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REVIEW OF WORLD SULPHUR SITUATION - 1966

by

Dr. Z. Kalix

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Sulphur, either in the elemental form or derived from sulphide minerals, is of vital importance to Australian industry, particularly as the source of sulphuric acid required in the manufacture of fertilizers, mainly superphosphate. It is essential that adequate supplies of acid be maintained if food production is to be given a high priority. Sulphuric acid is an essential raw material for many industrial chemicals, certain pigments and dyes, and many other substances; it is used in petroleum refining, in the rayon industry, and for pickling steel before galvanising, has important applications in extractive metallurgy, such as the electrolytic refining of copper and zinc and extraction of uranium oxide. The most important use of other sulphur compounds is in paper making. Elemental sulphur is used mainly as an insecticide, fungicide, to correct soil deficiency and in the rubber industry.

Sulphuric acid is produced in Australia from various materials. Of the total acid production of 1,677,142 mono-tons (mono-ton is a ton of 100 percent sulphuric acid) in 1965, an estimated 60.4 percent was produced from elemental sulphur; an estimated 16.6 percent from zinc concentrates; an estimated 4.6 percent from lead concentrates and the remaining 1.3 percent from other materials. Details of acid production and consumption of raw materials are given in Table 1.

Table 1. Production of Sulphuric Acid

	Quantity of raw material (tons)		Acid produced (monotons)	
	1964	1965(e)	1964	1965(e)
Elemental sulphur	284,436	330,900	871,084	1,013,496
Pyrite	246,100	230,000	305,935	286,000
Zinc Cons	320,186	340,800	261,686	278,455
Lead Cons	305,889	280,400	83,365	76,552
Other materials	181,284	20,200	20,536	22,639
Total Acid			1,542,606	1,677,142

(e) estimated

The elemental sulphur is imported; all other materials are produced in Australia.

Some 75 percent of the sulphuric acid made in Australia is used in the manufacture of superphosphate about 5 percent in the manufacture of sulphate of ammonia and the remainder for several chemicals, in mining and metallurgy and for other industrial application.

Since 1950 the procurement, freighting and distribution of elemental sulphur for use by Australian sulphuric acid manufacturers has been carried out by the British Phosphate Commissioners on behalf of the Sulphuric Acid Manufacturers Committee. It ceased to exist on 30th June, 1964. Since then, sulphur purchasing arrangements for all members of the old Sulphuric Acid Manufacturers Committee have been in the hands of the Australian Sulphur Purchasing Association for which The British Phosphate Commissioners have been appointed Managing Agents. Under the new arrangement, members of the Australian Sulphur Purchasing Association pay a common f.o.b. price, and costs beyond that, i.e.

freight, insurance, and discharge costs, are a direct charge to the particular member concerned. The delivered price of sulphur therefore varies from port to port and ship to ship.

Imports of elemental sulphur reached their highest level in recent years. In 1965, total imports were recorded at 387,869 tons, valued at $7,496,250 compared with 376,639 tons, valued at $6,508,286 in 1964 and 222,527 tons, valued at $4,303,908 in 1963. In recent years there has been a significant trend towards other sources of elemental sulphur supply than the United States and Mexico. In 1961 these two countries supplied practically the whole of Australia's elemental sulphur requirements of 182,052 tons ($3,840,258). In 1963 the United States and Mexico supplied 79 percent of the total and Canada 16 percent and other countries 5 percent. In 1964 the dominance of the United States and Mexico was cut back to 66.6 percent while Canada's share increased to 33.3 percent. In 1965, however, for the first time, Canada became the chief supplier, supplying 43.4 percent of the total. The United States and Mexico share was reduced to 41 percent and 15.7 percent respectively.

Since 1923, the Commonwealth Government, by paying a subsidy, has actively encouraged the production of sulphuric acid from certain indigenous raw materials such as pyrites and lead sinter gases (from 1957). In 1959, mainly because it was considered that plentiful supplies of sulphur would be available overseas in the foreseeable future, the Government decided to discontinue its support for the installation of any new equipment to manufacture sulphuric acid from indigenous materials. At the same time, it acknowledged that it had obligations to persons who had already co-operated or planned to co-operate in this policy an encouragement. In 1960 separate bounties based on an average disability of local producers of iron pyrite and sulphuric acid produced from it, were introduced. Bounty on acid produced from lead sinter gas was discontinued as from January, 1961, but this was reviewed in 1962, and bounty was paid retrospective. In 1965, the period of operation to both the sulphuric acid and pyrites industries was extended to 30th June, 1969.

The world supply and demand for sulphur particularly for elemental sulphur has changed fundamentally during the last fifteen years. The period, one of sulphur shortage (1950-1) changed to over-supply (1952-62); then in 1963, in contrast to earlier years, world consumption of elemental sulphur reached the level of production and several major suppliers were able to reduce their stockpiles. In subsequent years the unprecedented increase in demand for elemental sulphur and the resultant tight supply had obliged most producers to draw from stockpiles, and to limit forward commitments.

In general elemental sulphur occurs (1) as deposits around volcanoes (Japan, Mexico, Chile etc.); (2) in salt dome cap rocks (Gulf Coast of the United States and Mexico); (3) as sedimentary beds (Poland, Russia, Sicily etc.); (4) sulphuretted hydrogen containing natural gas (Canada, France, United States etc.).

Sulphur in salt dome cap rocks is extracted by the Frasch process, which consists in the injection of superheated water at about 175°C into the sulphur-bearing strata, whereby the sulphur, which melts at 115°C is melted and brought to the surface. Sulphur extracted by this method is called "Frasch" sulphur. Producers are the United States and Mexico.

After Frasch sulphur recovery of sulphur from sulphuretted hydrogen containing natural gas is second in importance as a source of elemental sulphur. The product is called in the industry as "recovered" sulphur. Main producers are Canada, France and the United States. As a matter of interest natural gas in Australia does not contain sulphur; it is classified as a sweet gas.

Elemental sulphur recovered from deposits around volcanoes, or from sedimentary beds or from some of the waste gases evolved at petroleum refineries appear under "others" in Table 2.

Preliminary results indicate that the non-Communist world sulphur production in 1965 increased by over 7 percent to 22.5 million tons. Details are shown in Table 2.

Table 2. Non-Communist World Production of Sulphur in all Forms
(millions of tons)

	1963	1964	1965
Elemental -			
Frasch	6.3	6.9	7.6
Recovered	4.1	4.5	5.0
Others	0.5	0.5	0.6
Total	10.9	11.9	13.2
Non-elemental -			
Pyrites	5.8	6.0	6.1
Others	2.6	3.0	3.2
Total	8.4	9.0	9.3
GRAND TOTAL	19.3	20.9	22.5

The outstanding achievement during 1965 was the increase of the United States Frasch sulphur production by about 900,000 tons to nearly 6½ million tons. Production of Frasch sulphur in Mexico receded. The inability of Pan American Sulphur Co. (PASCO) to fulfil even the reduced export quota of 1.5 million tons, authorised in April by the Mexican government, increased the difference between projected and actual deliveries to world markets to about 800,000 tons.

The production of "recovered" sulphur has become an important part of the sulphur industry. Increased supplies were reported from the United States. In Western Canada output rose only modestly to 1.6 million tons and so displaced Mexico as the world's second largest source of brimstone. In France production was again at the capacity level of around 1.5 million tons.

The Mexican government decree on export control started a rush by consumers to increase their stocks towards April, 1965. This situation was aggravated by certain production difficulties experienced by a major producer of recovered sulphur in Western Canada (substantial decrease in the volume of marketable gas expected to be recovered from Pincher Creek operated by British American Oil Co.) and resulted in a very tight supply position in the second half of 1965. There is no report of any ease in the situation. It is expected that production should be higher in 1966. The gain will not be as large as in 1965. Stocks of both producers and consumers while substantially reduced over the past years can help bridge the gap between demand and production.

Despite the increase in non-Communist World elemental production, there has been a further decline in world stocks during 1965. Producers stocks are estimated to have decreased by some ⅝ million tons to about 5⅝ million tons, including about 4 million tons of U.S. Frasch sulphur.

At the start of 1965 stocks of elemental sulphur held by consumers dependent on imports were at their highest level for many years, reflecting consumers' anticipation during 1964 of the increase in world prices. Although these stocks decreased during 1965, they are, with few exceptions still reported to be not excessive.

Australian consumers stocks of elemental sulphur are reported to be normal. On present indications it is estimated that consumers stocks might decrease from about 185,000 tons at 30th June, 1965, (which is about 46 percent of total elemental sulphur consumption for 1964/65) to an estimated 164,000 tons at 30th June, 1966 (about 38.5 percent of total estimated elemental sulphur consumption for 1965/66).

The tight supply position of elemental sulphur is reflected in the level of listed prices applicable to spot sales which has advanced sharply. SULEXCO's listed brimstone prices were based on $27.00 per ton f.o.b. Gulf ports on 1st December, 1964. New listed prices, based on $31 f.o.b. Gulf ports were effective as from 15th February, 1965. CANSULEX subsequently annointed the export price for Canadian recovered sulphur at $31.50 per ton f.o.b. Vancouver. In April, 1965, a new export price of $35.20 per ton f.o.b. Vancouver, were reported by CANSULEX. SULEXCO has rescinded its previous export price without substituting new listed prices. In October, 1965, by the cutback of Mexican exports have set the tone of world markets. The volume of purchases was very small, and spot prices have hardened and were reported at about $40-42 per ton f.o.b. SULEXCO's price to established consumers was reported to be on basis of $36 per ton f.o.b. Gulf ports. In March, 1966, further increases in listed prices were reported between $45 and $50 per ton f.o.b. Gulf ports.

It seems likely that a great part of further increase in demand for sulphur could be expected to be met primarily by increased output of established major sources of supply. Frasch sulphur in the United States and recovered sulphur in Canada, in the United States and in France.

Two prominent producers of Frasch sulphur in the United States has taken steps to increase supply. Both Freeport Sulphur Co. and Texas Gulf Sulphur Co. are increasing production by 25 percent and are re-examining domes that were previously worked with a view to putting them in production again.

A number of projects regarding new supplies in Canada could be implemented during 1966. Jefferson Lake Petrochemicals plans to double its sulphur recovery plant capacity at the Calgary field to 1,700 tons per day by October. At the Harmattan East Field, the Canadian Superior Oil Company is constructing a 800 tons per day plant to exploit the gas in this region which has an H_2S content of 43 percent and is being developed with sulphur recovery as the primary objective. The vast Athabasca tar sand reserves also promise to yield large tonnages of sulphur in the future. Great Canadian Oil Sands expects to recover 300 tons of sulphur per day, as a by product from a projected daily recovery of some 45,000 bbls. of crude oil. This operation is scheduled for completion by September, 1967.

In Mexico, numerous attempts were reported by interested companies to secure exploration permits. In France, the recently discovered gas field at Meillon held out promise of additional recovered sulphur output. In Italy, plans were under way to make Sicilian sulphur again competitive. The search for sulphur has spread to other countries, including South America and the Middle East. In 1967, new sulphur recovery projects in Iran, Kuwait and Canada are due to be completed with an aggregate annual capacity of nearly $\frac{3}{4}$ million tons of recovered sulphur.

It is envisaged, however, by many sulphur consumers in Australia that easing the tight supply of elemental sulphur could not be expected before 1968/69. The British Phosphate Commissioners expect that there will be a short supply of elemental sulphur in Australia by about 22,000 tons in 1965/66 and estimated sulphur requirement in 1966/67 might be 520,000 tons and estimated availability 372,500 tons only. The situation could be remedied to a certain degree by increasing use of certain indigenous materials such as pyrites for acid manufacture.

During 1965, the Australian sulphuric acid manufacturers utilised about 64 percent of their rated acid production capacity by the production of 1,677,000 mono-tons of acid.

Some increase in acid production from pyrites could be expected. ICIANZ at Yarraville, Vic., has already returned to pyrites roasting. It is expected that in 1966/67 the use will be around 80,000 tons of pyrite from Mt. Lyell. Sulphide Corporation at Cockle Creek uses pyrites from Mt. Morgan. Yearly acid capacity is about 33,000 mono-tons. Sulphuric Acid Ltd. producing around 110,000 mono-tons of acid from Nairne pyrites and is already at capacity level. Slight increase in the use of pyrites from Norseman (and probably also from Kalgoorlie) by Cuming Smith B.P. Ltd. can be expected. A.C.F. & Shirley's Fertilizer have already started to dismantle their pyrite burning plant.

Copper Concentrates from Cobar is roasted by Electrolytic Refining and Smelting Co. at Port Kembla and sulphuric acid is produced from the sinter gases by Australian Fertilizers. Capacity of the plant is around 33,000 mono-tons of acid per year.

Increased acid production from lead and zinc concentrates could not be expected. Acid production by B.H.A.S. at Port Pirie and by Sulphide Corporation at Cockle Creek are already at capacity levels, while sea transport of any plus acid from Risdon to the mainland is highly problematical.