CHAPTER -III

Evolution of Fertiliser Industry in Tamil Nadu
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Tamil Nadu is among the most industrialised states in India today. The State took second position, after Maharashtra in its contribution to the value added by the registered manufacturing sector.¹ The State's industrial base emerged from a conventional textiles dominated one to a diversified one on modern lines, comprising a chain of engineering, chemical and electronics complexes.

The last three decades had witnessed a silent industrial revolution in this part of the country, resulting in the transformation of a predominantly agricultural economy into an industrially important one. Impressive progress has been recorded in the field of large, medium and small industries in Tamil Nadu.²

The very first industrial venture in Tamil Nadu took place in the 1820's when a steel plant was set up in Porto Nova. The plant proved a failure despite considerable financial bailing out by the Government, which saw it as a prestige issue. The only success of the period up to the 1870's was in sugar. The first fertiliser industry started in 1906 in Ranipet.
1. E.I.D. Parry (India) Ltd

*Thomas Parry* who arrived in India in 1788 to seek his fortune was granted a licence to trade within limits as a free merchant by East India Company, which held monopoly of trade between India and the United Kingdom.

The E.I.D. Parry Ltd established a fertiliser factory in 1906 at Ranipet, in Tamilnadu, with a capacity of 6400 tonnes of Phosphate per annum, which was the first Single Super Phosphate factory in India. The preparation of various standard fertiliser mixtures, insecticides and fungicides was subsequently undertaken. The Ports of Madras and Cuddalore are near to Ranipet, the availability of raw materials and transportation, etc., are very convenience to the factory.³

The Parry & Co. which remained a private partnership until 1928, when it was converted into a Private Limited Company. In 1948 Parry & Co Ltd, was converted into a Public Limited Company.⁴

The Second fertiliser factory of E.I.D Parry (India) Ltd at Ennore, near Madras was produced compound fertilisers in 1963.
The factory was installed to manufacture about 51,000 tonnes per year of Ammonium Phosphate 16:20, now marketed by the Company under the trade name of “Paramfos”. The expansion of the factory was completed in January 1968 to manufacture an additional Nitrogenous fertiliser, Ammonium Sulphate to the extent of 38610 tonnes per year utilising the by product Gypsum obtained from the Phosphoric acid plant which in one of the plants in the manufacture process of Ammonium Phosphate. This factory has the distinction of being the first to manufacture NPK complex fertiliser in India.

Supplies of fertiliser mixture are blended to suit each crop and distributed to agriculturists and planters through mixing centres at Ranipet, Cuddalore and Mettuppalayam in Tamilnadu, Palluruthy in Kerala, Mysore in South Mysore, Tedapalli in Andhra and Shrirampur and Vikroli in Maharashtra State.

**Performance of the company:**

Work on the diversification of the E.I.D. Parry, Ennore fertiliser factory made considerable progress during 1970’s. There was an accident in the ammonia plant at Ennore in early December 1982 with consequential loss of production and profits. Production
in the super phosphate plant at E.I.D. Parry, Ranipet was also affected by severe power shortage. In 1983-84 with good monsoon the demand for fertilisers picked up. Production of “Paramfos” reached a record level. The ammonium plant at Ennore could not be restarted during the year as scheduled due to unexpected failure of the braced aluminium exchangers in gas separation units. In 1986-87 production and sales of ammonium phosphate increased due to better customer demand. During 1988-89 production improved by 24% to 89,314 tonnes mainly due to modernisation carried out in the unit.

During 1990-91 production of Phosphatic fertiliser at Ennore factory was adversely affected due to strike by workmen for two months. However, production of Super Phosphate was satisfactory at Ranipet plant. In 1991-92 production at Ennore crossed the one lakh tonne mark. In 1994 the new single super phosphate plant of 132000 tonne per annum capacity was commenced operation. Moreover, the major modernisation cum expansion of the Ennore fertiliser factory made satisfactory progress. During 1996-97 production of ‘Paramfos’ was affected due to constraints in availability of Ammonia during first half of the year and planned shutdown in February 1997 to facilitate completion of modernisation of
granulation plant. In 1997 phosphatic fertiliser registered record offtake.

2. Shaw Wallace & Co. Ltd

Shaw Wallace & Co Ltd. Company was founded as a private company on 15th January 1946 and converted into a public company on 25th July 1947 in Calcutta. It has Super Phosphate factory at Avadi in Madras. The company is manufacturing fertilisers, glue, sulphuric acid, etc.,

Performance of the company:

In 1970, the sales of complex and Urea as exceed almost doubled, sales of dry mixed fertilisers also registered an increase. In 1978, turn over reached a second level but the improvement in profitability was not satisfactory. In 1980, the volume of sales declined marginally due to increase in prices of fertilisers and drought in several district of South India. During 1984-85 there was record production of super phosphate. Granulated super phosphate was introduced in South India for the first time. In 1989-90, production of super phosphate was adversely affected due to erratic supply of raw materials at Avadi unit.
3. Neyveli Lignite Corporation Ltd

Neyveli Lignite Corporation was incorporated as a private limited company on 14 November 1956 by the Government of India for the commercial exploitation of vast reserves of lignite around Neyveli. The fertiliser factory was commissioned in 1966 as a part of the NLC project. It has been designed to produce 152000 tonnes per annum of Urea. Fertiliser production from lignite is one of the significant achievements made by NLC.

The original plant was designed to utilise half a million tonnes of raw lignite per annum for production of synthesis gas. NLC was at the time the first and the only one in India adopt solid fuel gasification for synthesis gas production. In 1966 the plant started to produce Urea.

Performance of the Company:

Neyveli Fertiliser Factory bagged the National Productivity Council’s Safety Award under the productivity performance in 1983-84. The plant achieved the capacity utilisation of 99 percent in 1984-85 against the achievable level the top in All India Fertiliser Plants, which are operating the fuel oil as the raw material. During 1988-89, the plant recorded the highest ever production of 141079
tonnes for any year since the commissioning of the plant. In 1992-93 the production declined the 108591 tonnes from 135169 tonnes in 1991-92.

Urea production during the year 1994 was 105543 tonnes against the target of 122400 tonnes. It was an achievement of 85.25 percent of the target. Production was affected mainly due to (i). frequent break down of equipment due to ageing, (ii). delay in start up after annual maintenance (process problem), (iii). catalyst changing in Ammonia reactor, and (iv). power failures and grid disturbances.

4. Premier Fertilisers Ltd.

Premier Fertilisers Ltd was set up at Cuddalore in 1960 which manufacture 16500 tonnes of Sulphuric Acid and 40,000 tonnes of Super Phosphate per annum. This factory was founded by M.Ct. Muthiah\(^7\). The capital investment was 1 Crore.

The factory is situated in the vicinity of Cuddalore in Tamil Nadu. It also marketing NPK mixtures for paddy and various other crops. A Cryolite plant of one tonne per day and BHC dust formulation of 8 tonnes per day have been installed. The BHC
branded name was "NATARAJA". It also marketed by Coromandal Indag Pesticides in Tamil Nadu (marketers of MFL) in the name of "Indag Nataraja" of Super Phosphate.⁸

In 1980, the company was closed, mainly due to heavy loss and low productivity in the plant. This company was taken over by 'Coromandal Indag' with effect from 24 April 1983. It increased its capacity to 72,221 tonnes [11555 tonnes of Nitrogen (N) and 14444 tonnes of Phosphate (P₂O₅)] per annum with effect from June 1983.

5. Kothari Industrial Corporation Ltd.

Kothari Industrial Corporation Ltd., the biggest of the group companies is a multi-product, multi-divisional industrial conglomerate founded by D.C. Kothari. In 1960 the company erected a fertiliser plant for the manufacture of Single Super Phosphate of 16 percent Phosphate (P₂O₅). The installed capacity of this plant in 4500 tonnes of Super Phosphate and 1500 tonnes of Sulphuric Acid per day. The plant is situated at Ennore near Madras and the same was commissioned during July 1962. The Super Phosphate is marketed under the Trade Mark "Horse Brand" in the States of Tamil Nadu, Karnataka, Andhra Pradesh and Pondicherry.
Performance of the company:

In 1971-72, for the first time the factory achieved full production in the acid plant. In 1975-76, production of Super Phosphate recorded a steep fall. In 1976-77, the Super Phosphate production was below rated capacity of the plant mainly because of intermittent labour strikes and consequent shut-downs in the factory. The strikes used to take place for some common reasons viz., to increase wages and need of basic amenities etc. In 1979-80, the turn over of fertiliser mixtures further increased to 76,473 tonnes on account of higher sales of NPK mixtures. During 1982-83 the company achieved only 75% rated capacity of the Super Phosphate plant. Severe power cuts were imposed which affected production of Sulphuric Acid. During 1989-90 the performance of fertiliser division was satisfactory.\(^9\)

6. Coimbatore Pioneer Fertilisers Ltd.

Coimbatore Pioneer Fertilisers Ltd., was founded in 1962 with the capital of 5 Crores, at Coimbatore. The factory is situated near Sulur Railway Station at a distance of 10 miles from Coimbatore, on a 48 acre plot of land and has commenced production from February 1966. The daily production of the factory is 150 tonnes of Super Phosphate and 50 tonnes of NPK mixtures in powder and granular forms. The plant manufacture and distribution of “SUN” brand NPK fertilisers.
The installed capacity of the factory is 48,000 metric tonnes of Super Phosphate, 18,000 metric tonnes of Sulphuric Acid and 3000 metric tonnes of Oleum per annum.

7. Madras Fertilisers Ltd. (MFL)

Madras Fertilisers Ltd., was incorporated in December 1966 with 51% of the equity shareholding held by Government of India and 24.5% each by Amco India Inc., U.S.A. and National Iranian Oil Company, Tehran, Iran. It was built at a cost of Rs.63.2 Crores. MFL plant is located at Manali 16 km North of Madras.

This giant fertilisers plant - better known as the MFL, is one of the most modern fertiliser plant in the World. This plant in the first large-scale producer in South India of Complex fertilisers containing different proportions of the basis soil nutrients, Nitrogen, Potash and Phosphorous. 19

The plant started commercial production in November 1971 manufacturing urea and complex fertilisers. The capacity for complex fertiliser production was increased by 50 percent in October 1976. The present annual production capacity in 2.48 lakh metric tonnes
of Ammonia, 1.53 lakh metric tonnes of Urea and 5.40 lakh metric tonnes of complex fertiliser products. The principal raw materials are Naptha from the Madras Refineries Ltd. (MRL) and Phosphoric Acid and Potash from imports.

MFL markets its products under the brand name "Vijay" which is popular with farmers in South India. Products manufactured presently are complex fertilisers in the grades - 17:17:17, 14:18:14, 24-24:0, and 18-46-0, and Urea.

The unique features of this plant include: (i). Large scale use of steam turbine drives, thereby reducing the electrical power consumption (ii). Refrigerated Ammonia storage for 5000 tonnes of atmospheric pressure, and (iii). Direct bagging of the products without intermediate bulk storage.

MFL marketing strategy includes making Vijay fertiliser available as near the consumer as possible. It has one of the best soil testing laboratories in the country and offers free soil test and fertiliser recommendation service. Facilities are also available to micronutrient analysis in soils and irrigation water analysis. It provides employment opportunity to 1341 persons.
Performance of the company:

Madras Fertilisers Ltd., (MFL) took a Long Term Agricultural Development Programme (LTADP). It had taken up 22 operational units covering a cultivated area of nearly 4.5 lakh acres. This programme was meant to provide supplies and services to such of those areas in the country where current levels of agricultural production were below the National average with a view to increase agricultural production by removing the constraints that farmers faced in increasing their production. The farmers co-operated fully. MFL was the first fertiliser Public Sector Unit to get ISO 9002 certification in 1995.

8. Southern Petrochemical Industries Corporation Ltd.

Southern Petrochemical Industries Corporation Ltd., popularly known as SPIC has set up modern facilities for the manufacture of fertilisers at SPIC Nagar near Tuticorin, Tamil Nadu in 1969. The group has widely diversified under the leadership of the industrialist A.C. Muthiah.

The company which was promoted by the Government of Tamil Nadu and private entrepreneurs headed by M.A. Chidambaram, is a joint sector venture. SPIC was the first major joint sector
enterprise of its kind in the South involving project cost Rs.110 Crores. At the time of its inception SPIC was the second largest of its kind and executed wholly on the turnkey basis.

In the first phase (1975) of the project the Ammonia and Urea plants were completed. In the second phase (1976) Phosphatic plants were completed. Besides, manufacturing Urea, SPIC was the first to introduce Di-Ammonium Phosphate (DAP). SPIC was ranked sixth in total assets of industrial conglomerates and thirteenth by net sale.

Performance of the company:

SPIC conducted seminars and group discussion involving farmers and several experts on relevant subjects were very enthusiastically received. Soil testing, seed treatment campaign, health care camps and a number of special projects are among the popular programmes conducted regularly.

SPIC fertiliser complex at Tuticorin has been accredited with the globally recognised ISO 14001 certificate for its excellent Environmental Management System. To keep the farmers informed of the latest developments SPIC in bringing out periodically a journal
called 'PANNAI CHEITHI MALAR' which is being published in English, Telugu and Kannada. These publications which are distributed to farmers free of cost, have become very popular.

Awards received:

1. The Global Level Safety Award has been given to SPIC for its excellent commitment to safety in 1981 from the British Safety Contest. 2. State Level Productivity Award from the Government of Tamil Nadu for 1994-95 and 1995-96. 3. Good Industrial Relations Award for 1997 from the Government of Tamil Nadu. And the same year State Level Safety Award from the Government of Tamil Nadu. 4. Best Productivity Award for Phosphatic sector for 1998-99 from the National Productivity Council, New Delhi. 5. Environmental Protection Award for Phosphatic fertiliser plant for 1999-2000 from the FAI, New Delhi.15


Pamani Fertiliser Factory is situated at Pamani village in Tiruvarur District in Tamil Nadu. This factory commenced its function in the year 1971. The investment of the factory was Rs.27.22 lakhs.16 The plant was built on a site measuring about 5 acres in Pamani village. The "Tamil Nadu Co-operative Marketing Federation Ltd.,' popularly known as 'TANFED' was founded this unit for production...
of NPK fertilisers. It has annual production capacity of 30,000 metric tonnes and the average production capacity of 120 metric tonnes per day.

Pamani is the only unit manufacturing granula in Tamil Nadu. Pamani fertiliser was established with the financial assistance from National Co-operative Development Corporation.' The financial assistance was Rs.28,37000 out of this Rs.10 lakhs was received through the Government loan and Rs.10.10 lakhs was provided by TANFED.

TANFED has manure mixing centre at Vellore, Kancheepuram, Cuddalore, Trichy, Tirunelveli, Madurai, Virudhunagar, Mannargudi and Nagarkoil. It has built up adequate storage capacity for undertaking fertiliser distribution and agricultural marketing operations. It has 32 godowns with a total capacity of 2500 metric tonnes in the State.

Fertilisers are transported to 14 districts in Tamil Nadu. During the year 1994-95 a quantity of 18,075 tonnes was produced and a quantity of 22048 tonnes worth Rs.1337.73 lakhs was sold. During the year 1995-96, 10718 tonnes was produced and a quantity of
11888 tonnes worth Rs.817.48 lakhs was sold. In 1996-97, it produced 22880 metric tonnes of fertilisers.

The complete plant and equipment for the factory was manufactured erected by Fertiplant Engineering Co. Pvt. Ltd., Bombay, pioneers in the manufacture of complete fertiliser granulation plant with cent percent indigenous equipment.17

10. Tuticorin Alkali Chemicals and Fertilisers Ltd.

The Tuticorin Alkali Chemicals and Fertilisers Ltd. (TAC), with the technical collaboration of m/s Hitachi Zoen Corporation of Japan, the company was set up a sophisticated plant at the cost of Rs.53.20 Crores for the manufacture of Soda Ash and Ammonium Chloride in Mullakadu village at Tuticorin, Tirunelveli District with an installed capacity of 66,000 tonnes per annum each. The company has gone into commercial production with effect from November 1982.18 The TAC was founded by A.C. Muthiah. The company was promoted by ‘Tamil Nadu Development Corporation Ltd.,’ (TIDCO) with Southern Petrochemical Industries Ltd’ (SPIC) as co-promoters. The company adopted the Toya Soda process for the first time in India for the manufacture of Soda Ash and Ammonium Chloride.
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<th>Shaw Wallace</th>
<th>Coimbatore Pioneer</th>
<th>Premier Ltd</th>
<th>TAC Ltd</th>
<th>MFL</th>
<th>Kothari Ltd</th>
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Note:  (i) This production data are include all kinds of fertilisers produced by the companies in Tamil Nadu.

These data are compiled from the Annual Reports of the Fertiliser Companies.

(ii) *Fertilisers produced by Manali Petrochemicals Ltd (MPL).

Source: (1) The Fertiliser Association of India, Chennai.
(2) Annual Reports of the companies.
<table>
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<tr>
<th>Fertiliser Companies</th>
<th>Unit Failures</th>
<th>Shut Downs</th>
<th>Power Cuts</th>
<th>Labour Strikes</th>
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<tr>
<td>4. Premier Fertilisers Ltd, Cuddalore</td>
<td></td>
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<td></td>
<td>1980</td>
</tr>
<tr>
<td>5. Coromandel Indag, Ltd, Ennore</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1996</td>
</tr>
<tr>
<td>7. Coimbatore Pioneer Fertilisers Ltd</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>8. Madras Fertilisers Ltd, Manali</td>
<td></td>
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<tr>
<td>9. SPIC, Tuticorin</td>
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<td></td>
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<tr>
<td>10. Pamani Fertiliser Factory, Pamani</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12. Manali Petro Chemicals Ltd, Manali</td>
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</tbody>
</table>

(Source: Annual Reports of Fertiliser Industries in Tamilnadu)
FIGURE - 3
FERTILISER PRODUCTION IN TAMIL NADU (1975-1999)
Performance of the company:

Trial production of Soda Ash and Ammonium-Chloride commenced from 20th June 1982. In 1985-86 the capacity utilisation was lower at 74% mainly due to shutdown of the plant for want of raw materials for 92 days, restricted availability of Carbon Dioxide and severe power cuts. Due to lack of raw materials the plant could not produce fertilisers and therefore it was closed for these days. During 1990-91 the loss of 56 stream days for want of imported Ammonia, coupled with annual turn around at SPIC for 35 days, resulted in a lower capacity utilisation at 63 percent.

Fertiliser Production in Tamil Nadu

In Tamilnadu, the rise in production of Nitrogen (N) was mainly due to the better performance of Neyveli Lignite Corporation, E.I.D. Parry Ltd and Madras Fertilisers Ltd. In 1974-75 the total production (Table-5) of the State was 5.96 lakh tonnes. In the next year it rose to 8.91 lakh tonnes of total production. During the year there were 8 fertiliser industries produced fertiliser in Tamilnadu. In 1980-81 the total production of fertiliser was 14.80 lakh tonnes. In the same year Premier Fertilisers Ltd., was closed mainly due to heavy loss and low productivity and the company was taken over by 'Coromendal Indag' with effect from April, 1983. The
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Tamil Nadu</th>
<th>All-India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of Plants</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>a. Nitrogenous</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>b. Phosphatic</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2. Installed Capacity (lakh tonnes)</td>
<td>9.77</td>
<td>9.10</td>
</tr>
<tr>
<td>a. Nitrogenous</td>
<td>5.90</td>
<td>5.88</td>
</tr>
<tr>
<td>b. Phosphatic</td>
<td>3.87</td>
<td>3.22</td>
</tr>
<tr>
<td>3. Production (lakh tonnes)</td>
<td>9.80</td>
<td>8.98</td>
</tr>
<tr>
<td>a. Nitrogenous</td>
<td>6.28</td>
<td>5.67</td>
</tr>
<tr>
<td>b. Phosphatic</td>
<td>3.52</td>
<td>3.31</td>
</tr>
<tr>
<td>4. Capacity Utilisation (Percentage)</td>
<td>100.3</td>
<td>98.8</td>
</tr>
<tr>
<td>a. Nitrogenous</td>
<td>106.0</td>
<td>94.5</td>
</tr>
<tr>
<td>b. Phosphatic</td>
<td>91.0</td>
<td>103.0</td>
</tr>
</tbody>
</table>

*Note: Figures in brackets indicate percentage share of Tamil Nadu to All-India.*

*Source: The Fertiliser Association of India, Southern Region, Chennai-1.*
'Coromendal Indag' commenced its production in 1983 and the production was 0.26 lakh tonnes in the next year. The total production had come down to 17.12 lakh tonnes in 1983-84. In 1984-85 there were 11 fertiliser industries produced 22.22 lakh tonnes of total fertilisers in Tamil Nadu. The next year the production had come down to 21.17 lakh tonnes.

As shown in the Figure-3, during 1985-86 to 1990-91 the production growth was stagnant in Tamil Nadu. Many constraints like power cuts, labour unrest, plant breakdowns, shortage of spare parts, teething troubles in new plants and difficulty in mustering adequate resources required for fertiliser production do time and again limit the production. But in 1990-91 the production was 21.43 lakh tonnes and it steeply raised in the year 1995-96 was 27.10 lakh tonnes in Tamil Nadu. In 1996-97 the 'Manali Petro Chemicals' was also started to produce fertilisers and its production was 1.4 thousand tonnes in the same year. In 1998-99 there were very slow progress in the production of fertilisers i.e., 27.36 lakh tonnes in the year.

There were 14 fertiliser industries produced chemical fertilisers in Tamil Nadu. Few fertilisers industries stopped the production such as, Premier Fertiliser Factory, Coromandal Indag Fertilisers Ltd., and
Manali Petro Chemicals Ltd., due to heavy loss, low production turn
over, machinery and administrative problems, etc., (Table-5a). At
present the following 10 fertiliser industries are producing fertilisers
in Tamilnadu:

1. EID Parry (India) Ltd, Ranipet. 2. EID Parry (India) Ltd,
Corporation Ltd, Neyveli 5) Kothari Industrial Corporation Ltd,
Ennore 6) Coimbatore Pioneer Fertilisers Ltd, Coimbatore. 7) Madras
Fertilisers Ltd, Manali. 8) Southern Petrochemical Industries
Corporation Ltd, Tuticorin. 9) Pamani Fertiliser Factory, Pamani,
Tiruvanur Dist. 10) Tuticorin Alkali Chemicals and Fertilisers Ltd,
Tuticorin.

The growth of Indian agriculture since Independence has been
synonymous with the rigid growth of fertiliser industry. In Tamil Nadu,
fertiliser industry had grown to new heights in 1991-92. With no
addition to the total installed capacity, the production of nitrogenous
and phosphatic fertilisers put together registering a significant
increases of 13.7 percent in 1991. Though, the State having 14
plants, only 10 plants (Table-6) are successfully producing fertilisers
at present in Tamil Nadu. In all India level there are 160 plants producing fertilisers.

To increase the fertiliser production the industry has to adopt the following strategies:-

i). Expansion or retrofitting or revamping of existing fertiliser plants.

ii). Setting up joint venture projects in the States having abundant and cheap raw materials resources.

iii). **Substitution of raw materials**: The transformation of the fertiliser industry in recent times has largely been a move from coal-based raw materials to a petroleum base for Ammonia process. The current trend in technological development seems to narrow the field down further to natural gas and naphtha. This trend has resulted in saving in capital equipment and operating costs. Much larger plants and more flexible and market oriented plant location have become possible, all of which have a bearing on productivity.

The fertiliser industry is in constant dependence on imported Rock Phosphate and Sulphur due to dearth of resources in the country. For the new plants to be put up, processes will have to be chosen which will mitigate this dependence at least in part. While
there is not much relief to be expected in imports of Rock Phosphate, Sulphur could be avoided by a variety of methods. The use of Pyrites and Gypsum as alternatives and of furnace process for Phosphoric Acid will come in for consideration.

iv) Automation-automatic control: The chemical industry, of which the Fertiliser Industry forms a significant part, was among the earliest to adopt advanced instrumentation and automatic controls. Automatic monitoring of process streams and computer control for optimizing production are available.

v) Material Handling: The movement of large volumes of liquid and solid materials, right round the clock, is a characteristic feature of fertiliser plants. In consequence, it is a fertile frontier in cost saving and the raising of productivity levels. The provision of adequate equipment for the movement of materials, loading and the minimizing of movements are points to be ensured.

vi) Fuel efficiency: The nitrogenous fertiliser industry is a large scale user of Carbonaceous Fuels both as raw material and as fuel. Efficiency in the use of these materials is therefore the very basis of efficiency in production. Systematic study of fuel and raw
material usage, for which the process industries are invariably well equipped, should be made standard practice and will pay handsome dividends.

vii) **Preventive maintenance:** By its nuance of trouble-free operation, preventive maintenance is an attractive and beguiling concept. Its application to integrated continuous process plants presents its own problems. Standby equipments are the exception rather than the rule in the fertiliser industry and processes do not tolerate prolonged shut-downs. Effects of corrosion and temperature complicate the maintenance of equipment. A statistical study of equipment breakdown and cognizance of statutory requirements like pressure tests and boiler inspections must precede the institution of preventive maintenance. Otherwise, it is bound to remain an unsatisfactory and frustrating experience. Preventive maintenance as a method of ensuring consistent operation of expensive plant and consequently as productivity practice is most desirable.

viii) **Organisation:** The importance of proper organization is as critical for productivity in the fertiliser industry as in any other industry. The basic principles of organization are the same as elsewhere. The structuring of the organization with definition of purpose, principles, policy and hierarchy are important.
ix) **Training:** Efficient running of complex plants cannot be achieved without trained personnel of whom there is a dearth in this country. Every major fertiliser factory must have its training programme for operating and maintenance personnel. Training programmes may also be necessary for administrative personnel since they form an essential adjunct for the technical departments. Training in the right methods of work in a formal training programme will smoothen the functioning of the organization and hence increase productivity.

x) **Safety:** Dealing as it does with gases and liquids which are hazardous to human life, a high place must be given to safety training and safe practices in the fertiliser industry. The benefits are not perhaps directly measurable in productivity terms, but it forms an essential function in the operation of a factory.
REFERENCES


3. Interviewed with the officials of EID Parry (India) Ltd, Dare House, Chennai, on 4 September 2004.


10. Mirchandani, G.G., op.cit., p-33.24,


