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FERTILIZER PRODUCTION CAPACITIES IN PAKISTAN AND PROBLEMS FACED DURING EXECUTION OF PAKSAUDI FERTILIZERS AMMONIA PLANT*

by

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Pakistan is an agricultural country and fertilizer is an essential farm input to achieve self-sufficiency in agricultural production.All out efforts are being made by the Government to increase the fertilizer production. At present two types of fertilizers are being produced in the country i.e.,nitrogenous and phosphatic. Existing fertilizer manufacturing capacities are given hereunder:

a)EXISTING UNITS	Annual Capacity (Nutrient tons)	Product
i) NFC-Pak American Fertilizers Ltd; Daudkhel.	18,900	Ammonium Sulphate
ii) NFC-Pak Arab Fertilizers Ltd; Multan	27,400 117,000 70,000	Urea CAN NP
iii) NFC-Paksaudi Fertilizers Ltd; Mirpur Mathelo.	256,220	Urea
iv) Exxon Chemicals Ltd; Daharki	80,000	Urea
v) Dawood Hercules Chericals Ltd; Lahore	160,000	Urea
vi) Lyallpur Chemicals & Fertilizers Ltd; Faisalabad	3,240	Single Super-phosphate.
vii) Lyallpur Chemicals & Fertilizers Ltd; Jaranwala.	12,960	Single Super-phosphate.
Total:-	745,720	

b) UNDER CONSTRUCTION UNITS		
i) NFC-Hazara Urea Fertilizer Plant Ltd;Haripur Hazara.	44,022	Urea
ii) Fauji Fertilizer Company Goth Machhi-Sadiqabad.	256,200	Urea
Total Additional capacity	300,222	
Total existing capacity	745,720	
Grand Total:-	1,045,942	

Paksaudi Fertilizers Limited is a subsidiary of National Fertilizer Corporation of Pakistan Limited(NFC). The plant is designed to produce 320,000 metric tons of Ammonia to be processed into 557,000 metric tons of Urea. Messers Snamprogetti S.p.A; Italy was selected as Engineering Contractor. Process Licensors are Haldor Topsoe A.S.Denmark for the ammonia process,Benfield Corporation USA for alkaline scrubbing process and Snamprogetti S.p.A; Italy for Urea Process.

This project was started in April,1975 and completed by the end of September 1980,i.e; it took about 6½ years to bring the project into commercial production.

Major difficulties faced during implementation and commissioning of the project are briefly narrated here under:-

1. FINANCING

Although foreign exchange funds were committed before execution of Engineering Contract but availability of these finances were limited to the company due to procedures and regulations imposed by the financing agencies.These restrictions badly affected Engineering and procurement activities which in turn delayed civil works and finalization of erection contract.

2. DETAILED ENGINEERING

Basic and detailed Engineering was carried out by Messers Snamprogetti S.p.A:They started work in their Head Office in Milan where competent and experience staff was employed.After six months this job was transferred to their newly established office at Basingstoke, England. This change over caused lot of confusion because new office was not properly equipped to handle the job.

3. EVALUATION/SELECTION OF PLANT AND EQUIPMENT

It is very important that detailed specifications are drawn carefully and bids are properly evaluated. Past experience should be utilized to improve the system, plant and equipment. On Ammonia Plant,Waste Heat Boiler and Feed Water system;High Pressure Exchangers;Refractory and Compressors are very critical.These are well known problem areas where we faced difficulties which are as under:-

a) Emergency Feed Water Pump is not adequate to supply water to three boilers of 400 tons capacity. In case of complete failure,water can not be adequately fed to these boilers to maintain water level.This has resulted in damage to one of the waste heat boilers.

b) Quality of refractory selected was not good.Although all castings were carried out under the supervision of Experts but even then the refractory in transfer line secondary reformer and manifold failed after two months operation.

c) Selection of an over designed vent valve by a factor of 3 at the discharge of Carbon Dioxide Compressor completely damaged the high pressure casing of the compressor after 30 days operation.Operation of one of the securities of the compressor resulted in tripping of Ammonia Feed Pump for urea reactor and time venting of this valve.This venting decreased the discharge pressure to 40 kg/cm^2 from 150 kg/cm^2 which unbalanced the HP casing thus causing abnormal thrust.After this incident Engineering Contractor recommended installation of axial displacement trip system,load cell for thrust monitoring and differential pressure security which were not recommended initially.

d) High Pressure Water Cooler on ammonia synthesis loop started leaking just after 6 months service thus affecting output of the plant.Similarly ammonia cooler on Urea Plant failed after 30 days operation.Both these coolers have now been replaced by new ones manufactured in different material.

4. INSTRUMENTATION

Instruments installed are of very sophisticated nature and about 80-85 percent are electronics.All these instruments gave lot of problems during first year of operation. There were about 101 trippings on auxiliary boilers only due to these instruments.Extensive modifications were carried out to make the system operational.Similar problems were faced on other units as well. It appears that local environmental conditions were not considered while manufacturing these instruments and related parts. After modifications the system has stabilized and now reliably functioning.

5. SELECTION OF PACKAGE UNITS

Various units were purchased as package units from different suppliers,for which broad specifications were provided by Engineering Contractor.Designing, detailed engineering and manufacturing was carried out by individual supplier.Certain packages proved to be under-designed.

a) Cooling Towers

Cooling Towers were designed by Messers Favra,Italy to cool the water from $42^{o}c$ to $32^{o}c$ with 4 degree approach to the wet bulb temperature.It have never achieved these parameters.

b) Inert Gas Generator

The Supplier, Supply Combustion Equipment Italy,could not commission this unit.The unit is based on combustion of natural gas and purification. Purity of nitrogen is also not reliable. This plant is an essential part of ammonia plant and should have been properly designed and adequately sized.

6. PROCESSES

Quite a few treatments recommended by Engineering Contractor were not suitable.Few examples are as under:-

a) Cooling Water Treatment based on Zinc Phosphonate and a dispersant mixture is not very effective.We have scaling problems in our heat exchangers.We are considering to replace this treatment with a more reliable one i.e; chromate system.

b) Antifoam chemical Nalfloc N 71-DS was not suitable for benfield solution.In the beginning we had a lot of foaming problem.Addition of this chemical was favouring foaming tendency of solution instead of retarding. The problem was solved by changing the antifoam.We are now using Ucon Foam Control Agent type-51.

c) Ammonia Plant contains seven catalysts and frequent stoppages effect the life and activity of these catalysts. Therefore it is essential to have continuous running of this unit and should be independent from other units. According to design logic, primary reforming furnace should remain in operation in case of auxiliary boilers failure but in practice this is not the case.

7. START UP TEAM

Developing countries, like ours, hire services of foreign Experts for transfer of technical knowhow and expect the persons provided by Engineering Contractor to be experienced and knowledge-able but in our case 50 percent of the expatriates were novices.

8. PERFORMANCE GUARANTEES

The plants should be capable of meeting the requirements of normal operation; capacity, quality of products, consumption of raw materials and utilities and efficiency of operation guaranteed by the Contractor. Two type of tests were defined in our case:-

a) A twenty five days continuous test run under normal operating conditions in order to demonstrate the continuous steady operation and capacity at an average of 90 percent of the ammonia plant alongwith the ability to produce quality ammonia and carbon dioxide.

b) A five days continuous test under normal operating conditions at 100 percent capacity and the demonstration of consumption of raw materials and utilities.

During these test runs contractor tried to shift their responsibility on us on one pretext or the other.