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FEEDSTOCK AVAILABILITY AND OPTIONS- GLOBAL SCENARIO

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L'industrie indienne des engrais est la troisième au monde. Avec la globalisation , l'industrie des engrais est liée par un degré élevé de commerce international. En ce qui concerne les matières premières , produits intermédiaires et produits finis, l'ammoniac est l'intermédiaire clé dans la fabrication des engrais azotés et il est produit à partir de matières hydrocarbonées comme le gaz naturel, naphta, fuel liquide, etc Les matières les plus usitées sont le naphta et le gaz naturel Ces matières premières servent aussi aux industries comme l'énergie et les produits pétroliers. L'industrie génératrice d'énergie est le plus gros consommateur de naphta et de gaz naturel suivie par l'industrie des engrais.

Actuellement le gaz naturel est la matière première la plus économique en raison de son rendement énergétique élevé et de sa bienveillance pour l'environnement. Le naphta est la meilleure option suivante disponible. Le fuel liquide et le charbon ne sont généralement pas préférés à cause des besoins importants en investissements et en énergie. Pour la fabrication des engrais azotés en Inde ces dernières années la proportion est restée à 50% de gaz naturel,28% de naphta,11% de fuel liquide, 6% d'ammoniac fourni directement,3% de Charbon, les 3% restants étant le coke et autres.

INTRODUCTION

The Indian fertilizer industry is the third largest in the world. With globalization, the fertilizer industry is linked by a high degree of international trade. As far as raw materials, intermediates and finished products are concerned, ammonia is a key intermediate in the manufacture of nitrogenous fertilizers and is produced from hydrocarbon feedstocks like natural gas, naphtha, fuel oil, etc. The commonly used feedstocks are naphtha and natural gas. These feedstocks are also used in the industries like power, petroproducts, etc. Power generation industry is the biggest consumer of naphtha and natural gas, followed by the fertilizer industry.

Presently natural gas is the most economical feedstock due to its high energy efficiency, cost effectiveness and environmental friendliness. Naphtha is the next available best option. Fuel oil and coal are not generally preferred because intensive investment and energy are required. For manufacturing nitrogenous nutrients in India during recent years, the proportion of feedstocks have remained as 50% of natural gas, 28% of naphtha, 11% of fuel oil, 6% of direct ammonia supplied, 3% of coal and remaining 3% of coke oven and others.

FEEDSTOCK - LOCAL & GLOBAL SCENARIO

The cost of feedstock plays an important role in determining the selling price of complex fertilizers and its retention price of urea (Exhibit 1). In view of constraints for availability of

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domestic natural gas and lack of facilities to import, many new projects have been conceived with naphtha as feedstock with the option to use naphtha and/or natural gas as and when available. Since the power and petrochemical industries use a significant share of naphtha/natural gas as feedstock, short supply of natural gas and naphtha is not ruled out and consequently manufacturers shall have to depend on imports. Supply of natural gas is controlled by Gas Authority of India Ltd. (GAIL). The prices are administered depending upon the calorific value of the feedstock and other factors. The prices of natural gas and furnace oil are indicated in Exhibit-1 and compared with selling price of urea during last two decades. The consumption of natural gas may continue to be in the constrained manner. The availability of natural gas was expected to be approximately 22-24 billion cubic metres during 1998-99 and is expected to be stagnant for next three years. The significant imports of gas are also not expected to take place in near future due to non-availability of adequate infrastructure in India.

In India, there exists the Gas Distribution Net work facility. At present there is only one long distance onshore pipeline connecting Hazira-Bijapur-Jagdishpur (HBJ pipeline covering 2200 KMs) with a capacity of 12.1 billion cubic metres per annum. The gas from Bombay High is delivered to Uran terminal near Bombay and is utilized in the Maharashtra State. The gas from free gas field South Basin delivered to Hazira terminal is utilized locally as well as through HBJ pipeline. Expansion of the Hazira terminal in mid 1997 from 20 MMSCMD capacity to 41 MMSCMD capacity was to ensure an availability of 32.55 MMSCMD at this terminal. This was to be transported through the upgraded HBJ pipeline, with a capacity of 33.6 MMSCMD. However, the lower supplies in the terminal from Oil and Natural Gas Corporation Ltd's fields have resulted in the operations of the pipeline at a lower capacity utilization of 71.5%.
The Government is seriously considering a National Gas Grid to bridge the gap between supply and demand. New resources for gas discovery is given top priority as well infrastructure to facilitate the import of gas. Government has allowed free import of LNG and many projects have been declared since 1997 involving the global players in the field. The four domestic oil majors IOC, ONGC, GAIL and BPCL have formed PETRONET LNG in 1997. Other foreign firms like AMCO Corpn, Royal Dutch/Shell Group, ENRON, British Gas Plc. Total sa and Mobil Corp, have shown willingness to invest around USD 10 billion in LNG venture. This will result in production and import of other 15 MMT of LNG by the year 2005. Such kind of long term agreements involving large investment are announced and may take some more time for implementation.

Worldwide industrial sector will be the largest consumer of natural gas (46%) followed by power plant (24%) and domestic use (15%). The developing countries in Asia, Africa, South and Central America and Middle East have found increase in natural gas demand. Africa, FSU and Middle East countries are only surplus areas. Trade of natural gas is not extensively done because of limitations in transportation. Secondly 35% of the production is consumed in the country of origin.

Global trade through pipeline during 1997 was 321.7 billion cubic metres. Trade through LNG was 111.3 billion cubic metres accounting for 5.1% of the world gas demand. LNG trade has shown steady growth at the rate of 6.31%. Japan and South Korea have traded 72% of the total trade in 1997 importing from Indonesia, Malaysia, Australia and Brunei.

World natural gas demand is expected to increase due to increasing energy consumption. Power sector is expected to be the main driver of demand accounting for around 50% of the expected demand growth. By 2000, the demand for natural gas is expected to increase to 2390 billion cubic metres from the present consumption of 2027 billion cubic metres. The demand growth in the medium to long term will continue to depend upon the alternative fuel prices, mainly crude oil and various petroleum products and environmental regulations. Use of natural gas is supported by its ecofriendliness.

In India, the naphtha consumption by 2001-2002 is expected to increase at a CAGR of about 39%. With this, supply demand condition shall produce deficit of naphtha which shall necessitate imports of naphtha. 45% of total natural gas produced in the country presently goes into the fertilizer. If we compare feedstock of naptha and natural gas, which is constituting the main cost of producing nitrogenous fertilizers, 70 - 80% of total cost is in case of old plants and 55 - 60% is in case of new plants. The cost of urea manufactured through these two alternate raw materials are given in the following table.

Urea manufactured through alternate raw materials

	NAPHTHA	**NATURAL GAS**
PRICE(Rs/TON)(Rs/1000 nm3)	9000	3650
Norms (Mkcal/ton or 1000 nm3)	10	8.5
Cost (9rs/Mkcal)	900	430
Energy consumption(Mkcal/ton)	6.6	6
Cost (Rs/ton)	5940	2580

ONE USD circa Rs. 44/-

Presently, the Asia Pacific region depends substantially on the Middle East and other countries for meeting its naphtha requirements. Asian naphtha demand (excluding Indian power demand) was expected to increase at a compound annual growth rate of 3% between 1998 and 1999 and thereafter increase at a compound annual growth rate of 4% till 2001. Additionally, 9.2 MMT of naphtha would be required for power plants in India in 2001.Based on the above, the demand for naphtha in the Asia Pacific region is expected to increase from 90 MMT in 1996 to 116 MT in 2001 or at a CAGR of 6.7% over the period 1998 to 2001.

In India the feedstock is priced at a substantially higher level - about USD 3 per million BTU to plants along the HBJ pipeline and USD 7-8 per million BTU to plants based on naphtha. In the Middle-east countries, gas is available to the plants at less than USD 1 per million BTU. The cost of capital in India is also almost double than that in the other countries.

The major natural gas plants are IFFCO, RCFL, KRIBHCO, NFL, Tata Chemicals, Chambal Fertilizer, Indogulf and Oswal Fertilizer. The major naptha-based plants are Duncan, SPIC, GSFC, ZACL, Shriram Fertilizers and FACT. Plants based on fuel oil and external ammonia are scarce and old.

The major determining factors for profitability in fertilizer industry are feedstock, plant age, plant location and imports. It is essentially linked with competitiveness and profitability of the organisation reflected in its raw material cost and consumption, fixed cost coverage, distribution

cost and cash flow management. The gas-based plants are technologically superior to naphtha-based plants as they are more energy efficient by 20-40% and consuming less water by 40-60%. The gas-based plants have got lower operating cost. Among the gas-based plants, middle aged plants are cheaper on capital cost compared to new plants. Feedstock has a strong influence on location of plants. The plants in seventies and eighties were largely located near consuming areas. All gas-based plants in the nineties have been laid down near HBJ pipeline from Haziara to Shahjahanpur. Naphtha-based plants, though widely distributed, have been laid down near refineries for their supplies.

The working capital requirements of the fertilizer industry are significantly high as they have to depend on import of raw materials and realisation of subsidies granted. Planning for raw material sourcing and inventory holding with long term agreement become unusual as long-term government policies are yet to take shape.

TECHNOLOGICAL DEVELOPMENT

As we continue depleting the energy resources all over the world, we are responsible to take care of all types of technological advancement in the manufacture of fertilizers, to improve fertilizer use efficiency and to conserve the energy source without impairing agricultural production growth to meet with the needs of expanding population. We have also to aim at reducing the energy consumption levels to minimise the requirement of feedstock and fuel. Presently the focus is on alternative means of energy from renewable natural source. In this context, it is imperative that the vintage fertilizer units in India and all over the world adapt themselves to the recent developments in technologies and modernize in terms of productivity, efficiency, safety and environmental standards.

AVAILABILITY AND OPTIONS

In search of options, the recoverable source of gas in the country are presently around 682 BCM. This can sustain the current production level of around 13 BCM for about 22 years. The gas consumption has increased at the rate of about 18% since 1980-81. This may be because of increase in availability. However, the consumption in the last 5 years has found only marginal increase in gross production during the said period. Serious efforts put primarily to reduce flaring has increased the net availability.

Feedstock availability from abroad and domestic market is to be weighed keeping in view pricing, quality, quantity, logistics, reliability etc. Apart from this business policy and culture of suppliers in terms of building up customers-supplier relationship can not be ignored in these days. In the present scenario, monopoly driven relationship is observed rather than cooperative relationship. Time is not far off to think of the co-existence principle for the mutual benefits, as against the present time of steep competition; the idea of such principle becomes next to impossible under the threat of survival.

The feedstock quality and availability have played important role in fertilizer manufacturing. The choice of feedstock, for example, for production of ammonia is based on cost, availability and technology. As it is closely related with energy resource, it is important to find out the options for energy resources in order to combat the depletion of energy reserves. The energy consumption

for a typical 1350 TPD ammonia plant is around 8.9 Gcal PMT as feedstock plus fuel for naptha-based plant. It is 20% higher than similar NG based plant which will require around 7.2 - 73 Gcal PMT.
LNG available in the international market is an alternative feedstock. LNG is linked up with the international oil price. The LNG price hike from first quarter to last quarter of 1999 is from USD 2 per MBTU to USD 2.8 per MBTU. The importers will have to pay FOB price of Arabian Gulf plus shipping cost plus operating cost at the terminal, which is estimated as USD 3.50 per MBTU for re-gasified LNG from Gulf and it may touch to USD 5 per MBTU at users' port. There will be additional cost for transportation if plant is away from the port. The typical comparison cost figures are given in **Exhibit-2**.

Some of the countries including India have to think of alternative of imported LNG for fertilizer industry and power plants. It is worth to note here that when the world oil price is going up, the international urea price shows decline. The economic implications of this option are serious. In the present scenario, only high-energy efficient plants can sustain their production and the balance urea demand can be met by importing the same. The world experts have predicted that currently proven oil reserves will last for 45 years if 100% net recovery is assumed. Indirectly it implies that fuel oil and naphtha-based units will face more problems as petroleum gets heavier and enriched with sulphur. Similar bad situation will be for gas supply also. Recently it is reported that the reserve of natural gas found in the form of gas hydrates in west coast in the area of 60,000 square kms is estimated to be approximately 1900 TCM. Of course, recovery of gas from these hydrate reserves is highly uncertain because of their inherent problems for recovery. Technology updating is required in this regard. The importance of coal as fuel and feedstock has not lost its lustre despite of many environmental concerns and its high ash and sulphur contents. 79% lignite coal is used to generate electricity, 11% is used in generating synthetic industrial gas and 7.5% is used for producing fertilizers worldwide.

A typical comparison based on the latest technologies for different feedstock is given in **Exhibit-3**. The cost figures given in the table are on preliminary study only. The actual figures may vary according to technology, time, location, etc. In the borderless world, with the effectiveness of WTO, the gas price, if linked up with oil product price, the difference between gas, naphtha, fuel oil and coal price and corresponding cost of production will widen more in days to come. The countries where natural gas is available shall have least ammonia production cost. Naphtha and fuel oil based units will not be economical. The coal based plants will be viable in the countries where coal is mined cheaply.

PROCUREMENT TRANSFORMATION

The feedstock trade can be in turmoil and turbulence because of depletion, substitutes, impact of end product options, closure of plants, fluctuations in demand, etc. etc. The market future is unforeseeable. The integrated approach to reduce input cost by sourcing improved logistics and regulated flow of material could help in survival. In the present scenario, monopoly driven relationship is observed rather than cooperative relationship. Time is not far off to think of the co-existence principle for mutual benefits. Three fundamental variables tremendously affect feedstock balance in the world, namely price, time and quality. Service is going to be so integral, that it will be a part of the product. The companies which could upgrade their service quality will be in a position to earn important share of mind, market and money. The incremental cost of

servicing an existing customer is far below the cost of acquiring a new one. The global economy today presents new challenges that require us to focus on our ability to co-operate and collaborate. How we mediate and negotiate will be critical to future success.

With the faster means of communications available, the distance is no more a barrier and time for communication and feedback from any corner of the world is vital, essential and available on line through information technology. In global competition speed of the business assumes prime importance. The information technology is a prime determinant to the velocity of business and operations. In the information net-work, the supplier remains all the time aware of the stock levels and inventory levels at buyers' premises and can plan for supply accordingly. Standardization and traditional techniques means suicidal concept. Creative, innovative and flexible approach shall leave others far behind.

The future belongs to those organisations who are prepared to change their strategy, structure and systems to take up the challenges of this millennium.

Exhibit 1 : SELLING PRICE OF UREA vis a vis COST OF FEED STOCK

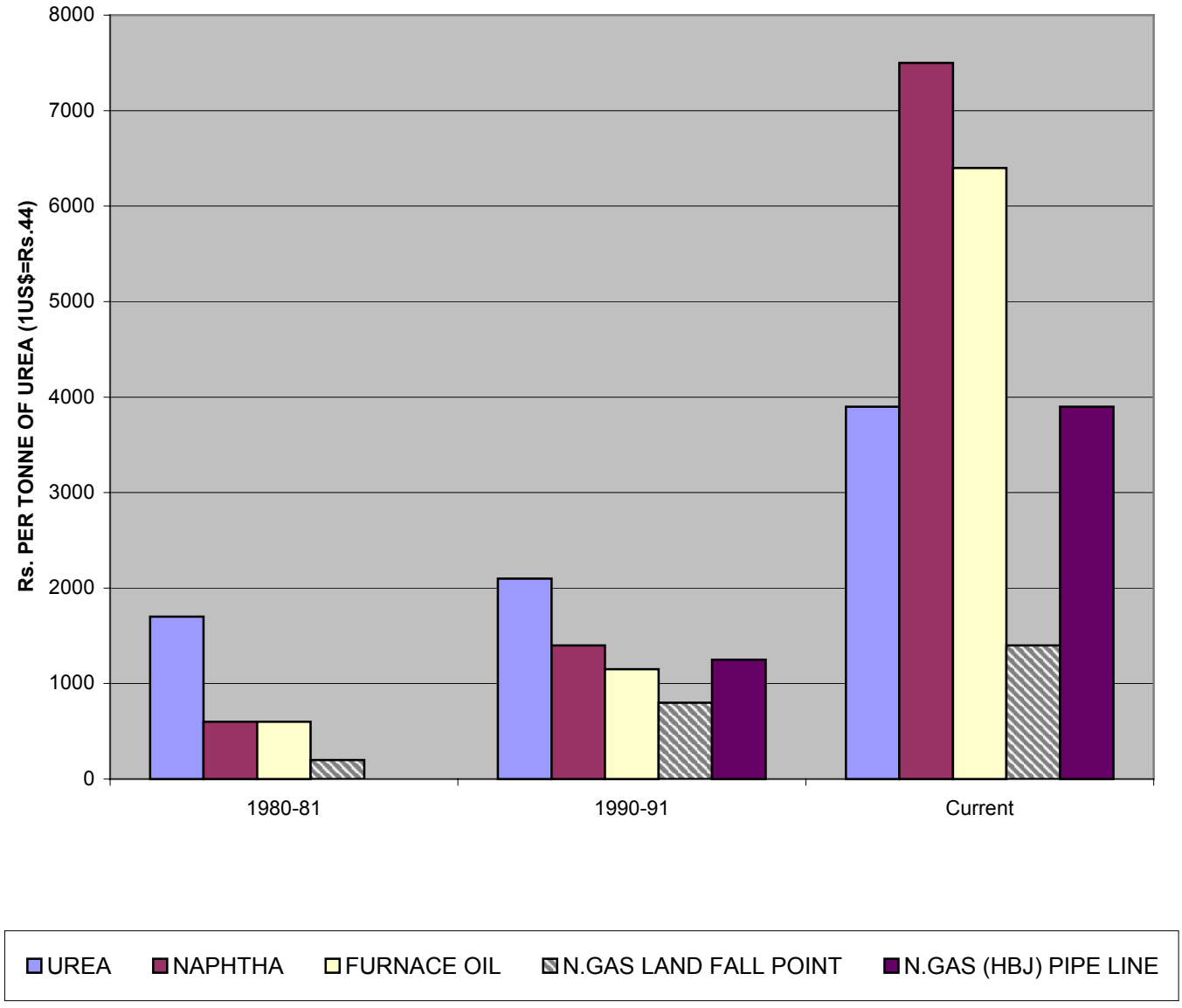

EXHIBIT-2

	Production (feedstock + fuel) Costs, USD/MT of ammonia
Indian Plants:	
Average GAIL supplied NG based:-	
- On-shore units (typical)	59.6
- HBJ remote units (typical)	103.9
Average naptha-based	307.2
Average fuel oil based	316.7
Indian plants if modified to operate on imported LNG	189.0
New modern plant in India, if put up, with LNG feed	148.5
Typical modern plant in US/Europe based on local LNG	80.0

EXHIBIT –3

LNG cost:	5.2 USD/MBTU	(20.63 USD/Gcal)
Calculated cost of production (energy) of ammonia with LNG feed:	161.9 USD/Tonne	
Coal cost :	1.27 USD/MBTU	(5.03 USD/Gcal)
Calculated cost of production (energy) of ammonia with coal feed:	51.4 USD/Tonne	
Min (gas-coal) cost difference for 10 year return:	3.43 USD/MBTU	(13.6USD/Gcal)
Present difference (gas-coal):	3.93 USD/MBTU	(15.6 USD/Gcal)