

## Production trends in Indian machine tool industry

Radhika T R<sup>1</sup> and Shripathi Kalluraya<sup>2</sup>

**Abstract:** *The paper aims to analyze the trends in production and consumption of machine tools. It also analyses the reason for the changes in production and consumption in Indian machine tool sector after economic reforms. The paper throws light on the changes in the type of machine tools produced after 2000 and compares with the type of machine tools produced in 1990. The paper concludes that the machine tool sector being an important industry producing mother machine has increased the production of computer numerically controlled machines. Growth of machine tool consumption has surpassed the growth in production which has increased the gap between the two.*

**Key words:** Machine tools, Production trends, Production.

### Introduction

Machine tool sector is a basic capital good industry. It is a sub-sector of the engineering industry. It is included under the category of heavy engineering units. Machine tool segment produces mother machines and therefore plays an important role in the development of technological up-gradation, quality and cost in the Engineering industry. Machine tool industry plays an important role in enhancing competitiveness, quality and output in the manufacturing sector. India stands 17<sup>th</sup> in production and 12<sup>th</sup> in consumption of machine tools in the world. The Indian machine tool industry comprises of 160 players in the organized sector and around 400 units in the small and ancillary sector, with a Rs. 17 billion worth production in machine tool industry. 75.0 per cent of the Indian producers are International Organization of Standardization (ISO) certified and CE<sup>3</sup> marketing certification firms which is a basic criterion required for exports.

### Profile of machine tool sector

Industry is segmented in several ways: Based on how the metal is shaped, the industry can be classified into metal cutting machines and metal forming machines. Based on how the movement is controlled, it is classified into Computer Numerically Controlled (CNC) and conventional machines. Based on the usage purpose, the industry can be classified into general purpose machines and special purpose machines.

Metal cutting machine tools consist of electro discharge machines, machining centers, lathe and automates, boring and milling machines, drilling machines, threading/tapping machines, grinding machines, planning, shaping, slotting and broaching machines, gear-cutting machines.

---

<sup>1</sup> Research scholar Mangalore University

<sup>2</sup> Professor, Department of studies and research in Economics, Mangalore University.

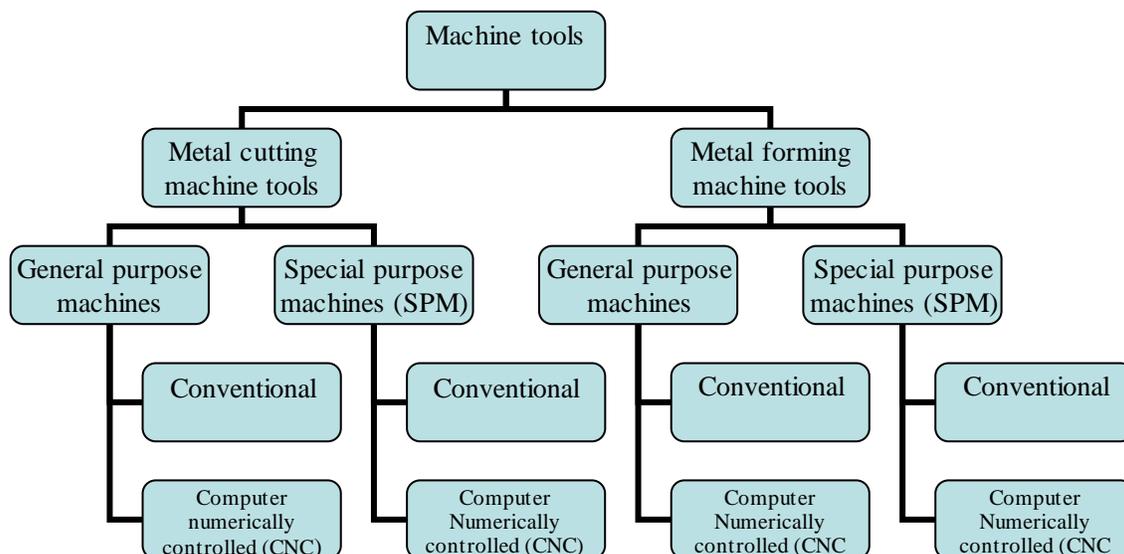
**Corresponding author:** Radhika T R can be contacted at: radhikatr18566@gmail.com

Any remaining errors or omissions rest solely with the author(s) of this paper

<sup>3</sup> CE is a symbol. The letters CE are the abbreviation of French phrase “Conformite Europeene” which literally means “European Conformity in the directive 93/68/EEC in 1993.

## Production trends in Indian machine tool industry

Metal forming machines consist of bending folding machines, straightening, flattening machines including press breaks, punching and/or shearing machines, presses, die-casting etc. Metal cutting machine tools accounts for 87 percent of the total machine tool production of which 66 percent is CNC machines. Indian machine tool is thus dominated by the metal cutting CNC segment by 2005-06.



Ten major Indian companies contribute almost 70 percent of the output. They are led by the public sector giant Hindustan Machine Tools (HMT) which contributes almost 30 percent of the output. Other major manufacturers are Bharat Fritz Werners Ltd, Kennametal India Ltd, Batliboi Ltd, Ace Designers, Ace Manufacturing systems Ltd. Fanuc India Pvt Ltd, Lakshmi Machine Works, Yuken India Ltd, ASB International Pvt. Ltd. Small scale sector has traditionally a strong presence in the machine tool industry. They meet the demand for components, accessories apart from manufacturing machines.

Machine tool industry is concentrated mainly in Mumbai and Pune in Maharashtra with 29 percent of the firms, Bangalore in Karnataka with 28 percent of the firms, and Jalandhar and Ludhiana in Punjab with 14 percent of the firms. Gujarat, Tamil Nadu, Delhi, Andhra Pradesh and Haryana also host machine tool firms in small numbers. As the growth of machine tool sector started mainly in Karnataka and Mumbai, the concentration of firms is larger in these areas.

### Brief review of literature

Machine tool sector being an important sector influencing the level of industrialization of a country has attracted researchers to study this sector. Vinish Kathuria(2000), made a comparative analysis of the role of state in the development of machine tool sector in India and Taiwan. He reviewed the government policies in the two countries and analysed the effect of the state policy on developing competitiveness in the two countries. He concluded that the multi-facet role played by the state in India made the Indian machine tool sector uncompetitive.

Klynveld Peat Marwick Goerdeler (KPMG) a professional service company which is one of the big four auditors company, conducted a study and submitted a report to India Brand Equity Foundation (IBEF). The study aimed at a study of machine tool sector's composition and

structure, market, opportunities by analyzing the supporting industries and institutions and user industries. The analysis referred to the year 2005-06. The report concluded that there are several opportunities for growth and the industry has to concentrate on R&D and innovation, acquiring the latest technology and improve productivity to remain globally competitive.

Susan B Maitra and Ramtanu Maitra (1997) in their article analysed the need to change the direction of trade of Indian machine tool sector in the light of disintegration of USSR and the changes it brought about in Eastern Europe. Development of trade in the new “silk road” required Indian machine tool industry to upgrade technology. The study points out the weaknesses that Indian machine tool sector faced in the process of upgrading technology in the early 1992-03 after globalization of Indian economy.

### **Machine tool sector before 1980's**

Beginning of machine tool industry dates back to the times of II world war. The sector received a real boost during the II and III five year plan with the establishment of Hindustan Machine Tools (HMT) in 1953. Production of machine tools grew at a rate of 26.38 percent during 1950-60 and at 11.23 percent between 1960 and 1970. Production of machine tool industry has witnessed growth from Rs 320.13 million in 1970 to Rs 560.12 million in 1980. Machine tool production witnessed a steady growth rate during 1970 and 1980. Growth rate is high in 1973, 1974 and 1979 but is negative in 1972, 1975, 1977 and 1980. Indian Machine tool industry grew at a moderate average rate of 6.65 percent between 1970 and 1980. During 1970-1980, government of India relaxed the existing policy of import controls and shifted from quota to tariff restriction. The number of machine tools placed under open general license increased but the tariffs for CNC machines were kept high.

### **Objectives**

The main purpose of this paper is to analyze the production trends in Machine Tool Industry in India. The specific objectives are;

1. The paper aims at analyzing the trends of production, consumption of machine tool industry in India.
2. To examines the changes in the type of machine tool production over time and the reason for changes.

### **Methodology**

The paper attempts to analyze the evolution of Machine tool industries in India using time series analysis. The analysis is based on secondary data. Comparison of trends across different time periods are attempted and classification of time periods are based on some important policy deviation. Later, using simple averages and growth rates the variations in growth trends are discussed.

### **Development of Indian machine tools after 1980's**

Indian machine tool sector experienced important policy changes by 1984. “Broad banding” to machine tool firms aimed at optimizing the utilization of capacity and encourage large volumes. Machine tool producers no longer needed an industrial license to produce new models within their licensed capacity. Though huge opportunity was created from Suzuki which collaborated with government of India for automobile production, they heavily relayed on Japanese machine tool manufacturers. Industry registered a slower growth rate of 6.05 percent between 1980 and

## Production trends in Indian machine tool industry

1990 as against 6.65 percent between 1970 and 1980. Indian machine tools had to shift from conventional machine tool production to production of CNC machines during this time. Mid 1980's witnessed several Japanese joint ventures and requirement of technological sophistication.

### Indian machine tools in liberalized era

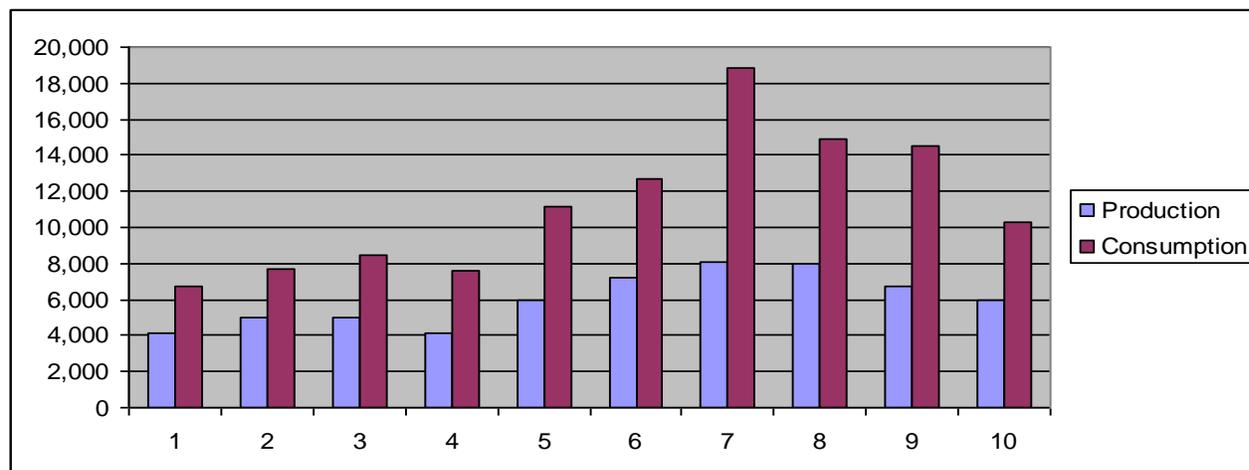
Liberalization after 1991 had a huge impact on the capital good sector. Abolition of import licenses, progressive fall in import duties, abolition of Foreign Exchange Regulation Act (FERA), led to increased competition in the machine tool sector. Machine Tool (MT) sector was protected and inefficiencies prevailed, liberalization proved heavy to breed inefficiencies. Indian economy witnessed a phase of economic crisis in the late 1980's. 1991 reforms was an answer to overcome the crisis. Indian industries were passing through a phase of recession during 1990-93. At the same time, the collapse of former Eastern Europe and USSR resulted in the collapse of the bilateral trade agreements between India and USSR and other East European countries. All these compounded and resulted in huge losses in several firms.

**Table 1: Production and Consumption of Machine tools in India, during 1990-99 (In million Rupees)**

Sl. no	Year	Production	% Growth rate	Consumption	% growth rate
1	1990	4,132	21.78	6,727	52.26
2	1991	5,043	22.04	7,720	14.76
3	1992	4,998	-0.89	8,491	9.98
4	1993	4,116	-17.64	7,577	-10.76
5	1994	5,990	45.52	11,119	46.74
6	1995	7,198	20.16	12,729	14.47
7	1996	8,080	12.25	18,834	47.96
8	1997	7,963	-1.44	14,863	-21.08
9	1998	6,712	-15.71	14,511	-2.36
10	1999	5,970	-11.05	10,315	-28.91

Source: IMTMA annual reports

### Production and Consumption of Machine Tools in India



Source: IMTMA Annual Reports

From the table-1, we find that domestic production has always fallen short of domestic consumption demand. The average rate of growth of domestic production between 1990 and 1999 is 7.50 percent whereas the average growth of consumption demand during the same period is 12.30 percent. Production is undoubtedly driven by consumption demand. Production growth rates have fallen in the years where consumption demand has slowed down. During the years 1993, 1997, 1998 and 1999 consumption growth rate is negative so also production growth.

Indian machine tool sector which was highly protected before 1990 was thrown open to face global competition. The above data shows that two years of negative growth was a period which the industry needed to bounce back with 45.52 percent growth. Indigenous demand shifted from public sector to private sector. Pre 1991 era was dominated by the government as a major consumer. 30 percent of the machine tool demand was from defense and railways, by 1997, government purchase of machine tools reduced to 10 percent.

After hiccups of the machine tool firm the sector geared up to face international competition. One of the important features that emerged is the increased share of technocrat-owned firms and enhanced role of subcontracting to avail the benefit of economies of scale which could slim their costs of production. As a result of lower import duties, prices of CNC machines fell as it had 30-40 percent import content.

Important change noticed in the Indian firms was the increase in demand and production of Computer Numerically Controlled (CNC) machines. Production of CNC machines increased from 16 numbers in 1984 to 800 in 1994 and 1220 machines in 1999. Increased demand for CNC was due to the boom in the automobile sector which demanded accuracy, repeatability and bulky production. Maruthi Suzuki in collaboration with government of India which started production of automobiles in India needed subcontractors for manufacturer of spare parts, accessories and components. Small scale engineering firms responded positively for this challenge to supply at a competitive price and maintain time schedules which were required to keep the order. This increased the demand for CNC machines in the auto sector which is a user sector of the machine tool firm.

**Table 2: Production and consumption of Machine tools in India during 2000-01 (in million rupees)**

Sl no	Year	Production	%growth rate	Consumption	%growth rate
1	2000-01	6,307 (27)	5.64	10,232	-0.80
2	2001-02	5,268 (40)	-16.47	7830	-23.47
3	2002-03	4,817(44.6)	-8.56	9640	23.12
4	2003-04	5,929 (59.6)	23.08	17,070	77.07
5	2004-05	10,950 (54.82)	84.68	28,632	67.73
6	2005-06	13,420 (57.44)	22.55	41,905	46.35
7	2006-07	17,217 (68.51)	28.29	63044	50.44
8	2007-08	19,020 (65.06)	10.47	77472	22.89
9	2008-09	14,244 (62.49)	-25.11	76055	-1.82
10	2009-10	16,562 (59.85)	16.27	64137	-15.67

**Source:** annual reports 2006-2010.

**Note:** production turnover adjusted to reflect turnover of companies outside IMTMA database.

**Note:** Figures in the bracket reflect the percentage of CNC machines produced.

## Production trends in Indian machine tool industry

The potential of the industry was optimally used and the challenges of slimming profits due to fall in the price were made up by adopting total quality management (TQM)<sup>4</sup>, lean manufacturing system<sup>5</sup>, in order to enhance their profitability. These management systems were introduced to the Indian manufacturing by mainly buyer- seller interaction. One of the most important aspects of cost in Indian industries was the amount of inventory holding. Inventory holdings were 8 months in the case of the average firm where as 1.1 months was the average holding for best Indian performer. Inventory holdings were 0.8 months in Japanese firms. Adoption of management techniques in the process of production and technological upgradation as a result of buyer-seller interaction helped Indian firms to reduce costs and face international competition.

Production after 2000 witnessed an upward trend with high growth rates in production and consumption. Production of CNC machines increased in real terms and in terms of percentage of the total production. By 1999, 22 percent of the machines produced were CNC machines this percentage increased to 59.6 percent by 2003. Indian industry faced recession between 1997 and 2002. In spite of a fall in production, number of CNC machines produced increased.

The table 2 suggests that the production recorded an impressive growth rate with the exception of three years in 2001, 2002 and 2008. This decade has an average growth rate of 14.08 percent. Machine tool sector has a very strong backward linkage. Indian economy grew at an impressive average rate of 8.3 percent with 9.7 percent as its peak and a low of 6.5 percent. Manufacturing sector also recorded an impressive average growth of 9.27 percent. This exponential performance showed its impact on the machine tool sector which showed 14.08 percent growth. Indian machine tool consumption also increased and moved on to 11<sup>th</sup> spot from 16<sup>th</sup> position in the world consumption table. India became a major destination for global investment in the machine tool sector as it promised enormous potential market.

This huge expansion in the consumption demand was both a threat and an opportunity for the domestic firms. It called for continuous technological upgradation, more buyer-seller interaction to assure the customer's requirement and expectation is met on time. Time schedules, technology and price became most important for the firms during this period. President of IMTMA called for the firms for "capacity expansion, strengthening the supply chain to ensure firms to meet the time schedules and at the same time adopt lean manufacturing, strong emphasis on technology and people development". Production of CNC machines also increased both in numbers and in percentages. It increased from 54.81 percent in 2004 to 68.51 percent in 2006 and 62.49 percent in 2008. Though the decade started with high growth, it slowed down towards the end with global slowdown influencing the growth of industrial sector. Technology development has taken the driver seat in this decade. Though global slowdown had reduced domestic consumption, production and exports, 10 machine tool firms were successful in developing new products which totaled 37 new models of machines.

Production growth has been less than the growth of consumption demand. Domestic firms are unable to expand production to meet the rate of expansion of consumption demand.

---

<sup>4</sup> Total quality management refers to the effort of all the members of the organization participating in improving processes, product, services and the culture in which they work. It is a management approach to long-term success through customer satisfaction.

<sup>5</sup> Lean manufacturing system or principle refers to the process of elimination of waste in production, waste in inventory which is also referred to as just in time manufacturing, continuous improvement, respect for humanity, leveled production, quality built in.

Therefore, the gap between production and consumption is widening over time. We find that domestic production meets less than 50.0 percent of the consumption demand in India. This shows the huge potential of the sector which is untapped by the firms.

**Table 3: Production, consumption and growth of Indian machine tool industry during 2010-16 (in Rs. Crores)**

Sl no	Year	Production	% rate of growth	Consumption	%rate of growth
1	2010-11	3624 (77.55)	45.89	10191	58.91
2	2011-12	4299 (78.28)	18.62	11764	15.43
3	2012-13	3885 (76.05)	-9.6	11269	-4.20
4	2013-14	3481 (81.56)	-10.39	7906	-29.8
5	2014-15	4230 (82.97)	21.51	9268	17.22
6	2015-16	4727 (84.69)	11.74	10376	11.95

**Source** annual report IMTMA 2011-12, 12-13, 14-15

**Note:** production turnover adjusted to reflect turnover of companies outside IMTMA database.

**Note:** Figures in the bracket reflect the percentage of CNC machines produced.

Global economic slowdown started in 2008 and this had its impact on Indian industry. Investments in the user sector were falling, exports reduced and runaway inflation in the Indian economy high deficits, low business sentiments, depreciating rupee, gloomy global trade, and crisis of confidence in institutional framework. By 2011, industry was expecting measures from the government to counter the slow down and high inflation in the economy. The optimism was short lived, tighter monetary policy, and Euro-zone crisis changed the industry sentiment. Still industry fared marginally better than the meltdown of 2008-09. For the first time government and industry worked in partnership to bring back the phase of 9.0 percent plus GDP growth back. The working group on capital goods and engineering sector recognized the importance of machine tool sector and intended to increase it from the current level to Rs 6, 81,000 crores by 2016-17. To achieve this target the group suggested focus on technology, R&D and skill development initiatives, besides a host of other segment specific measures.

In 2012-2013, global conditions were challenging though optimism prevailed in several manufacturing sectors such as automotive and defence. These two sectors experienced increase in orders for manufacturing technologies. The dynamics of machine tool business have changed over years. There is a need to renew focus on technology, innovation and new product development. As competition has increased, firms need to concentrate on superior performance, zero tolerance, Total Productive Maintenance and lean manufacturing, greater automation and integrating green aspects in manufacturing technology. The industry also needed to concentrate on human resources and skill development.

Indian government introduced series of reforms to lift the economy and the manufacturing sector paid off and Indian economy recorded a recovery to 7.3 percent growth. Industrial recovery firmly took root and an impending turnaround in the investment cycle. Machine tool sector recorded a growth rate of 21.51 percent which was a huge recovery from -10.39 percent. Prediction that Indian economy is expected to grow at 8 plus percent and International Monetary Fund (IMF) forecast that Indian economy is emerging as one of the fastest growing economy, built optimism in the industry. Machine tool sector recorded an average growth of 12.96 percent between 2010 and 2015 which is higher than the average consumption growth of 11.58 percent during the same period.

### **Make in India initiative for Machine Tools**

“Make in India” initiative introduced by the government of India has identified automobiles, auto-components, biotechnology, defence, railways and textiles for development. Machine tool industry will be the key enabler in this journey as automobiles, auto-components, defence and railways have been the main users of machine tools. It gives great opportunity for the sector to grow at 20-25 percent annually to increase its market share. Consumption demand is expected to grow at 15.0 percent, and the domestic production meets less than 50.0 percent of the domestic demand. The industry also faces the threat that if the sectors growth is not accelerated, it may end up being a poor brother of the foreign companies.

Under the Make in India initiative, Government of India and the Department of Heavy Industries has announced three major policy initiatives. They are:

- a) Comprehensive scheme for enhancement of global competitiveness in the capital goods sector.
- b) Support for establishment of a machine tool park
- c) Establishment of a centre of Excellence in machine tools and production technology.

Indian industry has to identify its strengths and strengthen its strengths and overcome its weakness to achieve sustained, high growth. Indian Machine Tool Manufacturers Association (IMTMA) in this regard has tried to identify the strengths of the industry. One of the hidden strength of the industry is its ability to design, engineer and manufacture a wide range of Special Purpose Machine's (SPM). Government of India under the “Make in India” initiative created the “Advance Centre of Excellence” for R&D and technology development with National Centres of Excellence in Education and Technology such as the Indian Institute of Technology (IIT's) and the Central Machine Tool Manufacturing Technology Institute (CMTI) Bangalore. IMTMA design institute was started in Gurugram and Pune to provide training to young engineers in sound design knowledge and enhance capabilities.

Technology up gradation is most essential in order to compete with the global players. India tied a pact with Germany for technology up gradation in 2016. Government of India created a fund under the “Technology Acquisition Fund Programme” in order to help the capital good sector to acquire and assimilate specific technologies.

Establishment of Machine Tool Park will help in making the sector cost effective, hi-tech machine tools, enhance export capabilities and attract more investment.

### **Conclusion**

Machine tool sector producing mother machines is an important capital good industry which influences the productivity of the industrial sector. It has strong backward linkage. Though the growth rate in production has been modest till 1990, it has shown strong growth rates in the post liberalization era. One can conclude that the industry is not only able to face global competition, but has grown in size and technology.

An important trend in the Machine Tool sector is the continuous increase in the production of CNC machines for the total machine production. This shows that the machine tool sector is now improving in technology. But, the level of automation is low compared to the advanced countries like Germany. Therefore, we can say that Indian MT sector is in the lower end of technology. Technology development is essential for the sector to move up the table in global production.

The rate of growth of consumption demand is higher than the rate of growth of production till 2011-12. Therefore the gap between domestic production and domestic

consumption of machine tools has increased. Domestic production is not able to meet 50 percent of the domestic consumption. It is therefore necessary that the firms expand production and new firms enter the industry. Potential for growth is high in this sector.

### Reference

- A report by KPMG for IBEF, (2007) "Machine Tools Markets and Opportunities".  
Indian Machine Tool Manufacturers Association- Report of the Executive Committee for the year 1974-75.  
Annual Reports of IMTMA 2006-07, 2007-08, 2008-09, 2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2014-15, 2015-16.  
Kathuria Vinish (Nov 2000), "Technical change, International Competitiveness, and Role of the state: Indian Machine Tool Industry's Experience" working paper 121, Gujarat institute of development research Gota, Ahmedabad.  
Maitra B Susan and Maitra Ramtanu (1997) "Upgrade India's machine tool industry to build the Eurasian land-bridge", Economics, Vol. 24, June 6.