

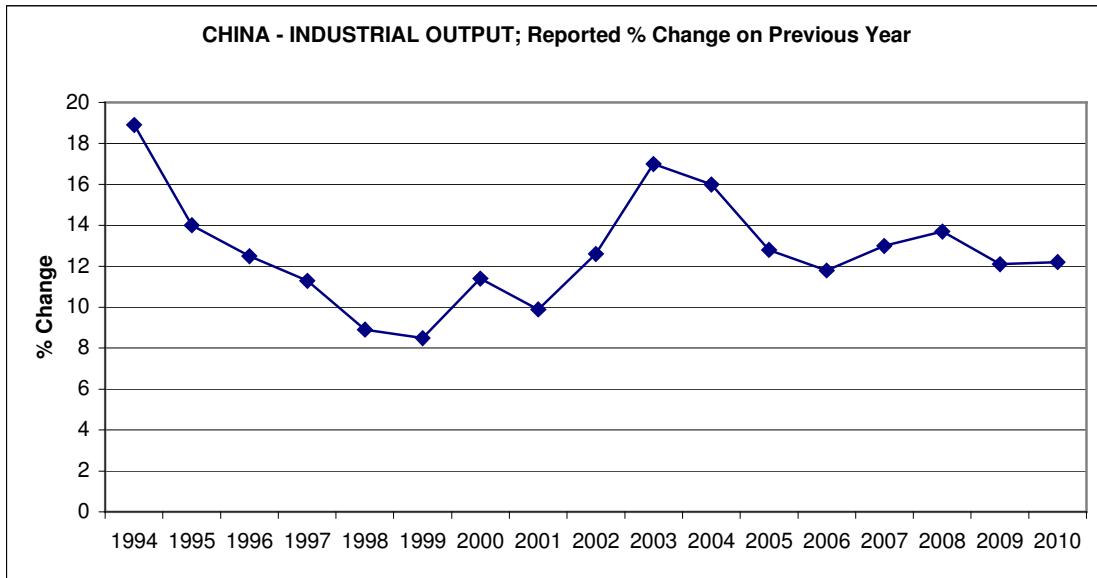
The Foundry Industry Trends in China: ***An evolution from volume to value path.***



Globally, today, nearly 65 million tonnes of castings are being cast and consumed. This is expected to grow to 85 million tonnes over next eight to ten year period. Of this nearly 50% of the growth is expected from the internally driven demand for continued improvement in the Chinese life style that will in turn bring about changes from being a commodity type volume supplier to a value added business partner for both domestic and overseas consumers, however with little or no major changes in labour pattern. This migration towards value chain has been possible owing to market reforms during early 90s and the legal and environment reforms after WTO accession. The increased trend in FDI-direct foreign investment with capital, technology, and training followed by Chinese entrepreneurial & scientific skills, work discipline and government support to the castings industry has further catalyzed the mindset change. The recent trend in Japanese, Taiwanese, Korean, American, European and Australian foundry investments in China is a factual reflection of the inherent strengths of the local manufacturing industry and its relevance to global OEM markets. Evolution towards value chain is in early phase today but it is already nucleating in terms of benchmarking with western standards for costs, quality, resources, government subsidy for export and imports, IP, HSE and last but not least the quality of life. The purpose of this paper is to capture these developments in a changing landscape with some specific real-time data for castings business perspectives benefiting all those networked with the Chinese foundry industry.

1.0 An introduction to the Chinese foundry industry.

The foundry industry is the mother of all industrialized economies driven by motor, rail ship, air or engineered components for life inputs such as food, medicine, leisure, sports and so on. The Chinese economic miracle witnessed by the world today is also driven by the same factors. The past two decades of transformation of the mindset from the planned economy to the current WTO ruled market economy with an unprecedented GDP growth per year in excess of 8 + % and the FDI investment of US\$ 40-60 billion of which nearly 70% consumed by the manufacturing sector has resulted in a robust economic performance similar to what Japan witnessed during the initial phase of the 80s.



1.1 Exports led infrastructure & manufacturing driven foundry industry.

Foreign capital apart the benefits of western technologies, training and management concepts also have quickened the pace of efficient and improved business skills and capabilities. Free trade zones, Special Economic zones, excellent infrastructure facility in express toll roads, airports, container ports in Yangtze river delta, Pearl river delta and Bohai gulf areas have transformed the face of the Chinese industry for successful global commerce.

The combination of the entrepreneurial drive, the governments support in conjunction with the overseas investments in the high technology and advanced manufacturing equipment, instruments and process control systems particularly from Japan, USA and Europe has enabled the Chinese industry to become a powerful global source for various manufactured goods –from garments, toys, shoes and fashion accessories to high value auto, medical and aerospace parts. Various past imports in excess of US\$150 b in less than two decades after Deng Xiaoping's launching of SEZs for overseas capital, know-how, technology, IT and business networks across heavy industries such as steel mills, cement, hot metal working, power, mining, railway, automotive, irrigation, agriculture and machine tools have contributed greatly for the robust growth in foundry castings business.

Needless to justify that the local foundry industry has played a significant role as we all know that no manufacturing industry can flourish sensibly without the simultaneous inputs from engineered, sound, lighter, machine-friendly, quality consistent and cost effective castings, whether be it ferrous or nonferrous. More so since the early 90s when the landscape of the foundry industry changed from increased direct investments from several leading foundry groups from Taiwan, Japan, Korea, Hongkong, Europe, Australia, USA and Asean countries for stand alone foundries as opposed to the Chinese State Owned, SoE captive ones. The Table 1.1 below gives a list of some foreign investments, which are the drivers for the growth of casting centers in China.

Table 1.1: The Drivers in the Chinese Manufacturing Industry.

Source	Company	Products/Businesses	Casting Centers City/province
European	GKN	Drive Shafts, automotive parts.	Jilin, Shnaghai
	Martic ZTS	Truck engines	Jixi
	Robert Bosch	Engine management	Shanghai.
	T & N Pistons	Piston products	Jiangsu
	Variety Perkins	Engines	Tianjin
American	Volvo	Buses	Shanxi
	Allied Signal	Turbo chargers	Shanghai,
	Arvin Industries	Exhaust systems	Jiangsu
	Cummins Engine	Diesel engines	Shanghai
	Ford	R &D	Hubei, Shanghai.
	Freight liner	Commercial vehicles	Jiangsu
	Rockwell	Axle & navigation	Jiangsu
	Tenecco	Exhaust systems	Dalian
	Timken	Bearings	Shandong, Yantai
	TRW	Aerospace parts, engine valves	Shandong, Shanxi and Jiangsu.
Japanese	Xerox	Copiers	Shanghai
	GE Medical Equip.	Medical instruments	Beijing
	Colgate-Palmolive	Tooth paste	Gongchow, in
	Gillette	Razors	Shanghai
	Asmo Co.	Small motors	Tianjin
	Hino	Diesel Engines	Hangchow
	Kokusan Denki &	Electrical components	Hebei
	Okutani Koki	for automotive	
	Koyo	Steering	Hunan
	Toyota	Engines	Tianjin
Others	Suzuki	Light trucks	Jiang Xi
	Mitsubishi	Engines & transmissions	Liaoning
	Tange	Bicycles	Shenzhen
	China Tai	Motor Cycles	Luoyang
	Daewoo	Cars and excavators	Shandong
Thailand	Mando Machinery	Generators	Jinzhou
Korean			
Korean			

2. The evolution path—the country & the foundry industry.

“China has telescoped into one generation what other countries took centuries to achieve” This nation’s unique attempt to complete two transitions at once –from command to market economy and from rural to an urban society –is without historical precedent. Nowhere else such mammoth transformation is recorded so far. Ref World Bank –China 2020 review. The table 2.1 below lists the events and the foundry evolution in China.

Table 2.1 The National Events & The Foundry Evolution

Period	Major Event -National	Foundry Industry Evolution...
1976-1980	The 10 th Chinese Communist Party, CCP restores Deng Xiaoping's to his post as vice-chairman the central committee and te central military committee. Cultural Resolution officially ends. Produce –agriculture & industrial by plan only.	Predominantly captive, labour intensive, hand moulding, cupola, clay/cement bonded, some silicate sand foundries. Mostly the State Owned, SoE, fragmented, regionally duplicated for security and social obligations. Capacity built in every foundry sector regardless of castings real consumption projections. The beginning of unorganized number games-statistics.
1981-1989	Rural-responsibility system for agriculture produce success best practice experiment tried on industrial output. Beginning of market oriented economic system. Profit retention and tax on profit first time introduced in 1984! The enterprise law enacted in 1988, limiting CCP intervention in the management of SoEs.	Induction furnaces, CNC machines introduction of chemically set binders system-using Chinese FF/FA. High impact green sand moulding lines imports, diecasting, precision casting and centrifugal pipe plants upgrades through gradual modernization programme by the state. Nearly US\$ 20 b spent in this decade for SoE upgrades including talent training abroad –Italy, Spain, Germany, USA & UK.
	Deng's SEZ experiment success, FDI investments in export processing zones, port, freight way/expressway and airports upgrade – infrastructure investment.	Universities –Tsinguaha, Jiatong, Wuhan, Xian, Nanjing, Dalian, Tianjin, Gansu, Haerbin, etc all pursuing extensive development of R&D and graduation subjects for metal casting industries.

Period	Major Event -National	Foundry Industry Evolution...
	<p>GDP growth main occupation on the provincial & local officials mind.</p> <p>Tiananmen democracy demonstrations in 1989, slowdown in economy until 1992.</p>	<p>Formation of China foundry Association –CFA, Beijing 1986. This gave birth to national level voluntary system for foundry enterprises data collection.</p> <p>Castings –output reported based on installed capacity only –hence even today the figures are not accurate and are left for much individual estimation. However it suffices to say that the market then was already large, grey iron 7, ductile at 0.74, cast steel at 1.12 malleable at 0.26, copper 0.11, al/Mg at 0.34, Zn at 0.02 others at 0.014 adding upto 9.6 m tonnes total in 1989.</p>
1990-1999	<p>Pudong Shanghai - investment center opens – nearly US\$ 20-25 billion FDI attracted, about half of national generated through 90s. Rapid economic development –car/auto JV policies, special incentives for Taiwanese Hongkong based investors. Almost every local and provincial government body busy drafting preferential tax, land use rights and subsidies for export-oriented industries.</p>	<p>Direct interest from European, American, UK, Taiwan and Hongkong based foundry groups to invest in JV or wholly owned foreign units. Taking the advantage of low cost and disciplined labour, abundant alloy, materials and chemicals resources with less environmentally restricting regulations this foundry industry In less than ten years of opening up in 1989 –nearly 32 IMF, several dozens of DISA.MBD, several Inductotherm, Pillar and several units of auto pour, mixers, sand reclaim systems, pattern design centers, shot blasting, diecasting, heat treatment technology poured into China. So much so that several foreign owned suppliers began negotiating with the local government for setting up local manufacturing units in China. Rough finished castings exported to some degree but nearly 90% of the castings produced locally were consumed within China used in both domestic and foreign invested industrial goods suppliers. The casting statistics approach still old fashioned, not much</p>

Period	Major Event -National	Foundry Industry Evolution...
2000-2006	<p>WTO in 2001, Insurance & banking sector reforms. Currency appreciation to 1US\$ =Rmb 7.9, Continued FDI flows in manufacturing sector. GDP growth at 7-8% but this time the gear is towards economic growth with equal emphasis on environment improvement and energy consumption reduction.</p> <p>Universities shrink the scope of foundry education, all metal forming sciences clubbed in one specialization, may lead to future shortages in engineering scientific talent expected.</p> <p>Growing gap between the rich coastal regions and relatively less developed west/inland areas.</p> <p>The government plans to reduce energy consumption by 20% age points for every GDP point growth.</p>	<p>change. Robust growth with more direct investments from foreign foundries.</p> <p>Higher value added castings exports via highly dedicated, smart and technology intensive machining centers invested by the successful foundry groups. A merger in SoE foundries –elimination of idle installed capacity, reduce waste and improve efficiency is the mood. Development of homegrown MNC foundries for international markets. Highly competitive with economy of scale upgrades in mind.</p> <p>Foundry industry is a national preoccupation; the government will do whatever it takes to protect this sector.</p> <p>Commodity prices up, getting scarce. Air, water pollution controls and the reduction of energy consumption will take the lead from now on.</p> <p>Expect closure of loss making privately and the SoE foundries.</p> <p>Expect mergers and further consolidation in the sector.</p> <p>Installed capacity will not change much, about 20 m tonnes of castings –only the distribution of the castings grades, also and the types will find only those enterprises that are upto date -technology, cash and market network driven.</p>
2006 & beyond	<p>Future –moving towards sustainable stability with improved living standards for the rural mass. This will attract home grown capital investments from already rich coastal and urban Chinese investors along with</p>	<p>Castings are difficult to travel long distances as the real growth potential in future is in rural areas where the infrastructure is yet to catch up with the highly developed SEZs and coastal zones. The future success of the castings enterprises depends upon the intrinsic competing strengths</p>

Period	Major Event -National	Foundry Industry Evolution...
	the usual FDI as China continues to attract world capital for many a years to come.	of the locally operating foundries –be it SoE, Chinese owned, JV or wholly foreign owned entity. Exports can grow only if the domestic castings business succeeds!

3. Look at big picture and ignore questions about statistics & industry data?

Even though PRC is a unified country of the main Han Chinese it has immense diversity in cultural, local dialect, gaps in development as well as the nature of the approach for information gathering technique. As much as the technology and economy have evolved over the past sixty to seventy years the foundry industry castings output estimation data gathering approach also has undergone constant change.

- China Foundry Association, CFA in 1986, first installed the information gathering data only. Before then the industry existed and had seen ups and downs mainly influenced by great leap forward, Cultural Revolution movements.
- Early 80s the foundry industry typically being captive type the size of the industry was measured by number of employees /head counts for a given foundry.
- The 90s onwards the installed capacity was the main indicator of the industry size. Because of the command economy still in vogue at many government levels-foundries in various regions often competed against each other even though the main industry apex bureau belonged to one national entity. This resulted in some foundries always remaining underutilized - Ship building, railway, tractor, machine tool, heavy engineering ingot moulds, and mining castings.
- Late 90s and early this new century the status of the national economy changed significantly with the influx of the foreign capital and related investments in the foundry industry. Foreign wholly owned and foreign – local JVs foundries have a good grasp of foundry size by shipped tonnage of the castings. However even during this period the national CFA data collection was not accurately reflected. The picture is even more clouded by unknown number of closures and also unknown number of newly registered foundries.
- The gigantic geography, the distances and the resources needed to update the foundry industry data are virtually impossible. The best data aggregated by CFA is only an indication that the foundry-installed capacity is big. The actual performance of the foundries in terms of liquid metal poured, treated, cast, machined and shipped data very from regions to regions and from foundries to foundries.

Based on this authors discussions with sand, pig iron, furan resin and scarp suppliers overall casting estimation data do point towards an industry that is as

big as 14-17 m tonnes today. The tonnage is large but the economy of scale is wanting with a fragmented business approach having in excess of 20,000 foundries of which majority having annual tonnage less than 700 tonnes. Moulding methods from jolt-squeeze type to modern IMF, DISA, GF+, Sinto, BMD, and Laempe exist. Clay bonded to green sand moulding type with appreciable presence of furan resin moulding/core processes in jobbing iron and steel industries. V-process, ECP, precision castings using sodium silicate with basic wax to high technology lost wax processes are in practice. The industry having some basic and unviable labour intensive foundries to ultramodern, having 5S/Kaizen/Six sigma mindset with well equipped technology, equipment, talent and R&D facilities type enterprises also co-exist simultaneously across sand, diecasting, lost wax foundries.

The castings growth is predominantly due to internal consumption as the customs data do indicate that between 1998-2005 the overall exports of castings have never exceeded a gross tonnage of 1.5-1.7 m tonnes per year. However it is important to recognize the indirect effect of impressive export value growth in machinery, utilities, toys, electronics components and accessories to global markets that has in fact offered a sound platform for cast components growth. The below list in Table 3.1 for the Chinese goods export may reflect the magnitude of the manufacturing led castings consumption in year 2005.

Table 3.1: The Major Exports and their relationship to the Foundries.

China Exports in Y2005 Asia: 48% Europe: 22% North America: 23% The RoW: 7%	Value in bn US\$	Growth over 2004, %	Typical castings consumed directly & indirectly in those machines that are applied to produce the export merchandise.
Office machines and automatic data processing machines,	111	27%	Diecast Mg/Al alloy, precision castings, instruments, gadgets.
Telecommunication & parts	95	39%	Copper/bronze switches, plastic injection moulding machines, dies & fixtures.
Electrical machinery & household appliances	76	27	Motors, gears, switches, pipe, tubes and machine tools & moulds.
Apparel & clothing accessories	74	20	Textile machine components, electrical instruments, motors, pumps
Textile yarn, fabrics and made up articles.	41	23%	Machine tools, control boxes and instruments & printing machines.
Metal Products	27	31%	Furnaces, moulds, patterns,

			wires, dies and control equipment
General industrial machinery and parts.	26	30%	Gears, valves, pumps, meters, flow units, transformers, dies, tools and injection molded parts.
Road Vehicles	22	33%	Automotive castings, forgings and engineered castings.
Iron & steel	19	39%	Ingot molds, continuous casting machines, cast roils –steel & SG iron
Footwear	19	25%	Al & steel moulds, injection-moulding machines for plastic and rubber components.
Industrial Minerals, refractories & ceramic	55	25%	Mining equipment, motors, pumps, and crushers, grinding media, tools, sieves and heavy engineering castings.
Bulk chemicals & industrial commodities	115	20%	Valves, machine tools, instruments, mixers, pumps, pipes and engineering tools and gadgets.
The Jewellery	6	24%	Precious metals processing, precision casting and meal polishing.
Others	76	15%	-
Total Exports	762	28%	Manufacturing =Castings=Foundry

Note: Of the total US\$ 60 billion foreign direct investment in 2005 approximately 70% of the cash went into the manufacturing sector. This trend is expected to remain unchanged in the coming years. In addition the value chain growth is expected in R&D projects initiated already, some notable projects include – Japanese –Tsinguha university for Mg alloy smelting and castings, Rolls-Royce aircraft parts development, Microsoft, ICI, Dupont R&D centers, he plans from Toyota, Honda –engine development centers, Airbus collaboration with China Aircraft industry for regional jet engine development, Kawasaki/Mitsubishi investments in steel making research, casting simulation, pattern materials and high efficiency induction furnace melting equipment development. Inductotherm Asiapacific R&D centered in Shanghai. Siemens, Mitsui and Fuji, GE investments in high the, heavy engineering and electrical and medical research centers and so on. The entire metal processing and casting industry is all set for high technology and innovative solutions to the castings quality and profitability upgrades. So much so that the PRC government treats the foundry industry as nationally prominent and strategic industry. The below given export tariff rebate

proposition reflects how the exports are promoted in the local industry. The FDI investment is from multinational organizations, which also incidentally have played a major role in exports by taking the maximum advantages of government subsidies for tax, tariff and preferential bonded zone policies, enacted since 1995. The below given table 3.2 proves the support given to the exporting industry.

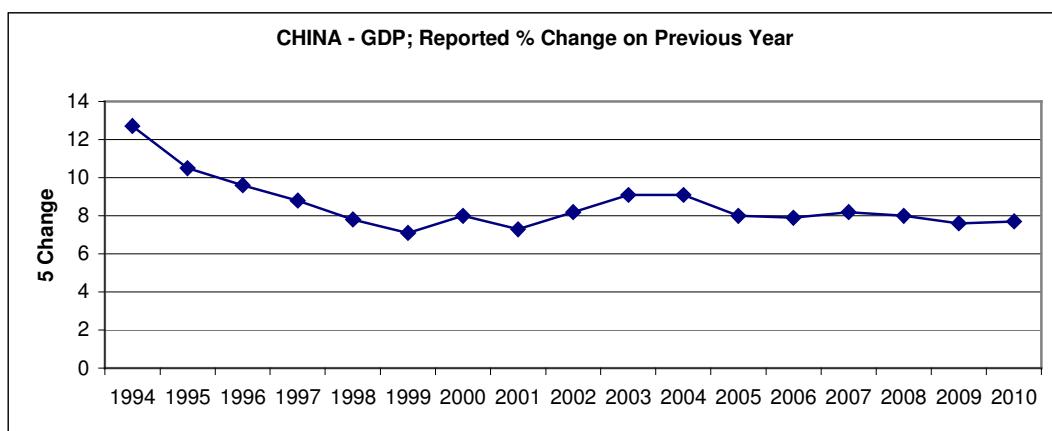
Table 3.2: The Chinese Custom Tariff & Duties Regulating Business

Custom Duty & Tariffs %					
Product/Item	Import Duty %		Export Duty		Export
	2000	2005/06	Exemption	VAT Return	
Auto Parts	6-50%	6-25%	Yes		17%
Cold Rolled Steel	8%	6%	Yes		13%
Pumps	6-18%	8-10%	Yes		11% or 13%
Valves	12-20%	5-7%	Yes		13%
Precision Castings Used in Medical & nuclear Energy	12-20%	8-10.5%	Yes		13%
Copper	8-10%	4-10%	Yes		13%
Zinc	8-10%	4-10%	Yes		13%
Nickel	8-10%	4-10%	Yes		13%
Stainless Steel	9-20%	4-10%	Yes		13%

4 The challenges ahead.

Nevertheless, the rapid industrialization and economic growth priorities at every micro & macro government levels have also resulted in faster depletion of natural resources and severe and questionable degradation of water, air quality standards. The rewards also have come with a cost of growing concerns of sanitation and municipal amenities burden in urban cities and the growing unrest

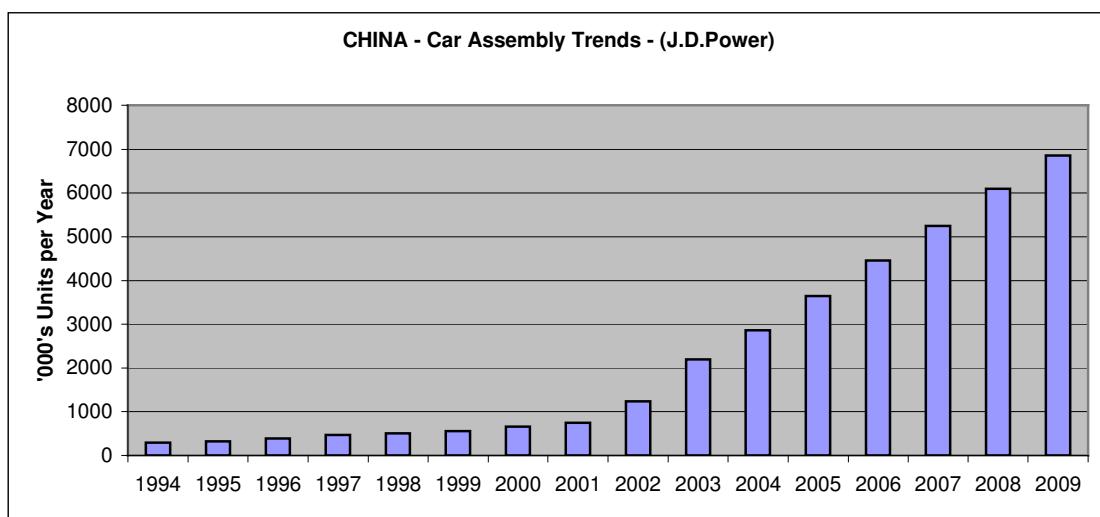
due to rural unemployment. Nearly 400 million people are jobless at rural China, of which only 150 million people or so are adequate to till the land, the challenge is to create industrial and service jobs far away from cities for the rest. This may offer continued cheaper labour force but the challenge ahead is for creation of sustainable economic transformation away from traditional coastal strong growth centers that have been already overburdened.



- At about 20 m tonnes of castings a year and with a 300 + million tonnes of crude steel output, China is one of the highest producers of energy and the consumer also in the global industrial world. China, today, is estimated to produce about 1.8 billion tonnes of standard coal, and consume lump sum energy equivalent to about 2.0 b tonnes of standard coal. Reduction of SO₂ emissions and emphasis for cleaner, renewable energies are the major tasks. This will increase future costs for capital investments and also increase the cost of operations for both the existing and newer business enterprises.
- Oil price and its availability.
- Power supply and its cost through national grid integration
- Waste water treatment facility and local government and the entrepreneur's attitude. Even in well governed cities of Shanghai and Jiangsu regions there are a number of industries that ought to be fined, a few to be closed for causing severe damage to the local air and water qualities, unfortunately these enterprises are also models for paying high taxes and some of them are good source for employment among local businesses.
- Iron ore source and its costs and therefore its impact on pig iron.
- Copper, zinc and nickel source and unchecked price hikes. China consumes about 5 million tonnes of copper still growing, the biggest in the world.
- Sand quality and its source limitations owing to costs and inland transport constraints.

- Deforestation and cost increases for good quality wooden pattern material.
- Younger and better-educated talent shying away from employment from hot metal processing and casting industries. Increased job opportunities in IT, service legal, management and professional jobs in banks, insurance, fashion and trading sectors will further make it difficult for foundries.

The future is challenging for the Chinese foundry industry but it has also a very highly dedicated, well-developed supply chain capability to meet the growing castings consumption for internally driven manufacturing industries particularly related to automotive sector that is set for robust growth with intense participation of almost all big players from USA, Europe, Japan, Korea and the emerging local car makers as well. The local government holds it in high esteem, is committed to



it, as the foundry industry currently employing in excess of 1 million people is also a major source of employment for the growing number of rural youth.

5.0 The Future & the Evolution.

The castings growth will not be dramatic, as the future mix will experience consolidation of the market, closure of small scale, energy inefficient and polluting foundries. The existing regional imbalances particularly in the State Owned foundries will reduce, as the business model will change from captive type castings consumption to independent profit driven enterprises. This will lead to actual number of casting foundries reduction thereby leading to mergers and joint management of key strategic groups under government bodies for automotive, energy-turbine, diesel, railway, tractor, mining and pipe industries. Whilst the government will continue to attract FDIs in manufacturing industries so will be the resultant inflow of investments in the foundry sectors –already multinational and homegrown castings groups have invested in green field sites for tonnage matching the western economy of scales-120 to 200 K tonnes per year. Even in aluminum wheel, pistons, engineering, diecast and lost wax

processing industries there is a buoyant mood for large-scale investments in new technologies, plant layout with ultramodern in-house facility for machining centers. A number of local foundries have invested in overseas distribution networks including owning some warehouses and castings design & service enterprises especially in Germany, US, UK & Japan.

The current mix is mainly consisting of 53% grey iron, 24% ductile iron, 12% cast steel, 6% al/Mg alloy, 3% Malleable and 2% Cu/Zn alloys in an estimated 14-17 m tonnes market, the projected growth in Y2020 mix will mostly shift toward ductile at 38% and Al alloy at 15% increasing at the expense of grey iron, cast steel and malleable castings. Y2020 tonnage is projected to reach 28 -30 m tonnes. Lean manufacturing systems coupled with new investments in overseas management talent in foundry industry is expected to enhance the competing ability of the local enterprises.

6.0 The Conclusions:

The casting industry evolution in China is on a progressive path that is positively moulded with combined strengths of ambitious multinational corporations, local and global entrepreneurs, local skill sets, disciplined labour and highly enthusiastic support from the Chinese government. The following factors summarize the emerging competing strengths of the Chinese foundry industry:

6.1 Strategic

- The Chinese government is very protective of this labour intensive and therefore a dependable source of employment resource. It is the castings industry that is the backbone of the Chinese manufacturing base that has become a global supply chain center for industrial, commercial and consumer goods and utilities. No foundry no manufacturing infrastructure!
- Almost all multinational corporation of Fortune 500 and various emerging economies are upbeat about China and they continue to include China as the key market and growth center for their own products, services and GDP growth!
- China therefore continues to leverage its market power whilst striking commercial agreements in favour of the Chinese economy for technology, capital, some cases even IP, talent resources and the related engineering and management training in western countries.
- For SoE the govt provides subsidies –loans, favourable energy, material and machine inputs.
- Some high quality and large foundry enterprises may claim rebate on VAT inputs.
- Extremely favourable to foreign invested foundries -Taiwanese, Japanese, Western invested business houses use this as a tool to expand business.
- Exports of castings –EXIM & Sinosure provide proactive assistance for funds and insurance.

- The Yuan peg against US currency, the Rmb is estimated to be approximately 40% undervalued against US\$ that is unfortunately the major trading currency in global markets, moreover the American currency has depreciated against other major international currencies in the past five years making Chinese exports very attractive. One may recall during early 80s it was 1.49 Chinese Yuan to one US\$ currency!
- Govt provides duty exemption for capital goods imports and some concession on 17% VAT input costs as well.

6.2 Environmental

- Legislation for waste dumps is not severe as yet, but the 11th five-year plan 2006-2011 is already stipulating strict energy and emissions governance.
- Expect cost increases, investments for efficiency improvement but already established and vast low cost business enterprises have attained sharp competing edge in global markets.

6.3 Labour/Scientific/engineering talent.

- Almost two-thirds the population size as in USA gets moved from rural China to urban and semi-urban towns every year in search of industrial jobs.
- Hence the costs for labour will continue to remain relatively competitive despite overall improvements in economic, quality of life and reduction of national poverty.
- Highly disciplined and motivated.
- Smooth and non-turbulent working mentality.
- Nearly 5000 engineers graduate every year with intensive engineering and science backgrounds who are keen to work hard to find their way up in the post cultural revolution era of immense wealth growth opportunities.

6.4 Capital Investments

- Supported by the State bank, interest rates less than 7 %, the currency is expected to gradually strengthen in favour of the Chinese manufacturers, as the shift will be towards domestic market penetration.
- During early 80 the local foundry industry benefited out of a very strong currency – 1US\$ = 1.49 Rmb as most of the technology, capital investments from Germany, Italy, USA & Japan took place in SoE sectors.
- The continued thrust to improve basic infrastructure – road, railways, seaports, energy and the urban life improvements. New businesses for projects looking at energy conservation, safety, health and environment and rural life improvements will qualify for special tax and land use rights incentives.

6.5 Operational

- Ever increasing cost of pig iron, coke, energy, and alloy inputs. However the Chinese economy of scale of manufacturing, business size will

continue to drive down selling prices of manufactured goods across all industrial segments.

- On the back of China manufacturing boom In the past three years the prices of oil, iron ore, copper, aluminum, nickel, steel scrap almost all industrial commodities rose to record levels in global market yet in those same markets the consumer price for cars, TVs, appliances, utility goods and so on the prices actually dropped. This trend will continue as the local consumer spending ability continues to rise.
- Like many industrial segments the casting industry is also highly fragmented with many suppliers operating on thin margins .It appears that the Chinese entrepreneurs operate on absolute value and asset creation rather than looking at margins in relative per cent age terms!
- Waste industry is very well networked almost every thing is recycled. Foundry machinery, patterns, spares, consumables suppliers are plenty, severe competition leading to continuous downward pressure on prices with improved quality & efficiency. Actually the export demand for quality and cost effective models coupled with unchecked IP breaches have led to cut throat high quality international brand of machines and spares at Chinese prices. This has made investment for a given casting/alloy at least 45-60% cheaper than the Western projects.
- Lower fixed costs for high-class machines and equipment meaning lower depreciation burden and hence faster recovery. Mixers, furnaces, moulding lines, shot blasting and machining facility are already not far from western quality and performance standards, but typically these cost about 35-45 % cheaper than those of the Japanese, German and US prices! In addition the factory construction costs compared to even better than many western factory layouts also are much quicker and cheaper to construct approximately 25-40 % cheaper depending on the nature of the location in China.

6.6 Technical

- Over engineered designs found in the old command economy is undergoing steady change in wall thickness reduction and overall metallurgical property specifications.
- Alloy/composition –over specified. In the past is taking new approach with extensive research in metallurgy.
- Japanese /Taiwanese operate in a very narrow range to control costs; the local foundries are now learning the trick. Cost reductions will follow.
- Defect prediction, NDT, corrective processes are not very well developed.
- Relatively higher cost of operation due to trial & error type quality assurance. In these context QC/NDT tools and systems investments is on the rise in recent period.
- Excess staff in State Owned foundries – design, R&D, process, QC, -all adding costs will become thing of the past. Separate project based profit center across all casting industries is emerging quicker.
- Foreign owned foundries in China operate lean, Local industry is following.

6.7 Management

- Cost accounting in most of the local foundries is not very clear. Difficult to estimate the true costs especially when the casting center is part of large house-example captive foundries
- Hence faulty or under cost pricing possibilities this is identified now, hence progressive foundries are investing in overseas talent in management.
- Scrap-to-furnace - Pattern-mould-casting –machine shop flow needs a full documentation, ISO14000 & ISO 1800 systems with 5S and Kaizen tools being implemented now.
- A good scope for a foundry dedicated ERP, -JV, SoE and foreign owned foundries are gearing up to exceed western enterprises.

6.8 Insurance -Risks costs

- Lower insurance costs for almost all types of industrial Insurance premiums.
- Hence reduced overall cost of transport/shipping, storing, etc

6.9 Machining & Treatment

- Post fettling/shot blasting, in-house activity more expensive because of hidden costs in SoE sectors. New policies being formulated to align the same with private enterprises.
- The trend in China is to either out-source machining/treatment or clearly separate cost /profit centers.

6.10 Trading/Business

- Mostly sold to mother companies-captive consumptions. Hence costs/profit would not matter much. This trend is changing for better now.
- The trend is to set up independent cost/profit centers. With independent audit firms inputs.
- Some progressive and ambitious foundries have set up technical service and warehouse network in overseas countries.
- Increased emphasis is expected on quality consistency, reliability and quick response to business deals. Proactive investments are taking place even in privately owned local firms.
- Globalization and China as the focal point for a foreseeable growth market for local and overseas manufacturers will continue to generate economy of scale for business attractive for enduring share and profit gain for foundries operating in China.

The casting industry closely linked to its booming manufacturing base is unique to China that is not just emerging, rather it is remerging to regain its past supremacy in global trade that it had enjoyed much before Marco Polo had explored the Far East.

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- **China Daily**
- **Shenzhen Daily**
- **Foseco China colleagues & Meera for technology inputs.**