SCOPE FOR THE MANUFACTURE OF SULPHURIC ACID AND HEAVY CHEMICALS BASED ON IT IN HYDERABAD.

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'We may judge with great accuracy the commercial prosperity of a country from the amount of sulphuric acid it consumes.' This is as much true to-day as it was in 1840, a century ago, when Liebig wrote this sentence. Judged from this standard, India is very poor compared to other countries. The world output of sulphuric acid in 1937 was about 10 million tons per annum of which Britain's share was nearly 1 million tons. India's present output of this chemical can be roughly estimated at about 40,000 tons, or nearly one-twentyfifth of that of Great Britain. The total consumption of this chemical in India is not very much different from this figure, as the quantity imported from other countries (representing pure and analytical reagent qualities) does not exceed 300 tons per annum.

Sulphuric acid is the parent substance of modern chemical industry. It is the starting point in the manufacture of many heavy chemicals, such as hydrochloric acid, nitric acid, aluminium sulphate, alum, ammonium sulphate, superphosphate of calcium, sodium sulphate, ferrous sulphate, etc., which are used in large quantities by other industries. It is no less essential to the manufacture of fine chemicals and dye-stuffs. Many of the largest industries which are of vital importance to us in peace and war, such as the manufacture of fertilisers, explosives, dyes, metallurgy, petroleum-refining and electroplating—to mention only a few out of a long list—depend upon sulphuric acid or other chemicals prepared with the help of this acid. As the acid itself is highly corrosive and is subject to heavy freight charges, only a small portion of its immense output comes on the market. A large portion is used by its manufacturers in producing other heavy chemicals on the spot. Big industries, consuming large quantities, make their own acid. The growth of industry in India is, thus, intimately connected with the increase in the production of this important chemical. Each new industrial enterprise will demand more sulphuric acid, and vice versa an increase in sulphuric acid production will mean more industrial expansion. It is, therefore, highly important that at this stage of our country's industrial progress we should take a stock of our country's resources with regard to the production of this vital necessity.

The raw materials for the production of sulphuric acid that come into serious consideration are brimstone or native sulphur and iron pyrites, although zincblende, copper pyrites, galena, gypsum and sulphur dioxide produced in metallurgical processes have also been used to a limited extent in some

countries. In India sulphuric acid has so far been manufactured mainly from native sulphur imported from Sicily, Japan and the United States of America. The war has cut down supplies from Sicily and Japan and the Indian manufacturer has to rely on the American supply, for which he pays about Rs.130 per ton at port, the pre-war price being about Rs.70 per ton. It need not be too much stressed that, unless India possesses extensive and cheap sources of sulphur within her own borders, she cannot hope to build up a chemical industry on an economical and permanent footing. During recent years, search for sources of sulphur has led to the discovery of iron pyrites in two places, namely Simla and Tandur collieries (Hyderabad-Dn.). The deposits near Simla, which are stated to be quite extensive, have been developed by Dr. Kedar Nath of Delhi who holds a lease for the mines. In Hyderabad, the pyrites occurs in thin layers, interbedded in the coal seams at Tandur collieries. The amount available at present is not more than 60 tons a month, but the quantity will increase with the output of coal which, in turn, is bound to increase with the expansion of industries in the State. Native sulphur has, so far, been found in Baluchistan and Simla Hills. The Baluchistan deposits are perhaps too far away from the existing centres of sulphuric acid industry to be of economic value to them at present, but, with the development of communications and the spirit of industrial enterprise in the country, these deposits might prove a very useful asset in future. The Simla deposits, on the other hand, can immediately serve as a source of economic supply to the sulphuric acid industry. If these expectations are realised, India will be able to manufacture sulphuric acid and other heavy chemicals cheaply and in quantities sufficient to meet the demands of her growing industries.

The development of industry and agriculture in H.E.H. the Nizam's Dominions during the last decade has led to an increasing demand for heavy chemicals, as testified by the import figures for the last five years, given below:—

Import of some heavy chemicals into Hyderabad.

Commodity.	Approximate quantity in tons.				
	1936.	1937.	1938.	1939.	1940.
Sulphuric acid	180	65	77	103	103
Hydrochloric acid ..	121	104	129	136	109
Nitric acid	54	34	46	62	89
Alum	41	59	57	146	109
Chemical manures (including ammonia sulphate and superphosphate) ..	300	255	300	1,260	1,640
Caustic soda	115	148	184	212	278

The figures for other heavy chemicals based on sulphuric acid are not available separately, but information gathered from Customs' authorities and

industrial concerns shows that the import of superphosphate of lime, ammonium sulphate, aluminium sulphate, magnesium sulphate, magnesium chloride, sodium sulphate and ferrous sulphate into the State is steadily increasing. The establishment of cane sugar industry and development of agriculture and fruit cultivation have increased the demand for fertilisers. The demand for heavy chemicals, already consumed in fairly large quantities by the existing textile industry, is bound to increase through the establishment of new industries such as the manufacture of paper, iron and steel industry and leather manufacture. The paper mills are expected to begin work shortly, while the manufacture of iron and steel is receiving serious consideration. The stage has, thus, been reached in the industrial progress of Hyderabad when the manufacture of sulphuric acid and heavy chemicals based on it could be economically and profitably taken up in the State. For some time past, Messrs. Vazir Sultan & Sons, Hyderabad, have been preparing commercial sulphuric acid and nitric acid from imported brimstone by the chamber method. But the scale of their operation is limited and no attempt has been made to prepare other heavy chemicals. Taking into consideration the figures for the consumption of sulphuric acid and heavy chemicals based on it, in the State, it has been estimated that a chamber plant, producing 4 tons of sulphuric acid per day, will meet the existing requirements of the State in these chemicals. The cost of the whole plant for the manufacture of sulphuric acid and other heavy chemicals, mentioned above, including a chamber plant with a maximum capacity of 6 tons, machinery and building, is estimated roughly at Rs. 6 lacs, and the working capital at about Rs. 1 lac. The main source of sulphur dioxide in this plant will be the local pyrites, but some imported brimstone may also be used until such time as the output of the pyrites is enough to do without it. The pyrites found in the State has been thoroughly tested and found to be of a good quality, with a high percentage of sulphur and no arsenic. Its average chemical composition, along with that of the Simla pyrites and the ores found in other parts of the world, is given below:—

Composition of pyrites from various countries.

Pyrites.	S	Fe	As	Cu	Pb	Zn	CaO	MgO	SiO_2	Al_2O_3
Hyderabad coal pyrites ..	45·2	41·0	nil	nil	nil	nil	1·14	nil	2·06	3·17
Simla (reported by Dr. Kedar Nath) ..	49·1	43·9	0·02	0·71	0·04	..	0·04	..	5·46	0·75
Spanish ..	48·5	40·9	0·33	4·21	1·52	0·22	0·9	..	3·46	..
Portuguese ..	48·9	43·5	0·47	3·1	0·93	0·35	0·2	..	0·73	..
French ..	46·4	39·0	0·1	1·5	..	..	..	..	9·25	3·75
West Phalian	45·6	38·5	trace	..	0·64	6	..	..	8·7	..
Norwegian ..	49·0	42·3	nil	2·5	0·2	2·0	0·23	0·22	1·85	1·25
American coal pyrites ..	25·0	..	..	..	..	..	..	..	..	..

The proper burning of iron pyrites for the production of sulphuric acid presents a serious difficulty. For the burning of lumps, ordinary burners of fire-place type with cast iron grate bars and brick walls are generally used. If these burners are designed and worked properly, the percentage of sulphur in the burnt pyrites should not exceed 1-2%. The sulphuric acid factory of the Mining & Chemical Industries Ltd., at Agra, is burning Simla pyrites with some success, and it is expected that with a little more improvement in their burners, the percentage of sulphur in the burnt pyrites will be reduced still further. For the burning of 'fines' which are necessarily formed in the process of mining and transporting the ore, automatic rotary shelf burners with horizontal shelves and air-cooled racking arms are being used in America and other countries. There is no reason why burners of this type could not be designed and constructed in this country.