SULPHUR

By Barrie Bain
FERTECON Ltd, Tunbridge Wells, UK

With demand growing more strongly than production, the World sulphur market continued to tighten in 2002 and prices stated to rise strongly. This trend has continued into 2003 despite the imminent start up of exports from Kazakhstan. However, there are signs mid-year that the market has now peaked.

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 just under one-third of total all-forms supply (Table 1).

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 2002 is estimated at 41.6 Mt, an increase of just 200,000 t on 2001.

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 2002 is estimated to have totalled 1 Mt compared with 1.1 Mt in 2001.

Polish Frasch sulphur production was around 0.75 Mt in 2002 compared with 0.88 Mt in 2001. Production is likely to continue at this level. Mined sulphur production in Iraq is estimated at around 250,000 t, although there is the potential to produce between 1 and 2 Mt/y. Production has been at a low level because UN sanctions forbad most exports and production was 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. With the regime change in Iraq it is expected that sulphur production will increase sharply once the country is stabilised.

World production of recovered sulphur increased from 40.3 Mt in 2001 to 40.5 Mt in 2002, the modest 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 16.7 Mt to an estimated 16.8 Mt, with increases in the US and Middle East and declines elsewhere. The US is by far the largest producer of oil recovered sulphur, with an estimated output of 6.7 Mt in 2002, compared with 6.5 Mt in 2001.

Sulphur recovered from sour gas production totalled 22.5 Mt in 2002 compared with 22.4 Mt in 2001. Canada is the largest producer at 6.7 Mt, followed by Russia at 5.3 Mt, Saudi Arabia at 1.9 Mt and the US with 1.6 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 and will also increase in the FSU.

World recovered sulphur production from other sources - oil sands, stack gases, etc. - totalled 1.4 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 20.7 Mt sulphur equivalent in 2002, compared to 20.2 Mt in 2002. 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 is expected to continue to fall as sulphuric acid plants are converted to elemental sulphur use, particularly as environmental pressure builds and older plants are closed. Other-forms sulphur production, essentially sulphur recovered in the form of sulphuric acid at non-ferrous metal smelters, increased from 14.4 Mt sulphur equivalent in 2001 to 15.0 Mt in 2002.

Demand developments

All-forms sulphur consumption increased from 58.8 Mt in 2001 to 60.7 Mt in 2002. 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) benefited during 2002 from strong demand for phosphates. Although demand was lower than production, as some elemental sulphur supplies cannot easily reach market due to logistics constraints, effective supply is reduced.

As a result, the sulphur market firmed throughout 2002 helped by growing import demand from China and lower supply of recovered sulphur from refineries in several key regions. In the first half of 2002, contract prices generally increased by at least US$5 from the extremely low levels of 2001. Vancouver prices increased from the US$15-20 fob range to the US$19-30 range. Middle East prices increased from a range of US$16-28 in December to US$20-30 fob in January.

In the US, prices increased by US$31-33/long ton in the fourth quarter of 2001 to US$38-41 in the first quarter, a reflection of stronger demand and lower supply, a result of lower refinery operating rates and the processing of less sour crude.

Prices continued to rise in the second quarter, with US level increasing by US$4. Middle East prices edged up to a high of US$37 fob on the back of a firmer Indian market. Canadian prices also edged up with reaching a high of US$35 fob in June.

The pace quickened in the second half, with the Chinese market absorbing any spare material from Canada and the Middle East. Canadian suppliers achieved increases of US$6-10 for second half contracts. Spot availability was very limited and those few suppliers with uncommitted tonnes, such as Iran, were able to get an ever-increasing premium over contract levels. Middle East prices rose through the third quarter to a high of US$44 fob, with Vancouver prices increasing to a similar level. In negotiations for the October-March contract period in Brazil, Canadian suppliers achieved increases of around US$10. US prices for the third quarter increased to US$48-52/long ton Central Florida.

In the fourth quarter, US prices increased by a further US$7.50 and there were reports of shortages, with some consumers having to curtail operating rates due to their inability to secure sufficient sulphur. Despite the increases in prices through the year, for many potential Canadian suppliers the levels achievable in the US were not attractive enough to bring rail cars back into service to supply the US market. In the international market, the supply/demand balance tightened, and a strong Indian market brought Middle East prices up, with Iran achieving a spot sale of US$69 fob – more than double the level at the beginning of the year.

First half and first quarter 2003, contract negations saw further significant increases, with Canadian suppliers achieving a range of US$52-62 fob Vancouver. Middle East prices also increased with contracts settling in the US$43-63 fob range, but spot levels rising to US$77 fob, achieved by Iran. US prices increased by a modest US$4 for the first quarter.

During the first quarter of 2003 prices continued to rise with spot levels of US$82 fob achieved in the Middle East. In Brazil, Canadian suppliers settled contracts for April-September in the US$63-67 fob range. In China, second quarter contracts ere settled in the mid US$90s cfr, netting back to Vancouver in the high US$70s fob. Spot levels in China reached over US$100 cfr. The high prices in China resulted in some sulphuric acid producers switching back to using domestic pyrite. However, this is not possible for all producers and imported sulphur demand continued to grow, albeit at a slower pace.

US domestic sulphur prices increased by US$8 for the second quarter.

Outlook

The two key factors in the development of the sulphur market over the balance of 2003 will be the start up of offshore exports from Kazakhstan and the prospects for phosphate industry. Exports through the Black Sea of sulphur from Kazakhstan were scheduled to start in May 2003 at an annual rate of 800,000 t/y, although technical problems mean exports are unlikely to start until June or July. Normally, the introduction of such a large new supply

source would disrupt the market, but this is not the case with the Kazakh tonnes which have already been placed under contract in Mediterranean markets and are eagerly awaited by buyers. The tonnage has found a home relatively easily as the material comes on to the market when demand is strong, and so it has not has to displace as much tonnage form other suppliers as might otherwise have been the case. Furthermore, the tonnage displaced has found a more profitable home in China. In fact, ultimately, it is the continued strong demand from China that has created the firm sulphur market conditions.

The recovery of phosphate demand and production was a key factor in the strengthening of the sulphur market in 2002 and so far in 2003. Providing phosphate demand does not falter, the sulphur market should remain firm for the balance of 2003, but it does appear that the market is now peaking and there could be some modest signs of easing during the second half.

In the medium term, the continued growth of sulphur production in the Middle East, and further expansions in Kazakhstan, will again put the sulphur market back into surplus and prices should eventually weaken. Another supply factor that could influence the sulphur market, both in the short and medium term, is a switch in oil markets back towards sourer crudes. The average sulphur content of crudes refined in many parts of the world has fallen in the past year, and this has meant lower sulphur production than would otherwise have been the case in several regions, including the US, West Europe and the Far East.

An unknown factor remains the re-entry of Iraq as a major sulphur supplier now sanctions are being removed. Iraq is capable of export in excess of 1 Mt/y sulphur. There will clearly be logistical and other constraints due to the dire state of the country's infrastructure but exports by truck to neighbouring countries such as Jordan, Syria and Turkey could restart in the next few months. Offshore exports may take some time to get going as there are likely to be other priorities for the use of the limited port facilities at Umm Qasr.

In the longer term, there is continued 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 fundamental of the sulphur industry.

Table 1

World Sulphur (Mt S-Equivalent)

	Supply		**Demand**	
	2001	**2002**	**2001**	**2002**
Elemental	41.4	41.6	38.6	40.0
Pyrite	5.8	5.7	5.8	5.7
Other-forms	14.4	15.0	14.4	15.0
TOTAL	**61.6**	**62.3**	**58.8**	**60.7**