

PRODUCTIVITY IN THE FERTILIZER INDUSTRY: AMMONIA PRODUCERS

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Historical background

Ammonia production in South Africa commenced in 1931 with the commissioning at Modderfontein at AECI's No 1 Ammonia plant, which was in fact the first ammonia plant in the Southern Hemisphere and was erected to meet the country's explosives and industrial demand rather than its fertilizer requirements. It was in

fact not until approximately 1950 that the domestic fertilizer industry began to take shape and to consume ammonia for the local production of fertilizer.

The capacity of the No 1 plant was some 6 000 tons ammonia per annum, and since then the country production capacity has been steadily increased to its present level of 829 000 tons per annum.

TABLE 1. Ammonia production capacity and consumption over the years.

Year	Plant	Capacity	Accumulative cap.	Consumption (accum.)	Consumption ÷ capacity (accum.)
		000t NH ₃			%
1931 –	AECI No 1 – Modderfontein	6	6	–	–
1935 – 1950	Progressive Uprating	18	24	13	54
1954	AECI No 2 – Modderfontein	48	72	22	31
1960	Uprating	48	120	56	47
1964	First SASOL Plant – Sasolburg	64	184	126	68
1966	Fedmis Plant at Milnerton	91	275	130	47
1967	AECI No 3 – Umbogintwini	180	455	171	38
1968	Closure of AECI No 1	(24)	431	192	45
1974	AECI No 4 – Modderfontein	290	721	338	47
1980	SASOL II – Secunda	100	821	622	76
1982	SASOL III – Secunda	100	921	633	69
1983	Closure of AECI No 3	(180)	741	491	66
1982 – 1984	Secunda Uprating	43	784	543	69
1985	Uprating of AECI No 4	45	829	537	65

Table 1 sets out the history of production capacity growth from the first plant to the present day. The most significant events during this fifty five year period are:

1931 The first ammonia production – AECI's No 1 plant at Modderfontein.
1954 Second plant – AECI's No 2 plant at Modderfontein.

1964 First Sasol plant – Sasol's No 1 plant at Sasolburg.
1966 Fedmis oil-based plant – Milnerton
1967 AECI oil-based plant – AECI's No 3 plant at Umbogintwini.
1974 AECI coal-based plant – AECI's No 4 plant at Modderfontein.

1980 Second Sasol plant — Sasol II at Secunda.
 1982 Third Sasol plant — Sasol III at Secunda.
 1983 Closure of AECI — at Umbogintwini.
 No 3 plant

Over this period the consumption of nitrogen by the South African fertilizer industry has increased significantly, until in 1985 the consumption of 537 000 tons ammonia equivalent represented 65% of the country's installed ammonia production capacity.

The last two columns in Table 1 shows the annual fertilizer nitrogen consumption in relation to the increase in country-installed production capacity.

The picture is somewhat clouded in that it does not follow that the total local fertilizer requirements are always satisfied from locally produced ammonia. Plants not achieving rated capacity and imports of ammonia or finished nitrogenous fertilizers will distort the picture, as will fertilizer exports, but whatever the variations from year to year, it is clear that the fertilizer industry is a potential consumer of at least 65% to 70% of locally produced ammonia. The local ammonia industry, which is of significant strategic value and which has grown to meet the requirements of the agricultural sector, is clearly of paramount importance to the health, stability and cost structure of the South African fertilizer industry.

Raw materials

In the absence of a domestic source of oil or natural gas the South African ammonia industry has had to rely on either coal or imported oil as a source of fuel and feedstock for its ammonia plants.

The vulnerability of dependence on imported materials was demonstrated during the dramatic oil price increases in the 1970's. While the local producers were able to weather the storm of the first increases in 1973, the second round of increases in 1979/80 resulted in the shut down and mothballing of AECI's No 3 ammonia plant at Umbogintwini, and the conversion from refinery gas to coal for the fueling of Fedmis' Milnerton plant. Apart from this latter plant, which now operates on a combination of coal, electricity, refinery gas and naphtha, all the other plants in South Africa are based entirely on coal.

Because of the much higher capital cost of the plant, coal based plants are by their very nature far more expensive to operate than plants which are based on natural gas in so far as capital charges, maintenance and labour are concerned. The raw materials may be cheaper for coal based plants, but here it depends on the flexibility that is available to the owners of the gas based plant in deciding how their raw materials should be costed to production.

Table 2 gives an approximate breakdown of the relative costs on coal and natural gas ammonia plants in 1985 money terms.

TABLE 2. Comparison of production costs on coal and gas based ammonia plants.

Cost item	Coal	Gas	
		Case 1	Case 2
	—R/t ammonia—		
Coal/Gas	42	192	96
Electricity	58	5	5
Water	4	5	5
(i) Subtotal:			
Raw materials	104	202	106
Labour	15	8	8
Maintenance			
materials	51	25	25
Chemicals/Catalysts	7	13	13
Miscellaneous	7	7	7
(ii) Subtotal: Other	80	53	53
(iii) Capital charges	290	164	164
Total production cost (i + ii + iii)	474	419	323

The figures assume the erection of 1 000 tons per day plants on established sites, and made no allowance for attracted overheads.

Case 1 represents a gas-based plant where the gas has been priced at a realistic energy cost of say US\$3 (R6) per gigajoule. The raw material cost is almost double that of a coal-based plant using electricity for driving its major machines. However, in the area of operating and capital costs the cost per ton is significantly lower, yielding a final product price some R55 per ton lower than that for a coal-based plant.

Case 2 shows the same gas-based plant with gas charged to production at half the price, or R3 per gigajoule, which has a major effect on the overall cost of the ammonia.

In the past, international ammonia prices tended to bear some relation to the cost of production, but what we are now seeing in the international market is not competition at cost related prices, but rather the dumping of ammonia at FOB prices below US\$110 (R220) per ton by countries having an abundance of natural gas and a shortage of foreign exchange. The artificially low prices are even placing considerable strain on the American producers who themselves are operating gas-based plants.

It is in this artificial world that our ammonia producers now find themselves competing without the assistance of any Government tariff protection or import control.

South African ammonia prices

Although suffering from considerable economic drawbacks, the South African ammonia producers have nevertheless managed over the years to keep their product price at realistic levels in relation to imported ammonia and in relation to other cost inputs to the agricultural sector.

The price at which ammonia is charged to fertilizer production, which we can conveniently refer to as the wholesale price, was subject to Government price control until the end of 1983, and since then producers have been required to compete, without tariff protection, against imports of ammonia.

Table 3 sets out the index of the wholesale price of ammonia since 1975 in relation to the consumer price index, the producer price index for summer cereal crops and the index of the major agricultural inputs, fertilizers, fuel and machinery and implements.

It can be seen that during the 1970's the oil price pressures had an adverse effect on the ammonia price relative to the CPI, but that for the last 3 years the ammonia price has been significantly below the consumer index. This trend can also be observed in relation to the producer price index for summer cereals. The 1985 producer price index is not yet available, but is likely to be

significantly in excess of the corresponding ammonia index. For virtually the entire period, the ammonia index compares favourably with those of fuel and machinery and implements.

Whereas the impact of the oil price increases is clearly evident in the cost of ammonia and fuel in 1979/80, the ammonia price increase was tempered by the then existing mix of oil and coal-based plants. Also, whereas the fuel index continued to rise thereafter, the increase in the ammonia index was halted by the closure of or modifications to the then expensive oil-based plants, and the subsequent reliance on coal as the source of fuel and feed.

After the cessation of price control at the end of 1983 the ammonia price was held at the same level during 1984, and the average increase over the last four years has been less than 10% per annum. This competitive pricing policy is clearly evident in the overall fertilizer index, where increases have been significantly lower than those of the other agricultural inputs.

Competition from imports

Holding prices at a realistic level in relation to other commodity prices within the country is one thing, but the real test is of course whether or not the price of a commodity is competitive against supplies of the same commodity from other sources, ie. imports.

TABLE 3. Comparative price indices (1975 = 100)

Year	C.P.I.	Prod. Price cereals	Ammonia	All ferts.	Fuel	Machinery & implem.
1975	100,0	100,0	100,0	100,0	100,0	100,0
1976	111,1	104,8	116,2	107,2	132,5	118,3
1977	123,7	118,6	135,6	120,0	146,3	132,2
1978	137,2	127,9	151,5	140,3	151,6	152,8
1979	155,3	159,3	165,8	159,3	278,2	170,7
1980	176,7	185,2	210,7	186,7	355,9	188,0
1981	203,5	185,6	235,3	198,9	371,5	212,8
1982	233,5	215,3	248,7	228,2	430,5	260,8
1983	262,3	268,0	261,2	260,3	422,1	298,0
1984	292,8	345,5	261,2	273,3	398,7	337,4
1985	340,3		308,0	363,2	500,6	419,7

(CPI = consumer price index)

Figure 1 shows the relationship between the imported cost of ammonia landed on the Reef and the ammonia producers' wholesale price. Although there was a tariff duty structure in operation on ammonia imports until the end of 1983, for comparative purposes the imported price is shown without duty or any general Government import surcharges.

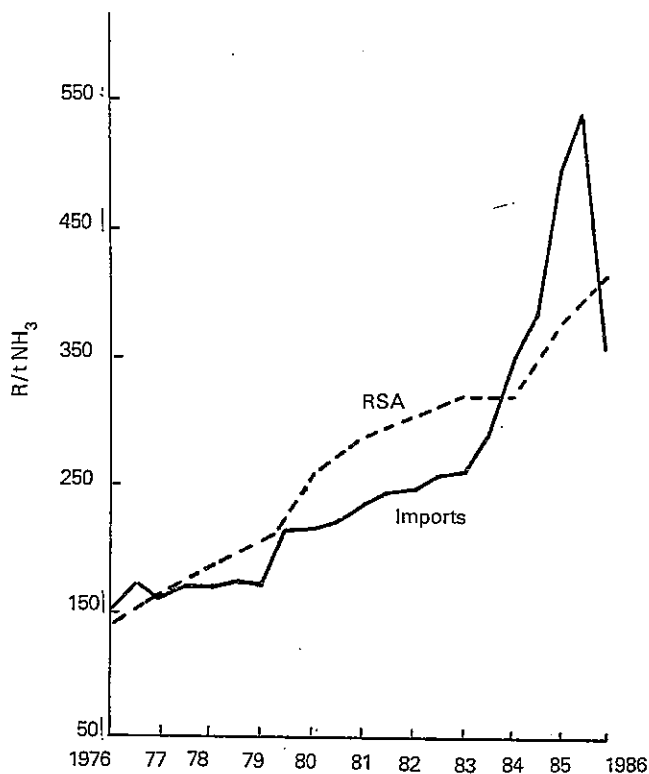


FIG 1. RSA — Fertilizer ammonia trade price (f.o.r. factory) vs. import price (landed Reef excl. duty, surcharges.)

It can be seen that during the period 1976 to 1980, the local ammonia price correlated extremely closely with the import parity price. The oil price increase then made itself felt, and for a period the domestic price increased fairly significantly above the import price as a result of these cost pressures. Corrective action was taken in the modification of the Fedmis Milnerton plant and the closure of AECI's Umbogintwini plant — both oil based — and the domestic price then stabilised for two years at a level well below import parity.

A firming of the world price accompanied by the weaker Rand then caused the import price to escalate sharply in the last two years, with the complete reverse being responsible for the present low import price. As there is no duty on ammonia, the industry will have to react in response to this competition, and a lower domestic price is already evident.

Figure 1 reflects the cost of imported ammonia which incorporates a national terminal throughput charge but without any outside interference factors. Until the erection of the Richards Bay ammonia terminal in 1984 the only terminal available for the importation of ammonia

was that at Maputo. It is inconceivable that the terminal owners would have priced their ammonia at a large discount against the local product, and experience has shown this to be true. For all practical purposes therefore, before 1984 imported ammonia was not available at below the local price.

When one considers the cost disadvantages that the local industry suffers from in relation to overseas procedures, achieving a local/import relationship as pictured in Figure 1, without the inclusion of any duty, speaks volumes for the responsibility and productivity of the local producers.

Achievement

How has this productivity been achieved? In a number of ways:

- (i) By being willing and able to react to competitive forces rather than relying on artificial Government protection. This was evident in the switch from the traditionally cheaper oil based plants to plants based on coal when this change was seen to be required.
- (ii) By adopting a responsible approach to product pricing and not exploiting the customer at times when circumstances are more favourable to the producer.
- (iii) By having the foresight to invest in the past in large coal-based plants in spite of the apparent cost disadvantages.
- (iv) By maintaining ongoing cost control within the ammonia manufacturing operations.
- (v) By upgrading existing plants and thereby obtaining improved efficiencies and a better spread of fixed costs for relatively small amounts of capital, notably the No 4 ammonia plant at Modderfontein, and the increased Sasol production from Secunda.
- (vi) By making imports themselves more competitive through the erection of the Richards Bay ammonia terminal, thereby enabling users to import ammonia for their own account at international prices.

Summary

In the dynamic world in which we live, change has become a way of life, and no one can afford to become complacent. The oil price, which in the early seventies was not something of which people were aware, became a significant factor over the next 10 years. Exchange rates too, have had their share of the limelight over the last two years. The ability of plants to compete with imports, particularly with artificially priced 'dumped' products, varies from day to day depending on numerous factors, many of which are outside the

control of the producer. Plants cannot be closed one day and open the next according to the price of the day. If we are to encourage investment and employment opportunity, both the producer and the customer must act responsibly, balancing their short term and their longer term interests in an awareness of the overall good for all parties.

The South African ammonia industry is an essential part of the South African economic scene, embracing explosives, industrial chemicals and agriculture. This industry has grown with the South African economy over

many years, and has a track record of which it can be proud.

In future, more ammonia capacity will be required, and when one considers the Mossel Bay gas finds, next time the additions may well be based on gas. Whatever the future holds, the coal based plants have proved themselves to be competitive in the longer term and are an integral part of the local scene, and they and their successors will continue to serve the country well for many a year to come.