

# SULPHUR

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**W**ith flat demand and growing production, the world sulphur market remained in surplus in 2001. However, significant tonnage was held off the market by some suppliers and this helped firm prices in the second half of the year. This firming trend has continued and accelerated in 2002, mostly driven by improved demand. Sulphur prices have recovered during the first half of 2002 and are expected to increase further in the second half of the year.

## Supply Developments

In analysing the sulphur market, it is necessary to look at sulphur in all forms, not just elemental sulphur (brimstone). All-forms sulphur includes, in addition to elemental sulphur, the exploited sulphur values of pyrite and off-gasses from non-ferrous metal smelters. Non elemental sulphur - generally utilised in the form of sulphuric acid - accounts for 30% of total all-forms supply.

## World Sulphur (Mt)

	Supply		Demand	
	2000	2001	2000	2001
Elemental	41.8	41.5	39.8	39.3
Pyrite	5.2	5.2	5.2	5.2
Other-forms	13.8	14.5	13.8	14.5
<b>TOTAL</b>	<b>60.8</b>	<b>61.2</b>	<b>58.8</b>	<b>59.0</b>

Elemental sulphur is by far the most important sector of the market and is the sector that sees the market swings. Elemental sulphur is produced either from ores by conventional mining or the Frasch method (mined sulphur) or as a by-product of sour natural gas processing, sour crude refining, tar sands processing and stack gas clean-up (recovered

sulphur). Mined sulphur production has declined sharply in recent years and recovered sulphur production now accounts for over 97% of total world elemental sulphur production. Total elemental sulphur production in 2001 was 41.5 Mt, marginally down on 2000.

Frasch sulphur is produced by injecting super-heated water into sulphur-bearing deposits to melt the sulphur, which is then forced to the surface by compressed air. Frasch sulphur production on a commercial scale takes place in Poland and Iraq. Frasch sulphur production ceased in the US in 2000. Mined sulphur production in 2001 is estimated to have totalled 1.1 Mt compared with 2.3 Mt in 2000. The reduction was due to the ending of US production and market-driven production cutbacks in Poland. Freeport Sulphur closed the last remaining Frasch mine in the US, Main Pass, which was located offshore Louisiana in 2000 and is selling off the physical assets of the mine.

Polish Frasch sulphur production was around 0.9 Mt in 2001, compared with 1.2 Mt in 2000. Production has been cut further, and is now restricted to one mine and will probably total around 600,000 t in 2002. Mined sulphur production in Iraq is estimated at around 200,000 t, although there is the potential to produce between 1 Mt and 2 Mt/y. Production is currently at a low level because UN sanctions forbid exports and production is being run at a level sufficient to meet domestic demand. Iraq has been supplying Jordan with sulphur since the end of 2000, but this is mostly coming from stock.

World production of recovered sulphur increased from 39.5 Mt in 2000 to 40.4 Mt in 2001, the growth coming from increased sulphur recovery from both sour gas processing plants and from the refining of sour crude oil. Sulphur recovery at oil refineries

increased from 16.2 Mt to an estimated 16.7 Mt, with increases throughout the world. The US is by far the largest producer of oil-recovered sulphur, with an estimated output of 6.5 Mt, compared with 6.4 Mt in 2000. Sulphur recovered from sour gas production totalled 22.5 Mt in 2001, marginally up on 2000. Canada is the largest producer at 7.0 Mt, followed by Russia at 4.8 Mt, Saudi Arabia at 2 Mt and the US with 1.8 Mt. Other significant producers are United Arab Emirates, France, Germany, Kazakhstan, Uzbekistan, Kuwait, Iran, Iraq, Qatar and Mexico. Production is growing rapidly in the Middle East.

World recovered sulphur production from other sources - oil sands, stack gases, etc. - totalled 1.2 Mt, around two-thirds of which was from oil sands operations in Canada. This sector is set to grow strongly with further developments in Canada and the start-up of heavy oil upgrading projects in Venezuela.

Non-elemental sulphur production totalled 19.7 Mt sulphur equivalent in 2001, compared to 19.0 Mt in 2000. The two components of this category are pyrite and 'other-forms'. Pyrite sulphur output was stagnant. China is by far the largest exploiter of the sulphur values of pyrite, accounting for over three quarters of total pyrite use. Pyrite use in China has fallen steadily in recent years as sulphuric acid plants have been converted to elemental sulphur use, although the decline now appears to have stopped. Other-forms sulphur production, essentially sulphur recovered in the form of sulphuric acid at non-ferrous metal smelters, increased from 13.8 Mt sulphur equivalent in 2000 to 14.5 Mt in 2001.

### **Demand Developments**

All-forms sulphur consumption increased from 58.8 Mt in 2000 to 59.0 Mt in 2001. The fortunes of the sulphur market depend primarily on the phosphate fertiliser industry. Sulphur consumption in the fertiliser sector (responsible for around two thirds of total demand) was hit by lower phosphate imports by China in 2001, and fell, particularly in the US. In the non-fertiliser sector, demand

increased by around 1.5%. Elemental sulphur consumption fell by 500,000 t to 39.3 Mt. Sulphur demand increased in Asia and Oceania, but fell in most other regions.

### **Market Balance**

The sulphur market has been operating in surplus for the past few years with the market balance being achieved through increases in inventory in Canada, Russia and Kazakhstan. Most other suppliers do not hold long-term inventory. In Kazakhstan, the recovered sulphur producer, Tengizchevroil, is under severe pressure from the government to remove the sulphur inventories.

In the US domestic market, where sulphur is generally marketed in molten form and there are very limited facilities for long-term storage, the collapse of sulphur demand from the phosphate industry caused a major logistical headache. In late 2000, it was expected that the US market would be short of sulphur following the closure of the Main Pass sulphur mine, and several solid sulphur cargoes were imported to help meet demand. However, in 2001, a sharp downturn in demand moved the US market into surplus, and most Canadian imports were backed out of the market by aggressive pricing by US recovered sulphur producers, who feared they would have to close refineries because they were unable to dispose of all their sulphur.

These events have worried both sides of the industry. The shortages in late 2000 have given impetus to the potential development by a group of consumers of a solid sulphur import and remelt terminal in Florida. On the supply side, a number of major producers are looking at the construction of an export facility on the Gulf Coast to provide an outlet in case of future surpluses.

### **Price Developments**

Sulphur prices began a downward trend at the start of 2000. Vancouver levels started the year in the mid-high US\$30s per tonne fob, but slipped during the year to the high US\$20s and settlements for first half 2001 were in the

high teens-low US\$20s fob. Middle East prices also fell, from the high US\$30s to around US\$20/t fob, with spot sales lower than this.

In the second half of 2001 some Vancouver prices were settled as low as US\$14-15/t fob and Middle East prices fell to around US\$16-17/t fob. By October there were signs of the market turning, and Canadian exporters were able to get a small increase in Brazil. Good demand in India enabled Middle East prices to increase from around October, and by December, spot prices had recovered to a high of US\$25/t fob.

In the early part of 2002, Canadian contract prices increased to the high US\$20s fob and Middle East contract prices increased to the low to-mid US\$20s fob. Prices continued to rise through the first half of 2002 with price levels from both Vancouver and the Middle East increasing to the low-mid US\$30s fob. Prices look set to increase further in the second half of 2002.

The US domestic market had an eventful year. In the fourth quarter of 2000 supply fears resulting from the closure of Main Pass, the last remaining sulphur mine in the US, resulted in a US\$6/long ton increase. Further price increases were threatened for the first quarter, but a sharp downturn in demand from the phosphate industry cancelled out the impact of the closure of Main Pass and first quarter 2001 prices fell back to US\$55-57/long ton. Further weakening in demand led US recovered sulphur producers to reduce prices further in the second quarter, in order to discourage imports. Second quarter contract prices were US\$40-42/long ton delivered central Florida.

However, in May, as US producers became increasingly concerned about disposing of their sulphur, there was a retrospective downward adjustment of some contracts to US\$26 delivered, an all-time low. In the third quarter, prices were settled at US\$26-28. In the fourth quarter, improving demand led to

prices being set at US\$31-33, with further increases in first quarter 2002 to US\$38-41 delivered central Florida and in the second quarter to US\$42-45. In late 2001 and early 2002 the tighter US market led to a premium being paid for spot tonnes. The higher prices finally began to attract in more Canadian tonnage and the market is now more balanced and the spot premiums are disappearing.

### Outlook

In the medium term, the key to the prospects for the sulphur industry will be developments in the phosphate industry. If the recovery in phosphate demand continues, this will generate further sulphur use.

Another key factor in sulphur demand growth will be the development of laterite ore leach programmes in the metals industry, particularly for nickel. The first major project, Anaconda in Australia, has had some teething problems, but the use of sulphuric acid for metals leaching looks like developing into a major end use of sulphur. There are a number of projects around the world that will lead to a major growth of sulphur usage, although several of these projects have begun to look uncertain.

On the supply side, this year will see the start of exports from Kazakhstan, where up to now sulphur has been poured to block. Exports from Kazakhstan will start at the end of 2002 at an annual rate of around 800,000 t/y, and are expected to increase further in the following years. Although sales of Kazakh sulphur will yield a negative netback, the operating company, Tengizchevroil, is determined to avoid adding more sulphur to its already considerable block, and is under strong pressure from the government to remove the existing block. The introduction of a major new supply source is certain to have a significant impact on the market in 2003 and prices could fall.

In the medium to longer term, a key factor could be the availability of sulphur from the Middle East. Supply from the region is increasing steadily. A key question is how much Iraqi

tonnage will re-enter the market. If Iraq again becomes a major exporter, it will exacerbate the current imbalance in the market.

There is a growing reluctance among major suppliers to pour to block, even if this means negative netbacks. There is increasing interest in investigating gas- producing processes that do not lead to sulphur output, generally through re-injection. There is a pilot project in the US and sulphur producers in

Canada and Kazakhstan are also investigating ways to avoid producing sulphur. Should these processes become technically and economically viable, it could change the market fundamentals of the sulphur industry.

In the meantime, the sulphur market is still, in terms of production and consumption, in a period of surplus, which shows little sign of changing. Increasingly the key aspect of the sulphur market is becoming one of disposal.