EXPORT-IMPORT BANK OF INDIA

WORKING PAPER NO. 62

MACHINERY SECTOR IN INDIA: EXPLORING OPTIONS FOR NEUTRALIZING TRADE DEFICIT

March 2017

CONTENTS

	Page No.
List of Tables	5
List of Exhibits	7
List of Boxes	9
Executive Summary	11
1 Introduction	20
2 Production Scenario	23
3 International Trade Scenario	31
4 Policy Support for Machinery Sector	60
5 Strategies	65
Annexure: Categorization of HS Codes	72

Project Team

Mr. Prahalathan Iyer, Chief General Manager, Research and Analysis Group
Mr. Ashish Kumar, Deputy General Manager, Research and Analysis Group
Ms. Jahanwi, Manager, Research and Analysis Group

LIST OF TABLES

Table No.	Title	Page No.
1.	Trade Balance by Product Categories (Value in US$ Mn)	22
2.	Top Producers of Machinery and Equipment (ISIC 28)	23
3.	Top Producers of Electrical Equipment (ISIC 27)	23
4.	Top Producers of Machinery and Equipment (ISIC 28) among Developing and Emerging Industrial Economies	24
5.	Top Producers of Electrical Equipment (ISIC 27) among Developing and Emerging Industrial Economies	24
6.	Production of Select Categories of General Purpose Machinery ('000 no.s)	26
7.	Production of Industrial Machinery (Value in Rs. Billion)	29
8.	Production of Construction and Mining Equipment	29
9.	Category-wise Top Exporters in Machinery Sector (Value in US$ Bn)	32
10.	Category-wise Top Importers in Machinery Sector (Value in US$ Bn)	33
11.	Category-wise Top Destinations for India's Machinery Exports (Value in US$ Mn)	36
12.	Category-wise Top Sources for India's Machinery Imports (Value in US$ Mn)	38
13.	Identified Products for Export Promotion in Construction Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)	40
14.	Identified Products for Export Promotion in Electrical Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)	42
15.	Identified Products for Export Promotion in Hand Tools Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)	46
16.	Identified Products for Export Promotion in Machine Tools Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)	47
17.	Identified Products for Export Promotion in Miscellaneous Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)	49
18.	Identified Products for Export Promotion in Process Plant Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)	52
19.	Identified Products for Export Promotion in Textile Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)	59
20.	FDI Inflows in Machinery Sector of India	63
21.	Top Destinations for Global Investment in Machinery	64
22.	Proposed Changes in Investment Limits for MSMEs	66

LIST OF EXHIBITS

Exhibit No.	Title	Page No.
1.	India's Trade over the Past Decade	22
2.	Movements in General and Capital Goods Index of Industrial Production	25
3.	Movements in Sub-Segments of Machinery IIP	25
4.	Broad Classification of Indian Machinery Sector	26
5.	Production of Valves in India (Value in Rs. Bn)	27
6.	Production of Boilers and Turbines in India (Value in Rs. Bn)	27
7.	Production of Machine Tools in India (Value in Rs. Bn)	28
8.	Segment-wise Growth in Electrical Equipment Industry during 2015-16	30
9.	Category-wise Global Exports of Machinery (US$ Bn)	31
10.	Major Exporters and Importers of Machinery in the World (2014)	32
11.	Category-wise Exports of Machinery from India (US$ Bn)	35
12.	Category-wise Imports of Machinery by India (US$ Bn)	35
13.	India's Major Export Destinations and Import Sources for Machinery (2015-16)	36
14.	Share of Products where India had Positive TSI	39
15.	Top Destination Countries for Greenfield FDI Investments by Value of Capital Expenditure (Cumulative 2010-2015) in the Machinery Sector	63
16.	Top Source Countries for Greenfield FDI Investments by Value of Capital Expenditure (Cumulative 2010-2015) in the Machinery Sector	63

LIST OF BOXES

Box No.	Title	Page No.
1.	Key Recommendations of National Capital Goods Policy 2016	60
2.	Productivity Gains through IoT: Case of Stanley Black and Decker Inc.	67

Executive Summary

The machinery sector is of strategic importance to the Indian economy and forms the backbone of the manufacturing activity. The sector has a multiplier effect on the overall economic growth and facilitates development of a wide range of user industries by providing critical inputs necessary for manufacturing. Therefore, the sector influences the core manufacturing development within India.

An analysis of India's trade as per Broad Economic Categories (BEC) classification indicates that main sectors contributing to India's trade deficit include capital goods (except transport equipment), parts and accessories of capital goods, fuels and lubricants (primary), and industrial supplies not elsewhere specified (both primary and processed). The capital goods sector as defined by BEC classification includes machinery as well as electronics sector. A previous Exim Bank Study titled, 'Indian Electronic Goods Industry-Neutralizing Trade Deficit with China' highlights the prospects for neutralizing India's trade deficit in the electronics sector.

The current Study attempts to analyse the machinery sector, and identify major products which can be targeted for neutralizing the overall trade deficit. Strategies have also been recommended for developing domestic production and export capabilities by attracting FDI and/ or relevant non-trade-distorting government incentives.

GLOBAL SCENARIO

Machinery and equipment (ISIC Code 28) mainly consists of general purpose machinery (such as engines, turbines, pumps, compressors, taps, valves, bearings, gears, ovens, furnaces, lifting and handling equipment) and special purpose machinery (such as agricultural machinery, machine tools, metallurgical machinery, mining / quarrying / construction machinery, textile / leather machinery, and food processing machinery). According to the 2016 International Year Book of Industrial Statistics brought out by the United Nations Industrial Development Organisation, China emerged as the largest manufacturer of machinery and equipment in 2014, up from the third position in 2010. Its share in global production increased by more than four percentage points during this period to reach 19.1 percent in 2014. Other major producers during 2014 were the USA (17.0 percent), Japan (15.7 percent), Germany (13.2 percent), Italy (4.8 percent), and the UK (2.1 percent). India's position in global production of machinery and equipment slipped from 8th in 2010 to 10th in 2014.

In the case of electrical equipment (ISIC 27), China accounted for nearly 22.3 percent of the global production. This division includes the manufacture of products that generate, distribute and use electrical power. Also included is the manufacture of electrical lighting, signalling equipment and electric household appliances. Japan (14.6 percent), Germany (12.8 percent), the USA (11.2 percent), and India (2.9 percent) were the other top producers in this category during 2014. India's position in production of these products improved from sixth in 2010 to fifth in 2014, albeit its share registered a marginal decline.

According to the IMF World Economic Outlook, economic activity is expected to pick up pace during 2017 and 2018, particularly in the emerging and developing economies. Improvement in manufacturing and industrial activity shall provide a boost to the global machinery sector. With per capita income rising in the emerging economies, demand for automotive and consumer products are expected to increase, which is likely to propel the demand for general purpose machinery, electrical equipment, etc. Specific purpose machinery is also expected to witness growth at the back of improvements in individual sectors.

INDIAN SCENARIO

India produces a wide range of machinery and equipment. Some of the prominent machines produced in India include heavy electrical machinery, textile machinery, machine tools, earthmoving and construction equipment, material handling equipment,

oil and gas exploration equipment, food processing and packaging machinery, railway equipment, metallurgical equipment, process plants machinery and equipment, paper and pulp machinery, and printing machinery.

The overall performance of the machinery sector in India can be gauged from the movement of the Index of Industrial Production (IIP) for capital goods (base: 2004-05). During the period 2005-06 to 2010-11, the IIP for capital goods registered positive growth rates, with the growth rate remaining higher than the general IIP during the entire period, except in 2009-10. However, from 2011-12 onwards, capital goods index has consistently recorded negative growth, except in 2014-15, when the index grew by 6.3 percent.

A further drill down in terms of various machinery segments reveals that during 2011-12 to 2015-16, the IIP for machinery and equipment n.e.c. (NIC 29), and office, accounting and computing machinery (NIC 30) witnessed negative to moderate growth rates. Electrical machinery and apparatus n.e.c (NIC 31) registered double-digit growth rates during 2013-14 and 2014-15, before declining by (-) 11.4 percent during 2015-16.

INTERNATIONAL TRADE

Trade forms an integral element of the machinery production cycle, especially since the emergence of the global value chains. The regions of North America, West Europe and East Asia currently account for nearly 77 percent of the global value added in this sector, with developing countries forming a major link in the value chain.

In 2014, global exports of machinery stood at US$ 2.3 trillion, recording a y-o-y growth of 4.4 percent. The growth was broad-based with all segments — process plant machinery, electrical equipment and parts, construction machinery, hand tools, machine tools and miscellaneous machinery – registering a growth during the year. Process plant machinery was the largest segment of exports, accounting for nearly 44.0 percent of the total machinery exports, followed by electrical equipment and parts with a share of 25.1 percent.

China was the largest machinery exporter during 2014, while the USA was the largest importer. Several of the top machinery exporters were also the major importers. For example, while China had a share of 15.4 percent in world exports during 2014, it was also the third largest importer of these products with a share of 7.0 percent. The USA accounted for 15.4 percent of global imports of machinery, while nearly 10.2 percent of the machinery exports also originated from this country. Germany, the second largest exporter of machinery with a share of 13.5 percent in global exports, was also the second largest importer of these products, having a share of 7.7 percent in global imports.

India's share in global machinery trade has been relatively low. It was the 20th largest importer of machinery in 2014, with a share of 1.5 percent in global imports. The share in global exports was also low at 0.7 percent. The country is a net importer of machinery, with exports in 2015-16 amounting to US$ 19.4 bn, and imports aggregating US$ 34.0 bn.

The trade deficit in the machinery sector has been gradually declining on account of an improvement in exports, and a concomitant decline in imports. Exports of machinery from India witnessed positive y-o-y growth over the past few years, before registering a decline of (-) 4.2 percent in 2015-16. In spite of this decline, the CAGR for exports during FY12-FY16 remained robust at 3.8 percent. On the other hand, imports of machinery declined from US$ 39.3 bn in FY12 to US$ 34.0 bn in FY16. These intersecting trends have reduced the overall trade deficit in the sector, although it still remains sizeable at US$ 14.6 bn.

Exports from India declined across most segments of the machinery sector in FY16. Only the segments of machine tools, miscellaneous machinery and textile machinery registered positive y-o-y growth in exports of 4.1 percent, 7.6 percent and 1.5 percent, respectively. In case of imports, process plant machinery imports recorded the highest y-o-y growth during FY16 of 10.2 percent. This was also the largest category of imports by India.

The availability of low-cost equipment from China and other countries has led to increased imports of process equipment machinery by India. Moreover, the availability of new, innovative and technologically advanced process plant equipment in developed countries has also contributed to the increase in

imports. Over the past few years, Indian vendors are adopting new and innovative techniques to compete with international vendors, thereby reducing the import of process plant equipment.

NEUTRALIZING INDIA'S TRADE DEFICIT

Indian machinery sector has significant opportunities both in domestic and export markets. However, there are also challenges engulfing this sector. While the demand for capital goods in the country has been witnessing a consistent increase, domestic machinery manufacturers have not been able to keep up with the pace of demand, leading to increasing dependence on imports across market segments.

India is among the top ten producers for machinery in the world, and exports from the sector have registered a consistent increase over the past few years. In spite of the prowess of Indian companies in the sector, imports of these products still far outpace the exports from the sector, thereby leading to substantial trade deficit. A two pronged approach of import substitution and export promotion can be adopted for neutralizing this trade deficit.

The domestic market for machinery provides significant opportunities for Indian machinery manufacturers to grow and achieve economies of scale, as also increase their efficiency levels for competing in export markets. In the present Study, an analysis of India's exports and imports of machinery products is undertaken with the purpose of identifying products and markets where Indian companies can expand their presence.

Identification of Domestic Capabilities

Trade Specialization Index (TSI) is used to measure the degree of net exportation by a country in a particular commodity. It basically compares the net flow of goods with the total flow of goods, thereby removing bias due to re-export activities, if any. It thus helps in identification of producers of a commodity and not merely traders. The range of TSI is (+) 1 to (-) 1, where (+) 1 indicates complete specialization and (-) 1 indicates no specialization. Algebraically, it can be written as-

$$TSI = \frac{X-M}{X+M}$$

where X refers to exports and M refers to imports of the commodity by a country.

Of the 626 machinery products at HS-6 digit level for which TSI was calculated, India had negative TSI in 473 products. Of the products taken into consideration, India had negative TSI in nearly 99 percent of machine tools, 82 percent of textile machinery, 75 percent of construction machinery, 73 percent of process plant machinery, 71 percent of hand tools, 65 percent of electrical equipment, and 77 percent of miscellaneous machinery. Capacity additions in these segments can help meet the demand of the domestic market.

An attempt has been made in the present Study to identify focus machinery products where domestic production can be incentivised with the purpose of not only meeting the domestic demand but also penetrating the export market. Further, a market specific approach has been outlined for exporters by analysing the major importers of these products and the key competitors in these markets.

Construction Machinery

A total of four construction machinery products have been identified where domestic capacity additions can be encouraged. In the category of overhead travelling cranes, transporter cranes, gantry cranes, bridge cranes and mobile lifting frames (HS: 842619), the Asian economies of Singapore, Indonesia, Vietnam and South Korea are among the top importers. China accounts for bulk of the share in these markets, which creates a case for seeking horizontal FDI from China in this category.

Electrical Equipment and Parts

Eleven electrical equipment and parts have been identified where the country can expand domestic capacities with an aim of not only import substitution but also of export promotion.

Among the eleven products, turbojets of a thrust > 25 kN (HS: 841112) is the largest (non-residual) imported product at the global level with imports worth US$

33.5 billion in 2014. It was also the largest import item for India with a value of US$ 537 million – this figure having grown significantly during the 2010-14 period, registering an exponential AAGR of 147.4%. However, India is also a key supplier to the UK, which was the largest importer of these products in 2014. India had a share of 2.8 percent in the UK market for this product, with the USA, France, Singapore and Germany being the major competitors for India in the market. Focusing on creating and expanding domestic capacities for this product can create the twin benefits of not only reducing imports, but also providing opportunities for exports of a product whose demand has been increasing across the world. One way of adding capacities could be to attract FDI in this sector from one of the major suppliers, viz. the USA.

FDI from China can be attracted in the segment of switches for a voltage <= 1.000 V (excluding relays and automatic circuit breakers) (HS: 853650) on account of its significant share in the key global markets, which is indicative of the substantial expertise of Chinese players in this segment.

Several low cost manufacturing destinations feature among the top suppliers for lead acid accumulators (HS: 850720). India can focus on capacity additions in this segment to capture a greater market share.

Hand Tools

Two products have been identified in the hand tools category, namely interchangeable tools for pressing, stamping or punching (HS: 820730), and plates, sticks, tips and the like for tools, unmounted, of sintered metal carbides or cermets (HS: 820900). More than 90 percent of domestic production of hand tools is from the small scale sector. Strategies for augmenting production and exports from the sector must focus on initiatives such as setting up of Common Facility Centres, which will enable Micro, Small and Medium Enterprises (MSMEs) to adopt new technologies, carry out research and development, etc.

Machine Tools

Six products have been identified in the machine tools sector where capacity additions can be targeted. Of these six products, machine tools for working any material by removal of material, operated by laser or other light or photon beam processes (HS: 845610) is the largest category of global imports (US$ 37.1 billion), with the Asian economies of China, Taiwan, South Korea, and Japan being the top importers of these products. India's imports of these products have witnessed an AAGR of 39.4 percent during 2010-2014, necessitating capacity additions in this segment for meeting the domestic demand for these products.

Miscellaneous Machinery

There are six products in the miscellaneous machinery segment, of which India is among the top importing countries in two products. These are millstones, grindstones, grinding wheels and the like, without frameworks, for sharpening polishing, trueing or cutting, of agglomerated abrasives or ceramics (HS: 680422) where India accounted for 4 percent of the global imports during 2014, and wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, electrically operated, with opto-electronic display and with combined mechanical and opto-electronic display (HS: 910119) in which India had a share of 9 percent in global imports. In case of latter, Switzerland is the largest supplier, and accounts for more than 90 percent share in several of the top importing markets. Market seeking investment can be attracted in these product categories on account of the significant import demand for these products.

Process Plant Machinery

Maximum number of identified products are in the segment of process plant machinery. Of the 26 identified products in this category, compression-ignition internal combustion piston engine "diesel or semi-diesel engine", for the propulsion of vehicles of Chapter 87 (HS: 840820) is the largest category of global imports, with Germany, Mexico, the USA, the UK and Turkey being the top importers of this product. European countries are among the major suppliers of these products to the top importing countries. Horizontal FDI can therefore be attracted from these countries.

Parts of ball or roller bearings (excluding balls, needles and rollers), n.e.s. (HS: 848299) is the only product

category where India is among the major suppliers for the top importing countries. India accounts for 10.0 percent share in the USA, the second largest market in this product group. India also accounts for 3.9 percent share in the Italian market, the fifth largest market in this product group. Japan, China, Germany are some of the top competitors for India in this product category

India is among the top importing countries for casting machines of a kind used in metallurgy or in metal foundries (HS: 845430), machinery for moulding or re-treading pneumatic tyres or for moulding or otherwise forming inner tubes of rubber or plastics (HS: 847751), moulds for mineral materials (HS: 848060), and moulds for rubber or plastics (HS: 848079). There is need for import substitution in these product categories by attracting FDI from top supplier countries in these segments.

Textile Machinery

Two products have been identified in the textile machinery sector, namely textile spinning machines (excluding extruding and drawing or roving machines) (HS: 844520), and parts and accessories of machines for extruding, drawing, texturing or cutting man-made textile (HS: 844820). India was the fourth largest importer in the former category, and the second largest importer in the latter. It was also a major supplier of these products to several of the top importing countries. For example, India had a share of 23.1 percent in Vietnam's import market for textile spinning machinery. India also accounted for 4.1 percent of Indonesia's imports of parts and accessories of machines for extruding, drawing, texturing or cutting man-made textile, and 74.4 percent of Switzerland's imports of this product. Capacity building in the textile machinery sector will be essential in order to ensure continued growth in textiles and garments sector, as also for neutralizing the overall trade deficit of the country.

STRATEGIES

Due to various reasons such as capacity constraints and inadequate technological capabilities, Indian machinery suppliers are unable to secure greater share in the global market. Development of a strong machinery sector has the potential to position India as an attractive manufacturing destination. Apart from the benefits in the form of foreign exchange savings arising out of reduced imports, a robust manufacturing base will ensure greater export revenues, provide large scale employment, and foster economic growth and development.

In order to facilitate this, there are certain challenges that need to be overcome. The Study highlights some of the key challenges faced by the industry whilst outlining select strategies that could be employed for their alleviation. The National Capital Goods Policy 2016 already outlines a robust framework for boosting the production and exports from the sector, but a lot hinges on the implementation of various facets of the policy. The Study highlights some additional interventions and incentives which could help place the sector on a higher growth trajectory by not only neutralising the existing trade deficit but also promoting exports.

Curtailing Protectionary Measures

In many of the focus products identified in the Study, low cost manufacturing destinations are the major suppliers, and key competitors for India. In order to compete with these countries, all the major elements of cost competitiveness need to be assessed and improved to match or outshine those prevailing in these countries. Steel is an important input for the machinery sector, and therefore a major factor for determining the cost competitiveness. Hence, it is a matter of concern that the cost of steel production in India is nearly 50-75 percent higher for some of the firms in comparison to global norms.

The Indian steel industry has been grappling with rising imports from China, South Korea and Japan. In response to this, the Government of India has taken several measures to protect the domestic industry. Minimum import price, anti-dumping duty and safeguard duty on steel products have been able to reduce the imports. During the period April- November 2017, imports of finished steel declined at a y-o-y rate of (-) 40.3 percent.

While these measures bode well for steel manufacturers, it hurts the competitiveness of machinery industry. It is

estimated that a 10 percent increase in steel prices due to a hike in anti-dumping or import duties, increases the cost of production of machineries by 1.3 percent. Therefore, companies and industry associations in the machinery sector need to be taken on board before imposing these measures. There is also a need to undertake a thorough analysis of the impact of such measures on end - user industries.

Redefining Investment Cap for MSMEs

In the machinery sector, a majority of operational units are MSMEs. Low operating scale and low technology orientation of MSMEs is a major constraint for growth in the machinery sector. An important reason for low technology orientation of Indian MSMEs is the low level of ceiling on capital investment, especially for medium enterprises. The cap on investment in plants and machinery for the purpose of classifying the units as MSMEs does not encourage Indian MSMEs to move up the value chain.

Since the manufacturing operations in the machinery sector are capital intensive, investment ceiling for treatment of medium enterprises need to be raised at least in this sector, benchmarking with such ceiling on investment in other countries. Some countries (such as the EU and China) have positioned the ceiling on investment for medium enterprises at high level, thereby encouraging capital intensiveness, technology upgradation, quality improvement, export orientation and employment generation.

A major step which has been taken in this direction is the Micro, Small and Medium Enterprises (Amendment) Bill, 2015 which was introduced in the Lok Sabha in April 2015. The Bill seeks to increase the allowance for investment in plants and machinery by MSMEs. The Bill proposes raising the investment limit for medium enterprises in the manufacturing sector to Rs. 30 crore. While this is a positive step, the revision of ceiling on capital investment for medium enterprises in India needs to be increased significantly – at least to an extent of US$ 10 million to US$ 12 million, in line with peer group countries. This would encourage higher investments for technology absorption, quality upgradation, and export orientation. Moreover, the Bill also needs speedy implementation.

Introduction of New Product Lines

Over the years, players in the Indian machinery sector have been diversifying the product lines offered, with the objective of mitigating risks associated with business and cyclical trends. However, more focus needs to be given towards building new generation machines that may be in demand in future. Such new generation machines should have greater flexibility to produce a variety of products, and also create opportunities for offering engineering services that are less sensitive to business and cyclical fluctuations. This trend is already evident in developed markets which continue to be at the forefront of innovation and new technology. Greater automation is driving the development of the next generation of industrial machinery. While such technical innovation is absorbed first by the developed world, it is adopted later by the developing world as well. In order to become a global force, Indian machinery sector needs to understand these changes and evolve to serve the user industries with the next generation products. For instance, a sector where technical innovation and automation is becoming ever more important in mature markets is mining equipment. Next generation mining is transforming operations that were once manual and local into those that are automated, remotely operated and integrated. Increasingly, a steep change in productivity is being delivered through integration of equipment with information technology. The usage of autonomous haulage or unmanned vehicles for earth moving is a step in this direction. These earth movers are equipped with GPS, CCTV cameras, inertial guidance systems, and leverage dispatch route planning and guidance software for functioning. Several global mining players are already migrating towards such advanced means of autonomous haulage.

Promotion of Intelligent Manufacturing

Significant engineering skills, with the combination of hardware, software and system integration skills, are required in the evolution stage of advanced technology products. This niche area is called intelligent

manufacturing. These are usually high tech products which provide high value addition but low volumes in highly quality conscious machinery sector. India has a competitive advantage in this sector where a large proportion of value addition is through software and system integration.

Establishing joint ventures with Chinese companies, which have manufacturing strengths and substantial market share in developing countries, would help in increasing high tech exports to developing countries in Africa and the Middle East.

Transformation in Objective and Approach

Sale of machinery is not a one-time business but requires technical support in transportation, construction, staff training (for operation and minor repairs), continuous service maintenance and periodical upgradation in technology. All over the world, manufacturers in the sector are turning themselves into engineering services companies, offering turnkey solutions to retain the customers. Companies in India could also reorient their approach to transform themselves into service based organizations. Such service orientation would help the industry in strengthening its competitive advantage.

Delivery Schedules

Several machinery products are not supplied off-the-shelf and are custom-made to suit the requirements of end users. Thus, the delivery schedule to cater to the order is longer than many other engineering products. However, due to various reasons, including capacity constraints, the delivery schedules of Indian machinery suppliers are longer than their foreign counterparts. The delivery time of locally made machinery in many cases is 1.5 to 2 times longer than in industrialized nations. In the case of textile machinery, delivery time for domestic manufacturers is nearly 12-24 months, as against 2-4 months for Chinese manufacturers.

The quality of infrastructure (transport, communication and power) in India is inadequate, thus affecting competitive delivery schedules, and increasing the operating costs. Inland transport is slow, although the railroad density in India is amongst the highest in the world. The cost of electric power is comparable to that in other developing nations, but the reliability is uncertain. Many firms have set up their own captive power plants to obviate the problem. This has added to the costs.

Longer lead times for parts and accessories is also a reason for longer delivery times. Development of efficient supply chain and common vendor base can help reduce the lead times. Availability of trained and skilled manpower can also help expedite the production process. Firms can also adopt modern manufacturing processes and systems such as forecasting, advance planning and scheduling processes with use of Enterprise Resource Planning solutions.

Strategic Acquisitions for Technology Upgradation

The end-user industries seek the latest technologies in order to produce quality products at competitive prices. Low spending on research and development by companies in the machinery sector has increased India's dependence on imports. There is substantial gap in the manufacturing technologies in India and overseas. Under these circumstances, strategic acquisition of technology by Indian companies could be an essential element of the overall business strategy. While Indian private companies have been engaging in strategic acquisitions for accessing technology and markets, they need to pursue this at a broader level.

The Government of India has launched several schemes for assisting Indian manufacturers to acquire and evolve cutting-edge technologies to catalyse growth and compete in global market. One such initiative is the Technology Acquisition Fund Programme (TAFP) which is an industry driven initiative aimed towards assimilation of technology in a short span of time. In view of the objectives laid out in the 12th Five Year Plan, TAFP mandates to provide funding to offset the higher cost of the best technology available globally. The TAFP provides financial assistance to Indian capital goods sector to facilitate the acquisition of strategic and relevant technologies, and also development of technologies through contract route, in-house route or through joint route of contract and in-house. Similarly, the Technology Acquisition and Development Fund aims to facilitate acquisition of clean and green technologies

by MSMEs across sectors, and bridge the technological gap at an affordable cost. Another route through which the Government can promote technology acquisitions is through mergers and acquisitions (M&A).

Chinese companies have been proactive in strategic M&A in technology space. Over the years, Chinese strategy for technological upgradation has gradually transformed. China has changed its position from only allowing limited foreign ownership – through joint ventures, for instance – to permitting mergers and acquisitions as a crucial way to invigorate state and semi-state owned firm. This is evident from the fact that during the first four months of 2016, China accounted for 45 percent of the M&A in the technology industry.

To promote M&A by Indian companies, an Alternative Investment Fund can be jointly floated by domestic and international institutional investors. Any public sector bank/ financial institution can take lead at the behest of the Government of India for setting up this Fund. The proposed Fund can invest in equity or equity linked instruments of Indian companies in machinery and other high-technology sector. Evidence suggests that among the portfolio companies that engaged in cross-border M&A, about 80 percent completed their first cross-border M&A deal only after the initial private equity investment. The proposed Fund can adopt a buy and build strategy wherein investments are made in a platform company with a well-developed management team and infrastructure, and thereafter more companies are acquired to build and grow the platform company. Through the buy and build strategy, the proposed Fund can assist firms in the machinery sector to engage in M&A and thereby upgrade production technology.

Establishing Joint Ventures in Textile Machinery

Many objectives have been identified by researchers for setting up of joint ventures (JV). The prominent ones include reducing risks, achieving economies of scale, supporting technologies/ patents, blocking competitors, overcoming trade barriers, expanding internationally and integrating vertically with a partner. While looking for a potential JV partner, companies look at various aspects like financial security, resource and management capabilities, production performance, reputation, etc. Hence, JVs can be attracted successfully in those sectors where Indian companies already have a critical mass and experience.

India is not only a major importer of textile machinery but also a supplier in several key import markets. To meet the burgeoning domestic demand and increase share in global market, Indian textile machinery manufacturers could enter into joint ventures with foreign companies. This shall also help upgrade the quality and performance of machineries produced in the country. Currently, except for the units in the spinning sector where the machineries are of international standards, other textile machinery manufacturing leaves a lot of scope for improvement in terms of quality and performance, compared to the European manufacturers.

According to the fDi markets database, Germany, Japan, and Switzerland are among the top investors in the textile machinery segment. China is the topmost destination for investments by companies from Germany and Switzerland, and Vietnam is the topmost destination in case of Japan. In comparison to the destinations of China and Vietnam, India has received lesser investments from these countries in the textile machinery segment. Indian companies can make an attempt to forge ties with companies from these top investor countries.

Financing Machinery Exports

Several categories of machinery exports require medium to long term export financing. Financing from Export Credit Agencies (ECAs) is essential because finance from the private sector over the medium to long term is either unavailable or unaffordable. Like other ECAs, Export-Import Bank of India (Exim Bank) has been closely associated with the export efforts of Indian machinery sector, in its entire value chain. The Bank has a variety of loan products to cater to the financing requirements of enterprises. Apart from direct exposure, the Bank also supports the sector by virtue of supporting project exports. Project Exports are broadly classified into four categories, viz. Supply contracts on deferred payment terms, Civil Construction, Turnkey and Consultancy Services Contracts.

The Bank's Lines of Credit (LOCs) extended to commercial banks, financial institutions, regional development banks, and entities overseas serve as a market entry mechanism to Indian exporters and provide a safe mode of nonrecourse financing option to Indian exporters. LOCs enable buyers in overseas markets to import engineering goods, industrial manufactures and related services from India on deferred payment terms. The Indian machinery sector has been increasingly using the LOC mechanism to export to other developing countries. This helps in establishing products abroad and generating export opportunities subsequently.

The Bank's strong emphasis on increasing project exports from India has been further enhanced with the introduction of the Buyer's Credit under the National Export Insurance Account (BC-NEIA) programme. The Indian project exporter, under this programme, is backed by a tailored financing package that meets the funding needs of the project, without impacting the balance sheet of the Indian project exporter. Consequently, while the Indian company remains responsible for timely and satisfactory execution of the project, it is free from commercial and political risks while executing the project. With the BC-NEIA product, machinery exporters from India can venture into new markets and help diversify the exports.

In spite of the range of activities undertaken by Exim Bank, the support can at the best be considered moderate when compared to the kind of support being provided by other countries in promotion of machinery exports. As on 31st March 2016, the sector accounted for about 4 percent of Exim Bank's total exposure. A primary reason for this is that the ECAs of other countries have a strong financial backing from their respective governments, while also not being subject to regulatory norms that are applicable for commercial banks. This is where the Government of India (GOI) could consider bolstering its support to Exim Bank in order to take the exports of Indian machinery products to a higher trajectory. Select mechanisms that the GOI could consider in this respect include the following:

- For most ECAs across the world, profitability is not a major consideration. Exim Bank's charter requires it to be run on business principles with due regard to public interest. Exim Bank has been regularly paying dividends, and its dividend pay-out is one of the highest in the industry. Paradoxically, the higher the dividends pay-out to the GOI, the greater the need for capital. Therefore, Exim Bank could be allowed to plough back its dividend that it is paying to the Government of India and utilise the proceeds exclusively for facilitating development of indigenous machinery sector. Exim Bank could also be freed from the requirement of paying tax, with the proviso that the amounts equivalent to the tax load be earmarked for capacity building activities in the machinery sector.

- In order to avoid growth limitations in the portfolio for machinery sector, Exim Bank must be adequately equipped with equity. It is to be noted that Exim Bank's authorised capital is Rs. 100 billion, which can be further enhanced by notification. Moreover, as on March 31, 2016, Exim Bank's paid-up capital amounted to Rs. 63.59 billion. Hence, there is enough head room for the paid-up capital to move up.

The National Capital Good Policy also highlights some of these constraints for greater financing from Exim Bank, and recommends increasing Exim Bank's capital base and providing refinancing at soft rates via the Government/ RBI. It also recommends formation of a dedicated fund to support exporters through buyer's credit at rates of interest at par with LIBOR/ international rates, and with a repayment period of at least 10 years in addition to the moratorium/ grace period equal to project construction period against Project Agreements. Whilst Exim Bank already has a Buyer's Credit under NEIA program wherein lending is usually for a credit period of 8 to 12 years, the interest rate is linked to the Exim Bank's cost of funds plus a spread. Implementation of these recommendations can alleviate the constraints faced by the machinery sector.

1. Introduction

The engineering sector in India is the largest among industrial sectors and can be broadly categorized into heavy engineering and light engineering sectors. The heavy engineering industry can be further classified into capital goods/machinery and equipment segments. The capital goods/machinery segment can be further classified into electrical machinery and non-electrical machinery.

The machinery sector is of strategic importance to the Indian economy and forms the backbone of the manufacturing activity. The sector has a multiplier effect on the overall economic growth and facilitates development of a wide range of user industries by providing critical inputs necessary for manufacturing. Therefore, the sector influences the core manufacturing development within India.

India today has a strong and diverse base of machinery, primarily an outcome of the country's import substitution policy followed during most part of the last century post-independence. Despite the significant progress in production of machinery in India, the country remains a major importer of these products. Further development of domestic capabilities in this sector is essential to neutralize the existing trade deficit and ensure self-reliance.

While there is no set definition of capital goods/ machinery, a study commissioned by the Government of India described these as plant machineries for agricultural, industrial and commercial segments of economic activities that have economic asset life of over 3 years. According to the Working Group on Capital Goods and Engineering Sector for the 12th Five Year Plan (2012-2017), the sector comprises plant and machinery, equipment/ accessories required for manufacture/ production, either directly or indirectly, of goods or for rendering services, including those required for replacement, modernization, technological upgradation and expansion. It also includes packaging machinery and equipment, refrigeration equipment, power generating sets, equipment and instruments for testing, research and development, quality and pollution control.

United Nations' International Standard Industrial Classification (ISIC) of all economic activities (Revision–4) classifies most of the machinery items under two divisions (28 and 27) with the following codes:

281 - Manufacture of General Purpose Machinery

282 - Manufacture of Special Purpose Machinery

271 - Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus

272 - Manufacture of batteries and accumulators

273 - Manufacture of wiring and wiring devices

274 - Manufacture of electric lighting equipment

275 - Manufacture of domestic appliances

279 - Manufacture of other electrical equipment

SEGMENTS OF MACHINERY

Machinery can be further divided into: process plant machinery, electrical equipment and parts, construction machinery, machine tools, hand tools, textile machinery and miscellaneous machinery.

Process Plant Machinery: The process plant machinery and components industry is a heterogeneous segment of the Indian machinery sector. This segment caters to a wide variety of process industries like oil and gas, petroleum refining, petrochemicals, chemicals, fertilizer, pharmaceuticals, metal industry, cement, paper, sugar, cryogenics, distilleries etc. Companies in this segment design and manufacture a 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. Currently, 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 being manufactured and exported by India.

Electrical Equipment and Parts: Electrical equipment and parts are principally used in the power industry (generation, transmission and distribution), as well as in other manufacturing industries such as automobiles, cement, steel, petrochemicals and refining. The segment comprises a range of products, such as transformers, switchgears, motors, generators and control equipment.

Construction Machinery: India produces a wide range of construction and mining machinery such as hydraulic excavators, wheel loaders, backhoe loaders, bull dozers, dump trucks, tippers, graders, pavers, asphalt drum/ wet mix plants, breakers, vibratory compactors, cranes, forklifts, dozers, off-highway dumpers (20 tons to 170 tons), drills, scrapers, motor graders, rope shovels, etc. They perform a variety of functions like preparation of ground, excavation, haulage of material, dumping/ laying in specified manner, material handling, road construction, etc.

Machine Tools: The machine tools sector is one of the important segments of the machinery industry in India. The sector is recognized as a provider of cost-effective high quality lean-manufacturing solutions. The sector manufactures almost the complete range of metal-cutting and metal-forming machine tools. Customized in nature, the products of the Indian companies comprise conventional machine tools as well as computer numerically controlled (CNC) machines.

Hand Tools: Hand tools are those powered by manual labour and not by an engine. These find usage in a wide array of industries, especially in the agriculture, horticulture and forestry sector.

Textile Machinery: The textile machinery industry includes sorting machinery, carding machinery, processing machinery for yarns/ fabrics, weaving machinery, etc. Demand for textile machinery is directly dependent on the growth in textile industry, and to some extent indirectly dependent on the demand in other sectors such as housing and automobiles, as these sectors also consume textile products like upholstery and carpets.

Miscellaneous Machinery: The ambit of products classified as machinery is large, and the products not classified under any of the above categories have been referred as miscellaneous machinery for the purpose of this Study.

ROLE OF MACHINERY SECTOR IN NEUTRALIZING INDIA'S TRADE DEFICIT

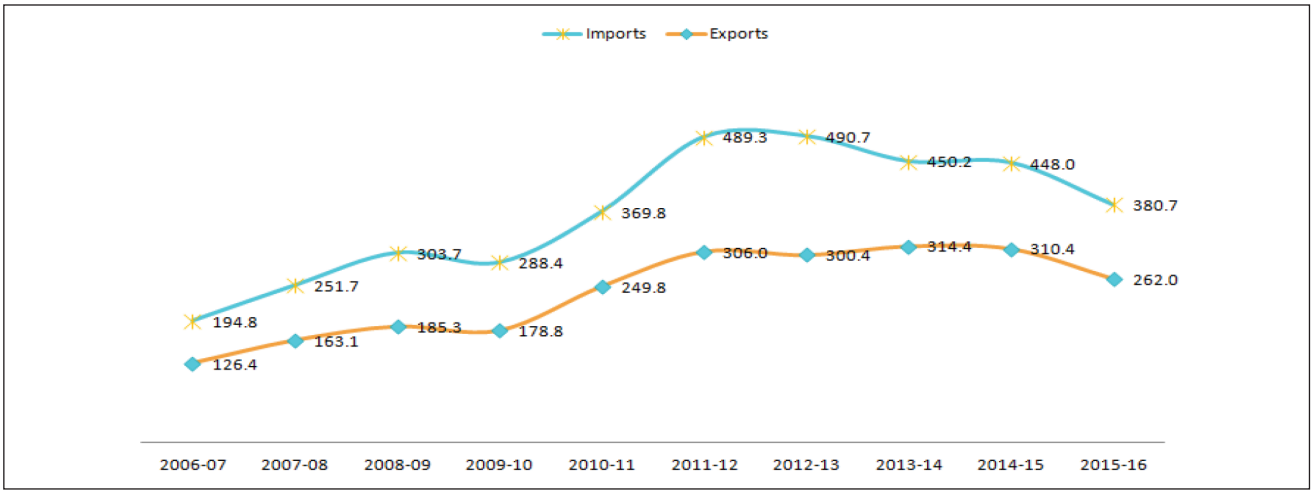
Over the past decade, India's merchandise exports and imports have grown at a robust pace, although they have stagnated during the past few years. India's exports registered a Compound Annual Growth Rate (CAGR) of 8.4 percent during the period 2006-07 to 2015-16, while imports recorded a CAGR of 7.7 percent during the same period. Alongside, India's merchandise trade deficit has grown from US$ 68.4 bn in 2006-07 to US$ 118.6 bn in 2015-16.

Growth in exports have been less encouraging in recent years. India's exports registered second consecutive year of decline during 2015-16, with exports amounting to US$ 262.0 bn during the year. Led by fall in petroleum, oil and lubricant imports, total merchandise imports also registered third consecutive year of decline in 2015-16, reaching a level of US$ 380.7 bn (Exhibit 1). Concomitantly, in 2015-16, the country registered its lowest trade deficit witnessed in the past six years. However, the deficit still remains sizeable.

An analysis of India's trade as per BEC classification[1] indicates that India's trade deficit is in the broad sectors of: capital goods (except transport equipment), parts and accessories of capital goods, fuels and lubricants (primary), and industrial supplies not elsewhere specified (both primary and processed) (Table 1). The capital goods sector as defined by BEC classification includes machinery as well as the electronics sector. A previous Exim Bank Study titled, 'Indian Electronic

[1]BEC codes have been matched with the Harmonised System (HS) codes to analyse the broad sectors where India has a trade deficit.

Exhibit 1: India's Trade over the Past Decade



Source: DGCI & S

Table 1: Trade Balance by Product Categories (Value in US$ Mn)

Product Categories	2010	2011	2012	2013	2014
Capital Goods					
Capital Goods (except transport equipment)	*-21712*	*-22139*	*-25310*	*-25351*	*-26290*
Capital Goods Parts and Accessories	*-12666*	*-17342*	*-17511*	*-13870*	*-13108*
Passenger motor cars	4038	2828	3654	5263	5566
Other transport equipment	-1605	1737	1254	4041	7349
Transport equipment parts and accessories	-1607	-548	-1057	431	162
Consumer Goods					
Consumer goods not elsewhere specified- durable	8011	13897	12422	8827	11358
Consumer goods not elsewhere specified- non-durable	8523	11119	12605	16150	15850
Consumer goods not elsewhere specified- semi-durable	11451	14818	14883	18414	18817
Food and Beverages					
Food and Beverages Primary	2391	4545	5199	6549	6179
Food and Beverages Processed	1304	4503	5321	7187	6309
Fuels and Lubricants					
Fuels and lubricants Primary	-97899	-136447	-163800	-162817	-152125
Fuels and lubricants Processed	24466	34910	32172	47351	37914
Industrial Supplies					
Industrial Supplies not elsewhere specified Primary	*-9422*	*-17454*	*-22727*	*-22856*	*-28110*
Industrial Supplies not elsewhere specified Processed	*-42245*	*-56902*	*-45908*	*-16736*	*-25909*
Goods not elsewhere specified	-4028	2494	-9569	-6494	-9712

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Goods Industry- Neutralizing Trade Deficit with China' highlights the prospects for neutralizing India's trade deficit in the electronics sector. The Study provides recommendations for capacity building and export promotion in the sector, and identifies the products and markets which shall play an instrumental role in achieving the desired outcomes.

The current Study attempts to analyse the machinery sector, and identify major products which can be targeted for neutralizing the overall trade deficit. Strategies have also been recommended for developing domestic production and export capabilities by attracting FDI and/ or relevant non-trade-distorting government incentives.

2. Production Scenario

GLOBAL SCENARIO

Machinery and equipment (ISIC Code 28) mainly consist of general purpose machinery (engines, turbines, pumps, compressors, taps, valves, bearings, gears, ovens, furnaces, lifting and handling equipment) and special purpose machinery (such as agricultural machinery, machine tools, metallurgical machinery, mining / quarrying / construction machinery, textile / leather machinery, and food processing machinery). According to the 2016 International Year Book of Industrial Statistics brought out by the United Nations Industrial Development Organisation (UNIDO), China emerged as the largest manufacturer[2] of machinery and equipment in 2014, up from the third position in 2010. Its share in global production increased by more than four percentage points during this period to reach 19.1 percent in 2014. Other major producers during 2014 were the USA (17.0 percent), Japan (15.7 percent), Germany (13.2 percent), Italy (4.8 percent), and the UK (2.1 percent). India's position in global production of these products slipped from 8th in 2010 to 10th in 2014 (Table 2).

In the case of electrical equipment (ISIC 27), China accounted for nearly 22.3 percent of the global production in 2014. This division includes the manufacture of products that generate, distribute and use electrical power. Also included is the manufacture of electrical lighting, signalling equipment and electric household appliances. Japan (14.6 percent), Germany (12.8 percent), the USA (11.2 percent), and India (2.9 percent) were the other top producers in this category during 2014. India's position in global production improved from sixth in 2010 to fifth in the year, albeit its share registered a marginal decline (Table 3).

Table 2: Top Producers of Machinery and Equipment (ISIC 28)

2010		2014	
Countries	**Share %**	**Countries**	**Share %**
The USA	16.6	China	19.1
Japan	16.0	The USA	17.0
China	15.0	Japan	15.7
Germany	13.6	Germany	13.2
Italy	5.7	Italy	4.8
The UK	2.4	The UK	2.1
Brazil	2.2	Canada	1.9
India	2.1	France	1.8
France	2.0	Brazil	1.7
Canada	1.9	India	1.6
Russia	1.6	Russia	1.4
South Korea	1.5	South Korea	1.4
Switzerland	1.4	The Netherlands	1.3
The Netherlands	1.3	Switzerland	1.2
Spain	1.3	Spain	1.1
Others	15.4	Others	14.7

Source: International Yearbook of Industrial Statistics 2016

Table 3: Top Producers of Electrical Equipment (ISIC 27)

2010		2014	
Countries	**Share %**	**Countries**	**Share %**
China	16.7	China	22.3
Japan	15.8	Japan	14.6
Germany	14.0	Germany	12.8
The USA	11.5	The USA	11.2
Italy	4.0	India	2.9
India	3.0	Italy	2.7
France	2.7	Turkey	2.4
Brazil	2.4	Indonesia	2.2
Turkey	2.1	France	2.2
Mexico	1.9	Brazil	2.0
Spain	1.9	Mexico	1.8
South Korea	1.8	The UK	1.6
The UK	1.8	South Korea	1.5
Indonesia	1.6	Thailand	1.4
Austria	1.5	Spain	1.4
Others	17.3	Others	17

Source: International Yearbook of Industrial Statistics 2016

[2]In terms of world total value added at constant 2005 prices. All rankings in this study are based on total value added unless mentioned otherwise

Among developing and emerging industrial economies, Brazil and India were the top two producers for machinery and equipment in both 2010 and 2014. However, India's share in the total for developing and emerging industrial economies has declined from 19.1 percent in 2010 to 16.1 percent in 2014. The share of Turkey and Mexico has increased during the same period (Table 4).

Table 4: Top Producers of Machinery and Equipment (ISIC 28) among Developing and Emerging Industrial Economies

2010		2014	
Countries	**Share %**	**Countries**	**Share %**
Brazil	20.4	Brazil	18.1
India	19.1	India	16.1
Turkey	7.1	Turkey	9.7
Mexico	6.9	Mexico	7.8
Poland	5.9	Poland	5.9
Argentina	5.9	Thailand	5.4
Thailand	5.3	Argentina	4.5
South Africa	4.0	Iran	4.3
Indonesia	3.0	South Africa	3.9
Ukraine	2.7	Indonesia	3.5
Iran	2.5	Saudi Arabia	2.9
Saudi Arabia	2.3	Romania	2.6
Romania	1.8	Ukraine	2.3
Venezuela	1.7	Belarus	1.9
Belarus	1.7	Algeria	1.7
Others	9.7	Others	9.4

Source: International Yearbook of Industrial Statistics 2016

Among developing and emerging industrial economies, India remained the largest producer of electrical equipment in 2014, although its share declined from 16.9 percent in 2010 to 15.8 percent in 2014. Turkey and Indonesia are emerging as strong competitors for India, and their share in production has steadily increased during the period under consideration (Table 5).

According to the IMF World Economic Outlook, economic activity is expected to pick up pace during 2017 and 2018, particularly in the emerging and developing the economies. Stronger global economic activity in the second half of 2016, coupled with projected fiscal stimulus in the USA presents a favourable outlook for global economy in the medium term.

Table 5: Top Producers of Electrical Equipment (ISIC 27) among Developing and Emerging Industrial Economies

2010		2014	
Countries	**Share %**	**Countries**	**Share %**
India	16.9	India	15.8
Brazil	13.4	Turkey	13.0
Turkey	11.8	Indonesia	12.0
Mexico	10.8	Brazil	10.9
Indonesia	8.9	Mexico	9.6
Thailand	7.0	Thailand	7.9
Poland	5.7	Poland	6.6
Iran	2.4	Iran	2.8
Philippines	2.3	Romania	2.2
Argentina	1.9	Philippines	2.2
Egypt	1.7	Argentina	1.8
Romania	1.6	Saudi Arabia	1.7
Saudi Arabia	1.5	Ukraine	1.2
Ukraine	1.3	South Africa	1.1
South Africa	1.2	Colombia	1.0
Others	11.6	Others	10.2

Source: International Yearbook of Industrial Statistics 2016

This expected improvement in manufacturing and industrial activity shall provide a boost to the global machinery sector. With per capita income rising in the emerging economies, demand for automotive and consumer products are expected to increase, which is likely to propel the demand for general purpose machinery, electrical equipment, etc. Specific purpose machinery is also expected to witness growth at the back of improvements in individual sectors. Global infrastructure development shall be one of the primary drivers for segments such as construction and mining machinery. Growing demand for technical textiles from a wide array of industries shall propel the demand for global textile machinery industry.

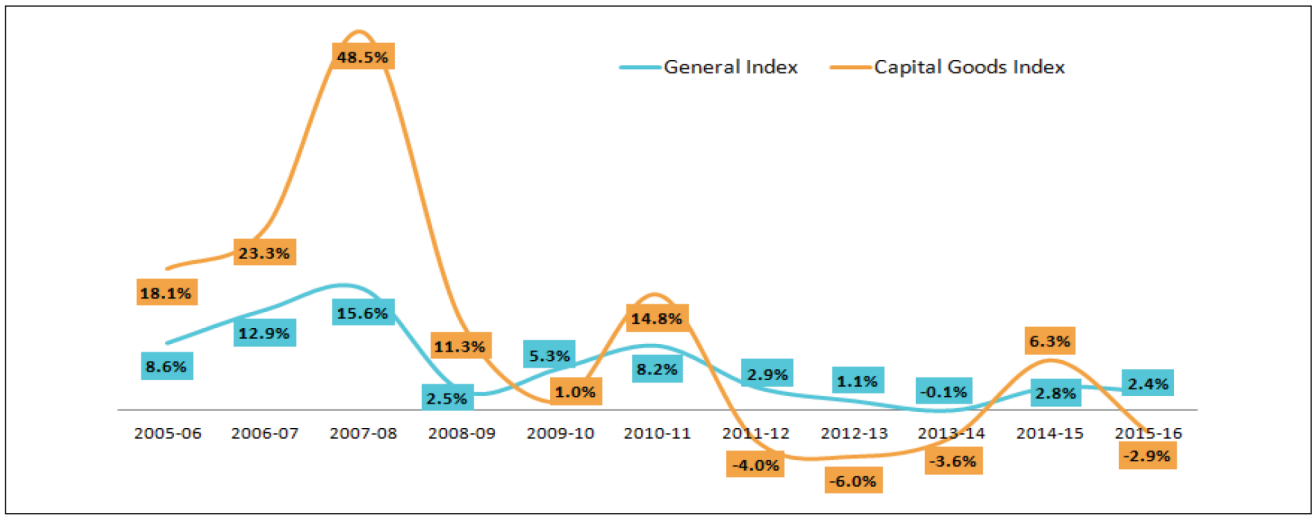
INDIAN SCENARIO

India produces a wide range of machinery. Some of the prominent machinery produced in India include heavy electrical machinery, textile machinery, machine tools, earthmoving and construction equipment, material handling equipment, oil and gas exploration equipment, food processing and packaging machinery, railway equipment, metallurgical equipment, process plants machinery and equipment, paper and pulp machinery,

and printing machinery. The overall performance of the machinery sector in India can be gauged from the movement of the Index of Industrial Production (IIP) for capital goods (base: 2004-05). During the period 2005-06 to 2010-11, the IIP for capital goods registered positive growth rates, with the growth rate remaining higher than the general IIP during the entire period, except in 2009-10. However, from 2011-12 onwards, the capital goods index has consistently recorded negative growth, except in 2014-15, when the index grew by 6.3 percent (Exhibit 2).

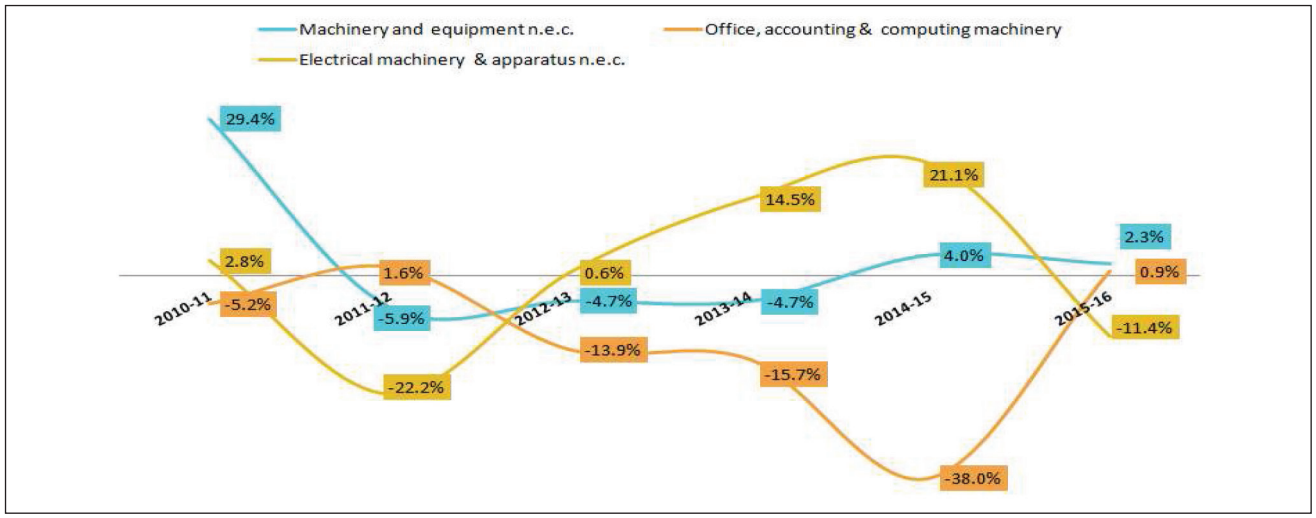
A further drill down in terms of various machinery segments reveals that during 2011-12 to 2015-16, the IIP for machinery and equipment n.e.c. (NIC 29), and office, accounting and computing machinery (NIC 30) witnessed negative to moderate growth rates. Electrical machinery and apparatus n.e.c (NIC 31), on the other hand, registered double-digit growth rates during 2013-14 and 2014-15, before declining by (-) 11.4 percent during 2015-16 (Exhibit 3).

Exhibit 2: Movements in General and Capital Goods Index of Industrial Production



Source: MOSPI

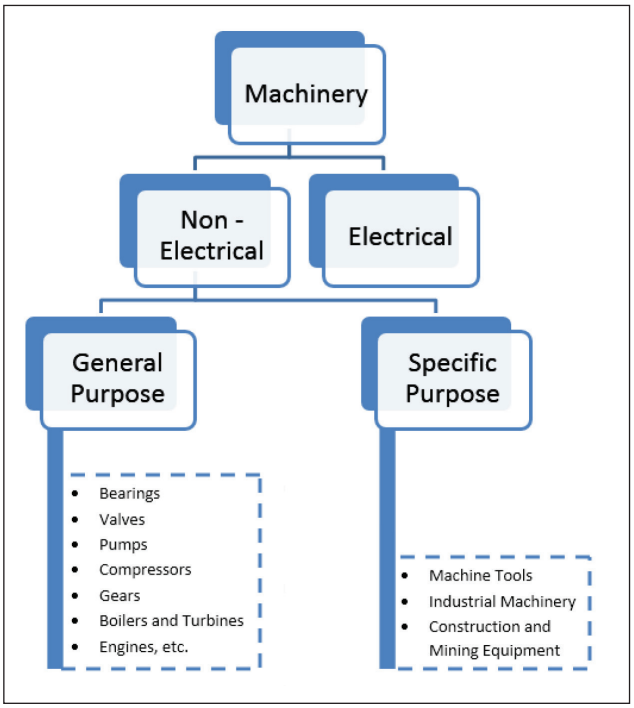
Exhibit 3: Movements in Sub-Segments of Machinery IIP



Source: MOSPI

The machinery industry in India can be broadly divided into non-electrical and electrical machinery. The non-electrical machinery segment can be further divided into general purpose and specific purpose machinery (Exhibit 4).

Exhibit 4: Broad Classification of Indian Machinery Sector



Source: MOSPI

Non-Electrical Machinery

General Purpose Machinery

General purpose machinery are used across a wide array of manufacturing industries such as automotive, chemicals, power and consumer durables. Over the past decade, the industry has registered robust capacity additions which have translated into a substantial increase in domestic production. This is evident from the production statistics for the past decade[3]. The production of bearings, pumps, compressors and engines registered robust CAGR during the period FY05-FY16 (Table 6). However, growth across various segments of general purpose machinery has been less encouraging in recent years.

Slowdown in demand from user industries led to a decline in production of engines and compressors during 2015-16. Production of engines declined at a y-o-y rate of (-) 3.8 percent, while that of compressors declined by (-) 5.0 percent. Bearings registered a marginal growth rate of 1.0 percent during the year. Production of pumps was at variance with the overall performance of the industry during FY16, with the segment recording a healthy growth of 12.8 percent.

Production of valves in India reached a decadal high of Rs. 36,375 billion in 2014-15, before registering a y-o-y decline of (-) 18.8 percent in 2015-16, on account of tepid end-user demand (Exhibit 5). With increase in capacity additions in fluid handling industries, the domestic production of valves is expected to improve in medium term. As the revenue of Indian companies in this segment expands, they are expected to face increasing complexity in terms of product portfolio, geographies, customer expectation, etc. Robust processes, and improved branding and service delivery can help revive the industry.

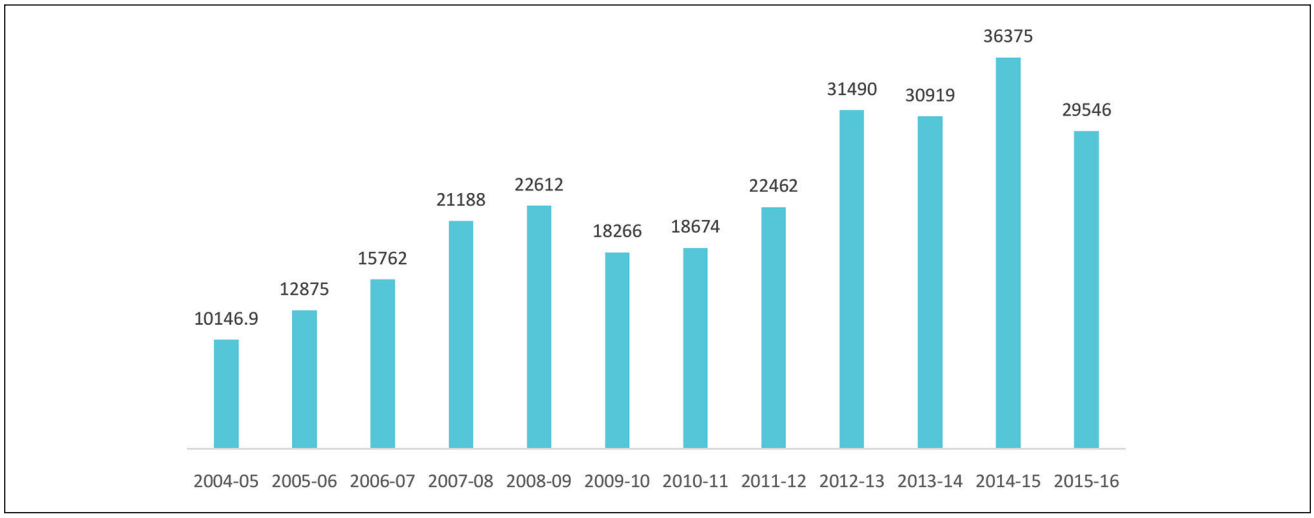
Table 6: Production of Select Categories of General Purpose Machinery ('000 no.s)

Category	2004-05	2011-12	2012-13	2013-14	2014-15	2015-16	CAGR (FY05-FY16)
Bearings	422410.8	806510	802656.2	799382.4	890724.8	899789.6	7.10%
Pumps	1549.8	3014.4	3202.1	3152	3383.8	3815.7	8.50%
Compressors	3756.2	6977.2	8959.4	8694	9753	9261.7	8.60%
Gears	5551.6	2375	2383.6	2473	3124.8		-5.6%*
Engines	814.1	1565.2	1752.6	1617.5	1559	1499.4	5.71%

*CAGR for the period FY05-FY15
Source: CMIE, Exim Bank Research

[3]Production data for some categories is in value terms, while for others it is in volume terms depending upon data availability.

Exhibit 5: Production of Valves in India (Value in Rs. Bn)

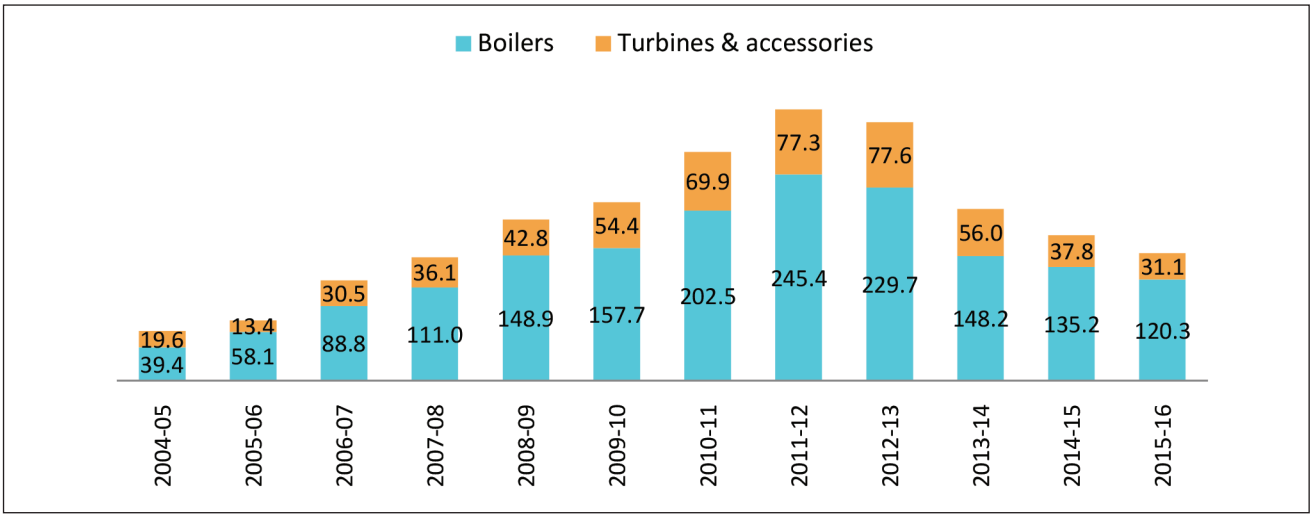


Source: CMIE, Exim Bank Research

Production of boilers and turbines in India has registered a declining trend over the past several years. In fact, production levels in 2015-16 were similar to those achieved by the industry in 2007-08 (Exhibit 6). Challenges in the power sector have adversely impacted capacity additions and production in the sector. With power sector reforms and adoption of the comprehensive National Capital Goods Policy, the growth constraints for the sector may be alleviated.

Significant capacity additions in end-user industries fuelled by revival in demand are expected to spur the growth in production of general purpose machinery in the medium term. Segments such as bearings will benefit on account of improvement in automotive demand. Increasing capacity additions in fluid handling industries such as chemical and allied products, oil and gas, and irrigation shall benefit the pumps and valves industry in the country. Demand for compressors stems from white goods such as air conditioners, refrigerators, etc. Production of these consumer durables is expected to remain buoyant in the medium term, thereby providing a boost to the compressor segment.

Exhibit 6: Production of Boilers and Turbines in India (Value in Rs. Bn)



Source: CMIE, Exim Bank Research

Specific Purpose Machinery

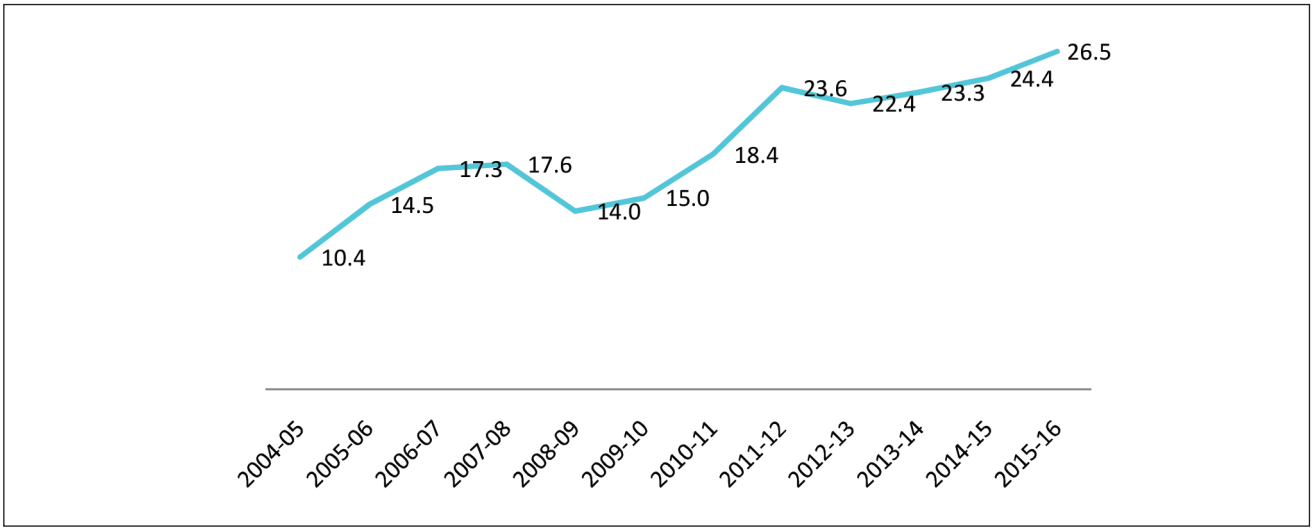
Machine tools, industrial machinery, and construction and mining machinery are the key segments within the category of specific purpose machinery. As per the 2016 Gardner Business Media survey, India was the 13th largest producer and 10th largest consumer of machine tools in the world. Driven by demand from end user industries such as automotive and consumer durables, production of machine tools have consistently increased over the past few years (Exhibit 7). In spite of this increase, there remains substantial demand – supply gap for machine tools in the domestic market, with current production meeting only one-fourth of the domestic consumption of machine tools[4]. This demand supply gap will facilitate investments in the sector.

On account of the changing demand patterns, the industry is gradually moving towards production of sophisticated CNC machines. Investment in these key growth areas should be encouraged for building self-reliance, as well as encouraging exports. In order to tap the global markets for these products, machine tool manufacturers also need to obtain necessary certification to meet the requirements in some of the major markets.

Industrial machinery is another important segment from the perspective of Indian companies. Chemical machinery and textile machinery are among the top segments of industrial machinery in India. Value of production in the chemical machinery segment recorded a CAGR of 10.7 percent during FY05 - FY16, reaching the level of Rs. 52.1 billion in 2015-16. During the same period, textile machinery production nearly doubled from Rs. 14.4 billion in 2004-05 to Rs. 29.2 billion in 2015-16 (Table 7). Nearly 84 percent of the total textile machinery production is concentrated in the States of Tamil Nadu and Gujarat[5].

India also has a few companies operating in the construction and mining equipment segment. The domestic production across several categories of construction and mining equipment has declined over the past few years. This lacklustre performance can be attributed to the muted demand from the construction and infrastructure sectors and only a marginal pick-up in mining activity, coupled with rising imports in this segment. In certain segments like mining equipment, the production levels in 2015-16 are not very different from those in 2004-05. On the other hand, some segments like material handling equipment have registered robust CAGR during the period 2004-05 to 2015-16 (Table 8).

Exhibit 7: Production of Machine Tools in India (Value in Rs. Bn)



Source: CMIE, Exim Bank Research

[4]Calculation based on CMIE data
[5]India International Textile Machinery Exhibition Society

Table 7: Production of Industrial Machinery (Value in Rs. Billion)

Category	2004-05	2011-12	2012-13	2013-14	2014-15	2015-16	CAGR (FY05-FY16)
Chemical Machinery	17.1	58.9	53.3	57.9	55.4	52.1	10.7%
Cooling Towers	2.3	6.6	4.6	4.2	3.9	4.6	6.6%
Textile Machinery	14.4	29.8	25.7	27.6	27.2	29.2	6.7%
Food Processing	1.6	4.1	3.7	3.0	2.5	4.0	8.9%
Cement Machinery	2.1	4.9	3.9	3.9	4.6	3.7	5.4%
Packaging Machinery	0.5	1.9	2.7	3.4	3.1	3.9	21.2%
Printing Machinery	2.6	4.1	4.3	3.1	3.5	3.4	2.4%
Total of Above	40.5	110.3	98.1	103.1	100.2	100.9	8.7%

Source: CMIE, Exim Bank Research

Table 8: Production of Construction and Mining Equipment

Category	Units	2004-05	2011-12	2012-13	2013-14	2014-15	2015-16	CAGR (FY05-FY16)
Earth Moving Equipment	Numbers	12,720	43,365	40,531	30,802	29,109	32,482	8.9%
Cranes	Tonnes	7,994	19,199	17,327	17,899	17,064	14,597	5.6%
Material Handling Equipment	Rs. Mn	4,714	18,891	17,400	17,774	21,478	28,884	17.9%
Forklift	Numbers	1,588	3,494	3,975	3,227	3,289	4,031	8.8%
Lift and Escalator	Rs. Mn	4,408	7,420	10,535	11,131	13,239	11,265	8.9%
Construction Equipment	Rs. Mn	1,154	4,552	4,581	4,505	3,696	3,148	9.6%
Mining Equipment	Rs. Mn	1,394	2,368	3,695	2,619	1,914	1,553	1.0%

Source: CMIE, Exim Bank Research

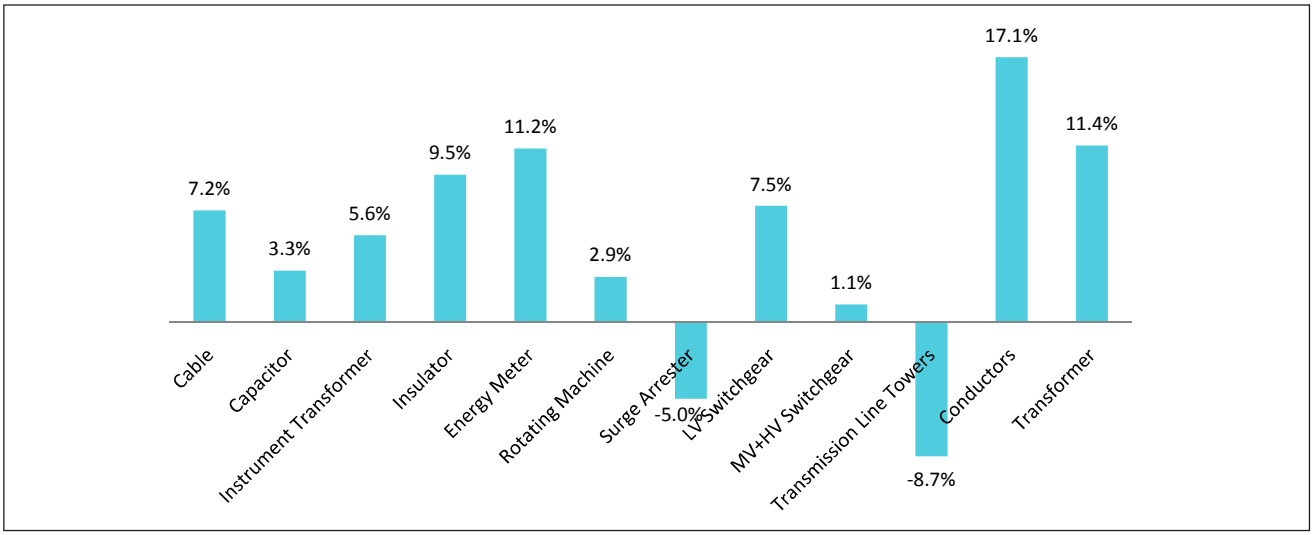
The Government has put emphasis on the infrastructure sector in the Union Budget 2017-18. The allocation for roads and highways has increased significantly. Government has also earmarked additional investments for rural roads construction projects. Execution of these projects shall provide an impetus to the mining and construction equipment sector.

Electrical Equipment

The Indian electrical equipment industry comprises two broad segments—generation equipment, and transmission and distribution, with the latter accounting for 72 percent of the industry. According to Indian Electrical and Electronics Manufacturers' Association, most segments of the electrical equipment industry registered positive y-o-y growth during 2015-16. Conductors segment witnessed the highest y-o-y growth of 17.1 percent on account of increasing domestic off-take (Exhibit 8). Transformers also registered a robust y-o-y growth rate of 11.4 percent; however, declining order-book position is a concern for this segment.

The segments of transmission line towers and surge arrester witnessed negative growth rates during the year. In case of transmission line towers, export orders received by domestic manufacturers have increased, but the domestic orders continue to decline. In case of surge arrester as well, the decline has largely been on account of declining domestic sales. While domestic sales of surge arresters decreased by 9 percent, export sales increased by 15 percent.

Exhibit 8: Segment-wise Growth in Electrical Equipment Industry during 2015-16



Note: Data refers to changes in growth indices as calculated by Indian Electrical & Electronics Manufacturers' Association
Source: IEEMA, Exim Bank Research

The country is expected to witness substantial expansion in the generation capacity, and strengthening of the power transmission and distribution network. Besides the developments in conventional energy sector, the government also aims to achieve 175 GW of renewable power generation capacity by 2022. The government also plans to undertake 'green energy corridor' projects entailing investments of Rs. 380 billion. All these factors are expected to augur well for the electrical equipment industry.

While the demand for machinery products from the country is set to improve over the medium term, the manufacturers must keep pace through increase in investment, improvement in technological capabilities and development of standards at par with global benchmark.

3. International Trade Scenario

Trade forms an integral element of the machinery production cycle, especially since the emergence of the global value chains. The regions of North America, West Europe and East Asia currently account for nearly 77 percent of the global value added in this sector, with developing countries forming a major link in the value chain.

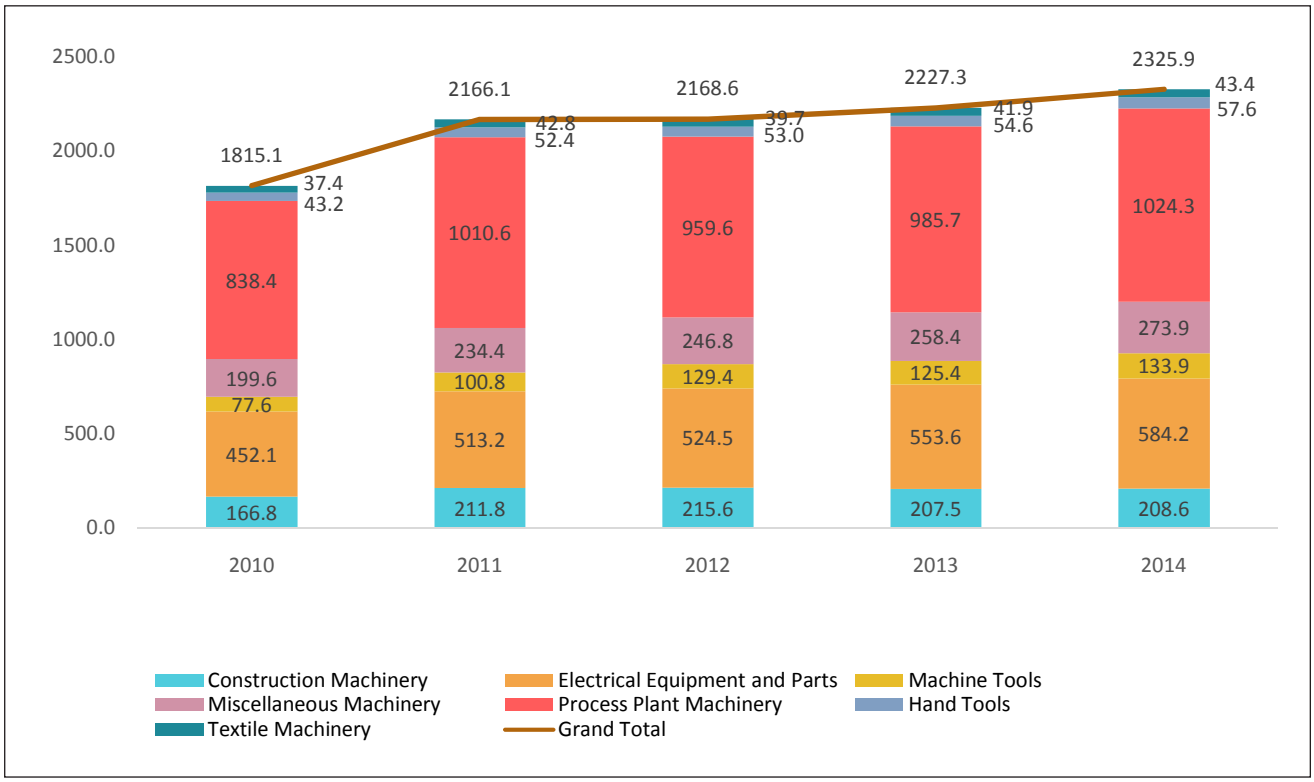
GLOBAL SCENARIO

In 2014, global exports of machinery stood at US$ 2.3 trillion, recording a y-o-y growth of 4.4 percent. The growth was broad-based with all segments registering a growth during the year (Exhibit 9). The HS Codes for each of the segments is provided at Annexure 1. Process plant machinery was the largest segment of exports, accounting for nearly 44.0 percent of the total machinery exports. Electrical equipment and parts had the second largest share of 25.1 percent.

China was the largest machinery exporter during 2014, while the USA was the largest importer. Several of the top machinery exporters were also the major importers. For example, while China had a share of 15.4 percent in world exports during 2014, it was also the third largest importer of these products with a share of 7.0 percent. The USA accounted for nearly 15.4 percent of global imports of machinery, while nearly 10.2 percent of the machinery exports also originated from this country. Germany, the second largest exporter of machinery with a share of 13.5 percent in global exports, was also the second largest importer of these products, having a share of 7.7 percent in global imports (Exhibit 10).

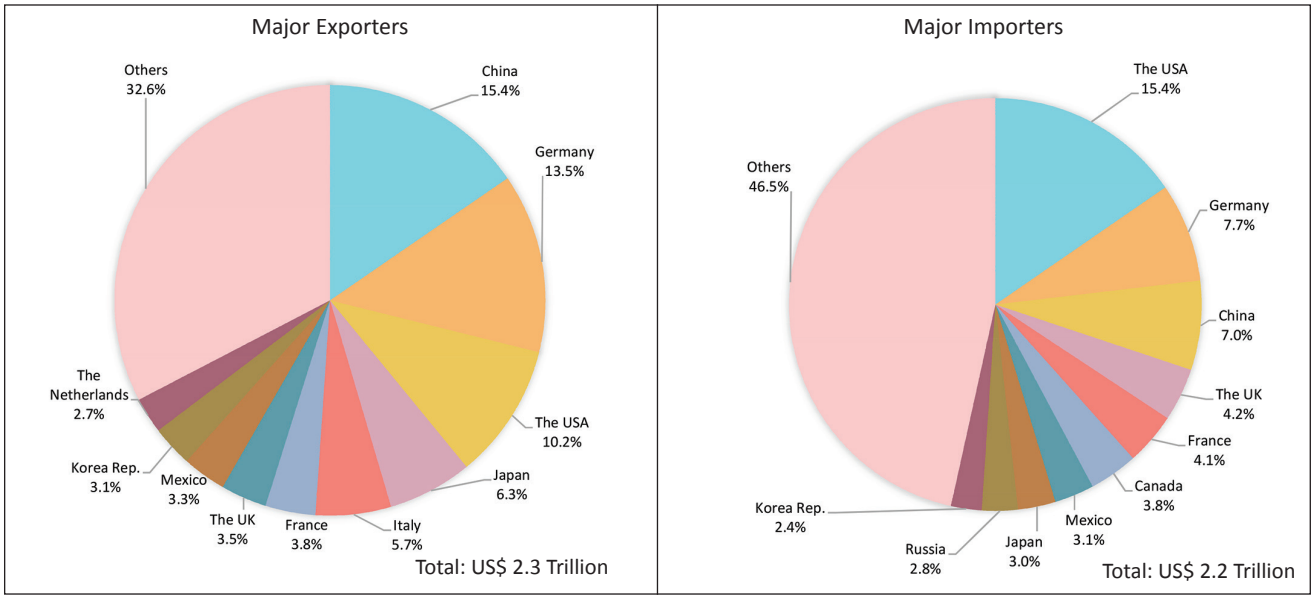
India's share in global machinery trade has been relatively low. It was the 20th largest importer of machinery in the world, with a share of 1.5 percent in global imports. The share in global exports was also low at 0.7 percent.

Exhibit 9: Category-wise Global Exports of Machinery (US$ Bn)



Source: ITC/UNCTAD-PCTAS

Exhibit 10: Major Exporters and Importers of Machinery in the World (2014)



Source: ITC/UNCTAD-PCTAS

Process plant machinery was the largest category of machinery imports in the world. The USA was the largest import market for these products, accounting for 14.4 percent of global imports during 2014 (Table 10). Germany, on the other hand, was the largest exporter of these products, with a share of 16.1 percent during the year. China was the largest exporter in the categories of electrical equipment and parts, construction machinery, hand tools, textile machinery and miscellaneous machinery (Table 9). India was not among the top five exporters in any of the categories of machinery, although it featured as the fifth largest importer of textile machinery in 2014.

Table 9: Category-wise Top Exporters in Machinery Sector (Value in US$ Bn)

Category/ Exporter	2010	2014	CAGR	Share % (2014)
Construction Machinery	**166.8**	**208.6**	**5.7%**	**100.0%**
China	17.0	29.4	14.7%	14.1%
The USA	25.2	27.1	1.8%	13.0%
Germany	20.6	24.1	4.0%	11.6%
Japan	16.7	15.6	-1.7%	7.5%
Italy	8.3	11.1	7.4%	5.3%
Electrical Equipment and Parts	**452.1**	**584.2**	**6.6%**	**100.0%**
China	75.5	125.9	13.6%	21.6%
Germany	54.9	61.1	2.7%	10.5%
The USA	40.3	49.3	5.1%	8.4%
The UK	23.8	31.5	7.3%	5.4%
France	24.8	27.2	2.3%	4.6%
Machine Tools	**77.6**	**133.9**	**14.6%**	**100.0%**
Japan	11.3	22.5	18.6%	16.8%
Germany	13.5	19.7	9.9%	14.7%

China	9.6	15.7	13.1%	11.7%
The USA	6.1	14.6	24.4%	10.9%
Italy	6.5	8.1	5.7%	6.0%
Miscellaneous Machinery	**199.6**	**273.9**	**8.2%**	**100.0%**
China	31.4	51.2	13.0%	18.7%
Germany	23.9	29.5	5.4%	10.8%
The USA	20.0	26.8	7.7%	9.8%
Switzerland	17.4	26.6	11.2%	9.7%
Italy	9.6	11.9	5.4%	4.3%
Process Plant Machinery	**838.4**	**1024.3**	**5.1%**	**100.0%**
Germany	130.9	164.7	5.9%	16.1%
China	73.9	113.5	11.3%	11.1%
The USA	95.0	112.8	4.4%	11.0%
Italy	61.5	74.2	4.8%	7.2%
Japan	88.8	66.1	-7.1%	6.5%
Hand Tools	**43.2**	**57.6**	**7.5%**	**100.0%**
China	7.6	12.8	14.1%	22.2%
Germany	6.4	8.7	7.7%	15.0%
The USA	4.2	4.9	4.3%	8.6%
Japan	3.3	3.7	3.0%	6.5%
Taiwan	2.0	2.7	7.0%	4.6%
Textile Machinery	**37.4**	**43.4**	**3.8%**	**100.0%**
China	6.0	9.8	13.2%	22.6%
Germany	5.6	5.5	-0.7%	12.7%
Italy	3.9	3.9	0.1%	9.1%
Japan	3.3	2.9	-2.6%	6.8%
South Korea	3.0	2.6	-3.5%	6.0%

Source: ITC/UNCTAD-PCTAS

Table 10: Category-wise Top Importers in Machinery Sector (Value in US$ Bn)

Category/ Importer	2010	2014	CAGR	Share % (2014)
Construction Machinery	**154.4**	**191.8**	**5.6%**	**100.0%**
The USA	12.8	23.7	16.7%	12.4%
Canada	7.1	9.5	7.7%	5.0%
Germany	6.5	9.3	9.3%	4.8%
China	11.6	9.2	-5.7%	4.8%
Russia	5.7	8.0	9.0%	4.2%
Electrical Equipment and Parts	**470.0**	**580.0**	**5.4%**	**100.0%**
The USA	70.3	98.4	8.8%	17.0%
Germany	39.0	50.4	6.6%	8.7%
The UK	27.1	34.5	6.2%	5.9%
China	31.4	33.5	1.7%	5.8%
France	23.5	27.8	4.3%	4.8%

Machine Tools	**76.9**	**134.1**	**14.9%**	**100.0%**
China	12.7	22.6	15.4%	16.8%
The USA	8.8	19.3	21.7%	14.4%
Taiwan	1.3	8.4	60.5%	6.3%
South Korea	2.2	8.2	39.5%	6.1%
Germany	5.3	8.0	10.9%	6.0%
Miscellaneous Machinery	**202.4**	**262.7**	**6.7%**	**100.0%**
The USA	35.6	50.4	9.0%	19.2%
Germany	16.8	22.7	7.9%	8.6%
China	12.3	14.6	4.5%	5.6%
France	10.4	12.3	4.3%	4.7%
Hong Kong	8.5	11.5	8.0%	4.4%
Process Plant Machinery	**819.7**	**972.4**	**4.4%**	**100.0%**
The USA	93.1	140.2	10.8%	14.4%
Germany	59.5	75.4	6.1%	7.8%
China	74.7	68.8	-2.0%	7.1%
Canada	31.6	40.6	6.5%	4.2%
France	33.8	37.3	2.6%	3.8%
Hand Tools	**42.2**	**53.9**	**6.3%**	**100.0%**
The USA	5.8	8.2	8.9%	15.1%
Germany	3.8	5.0	7.5%	9.3%
China	2.6	3.4	6.9%	6.3%
The Netherlands	1.9	2.4	6.0%	4.4%
Canada	1.8	2.0	3.4%	3.7%
Textile Machinery	**37.6**	**42.4**	**3.1%**	**100.0%**
The USA	3.8	4.4	3.9%	10.4%
China	4.8	4.4	-2.1%	10.4%
Germany	2.0	2.3	4.0%	5.5%
Turkey	1.3	2.2	14.6%	5.2%
India	1.9	2.2	3.6%	5.1%

Source: ITC/UNCTAD-PCTAS

INDIAN SCENARIO

India is a net importer of machinery, with exports in 2015-16 amounting to US$ 19.4 bn, and imports aggregating US$ 34.0 bn (Exhibits 11 and 12). Exports of machinery witnessed positive y-o-y growth over the past few years, before registering a decline of (-) 4.2 percent in 2015-16. In spite of this decline, the CAGR for exports during FY12-FY16 remained robust at 3.8 percent. On the other hand, imports of machinery declined from US$ 39.3 bn in FY12 to US$ 34.0 bn in FY16. These intersecting trends have reduced the overall trade deficit in the sector, although it still remains sizeable at US$ 14.6 bn.

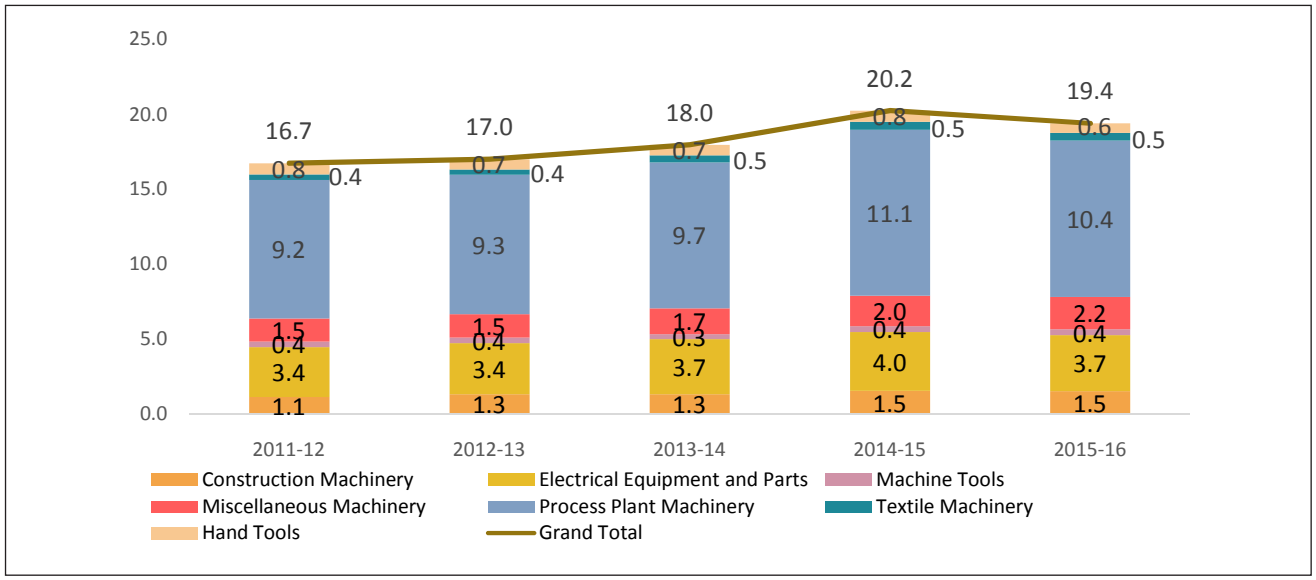
Process plant machinery — the largest category of machinery exports from India – has grown in line with the overall trend for machinery exports during the period FY11-FY15. Thereafter, exports of these products registered a decline of (-) 6.1 percent during FY16 (Exhibit 11). Exports from India declined across most segments of the machinery sector during FY16. Only the segments of machine tools, miscellaneous machinery and textile machinery registered a y-o-y growth in exports of 4.1 percent, 7.6 percent and 1.5 percent, respectively.

In case of imports, process plant machinery imports recorded the highest y-o-y growth during FY16 of 10.2

percent. This was also the largest category of imports by India (Figure 12). During the period FY11-FY16, imports by India in the categories of construction machinery, electrical equipment and parts, and process plant machinery registered negative CAGRs of (-) 10.6 percent, (-) 11.7 percent, and (-) 2.9 percent, respectively. Consequently, total imports registered a CAGR of (-) 3.6 percent during this period.

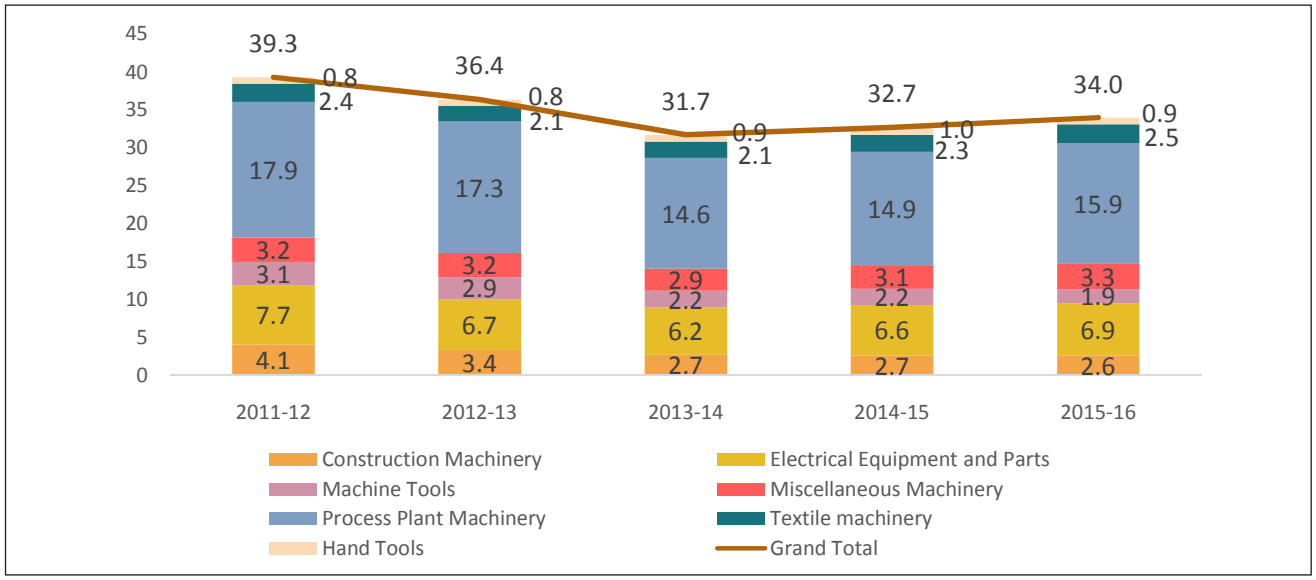
The availability of low-cost equipment from China and other countries has led to increased imports of process equipment machinery by India. Moreover, the availability of new, innovative and technologically advanced process plant equipment in developed countries has also contributed to the increase in imports. Over the past few years, Indian vendors are adopting new and innovative techniques to compete

Exhibit 11: Category-wise Exports of Machinery from India (US$ Bn)



Source: DGCI&S

Exhibit 12: Category-wise Imports of Machinery by India (US$ Bn)



Source: DGCI&S

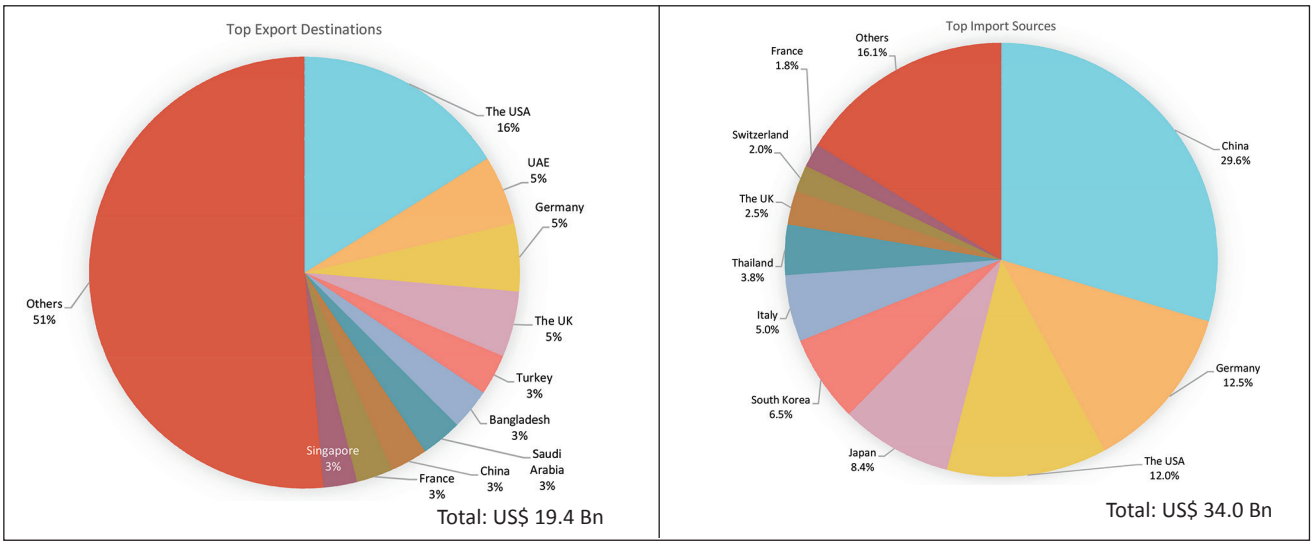
with international vendors, thereby reducing the import of process plant equipment[6].

The USA was the largest market for India's exports of machinery in 2015-16, with a share of 16 percent in total exports. UAE, Germany and the UK (shares of 5 percent each) were the other top export destinations for machinery exports during the year (Exhibit 13). The USA was the topmost export destination in the segments of electrical equipment and parts (share of 13.3 percent), process plant machinery (16.4 percent), hand tools (19.8 percent), machine tools (11.2 percent) and miscellaneous machinery (28.1 percent). For construction machinery export, UAE was the largest market for India's exports during 2015-16, with a share of 8.9 percent (Table 11).

While Asian countries (not including China) are not among the top global importers, they feature among India's major export destinations. For example, under construction machinery, UAE, Singapore and Saudi Arabia were among the top five export destinations for India in 2015-16, with shares of 8.9 percent, 5.8 percent and 4.9 percent, respectively. Bangladesh, Vietnam, and Indonesia were the top export destinations for India in the category of textile machinery, with shares of 12.2 percent, 8.5 percent, and 7.0 percent, respectively (Table 11).

Of the total imports of US$ 34.0 bn by India in 2015-16, more than a quarter was sourced from China, with Germany (12.5 percent), the USA (12.0 percent), and Japan (8.4 percent) being the other major sources (Exhibit 13). China was the largest import source for India among all categories of machinery (Table 12).

Exhibit 13: India's Major Export Destinations and Import Sources for Machinery (2015-16)



Source: DGCI&S

Table 11: Category-wise Top Destinations for India's Machinery Exports (Value in US$ Mn)

Category/ Import Sources	2011-12	2015-16	CAGR (%)	Share % (2015-16)
Construction Machinery	**1117.1**	**1500.0**	**7.6**	**100.0%**
UAE	164.5	133.6	-5.1	8.9%
The USA	90.6	126.3	8.6	8.4%
The UK	101.2	96.3	-1.2	6.4%
Singapore	117.2	86.8	-7.2	5.8%
Saudi Arabia	30.8	73.4	24.3	4.9%

[6]TechNavio

Electrical Equipment and Parts	**3353.5**	**3746.7**	**2.8**	**100.0%**
The USA	486.6	497.3	0.5	13.3%
Germany	252.4	233.9	-1.9	6.2%
UAE	170.5	223.2	7.0	6.0%
The UK	196.9	206.5	1.2	5.5%
Singapore	112.4	98.6	-3.2	2.6%
Hand Tools	**753.6**	**640.7**	**-4.0**	**100.0%**
The USA	119.2	126.7	1.5	19.8%
Germany	65.6	53.3	-5.1	8.3%
The Netherlands	34.6	45.0	6.8	7.0%
UAE	67.4	37.8	-13.4	5.9%
The UK	29.2	29.9	0.5	4.7%
Machine Tools	**362.8**	**392.3**	**2.0**	**100.0%**
The USA	43.4	44.1	0.4	11.2%
Germany	48.0	43.0	-2.7	11.0%
Bhutan	1.0	30.9	135.8	7.9%
China	17.8	26.1	10.0	6.7%
Belgium	25.5	25.9	0.4	6.6%
Miscellaneous Machinery	**1528.9**	**2175.0**	**9.2**	**100.0%**
The USA	252.6	612.0	24.8	28.1%
Germany	125.6	125.6	0.0	5.8%
UAE	117.2	117.5	0.1	5.4%
The UK	129.3	116.7	-2.5	5.4%
Singapore	109.9	74.8	-9.2	3.4%
Process Plant Machinery	**9241.1**	**10424.7**	**3.1**	**100.0%**
The USA	1458.2	1708.0	4.0	16.4%
The UK	548.2	492.3	-2.7	4.7%
Germany	477.9	474.0	-0.2	4.5%
UAE	375.0	472.3	5.9	4.5%
Turkey	258.6	416.8	12.7	4.0%
Textile machinery	**374.0**	**513.8**	**8.3**	**100.0%**
Bangladesh	32.8	62.8	17.6	12.2%
Vietnam	4.2	43.5	79.6	8.5%
Indonesia	29.8	35.8	4.8	7.0%
The Netherlands	17.7	35.4	19.0	6.9%
Germany	39.1	34.5	-3.1	6.7%

Source: DGCI&S

Table 12: Category-wise Top Sources for India's Machinery Imports (Value in US$ Mn)

Category/ Import Sources	2011-12	2015-16	CAGR (%)	Share % (2015-16)
Construction Machinery	**4080.5**	**2600.9**	**-10.6**	**100.0%**
China	1009.3	762.7	-6.8	29.3%
Germany	564.6	424.3	-6.9	16.3%
The USA	429.7	292.1	-9.2	11.2%
South Korea	304.1	232.1	-6.5	8.9%
Japan	440.8	176.7	-20.4	6.8%
Electrical Equipment and Parts	**7744.3**	**6895.7**	**-2.9**	**100.0%**
China	2388.0	2712.3	3.2	39.3%
The USA	722.6	919.1	6.2	13.3%
Germany	927.7	538.1	-12.7	7.8%
South Korea	417.8	437.2	1.1	6.3%
Japan	688.1	401.3	-12.6	5.8%
Hand Tools	**825.0**	**854.4**	**0.9**	**100.0%**
China	156.9	214.9	8.2	25.1%
Japan	146.3	153.8	1.3	18.0%
South Korea	93.2	131.4	9.0	15.4%
Germany	124.0	89.1	-7.9	10.4%
The USA	63.1	60.8	-0.9	7.1%
Machine Tools	**3147.3**	**1911.9**	**-11.7**	**100.0%**
China	462.0	431.7	-1.7	22.6%
Japan	666.8	342.7	-15.3	17.9%
Germany	458.1	286.0	-11.1	15.0%
Italy	306.7	192.0	-11.1	10.0%
South Korea	260.7	91.7	-23.0	4.8%
Miscellaneous Machinery	**3221.4**	**3299.0**	**0.6**	**100.0%**
China	817.6	1176.3	9.5	35.7%
Germany	562.5	423.0	-6.9	12.8%
Japan	251.5	256.1	0.5	7.8%
The USA	202.9	210.2	0.9	6.4%
Switzerland	191.3	159.8	-4.4	4.8%
Process Plant Machinery	**17897.5**	**15928.0**	**-2.9**	**100.0%**
China	3794.3	3804.1	0.1	23.9%
The USA	1610.3	2474.8	11.3	15.5%
Germany	2963.3	2081.2	-8.5	13.1%
Japan	1946.8	1177.1	-11.8	7.4%
South Korea	1241.7	1086.2	-3.3	6.8%
Textile machinery	**2405.5**	**2504.4**	**1.0**	**100.0%**
China	821.2	956.7	3.9	38.2%
Germany	408.4	404.9	-0.2	16.2%
Japan	306.3	338.0	2.5	13.5%
Italy	226.7	214.7	-1.3	8.6%
Switzerland	218.9	151.3	-8.8	6.0%

Source: DGCI&S

NEUTRALIZING INDIA'S TRADE DEFICIT

Indian machinery sector has significant opportunities both in domestic and export markets. However, there are also challenges engulfing this sector. While the demand for capital goods in the country has been witnessing a consistent increase, domestic machinery manufacturers have not been able to keep up with the pace of demand, leading to increasing dependence on imports across market segments.

India is among the top ten producers for machinery in the world, and exports from the sector have registered a consistent increase over the past few years. In spite of the prowess of Indian companies in the sector, imports of these products still far outpace the exports from the sector, thereby leading to substantial trade deficit. A two pronged approach of import substitution and export promotion can be adopted for neutralizing this trade deficit.

The domestic market for machinery provides significant opportunities for Indian machinery manufacturers to grow and achieve economies of scale, as also increase their efficiency levels for competing in export markets. In the present section, an analysis of India's exports and imports of machinery products is undertaken with the purpose of identifying products and markets where Indian companies can expand their presence.

Identification of Domestic Capabilities

Trade Specialization Index (TSI) is used to measure the degree of net exportation by a country in a particular commodity. It basically compares the net flow of goods with the total flow of goods, thereby removing bias due to re-export activities, if any. It thus helps in identification of producers of a commodity and not merely traders. The range of TSI is (+) 1 to (-) 1, where (+) 1 indicates complete specialization and (-) 1 indicates no specialization. Algebraically, it can be written as-

$$TSI = \frac{X-M}{X+M}$$

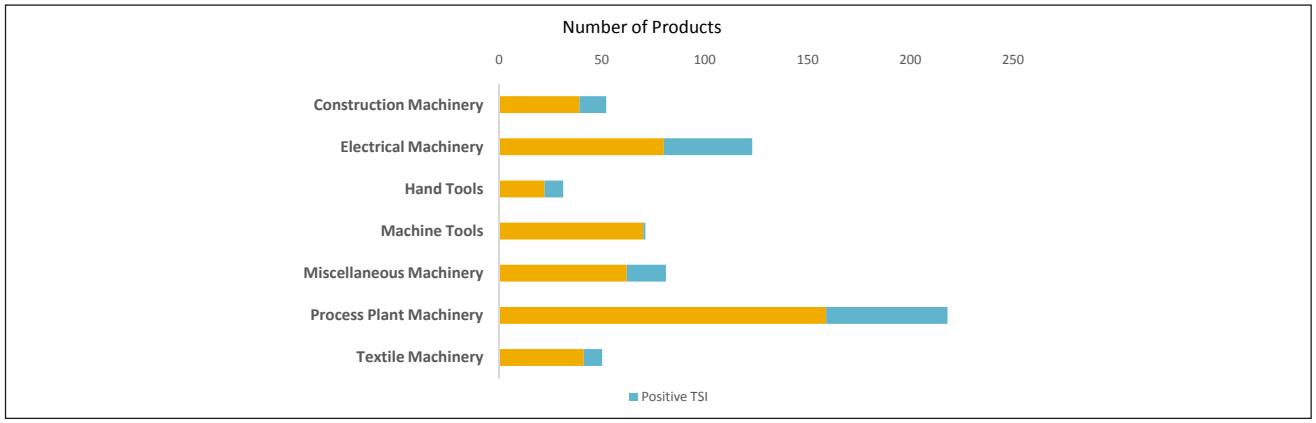
where X refers to exports and M refers to imports of the commodity by a country.

Of the 626 machinery products at HS-6 digit level for which TSI was calculated, India had negative TSI in 473 products. Of the products taken into consideration, India had negative TSI in nearly 99 percent of machine tools, 82 percent of textile machinery, 75 percent of construction machinery, 73 percent of process plant machinery, 71 percent of hand tools, 65 percent of electrical equipment and parts, and 77 percent of miscellaneous machinery (Exhibit 14). Capacity additions in these segments can help meet the demand of the domestic market.

Identification of Products for Import Substitution and Export Promotion

An attempt has been made to identify focus machinery products where domestic production can be incentivised with the purpose of meeting the domestic demand as well as penetrating the export market. Further, a market specific approach has been outlined for exporters by analysing the major importers of these products and the key competitors for India in these markets.

Exhibit 14: Share of Products where India had Positive TSI



Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Methodology

The analysis in this section considers four major parameters for identification of relevant products and markets:

- The TSI for product at HS-6 digit level is negative, indicative of India not having production and export specialization in the product
- Value of imports by India is at least US$ 50 million, suggestive of the robust domestic demand for the product
- Annual Average Growth rate (AAGR) for India's imports of the product is higher than that for imports of machinery as a whole, reflecting rising domestic demand for the product
- AAGR for global imports of these products is higher than that for imports of machinery as a whole, thereby providing opportunities for neutralization of trade deficit in such dynamic products through export promotion channel

Construction Machinery

Following the aforementioned methodology, a total of four construction machinery products have been identified where domestic capacity additions can be encouraged. In the category of lifts and skip hoists (HS: 842810), Russia, China, the UK, Canada and Switzerland are the top import markets. While China is a major importer of these products, it is also an important supplier in several top markets (Table 13).

In the category of overhead travelling cranes, transporter cranes, gantry cranes, bridge cranes and mobile lifting frames (HS: 842619), the Asian economies of Singapore, Indonesia, Vietnam and South Korea are among the top importers. China accounts for bulk of the share in these markets (Table 13), which creates a case for seeking horizontal FDI from China in this category.

Table 13: Identified Products for Export Promotion in Construction Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
842619	Overhead travelling cranes, transporter cranes, gantry cranes, bridge cranes and mobile lifting frames (excluding overhead travelling cranes on fixed support, mobile lifting frames on tyres, straddle carriers and portal or pedestal jib cranes)	94	39.3%	2169	Singapore	297	China (55.2), Germany (13.5), Japan (12.1), Norway (6.1), The USA (4.4)
					Indonesia	188	China (63.3), Japan (13.8), Singapore (9.6), South Korea (3.2), Finland (2.1)
					The USA	159	Japan (22.6), China (14.5), Ireland (13.8), Finland (13.2), Germany (7.5)
					Viet Nam	137	China (70.8), Germany (8.8), Japan (7.3), Malaysia (4.4), South Korea (3.6)
					South Korea	130	China (66.2), Poland (16.2), Norway (7.7), Estonia (4.6), Taiwan (PoC) (3.8)
842810	Lifts and skip hoists	104	18.3%	5208	Russia	469	Belarus (23.5), China (19.6), Germany (12.8), Czech Rep (8.5), France (7.9)
					China	244	Japan (66.4), Germany (10.2), South Korea (4.1), The USA (3.7), Sweden (3.7)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
					The UK	236	Italy (25.8), The Netherlands (25.4), Germany (9.7), The USA (8.9), Finland (7.6)
					Canada	191	The USA (89), China (3.7), Germany (2.1), Spain (0.5), Switzerland (0.5)
					Switzerland	172	Spain (57), Italy (16.3), Germany (10.5), France (6.4), Austria (2.3)
842890	Machinery for lifting, handling, loading or unloading, n.e.s.	143	7.0%	11547	The USA	2374	Mexico (29.7), Japan (17.5), Canada (14.1), Germany (10.1), China (5.7)
					China	1374	Germany (25.0), Japan (16.4), South Korea (12.0), Taiwan (PoC) (7.9), France (6.7)
					Australia	614	China (30.6), The USA (13.4), Germany (10.9), Malaysia (9.4), South Korea (6.5)
					Germany	606	France (12.5), Austria (10.2), The Netherlands (9.4), Switzerland (9.1), Sweden (7.8)
					Russia	489	Germany (27.0), Italy (15.1), France (9.0), China (6.1), The Netherlands (5.1)
843139	Parts of machinery of heading 8428, n.e.s.	135	10.1%	7371	The USA	1370	Canada (20.5), China (15.5), Germany (14.6), Mexico (8.5), Japan (6.2)
					Germany	614	Poland (13.0), Switzerland (12.2), Czech Rep (8.1), Austria (8.0), The Netherlands (7.3)
					Canada	379	The USA (51.7), China (7.7), France (6.6), Denmark (5.8), Germany (5.5)
					France	334	Italy (23.4), Germany (23.1), Austria (7.5), Belgium (4.2), The Netherlands (3.3)
					China	305	Germany (34.1), South Korea (16.1), The USA (11.1), Japan (9.2), France (6.6)

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Electrical Equipment and Parts

Eleven products have been identified in the electrical equipment and parts category where the country can expand domestic capacities with an aim of not only import substitution but also of export promotion.

Among the eleven products, turbojets of a thrust > 25 kN (HS: 841112) is the largest (non-residual) imported product at the global level, with imports worth US$ 33.5 billion in 2014. It was also the largest import item for India with a value of US$ 537 million – this figure having grown significantly during the 2010-14 period, registering an exponential AAGR of 147.4%. However, India is also a key supplier to the UK, which was the largest importer of these products in 2014. India had a share of 2.8 percent in the UK market for this product, with the USA, France, Singapore and Germany being the major competitors for India in the market (Table 14).

Focusing on creating and expanding domestic capacities for this product can create the twin benefits of not only reducing imports, but also providing opportunities for exports of a product whose demand has been increasing across the world. One way of adding capacities could be to attract FDI in this sector from one of the major suppliers, viz. the USA.

FDI from China can be attracted in the segment of switches for a voltage <= 1.000 V (excluding relays and automatic circuit breakers) (HS: 853650) on account of its significant share in the key global markets, which is indicative of the substantial expertise of Chinese players in this segment.

Several low cost manufacturing destinations feature among the top suppliers for lead acid accumulators (HS: 850720). India can focus on capacity additions in this segment to capture a greater market share.

Hand Tools

Two products have been identified in the hand tools category, namely interchangeable tools for pressing, stamping or punching (HS: 820730), and plates, sticks, tips and the like for tools, unmounted, of sintered metal carbides or cermets (HS: 820900) (Table 15). More than 90 percent of the domestic production of hand tools is from the small scale sector. Strategies for augmenting production and exports from the sector must focus on initiatives such as setting up of Common Facility Centres, which will enable Micro, Small and Medium Enterprises (MSMEs) to adopt new technologies, carry out research and development, etc.

Table 14: Identified Products for Export Promotion in Electrical Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
841112	Turbojets of a thrust > 25 kN	537	147.4%	33543	The UK	7060	The USA (62.7), France (3.3), India (2.8), Singapore (2.3), Germany (1.6)
					The USA	4463	France (41.7), The UK (29.1), Germany (22.2), Canada (5.9)
					Germany	4253	The USA (43.2), France (37.1), Switzerland (2.3), Canada (2.0), The UK (1.9)
					France	3535	The USA (54.1), Germany (31.7), Canada (6.3), Singapore (5.5)
					UAE	3511	The USA (80.2), The UK (15.0), France (4.5)
841191	Parts of turbojets or turbopropellers, n.e.s.	82	18.3%	52642	The USA	12133	France (29.3), Japan (15.5), The UK (10.7), Canada (8.9), Germany (7.6)
					The UK	7268	The USA (53.0), France (12.6), Germany (8.1), The UK (6.2), Japan (5.6)
					Singapore	5373	The USA (61.6), The UK (18.8), France (5.7), Canada (2.8), Germany (2.6)
					Germany	4435	The USA (47.7), Poland (9.9), Japan (9.6), France (8.6), Singapore (5.1)
					France	4432	The USA (60.1), The UK (6.5), Belgium (4.7), China (4.3), Canada (2.1)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
841290	Parts of non-electrical engines and motors, n.e.s.	78	22.8%	7357	The USA	1967	China (24.9), Germany (14), Mexico (11.9), Brazil (10.0), Canada (7.7)
					Germany	908	Portugal (21.4), Denmark (15.6), Spain (10.2), China (8.5), Brazil (8.1)
					Canada	436	The USA (57.8), Spain (8.7), Germany (5.7), China (5.5), Canada (5.5)
					The UK	386	Denmark (52.6), Germany (10.9), The USA (7.3), Spain (4.7), Italy (3.9)
					The Netherlands	270	The USA (25.2), South Africa (19.6), Germany (15.6), Spain (5.6), Italy (4.8)
850131	DC motors of an output > 37,5 W but <= 750 W and DC generators of an output <= 750 W	71	10.7%	8467	The USA	1848	Mexico (39.4), China (23.5), Japan (9.5), Germany (7.6), South Korea (6.2)
					Germany	972	China (26.9), Hungary (15.1), Switzerland (11.2), Czech Rep (9.2), France (5.5)
					China	628	Germany (26.4), Japan (15.8), South Korea (15.0), The USA (4.1)
					Mexico	486	China (33.7), The USA (23.3), South Korea (16.9), Germany (6.8), Taiwan (Poc) (6.2)
					France	431	Germany (35.7), China (17.9), Japan (17.4), Spain (6.5), The USA (3.0)
850152	AC motors, multi-phase, of an output > 750 W but <= 75 kW	122	26.0%	7341	The USA	1164	Mexico (26.0), China (19.8), Germany (11.4), Brazil (9.1), Japan (8.5)
					Germany	917	Italy (22.1), France (13), China (11.6), Poland (10.8), Czech Rep (7.2)
					China	711	Germany (30.4), Japan (22.8), France (13.6), Italy (6.9), The UK (3.9)
					Italy	401	Germany (41.6), China (20.7), Czech Rep (11.7), Poland (7.0), Austria (2.2)
					Japan	293	China (44.4), Thailand (13.3), Viet Nam (10.9), Taiwan (Poc) (8.2), The USA (6.5)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
850153	AC motors, multi-phase, of an output > 75 kW	60	3.8%	4613	The USA	821	Mexico (28.4), Brazil (16.4), Japan (13.0), Germany (7.6), China (7.2)
					China	530	Germany (36.8), Finland (10.0), Japan (9.4), France (6.6), Italy (5.5)
					Germany	347	Finland (24.5), Poland (11.0), Austria (10.4), China (9.5), Brazil (7.5)
					Canada	254	The USA (54.7), Brazil (9.4), Germany (7.1), Taiwan (Poc) (5.9), Japan (5.1)
					South Korea	178	Germany (29.2), Finland (16.3), Japan (9.6), The USA (9.0), Italy (9.0)
850720	Lead acid accumulators (excluding spent and starter batteries)	136	3.3%	6094	The USA	928	China (38.1), Mexico (33.1), Viet Nam (9.2), Taiwan (Poc) (7.1), Philippines (3.6)
					Germany	477	China (21.8), Slovenia (11.9), France (8.8), Italy (7.8), Greece (6.9)
					The Netherlands	318	China (20.4), Viet Nam (14.2), Germany (12.9), Philippines (11.9), Belgium (6.6)
					Canada	304	The USA (71.1), China (13.5), Mexico (3.9), Taiwan (Poc) (2.3), Viet Nam (2.0)
					Italy	294	China (33.3), Poland (15.3), Germany (10.5), Slovenia (7.8), Greece (4.4)
850790	Plates, separators and other parts of electric accumulators, n.e.s.	116	10.9%	2803	China	461	Japan (77.0), South Korea (8.9), The USA (2.8), Germany (2.0)
					The USA	425	Japan (64.9), China (7.1), South Korea (5.9), France (5.6), Mexico (3.8)
					France	280	Spain (28.6), Czech Rep (21.4), Germany (20.0), The UK (7.5), Canada (6.1)
					Germany	184	Czech Rep (26.1), The UK (14.7), Romania (13.6), Luxembourg (8.7), Italy (7.6)
					The UK	159	Japan (59.1), France (10.7), South Africa (6.3), Bulgaria (5.0), China (5.0)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
853650	Switches for a voltage <= 1.000 V (excluding relays and automatic circuit breakers)	179	12.3%	20064	The USA	2573	Mexico (26.5), China (20.2), Japan (13.6), Germany (8.0), South Korea (3.1)
					China	2254	The USA (22.4), Japan (22.1), Germany (7.7), South Korea (4.3)
					Germany	1914	China (12.6), Czech Rep (11.2), Switzerland (7.3), Hungary (6.5), Romania (6.0)
					Mexico	1153	The USA (38.9), China (18.6), Japan (11.8), Germany (7), Thailand (3.1)
					Hong Kong	1033	China (59.3), Japan (17.6), The USA (4.0), Thailand (3.4), Malaysia (3.4)
940510	Chandeliers and other electric ceiling or wall lighting fittings (excluding for lighting public open spaces or thoroughfares)	91	9.7%	13929	The USA	3451	China (51.5), Mexico (34.4), Canada (5.5), Germany (2.3), Italy (1.2)
					Germany	1191	China (53.5), Austria (10.7), Italy (5.3), Romania (3.4), Spain (2.9)
					France	748	China (40.4), Germany (13.4), Italy (13.2), Spain (5.2), Hungary (4.0)
					The UK	612	China (48.7), Austria (7.8), Italy (6.2), Germany (6.2), France (4.6)
					Canada	559	China (47.8), The USA (28.1), Mexico (19), Italy (1.6), Germany (0.7)
940540	Electric lamps and lighting fittings, n.e.s.	144	27.4%	16485	The USA	3703	China (71.1), Mexico (13.3), Canada (3.6), Germany (1.7), Taiwan (Poc) (1.5)
					Germany	1623	China (52.7), Malaysia (7.8), Italy (5.4), The Netherlands (4.5), South Korea (3.5)
					The UK	823	China (46.2), Spain (8.6), Germany (7.5), The Netherlands (7.4), Italy (6.2)
					France	654	China (50.9), Italy (8.4), Germany (7.6), Poland (4.6), Spain (4.0)
					Canada	623	China (49.8), The USA (35.6), Mexico (7.7), Germany (1.8), Italy (1.0)

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Table 15: Identified Products for Export Promotion in Hand Tools Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
820730	Interchangeable tools for pressing, stamping or punching	154	33.8%	5691	The USA	989	Japan (27.8), Canada (17.8), South Korea (16.2), China (15.8), Germany (7.7)
					China	897	South Korea (34.4), Japan (30.5), Germany (12.3), Taiwan (Poc) (8.2), Spain (3.7)
					Germany	578	Italy (17.6), Switzerland (10.0), China (7.6), South Korea (7.1), The UK (6.4)
					Mexico	547	The USA (29.3), Japan (21.4), China (13.3), South Korea (13.2), Germany (7.3)
					Canada	262	The USA (51.5), China (18.7), Japan (9.5), South Korea (8.8), Canada (4.6)
820900	Plates, sticks, tips and the like for tools, unmounted, of sintered metal carbides or cermets	122	19.6%	7450	The USA	1010	Sweden (21.1), Israel (18.4), Germany (15.9), Japan (15.0), China (5.7)
					Germany	965	Austria (14.4), Sweden (14.2), Japan (11.0), The USA (10.7), Belgium (9.3)
					The Netherlands	958	Sweden (41.8), Germany (26.4), The USA (5.6), Japan (5.1), Singapore (3.7)
					Belgium	550	Israel (47.6), Sweden (23.8), South Korea (6.0), Japan (5.3), Czech Rep (3.5)
					Italy	352	The Netherlands (36.9), Germany (25.9), Belgium (21.9), Luxembourg (3.4), The USA (2.0)

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Machine Tools

Six products have been identified in the machine tools sector where capacity additions can be targeted. Of these six products, machine tools for working any material by removal of material, operated by laser or other light or photon beam processes (HS: 845610) is the largest category of global imports (US$ 37.1 billion), with the Asian economies of China, Taiwan, South Korea, and Japan being the top importers of these products. India's imports of these products have witnessed an AAGR of 39.4 percent during 2010-2014 (Table 16), necessitating capacity additions in this segment for meeting the domestic demand for these products.

In four of the six identified products, India was among the top five importers in the world during 2014. These are hydraulic presses for working metal (HS: 846291), presses, not hydraulic, for working metal excluding forging, bending, folding, straightening, flattening, shearing, punching or notching (HS: 846299), machine tools for working stones, concrete, asbestos cement or similar mineral substances or for cold working glass (HS: 846490) and dividing heads and other special attachments for machine tools, n.e.s. (HS: 846630). In the category of machine tools for working stones, concrete, asbestos cement or similar mineral substances (HS: 846490), India has also emerged as one of the suppliers to the largest market of Nigeria. During 2014, India had a share of 4.9 percent in Nigerian imports of this product (Table 16).

Miscellaneous Machinery

There are six identified products in the miscellaneous machinery segment, of which India is among the top importing countries in two products. These are millstones, grindstones, grinding wheels and the like, without frameworks, for sharpening polishing, trueing or cutting, of agglomerated abrasives or ceramics (HS: 680422) where India accounted for 4 percent of the global imports during 2014, and wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, electrically operated, with opto-electronic display and with combined mechanical and opto-electronic display (HS: 910119) in which India had a share of 9 percent in global imports (Table 17). In case of latter, Switzerland is the largest supplier, and accounts for more than 90 percent share in several of the top importing markets. Market seeking investment can be attracted in these product categories on account of the significant import demand for these products.

Table 16: Identified Products for Export Promotion in Machine Tools Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
845610	Machine tools for working any material by removal of material, operated by laser or other light or photon beam processes (excluding soldering and welding machines, incl. those which can be used for cutting, material testing machines and machines for the manufacture of semiconductor devices or of electronic integrated circuits)	84	39.4%	37069	China	8915	Japan (31.1), South Korea (19), The USA (16.7), Taiwan (Poc) (8.6), The Netherlands (7.7)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
					Taiwan (Poc)	7430	Japan (35.4), The USA (26.1), The Netherlands (18.0), Singapore (11.3), South Korea (2.5)
					South Korea	5992	The USA (32.1), The Netherlands (30.7), Japan (26.7), Singapore (3.7), China (2.3)
					The USA	5582	The Netherlands (39.0), Japan (31.1), Singapore (7.7), South Korea (7.6), Germany (3.5)
					Japan	1885	The USA (41.4), The Netherlands (25.6), Singapore (13.2), Germany (6.6), China (3.1)
845710	Machining centres for working metal	234	12.7%	11841	China	4337	Japan (52.9), Germany (20.2), Taiwan (Poc) (9.4), South Korea (4.7), Italy (3.6)
					The USA	1365	Japan (59.9), Germany (14.4), Taiwan (Poc) (11.2), South Korea (5.6), Italy (2.0)
					Hong Kong	673	Japan (96.3), Taiwan (Poc) (1.3), Switzerland (1.0), China (0.6), Germany (0.3)
					Germany	521	Japan (23.4), The UK (11.5), Switzerland (11.5), Taiwan (Poc) (11.3), The Netherlands (8.1)
					Russia	503	Germany (35.6), Czech Rep (12.5), Taiwan (Poc) (10.9), Japan (8.2), Italy (7.8)
846291	Hydraulic presses for working metal (excluding forging, bending, folding, straightening and flattening presses)	75	7.9%	1124	China	177	Germany (42.4), Sweden (16.4), Japan (14.7), South Korea (7.9), Taiwan (Poc) (6.2)
					The USA	111	Germany (25.2), Italy (17.1), Japan (15.3), China (9.0), Spain (8.1)
					India	75	China (45.5), Italy (22.1), Germany (10.4), Japan (3.9), Switzerland (2.6)
					Thailand	65	Japan (61.5), Italy (6.2), The UK (4.6), China (4.6), Austria (4.6)
					Russia	59	Germany (44.1), Italy (22.0), China (15.3), France (5.1), Taiwan (Poc) (3.4)
846299	Presses, not hydraulic, for working metal (excluding forging, bending, folding, straightening and flattening presses)	89	24.6%	1175	Thailand	144	Japan (49.3), South Korea (11.1), Taiwan (Poc) (10.4), China (9.0), The USA (5.6)
					China	114	Germany (33.3), South Korea (16.7), Japan (12.3), Taiwan (Poc) (11.4), Italy (6.1)
					The USA	101	Japan (28.7), Germany (18.8), Canada (18.8), Taiwan (Poc) (11.9), Italy (7.9)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
					India	89	Japan (27.5), China (19.8), Taiwan (Poc) (8.8), Germany (8.8), South Korea (7.7)
					South Korea	69	Japan (50.7), Germany (27.5), The USA (8.7), China (4.3), Taiwan (Poc) (2.9)
846490	Machine tools for working stones, concrete, asbestos cement or similar mineral substances or for cold-working glass (excluding sawing machines, grinding machines, polishing machines, hand-operated machines and machines for scribing or scoring semiconductor wafers)	82	28.1%	1830	Nigeria	751	China (63.0), Germany (12.9), Italy (6.1), India (4.9), Sweden (2.3)
					China	284	Japan (38.0), Switzerland (21.5), Germany (8.1), Italy (7.7), Taiwan (Poc) (7.0)
					India	82	China (48.2), Italy (17.6), Israel (14.1), Germany (5.9), Belgium (4.7)
					The USA	64	Italy (32.8), China (17.2), Japan (12.5), Spain (10.9), Israel (6.3)
					Russia	62	Belarus (61.3), Italy (19.4), Germany (6.5), China (3.2), Austria (3.2)
846630	Dividing heads and other special attachments for machine tools, n.e.s.	131	11.9%	879	China	234	Japan (47.4), Taiwan (Poc) (26.5), Germany (11.5), The UK (4.7), The USA (2.1)
					India	131	South Korea (52.3), Japan (22.7), Germany (6.8), China (3.8), Thailand (3.0)
					The USA	85	China (29.4), Taiwan (Poc) (23.5), Germany (12.9), Japan (7.1), Canada (5.9)
					Germany	51	Switzerland (43.1), Italy (17.6), The USA (9.8), Japan (7.8), Austria (3.9)
					Italy	43	Germany (74.4), Japan (7.0), Czech Rep (4.7), Switzerland (4.7), Romania (4.7)

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Table 17: Identified Products for Export Promotion in Miscellaneous Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
680422	Millstones, grindstones, grinding wheels and the like, without frameworks, for sharpening, polishing, trueing or cutting, of agglomerated abrasives or ceramics (excluding of agglomerated synthetic or natural diamond, hand sharpening or polishing stones, perfumed pumice stones, and grinding wheels etc. specifically for dental drill engines)	95	16.1%	2481	China	224	Taiwan (Poc) (41.1), Japan (21.0), Germany (12.1), Austria (8.5), The USA (4.5)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
					Germany	222	Austria (23.4), Switzerland (11.3), Spain (11.3), Poland (11.3), China (9.0)
					The USA	206	China (20.4), Germany (16.0), Japan (14.1), Austria (10.7), Canada (6.8)
					India	95	China (47.4), Japan (10.5), Thailand (7.4), Germany (6.3), Austria (5.3)
					Mexico	93	The USA (44.1), Germany (12.9), China (11.8), Japan (7.5), Thailand (3.2)
830210	Hinges of all kinds, of base metal	70	22.0%	4599	The USA	816	China (35.5), Canada (21.0), Germany (8.0), Austria (7.2), Mexico (5.4)
					Germany	384	Austria (17.4), China (12.2), Italy (12.0), Czech Rep (10.2), Spain (9.6)
					Russia	225	Germany (27.1), China (26.7), Austria (15.1), Turkey (6.7), Italy (4.4)
					China	224	Germany (42), Austria (15.2), South Korea (11.6), Japan (7.1), The USA (4.0)
					Austria	222	Germany (79.3), Switzerland (9.9), Italy (4.5), France (2.3), The USA (0.9)
848330	Bearing housings for machinery, not incorporating ball or roller bearings; plain shaft bearings for machinery	87	11.4%	5942	The USA	973	China (21.6), Japan (19.5), Mexico (11.4), Germany (11.2), Canada (4.5)
					Germany	619	China (12.9), Japan (10.7), Austria (10.5), Poland (8.1), The USA (7.4)
					Mexico	430	The USA (52.8), Germany (7.2), Taiwan (Poc) (7.0), China (7.0), Japan (7.0)
					China	412	Germany (27.7), Japan (23.3), The USA (9.7), South Korea (7.5), France (5.1)
					Canada	227	The USA (62.1), China (10.6), Japan (7.9), Germany (4.8), The UK (1.8)
848350	Flywheels and pulleys, incl. pulley blocks	80	12.7%	7271	Canada	973	The USA (82.6), Japan (5.4), South Korea (4.3), China (3.3), Germany (1.6)
					Germany	948	Hungary (17.1), Canada (15.2), Slovakia (15.1), France (13.2), China (6.9)
					The USA	638	Canada (29.2), China (22.1), Japan (13), Germany (9.9), South Korea (6.1)
					France	519	Germany (47.4), Italy (11.8), Slovakia (7.9), Canada (6.7), Turkey (5.0)
					Mexico	346	The USA (47.7), China (11.0), Japan (10.7), Germany (8.4), Canada (7.2)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
910119	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, electrically operated, with opto-electronic display and with combined mechanical and opto-electronic display (excluding with backs made of steel)	64	33.9%	691	Thailand	175	Switzerland (97.1), Germany (1.7), China (0.6), France (0.6)
					Malaysia	86	Singapore (43.0), China (36.0), Switzerland (8.1), Hong Kong (5.8), Germany (2.3)
					India	64	Switzerland (95.3), The USA (1.6), China (1.6), Viet Nam (1.6)
					Spain	64	Switzerland (95.3), France (3.1), Italy (1.6)
					Italy	33	Spain (33.3), France (18.2), Austria (12.1), The Netherlands (9.1), Switzerland (6.1)
940190	Parts of seats, n.e.s.	132	12.6%	31022	The USA	9886	Mexico (59.2), China (14.9), Canada (9.7), Viet Nam (2.9), Japan (2.3)
					Germany	4760	Czech Rep (28.8), Poland (18.7), Hungary (7.4), Romania (5.1), China (4.5)
					Canada	1676	Mexico (46.1), The USA (37.1), China (6.9), Japan (1.9), South Korea (1.1)
					The UK	1516	Poland (20.5), The USA (12.1), Germany (9.2), Czech Rep (7.1), China (6.3)
					Mexico	1451	The USA (61.9), Canada (14), China (7.4), Germany (3.6), Japan (2.8)

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Process Plant Machinery

Maximum number of identified products are in the segment of process plant machinery. Table 18 highlights the focus products in this segment, along with top importing markets for these products, and the major supplier countries in these markets.

Of the 26 identified products, compression-ignition internal combustion piston engine "diesel or semi-diesel engine", for the propulsion of vehicles of Chapter 87 (HS: 840820) is the largest category of global imports, with Germany, Mexico, the USA, the UK and Turkey being the top importers for this product (Table 18). European countries are among the major suppliers of these products to the top importing countries. Horizontal FDI can therefore be attracted from these countries.

Parts of ball or roller bearings (excluding balls, needles and rollers), n.e.s. (HS: 848299) is the only product category where India is among the major suppliers for the top importing countries. India accounts for 10.0 percent share in the USA, the second largest market in this product group. India also accounts for 3.9 percent share in the Italian market, the fifth largest market in this product group. Japan, China, Germany are some of the top competitors for India in this product category (Table 18).

India is among the top importing countries for casting machines of a kind used in metallurgy or in metal foundries (HS: 845430), machinery for moulding or retreading pneumatic tyres or for moulding or otherwise forming inner tubes of rubber or plastics (HS: 847751), moulds for mineral materials (HS: 848060), and moulds for rubber or plastics (HS: 848079) (Table 18). There is need for import substitution in these product categories by attracting FDI from top supplier countries in these segments.

Textile Machinery

Two products have been identified in the textile machinery sector, namely textile spinning machines (excluding extruding and drawing or roving machines) (HS: 844520), and parts and accessories of machines

for extruding, drawing, texturing or cutting man-made textile (HS: 844820) (Table 19). India was the fourth largest importer in the former category, and the second largest importer in the latter. It was also a major supplier of these products to several of the top importing countries. For example, India had a share of 23.1 percent in Vietnam's import market for textile spinning machinery. India also accounted for 4.1 percent of Indonesia's imports of parts and accessories of machines for extruding, drawing, texturing or cutting man-made textile, and 74.4 percent of Switzerland's imports of this product. Capacity building in the textile machinery sector will be essential in order to ensure continued growth in textiles and garments sector, as also for neutralizing the overall trade deficit of the country.

Table 18: Identified Products for Export Promotion in Process Plant Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
840820	Compression-ignition internal combustion piston engine "diesel or semi-diesel engine", for the propulsion of vehicles of chapter 87	553	17.1%	33143	Germany	5662	Austria (35.9), Hungary (30.8), Poland (14.1), The UK (8.6), France (6.3)
					Mexico	4240	The USA (92.3), Italy (2.4), Germany (1.8), Poland (1.8), Brazil (1.0)
					The USA	3514	Mexico (34.6), Italy (18.7), Germany (18.4), Austria (9.0), Japan (6.4)
					The UK	2556	Spain (27.4), France (20.3), Germany (20.1), Poland (8.3), The USA (4.3)
					Turkey	1953	The UK (32.2), Poland (24.4), Germany (18.3), Italy (9.4), Austria (4.2)
841330	Fuel, lubricating or cooling medium pumps for internal combustion piston engine	163	13.7%	13331	The USA	2546	Mexico (27.7), Germany (13.7), Japan (11.4), Canada (10.8), China (10.3)
					Germany	1379	Czech Rep (48.6), Italy (9.9), Spain (8.8), Brazil (4.6), Austria (3.6)
					China	804	Germany (35), Czech Rep (13.7), Italy (11.2), Japan (9.5), South Korea (7.2)
					Mexico	754	The USA (56.8), China (8.8), Japan (6.2), Canada (5.0), Poland (4.0)
					The UK	727	Germany (34.5), Czech Rep (13.8), The USA (12.4), Italy (8.5), Japan (5.1)
841350	Reciprocating positive displacement pumps for liquids, power-driven (excluding those of subheading 8413.11 and 8413,19, fuel, lubricating or cooling medium pumps for internal combustion piston engine and concrete pumps)	52	6.1%	7292	The USA	1941	China (29.9), Mexico (17.6), Germany (14.8), Canada (12.3), Japan (7.0)
					China	896	Germany (24.3), The USA (22.8), Japan (16.7), Italy (7.9), South Korea (6.0)
					Canada	426	The USA (60.3), China (17.1), Germany (7.5), Japan (3.5), Mexico (2.6)
					Germany	324	The USA (31.8), Switzerland (11.1), France (10.8), Turkey (10.2), Italy (7.1)
					France	234	Germany (52.6), Italy (8.5), The USA (8.1), China (4.7), Czech Rep (4.3)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
841360	Rotary positive displacement pumps for liquids, power-driven (excluding those of subheading 8413.11 and 8413.19 and fuel, lubricating or cooling medium pumps for internal combustion piston engine)	62	9.2%	6218	The USA	1475	Germany (18.8), Canada (16.6), Japan (13.4), China (13.0), France (10.6)
					China	845	Germany (27.0), Japan (20.8), South Korea (11.6), France (10.4), The USA (9.1)
					Germany	388	Bulgaria (17.3), The USA (12.9), Japan (11.9), Switzerland (10.3), Italy (8.5)
					Mexico	386	The USA (45.6), Japan (14.8), Canada (11.1), China (9.6), Germany (7.0)
					Canada	334	The USA (60.8), China (15.3), Germany (7.2), Mexico (3.6), Japan (3.3)
841590	Parts of air conditioning machines, comprising a motor-driven fan and elements for changing the temperature and humidity, n.e.s.	344	5.4%	17026	The USA	4001	Mexico (56.0), China (13.2), Thailand (9.6), Japan (8.3), South Korea (4.9)
					Germany	1144	Czech Rep (30.3), France (14.1), Japan (8.7), Thailand (7.6), Belgium (6.3)
					Japan	1096	China (58.4), Thailand (30.6), South Korea (3.6), Malaysia (2.3), The USA (1.4)
					Canada	710	The USA (76.6), Mexico (10.6), China (3.9), Japan (1.8), South Korea (1.7)
					France	595	Czech Rep (24.2), Belgium (15.3), China (11.9), Spain (7.6), Italy (7.2)
841869	Refrigerating or freezing equipment (excluding refrigerating and freezing furniture)	115	4.5%	7668	The USA	1229	Mexico (40.1), China (31.7), Canada (4.6), South Korea (4.1), Italy (4.1)
					China	822	Singapore (66.2), The USA (11.8), France (4.4), Germany (3.6), Japan (2.6)
					Germany	637	France (41.4), China (10.5), Italy (9.4), The USA (8.5), Ireland (7.4)
					Canada	429	The USA (59.4), Mexico (12.6), China (12.1), South Korea (8.6), Italy (2.3)
					Australia	251	China (28.7), The USA (23.5), Japan (10.0), Italy (10.0), Ireland (4.0)
841950	Heat-exchange units (excluding instantaneous heaters, storage water heaters, boilers and equipment without a separating wall)	202	29.1%	10365	Australia	916	South Korea (54.7), Philippines (23.1), The USA (12.2), China (2.2), Germany (1.3)
					The USA	893	Mexico (12.9), Canada (11.9), Germany (11.5), China (10.1), France (7.6)
					Germany	888	Italy (13.2), Hungary (11.4), Sweden (7.8), Switzerland (7.3), France (7.0)
					China	817	Germany (18.5), The USA (13.2), Japan (13.0), Spain (10.8), South Korea (9.9)
					Canada	431	The USA (68.4), South Korea (6.5), Germany (4.9), Sweden (3.9), China (3.7)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
841989	Machinery, plant or laboratory equipment, whether or not electrically heated, for the treatment of materials by a process involving a change of temperature, n.e.s.	240	14.0%	8991	Russia	1526	Italy (15.4), Germany (15.2), Japan (14.4), South Korea (10.7), The Netherlands (6.1)
					China	919	Germany (24.5), The USA (17.4), Japan (9.9), Italy (7.9), Austria (6.5)
					The USA	594	Germany (21.5), Canada (15.7), China (11.4), Italy (9.6), Japan (5.7)
					Australia	555	Indonesia (78.7), China (3.2), The USA (3.2), Germany (2.5), Belgium (2.3)
					South Korea	396	Germany (19.2), The USA (16.2), Japan (15.4), China (14.1), Italy (6.6)
842139	Machinery and apparatus for filtering or purifying gases (excluding isotope separators and intake air filters for internal combustion engines)	227	9.3%	19572	The USA	2958	Mexico (36.4), Canada (10.8), South Africa (9.2), China (8.5), Germany (8.0)
					Germany	2780	South Africa (28.8), Macedonia (15.3), The UK (12.0), Sweden (9.6), Czech Rep (9.1)
					China	1103	Germany (23.9), South Korea (18.7), The USA (13.1), Japan (11.1), Denmark (6.0)
					Mexico	1090	The USA (82.8), Germany (5.9), China (1.5), Italy (1.5), Japan (1.4)
					Canada	936	The USA (76.7), Mexico (6.9), China (5.0), South Africa (2.2), Germany (1.9)
842230	Machinery for filling, closing, sealing or labelling bottles, cans, boxes, bags or other containers; machinery for capsuling bottles, jars, tubes and similar containers; machinery for aerating beverages	163	11.8%	7673	The USA	1062	Germany (32), Italy (16.3), China (10.5), Canada (10.3), Spain (4.6)
					China	852	Italy (31.9), Germany (27), Sweden (10.4), Japan (8.6), Taiwan (Poc) (4.7)
					Russia	402	Germany (44.8), Italy (24.1), France (5.2), Switzerland (3.0), Czech Rep (3.0)
					Mexico	271	The USA (27.3), Germany (25.8), Italy (21.4), Spain (5.9), Belgium (3.0)
					France	250	Italy (37.2), Germany (33.6), Israel (6.4), The Netherlands (5.2), Spain (2.8)
842240	Packing or wrapping machinery, incl. heat-shrink wrapping machinery (excluding machinery for filling, closing, sealing or labelling bottles, cans, boxes, bags or other containers and machinery for capsuling bottles, jars, tubes and similar containers)	112	13.6%	7901	The USA	848	Germany (27.2), Italy (20.4), Canada (13.0), Switzerland (5.9), Spain (5.3)
					China	811	Germany (30.9), Italy (17.9), Japan (14.2), Taiwan (Poc) (8.0), Malaysia (6.5)
					Germany	452	Italy (26.1), Switzerland (24.3), Austria (10.2), The Netherlands (9.3), Japan (4.9)
					Russia	430	Germany (34.9), Italy (30.5), The Netherlands (5.3), Spain (3.7), Denmark (3.0)
					Indonesia	358	Germany (40.8), Italy (33.0), China (7.0), Japan (6.4), South Korea (2.5)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
842290	Parts of dishwashing machines, packing or wrapping machinery and other machinery and apparatus of heading 8422, n.e.s.	58	10.0%	6420	The USA	789	Germany (27.2), Italy (23.8), China (7.9), France (6.8), Canada (6.3)
					Germany	573	Austria (20.6), Italy (20.1), Switzerland (11.3), Poland (7.3), The Netherlands (6.1)
					France	514	Italy (38.3), Germany (27), Switzerland (4.3), The UK (4.1), Spain (3.5)
					The UK	279	Germany (36.9), Italy (21.9), France (7.2), The USA (5.7), The Netherlands (5.7)
					Spain	255	Germany (38.4), Italy (29.0), France (7.5), The UK (3.5), Austria (3.5)
842481	Agricultural or horticultural mechanical appliances, whether or not hand-operated, for projecting, dispersing or spraying liquids or powders	65	26.1%	2847	Mexico	290	The USA (73.1), China (5.9), Brazil (4.5), Israel (3.8), Italy (3.4)
					France	172	Germany (27.3), The Netherlands (18), Italy (13.4), The USA (8.1), China (7.6)
					The USA	161	China (29.2), Mexico (26.1), Canada (19.9), Italy (4.3), Brazil (2.5)
					Australia	144	The USA (60.4), China (13.2), Taiwan (Poc) (4.2), France (4.2), Italy (4.2)
					Russia	140	The USA (27.1), Germany (13.6), China (10.7), Italy (7.9), Brazil (6.4)
842489	Mechanical appliances, whether or not hand-operated, for projecting, dispersing or spraying liquids or powders, n.e.s.	56	15.4%	4991	China	901	Germany (33.7), The USA (17.8), Japan (12.5), South Korea (7.1), Taiwan (Poc) (5.9)
					The USA	616	China (41.7), Mexico (16.2), Germany (14.1), Japan (6.2), Canada (5.2)
					Germany	319	France (22.3), China (21.6), Switzerland (12.2), Italy (7.8), The Netherlands (7.8)
					Russia	269	Germany (34.9), Italy (19.7), China (11.9), Finland (3.7), The UK (3.3)
					Mexico	214	Germany (41.1), The USA (36.0), China (7.9), Japan (5.6), Spain (2.8)
843880	Machinery for the industrial preparation or manufacture of food or drink, n.e.s.	54	43.8%	2338	The USA	280	Germany (34.3), China (9.6), Italy (8.9), Spain (8.6), Denmark (6.4)
					Russia	185	Germany (37.8), The Netherlands (12.4), Denmark (8.1), Spain (8.1), Italy (4.3)
					China	155	Japan (27.7), Germany (16.8), Taiwan (Poc) (11.6), The USA (7.7), Italy (7.7)
					The UK	81	Germany (17.3), The USA (13.6), Denmark (13.6), The Netherlands (9.9), France (8.6)
					France	65	Switzerland (40.0), Italy (20.0), Germany (10.8), The Netherlands (6.2), The USA (4.6)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
845430	Casting machines of a kind used in metallurgy or in metal foundries	119	12.0%	1686	China	444	Japan (30.9), Switzerland (21.4), The USA (18.7), Italy (9.7), Germany (9.2)
					Viet Nam	159	China (42.8), Germany (20.1), Italy (14.5), Japan (11.9), South Korea (2.5)
					Mexico	149	Japan (40.3), Italy (26.2), China (5.4), Spain (4.0), The USA (1.4)
					India	119	China (35.3), Japan (16.8), Taiwan (Poc) (11.8), Germany (9.2), Italy (8.4)
					The USA	76	Italy (32.9), Japan (28.9), Canada (11.8), Germany (7.9), China (6.6)
845490	Parts of converters, ladles, ingot moulds and casting machines of a kind used in metallurgy or in metal foundries, n.e.s.	68	13.3%	1398	The USA	276	Canada (32.2), Japan (27.2), China (14.5), Germany (9.1), Italy (6.2)
					Germany	137	Austria (21.9), Italy (19.7), Switzerland (18.2), The Netherlands (8.8), China (7.3)
					China	100	Germany (33), The USA (15.0), Switzerland (12.0), Japan (12.0), Italy (9.0)
					Canada	81	The USA (80.2), China (4.9), Spain (4.9), Germany (3.7), Japan (2.5)
					Namibia	71	Germany (100.0)
847720	Extruders for working rubber or plastics	71	8.5%	2726	China	613	Germany (51.4), Taiwan (Poc) (18.1), Japan (14.2), Austria (5.1), The USA (4.4)
					Russia	189	Germany (31.7), Italy (23.8), China (15.3), Switzerland (6.9), Austria (5.3)
					Turkey	174	Germany (29.9), Japan (17.2), China (14.4), Italy (14.4), Austria (6.3)
					The USA	148	Germany (48), Austria (8.8), Italy (8.8), China (7.4), Japan (5.4)
					Mexico	109	Germany (26.6), The USA (20.2), China (10.1), Italy (9.2), Austria (9.2)
847751	Machinery for moulding or retreading pneumatic tyres or for moulding or otherwise forming inner tubes of rubber or plastics	54	74.6%	514	The USA	147	Japan (19.7), France (19.0), Germany (17.0), The Netherlands (15.0), China (13.6)
					China	66	South Korea (59.1), Japan (21.2), Germany (15.2), Italy (1.5)
					India	54	The Netherlands (37.0), The USA (14.8), China (13.0), Germany (11.1), Japan (11.1)
					South Korea	40	The Netherlands (95.0), China (2.5), Italy (2.5)
					Hungary	29	South Korea (75.9), Japan (24.1)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
847950	Industrial robots, n.e.s.	72	34.3%	3873	China	900	Japan (56.9), Germany (16.9), South Korea (4.6), Sweden (4.0), The USA (3.2)
					Germany	432	Japan (41.0), Sweden (21.1), France (10.0), Austria (8.3), Switzerland (5.6)
					The USA	211	Japan (23.7), Canada (14.2), Germany (12.8), France (11.8), Italy (7.1)
					Turkey	183	Germany (44.8), South Korea (26.2), Italy (8.2), Sweden (6.6), Japan (6.6)
					Italy	165	Germany (32.7), Sweden (21.2), Luxembourg (9.7), France (5.5), The Netherlands (5.5)
847982	Mixing, kneading, crushing, grinding, screening, sifting, homogenising, emulsifying or stirring machines, n.e.s. (excluding industrial robots)	78	20.5%	4421	China	553	Germany (37.1), The USA (11.6), Japan (11.0), Taiwan (Poc) (9.6), Italy (5.4)
					The USA	449	Germany (36.1), Canada (14.7), China (7.8), Italy (7.1), Sweden (5.1)
					Germany	224	Denmark (23.2), Switzerland (15.2), France (9.4), Austria (8.0), The Netherlands (6.7)
					Russia	195	Germany (26.2), Italy (15.4), China (8.2), France (8.2), The Netherlands (7.2)
					South Korea	170	Germany (25.3), The USA (18.2), Japan (11.2), China (8.8), Italy (7.6)
848060	Moulds for mineral materials (excluding moulds of graphite or other carbons, ceramic or glass moulds)	72	27.1%	987	The USA	156	Germany (40.4), Canada (19.9), China (10.3), The UK (4.5), Spain (3.8)
					Malaysia	99	South Korea (44.4), China (17.2), Germany (14.1), The USA (3.0), Austria (3.0)
					India	72	Malaysia (54.8), South Korea (30.1), Austria (4.1), Finland (2.7), China (2.7)
					Canada	65	The USA (46.2), Germany (41.5), Austria (3.1), China (1.5), Spain (1.5)
					Indonesia	45	South Korea (31.1), China (26.7), Japan (11.1), Thailand (8.9), Singapore (6.7)
848071	Injection or compression-type moulds for rubber or plastics	196	18.2%	10727	The USA	1448	Canada (44.4), China (21.2), Japan (7.5), South Korea (6.4), Germany (5.8)
					China	1152	South Korea (28.7), Japan (16.1), Germany (6.8), Taiwan (Poc) (6.7)
					Mexico	1066	The USA (28.1), China (17.8), South Korea (12.4), Canada (10.4), Japan (7.2)
					Germany	845	China (27.0), Italy (15.9), Switzerland (13.3), Portugal (9.3), Czech Rep (6.2)
					Japan	749	South Korea (51.1), China (34.6), Thailand (4.7), Taiwan (Poc) (2.4), Canada (2.0)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
848079	Moulds for rubber or plastics (other than injection or compression types)	195	7.6%	2305	Viet Nam	252	South Korea (48.0), China (28.2), Japan (11.9), Taiwan (Poc) (4.0), Thailand (2.4)
					India	195	China (44.9), South Korea (13.3), Taiwan (Poc) (8.7), Japan (7.7), Italy (5.1)
					The USA	181	Canada (27.6), China (20.4), Germany (15.5), Japan (12.7), Italy (2.8)
					Malaysia	148	Singapore (35.1), China (28.4), South Korea (11.5), Japan (8.8), Taiwan (Poc) (4.7)
					China	119	Taiwan (Poc) (22.7), Japan (22.7), Germany (16.0), South Korea (7.6), The USA (6.7)
848299	Parts of ball or roller bearings (excluding balls, needles and rollers), n.e.s.	140	6.9%	4927	Germany	792	Slovakia (24.6), Romania (22.2), Italy (8.7), China (4.9), Taiwan (Poc) (3.8)
					The USA	542	Japan (43.0), China (14.0), India (10.0), Mexico (7.4), Germany (6.3)
					France	434	Italy (20.3), Germany (18.0), Romania (15.7), Slovakia (13.6), Spain (9.7)
					China	354	Japan (44.6), Germany (14.4), The USA (6.8), South Korea (4.2), Romania (3.7)
					Italy	207	Germany (30.9), China (27.1), Bulgaria (11.6), France (9.2), India (3.9)
848340	Gears and gearing for machinery (excluding toothed wheels, chain sprockets and other transmission elements presented separately); ball or roller screws; gear boxes and other speed changers, incl. torque converters	304	6.9%	17771	The USA	2670	China (24.6), Germany (19.0), Italy (12.7), Japan (11.5), Mexico (4.8)
					China	2057	Germany (28.2), Japan (17.5), The USA (13.7), Taiwan (Poc) (9.6), Italy (7.6)
					Canada	1537	The USA (49.2), Japan (31.2), Germany (5.5), Italy (3.1), China (2.6)
					Germany	1271	Denmark (17.2), Belgium (12.8), Italy (11.4), Japan (9.5), Czech Rep (9.4)
					Brazil	706	Germany (20.7), The USA (19.3), Italy (10.6), China (8.9), Spain (7.5)

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

Table 19: Identified Products for Export Promotion in Textile Machinery Category: Top Import Markets and Major Competitors for India (Values in US$ Mn)

HS Code	HS Description	India Imports (2014)	AAGR for India's Imports (2010-14)	Global Imports (2014)	Top Importers	Value of Imports	Top Suppliers (figures in parenthesis represent respective country shares in world exports)
844520	Textile spinning machines (excluding extruding and drawing or roving machines)	115	6.7%	1314	Turkey	272	Germany (44.1), Switzerland (41.5), China (5.9), Japan (4.0), France (1.5)
					China	227	Japan (59.0), Germany (23.3), Italy (8.8), Czech Rep (3.5), Malaysia (3.1)
					Viet Nam	147	China (55.1), India (23.1), Japan (12.9), Switzerland (2.0), Germany (2.0)
					India	115	Germany (55.2), China (19.8), Italy (6.9), Japan (6.0), Spain (4.3)
					The Netherlands	107	Germany (75.7), Czech Rep (23.4), The UK (0.9)
844820	Parts and accessories of machines for extruding, drawing, texturing or cutting man-made textile materials or of their auxiliary machinery, n.e.s.	56	107.1%	482	China	83	Germany (45.8), Japan (36.1), South Korea (7.2), Switzerland (4.8), Taiwan (Poc) (2.4)
					India	56	Switzerland (45.6), Germany (17.5), China (17.5), Czech Rep (12.3), Viet Nam (1.8)
					Indonesia	49	China (79.6), Germany (6.1), India (4.1), Japan (4.1), Singapore (2.0)
					Germany	41	China (36.6), Switzerland (26.8), Austria (9.8), Italy (9.8), Czech Rep (4.9)
					Switzerland	39	India (74.4), Germany (10.3), Italy (10.3)

Source: ITC/UNCTAD-PCTAS, Exim Bank Research

4. Policy Support for Machinery Sector

NATIONAL CAPITAL GOODS POLICY 2016

The National Policy on Capital Goods has been envisaged to unlock the potential of the machinery sector and establish India as a global manufacturing powerhouse. The policy aims at:

- Increasing the production of capital goods from ~Rs. 230,000 Cr in 2014-15 to Rs. 750,000 Cr in 2025
- Raising direct and indirect employment from the current 8.4 million to ~30 million
- Increasing export orientation of capital goods from the current 27 percent to 40 percent of production
- Increasing share of domestic production in India's demand for capital goods from 60 percent to 80 percent

Some of the key issues addressed in the Policy are availability of finance, raw material, innovation and technology, productivity, quality and environment friendly manufacturing practices, promoting exports and creating domestic demand. The Policy document attempts to comprehensively address these issues (Box 1).

The Policy document also contains reference to the integral role of Export-Import Bank of India (Exim Bank) in achieving the desired objectives through its various financing programme. The major recommendations of the Policy document in the context of Exim Bank are:

- To open focused Line of Credit (LOC) with Exim Bank and ensure that credit availability for key export markets (e.g. buyer's credit in Bangladesh, Indonesia, CIS, Iran) are at rates at par with LIBOR/ international rates.
- Restore original guidelines on GoI supported LOC to entities with 51 percent Indian ownership.
- To strengthen Exim Bank by increasing its capital base.
- To form a dedicated fund for Exim Bank to support exporters through Buyer's Credit at rates of interest at par with LIBOR/ international rates, and with a repayment period of at least 10 years in addition to the moratorium/grace period equal to the project construction period against Project Agreements.
- To defray part of borrowing cost of Exim Bank, or provide refinancing to Exim Bank at soft rates via the Government / Central Bank.

Box 1: Key Recommendations of National Capital Goods Policy 2016

- **Creation of an ecosystem for globally competitive capital goods sector**
  - Adoption of a long term, stable and rationalized tax structure by adopting GST; ensuring parity of import duties with domestic duties; correcting inverted duty structure; adopting uniform custom duty on imports of all capital goods related products, and providing incentives for further processing of such goods.
  - Create a 'Start-up Centre for Capital Goods Sector' shared by the Department of Heavy Industries, Government of India, and capital goods industry/ Industry association in a 80:20 ratio to provide end to end support to promising start-ups.
  - Set up at least 5 Incubation Centres in PPP mode for cross-fertilization of ideas and mentorship.
  - Allow External Commercial Borrowings under automatic route for all capital goods.
- **Creation and expansion of market for capital goods sector**
  - Simplify terms of procurement contracts and amend key qualification criteria in public procurement contracts.
  - Introduction of special provisions such as 30-40 percent domestic value addition for promoting indigenously manufactured product.

- Allow second hand imports adhering to specific terms and conditions.
- Eliminate 'Zero duty' clause for capital goods under Project Imports in the Taxation Policy, except if the goods are not manufactured in India. 'Physical export' status can be accorded to domestic manufacturers using such imports so that these manufacturers can avail duty drawback.

- **Export Promotion**
  - Create a pilot for 'Heavy Industry Export and Market Development Assistance Scheme (HIEMDA)' with a view to enhance the export of capital goods.
  - Influence equipment purchase in "indirect barter" and/or "Indian Rupee" form while negotiating trade agreements with countries with whom the trade balance is negative.
  - Initiate trade agreements with countries where India has good export potential and commission studies to guide negotiations in Free Trade Agreements.
  - Integrate major capital goods sectors as priority sectors under the 'Make in India' and develop a comprehensive branding plan for the sector with the support of India Brand Equity Foundation.
  - Provide government guarantees/ enhanced equity to ECGC to cover high value project risks.
  - Consider replacing Sovereign Guarantee for project export bids with Project Recourse Guarantee or Corporate Guarantee accompanied by Bank Guarantee from local banker.
  - Extend project-tied credits on priority basis to certain infrastructure projects like power, which fulfil specific conditions, such as a life of 25-30 years during which it is a regular foreign exchange earner.
  - Provide excise duty exemption on final exportable goods, and countervailing duty exemption on imports meant to be used for production of exportable goods.

- **Human Resource Development**
  - Build capacity of existing training facilities in both public and private domain through PPP model.
  - Draw up a comprehensive skill development plan/ scheme with Capital Goods Skills Council.
  - Enhancement of skill development clusters and establishing linkages with SEZs, EPZs, etc.
  - Encourage industry to get existing uncertified workforce certified through 'Recognition of Prior Learning'.
  - Streamlining certification framework through the National Skill Qualification Framework.
  - Update curriculum of Industrial Training Institutes, Polytechnics, etc. to match the skill requirements.
  - Set up 5 regional State of the Art greenfield Centres of Excellence

- **Technology and Intellectual Property Regime**
  - Introduce "Technology Transfer" requirement and specify "Minimum Domestic Value Addition" threshold for high-value and high-technology imports.
  - Introduce a five-year policy to increase the investment allowance, which is a tax incentive offered on capital investments, from 15 percent to 25 percent.
  - Extend the definition of industrial R&D till the point of commercial production for companies to avail tax benefits under the provisions of 0 percent tax deduction.
  - Provide 2-year income tax holiday on sales of products emanating from a defined 'new technology' list by capital goods sub-sector.
  - Launch a Technology Development Fund preferably under PPP model to fund technology development and commercialization in capital goods.
  - Develop an insurance product to cover risk of failure of locally developed technology.
  - Upgrade testing and certification infrastructure such as Central Manufacturing Technology Institute (CMTI), Central Power Research Institute and set up 10 more CMTI like institutes.

- Set up Technology Development Institutes for implementation of proposals by CMTI.
- Formulate a National Policy for advanced manufacturing in India.
- Increase the budgetary allocation and scope of the present 'Scheme on Enhancement of Competitiveness of Capital Goods'.

- **Introduction of Mandatory Standards**
  - Evolve a standards policy that is at par with global benchmarks and based on performance.
  - Ensure greater participation and influence in international standard forums, for example, through collaboration with National Institute of Standards and Technology in the USA.
  - Formulate formal program for promoting interaction of Standards Developing Organizations and industry stakeholders with international standard bodies.
  - Prohibit usage of capital goods above threshold level of years since purchase, based on depreciation norms and lifecycle of machinery.
  - Provide special thrust for Green Manufacturing and encourage companies to adopt sustainability based codes like the CII Code for Ecologically Sustainable Business Growth.
- **Focus on SME Development**
  - Promote modernization of SMEs through interest subvention scheme like Technology Upgradation Fund Scheme, and concessional rates of interest at 2-4%.
  - Incorporate all capital goods sub-sectors under Credit Linked Capital Subsidy Scheme and expand its geographical reach to all regions.
  - Develop and promote supplier clusters, common manufacturing clusters for MSMEs around large manufacturers. Incentivize large industries and corporates for hand holding MSMEs, and help in bringing them up to global standards.
  - Provide MSME tax allowance to corporates and public sector companies to purchase a certain percentage from MSMEs and function as 'Anchor Industry' for them.
  - Include employment generation as a criterion for MSMEs to get qualified for various initiatives under National Capital Goods Policy, apart from the definition given in MSMED Act 2006.
- **Support Services**
  - Build robust system for capturing production and trade data, while also improving the reporting system for imports of second-hand machinery.

Source: National Capital Goods Policy 2016

FOREIGN DIRECT INVESTMENT

Domestic capacity for production of machinery has grown significantly since liberalization, supported by the inward direct investments in the sector. Currently, 100% Foreign Direct Investments (FDI) is allowed under the automatic route in the Indian machinery sector, subject to applicable regulations and laws. Cumulative FDI in the machinery sector amounted to US$ 12.0 billion during April 2000 to March 2016. FDI inflows in electrical equipment and industrial machinery account for more than two-third of the total FDI inflows in the sector (Table 20).

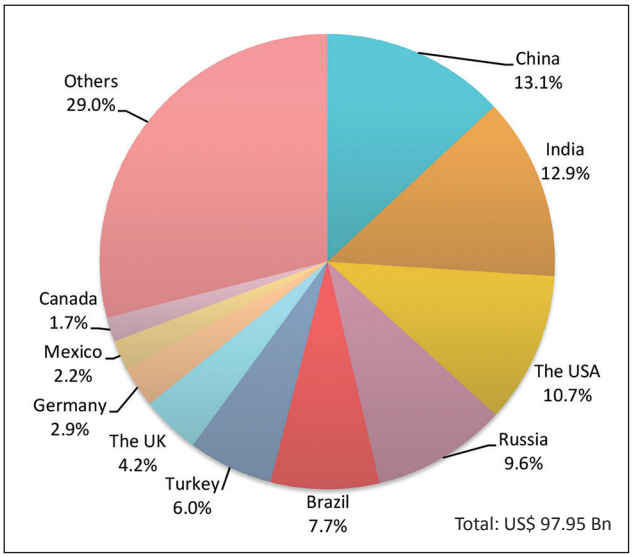
Table 20: FDI Inflows in Machinery Sector of India

Sub-segments	Total from April 2000 To March 2016	
	US $ Million	% share in total FDI inflows
Electrical equipment	4,336.72	1.5%
Machine tools	837.96	0.3%
Industrial machinery	4,064.57	1.4%
Agricultural machinery	433.99	0.2%
Earthmoving machinery	337.16	0.1%
Boilers and steam generating plants	141.24	0.0%
Prime movers	1,451.29	0.5%
Industrial Instruments	75.34	0.0%
Commercial, Office & Household Equipment	346.03	0.1%
Total above	**12,024.30**	**4.2%**
Total FDI inflows	**2,88,634.11**	**100.0%**

Source: Department of Industrial Policy and Promotion, Government of India

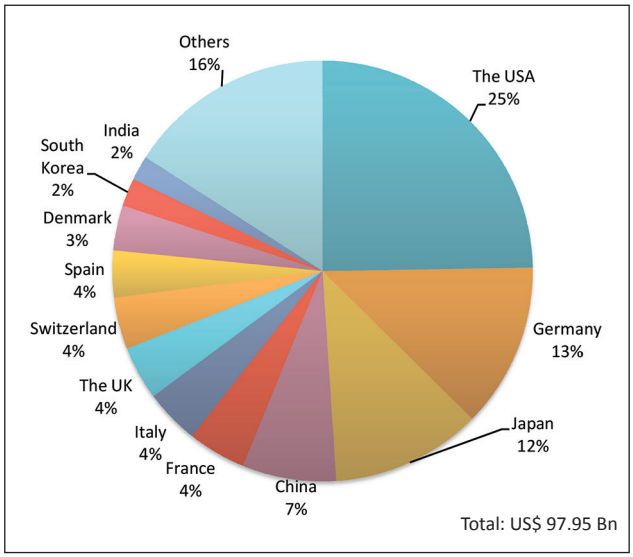
Globally, India is among the top FDI destinations in the machinery sector. According to the fDi Markets database[7], during the period 2010-2015, China received the largest share of global investments (in value terms) in the machinery sector (13.1 percent), followed by India (12.9 percent), the USA (10.7 percent), Russia (9.6 percent), Brazil (7.7 percent), and Turkey (6.0 percent) (Exhibit 15). The USA, Germany and Japan were the top investing countries, accounting for close to 50 percent of the total investments in the machinery sector during this period (Exhibit 16).

Exhibit 15: Top Destination Countries for Greenfield FDI Investments by Value of Capital Expenditure (Cumulative 2010-2015) in the Machinery Sector



Source: fDi Markets, Exim Bank Research

Exhibit 16: Top Source Countries for Greenfield FDI Investments by Value of Capital Expenditure (Cumulative 2010-2015) in the Machinery Sector



Source: fDi Markets, Exim Bank Research

[7]fDi Markets tracks crossborder investment in a new physical project or expansion of an existing investment which creates new jobs and capital investment. This data differs from official data on FDI flows as company can raise capital locally, phase their investment over a period of time, and can channel their investment through different countries for tax efficiency.

India is among the top destinations for global greenfield investments in some segments of the machinery sector, such as power transmission equipment (share of 23.9 percent in global foreign capital expenditure), textile machinery (23.8 percent), plastics and rubber industry machinery (22.4 percent), etc. However, there are certain sectors where the greenfield FDI levels have been relatively low. These include sectors such as semiconductor machinery, sawmill and woodworking machinery, commercial and service industry machinery, etc (Table 21).

Table 21: Top Destinations for Global Investment in Machinery

Category	Major Investment Destinations	India's Share
Engines and Turbines	Turkey, **India**, The USA, China, UK	11.9%
Agriculture, construction, and mining machinery	Brazil, **India**, Russia, China, The USA	12.0%
General purpose machinery	China, The USA, **India**, Brazil, Russia	12.0%
Power transmission equipment	**India**, China, The USA, Russia, Turkey	23.9%
All other industrial machinery	Russia, China, The USA, **India**, Egypt	4.1%
Ventilation, heating, air conditioning, and commercial refrigeration equipment manufacturing	The USA, **India**, China, Mexico, Russia	13.8%
Metalworking machinery	China, **India**, The USA, Russia, Germany	16.8%
Boiler, tank, and shipping container	Egypt, Kazakhstan, **India**, The UK, China	19.0%
Plastics and rubber industry machinery	China, **India**, Oman, The USA, Mexico	22.4%
Semiconductor machinery	China, Taiwan, South Korea, Singapore, Israel	0.0%
Printing machinery and equipment	China, The USA, **India**, Singapore, Germany	12.1%
Food product machinery	China, Brazil, Russia, Morocco, Tunisia	5.4%
Commercial and service industry machinery	China, Brazil, Romania, Mexico, Germany	0.6%
Textile machinery	China, **India**, Vietnam, France, Czech Republic	23.8%
Paper industry machinery	China, **India**, The USA, Finland, Germany	16.1%
Sawmill and woodworking machinery	Russia, China, The USA, The UK, Spain	0.0%

Source: fDi Markets, Exim Bank Research

5. Strategies

Due to various reasons such as capacity constraints and inadequate technological capabilities, Indian machinery suppliers are unable to secure greater share in the global market. Development of a strong machinery sector has the potential to position India as an attractive manufacturing destination. Apart from the benefits in the form of foreign exchange savings arising out of reduced imports, a robust manufacturing base will ensure greater export revenues, provide large scale employment, and foster economic growth and development.

In order to facilitate this, there are certain challenges that need to be overcome. This section highlights some of the key challenges faced by the industry whilst outlining select strategies that could be employed for their alleviation. The National Capital Goods Policy 2016 already outlines a robust framework for boosting the production and exports from the sector, but a lot hinges on the implementation of various facets of the policy. The current section highlights some additional interventions and incentives which could help place the sector on a higher growth trajectory by not only neutralising the existing trade deficit but also promoting exports.

CURTAILING PROTECTIONARY MEASURES

In many of the focus products identified in this Study, low cost manufacturing destinations are the major suppliers, and key competitors for India. In order to compete with these countries, all the major elements of cost competitiveness need to be assessed and improved to match or outshine those prevailing in these countries. Steel is an important input for the machinery sector, and therefore a major factor for determining the cost competitiveness. Hence, it is a matter of concern that the cost of steel production in India is nearly 50-75 percent higher for some of the firms in comparison to global norms.

The Indian steel industry has been grappling with rising imports from China, South Korea and Japan. In response to this, the Government of India has taken several measures to protect the domestic industry. Minimum import price, anti-dumping duty and safeguard duty on steel products have been able to reduce the imports. During the period April- November 2017, imports of finished steel declined at a y-o-y rate of (-) 40.3 percent.

In February 2016, the government had imposed a minimum import price (MIP) on 173 iron and steel products for six months, which was further extended for several products. Finished steel prices averaged at Rs. 38,325 per tonne in July 2016 compared to Rs. 35,193 per tonne in January 2016 before the MIP was fixed[8]. While this bodes well for steel manufacturers, it hurts the competitiveness of machinery industry. It is estimated that a 10 percent increase in steel prices due to a hike in anti-dumping or import duties, increases the cost of production of machineries by 1.3 percent. The Government has been extending the validity of MIP as a measure to boost the sales of domestic steel manufacturers ever since it was introduced in February 2016. The MIP was valid till February 2017, after which it has been discontinued.

Companies and industry associations in the machinery sector need to be taken on board before imposing these measures. There is also a need to undertake a thorough analysis of the impact of such measures on end user industries.

REDEFINING INVESTMENT CAP FOR MSMEs

In the machinery sector, a majority of operational units are Micro, Small and Medium Enterprises (MSMEs). Low operating scale and low technology orientation of MSMEs is a major constraint for growth in the machinery sector. An important reason for low technology orientation of Indian MSMEs is the low level of ceiling on capital investment, especially for medium enterprises.

Although MSMEs play an important role in India's economic growth, be it in terms of their contribution

[8]CMIE

to manufacturing value-added, exports or employment generation, not many units have the ability to access technological expertise or mobilize resources for in-house innovation. Also, the cap on investment in plant and machinery for the purpose of classifying the units as MSMEs does not encourage Indian MSMEs to move up the value chain. It may be mentioned that within the manufacturing sector, micro enterprises are classified as those with investment in plant and machinery not exceeding Rs 25 lakh. While investments in plant and machinery for a small enterprise have been kept in the range between Rs 25 lakh and Rs 5 crore, a medium enterprise is defined with investment in plant and machinery in the range between Rs 5 crore and Rs 10 crore. With such low level of investment ceiling, MSMEs in the machinery sector are either expanding laterally or engaging themselves in low-tech/low-value products.

Since the manufacturing operations in the machinery sector are capital intensive, investment ceiling for treatment of medium enterprises need to be raised at least in this sector, benchmarking with such ceiling on investment in other countries. Some countries (such as the EU and China) have positioned the ceiling on investment for medium enterprises at high level, encouraging capital intensiveness, technology upgradation, quality improvement, export orientation and employment generation.

An important step in this direction is the Micro, Small and Medium Enterprises (Amendment) Bill, 2015 which was introduced in the Lok Sabha in April 2015. The Bill seeks to increase the allowance for investment in plants and machinery by MSMEs. The Bill proposes raising the investment limit for medium enterprises in the manufacturing sector to Rs. 30 crore (Table 22).

Table 22: Proposed Changes in Investment Limits for MSMEs

Type of Enterprise	MSME Act, 2006	MSME Bill, 2015
Manufacturing		
Micro	25 lakh	50 lakh
Small	25 lakh to 5 crore	50 lakh to 10 crore
Medium	5 crore to 10 crore	10 crore to 30 crore
Services		
Micro	10 lakh	20 lakh
Small	10 lakh to 2 crore	20 lakh to 5 crore
Medium	2 crore to 5 crore	5 crore to 15 crore

Source: Ministry of Micro, Small and Medium Enterprises, Government of India

While this is a positive step, the revision of ceiling on capital investment for medium enterprises in India needs to be increased significantly – at least to an extent of US$ 10 million to US$ 12 million, in line with peer group countries. This would encourage higher investments for technology absorption, quality upgradation, and export orientation. Moreover, the Bill also needs speedy implementation.

INTRODUCTION OF NEW PRODUCT LINES

Over the years, players in the Indian machinery sector have been diversifying the product lines offered with the objective of mitigating risks associated with business and cyclical trends. However, more focus needs to be given towards building new generation machines that may be in demand in future. Such new generation machines should have greater flexibility to produce a variety of products, and also create opportunities for offering engineering services that are less sensitive to business and cyclical fluctuations. This trend is already evident in developed markets which continue to be at the forefront of innovation and new technology. Greater automation is driving the development of the next generation of industrial machinery. While such technical innovation is absorbed first by the developed world, it is adopted later by the developing world as well. In order to become a global force, the Indian machinery sector needs to understand these changes and evolve to serve the user industries with the next generation products. For instance, a sector where technical innovation and automation is becoming ever more important in mature markets is mining equipment. Next generation mining is transforming operations that were once manual and local into those that are automated, remotely operated and integrated. Increasingly, a steep change in productivity is being delivered through integration of equipment with information technology. The usage of autonomous haulage or unmanned vehicles for earth moving is a step in that direction. These earth

movers are equipped with GPS, CCTV cameras, inertial guidance systems, and leverage dispatch route planning and guidance software for functioning. Several global mining players are already migrating towards such advanced means of autonomous haulage.

PROMOTION OF INTELLIGENT MANUFACTURING

Significant engineering skills, with the combination of hardware, software and system integration skills, are required in the evolution stage of advanced technology products. This niche area is called intelligent manufacturing. These are usually high tech products which provide high value addition but low volumes in highly quality conscious machinery sector. India has a competitive advantage in this sector where a large proportion of value addition is through software and system integration. Establishing joint ventures with Chinese companies, which have manufacturing strengths and substantial market share in developing countries, would help in increasing high tech exports to developing countries in Africa and the Middle East.

New revenue opportunities, cost saving and increase in productivity in the machinery sector is increasingly being driven by the Internet of Things (IoT) and Industry 4.0. Industry 4.0 is the next level of manufacturing which focuses on machine connectivity and supply chain integration. It is enabled by the IoT which leverages the data gathered from physical objects to optimise processes. Companies are using sensors, software, machine learning and other technologies to attain operational efficiency and deliver products of high quality and durability.

Several companies in both developed and developing countries have reaped advantages of making the transition from traditional processes to advanced intelligent manufacturing process. For example, wind turbines manufactured by General Electric contain some 20,000 sensors that produce 400 data points per second, thereby enabling customers to optimize turbine performance. Similarly, Stanley Black and Decker Inc, a leading tool manufacturer attained significant productivity gains in its operations in Mexico with IoT (Box 2).

TRANSFORMATION IN OBJECTIVE AND APPROACH

Sale of machinery is not a one-time business but requires technical support in transportation, construction, staff training (for operation and minor repairs), continuous

Box 2: Productivity Gains through IoT: Case of Stanley Black and Decker Inc.

Stanley Black & Decker Inc., an S&P 500 company headquartered in New Britain, Connecticut, is a leading global provider of hand tools, power tools and related accessories, mechanical access solutions, electronic security and monitoring systems, and products and services for industrial applications. The company operates one of its largest tool manufacturing plants in Reynosa, Mexico, which serves the North American market.

Stanley Black & Decker's plant in Reynosa is a textbook example of IoT through its fully connected production lines with Real-Time Location System (RTLS). The RTLS includes small and easily deployed Wi-Fi RFID tags that track production as it happens.

After the initial implementation was completed, direct cost benefits became immediately apparent. On the router production line, overall equipment effectiveness increased by 24 percent, and labour needs became more clearly defined. The plant has achieved an estimated 10 percent greater labour efficiency. With more accurate work in process data than ever before, Stanley Black & Decker's Reynosa plant can keep its materials and components inventory as low as possible and consequently lower the costs associated with managing that inventory.

Source: CISCO

service maintenance and periodical upgradation in technology. All over the world, manufacturers in the sector are turning themselves into engineering services companies, offering turnkey solutions to retain the customers. Companies in India could also reorient their approach to transform themselves into service based organizations. Such service orientation would help the industry in strengthening its competitive advantage.

DELIVERY SCHEDULES

Several machinery products are not supplied off-the-shelf and are custom-made to suit the requirements of end users. Thus, the delivery schedule to cater to the order is longer than many other engineering products. However, due to various reasons, including capacity constraints, the delivery schedules of Indian machinery suppliers are longer than their foreign counterparts. The delivery time of locally made machinery in many cases is 1.5 to 2 times longer than in industrialized nations[9]. In the case of textile machinery, delivery time for domestic manufacturers is nearly 12-24 months, as against 2-4 months for Chinese manufacturers[10].

The quality of infrastructure (transport, communication and power) is inadequate, thus affecting competitive delivery schedules, and increasing the operating costs. Inland transport is slow, although the railroad density in India is amongst the highest in the world. The cost of electric power is comparable to that in other developing nations, but the reliability is uncertain. Many firms have set up their own captive power plants to obviate the problem. This has added to the costs.

Longer lead times for parts and accessories is also a reason for longer delivery times. Development of efficient supply chain and common vendor base can help reduce the lead times. Availability of trained and skilled manpower can also help expedite the production process. Firms can also adopt modern manufacturing processes and systems such as forecasting, advance planning and scheduling processes with use of Enterprise Resource Planning solutions.

STRATEGIC ACQUISITIONS FOR TECHNOLOGY UPGRADATION

The end-user industries seek the latest technologies in order to produce quality products at competitive prices. Low spending on research and development by companies in the machinery sector has increased India's dependence on imports. There is substantial gap in the manufacturing technologies in India and overseas. Under these circumstances, strategic acquisition of technology by Indian companies could be an essential element of the overall business strategy. While Indian private companies have been engaging in strategic acquisitions for accessing technology and markets, they need to pursue this at a broader level.

The Government of India has launched several schemes for assisting Indian manufacturers to acquire and evolve cutting-edge technologies to catalyse growth and compete in global market. One such initiative is the Technology Acquisition Fund Programme (TAFP) which is an industry driven initiative aimed towards assimilation of technology in a short span of time. In view of the objectives laid out in the 12th Five Year Plan, TAFP mandates to provide funding to offset the higher cost of the best technology available globally. The TAFP provides financial assistance to Indian capital goods sector to facilitate the acquisition of strategic and relevant technologies, and also development of technologies through contract route, in-house route or through joint route of contract and in-house. Similarly, the Technology Acquisition and Development Fund aims to facilitate acquisition of clean and green technologies by MSMEs across sectors, and bridge the technological gap at an affordable cost. Another route through which the Government can promote technology acquisitions is through mergers and acquisitions (M&A).

Chinese companies have been proactive in strategic M&A in technology space. Over the years, Chinese strategy for technological upgradation has gradually transformed. China has changed its position from only allowing limited foreign ownership – through joint ventures, for instance – to permitting mergers

[9]Report on Indian capital goods sector by PWC
[10]Indian Textile Journal, May 2014

and acquisitions as a crucial way to invigorate state and semi-state owned firm[11]. This is evident from the fact that during the first four months of 2016, China accounted for 45 percent of the M&A in the technology industry[12].

To promote M&A by Indian companies, an Alternative Investment Fund can be jointly floated by domestic and international institutional investors. Any public sector bank/ financial institution can take lead at the behest of the Government of India for setting up this Fund. The proposed Fund can invest in equity or equity linked instruments of Indian companies in machinery and other high-technology sector. Evidence suggests that among the portfolio companies that engaged in cross-border M&A, about 80 percent completed their first cross-border M&A deal only after the initial private equity investment[13]. The proposed Fund can adopt a buy and build strategy wherein investments are made in a platform company with a well-developed management team and infrastructure, and thereafter more companies are acquired to build and grow the platform company. Through the buy and build strategy, the proposed Fund can assist firms in the machinery sector to engage in M&A and thereby upgrade production technology.

ESTABLISHING JOINT VENTURES IN TEXTILE MACHINERY

Many objectives have been identified by researchers for setting up of joint ventures (JV). The prominent ones include reducing risks, achieving economies of scale, supporting technologies/ patents, blocking competitors, overcoming trade barriers, expanding internationally and integrating vertically with a partner. While looking for a potential JV partner, companies look at various aspects like financial security, resource and management capabilities, production performance, reputation, etc. Hence, JVs can be attracted successfully in those sectors where Indian companies already have a critical mass and experience.

As noted in Chapter 3 of the Study, India is not only a major importer of textile machinery but also a supplier in several key import markets. To meet the burgeoning domestic demand and increase share in global market, Indian textile machinery manufacturers could enter into joint ventures with foreign companies. This shall also help upgrade the quality and performance of machineries produced in the country. Currently, except for the units in the spinning sector where the machineries are of international standards, other textile machinery manufacturing leaves a lot of scope for improvement in terms of quality and performance, compared to the European manufacturers.

According to the fDi markets database[14], Germany, Japan, and Switzerland are among the top investors in the textile machinery segment. China is the topmost destination for investments by companies from Germany and Switzerland, and Vietnam is the topmost destination in case of Japan. In comparison to the destinations of China and Vietnam, India has received lesser investments from these countries in the textile machinery segment. Indian companies can make an attempt to forge ties with companies from these top investor countries.

FINANCING MACHINERY EXPORTS

Several categories of machinery exports require medium to long term export financing. Financing from Export Credit Agencies (ECAs) is essential because finance from the private sector over the medium to long term is either unavailable or unaffordable. Like other ECAs, Exim Bank has been closely associated with the export efforts of Indian machinery sector, in its entire value chain. The Bank has a variety of loan products to cater to the financing requirements of enterprises. Apart from direct exposure, the Bank also supports the sector by virtue of supporting project exports. Project Exports are broadly classified into four categories, viz. Supply contracts on deferred payment terms, Civil Construction, Turnkey and Consultancy Services Contracts.

[11]Angwin, D.; 2007; "Mergers and Acquisitions"; Blackwell Publishing Ltd
[12]Dealogic Report
[13]McKinsey (2015), Indian Private Equity: Road to Resurgence
[14]fDi Markets tracks cross border investment in a new physical project or expansion of an existing investment which creates new jobs and capital investment. This data differs from official data on FDI flows as company can raise capital locally, phase their investment over a period of time, and can channel their investment through different countries for tax efficiency

The Bank's Lines of Credit (LOCs) extended to commercial banks, financial institutions, regional development banks, and entities overseas serve as a market entry mechanism to Indian exporters and provide a safe mode of nonrecourse financing option to Indian exporters. LOCs enable buyers in overseas markets to import engineering goods, industrial manufactures and related services from India on deferred payment terms. The Indian machinery sector has been increasingly using the LOC mechanism to export to other developing countries. This helps in establishing products abroad and generating export opportunities subsequently.

The Bank's strong emphasis on increasing project exports from India has been further enhanced with the introduction of the Buyer's Credit under the National Export Insurance Account (BC-NEIA) programme. The Indian project exporter, under this programme, is backed by a tailored financing package that meets the funding needs of the project, without impacting the balance sheet of the Indian project exporter. Consequently, while the Indian company remains responsible for timely and satisfactory execution of the project, it is free from commercial and political risks while executing the project. With the BC-NEIA product, machinery exporters from India can venture into new markets and help diversify the exports.

Exim Bank had also identified Indian machine tools sector – a sub-segment of Indian machinery industry – as having a strong multiplier effect, and had brought out a study outlining appropriate strategies to strengthen this sector and thereby help contribute to the growth of Indian manufacturing sector. One such recommendation made by the Study was that the Indian Machine Tools Manufacturers Association (IMTMA) could adopt a cluster approach, seeking institutional support to help the member-firms in overcoming the weaknesses by adopting best practices in the industry across the globe. Subsequently, a National Programme for Development of Indian Machine Tool Industry (NPDMI) was launched, as a cooperative effort of Government of India, IMTMA, UNIDO and Exim Bank.

Under this programme, a range of activities was undertaken to update the manufacturing and management practices of the players in the Indian machine tools sector. Evaluation of machine tool technology and market trends in the USA and Europe was undertaken through technology surveys and participation in international exhibitions. Learning through such activities was supplemented with showcasing the capabilities of Indian machine tools manufacturers.

To bridge the technology gap, especially in the small and medium segment, a series of advanced machine tool design courses were organized at the International Centre for Advancement of Manufacturing Technology, Bangalore. UNIDO had declared this initiative as a success story.

The Bank has been supporting the machine tools sector to modernise and upgrade their production facilities, adaptation of technology and achievement of internationally acceptable standards through its various financing products and services. The Bank, under its Export Facilitation Programme, has supported the initiative of IMTMA in setting up of the Bangalore International Exhibition Centre.

In spite of the range of activities undertaken by Exim Bank, the support can at the best be considered moderate when compared to the kind of support being provided by other countries in promotion of machinery exports. As on 31st March 2016, the sector accounted for about 4 percent of Exim Bank's total exposure. A primary reason for this is that the ECAs of other countries have a strong financial backing from their respective governments, while also not being subject to regulatory norms that are applicable for commercial banks. This is where the Government of India (GOI) could consider bolstering its support to Exim Bank in order to take the exports of Indian machinery products to a higher trajectory. Select mechanisms that the GOI could consider in this respect include the following:

- For most ECAs across the world, profitability is not a major consideration. For example, for Exim Korea, as a state-owned bank with a public-policy mandate, maximizing profits has not been a primary focus and hence net interest margin has historically

remained low. The ECAs in the USA, Japan, Canada, Turkey and Australia are currently exempt from payment of income tax. It may be noted that the Korean Government compensates Exim Korea for the negative margins between its overall borrowing rates from abroad and the Bank's lending rates. The Act establishing Exim Korea provides that if its reserves are insufficient to meet its net loss in any fiscal year, then the government will provide funds to cover the shortfall. Similar is the case with JBIC of Japan. The Japanese government's existing strong support for JBIC in the form of capital injections, low-cost direct funding through the Fiscal Investment and Loan Programme, and guarantees for its foreign-currency funding gives requisite strength to JBIC to support Japanese companies in developing infrastructure overseas. Exim Bank's charter requires it to be run on business principles with due regard to public interest. Exim Bank has been regularly paying dividends, and its dividend pay-out is one of the highest in the industry. Paradoxically, the higher the dividends pay-out to the GOI, the greater the need for capital. Therefore, Exim Bank could be allowed to plough back its dividend that it is paying to the Government of India and utilise the proceeds exclusively for facilitating development of indigenous machinery sector. Exim Bank could also be freed from the requirement of paying tax, with the proviso that the amounts equivalent to the tax load be earmarked for capacity building activities in the machinery sector.

- In order to avoid growth limitations in the portfolio for machinery sector, Exim Bank must be adequately equipped with equity. It is to be noted that Exim Bank's authorised capital is Rs. 100 billion, which can be further enhanced by notification. Moreover, as on March 31, 2016, Exim Bank's paid-up capital amounted to Rs. 63.59 billion. Hence, there is enough head room for the paid-up capital to move up.

The National Capital Good Policy also highlights some of these constraints for greater financing from Exim Bank, and recommends increasing Exim Bank's capital base and providing refinancing at soft rates via the Government/ RBI. It also recommends formation of a dedicated fund to support exporters through buyer's credit at rates of interest at par with LIBOR/ international rates, and with a repayment period of at least 10 years in addition to the moratorium/ grace period equal to project construction period against Project Agreements. Whilst Exim Bank already has a Buyer's Credit under NEIA program wherein lending is usually for a credit period of 8 to 12 years, the interest rate is currently linked to the Exim Bank's cost of funds plus a spread. Implementation of these recommendations can alleviate the constraints faced by the machinery sector in terms of access and cost of finance.

Annexure

Categorization of HS Codes

HS Code	HS Description	Category
843110	Parts of pulley tackles and hoists (other than skip hoists), winches, capstans and jacks, n.e.s.	Construction Machinery
843120	Parts of fork-lift trucks and other works trucks fitted with lifting or handling equipment, n.e.s.	Construction Machinery
843131	Parts of lifts, skip hoists or escalators, n.e.s.	Construction Machinery
843139	Parts of machinery of heading 8428, n.e.s.	Construction Machinery
843141	Buckets, shovels, grabs and grips for machinery of heading 8426, 8429 and 8430	Construction Machinery
843142	Bulldozer or angledozer blades, n.e.s.	Construction Machinery
843143	Parts for boring or sinking machinery of subheading 8430.41 or 8430.49, n.e.s.	Construction Machinery
843149	Parts of machinery of heading 8426, 8429 and 8430, n.e.s.	Construction Machinery
847410	Sorting, screening, separating or washing machines for solid mineral substances, incl. those in powder or paste form (excluding centrifuges and filter presses)	Construction Machinery
847420	Crushing or grinding machines for solid mineral substances	Construction Machinery
847431	Concrete or mortar mixers (excluding those mounted on railway wagons or lorry chassis)	Construction Machinery
847432	Machines for mixing mineral substances with bitumen	Construction Machinery
847439	Machinery for mixing or kneading solid mineral substances, incl. those in powder or paste form (excluding concrete and mortar mixers, machines for mixing mineral substances with bitumen and calenders)	Construction Machinery
847480	Machinery for agglomerating, shaping or moulding solid mineral fuels, ceramic paste, unhardened cements, plastering materials and other mineral products in powder or paste form; machines for forming foundry moulds of sand (excluding those for the casting or pressing of glass)	Construction Machinery
847910	Machinery for public works, building or the like, n.e.s.	Construction Machinery
831110	Coated electrodes of base metal, for electric arc-welding	Electrical Equipment and Parts
831120	Cored wire of base metal, for electric arc-welding	Electrical Equipment and Parts
831130	Coated rods and cored wire, of base metal, for soldering, brazing or welding by flame (excluding wire and rods cored with solder which, excluding the flux material, contains >= 2% by weight of precious metal)	Electrical Equipment and Parts
840120	Machinery and apparatus for isotopic separation and parts thereof, n.e.s.	Electrical Equipment and Parts
840130	Fuel elements “cartridges”, non-irradiated, in casing with handling fixtures, for nuclear reactors	Electrical Equipment and Parts
841451	Table, floor, wall, window, ceiling or roof fans, with a self-contained electric motor of an output <= 125 W	Electrical Equipment and Parts
841459	Fans (excluding table, floor, wall, window, ceiling or roof fans, with a self-contained electric motor of an output <= 125 W)	Electrical Equipment and Parts
842112	Centrifugal clothes-dryers	Electrical Equipment and Parts
850110	Motors of an output <= 37,5 W	Electrical Equipment and Parts
850120	Universal AC-DC motors of an output > 37,5 W	Electrical Equipment and Parts
850131	DC motors of an output > 37,5 W but <= 750 W and DC generators of an output <= 750 W	Electrical Equipment and Parts
850132	DC motors and DC generators of an output > 750 W but <= 75 kW	Electrical Equipment and Parts

850133	DC motors and DC generators of an output > 75 kW but <= 375 kW	Electrical Equipment and Parts
850134	DC motors and DC generators of an output > 375 kW	Electrical Equipment and Parts
850140	AC motors, single-phase, of an output > 37,5 W	Electrical Equipment and Parts
850151	AC motors, multi-phase, of an output > 37,5 W but <= 750 W	Electrical Equipment and Parts
850152	AC motors, multi-phase, of an output > 750 W but <= 75 kW	Electrical Equipment and Parts
850153	AC motors, multi-phase, of an output > 75 kW	Electrical Equipment and Parts
850161	AC generators “alternators”, of an output <= 75 kVA	Electrical Equipment and Parts
850162	AC generators “alternators”, of an output > 75 kVA but <= 375 kVA	Electrical Equipment and Parts
850163	AC generators “alternators”, of an output > 375 kVA but <= 750 kVA	Electrical Equipment and Parts
850164	AC generators “alternators”, of an output > 750 kVA	Electrical Equipment and Parts
850410	Ballasts for discharge lamps or tubes	Electrical Equipment and Parts
850423	Liquid dielectric transformers, having a power handling capacity > 10.000 kVA	Electrical Equipment and Parts
850433	Transformers having a power handling capacity > 16 kVA but <= 500 kVA (excluding liquid dielectric transformers)	Electrical Equipment and Parts
850434	Transformers having a power handling capacity > 500 kVA (excluding liquid dielectric transformers)	Electrical Equipment and Parts
850520	Electromagnetic couplings, clutches and brakes	Electrical Equipment and Parts
850590	Electromagnets and electromagnetic lifting heads, and their parts (excluding magnets for medical use); electromagnetic or permanent magnet chucks, clamps and similar holding devices and their parts, n.e.s.	Electrical Equipment and Parts
850610	Manganese dioxide cells and batteries (excluding spent)	Electrical Equipment and Parts
850630	Mercuric oxide cells and batteries (excluding spent)	Electrical Equipment and Parts
850640	Silver oxide cells and batteries (excluding spent)	Electrical Equipment and Parts
850650	Lithium cells and batteries (excluding spent)	Electrical Equipment and Parts
850660	Air-zinc cells and batteries (excluding spent)	Electrical Equipment and Parts
850690	Parts of primary cells and primary batteries, n.e.s.	Electrical Equipment and Parts
851110	Sparking plugs of a kind used for spark-ignition or compression-ignition internal combustion engines	Electrical Equipment and Parts
851120	Ignition magnetos, magneto-dynamos and magnetic flywheels, for spark-ignition or compression-ignition internal combustion engines	Electrical Equipment and Parts
851130	Distributors and ignition coils of a kind used for spark-ignition or compression-ignition internal combustion engines	Electrical Equipment and Parts
851140	Starter motors and dual purpose starter-generators of a kind used for spark-ignition or compression-ignition internal combustion engines	Electrical Equipment and Parts
851150	Generators of a kind used for internal combustion engines (excluding magneto dynamos and dual purpose starter-generators)	Electrical Equipment and Parts
851180	Electrical ignition or starting equipment, incl. cut-outs, of a kind used for spark-ignition or compression-ignition internal combustion engines (excluding generators, starter motors, distributors, ignition coils, ignition magnetos, magnetic flywheels and sparking plugs)	Electrical Equipment and Parts
851190	Parts of electrical ignition or starting equipment, generators, etc. of heading 8511, n.e.s.	Electrical Equipment and Parts
851610	Electric instantaneous or storage water heaters and immersion heaters	Electrical Equipment and Parts
851621	Electric storage heating radiators, for space-heating	Electrical Equipment and Parts
851629	Electric space-heating and soil-heating apparatus (excluding storage heating radiators)	Electrical Equipment and Parts
851631	Electric hairdryers	Electrical Equipment and Parts
851632	Electro-thermic hairdressing apparatus (excluding hairdryers)	Electrical Equipment and Parts

851633	Electric hand-drying apparatus	Electrical Equipment and Parts
851640	Electric smoothing irons	Electrical Equipment and Parts
851660	Electric ovens, cookers, cooking plates and boiling rings, electric grillers and roasters, for domestic use (excluding space-heating stoves and microwave ovens)	Electrical Equipment and Parts
851671	Electro-thermic coffee or tea makers, for domestic use	Electrical Equipment and Parts
851672	Electric toasters, for domestic use	Electrical Equipment and Parts
851679	Electro-thermic appliances, for domestic use (excluding hairdressing appliances and hand dryers, space-heating and soil-heating apparatus, water heaters, immersion heaters, smoothing irons, microwave ovens, ovens, cookers, cooking plates, boiling rings, grillers, roasters, coffee makers, tea makers and toasters)	Electrical Equipment and Parts
851680	Electric heating resistors (excluding those of agglomerated coal and graphite)	Electrical Equipment and Parts
851690	Parts of electric water heaters, immersion heaters, space-heating apparatus and soil-heating apparatus, hairdressing apparatus and hand dryers, electro-thermic appliances of a kind used for domestic purposes and electric heating resistors, n.e.s.	Electrical Equipment and Parts
853510	Fuses for a voltage > 1.000 V	Electrical Equipment and Parts
853521	Automatic circuit breakers for a voltage > 1.000 V but < 72,5 kV	Electrical Equipment and Parts
853529	Automatic circuit breakers for a voltage >= 72,5 kV	Electrical Equipment and Parts
853530	Isolating switches and make-and-break switches, for a voltage > 1.000 V	Electrical Equipment and Parts
853540	Lightning arresters, voltage limiters and surge suppressors, for a voltage > 1.000 V	Electrical Equipment and Parts
853590	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits, for a voltage > 1.000 V (excluding fuses, automatic circuit breakers, isolating switches, make-and-break switches, lightning arresters, voltage limiters, surge suppressors and control desks, cabinets, panels etc. of heading 8537)	Electrical Equipment and Parts
853610	Fuses for a voltage <= 1.000 V	Electrical Equipment and Parts
853620	Automatic circuit breakers for a voltage <= 1.000 V	Electrical Equipment and Parts
853630	Apparatus for protecting electrical circuits for a voltage <= 1.000 V (excluding fuses and automatic circuit breakers)	Electrical Equipment and Parts
853650	Switches for a voltage <= 1.000 V (excluding relays and automatic circuit breakers)	Electrical Equipment and Parts
853661	Lamp holders for a voltage <= 1.000 V	Electrical Equipment and Parts
853669	Plugs and sockets for a voltage <= 1.000 V (excluding lamp holders)	Electrical Equipment and Parts
854419	Winding wire for electrical purposes, of material other than copper, insulated	Electrical Equipment and Parts
854420	Coaxial cable and other coaxial electric conductors, insulated	Electrical Equipment and Parts
854430	Ignition wiring sets and other wiring sets for vehicles, aircraft or ships	Electrical Equipment and Parts
854449	Electric conductors, for a voltage <= 1.000 V, insulated, not fitted with connectors, n.e.s.	Electrical Equipment and Parts
854460	Electric conductors, for a voltage > 1.000 V, insulated, n.e.s.	Electrical Equipment and Parts
854470	Optical fibre cables made up of individually sheathed fibres, whether or not containing electric conductors or fitted with connectors	Electrical Equipment and Parts
854520	Carbon brushes for electrical purposes	Electrical Equipment and Parts
854590	Articles of graphite or other carbon, for electrical purposes (excluding electrodes and carbon brushes)	Electrical Equipment and Parts
854790	Insulating fittings for electrical purposes, of materials other than ceramics or plastics; electrical conduit tubing and joints therefor, of base metal lined with insulating material	Electrical Equipment and Parts
854890	Electrical parts of machinery or apparatus, not specified or included elsewhere in chapter 85	Electrical Equipment and Parts
940510	Chandeliers and other electric ceiling or wall lighting fittings (excluding for lighting public open spaces or thoroughfares)	Electrical Equipment and Parts
940520	Electric table, desk, bedside or floor-standing lamps	Electrical Equipment and Parts

940530	Electric lighting sets of a kind used for Christmas trees	Electrical Equipment and Parts
940540	Electric lamps and lighting fittings, n.e.s.	Electrical Equipment and Parts
940550	Non-electrical lamps and lighting fittings, n.e.s.	Electrical Equipment and Parts
8464	Machine tools for working stone, ceramics, concrete, asbestos-cement or like mineral materials or for cold-working glass (excluding machines for working in the hand)	Electrical Equipment and Parts
8465	Machine tools, incl. machines for nailing, stapling, glueing or otherwise assembling, for working wood, cork, bone, hard rubber, hard plastics or similar hard materials (excluding machines for working in the hand)	Electrical Equipment and Parts
8466	Parts and accessories suitable for use solely or principally with the machine tools of heading 8456 to 8465, incl. work or tool holders, self-opening dieheads, dividing heads and other special attachments for machine tools, n.e.s.; tool holders for any type of tool for working in the hand	Electrical Equipment and Parts
8467	Tools for working in the hand, pneumatic, hydraulic or with self-contained electric or non-electric motor; parts thereof	Electrical Equipment and Parts
8468	Machinery and apparatus for soldering, brazing or welding, whether or not capable of cutting (other than those of heading 8515); gas-operated surface tempering machines and appliances; parts thereof	Electrical Equipment and Parts
8475	Machines for assembling electric or electronic lamps, tubes or valves or flashbulbs, in glass envelopes; machines for manufacturing or hot working glass or glassware (excluding furnaces and heating apparatus for manufacturing toughened glass); parts thereof	Electrical Equipment and Parts
8801	Balloons and dirigibles; gliders, hang gliders and other non-powered aircraft	Electrical Equipment and Parts
9006	Photographic cameras, photographic flashlight apparatus and flashbulbs (excluding discharge lamps of heading 8539)	Electrical Equipment and Parts
9007	Cinematographic cameras and projectors, whether or not incorporating sound recording or reproducing apparatus (excluding video equipment)	Electrical Equipment and Parts
9008	Image projectors, and photographic enlargers and reducers (excluding cinematographic)	Electrical Equipment and Parts
9010	Apparatus and equipment for photographic or cinematographic laboratories, not elsewhere specified in chapter 90; negatoscopes; projection screens	Electrical Equipment and Parts
9104	Instrument panel clocks and clocks of a similar type for vehicles, aircraft, vessels and other vehicles	Electrical Equipment and Parts
9107	Time switches with clock or watch movement or with synchronous motor	Electrical Equipment and Parts
9110	Complete, unassembled or partly assembled watch or clock movements or movement sets; incomplete watch or clock movements, assembled; rough watch or clock movements	Electrical Equipment and Parts
9111	Cases for wrist-watches, pocket-watches and other watches, incl. stop-watches, of heading 9101 or 9102, and parts thereof, n.e.s.	Electrical Equipment and Parts
9112	Clock and watch cases and parts thereof, n.e.s. (excluding for wrist-watches, pocket-watches and other watches of heading 9101 or 9102)	Electrical Equipment and Parts
9113	Watch straps, watch bands and watch bracelets, and parts thereof, n.e.s.	Electrical Equipment and Parts
9114	Clock or watch parts, n.e.s.	Electrical Equipment and Parts
9201	Pianos, incl. automatic; harpsichords and other keyboard stringed instruments	Electrical Equipment and Parts
9202	String musical instruments, e.g. guitars, violins, and harps (excluding with keyboard)	Electrical Equipment and Parts
9205	Wind musical instruments “e.g. clarinets, trumpets, bagpipes, keyboard pipe organs, harmoniums and similar keyboard instruments with free metal reeds, accordions and similar instruments, mouth organs”	Electrical Equipment and Parts

9206	Percussion musical instruments, e.g. drums, xylophones, cymbals, castanets, maracas	Electrical Equipment and Parts
9207	Musical instruments, the sound of which is produced, or must be amplified, electrically, e.g. organs, guitars, accordions	Electrical Equipment and Parts
9208	Musical boxes, fairground organs, mechanical street organs, mechanical singing birds, musical saws and other musical instruments not falling within any other heading in chapter 92; decoy calls of all kinds; whistles, call horns and other mouth-blown sound signalling instruments	Electrical Equipment and Parts
9209	Parts and accessories for musical instruments, e.g. mechanisms for musical boxes, cards, discs and rolls for mechanical instruments, n.e.s; metronomes, tuning forks and pitch pipes of all kinds	Electrical Equipment and Parts
820510	Hand-operated drilling, threading or tapping hand tools	Hand Tool
820520	Hammers and sledge hammers with working parts of base metal	Hand Tool
820530	Planes, chisels, gouges and similar cutting tools for working wood	Hand Tool
820540	Hand-operated screwdrivers	Hand Tool
820551	Household hand tools, non-mechanical, with working parts of base metal, n.e.s.	Hand Tool
820559	Hand tools, incl. glaziers' diamonds, of base metal, n.e.s.	Hand Tool
820560	Blowlamps and the like (excluding gas-powered blowlamps)	Hand Tool
820570	Vices, clamps and the like (excluding accessories for and parts of machine tools)	Hand Tool
820590	Anvils; portable forges; hand- or pedal-operated grinding wheels with frameworks; sets of articles of two or more subheadings of heading 8205	Hand Tool
820810	Knives and cutting blades, of base metal, for machines or for mechanical appliances, for metalworking	Hand Tool
820820	Knives and cutting blades, of base metal, for machines or for mechanical appliances, for wood-working	Hand Tool
820830	Knives and cutting blades, of base metal, for kitchen appliances or for machines used by the food industry	Hand Tool
820890	Knives and cutting blades, of base metal, for machines or for mechanical appliances (excluding those for metal or wood-working, kitchen appliances or machines used by the food industry and those for agricultural, horticultural or forestry machines)	Hand Tool
8402	Steam or other vapour generating boilers (excluding central heating hot water boilers capable also of producing low pressure steam); superheated water boilers; parts thereof	Hand Tool
8403	Central heating boilers, non-electric; parts thereof (excluding vapour generating boilers and superheated water boilers of heading 8402)	Hand Tool
8404	Auxiliary plant for use with boilers of heading 8402 or 8403, e.g. economizers, superheaters, soot removers and gas recoverers; condensers for steam or other vapour power units; parts thereof	Hand Tool
8405	Producer gas or water gas generators, with or without their purifiers; acetylene gas generators and similar water process gas generators, with or without their purifiers; parts thereof (excluding coke ovens, electrolytic process gas generators and carbide lamps)	Hand Tool
8406	Steam turbines and other vapour turbines; parts thereof	Hand Tool
8407	Spark-ignition reciprocating or rotary internal combustion piston engine	Hand Tool
8408	Compression-ignition internal combustion piston engine "diesel or semi-diesel engine"	Hand Tool
8409	Parts suitable for use solely or principally with internal combustion piston engine of heading 8407 or 8408	Hand Tool

8410	Hydraulic turbines, water wheels, and regulators therefor (excluding hydraulic power engines and motors of heading 8412)	Hand Tool
8411	Turbojets, turbopropellers and other gas turbines	Hand Tool
8412	Engines and motors (excluding steam turbines, internal combustion piston engine, hydraulic turbines, water wheels, gas turbines and electric motors); parts thereof	Hand Tool
8413	Pumps for liquids, whether or not fitted with a measuring device (excluding ceramic pumps and secretion aspirating pumps for medical use and medical pumps carried on or implanted in the body); liquid elevators (excluding pumps); parts thereof	Hand Tool
8415	Air conditioning machines comprising a motor-driven fan and elements for changing the temperature and humidity, incl. those machines in which the humidity cannot be separately regulated; parts thereof	Hand Tool
8420	Calendering or other rolling machines (other than for metals or glass) and cylinders therefor; parts thereof	Hand Tool
8422	Dishwashing machines; machinery for cleaning or drying bottles or other containers; machinery for filling, closing, sealing or labelling bottles, cans, boxes, bags or other containers; machinery for capsuling bottles, jars, tubes and similar containers; other packing or wrapping machinery, incl. heat-shrink wrapping machinery; machinery for aerating beverages; parts thereof	Hand Tool
8423	Weighing machinery, incl. weight-operated counting or checking machines (excluding balances of a sensitivity of 5 cg or better); weighing machine weights of all kinds; parts thereof	Hand Tool
8425	Pulley tackle and hoists (other than skip hoists); winches and capstans; jacks	Hand Tool
8426	Ships' derricks; cranes, incl. cable cranes (excluding wheel-mounted cranes and vehicle cranes for railways); mobile lifting frames, straddle carriers and works trucks fitted with a crane	Hand Tool
8427	Fork-lift trucks; other works trucks fitted with lifting or handling equipment (excluding straddle carriers and works trucks fitted with a crane)	Hand Tool
8428	Lifting, handling, loading or unloading machinery, e.g. lifts, escalators, conveyors, teleferics (excluding pulley tackle and hoists, winches and capstans, jacks, cranes of all kinds, mobile lifting frames and straddle carriers, works trucks fitted with a crane, fork-lift trucks and other works trucks fitted with lifting or handling equipment)	Hand Tool
8429	Self-propelled bulldozers, angledozers, graders, levellers, scrapers, mechanical shovels, excavators, shovel loaders, tamping machines and roadrollers	Hand Tool
8430	Moving, grading, levelling, scraping, excavating, tamping, compacting, extracting or boring machinery, for earth, minerals or ores; pile-drivers and pile-extractors; snowploughs and snowblowers (excluding those mounted on railway wagons, motor vehicle chassis or lorries, self-propelled machinery of heading 8429, lifting, handling, loading or unloading machinery of heading 8425 to 8428 and hand-operated tools)	Hand Tool
8432	Agricultural, horticultural or forestry machinery for soil preparation or cultivation (excluding sprayers and dusters); lawn or sports-ground rollers; parts thereof	Hand Tool
8433	Harvesting or threshing machinery, incl. straw or fodder balers; grass or hay mowers; machines for cleaning, sorting or grading eggs, fruit or other agricultural produce; parts thereof (other than machines for cleaning, sorting or grading seed, grain or dried leguminous vegetables of heading 8437)	Hand Tool
8434	Milking machines and dairy machinery (excluding refrigerating or heat treatment equipment, cream separators, clarifying centrifuges, filter presses and other filtering equipment); parts thereof	Hand Tool
8435	Presses, crushers and similar machinery used in the manufacture of wine, cider, fruit juices or similar beverages (excluding machinery for the treatment of these beverages, incl. centrifuges, filter presses, other filtering equipment and domestic appliances); parts thereof	Hand Tool

8437	Machines for cleaning, sorting or grading seed, grain or dried leguminous vegetables; machinery used in the milling industry or for the working of cereals or dried leguminous vegetables (excluding farm-type machinery, heat treatment equipment, centrifugal dryers and air filters); parts thereof	Hand Tool
8438	Machinery, not specified or included elsewhere in this chapter, for the industrial preparation or manufacture of food or drink (other than machinery for the extraction or preparation of animal or fixed vegetable fats or oils); parts thereof	Hand Tool
8439	Machinery for making pulp of fibrous cellulosic material or for making or finishing paper or paperboard (excluding autoclaves, boilers, dryers, other heating appliances and calenders); parts thereof	Hand Tool
8440	Bookbinding machinery, incl. book-sewing machines (excluding machinery of heading 8441, general-purpose presses, printing machinery of heading 8443 and machines of uses ancillary to printing); parts thereof	Hand Tool
8441	Machinery for making up paper pulp, paper or paperboard, incl. cutting machines of all kinds, n.e.s.; parts thereof	Hand Tool
8444	Machines for extruding, drawing, texturing or cutting man-made textile materials	Hand Tool
8448	Auxiliary machinery for use with machines of heading 8444, 8445, 8446 or 8447, e.g. dobbies, jacquards, automatic stop motions, shuttle changing mechanisms; parts and accessories suitable for use solely or principally with the machines of this heading or of heading 8444, 8445, 8446 or 8447, e.g. spindles and spindle flyers, card clothing, combs, extruding nipples, shuttles, healds and heald-frames, hosiery needles	Hand Tool
8449	Machinery for the manufacture or finishing of felt or nonwovens in the piece or in shapes, incl. machinery for making felt hats; blocks for making hats; parts thereof (excluding machinery for preparing fibres for felt and calenders)	Hand Tool
8450	Household or laundry-type washing machines, incl. machines which both wash and dry; parts thereof	Hand Tool
8451	Machinery (excluding of heading 8450) for washing, cleaning, wringing, drying, ironing, pressing incl. fusing presses, bleaching, dyeing, dressing, finishing, coating or impregnating textile yarns, fabrics or made-up textile articles and for applying paste to the base fabric or other support used in the manufacture of floor coverings like linoleum; machines for reeling, unreeling, folding, cutting or pinking textile fabrics; parts thereof	Hand Tool
8452	Sewing machines (other than book-sewing machines of heading 8440); furniture, bases and covers specially designed for sewing machines; sewing machine needles; parts thereof	Hand Tool
846310	Draw-benches for metal bars, tubes, profiles, wire or the like	Machine Tools
846320	Thread rolling machines, for working metal	Machine Tools
846390	Machine tools for working metal, sintered metal carbides or cermets, without removing metal (excluding forging, bending, folding, straightening and flattening presses, shearing machines, punching or notching machines, presses, draw-benches, thread rolling machines, machines for working metal wire and machines for working in the hand)	Machine Tools
680421	Millstones, grindstones, grinding wheels and the like, without frameworks, for sharpening, polishing, trueing or cutting, of agglomerated synthetic or natural diamond (excluding hand sharpening or polishing stones, and grinding wheels etc. specifically for dental drill engines)	Miscellaneous Machinery
680422	Millstones, grindstones, grinding wheels and the like, without frameworks, for sharpening, polishing, trueing or cutting, of agglomerated abrasives or ceramics (excluding of agglomerated synthetic or natural diamond, hand sharpening or polishing stones, perfumed pumice stones, and grinding wheels etc. specifically for dental drill engines)	Miscellaneous Machinery
680430	Hand sharpening or polishing stones	Miscellaneous Machinery
681510	Articles of graphite or other carbon, incl. carbon fibres, for non-electrical purposes	Miscellaneous Machinery

681599	Articles of stone or other mineral substances, n.e.s. (excluding containing magnesite, dolomite or chromite and articles of graphite or other carbon)	Miscellaneous Machinery
722990	Wire of alloy steel other than stainless, in coils (excluding bars and rods and wire of silico-manganese steel)	Miscellaneous Machinery
830210	Hinges of all kinds, of base metal	Miscellaneous Machinery
830710	Flexible tubing of iron or steel, with or without fittings	Miscellaneous Machinery
830990	Stoppers, caps and lids, incl. screw caps and pouring stoppers, capsules for bottles, threaded bungs, bung covers, seals and other packing accessories of base metal (excluding crow corks)	Miscellaneous Machinery
842410	Fire extinguishers, whether or not charged	Miscellaneous Machinery
844319	Printing machinery used for printing by means of plates, cylinders and other printing components of heading 8442 (excluding hectograph or stencil duplicating machines, addressing machines and other office printing machines of heading 8469 to 8472, ink jet printing machines and offset, flexographic, letterpress and gravure printing machinery)	Miscellaneous Machinery
848110	Pressure-reducing valves	Miscellaneous Machinery
848120	Valves for oleohydraulic or pneumatic transmission	Miscellaneous Machinery
848130	Check “non-return” valves for pipes, boiler shells, tanks, vats or the like	Miscellaneous Machinery
848140	Safety or relief valves	Miscellaneous Machinery
848310	Transmission shafts, incl. cam shafts and crank shafts, and cranks	Miscellaneous Machinery
848330	Bearing housings for machinery, not incorporating ball or roller bearings; plain shaft bearings for machinery	Miscellaneous Machinery
848350	Flywheels and pulleys, incl. pulley blocks	Miscellaneous Machinery
848360	Clutches and shaft couplings, incl. universal joints, for machinery	Miscellaneous Machinery
848390	Toothed wheels, chain sprockets and other transmission elements presented separately; parts of transmission shafts, ball screws, couplings and other articles of heading 8483, n.e.s.	Miscellaneous Machinery
853229	Fixed electrical capacitors (excluding tantalum, aluminium electrolytic, ceramic, paper, plastic and power capacitors)	Miscellaneous Machinery
854690	Electrical insulators (excluding those of glass or ceramics and insulating fittings)	Miscellaneous Machinery
890610	Warships of all kinds	Miscellaneous Machinery
901720	Drawing, marking-out and mathematical calculating instruments (excluding drafting tables and machines and calculating machines)	Miscellaneous Machinery
910111	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, electrically operated, with mechanical display only (excluding with backs made of steel)	Miscellaneous Machinery
910119	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, electrically operated, with opto-electronic display and with combined mechanical and opto-electronic display (excluding with backs made of steel)	Miscellaneous Machinery
910121	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, with automatic winding (excluding with backs made of steel)	Miscellaneous Machinery
910129	Wrist-watches of precious metal or of metal clad with precious metal, whether or not incorporating a stop-watch facility, with hand winding only (excluding with backs made of steel)	Miscellaneous Machinery
910199	Pocket-watches and the like, incl. stop-watches, of precious metal or of metal clad with precious metal, with hand or automatic winding (excluding with backs made of steel and wrist-watches)	Miscellaneous Machinery

910211	Wrist-watches, whether or not incorporating a stop-watch facility, electrically operated, with mechanical display only (excluding of precious metal or of metal clad with precious metal)	Miscellaneous Machinery
910219	Wrist-watches, whether or not incorporating a stop-watch facility, electrically operated, with combined mechanical and opto-electronic display (excluding of precious metal or of metal clad with precious metal)	Miscellaneous Machinery
910221	Wrist-watches, whether or not incorporating a stop-watch facility, with automatic winding (excluding of precious metal or of metal clad with precious metal)	Miscellaneous Machinery
910229	Wrist-watches, whether or not incorporating a stop-watch facility, with hand winding only (excluding of precious metal or of metal clad with precious metal)	Miscellaneous Machinery
910299	Pocket-watches and the like, incl. stop-watches, with hand or automatic winding (excluding of precious metal or of metal clad with precious metal)	Miscellaneous Machinery
910390	Clocks with watch movements (excluding electrically operated, wrist-watches, pocket-watches and other watches of heading 9101 or 9102, and instrument panel clocks and the like of heading 9104)	Miscellaneous Machinery
910519	Alarm clocks (excluding electrically operated)	Miscellaneous Machinery
910529	Wall clocks (excluding electrically operated)	Miscellaneous Machinery
910599	Clocks (excluding electrically operated, wrist-watches, pocket-watches and other watches of heading 9101 or 9102, clocks with watch movements of heading 9103, instrument panel clocks and the like of heading 9104, alarm clocks and wall clocks)	Miscellaneous Machinery
910820	Watch movements, complete and assembled, with automatic winding	Miscellaneous Machinery
910890	Watch movements, complete and assembled, with hand winding only	Miscellaneous Machinery
910990	Clock movements, complete and assembled (excluding electrically operated and watch movements)	Miscellaneous Machinery
930310	Muzzle-loading firearms, neither designed nor suitable for projecting cartridges	Miscellaneous Machinery
930390	Firearms and similar devices which operate by the firing of an explosive charge (excluding sporting, hunting or target-shooting rifles, revolvers and pistols of heading 9302 and military weapons)	Miscellaneous Machinery
940310	Metal furniture for offices (excluding seats)	Miscellaneous Machinery
940320	Metal furniture (excluding for offices, seats and medical, surgical, dental or veterinary furniture)	Miscellaneous Machinery
940429	Mattresses, fitted with springs or stuffed or internally filled with any material (excluding cellular rubber or plastics, pneumatic or water mattresses and pillows)	Miscellaneous Machinery
6601	Umbrellas and sun umbrellas, incl. walking-stick umbrellas, garden umbrellas and similar umbrellas (excluding toy umbrellas and beach tents)	Miscellaneous Machinery
6603	Parts, trimmings and accessories for umbrellas and sun umbrellas of heading 6601 or for walking sticks, seat-sticks, whips, riding-crops and the like of heading 6602	Miscellaneous Machinery
6814	Worked mica and articles of mica, incl. agglomerated or reconstituted mica, whether or not on a support of paper, paperboard or other materials (excluding electrical insulators, insulating fittings, resistors and capacitors, protective goggles of mica and their glasses, and mica in the form of Christmas tree decorations)	Miscellaneous Machinery
8201	Hand tools, the following: spades, shovels, mattocks, picks, hoes, forks and rakes, of base metal; axes, billhooks and similar hewing tools, of base metal; poultry shears, secateurs and pruners of any kind, of base metal; scythes, sickles, hay knives, hedge shears, timber wedges and other tools of a kind used in agriculture, horticulture or forestry, of base metal	Miscellaneous Machinery
8202	Handsaws, with working parts of base metal (excluding power-operated saws); blades for saws of all kinds, incl. slitting, slotting or toothless saw blades, of base metal	Miscellaneous Machinery
8203	Files, rasps, pliers, incl. cutting pliers, pincers and tweezers for non-medical use, metal-cutting shears, pipe-cutters, bolt croppers, perforating punches and similar hand tools, of base metal	Miscellaneous Machinery

8204	Hand-operated spanners and wrenches, incl. torque meter wrenches (excluding tap wrenches), of base metal; interchangeable spanner sockets, with or without handles, of base metal	Miscellaneous Machinery
8206	Sets of two or more tools of heading 8202 to 8205, put up in sets for retail sale	Miscellaneous Machinery
8445	Machines for preparing textile fibres; spinning, doubling or twisting machines and other machinery for producing textile yarns (excluding machines of heading 8444); textile reeling or winding, incl. weft-winding, machines, and machines for preparing textile yarns for use on the machines of heading 8446 or 8447	Miscellaneous Machinery
8446	Weaving machines “looms”	Miscellaneous Machinery
8447	Knitting machines, stitch-bonding machines and machines for making gimped yarn, tulle, lace, embroidery, trimmings, braid or net and machines for tufting (excluding hem-stitching machines)	Miscellaneous Machinery
820840	Knives and cutting blades, of base metal, for agricultural, horticultural or forestry machines (excluding those for wood-working)	Process Plant Machinery
840110	Nuclear reactors	Process Plant Machinery
840140	Parts of nuclear reactors, n.e.s.	Process Plant Machinery
841410	Vacuum pumps	Process Plant Machinery
841420	Hand-operated or foot-operated air pumps	Process Plant Machinery
841430	Compressors for refrigerating equipment	Process Plant Machinery
841440	Air compressors mounted on a wheeled chassis for towing	Process Plant Machinery
841460	Hoods incorporating a fan, whether or not fitted with filters, having a maximum horizontal side <= 120 cm	Process Plant Machinery
841480	Air pumps, air or other gas compressors and ventilating or recycling hoods incorporating a fan, whether or not fitted with filters, having a maximum horizontal side > 120 cm (excluding vacuum pumps, hand- or foot-operated air pumps, compressors for refrigerating equipment and air compressors mounted on a wheeled chassis for towing)	Process Plant Machinery
841490	Parts of : air or vacuum pumps, air or other gas compressors, fans and ventilating or recycling hoods incorporating a fan, n.e.s.	Process Plant Machinery
841610	Furnace burners for liquid fuel	Process Plant Machinery
841620	Furnace burners for pulverised solid fuel or gas, incl. combination burners	Process Plant Machinery
841630	Mechanical stokers, incl. their mechanical grates, mechanical ash dischargers and similar appliances (excluding burners)	Process Plant Machinery
841690	Parts of furnace burners such as mechanical stokers, incl. their mechanical grates, mechanical ash dischargers and similar appliances, n.e.s.	Process Plant Machinery
841710	Industrial or laboratory furnaces and ovens, non-electric, for the roasting, melting or other heat treatment of ores, pyrites or metals (excluding drying ovens)	Process Plant Machinery
841720	Bakery ovens, incl. biscuit ovens, non-electric	Process Plant Machinery
841780	Industrial or laboratory furnaces and ovens, non-electric, incl. incinerators (excluding those for the roasting, melting or other heat treatment of ores, pyrites or metals, bakery ovens, drying ovens and ovens for cracking operations)	Process Plant Machinery
841790	Parts of industrial or laboratory furnaces, non-electric, incl. incinerators, n.e.s.	Process Plant Machinery
841810	Combined refrigerator-freezers, with separate external doors	Process Plant Machinery
841821	Household refrigerators, compression-type	Process Plant Machinery
841829	Household refrigerators, absorption-type	Process Plant Machinery
841830	Freezers of the chest type, of a capacity <= 800 litres	Process Plant Machinery
841840	Freezers of the upright type, of a capacity <= 900 litres	Process Plant Machinery
841850	Furniture “chests, cabinets, display counters, show-cases and the like” for storage and display, incorporating refrigerating or freezing equipment (excluding combined refrigerator-freezers with separate external doors, household refrigerators and freezers of the chest type of a capacity <= 800 l or of the upright type of a capacity <= 900 l)	Process Plant Machinery

841861	Heat pumps (excluding air conditioning machines of heading 8415)	Process Plant Machinery
841869	Refrigerating or freezing equipment (excluding refrigerating and freezing furniture)	Process Plant Machinery
841891	Furniture designed to receive refrigerating or freezing equipment	Process Plant Machinery
841899	Parts of refrigerating or freezing equipment and heat pumps, n.e.s.	Process Plant Machinery
841911	Instantaneous gas water heaters (excluding boilers or water heaters for central heating)	Process Plant Machinery
841919	Instantaneous or storage water heaters, non-electric (excluding instantaneous gas water heaters and boilers or water heaters for central heating)	Process Plant Machinery
841920	Medical, surgical or laboratory sterilizers	Process Plant Machinery
841931	Dryers for agricultural products	Process Plant Machinery
841932	Dryers for wood, paper pulp, paper or paperboard	Process Plant Machinery
841939	Dryers (excluding dryers for agricultural products, for wood, paper pulp, paper or paperboard, for yarns, fabrics and other textile products, dryers for bottles or other containers, hairdryers, hand dryers and domestic appliances)	Process Plant Machinery
841940	Distilling or rectifying plant	Process Plant Machinery
841950	Heat-exchange units (excluding instantaneous heaters, storage water heaters, boilers and equipment without a separating wall)	Process Plant Machinery
841960	Machinery for liquefying air or other gases	Process Plant Machinery
841981	Machinery, plant and equipment for making hot drinks or for cooking or heating food (excluding domestic appliances)	Process Plant Machinery
841989	Machinery, plant or laboratory equipment, whether or not electrically heated, for the treatment of materials by a process involving a change of temperature such as heating, cooking, roasting, sterilising, pasteurising, steaming, evaporating, vaporising, condensing or cooling, n.e.s. (excluding machinery used for domestic purposes and furnaces, ovens and other equipment of heading 8514)	Process Plant Machinery
841990	Parts of machinery, plant and laboratory equipment, whether or not electrically heated, for the treatment of materials by a process involving a change of temperature, and of non-electric instantaneous and storage water heaters, n.e.s.	Process Plant Machinery
842111	Centrifugal cream separators	Process Plant Machinery
842119	Centrifuges, incl. centrifugal dryers (excluding isotope separators, cream separators and clothes dryers)	Process Plant Machinery
842121	Machinery and apparatus for filtering or purifying water	Process Plant Machinery
842122	Machinery and apparatus for filtering or purifying beverages (excludingwater)	Process Plant Machinery
842123	Oil or petrol-filters for internal combustion engines	Process Plant Machinery
842129	Machinery and apparatus for filtering or purifying liquids (excluding such machinery and apparatus for water and other beverages, oil or petrol-filters for internal combustion engines and artificial kidneys)	Process Plant Machinery
842131	Intake air filters for internal combustion engines	Process Plant Machinery
842139	Machinery and apparatus for filtering or purifying gases (excluding isotope separators and intake air filters for internal combustion engines)	Process Plant Machinery
842191	Parts of centrifuges, incl. centrifugal dryers, n.e.s.	Process Plant Machinery
842199	Parts of machinery and apparatus for filtering or purifying liquids or gases, n.e.s.	Process Plant Machinery
842420	Spray guns and similar appliances (other than electrical machines, appliances and other devices for spraying molten metals or metal carbides of heading 8515, sand blasting machines and similar jet projecting machines)	Process Plant Machinery
842430	Steam or sand blasting machines and similar jet projecting machines, incl. water cleaning appliances with built-in motor (excluding appliances for cleaning special containers)	Process Plant Machinery
842481	Agricultural or horticultural mechanical appliances, whether or not hand-operated, for projecting, dispersing or spraying liquids or powders	Process Plant Machinery

842489	Mechanical appliances, whether or not hand-operated, for projecting, dispersing or spraying liquids or powders, n.e.s.	Process Plant Machinery
842490	Parts of fire extinguishers, spray guns and similar appliances, steam or sand blasting machines and similar jet projecting machines and machinery and apparatus for projecting, dispersing or spraying liquids or powders, n.e.s.	Process Plant Machinery
844230	Machinery, apparatus and equipment for preparing or making printing blocks, plates, cylinders or other printing components (excluding machine tools of heading 8456 to 8465 and machinery for type founding and typesetting)	Process Plant Machinery
844240	Parts of machinery, apparatus and equipment for preparing or making printing blocks, plates, cylinders or other printing components, n.e.s.	Process Plant Machinery
844250	Plates, cylinders and other printing components; plates, cylinders and lithographic stones, prepared for printing purposes, e.g. planed, grained or polished	Process Plant Machinery
844311	Offset printing machinery, reel fed	Process Plant Machinery
844312	Offset printing machinery, sheet fed [office type], using sheets of a side <= 22 x 36 cm in the unfolded state	Process Plant Machinery
846330	Machine tools for working metal wire, without removing material (excluding wire bending machines of heading 8461 and machines for working in the hand)	Process Plant Machinery
847490	Parts of machinery for working mineral substances of heading 8474, n.e.s.	Process Plant Machinery
847621	Automatic beverage-vending machines incorporating heating or refrigerating devices	Process Plant Machinery
847629	Automatic beverage-vending machines, without heating or refrigerating devices	Process Plant Machinery
847681	Automatic goods-vending machines incorporating heating or refrigerating devices (excluding automatic beverage-vending machines)	Process Plant Machinery
847689	Automatic goods-vending machines, without heating or refrigerating devices; money changing machines (excluding automatic beverage-vending machines)	Process Plant Machinery
847690	Parts of automatic goods-vending machines, incl. money changing machines, n.e.s.	Process Plant Machinery
847920	Machinery for the extraction or preparation of animal or fixed vegetable fats or oils (other than centrifuges, filters and heating appliances)	Process Plant Machinery
847930	Presses for the manufacture of particle board or fibre building board of wood or other ligneous materials and other machinery for treating wood or cork (excluding dryers, spray guns and the like and machine tools)	Process Plant Machinery
847940	Rope or cable-making machines (excluding twisting machines of the type used in spinning mills)	Process Plant Machinery
847950	Industrial robots, n.e.s.	Process Plant Machinery
847960	Evaporative air coolers, n.e.s.	Process Plant Machinery
847981	Machinery for treating metal, incl. electric wire coil-winders, n.e.s. (excluding industrial robots, furnaces, dryers, spray guns and the like, high-pressure cleaning equipment and other jet cleaners, rolling millls or machines, machine tools and rope or cable-making machines)	Process Plant Machinery
847982	Mixing, kneading, crushing, grinding, screening, sifting, homogenising, emulsifying or stirring machines, n.e.s. (excluding industrial robots)	Process Plant Machinery
847989	Machines and mechanical appliances, n.e.s.	Process Plant Machinery
847990	Parts of machines and mechanical appliances, n.e.s.	Process Plant Machinery
848180	Appliances for pipes, boiler shells, tanks, vats or the like (excluding pressure-reducing valves, valves for the control of pneumatic power transmission, check “non-return” valves and safety or relief valves)	Process Plant Machinery
848190	Parts of valves and similar articles for pipes, boiler shells, tanks, vats or the like, n.e.s.	Process Plant Machinery
848210	Ball bearings	Process Plant Machinery
848220	Tapered roller bearings, incl. cone and tapered roller assemblies	Process Plant Machinery
848230	Spherical roller bearings	Process Plant Machinery
848240	Needle roller bearings	Process Plant Machinery

848250	Cylindrical roller bearings (excluding needle roller bearings)	Process Plant Machinery
848280	Roller bearings, incl. combined ball-roller bearings (excluding ball bearings, tapered roller bearings, incl. cone and tapered roller assemblies, spherical roller bearings, needle and cylindrical roller bearings)	Process Plant Machinery
848291	Balls, needles and rollers for bearings (excluding steel balls of heading 7326)	Process Plant Machinery
848299	Parts of ball or roller bearings (excluding balls, needles and rollers), n.e.s.	Process Plant Machinery
848320	Bearing housings, incorporating ball or roller bearings, for machinery	Process Plant Machinery
848340	Gears and gearing for machinery (excluding toothed wheels, chain sprockets and other transmission elements presented separately); ball or roller screws; gear boxes and other speed changers, incl. torque converters	Process Plant Machinery
848420	Mechanical seals	Process Plant Machinery
851410	Resistance heated industrial or laboratory furnaces and ovens (excluding drying ovens)	Process Plant Machinery
851420	Furnaces and ovens functioning by induction or dielectric loss	Process Plant Machinery
851430	Electric industrial or laboratory furnaces and ovens (excluding resistance heated, induction, dielectric and drying furnaces and ovens)	Process Plant Machinery
851440	Equipment for the heat treatment of materials by induction or dielectric loss (excluding ovens and furnaces)	Process Plant Machinery
851490	Parts of electric industrial or laboratory furnaces and ovens, incl. of those functioning by induction or dielectric loss, and of industrial or laboratory equipment for the heat treatment of materials by induction or dielectric loss, n.e.s. (other than for the manufacture of semiconductor devices on semiconductor wafers)	Process Plant Machinery
854511	Electrodes of graphite or other carbon, for electric furnaces	Process Plant Machinery
870810	Bumpers and parts thereof for tractors, motor vehicles for the transport of ten or more persons, motor cars and other motor vehicles principally designed for the transport of persons, motor vehicles for the transport of goods and special purpose motor vehicles, n.e.s.	Process Plant Machinery
871610	Trailers and semi-trailers of the caravan type, for housing or camping	Process Plant Machinery
871620	Self-loading or self-unloading trailers and semi-trailers for agricultural purposes	Process Plant Machinery
871631	Tanker trailers and tanker semi-trailers, not designed for running on rails	Process Plant Machinery
871639	Trailers and semi-trailers for the transport of goods, not designed for running on rails (excluding self-loading or self-unloading trailers and semi-trailers for agricultural purposes and tanker trailers and tanker semi-trailers)	Process Plant Machinery
871640	Trailers and semi-trailers, not designed for running on rails (excluding trailers and semi-trailers for the transport of goods and those of the caravan type for housing or camping)	Process Plant Machinery
871690	Parts of trailers and semi-trailers and other vehicles not mechanically propelled, n.e.s.	Process Plant Machinery
8207	Tools, interchangeable, for hand tools, whether or not power-operated, or for machine tools “e.g. for pressing, stamping, punching, tapping, threading, drilling, boring, broaching, milling, turning or screw driving”, incl. dies for drawing or extruding metal, and rock-drilling or earth-boring tools	Process Plant Machinery
8209	Plates, sticks, tips and the like for tools, unmounted, of sintered metal carbides or cermets	Process Plant Machinery
8210	Hand-operated mechanical devices, of base metal, weighing <= 10 kg, used in the preparation, conditioning or serving of food or drink	Process Plant Machinery
8211	Knives with cutting blades, serrated or not, incl. pruning knives, and blades therefor, of base metal (excluding straw knives, machetes, knives and cutting blades for machines or mechanical appliances, fish knives, butter knives, razors and razor blades and knives of heading 8214)	Process Plant Machinery
8212	Non-electric razors and razor blades of base metal, incl. razor blade blanks in strips	Process Plant Machinery

8213	Scissors, tailors' shears and similar shears, and blades therefor, of base metal (excluding hedge shears, two-handed pruning shears and similar two-handed shears, secateurs and similar one-handed pruners and shears and hoof nippers for farriers)	Process Plant Machinery
8215	Spoons, forks, ladles, skimmers, cake-servers, fish-knives, butter-knives, sugar tongs and similar kitchen or tableware of base metal (excluding lobster cutters and poultry shears of heading 8201 and 8213)	Process Plant Machinery
8436	Agricultural, horticultural, forestry, poultry-keeping or bee-keeping machinery, incl. germination plant fitted with mechanical or thermal equipment; poultry incubators and brooders; parts thereof	Process Plant Machinery
8453	Machinery for preparing, tanning or working hides, skins or leather or for making or repairing footwear or other articles of hides, skins or leather (excluding drying machines, spray guns, machines for the dehairing of pigs, sewing machines and general purpose presses); parts thereof	Process Plant Machinery
8454	Converters, ladles, ingot moulds and casting machines of a kind used in metallurgy or in metal foundries (excluding metal powder presses); parts thereof	Process Plant Machinery
8455	Metal-rolling mills and rolls therefor; parts of metal-rolling mills	Process Plant Machinery
8456	Machine tools for working any material by removal of material, by laser or other light or photon beam, ultrasonic, electro-discharge, electro-chemical, electron beam, ionic-beam or plasma arc processes; water-jet cutting machines (excluding cleaning apparatus operated by ultrasonic processes, soldering and welding machines, incl. those which can be used for cutting, and material testing machines)	Process Plant Machinery
8457	Machining centres, unit construction machines "single station" and multi-station transfer machines for working metal	Process Plant Machinery
8458	Lathes, incl. turning centres, for removing metal	Process Plant Machinery
8459	Machine tools, incl. way-type unit head machines, for drilling, boring, milling, threading or tapping (excluding lathes and turning centres of heading 8458, gear cutting machines of heading 8461 and hand-operated machines)	Process Plant Machinery
8460	Machine tools for deburring, sharpening, grinding, honing, lapping, polishing or otherwise finishing metal, metal carbides or cermets by means of grinding stones, abrasives or polishing products (excluding gear cutting, gear grinding or gear finishing machines of heading 8461 and machines for working in the hand)	Process Plant Machinery
8461	Machine tools for planing, shaping, slotting, broaching, gear cutting, gear grinding or gear finishing, sawing, cutting-off and other machine tools working by removing metal, sintered metal carbides or cermets, n.e.s.	Process Plant Machinery
8462	Machine tools, incl. presses, for working metal by forging, hammering or die-stamping; machine tools, incl. presses, for working metal by bending, folding, straightening, flattening, shearing, punching or notching; presses for working metal or metal carbides (excluding machines of chapters 8456 to 8461)	Process Plant Machinery
8477	Machinery for working rubber or plastics or for the manufacture of products from these materials, not specified or included elsewhere in this chapter, parts thereof	Process Plant Machinery
8478	Machinery for preparing or making up tobacco, not specified or included elsewhere in this chapter; parts thereof	Process Plant Machinery
8480	Moulding boxes for metal foundry; mould bases; moulding patterns; moulds for metal (other than ingot moulds), metal carbides, glass, mineral materials, rubber or plastics (excluding moulds of graphite or other carbons, ceramic or glass moulds and linotype moulds or matrices)	Process Plant Machinery
8502	Electric generating sets and rotary converters	Process Plant Machinery
8503	Parts suitable for use solely or principally with electric motors and generators, electric generating sets and rotary converters, n.e.s.	Process Plant Machinery
8507	Electric accumulators, incl. separators therefor, whether or not square or rectangular; parts thereof (excluding spent and those of unhardened rubber or textiles)	Process Plant Machinery
8509	Electromechanical domestic appliances, with self-contained electric motor; parts thereof (excluding vacuum cleaners, dry and wet vacuum cleaners)	Process Plant Machinery

8510	Electric shavers, hair clippers and hair-removing appliances, with self-contained electric motor; parts thereof	Process Plant Machinery
8513	Portable electric lamps designed to function by their own source of energy, e.g. dry batteries, accumulators and magnetos; parts thereof (excluding lighting equipment of heading 8512)	Process Plant Machinery
8515	Electric, incl. electrically heated gas, laser or other light or photon beam, ultrasonic, electron beam, magnetic pulse or plasma arc soldering, brazing or welding machines and apparatus, whether or not capable of cutting; electric machines and apparatus for hot spraying of metals, metal carbides or cermets; parts thereof (excluding guns for spraying hot materials of heading 8424)	Process Plant Machinery
8530	Electrical signalling, safety or traffic control equipment for railways, tramways, roads, inland waterways, parking facilities, port installations or airfields (excluding mechanical or electromechanical equipment of heading 8608); parts thereof	Process Plant Machinery
8539	Electric filament or discharge lamps, incl. sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps; parts thereof	Process Plant Machinery
8701	Tractors (other than tractors of heading 8709)	Process Plant Machinery
8710	Tanks and other armoured fighting vehicles, motorised, whether or not fitted with weapons, and parts of such vehicles, n.e.s.	Process Plant Machinery
9301	Military weapons, incl. sub-machine guns (excluding revolvers and pistols of heading 9302 and cutting and thrusting weapons of heading 9307)	Process Plant Machinery
9302	Revolvers and pistols (excluding those of heading 9303 or 9304 and sub-machine guns for military purposes)	Process Plant Machinery
9305	Parts and accessories for weapons and the like of heading 9301 to 9304, n.e.s.	Process Plant Machinery
9306	Bombs, grenades, torpedoes, mines, missiles, cartridges and other ammunition and projectiles and parts thereof, incl. buckshot, shot and cartridge wads, n.e.s.	Process Plant Machinery
9307	Swords, cutlasses, bayonets, lances and similar arms and parts thereof, and scabbards and sheaths therefor (excluding of precious metal or of metal clad with precious metal, blunt weapons for fencing, hunting knives and daggers, camping knives and other knives of heading 8211, sword belts and the like of leather or textile materials, and sword knots)	Process Plant Machinery
9401	Seats, whether or not convertible into beds, and parts thereof, n.e.s. (excluding medical, surgical, dental or veterinary of heading 9402)	Process Plant Machinery
9402	Medical, surgical, dental or veterinary furniture, e.g. operating tables, examination tables, hospital beds with mechanical fittings and dentists' chairs; barbers' chairs and similar chairs having rotating as well as both reclining and elevating movement; parts thereof	Process Plant Machinery