THE SOUTH AFRICAN NITROGEN INDUSTRY IN RELATION TO THE WORLD MARKET

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The South African Market

Capacity

The current South African installed production capacity is of the order of 646 000 t ammonia.This total includes the new 1 000 tons per day plant at Modderfontein, which plant has just been commissioned and will not produce at full rates for the whole of this year. It does not take into account the old plant at Modderfontein for reasons which follow later. Table 1 gives details of plants and feedstock used. Of the ammonia produced synthetically, about 370 000 t is coal based. With the world market of the order of 70 million tonnes (51 million tonnes for fertilizer use) our capacity amounts to about 1 per cent, and is therefore unlikely to have any effect on the overall position, but we, on the other hand will be markedly affected by world prices if we are unable to produce enough for our own requirements.

Supply and Demand

Local demand for 1975 (all uses) is likely to be about 550 000 t (of which fertilizers account for 400 000 t), rising to 700 000 t by 1978 and 800 000 t by 1980. This is shown in Table 2 together with the projected supplies from local sources. The estimated availability allows for the new plant at Modderfontein to build up to maximum capacity over the next two years.

These figures include by-product material (currently about 40 000 tons p a) which also accounts for the significant increase in supply in 1981, with the advent of Sasol 2. The demand figures include a growth rate for fertilizer nitrogen of 8 per cent compared with the average of 11 per cent experienced over the period 1967 to 1974.

TABLE 1 Ammonia production capacity (tons NH_3 p a)

Producer	Feedstock	Capacity	Date of commissioning
Fedmis Milnerton	Refinery gas/ Naphtha	92 000	1967
Sasol (Sasolburg)	Coal	62 000	1964
AE & CI (Umbogintwini)	Refinery gas/ Naphtha	180 000	1967
AE & CI (Modderfontein)	Coal	312 000	1975
		646 000	

TABLE 2 Ammonia supply and demand (tons 000's NH_3)

Year	Demand	Supply	Surplus	Shortfall
1975	550	530		20
1976	595	600	5	
1977	641	630		11
1978	693	656		37
1979	743	670		73
1980	797	670		127
1981	854	750		104

It appears likely therefore that supply and demand will be more or less in balance over the next 2 or 3 years with significant shortages starting to develop in about 1978.

In all these figures the old Modderfontein ammonia plant has been ignored. This plant is 20 years old, of low capacity, and is expensive to operate. It was intended that this plant be shut down with the advent of the latest plant, when the continued supply of its product to the local market would no longer be necessary.

Because of the very high ammonia prices in the world market which developed last year, this picture changed and it became feasible to continue operation of the plant and to export its product.

This situation will continue until such time as the world prices decline to a level at which the operation is no longer viable. The above forecasts indicate that imports will be necessary from 1978 but any new plant erected at that time will result in temporary surplus capacity being available — a situation which is also affected by by-product material entering the market from Sasol 2.

World supply and demand

It is necessary now to look at what the world supply and demand position is likely to be by the time local capacity is again exhausted.

Demand

World consumption of nitrogenous fertilizer has increased at an average rate of 8,2 per cent per annum over the last six years; if an average growth rate of 8 per cent in the next few years is assumed, consumption by 1980/81 will be equivalent to 75 million tonnes of ammonia.

Production

It is widely forecast that demand for fertilizer nitrogen will be in excess of supply until about 1977 when new capacity now being installed all over the world comes into operation but an interesting view on this subject is that expressed by Dr van Steenis, of UKF, at the Fertilizer Society in London a month or so ago, when he made the point that new plants would not operate at the utilization rates we have been accustomed to in the past. Firstly, the newer, larger plants have utilization factors of some 85 per cent (in the industrial countries) compared to the 90 per cent which was customary previously. In plants that are being erected in developing countries, however, this factor could be between 50—60 per cent. This means that the capacity which will exist in theory will, in effect, be down-rated and could result once again in a significant shortage of fertilizers, when one considers that much of the new capacity is being installed in the developing countries. Dr van Steenis calculates that effective availability for fertilizer use will be about 70,5 million tonnes in 1980/81, leaving quite a significant shortfall. I believe this view is the correct one, and it appears likely therefore that nitrogen will be in short supply overall by the time significant tonnages are needed here to augment domestic production and provision of more local capacity seems indicated.

We should however look at what world prices are likely to be at that time.

Prices

The price fluctuations in the nitrogen fertilizer industry over the last decade have been essentially caused by fluctuations in investment. The over-production which characterized the late 1960's and early 1970's led to keen competition in world markets and a severe erosion of prices with most producers showing poor profits. This slowed down investment, and also resulted in many of the smaller, uneconomic units being shut down. With the demand continuing to increase steadily this resulted in shortages as from 1972/73 with prices reaching record high levels in 1974.

At the present time export prices are considerably down from the peaks of last year but are, as yet, nowhere near the levels that pertained before that. The fluctuation in ammonia prices over the last few years is shown in Figure 1. The present decrease has been attributed to a combination of factors, the most significant of which are the reduction in demand for nitrogen for industrial requirements as a result of the general business recession, and consumer resistance to these prices. From the supply and demand balance examined earlier it appears unlikely that an excessive over-supply will develop to force prices down to previous levels. On the contrary the balance of production and demand by the end of the decade is more likely to keep price levels up.

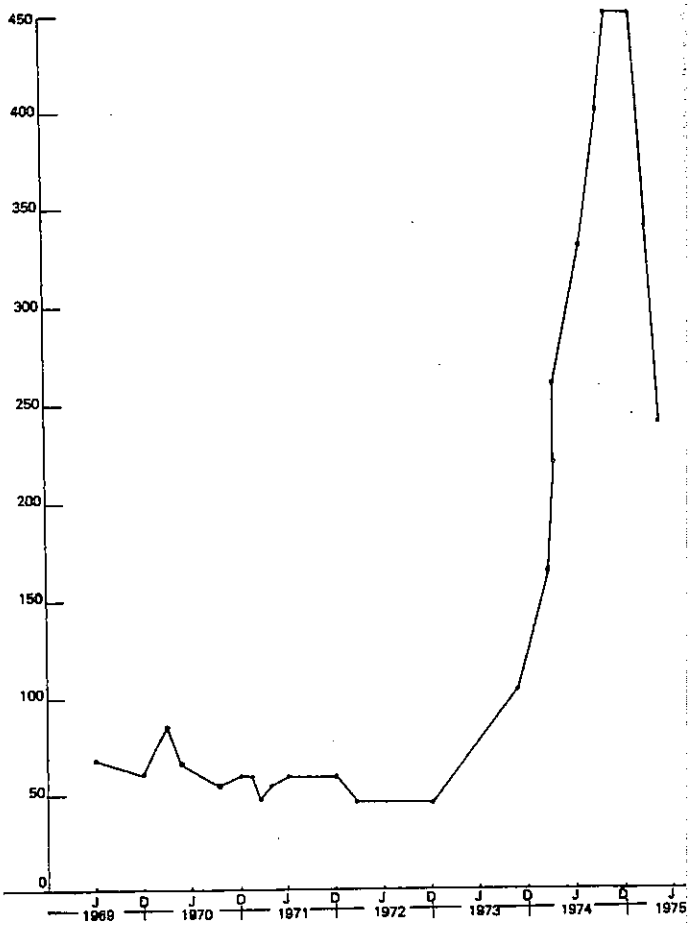

FIG 1 Price of Anydrous Ammonia (c & f Lourenço Marques)

The high capital cost of new plant will also tend to push up prices, but at what level they will settle is impossible to predict. A significant factor however will be the policy adopted by producers in areas where feedstock is naturally cheaply available. If Governments who have access to such feedstock are prepared to cost in gas at no charge it will make the task for other potential investors very difficult. This was well demonstrated by Mr Jack Heath of Fisons in a recent paper when he showed that a new plant (on stream in 1976, say) would, because of its very much higher capital cost, need an ammonia price of nearly four times as much as a plant completed in 1973, to provide a reasonable return on the investment. If, however, the owners had access to free gas and had more cash or foreign exchange than they could deploy they might forego a return on the investment to build a new industry and then indeed such new plants could be competitive with existing plants. Such a plant, at a capital cost of perhaps $85 million could produce ammonia at, say, $67/ton (including

depreciation) and even with a return on investment of 20 per cent this would increase only to about $140/ton. Feedstock costs to an operator buying it in would add about $80/ton to this cost.

While it is unlikely that there will be significant quantities available for export from South Africa it is possible that we may have some surpluses if local demand does not reach anticipated levels. The cost of such material and the possibility of exporting it should therefore be examined.

Costs

Local cost of production

If we consider the present price of coal, of around R6/ton, delivered to the Reef area, and allow perhaps a 50 per cent increase in the immediate future, we find a cost of coal per ton of ammonia of R22-50. For exports of material surplus to requirements, the variable costs of manufacture would amount to some R7-50 per ton in addition to the cost of feedstock. Railage to the port (assuming the product is to be shipped out) and terminal charges, will bring the total cost up to R57 or $84 fob port. This would, of course, apply only if the quantities available for export were marginal — no allowance for fixed costs or a return on the investment has been included.

Shipping

We must next consider where this material will be sold. Apart from territories in, or around, Southern and Central Africa, the most likely markets are some distance away and freight of perhaps $50 per ton must be added, resulting in a c & f price of something like $135 per ton when delivered, say, to the US Gulf or Europe. While ammonia is changing hands at prices above this it will therefore be possible to export any surpluses at some profit.

Investment for the export market

The position of plants operated specifically for exports is of course very different from that shown previously, as fixed costs must also be taken into consideration, as well as a return on the investment.

For a 1 000 tons per day coal based plant (completed in 1974) and operating at full output the cost figures will be as follows:

	Rand per ton ammonia
Coal	22-50
Other variable costs	6-50
Fixed costs (including depreciation	33-00
Return on capital	50-00
Railage and terminal charges	27-00
	139-00 or $204 fob

With a freight factor of about $50, the selling price required is approximately $250.

The distance of our coal based plants from the port and the remoteness of the export markets which can be served, therefore, make such a venture unattractive for the future, when these factors are considered together with the much higher capital cost of new plant. To move a ton of ammonia from Johannesburg to Europe, say, will cost a total of $90 for railage, terminal and freight charges. If the capital cost of a new plant is assumed to be the same as for one in Europe, (and this is clearly not the case because of the additional cost of the coal gasification plant) this disadvantage must be offset in the cost of feedstock, and this possibility is unlikely.

Investment can, therefore, only be justified to serve the local market and it is thus essential that local prices be maintained at such a level so as to give an adequate return on capital employed. Such investment should continue to be made to make our industry as self-sufficient as possible with the minimum of dependence on outside sources.