NorFalco's continuous efforts to promote that we are "Delivering MORE than H<sub>2</sub>SO<sub>4</sub>", each year we offer safety and technical seminars catering to customers, terminals, carriers, fire departments and DOT inspectors. Each year, over 100 participants attend our seminars. These seminars are complimentary with product supply. Each participant will receive training certificates which help meet regulatory compliance training requirements for DOT, OSHA, TDG and WHMIS.

This year NorFalco will offer two seminars. The first seminar will be held May 5<sup>th</sup> at the Double Tree Hotel and Conference Center in St. Louis, MO. The second seminar, offered in French, is tentatively scheduled for September and will be held in Montreal, Quebec.

For additional information, please contact your NorFalco commercial representative.



Photo courtesy of the Double Tree Hotel

## NorFalco - Sulfuric Acid and Sustainable Development

NorFalco is a 100% Xstrata owned marketing and distribution company responsible for selling 2 million tons of sulfuric acid produced by Xstrata's Canadian smelters. Key to our efforts are the sustainable development ethics of Xstrata and the safe shipping and handling of sulfuric acid. We take a "cradle to grave" approach to this hazardous product and are very proud of our record in the industry.

In the short span of a few decades sulfuric acid has become a critical by-product in the mining and smelting of base metals. Some of us may not remember the environmental damage created by sulfur and carbon dioxide emissions, nor remember the discussion it created in the halls of Canadian and US governments. It was this damage and its subsequent debate that resulted in the mandating of sulfur dioxide (SO<sub>2</sub>) capture at metal smelters in 1980's in eastern Canada.

First a quick lesson in pyro-metallurgy. When roasted, sulphide bearing metal ores such as zinc, copper, nickel and lead concentrates release sulfur as a gas (SO<sub>2</sub>). With sulfur content in the ore of 20-30%, the volume of gases released into the atmosphere is considerable, if not captured. SO<sub>2</sub> is therefore produced involuntarily with the production of metal. When these gases combine with moisture they form acid rain. A closer look at the production of sulfuric acid and how NorFalco distributes it, reveals remarkable sustainability attributes touching many of Xstrata's Sustainable Development Standards.

The production of SO<sub>2</sub> and other acidic gases is mainly a by-product of industrialization. Coal fired power plants, factories and motor vehicles are principal causes. The construction of ever taller smokestacks, however, is not the solution. They only send the emissions further afield. Acid rain disrupts lake ecosystems and kills wildlife in affected lakes, rivers and streams. Acid rain also damages soil and the tree roots in it. When soil is acidified, tree roots are damaged, leaving them unable to draw in enough nutrients to support the tree. The capture of SO<sub>2</sub> reduces the impact of smelting activity on the local environment and its biodiversity. The capture of SO<sub>2</sub> helps to preserve the long-term health, function and viability of the natural environments affected by our operations. Our Xstrata plants operate within a larger community and our activities need to respect the interests of our external stakeholders to create sustainable community relations. Xstrata plants now capture over 90% of our SO<sub>2</sub> emissions in Canada meeting this key environmental sustainability objective. The SO<sub>2</sub> gas captured is then cleaned and reacted with water to form H<sub>2</sub>SO<sub>4</sub>, otherwise known as sulfuric acid.

But sustainability is not just about the environment. Sulfuric acid is one of the most widely consumed bulk chemical commodities. The global marketplace for H<sub>2</sub>SO<sub>4</sub> is close to 200 million metric tonnes per year. Sulfuric acid is a powerful, virtually irreplaceable constituent of countless industrial processes. It conducts electricity, neutralizes alkalies, acts as a solvent and corrodes many metals. When strong sulfuric acid is heated, it behaves also as an oxidizing agent dissolving relatively unreactive metals such as copper, mercury and lead. As sulfuric acid has a very strong affinity for water, it is a valuable desiccating agent and can be used to dehydrate many compounds. It is used in the manufacture of products such as fertilizers, paints and pigments, explosives, pulp and paper, plastics, detergents, textiles,

## NorFalco - Sulfuric Acid and Sustainable Development

batteries and a variety of specialty chemicals. It is also used for processing mineral ores, metal refining, petrochemical processing and water treatment. Transforming a waste gas into a marketable by-product of metal smelting recycles the sulfur molecule and therefore creates an efficient allocation of resources. It also avoids expensive neutralization and waste disposal costs. Moreover, the sale of by-product sulfuric acid generates a valuable new revenue stream for the plant that contributes to the overall fixed cost of operating the plant. As an agent for the distribution and sale of Xstrata's Canadian metal smelting plant's sulfuric acid production, NorFalco provides a revenue stream that increases our plants long term viability, thereby meeting another sustainability objective.

The same chemical properties that make sulfuric acid useful to industry also make it a hazard and a potential danger to those operators handling and transporting it. Sulfuric acid's corrosive and reactive properties make it extremely hazardous when it comes in contact with organic substances, such as the sugars, fats and proteins that make up human tissue. Many of NorFalco's customers are hundreds of miles from Xstrata acid producing plants and outside NorFalco's direct control. As manufacturers of sulfuric acid, Xstrata through NorFalco, implements and manages an integrated system which identifies, analyzes, evaluates and treats sustainable development impacts and risks associated with sulfuric acid at every stage of its distribution and life cycle. This "cradle to grave" ethic is a principal tenet of Product Stewardship and is integral to everything we do at NorFalco.

Sustainability is also concerned with the health and safety of Xstrata employees, customers and service partners. Looking after the long term safety of acid handlers creates a sustainable business model. An important component of NorFalco's Product Stewardship ethic is ongoing safety training. NorFalco employs a team of technical representatives whose responsibility it is to train all those involved in handling and transporting acid from Xstrata plant to consuming site. These training seminars are held at our customer or partner's site or as part of a regional seminar drawing in wider group of attendees involved in acid handling and first response. This training reduces the number and severity of incidents and keeps employees and our partners safer.

As you can see, NorFalco's product stewardship is a natural partner for Sustainable Development.

### Product Stewardship Highlights

#### 1. NorFalco successfully completes Responsible Distributor Re-Validation

In October 2010 NorFalco was successfully re-validated in accordance with National Association of Chemical Distributors' (NACD) Responsible Distribution principles. NorFalco's senior management was recognized as "Leaders in Responsible Distribution".



#### 2. NorFalco successfully completes Responsible Care Re-Verification

NorFalco also was re-verified in accordance with the Chemical Industry Association of Canada (CIAC) Responsible Care principles in February 2011. NorFalco's web based training was cited as an industry "best practice".



**Responsible Care®**  
Our commitment to sustainability.

3. NorFalco has been awarded Canadian National's (CN) Gold Award for safe shipping of rail cars in 2010.

4. NorFalco is also the recipient of the 2010 Union Pacific Chemical Transportation Safety Pinnacle Award. NorFalco exhibited safe loading practices and had zero non-accidental releases last year.

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### Motor Carrier Performance Award Winners

This year two NorFalco motor carriers qualified for NorFalco's Motor Carrier of the Year Award for leadership in safety and performance for calendar year 2010. NorFalco Inc. is proud to announce and congratulate **Groendyke Transport, Inc.** of Enid, OK and **Regional Enterprises Inc.** of Hopewell VA as recipients of the award.

To be eligible for this recognition, NorFalco carriers are rigorously assessed on a combination of safety performance, regulatory compliance, on-site audit results and customer service performance. Level I awards are granted to carriers that have hauled more than 500 loads of NorFalco sulfuric acid. Level II awards are provided to carriers that have transported between 100 and 500 loads.

## The Economic Recovery and Sulfuric Acid Demand

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payrolls in the face of shrinking tax revenues. For manufacturers, operating rates remain well below pre-recession levels as consumer demand for their products has not fully recovered to where it was in 2007-2008. In contrast to the total recovery in real GDP, manufacturing operating rates have only recovered about two-thirds of their drop from pre-recession levels.

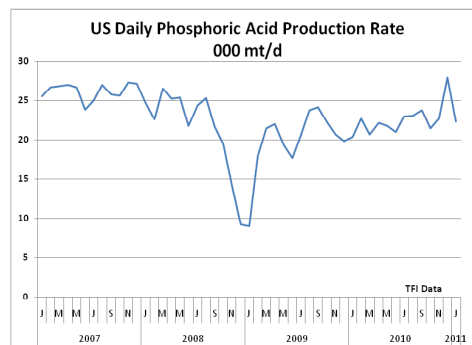
However, to many observers the sulfuric acid market in the USA appears to have rebounded from its recession lows. Supplies are currently tight and demand appears strong. During the first half of 2009 as the recession slashed demand across many industries, acid producers' inventories ballooned before they could reduce production sufficiently and secure enough export sales to balance demand. Acid inventories remained higher than normal through 2009, but the need for production curtailments eased as demand began to recover. Labor disputes further reduced acid supplies, particularly with the strike at Vale's nickel smelter in Canada from Q2 2009 into Q3 2010, and in Mexico where acid production at the La Caridad copper smelter was limited due to a long-running labor disagreement which kept a major mine source closed until Q3 2010. In May 2010, due to lack of sufficient economically viable feedstocks, Xstrata permanently closed its Kidd Creek copper and zinc smelters and acid plants, a source of about 600,000 tons per year of acid to the market. Moreover, by early 2010 producers of acid from sulfur began to fall short of production goals due to insufficient sulfur supplies. The sulfur scarcity arose from lower levels of sulfur production from domestic oil refineries, whose operating rates were still depressed by recession-induced shrinkage in fuel demand, and from strategic decisions by the refineries to diversify their sulfur sales into export markets to reduce market risks encountered during the recession in early 2009.

The overhang of acid stocks meant that for much of 2009 and early 2010, despite the production curtailments and disruptions, there was ample supply of acid to satisfy consumer needs, which were recovering from a low early-2009 bottom. However, there has been little evidence of surplus acid stocks since the middle of 2010 – acid exports from North America have dropped off. In the past year demand has apparently recovered to the point there is no excess of production and no stock overhang to buffer any disruptions to supply, and with little local spot acid available, spot prices have risen in order to attract offshore acid into US coastal markets against competition from buyers in South America.

Sulfuric acid demand is often considered an indicator of industrial activity. So how is it that acid demand has recovered so strongly despite manufacturing running well below pre-recession operating rates? In this article we will look at some acid-consuming business sectors to see how their activity has fared during the recession and recovery.

### Phosphate Fertilizers

Phosphate fertilizer production is the largest single end use for acid, about 17 to 20 million tons annually, representing over 70% of total consumption in the USA. During 2008 soaring commodity prices in the first half of the year led to strong increases in fertilizer prices, and by the fall with rising uncertainty about crop prices many farmers decided to cut back on their fertilizer purchases and 'mine' the residual phosphates remaining in the soil. Phosphate fertilizer demand and production tumbled in the autumn of 2008 through early 2009 as the economic crisis and credit crunch took hold, further impacting domestic and export demand for fertilizers. This can be seen in the next chart, which shows the daily production rate for phosphoric acid, the key component in phosphate fertilizers. Since most sulfuric acid used in phosphoric acid production is produced on-site from sulfur, the phosphate production plunge had a severe and sudden impact on sulfur demand. The merchant acid market was also impacted as fertilizer producers ceased purchases of acid to supplement their own production. By the end of 2009 crop prices had improved and farmers could no longer expect to keep mining the soil from prior applications, so demand began recover, which stimulated production to ensure sufficient fertilizer for the spring season. Export sales added further demand for phosphates, and phosphoric acid recovered to pre-recession levels by the end of 2010. The drops in production in early 2010 and 2011 were largely due to lack of sufficient sulfur to meet production needs.



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## Industrial Production

The industrial sector represents the balance of acid consumption in the USA, about 30%. The US Federal Reserve Bank publishes statistics on industrial production and operating rates for numerous segments of US industry in order to track their contribution to the economy. The widely followed monthly Industrial Production index is a leading indicator of the quarterly GDP changes. While real GDP has recovered to its 2007 pre-recession peak, the US industrial economy has lagged behind, reaching just over 95% of its average 2007 levels by January, 2011. However, a number of key acid-consuming industrial sectors have recovered better than industry overall, thus helping to explain the apparent strength in the recovery in acid demand.

## Chemicals

The chemical industry is one of the largest industrial consumers of sulfuric acid, using about two million tons annually to produce water treatment compounds, pigments, synthetic materials and plastics, organic chemicals and inorganic chemicals. The downturn hit the chemical industry sooner than the overall industrial economy, but it began to recover earlier too, helped by strong export performance thanks to demand from faster-growing economies such as China and by a weaker US dollar. The chemical industry has produced at higher rates than overall industry for almost all of the recovery so far, and by January, 2011 was producing almost 98% as much as in 2007, whereas total industry had recovered to just over 95% of 2007 rates.

## Pulp & Paper

The pulp and paper industry is a significant driver of sulfuric acid demand, through direct consumption of about one million tons of acid annually for water treatment and production of chlorine dioxide bleach, and through consumption of chemicals produced from sulfuric acid such as aluminum sulphate. The industry was still going through a period of consolidation and restructuring to cope with changing markets and foreign competition when the recession hit. The sudden drop in demand for many paper products, especially for industrial packaging and for print media, led to Chapter 11 declarations by major producers, mill closures, asset sales and mill conversions to different products. The restructuring process is still ongoing as some product segments, such as newsprint, are suffering long-term decline in demand in North America.

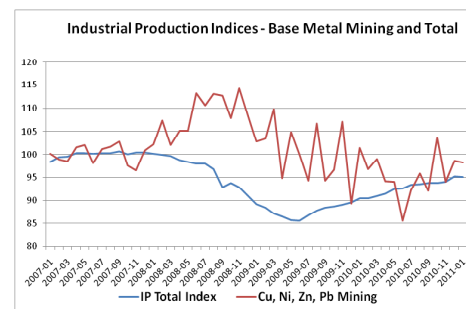
Paper products are made from wood pulp as well as other materials such as recycled paper and cardboard. Bleaching takes place at the wood pulp production stage and represents much of the acid use

in this industry. The wood pulp may be produced at the same site in an integrated paper mill operation, or it may be purchased from merchant pulp mills located elsewhere. During 2009 production of wood pulp was sustained despite the drop in paper product demand thanks to windfall renewable energy credits that US pulp producers could earn when they burned their 'black liquor' waste in the mill's boilers. Since paper demand in Asian markets was still growing strongly, surplus US production of pulp could be readily exported while the mills continued operating and collecting the energy credits. The tax credit loophole was plugged at the end of 2009, but by then domestic demand for pulp had improved and production rates were able to be sustained.

The IP data shows the rapid rebound in production from acid-intensive pulp mills accelerated rapidly in Q3 2009 to reach 95% of 2007 levels, then worked its way back to 100% by the end of 2010. By contrast the paper side of the industry was lagging the overall recovery in industrial production, held down by the decline in newsprint and other non-bleached paper and packaging products to only about 90% of 2007 levels.

## Copper Mining

The use of sulfuric acid for leaching copper from suitable oxide ore types has grown dramatically in the past 30 years, approaching 1.5 million tons annually in the USA, as it offers lower costs than the traditional grind-concentrate-smelt-convert-refine process used for sulphide ores. Acid usage in mining of other base metals in the USA, such as nickel, zinc and lead, is much smaller than for copper, as their production volumes are much less and their acid usage is principally for water treatment rather than metal extraction. The Industrial Production Index for copper, nickel, zinc and lead mining in the USA is therefore largely representative of acid consumed in copper ore leaching.



The chart above shows that copper ore leaching apparently expanded to over 110% of 2007 levels while the rest of the economy was in decline in 2008. During the first three quarters of 2008 prices were high for copper, as was the case for many

commodities, so mines maximized copper output. When metal prices crashed in Q4 2008 mine production did decline modestly, but producers tended to curtail higher cost sulphide production and maintained lower cost production from leaching oxide ores through 2009 and 2010, although with wide swings in output from month to month. By the fourth quarter of 2010, copper production was again back to near 2007 rates, thanks to high copper prices. High copper prices have continued into 2011 and ore leaching demand for acid should grow further as mines seek to maximize copper production.

### **Ethanol**

Production of corn-based ethanol in the USA has grown strongly in the past decade as corn farmers sought to diversify their income and governments encouraged bio-fuel production to reduce America's dependence on imported fossil fuels. Some ethanol is sold as an 85% ethanol/15% gasoline blend (E85), suitable for 'flex-fuel' vehicles. However most ethanol has been blended into gasoline as an additive, up to 10% content (E10), initially to meet EPA targets for oxygenated fuel, and then to meet government mandated targets of increasing bio-fuel usage. Most gasoline sold as motor fuel in the USA now is at or just below 10% ethanol content in order to meet the overall annual targets.

Ethanol plants consume sulfuric acid for several purposes, principally for water treatment and for equipment cleaning. While acid is a relatively small input at an ethanol plant, the sheer number of plants and the growth in ethanol production volumes have made this industry an important acid consumer overall. While it is hard to precisely determine acid use by this industry, NorFalco estimates that it has now risen to over 400,000 tons of acid annually; approaching half the volume used in pulp and paper or about one-third the usage in copper ore leaching.

The recession did impact ethanol production and demand for acid as some ethanol producers went bankrupt during the credit

crunch, but most bankrupt plants eventually reopened under new owners. Moreover, new plants came into production as they completed construction that had begun before the recession. Ethanol production demand for acid should be sustained through 2011 as a one-year extension in tax credits and tariff protection from imports was passed by Congress at the end of 2010, and targets for total corn ethanol use are set to rise. In addition, if oil and gasoline prices are sustained at high levels following the turmoil in North Africa and the Middle East, then drivers of flex-fuel vehicles may begin using more E85 fuel as it becomes more economically attractive.

### **Outlook**

In summary, one of the reasons that acid demand has performed more strongly than the overall industrial recovery is because production in key acid consuming sectors recovered faster, such as in fertilizers, chemicals, pulp and copper mining, or because its growth was driven by government mandates, as in the case of ethanol. There are new acid production sources entering the market this year, such as a new sulfur burner at a copper mine in Arizona which will replace the need to source expensive offshore acid imports for copper leaching, and a fertilizer plant in Texas which will halt phosphate fertilizer production and sell its sulfuric acid production into the merchant market around the US Gulf, but there seems little risk of the market becoming over-supplied, especially since sulfur burning acid plants will continue to experience tight sulfur availability as oil refiners keep exporting sulfur to spread their market risk.

As the economic recovery continues, growth in acid demand should continue to outpace overall industrial growth, and thus should absorb the additions to supply. While rising oil prices could pose a risk to the economic recovery, at this time they are not near the point of posing a real threat and other economic forces are still building momentum which should sustain growth.

Kim Ross, Director of Marketing



NorFalco Inc. is one of the largest merchant marketers of sulfuric acid in North America, selling and distributing about two million tons per year. NorFalco's extensive multi-modal distribution network, supplied by the metallurgical facilities of parent company Xstrata, serves customers from a wide variety of industries.