

## **PROCESS PLANT EQUIPMENT**

### **BACKGROUND & HISTORICAL TRENDS**

- The process plant machinery and component industry in India is a very heterogeneous industry with a turnover of Rs.10,000 crore per annum as of 2004-05.
- The industry caters to a wide variety of process industries like oil & gas, petroleum refining, petrochemicals, chemicals, fertilizer, pharmaceuticals, metal industry, cement, paper, sugar, cryogenics, distilleries etc. The industry designs and manufactures a very wide range of equipment and systems such as: pressure vessels, columns, towers, heat exchangers, multi-tubular reactors, evaporators, crystallizers, dryers, road/rail tankers, most modern storage equipment, loading and unloading systems, cooling towers, cryogenic systems, equipment for dairy and food processing, mineral beneficiation equipment, rotary kilns, equipment for power plants, equipment for offshore projects, thermal and combustion systems etc. An impressive array of equipment for solid-liquid separation, equipment for water and waste water treatment, systems for environmental engineering and pollution control, large material handling equipment, marine equipment and special purpose equipment for critical services such as reformers, multiwall ammonia converters, urea reactors, urea strippers, transfer line exchangers, process gas waste heat boilers, hydrocracker reactors, fired heaters etc. are also being manufactured and exported by the industry.
- It is a highly capital as well as labour intensive sector with a strong engineering orientation where the products are mostly custom built. Hence economies of scale have less relevance in this sector except for the machine, or labour utilization factor if work load is not uniform.
- During the initial phases of India's industrialization (1951-66) Government set up a number of machine building companies. These were set up with appropriate infrastructure and capabilities including technology tie-ups to build and manufacture equipment for the core process industries like steel plants, refineries, petrochemicals, fertilizer plants, aluminium plants etc. Very few private players got licences to manufacture equipment for these sectors. In the first phases of liberalization in the mid 1980s, more and more private players entered the arena initially as sub contractors to the big players. Today, the PSUs are no longer competitive though they still possess the infrastructure. However, the volume of work required to sustain them has tapered off after the core sector industries were set up and no further major investment having taken place during the 1980s and 1990s.
- The industry at present is equipped with modern machinery in addition to competent engineers with management skills, skilled technicians and qualified welders. Their experience ranges across a wide spectrum of materials of

construction such as various grade / duplex / martensite stainless steels, titanium and its alloys, aluminium, nickel, monel cupronickel etc. Their experience also spans across a wide range of welding processes for welding materials of thickness ranging from 2 mm to 200 mm.

## **International Trends**

Over the past few decades the process plant equipment manufacturers have witnessed fragmentation mainly because of the shift in the base of manufacturing and the emergence of new companies.

The European manufacturers specially those from Italy and Germany were the leaders in the manufacturing of process plant equipment since they had developed specialized technology packages along with the user sectors. The European companies were not only technology leaders but also supplied high quality equipment.

Two decades back the Japanese firms descended with their innovative pricing strategies, and financial packages, which helped them to capture a substantial market. They were further helped in penetrating the market by their agency network and trading houses. With the Yen becoming stronger, the Koreans and Taiwanese made inroads with their aggressive pricing and established themselves in the Middle East and South East Asia. Today China is beginning to be a force to reckon with since they are insisting on transfer of detailed engineering and manufacturing technology for all the projects coming up in China to the local companies and they are able to produce the equipment at a very low cost. However, their quality is not of very high standard. Some of the Indian companies are also making inroads into the Middle East and South East Asia. The strengthening of the Rupee and rising material costs will force the companies to look at their internal efficiencies.

Hence, internationally the trend that is witnessed in the heavy engineering sector is that of a shift in base from Europe to Japan to now Korea, Taiwan, East European countries and China due to logistics and cost.

Even in the user sector, globalization as a trend is evident and reported on numerous occasions across a range of industry segments for the chemical industry.

The chemical industry world-wide witnessed a reversal in fortunes with rising top lines and profits, but the recovery has failed to boost aggregate capital spending and R&D spending. Spending on R&D has slipped to 2.1% of total chemical sales in 2003, following four years in which R&D spending as a percentage of chemical sales ranged from 2.5% to 2.6%. Chemical sector capital spending also continued to slide. Capital spending as a percentage of chemical sales was 4.9% down from a year ago, when capital spending was only 5.5% of the chemical sales of the global top 50 companies.

There is an increasing trend of shifting manufacturing bases to Asia in the chemicals industry. This trend is due to a number of reasons:

- There is a greater focus on agriculture, manufacturing, durable goods, textiles, construction, leather etc. (industries where the demand for chemicals is greater)
- The rate of growth in industrial production in these economies is significantly greater than that in the developed countries. China has been able to demonstrate growth rates in the range of 10-15% in the last 10 years and despite efforts by the Chinese government to cool down the economy, projected growth rates will still be in the region of 8-10% in the coming years. India on the other hand, has witnessed steady growth rates in the range of 6-10% and is projected to maintain an average growth rate of approximately 8% in the coming years.

The emerging countries are making greater efforts to become global production bases in these sectors. Many of the major players in the chemical industry have already devoted substantial investments to new production capacity in China, particularly in growing chemical industry parks. For bulk chemical companies, whose logistics costs such as freight and tariffs can often account for upto a third of the total costs, setting up shop in Asia has become virtually a foregone conclusion.

The Asia-Pacific is turning into the world's chemical production center, with production capacities growing rapidly over the last several years.

India and China are benefiting most from the globalization of the chemical market, due to their lower cost structures, huge domestic demand for chemicals and close proximity to other Asian countries with a huge demand for chemicals.

In the steel industry too a major consolidation process is being witnessed globally.

With the shortage of energy world-over and new reserves being found in countries like Brazil and Peru, the oil & gas sector will continue to grow.

### **Current Status in India**

Today in India there are a few companies who have made a mark in the export arena due to their manufacturing skills and quality. Today the manufacturing facilities are equipped with modern machinery and are producing very sophisticated equipment such as high pressure heat exchangers, spiral heat exchangers, multiwall vessels, airfin coolers, multi-tubular reactors etc.

A few large companies have equipped themselves with the best welding facilities like SMAW, MIG/MAG, synergic pulsed MIG & TIG, SAW and plasma welding with facilities for establishing welding procedures with laboratories having destructive / non-destructive testing and metallographic studies. Hence they can do critical welding of cryogenic materials, high temperature steel, corrosion resistant

materials, special grade high strength quenched and tempered steel, corrosion resistant overlays by strip cladding and submerged arc welding.

The largest single piece fabrication capacity has touched 1200 MT. The modern facilities include hot and cold rolling, metal forming, an impressive array of welding equipment, heat treatment and sophisticated inspection facilities. Most of the manufacturers are also equipped with a basic but modern design and drawing office. This infrastructure coupled with dedicated teamwork they are able to extend total quality assurance.

High-dome workshop bays are well equipped with a variety of cranes and material handling equipment. Many of these workshops have been authorized by the American Society of Mechanical Engineers (ASME) for the use of U, U2 and S code symbol stamps. Lloyds Register has granted approval for the manufacture of class/fusion welded pressure vessels.

With the pick up in investments, the growth of the process plant equipment sector in 2004-05 has been very encouraging and far exceeded estimates. On an average, the industry grew at more than 35 percent.

For the process plant equipment sector the unprecedented rise in input raw materials prices especially steel put pressure on the margins of most companies. It also encouraged companies to look at various cost cutting methods and business process reengineering.

- The design & engineering sector of the industry has upgraded itself with the latest software and communication methods to international standards but the percentage of companies doing so is very small, and is confined mostly to the bigger companies.
- The process plant equipment manufacturing sector, barring a few exceptions, is still following traditional manufacturing technologies. However, they have upgraded their methodology to the extent that they are now able to produce equipment acceptable to international quality standards.
- Automation in fabrication and welding techniques is not to international standards. Companies are unable to invest in these areas due to high investment requirements.
- Inconsistent performance on delivery and time schedules due to poor infrastructure facilities are some of the drawbacks of the sector.
- Issues of safety, health and environment (SHE) are causes for concern in small and medium sized companies. These companies are often unable to convince foreign buyers that their SHE policies and their implementation within their factories and worksites are at acceptable levels. Often, despite having an acceptable product they fail to pre-qualify for foreign orders. State-of-the-art manufacturing capabilities are available only in the medium and big companies.

- India has a world-class pool of talent in engineering and management skills. Since this sector is more engineering and labour intensive, a highly talented pool of skilled manpower at competitive wage rates is an added advantage for India. This sector is globally competent in terms of quality and competitive in engineering man-hour costs.
- World-class competency levels exists in engineering, manufacturing and handling of lump sum turnkey contracts but again these capabilities are restricted to a few of the bigger companies.
- Companies are able to offer customization in products and systems as per customer requirements.
- This industry can offer a comprehensive variety of systems, equipment and services. There is complete familiarity with all the major international manufacturing codes and practices like ASME, API, AD-Merkblatter, Pd5500, JIS, UBC, TEMA, Australian code (AS), IS. Workshops possess U, U2 & S stamps, ISO 9001, ISO 14001 quality assurance systems etc.

Because of its heterogeneous nature, the process plant industry is a very fragmented one.

Some large companies in this sector are diversified in terms of products and are also in various sectors. Even the medium sized companies are of a diversified nature. It is only the smaller companies with less than a Rs.50 crore turnover who are equipment manufacturers catering to the process industries directly, or to the EPC contractors.

International companies have their presence in India through joint ventures like Atlas Copco, Alfa Laval, J. L.Smith, Sulzer, etc. Others have technology tie-ups with renowned Indian equipment manufacturers.

The internationally renowned consultants in the process industries like Flour Daniel, Bechtel, Foster Wheel, LG, Daelim, Jacobs, Kvaerner, Mitsui Babcock, Linde, ABB Lummus, Technip, Jacobs, Stone & Webster, Udhe and Toyo Engineering have offices in India. They are increasingly using the Indian process plant manufacturers' expertise in engineering and manufacturing for outsourcing since they are in the process of creating global vendor databases for the purpose of expanding their low cost structure purchase options.

Many of these world leaders with know-how in the process industries subcontract their engineering and design jobs to India and outsource equipment from India for projects abroad.

The market share and total market size of the different product ranges manufactured by the Industry is given below :-

<b>Major Companies</b>	<b>Products</b>	<b>Market Share (%)</b>
<b>Chemical Machinery</b>	<b>Total No. of companies : 78</b>	
	Larsen & Toubro	53.18
	Godrej & Boyce Mfg. Co.	10.81
	Ingersoll Rand (India)	5.36
	Ondeo Degremont	4.52
	Saraswati Industrial Syndicate	3.50
	Alfa Laval (India)	3.06
	G M M Pfaudler	2.87
	G E I Hammon Ind.	2.71
	Bharat Heavy Electricals	2.40
	Graphite India	1.64
	Gansons	1.38
	Kilburn Engineering	1.34
	Paharpur Cooling Towers	0.81
	Richardsons & Cruddas(1972)	0.40
	I D M C	0.31
	Remi Process Plant & Machinery	0.30
	Patels Airtemp (India)	0.30
	Ultra Drytech Engineering	0.24
	Mazda	0.13
	Jord Engineers India	0.12
	Artson Engineering	0.09
	Texmaco	0.09
	Polutech	0.05
	Sulzer India	0.03
	India Radiators	0.02
	Thermax Surface Coatings	0.02
	Incon Engineers	0.01
	Bharat Heavy Plate & Vessels	
	Anup Engineering	
	Ghanshyam Steel Works	
	<b>Total Market size : Rs.1365.1 Cr.</b>	

Source : CMIE, Industry Market Size and Shares, February 2005

<b>Major Companies</b>	<b>Products</b>	<b>Market Share (%)</b>
<b>Cement Machinery</b>	<b>Total No. of companies : 9</b>	
	F L Smidth	40.56
	Larsen & Toubro	34.33
	Walchandnagar Industries	11.47
	Alstom Projects India	8.27
	K C P	5.06
	Swetha Engineering	0.30
	Saboo Brothers	
	Cimmco Birla	
	Alstom Power Boilers (Merged)	
	<b>Total Market size : Rs.75.7 Cr.</b>	

### **Structure of the Sector**

This sector can basically be categorized into two major segments, one manufacturing standard products to own, or collaborators' design and the other manufacturing custom built products based on own, or collaborator/consultants' designs. Since the product costs are not very high, in the majority of cases the turnover of individual companies are also not very high except for a few companies who operate on a much higher technological platform compared to the others based on their expertise and infrastructure facilities built by them.

Of the total companies covered under the study it was noticed that the turnover of 62% of the companies was below Rs.50 crores and hence we can derive that majority of the players in this sector are in the medium sized category. 6 percent of the companies had a turnover above Rs.500 crores and they had a market share of 43 percent.

The industry ownership structure is also very heterogeneous with 6 percent of the companies being partnership firms, 29 percent closely held private, 18 percent private limited, 42 percent public limited companies and 7 percent are public sector undertakings.

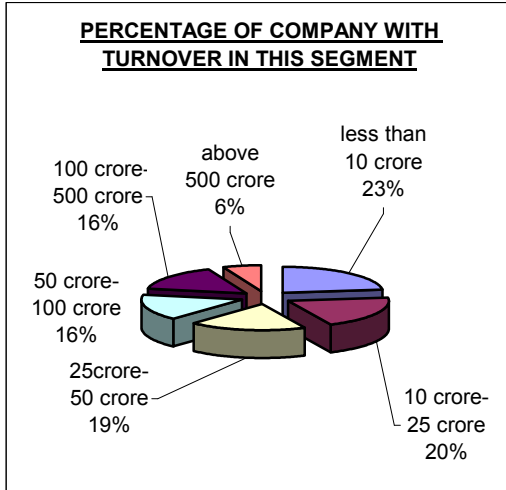


Chart 1

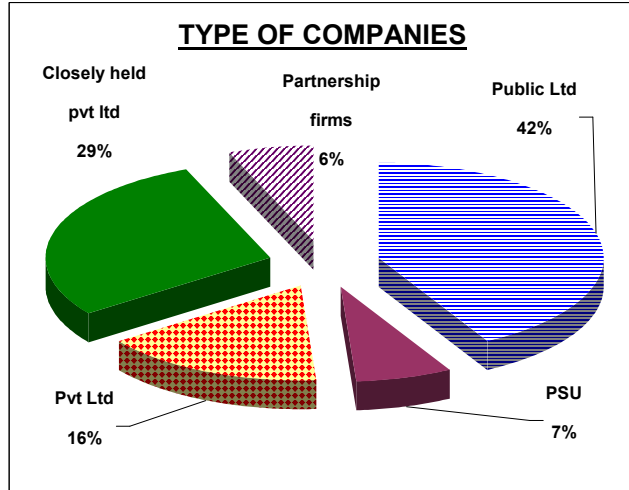


Chart 2

The Industry's opinion about the future structure of the sector is as given below:-

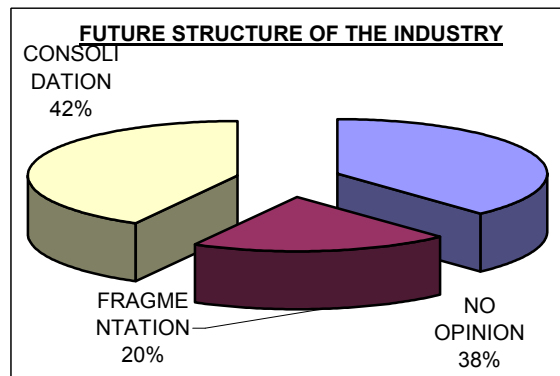


Chart 3

Since economies of scales, higher technical expertise and experience coupled with manufacturing excellence bring down the production costs, it is foreseen that the industry will witness a process of consolidation with the smaller players acting as sub-suppliers or sub-contractors to the bigger players.

41% of the companies catered to the whole range of activities like design and engineering, manufacturing, erection, servicing and commissioning. The process plant equipment segment has 15 percent of the players who depend on customer design for manufacturing and they are the companies whose turnover is less than Rs.10 crores per annum.

These are the companies who may find it difficult to sustain on their own and are likely to be a part of the supply chain of the bigger companies in future.

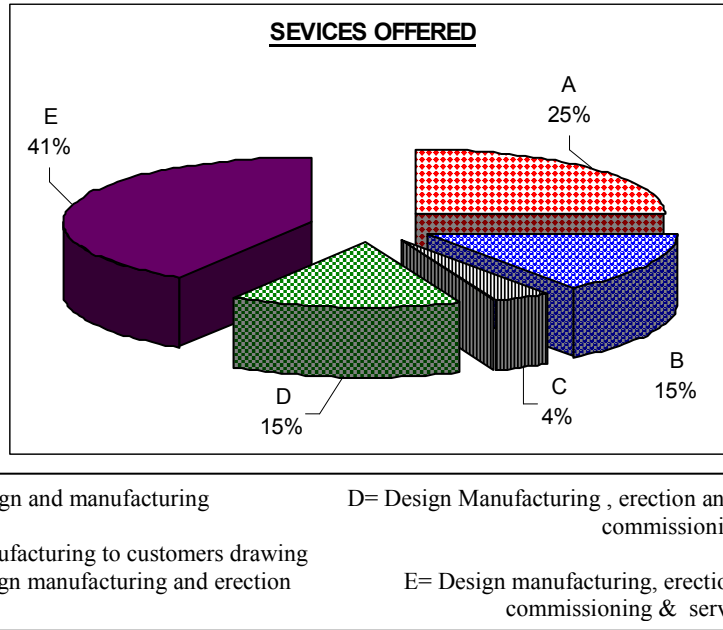


Chart 4

## Technology

The technology of the equipment depends on whether it is static like reactors, columns tanks, heat exchangers etc. or moving like pumps, compressors and rotary equipment or special unit operation packages.

In terms of technology, the static equipment can be categorized into four broad categories:

- Critical equipment capable of withstanding high pressure (40-200 bar) and high temperature (above 200 Deg.C.)
- Equipment for the medium pressure (10-40 bar) and temperature
- Cryogenic equipment (sub zero temperatures)
- Low pressure equipment (below 10 bar)

In India manufacturers for the first category and also for equipment manufactured from noble metal are very few since these require very high levels of manufacturing expertise and standards of welding, annealing and heat treatment.

The medium pressure and temperature equipment are also catered to by a few of the big players. Most of these manufacturers are authorized by ASME for use of U, U2 and S code symbol stamps.

The majority of the manufacturers in the process plant equipment sector cater to the lower end segment and the players in the top two segments are not cost competitive in manufacturing these equipment.

The technology for the static equipment can also pertain to process technology or to manufacturing technology. The process technology which determines the basic

process design as well as the proprietary component is available with the process licensees. Further, the basic and extended basic engineering capabilities are available with the global EPC companies all of whom are already operating in India and working with these companies.

The manufacturing technologies pertain to the fabrication of materials of complicated metallurgy. Most of the large Indian companies started with import substitution, followed by technology absorption. Very few companies have the modern techniques of welding and fabrication like plasma welding, automated fabrication machines etc., which are used globally.

At present the technology requirements are for niche areas and particular types of equipment and unit operation packages and they are not easily available due to many constraints. For example automated silos, automatic bagging machines, high speed agitators, extruder for plastic raw material manufacturing, wiped film evaporators etc. One of the reasons for lack of technology availability is that for the technology provider hardware supply is more profitable. Technology which emits low sulphur dioxide and nitrogen oxide, for example, circulating fluidized bed boilers without expensive pollution control equipment should be acquired for protecting the environment.

In the case of unit operation packages, like filtration, drying, centrifuges, the technology cannot be developed in India due to lack of enough opportunities in the user industries and has to be transferred through collaboration or JVs.

For the moving machinery most of the global leaders are already manufacturing their products through subsidiaries or JVs. However, the equipment manufactured may not be of size or capacity available abroad because of lack of economies of scale and lack of demand for such equipment due to lower capacity plants being set up as compared to the ones set up globally.

In the iron and steel sector imports of foreign technology are freely taking place. Technology for coal gasification and super critical boilers are by and large not available but a few Indian companies are in the process of acquiring the technology.

The technology in this sector globally has always been developed through mutual cooperation between the user, process licensor and the manufacturer. In India, user industries are not giving the domestic companies this opportunity of developing new products. They instead prefer to import the equipment directly from the manufacturer associated with the process licensor.

## **Design and Engineering**

Some of the bigger companies due to their association with international companies have installed modern computer systems and have incorporated and developed several software programmes in areas such as piping designs and engineering, stress analysis, heat exchanger design, pressure vessel design, process simulation and analysis, structural analysis and design, project management etc.

Since the equipment manufacturer has to prepare the detailed manufacturing drawing, design and engineering departments are found in almost all the big and medium companies. 85 percent of the surveyed companies offer design services, however, only 61 percent of the companies had in-house design and engineering set ups. The rest of the companies sub-contracted the design and engineering. All the companies having design and engineering department used CAD / CAE. Many of the companies who have design and engineering set ups, during the recession phase started diversifying by catering to design and engineering orders from consultants. These companies bagged design and engineering orders worth Rs.4 crores in 2003-04 and many companies are looking at this as another business opportunity.

The percentage of engineering hours spent on doing engineering rework was found to be higher on an average at 13 percent with the range being 2 percent to 20 percent in some cases.

### **Technology Transfer**

Only 36 percent of the companies had technology transfer agreements and another 6 percent were planning a technology tie-up to upgrade their products / process. This sector is predominantly a manufacturing one based on certain fixed design parameters and process technologies which are with only a very few technology providers and hence the scope for technology tie-ups is very limited. Only companies, which have the capabilities of absorbing the extended basic engineering and have the capability of developing the manufacturing technology on their own are interested in technology tie ups.

Moreover, there are financial constraints for companies who are looking for technology transfer since the technology providers demand upfront fees which may not be economically viable for these manufacturers.

For this reason GOI should have a national technology transfer policy whereby the equipment required by the Government controlled user sector is mandatorily manufactured in India with technology transfer to a suitable company based on their track record. This will help them in gaining expertise to use it in the global market. This is particularly important if India has to expand its export market. All companies who are dependant on collaborations for technology are also restricted in their access to global markets which is not desirable on a long-term basis.

28 percent of the companies having technology tie-ups faced problems in retaining foreign trained personnel during and after the technology absorption phase. This is mainly attributed to the booming conditions in the IT sector and comparatively low wages in this sector.

## **Research and Development**

Only 30 percent of the companies are into R&D and 80 percent of them started allocating for R&D after 1990 i.e. with the advent of the liberalization process in the country.

The percentage of sales budgeted for R&D ranged from 0.5 percent to 3 percent. Out of the companies engaged in R&D only 35 percent of them are working in collaboration with some educational / research institutes. The prominent ones among them being IITs / NCL / Heavy Water Board / VIT Pune. Half the industry surveyed feels that the Government should create a R&D fund.

The strategies suggested by them are:

- ❑ Direct financial assistance to recognized R&D Units
- ❑ Disbursement of funds should be earmarked for core areas like energy and environment / super critical extraction projects and projects of national interest like nuclear, space, defence
- ❑ Should depend on project specifications and commercial applications

However, this industry is not very inclined towards R&D since profit maximizing takes the priority when the market is booming. There is a lack of strategic thinking on the part of the industry.

## **Management Efficiencies**

The industry barring the few big players need stronger marketing abilities. That is the reason why only 20% of companies under survey had a larger chunk of the market share. It was observed that the smaller players comprising approximately 32 percent had no formal strategy planning or were aware of strategic planning or product development strategy. 36 percent of the companies have said that they have established procedures of strategic planning and 32 percent did indepth strategic planning.

When asked what should be the company's strategy to enhance market share, 47 percent said that they followed no strategy at all. Out of the remaining 53 percent companies who have or followed a strategy to enhance their market share, the majority felt that the top most priority in enhancing market share was by achieving high quality and service. The second priority they felt was aggressive marketing. Third was to reduce costs and lastly they felt increasing the product range may help them to increase their market share.

However, surprisingly it was noted that an aggressive marketing strategy was followed only by 28 percent of the companies, 30 percent do not even collect competitors' information and the balance 42 percent have a basic understanding of marketing strategies and are aware of their competitors / own competitive advantage.

37 percent of the companies do not consider any form of strategic alliance to enhance their market share. The top management of 48 percent of the companies consider that strategic alliances are required from time to time and have participated in new product development projects or have gone in for alliances for new product development / market development.

One fourth of the companies have strategic alliance on an ongoing basis and were interested to enhance their market share through mergers and acquisitions.

The level of quality consciousness is not very high especially among the smaller companies. They mainly work as sub-contractors to the bigger manufacturers, or to EPC contractors. This is evident from the high percentage of the companies not being interested in getting ISO certification. The reluctance stems from the fact that due to the fluctuating order position of the sector, the companies do not invest in requisite manpower, training, engineering and welding skills, good practices, quality systems and standards.

In this sector only 65 percent of the companies manufacturing complete equipment had manufacturing facilities ISO certified and 12 percent are seeking certification whereas 23 percent have said that they are not interested in getting ISO certification. It is further noticed that the percentage of scrap due to errors in manufacturing is quite high ranging from 0.5 percent to 10 percent and is higher for people who are not ISO certified. Similar is the case in terms of percentage of labour hours spent on reworking. The percentage was much lower, approximately 0.1 percent to 2 percent for ISO certified companies whereas it was as high as 5 to 10 percent for companies who had not got their certification.

Due to the fragmented nature of the industry and the small size of the players, most of them have not implemented any of the latest soft technologies and only 35 percent of them have undergone business process re-engineering in the past three years to make themselves more competitive in the face of increasing international competition.

There has been an interesting observation in the industry that, by relooking at their business processes and manufacturing methodologies, a few companies have been able to grow at more than 30% without any capacity expansion. 35 percent of the companies also underwent downsizing to enhance cost competitiveness.

The level of penetration of computerization is average compared to other segments of the capital goods sector.

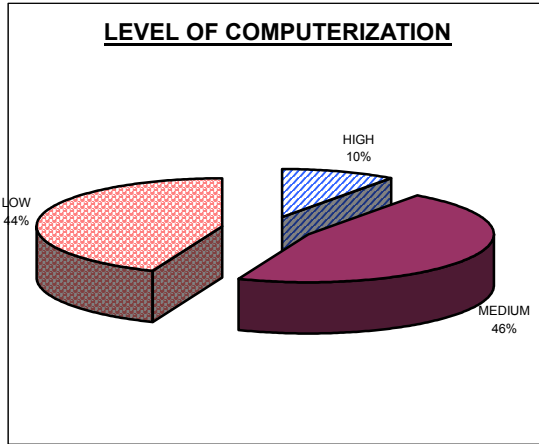


Chart 5

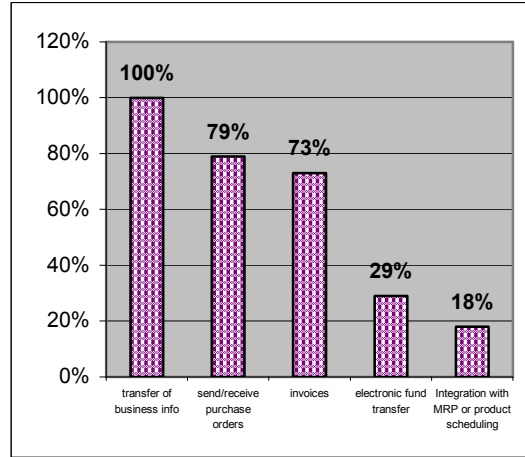


Chart 6

The various activities computerized by companies is shown in the second graph above.

The percentage of IT expenditure to sales during the last one-year has been a meagre 0.5 percent. The training of employees in computers however has undergone a significant increase over the past few years.

Companies should use technology for reducing procurement and vendor management costs through e-procurement and other supply chain optimization features like vendor-managed inventories.

Only 40 percent of the companies who were among the medium and high users of computerization had ERP solutions installed. Only one company had SCM and CRM too.

ERP or enterprise resource planning is an industry term for the broad set of activities supported by multi product application software that helps a manufacturer or other businesses manage the important functions of its business including product planning, parts purchasing, maintaining inventories, interaction with suppliers, providing customer service and tracking orders.

Supply Chain Management (SCM) is the management of the entire value added chain, from the supplier to manufacturer right through to the retailer and the final customer. SCM has the primary goal of reducing inventory, increasing the transaction speed by exchanging data in real time and increasing sales by implementing customer requirements more efficiently.

CRM (Customer Relationship Management) entails all aspects of interaction a company has with its customers, whether it be sales or service related. CRM is an information industry term for methodologies, software and normally patent capabilities that help an enterprise manage customer relationships in an organized way.

Since this sector has the capability of enhancing its export share, the companies need to focus more on computerization to increase not only their productivity, but also for easy connectivity with its network of suppliers and customers.

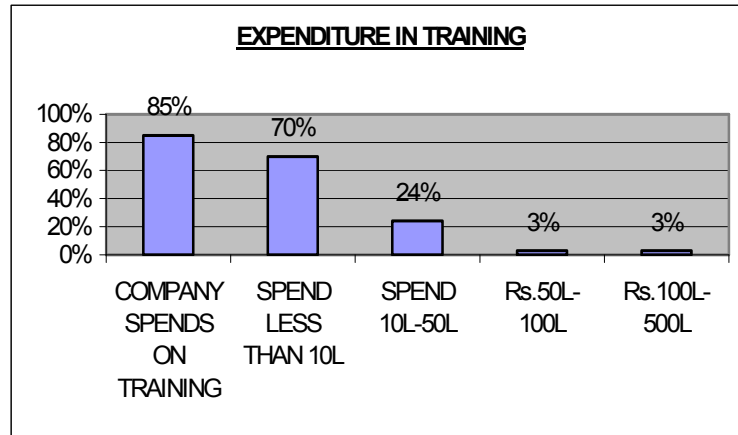


Chart 7

Only 85 percent of the companies spent money and time on training. Out of this 70 percent spent less than Rs.10 lakhs per annum and only 30 percent spent above Rs.50 lakhs per annum. Companies are realizing that to retain talent, the expenditure on training and HRD needs to be increased and human resources should be the focus since this sector, specially the engineering side, has its competitive edge because of its talented manpower.

This sector is unable to retain talent and experienced technical manpower like welders, fitters, machinists and design engineers who are lured by the high wages in the Middle East. Hence HRD has an important role to play to motivate employees and try their best to stop the flight of the trained workforce.

Production planning / inventory / scheduling is followed by 43 percent of the companies covered under the study. Out of these companies, 90 percent reported that they used either of the following software or software developed in-house by them.

- Sun Micro Systems-ERP applications
- Movex-Intentia
- Oracle Applications
- SAP Applications

The percentage of shipments before / within the due date is very low at only 60%. However, this figure would have been lower but for a few companies who deliver 90% of the time within the due date. There is no co-relation found between delivery on time and computerization used for production planning and scheduling.

The reasons for late deliveries were attributed mainly to delays in customer clearance and design clearance by the small players who either supply to the bigger companies, or EPC companies, or are dependent on design from them. The

majority of the companies have however attributed their delays to capacity constraints and delays in procurement of raw materials.

**Operational Efficiencies**

**Sales Growth Rate and Exports**

The year 2004-05 has been excellent for this sector with an average sales growth of 40 percent with some of the smaller companies showing sales growth rates as high as 240 percent. Some medium size companies also showed high growth of 65 percent. The export growth rate has been phenomenal in 2002-03 when the industry was facing recession in the domestic market. With a pick up in the domestic market, the exports have not fallen but have also not shown any growth because most of the companies were unable to cope up with the domestic demand and hence did not focus much on exports.

The majority of the exports are to the Gulf taking advantage of the investment in that region and the proximity of that region to western India has helped.

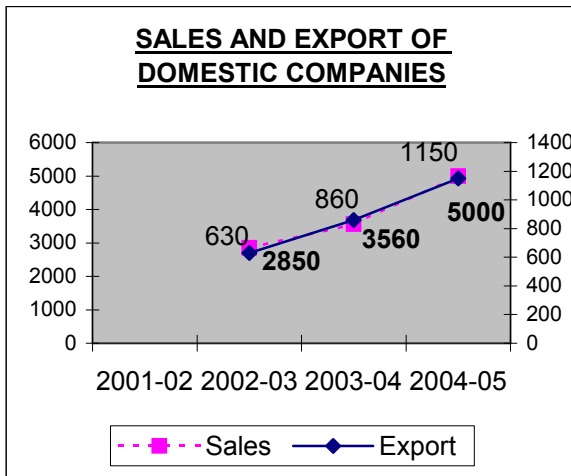


Chart 8

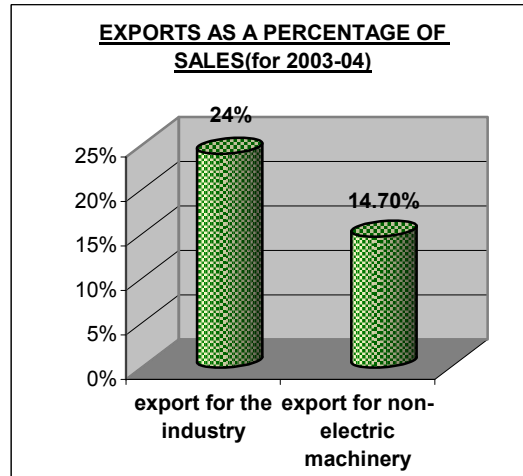


Chart 9

Source : CMIE

As is evident the cost of raw material as a percentage of net sales has been increasing over the years because of the rise in steel prices which is a major raw material component of this industry. The cost of procurement is also not optimized considering that majority of the raw materials for high technology equipment is required to be sourced from abroad.

From the CMIE Industry Financial Aggregate and Ratios, it was noticed that the percentage had increased marginally from 55.8 percent to 56 percent in the years 2002-03 and 2003-04 respectively.

The power consumed to sales as compared to other manufacturing industry is higher because the products manufactured have a high component of fabricated items. However it is noted that the power consumed to sales is showing a steady decline over the years.

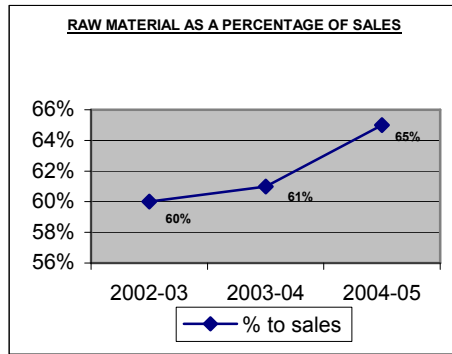


Chart 10

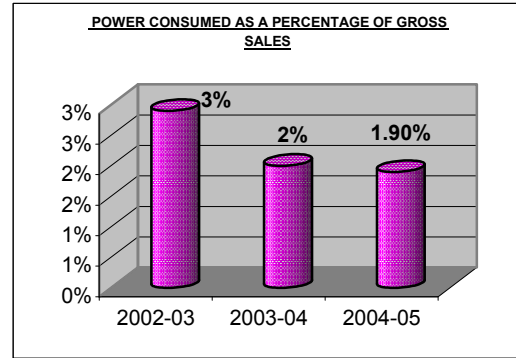
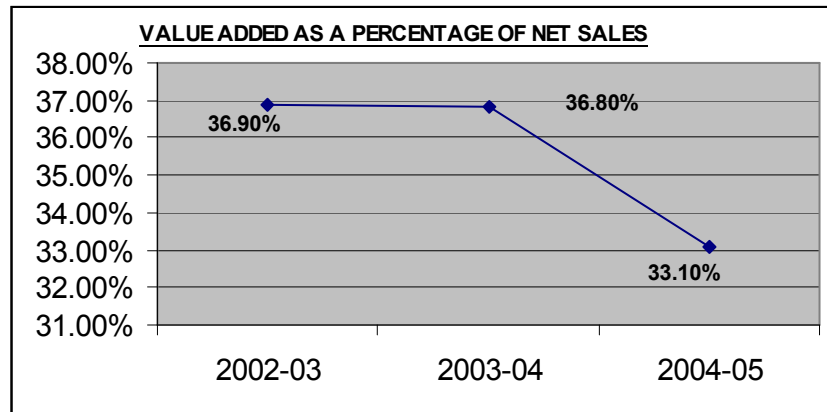


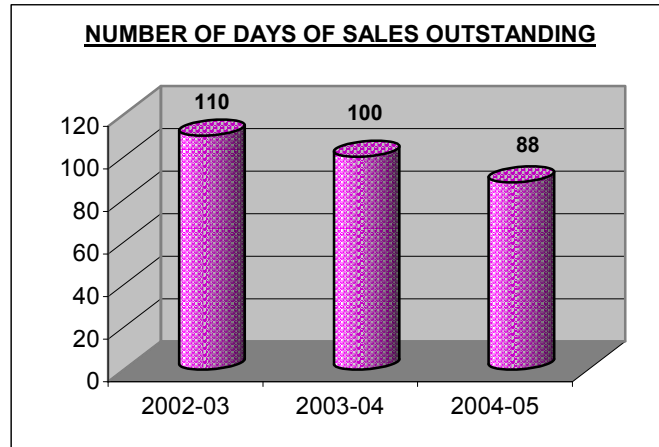
Chart 11

Value added for an industry is the difference between the value of the output and the value of the input namely raw materials & bought outs. In other words we can attribute this difference to the value added to the product by the company. The value added in this sector is comparatively low because the raw materials constitute a major portion of the value of the equipment. The value added as percentage of net sales has shown a sharp decline in 2004-05. This is due to unprecedented increase in the cost of raw materials specially steel which is a major raw material. Another trend noticed in the survey was that bought-outs had increased significantly in 2004-05 thereby indicating more sub-contracting and hence lower value addition by the companies.

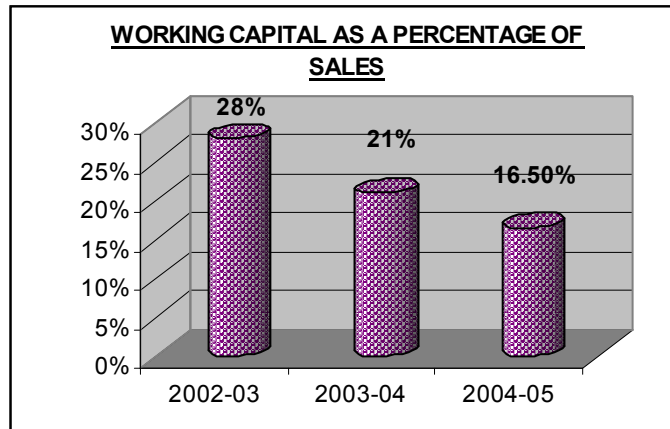


Inventory on an average was found to be 24 percent of net sales. Average turnover of inventory in 2003-04 was found to be 5.75 or in other words companies held inventory for 64 days. The reason for such low inventory turnover was due to the fact that inventory management and procurement techniques were nowhere near the global standards. Moreover this industry is a conglomeration of companies manufacturing both standard products as well as custom built products and hence the average inventory was higher. However, compared to the other sectors of the capital goods, the inventory turnover is on the higher side.

The number of days sales outstanding was on an average around 90 days in 2004-05. The industry has taken efforts to reduce the outstanding over the past few years to reduce the working capital requirements.



The reasons for such high outstanding levels were retention amounts being kept by the public sector companies who are the major clientele of this industry.



On an average working capital as a percentage of gross sales was found to be 16.5% in 2004-05. Individual company data has shown that from 2002-03 onwards, the percentage of working capital to sales has been on a steady decline. This shows that the industry has been working on its financial management to be cost effective and in turn achieve a higher ROCE.

The average cost of wages to gross sales for the industry was found to be 10.5 percent in 2003-04. The range varied from a low of 2 percent to a high of 25 percent.

The average sale per employee was found to be Rs.26 lakhs. The range varied from a low of Rs.1 lakh to a high of Rs.70 lakhs per employee. The average value added per employee was found to be Rs.9.5 lakhs and PBIT per employee was Rs.2.7 lakhs.

## Profitability

The profitability of this sector has shown an upward trend. This has happened because the industry took measures in improving productivity, reducing inventory and receivables and undertook measures for better financial management.

### a) PBIT to Capital Employed

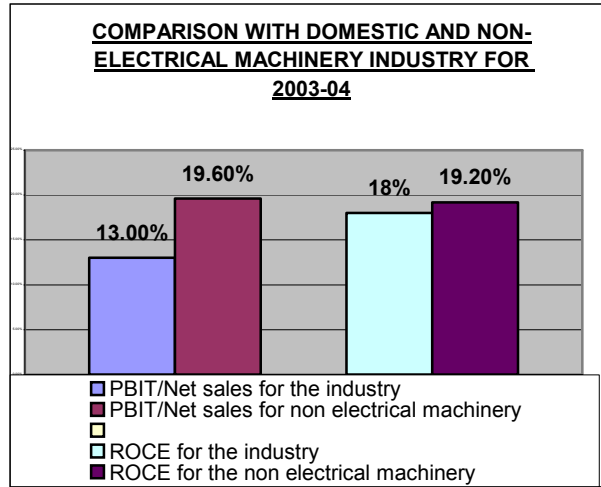


Chart 15

The capital employed by the companies operating in the process plant equipment segment in 2003-04 was approximately Rs.1850 crores and the PBIT was Rs.330 crores. (The capital employed & PBIT of the PSU companies were not considered).

In 2004-05 for the companies who have reported their figures, it was noticed that the ROCE has shown an excellent growth and ranged between 12 percent to more than 100 percent in some cases.

### b) PBIT and PAT to Net Sales in 2003-04

PBIT to net sales in 2003-04 was found to be 13 percent on an average and PAT to net sales was 9 percent. PBIT as a percentage of sales ranged from a low of 2 percent and was as high as 58 percent for some companies. PAT as a percentage of sales also ranged from losses for some companies to a high of 26 percent.

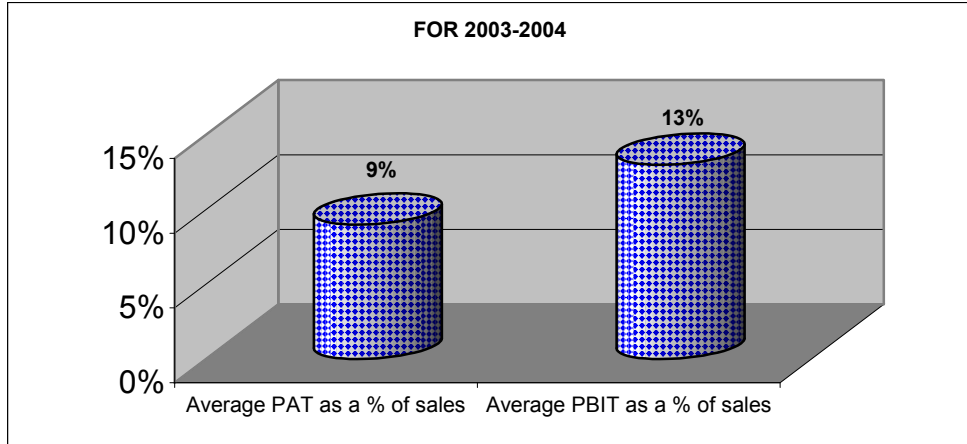


Chart 16

It was noticed that in general 70 percent of the companies in this sector had a debt to equity ratio less than one. It was also noticed that wherever a company had a high debt to equity ratio, they incurred losses and where the debt to equity ratio was less than 0.3 the ROCE for these companies were 40 percent or higher.

## Productivity Parameters

### Machine and Labour Utilization

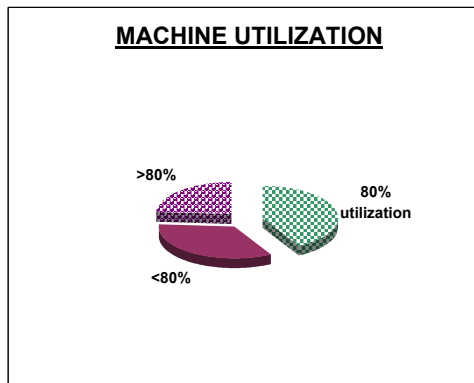


Chart 17

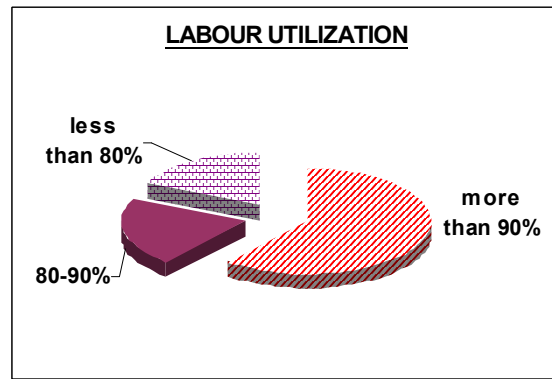


Chart 18

Machine breakdown ranged from 1 percent to as high as 12 percent with an average of 7 percent.

Only 40 percent of the companies used CNC or NC machines because most of the manufacturers are small players and did not find it economical to invest in CNC machines. Another reason being this sector is heavily dependent on fabrication. Wherever the smaller manufacturers required machining or castings, they subcontracted it to machine shop vendors and smaller foundries respectively.

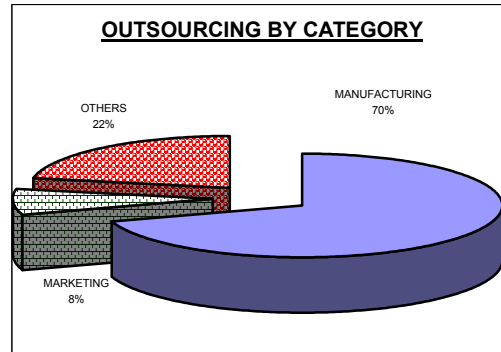


Chart 19

90 percent of the companies subcontracted their manufacturing and subcontracting this ranged from 2 percent of the production to 80 percent in some cases. Companies subcontracted their work due to higher workload or capacity constraints, sometimes due to cost considerations and also to expedite delivery.

Procurement lead-time was considerably high ranging from 15 days to 6 months in some cases. Manufacturers have cited examples of customer stipulated usage of specific material which needed to be necessarily imported since they are not manufactured in India and hence in such cases, there are slippages in delivery. Moreover majority of the companies being small and less leveraged on computerization had longer procurement lead times and lacked expertise in inventory management.

A major problem faced by this industry is the lack of support it receives from the domestic steel industry which does not provide the quantity of alloy and SS plates required by the industry which forces the companies to source their material from Europe and Japan. This has three disadvantages namely:

- Higher cycle time required to manufacture an equipment
- Fluctuation of prices and sometimes competitors from Japan and Europe being able to get material at competitive rates
- The challenges of the logistics involved and consequently requirement for higher inventory.

### **Capital Investment**

Only 25% of the companies who were surveyed have reported capital expenditure plans of Rs.900 crores for the next 2-3 years.

### **User Sector Feedback**

Since the industry is of a vastly divergent nature with regard to the products manufactured, technology used and the equipment required, it is very difficult to ascertain responses from a uniform cross section of users. However responses from a cross section of users were obtained and it was found that in the process plant equipment sector the majority of the procurement is done only if there is

modernization / expansion or renovation in the user sector. A small percentage is in the form of replacement on a regular basis.

It was noticed that except in the cases of pumps, steel plant and paper plant equipment the majority of the process plant equipment were procured from the domestic market especially in the case of hydrocarbon and the fertilizer sectors. Many of the user industries also have their own captive manufacturing base catering to the requirements of their own static equipment for replacement or repairing purposes.

The consultants prior to procurement generally vet the process plant equipment specifications and such procurement is approximately 85-90 percent of the total consumption and is mostly in the form of projects.

According to the users, the process plant equipment manufacturers were at par with the international suppliers in offering design services and with regard to quality of the manufactured equipment and providing spares or service wherever required.

The shortcomings of the domestic industry were felt in the technology offered and delivery requirements. In the case of equipment where fuel, or power consumption was of importance, the equipment available in the domestic market was short of expectations.

**Market Situation and Demand**

The total turnover of the domestic companies in this segment manufacturing total equipment for the process industry is estimated to be approximately Rs.5,250 crores in 2004-05.

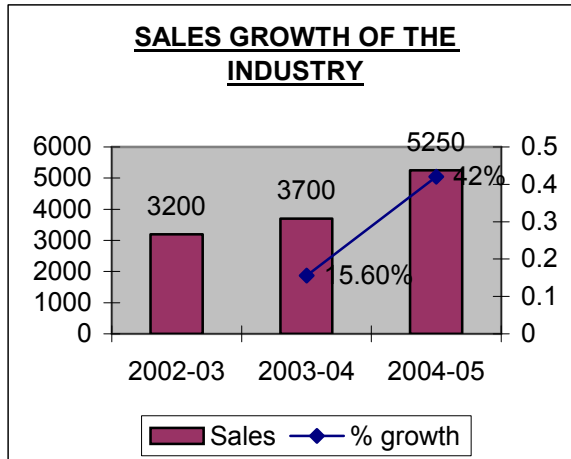


Chart 20

The sales turnover of the companies for this particular segment having reported for the study is given below.

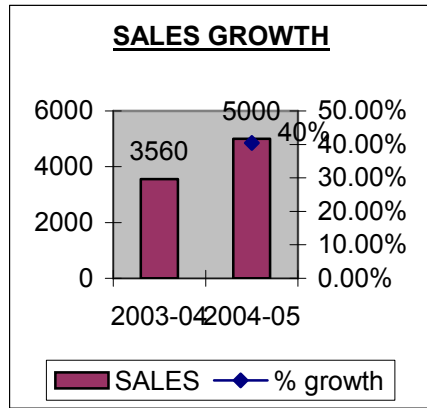


Chart 21

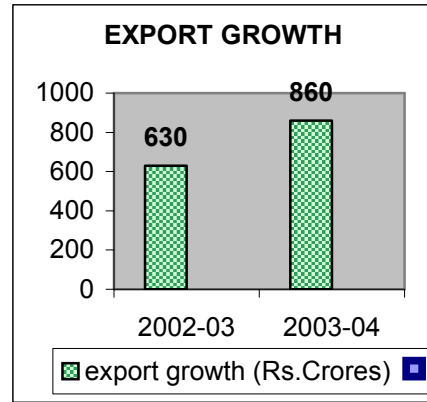


Chart 22

Out of the companies covered by the survey, only 70 percent of them export their products to either other customers or to their own parent company. However these 70 percent of the companies had 24 percent of their sales as exports.

The export growth rate shown by these companies was 36 percent in 2003-04 over 2002-03. This growth rate has been exceeded in the year 2004-05 over 2003-04. The number of companies who have reported their export figures for the year 2004-05 have shown an average growth rate of 48 percent with some companies exporting as high as 60-70% of its sales.

The order backlog as on 31<sup>st</sup> March 2005 was Rs.5,000 crores which is almost 95 percent of the 2004-05 sales. The growth projections for 2005-06 as given by the industry is Rs.6,000 crores, a jump of 15 percent on an average.

In the subsequent years it is noticed that the rate of growth in sales as projected by the industry is lower than that in the year 2005-06. This is probably because of the higher base effect and the uncertainty of investments, which are likely to take place in the future. Further, the industry fears that with the economy continuing to open up, customs duty gradually getting reduced, free trade agreements being signed, international competition would further intensify and provide more options to customers.

At present the export market is likely to see a major thrust and focus by companies who foresee better profitability and business prospects abroad, especially in the developing countries.

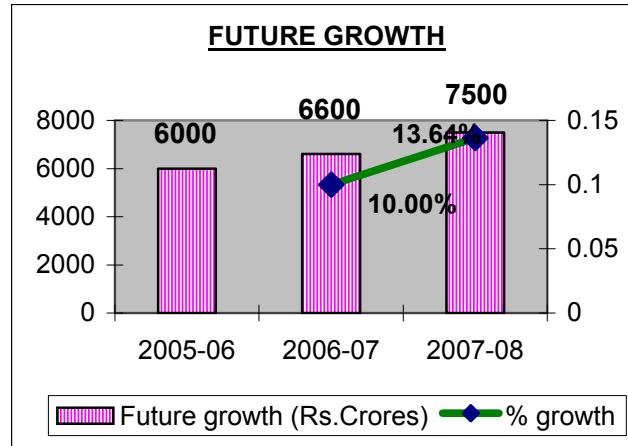


Chart 23

India has a competitive advantage in products, which are critical in nature and are to be designed and manufactured to customers requirement because of the engineering skills available. Equipment such as FRP lined equipment, glass lined equipment and equipment manufactured from incoloy, titanium and its alloys, aluminium, nickel, monel, cupro nickel, stainless steel etc. are more cost competitive due to high labour content and expertise.

At present many companies are exporting equipment manufactured to customers' designs for projects in the Middle East, SAARC countries, Germany, USA, Egypt, Australia, UK, France, Japan etc. secured through leading EPC contractors. **(Refer Annexure IX)**. Some of the products are being exported through parent companies who use India as an outsourcing base since here they can avail of low cost manufacturing at international standards.

The only hindrance to exports lies in the cumbersome export procedures and the lack of infrastructure, which are crucial for transporting the large dimensional equipment to ports. The lack of proper port infrastructure leading to higher transaction costs and freight cost are also reducing the margins of the companies. For example if a company is required to transport a very heavy equipment of say average weight 100 T upwards from Mumbai port, they need to charter a ship with heavy lifting facilities for handling since the port does not have heavy floating cranes of higher capacity.

There are also severe restrictions on the movement of ODC within Mumbai city due to bad roads and inadequate clearance under overhead cables / flyovers.

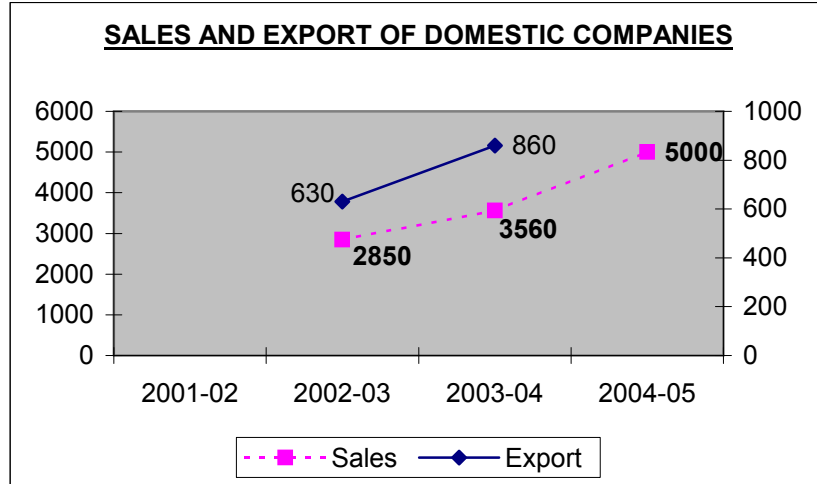


Chart 24

The issues of inconsistent delivery and the stringent application of the SHE policy by some countries are acting as deterrents for some of the medium and small companies to focus on the export market.

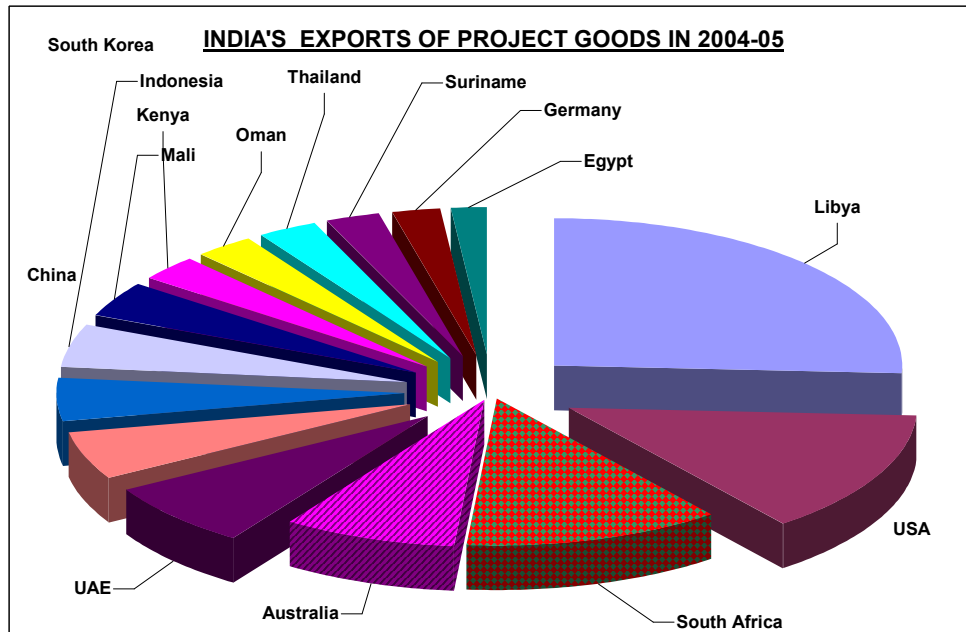


Chart 25

While Indian companies would benefit by focusing on exports, companies fear that a greater focus on exports would make them vulnerable to the developments in the international markets as well as foreign exchange rate fluctuations, which the smaller companies may not be able to manage effectively. Further, if their markets are not diversified, the risk increases in case of an adverse political environment.

The domestic demand for process plant equipment is on the rise. India has the fastest growing per capita energy consumption growth rate in Asia and is the sixth largest consumer in the world. The Indian energy consumption matrix is dominated

by coal followed by oil and natural gas against the international trend where oil and natural gas dominates the consumption matrix. However, demand for oil and gas is increasing in India. As per the Tenth Five Year Plan, the consumption of oil in India is expected to increase at 3.6% annually as compared to the annual growth rate of 2% for the world. The Government of India has earmarked US\$ 12.91 billion for exploration & production and US\$ 7.97 billion for the downstream sector in the Tenth Five Year Plan. As per the India Hydrocarbon Vision 2025, refining would have an investment of US\$ 50 Billion and the marketing infrastructure would involve an investment of US\$ 29.34 Billion. The breakup for the marketing infrastructure is as follows:

Product Pipelines: US\$ 4.56 billion; Product Tankage and related facilities: US\$ 3.47 billion; Retail Outlets: US\$ 20.2 billion; LPG Bottling Plants: US\$ 1.08 billion.

India has attained self-sufficiency in refining crude oil. This benefits the country in avoiding import of expensive products like petrol and diesel and provides local value addition to crude by converting to more expensive products within the country. It has the 10th largest refining capacity in the world. Increased marketing focus, CBM, coal gasification, ethanol blended fuel and quality standards are new initiatives being taken up. Indian companies are expanding overseas by way of acquisitions and JVs.

Stagnant demand in the caustic soda industry and higher interest costs have adversely affected the financial health of the industry and this deterred players from incurring the huge capital expenditure required for adopting the membrane cell technology. However, over the last 2 years, demand growth has been significantly higher. Besides, soaring prices have improved the financial flexibility of players. Hence, many capacities based on mercury cell technology are expected to be converted to the membrane cell technology over the medium term. The conversion will also be in line with the commitment under the "Charter on Corporate Responsibility for Environmental Protection (CREP)".

The Chemical industry in Egypt has been facilitated in its development by the country's strong oil industry sector, which is able to provide raw materials, feedstock and manufacturing infrastructure. Key chemical industry sectors include fertilizers, petrochemicals, polymers and other chemicals.

Egypt is carrying out a US\$ 1 billion plan to increase the output of fertilizers from six to nine million tones a year. The locally funded project will enable Egypt to double its export of fertilizers over the next three years. This means significant potential for consultancy and technical services for Indian companies.

Egypt now levies a number of penalties, both financial and operational, against companies that are not in compliance with its environmental policy. The Government has allocated \$2.6 billion through 2007 to execute an environmental plan. The Government has made solid waste disposal a priority in its environmental programme. The most promising sub-sectors are: Incinerators, industrial and other filters, recycling plants, solid waste management, kits for switching motor vehicles to

use natural gas and equipment to extract sulphur from gas to reduce pollution. The growth rate is expected to be 10% in the coming three years.

Today Brazil is ranked among the top ten countries in the world, with respect to the size of its chemical industry. The Brazilian oil and gas sector is considered today to be one of the most attractive markets due to Petrobra's (Federal oil and gas producer) ambitious investment plans and to the significant presence of heavy weights in both the upstream and downstream segments. The demise of the Brazilian constitutionally mandated petroleum monopoly in 1997 resulted in a steady inflow of foreign risk capital into Brazil, intending to lead to the country's self sufficiency in hydrocarbons in the medium term. The total Brazilian market for oil and gas equipment and services was projected at US\$ 5.4 billion in 2000 of which over US\$ 1.6 billion (30%) was represented by imports. With the gradual removal of barriers to trade and investment in this sector, the market is expected to continue growing at high average yearly rates: 17% (total oil market) and 30% (imports) over the next five years.

Environmental experts estimated Brazil's environmental technology market at US\$ 2.9 billion in 2000, including equipment, engineering and consulting services and instrumentation associated with pollution control and cleanup projects. The market for air pollution control products was estimated at US\$ 230 million, water and wastewater treatment sector was estimated at US\$ 1.6 billion and the market for solid waste treatment was at US\$ 1.2 billion. The market was increasing at a rate of 5 to 8% per year. Best prospects for environmental products and services include: environmental engineering and consulting services; treatment stations, general pollution projects / installations etc.; solid waste management technologies: domestic garbage, sludge, co-processing, incineration, recycling etc.; clean technologies; soil recovery technologies; automation and monitoring systems for water and wastewater treatment plants.

Peru offers the best prospects for growth, as it is believed to have large undiscovered reserves. Several major new investments in the oil & gas sector are taking place and planned for the next couple of years.

Chemicals will play a key role in China's industrial development, driven by production of ethylene and aromatics, and major downstream materials such as plastics, rubber and fibres. The rapid development of many of China's industrial sectors, such as agriculture, textiles, electronics, healthcare, building, cosmetics and petroleum, has stimulated market demand for high quality, high tech fine and speciality chemicals. As domestic products cannot meet this demand due to poor product variety and quality, China is relying increasingly on importing many fine and speciality chemicals and intermediates to fulfil its requirements. Hence it can be expected that production facilities to meet the domestic demand will soon be set up in China.

Over the next 5 years, most capacity additions are expected in Asia and the Middle East. In the medium term, capacity additions are expected to grow more or less in line with the demand growth rate.

In India, there is however an overcapacity in the refinery sector and foreign investors do not find this sector attractive for investment.

Major refining modifications needed to be considered to get gasoline/diesel to meet EURO – II/III standards. Additional capital will be added for these modifications.

Planned capacity additions by players like IOC, ONGC, GAIL and Reliance are expected to add to new capacities.

The liberalization of industrial policy and other initiatives taken by the Government have given a definite impetus for entry, participation and growth of the private sector in the steel industry. While the existing units are being modernized/expanded, a large number of new/greenfield steel plants have also come up in different parts of the country based on modern, cost effective, state-of-the-art technologies.

At present, total (crude) steel making capacity is over 34 million tonnes and India, the 8<sup>th</sup> largest producer of steel in the world, has to its credit, the capability to produce a variety of grades and that too, of international quality standards. As per the ratings of the prestigious "World Steel Dynamics", Indian HR products are classified in the Tier-II category quality products – a major reason behind their acceptance in the world market. EU, Japan have qualified for the top slot, while countries like South Korea and the USA share the same position as India.

In pig iron also, the growth has been substantial. It is estimated that an additional capacity of 64 million tones of steel making capacity is likely to be added in India alone.

Natural gas represented 24% of the energy consumed and 27% of the energy produced in the United States in 2000. The industrial sector is the largest user of natural gas – for plant operations, cogeneration of electric power, and as an industrial feedstock. In addition, natural gas is the largest energy source consumed in the residential sector and the fastest growing energy source for electricity generation.

North America is the largest and fastest growing natural gas market in the world. North America has abundant natural gas resources that will continue to satisfy most but not all of the natural gas demand for the next two to three decades. With the LNG market projected to grow at a fast rate, the LNG projects will fuel the demand for the process plant manufacturers.

The total UK expenditure on process plant was estimated to be £5.27 billion in 2005. After a long period of low investment, the oil and gas sector has announced large expansion plans for the North Sea.

To some extent, the low investment in process plant and automation has been caused by a move towards protection of low wage economies rather than the

installation of modern machinery to reduce labour costs in the UK and European factories.

## **ROADMAP**

The process plant equipment industry has evolved primarily on the basis of the requirement to set up core process industries in India after Independence. The demand today is also from these process industries being set up but the size of the plants have increased and are at times comparable, or larger than global capacities.

Since for the past few years no new investments were made due to the recession, the industry faced a severe downturn and this made them focus on exports and today it is one of the sectors in the capital goods industry to have the highest percentage of exports.

The industry being very heterogeneous is also very fragmented with each player operating in a specialized product category. It is also the larger companies who are diversified into many product ranges catering to a larger user segment. The industry is expecting a process of consolidation to take place and this process has already started with the bigger players using the smaller companies as sub-contractors and this is also evident from the value added of the industry which has gone down in 2004-05.

Some companies have divested unrelated businesses to focus on their core competencies and some have gone in for acquisitions to consolidate and further their growth.

The industry will see tremendous growth since investment in the hydrocarbon sector is likely to increase. Companies who can position themselves in areas of high growth will be benefited in the years to come.

Liberalization has helped the sector in allowing it to access the global markets. Ease of imports has helped companies to source raw materials and high technology components easily. With the reduction of customs duties, companies can import high grade or higher thickness raw material easily, which is not available in India. Non-availability of alloy steel and SS grade material required in bulk by the industry is hurting the industry in terms of cost competitiveness and delivery.

- Almost 80 to 85% of the raw materials required by the industry like alloy steel plates and forgings are imported from mainly Western Europe and Japan, as these are not manufactured in India. The main grade and specifications of plates required to cater to the critical high pressure, high temperatures and corrosive medium are:
  1. Chrome Moly plates SA 387, grade 11 & 22
  2. Chrome Moly Vanadium plates – SA 542
  3. Manganese Moly plates, SA 533 and SA 302

The thickness of these plates are in the range from 32 mm to 130 mm.

4. Even carbon steel grades such as SA 516 are being imported beyond thickness of 50 mm.

- **GOI should reduce the customs duty of all these materials to 5% to help the manufacturers.**
- **The domestic steel industry should try to meet the requirements of the sector in terms of availability of quality raw materials.**
- The industry can help itself by adopting the following measures which are being carried out by some of the big players.
  - **A few sub-suppliers should be adopted as an extension of the company and help extended to them in terms of training in engineering, welding, planning and quality systems and standards and upgradation of technology**
  - **Assistance in terms of finance also can be extended along with assured workload**
  - **Training of a large number of labour apprentices many of whom find employment in the smaller units who cannot afford such training**

Manufacturers do not foresee any threat from the FTA / PTA's being signed. Instead they look upon them as opportunities to make inroads into those countries. However, companies are gearing up to face the increasing international competition by focusing on the latest and high technology areas by enhancing quality and acquiring international standards such as ISO, ASME, CE etc., better productivity thereby reducing cost and improving upon the delivery period.

The Indian companies as highlighted in the report are already positioning themselves as a low cost manufacturing hub by aligning themselves and working together with the leading international consultants. The oil rich countries are investing in refineries and downstream industries which have thrown open vast opportunities. A leading process plant equipment manufacturer had envisioned these opportunities and built manufacturing bases on the waterfronts with facilities to transport ODC consignment through the sea routes, thereby making the equipment cost competitive. These capital expenditures are now paying off.

Leading overseas manufacturers like Doosan Heavy Industries, Korea are already considering making India their manufacturing hub for exports to the Middle East. A base in India would reduce transportation time by a third, which is a significant competitive advantage.

The process plant equipment manufacturers have the right mix of talent, expertise and opportunity to grow at a fast pace if the much-needed investment in the core infrastructure industry takes place and they relook at their operational and management inefficiencies.

Companies need to stress more on HRD since they can leverage more on the human resource expertise especially in the design and engineering field and R&D. Attracting and retaining talents will be a major constraint in this sector.

Many of the domestic process equipment manufacturers have faced difficulties in increasing capacity both in their supplier base and recruitment of talents owing to the sudden buoyancy in the sector.

The average wages per employee is quite low in this sector, which is the reason that companies are not able to attract and retain talent. The smaller companies rarely can afford a qualified engineer in their manufacturing shop and more often than not depend on diploma or ITI trained manpower or even experienced welders, fitters and machinists.

The low wage structure of the industry is creating a vacuum in terms of a trained technical workforce which is lost to the Middle East because of their high wage structure. This issue needs to be looked at very seriously by the industry since the competitive advantage of the sector lies in its human resources.

The industry needs to focus more on human resources so that the in-house talent and expertise can be harnessed with minimum effort and cost. Multi tasking skills need to be inculcated so that at all times manpower can be utilized to the maximum especially since the industry is dependent on industries which are cyclical in nature like steel, cement, paper etc.

- **Top-level management both in the private sector companies and the PSUs should be exposed to skill upgradation programmes regularly on management issues and the international scenario.**

Companies need to focus more on best practices to reduce their manufacturing costs and improve upon quality standards. Since raw material is a major component in the cost of the equipment, companies need to invest more in IT to integrate their supply chain system, thereby reducing the inventory levels and allow for cost effective methods of procurement.

They also need to improve upon their manufacturing technologies and invest more in IT to enhance their productivity, give shorter delivery through better integration with supply chain systems and better service by integrating with customers' systems through CRM.

The quality consciousness of the industry barring a few larger companies is not upto expectation. These are the companies who use poor quality material and do not follow the process or quality standards. However, with the users becoming more conscious of the quality aspects, they do specify procurement from ISO certified companies and hence the non-ISO certified companies end up being sub-contractors to the ISO certified companies.

The manufacturing companies need to invest into R&D for developing manufacturing capabilities involving different materials in a most cost effective manner. Like other global players, they should invest in R&D to develop market oriented optimal technologies; new technologies and businesses which are likely to see a high growth in the future and at the same time strengthen the production technologies.

Most of the companies should take a relook at their business processes and focus on ways and means to improve the productivity and enhance capacity to improve returns on assets and capital employed. ROCE and PBIT as a percentage of sales for the industry is lower than that for non-electrical machinery as reported by CMIE and the industry needs to focus on this aspect.

For the fabrication industry, with the enhancement of quality standards and improvement in delivery schedules, India can be a major outsourcing destination due to the availability of highly skilled welders / machinists at a very competitive rate.

At present, automation in fabrication, machining and welding techniques and integration of the processes through IT is minimum since high investments are required.

- **GOI should increase depreciation rate on such equipment to encourage companies to invest.**
- **The workloads in the fabrication industry are of a fluctuating nature. Labour reforms should be carried out to enable a flexible system of hiring labour to meet these fluctuations on a contractual basis.**

Though PSUs in India like HEC and BHPV are equipped with the best manufacturing facilities in heavy engineering, they lack the managerial effectiveness because of red tapism.

- GOI should provide a certain degree of autonomy in terms of marketing and ensure accountability for the performance of the PSUs
- Companies should diversify their product range to counter the problem of cyclical downturns.

The outstanding as a number of day's sales can be further brought down by the industry to improve its profitability.

- It should be mandatory on the part of all users including PSUs and Government organizations to pay the clear dues of suppliers within 60 days.

The opening up of imports has increased competition for the domestic manufacturers since they do not enjoy a level playing field due to high domestic taxes and duties. A number of recommendations have been given in the first section to counter the disadvantage.

To focus more on exports, companies would need to focus more on marketing and sales and build on the India brand image. They should also interact with all the International Consultants based in India / abroad and work in close proximity so that more and more jobs can be outsourced from India for projects being set up abroad.

Since the industry has the potential to increase its exports, GOI should provide all help to the industry in the following ways:

- Ease of export regulation and formalities and quick reimbursement of export related financial benefits.
- To extend a higher credit through EXIM Bank
- Encourage participation in international trade shows and trade missions to countries with potential demand
- Ensure that equipment are procured from Indian companies when GOI extends the credit
- Improve Infrastructural facilities specially port handling facilities to enable companies to reduce their handling and transportation costs since the future plants that are set up will have global scales and therefore the equipment will be heavier and larger.

There are tremendous opportunities in the oil and gas sector since oil companies worldwide are expected to make significant investments in the field fueled by continuing oil price increases and the rise in energy demand. It would be prudent for the manufacturers to position themselves in this field both in design and manufacturing to be able to capture the market. Large investments are also foreseen in desalination plants and environmental facilities in the Middle East due to rapid growth in population and the aging of the desalination plant facilities, which were installed in the 1970s and 1980s. Investments in natural gas will also be significant and requirements for gas to liquid (GTL) and liquid natural gas production plants are going to have a high trajectory growth path.

Companies in this sector therefore need vision and strategies to enter a market with future potential by partnering with either high tech companies or related process license holders.

## ANNEXURE-IX

**EXPORTS FOR PROCESS PLANT EQUIPMENTS**

**Commodity:** 8413 PUMPS FOR LIQUIDS; W/N FTED WITH A MEASURING DEVICE; LIQUID ELEVATORS **Unit:**

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS	66.85	275.18	311.64			
2.	ALGERIA	157.94	120.07	-23.98			
3.	ANGOLA	19.79	214.87	985.73			
4.	ARGENTINA	20.72	24.25	17.04			
5.	ARMENIA	0.14	1.24	761.12			
6.	AUSTRALIA	565.40	866.80	53.31			
7.	AUSTRIA	15.66	43.39	177.08			
8.	AZERBAIJAN		20.24				
9.	BAHARAIN IS	137.57	193.05	40.32			
10.	BANGLADESH PR	592.42	580.33	-2.04			
11.	BELGIUM	295.88	437.59	47.89			
12.	BENIN	0.25	6.98	2,680.06			
13.	BHUTAN	102.17	155.17	51.87			
14.	BOTSWANA	0.20	17.86	9,001.68			
15.	BRAZIL	335.10	1,155.18	244.73			
16.	BULGARIA	1.55					
17.	BURKINA FASO	38.11	148.19	288.87			
18.	BURUNDI		0.34				
19.	CAMBODIA	923.15	99.11	-89.26			
20.	CAMEROON	100.66	14.99	-85.10			
21.	CANADA	604.73	397.74	-34.23			
22.	C AFRI REP	7.13					
23.	CHAD		17.66				
24.	CHILE	19.36	40.72	110.33			
25.	TAIWAN	1,107.44	173.95	-84.29			
26.	CHINA P RP	446.47	659.61	47.74			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

27.	COLOMBIA	181.65	200.05	10.13			
28.	CONGO P REP	8.25	146.19	1,671.03			
29.	CUBA	6.90	17.69	156.43			
30.	CYPRUS	4.85	16.64	242.68			
31.	CZECH REPUBLIC	1.33	4.43	234.63			
32.	DENMARK	18.67	15.25	-18.32			
33.	DJIBOUTI	68.64	387.45	464.44			
34.	DOMINIC REP		0.38				
35.	ECUADOR		5.29				
36.	EGYPT A RP	768.61	696.90	-9.33			
37.	EL SALVADOR	3.68	73.86	1,908.39			
38.	ESTONIA	16.27					
39.	ETHIOPIA	183.56	405.84	121.09			
40.	ERITREA		27.06				
41.	FAROE IS		2.57				
42.	FINLAND	3.83	27.51	618.51			
43.	FIJI IS	15.23	8.01	-47.38			
44.	FRANCE	1,567.43	2,717.37	73.36			
45.	GABON	1.72					
46.	GAMBIA	2.23	13.23	494.36			
47.	GEORGIA	1.60	27.50	1,618.78			
48.	GERMANY	16,430.68	7,585.62	-53.83			
49.	GHANA	210.96	671.72	218.41			
50.	GIBRALTAR	0.45					
51.	GREECE	474.89	180.50	-61.99			
52.	GREENLAND		1.43				
53.	GUAM		0.62				
54.	GUATEMALA	3.10	0.76	-75.54			
55.	GUINEA	62.36	6.76	-89.17			
56.	GUYANA	77.01	109.22	41.82			
57.	HAITI	9.81					
58.	HONDURAS	5.91	5.24	-11.38			
59.	HONG KONG	146.53	230.95	57.62			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

60.	HUNGARY	27.37					
61.	INDONESIA	781.65	434.63	-44.40			
62.	IRAN	111.71	310.56	178.02			
63.	IRAQ	115.05	2,591.12	2,152.16			
64.	IRELAND	183.70	41.06	-77.65			
65.	ISRAEL	38.26	33.86	-11.50			
66.	ITALY	1,280.00	1,214.17	-5.14			
67.	CONTE D'IVORY	27.36	23.99	-12.33			
68.	JAMAICA	22.34	9.84	-55.94			
69.	JAPAN	954.98	1,132.84	18.62			
70.	JORDAN	276.25	101.94	-63.10			
71.	KAZAKHSTAN		500.82				
72.	KENYA	461.57	466.61	1.09			
73.	KOREA DP RP	27.27	135.69	397.52			
74.	KOREA RP	176.40	319.00	80.84			
75.	KUWAIT	137.07	188.45	37.48			
76.	LAO PD RP	17.37	16.90	-2.69			
77.	LATVIA	51.79					
78.	LEBANON	9.06	18.11	99.96			
79.	LIBERIA	85.11	107.07	25.81			
80.	LIBYA		1.90				
81.	LITHUANIA	0.05	47.68	105,616.08			
82.	LUXEMBOURG	12.88	10.54	-18.20			
83.	MACAO	7.37					
84.	MADAGASCAR	26.36	17.73	-32.72			
85.	MALAWI	601.08	549.18	-8.63			
86.	MALAYSIA	840.16	703.64	-16.25			
87.	MALDIVES	1.83	41.25	2,148.19			
88.	MALI	158.86	103.89	-34.60			
89.	MALTA	0.41					
90.	MAURITANIA	2.39	2.77	16.05			
91.	MAURITIUS	100.15	138.74	38.53			
92.	MYANMAR	94.74	222.62	134.98			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

93.	MEXICO	128.86	120.41	-6.56			
94.	MOLDVA	0.40					
95.	MONGOLIA		0.86				
96.	MOROCCO	252.32	489.78	94.11			
97.	MOZAMBIQUE	8.37	81.57	874.12			
98.	NAMIBIA	1.77	1.26	-28.86			
99.	NEPAL	674.83	595.58	-11.74			
100.	NETHERLAND	1,065.09	823.64	-22.67			
101.	NEW ZEALAND	28.41	27.69	-2.56			
102.	NIGER		4.02				
103.	NIGERIA	615.40	864.02	40.40			
104.	NORWAY	2.70	21.99	713.14			
105.	OMAN	479.82	1,000.32	108.48			
106.	PAKISTAN IR	3.54	32.52	818.67			
107.	PANAMA REPUBLIC	17.83	11.44	-35.83			
108.	PANAMA C Z	0.18					
109.	PAPUA N GNA	2.23	1.19	-46.80			
110.	PERU	24.37	4.07	-83.31			
111.	PHILIPPINES	119.85	132.15	10.26			
112.	POLAND	152.30	195.44	28.32			
113.	PORTUGAL	4.03	51.40	1,174.22			
114.	PUERTO RICO		0.19				
115.	QATAR	99.47	51.03	-48.70			
116.	ROMANIA	0.29	9.68	3,224.70			
117.	RUSSIA	628.64	28.09	-95.53			
118.	RWANDA	7.84	20.96	167.46			
119.	SAUDI ARAB	344.04	1,062.61	208.86			
120.	SENEGAL	68.37	44.87	-34.37			
121.	UNION OF SERBIA & MONTENEGRO	22.41	15.09	-32.66			
122.	SEYCHELLES	5.13	6.44	25.55			
123.	SIERRA LEONE	1.87	12.79	583.63			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

124.	SLOVAK REP	1.61	4.71	192.54			
125.	SINGAPORE	1,373.22	1,395.13	1.60			
126.	SLOVENIA	21.73	28.79	32.49			
127.	SOMALIA	3.77	0.48	-87.14			
128.	SOUTH AFRICA	571.96	1,158.70	102.58			
129.	SPAIN	447.65	443.23	-0.99			
130.	SRI LANKA DSR	691.61	610.52	-11.73			
131.	SUDAN	302.24	871.77	188.44			
132.	SURINAME	1.47	464.22	31,426.34			
133.	SWEDEN	45.23	31.75	-29.80			
134.	SWITZERLAND	76.80	58.86	-23.36			
135.	SYRIA	418.28	211.03	-49.55			
136.	TAJIKISTAN	1.44	1.58	9.47			
137.	TANZANIA REP	1,128.05	258.81	-77.06			
138.	THAILAND	973.70	576.34	-40.81			
139.	TOGO	18.56	24.45	31.70			
140.	TUNISIA	26.78	69.74	160.36			
141.	TURKEY	267.84	333.96	24.69			
142.	TURKS C IS	4.99					
143.	UGANDA	266.59	209.03	-21.59			
144.	U ARAB EMTS	2,473.67	3,973.66	60.64			
145.	U K	3,443.63	5,569.72	61.74			
146.	UKRAINE	8.37	0.03	-99.65			
147.	U S A	5,221.72	8,037.52	53.92			
148.	UZBEKISTAN	6.43					
149.	VIETNAM SOC REP	36.43	87.43	139.99			
150.	YEMEN REPUBLIC	73.11	383.20	424.17			
151.	ZAMBIA	214.40	330.26	54.04			
152.	ZIMBABWE	0.93	190.48	20,362.91			
153.	UNSPECIFIED	27.74	111.47	301.89			
	<b>Total</b>	<b>55,375.72</b>	<b>59,885.11</b>	<b>8.14</b>			

**Commodity:** 8414 AIR/VACUUM PUMPS,AIR/OTHR GAS COMPRRSRS & FANS;VNTLTNG/RCYCLNG HOODS INCRPRTNG A FAN,W/N FITTED WITH FILTERS **Unit:**

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS	22.88	9.96	-56.47			
2.	ALGERIA	33.12	39.06	17.96			
3.	ANGOLA	0.13	16.56	12,234.08			
4.	ARGENTINA	6.53	15.47	137.10			
5.	ARMENIA		0.13				
6.	AUSTRALIA	260.78	137.88	-47.13			
7.	AUSTRIA	3.29	15.14	360.92			
8.	AZERBAIJAN	0.29	27.57	9,383.45			
9.	BAHAMAS	0.30	25.78	8,437.84			
10.	BAHARAIN IS	680.62	874.04	28.42			
11.	BANGLADESH PR	1,082.57	227.42	-78.99			
12.	BELIZE	13.22					
13.	BELGIUM	114.06	188.79	65.52			
14.	BENIN	0.91	15.67	1,616.80			
15.	BHUTAN	25.74	55.29	114.85			
16.	BOTSWANA	2.29	14.41	528.47			
17.	BRAZIL	56.55	22.11	-60.90			
18.	BRUNEI		0.11				
19.	BULGARIA		0.59				
20.	BURKINA FASO	4.14	25.43	514.63			
21.	BURUNDI	2.02	0.58	-71.53			
22.	CAMBODIA		27.41				
23.	CAMEROON		3.38				
24.	CANADA	148.12	226.60	52.99			
25.	CHAD		1.44				
26.	CHILE	7.11	119.36	1,579.33			
27.	TAIWAN	163.43	265.87	62.68			
28.	CHINA P RP	1,538.78	2,896.81	88.25			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

29.	COLOMBIA	11.61	4.26	-63.30			
30.	CONGO P REP	18.13	8.45	-53.39			
31.	CROATIA	0.19					
32.	CYPRUS	16.56	15.44	-6.76			
33.	CZECH REPUBLIC	23.64	78.03	230.08			
34.	DENMARK	4.58	7.85	71.34			
35.	DJIBOUTI	30.08	47.05	56.42			
36.	ECUADOR	18.18	0.15	-99.20			
37.	EGYPT A RP	724.10	947.53	30.86			
38.	EL SALVADOR	0.14	3.09	2,039.46			
39.	ESTONIA	1.81					
40.	ETHIOPIA	62.24	15.96	-74.36			
41.	FINLAND		0.58				
42.	FIJI IS	13.17	7.86	-40.28			
43.	FRANCE	518.17	329.65	-36.38			
44.	FR GUIANA	0.53					
45.	GAMBIA	24.03	9.81	-59.18			
46.	GEORGIA		62.06				
47.	GERMANY	747.39	1,633.35	118.54			
48.	GHANA	519.25	859.66	65.56			
49.	GREECE	89.91	65.90	-26.70			
50.	GRENADA	1.18	0.66	-43.64			
51.	GUADELOUPE		2.04				
52.	GUATEMALA	1.48					
53.	GUINEA	1.59	14.65	822.60			
54.	GUYANA	1.32					
55.	HONDURAS		3.47				
56.	HONG KONG	65.51	22.67	-65.39			
57.	HUNGARY	1.49	0.76	-49.05			
58.	INDONESIA	211.32	110.80	-47.57			
59.	IRAN	724.98	1,060.19	46.24			
60.	IRAQ	322.00	1,553.29	382.39			
61.	IRELAND	5.25	36.52	595.02			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

62.	ISRAEL	561.85	532.17	-5.28			
63.	ITALY	632.04	420.40	-33.49			
64.	CONTE D'IVORY	5.55	0.00	-99.91			
65.	JAMAICA	18.84	29.91	58.72			
66.	JAPAN	167.75	205.22	22.34			
67.	JORDAN	517.83	430.38	-16.89			
68.	KAZAKHSTAN	23.25	29.29	25.96			
69.	KENYA	380.26	323.47	-14.94			
70.	KOREA DP RP	110.23	164.23	49.00			
71.	KOREA RP	3,469.61	199.91	-94.24			
72.	KUWAIT	247.07	378.96	53.38			
73.	LATVIA	0.64					
74.	LEBANON	14.75	45.83	210.61			
75.	LIBERIA	27.04	0.43	-98.42			
76.	LIBYA	0.45	10.62	2,282.71			
77.	LIECHTENSTEIN	0.01	1.28	9,215.13			
78.	MADAGASCAR	20.93	0.89	-95.77			
79.	MALAWI	13.38	25.15	87.95			
80.	MALAYSIA	386.68	326.30	-15.61			
81.	MALDIVES	153.83	173.57	12.83			
82.	MALI		31.98				
83.	MALTA	31.35					
84.	MAURITIUS	77.43	25.48	-67.09			
85.	MYANMAR	27.15	62.53	130.26			
86.	MEXICO	14.84	90.19	507.76			
87.	MONGOLIA	19.90					
88.	MOROCCO	3.18	2.46	-22.70			
89.	MOZAMBIQUE	2.54	19.87	682.74			
90.	NAMIBIA		0.62				
91.	NEPAL	483.71	436.82	-9.69			
92.	NETHERLAND	3,025.78	3,747.32	23.85			
93.	NETHERLANDANTIL		3.05				
94.	NEW CALEDONIA	0.10					

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

95.	NEW ZEALAND	71.50	17.03	-76.18			
96.	NIGER		0.27				
97.	NIGERIA	1,618.51	940.15	-41.91			
98.	NORWAY	5.66	82.30	1,354.69			
99.	OMAN	436.94	545.01	24.73			
100.	PAKISTAN IR	90.90	185.65	104.23			
101.	PANAMA REPUBLIC	8.13					
102.	PAPUA N GNA		18.65				
103.	PARAGUAY	0.11					
104.	PERU	49.14	4.29	-91.27			
105.	PHILIPPINES	50.95	43.99	-13.67			
106.	POLAND	1.47	52.35	3,472.41			
107.	PORTUGAL	35.61	29.34	-17.59			
108.	EAST TIMOR		3.78				
109.	QATAR	88.89	45.09	-49.27			
110.	REUNION	15.28					
111.	ROMANIA	5.95	11.71	97.01			
112.	RUSSIA	34.12	85.59	150.83			
113.	RWANDA	0.97	2.27	134.25			
114.	SAUDI ARAB	5,021.13	3,248.04	-35.31			
115.	SENEGAL	44.66	7.54	-83.12			
116.	UNION OF SERBIA & MONTENEGRO	0.56	0.49	-11.46			
117.	SEYCHELLES	8.39	20.85	148.59			
118.	SIERRA LEONE	16.59	12.36	-25.50			
119.	SLOVAK REP	1.57					
120.	SINGAPORE	469.91	1,267.45	169.72			
121.	SLOVENIA	6.23					
122.	SOUTH AFRICA	643.80	813.72	26.39			
123.	SPAIN	99.46	50.03	-49.70			
124.	SRI LANKA DSR	1,276.24	1,452.01	13.77			
125.	ST HELENA		7.87				
126.	ST PIERRE		4.62				
127.	SUDAN	991.03	1,101.33	11.13			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

128.	SURINAME		6.09			
129.	SWAZILAND	4.56				
130.	SWEDEN	23.88	21.79	-8.77		
131.	SWITZERLAND	66.55	69.95	5.11		
132.	SYRIA	69.44	50.27	-27.61		
133.	TAJKISTAN		1.33			
134.	TANZANIA REP	139.78	237.24	69.72		
135.	THAILAND	466.36	364.66	-21.81		
136.	TOGO	66.96	55.90	-16.51		
137.	TRINIDAD	7.44	0.13	-98.30		
138.	TUNISIA	7.14	0.21	-97.04		
139.	TURKEY	285.29	34.92	-87.76		
140.	TURKMENISTAN	11.67	22.88	96.10		
141.	UGANDA	91.39	81.75	-10.55		
142.	U ARAB EMTS	6,730.47	5,872.95	-12.74		
143.	U K	945.11	1,971.25	108.57		
144.	UKRAINE	22.86	0.18	-99.23		
145.	U S A	7,404.97	8,857.24	19.61		
146.	UZBEKISTAN	75.09	2.11	-97.19		
147.	VIETNAM SOC REP	105.13	28.25	-73.13		
148.	YEMEN REPUBLC	96.92	177.13	82.77		
149.	CONGO D. REP	0.80				
150.	ZAMBIA	45.10	11.51	-74.48		
151.	ZIMBABWE	14.74	16.73	13.50		
152.	UNSPECIFIED	153.38	24.62	-83.95		
	<b>Total</b>	<b>46,693.38</b>	<b>47,835.79</b>	<b>2.45</b>		

**Commodity:** 8421 CENTRIFUGES,INCL CNTRFGL DRYRS;FLTRNG OR PRUFYNG MCHNRY & APPRTS,FR LIQUIDS/GASES **Unit:**

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS	91.24	53.24	-41.65			
2.	ALGERIA	41.05	38.71	-5.70			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

3.	ANGOLA	0.03	20.18	67,160.63			
4.	ARGENTINA	24.14	113.87	371.81			
5.	ARMENIA		31.41				
6.	AUSTRALIA	127.22	305.81	140.38			
7.	AUSTRIA	38.52	107.61	179.41			
8.	BAHAMAS		63.77				
9.	BAHARAIN IS	15.73	294.69	1,773.48			
10.	BANGLADESH PR	407.43	518.70	27.31			
11.	BARBADOS	16.12					
12.	BELIZE	8.77					
13.	BELGIUM	543.50	810.33	49.09			
14.	BHUTAN	6.52					
15.	BOLIVIA		6.73				
16.	BOTSWANA	6.64	0.28	-95.85			
17.	BRAZIL	63.23	162.08	156.31			
18.	BULGARIA	0.54	25.67	4,675.17			
19.	BURKINA FASO	24.35	23.02	-5.49			
20.	BURUNDI	5.34	0.05	-99.13			
21.	CAMEROON		0.82				
22.	CANADA	159.16	254.24	59.74			
23.	CHAD		7.18				
24.	CHILE		117.75				
25.	TAIWAN	256.00	759.71	196.76			
26.	CHINA P RP	570.23	1,327.93	132.88			
27.	COLOMBIA	1.75	27.70	1,478.70			
28.	COMOROS	0.35					
29.	CONGO P REP	27.77	128.87	363.97			
30.	COSTA RICA	4.35	4.97	14.34			
31.	CUBA	0.78	5.22	568.55			
32.	CYPRUS	0.43	85.47	19,725.31			
33.	CZECH REPUBLIC	160.17	220.06	37.39			
34.	DENMARK	610.80	577.78	-5.41			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

35.	DJIBOUTI	19.04	4.15	-78.22			
36.	ECUADOR		25.95				
37.	EGYPT A RP	93.74	449.23	379.25			
38.	EL SALVADOR		0.91				
39.	ETHIOPIA	87.84	137.24	56.23			
40.	FINLAND	8.95	49.02	447.83			
41.	FIJI IS		1.13				
42.	FRANCE	248.25	142.65	-42.54			
43.	GAMBIA	0.60	0.19	-68.84			
44.	GERMANY	1,044.83	1,153.72	10.42			
45.	GHANA	29.24	19.24	-34.21			
46.	GREECE	23.59	61.44	160.48			
47.	GUYANA		6.12				
48.	HONDURAS		0.09				
49.	HONG KONG	38.31	197.74	416.17			
50.	HUNGARY		0.93				
51.	INDONESIA	790.72	464.20	-41.29			
52.	IRAN	631.15	656.72	4.05			
53.	IRAQ	14.45	56.19	288.89			
54.	IRELAND	0.38	11.88	3,011.54			
55.	ISRAEL	2.21	7.11	222.51			
56.	ITALY	2,102.56	2,680.01	27.46			
57.	CONTE D'IVORY	3.09					
58.	JAMAICA	0.19					
59.	JAPAN	982.56	1,053.96	7.27			
60.	JORDAN	54.03	35.19	-34.88			
61.	KAZAKHSTAN	61.30					
62.	KENYA	259.28	127.93	-50.66			
63.	KOREA DP RP	30.05	33.56	11.65			
64.	KOREA RP	181.24	296.95	63.84			
65.	KUWAIT	34.59	173.75	402.34			
66.	LEBANON	1.16	3.80	229.19			
67.	LIBYA	134.94					

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

68.	LITHUANIA		6.21			
69.	LUXEMBOURG	2.63				
70.	MACAO	36.69				
71.	MADAGASCAR	8.08	19.37	139.80		
72.	MALAWI	17.36	5.49	-68.39		
73.	MALAYSIA	1,695.23	863.82	-49.04		
74.	MALDIVES	21.93	50.11	128.47		
75.	MALI		277.53			
76.	MALTA		0.19			
77.	MAURITIUS	123.77	25.92	-79.06		
78.	MYANMAR	6.46	25.13	288.84		
79.	MEXICO	61.95	34.63	-44.10		
80.	MOLDVA	0.33				
81.	MONGOLIA	34.57				
82.	MOROCCO	0.29				
83.	MOZAMBIQUE	134.30	14.17	-89.45		
84.	NAURU RP	5.57				
85.	NEPAL	179.99	291.58	62.00		
86.	NETHERLAND	122.35	245.44	100.60		
87.	NEW ZEALAND	11.05	49.44	347.54		
88.	NIGERIA	328.02	571.00	74.08		
89.	NORWAY	0.92	71.84	7,747.56		
90.	OMAN	416.55	1,845.26	342.99		
91.	PAKISTAN IR	12.13	55.85	360.30		
92.	PANAMA REPUBLIC	5.78	0.36	-93.70		
93.	PERU		8.41			
94.	PHILIPPINES	37.14	80.24	116.02		
95.	POLAND	267.64	140.82	-47.38		
96.	PORTUGAL	11.32	116.26	927.24		
97.	PUERTO RICO	16.64				
98.	QATAR	0.38	18.27	4,733.69		
99.	REUNION		12.71			
100.	ROMANIA	69.79	24.64	-64.69		

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

101.	RUSSIA	17.47	0.85	-95.13			
102.	RWANDA	3.03	0.94	-69.02			
103.	SAUDI ARAB	471.24	267.10	-43.32			
104.	SENEGAL		6.85				
105.	SEYCHELLES		22.10				
106.	SIERRA LEONE	0.72	9.22	1,182.03			
107.	SLOVAK REP		42.40				
108.	SINGAPORE	294.72	1,008.45	242.18			
109.	SLOVENIA	0.11					
110.	SOUTH AFRICA	44.91	157.56	250.81			
111.	SPAIN	1,660.07	594.30	-64.20			
112.	SRI LANKA DSR	392.90	485.00	23.44			
113.	ST PIERRE		212.54				
114.	SUDAN	147.45	211.83	43.67			
115.	SURINAME		5.92				
116.	SWEDEN	272.58	254.46	-6.65			
117.	SWITZERLAND	104.47	243.66	133.24			
118.	SYRIA	189.75	88.71	-53.25			
119.	TAJIKISTAN		31.33				
120.	TANZANIA REP	232.60	137.51	-40.88			
121.	THAILAND	244.86	924.01	277.36			
122.	TOGO	129.90	69.05	-46.85			
123.	TRINIDAD	2.74					
124.	TUNISIA		0.27				
125.	TURKEY	53.76	104.26	93.91			
126.	TURKMENISTAN	61.05					
127.	UGANDA	90.53	15.84	-82.50			
128.	U ARAB EMTS	743.99	1,305.81	75.52			
129.	U K	289.77	1,258.65	334.36			
130.	UKRAINE	8.91	2.71	-69.57			
131.	U S A	2,703.31	3,943.56	45.88			
132.	URUGUAY		5.22				
133.	UZBEKISTAN	0.79	58.50	7,291.43			

134.	VENEZUELA	16.70	0.94	-94.35			
135.	VIETNAM SOC REP	281.87	86.99	-69.14			
136.	YEMEN REPubLC	130.36	137.43	5.42			
137.	CONGO D. REP		5.95				
138.	ZAMBIA	12.08	17.58	45.54			
139.	ZIMBABWE	0.18	3.82	2,011.61			
140.	UNSPECIFIED		1.69				
	<b>Total</b>	<b>22,322.11</b>	<b>30,522.57</b>	<b>36.74</b>			

**Commodity:** 8439 MCHNRY FR MKNG PULP OF FIBROUS CELLULOSIC MTRL/FR MKNG/FNSHNG PAPER/PAPERBOARD **Unit:**

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AUSTRALIA	31.90	5.10	-84.01			
2.	AUSTRIA		1.09				
3.	BAHARAIN IS		14.64				
4.	BANGLADESH PR	577.14	800.32	38.67			
5.	BELGIUM	0.19					
6.	BHUTAN		165.78				
7.	BRAZIL	39.51					
8.	CANADA	1.56	5.11	227.26			
9.	CHILE		9.80				
10.	TAIWAN		0.43				
11.	CHINA P RP	30.75	29.00	-5.68			
12.	COLOMBIA	9.12					
13.	DENMARK	0.14					
14.	DJIBOUTI		5.65				
15.	EGYPT A RP	20.40	14.46	-29.15			
16.	FINLAND	6.66	0.26	-96.09			
17.	FRANCE	17.60	51.56	193.04			
18.	GERMANY	673.56	216.45	-67.87			
19.	GHANA	1.67	3.69	120.79			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

20.	GUINEA	3.48	0.55	-84.34			
21.	GUYANA		0.42				
22.	INDONESIA	524.51	40.91	-92.20			
23.	IRAN	78.05	362.61	364.59			
24.	ISRAEL		1.32				
25.	ITALY	31.94	8.43	-73.61			
26.	JAPAN		0.12				
27.	JORDAN	12.01	2.95	-75.44			
28.	KAZAKHSTAN		90.78				
29.	KENYA	20.15	11.68	-42.05			
30.	KOREA DP RP	0.34					
31.	KOREA RP	3.48	7.07	103.37			
32.	KUWAIT		287.49				
33.	LEBANON	9.42	4.09	-56.62			
34.	MADAGASCAR	15.82	0.38	-97.59			
35.	MALAWI		1.83				
36.	MALAYSIA	5.77	13.47	133.32			
37.	MALDIVES		2.41				
38.	MAURITIUS	9.65					
39.	NEPAL	14.91	23.85	60.03			
40.	NETHERLAND	78.87	0.46	-99.42			
41.	NIGERIA	2.96	106.16	3,490.63			
42.	OMAN		2.65				
43.	PAKISTAN IR	102.35	85.01	-16.94			
44.	PANAMA REPUBLIC	4.04					
45.	PHILIPPINES	27.37	42.84	56.53			
46.	QATAR		8.47				
47.	ROMANIA		5.97				
48.	RUSSIA	40.03	20.21	-49.52			
49.	SAUDI ARAB	5.69	35.00	515.41			
50.	SINGAPORE	1.26	16.12	1,176.92			
51.	SLOVENIA	0.73					
52.	SOUTH AFRICA	60.16	84.52	40.51			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

53.	SPAIN	0.24					
54.	SRI LANKA DSR	13.67	5.57	-59.22			
55.	SWEDEN	13.66					
56.	SWITZERLAND	19.39	9.46	-51.21			
57.	SYRIA	6.00	7.69	28.25			
58.	TANZANIA REP	1.21	10.42	758.62			
59.	THAILAND	110.42	48.07	-56.47			
60.	TRINIDAD	183.24					
61.	TURKEY	6.60					
62.	TURKMENISTAN	820.39	33.26	-95.95			
63.	UGANDA	0.56					
64.	U ARAB EMTS	344.98	61.80	-82.08			
65.	U K	17.11	8.70	-49.16			
66.	UKRAINE		20.69				
67.	U S A	25.55	13.67	-46.49			
68.	VIETNAM SOC REP		0.80				
69.	ZAMBIA	15.51	0.10	-99.38			
70.	UNSPECIFIED	1.55					
	<b>Total</b>	<b>4,043.26</b>	<b>2,811.34</b>	<b>-30.47</b>			

**Commodity:** 84304120 PETROLEUM & GAS WELL DRILLING  
EQUIPMENT **Unit:** NOS

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003- 2004	2004- 2005	%Growth	2003- 2004	2004- 2005	%Growth
1.	AUSTRALIA		37.83			0.00	
2.	BANGLADESH PR		21.10			0.03	
3.	BELGIUM		2.50			0.00	
4.	CANADA		102.63			0.01	
5.	CHINA P RP	130.57			0.01		
6.	EGYPT A RP	16.69	265.88	1,492.81	0.05	0.00	-97.87
7.	FRANCE		61.64			0.01	

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

8.	HONG KONG	14.26			0.00		
9.	ICELAND	16.79	23.71	41.15	0.01	0.00	-58.33
10.	IRAN	83.12			0.15		
11.	ITALY	225.16	6.46	-97.13	0.01	0.01	-28.57
12.	JAPAN	0.56	92.58	16,285.05	0.00	0.00	200.00
13.	MYANMAR		108.91			0.01	
14.	NORWAY		11.53			0.01	
15.	OMAN	27.07	7.04	-74.00	0.01	0.00	-83.33
16.	SINGAPORE	1,277.85	27,599.00	2,059.81	0.43	6.55	1,425.64
17.	SPAIN		0.59			0.00	
18.	TURKEY		19.85			0.00	
19.	U ARAB EMTS	14,492.00	1,341.28	-90.74	6.47	0.42	-93.47
20.	U K	36.85	91.36	147.92	0.01	0.03	200.00
21.	U S A	260.29	253.58	-2.58	0.01	0.05	200.00
	<b>Total</b>	<b>16,581.22</b>	<b>30,047.47</b>	<b>81.21</b>			

**Commodity:** 87052000 MOBILE DRILLING DERRICKS **Unit:** NOS

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	LIBYA	38.33			0.00		
2.	U K	2.39			0.00		
	<b>Total</b>	<b>40.73</b>					

**Commodity:** 73090040 PRESSURE VESSELS **Unit:** KGS

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AUSTRALIA	0.99	0.23	-76.85	0.50	0.05	-90.91
2.	BELGIUM	10.77	38.25	255.22	3.00	15.36	411.90
3.	CANADA		0.95			2.00	
4.	TAIWAN	5.61	121.90	2,073.37	1.94	122.05	6,191.24
5.	CHINA P RP		126.34			93.80	
6.	DENMARK		4.47			1.40	

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

7.	GHANA	2.37			1.20		
8.	HONG KONG		136.53			79.00	
9.	ITALY		4.70			1.70	
10.	JORDAN	58.49			24.00		
11.	KOREA DP RP	3.28			1.40		
12.	KUWAIT		86.77			19.00	
13.	MACAO	2.20			9.00		
14.	NEPAL	12.26	11.28	-7.99	24.80	18.20	-26.61
15.	NIGERIA	1.65			5.00		
16.	NORWAY	3.00			1.10		
17.	SAUDI ARAB	24.10	36.52	51.52	9.50	9.60	1.11
18.	SINGAPORE	24.31	33.19	36.53	1.99	6.69	235.79
19.	SOUTH AFRICA	6.55	0.51	-92.19	9.50	0.17	-98.21
20.	SRI LANKA DSR	10.68			9.50		
21.	THAILAND	3.26	33.33	922.36	0.65	11.03	1,597.69
22.	TURKEY	1.22	2.10	72.18	0.69	0.75	9.17
23.	U ARAB EMTS	1.11	2.82	153.75	0.87	0.90	4.05
24.	U S A		73.35			24.78	
	<b>Total</b>	<b>171.86</b>	<b>713.25</b>	<b>315.03</b>			

**Commodity:** 84198910 PRESSURE VESSELS  
 REACTORS,COLUMNS/TOWERS OR CHEMICAL STORAGE TANKS **Unit:** NOS

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS	8.45			0.00		
2.	ANGOLA		0.41			0.00	
3.	AUSTRALIA	30.04	238.30	693.20	0.05	0.00	-94.00
4.	BANGLADESH PR	335.67	13.95	-95.84	11.16	0.00	-99.98
5.	BELGIUM	99.56	9.62	-90.33	0.00	0.01	150.00
6.	BRAZIL	2.38			0.01		
7.	BURUNDI	4.34			0.00		

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

8.	TAIWAN	1.02	60.52	5,804.46	0.00	0.19	9,550.00
9.	CHINA P RP	3,961.50	4,671.02	17.91	1.35	1.00	-25.91
10.	COLOMBIA		29.37			0.00	
11.	DENMARK	3.72			0.00		
12.	DJIBOUTI	7.16	16.14	125.20	0.00	0.00	100.00
13.	DOMINIC REP	21.03			0.00		
14.	EGYPT A RP	26.00	13.86	-46.70	0.00	9.00	224,899.99
15.	ETHIOPIA	307.52	41.78	-86.41	0.01	0.04	185.71
16.	FRANCE	81.10	34.09	-57.97	0.00	0.01	200.00
17.	GERMANY	2.28	41.67	1,728.92	0.01	0.25	4,150.00
18.	GHANA	10.17			0.00		
19.	HONG KONG		73.01			0.26	
20.	INDONESIA	59.52			0.01		
21.	IRAN	52.49	137.59	162.15	0.01	0.04	550.00
22.	ITALY	1.64	4.32	163.36	0.01	0.00	-54.55
23.	JAPAN	18.97	17.91	-5.55	0.00	0.03	520.00
24.	JORDAN		21.45			0.00	
25.	KAZAKHSTAN		155.06			0.01	
26.	KENYA	98.13	12.18	-87.59	0.01	0.00	-90.91
27.	KOREA RP	5.44	3.48	-35.95	0.02	0.03	50.00
28.	KUWAIT	322.12	22.89	-92.89	0.10	0.01	-86.67
29.	MALAWI	8.63			0.00		
30.	MALAYSIA	50.50	73.51	45.56	0.01	0.01	116.67
31.	MALDIVES	68.82	29.32	-57.40	0.01	0.01	66.67
32.	MALI		30.42			0.01	
33.	MALTA		7.91			0.02	
34.	MYANMAR	2.05	2.96	44.15	0.00	0.00	0.00
35.	NEPAL	30.00	1.37	-95.44	0.01	0.00	-50.00
36.	NETHERLAND	66.02	0.48	-99.28	0.00	0.00	0.00
37.	NIGERIA	39.52	35.18	-10.97	0.01	0.02	54.55
38.	OMAN	587.07	18.36	-96.87	0.04	0.01	-82.93
39.	PERU		5.74			0.00	
40.	POLAND	20.22			0.04		

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

41.	QATAR	784.97	239.18	-69.53	0.05	0.01	-79.25
42.	RWANDA	1.68			0.01		
43.	SAUDI ARAB	141.37	2,703.02	1,812.08	0.12	0.70	489.08
44.	SINGAPORE	83.48	19.15	-77.06	0.13	0.05	-64.39
45.	SOUTH AFRICA		1.01			0.00	
46.	SRI LANKA DSR	47.66	60.52	26.99	0.03	0.08	175.86
47.	SUDAN		27.74			0.00	
48.	SWITZERLAND		20.86			0.01	
49.	SYRIA		31.14			0.01	
50.	TANZANIA REP		240.28			0.02	
51.	THAILAND	3.56	43.15	1,111.53	0.01	0.01	50.00
52.	TOGO		124.60			0.00	
53.	TURKEY	616.45	13.06	-97.88	0.02	0.05	212.50
54.	UGANDA		0.67			0.00	
55.	U ARAB EMTS	168.53	674.89	300.45	0.10	0.13	26.47
56.	U K	15.38	2.47	-83.93	0.02	0.00	-94.44
57.	UKRAINE	49.65			0.01		
58.	U S A	1,856.19	671.40	-63.83	0.44	1.86	319.91
59.	YEMEN REPUBLIC	1.82			0.00		
	<b>Total</b>	<b>10,103.79</b>	<b>10,697.05</b>	<b>5.87</b>			

**Commodity:** 84186100 COMPRESSION TYPE UNITS WHOSE CONDENSERS ARE HEAT EXCHANGERS **Unit:** KGS

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS		5.42			1.00	
2.	AUSTRALIA	2.49	0.86	-65.49	0.60	0.44	-26.37
3.	BAHARAIN IS	1.88			0.20		
4.	BANGLADESH PR	26.64	31.83	19.48	14.00	3.30	-76.43
5.	BELGIUM		100.99			40.00	
6.	CHILE	0.78			0.02		
7.	CONGO P REP	2.02			0.60		

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

8.	FRANCE	21.71			2.10		
9.	GEORGIA		11.92			0.70	
10.	GERMANY	1.67	15.74	841.62	0.90	2.50	177.78
11.	GHANA	0.23	0.43	86.34	0.05	0.15	226.09
12.	ITALY	20.13	3.95	-80.39	10.00	0.09	-99.10
13.	JORDAN		3.47			1.00	
14.	KENYA		0.10			0.02	
15.	KUWAIT	131.99			40.00		
16.	LEBANON		2.33			1.20	
17.	MALAYSIA	44.67	10.27	-77.02	32.56	1.01	-96.90
18.	MAURITIUS	13.23			9.00		
19.	MYANMAR	1.62			1.20		
20.	MOROCCO		9.88			2.40	
21.	NEPAL	7.71	0.58	-92.54	3.36	0.10	-96.93
22.	NETHERLAND	0.39			0.10		
23.	NIGERIA	1.43	79.21	5,453.03	4.30	35.00	713.98
24.	OMAN	0.40	11.85	2,887.80	0.00	0.03	580.00
25.	PAKISTAN IR		0.81			0.02	
26.	SAUDI ARAB		159.53			14.00	
27.	SINGAPORE	37.78	78.00	106.45	15.15	23.00	51.77
28.	SOUTH AFRICA	5.25			1.23		
29.	SRI LANKA DSR	8.09	57.59	612.13	6.80	11.81	73.62
30.	TANZANIA REP		73.33			19.00	
31.	THAILAND	10.49	35.15	235.20	3.00	10.00	233.40
32.	TOGO		0.38			0.40	
33.	U ARAB EMTS	11.85	55.32	367.03	1.76	16.02	808.16
34.	U K	27.16	66.30	144.15	8.47	18.40	117.16
35.	U S A	38.45	66.56	73.11	27.01	28.33	4.87
36.	VIETNAM SOC REP	0.34			0.03		
37.	YEMEN REPubLC		15.52			3.00	
	<b>Total</b>	<b>418.39</b>	<b>897.30</b>	<b>114.47</b>			

**Commodity:** 84 NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES; PARTS THEREOF. **Unit:**

S.No.	Country	Values in Rs. Lacs		Quantity in thousands			
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS	3,112.23	3,388.62	8.88			
2.	ALBANIA	162.17	53.50	-67.01			
3.	ALGERIA	1,457.02	2,578.12	76.94			
4.	AMERI SAMOA	0.85	1.65	95.09			
5.	ANGOLA	289.34	1,621.73	460.50			
6.	ANTIGUA	1,157.97	0.41	-99.96			
7.	ARGENTINA	697.97	1,850.72	165.16			
8.	ARMENIA	13.46	98.69	633.23			
9.	AUSTRALIA	10,665.61	21,863.12	104.99			
10.	AUSTRIA	2,309.57	2,933.41	27.01			
11.	ARUBA	1.02					
12.	AZERBAIJAN	87.11	349.32	301.00			
13.	BAHAMAS	81.29	246.69	203.48			
14.	BAHARAIN IS	2,675.06	5,353.55	100.13			
15.	BANGLADESH PR	45,458.31	29,131.78	-35.92			
16.	BARBADOS	82.44	88.88	7.81			
17.	BELIZE	57.94	20.29	-64.98			
18.	BELGIUM	10,458.19	15,883.01	51.87			
19.	BENIN	134.73	475.87	253.20			
20.	BERMUDA	0.22					
21.	BHUTAN	3,603.70	4,402.73	22.17			
22.	BOLIVIA	173.37	36.29	-79.07			
23.	BOSNIA-HRZGOVIN	13.93	18.17	30.44			
24.	BOTSWANA	651.58	248.20	-61.91			
25.	BRAZIL	6,093.48	10,509.73	72.48			
26.	BRUNEI	92.87	46.12	-50.34			
27.	BULGARIA	386.75	573.78	48.36			
28.	BURKINA FASO	404.73	547.01	35.15			
29.	BURUNDI	119.82	25.79	-78.47			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

30.	BELARUS	212.04	616.99	190.97			
31.	CAMBODIA	1,404.32	642.60	-54.24			
32.	CAMEROON	232.55	334.34	43.77			
33.	CANADA	7,919.46	14,898.61	88.13			
34.	CAPE VERDE IS		3.63				
35.	CAYMAN IS		0.02				
36.	C AFRI REP	21.11	48.84	131.42			
37.	CHAD	32.61	80.50	146.87			
38.	CHANNEL IS	16.19					
39.	CHILE	644.61	1,605.47	149.06			
40.	TAIWAN	7,455.12	6,934.67	-6.98			
41.	CHINA P RP	31,302.05	44,013.99	40.61			
42.	COLOMBIA	1,147.96	8,901.98	675.46			
43.	COMOROS	49.36	66.28	34.28			
44.	CONGO P REP	966.80	2,037.40	110.74			
45.	COOK IS	0.05					
46.	COSTA RICA	1,329.59	285.64	-78.52			
47.	CROATIA	355.64	143.51	-59.65			
48.	CUBA	68.91	128.94	87.11			
49.	CYPRUS	563.79	389.56	-30.90			
50.	CZECH REPUBLIC	1,639.88	2,473.95	50.86			
51.	DENMARK	2,700.55	5,459.28	102.15			
52.	DJIBOUTI	2,301.77	3,885.55	68.81			
53.	DOMINIC REP	78.33	260.82	232.97			
54.	DOMINICA	26.96	30.44	12.91			
55.	ECUADOR	137.57	489.41	255.76			
56.	EGYPT A RP	15,096.69	15,681.64	3.87			
57.	EL SALVADOR	25.48	171.37	572.63			
58.	ESTONIA	48.16	55.71	15.68			
59.	ETHIOPIA	3,152.11	2,941.42	-6.68			
60.	ERITREA	310.79	246.93	-20.55			
61.	EQUATL GUINEA	9.60	4.21	-56.18			
62.	FAROE IS	16.74	2.57	-84.63			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

63.	FINLAND	1,468.06	3,343.33	127.74			
64.	FIJI IS	196.08	208.87	6.53			
65.	FRANCE	18,312.33	24,636.82	34.54			
66.	FR GUIANA	87.05					
67.	FR POLYNESIA		42.55				
68.	GABON	90.07	402.50	346.90			
69.	GAMBIA	87.44	422.31	382.98			
70.	GEORGIA	817.81	912.87	11.62			
71.	GERMANY	74,389.81	83,189.22	11.83			
72.	GHANA	5,409.55	7,223.93	33.54			
73.	GIBRALTAR	1.37	0.53	-61.30			
74.	GREECE	2,042.12	2,366.71	15.89			
75.	GREENLAND		3.61				
76.	GRENADA	12.41	17.49	40.91			
77.	GUADELOUPE	3.74	14.50	287.64			
78.	GUAM	1.42	2.77	95.06			
79.	GUATEMALA	425.27	653.53	53.67			
80.	GUINEA	507.69	569.45	12.16			
81.	GUINEA BISSAU	9.55	2.24	-76.56			
82.	GUYANA	167.20	232.09	38.81			
83.	HAITI	178.47	33.67	-81.13			
84.	HONDURAS	131.14	242.74	85.10			
85.	HONG KONG	5,762.09	5,374.64	-6.72			
86.	HUNGARY	505.91	1,554.48	207.26			
87.	ICELAND	31.67	59.95	89.29			
88.	INDONESIA	14,719.85	30,617.69	108.00			
89.	IRAN	16,414.82	26,227.87	59.78			
90.	IRAQ	2,131.22	6,636.39	211.39			
91.	IRELAND	2,358.36	1,725.21	-26.85			
92.	ISRAEL	3,269.19	3,716.02	13.67			
93.	ITALY	28,147.79	31,416.36	11.61			
94.	CONTE D'IVORY	374.38	1,015.49	171.24			
95.	JAMAICA	492.64	600.20	21.83			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

96.	JAPAN	20,892.89	22,749.99	8.89			
97.	JORDAN	3,332.48	3,231.76	-3.02			
98.	KAZAKHSTAN	3,585.51	2,942.34	-17.94			
99.	KENYA	12,514.98	15,046.30	20.23			
100.	KIRIBATI REP		7.88				
101.	KOREA DP RP	3,078.55	1,720.83	-44.10			
102.	KYRGHYZSTAN	153.24	89.93	-41.32			
103.	KOREA RP	7,765.83	12,112.52	55.97			
104.	KUWAIT	5,039.54	6,817.10	35.27			
105.	LAO PD RP	52.64	238.21	352.56			
106.	LATVIA	834.38	769.66	-7.76			
107.	LEBANON	848.97	590.42	-30.45			
108.	LIBERIA	445.26	427.52	-3.98			
109.	LIBYA	1,239.50	32,037.60	2,484.73			
110.	LIECHTENSTEIN	5.62	1.59	-71.69			
111.	LITHUANIA	50.50	383.54	659.42			
112.	LUXEMBOURG	153.21	221.67	44.68			
113.	MACAO	81.38	29.49	-63.76			
114.	MACEDOENIA	9.83	157.47	1,502.68			
115.	MADAGASCAR	1,159.34	392.77	-66.12			
116.	MALAWI	2,246.63	2,735.76	21.77			
117.	MALAYSIA	35,793.44	39,696.20	10.90			
118.	MALDIVES	568.12	1,531.17	169.52			
119.	MALI	526.28	1,738.46	230.33			
120.	MALTA	74.20	225.30	203.66			
121.	MARSHALL ISLAND	1.35					
122.	MARTINIQUE	21.29	17.32	-18.66			
123.	MAURITANIA	21.67	78.10	260.45			
124.	MICRONESIA		12.70				
125.	MAURITIUS	4,428.51	1,714.60	-61.28			
126.	MYANMAR	1,301.78	6,894.32	429.61			
127.	MEXICO	3,035.45	4,017.31	32.35			
128.	MOLDVA	6.89	1.36	-80.32			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

129.	MONGOLIA	182.49	182.88	0.22			
130.	MONTserrat		4.28				
131.	MOROCCO	4,428.47	3,746.61	-15.40			
132.	MOZAMBIQUE	2,722.87	1,554.82	-42.90			
133.	NAMIBIA	258.65	239.26	-7.50			
134.	NAURU RP	11.10	1.46	-86.83			
135.	NEPAL	10,239.17	10,794.39	5.42			
136.	NETHERLAND	32,966.87	32,042.65	-2.80			
137.	NETHERLANDANTIL	211.99	15.37	-92.75			
138.	NEW CALEDONIA	1.81					
139.	NEW ZEALAND	1,074.17	1,628.33	51.59			
140.	NICARAGUA	23.24	46.00	97.91			
141.	NIGER	47.00	83.93	78.55			
142.	NIGERIA	33,701.06	34,913.61	3.60			
143.	N. MARIANA IS.	52.55					
144.	NORFOLK IS	2.47					
145.	NORWAY	294.51	718.09	143.82			
146.	OMAN	27,050.09	18,211.36	-32.68			
147.	PAKISTAN IR	1,228.86	2,033.25	65.46			
148.	PANAMA REPUBLIC	249.98	789.08	215.66			
149.	PANAMA C Z	35.39	16.34	-53.82			
150.	PAPUA N GNA	54.72	83.97	53.45			
151.	PARAGUAY	134.24	188.51	40.43			
152.	PERU	475.21	586.71	23.46			
153.	PHILIPPINES	5,132.86	5,989.80	16.70			
154.	POLAND	3,089.88	3,217.68	4.14			
155.	PORTUGAL	497.38	733.83	47.54			
156.	EAST TIMOR		6.78				
157.	PUERTO RICO	190.94	259.55	35.93			
158.	QATAR	8,756.09	4,546.74	-48.07			
159.	REUNION	36.14	30.63	-15.26			
160.	ROMANIA	2,081.76	1,464.02	-29.67			
161.	RUSSIA	5,972.29	7,818.93	30.92			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

162.	RWANDA	161.12	469.85	191.62			
163.	SAO TOME	11.65	12.96	11.30			
164.	SAUDI ARAB	23,551.12	21,335.08	-9.41			
165.	SENEGAL	844.05	777.63	-7.87			
166.	UNION OF SERBIA & MONTENEGRO	305.36	273.74	-10.35			
167.	SEYCHELLES	84.17	169.11	100.92			
168.	SIERRA LEONE	603.44	237.02	-60.72			
169.	SLOVAK REP	50.87	269.80	430.36			
170.	SINGAPORE	41,381.73	84,253.66	103.60			
171.	SLOVENIA	273.63	264.45	-3.36			
172.	SOLOMON IS	4.75	2.97	-37.53			
173.	SOMALIA	25.03	79.26	216.64			
174.	SOUTH AFRICA	11,732.66	13,215.11	12.64			
175.	SPAIN	6,807.83	7,675.67	12.75			
176.	SRI LANKA DSR	22,193.65	23,266.16	4.83			
177.	ST HELENA	6.07	7.87	29.57			
178.	ST KITT N A		37.38				
179.	ST LUCIA	26.51	24.12	-9.03			
180.	ST PIERRE		381.90				
181.	ST VINCENT		1.88				
182.	SUDAN	6,260.95	9,388.31	49.95			
183.	SURINAME	159.26	2,823.97	1,673.20			
184.	SWAZILAND	15.03	164.76	995.88			
185.	SWEDEN	2,562.19	3,918.69	52.94			
186.	SWITZERLAND	9,309.70	5,166.62	-44.50			
187.	SYRIA	7,651.54	6,532.17	-14.63			
188.	TAJIKISTAN	158.51	402.27	153.78			
189.	TANZANIA REP	9,623.18	9,928.20	3.17			
190.	THAILAND	33,091.46	20,494.43	-38.07			
191.	TOGO	626.01	1,817.16	190.28			
192.	TOKELAU IS	0.47					
193.	TONGA	1.59					
194.	TRINIDAD	468.01	594.35	26.99			

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

195.	TUNISIA	771.70	594.24	-23.00			
196.	TURKEY	12,470.63	7,785.45	-37.57			
197.	TURKMENISTAN	2,786.44	744.60	-73.28			
198.	TURKS C IS	219.98					
199.	UGANDA	3,890.02	4,404.68	13.23			
200.	U ARAB EMTS	88,410.06	89,740.36	1.50			
201.	U K	61,352.65	92,963.48	51.52			
202.	UKRAINE	1,691.07	6,217.14	267.65			
203.	U S A	189,128.78	246,720.15	30.45			
204.	URUGUAY	186.62	171.39	-8.16			
205.	UZBEKISTAN	1,523.65	691.57	-54.61			
206.	VANUATU REP	0.66	112.69	16,923.72			
207.	VENEZUELA	90.34	1,741.86	1,828.06			
208.	VIETNAM SOC REP	4,203.49	3,579.82	-14.84			
209.	VIRGIN IS US	5.82	95.63	1,542.15			
210.	WALLIS F IS		6.80				
211.	SAMOA	3.52					
212.	YEMEN REPUBLC	2,431.92	4,030.60	65.74			
213.	CONGO D. REP	25.50	86.57	239.48			
214.	ZAMBIA	1,846.85	2,910.68	57.60			
215.	ZIMBABWE	523.78	865.53	65.25			
216.	UNSPECIFIED	3,430.06	2,048.35	-40.28			
	<b>Total</b>	<b>1,151,714.64</b>	<b>1,418,727.61</b>	<b>23.18</b>			

**Commodity:** 84011000 NUCLEAR REACTORS **Unit:** KGS

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS		12.77			1.54	
2.	ARGENTINA		3.05			0.40	
3.	AUSTRALIA	1.92	10.30	436.61	0.53	2.61	389.31
4.	AUSTRIA	0.45			0.15		
5.	BRAZIL	34.60	0.31	-99.11	8.06	0.05	-99.38

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

6.	CANADA		3,462.60			959.00	
7.	CHINA P RP	1.42	0.05	-96.43	0.15	0.00	-96.73
8.	DENMARK		1.01			0.15	
9.	FINLAND	1.93			0.11		
10.	FRANCE	3.71	32.70	780.41	1.22	12.01	888.15
11.	GERMANY	30.52	0.65	-97.86	4.96	0.06	-98.83
12.	GHANA		0.36			0.11	
13.	GUATEMALA		0.33			0.03	
14.	IRAN		0.33			0.08	
15.	ITALY	4.01	0.28	-93.00	0.80	0.02	-97.13
16.	JAPAN		4.15			0.74	
17.	KENYA		0.02			0.00	
18.	MALAYSIA	0.01	0.07	548.55	0.00	0.01	333.33
19.	MAURITIUS		0.21			0.03	
20.	NETHERLAND	2.27	0.20	-91.29	0.55	0.02	-96.36
21.	NEW ZEALAND		0.10			0.01	
22.	NIGER		1.59			0.16	
23.	NIGERIA	0.44	0.54	22.52	0.13	0.04	-68.18
24.	PAPUA N GNA		0.22			0.04	
25.	ROMANIA		6.96			0.54	
26.	SAUDI ARAB	1.06	0.22	-79.44	0.31	0.03	-91.61
27.	SINGAPORE	1.47	0.36	-75.12	0.34	0.09	-75.00
28.	SOUTH AFRICA	0.66	1.32	101.73	0.20	0.09	-52.50
29.	SPAIN		17.29			2.86	
30.	SRI LANKA DSR	0.34	14.66	4,258.30	0.06	2.71	4,203.17
31.	SUDAN		3.22			0.29	
32.	SWEDEN	0.17			0.05		
33.	SWITZERLAND	6.01	0.05	-99.09	1.12	0.01	-99.11
34.	UGANDA	2.03	0.62	-69.49	0.55	0.13	-76.28
35.	U ARAB EMTS	1.98	2.40	21.55	0.97	0.44	-54.85
36.	U K	5.01	19.22	283.62	1.02	3.73	264.91
37.	U S A	28.27	85.22	201.41	4.07	25.75	532.78
38.	VIETNAM SOC REP		0.63			0.18	

<b>Total</b>	<b>128.27</b>	<b>3,684.04</b>	<b>2,771.99</b>			
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**Commodity:** 840140 PARTS OF NUCLEAR REACTORS **Unit:**

S.No.	Country	Values in Rs. Lacs			Quantity in thousands		
		2003-2004	2004-2005	%Growth	2003-2004	2004-2005	%Growth
1.	AFGHANISTAN TIS		5.62			0.54	
2.	AUSTRIA		0.32			0.03	
3.	TAIWAN	0.68			0.01		
4.	CHINA P RP	2.12			1.02		
5.	FRANCE		505.76			36.00	
6.	GERMANY	1.91			0.04		
7.	GHANA	2.74			3.25		
8.	KUWAIT		7.92			0.20	
9.	MALAYSIA	9.31			2.60		
10.	PORTUGAL		1.55			0.02	
11.	SAUDI ARAB	0.34			0.02		
12.	U ARAB EMTS	30.44			0.92		
13.	U K	1.27			0.20		
	<b>Total</b>	<b>48.80</b>	<b>521.17</b>	<b>968.02</b>			

**PROCESS PLANT PROJECTS  
OVERSEAS**
**ANNEXURE-X**

	<b>Authorizer</b>	<b>Home Country</b>	<b>Description of Projects</b>	<b>Capacity</b>	<b>Host Country</b>	<b>Projected Amount (Rs.Crores) [1 USD= Rs45.27] and 1 RAND = RS.6.78 and 1 EURO = Rs 53.65</b>	<b>Date of Expiry</b>	<b>Funding Authority</b>
1	Minera Escondida	Australia	Building a cathode copper plant		Chile	3938.49		
2	South African Government & Industrial Development Corporation	South Africa	Construction of a greenfield plant as part of its mineral beneficiation strategy		South Africa	18984		
3	Maritsa East 2	Bulgaria	Maritsa East II Supply and Installation of plant and Equipment project		Bulgaria	478.77		EBRD
4		Cameroon	Construction of Infrastructure for Petroleum Industry Project		Cameroon	289.72		AFDB
5	Lukoil Overseas	Azerbaijan	Lukagip-Shas Deniz Gas condensate field development project		Azerbaijan	497.97		EBRD
6	Huntsman Corporation	Europe	Expanding capacity of plant from 130 mnpa pounds to 990 mnpa	990mnpa	Geismar			
7	Huntsman Corporation	Europe	Expanding capacity of plant from 220 mnpa pounds to 880 mnpa	880mnpa	Rozenburg			
8	Sempra Energy	Europe	Salt Cavern natural gas storage facility		Louisiana		End 2006	
9	Black & Veatch led consortium	Mexico	Construction of LNG terminal	160,000 cu.m	Mexico		2008	
10	Suncor Energy	USA	Build third oil sand upgrader		America		Will begin in 2007	
11	Jacobs Engineering Group	USA	Ultra Low Sulphur Diesel Project		Washington	339.52	End 2006	
12	Flour Corporation	USA	Refinery Project				End 2006	
13	Skanska	USA	Refinery Project	289	Brazil	692.63	2007	

	Authorizer	Home Country	Description of Projects	Capacity	Host Country	Projected Amount (Rs.Crores) [1 USD= Rs45.27] and 1 RAND = RS.6.78 and 1 EURO = Rs 53.65	Date of Expiry	Funding Authority
17	Technip	America	Refinery Project		America		End 2006	
18	Oman Oil Company	Middle East	Refinery project	3000 metric ton per day	Oman		End 2008	
19	Snamprogetti	Middle East	Refinery project	24400 tons/day of NGL	UAE	6473.61	2008	
20	BP	Indonesia	LNG Project		Indonesia	22635	2007	
21	Aker Kvaerner	Netherlands	New Polythylene plant	400,000 tpa	China		2008	
22	Foster Wheeler	Australia	LNG Project	4.2 mntpa		7152.66	2008	
23	Kupe Limited	Australia	New Gas production station				2007	
	Posco	South Korea	Setting up Steel Plant	India		54324	2016	

## Other Global opportunities

EPC activity and size	Region / country	Thrust areas	Competitive landscape	Strategy for Indian firms
Refineries: New capacity (3.3 mn b/d)	China, Canada, India, Iran, Oman, Russia, Venezuela	Hydrotreater, Hydrocracker, De-sulphurisation	Profitable growth is expected as new projects emerge to meet stricter domestic regulations and international agreements	<ul style="list-style-type: none"> <li>Strategic partnership with global majors</li> <li>Target lower scale projects</li> <li>Strategic alliance with Indian players owning oil-fields abroad</li> </ul>
Refineries: Expansion (271500 b/d)	France, Spain, Germany, USA			<ul style="list-style-type: none"> <li>Join hands with local majors</li> <li>Target the operations and maintenance components of contracts</li> </ul>

Gas processing: New capacity (50 bcf/d)	China, Canada, Qatar, Egypt, Iran, Mexico, USA, Venezuela	LNG, LNG regasification	Competition is expected to ease slightly because of high entry barriers in terms of capital costs and technological know-how.	<ul style="list-style-type: none"> <li>Strategic alliance with Indian players owning oilfields abroad</li> <li>Enter swap agreements with LNG importers in Asia Pacific</li> <li>Bid for medium and short scale projects</li> <li>Target the large number of upcoming projects in China and Venezuela</li> <li>Partner with Chinese EPC players for installing re-gasification plants</li> </ul>
Gas processing: Expansion (6 bcf/d)	Nigeria, Norway, Saudi Arabia, Spain			<ul style="list-style-type: none"> <li>Associate with global EPC majors to execute large projects</li> </ul>
De-sulphurisation: New capacity addition (16474 t/d)	Abu Dhabi, Kazakhstan, India, Iran, USA, Saudi Arabia	Claus Process	Low competition due to large number of small projects	<ul style="list-style-type: none"> <li>Leverage the excellent rapport in the host countries to win projects</li> <li>User the cost advantage to win projects since the activity is fairly commoditized as most of the players have the same technology</li> </ul>
De sulphurisation Capacity Expansion (2840 t/d)	Italy, Kuwait			<ul style="list-style-type: none"> <li>Enter technical assistance contractors with global majors to develop new processes for de sulphurisation</li> </ul>
Pipe-lines: New capacity (26000 miles)	Australia, Brazil, Canada, China, India, Iran, Kazakhstan, Russia, USA	Crude transmission, type G	Competition is expected to ease slightly because of high entry barriers in terms of capital costs and technological know.	<ul style="list-style-type: none"> <li>Enter EPC consortia to execute large scale transnational projects</li> <li>Partner with financial institutions to raise resources for the proposed large scale projects</li> <li>Impress upon central and state governments the need to initiate large scale pipeline projects</li> </ul>
Gas to liquid : New capacity (443000 b/d)	Egypt, Iran, Qatar	GTL		<ul style="list-style-type: none"> <li>Enter swap agreements with LNG importers in Asia Pacific</li> </ul>

**INDIAN PROJECTS**

<b>Fertilizer Projects</b>				
	<b>Company Name</b>	<b>Project Name</b>	<b>Project Status</b>	<b>Project Cost Rs. Crore</b>
1	Coromandel Fertilisers Ltd.	Modernisation Project	Proposed	40
2	Krishak Bharati Co-Op. Ltd.	Hazira Gas Based Fertilizer Complex Project	Proposed	1750
3	Rashtriya Chemicals & Fertilizers Ltd.	Thal Fertilisers Project	Proposed	1446
4	Shri Bhogawati Sahakari Rasayan & Khad Udyog Ltd.	Single Super Phosphate Project	Proposed	20.6
5	IFFCO	Urea Expansion Project		4800
6	Tata chemicals	Urea Project		250

<b>Steel &amp; Metals</b>	<b>Company Name</b>	<b>Project Name</b>	<b>Project Status</b>	<b>Project Cost (Crores)</b>
1	Aarti Steels Ltd.	Ghantikhal Steel Project	Announcement	633
2	Abhijeet Infrastructure Pvt. Ltd.	Sponge Iron & Ferro Alloy Project	Announcement	300
3	Adhunik Alloys & Power Ltd.	Steel & Sponge Iron Project	Announcement	990
4	Adhunik Rollers Pvt. Ltd.	Sponge Iron Project	Announcement	68.98
5	Akshay Investment Pvt. Ltd.	Sponge Iron & Furnace Project	Announcement	115
6	B D Castings Pvt. Ltd.	Sponge Iron Project	Announcement	71
7	B D Castings Pvt. Ltd.	Sponge Iron Project	Announcement	31
8	Bhushan Steel & Strips Ltd.	Orissa Steel Project	Announcement	3000
9	Deo Mines & Minerals Pvt. Ltd.	Steel Project	Announcement	320
10	Ind Agro Synergy Ltd.	Sponge Iron Project	Announcement	350
11	Indian Metals & Ferro Alloys Ltd.	Sponge Iron Project	Announcement	125
12	Ispat Pvt. Ltd.	Steel & Sponge Iron Project	Announcement	400
13	Maa Mahamaya Inds. Pvt. Ltd.	Sponge Iron Project	Announcement	106
14	Marmagoa Steel Ltd.	Sponge Iron Project	Announcement	400
15	National Steel & Agro Inds. Ltd.	Sponge Iron Project	Announcement	50
16	Nava Bharat Ferro Alloys Ltd.	Sponge Iron & Captive Power Project	Announcement	75
17	Rashtriya Ispat Nigam Ltd.	Visakhapatnam Steel Expansion Phase I Project	Announcement	2500
18	Rupa & Co. Ltd.	Steel Project	Announcement	300
19	S M C Power Generation Ltd.	Hirma Steel Project	Announcement	455
20	S M C Power Generation Ltd.	Sponge Iron Project	Announcement	255
21	S P S Steels Rolling Mills Ltd.	Sponge Iron Project	Announcement	100

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

22	Sanvijay Rolling & Engg. Ltd.	Sponge Iron Project	Announcement	120
23	Scaw Industries Pvt. Ltd.	Steel Project	Announcement	300
24	Steel Authority Of India Ltd.	Bokaro Sponge Iron Project	Announcement	75
25	Steel Authority Of India Ltd.	Rourkela Steel Project	Announcement	2000
26	Sterlite Industries (India) Ltd.	Tuticorin Copper Anode Project	Announcement	524
27	Sterlite Iron & Steel Co. Ltd.	Steel Project	Announcement	12500
28	Superior Sponge Iron Pvt. Ltd.	Sponge Iron Project	Announcement	65
29	Tata Iron & Steel Co. Ltd.	Sponge Iron Project	Announcement	200
30	Tata Sponge Iron Ltd.	Steel Project	Announcement	1000
31	United Special Ispat Ltd.	Steel Project	Announcement	483
32	Visa Industries Ltd.	Sponge Iron Project	Announcement	180
33	Vision Sponge Iron Pvt. Ltd.	Sponge Iron Project	Announcement	60
34	Gokarn Sponge & Power Ltd.	Sponge Iron Project	Proposed	49
35	Haryana Ship Breakers Ltd.	Iron & Steel Project	Proposed	49
36	Maheshwary Ispat Pvt. Ltd.	Steel Project	Proposed	210

<b>STEEL</b>				
37	BHP Billiton & POSCO	10 MT	Orissa	3900
38	SAIL	Increase capacity to 20 MT by 2012		25000
39	TISCO	New Steel Plant	Orissa	15000
40	TISCO (Capacity addition)	Addition of 3.4 MT		9800
41	Essar Steel	4 MT Steel Complex +6 MT pellet plant	Orissa	
42	Essar Steel	Increase in 2.2 MT to 3.4 MT	Hazira	700
43	JISCO	10 MT by 2010		
44	Jindal Stainless steel	1.6 MT Integrated stainless Steel plant	Orissa	7000
45	Ispat Industries	2nd phase of expansion to 3 MT		
46	Vedanta resources	Iron ore mining and steel making	Orissa	12500
47	Maharashtra seamless	0.5 MT steel round billetr	Orissa	450
48	Nalco	1.5 lakh ton smelter	Orissa	1000
49	Tata	Steel plant	Bangladesh	3500
50	Jindal Steel Power Ltd	2 MT steel plant 80000 MTPA ferro alloy	Orissa 2005-2012	2850

<b>Oil &amp; Gas</b>				
	Company Name	Project Name	Project Status	Project Cost
1	Bharat Petroleum Corpn. Ltd.	Automotive & Lubricating Base Oil Project	Announcement	318
2	Ennore Oil & Gas Co. Ltd.	Export Oriented Petroleum Refinery Project	Announcement	23600

FINAL REPORT ON THE INDIAN CAPITAL GOODS INDUSTRY

3	GAIL (India) Ltd.	Assam Gas Cracker Project	Announcement	2500
4	Hindustan Petroleum Corpn. Ltd.	Vishakhapatnam Refinery Project	Announcement	1635
5	Indian Oil Corpn. Ltd.	Conversion To High Quality Motor Spirit Project	Announcement	100
6	Indian Oil Corpn. Ltd.	Naphtha Conversion To Lpg Unit Project	Announcement	1200
7	Kochi Refineries Ltd.	Phase II Capacity Expansion & Modernisation Project	Announcement	1600
8	Mangalore Refinery & Petrochemicals Ltd.	Petroleum Refinery Phase -IV Project	Announcement	2000
9	Naturol Bioenergy Ltd.	Bio-Diesel Project	Announcement	140
10	Oil & Natural Gas Corpn. Ltd.	Uran Naphtha conversion to gasoline	Announcement	667
11	Bharat Petroleum Corpn. Ltd.	Lohagara refinery project	Proposed	6179
12	Indian Oil Corpn. Ltd.	Gujarat Refinery Motor Spirit Quality Improvement Project	Proposed	673
13	Essar oil ltd	Vadinar refinery		9863
14	ONGC	2 new refinery by 2010	Rajasthan	
15	ONGC	Capacity Expansion of refinery by 2010	Mangalore	
16	Miju group ,South Korea	Set up new steel plant	Orissa	350
17	Tata steel and Blue Scope of Australia	Set up new metallic coating unit	Jharkhand	900

Miscellaneous	Company name	Project Name	Location	Target date of commissioning	Cost (Rs.crores)
1	Grasim industries Ltd	Rayon fibre project	Andra Pradesh		700
2	Hutti Gold Mines Co.Ltd	Gold processing project	Hutti,Karnataka	31.12.2006	22