

## India

### Udyogamandal Ammonia Plant Replacement Project

Report Date : June, 2002

Field Survey : August, 2001

#### 1. Project Profile and Japan's ODA Loan



Location map



Ammonia production plant

#### 1.1. Background

Domestic supply of fertilizer products could not fulfill demand, with the result that India had been importing to fill the resultant gap. With significant demand increases forecast, a similar trend was projected for the future. Prompt improvements in the efficiency of fertilizer plants were required to enhance production capacity. In addition, the government's Eighth Five-Year Development Plan (FY1992-1996) for the fertilizer production sector highlighted urgent rehabilitation and expansion of existing plants as a major policy direction.

Fertilizers and Chemicals Travancore Limited (FACT), which is one of nine national fertilizer companies, produced 1,680 thousand tons of fertilizer (1,610 thousand tons of nitrogenous fertilizer and 70 thousand tons of phosphoric manure fertilizer) in 1991. Ammonia utilized for nitrogen fertilizer production in FACT plants was provided by three old-type plants in Udyogamandal (production capacity : 112 thousand tons in 1991), a plant in Cochin (120 thousand tons in 1991) and foreign countries. However, by 1991, ammonia production capacity of the existing plants in Udyogamandal had deteriorated to 57 % of installed capacity, and one of the three plants had already ceased operations. As a result, the amount of ammonia FACT needed to import was increasing. An improvement in the existing ammonia production capacity was required, in order to contribute to more stable and efficient fertilizer production in FACT.

## 1.2. Objectives

To supply ammonia required for fertilizer production at the Udoyogamandal and Cochin Divisions of FACT, by replacing the three old, energy-intensive ammonia plants (340 tons per day : TPD) at Udoyogamandal with a larger and more efficient plant facility (900 TPD).

## 1.3. Project Scope

- 1) Installation of one ammonia plant (production capacity : 900 TPD) and associated facilities, such as a naphtha storage tank, ammonia storage tank, steam power and steam generation utilities
- 2) Procurement of consulting and licensing services

The ODA Loan was mobilized for equipment and material procurement and for mechanical and civil works, both in the foreign and local currency portions.

## 1.4. Borrower / Executing Agency

The President of India / Fertilizers and Chemical Travancore Limited (FACT)

## 1.5. Outline of Loan Agreement

Loan Amount / Loan Disbursed Amount	24,482 million yen / 13,145 million yen
Exchanges of Notes / Loan Agreement	October 1992 / December 1992
Terms and Conditions	
Interest Rate	2.6 % per annum
Repayment Period (Grace Period)	30 years (10 years)
Procurement	General Untied
Final Disbursement Date	April 1999

## 2. Results and Evaluation

### 2.1. Relevance

The augmentation of fertilizer production capacity through rehabilitation and expansion of existing production plants was addressed in the National Development Plan for the fertilizer production sector, thereby giving this project plan validity.

It is also noted that the Government of India has followed a policy of self-sufficiency for fertilizer products<sup>1</sup>. This indicates that an improvement of existing fertilizer production capacity in order to meet the increasing demand has been still required. Therefore, the project, which is in line with this idea, is considered to be relevant.

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<sup>1</sup> Background Paper on Long-term Policy for the Fertilizer Sector prepared by Ministry of Chemicals and Fertilizers, Department of the Fertilizer Sector, January 2000. The Paper addresses logistical difficulty in importing the entire requirement and the need to protect domestic industry as main concerns.

## 2.2. Efficiency

### 2.2.1. Project Scope

The project scope was implemented largely as planned.

### 2.2.2. Implementation Schedule

After the loan agreement was signed in December 1992, the start of the project implementation was delayed because the executing agency did not have sufficient funds to settle the ammonia manufacturing license agreement. Actual project implementation began in March 1994.

During project implementation, the installation of a steam generation plant and heat exchanger works were delayed extensively due to the local contractor's inefficiency.

As a result, plant commissioning was delayed two years, finally occurring in May 1998.

### 2.2.3. Project Cost

The project saw a large cost under-run in terms of Yen due to three factors.

First, the appreciation of the Yen against the Rupee lessened the Yen requirement for locally procured equipment, materials, and services. Secondly, keen bidding competition successfully lowered the tender prices. Finally, because the project was implemented as planned in terms of cost, it was not necessary to mobilize physical or escalation contingencies, as envisaged at the time of estimate.

## 2.3. Effectiveness

### 2.3.1. Ammonia production at the project plant

Plant utilization is good. Though the utilization level was relatively poor during the early commissioning period, due to initial teething problems<sup>2</sup>, these were rectified during the second quarter of the second operating year. Since 2000, the plant has produced at full capacity. The plant has got fully utilized to the extent of more than over rated-capacity.

Table 1 Ammonia production by the project plant (Udoyogamandal Division)

(Units : tons)

	Yearly ammonia production	Average daily ammonia production <sup>3)</sup>	Rated daily ammonia production	Plant operating rate (%) <sup>4)</sup>
Target level	267,000	810	900	90.0 %
1995 / 96 <sup>1)</sup>	38,230	116	260 <sup>5)</sup>	44.6 %
1996 / 97 <sup>1)</sup>	29,703	90	260	34.6 %
1997 / 98 <sup>1)</sup>	31,997	97	260	37.3 %
1998 / 99	138,941	421	900	46.7 %
1999 / 00	255,574	775	900	86.1 %
2000 / 01	298,880	906	900	100.6 %
Afterwards <sup>2)</sup>	297,000	900	900	100.0 %

<sup>2</sup> The Induced Draft Fan (IDF), which draws in and redirects hot gas processed by the plant, was not working as planned due to design defects.

Source : FACT, Udo yogamandal Division

Note <sup>1)</sup> The project plant was commissioned in 1997/98. Figures during 1995/96-1997/98 are of the records by old plants.

Note <sup>2)</sup> Figures for “Afterwards” are of projection.

Note <sup>3)</sup> Tons per day is derived assuming 330 operating days per year.

Note <sup>4)</sup> Plant operating rate = Daily production / Rated daily production x 100.

Note <sup>5)</sup> Out of total rated 340 tons, 80 tons was unable to be produced due to plant closing.

The number of project plant interruptions was relatively high in the early commissioning period, due to the problems mentioned above. Improvements since then are evident; only one accidental plant interruption is recorded for the year 2000/01 (and it lasted only 11 hours). As a result, losses have been minimized.

Table 2 Accidental interruption of project plant operations

	Number of interruptions	Total hours of interruption	Expected losses of ammonia production (tons) <sup>1)</sup>
1998 / 99	23	4,286	176,806
1999 / 00	17	1,390	57,317
2000 / 01	1	11	455

Source : FACT, Udo yogamandal Division

Note : <sup>1)</sup> Based on executing agency’s experienced unit rate of production per hour.

It is also noted that the efficiency of energy and material consumption has largely improved, compared with the existing ammonia plant at Cochin Division.

Table 3 Comparison of consumption efficiency per unit ammonia production

	Electricity (kWh per ton)	Naphtha (MT per ton)
Ammonia plant at Cochin	837	0.9586
Project ammonia plant	106	0.6964

Source : FACT, Udo yogamandal Division

Note : Figures are of those during the year 1999/00.

### 2.3.2. Project FIRR re-calculation

FIRR re-calculation

Before implementing the project, the FIRR was calculated at 11.7 %. With the actual records, however, the recalculated FIRR is negative. Though there was a large cost under-run, the value of benefit (avoidable cost incurred by importing ammonia<sup>4</sup>) decreased markedly and the project O&M costs, mainly composed of naphtha procurement expenditures, rose rapidly, contrary to initial expectations. As stated later, two assumptions on which the project was based changed adversely, resulting in poor financial viability.

Therefore, the project can be justified only in terms of providing an alternative to imported ammonia. Imported ammonia has proved to be the cheaper option for the executing agency, resulting in the project’s negative financial performance.

<sup>3</sup> Construction of Caprolactam plant in Petrochemical Division of FACT was assisted by Japan’s ODA loan in 1983.

<sup>4</sup> The executing agency can save the expenses of ammonia imported.

## 2.4. Impact

### 2.4.1. Output volume of fertilizer and other chemical products

Initially, the project was expected to contribute to more stable fertilizer production in India by augmenting ammonia plant capacity. And the project ammonia plant was intended to supply ammonia to four plants under FACT (two fertilizer plants at Udoyogamandal Division, a NPK compound fertilizer plant at Cochin Division and a Caprolactam plant at Petro-chemical Division).

As seen in the table below, the record of fertilizer production of FACT has exceeded initially targeted figures for all plants except the urea plant. The urea plant at Cochin Division is not supposed to receive the ammonia supply from the project plant, therefore out of control by the project plant. As discussed before, another ammonia plant installed for the urea plant has been mal-functioned and an excess demand for ammonia by the urea plant has been partly covered by the project plant to secure the volume of urea production, as close as possible to the targeted level.

Table 4 Output volume of fertilizer and other chemical products of FACT

(Units : tons)

	Udodyogamandal Division		Petrochemical Division	Cochin Division	
	Ammonium Phosphate plant	Ammonium sulfate plant	Caprolactam plant	NPK compound fertilizer plant	Urea factory <sup>2)</sup>
1995/96	157,961	207,982	47,098	575,137	266,910
1996/97	139,735	188,088	41,058	518,700	239,183
1997/98	124,026	184,556	40,451	518,693	274,200
Target	148,500	225,000	50,000	555,000	330,000
1998/99	157,639	179,238	38,783	580,200	183,065
1999/00	194,415	231,286	50,723	590,100	265,298
2000/01	205,108	238,066	52,541	633,000	275,710
Afterwards <sup>1)</sup>	200,000	231,500	50,500	633,000	300,000-325,000

Source : FACT, Udoyogamandal Division

Note <sup>1)</sup> Figure for "Afterwards" is of projection.

Note <sup>2)</sup> Normally, the project plant is not supposed to supply urea plant with ammonia.

The executing agency reports that the production capacity at the ammonium phosphate, ammonium sulfate, caprolactam and NPK compound plants has increased as a result of the stable supply of ammonia.

### 2.4.2. Contribution to local market

In light of unfulfilled demand, which is widely observed in India, and an Indian policy promoting self-sufficiency in fertilizer products, the executing agency has an important role in stabilizing fertilizer supply, particularly in the southern four states (Kerala, Tamilnadu, Karnataka, and Andhra Pradesh). From 1995/96 to 2000/01, the executing agency has maintained a corresponding share of demand (growing 3.6 % per annum for Nitrogenous and

6.7 % for Phosphoric manure), though a small portion of market share was lost. The executing agency claims that the increased, continuous supply of fertilizer was made possible by the increased capacity of the ammonia plant.

Table 5 Market share for the executing agency in the southern four states

(Units : thousand tons)

Product		1995 / 96	1996 / 97	1997 / 98	1998 / 99	1999 / 00	2000 / 01
N	Total consumption	2,242.1	2,300.9	2,286.6	2,540.0	2,659.9	2,666.4
	FACT supply	318.1	264.5	303.5	303.1	317.8	343.5
	Share (%)	<b>14.2</b>	<b>11.5</b>	<b>13.3</b>	<b>11.9</b>	<b>11.9</b>	<b>12.9</b>
P	Total consumption	854.7	818.8	1,050.2	1,146.3	1,212.9	1,144.2
	FACT supply	156.8	127.7	143.6	148.7	166.4	169.4
	Share (%)	<b>18.3</b>	<b>15.6</b>	<b>13.7</b>	<b>13.0</b>	<b>13.7</b>	<b>14.8</b>

Source : FACT, Udoyogamandal Division

Note <sup>1)</sup> N = Nitrogenous fertilizers and P = Phosphoric manure fertilizers

### 2.4.3. Ammonia import reduction (Balance of ammonia production and consumption)

Another important aspect of the project was for the resolution of the safety concerns of residents in the area surrounding the airport. For imported ammonia, the executing agency had a storage tank near the local airport, which raised local residents' concerns of hazardous risk (anticipated in case of a plane crash or mis-operation of the tank). The local population had requested that the tank be moved or imports stopped.

In light of the potential hazardous effects of the existing ammonia storage tank at Cochin Airport, it was expected that this project would bring an end to all ammonia imports. The executing agency, however, has still needed to import ammonia. Ammonia imports were required in 1998/99 and 1999/00 because of below-capacity production, as discussed above. The executing agency imported ammonia in 2000/01, to compensate for a regularly scheduled shut-down, which lasted less than one month.

Furthermore, when another ammonia plant (installed for a urea plant at FACT Cochin Division) was accidentally shut down for long period, more ammonia imports were required. However, ammonia imports have been decreasing steadily every year since the commissioning of the project plant.

Table 6 Balance of ammonia consumption and requirements of FACT

(Units : tons)

	Total ammonia requirements <sup>2)</sup>	Total ammonia production <sup>3)</sup>	Amount of ammonia imported <sup>4)</sup>
1995 / 96	253,808	38,230	215,578
1996 / 97	209,011	29,703	179,308
1997 / 98	205,337	31,997	173,340
1998 / 99	243,455	138,941	104,563
1999 / 00	300,539	255,574	57,447
2000 / 01	315,373	298,880	14,580
Afterwards <sup>1)</sup>	297,000	297,000	0

Source : FACT, Udoyogamandal Division

Note <sup>1)</sup> Figures for “Afterwards” are of projection.

Note <sup>2)</sup> Amount of ammonia requirements includes the additional requirements by the Cochin urea plant which was not to be supplied with ammonia from this project plant.

Note <sup>3)</sup> Figures during 1995/96-1997/98 are of the records by old plants.

Note <sup>4)</sup> Amount of ammonia imported is partly determined by the existing stock volume..

The ammonia storage tank located near Cochin Airport continued to be used after the project plant’s commissioning, although less frequently and for smaller volumes. In 1989, neighboring residents brought a suit demanding FACT stop using the ammonia storage tank to avoid the occurrence of a hazardous event. In 1999, however, Cochin Airport was transferred to a new site.

The executing agency indicates that the airport’s transfer has eliminated the risk of hazardous impact on the local population. It should be noted that the executing agency ensures that the stock in the storage tank is maintained at the minimum level of 10% at all times, except during plant shut down. According to the executing agency, a supreme judicial decision on continuous use of the storage tank is pending.

#### 2.4.4. Synthesis Gas / Carbon-dioxide Gas Production

Synthesis gas is another product supplied to the Petro-chemical (Caprolactam) Division of the executing agency.

Table 7 Synthesis gas production

	Yearly synthesis gas production (tons equivalent to ammonia)	Average hourly production (NM <sup>3</sup> ) <sup>2)</sup>
Target (rated)	29,700	10,800
1998 / 99	8,945	3,252
1999 / 00	14,135	5,140
2000 / 01	22,697	8,254
Afterwards <sup>1)</sup>	24,750	9,000

Source : FACT, Udoyogamandal Division

Note : <sup>1)</sup> This figure is a projection.

Note : <sup>2)</sup> 10,800 NM<sup>3</sup>/hour synthesis gas production is equivalent to 90 tons/day of ammonia.

Because of the Caprolactam plant’s efficient operation<sup>5</sup>, the executing agency considers the present level of synthesis gas production satisfactory.

Besides synthesis gas, the project is also supplying carbon-dioxide gas to the Caprolactam plant. The record of its production volume were not available.

#### 2.4.5. Penetration of new technology by the project

During project implementation, the executing agency hired a chemical process engineering licensor, HALDOR TOPSPOE A/S Denmark (HTAS), to prepare a basic design for the project plant, using its own budget. Based on the output of basic design, detailed engineering and

<sup>5</sup> Construction of Caprolactam plant in Petrochemical Division of FACT was assisted by Japan’s ODA loan in 1983.

process design works were undertaken by the executing agency's engineering design firm, FACT Engineering and Design Organization (FEDO). The executing agency admitted that working with HTAS helped it acquire knowledge, information and practical experience in technologically advanced plant engineering.

#### 2.4.6. Environmental impacts

The executing agency has conducted an environmental performance evaluation for the project ammonia plant's operations, using an established environmental monitoring system to monitor impacts of pollution monthly and quantitatively and to determine whether performance is within tolerable limits.

##### 1) Water pollution contained in effluent from ammonia plant

Table 8 Effluent performance of ammonia plant

Particulars	Unit	Tolerance limits	Results and date of sampling
PH	-	6.5-8.0	7.4
Ammonia Nitrogen	mg/l	75.00	28.40
Nitrate Nitrogen	mg/l	20.00	0.74
Oil & Grease	mg/l	10.00	Nil
Suspended solids	mg/l	100.00	40.00
Flow of effluent	kilo liter	4,800	816

Source : FACT, Udoyogamandal Division

Note : Monitored on July 2001, and tolerance limits are standard prescribed by KSPCB.

##### 2) Stack emission from ammonia plant

Table 9 Stack emission performance of ammonia plant

Chimney No.	Parameter	Limiting standard (mg/NM <sup>3</sup> )	Sampling result (mg/NM <sup>3</sup> )	Rate of consented emission (NM <sup>3</sup> /hr)	Rate of actual emission (NM <sup>3</sup> /hr)
A	SO <sub>2</sub>	1,200	24.7	3,204	1,679
B	SO <sub>2</sub>	1,200	28.6	6,684	3,822
C	SO <sub>2</sub>	1,200	46.2	118,480	75,166
D	PM	1,200	140.4	90,290	39,909
	SO <sub>2</sub>	1,200	924.8		

Source : FACT, Udoyogamandal Division

Note : Monitored in July 2001.

To prevent water pollution from the plant effluent, the executing agency installed an effluent treatment plant; the design standards was approved by the Kerala State Pollution Control Board (KSPCB). In addition, gaseous emissions containing ammonia and fluorine are scrubbed with water to prevent the escape of ammonia to atmosphere.

As observed, the executing agency has shown environmentally acceptable performance for ammonia plant operation. In 1999, the Udoyogamandal Division secured first place among the large-scale industries for making substantial, sustained efforts in pollution control, as rated by

KSPCB. Furthermore, in March 2000, it received ISO 14001 certification, valid for three years, for conforming to the Environmental Management System Standards.

## 2.5. Sustainability

### 2.5.1. Operations and Maintenance

Operation and Maintenance (O&M) for the newly installed ammonia plant has been shared by several subsections of the Udoyogamandal Division of the executing agency.

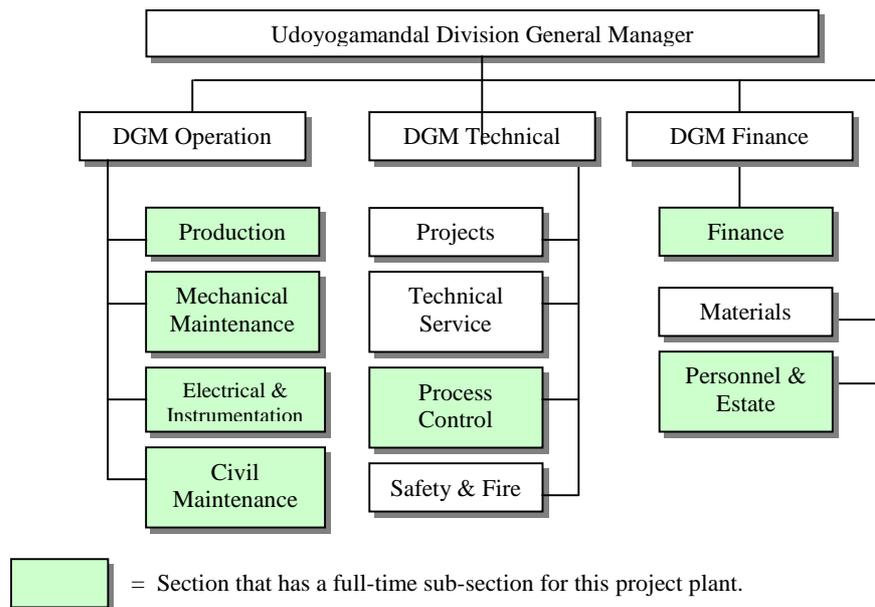


Figure 1 Organization chart of Udoyogamandal Division and O&M sub-section for the ammonia plant

Note : DGM / Deputy General Manager.

Udoyogamandal Division comprises 11 sections, some of which have a full-time sub-section for O&M of the project plant (see organization chart above).

All O&M and administrative works related to the ammonia plant are reported to each sub-section leader, who in turn reports to the concerned section chief or directly to the Deputy General Manager, who has overall responsibility.

#### (1) Operation

The ammonia plant, as already stated, has performed satisfactorily except for the early commissioning period. During the year 2000/01 the over-rated capacity performance has been recorded, through full-time plant mobilization except for annual overhaul period.

The executing agency has paid careful attention to input availability for ammonia processing. Major materials and utilities required include energy, water, heavy oil and, most importantly, naphtha. The executing agency has arranged a series of measures to avoid supply shortage or interruption of those inputs, including supply volume guarantee and augmentation of supply

pipeline capacity for naphtha fuel. A 6MW captive power plant was installed as a part of the project to ensure energy supply. Since the commissioning, no shortage of input supply has been experienced, according to the executing agency.

## **(2) Maintenance**

Preventive maintenance on mechanical and electrical equipment is carried out, as prescribed in each maintenance manual, by the ammonia sub-sections of the Mechanical Maintenance and Electrical & Instrumentation sections. Maintenance manuals have been supplied for each manufacturer. The main focus of preventive maintenance, according to the executing agency, is to check rotating electrical equipment, such as compressors, pumps, boilers and blowers. All rotating mechanical and electrical equipment have at least one installed standby and are kept in the desired condition.

As for major machinery, supply of spare parts are maintained as recommended by the supplier. These spare stock affordable for two years operation has been procured and replenished immediately after consuming them. Spare stock is managed as part of FACT's online integrated information system. Whenever an item is consumed, an indent for procurement of the same item is notified automatically.

For overhaul maintenance (annual shut-down), which takes 20 to 30 days, the Central Maintenance group under the head office of the executing agency joins the plant maintenance group and conducts statutory testing and inspection of the entire plant jointly. To date, overhaul maintenance has been performed satisfactorily.

### **2.5.2. Technical Capacity**

The project introduced a Centralized Computer Controlling System and other sophisticated management tools for the project ammonia plant. Also, the executing agency acquired, to a limited extent, the new technical skills required. Operators of the old ammonia units were given short-term, extensive training and have been fully adopted into the new plant operation, according to the executing agency.

Out of a total staff of 2,277 in the Udoyogamandal Division, 66 managers, 144 technical engineers and 24 laborers are in charge of administration and O&M of the project plant (as of March 2001). There is no bench marking system to quantitatively evaluate technical skills and capacity at the moment. However, the executing agency claims that people with adequate skill and capacity are identified and posted into suitable positions. The agency reports that the ammonia plant has not faced any problems related to the technical skill and capacity of the staff since operations stabilized.

The technical training and development of managerial personnel have been carried out at the Management Development Center. Two training schools at the Udoyoganmadal and Cochin Divisions have provided technical training courses and facilities to workers. Also, as a continuous program to motivate staff to develop and learn further technical and administrative

capacity, the executing agency instituted “Awards for Excellence”, which are given to an individual or group of employees in recognition of excellent work in tackling a problem or undertaking a job.

### 2.5.3. Financial Status

In contrast to production and sales performance and the executing agency’s successful utilization of the project, its financial performance has gotten worse since 1998/99. The executing agency ended the year 1999/00 with a loss of Rs. 398.0 million (against Rs. 482.6 million in 1998/99), after depreciation and interest. Accordingly, reserves and surplus had diminished from Rs. 3,080.6 million in 1997/98 to 2,199.3 million in 1999/00. The executing agency has identified the following reasons for its poor financial performance:

Table 10 Highlights in financial performance of FACT

(Unit : Rs. million)					
Item	1996/97	1997/98	1998/99	1999/00	2000/01
Total income	11,123.7	12,083.3	12,278.4	16,826.6	15,654.1
for (Sales)	9,276.7	10,545.6	10,970.9	12,755.0	15,525.4
for (Subsidy)	989.0	1,516.6	1,158.6	2,747.4	
Total expenditure	9,991.1	11,009.6	11,372.6	15,825.8	17,208.9
Interest & depreciation	421.1	467.5	1,450.0	1,398.8	1,454.6
<b>Profit before tax</b>	<b>617.8</b>	<b>539.4</b>	<b>-482.6</b>	<b>-398.0</b>	<b>-3,009.4</b>
Share holder’s funds	6,281.1	6,628.3	6,145.5	5,747.0	n.a
<b>for (Reserves and Surplus)</b>	<b>2,733.3</b>	<b>3,080.6</b>	<b>2,597.8</b>	<b>2,199.3</b>	n.a

Source : FACT, Udayogamandal Division

Note : Figures in year 2000/01 are of provisional.

- 1) With the commissioning of the new ammonia plant in early 1998, the high capital related charge (reflected in increasing interest and depreciation charges) of the plant had to be absorbed.
- 2) Instead of procuring cost-attractive import ammonia, the executing agency has been producing ammonia at an in-house ammonia plant. The increased cost of in-house ammonia production is partly explained by an upward increase in the price of naphtha and furnace oil. These petroleum products are directly subject to international price fluctuations and administrative pricing mechanisms (Price ceiling controls by the government, formerly set at Rs. 4,000 per ton for naphtha, were removed in 1998). Naphtha prices, for example, have ranged from Rs. 6,700 - 8,000 per ton (right after removal of price control) to Rs. 14,477 (October 2000). The executing agency is presently considering switching to liquid natural gas (LNG) to enjoy its cost advantage.
- 3) The government’s pricing policy<sup>6</sup> for fertilizer products adversely affects the financial soundness of the executing agency. FACT’s most important fertilizer product, ammonium phosphate (known as Factamfos 20:20), has been the object of an ad-hoc subsidy scheme, in

<sup>6</sup> All fertilizer products used to be under “Retention Pricing Scheme (RPS)”. Before commissioning of new ammonia plant, DAP, ammonium sulphate and phosphate were excluded from RPS. Presently, ammonium phosphate is an object to ad-hoc subsidy scheme as explained. Urea is still under RPS, but as per new fertilizer policy, there is every possibility that subsidy on urea also would cease in the near future. No subsidy is already available for other fertilizer products.

which the procurement of ammonia is subsidized by the government. However, since the subsidy for ammonia procurement cost is calculated based on its import price, the executing agency has been increasingly disadvantaged.

- 4) The executing agency produces other kinds of fertilizer products with lesser capacity compared with main product, ammonium phosphate. These include ammonium sulphate (a chemical by-product), DAP and urea. Ammonium sulphate is sold at a lower price than actual variable cost due to diminishing demand in a competitive market. The price of urea is still controlled by the government, which guarantees that it brings 12% return on equity, based on the standard performance of the fertilizer industry. Average selling price with subsidy against production costs is summarized in the table that follows.

Table 11 Average selling price with subsidy against production costs of fertilizer products

(unit : Rs. per MT)

Product name	Selling price	Subsidy	Production Costs (Variable cost)
Ammonium phosphate	6,880	2,492	10,380 (8,280)
Ammonium sulphate	4,742	0	6,174 (5,076)
Urea	4,600	11,452	16,877 (14,637)

Source : FACT, Udoyogamandal Division

Note : Figures are of average during the year 2000/01.

With financial performance hampered by the reasons above, the executing agency has realized the importance of cost reduction efforts in other areas. It presently conducts manpower rationalization and implements a restructuring plan based on a study report by the National Productivity Council in Bangalore.

The executing agency has also applied for a comprehensive financial relief package (known as "Rehabilitation Package"), consisting of write-offs of government loans and the waiver of unpaid interest, from the Government of India. According to the executing agency, once the requested relief is sanctioned, financial soundness will improve significantly.

### 3. Lessons Learned

The project plant has been satisfactorily utilized, producing desired outputs and providing an alternative to imported ammonia as originally envisaged. It is also evident, however, that this project plant has been a financial burden to the executing agency.

Changes in such conditions as government-controlled prices or the international market price of major materials are beyond the control of the executing agency, but sometimes they can erode the relevance or rationale of a project.

In such cases that the direction of government price policy or the market conditions for material procurement are considered decisive factors for project viability, they need to be examined at the time of project formulation/appraisal as carefully as possible, particularly in case of industrial and manufacturing projects.

### Comparison of Original and Actual Scope

Item	Original Plan	Actual
<b>Project Scope</b>		
1. Location	Udoyogamandal, Cochin, Kerala	} As planned.
2. Project Area	210m × 125m	
3. Major Facilities		
(1) Ammonia Plant		
-Production Capacity	900 tons/day	
(2) Converted Gas Plant		
-Production Capacity	10,800 NM <sup>3</sup> /hr (22.5kg/cm <sup>2</sup> )	
(3) CO <sub>2</sub> Plant		
-Production Capacity	32,121 NM <sup>3</sup> /hr	
(4) Naphtha Storage Tank	1,500 tons × 1 unit 800 tons × 1 unit	
(5) Ammonia Storage Tank	5,000 tons × 1 unit	
(6) Steam Generation Unit	45t/hr (110kg/cm <sup>2</sup> ) × 2 units	
(7) Desalination Facility	70m <sup>3</sup> /hr × 2 units	} As Planned.
(8) Water Refrigeration System		
-For Main Plant	12,000m <sup>3</sup> /hr (42-32 C)	
-For Utilities	2,000m <sup>3</sup> /hr (42-32 C)	
(9) Inert Gas Plant	1,000 m <sup>3</sup> /hr	
(10) Instr. Air Unit	1,500 m <sup>3</sup> /hr (7kg/cm <sup>2</sup> )	
(11) Liquid Industrial Waste Treatment	1 unit	
(12) Fire Hydrant System	1 unit	
4. Utilities		
(1) Electricity		
a) Steam Turbine Generator	6MW × 1 unit	
b) Substation (11kv)	1 no.	
c) Diesel Power Generator	500kW × 1 set	
(2) Water Intake / Treatment Facility (from Periyar River)	Capacity:3,000m <sup>3</sup> /hr	Deleted. Using the existing intake and treatment facility.
(3) Communication System	1 unit	As planned.
5. Auxiliary Facilities		
(1) R&D Building	1 no.	} Deleted. Existing when appraisal mission, no new buildings are constructed.
(2) FEDO Building	1 no.	
(3) Flare Stack	1 no.	As planned.
6. Consulting Service	Total : 5,092 M/M	4,000 M/M (local : FEDO) 215 M/M (foreign : HALDOR TOPSOE A/S)
<b>Implementation Schedule</b>		
(1) Loan Agreement	Dec. 1992	Dec. 1992
(2) Engineering	Dec. 1992 - Nov. 1994	Feb. 1994 - Dec. 1995
(3) Procurement	Feb. 1993 - Nov. 1994	Apr. 1994 - Jun. 1997
(4) Civil Work	Feb. 1993 - Jul. 1995	Feb. 1994 - Jun. 1996
(5) Erection	Jul. 1993 - Nov. 1995	Jul. 1994 - May. 1998
(6) Commissioning	May. 1996	May. 1998
<b>Project Cost</b>		
Foreign currency	9,708 million yen	5,708 million yen
Local currency	5,312 million Rs.	4,659 million Rs.
Total	33,240 million yen	21,037 million yen
Yen loan portion	24,482 million yen	13,145 million yen
Exchange Rate	Rs.1 = 4.43 yen (as of May 1992)	Rs.1 = 3.29 yen (average during 1992-1999)

Source: FACT

## Independent Evaluator's Opinion on FACT Udoyogamandal Ammonia Plant Replacement Project

Ashim CHATTERJI  
Independent Evaluator

1. The Project was relevant enough, as GOI decided to set up a new ammonia plant to replace old Ammonia plants and to meet the requirement, which was hitherto being imported.
2. The ammonia project was sanctioned not as much on the basis of economic viability as due to environmental considerations. As evaluation report pointed, environmental consideration was also strong motive for the Project implementation.
3. The company made profit till 1997-98, but started loosing thereafter due mainly to the following reasons;
  - a. Higher loan and interest repayment liability
  - b. High cost of transportation of ammonia
  - c. Lower profits from Caprolactum and Ammonium sulphate
  - d. Surplus manpower
  - e. Low capacity utilization of Phosphoric acid plant
  - f. Foreign exchange rate fluctuation
  - g. High cost of naphtha

For the Project sustainability purpose, financial soundness of the FACT does really matter. Therefore, an improvement of financial management is essential to the sustainability of the Project outcomes and impacts. While some of the factors for losses are beyond the control of the company's management, but items like higher loan and interest repayment, transportation of ammonia and surplus manpower can be taken care through policy decisions and improved management. As pointed in the evaluation report, the action on this internal management issue is required in a prompt manner.

Note : It is reported in the financial daily "The Economic Times" dated 3 May, 2002 at page 11, that FACT has registered a profit of Rs. 41 crores during the fiscal year of 2001, despite low turnover. This was due to the effect of "Financial Restructuring Scheme" where an outstanding interest could have been waived (the evaluation report mentioned this scheme as measures to relief FACT from financial degradation).

\*Rs. 1 Crores = Rs. 10 million

May 8, 2002