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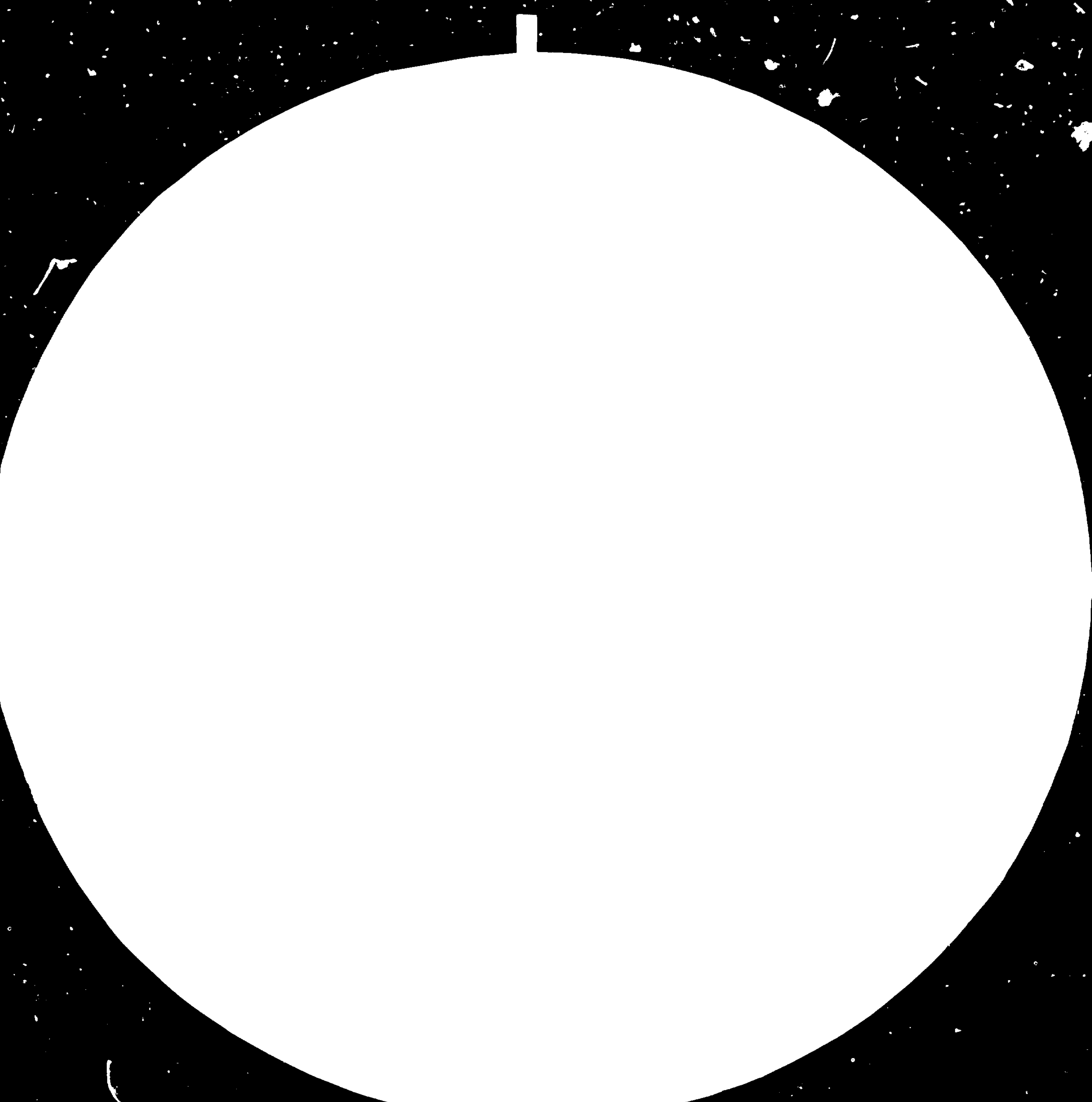

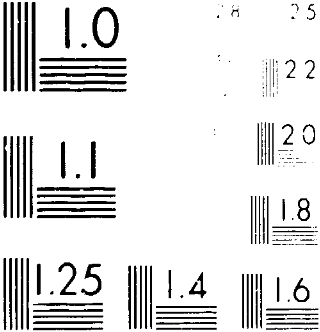
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COUNTRY PAPER ON BANGLADESH FERTILIZER INDUSTRY*

by

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INTRODUCTION:

Agriculture is the dominant sector of Bangladesh economy, providing more than 75% of the employment of the active population and contributing to 90% of the Foreign Exchange earnings.

Bangladesh is a most densely populated country with density of 2030 per square mile. The population of the country estimated at 90 Million at the annual growth of 2.5%, higher than the average growth of rate of food production of 2.1% per annum. To resist food import which consumes large amount of hard earned Foreign-exchange, the government has taken a massive programme for increasing the food production. The production and consumption of fertilizer has been the main issue of the programme for increasing the agricultural product.

The total area of the country is 54 thousand square miles or 35.5 million acres of which 22.5 million acres are under cultivation. In view of the limitation of expanding the area under cultivation, expansion of the agriculture holds the potential for increasing the agricultural production. The fertilizer use as well as yield of paddy per acre in Bangladesh is much lower than most of the countries in Asia though fertilizer was first introduced as early as in 1951-52, with ammonium sulphate in the country. Therefore, fertilizer can play a vital role in increasing agricultural production aiming at self-sufficiency in food. Fertilizer demand was sharply increased with the introduction of High Yielding Variety of Rice in 1966-67. In 1980-81 fertilizer consumption recorded its ever highest figure at 875 thousand tons with the increase of 3.7% over the previous year. The Fertilizer consumption is shown in the figure-I.

Fortunately Bangladesh is well endowed with Natural Gas, the best raw material for the production of Ammonia Fertilizer. So far 9(nine) gas fields onshore and one in the offshore Kutubia have been discovered in the eastern zone. The current reserves and other specifics of the gas field are shown in Table-I.

Gas consumption during the fixcal year was around 130 MMCFD but by the end of the current fixcal year it is expected to shoot up by more than 50% to around 220 MMCFD, mainly on account of higher consumption of power, fertilizer and other industries. By the end of 1985 gas consumption is expected to rise to 550 MMCFD and will go a long away towards substitution of imported fuel and saving of Foreign-exchange. The government has given high priority to the development of indegenous Natural Gas resources to reduce the country dependence on imported energy. The gas consumption pattern is as given in the following table-II.

FERTILIZER PLANTS IN BANGLADESH:

The first Fertilizer plant in the country was put on stream in November, 1961 and by the time we have more 5(five) fertilizer Plants in the country and except Zia Fertilizer Company Ltd., the other factories were constructed on Turn Key basis by the Foreign General Contractors. The particulars of those are shown in table-III and IV.

Out of the experience from these factories the following points may be mentioned here to share the same by all.

(A) CAPACITY UTILIZATION:

The capacity utilization in our plant varies from 60 to 80%. The performance is dependent on several factors like age, size, feed-stock, process, product, utility facilities, training concept and Managerial capacity etc and more important on the reliability features of plant and equipment. The plants in the under developed countries are mostly constructed on Turn-Key basis. The contractors are given the free hand to select the plant equipment-clients fully depend on the goodwill of the contractors. Modern plants with the latest technology are normally imported without due consideration of the maintenance of the same. With the technology development, maintenance philosophy is also changed but unfortunately that point is not taken into consideration. In our case that is the main constraint of capacity utilization. A brief analysis of the loss of stream days in case of Urea Fertilizer Factory Limited, Ghorasal, Dacca is shown in table-V (a, b & c). It will be seen that the main cause of loss of production is the break down of machinery and failure f Instruments. The modern thought of continuous run of single train ammonia plants came into being with the introduction of Preventive/Perdictive maintenance which we lag very much. The correct assessment of the operating and mechanical condition of the machine to plan the maintenance only when a need is indicated has become possible mainly due to the development of sophisticated diagnostic aids. Thus the developing countries should consider hiring of the latest concept of the maintenance technology along with the modern fertilizer plants.

The developing countries can not aford to be guinea-pigs for engineering firms for untried design or equipments. It is preferable to adopt proven process and use proven equipment instead of experimenting with newer processess. In this respect the developing countries may share the valuable experience through a centrally organised data bank. The question of maintaining uniformity in plant capacity and selection of vendors for the proven equipments may also be given due consideration to avail the benefit of low inventory level for costly spares.

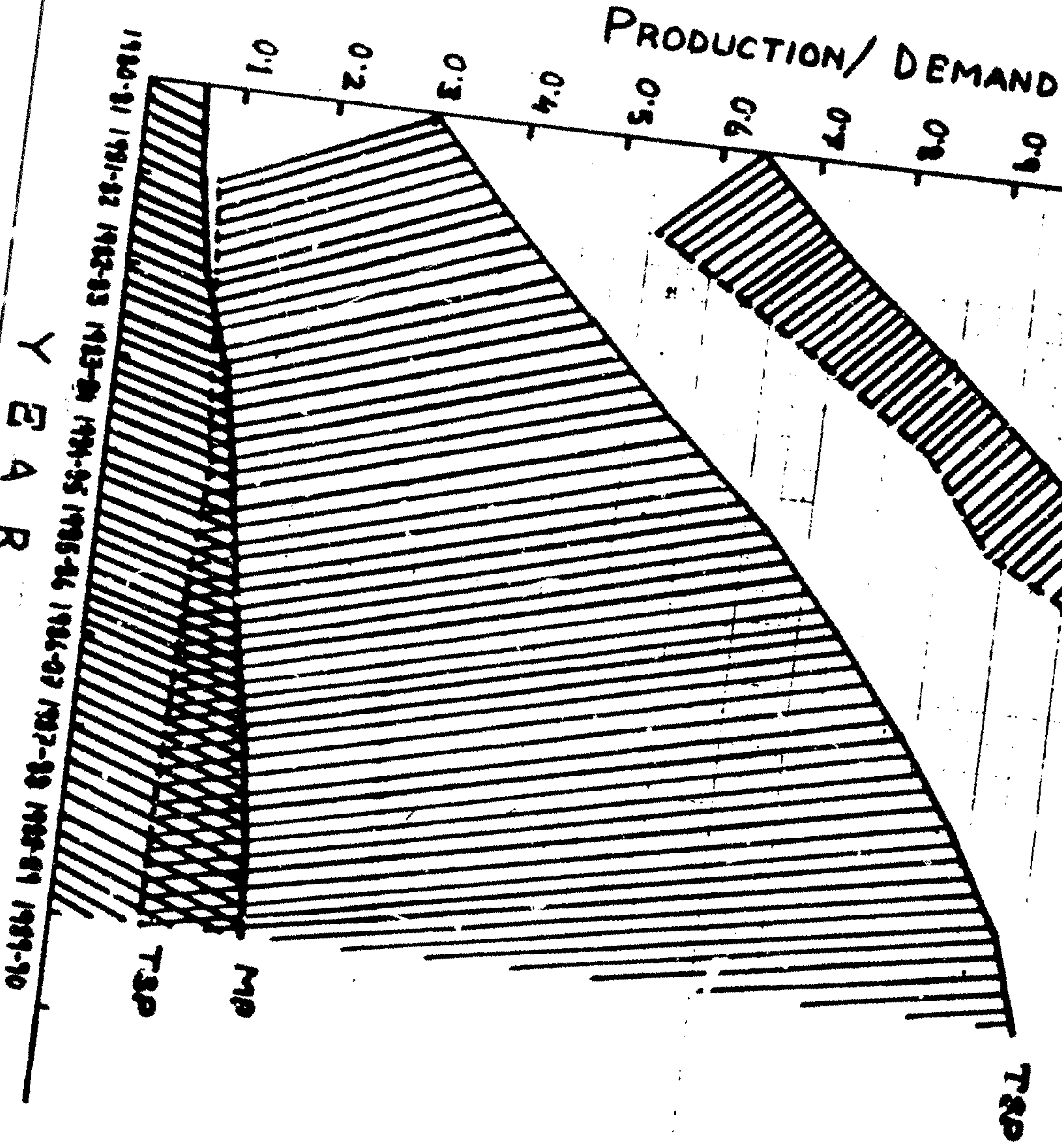
(B) REMOVAL OF PLANT CONSTRAINTS:

It is observed that almost all plants inherit certain short comings of varying degree from the design stage. Even a well designed plant may need periodic modifications to give good performance on a sustained basis. Ghorasal Fertilizer Plant suf suffers utility constraints which are taken care of in the Rehabilitation Scheme in 1983-84. Normally excess capacity is required to take care of the future increase of utility consumption with the ageing of the factory. In developing countries where plant operation can never be as closely monitored and controlled as in industrially more advanced countries the utilities consumption ratio should be considered slightly in higher side at the design stage.

Both the Cooling Towers (one in Urea and the other in Ammonia) will be extended by more 7 cells with the addition of one DM Unit and package Boiler with a view to maximising the capacity utilization.

Besides design constraints, all the plants need some changes for improving their performance. The timely innovations help the plants maintain consistently high level of performance. Effluent disposal is one of such innovations. UFFL suffered three total shutdown on those occasions because of effluent disposal system. As nothing about disposal of the same was in grass-root stage of the plant much innovation had to be made to approach zero discharge of harmful water effluent.

Switching over from the conventional chrome treatment to non-chrome treatment of the open type circulating Cooling Water system may also be mentioned as an improvement so far pollution is concerned. Initially both the Cooling Towers were on Chrome treatment but in October-November, 1980 Urea Cooling Water System was changed to non-chrome treatment from Kurita Water Industries, Japan and the effect is in no way inferior to Chrome Treatment.


PRODUCTION/ DEMAND
YEAR
1980-81
1981-82
1982-83
1983-84
1984-85
1985-86
1986-87
1987-88
1988-89
1989-90
T&P
MP
T&P

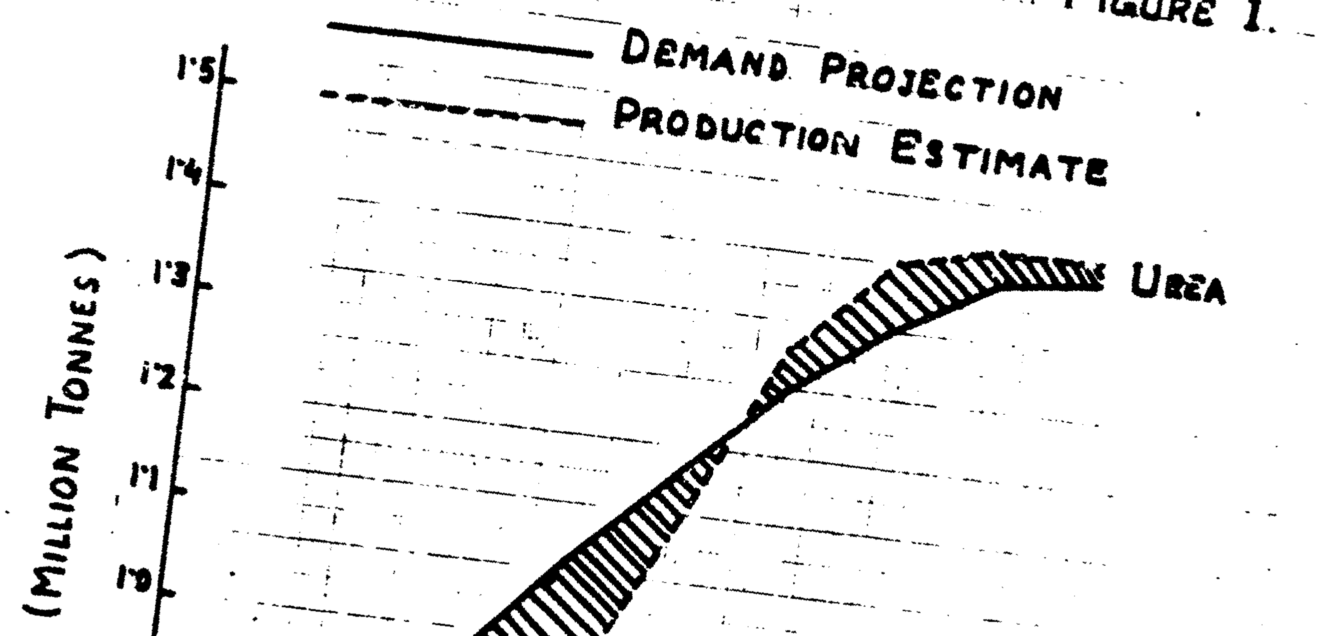

DEMAND PROJECTION
PRODUCTION ESTIMATE
UREA
(MILLION TONNES)
1·5
1·4
1·3
1·2
1·1
1·0

FIGURE 1.

(TABLE-I)

NATURAL GAS RESERVES IN BANGLADESH AND THEIR CHEMICAL COMPOSITION

Fields	Chhatak	Sylhet	Kailastila	Rashidpur	Habiganj	Titas	Bakhrabad	Semutang	Kutubdia	Begumganj
Proven Reserves in tncf	0.04	0.28-0.43	0.60	1.06	1.28	2.25	2.78-3.70	0.03	1.0	0.25
Discounted Reserves as on June 30, 1981	0.020	0.249	0.60	1.06	1.234	0.031	3.70	0.030	1.00	0.25
Rate of Consumption 1980-81	0.0021	0.0070	-	-	0.00745	0.03341	-	-	-	-
No. of Years available for consumption* based on 1980-81	9.6 Yrs. approx.	36Yrs. approx	Untapped	Untapped	166Yrs	61Yrs	Untapped	Untapped	Untapped	Untapped
Condensate recovery bbl/mmcf Trace	Trace	3.4	10.00	0.30	0.05	1.5	2.00	Trace	Trace	-
Calorific value Gross btu/cft	1007	1052	1052	1014	1020	1036	1022	-	1043	-
Chemical Composition										
Methane %	99.05	96.26	95.7	98.02	97.8	98.8	94.3	96.94	95.72	-
Ethane %	0.24	1.99	2.6	1.2	1.5	1.7	3.4	1.70	2.87	-
Propane %	-	0.14	0.9	0.2	-	0.4	0.8	0.14	0.67	-
Butane %	-	0.32	0.4	0.1	-	0.5	0.6	1.01	0.31	-
Nitrogen %	0.67	0.98	0.2	0.25	0.7	0.3	0.4	0.86	0.365	-
Carbon Dioxide %	0.04	0.34	0.2	0.05	-	0.3	0.5	0.35	0.065	-
Year of Discovery	1959	1955	1962	1960	1962	1962	1968	1969	1977	

Note : tncf - Trillion Feet - 10^{12}

bbl - American Barrel

mmcf - 10^6 cft

btu - British Thermal Unit

(TABLE-II)

The gas consumption pattern is as given in the following table:

Category of consumers	Gas consumption 1979-80		Gas consumption 1980-81		Gas consumption 1984-85	
	MMCFD	%	MMCFD	%	MMCFD	%
A. FUEL SUB TITUTION:						
i) Power	45.5	35	80	34	179	33
ii) Industries	18	14	27	11	122	22
iii) Commercial Unit	4	3	10	4	31	5.8
iv) Residents	6.5	5	11	5	23	4.2
Sub-Total - A :	74	57	128 March'81 (61%)	54	355	65
B. FOR FERTILIZER PRODUCTION:						
i) Fenchuganj	20		20		20	
ii) Ghorasal	36		40		42	
iii) Ashuganj	-		50		50	
iv) Chittagong	-		-		55	
v) Polash	-		-		22	
Sub-Total-B	56	43	110 (39%)	46	189	35
TOTAL ALL CATEGORIES	130	100	238	100	544	100

(TABLE-III)

The Installed Capacity of the plants already installed and also under implementation and planning as follows:-

Sl. No.	Name of enterprises/Project	Product	Installed capacity per year (M.T.)	Raw Material	Year of commissioning	General Contractor.
1.	Natural Gas Fertilizer Factory (NGFF) Sylhet	Urea	1,06,000	Natural Gas @20 million Cft/day	1962	M/s. Kobe Steel Ltd., & M/s. Mitsubishi (Turn Key)
2.	Ammonium Sulphate plant (ASP) Sylhet	Ammonium Sulphate	12,000	Imported Raw sulphur & Ammonia from NGFF	1969	M/s. Mitsubishi (Turn Key)
3.	Triple Super Phosphate Plant(I), Chittagong	T.S.P.	32,000	Imported Raw sulphur and Rock phospates	1978	M/s. Technique Chemie, France (Turn Key)
4.	Triple Super Phospates Plant (II), Chittagong	T.S.P.	1,20,000	Imported Raw sulphur and Rock Phospates	1974	M/s. Hitachi Zosen, Japan, (Turn Key)
5.	Urea Fertilizer Factory, Ghorasal. Dacca.	Urea	3,40,000	Natural Gas @ 39 million CFT/day	1970	M/s. Toyo Engineering Corp., Japan (Turn Key)
6.	Zia Fertilizer Chemical Co., Comilla.	Urea	5,28,000	Natural Gas @ 45 million Cft/day	Prod. December, 1981	M/s. Foster Wheeler & Co., (Cost Plus fee)
7.	Polash Urea Fertilizer Factory, Ghorasal.	Urea	1,00,000	Natural Gas @22 million Cft/day		Chinese Govt. assisted.
8.	Chittagong Urea Fertilizer Factory.	Urea	5,61,000	Natural Gas		

(TABLE-IV)

Processes and other basic data of Urea
Fertilizer Plants in Bangladesh

	N. G. F. F.	U. F. F. G.	Z. F. C. C.
Reforming (Gas Section	Steam Reforming Chemico, USA	Steam Reforming	Steam Reforming
CO_2 Recovery	Potassium Carbonate Solution	Giammarco Vetrocoke	Benfield
Ammonia Synthesis	Chemico (350/360 Kg/Cm^2G)	T.E.C. Similar to Kellog (130-140 Kg/Cm^2G)	Uhde
Urea Synthesis	Chemico (Total Gas Recycle) with MEA Solution	Mitsui Koatsu Total Recycle-C	Stami Carbon
Water System	Kurita Water Industries Ltd., Japan.	Japan Organo Co., Ltd.	Belco, USA Cooling Tower (Paharpur, India)
Electric Power	24 MW Captive (with one stand-by Generator of 12 MW)	16 MW Captive	i) 13 MW Captive Power for essential services. ii) 5 MW Natural National Power for other uses
Prod. Storage Capacity. 1) Ammonia Tank.	1000.000 M.T. at low press.	750x2 M.T at 23Kg/Cm^2G	10,000 M.T. at ambient temp. (Vijoy tank vessel,) India
ii) Urea 1. Losse	30,000 M.T	42,000 M.T	40,000 M.T
2. Bagged	2,000 M.T	8,000 M.T	8,000 M.T

UREA FERTILIZER FACTORY LIMITED,
GHORASAL, DACCA

(TABLE-V)(a)

YEARWISE DOWNTIME ANALYSIS

Unit : Days.

(Year ended June '30)

Sl. No.	Causes	1981-82 Upto Dec.'81	1980-81	1979-80	1978-79	1977-78	1976-77	1975-76
1.	Breakdown of Machinery	43.67	19.39	14.52	25.85	16.77	17.30	29.08
2.	Corrosion/Erosion	-	10.39	1.84	7.79	22.84	15.41	8.50
3.	Elect. Distribution.	-	-	2.36	2.81	7.08	0.33	39.54
4.	Elect. Power:							
	i) Captive	-	-	18.63	0.35	31.96	4.81	-
	ii) PDB	0.31	-	3.45	16.61	-	-	-
5.	Instrument	13.00	11.04	15.69	5.61	30.16	21.61	23.94
6.	Failure of pipe joints	-	-	0.58	-	1.31	4.46	3.28
7.	Packing Failure	-	0.12	9.40	-	-	-	-
8.	Process Operational problem	-	0.22	20.20	-	22.39	0.04	4.05
9.	Shortfall of spares & other production	-	-	-	-	-	-	-
10.	Shortfall of raw material	-	3.39	1.78	24.79	-	2.25	9.58
11.	Fouling of Heat Exchanger.	2.41	0.43	1.06	2.92	10.97	-	1.93
12.	Unforseen	-	-	-	3.83	-	-	-
13.	Any other reason:							
	i) Personnel/Labour	-	-	-	-	-	-	-
	ii) Off take of product	-	-	-	-	-	-	-
14.	Shortage of Skilled Manpower.	-	1.83	-	-	-	-	-
	Total loss (days)	59	47	89	91	143	66	120
	Annual Turn around	41	66	-	20	60	77	-
	Grand Total loss	100	113	89	111	203	143	120
	Stream days	84	252	276	254	162	222	245
	Prod. per Stream (M.T.)	973	974	930	930	932	937	934

(TABLE-V)(b)

BRIEF DESCRIPTION THE CAUSES
LESS STREAM DAYS

MAJOR CAUSES OF DOWNTIME

FY	Machinery	Corrosion/erosion	Remarks
1981-82 (Upto Dec.'82)	i) Breakage of 5th stage blade of the Air Turbo Blower ii) Turbine thrust bearing failure of RTB for four times		Manufacturer's expert needed
1980-81	i) Thrust bearing failure of RTB ii) Governor leakage problem of FDF of boiler.	i) Sight glass failure of HPD - tube leakage of Ammonia Preheater -crack in boiler feed water line - tube failure of syn. Gas after cooler.	
1979-80	i) Radial bearing (High temp.) of CO_2 Booster Compr.	i) Body leakage from HPD.	
1978-79	i) Coupling failure of G.V. Solution Pump. ii) Governor problem of Syn. Gas Compressor	i) G.V. Reboiler's vapour line leakage. ii) Ammonia piping leakage in Urea Plant	
1977-78	i) Thrust bearing failure of CO_2 Booster Compr. ii) Thrust bearing failure of RTB.	i) Tube leakage of G.V. Solution Heat Exchangers Process Gas Reboiler and Syn. Gas Compr. Inter cooler.	
1976-77		i) Methanator outlet gas line leakage - Ammonia preheater ii) Ammonia header in Urea Plant.	
1975-76	i) Thrust bearing failure of RTB. ii) High temp. of metallic packing of CO_2 main compr.	i) Carbamate return line cracked.	

BRIEF DESCRIPTION OF THE CAUSES OF LESS STREAM DAYS

(TABLE-V)(c)

MAJOR CAUSES OF DOWNTIME:

FY	Instruments	Process & Operation	Remarks
1981-82 (upto Dec.'81)	i) Overspeed trip of RTB & FIF. ii) Cable failure of solenoid valves in process air line to 2HF.		
1980-81	i) Closure of N.G. emergency valve. ii) FIF tripped due to wrong signal of low lub oil press. iii) Overspeed of RTB.	i) Blockage of Ammonia Preheater pipings in Urea.	
1979-80	i) Breakage of air filter connected to control valve. ii) Wrong press. signal of fuel N.G. iii) Failure of Askania controller the Syn. Gas turbine steam extraction line.	i) Mild explosion in the duct of Auxiliary Boiler while firing the same.	
1978-79	i) Extra low level signal for RTB economize		
1977-78	i) RTB inlet steam press (extra low) ii) Extra low drum level of Auxiliary Boiler. iii) Extra low Instrument Air Press.	i) Carry over of G.V. solution to MTH.	
1976-77	i) Failure of PCV in 'Rea Reactor. ii) Low Instrument Air Press.		
1975-76	i) Gas Turbine No.2 (GTG No.2) tripped due to turbine exhaust temperature high (wrong signal) ii) Hyper compressor inlet steam pressure extra low (wrong signal).