

Assessment of metal rolls and engineering castings industry

Report

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Global macroeconomic overview

GDP trend

Growth had contracted 2.7% in 2020 as the Covid-19 pandemic disrupted economic activity. However, the contraction was considerably lower than estimated by the International Monetary Fund (IMF), with a strong rebound in manufacturing, shift to new ways of working, and fiscal and policy support arresting a further slide¹.

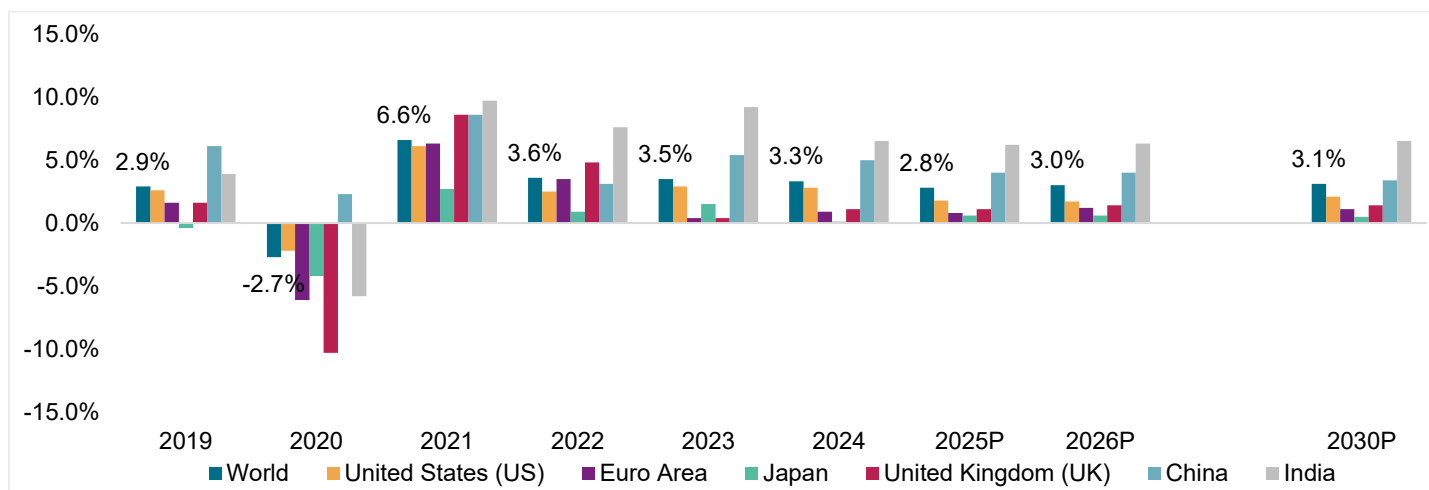
The global economy has shown remarkable resilience in the face of unprecedented challenges, including the Covid-19 pandemic. A swift recovery in 2021, driven by vaccine-powered normalization and fiscal support, laid the foundation for sustained growth. The economy expanded by 3.6% in 2022 and 3.3% in 2023, despite being moderated by supply chain constraints, inflation, and geopolitical uncertainties. The global economy's ability to navigate complex challenges and continue to move forward is a testament to its strength and adaptability.

Five-year historical data and growth forecast

The IMF projects global growth to decline from 3.3% in 2024 to 2.8% in 2025, before recovering to 3.1% in 2030. This downward revision is broad-based across countries, driven by the direct and indirect effects of new trade measures, including trade spillovers, heightened uncertainty, and deteriorating sentiment. The downgrade reflects a significant shift in the global economic outlook, underscoring the need for policymakers to address trade tensions and restore confidence to support a more robust and sustainable recovery, and mitigate the risks to global economic stability and growth prospects.

Regional outlooks have been revised owing to recent shocks and policies. The outlooks for the Middle East, Central Asia and sub-Saharan Africa have been revised downwards because of commodity production cuts, conflicts and unrest. In contrast, growth in emerging Asia has been stronger, driven by surging demand for semiconductors and electronics, fuelled by artificial intelligence (AI) investments.²

Economic review and outlook (growth rate)



P: Projected (years mentioned on the horizontal axis correspond to the calendar years)

Note: Unless mentioned otherwise, the years correspond to calendar years throughout the report, whereas India data is in fiscal years, 2020 being fiscal 2021 and so on.

¹ IMF – World Economic Outlook October 2024

² All outlooks as stated by IMF unless stated otherwise

Source: Crisil Intelligence, IMF, World Bank, S&P Global

Region-wise and country-wise economic review and outlook³

Real GDP (on-year growth)	2020	2021	2022	2023	2024	2025P	2026P	2030P
World	-2.70%	6.60%	3.60%	3.50%	3.30%	2.80%	3.00%	3.10%
Euro area*	-6.10%	6.30%	3.50%	0.40%	0.90%	0.80%	1.20%	1.10%
Emerging and developing Asia	-0.50%	7.80%	4.70%	6.10%	5.30%	4.50%	4.60%	4.50%
Emerging and developing Europe	-1.80%	7.10%	0.50%	3.60%	3.40%	2.10%	2.10%	2.50%
Latin America and Caribbean	-6.90%	7.40%	4.20%	2.40%	2.40%	2.00%	2.40%	2.60%
Middle East and Central Asia	-2.20%	4.40%	5.50%	2.20%	2.40%	3.00%	3.50%	3.70%
Sub-Saharan Africa	-1.50%	4.70%	4.10%	3.60%	4.00%	3.80%	4.20%	4.50%

*The euro area consists of member states of the European Union that have adopted the euro as their currency

P: Projected

Source: Crisil Intelligence, industry, IMF

Real GDP growth (on-year)	2020	2021	2022	2023	2024	2025P	2026P	2030P
US	-2.20%	6.10%	2.50%	2.90%	2.80%	1.80%	1.70%	2.10%
China	2.30%	8.60%	3.10%	5.40%	5.00%	4.00%	4.00%	3.40%
Germany	-4.10%	3.70%	1.40%	-0.30%	-0.02%	0.00%	0.09%	0.70%
Japan	-4.20%	2.70%	0.90%	1.50%	0.10%	0.60%	0.60%	0.50%
India	-5.80%	9.70%	7.60%	9.20%	6.50%	6.20%	6.30%	6.50%
UK	-10.30%	8.60%	4.80%	0.40%	1.10%	1.10%	1.40%	1.40%
France	-7.60%	6.80%	2.60%	1.10%	1.10%	0.60%	1.00%	1.20%
Italy	-8.90%	8.90%	4.80%	0.70%	0.70%	0.40%	0.08%	0.70%
Canada	-5.00%	6.00%	4.20%	1.50%	1.50%	1.40%	1.60%	1.50%
Brazil	-3.30%	4.80%	3.00%	3.20%	1.30%	1.10%	0.9%	NA

P: Projected

Source: Crisil Intelligence, industry, IMF

The GDP trajectory varies for key economies and regions, as detailed below

US

The country's GDP growth, which expanded from 2.5% in 2022 to only 2.9% in 2023, would have been higher if not for high inflation and, consequently, the hike in interest rates by the US Federal Reserve (Fed) to cool the print, which impacted spending. The 2024 growth forecast has been revised up to 2.8%⁴ because of strong consumption and non-residential investment, driven by rising real wages and wealth effects. However, growth is expected to slow to 1.8% in 2025 as fiscal policy tightens and the labour market cools, closing the output gap.

³ All classifications according to IMF

⁴ All forecasts are by the IMF unless otherwise stated

Euro area

The euro area growth slowed to 0.4% in 2023 owing to geopolitical issues, tighter financial conditions and high gas prices. Growth is expected to recover to 0.9% in 2024 and 0.08% in 2025, driven by improved exports, rising real wages and looser monetary policy, despite persistent manufacturing weakness in Germany and Italy.

Japan

In 2023, Japan's economy grew at 1.0%, driven by pent-up demand, tourism and accommodative policies. However, growth is expected to slow to 0.6% in 2024 and 0.6% in 2025 because of temporary supply disruptions and fading one-off factors.

UK

The UK's growth slowed to 1.10% in 2023 owing to tight monetary policy and high energy prices but was supported by a 2022 fiscal package. Growth is expected to accelerate to 1.10% in 2024 and 1.40% in 2025, driven by falling inflation and interest rates, which will stimulate domestic demand.

China

China's GDP grew at 8.4% in 2021, driven by pent-up demand and strong exports. Despite a property market-driven downturn, growth is expected to slow gradually to 4.0% in 2024 and 4.0% in 2025, supported by better-than-expected net exports. Recent policy measures may provide upside risk to near-term growth.

India

After a 5.8% contraction in 2020, the country's GDP rebounded, growing at 9.7%, 7.6% and 9.2% in 2021, 2022 and 2023, respectively. Growth moderated to 6.2% in 2024 and is expected to be at 6.3% in 2025, as pent-up demand is exhausted and the economy returns to its potential.

Middle East and Central Asia

The Middle Eastern and Central Asian economy contracted 2.2% in 2020, then rebounded to grow at 4.4% and 5.5% in 2021 and 2022. Growth slowed to 2.2% in 2023 but is projected to pick up to 3.0% in 2025 as oil production and shipping disruptions fade. The 2024 growth stood at 2.4%.

Sub-Saharan Africa

Sub-Saharan Africa's GDP contracted -1.5% in 2020, then grew at 4.7% in 2021 and 4.1% in 2022. Growth slowed to 3.6% in 2023 and 4.0% in 2024 because of weather disruptions and supply constraints. However, growth is projected to be at 3.8% in 2025 as weather shocks abate and supply constraints ease.

Latin America and the Caribbean

The Latin America and the Caribbean region grew at 2.4% in 2024 and projected to rebound to 3.0% in 2025. Brazil's growth has been revised to 1.3% in 2024, and is expected to moderate to 1.1% in 2025 owing to a restrictive monetary policy and cooling labour market.

The GDP growth data highlights clear divergence in economic momentum across global regions. India stands out as the fastest-growing major economy, with GDP growth projected to remain strong at 6.5% even in 2030, underscoring its role as a key engine of global growth. China, while still maintaining relatively high growth, is expected to continue its structural slowdown, with GDP growth moderating to 3.4% by 2030, reflecting a maturing economy. Among advanced economies,

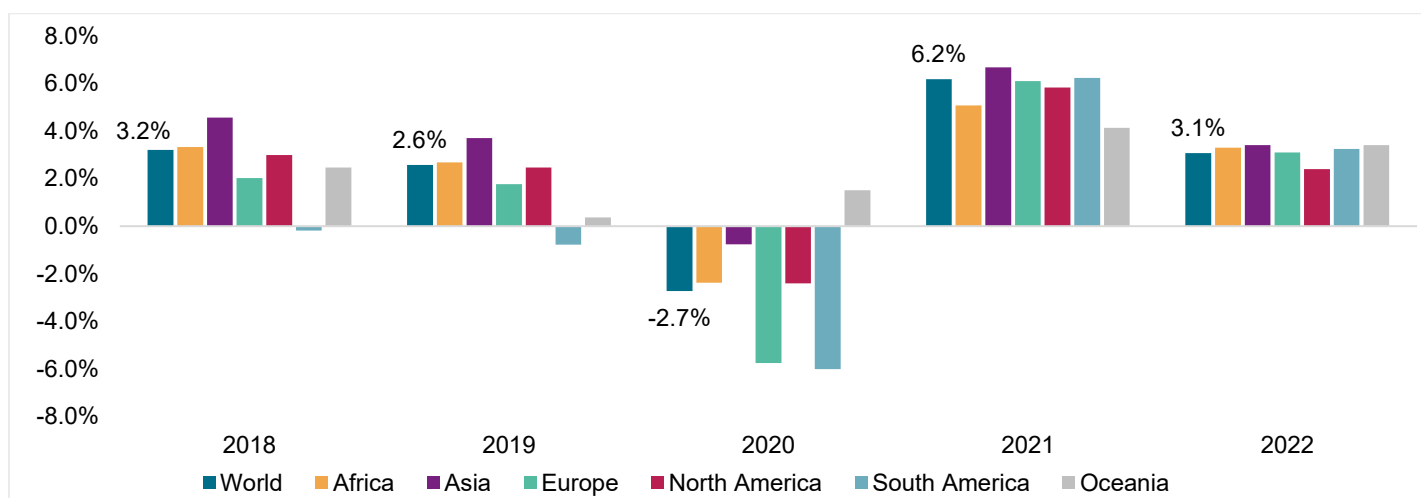
the US is projected to grow at a steady but modest pace of 2.1% in 2030. In contrast, Japan and major European economies such as Germany, France, and Italy are forecast to remain in a low-growth trajectory, with 2030 growth ranging between 0.5-1.2%, pointing to persistent structural challenges.

This growing disparity between developed and emerging markets is especially evident in long-term projections. Regions like Sub-Saharan Africa (4.5%), Emerging and Developing Asia (4.5%), and the Middle East and Central Asia (3.7%) are expected to sustain higher growth compared to the global average of 3.1% in 2030. These trends reinforce the ongoing global economic realignment, with India and other emerging markets increasingly at the forefront of global economic expansion, while mature economies contend with structural headwinds and subdued growth.

Gross value added (GVA)

The global economy went through a tumultuous period, with a sharp decline in growth in 2020 (-2.7%) because of the Covid-19 pandemic, followed by a strong rebound in 2021 (6.2%). The subsequent slowdown in 2022 (3.1%) was driven by rising inflation, supply chain disruptions and monetary policy tightening. Prior to the pandemic, the world GVA averaged 3.0% from 2000-2019, with regional performances varying. This included steady growth in Africa, robust expansion in Asia, and Europe and South America's struggles with the lingering effects of the pandemic and economic instability.

GVA trend (growth rate)



Source: Crisil Intelligence, industry, UN Statistics Division

Note: GVA data available from United Nations up till 2022

World (\$ trillion)	2018	2019	2020	2021	2022
Primary⁵	7.55	7.70	7.71	7.88	8.01
Secondary⁶	18.00	18.29	17.85	19.17	19.63
Tertiary⁷	53.33	54.93	53.28	56.69	58.69
Total	78.88	80.93	78.84	83.74	86.33

Source: Crisil Intelligence, industry, UN Statistics Division

Note: GVA data available from United Nations up till 2022

⁵ Segregation based on UN classification, includes agriculture, hunting, forestry and fishing, mining and quarrying, and utilities

⁶ Segregation based on UN classification, includes manufacturing and construction

⁷ Segregation based on UN classification, includes services and other activities

The GVA trend across regions displays a synchronised pattern, marked by a global downturn in 2020 and a subsequent rebound in 2021. Notably, Asia demonstrated resilience with a mild 4% contraction in 2020, compared with a decline of 5-8% in other regions, except for Oceania, which bucked the trend with growth. Over the observed period, Asia consistently outperformed the global GVA average, while Europe struggled with lower growth rates. The 2022 data indicate a return to pre-pandemic growth rates, with most regions converging around 3%. This synchronised recovery suggests a strong global economic rebound, driven by Asia's sustained growth momentum.

Region-wise GVA

Components of GVA (At constant 2015 \$)

Primary (\$ trillion) ⁸	2018	2019	2020	2021	2022
Africa	0.68	0.69	0.68	0.71	0.72
Asia	4.04	4.16	4.19	4.39	4.56
Europe	1.11	1.12	1.11	1.09	1.06
North America	0.96	0.99	0.99	0.96	0.93
Oceania	0.17	0.18	0.18	0.18	0.18
South America	0.44	0.42	0.41	0.41	0.42

Source: Crisil Intelligence, industry, UN Statistics Division

Note: GVA data available from United Nations up till 2022

Secondary (\$ trillion) ⁹	2018	2019	2020	2021	2022
Africa	0.43	0.45	0.43	0.45	0.47
Asia	9.08	9.31	9.34	10.08	10.43
Europe	3.91	3.95	3.73	4.03	4.12
North America	3.30	3.32	3.19	3.35	3.33
Oceania	0.22	0.21	0.21	0.22	0.22
South America	0.66	0.65	0.58	0.65	0.68

Source: Crisil Intelligence, industry, UN Statistics Division

Note: GVA data available from United Nations up till 2022

Tertiary (\$ trillion) ¹⁰	2018	2019	2020	2021	2022
Africa	1.40	1.44	1.40	1.47	1.54
Asia	17.23	18.02	17.82	18.98	19.60
Europe	13.33	13.60	12.77	13.57	14.09
North America	16.96	17.43	17.04	18.16	18.75
Oceania	1.09	1.10	1.12	1.18	1.23
South America	2.15	2.15	2.03	2.18	2.27

Source: Crisil Intelligence, industry, UN Statistics Division

Note: GVA data available from United Nations up till 2022

⁸ Segregation based on UN classification, includes agriculture, hunting, forestry and fishing, mining and quarrying, and utilities

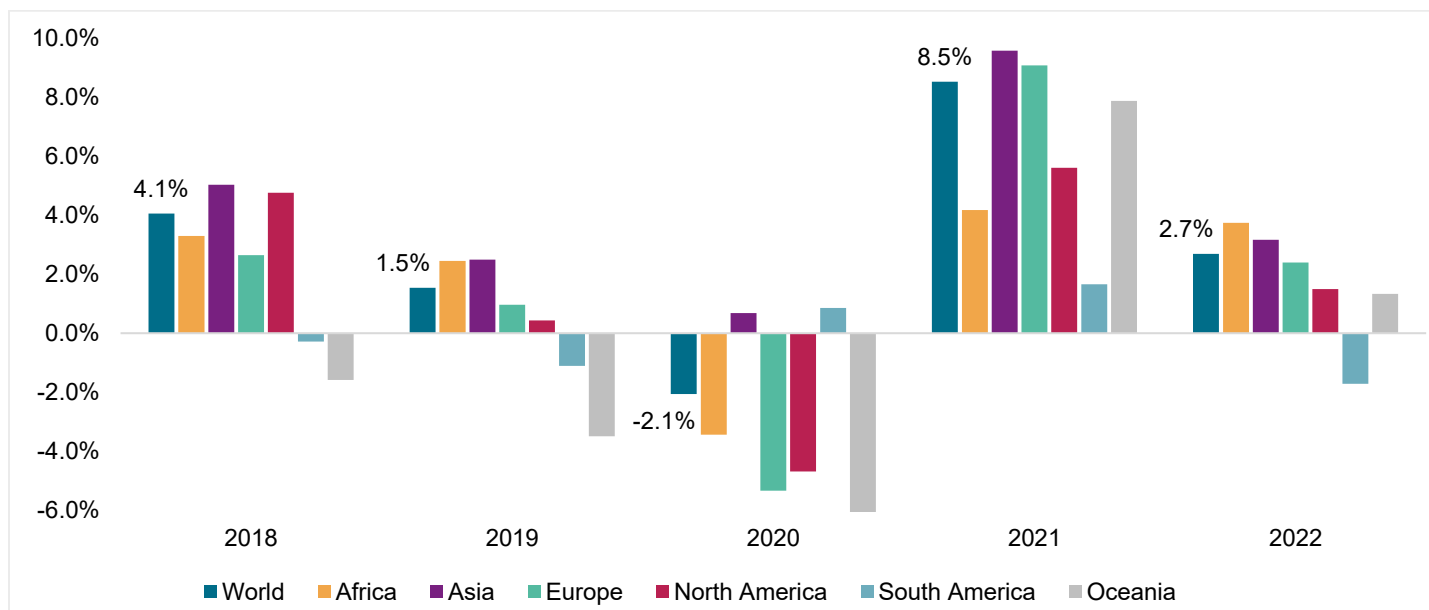
⁹ Segregation based on UN classification, includes manufacturing and construction

¹⁰ Segregation based on UN classification, includes services and other activities

In terms of regional GVA, primary activities accounted for a significant share in Africa (26-27%), Asia (13%), Oceania (11-12%) and South America (12-14%). In contrast, North America (5-6%) and Europe (4-5%) relied less on primary activities. Asia experienced steady growth in its primary sector, with year-on-year increases of 3%, 1%, 5% and 4% from 2018 to 2022. The region also had the largest contribution to the secondary sector, accounting for 30% of the total, while other regions contributed between 15% and 22%. Asia's secondary sector grew 3%, 0%, 8% and 3% annually from 2018 to 2022. The tertiary sector was the largest contributor to GVA across all regions, largely owing to the size and diversity of industries included in this sector, such as trade, hospitality, transport, financial services and other services.

GVA by manufacturing

GVA manufacturing trend (growth rate)



Source: Crisil Intelligence, industry, UN Statistics Division

Note: GVA from UN available up till 2022

The manufacturing sector exhibited divergent growth patterns across regions from 2018 to 2022, shaped by a complex array of drivers. Asia's remarkable 9.6% growth in 2021 was fuelled by large-scale industrialisation and significant investments in technology. Its manufacturing sector has transformed significantly in recent years, with the region accounting for over half of global manufacturing value addition in 2022. The traditional model of low-cost, labour-driven manufacturing is giving way to cutting-edge production facilities, producing high-tech goods such as semiconductors and solar panels. This shift is driven by the need for supply chain diversification, creating opportunities for economies across Asia to move up the value chain. Notably, during the 2020 downturn, Asia and South America were the only regions to grow, while others contracted. The manufacturing sector peaked in 2021, driven by pent-up demand from the pandemic, and stabilised in 2022 as demand returned to normal and supply chain constraints started affecting manufacturing.

Europe's impressive 9.1% recovery in 2021 was attributed to post-pandemic stimulus packages and a rebound in global trade. Meanwhile, North America's steady growth at 5.6% was underpinned by a strong domestic market and investments in automation. Key factors contributing to growth include supply chain normalisation, reduced input costs and targeted industrial policies, such as Asia's semiconductor initiatives and Europe's green manufacturing push. Additionally, digital transformation and Industry 4.0 adoption have accelerated production capabilities, while regional trade agreements have facilitated smoother cross-border manufacturing operations. Labour market stabilisation and improved productivity through automation have also contributed to steady output levels. However, persistent inflationary pressures and monetary

tightening measures have caused growth potential to moderate in some regions. Furthermore, the sector has benefitted from increased investment in sustainable production methods and circular economy initiatives, particularly in developed economies.

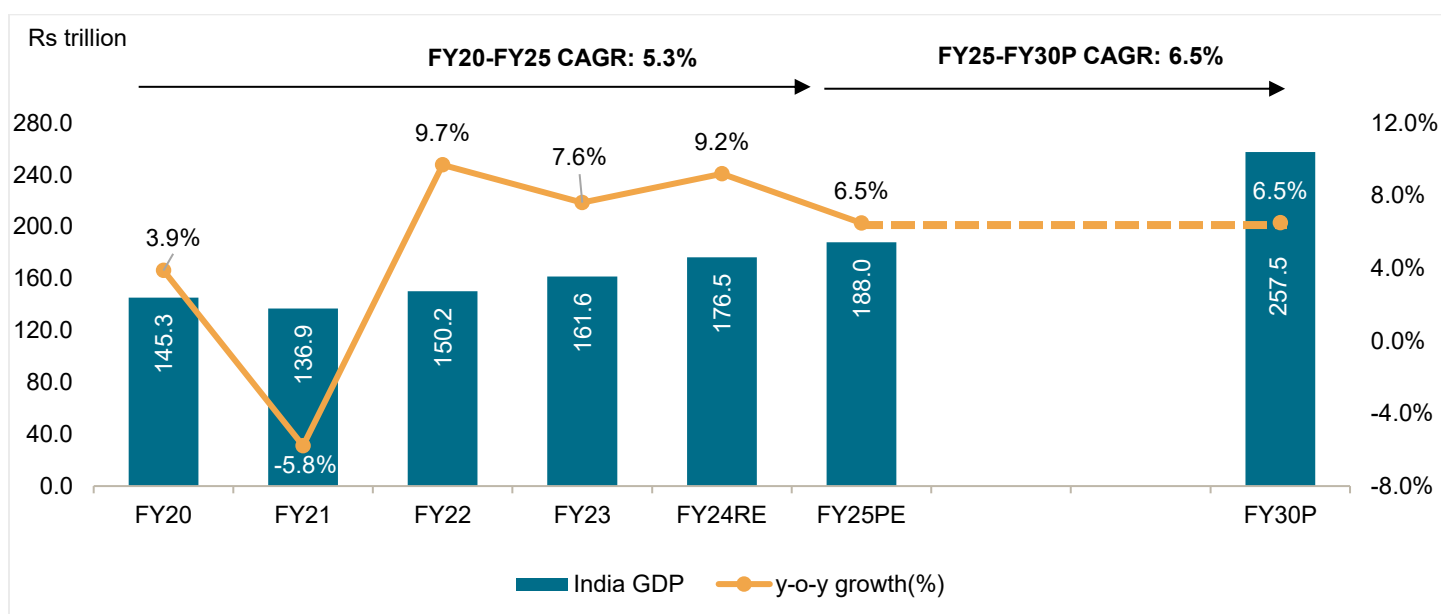
Indian macroeconomic overview

GDP trend

India's GDP clocked a compound annual growth rate (CAGR) of 5.0% between fiscals 2019 and 2024 to Rs 176.5 trillion,¹¹ following the change in base year for calculation to fiscal 2012 from fiscal 2005 effected by the Ministry of Statistics and Programme Implementation in 2015.

The pandemic-induced lockdowns led to a 5.8% decline in GDP in fiscal 2021, but the post-pandemic scenario has been positive, starting with a 9.7% on-year growth in fiscal 2022 led by the manufacturing and construction sectors.

India's Real GDP trend (at constant 2011-2012 prices)



For FY24RE: Revised Estimate, FY25PE: Provisional Estimated; FY30P: Projected; FY: Fiscal year

Source: National Statistical Office (NSO), Crisil Intelligence

India's real GDP is estimated to have grown 9.2% on-year in fiscal 2024 compared with 7.6% the previous fiscal. Although there will be support from the demand side on account of a normal monsoon and easing inflation, the second advance estimate has projected growth to slow to 6.5% in fiscal 2025. Manufacturing is projected to experience the sharpest decline, with growth estimates dropping from 12.3% to 4.5%. Other major contributors to GDP, such as trade and hotels, and financial services and real estate, are also likely to grow slower.

On the demand side, investment (gross fixed capital formation) is expected to cool moderately this fiscal (7.1% on-year this fiscal vs 8.8% the previous fiscal). Private consumption is expected to increase. Private consumption expenditure is predicted to grow to 7.2% this fiscal vs 5.6% last fiscal. Government consumption expenditure is expected to grow slower this fiscal by 2.3% on-year compared with 8.1% last fiscal and punch below its weight in overall GDP.

India's net exports are poised to improve significantly compared with the previous fiscal. This optimism stems from a robust export growth forecast of 6.3%, a substantial increase from the 2.2% growth recorded last fiscal. On the other hand, imports are expected to contract in stark contrast to the 13.8% growth seen in the previous fiscal. This divergence in export and import trends is likely to boost India's net exports, thereby supporting the trade balance. The improvement in

¹¹ Statistics from second advance estimates of gross domestic product 2024-25

exports can be attributed to the government's efforts to enhance competitiveness and diversify export markets. Meanwhile, the decline in imports reflects its initiatives to promote domestic production and reduce dependence on foreign goods.

Yearly demand-side real GDP growth

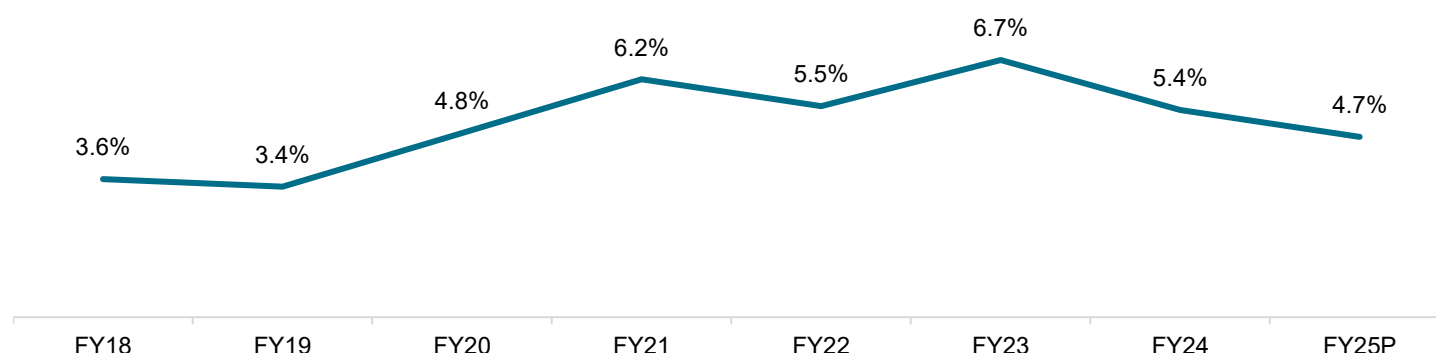
At constant 2011-12 prices	FY19	FY20	FY21	FY22	FY23	FY24RE	FY25PE
Private consumption	7.1%	5.2%	-5.3%	11.7%	7.5%	5.6%	7.2%
Government consumption	6.7%	3.9%	-0.8%	0.0%	4.3%	8.1%	2.3%
Gross fixed capital formation	11.2%	1.1%	-7.1%	17.5%	8.4%	8.8%	7.1%
Exports	11.9%	-3.4%	-7.0%	29.6%	10.3%	2.2%	6.3%
Imports	8.8%	-0.8%	-12.6%	22.1%	8.9%	13.8%	-3.7%

Source: Crisil Intelligence, National Statistical Office (NSO)

For FY24RE: Revised Estimate, FY25PE: Provisional Estimated; FY: Fiscal year

Consumer Price Index inflation trend

India's average Consumer Price Index (CPI) inflation rate remained ~4.70% between fiscals 2018 and 2022. However, in fiscal 2023, it increased to 6.70%, mainly led by surging food prices before moderating slightly to an average of 5.4% in fiscal 2024. Although core and fuel inflation numbers have remained low, the food inflation has been keeping CPI inflation above the Reserve Bank of India's medium-level target rate of 4%. For instance, according to the CPI figures for March 2024, food inflation stood at 8.5%, primarily due to strong accelerations in inflation in foodgrains, meat and fish and slower pace of deflation in edible oils during the month.



Source: National Statistical Office (NSO), Ministry of Industry and Commerce, Crisil Intelligence

P: Projected

Repo Rate Changes

Effective Date	Repo Rate	Change
04-Apr-19	6.00%	
06-Jun-19	5.75%	-0.25%
07-Aug-19	5.40%	-0.35%
06-Feb-20	5.15%	-0.25%
27-Mar-20	4.40%	-0.75%

22-May-20	4.00%	-0.40%
06-May-22	4.40%	0.40%
08-Jun-22	4.90%	0.50%
05-Aug-22	5.40%	0.50%
30-Sep-22	5.90%	0.50%
07-Dec-22	6.25%	0.35%
08-Feb-23	6.50%	0.25%
07-Feb-25	6.25%	-0.25%

Source: Crisil Intelligence, RBI

India's repo rate adjustments reflect the Reserve Bank of India's strategic and responsive monetary policy management, effectively navigating various economic challenges while promoting sustainable growth. The RBI implemented a series of cuts from 6.00% in April 2019 to 5.15% by February 2020, demonstrating foresight in addressing pre-pandemic economic deceleration. When COVID-19 struck, the central bank responded decisively with historic reductions, slashing rates to 4.40% in March 2020 and further to 4.00% by May 2020, injecting crucial liquidity of into the system. This emergency intervention successfully stabilized markets and protected economic fundamentals during unprecedented uncertainty. As India achieved remarkable post-pandemic recovery with an 7.0% expansion in FY23—the RBI skillfully shifted to inflation management with measured rate increases between May 2022 and February 2023, reaching 6.50%. Throughout this tightening cycle, India maintained robust growth while effectively bringing inflation within target range. The February 2025 cut to 6.25% represents a balanced pivot toward supporting investment and consumption, particularly benefiting sectors like housing and manufacturing, while maintaining price stability. This sophisticated rate management has been instrumental in India's economic resilience and continued growth trajectory despite global volatility.

GVA trend

On-year supply-side gross value added by economic activity

At basic 2011-12 price	FY19	FY20	FY21	FY22	FY23	FY24P	FY25E
Agriculture and allied	2.1%	6.2%	4.0%	4.6%	6.3%	2.7%	4.6%
Mining and quarrying	-0.8%	-3.0%	-8.2%	6.3%	3.4%	3.2%	2.8%
Manufacturing	5.4%	-3.0%	3.1%	10.0%	-1.7%	12.3%	4.3%
Utilities*	7.9%	2.3%	-4.2%	10.3%	10.8%	8.6%	6.0%
Construction	6.5%	1.6%	-4.6%	19.9%	9.1%	10.4%	8.6%
Services^	7.2%	6.4%	-8.4%	9.2%	10.3%	9.0%	7.3%

*Utilities include, electricity, gas, water supply and other utilities

^Services include those related to trade, hotels, transport, communication, broadcasting, finance, real estate, public administration, defence, and professional and other services

Source: Crisil Intelligence, CSO

The primary sector, comprising agriculture and mining, shows moderate but stable growth, averaging 3-4%, with notable resilience during the pandemic period. The secondary sector, encompassing manufacturing, utilities and construction, demonstrates high volatility, swinging from a contraction of -1.3% in fiscal 2020 to a robust 12.7% growth in fiscal 2022, driven primarily by the post-pandemic manufacturing recovery and construction boom. The tertiary sector, dominated by services, has

performed the most consistently, maintaining growth rates between 6-10% throughout the period, except for the pandemic-induced contraction in fiscal 2021.

As per the latest data, the growth rates for fiscal 2024 are 5.9% for the primary sector, 11.4% for the secondary sector, and 9.0% for the tertiary sector. The estimated growth rates for fiscal 2025 are 4.4% for the primary sector, 5.8% for the secondary sector, and 7.3% for the tertiary sector. This trend underscores India's evolving economic structure, with the services sector maintaining its role as the primary growth driver. The construction sector, in particular, has shown significant growth, with a rate of 10.4% in fiscal 2024 and an estimated 8.6% in fiscal 2025, driven by government initiatives and infrastructure development. The manufacturing sector has also shown a strong recovery, with a growth rate of 12.3% in fiscal 2024 and an estimated 4.3% in fiscal 2025. Overall, the Indian economy is expected to maintain a balanced growth trajectory, with all sectors contributing to the country's economic expansion.

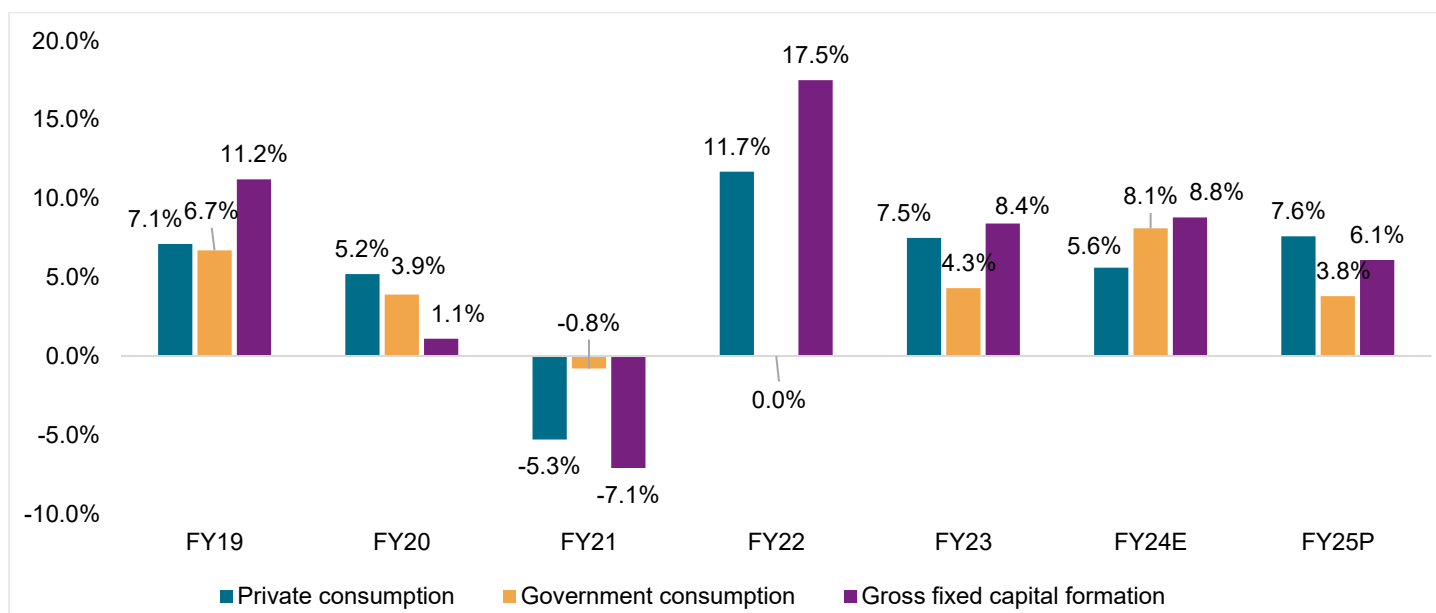
On-year supply-side gross value added by sectors

At basic 2011-12 price	FY19	FY20	FY21	FY22	FY23	FY24P	FY25E
Primary sector¹²	1.6%	4.8%	2.3%	4.8%	4.8%	5.9%	4.4%
Secondary sector¹³	5.9%	-1.3%	0.2%	12.7%	2.4%	11.4%	5.8%
Tertiary sector¹⁴	7.2%	6.4%	-8.4%	9.2%	10.3%	9.0%	7.3%

Source: Crisil Intelligence, CSO

India's investment and consumption trend

Investment and consumption trend



Source: Crisil Intelligence, CSO

¹² Include Agriculture, Livestock, Forestry & Fishing and Mining & Quarrying

¹³ Include Manufacturing, Electricity, Gas, Water supply & Other Utility Services and Construction

¹⁴ Include Trade, Hotels, Transport, Communication and Services related to Broadcasting, Financial, Real Estate & Professional Services and Public Administration, Defence & Other Services

India's investment growth, measured by gross fixed capital formation (GFCF), has demonstrated a fluctuating trend over recent years. After a strong recovery of 17.5% in fiscal 2022, investment growth slowed to 8.4% in fiscal 2023 and 8.8% in fiscal 2024. GFCF is projected to decline to 6.1% in fiscal 2025. This deceleration reflects reduced momentum in industrial and manufacturing activities, which are critical to capital formation. The on-year change shows a sharp drop of 9.1 percentage points from fiscal 2022 to 2023, followed by a modest recovery of 0.4 percentage points in 2024. That said, a contraction of 2.7 percentage points is expected in fiscal 2025.

The slowdown can be attributed to global economic uncertainties and tighter monetary policies. However, the average GFCF growth rate of 6.3% over the period indicates resilience, supported by infrastructure spending and government initiatives such as the production-linked incentive (PLI) schemes. While investment levels remain positive, the declining trend highlights the need for policy measures to stimulate private sector participation and sustain long-term capital formation.

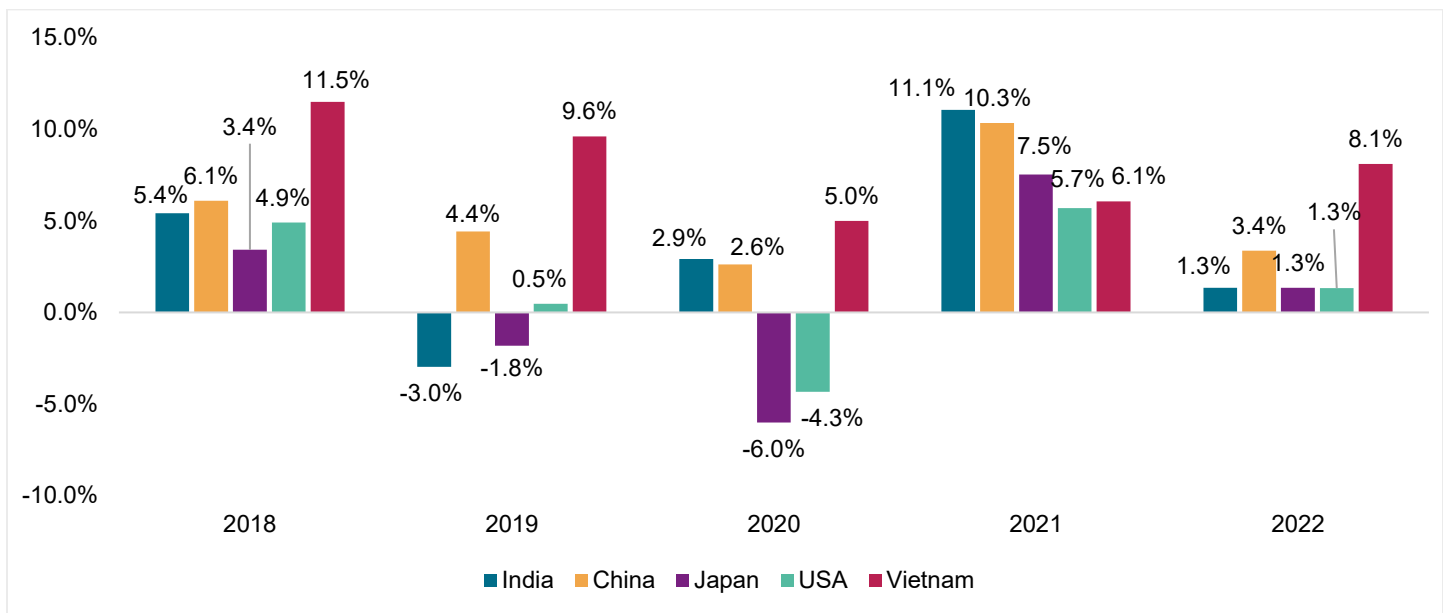
Private consumption growth has varied considerably, peaking at 11.7% in fiscal 2022 before slowing to 7.5% in fiscal 2023 and 5.6% in fiscal 2024, with a rebound to 7.6% projected in fiscal 2025. The slowdown reflects inflationary pressures and lower disposable incomes, while the projected recovery would be attributable to improving consumer sentiment driven by easing inflation and higher rural demand. The average private consumption growth of 6.8% over the period underscores its role as a key driver of GDP growth.

Government consumption has been more subdued, with an average growth rate of 3.6%. It contracted -0.8% in fiscal 2021 but rebounded sharply to 4.3% in fiscal 2023 due to pandemic-related spending, before slowing to 8.1% in fiscal 2024, and projected to recover to a modest 3.8% in fiscal 2025. This trend reflects fiscal consolidation efforts, with a focus on expenditure rather than direct consumption spending. The projected uptick in fiscal 2025 suggests renewed government focus on welfare schemes and public services.

Exports have also shown a fluctuating trend, with a growth rate of 29.6% in fiscal 2022, followed by a slowdown to 10.3% in fiscal 2023 and 2.2% in fiscal 2024. Exports are projected to grow at 7.1% in fiscal 2025. Imports, on the other hand, have grown at a slower pace, with a growth rate of 22.1% in fiscal 2022, followed by 8.9% in fiscal 2023 and 13.8% in fiscal 2024. Imports are projected to decline by 1.1% in fiscal 2025.

India's manufacturing sector

Trend of manufacturing sector in GVA (% growth rate)



Source: Crisil Intelligence, United Nations Statistics division

Note: GVA from the UN available till 2022.

Note: Unless mentioned otherwise, the years correspond to calendar years throughout.

The manufacturing sector across major economies has experienced varying growth trajectories over the past few years, shaped by pandemic-induced disruptions and subsequent recovery efforts. India's manufacturing sector, which grew at 5.4% in 2018, contracted to -3% in 2019 due to structural challenges, and was further impacted by the COVID-19 pandemic in 2020, witnessing a slow growth of 2.9%. However, the metric rebounded strongly in 2021 with an impressive growth rate of 11.1%, driven by pent-up demand and government initiatives such as PLI scheme. Growth moderated to 1.3% in 2022 due to lingering supply chain constraints and global inflationary pressures. Comparatively, China maintained resilience during the pandemic with a modest growth of 2.6% in 2020 and steady recovery thereafter, while Vietnam emerged as an outlier, consistently achieving high growth rates (5% in 2020 and 8.1% in 2022) due to its strategic positioning under the "China+1" policy.

The manufacturing sector is a vital component of India's economy, accounting for 16% of the country's GDP in fiscal 2024, according to the Central Statistical Office (CSO). The sector is also a major employer, providing livelihood for over 27 million workers. In fiscal 2024, the manufacturing sector experienced a growth rate of 9.9%, demonstrating its potential as a key driver of economic transformation.

However, the sector is projected to experience a slowdown in fiscal 2025, with a growth rate of 5.3%. Despite this, India remains well-positioned to expand its manufacturing base on account of favorable demographics, strategic government support for infrastructure development, and policies aimed at reducing import dependencies. Some of them include:

- **National Steel Policy 2017**

This policy aims to increase the country's steel production capacity to 300 million tons by 2030-31, with a focus on high-grade steel production. The policy also emphasizes the need for increasing domestic steel consumption, reducing imports, and promoting research and development in the steel sector. The policy's objectives are expected to be achieved through measures such as increasing public and private sector investment, improving infrastructure, and providing incentives for the use of clean and green technologies. By promoting the growth of the steel sector, the National Steel Policy 2017 is likely to have a positive impact on the manufacturing sector as a whole, as steel is a critical input for many industries, including construction, automotive, and engineering. This, in turn, is expected to contribute to the country's overall economic growth and development.

- **Make in India**

Launched in 2014, the Make in India initiative aims to transform the country into a global manufacturing hub by increasing manufacturing's contribution to the GDP from 16% in fiscal 2014 to 25% by 2025. It focuses on 27 key sectors, including automobiles, electronics, textiles, and defence. Despite some notable achievements, India's manufacturing sector still lags behind the target, contributing around 16% to the country's GDP in fiscal 2024. However, the initiative has attracted significant foreign investment, with over \$165.1 billion in Foreign Direct Investment (FDI) flowing into the country between 2014 and 2024. India's ranking in the World Bank's Ease of Doing Business Index has also improved significantly, from 142 in 2014 to 63 in 2019, before the index was discontinued. Key achievements of the initiative include India's emergence as the second-largest mobile phone manufacturer globally, as well as a surge in automobile and electronics production. However, challenges remain in achieving the ambitious GDP target due to infrastructure gaps and regulatory hurdles.

- **Production Linked Incentive (PLI) Scheme**

Introduced in 2020 with an outlay of Rs 1.97 lakh crore, the PLI scheme incentivises production across 14 sectors, including electronics, pharmaceuticals, and renewable energy. As of December 2024, it has attracted Rs 1.46 lakh crore in investments, generated Rs 12.5 lakh crore in production/sales, and created approximately 9.5 lakh jobs. The programme has significantly boosted smartphone manufacturing, with exports reaching \$11 billion in fiscal 2023. The scheme also supports import substitution and export growth, particularly in high-tech industries like telecommunication and solar PV modules.

- **Pradhan Mantri Kaushal Vikas Yojana (PMKVY)**

Launched in 2015 under the Skill India Mission, PMKVY aims to bridge skill gaps by providing industry-relevant training. As of January 2025, it has trained over 1.42 crore individuals across sectors such as manufacturing and information technology. PMKVY incorporates new-age skills like artificial intelligence (AI) and robotics to align with Industry 4.0 demands. Its Recognition of Prior Learning (RPL) programme has certified informal workers, enhancing their employability. The scheme supports manufacturing by creating a skilled workforce aligned with industry needs.

- **PM Gati Shakti**

Launched in 2021 with a Rs 100 lakh crore investment plan, PM Gati Shakti integrates infrastructure projects across 16 ministries to enhance multimodal connectivity. By reducing logistics costs (currently at 13-14% of GDP) to global benchmarks of 8-9%, it directly benefits manufacturers through seamless supply chains and faster project execution. As of October 2024, over Rs 15.39 lakh crore worth of projects have been assessed under this initiative. Improved connectivity has bolstered industrial growth in tier-II and tier-III cities.

- **Industry 4.0 and Digital India**

The Digital India programme has accelerated the adoption of Industry 4.0 technologies like Internet of Things (IoT), AI, and robotics within manufacturing processes. Initiatives such as smart factories and digital supply chains have enhanced productivity while fostering innovation. The integration of digital tools into manufacturing aligns with global standards, positioning India as a competitive player on the world stage.

- **National Logistics Policy (NLP)**

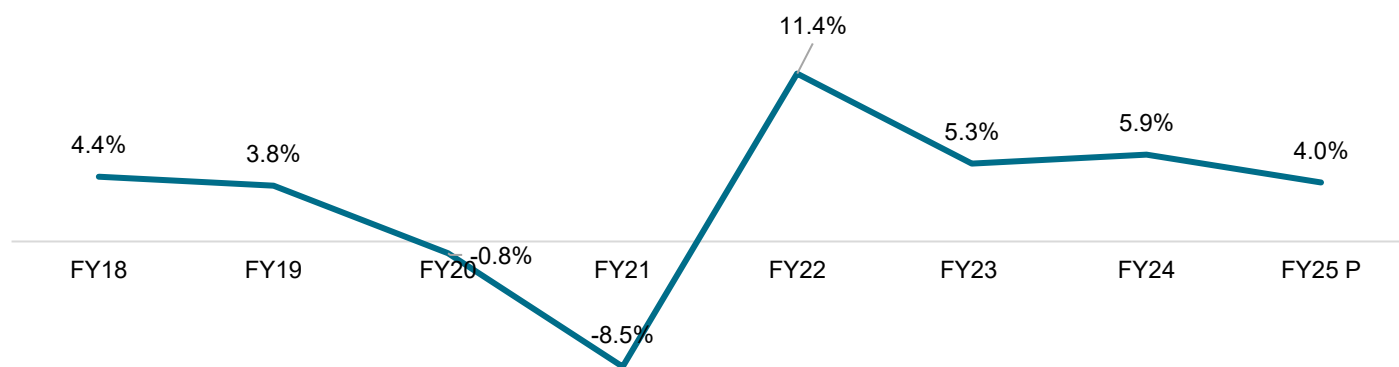
Launched to complement the PM Gati Shakti scheme, NLP aims to reduce logistics costs from 16% of India's GDP to a global average of ~8% by improving multimodal transport systems and warehousing infrastructure. Improved logistical efficiency aids manufacturers by lowering operational costs and improving export competitiveness.

- **National Infrastructure Pipeline (NIP)**

The NIP involves an investment of Rs 111 lakh crore over five years from fiscal 2020 to fiscal 2025 to develop critical infrastructure such as industrial corridors and smart cities. This initiative provides manufacturers with state-of-the-art facilities, while improving access to domestic and international markets.

Index of Industrial Production growth trend

India's Index of Industrial Production (IIP) had a moderate 3.8% growth in FY19, IIP contracted by 0.8% in FY20 and sharply declined by 8.5% in FY21 due to the pandemic. However, a strong recovery was seen in FY22 with 11.4% growth. The growth rate moderated to 5.3% in FY23 and improved to 5.9% in FY24. The uptick in the index was mainly led by strong pick-up in the manufacturing of electrical equipment and basic metals. Further, an uptick in consumer durables sector aided the IIP growth.



Source: NSO, Ministry of Industry and Commerce, Crisil Intelligence

China+1 strategy

In the 1990s and early 2000s, China emerged as the leading global manufacturing hub primarily because of availability of a large labour force at cheap rates, favourable government policies, and vast infrastructure investment. However, in the mid- to late-2010s, the country started losing its competitiveness in terms of manufacturing on account of the emergence of “China+1”.

China+1 is a strategy that encourages companies across the globe to diversify their supply chain and manufacturing away from China to mitigate concentration risk. This strategy, which first garnered attention in the early 2010s, picked up calendar year 2018, when global companies started looking at reducing their dependence on China by adding other countries as alternative production bases.

The early drivers of the strategy included the following:

- **Rising labour costs in China:** As the Chinese economy started growing at a rapid pace, wages also started increasing. With increasing labour costs, China started losing its cost-competitiveness, particularly in industries which were highly labour intensive. For example, currently, the minimum wage rate in China in rupee terms is Rs 25,000–30,000 per month, which is significantly higher than India, where the minimum wage rate is Rs 5,000-5,500 per month. This increasing wages in China forced the global companies to start looking to diversify their manufacturing operations to other countries such as India and Vietnam. that offered favourable business environments with lower labour costs.
- **Geopolitical and regulatory tensions:** Various geopolitical tensions also forced companies to shift some of their manufacturing operations outside China. For example, the trade war between the US and China that started in 2018

led to introduction of tariffs and trade barriers, making Chinese goods more expensive and less competitive in the global market. Further, regulatory challenges such as strict environmental norms and bureaucratic hurdles added to the complexity and costs of doing business in China. As an example, ease of doing business in China was affected when foreign companies were required to share proprietary information with their local Chinese counterparts as a condition for access to markets. These policy-related barriers along with their unpredictable nature prompted companies to explore other manufacturing locations to avoid the impact of tariffs, maintain cost-competitiveness and geographical diversification in the global market.

- **Covid-19 pandemic:** The pandemic, which reportedly originated between late calendar year 2019 and early 2020, also exposed vulnerabilities and risk of over-dependence on China. The country, which was the initial epicentre of the pandemic, announced lockdowns, which led to factory closures causing severe global supply chain disruptions. The companies, as a result, struggled to source materials (raw materials or finished goods), thus highlighting the risk of over-dependence on a single region. This prompted the companies to accelerate their diversification efforts to avoid or mitigate such disruptions in the future.
- **Economic development and proactive approach of other countries:** Many countries, mostly in south and south-east Asia, including India, positioned themselves as alternative manufacturing locations by investing heavily in infrastructure, simplifying regulations, increasing the ease of doing business, offering FDI-related incentives, etc.

Capitalising on China +1

Indian manufacturing is likely to benefit from multinational companies' decision to move their manufacturing bases out of China. The manufacturing of steel and related products in India is expected to benefit from the strategy, primarily because of supporting supply side and demand side business environment, government policy, and other key factors as detailed below:

- **Government initiatives and policy support:** The government has introduced schemes such as PLI, which provides various incentives to industries such as specialty steel, electronics, automobiles, which are end-users for the steel sector. As per the PLI scheme, an incentive outlay of Rs 1.97 lakh crore (equivalent to over \$26 billion) is underway for 14 key sectors to enhance the country's manufacturing capabilities and exports. This scheme, which will benefit many sectors in India, is also expected to increase demand for steel and, in particular stainless steel. For example, with automobile companies looking to reduce the weight of their vehicles by substituting conventional steel with other types of materials such as stainless steel, the demand for stainless steel is expected to increase, benefiting the domestic stainless steel manufacturing industry. Further, in calendar year 2017, the government introduced National Steel Policy (NSP), which aims to increase steel production in India to 300 million tonne by 2030 from ~178 million tonne as of 2024.
- **Growing export opportunities:** The Indian government has introduced policies such as PLI scheme, Make in India, Trade Infrastructure for Export Scheme (TIES), *Market Access Initiative (MAI)*, to improve ease of doing business. It has also introduced schemes related to foreign direct investment and reforms thereof, to boost the manufacturing and exports of steel and value-added products. For example, under the PLI scheme for specialty steel, a total investment outlay of Rs 4,300 crore is expected to happen. Under MAI, which is an export promotion scheme, a yearly budget of ~Rs 2 billion is earmarked per year, which is expected to increase in the coming years. Further, multiple countries want to reduce the dependence on steel from China. The Indian steel industry can cater to their requirements. Moreover, the Indian stainless steel industry is focussing heavily on producing sustainable and environmentally friendly products, which is expected to garner huge demand in the export markets in coming years
- **Growing demand from key industries:** The Indian steel industry is poised to benefit from the country's growing infrastructure development. As the government invests heavily in this sector, the demand for steel is expected to increase, driving growth for domestic steel producers. Additionally, India's position as the second-largest producer of

steel after China makes it an attractive alternative source for companies looking to diversify their supply chains. India's growing infrastructure and steel production capabilities make it a potential beneficiary of shifting global supply chains and an increasingly attractive destination for businesses.

- **Raw material availability:** India has significant reserves of iron ore and coal, which are key raw material/consumables in steel production. With total reserves of over 33.28 billion tonne of haematite (Fe_2O_3) and magnetite (Fe_3O_4) as of May 2023, India is one of the leading producers of iron ore in the world, according to the Indian Bureau of Mines. Further, the Ministry of Coal indicates India's total estimated coal reserves stood at 378.21 billion tonne in fiscal 2023
- **Existing expertise in India:** India, being the second-largest producer of crude steel in the world (with a production volume of 144.30 million tonne in fiscal 2024, as reported by Joint Plant Committee), is the most obvious choice for the global industries looking to shift their supply base from China. India is home to key integrated steel producers such as Steel Authority of India Ltd, JSW Ltd, Tata Steel Ltd, etc. which provides the country a strong competitive edge against others from the perspective of availability of skilled workforce and technology

Key government schemes for end-use industries

1. Defence industry

The Indian defence manufacturing sector has undergone a significant transformation under the Make in India initiative, with a focus on enhancing domestic manufacturing capabilities and reducing dependence on imports. The government's strategic policies and initiatives have propelled the sector towards self-reliance, resulting in a substantial increase in domestic production and exports.

Key Highlights:

- **Domestic defence production:** The Ministry of Defence reported an unprecedented domestic defence production of Rs 1.27 lakh crore in fiscal 2024, a significant milestone in the country's journey towards self-reliance
- **Exports:** India's defence exports have grown remarkably, reaching a record high of Rs 21,083 crore in fiscal 2024, compared with Rs 686 crore in 2014, clocking a CAGR of 34.6%

Policies and initiatives:

- **Liberalised FDI Policy:** The FDI limit in the defence sector was raised to 74% through the automatic route and up to 100% through the government route, attracting significant investment in the sector. The liberalised FDI policy has attracted significant investment in the defence sector, with Rs 5,077 crore worth of FDI reported by companies operating in the sector as of February 9, 2024
- **Defence Acquisition Procedure (DAP) 2020:** The policy emphasises procurement of capital items from domestic sources, promoting indigenous production and reducing dependence on imports. Historically, India relied heavily on foreign countries for its defence needs, importing 65-70% of defence equipment. However, this landscape has dramatically shifted, with ~65% of defence equipment now manufactured domestically. This transformation reflects the country's commitment to self-reliance in this critical sector and underscores the strength of its defence industrial base, which comprises 16 defence public sector undertakings (DPSUs), over 430 licensed companies, and ~16,000 micro, small, and medium enterprises (MSMEs). Notably, 21% of this production comes from the private sector, bolstering India's journey toward self-reliance

2. Green steel taxonomy

As the world's second-largest steel producer, the sector is both a cornerstone of the Indian economy (~2% of GDP in fiscal 2024) and a major source of greenhouse gas emissions, contributing to 10-12% of the country's total emissions in fiscal 2024. In fiscal 2024, steel production in India had an emission intensity of 2.54 tCO₂/tcs (CO₂ emissions per tonne of crude steel) which is higher than the calendar year 2023 global average of 1.92 tCO₂/tcs. As per the National Steel Policy 2017, India is set to increase steel production capacity to 300 million tonne, which would add to sustainability concerns. To address this, the Ministry of Steel introduced the green steel taxonomy.

In December 2024, India became the first country to release a taxonomy for green steel, outlining the following key features: Green steel is defined as steel produced with a CO₂ equivalent emission intensity of less than 2.2 tCO₂e/tfs (CO₂ emissions equivalent per tonne of finished steel). The ministry, in collaboration with industry stakeholders, aims to establish a green steel taxonomy to reduce the emission intensity to 2.2 tCO₂ e/tfs by 2030. Greenness is expressed as a percentage based on emission reductions below the threshold value. A star rating system will be used, with 5-star (<1.6 tCO₂e/tfs), 4-star (1.6-2.0 tCO₂e/tfs), and 3-star (2.0-2.2 tCO₂e/tfs) ratings. The threshold values will be reviewed every three years starting in 2030.

3. PLI scheme

Keeping in view India's vision of becoming 'Atmanirbhar', an incentive outlay of Rs 1.97 lakh crore (equivalent to over \$26 billion) under the PLI scheme for 14 key sectors is underway to enhance the country's manufacturing capabilities and exports. The implementation of the scheme across the sectors aims to attract investments (domestic and foreign) in the areas of core competency and apply cutting-edge technology, ensure efficiencies, create economies of scale and boost exports to make India an integral part of the global value chain.

Particulars	Units	Amount
PLI scheme-led investment	Rs lakh crore	1.46
PLI scheme production/sales	Rs lakh crore	12.50
PLI scheme-led exports	Rs lakh crore	4.00
PLI-led employment generation	In lakh	9.5 (direct and indirect)

Source: Press information bureau (PIB)

Note: All figures in the table are As of August 2024

Benefits of PLI scheme

Food processing sector

- Sourcing of raw material from India has increased significantly, benefitting farmers and small-scale industries
- Sales of organic products has increased, enhancing the visibility of Indian brands in the global market
- The scheme has also led to increased millet procurement by over five times between fiscals 2021 and 2023

Specialty steel sector

- Ministry of Steel has a target of generating an investment of Rs 29.5 billion, an additional capacity of 25 million tonne for producing specialty steel grades and an additional employment to about 17,000 people between fiscals 2024 and 2028 through its PLI programme
- In fiscal 2024 itself, an estimated investment of Rs 160 billion has been made. In fiscal 2025, an investment of another Rs 10 billion is expected to be made into the sector through the PLI scheme

Renewable energy and solar PV

- India's solar PV manufacturing sector has grown rapidly, with installed capacity increasing from 2.3 GW in 2014 to ~67 GW in 2024. The government's phased development approach, with an outlay of Rs 4,500 crore in the first phase and Rs 19,500 crore in the second, has established a robust manufacturing ecosystem.
- The PLI scheme for solar has aided growth, with implementation of 48 GW of fully/partially integrated projects underway. It is expected to attract Rs 1.1 lakh crore investment and create 45,000 direct employment opportunities

Automotive and auto components

- The Union Cabinet approved the PLI Scheme for Automobile & Auto Components with a budgetary outlay of ₹25,938 crore, the scheme aims to overcome cost disabilities and boost domestic manufacturing of Advanced Automotive Technology (AAT) products in India.
- The scheme covers 19 categories of AAT vehicles and 103 AAT components, as notified by the Ministry of Heavy Industries (MHI).
- As of December 2024, companies under the scheme have committed over ₹25,000 crore in capital investment, including setting up new production facilities and upgrading technology.
- The first performance year of the scheme was FY 2023-24, and an aggregate incentive of ₹322 crores has been disbursed under the scheme as of December 2024.

White goods (air conditioners and LED lights)

- The Union Cabinet approved the PLI Scheme for White Goods with an outlay of ₹6,238 crore to be implemented over FY 2021-22 to FY 2028-29, the Scheme aims to create a robust component ecosystem for Air Conditioners and LED Lights Industry in India and make India an integral part of the global supply chains.
- The Scheme extends an incentive of 6% to 4% on reducing basis on incremental sales for a period of five (5) years subsequent to the base year and one year of gestation period.
- A total of 84 companies under the Scheme are set to bring investments of ₹10,478 crore, resulting in production worth ₹1,72,663 crore during the Scheme period.

Manufacturing of Medical Devices

- The total financial outlay of the scheme is Rs. 3,420 crore with production tenure from FY 2022-2023 to FY 2026-27
- The scheme provides incentive to selected companies at the rate of 5% on incremental sales of medical devices manufactured in India and covered under the four Target segments of the scheme, for a period of five (5) years.
- 19 green-field projects have been commissioned and production of 44 products including high end medical devices which were previously imported into the country has started under the scheme as of Dec 2024.
- The cumulative sales made by the applicants under the scheme up to September, 2024 is Rs 8,039.63 crore (which includes exports worth Rs 3,844.01 crore).

4. Production Linked Incentive 1.1 (PLI 1.1)

The Indian government has introduced the PLI Scheme 1.1 to increase the production of specialty steel. This initiative focuses on five product categories: coated/plated steel products, high strength/wear resistant steel, specialty rails, alloy steel products and steel wires, and electrical steel.

The application window for the PLI Scheme 1.1 is open from January 6 to January 31, 2025, and investments made after January 6 will be eligible for the scheme. This version of the scheme will operate within the original allocation of Rs 6,322 crore for the steel sector's PLI Scheme. It aims to promote high-value steel manufacturing, reduce import dependence and strengthen India's position as a global steel powerhouse. The government also aims to attract investments and generate employment in the steel sector through this route.

In the first round of the Production Linked Incentive (PLI) Scheme for specialty steel, launched in July 2021, the government approved 44 projects from 26 companies. Major steel companies such as SAIL, Tata Steel, JSW, Jindal Steel and Power Limited (JSPL) and ArcelorMittal Nippon Steel (AMNS) were among the participants.

5. Green hydrogen mission

The National Green Hydrogen Mission, launched in January 2023 with an outlay of Rs 19,744 crore, aims to propel India to the forefront of the global green hydrogen industry. The mission's overarching objective is to make India a global hub for the production, usage and export of green hydrogen and its derivatives. The scheme aims to establish a production capacity of 5 million tonnes (MT) per annum by 2030. This capacity creation is expected to bring in more than Rs 8 lakh crore in investments. This investment is estimated to generate 6 lakh jobs by 2030, contributing to the country's employment growth and economic development. Green hydrogen has the potential to replace imported fossil fuels in various areas, including fertiliser production, petroleum refining, mobility, steel production and shipping propulsion applications. The mission is expected to reduce a cumulative Rs 1 lakh crore worth of fossil fuel imports by 2030, contributing to the country's energy security and reducing its trade deficit. Some notable achievements include:

- GAIL Limited has started India's maiden project to blend hydrogen with the city gas distribution grid in Indore (Madhya Pradesh)
- NTPC Limited has initiated up to 8% blending of green hydrogen in the piped natural gas (PNG) network at the NTPC township in Surat (Gujarat)
- NTPC has helped to deploy Hydrogen-based fuel-cell electric vehicle (FCEV) buses in Greater Noida (Uttar Pradesh) and Leh
- Oil India Limited has developed a bus powered by a 60-kW capacity hydrogen fuel cell and can run on electric power, too

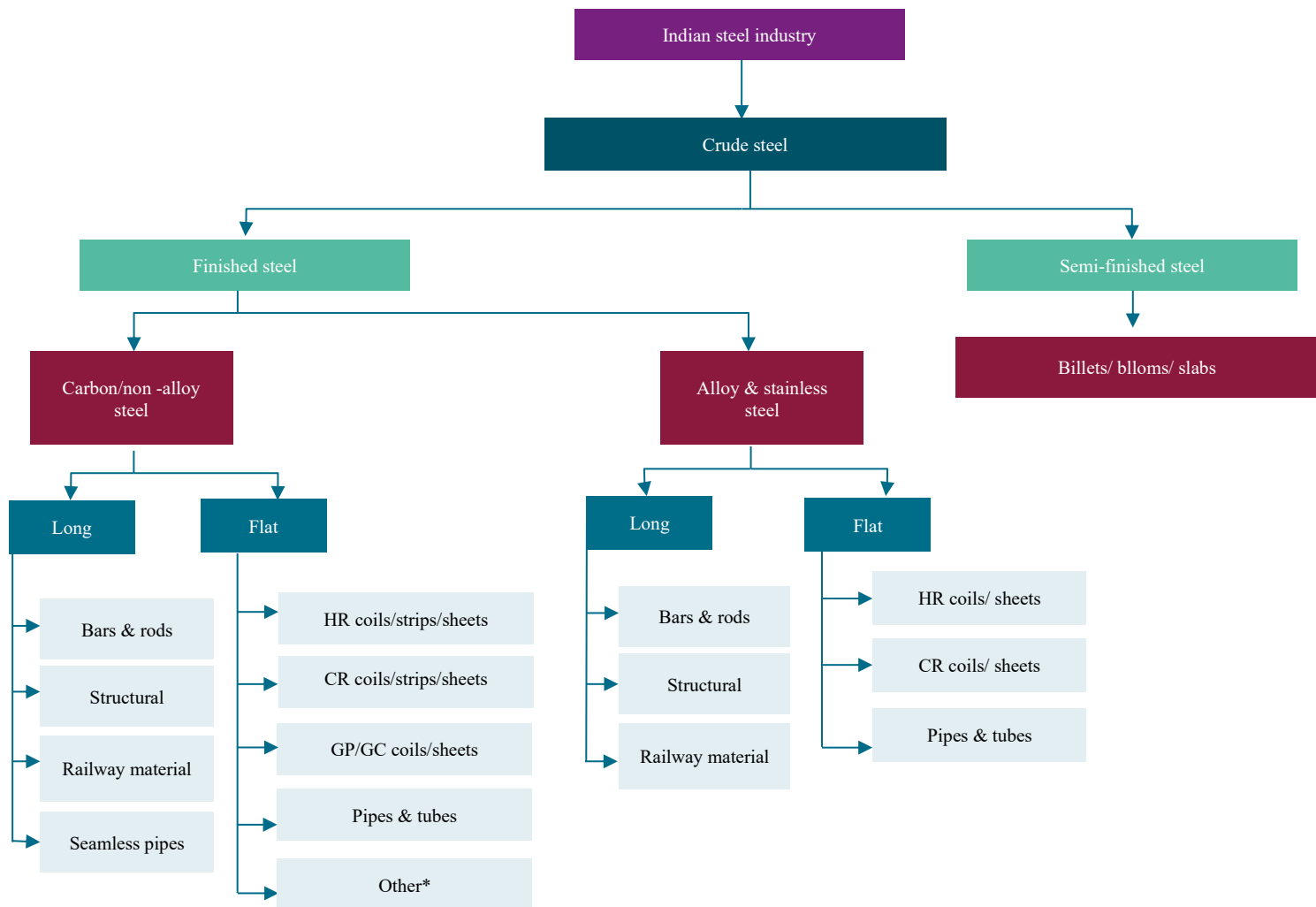
6. Environment Protection (End-of-Life Vehicles) Rules & Vehicle Scrapping Policy

The Ministry of Environment, Forest & Climate Change has notified a rule, effective April 2025, that complements the Vehicle Scrappage Policy launched by the Ministry of Road Transport and Highways (MoRTH) in 2021. The policy aims to phase out old and polluting end-of-life vehicles (ELVs) from the roads, with a multifaceted objective to reduce pollution, enhance road safety, stimulate the automotive industry and promote sustainable transportation. To achieve this, a comprehensive vehicle inspection and certification programme will be established to identify vehicles for scrapping. Participating vehicle owners will get incentives such as cash rewards, discounts on new vehicles and exemptions from registration fees. Furthermore, the MoRTH has approved 141 registered vehicle scrapping facilities (RVSFs) for

environmentally responsible disposal of old vehicles; more such facilities will be set up. To promote the policy, the government will collaborate with industry stakeholders, including automotive manufacturers and dealers, and offer incentives to customers so as to develop a more sustainable and environmentally friendly transportation ecosystem.

India's steel industry: An overview

Structure of the industry



**Others include prime plate plates, hot strip mill plates, colour-coated coils/sheets, electrical coils/sheets, tin plates, tin-free steel, tin mill black plates, pipes, etc*

HR: hot rolled; CR: cold rolled

Source: CRISIL MI&A Consulting, industry

Note: Pipes and tubes included under both flat carbon/non-alloy steel segment and flat alloy & stainless-steel segment include hollow section pipes and welded pipes. Further, seamless pipes under long segment also include hollow section

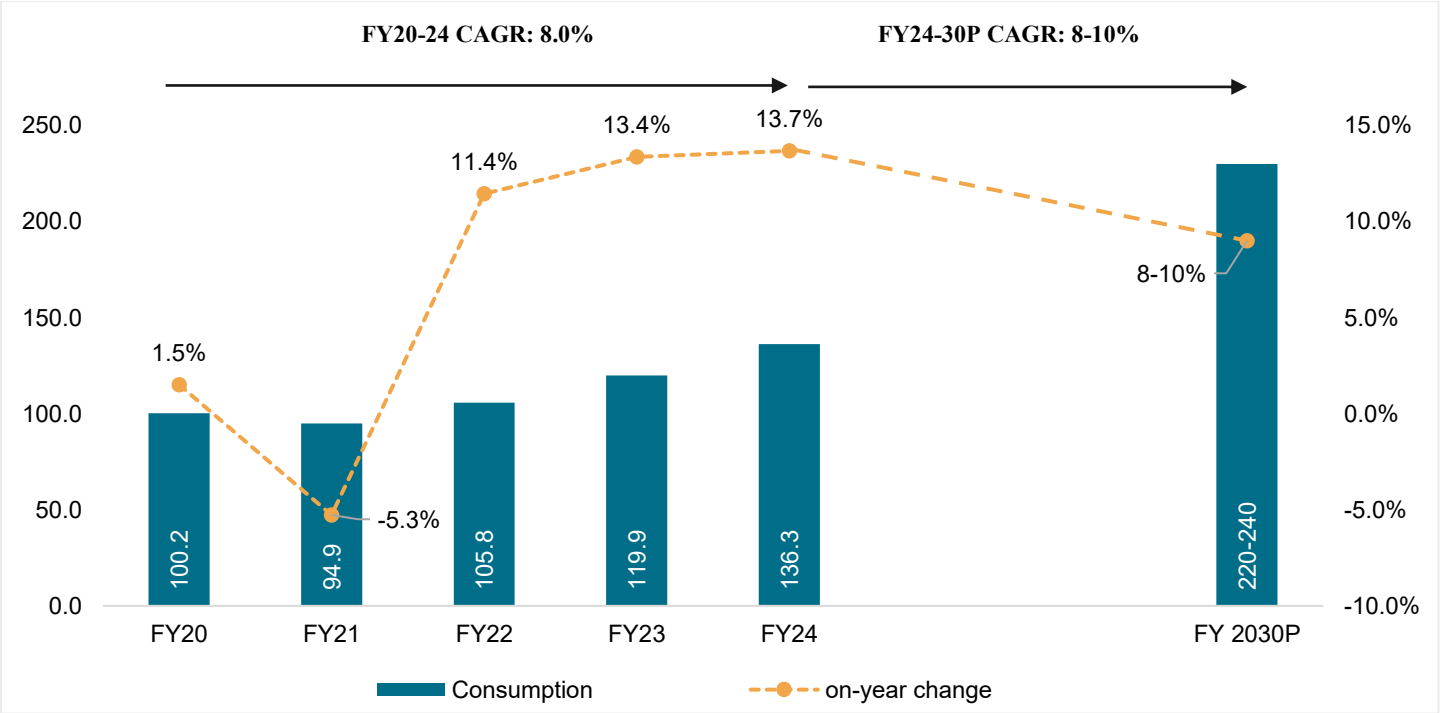
Steel is an alloy primarily composed of iron and carbon, with small amounts of other elements. It is one of the most versatile and widely used materials globally due to its strength, durability and recyclability. The steel industry plays a critical role in economic development, supporting infrastructure, construction, automotive and manufacturing sectors. The steel industry can be classified into crude steel, semi-finished steel and finished steel. Crude steel is the raw material produced in furnaces, serving as the foundation for further processing. Semi-finished steel includes intermediate products such as billets, blooms and slabs, which are inputs for rolling mills. Finished steel is the final product, categorised into carbon/non-alloy steel and alloy & stainless steel. Finished steel is further divided into long products (e.g., bars, rods, structural materials, railway components) and flat products (e.g., hot-rolled (HR) coils/sheets, cold-rolled (CR)

coils/sheets, galvanised sheets). Alloy and stainless-steel products offer enhanced properties for specialised applications. Flat products are widely used in automotive and appliances, while long products dominate construction and infrastructure projects.

Consumption trend of finished steel

The domestic steel demand has logged a significant 8% CAGR between fiscals 2020 and 2024. In fiscal 2021, the industry saw a 5.3% on-year decline in demand due to the pandemic. Demand rebounded in fiscal 2022, growing 11.4% on-year, with a revival of industrial activities, release of pent-up demand and growth inducement in key end-use sectors. Steel demand grew 13.4% to 136.3 MT in fiscal 2024 from 100.2 million tonne (MT) in fiscal 2020, owing to the aggregate effect of growth in the end-use sectors of steel — such as automobile, infrastructure and construction — and the market volatility faced during the pandemic. The increase in demand is expected to accelerate at a CAGR of ~8-10% by fiscal 2030, rising to 220-240 MT.

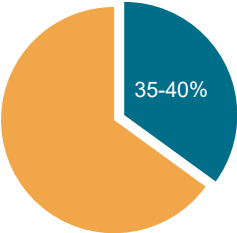
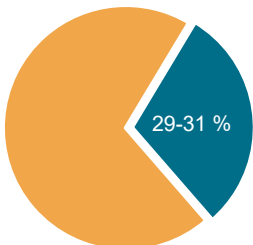
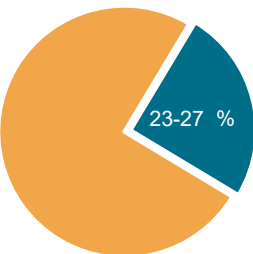
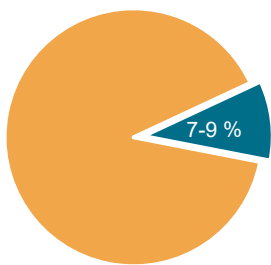
Domestic steel consumption (MT)



P: Projected
Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)

Building and construction (B&C), infrastructure and engineering, and packaging sectors make up ~90% of the aggregate demand for finished steel; B&C has the largest share. Infrastructure projects, housing and construction sectors are expected to spearhead the growth in steel demand between fiscals 2025 and 2030. Projects such as the Pradhan Mantri Awas Yojana (PMAY) and the National Infrastructure Pipeline (NIP) will help sustain the growth momentum.

Steel consumption break-up by use

SEGMENT	SHARE OF CONSUMPTION	GROWTH IN FY20-24	GROWTH IN FY25-30P	Application	DEMAND DRIVERS
BUILDING AND CONSTRUCTION		5.4%	6–8%	- Reinforced concrete structures - Roofing & cladding - Prefabricated buildings - Doors, windows, staircases	- Affordable housing - Pick-up in rural housing (healthy rural sentiments) - Commercialisation of Tier III and IV cities
INFRASTRUCTURE		8.8 %	10–12%	- Bridges (girders, trusses) - Rail/Metro infrastructure - Roads & highways (guardrails, crash barriers) - Airports, ports	- Investment in developing 2,843 km of dedicated freight corridor; ~4,300 km more proposed - Investment of Rs 24.93 thousand crore for urban infrastructure like mass rapid transit system (MRTS)
ENGINEERING AND PACKAGING		8%	8–10%	- Industrial machinery - Power equipments (boilers, turbines) - Transmission towers - Earthmoving equipments - Food and beverages cans - Aeosol containers - Paint cans, Bottle caps & closures	- Push for sustainability will lead to increased steel demand - Government initiatives like Atmanirbhar Bharat and PLI schemes increased domestic manufacturing
AUTOMOTIVE		3.8%	5-7%	- Car body panels - Chassis & suspension - Engine & transmission parts - Wheels & bumpers	- Automotive production expected to drive demand growth, with cars/utility vehicles growing 1-3% - Tractor production forecast to increase 6-8% in fiscal 2025 due to favourable weather and government measures - Two-wheeler production anticipated to grow 15-17% in fiscal 2025 due to rural market recovery and premiumisation

Note: This is not an exhaustive list. Other segments include industries such as capital goods and consumer durables, among others

Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)

Infrastructure to drive steel demand

The infrastructure sector is poised to be a significant driver of domestic steel demand; it currently accounts for approximately 30% of the demand. Over the next five years, this sector is expected to log a CAGR of around 11%.

Key drivers of infrastructure growth

Some initiatives that are expected to fuel the growth of the infrastructure sector:

- Substantial budgetary allocation: The government has allocated Rs 630 thousand crore for road, railway and urban development, representing a 4% on-year increase. Although the increase is marginal, the capital expenditure (capex) allocation remains significant.
- Bharatmala Pariyojana: This scheme aims to improve efficiency in the road sector, with Phase I targeting the development of 34,800 km, including 24,800 km of various categories of roads and 10,000 km of residual National Highways Development Project (NHDP) work. Approximately 26,425 km of work has been awarded under the Rs 5.35 lakh crore project and 18,714 km completed as of October 2024.
- Smart Cities project: The proposed investment of Rs 2.05 lakh crore into the National Smart Cities Mission is expected to boost infrastructure development, driving demand for steel.

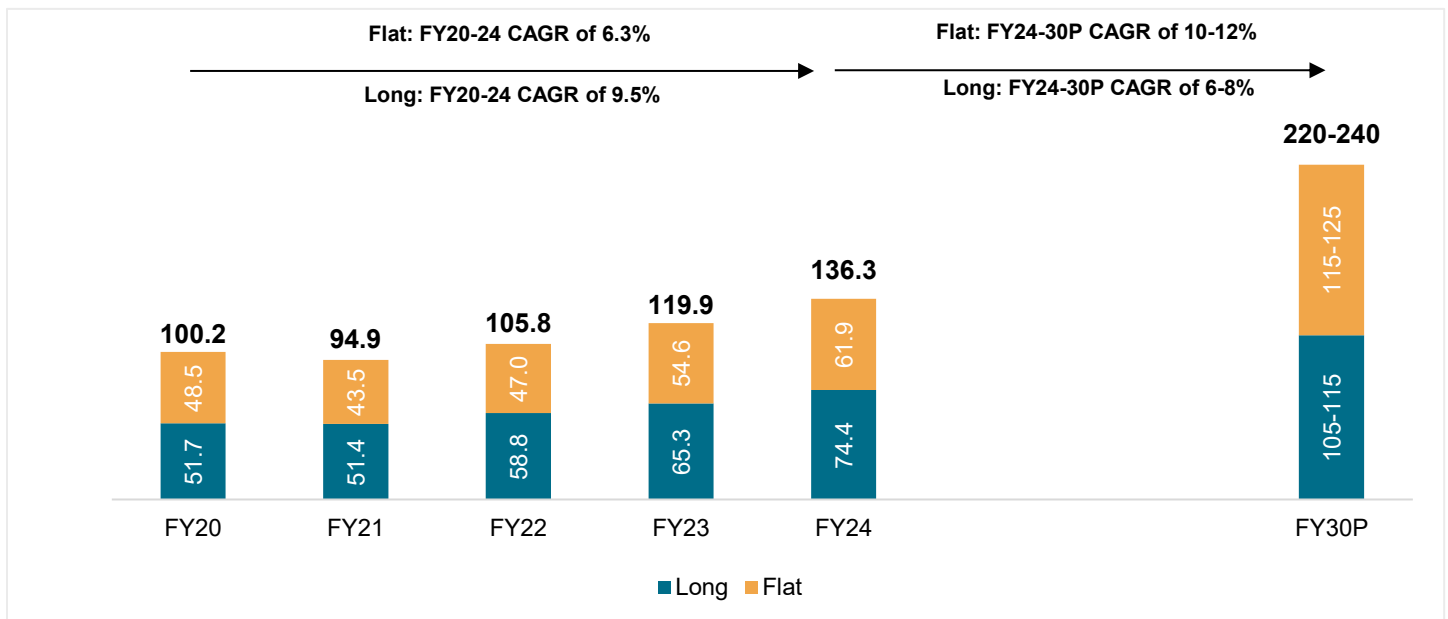
Key infrastructure signposts and demand drivers:

Scheme	 PMAY - G	 PMAY-U	 Sagarmala	 Freight Corridor
Initial Target	~38 Mn Houses	~12 Mn Houses	839 Projects	2843 Km of Railway lines
Project Duration	FY 2015-2029	FY 2015-2027	FY 2015-2035	FY 2006-2025
Status as of 2024	- As of Mar 25, ~27.2 Mn houses constructed ~8.4 Mn units under construction	- As of March 25, ~9.2 Mn houses constructed ~2.1 million houses under construction	- As of Apr 2024, 262 projects completed ~577 projects are under implementation and various stages of development.	- As of Feb 2024, ~2741 kms completed (under both EDFC and WDFC). - EDFC completed fully while WDFC on the verge of completion ~100% of land acquired for WDFC, except ~1.87 km left to be acquired
Schemes Completion as of Dec'24 (In %)	~76% of the sanctioned units	~78% of the sanctioned units	~21% of the total projects	~96% physical progress ~93% financial progress
Est steel demand till 2024 (In MT)	50-60		5-7	6-7
Revised Target	Additional 20 Mn houses	Additional 10 Mn houses	-	Additional ~4300 Km New Lines to be added (Still in proposal stage)
Projected steel demand for balance project duration	40-45 MT		13-14	-

Source: Industry, Crisil Intelligence

Steel consumption by category

The Indian steel industry has witnessed a steady uptrend in demand, with consumption growing from approximately 100 million tonnes (MT) in Fiscal 2020 to around 136 MT in Fiscal 2024. This translates to a compound annual growth rate (CAGR) of 8% over the four-year period. The key drivers of this growth are the automotive and infrastructure sectors, which are experiencing significant expansion and development. In line with this growth trajectory, the Government of India has set an ambitious target of increasing the country's steel production capacity to 300 million tonnes by 2030, as outlined in the National Steel Policy 2017. This policy initiative is expected to provide a supportive framework for the industry's continued growth, driven by increasing demand from core sectors such as construction, infrastructure, and automotive.



Consumption of long and flat products (MT)

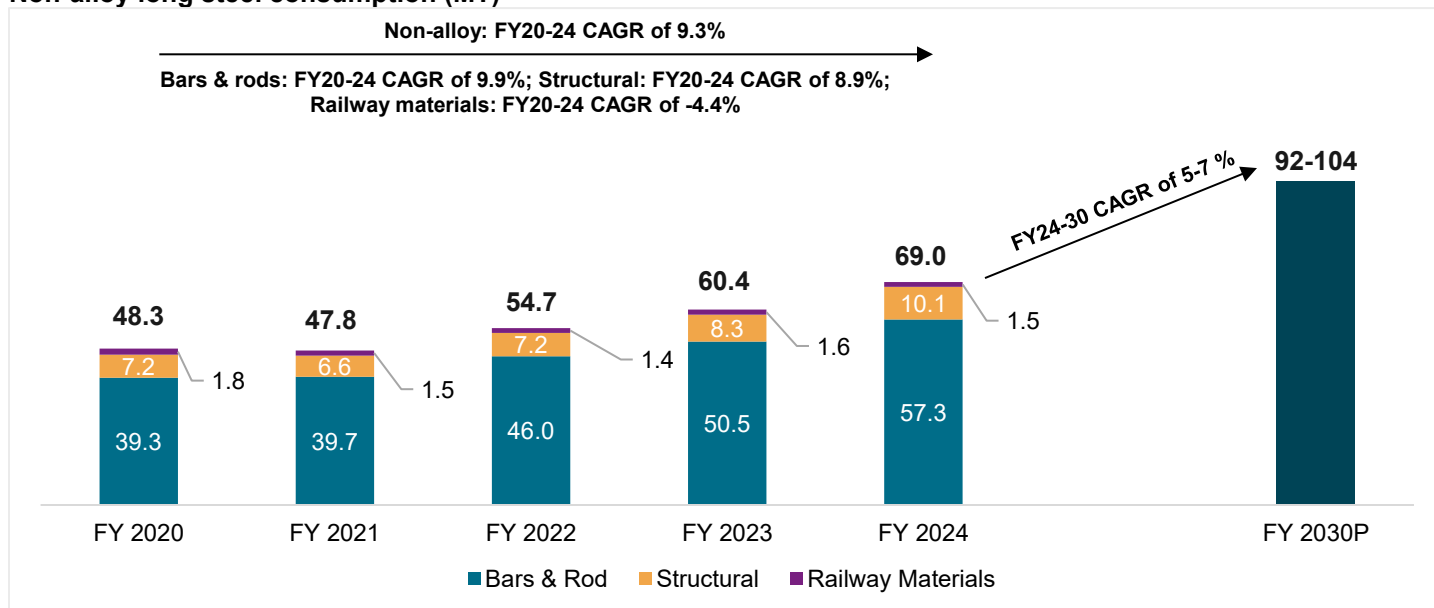
P: Projected

Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)

Demand for long steel increased at 9.5% CAGR between fiscals 2020 and 2024, led by growth in infrastructure and in the building and construction sector. Demand for flat steel rose 6.3% CAGR. This increased the share of long steel in overall demand for finished steel to ~55% in fiscal 2024 from ~52% in fiscal 2020.

The resolution of the supply chain issues in the automobile segment and an increase in demand in construction and infrastructure segments are expected to give flat steel demand a CAGR of 10-12% between fiscals 2024 and 2030. This would outpace the demand growth of long steel, which is set to clock a CAGR of 6-8% in the period owing to positive sentiments in the private housing construction sector and the government's robust push for infrastructure development.

Non-alloy long steel consumption (MT)



Source: Crisil intelligence, industry, Joint Plant Committee (JPC)

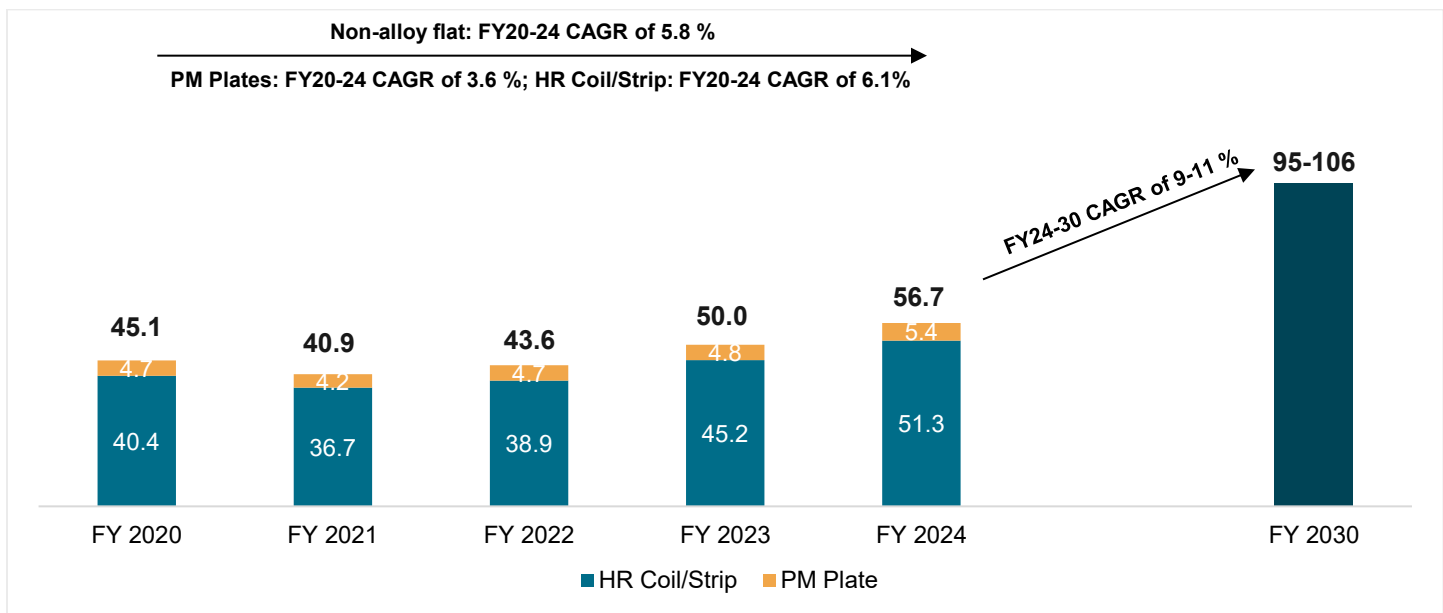
Note: Bars & rods production volume considers seamless pipes as well

Consumption of non-alloy steel has shown consistent growth across key categories, driven by infrastructure expansion and industrial development. Between FY20 and FY24, the demand for bars and rods increased from 39.3 MT to 57.3 MT, representing a CAGR of 9.9%. The consumption of structural steel, used in buildings and heavy infrastructure, rose from 7.2 MT to 10.1 MT during the period, with a CAGR of 8.9%. However, the demand for railway materials declined from 1.8 MT in FY20 to 1.5 MT in FY24, reflecting a negative CAGR of 4.4%, due to slower growth in railway infrastructure projects as well as the pandemic-induced lockdowns.

The broader trend in Indian steel consumption highlights a strong growth in long steel products, which cater primarily to the construction and infrastructure sectors. Between FY20 and FY24, long steel demand clocked a CAGR of 9.5%, outpacing that of flat steel products, which grew at 6.3%. By FY24, consumption of long steel reached 74.4 MT compared with 61.9 MT for flat steel. This growth was fuelled by significant investments in urban development, housing projects and large-scale infrastructure initiatives under government programmes, such as the National Infrastructure Pipeline (NIP).

India's strategic focus on infrastructure development positions it well to see sustained growth in non-alloy long steel consumption. The country's growing urbanisation, rising middle class and increasing investments in housing and industrial projects are expected to drive the demand further. It is expected to grow at a CAGR of 5-7% between fiscal 2024 and 2030.

Non-alloy flat steel consumption (MT)



Source: Crisil intelligence, industry, Joint Plant Committee (JPC)

India's non-alloy flat steel consumption demonstrated a steady growth trajectory from FY20 to FY24, fueled by robust demand across key sectors. Consumption increased from 45.1 MT in FY20 to 56.6 MT in FY24, reflecting a compound annual growth rate (CAGR) of 5.8%. This growth was primarily driven by the HR coil/strip segment, which grew at a CAGR of 6.1%, compared to a slower 3.6% CAGR for PM plates.

The decline in consumption during FY21 (40.9 MT) was due to the COVID-19 pandemic, which disrupted industrial activity and demand across construction, automotive, and manufacturing sectors. However, recovery began in FY22 (43.5 MT) as economic activity resumed, supported by government infrastructure investments and rising demand in automotive and capital goods industries.

HR coil/strip consumption consistently outpaced PM plates due to its widespread application in automotive manufacturing, construction, and general engineering. By FY24, HR coil/strip accounted for 51.3 MT of total consumption, while PM plates contributed 5.4 MT. The non-alloy flat consumption is expected to grow at a CAGR of 9-11% between fiscal 2024 and fiscal 2030.

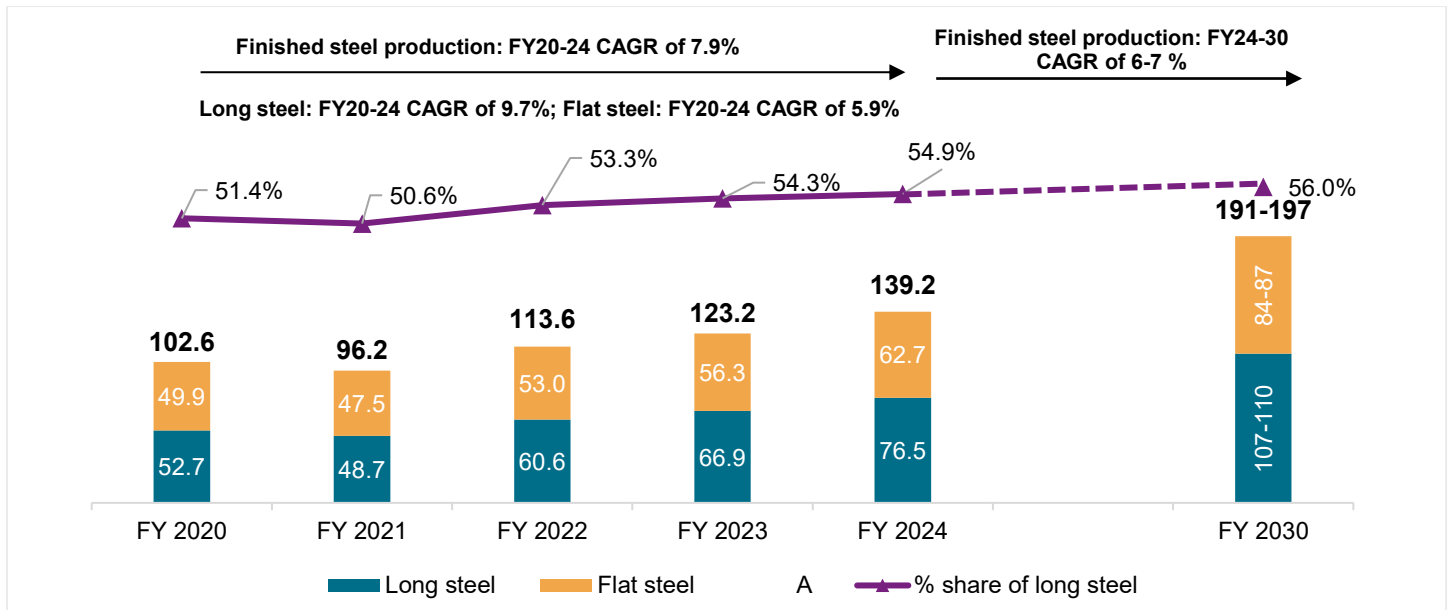
India's finished steel production trend

By product

Long products: Finished long steel products are typically produced by hot rolling/forging of bloom/billets/ingots into useable shape/sizes. These are normally supplied in straight length/cut length, except wire rods, which are supplied in wound coils. The types of long products include bar and rods (thermo-mechanically treated (TMT) bars, wire rods, round bars, etc), structural steel (angles, channels, beams, fabricated sections, girders, etc), and railway materials.

Flat products: Flat products are produced from slabs/thin slabs in rolling mills using flat rolls, and comprise hot rolled (HR) and cold rolled (CR) coils, coated products, etc. HR flat products are produced by re-rolling slabs/thin slabs at high temperature (above 1,000°C) in plate mills or in hot strip mills. CR coils/strips are produced by cold rolling HR coils/strips in cold rolling mills (normally at room temperature). CR coils/strips/sheets are characterised by lower thickness, better/bright finish and specific mechanical/metallurgical properties.

Finished steel production (MT)



Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)

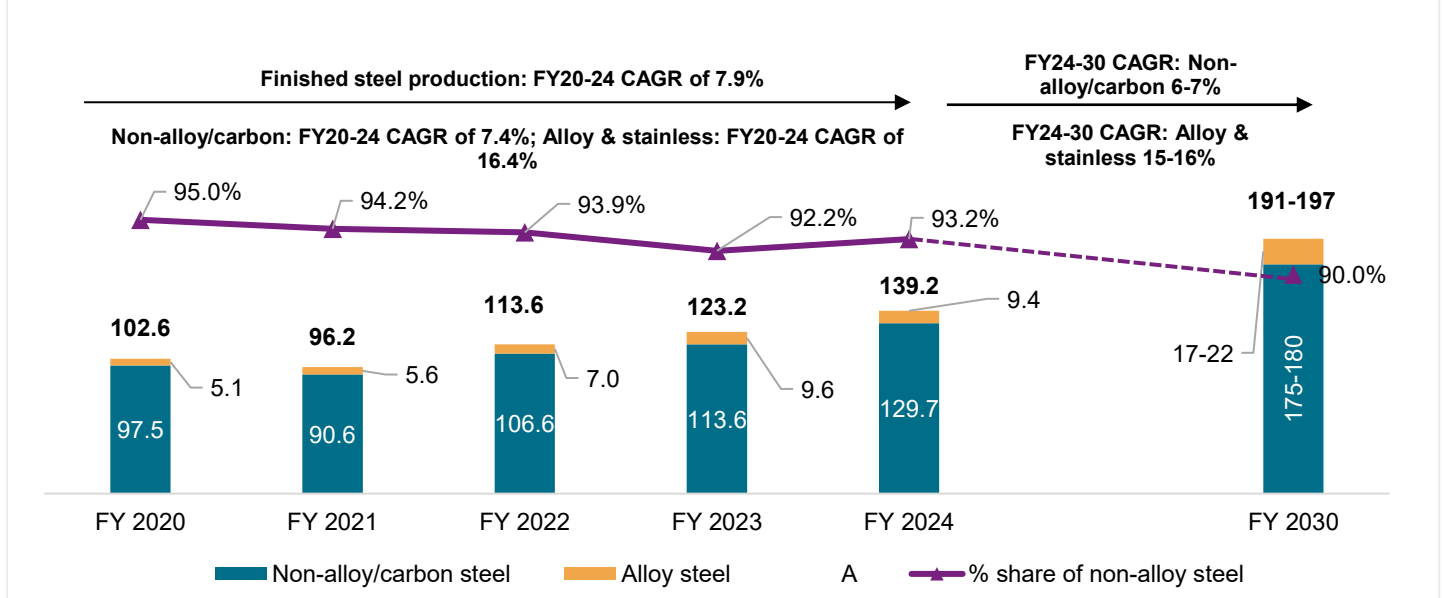
India's finished steel production saw robust growth from FY20 to FY24 — from 102.6 MT to 139.2 MT — driven by a higher growth rate in the production of long steel production than flat steel. Long steel output increased from 52.7 MT to 76.5 MT, a CAGR of 9.7%. Output of flat steel grew from 49.9 MT to 62.7 MT, a CAGR of 5.9%. The share of long steel in overall steel production rose from 51.4% in FY20 to 54.9% in FY24, likely due to demand from the infrastructure and construction sectors.

By composition

Alloy steel: Steel that is produced with one or more elements in specified proportions to impart specific physical, mechanical, metallurgical and electrical properties is called alloy steel. Stainless steel is a type of alloy steel. Alloy/stainless steel is manufactured in different grades, with varying proportions of carbon and other elements. Common elements used to make alloys are manganese, silicon, nickel, lead, copper, chromium, tungsten, molybdenum, niobium and vanadium. Alloy/stainless steel is used in forgings, tools and dies, bearings, fasteners, etc, which are subsequently used by end-use sectors such as automobiles, power, oil and gas, industrial machines, railways/mass rapid transport systems and defence to manufacture products such as crankshafts, connecting rods, cam shafts, bearings, fasteners, railway carriage wheels, bomb shells, cutting tools, surgical instruments and utensils, among others.

Non-alloy steel: Non-alloy or carbon steel comprises iron and carbon. It has a 93-95% share in India's finished steel production in the past five years). The main components of this steel are carbon, manganese and silicon in proportions of up to 1.70%, 0.90% and 0.30%, respectively. A change in the composition of carbon affects the properties of carbon steel. Steel, by definition, does not contain any alloying element. Non-alloy steel is used in construction, infrastructure, automobiles, consumer durables and other sectors. Popular applications include buildings, bridges, rails, pipelines, body panels for cars, refrigerators and washing machines.

Non-alloy vs alloy steel production (MT)



Source: CRISIL MI&A Consulting, industry, Joint Plant Committee (JPC)

Note: Alloy steel production volume considers stainless steel as well.

India's finished steel production between FY20 and FY24 highlights the dominance of non-alloy/carbon steel, which consistently accounted for over 92% of the total production. Non-alloy steel production increased from 97.5 MT in FY20 to 129.7 MT in FY24, a CAGR of approximately 7.4%. Alloy steel, including stainless steel, clocked a faster CAGR of 16.5%, rising from 5.1 MT in FY20 to 9.4 MT in FY24, though its share remained relatively small at 6-8%. Total finished steel production expanded from 102.6 MT in FY20 to 139.1 MT in FY24, driven primarily by the growth in non-alloy steel.

Non-alloy steel products

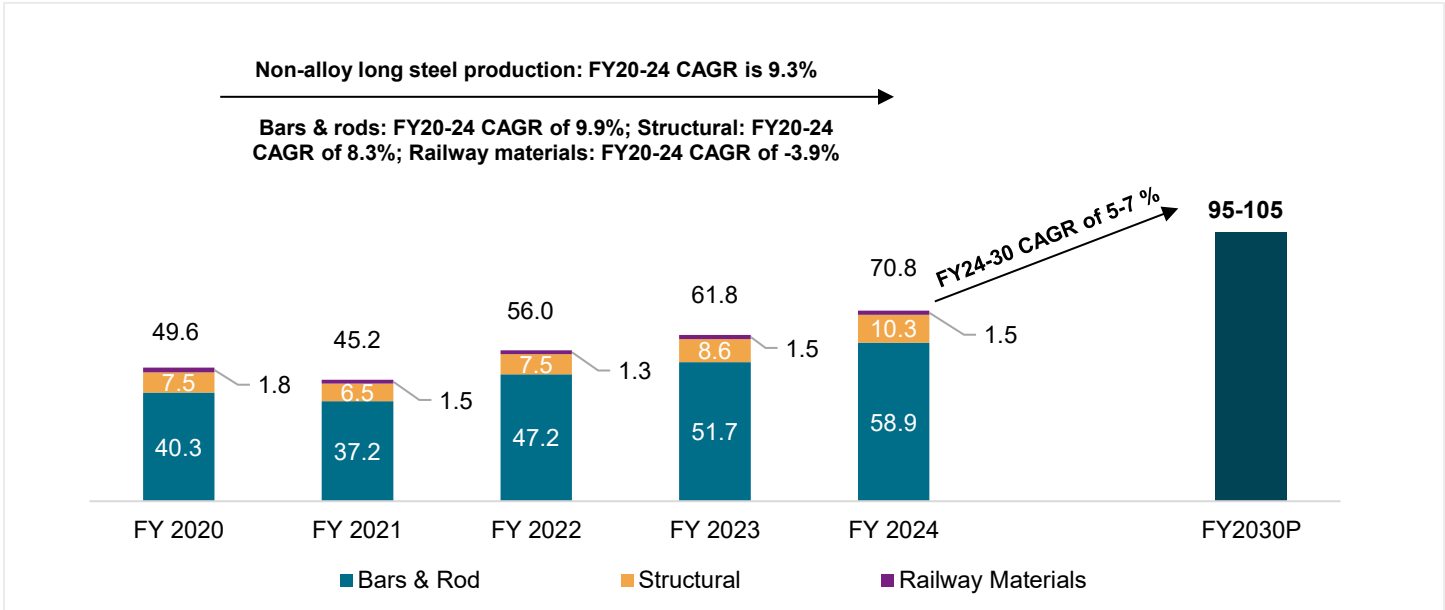
Bars and rods: Bars and rods are long, hot-rolled steel products that come in various shapes, including round, square, and rectangular. They are typically used in construction for reinforcement purposes, such as in concrete structures, and are also processed further into other products. They are known for their strength, ductility and weldability.

Seamless pipes: Seamless pipes are manufactured without welded joints, and this gives them superior strength and reliability. They are produced through processes such as piercing and elongation of solid steel billets. Seamless pipes are particularly valued in high-pressure applications, making them essential for industries such as oil and gas, automotive and construction. Their ability to withstand extreme conditions without compromising integrity makes them a preferred choice for many engineering applications.

Structural steel products: Structural steel products are essential components in the construction and infrastructure sectors, providing the framework for buildings, bridges and other structures. These products include beams, columns, angles, channels and plates. They are designed to bear loads and provide stability. Structural steel is known for its high strength-to-weight ratio, making it an ideal choice for large-scale construction projects. The versatility of structural steel allows it to be used in various forms, including rolled sections and fabricated shapes.

Railway materials: Railway materials encompass a range of products specifically designed for the construction and maintenance of railway infrastructure. This category includes rails, sleepers, fish plates, and other components that ensure safe and efficient train operations. Rails are typically made from high-strength steel to withstand heavy loads and dynamic forces from trains.

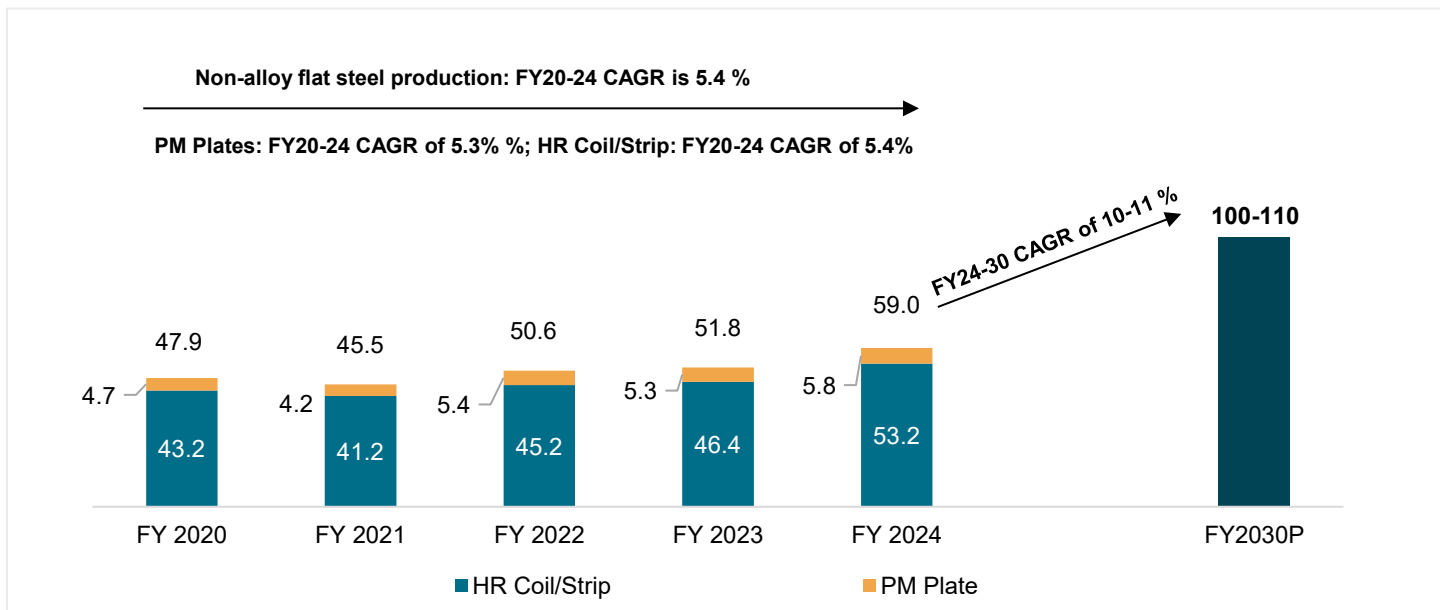
Non-alloy long steel production (MT)



Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)
Note: Bars & rods production volume considers seamless pipes as well

India’s non-alloy long steel production data from FY20 to FY24 highlights the dominance of bars and rods, which consistently accounted for over 81% of non-alloy production. Bars and rods production grew from 40.3 MT in FY20 to 58.9 MT in FY24, achieving a CAGR of 9.9%. The share of bars and rods in non-alloy production remained stable, reflecting its critical role in construction and infrastructure sectors. Structural steel, the second-largest segment, saw a modest increase in production from 7.5 MT to 10.3 MT, with its share fluctuating slightly between 13.4% and 15.1%. Railway materials maintained a small yet consistent contribution of 2-3%, with production remaining steady at approximately 1.5 MT annually.

Non-alloy flat steel production (MT)



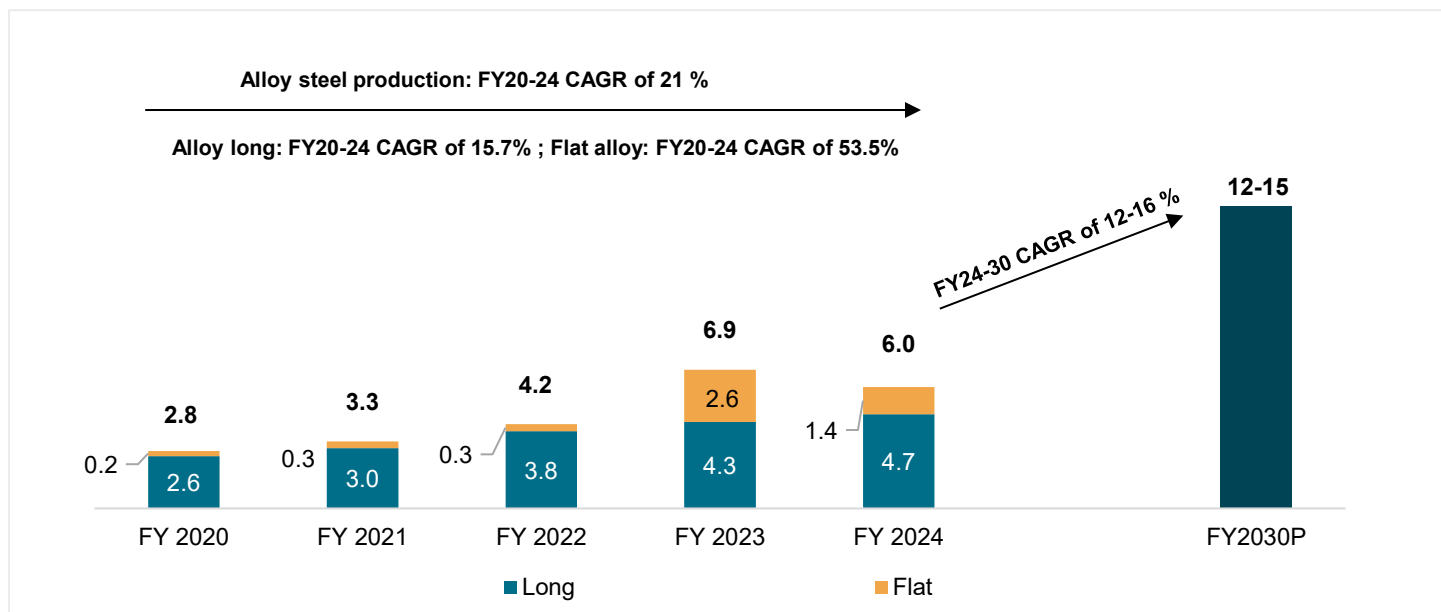
Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)

India's non-alloy flat steel production exhibited a steady growth trend between FY2020 and FY2024, with a Compound Annual Growth Rate (CAGR) of 5.4%. Starting at 47.9 million tonnes (MT) in FY2020, production dipped slightly to 45.5 MT in FY2021, due to disruptions caused by the COVID-19 pandemic. However, the sector rebounded in subsequent years, reaching 50.6 MT in FY2022 and 51.8 MT in FY2023, before achieving a significant peak of 59.0 MT in FY2024. This recovery highlights the resilience of India's steel industry, driven by rising domestic demand and infrastructure development.

Production is primarily dominated by Hot Rolled (HR) Coil/Strip, which consistently accounted for over 90% of total output across the years, growing at a CAGR of 5.4%. PM Plates, while contributing a smaller share, also grew at a healthy CAGR of 5.3%, reflecting balanced growth across segments. The sharp rise in FY2024, with HR Coil/Strip reaching 53.2 MT and PM Plates hitting 5.8 MT, underscores strong demand recovery.

Looking ahead, the sector is projected to grow at an accelerated CAGR of 10-12% from FY2024 to FY2030, fueled by government initiatives in infrastructure and manufacturing, positioning India as a key player in global steel production.

Alloy steel production (MT)



Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)

India's alloy steel production witnessed robust growth from FY2020 to FY2024, with a Compound Annual Growth Rate (CAGR) of 21%. Total production increased from 2.8 million tonnes (MT) in FY2020 to 6.0 MT in FY2024, driven by strong demand across both long and flat alloy steel segments. The long alloy steel segment grew at a CAGR of 15.7%, rising from 2.6 MT in FY2020 to 4.7 MT in FY2024, supported by increased construction activities and infrastructure projects. Meanwhile, the flat alloy steel segment saw remarkable growth at a CAGR of 53.5%, albeit from a smaller base, increasing from 0.2 MT in FY2020 to 1.4 MT in FY2024, reflecting its growing adoption in automotive and manufacturing sectors.

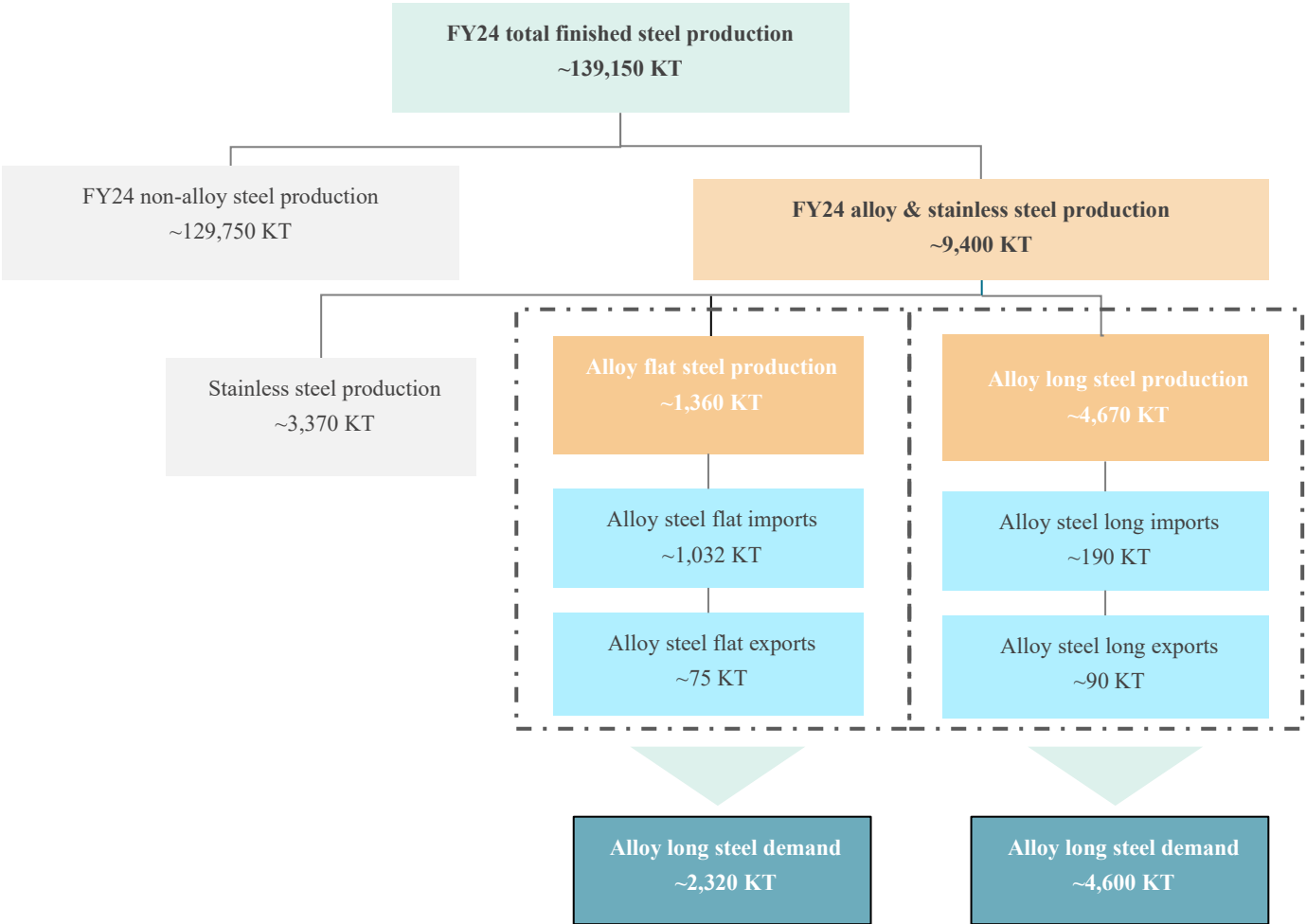
The sharp rise in production can be attributed to government initiatives like "Make in India" and the National Infrastructure Pipeline (NIP), which boosted the demand for alloy steel in critical sectors such as construction, railways, and automotive manufacturing. Additionally, the push for electric vehicles (EVs) and renewable energy projects has driven demand for high-strength flat alloy steel products. Looking ahead, the sector is projected to grow at a CAGR of 12-16% through FY2030, underpinned by sustained industrial growth, urbanization, and export opportunities for value-added steel products.

Overview of the alloy steel industry

Overview

Alloy steel long products, encompassing a diverse range of structural shapes, bars, rods, and wires, play a vital role in the Indian steel industry, with the incorporation of alloying elements such as chromium, nickel, molybdenum, and vanadium enhancing their mechanical properties and rendering them ideal for various applications. They are widely used in various industries, including construction, automotive, energy, defence and manufacturing, where their superior performance, wear resistance, and ability to maintain properties at high temperatures are valued.

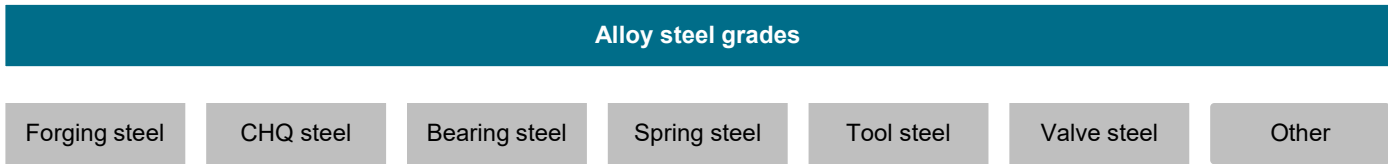
In addition to long products, alloy steel flat products, such as plates, sheets, and coils, also play a significant role in the industry. These flat products are used in applications where high strength, corrosion resistance, and formability are essential, such as in the manufacture of automotive components, industrial equipment, and construction materials.



Source: CRISIL Intelligence, industry, Joint Plant Committee (JPC)

Note: some of the alloy long production is considered as stock

Alloy steel grades



Source: CRISIL Intelligence, industry
Other includes free cutting grade steel etc

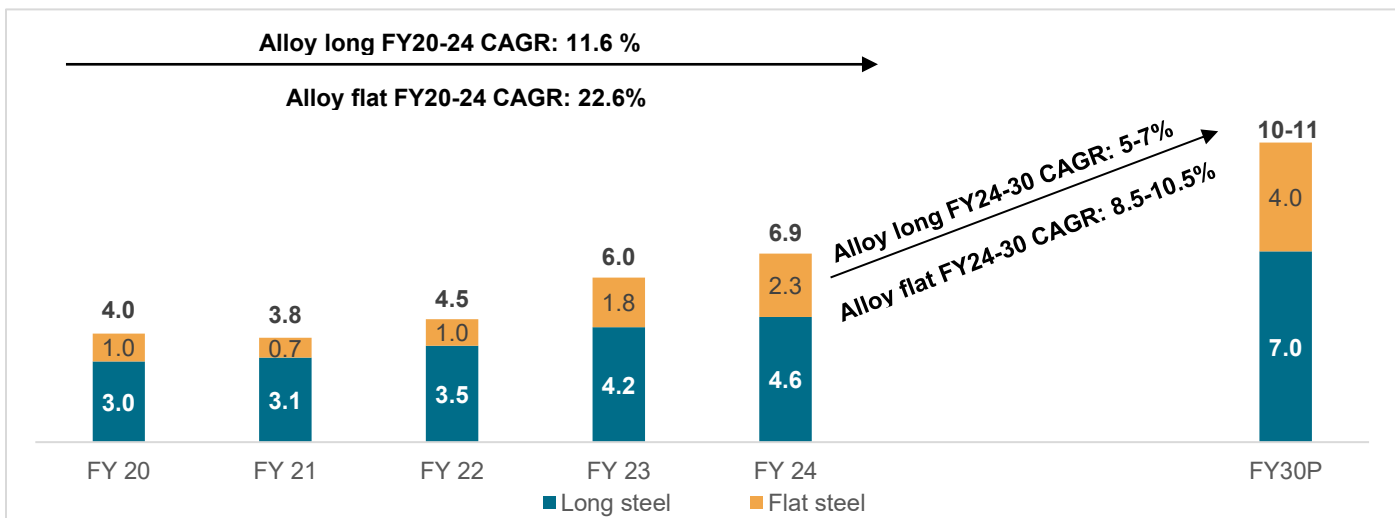
Manufacturing Overview



Source: CRISIL Intelligence Consulting, industry

The production of alloy steel involves a multi-step process that commences with the meticulous selection and preparation of high-quality raw materials, including iron ore, scrap steel, and alloying elements. The raw materials are then melted in an Electric Arc Furnace (EAF) or Basic Oxygen Furnace (BOF) to produce molten steel, which is subsequently transferred to a Ladle Refining Furnace (LRF) for alloying. The molten steel undergoes vacuum degassing to remove dissolved gases, followed by continuous casting into semi-finished forms, such as blooms, billets, or slabs. The cast blooms or billets are then subjected to rolling or hot forging processes to achieve the desired shapes and dimensions, enhancing the mechanical properties of the alloy steel. The steel is then heat-treated through processes like annealing, quenching, or normalizing to optimize its performance for specific applications. Finally, the processed steel undergoes machining or grinding operations to achieve precise dimensions and surface finishes, resulting in a high-quality alloy steel product with improved mechanical properties, suitable for a wide range of applications. This rigorous process ensures the production of high-quality alloy steel with precise control over chemical composition and properties.

Alloy steel consumption (million tonnes)



Source: CRISIL Intelligence Consulting, industry, Joint Plant Committee (JPC)

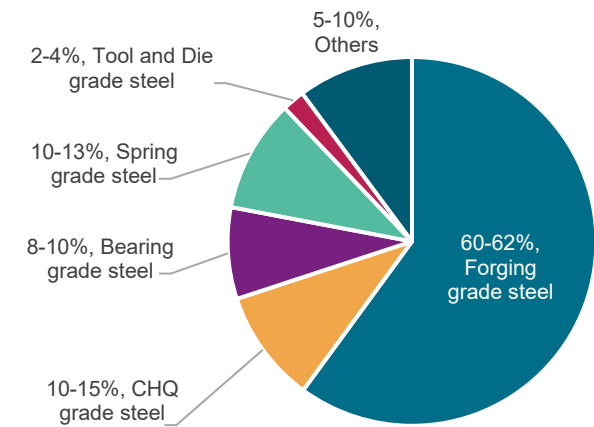
India's alloy steel consumption has shown consistent growth, driven by demand from sectors such as automotive, construction, and manufacturing. Between FY20 and FY24, alloy long steel consumption grew at a compound annual

growth rate (CAGR) of 11.6%, rising from 3.0 million tonnes in FY20 to 4.6 million tonnes in FY24. Alloy flat steel consumption exhibited even stronger growth, with a CAGR of 22.6%, increasing from 1.0 million tonnes in FY20 to 2.3 million tonnes in FY24. This growth reflects the increasing preference for high-performance materials that offer superior strength, durability, and corrosion resistance.

Looking forward to FY30, India's alloy steel market is poised for significant growth, with alloy long steel consumption projected to increase at a CAGR of 5-7% and alloy flat steel expected to grow at a higher CAGR of 8.5-10.5%. This anticipated expansion is driven by a combination of factors, including India's robust infrastructure development, rising vehicle production, and the adoption of advanced manufacturing technologies.

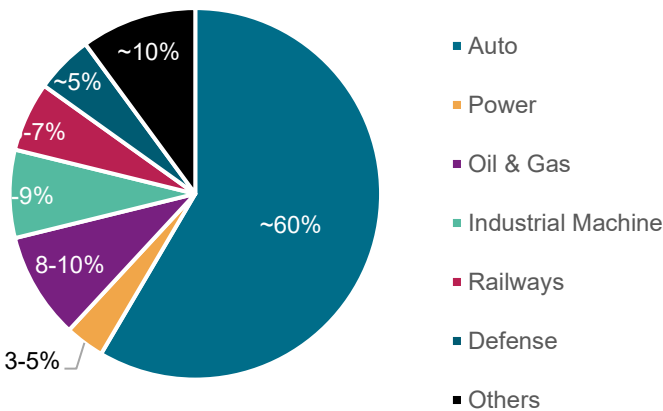
Demand segmentation (FY24)

By grade



Source: CRISIL Intelligence, industry
Other: valve steel, free cutting steel etc

By end-industry



Source: CRISIL Intelligence, industry

Application across key end-use industries

Alloy steel long products are integral to various industries due to their enhanced mechanical properties, such as strength, toughness, and resistance to wear and corrosion. Below is a detailed mapping of their applications across key sectors: infrastructure, automotive, defense, engineering, and railway.

Industry	Application	Steel grades	Popular grades
Automotive	Alloy steels are used in crankshafts, pistons, and turbochargers for their high tensile strength and heat resistance. Components such as frames and suspension benefit from the lightweight yet strong nature of alloy steel. Gears and shafts made from alloy steel ensure durability under high stress.	Forging steel, spring steel, bearing steel, CHQ steel, tool steel	4340, 55Si7, 60Si7, AISI 52100, SAE 1008, SAE 1010, D2
Power	Alloy steel is used in the manufacture of turbine blades, shafts, and other components due to its high strength, toughness, and resistance to fatigue. Also is used in the manufacture of boiler and piping systems due to its high temperature resistance and corrosion resistance.	Spring steel, CHQ steel, valve steel	4130, 4140, F11, F22, F9, SAE 8620

Industry	Application	Steel grades	Popular grades
Oil & Gas	Alloy steel is used in the manufacture of drilling and completion equipment such as drill pipes, tubing, and casing due to its high strength, toughness, and resistance to corrosion. Also is used in the manufacture of valves, fittings and pipings due to its high strength, toughness, and resistance to corrosion.	Tool steel, spring steel, valve steel	4130, 4140, F22, D2
Industrial	Gears, shafts, and heavy machinery, bearings in industrial machinery. Tool steel is critical in manufacturing cutting tools, dies, and moulds due to its hardness and durability. Springs in industrial machinery (clutch springs, vibration dampers)	Forging steel, bearing steel, spring steel, tool steel	4140, AISI 52100 55Si7 H13
Railway	Suspension springs for railcars, bearings in wheelsets, helical springs for shock absorption	Spring steel, bearing steel	SiCr Steels, AISI 52100 SiMn Steels
Defence	Alloy steels are used to manufacture firearms and ammunition due to their toughness and ability to withstand high pressure. Chassis and armour components made from alloy steel provide protection while maintaining mobility. Used in aircraft components such as landing gear for their strength-to-weight ratio. High-pressure valves, bearings for aerospace applications.	Spring steel, valve steel, bearing steel, CHQ steel	SiCr Steels, SAE 8620, SAE 8640 M50, SAE 1010
Infrastructure	Structural components such as beams, columns, reinforcement bars; valves for water and gas pipelines, springs in suspension bridge cables, pre-stressed concrete, bearings in movable bridges and signaling systems, fasteners for construction rail tracks and tunnel reinforcements	Forging steel, tool steel, spring steel, bearing steel, CHQ steel	4140, H13, 55Si7, 60Si7, AISI 52100, SAE 1008, SAE 1010
Tractor	Alloy steel is a critical component in the manufacture of tractors, where it is utilized in a variety of key applications, including: gears, shafts, axles, valve bodies and drive shafts. Its high strength, durability, and resistance to wear and tear make it an ideal material for these components, enabling tractors to withstand the rigors of heavy use and harsh operating conditions.	Forging steel, spring steel, CHQ steel,	4140, 4340, SAE 20MnCr5

Source: CRISIL Intelligence Consulting, industry

Key growth drivers for alloy steel:

Government Initiatives: Alloy steel is extensively used in infrastructure projects due to its enhanced strength, corrosion resistance, and durability. With India's focus on large-scale infrastructure development, including highways, railways, metro systems, and urban housing under initiatives like PM Gati Shakti and Smart Cities Mission, the demand for alloy steel has surged. The material is particularly critical for bridges, high-rise buildings, and industrial structures where superior

performance is required. These projects demand higher-quality materials than non-alloy steel can provide, boosting alloy steel consumption.

Construction Sector: The construction industry in India is a significant consumer of alloy steel, driven by its need for high-strength, durable materials. With the sector expected to grow 6-8% annually between FY26 and FY30, alloy steel demand is poised to increase, driven by infrastructure projects such as roads, railways, and urban development, which require superior performance and durability.

Urbanization: Rapid urbanization and real estate development require durable materials for high-rise buildings and industrial structures, where alloy steel is preferred for its strength and corrosion resistance. The increase in urbanisation over the past decade is driving demand for all end-use segments. It is expected ~40% of the population will be based out India's towns and cities by 2036, which is up from 30% in 2011, contributing to 70% of the GDP. This trend of a growing population with an average age of 29 years will drive the demand for alloy steel across all industries.

Oil & Gas Industry: The oil and gas sector in India is a significant consumer of alloy steel, driven by its requirement for high-quality, heat- and corrosion-resistant materials. With a robust 6-10% CAGR in natural gas demand projected between fiscal 2026 and 2030, and a 2-4% CAGR in crude oil demand up to 2028, the demand for alloy steel is poised to increase, driven by the expansion of the oil and gas pipeline network, which necessitates the use of durable and reliable materials that can withstand harsh conditions. The growth in pipeline infrastructure, with over 10,805 Kms of natural gas pipeline under development, will particularly drive the demand for alloy steel, which offers unique properties such as corrosion resistance and high-temperature strength, making it an essential material for pipeline construction. The length of operational Natural Gas Pipeline in the country has increased from 15,340 Km in 2014 to 24,945 Kms as on 30.09.2024.

Power Sector: The power sector in India is a significant consumer of alloy steel, driven by its requirement for high-quality, durable, and corrosion-resistant materials. With power demand projected to grow at a CAGR of 5-7% between fiscal 2025 and 2030, and a shift towards renewable energy sources, the demand for alloy steel is poised to increase, driven by the need for specialty steels in the construction of wind turbines, solar panels, and other renewable energy infrastructure. The growth in conventional capacity additions, as well as investments in clean-energy supply, will particularly drive the demand for alloy steel, which offers unique properties such as high strength, toughness, and resistance to corrosion, making it an essential material for power generation.

Defence Sector: Investments India's increasing defense spending is driving the consumption high-grade alloy steel in the production of weapons systems and armored vehicles. India's defence sector achieved significant milestones in fiscal 2024, showcasing robust growth and global recognition. Defence exports reached a record high of ₹23,622 crore, marking a 12.04% increase from the previous year, driven by contributions from Defence Public Sector Undertakings (DPSUs) and private entities. Indigenous production also saw substantial progress, with defence manufacturing valued at ₹1.26 lakh crore, a 16.7% rise over FY 2023-24. Key advancements included testing hypersonic missiles, inducting Light Combat Aircraft Tejas Mk1A, and expanding export markets to 80 countries. Strategic reforms like simplified licensing processes and increased foreign direct investment (FDI) limits bolstered domestic capabilities. Looking ahead, India aims to achieve ₹50,000 crore in defence exports by 2029 and grow production to ₹3 lakh crore by FY29.

Tractors: In FY26, India's tractor production is anticipated to experience a 5-7% year-on-year growth, contingent upon a normal monsoon season and stable agricultural conditions. This upward trend is expected to be driven by an increase in farmers' disposable income, bolstered by a robust rabi harvest, higher Minimum Support Prices (MSPs), and an anticipated rise in government crop procurement. Furthermore, favorable rural liquidity, facilitated by timely payments to farmers and improved credit availability, is likely to support tractor production. The growth in tractor production is poised to drive demand for alloy steel, a critical component in tractor manufacturing. A range of alloy steel grades are utilized in

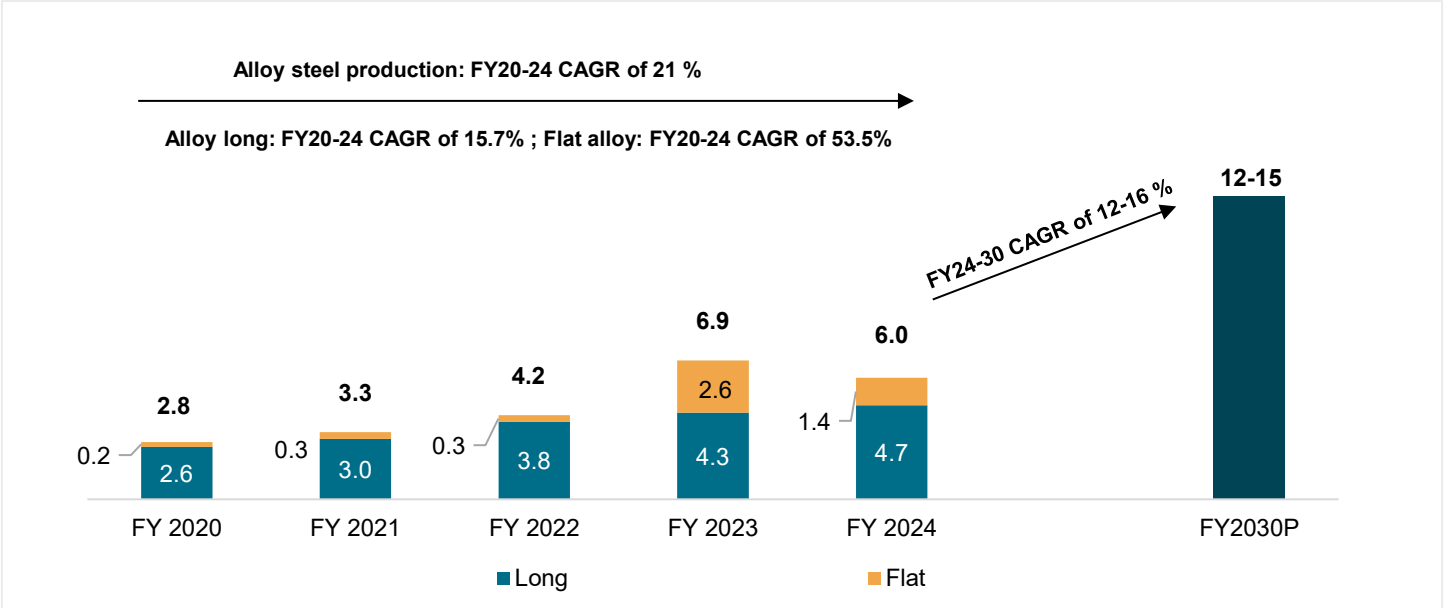
tractor production, These specialized alloy steel grades offer a unique combination of strength, toughness, and resistance to wear and tear, fatigue, and corrosion, making them essential for the manufacture of high-performance tractors.

Export Opportunities The growing global demand for Indian-made industrial goods has created new opportunities for the production of high-quality alloy steels. As Indian manufacturers expand their export capabilities, they are increasingly seeking to produce high-grade alloy steels that can meet the stringent quality standards of international markets. The use of alloy steel in export-oriented industries, such as automotive and engineering, enables Indian manufacturers to produce high-quality products that can compete with global players.

Sustainability Focus The shift towards sustainable construction practices is driving the use of advanced materials like alloy steel, which offers longer life cycles and reduced maintenance costs. Alloy steel's unique properties, such as its high strength and resistance to corrosion, enable the construction of durable and long-lasting buildings and infrastructure, which can reduce the need for frequent repairs and replacements. As India focuses on sustainable development and reducing its environmental footprint, the demand for alloy steel is expected to rise, driven by the need for materials that can support sustainable construction practices. The use of alloy steel in sustainable construction can help reduce waste, conserve resources, and minimize the environmental impact of building and infrastructure projects.

India’s alloy steel supply overview

Alloy steel production (million tonnes)



Source: Crisil Intelligence, industry, Joint Plant Committee (JPC)

India’s alloy steel production witnessed robust growth from FY2020 to FY2024, with a Compound Annual Growth Rate (CAGR) of 21%. Total production increased from 2.8 million tonnes (MT) in FY2020 to 6.0 MT in FY2024, driven by strong demand across both long and flat alloy steel segments. The long alloy steel segment grew at a CAGR of 15.7%, rising from 2.6 MT in FY2020 to 4.7 MT in FY2024, supported by increased construction activities and infrastructure projects. Meanwhile, the flat alloy steel segment saw remarkable growth at a CAGR of 53.5%, albeit from a smaller base,

increasing from 0.2 MT in FY2020 to 1.4 MT in FY2024, reflecting its growing adoption in automotive and manufacturing sectors.

Volume growth in alloy steel: The Indian steel industry has exhibited a notable trend in recent years, characterized by alloy steel surpassing non-alloy steel products in terms of volume growth. Notably, alloy steel has achieved a remarkable compound annual growth rate (CAGR) of 20.6% from FY20 to FY24, with production expanding from 2.8 million tonnes (MT) to 6.0 MT. This substantial growth trajectory is primarily driven by the increasing adoption of alloy steel across diverse sectors, including automotive, construction, and consumer durables. Looking ahead, the demand for alloy steel is poised to rise further, fueled by its exceptional properties, such as high strength, corrosion resistance, and durability, which render it an indispensable material in key end-use industries. As the Indian economy continues to grow, driven by government initiatives and increasing consumer demand, the demand for alloy steel is expected to experience a significant uptick, driven by its versatility and critical applications in various sectors.

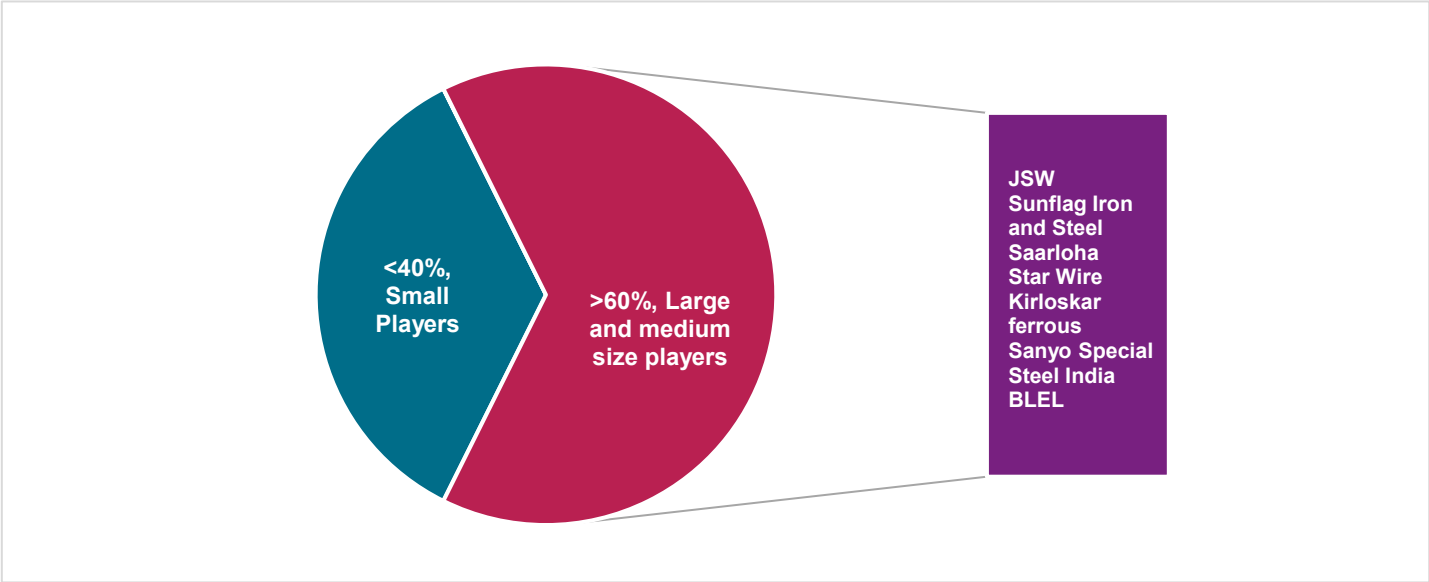
Key India alloy steel players

Company	Capacity FY24 (in MT)
JSW Limited	1.95
Jayasawal Neco	1.00*
Sunflag Iron & Steel	0.5
Saarloha	0.25
RL Steels	0.18
Sanyo Special Steel India	0.18
Behari Lal Engineering Limited	0.06

Source: CRISIL Intelligence, Industry, company website

The Indian alloy steel market is characterized by a dichotomy in market share, where large and mid-sized companies constitute a significant 60-65% and the remaining is held by smaller and unorganized players. These large and mid-sized companies benefit from economies of scale, advanced technology, and established distribution networks, enabling them to capture a substantial portion of the market. Smaller companies, along with unorganized players, often operate with limited resources and cater to niche markets or regional demands. This fragmented structure presents both challenges and opportunities, with smaller players needing to innovate and enhance their competitiveness to gain a larger market share.

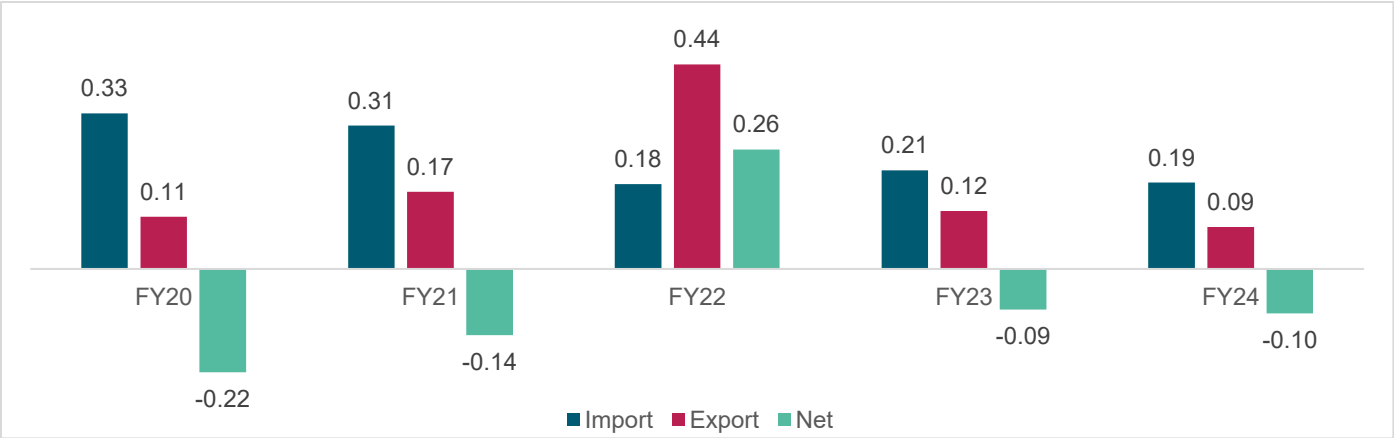
Overview on alloy steel players making tool & die and valve steel products



Source: CRISIL Intelligence, Industry

In India the market is dominated by large and medium-sized players, accounting for over 60% of the supply. Key suppliers include JSW, Sunflag Iron and Steel, Saarloha, Sanyo Special Steel India and Behari Lal Engineering Limited. They benefit from economies of scale, enabling them to offer a wide range of steel grades with consistent quality. Smaller players, accounting for less than 40% of the market, cater to niche segments or regional demands.

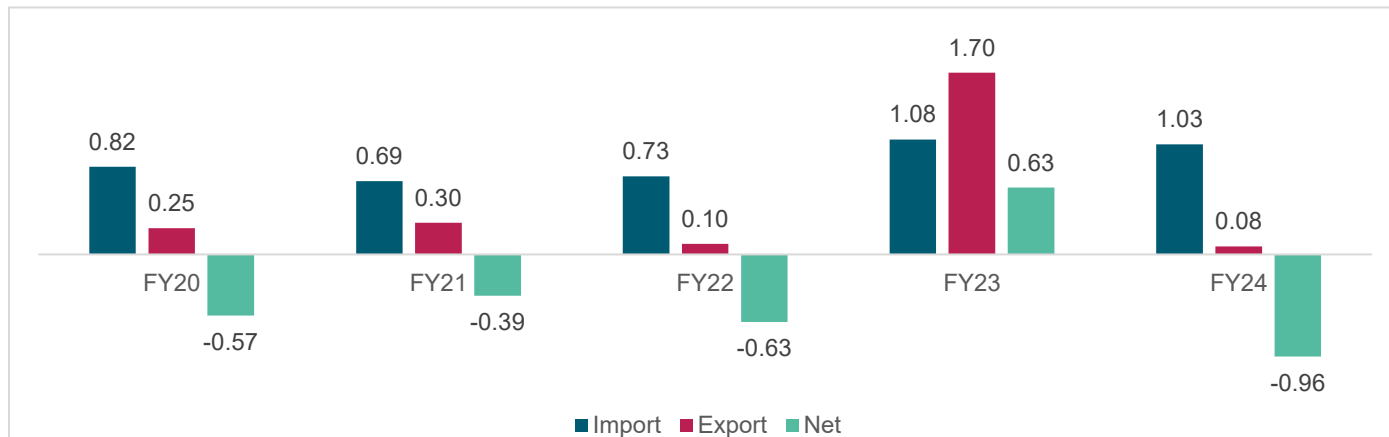
Alloy long steel trade (million tonnes)



Source: CRISIL Intelligence Consulting, industry, Joint Plant Committee (JPC)

The government's production-linked incentive (PLI) and Make in India schemes have contributed to a reduction in alloy steel long imports. These initiatives have boosted domestic production of special steel and carbon steel, enabling a decrease in imports from 0.33 million tonnes in Fiscal 2020 to 0.19 million tonnes in Fiscal 2024, as India focused on import substitution and being self-reliant. The net trade position, although predominantly negative, reached a positive value of 0.26 million tonnes in Fiscal 2022, driven by a surge in exports, which was due to the pent-up demand from the lingering effects of the pandemic. Some key importing countries include China, Japan, Italy, South Korea and Germany. While some destination for exports from India include Kenya, Thailand, UAE and Malaysia.

Alloy flat steel trade (million tonnes)



Source: CRISIL Intelligence Consulting, industry, Joint Plant Committee (JPC)

India's alloy flat steel trade has exhibited significant fluctuations over the past five years, with imports exceeding exports in most years. The net trade deficit was -0.57 and -0.39 in FY20 and FY21, respectively, indicating a reliance on foreign supplies. However, in FY22, the deficit widened to -0.63, despite a decline in imports, due to a sharp drop in exports. A remarkable shift occurred in FY23, as exports surged to 1.70, resulting in a net trade surplus of 0.63, driven by the recovery of industries such as automotive, construction, and manufacturing, which led to a surge in demand for alloy flat steel. The decline in exports in FY24 can be attributed to a slowdown in demand from these end-use sectors, as well as increased competition from other countries, such as China and South Korea, which have been aggressively expanding their steel production and export capacities. The Indian government's initiatives, such as the Production-Linked Incentive (PLI) scheme, aimed at boosting domestic manufacturing and exports, may have also played a role in the fluctuations, highlighting the complexities and challenges faced by the Indian steel industry in the global market.

Risk and Challenges

Economic Slowdowns: The alloy steel industry is heavily dependent on economic growth and industrial activity. Any slowdown in the global or domestic economy, caused by factors such as inflation, geopolitical tensions, or financial crises, can reduce demand. Infrastructure projects and industrial investments are often delayed during downturns, directly affecting alloy steel consumption.

Raw Material Price Volatility: Alloy steel production relies on critical raw materials like nickel, chromium, and manganese. Fluctuations in the prices of these inputs due to supply chain disruptions or geopolitical factors can increase production costs, making alloy steel less competitive compared to alternatives.

Environmental Regulation: India's increasing focus on reducing carbon emissions and adhering to global sustainability standards could impose stricter regulations on the steel industry. Alloy steel production is energy-intensive, and compliance with emission norms may increase costs for manufacturers.

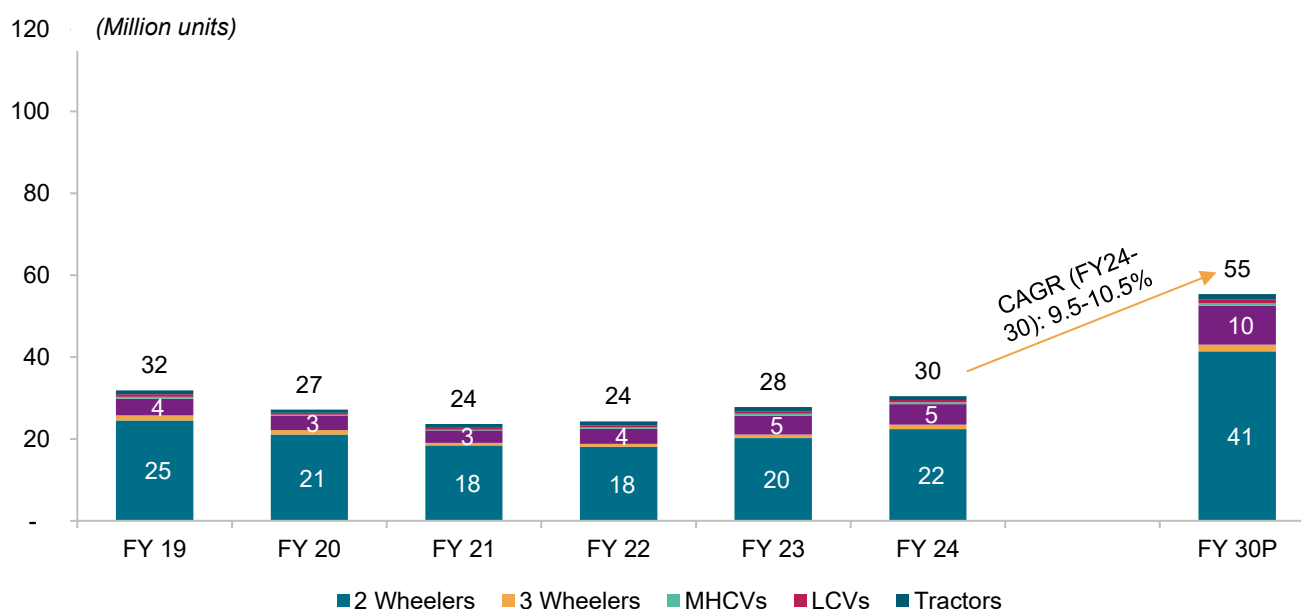
Industry-Specific Challenges

Automotive Sector: The transition to electric vehicles (EVs) requires specialized materials, but alloy steel faces competition from lighter alternatives like aluminum and magnesium alloys. Stringent emission norms may also increase costs for manufacturers, impacting material choices.

The Indian automobile industry is the world's fourth largest by production and valuation as per 2022 statistics. As of 2023, India is the 3rd largest automobile market in the world in terms of sales. The automobile sector resulted in 5.27% of the total FDI inflow as per the Jun 2024 DPIIT Report.

Although overall automobile production didn't grow much over fiscals 2019 to 2024, the production is expected to accelerate by 9.5-10.5% CAGR between fiscals 2024 and 2030. Growth will be spurred by small cars, compact utility vehicles (UVs) and two wheelers. Rise in middle class income and young population are expected to drive demand. Other factors include increased urbanisation, expanding working population and easy availability of finance. Automotive Mission Plan 2016-2026 and vehicle scrappage policy are some of the government initiatives that will support growth of the domestic auto industry.

Automobile production: Review and outlook



P: Projected

Source: Crisil Intelligence

Within the automobile sector, two-wheelers and PVs accounted for the majority share in stainless steel demand. Collectively, these two segments accounted for 85-90% of the total stainless steel consumption in the auto sector.

Application of stainless steel has expanded to various parts such as pump bodies, heat shields, wipers, airbag containers, belt springs, and hose clamps. Further, increased safety features are expected to raise stainless steel intensity per vehicle in the future.

Oil & Gas Industry: The shift toward renewable energy sources and declining investments in fossil fuel projects could reduce demand for alloy steel used in pipelines and refineries. Additionally, high corrosion-resistant grades required in this sector may face cost pressures.

Oil & gas and petrochemicals industry is estimated to account for ~45-50% of total stainless steel demand in process industries. The demand for stainless steel from this segment is directly correlated to the investment growth across these segments, which in turn is driven by demand for oil, gas and other petrochemicals across end-use industries.

In fiscal 2024, domestic petrochemical demand is estimated to have grown 8-10% on-year against a ~4% growth in the previous year. This was owing to growth and healthy demand by Polymers (PE, PP, PVC and PS) and Olefins (Ethylene, Propylene). Given the continued healthy demand growth as economy has rebounded to pre-Covid levels with healthy

growth in private consumption and infrastructure spending, demand is expected to be driven from packaging, auto, infrastructure, industrial products, and consumer durables sectors.

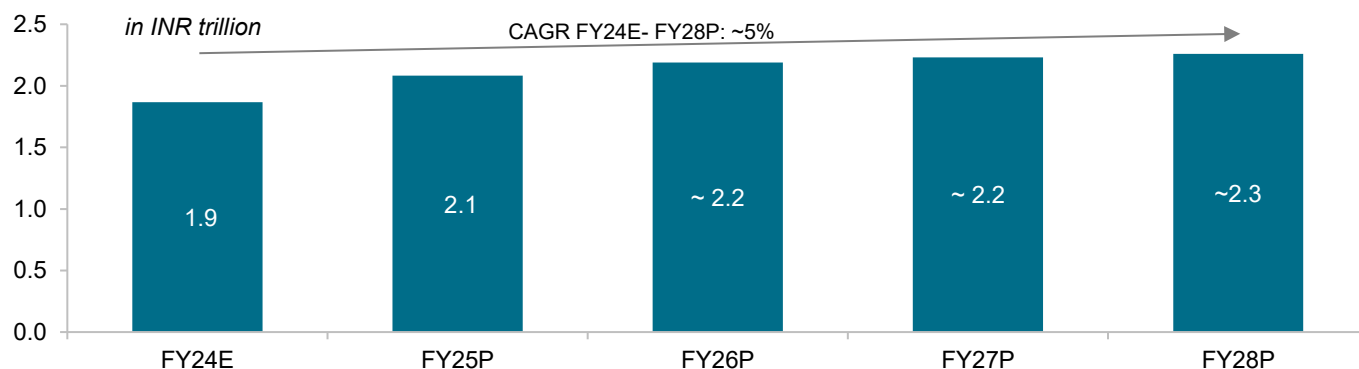
In fiscal 2025, petrochemicals demand is expected to grow by 8-10%, following healthy consumption from underlying sectors consumer durables, auto mobiles and housing over 9% growth in fiscal 2024.

Between fiscals 2024 and 2029, Crisil expects petrochemicals demand to clock a compound annual growth rate (CAGR) of 7-9%, as against ~4% CAGR over the past five years. This would be driven by end-use sectors, such as automobiles, infra, industrial, packaging, irrigation and construction as the consumption is expected to increase with growing population and rise in income levels.

In 2024, oil demand in India is expected to reach an all-time high of approximately 5.7-5.8 million barrels per day (mbpd), owing to healthy economic growth coupled with steady demand from the transportation segment, with improved automobile sales adding to consumption. The demand growth of 0.2 mbpd year-on-year is attributed to improving operating rates, which are returning to pre-COVID-19 levels for refineries, leading to growth in production.

In 2023, demand growth was favourable supported by healthy demand growth in the automobiles segment, resulting in higher consumption where Indian GDP was projected to increase by 6.7%. Improving mobility, coupled with improving production from the Industrial Fuels and Petrochemicals units, are expected to result in a healthy demand growth of 0.1-0.3 mbpd to 5.3-5.6 mbpd in 2023.

Oil and Gas sector investments



E: Estimated; P: Projected

Source: Crisil Intelligence

The demand will also be pushed by investments which are expected to increase at a good CAGR of ~5% between fiscals 2024-2028.

Overall, Crisil expects India's crude oil demand to increase moderately going forward. Domestic capacity addition of refineries would likely increase at a compound annual growth rate (CAGR) of ~5-7% from 2024-28, reaching ~340 million tonnes. Growth in crude oil demand is expected to slow down to 2-4% CAGR up to 2028, reaching 5.7-5.9 mbpd, considering the following factors:

- Gradual recovery in economy posts the pandemic
- Regulatory ban on polluting fuels such as fuel oil and pet coke
- Lower liquefied natural gas prices to accelerate switchover to industrial piped natural gas
- City gas distribution segment to eat away share in the transport and household segment
- Government push for electric vehicles (EVs), compressed natural gas (CNG), ethanol blending and cleaner fuel such as hydrogen

- Increase in naphtha-based petrochemicals capacities

Forging Industry

The forging industry is a cornerstone of modern manufacturing, shaping metal into high-strength components through compressive forces using hammers, presses, or dies. This process aligns the metal's grain structure, enhancing mechanical properties like tensile strength, fatigue resistance, and durability. Forgings are integral to sectors demanding reliability under stress, including automotive, industrial machinery, aerospace, power, defense, and construction. Forging is primarily done through two routes: open die and closed die.

Alloy steel grades are popular in the forging industry given their usage in a variety of applications. Alloy steels, enhanced with elements like chromium, nickel, molybdenum, and vanadium, are pivotal in forging due to their tailored properties:

- **Strength & Toughness:** Alloys like 4140 (chromium-molybdenum) and 4340 (nickel-chromium-molybdenum) are used in automotive crankshafts and aerospace landing gear.
- **Heat Resistance:** Grades such as AISI 8620 (nickel-chromium) are ideal for turbine blades and exhaust valves in high-temperature environments.
- **Wear Resistance:** Tool steels (e.g., H13) are employed in dies for shaping metals, ensuring longevity under repetitive stress.

Key Industries

- **Automotive:** Forgings are critical for high-load parts such as crankshafts, connecting rods, gears, and axles. Their superior strength-to-weight ratio ensures performance in engines, transmissions, and suspension systems.
- **Industrial Machinery:** Heavy-duty components like gears, shafts, and valves for oil and gas equipment, mining machinery, and power generation turbines rely on forgings for longevity under extreme conditions.
- **Aerospace & Defense:** Landing gear, turbine disks, and missile components are forged to meet stringent safety and performance standards.
- **Power:** Wind turbine shafts, drill bits, and nuclear reactor parts utilize forgings for their ability to withstand corrosion, high temperatures, and cyclic stresses.
- **Construction:** Cranes, bulldozers, and structural elements depend on forged parts for load-bearing capacity and resilience.

Tool & die steel

Overview

Tool steel is engineered for exceptional hardness, toughness and wear resistance. This grade of steel is categorised into several classes based on the properties:

- **High-speed steel (HSS):** This steel maintains its hardness at the elevated temperatures generated during cutting operations. It is commonly used in drill bits, milling cutters and saw blades.
- **Cold work tool steel:** This includes oil-hardening (O-grades), air-hardening (A-grades) and D-grades known for its abrasion resistance. Applications include punches, dies for metal forming, and cutting tools.
- **Hot work tool steel:** Designed for applications involving hot metal processing, this steel retains strength at high temperatures. Such materials are used in die-casting dies and hot forging tools.
- **Plastic mould steel:** Plastic mould alloy steel grades are specialized steels designed for plastic injection molding applications. They offer high hardness, wear resistance, and corrosion resistance, ensuring durability and precision in mold production

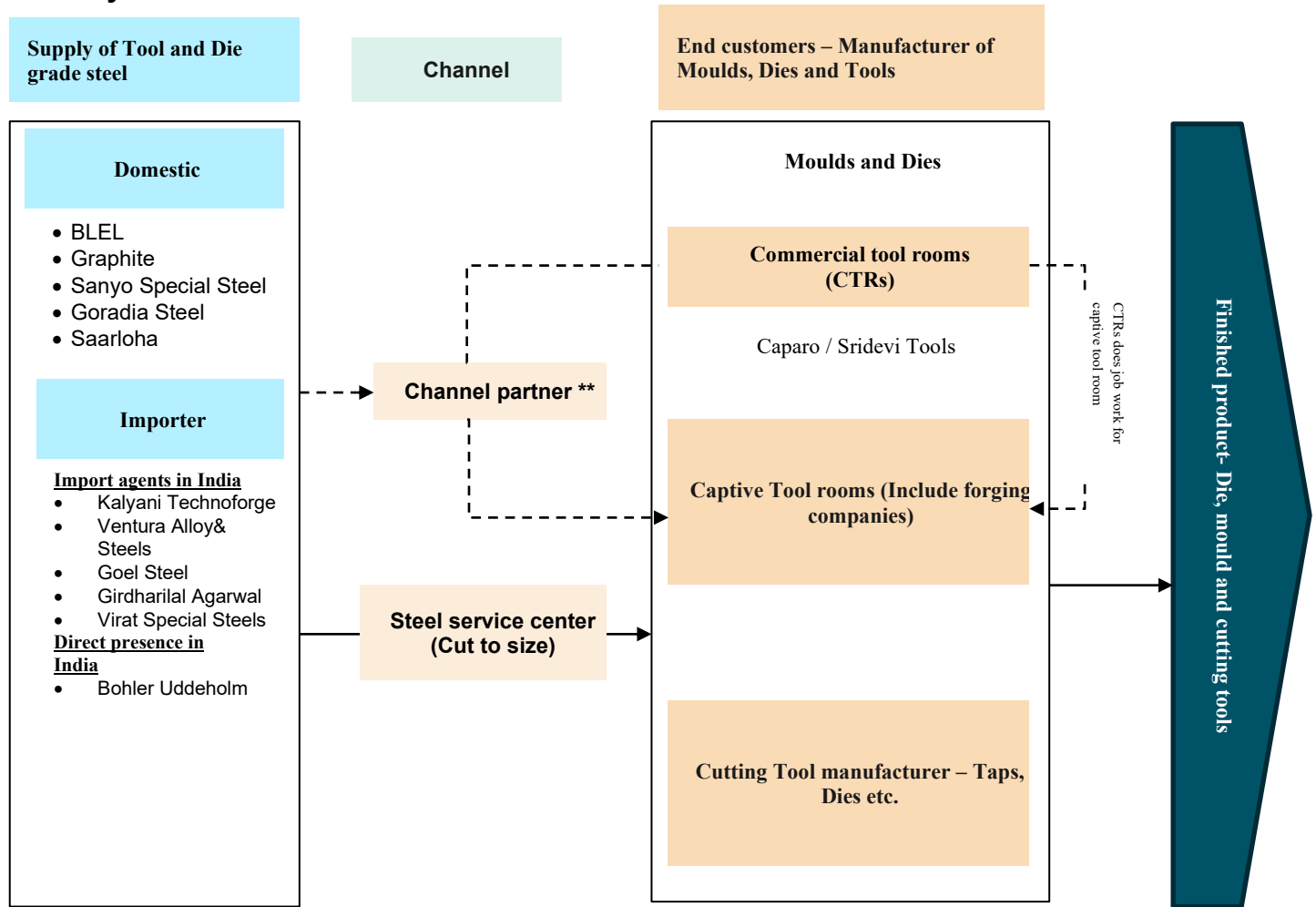
These specialised types of steel are extensively employed in the die and mold-making industry for various applications — including cutting tools, punches and dies — with specific grades such as D2 being preferred for cold-work applications due to its high wear resistance, and H13 being ideal for hot-work tools like extrusion dies and forging dies.

Application overview (by type of steel)

Type of steel	Properties and characteristics	Applications		Remarks
Plastic Mould Steel	- Wear resistance - Corrosion resistance - Mirror finish-ability - Surface work-ability	- Plastic mould industry - Mould frames - Mould parts - Preform dies		Plastic moulds are used for: Chairs, Telephones, Frames, Printers, Monitors, Key boards, Water tanks, Dashboard etc.
Cold work Steel	- Wear resistance of Dies - Resistance to chipping off - Resistance to cracking - Higher hardness & Strength - Higher toughness	- Sheet metal components - Shear blades - Cutting tools - Punching tools - Drawing tools	- Pressing tools - Stamping dies - Punches tools	These steels are used for manufacturing cutting tools which is used to cut , form , extrusion of CI and other non-ferrous metals (Primary application as cold processing)
Hot work Steel	- High mechanical strength - High polish ability - Ductility - High thermal conductivity - Good weld-ability	- Die inserts - Forming dies - Forging dies - Moulds for thermoplastic polymer injection with high polish-ability	- Tools for nuts, screws, bolts, rivets, fasteners etc. - Mandrels	These steel works with heat condition Recognized for great wear resistance, heat conductivity, hardness and roughness of increased temperature
High Speed Steel	- High working hardness - High wear resistance - Excellent toughness - High retention of hardness and red hardness - Fine robustness	- Machining tools - Broaching tools - Taps, twist drills, metal cutters - Metal saws, wood work tools etc.		These steels are fast cutting steels with high resistance, fine robustness, high compression strength, and fine wire resistance properties

Source: CRISIL Intelligence, industry

Industry Structure of tool & die steel



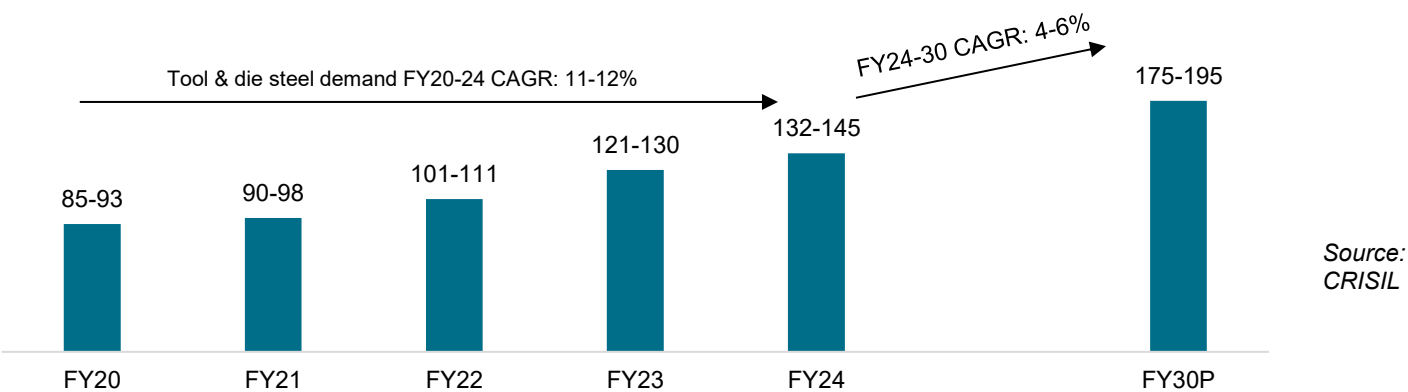
Source: CRISIL Intelligence, industry

** Channel partner:

- Typically, channel keep stock of imported tool steel
- Channel partners mainly supply small to medium commercial tool rooms

Demand Overview

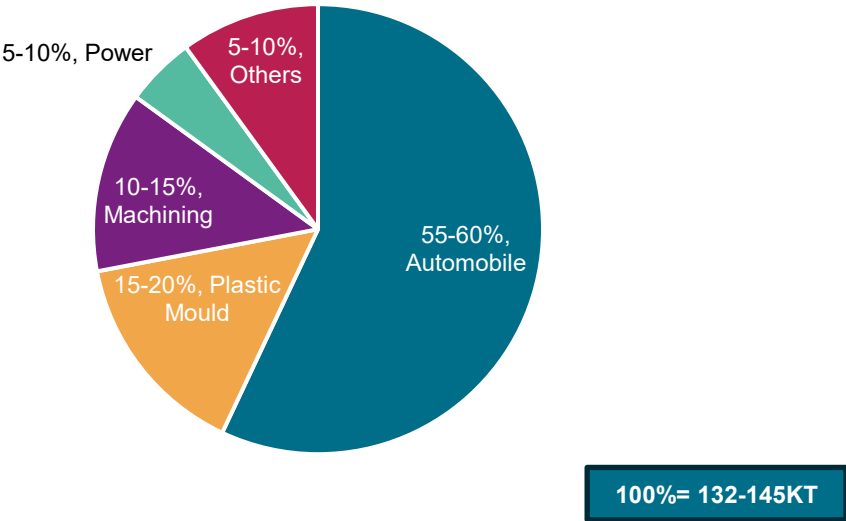
Tool & die steel domestic demand (in KT)



Intelligence, industry

The tool and die steel demand in India shows a consistent and robust upward trajectory from FY20 through FY24, reflecting significant growth in the manufacturing and industrial sectors. Starting from a demand range of 85-93 KT in FY20, the market has expanded substantially to reach 132-145 KT in FY24. This sustained growth pattern suggests increasing industrialization, particularly in sectors that heavily rely on tool steel, such as automotive manufacturing, machinery production, and infrastructure development. The demand for the tool and die steel industry has grown at a CAGR of 11-12% between fiscal 2020 and fiscal 2024. The tool and die steel demand is estimated to increase by a CAGR of 4-6% between fiscal 2020 and 2024, to around 175-195 KT in fiscal 2030.

By end-industry in FY24 (in % share)



Source: CRISIL Intelligence, industry

The automobile sector dominates the demand, accounting for 55–60% of the total. This highlights the critical role of tool and die steel in manufacturing automotive components, driven by India's growing automotive industry. The plastic mould segment follows with a 15–20% share, reflecting its use in consumer goods, packaging, and electronics manufacturing.

Machining applications contribute 10–15% to the demand, showcasing the reliance on tool steel for general engineering and industrial applications. The power sector holds a modest 5–10% share, indicating its niche but steady requirement for specialized tools. The remaining 5–10% is attributed to other industries, signifying diverse but smaller-scale uses.

End-use industry wise key application areas

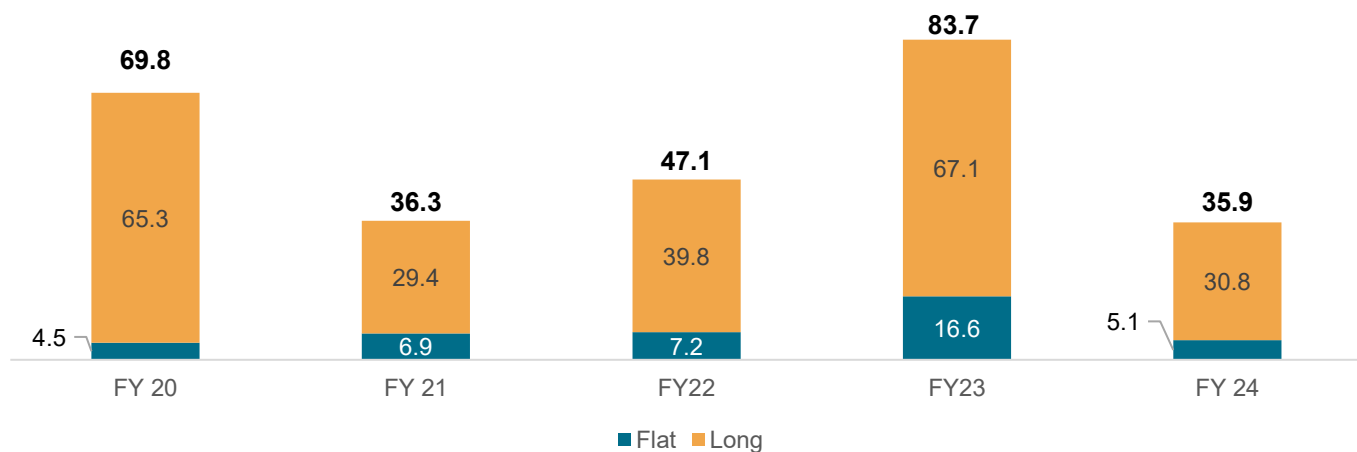
End-use industry	Applications
Automobile	Forging dies for crankshafts, gears, and connecting rods, stamping dies for body panels, Injection molds for plastic automotive components, Cutting tools for machining engine parts
Plastic moulds	Injection molds for consumer goods, compression molds for thermoset plastics, extrusion dies for plastic profiles
Machining	Cutting tools (drills, end mills, reamers), punches and dies for sheet metal forming, broaches and gear cutting tools
Power	Turbine blade forging dies, dies for electrical component manufacturing, cutting tools for machining power plant components

Source: CRISIL Intelligence, industry

Trade overview

Imports trend

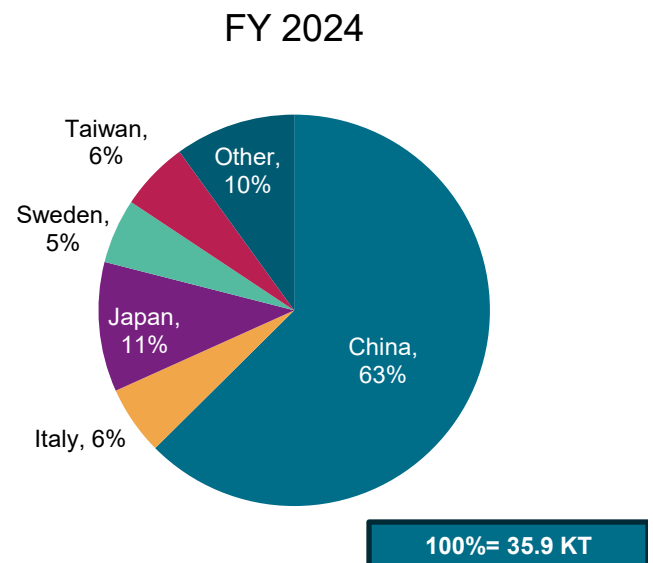
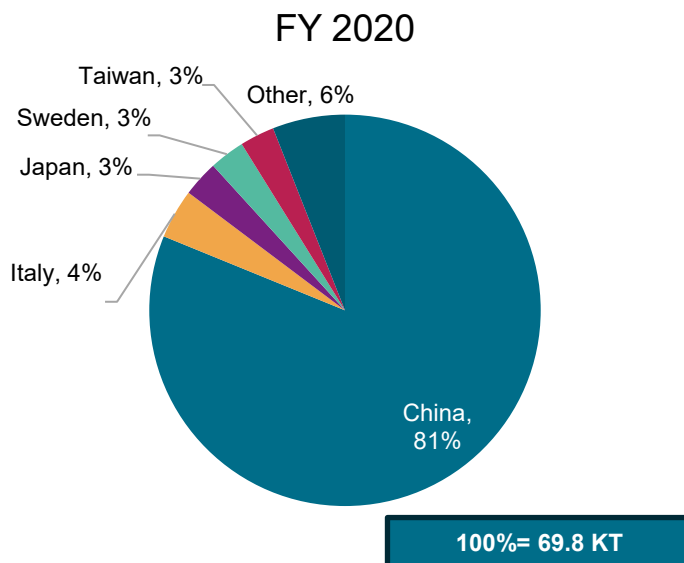
Tool & die steel imports by volume (in KT)



Source: CRISIL Intelligence, industry, DGFT

From FY20 to FY24, India's tool and die steel imports exhibited significant fluctuations, influenced by global market dynamics and domestic demand. Imports peaked at 69.8 KT in FY20, dropped sharply to 36.3 KT in FY21 due to pandemic-induced disruptions, and rebounded to 47.1 KT in FY22 as economic activity resumed. FY23 saw the highest import volume of 83.7 KT, driven by robust demand in infrastructure and manufacturing sectors, before declining to 35.9 KT in FY24 as India began implementing measures to curb dependency on imports.

Tool & die steel imports by origin (in % share)

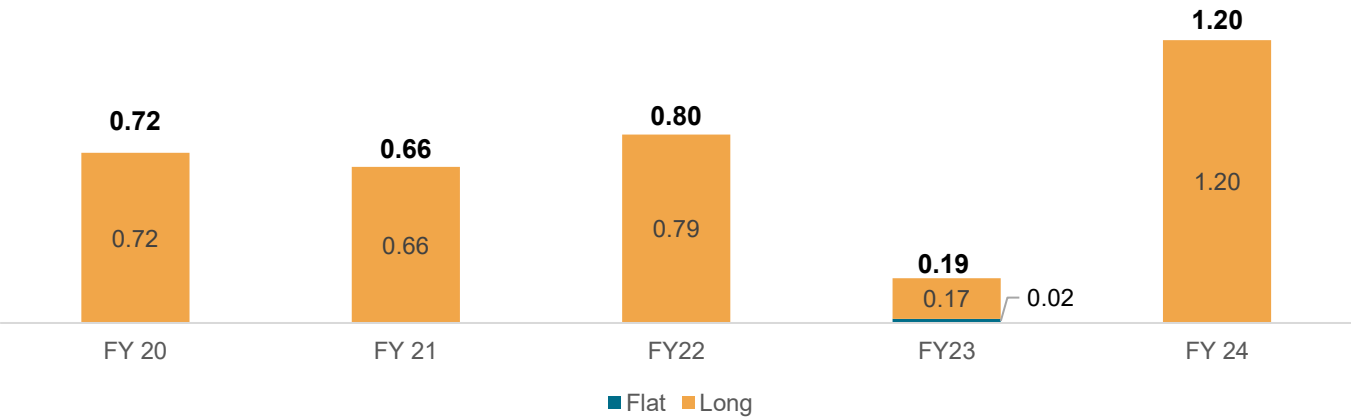


Source: CRISIL Intelligence, industry, DGFT

China has been the dominant supplier throughout this period, accounting for 63% of India's tool steel imports in FY24, down from 81% in FY20. This decline reflects India's strategic efforts to reduce reliance on Chinese imports amid geopolitical tensions and trade imbalances. China's dominance stems from its cost-competitive production and surplus steel capacity due to weak domestic demand, particularly in its real estate sector. However, India has been diversifying its sourcing by increasing imports from Japan (11%), Italy (6%), and Sweden (5%) in FY24.

The Production-Linked Incentive (PLI) scheme launched by the Indian government aims to bolster domestic production of specialty steels, including tool steel grades, reducing import dependency over time. Additionally, safeguard duties and anti-dumping measures are being explored to counter cheap imports from China. These initiatives align with India's broader strategy of self-reliance and fostering a resilient domestic steel industry while mitigating the financial strain on local producers caused by low-priced Chinese imports.

Tool & die steel exports by volume (in KT)

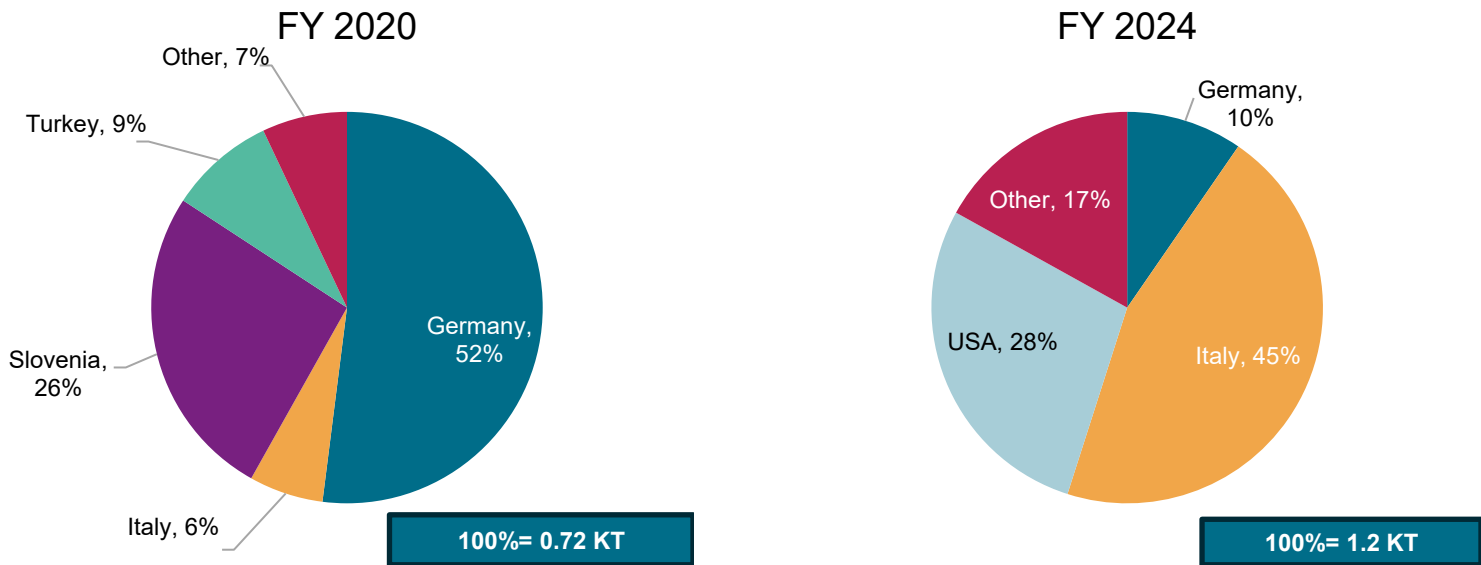


Source: CRISIL Intelligence, industry, DGFT

India’s tool steel exports have shown a steady upward trend from FY20 to FY24, reflecting the country’s growing capability to cater to global demand for high-quality specialty steels. In FY20, India exported 0.72 KT of tool and die steel, primarily to Germany (52%), Slovenia (26%), and Turkey (9%). By FY24, exports surged to 1.2 KT, marking a 67% increase, with Italy (45%), the USA (28%), and Germany (10%) emerging as the top destinations.

This growth can be attributed to multiple factors. First, Indian manufacturers have increasingly aligned their production capabilities with international standards, enabling them to penetrate advanced markets such as Europe and North America. Second, the global supply chain disruptions caused by the COVID-19 pandemic in FY21 prompted many countries to diversify their sourcing strategies, creating opportunities for Indian exporters. Third, India’s government initiatives, such as the Production-Linked Incentive (PLI) scheme for specialty steel and export promotion policies, have provided a conducive environment for growth.

Tool & die steel exports by destination (in % share)



Source: CRISIL Intelligence, industry, DGFT

The shift in export destinations is noteworthy. In FY20, Europe accounted for the majority of exports, with Germany and Slovenia leading. By FY24, Italy and the USA became dominant markets, driven by rising demand for high-grade tool steel in automotive and aerospace industries in these regions. This diversification reflects India’s ability to cater to varied technical requirements across geographies.

The increase in export volumes also underscores India's competitive edge in terms of cost efficiency and quality. However, challenges remain. Indian exporters face stiff competition from established players like China and Japan, which dominate global tool steel supply due to their advanced technology and economies of scale. Additionally, fluctuating raw material prices and logistical constraints could impact export growth.

Tool and die steel: pricing and sensitivity

Tool and die steel is a high-grade alloy steel used in manufacturing tools, dies, molds, and cutting instruments. It is priced at a significant premium compared to general alloy steel long products due to its exceptional hardness, wear resistance, and ability to retain strength at high temperatures. The inclusion of costly alloying elements like tungsten, vanadium, and cobalt further elevates its price. Additionally, its production involves precise heat treatments and machining processes to achieve the desired mechanical properties

Price in INR per tonne	Country imported from	FY20	FY21	FY22	FY23	FY24
Tool & die steel round bar (Grade:H13)	Korea	2,16,900	1,84,636	2,88,375	3,46,290	2,86,868
Cold rolled steel strip (Grade: 16MnCr5)	Germany	79,250	1,22,966	1,20,651	1,58,113	1,98,094

Source: Crisil Intelligence, Industry

The pricing sensitivity of tool and die steel is closely tied to industrial activity levels. Demand surges during periods of robust manufacturing growth when industries require tools for machining, molding, or stamping operations. Conversely, economic slowdowns can reduce demand. Raw material price volatility also plays a critical role; for example, fluctuations in tungsten or vanadium prices can significantly affect production costs. Despite these sensitivities, tool and die steel maintains its premium pricing because of its critical role in ensuring precision and durability in tooling applications.

Valve steel

Overview

Valve steels are a class of high-performance materials engineered to excel in extreme environments, such as those encountered in oil refineries, power plants, and petrochemical facilities, where high temperatures, corrosive conditions, and significant pressure fluctuations are prevalent. These specialized steels exhibit a unique combination of properties, including high-temperature resistance, corrosion resistance, and high tensile strength, rendering them an ideal choice for valve components in high-pressure systems.

Valve steel is crafted using a precise combination of alloying elements to ensure durability, high-temperature strength, and corrosion resistance for demanding applications. The base composition

includes iron (Fe) and carbon (C) for foundational strength. Key alloying elements include chromium (Cr) for corrosion and oxidation resistance, nickel (Ni) for toughness, and molybdenum (Mo) for creep resistance at high temperatures. Manganese (Mn) improves hardenability, while silicon (Si) strengthens the matrix and resists scaling. Trace vanadium (V) refines grain structure for enhanced mechanical properties, while impurities like sulfur and phosphorus are minimized to prevent brittleness. These elements are blended through electric arc furnace melting and refined via ladle treatment to achieve precise chemistry, followed by quenching and tempering for optimal microstructure.

The valve steel family, comprising grades such as F9, F11, F12, F22, F91, and F92, is widely utilized in the oil and gas industry for manufacturing critical components, including valve bodies and stems. The selection of specific grades is based on application requirements, with F9 and F11 grades preferred for high-temperature applications, and F22 and F91 grades for high-pressure and high-temperature services.

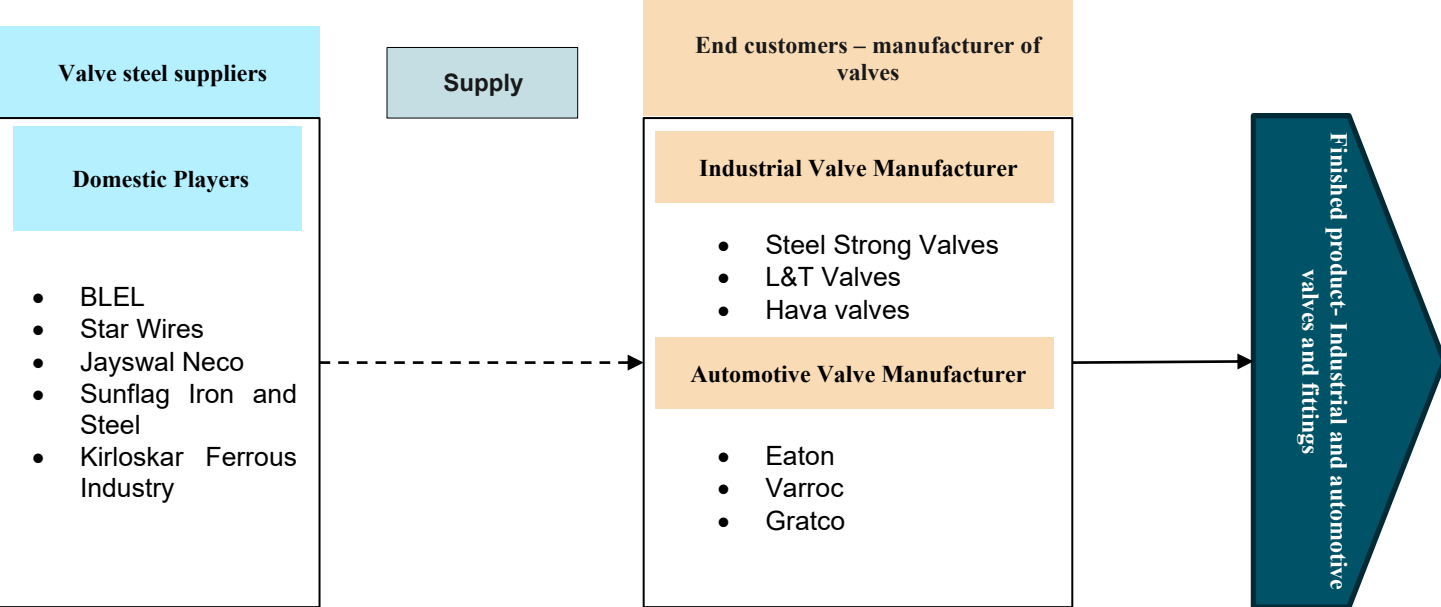
In addition to their use in industrial applications, valve steels are also used in the production of engine valves for automotive engines. Engine valve steel grades, such as 21-4N and 23-8N, are high-strength, high-temperature alloys used in internal combustion engine valves, with 21-4N commonly used for exhaust valves and 23-8N for intake valves. Other grades, including X45CrSi9-3 and 4Cr10Si2Mo, are used for high-performance engine valves.

Application mapping by key end use industries

Industry	Properties and characteristics	Applications
Oil and Gas Industry	- Corrosion resistance - High pressure resistance	Pipelines and drilling equipment
Chemical Processing	- High strength - Corrosion resistance	Used to make valves in chemical plants to control the flow of aggressive substances, suitable for use in reactors, distillation columns, and storage tanks.
Power	- High working temperature - High strength - Corrosion resistance	In power plants, valve alloy steels are used for regulating steam and water flow within boilers, turbines, and other critical systems.
Water Treatment	- High wear resistance - Corrosion resistance - High strength	Alloy steel valves play a vital role in water treatment processes by managing fluid flow during filtration and treatment operations.
Automotive	- High strength - High temperature - Corrosion resistance	Valve steel has excellent resistance to heat, corrosion, and wear, making them suitable for applications in automotive engines, where high-temperature and high-stress conditions are prevalent
Mining	- High wear resistance - High strength - Corrosion resistance	Valves made from alloy steel are essential in mining operations where they manage the flow of slurries and other abrasive materials during mineral extraction processes.

Source: CRISIL Intelligence, industry

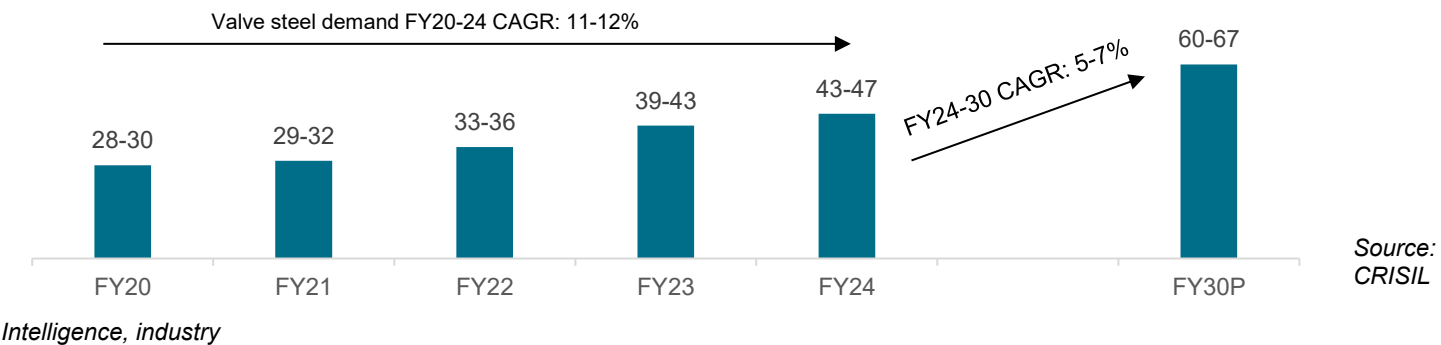
Industry structure



Source: CRISIL Intelligence, industry

Demand overview

Valve steel demand (in KT)



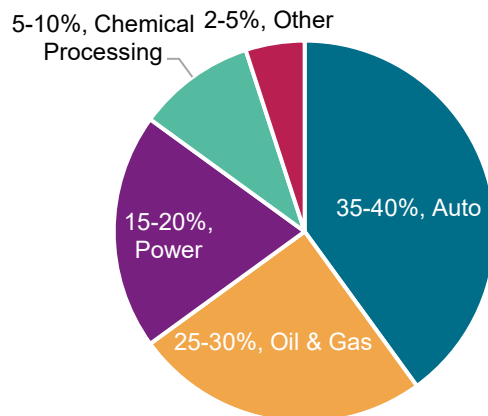
The demand for valve alloy long steel in India has shown a steady growth trajectory from FY20 to FY24, driven by its critical applications in automotive, oil and gas, power, chemical processing, and other industrial sectors. The total demand, which includes both F-grade and engine alloy valve steel grades, increased from 28–30 KT in FY20 to 43–47 KT in FY24, reflecting a compound annual growth rate (CAGR) of approximately 11–12%.

The automotive sector remains the largest consumer, fueled by the growing demand for internal combustion engine components and the expansion of India's vehicle manufacturing base. The oil and gas industry, with its need for high-performance materials in extreme environments, also contributes significantly to the rising demand. Similarly, the power and chemical processing industries rely on valve alloy steel for its durability and corrosion resistance in critical applications. The demand for valve steel is estimated to rise by a CAGR of 5-7% between fiscal 2024 and fiscal 2030, to around ~67KT.

Key drivers of growth for valve steel

- **Improved Domestic Capabilities:** Indian manufacturers have enhanced their production capabilities, focusing on high-grade valve steel that meets international standards. This has enabled them to compete effectively in advanced markets.
- **Global Supply Chain Realignment:** Disruptions caused by the COVID-19 pandemic prompted many countries to diversify their sourcing strategies, creating opportunities for Indian exporters.
- **Government Support:** Initiatives such as the Production-Linked Incentive (PLI) scheme for specialty steels have incentivized production and export growth.
- **Rising Demand from Automotive and Industrial Sectors:** The global automotive industry's recovery post-pandemic and increased industrial activity have driven demand for valve steel.

Demand by end use industry in FY24 (% share)



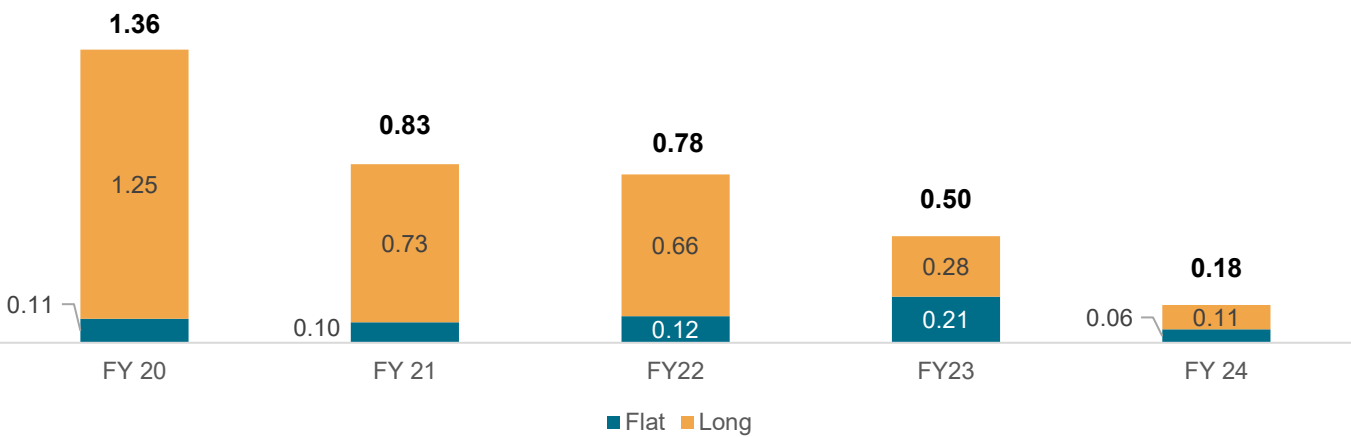
100%= 43-47 KT

Source: CRISIL Intelligence, industry

The demand for valve steel in India for FY24 stood at 43–47 KT, driven by its critical applications across multiple industries. The automotive sector leads with a 35–40% share, reflecting its reliance on valve steel for internal combustion engines and other components. The oil and gas sector follows with a 25–30% share, underpinned by the need for high-performance materials in extreme environments such as pipelines and refineries. The power industry accounts for 15–20% of the demand, with grades like F22 and F91 being preferred for high-pressure applications such as steam turbines and supercritical power plants. The chemical processing sector contributes 5–10%, leveraging valve steel's corrosion resistance for handling aggressive chemicals. The remaining 2–5% comes from other industrial applications, showcasing its versatility.

Imports trend

Valve steel imports by volume (in KT)



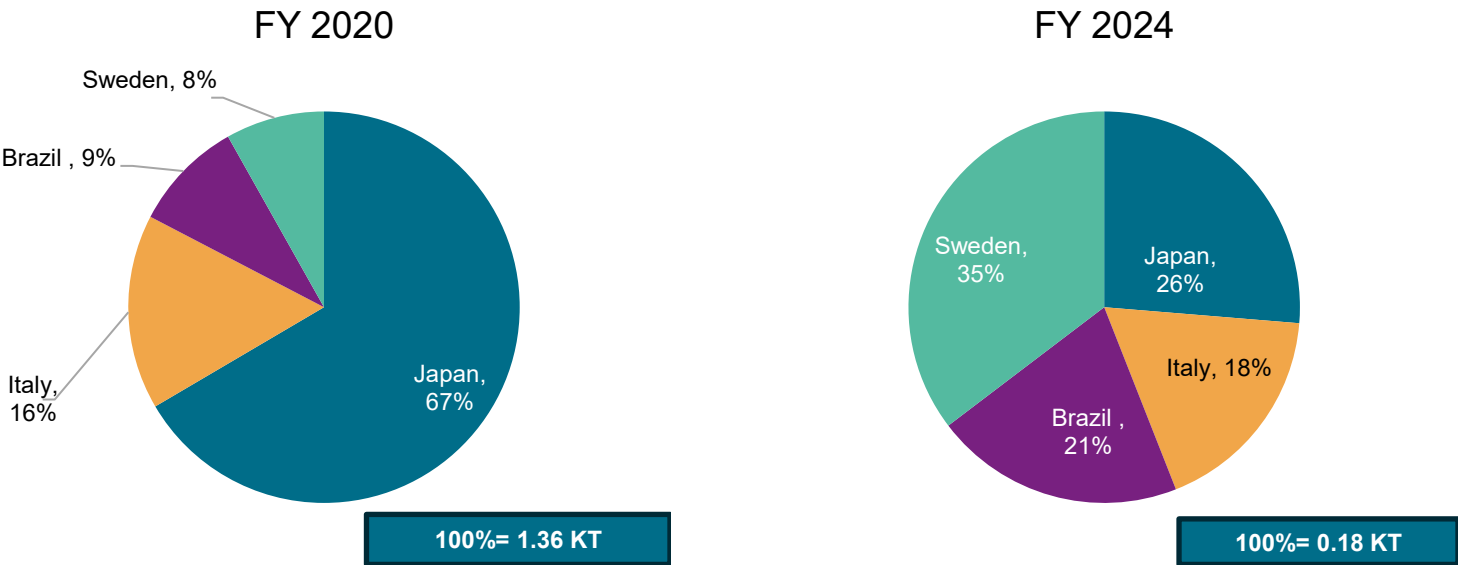
Source: CRISIL Intelligence, industry, DGFT

India's valve steel imports from FY20 to FY24 have shown a significant decline, reflecting both global and domestic factors. In FY20, imports stood at 1.36 KT, with Japan dominating as the primary supplier (67%), followed by Italy (16%), Brazil (9%), and Sweden (8%). By FY24, imports had fallen sharply to 0.18 KT, with Japan's share declining to 26%, while Sweden emerged as the largest supplier (35%), followed by Brazil (21%) and Italy (18%).

The steep decline in valve steel imports can be attributed to some factors such as:

- **Domestic Capacity Expansion:** India has been ramping up its domestic production of specialty steels, including valve steel, under initiatives like the Production-Linked Incentive (PLI 1.1) scheme. This has reduced dependency on imports.
- **Geopolitical and Trade Shifts:** Geopolitical tensions and India's push for self-reliance have led to a conscious effort to diversify import sources and reduce reliance on traditional suppliers like Japan.

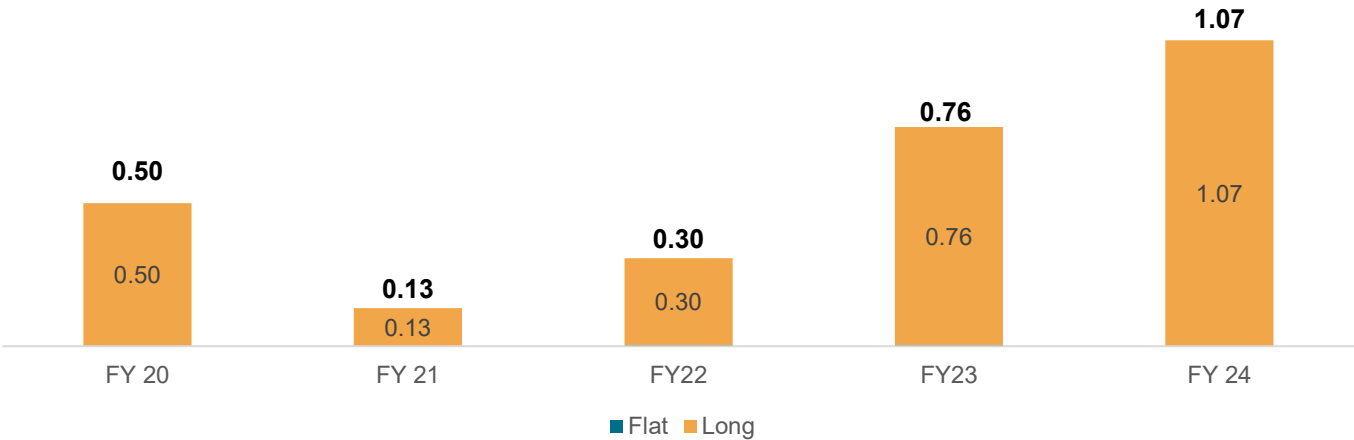
Valve steel imports by origin (in % share)



Source: CRISIL Intelligence, industry, DGFT

India’s declining valve steel imports align with its broader strategy of reducing dependency on foreign suppliers for critical materials. The government’s PLI scheme has incentivized investments in specialty steel production, with significant capacity additions expected by 2030. Moreover, anti-dumping measures and safeguard duties have been implemented to protect domestic manufacturers from low-cost imports.

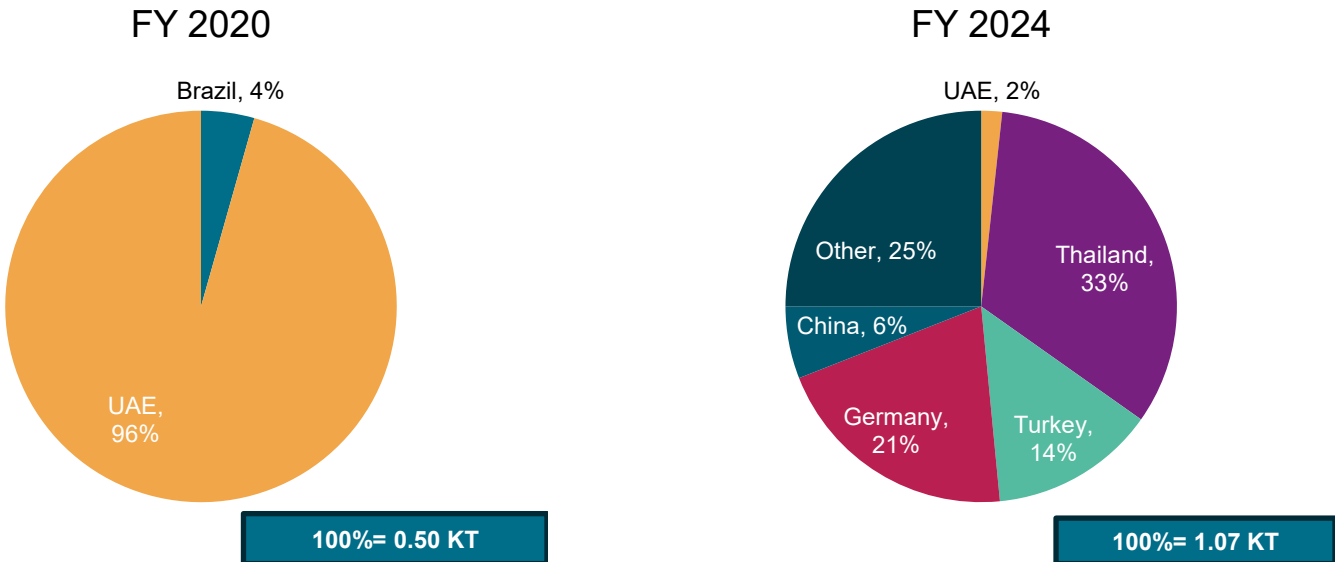
Valve steel exports by volume (in KT)



Source: CRISIL Intelligence, industry, DGFT

India's valve steel exports have shown remarkable growth from FY20 to FY24, reflecting the country’s increasing competitiveness in the global specialty steel market. Export volumes rose significantly from 0.50 KT in FY20 to 1.07 KT in FY24, marking a 114% increase over five years. This growth has been driven by rising global demand for high-quality valve steel, particularly in automotive and industrial applications, as well as India’s strategic focus on expanding its export footprint.

Valve steel exports by destination (in % share)



Source: CRISIL Intelligence, industry, DGFT

In FY20, India's valve steel exports were heavily concentrated in the UAE, which accounted for 96% of total exports (0.50 KT). However, by FY24, the export landscape had diversified significantly. Thailand emerged as the largest destination with a 33% share, followed by Germany (21%), Turkey (14%), and China (6%). The UAE's share dropped to just 2%, reflecting a shift toward more diversified and advanced markets.

This shift highlights India's growing ability to meet the stringent quality and technical requirements of developed economies like Germany and emerging markets like Thailand. The diversification can also be attributed to India's efforts to reduce dependency on single markets and tap into new opportunities globally.

Valve steel pricing and sensitivity

Valve steel, a specialized alloy steel, is engineered to withstand high temperatures, pressures, and corrosive environments, making it indispensable in automotive engines, power plants, and industrial applications. Its pricing is significantly higher than general alloy steel long products due to its unique composition, which often includes expensive elements like nickel, chromium, and molybdenum. The production process is also more complex, involving advanced heat treatment and surface finishing techniques to enhance durability and performance.

Price in INR per tonne	Country imported from	FY20	FY21	FY22	FY23	FY24
Valve steel bars (Grade: 21-4N)	Japan	3,64,608	4,08,405	3,79,631	4,53,140	6,23,856
Cold rolled steel strip (Grade: 16MnCr5)	Germany	79,250	1,22,966	1,20,651	1,58,113	1,98,094

Source: Crisil Intelligence, Industry

Pricing sensitivity for valve steel is influenced by raw material costs, particularly for rare alloying elements, as well as demand from end-use industries like automotive and energy. For instance, fluctuations in nickel or chromium prices directly impact valve steel costs. Additionally, the growing adoption of electric vehicles (EVs), which use fewer internal combustion engine components, could temper demand for valve steel in the long term. However, its critical role in high-performance applications ensures that it commands a premium over general alloy steels. Buyers are willing to pay this premium due to the material's superior properties and reliability under extreme conditions.

Overview of the metal rolls industry

Overview

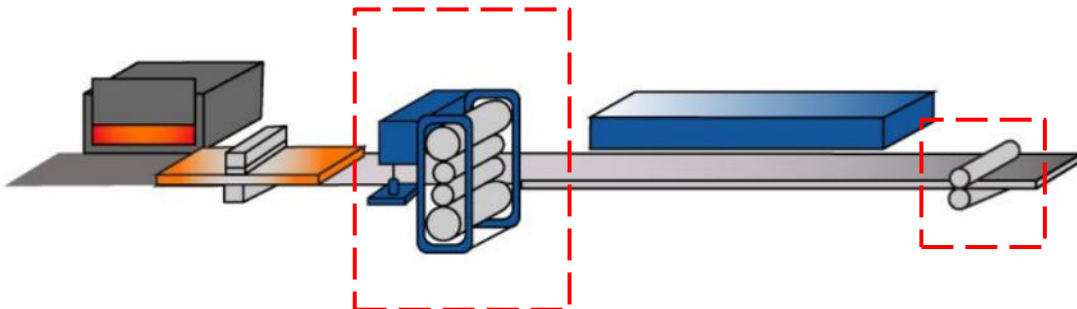
Rolls are a critical component of rolling mills, which are machines used to shape metal by passing it through a pair of rolls. The rolls apply pressure to the metal, causing it to deform and take on the desired shape and size. Its desired metallographic structure and mechanical properties are achieved through selective measures such as controlled alloying, casting, and heat treatment. Rolls can be further classified based on their surface texture, hardness, and material composition. The choice of roll type and design depends on the specific rolling application, the type of metal being rolled, and the desired product characteristics. Rolls are designed to withstand high temperatures, pressures, and wear, making them essential for metal forming, rolling, and shaping processes.

This industry is crucial in manufacturing a wide range of products for sectors like construction, automotive, aerospace, energy, and consumer goods.

Functions of Metal Rolls in Rolling Mills

1. Shaping Metal: Apply pressure to deform metal into desired thickness and shape.
2. Reducing Thickness: Used in hot or cold rolling to achieve the required dimensions.
3. Surface Finishing: Improve the texture and quality of metal surfaces.
4. Enhancing Strength: Rolling improves metal grain structure, increasing mechanical properties.
5. Guiding and Supporting Material: Ensure proper alignment of metal sheets, bars, and rods during rolling.

Working Principle of Metal Rolls



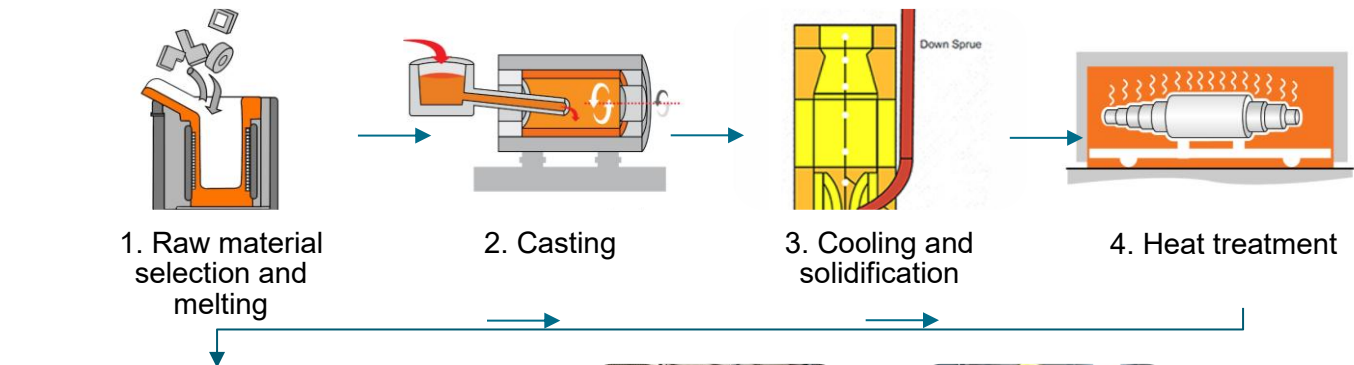
- Metal stock (slab, billet, or ingot) is fed between rotating rolls.
- The rolls apply compressive forces to reduce the thickness and alter the shape.
- The gap between the rolls (roll gap) determines the final thickness.
- Friction between the metal and rolls helps in pulling the material forward.
- The metal undergoes plastic deformation, meaning it changes shape without breaking.
- Depending on the type of rolling, multiple passes may be required to achieve the desired thickness.

Manufacturing Overview

The manufacturing process of metal rolls involves several steps, from casting to machining and heat treatment, to ensure the rolls are durable, wear-resistant, and able to withstand the extreme conditions in rolling mills. Metal rolls, such as

those made from alloy steel, spheroidal graphite iron, or high-carbon steel, are used to shape and flatten steel products like billets, blooms, and slabs during hot and cold rolling processes.

Metal Rolls Manufacturing Process



Source: CRISIL Intelligence

1. **Material Selection**
 application.

- Steel, Alloy Steel, Carbon Steel, Graphitic Steel and High-Speed Steel
 - Cast Iron, Alloyed Spheroidal Graphite Cast Iron, Grain Alloyed Indefinite Chilled Iron and Chromium Iron
 - Tungsten Carbide

5. **Precision machining**

6. **Surface treatment**

7. **Final testing**

The alloy composition is selected to enhance the wear resistance, thermal conductivity, and strength of the rolls.

2. **Forming the Roll Shape:** Rolls are formed using different manufacturing techniques, including:
 - Static Casting: The roll is formed by pouring molten metal into a stationary composite mould.
 - Centrifugal Casting: This process is used for producing double or triple poured rolls. Molten metal is poured into a rotating mould, forming a dense, fine-grained structure.
 - Forging: Forged rolls are formed by heating the material and applying compressive forces to shape it. This method is primarily used for producing high strength rolls for specific applications where stresses are very high.
 - Composite Manufacturing: Some rolls are manufactured using composite materials or hybrid processes involving a combination of casting and forging. It includes HSS (High-Speed Steel) or alloy-based composite rolls.
3. **Cooling and Solidification:** After casting, the rolls are allowed to cool and solidify. During this stage, the material gains its basic shape and structure, but further processing is required to achieve the desired properties.
4. **Heat Treatment:** To enhance mechanical properties, rolls undergo heat treatment processes such as:
 - Annealing: After casting, the rolls often undergo an annealing process to relieve internal stresses that may have formed during casting and improve the material's workability.

- **Quenching and Tempering:** To increase the hardness durability of the rolls, especially for rolls used in heavy-duty applications (e.g., hot rolling mills), the roll is subjected to quenching (rapid cooling) followed by tempering (reheating to a specific temperature and then cooling slowly). This improves both hardness and toughness.
 - **Hardening:** Rolls are hardened using high-frequency induction heating or electric furnace hardening. This involves localized heating to a specific hardness and depth to ensure the roll surface can withstand extreme pressure and wear.
5. **Machining (Finishing the Roll Shape):** After heat treatment, the roll is machined to achieve precise dimensions and surface quality. Different machining operations include:
- **Turning:** The outer diameter is precision-turned on a lathe machine to achieve the desired size and surface finish.
 - **Grinding:** Rolls are ground to provide a smooth, even surface. The grinding process is critical to achieving the necessary surface roughness required for rolling operations.
 - **Milling:** Milling operations are performed on specially designed Milling Machines enable precise cutting of complex features, including Clove leaf wobblers, Flats, Keyways and other grooves. Additionally, custom-designed fixtures facilitate fluting and special grooving operations, ensuring accurate and efficient machining.
 - **Drilling:** Drilling is a machining process that removes material from the inside of a workpiece, creating a hole with a diameter equal to the size of the drill bit used.
 - **Tapping:** Tapping is a process that follows drilling, where a tapping tool is inserted axially into the drilled hole to cut uniform threads. The tapped hole is designed to match a corresponding thread size, accommodating the desired tapping tool. The resulting thread is a precise, helical groove with specified length and pitch. To achieve deeper threads, multiple passes of the tapping tool may be required.
6. **Inspection and Quality Control:** Rolls are subjected to stringent inspection and quality control measures to ensure they meet the required specifications.
- Non-Destructive Testing (NDT) methods like ultrasonic testing or magnetic particle testing are used to detect any internal cracks or defects in the rolls.
- Hardness Testing: The hardness of the rolls is measured to confirm that it meets the specifications needed for its intended use.
- **Non-Destructive Testing (NDT):** Methods like ultrasonic testing and magnetic particle testing are used to detect defects in the rolls.
 - **Hardness Testing:** The hardness of the rolls is measured to confirm that it meets the specifications.
 - **Visual Inspection:** Rolls are visually inspected for surface defects such as cracks, pits, and inclusions.
7. **Final Testing:**
- Rolls undergo final dimensional checks to ensure they fit within the specified tolerances before final packaging and dispatch to the customer site.

Types and Applications

Various types of metal rolls are employed depending on the specific requirements of the rolling process and the type of material being processed. The major types of rolls used in rolling mills include Adamite rolls, Spheroidal Graphite Iron (SGI) rolls, Alloy steel rolls etc.

Common types of Metal rolls

Metal Roll Type	Basic Properties/ Composition	Common grades	Application
Alloy Cast Steel Rolls 	- Carbon content: 0.50% to 0.80% - Alloyed with Chromium and Molybdenum	- ACS 33 (30°-35° Sh C) - ACS 37 (35°-40° Sh C)	- Blooming Mills - Roughing Stands for Light & Heavy Section Mills
Alloy Steel Base Adamite Rolls 	- Carbon content: 0.80% to 2.00% - Alloyed with Nickel, Chromium and Molybdenum	- ADM 37 (35°-40° Sh C) - ADM 42 (40°-45° Sh C) - ADM 47 (45°-50° Sh C) - ADM 50 (48°-52° Sh C)	- Heavy Section and Rail Mills - Universal Beam Mills - TMT Bar Mills - Medium Section Mills - Billet Mills
Graphite Steel Rolls 	- Some properties of cast iron are included in the steel material - Service performance of this roll is superior to normal steel roll	- GPH 50 (48° - 52° Sh C) - GPH 53 (53° - 58° Sh C)	Medium Heavy Section Mills where fire cracking is a major concern
High Chrome Steel Rolls 	- Shell contains high chromium, Nickel and Molybdenum. - High Toughness	HCS (65°-85° Sh C)	Work Rolls of Roughing Stands of HSM, CSP and Steckel Mills
High Chrome Iron Rolls 	High Wear Resistance	HCI (75°-85° Sh C)	Work Rolls of Early Finishing Stands of HSM and CSP Mills
S. G. Iron Ferritic Rolls 	High Fire Crack Resistance	SG F (40°-50° Sh C)	Roughing Stands of Wire Rod and Bar Mills

S. G. Iron Pearlitic Rolls 	- Distinguished by presence of graphite in nodular form - Improved toughness and strength along with superior wear resistance	- SG P 47 (45°-50° Sh C) - SG P 53 (50°-55° Sh C) - SG P 57 (55°-60° Sh C) - SG P 63 (60°-65° Sh C)	- Roughing and Intermediate Mill stands of Blooming/Slabbing - TMT Bars Mills - Wire Rod mills - Structural Mills - Merchant Mills
S. G. Iron Bainitic/Acicular Rolls 	- Stronger rolls with more wear resistant than S.G.I. Pearlitic Rolls - Alloyed with a higher % of Nickel and Molybdenum than S.G.I Pearlitic	- SG AC 63 (60°-65° Sh C) - SG AC 67 (65°-70° Sh C) - SG AC 73 (70°-75° Sh C)	- Rail and Structural mills - Intermediate and Finishing Mill stands for TMT Bar Mills - TMT Re-Bar Mills - Wire Rod Mills
Alloyed Indefinite Chill Rolls 	Due to alloy addition, these rolls have a much better hardness penetration than clear chill and other cast iron rolls	- AIC 57 (55°-60° Sh C) - AIC 63 (60°-65° Sh C) - AIC 67 (65°-70° Sh C) - AIC 73 (70°-75° Sh C) - SPIC (70°-80° Sh C)	Intermediate/Finishing stand of: - Wire Rod Mills - TMT re-bar Mills - Merchant Mills - Structural Mills Finishing stand of Strips, Sheet and flat rolling mills
ICDP Rolls 	- Good surface of Rolled Product - Good wear resistance	- ICDP (70°-85° Sh C) - EN-ICDP (70°-85° Sh C)	- Work Rolls of Final Finishing Stands of Hot Strip Mills and CSP Mills - Work Rolls of Finishing Stands of Steckel Mills - Work Rolls of Plate Mill

Source: CRISIL Intelligence Consulting, industry

ICDP rolls are manufactured in very little quantities and HSS rolls are currently not being manufactured in India.

Mills wise Rolls grades for Flat Products

- Hot Rolling Mills: Used to shape heated metal into various steel products :
 - TMT Re-Bars,
 - Wire Rods,
 - Structure (Angle, Channel, Beam, and various others),
 - Section (Round, Square, Flat, Hex, and various others),
 - HR Coil, HR Strips and HR Plates
- Cold Rolling Mills: Used to reduce the thickness of metal at room temperature for enhanced surface finish and precision, converting Hot Rolled Coil (HRC) to Cold Rolled Coil (CRC).
- Seam/ERW Tube and Pipe Mills

- a. The HR / CR Coils are uncoiled and the sheet passes through a series of rollers at room temperature, shaping it into a cylindrical form
- b. The seams are then welded together using electric resistance welding (ERW), forming a strong and durable pipe/tube.

4. Seamless Tube and Pipe Mills

- a. A Solid Billet or Round Bar is heated to a high temperature, followed by piercing to create a hollow shell.
- b. The shell is then rolled and elongated to the desired size and sized to precise dimensions.
- c. Finally, the pipe undergoes heat treatment to enhance its strength and durability, resulting in a strong, durable, and seamless pipe.

Rolling Mill Grades by application

1. Mill Wise Rolls Grades for Long Products

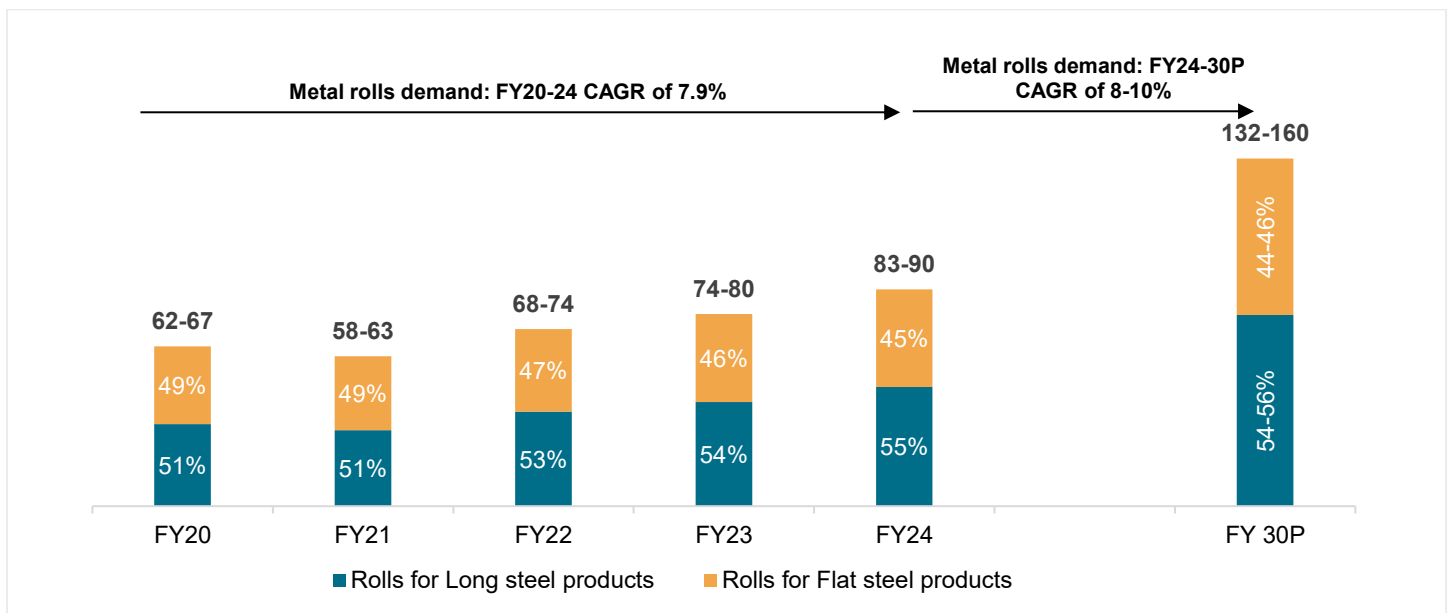
- a. TMT Re-Bar and Wire Rod Mills: Roughing - ADM, GS, SGF, SGP; Intermediate & Finishing - SGP, AIC, SGAC, HSS
- b. Structural & Section Mills: Roughing - ACS, ADM, GS, SGP; Intermediate & Finishing - ADM, GS, SGP, AIC, SGAC
- c. Universal Mills: Roughing / Breakdown Mill – ADM; Universal Roughing, Edger and Universal Finishing - GS, SGP, SGAC

2. Seamless Tube and Pipe Mills

- a. Hot Strip Mill: Roughing - S-HSS, HCS; Edger - ADM, GS, SGP; Early Finishing - HCI, ICDP, S-HSS, HSS; Final Finishing – ICDP, EN-ICDP
- b. Narrow Strip Mill: Roughing – ACS, ADM, GS; Edger – ADM; Early Finishing – SGP; Final Finishing – SGP, ICDP, EN-ICDP; Back Up – ADM

India's Metal rolls for rolling mill overview and outlook

Metal rolls demand (KT)



Source: Industry, CRISIL Intelligence Consulting

India's metal rolls demand saw a robust growth of 7.9% (CAGR) over fiscals 2020-2024, increasing from ~62-67 KT in fiscal 2020 to ~83-90 KT, driven by a higher growth rate in the domestic production of finished steel production.

The metal rolls requirement for long steel products increased from ~34 KT in fiscal 2020 to ~50 KT in fiscal 2024, a CAGR of 9.7%, as share of long steel in overall steel production rose due to demand from the infrastructure and construction sectors. The demand of metal rolls for flat steel products increased from ~32 KT in fiscal 2020 to ~40 KT in fiscal 2024, logging a CAGR of ~5.9%.

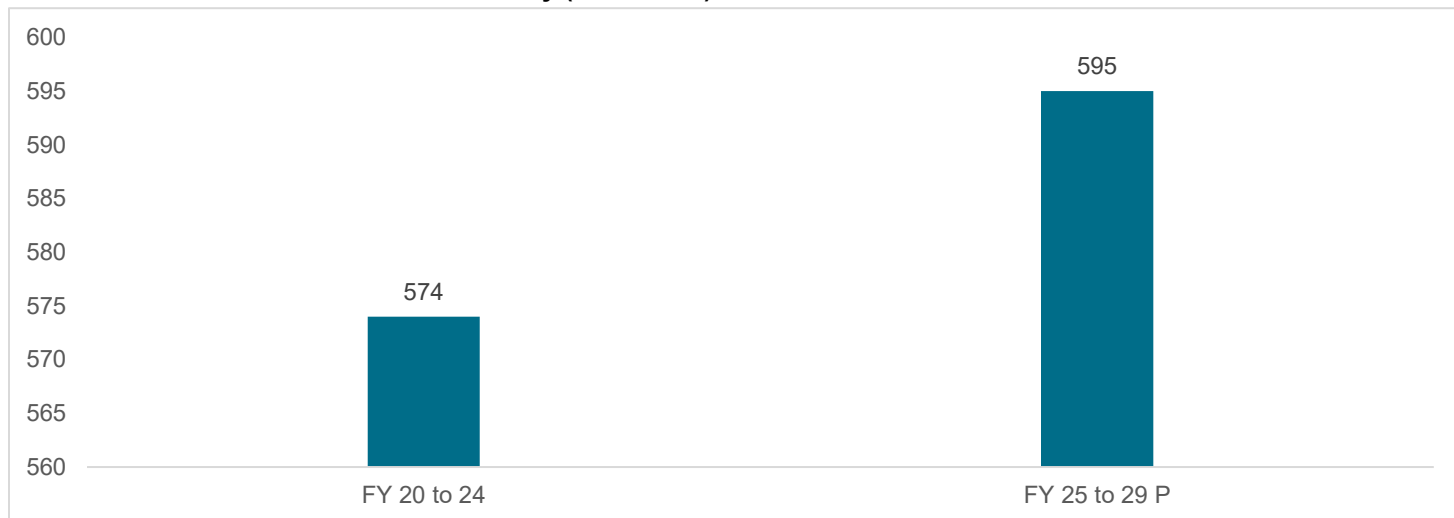
The demand for metal rolls for rolling mills is perfectly and positively correlated with the demand for finished steel products in India, meaning the metal rolls demand tend to follow the same growth as that of steel demand. It is projected to increase at a CAGR of ~8-10% during fiscals 2024-2030 and reach ~132-160 KT in fiscal 2030.

The rolling mill rolls market in India is expected to witness significant growth over the forecast period owing to increasing demand for rolled products from various industries such as automotive, construction, engineering and power generation. Increasing investments by international players in India manufacturing industry will further drive demand for rolling mill rolls. Moreover, with rising per capita disposable income among urban populations leading to increased consumption of durable goods and consumer appliances, manufacturers are likely to increase their production capacity which will bolster demand for high quality rolling mills rolls in India.

CAPEX in Metal Industry

The metal industry accounts for around 12%-20% of the total investment in the construction industry.

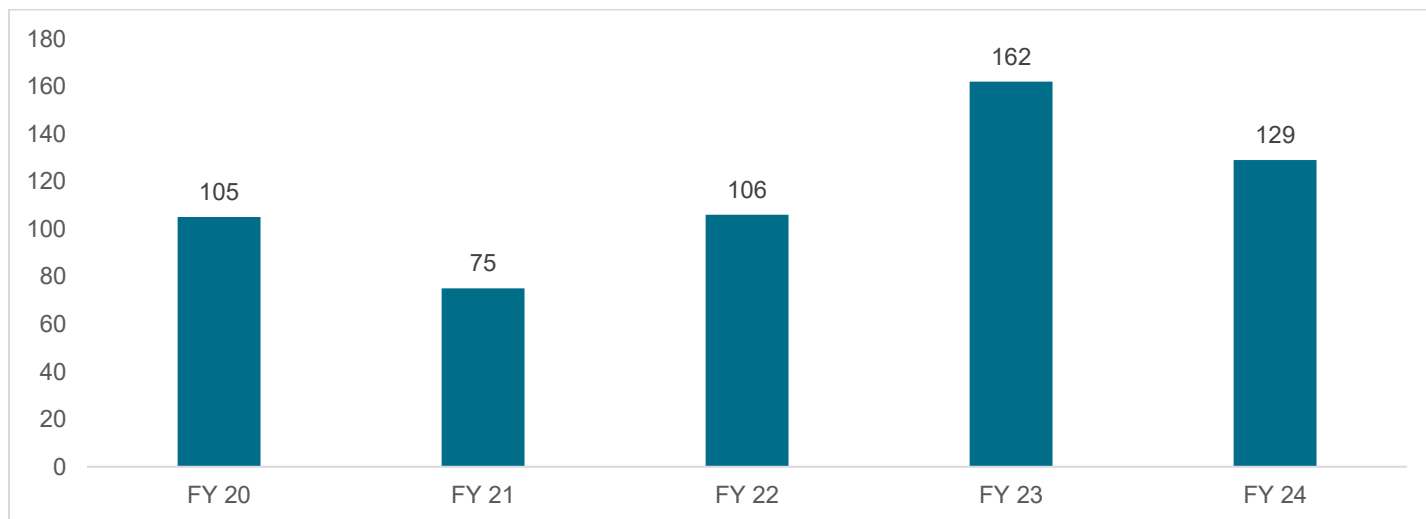
Construction Investments in Metal Industry (Rs. Billion)



Source: Industry, CRISIL Intelligence Consulting

India's metal industry is set for a steady rise in construction investments, with projections reaching Rs 595 billion over the next five years, slightly higher than the Rs 574 billion in the previous period. A key trend driving this growth is the industry's focus on brownfield expansions, as larger players seek inorganic growth opportunities amid stressed assets.

Year-wise Metal Industry's Construction Investments Review (Rs. Billion)



Source: Industry, CRISIL Intelligence Consulting

The steel industry has already expanded by 26 million tonnes (MT) over the past five years, with an additional 35–40 MT expected, primarily through brownfield projects. However, large-scale projects have faced delays due to landownership conflicts and legal disputes, increasing financial strain on steel companies. Despite these challenges, AM/NS continues to lead greenfield expansions, signaling long-term commitment to capacity building.

Meanwhile, the aluminum sector is witnessing rising investments, driven by Nalco's capacity expansion. With growing domestic demand and rising global aluminum prices, local players stand to benefit, further strengthening the industry's growth outlook.

Various CAPEX Initiatives in Steel Sector

The Indian steel sector is experiencing significant capex initiatives, driven by government policies like the Production Linked Incentive (PLI) scheme for specialty steel and increased infrastructure spending, aiming to boost domestic production and reduce imports.

Here's a breakdown of key capex initiatives and their impact:

1. Government Initiatives & Policies:

- **Increased Infrastructure Spending:** The Union Budget 2024-25 allocated a substantial amount (Rs. 11.11 lakh crore) to enhance national infrastructure, which is expected to boost steel consumption.
- **Domestically Manufactured Iron & Steel Products (DMI&SP) Policy:** This policy promotes the use of domestically manufactured steel in government procurement.
- **Reduction in Basic Customs Duty (BCD):** The budget 2024 reduced the BCD on Ferro Nickel, a crucial raw material for stainless steel, from 2.5% to zero, and extended duty exemptions on ferrous scrap.

2. Private Sector Investments:

- **JSW Steel:** JSW Steel, with POSCO, is planning a significant investment of \$7.73 billion in a new steel plant in Odisha, India, with an initial capacity of 5 million metric tons annually, expanding to 18 million metric tons, aiming to capitalize on India's rising steel demand
- **ArcelorMittal Nippon Steel India:** This joint venture has announced plans to expand its operations in India with investments of around Rs. 1 trillion over 10 years.
- **Tata Steel:** Tata Steel today successfully commissioned India's largest blast furnace at Kalinganagar, Odisha. With a total investment of Rs 27,000 crore, the Phase II expansion at Kalinganagar will take the total capacity at the site from 3 million tonnes per annum (MTPA) to 8 MTPA.
- **Jindal Steel & Power Ltd.:** The company's Angul plant, currently at 6-MTPA capacity, will double to 12 MTPA this year and is set to reach 25.2 MTPA by 2030

3. Impact of Capex on the Steel Sector:

- **Increased Steel Demand:** Increased capex on infrastructure projects, especially railways, housing, and industrial parks, is expected to drive steel demand.
- **Capacity Expansion:** The investments are aimed at expanding steel production capacity, both in the long and flat products segments.
- **Raw Material Availability:** Initiatives to improve raw material availability and reduce costs are expected to support the steel industry.
- **Job Creation:** The expansion of the steel industry is expected to create new jobs.
- **Technological Advancement:** Investments in modern technologies and processes are expected to improve efficiency and productivity in the steel industry.
- **ESG Benefits:** Reduction in import duties on eco-friendly materials and encouragement of recycling through extended ferrous scrap import exemptions are expected to promote sustainable steel production.

Number of Metal Rolls required per ton of Steel

The production of 1 lakh tons of steel necessitates approximately 4 to 5 metal rolls for finished steel flat products, whereas finished steel long products require around 4 metal rolls.

In large-scale steel plants, the number of rolls required for finished steel flat products typically ranges between 220 and 250, while for finished steel long products, it varies from 200 to 210. Finished steel flat products require a greater number of rolls than finished steel long products because they experience higher wear and tear due to the greater pressure needed for processing.

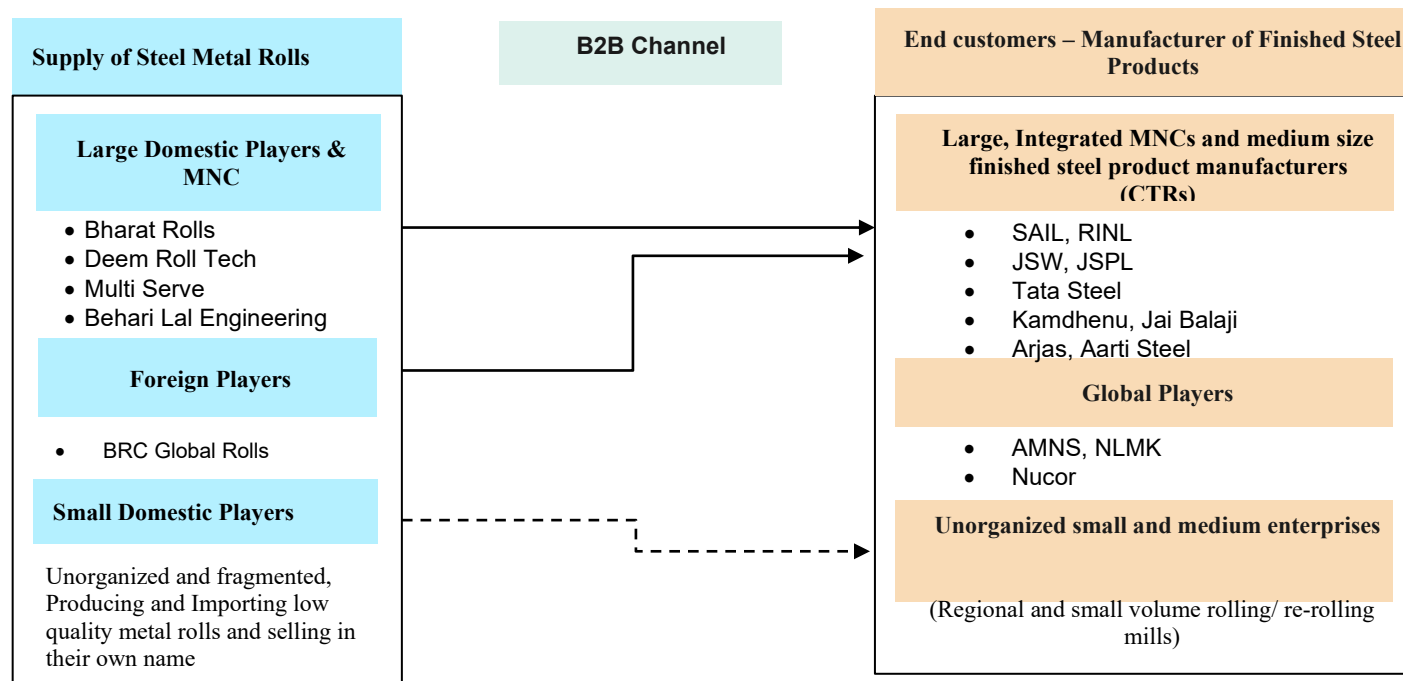
Frequency of Metal Roll Replacement: Frequency of replacement of metal roll in a rolling mill is influenced by multiple factors, including:

1. The type of metal being processed
2. The weight of the metal roll
3. The quality of the metal roll
4. The diameter of the metal roll

However, on an average basis, metal roll replacement is required within a timeframe of 5-10 weeks.

Capital Expenditure (Capex) for Metal Rolls: The total Capex required to establish a hot rolling mill of 1-million-ton capacity plant is approx. 500-700 Cr . Of this, approximately 7-10% is allocated for metal rolls. Therefore, for 1 million ton capacity of hot rolling mill, the Capex required for metal rolls ranges between Rs. 35-50 crores.

Industry Structure



Notes: Dotted line represents supply of metal rolls by small domestic players to unorganized SMEs

Source: Industry, CRISIL Intelligence Consulting

Key Industry Characteristics

The metal rolls industry in India is predominantly dominated by the organized sector, which makes up a significant portion of the market. While the organized sector holds a relatively smaller share in terms of the number of firms but a larger share in terms of production capacity, market reach, and exports.

Average Pricing of Metal Rolls:

S.No	Type of Metal Roll	Pricing by Big Players (Rs./Kg)	Pricing by Small Players (Rs./Kg)
1	Adamite Rolls	118-120	110-120
2	Alloyed SG Iron Bainitic/Acicular	120-130	112-120
3	Indefinite Chilled Rolls	135-140	125-133
4	SG Iron Bainitic/Acicular	180-195	170-180

Source: Industry, CRISIL Intelligence Consulting

Pricing of Premium Rolls

- The prices for premium rolls range between Rs. 118-140, while high-carbon or alloy-mixed rolls are priced higher, between Rs. 180-195. The price difference between small and large players is generally of Rs. 8-10/kg. Small players tend to sell at lower prices than the standard market rates.
- For exports, prices remain the same, with additional Freight on Board (FOB) charges applied

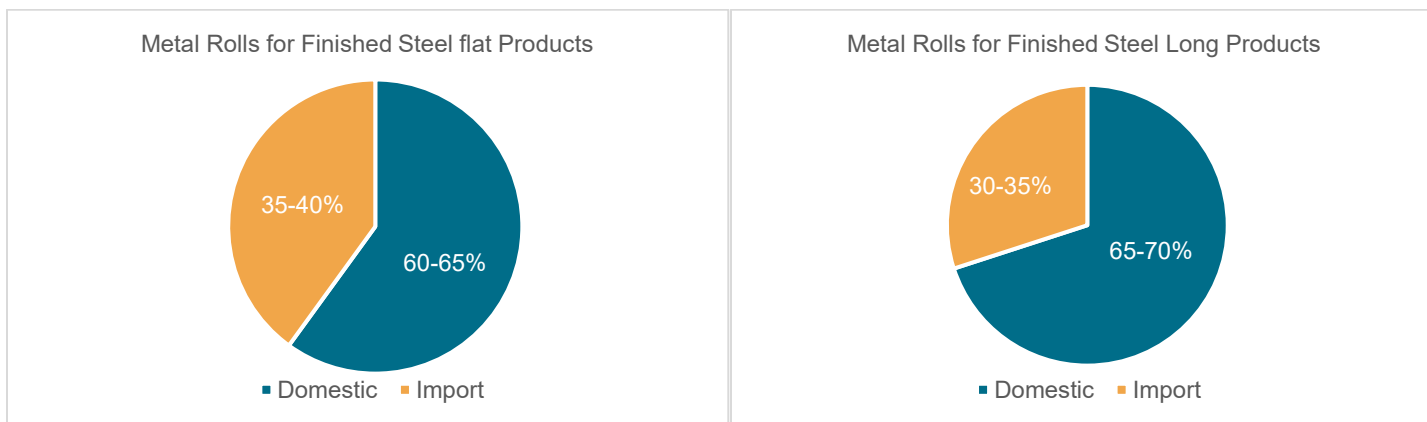
Metal Rolls Import Pricing and Reasons for Imports

Imported metal rolls are priced at four times the cost of those available in the Indian market. Despite the high price, they continue to be imported due to the following reasons:

- Certain roll specifications are not available in the Indian market
- Imported rolls are of superior quality
- They have a longer lifespan
- They support long-duration production processes

Market Segmentation based on Product Type

Distribution of Imports of Metal Rolls for Finished Steel Long and Flat Products (Fiscal 2024)



The supply of metal rolls for finished steel flat products is met 60-65% by domestic suppliers, while 35-40% is fulfilled through imports. Similarly, for finished steel long products, 30-35% of the supply comes from imports, while 65-70% is sourced domestically.

The import of metal rolls for finished steel flat products is higher than for long products due to stringent quality requirements. Since wear and tear are more significant in flat products, the quality of metal rolls used for their production needs to be superior.

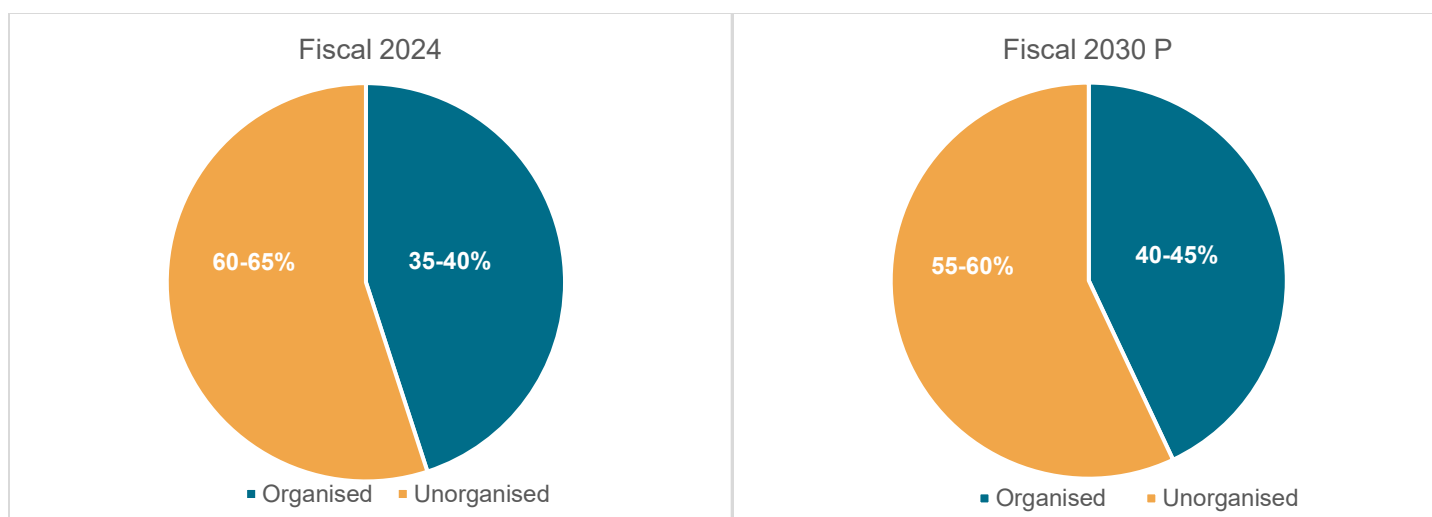
Key Import Sources:

Two types of metal rolls are imported into India:

High-quality rolls or those which are customised based on requirements and have particular specifications. For example, HSS Rolls and tungsten carbide roll are majorly imported. These are the rolls that are generally not available in India. These are primarily imported from Germany, Russia, and Japan and are priced up to 4 times higher than the Indian market rate.

Imports by Smaller Players: Some smaller metal roll manufacturers import rolls from China at 25% lower prices. However, these rolls are often substandard in quality.

Organised vs Unorganised Market Players



Source: Industry, CRISIL Intelligence Consulting

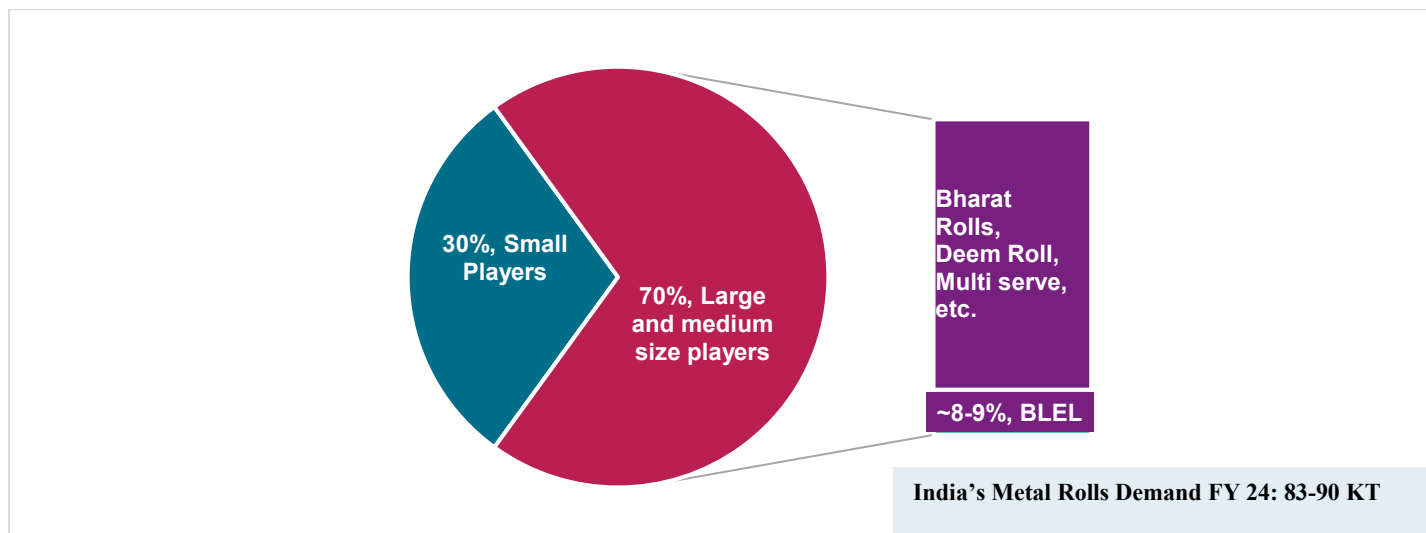
Organized Sector (~ 35-40%): The organized sector is primarily composed of large integrated metal rolls manufacturers like Behari Lal engineering, Bharat Rolls, Deem Roll Tech, etc. that have the capacity to invest in high-end technology, automation, and large-scale production. This sector is also more focused on high-value, specialized and customised products.

Unorganized Sector (~ 60-65%): The unorganized sector is characterized by a large number of small sized players who manufactures low quality metal rolls for small volume rolling mills and re-rolling units, many of which are family-owned or operate as smaller businesses. These units mainly cater to local or regional markets.

Future Trends: Organized vs. Unorganized Sector

- The organized sector consisting of medium and large sized players is undergoing significant changes. Players such as Deem Rolls is actively increasing their production capacity. As a result, by fiscal 2030, ~40-45% of the market will be dominated by organized players.
- In contrast, the market of small players is likely to decline. Many small scale players struggle to produce high-quality rolls, despite ongoing efforts. Consequently, large manufacturers are reducing their reliance on small suppliers. Based on the industry insights, the market of small and unorganized players likely to be shrink by 4-6% and projected to be at ~55-60% by fiscal 2030.

Market share of large, medium and small players (Fiscal 2024)



Source: Industry, CRISIL Intelligence Consulting

Large and Medium size players (~70% of market share):

The top players in the metal rolls industry are Behari Lal engineering Ltd., Bharat Rolls Industry Pvt Ltd., Deem roll tech Ltd., Multi serve etc. who hold a significant share of market and have a notable share in exports. These large companies supply their metal rolls to large integrated Indian finished steel product manufacturers like SAIL, RINL etc. as well as multinational corporations such as JSW, JSPL, Tata Steel etc. Large and medium size players together account for ~70% (~58-63 KT) of the market share of metal rolls in India.

Small Players (~30% of market size):

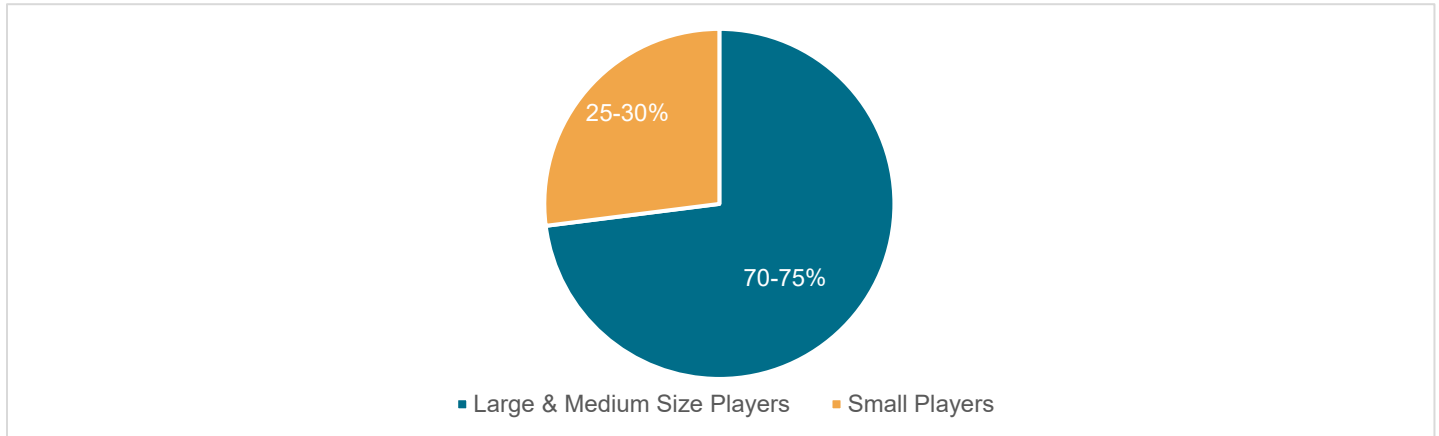
In contrast, there is a large number of small, unorganized players in the industry, who mainly cater to smaller rolling and re-rolling mills by offering low-cost, lower-quality rolls. Some of these smaller players also engage in importing cheap rolls from China, relabelling them under their own brand, and selling them in the domestic market. These smaller players are mostly concentrated in the northern and eastern regions of India catering to the secondary re-rollers/IF units, forming clusters of low-cost production units.

Competitiveness: The industry in India is highly competitive, with both domestic players and imports from countries like China, Japan, and South Korea. Price sensitivity is high, and businesses are under constant pressure to maintain cost efficiency while improving product quality.

Large Imports of high-quality metal rolls: India imports significant quantities of high-quality metal rolls from companies such as BRC Global Rolls, which supply directly to leading domestic manufacturers of finished steel products. Given that Behari Lal specializes in manufacturing high-quality rolls at competitive prices, there is strong potential for import substitution. This presents a substantial opportunity for Behari Lal to expand its market presence and reduce reliance on imported rolls.

Export Potential: India is a major exporter of metal rolls, particularly to Southeast Asia, the Middle East, and Africa. The cost competitiveness, quality improvement, and favourable government policies have bolstered India's export potential. Key export players are Deem Rolls, Behari Lal Engineering Ltd etc.

Projected Market Share (Fiscal 2030P)



Source: Industry, CRISIL Intelligence Consulting

The market share of medium and large sized players is going to increase to 70-75% by Fiscal 2030 as they are actively increasing their capacity. For Example, Deem Rolls have announced a capacity addition of 3,000 tons by fiscal 2025. In contrast, the market of small players is likely to decline by 4-5% and projected to be at ~25-30% by fiscal 2030.

Key trends and Challenges

- **Technological Divide:** The gap between the organized and unorganized sectors is significant, with organized players benefiting from automation, AI-driven processes, and better overall efficiency.
- **Labour and Skill set:** This industry requires mix of skilled, semi-skilled as well as un-skilled workforce. The industry requires skilled workforce, particularly in areas like quality control, machine operation, foundry and metallurgy. India has a strong educational and technical base in engineering, and many workers in this sector have been trained in metallurgy or mechanical engineering.
- **Environmental Concerns:** Organized players are more likely to adopt green and sustainable practices, while unorganized players face challenges in compliance with environmental regulations, often due to the lack of resources for adopting cleaner technologies.
- **Energy-Intensive Process:** The rolling process, particularly hot rolling, is highly energy-intensive. This is an ongoing challenge in India, where energy costs can be high, and the industry faces pressure to adopt more energy-efficient technologies.
- **Longer lead time resulting in lower operational leverage:** Manufacturing rolls for rolling mills is a complex process involving casting, machining, heat treatment, and quality testing. Longer lead times may result from specialized materials, precision engineering, and stringent quality checks. The metal rolls are high-value products that require significant capital investment in machinery and labour. A longer lead time means that capital is tied up for extended periods before the roll is ready for use, reducing the firm's ability to quickly scale production and generate revenues.

When the lead time for manufacturing metal rolls is long, companies face delays in production, increased capital lock-up, and reduced responsiveness to market demand. This negatively impacts operational leverage by limiting the ability to scale production efficiently, reducing profitability, and increasing overall costs.

- **Consumable nature of product/frequent replacement:** Metal rolls undergo continuous wear and tear during metal rolling operations, leading to frequent replacements. These rolls are subjected to high pressure, temperature, and mechanical stress, causing gradual surface degradation, cracking, and material fatigue. Factors such as the type of material being rolled, rolling speed, and cooling conditions further influence roll wear. As rolls

wear out, their surface roughness increases, affecting product quality and dimensional accuracy. To maintain efficiency and prevent production disruptions, rolling mills follow scheduled roll changes based on wear rates, ensuring optimal performance. The time of replacement varies depending on the roll material (e.g., cast iron, forged steel, or carbide), rolling conditions, and maintenance practices. Frequent roll replacement is essential for consistent production, minimizing downtime, and maintaining high-quality output in metal rolling processes.

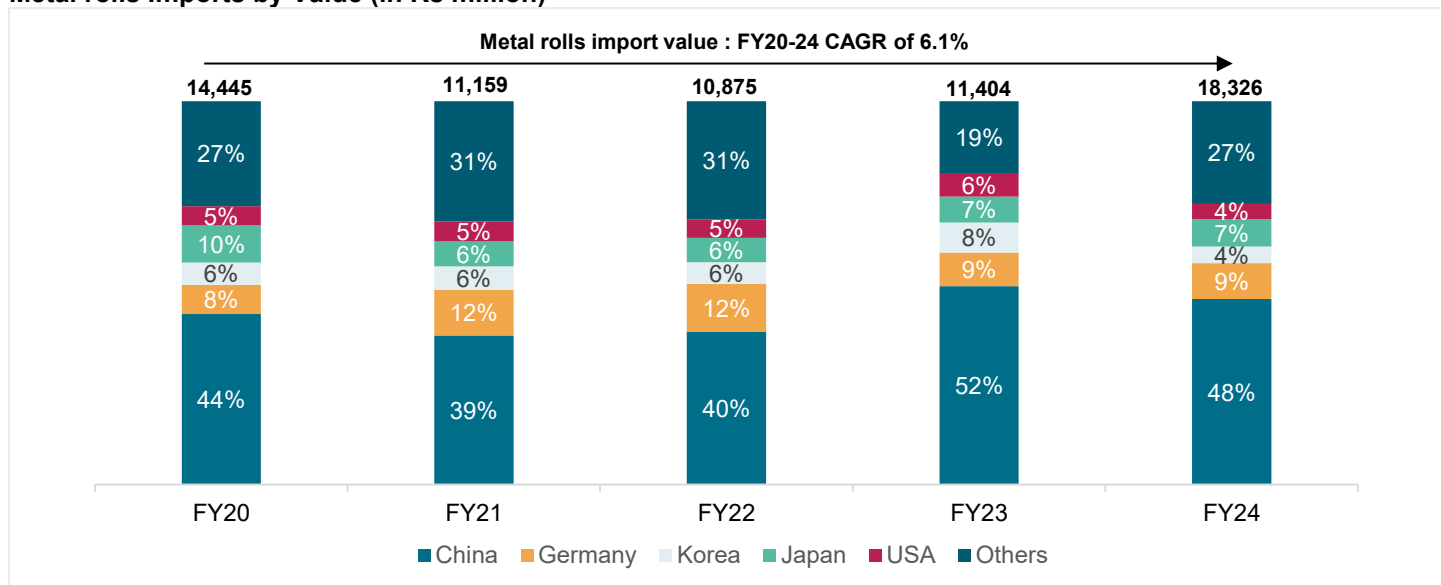
Outlook

- **Expansion in High Quality Products:** More industry players are expected to move toward producing those higher-value, high quality products like tungsten carbide rolls, ICDP rolls which are largely imported from outside India.
- **Green Initiatives:** The Indian metal rolls industry is likely to see further adoption of sustainable practices, such as the use of green technologies, renewable energy sources, and increased recycling.
- **Technological Upgrades:** As global competition intensifies, the adoption of advanced technologies like artificial intelligence (AI), machine learning, and automation will continue to play a significant role in optimizing manufacturing processes and enhancing quality control.
- **Import Substitution Advantage:** India has a significant opportunity to reduce reliance on imported metal rolls, which strengthens local production capacity and supports the "Make in India" initiative, ensuring better self-sufficiency in the sector.
- **Expanding Export Potential:** The global demand for metal rolls is on the rise, and India is well-positioned to tap into this growing export market, benefiting from its competitive manufacturing costs and advanced production capabilities.
- **Robust Domestic Demand:** With India's steel production seeing consistent growth, the demand for metal rolls in the domestic market is also expanding rapidly, creating a solid foundation for long-term growth in the sector.
- **Improved Profitability:** Higher import prices are driving better realisation for Indian manufacturers, allowing for increased profitability and making Indian-made metal rolls more attractive in both domestic and international markets.
- **Faster Delivery & Local Advantage:** Indian manufacturers can offer quicker turnaround times for deliveries, providing a competitive edge over global suppliers by reducing lead times and improving supply chain efficiency for domestic customers.

Trade overview

Imports trend

Metal rolls Imports by Value (in Rs million)



Source: Crisil Intelligence, DGFT

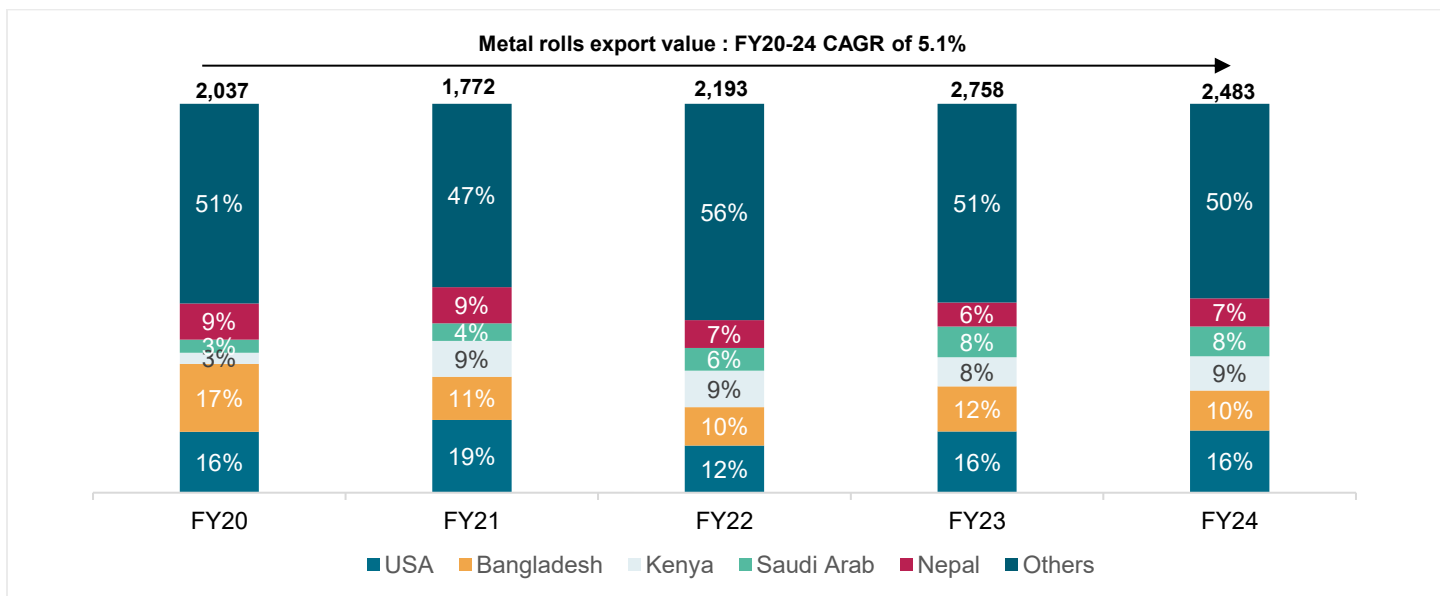
India's metal rolls imports increased from Rs. 14,445 million in fiscal 2020 to Rs. 18,326 million in fiscal 2024, registering a good CAGR of 6.1% during fiscals 2020-2024. The top 5 countries on the basis of import value were- China, Germany, Korea, Japan and USA. The distribution of imports from these primary countries has remained relatively stable over the years.

India's metal rolls imports increased from 39,000 units in fiscal 2020 to 131,000 units in fiscal 2024, registering a good CAGR of 35.5% during fiscals 2020-2024.

China is the largest exporter of metal rolls on number basis to India, accounting 90% (118,500 units) of India's total metal rolls imports in fiscal 2024. However, while China dominates in terms of metal rolls imported, it contributes a slightly lower percentage to the overall import value, at 39-52%, indicating that although the country imports the largest quantity of metal rolls from India, the value per unit is lower compared with other importing countries. This is because a large number of small players imports cheap metal rolls from China and relabel it by their own brand before selling it to small size rolling/re-rolling mills in India.

Exports trend

Metal rolls Export by Value (in Rs million)



Source: Crisil Intelligence, DGFT

India's metal rolls exports value increased from Rs. 2,307 million in fiscal 2020 to Rs. 2,483 million in fiscal 2024, registering a CAGR of 5.1% during fiscals 2020-2024. USA topped the list of top 5 importers of india's metal rolls- USA, Bangladesh, Kenya, Saudi Arab and Nepal, which together accounted to ~44-53% of the exports by value basis.

India's metal rolls exports increased from 66,000 units in fiscal 2020 to 122,000 units in fiscal 2024, registering a good CAGR of 16.5% during fiscals 2020-2024. The export pattern on quantity basis remained uneven throughout the review period.

While USA, Bangladesh, Kenya, Saudi Arab and Nepal were a regular importers of metal rolls which accounted for ~44-53% of the exports by value, their share in the export quantity remained within a range of 27-36%, meaning a higher average exports realisation from these countries and a much lower realisation from rest ~64-73% of the exports.

Overall, the imports for metal rolls increased at a much faster CAGR of 35.5% when compared to the rate at which exports from India grew at a rate of 16.4%, highlighting the dependence of India on International markets for metal rolls.

Improved Revenue Potential for Indian Manufacturers: Due to high import prices, Indian manufacturers, including companies like Behari Lal Engineering Ltd., can achieve better realization for their products. This creates an opportunity for enhanced profit margins, making Indian-made metal rolls more competitive in both the domestic and international.

Overview of the engineering castings & aggregate crushers industry

Overview of Indian foundry/castings industry

The casting and foundry industry is a key part of the manufacturing sector that produces metal components used in various industries, including automotive, aerospace, construction, railways, sugar, sponge iron, cement, power generation, mining and heavy engineering. This industry plays a crucial role in shaping raw metals into finished products that are essential for industrial and consumer applications.

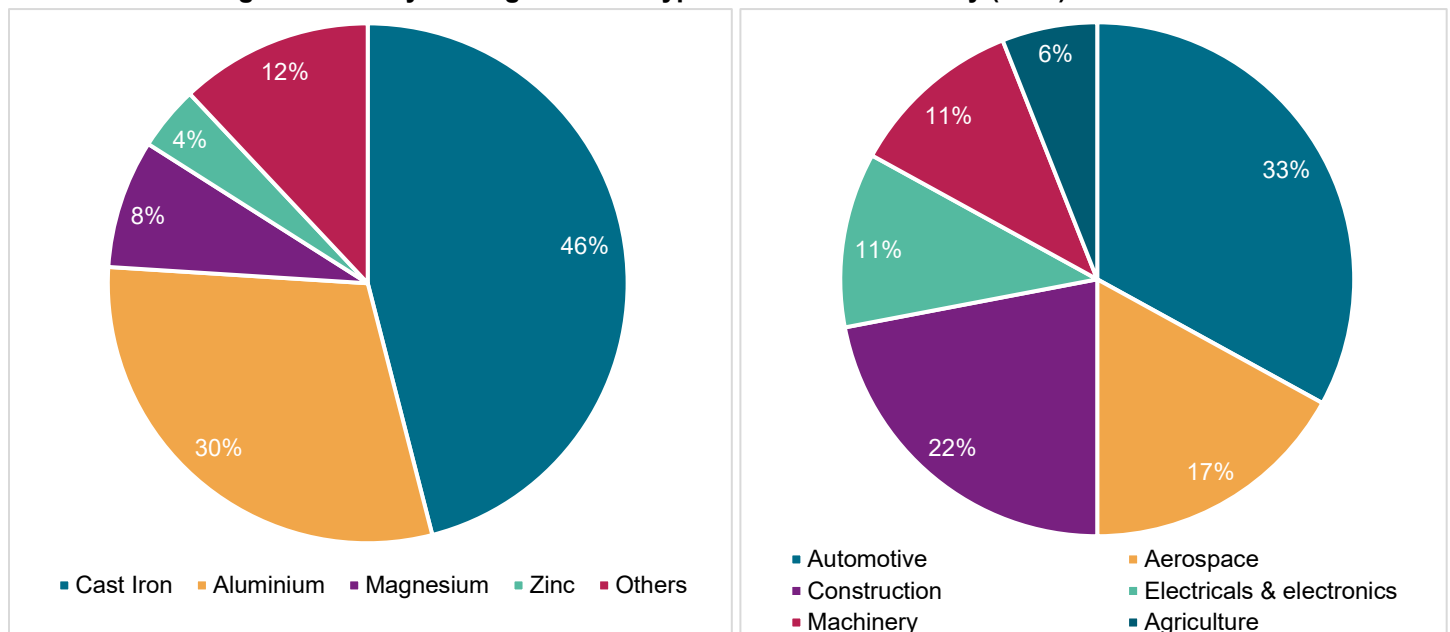
Casting is a manufacturing process where molten metal is poured into a mold and allowed to cool and solidify into a specific shape. Once hardened, the metal casting is removed from the mold and may undergo additional machining or finishing processes. This technique is widely used because it allows for the production of complex shapes that would be difficult or expensive to manufacture using other methods like machining or forging.

A foundry is a specialized facility where casting takes place. It consists of furnaces for melting metal, molds for shaping, and finishing equipment for refining the final product. Foundries work with various metals such as iron, steel, aluminum, bronze, and magnesium, depending on the intended application.

Global castings scenario

As per the World casting Census published by Modern Castings USA, Global Casting Production was estimated at 113.14 million tons in 2021, with China, India, and the United States ranking as the top three casting-producing countries.

Global demand segmentation by castings material type and end use industry (2021)



Source: Census of World Casting Production December 2021, CRISIL Intelligence Consulting

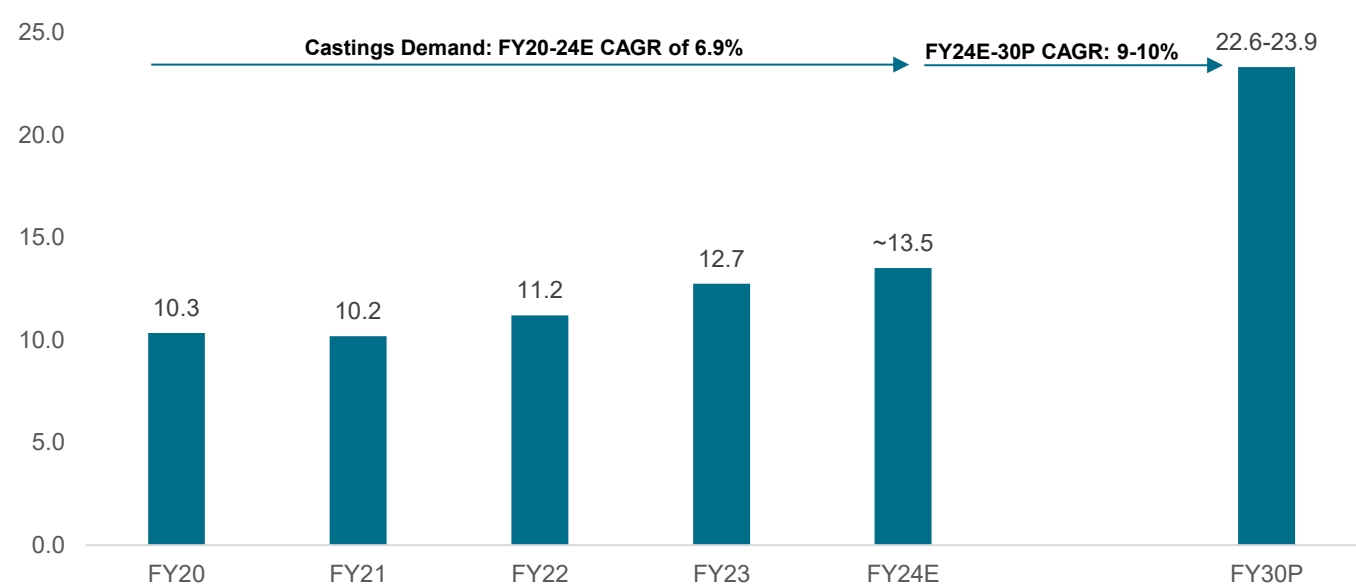
The global casting industry is primarily dominated by cast iron, accounting for 46% of total production, followed by aluminum (30%), magnesium (8%), zinc (4%), and other materials (12%). Cast iron remains the most widely used material due to its strength and cost-effectiveness, while aluminum and magnesium are gaining traction in industries focused on lightweight materials, such as automotive and aerospace.

In terms of end-use industries, automotive leads with 33% of global casting demand, followed by machinery (22%), construction (17%), aerospace (11%), electronics (11%), and agriculture (6%). The increasing demand for fuel-efficient vehicles, infrastructure development, and industrial machinery is driving growth in these sectors, with manufacturers focusing on advanced materials and sustainable production methods to meet global requirements.

India’s castings demand scenario

The foundry and castings market in India is a dynamic and essential part of the country's manufacturing sector. The castings demand in India stood at 10.3 million tons during fiscal 2020 and reached ~13.5 million tons during fiscal 2024, registering a CAGR of 6.9%.

India’s Engineering castings demand (in million tonne)



E: Estimated; P: Projected
Source: Industry, CRISIL Intelligence Consulting

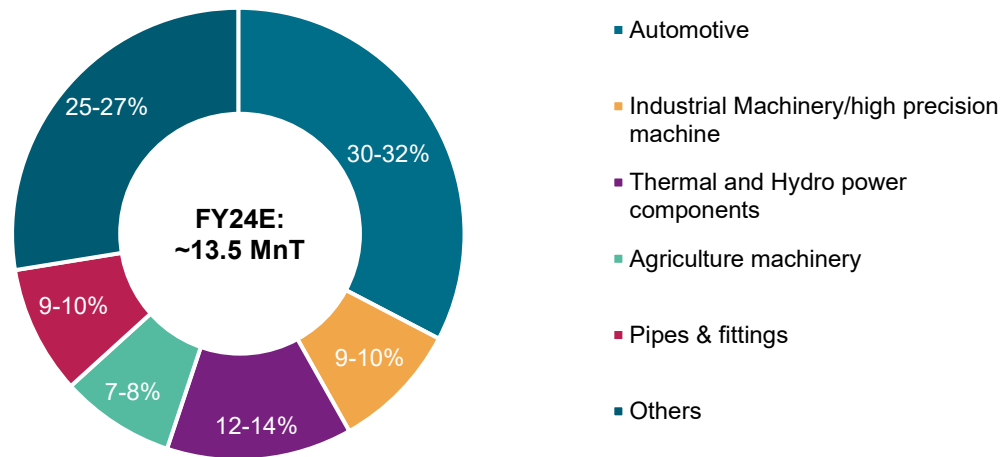
The Indian foundry market is expected to grow steadily at a rate of 9-10% during fiscals 2024-2030 to reach ~22.6-23.9 million tons in fiscal 2030, driven by demand from sectors like automotive, infrastructure, energy, and defense. The growing middle class and urbanization will further boost demand for industrial products that rely on castings.

The Indian market is experiencing a surge in demand for metal castings, driven by the rapid growth of infrastructure projects and increased government spending on expansion initiatives. This, in turn, has created a significant need for various machinery and equipment.

The country's thriving automobile sector, which has established India as a leading vehicle producer, is also a major contributor to the market's growth.

Advances in foundry technology have further boosted production while reducing costs, thanks to innovative practices and techniques. Meanwhile, the ongoing infrastructure development in India has led to a steady and substantial demand for metal rolls from hot rolling mills, which produce long and flat products, driving the market forward.

Castings demand segmentation by end use industries (Fiscal 2024)



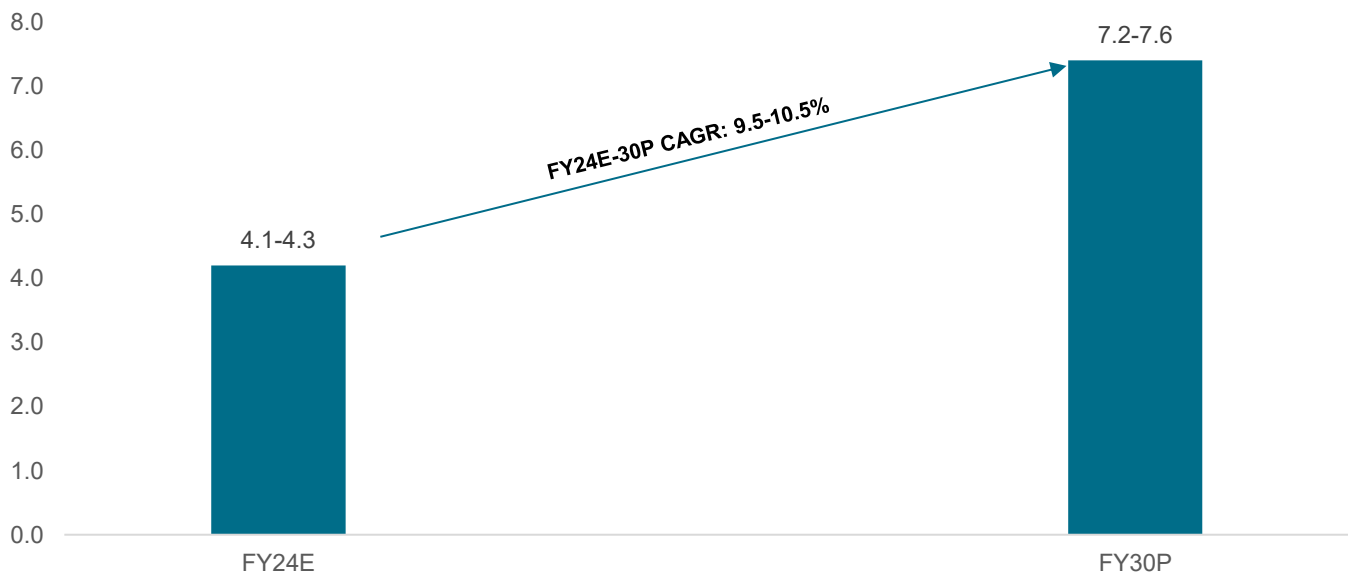
E: Estimated

Source: Industry, CRISIL Intelligence Consulting

Castings for Automotive Industry- overview and outlook

In automotive industry, castings are used in engine blocks, cylinder heads, transmission components, chassis, and other critical automotive parts. The automotive sector is one of the largest consumers of castings in India, and the demand for castings is expected to increase as the sector continues to grow.

Castings used for Automotive Industry (Demand in MT)



E: Estimated; P: Projected

Source: Industry, CRISIL Intelligence Consulting

India's castings demand for automotive industry in industry for fiscal 2024 is estimated at ~4.1-4.3 million tons. It is projected to increase at a CAGR of ~9.5-10.5% during fiscals 2024-2030 and reach ~7.2-7.6 million tons in fiscal 2030.

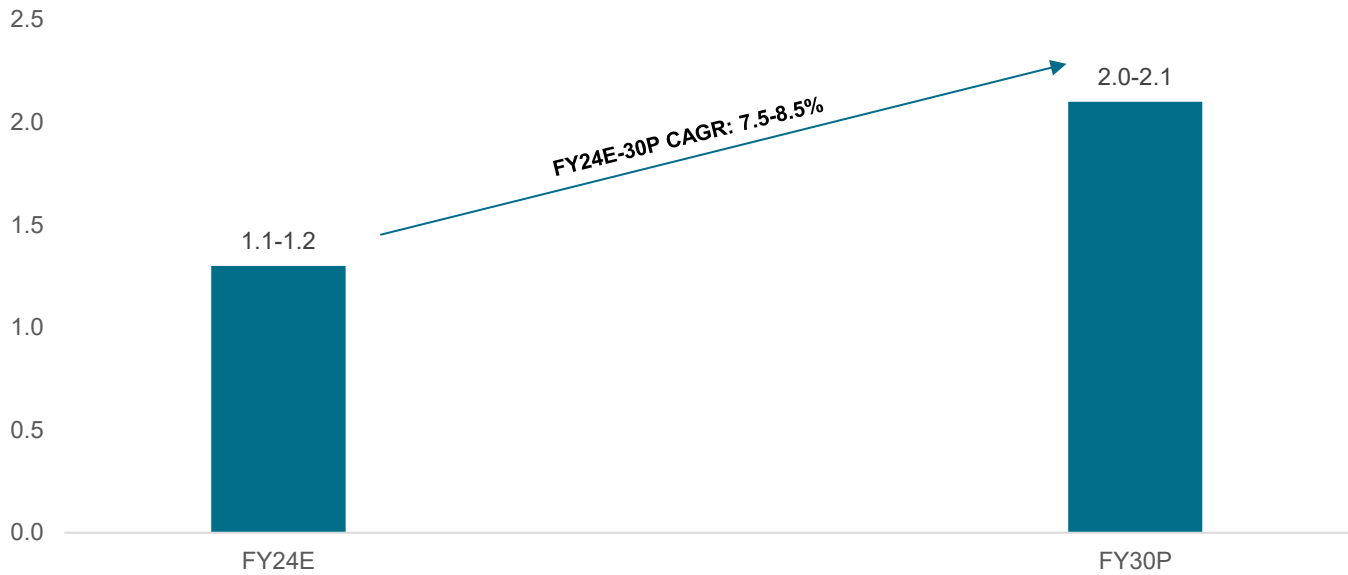
The key growth drivers for castings in the automobile industry include:

- **Increased Demand for Lightweight Vehicles:** The growing emphasis on fuel efficiency and reduced emissions has led to a demand for lightweight materials. Castings, especially those made from aluminum and magnesium, are ideal for reducing vehicle weight while maintaining strength and durability.
- **Technological Advancements in Casting Techniques:** Innovations in casting processes, such as 3D printing (additive manufacturing), die casting, and sand casting, have improved the precision, complexity, and cost-efficiency of cast parts. This allows automakers to create more intricate and efficient components.
- **Electrification of Vehicles:** The rise of electric vehicles (EVs) is boosting the demand for castings, particularly for components like battery enclosures, motor housings, and chassis. These parts require high-performance materials, which castings can provide at a lower weight.
- **Automotive Industry Growth:** Global growth in automobile production, especially in emerging markets, continues to drive the demand for castings. As vehicle production increases, so does the need for high-quality cast parts.
- **Stringent Regulatory Standards:** Governments are implementing stricter emission and safety regulations, prompting automakers to use high-strength castings for improved safety features (e.g., crash-resistant structures) and to meet efficiency standards.
- **Customization and Complexity of Design:** Modern vehicle designs often involve more complex geometries and customized parts, which are easier and more cost-effective to produce through casting methods compared to traditional machining.
- **Automotive Industry Shift Toward Sustainability:** The automobile industry's growing focus on sustainability and recycling drives the use of aluminum and other recyclable materials in casting processes. Cast parts can often be recycled, aligning with eco-friendly initiatives.
- **Integration of Smart Manufacturing:** The adoption of Industry 4.0 and smart manufacturing technologies in casting processes, such as robotics, sensors, and AI, is enhancing productivity, quality, and cost efficiency in casting production.
- **Demand for High-Performance Materials:** As consumer preferences shift toward vehicles with enhanced performance and durability (such as high-performance sports cars)

Castings for Industrial/High precision machining Industry- overview and outlook

Castings are used in industrial machinery, such as pumps, compressors, valves, and gears. The industrial equipment sector is a significant consumer of castings in India, and the demand for castings is expected to increase as the sector continues to grow.

Castings used for Industrial/High precision machining (Demand in MT)



E: Estimated; P: Projected

Source: Industry, CRISIL Intelligence Consulting

India's castings demand for Industrial or high precision machinery industry for fiscal 2024 is estimated at ~1.1-1.2 million tons. It is projected to increase at a CAGR of ~7.5-8.5% during fiscals 2024-2030 and reach ~2.0-2.1 million tons in fiscal 2030.

The key growth drivers for castings in Industrial/High precision machining include:

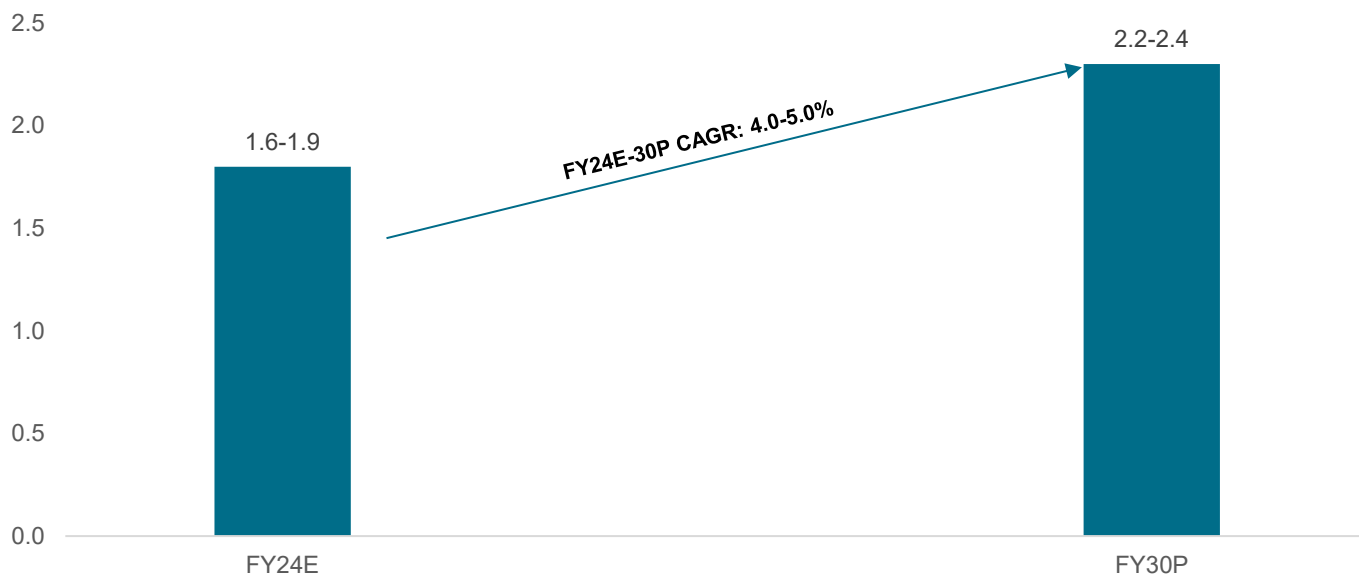
- **Rising Capital Goods & Heavy Machinery Demand:** India's capital goods sector is expected to grow at 12-14% CAGR, driven by increasing industrialization and infrastructure projects. Investments in power plants, mining, and construction equipment are boosting demand for cast housings, frames, and gear components.
- **Expansion of CNC & Precision Machining Industry:** India's CNC machine tools market is projected to reach \$3.7 billion by 2027, requiring high precision cast parts for lathe beds, spindles, and enclosures.
- **Government Push for 'Make in India' & PLI Schemes:** The Production Linked Incentive (PLI) scheme for capital goods and heavy engineering is encouraging local casting manufacturing. Lower import dependence on China and Europe is driving domestic foundry investments.
- **Infrastructure Boom Driving Demand for Heavy Castings:** India's National Infrastructure Pipeline (NIP) aims to invest ₹111 lakh crore by 2025, leading to higher demand for steel castings in bridges, railways, and metro projects. Companies like Texmaco Rail and Titagarh Wagons are investing in casting capacities for railway components.
- **Advancements in Foundry Technologies & Smart Manufacturing:** Adoption of 3D sand printing, robotic pouring, and real-time defect analysis is improving precision in industrial castings. High-pressure die casting (HPDC) and investment casting are gaining traction in specialized applications like aerospace and defense.
- **Local Sourcing & Supply Chain Optimization:** To reduce dependence on imports, Indian OEMs are sourcing from local foundries such as Electro steel Castings, Magna Electro Castings, and Amtek Auto.

Casting hubs in Coimbatore, Rajkot, and Kolhapur are witnessing increased investments in high precision casting facilities. or heavy-duty trucks), the demand for high strength, precision cast parts are growing.

Castings for Thermal and Hydro power components- overview and Outlook

Castings are used in power generation, especially for turbines, boilers, and generators. The energy sector is a significant consumer of castings in India, and the demand for castings is expected to increase as the sector continues to grow.

Castings used for Thermal and Hydro power components (Demand in MT)



E: Estimated; P: Projected

Source: Industry, CRISIL Intelligence Consulting

India's castings demand for Thermal and Hydro power industry for fiscal 2024 is estimated at ~1.6-1.9 million tons. It is projected to increase at a CAGR of ~4.0-5.0% during fiscals 2024-2030 and reach ~2.2-2.4 million tons in fiscal 2030.

Key Growth Drivers of Castings for Thermal & Hydro Power Components in India

- **Increasing Investments in Power Generation:** India's installed power capacity is set to reach 820 GW by 2030, driving demand for turbines, rotors, casings, and structural castings.
- **Thermal Power Expansion:** Despite a shift to renewables, India is adding 17 GW of coal-based capacity by 2027, ensuring continued demand for boiler, turbine, and pump castings.
- **Hydro Power Growth:** India aims to reach 70 GW of hydro capacity by 2030, requiring large-scale turbine and valve castings.

Government Policies & Investments:

- **PLI Scheme for Capital Goods:** Incentivizes local manufacturing of power equipment, reducing reliance on Chinese castings.
- **Hydropower Development Plan:** ₹20,000 crore investment in projects like Subansiri (2,000 MW) and Dibang (2,880 MW) is fueling demand for large turbine castings.
- **Expansion of Domestic Manufacturing:** Companies like BHEL, L&T, and GE Power India are ramping up domestic production of cast turbines, generator frames, and pressure parts. Foundry hubs in Punjab, Jharkhand, Chhattisgarh, and Tamil Nadu are scaling up large casting production.

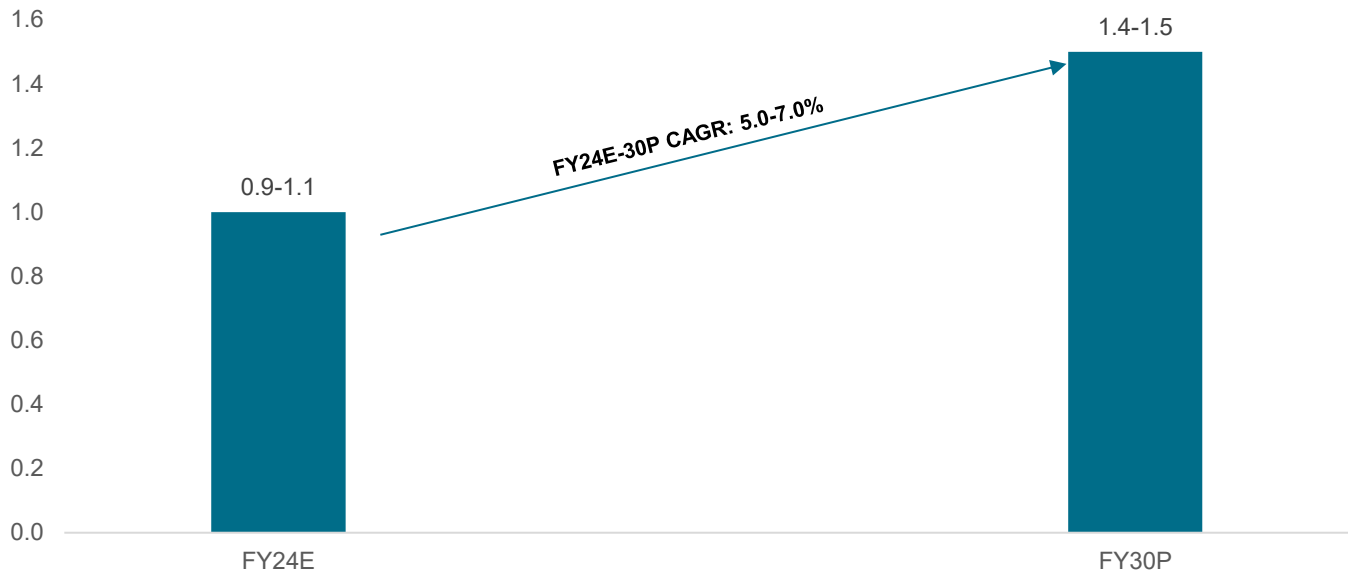
- **Modernization & Efficiency Upgrades:** Supercritical & Ultra-Supercritical Thermal Plants require high-performance steel and alloy castings to withstand extreme temperatures and pressures. Retrofitting of aging hydro plants is driving demand for replacement castings for runners, guide vanes, and casing parts.
- **Rising Demand for Precision & High-Strength Castings:** High-pressure steel castings, stainless steel (SS), and ductile iron components are increasingly used in hydro turbine casings and boiler components. Adoption of investment casting and sand casting techniques to improve efficiency and reduce downtime.
- **Localization & Supply Chain Optimization:** To reduce import dependency, NTPC and NHPC are sourcing more cast components locally.

Castings for Agriculture machinery- overview and outlook

Castings are widely used in the production of agricultural machinery, including tractors, harvesters, plows, and other equipment. Here are some examples of castings used in agricultural machinery:

- **Engine Blocks:** Cast iron or aluminum engine blocks are used in tractors and other agricultural equipment to house the engine's cylinders and provide a strong foundation for the engine.
- **Transmission Housings:** Cast iron or aluminum transmission housings are used to enclose the transmission components, such as gears and bearings, and provide a strong and durable structure for the transmission.
- **Gearboxes:** Cast iron or steel gearboxes are used to transmit power from the engine to the wheels or other components of the agricultural equipment.
- **Axle Housings:** Cast iron or steel axle housings are used to support the axles and provide a strong and durable structure for the wheels and other components.
- **Plow Shares:** Cast steel plow shares are used in plows to break and turn over soil, and are designed to withstand the stresses and wear of plowing.
- **Cylinder Blocks:** Cast iron or aluminum cylinder blocks are used in hydraulic cylinders to provide a strong and durable structure for the cylinder and piston.
- **Pump Housings:** Cast iron or aluminum pump housings are used to enclose the pump components, such as impellers and gears, and provide a strong and durable structure for the pump.
- **Harvester Heads:** Cast steel or aluminum harvester heads are used in combine harvesters to cut and collect crops and are designed to withstand the stresses and wear of harvesting.

Castings used for Agriculture machinery (Demand in MT)



E: Estimated; P: Projected

Source: Industry, CRISIL Intelligence Consulting

India's castings demand for Agriculture machinery for fiscal 2024 is estimated at ~1.0-1.1 million tons. It is projected to increase at a CAGR of ~5.0-7.0% during fiscals 2024-2030 and reach ~1.4-1.5 million tons in fiscal 2030.

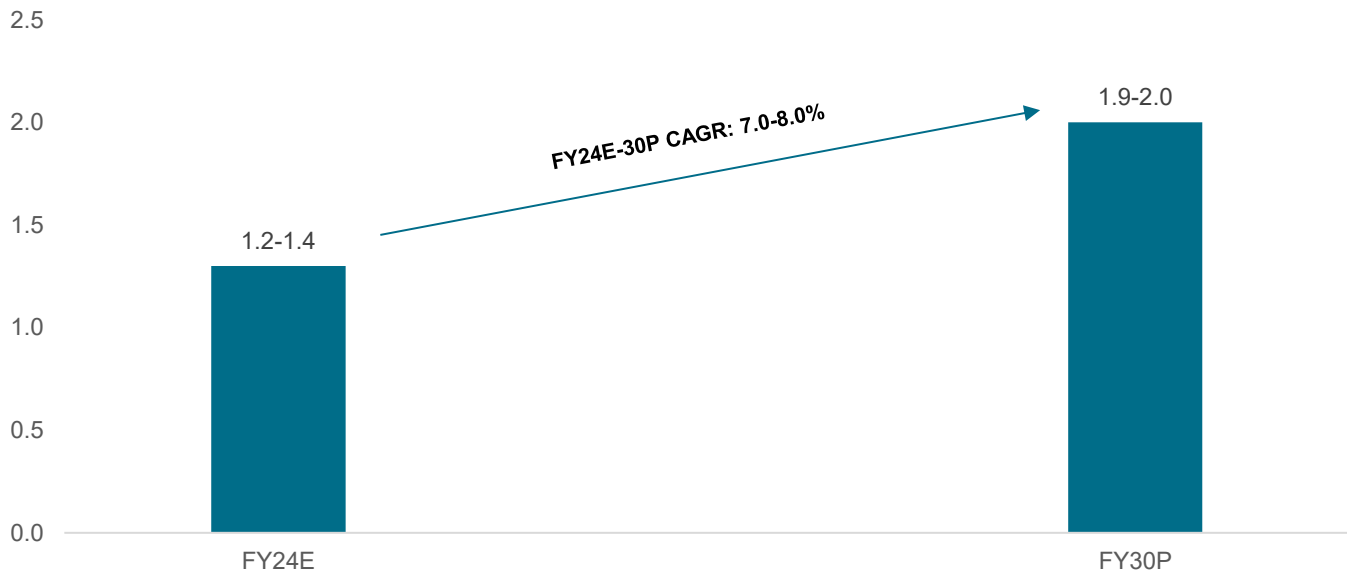
Key Growth Drivers of Castings for Agricultural Machinery in India:

- **Rising Farm Mechanization:** India's farm mechanization rate is expected to reach 70% by 2030 (from ~50% currently), boosting demand for cast components in tractors, tillers, harvesters, and irrigation pumps. Government schemes like Sub-Mission on Agricultural Mechanization (SMAM) are promoting modern equipment adoption.
- **Growth in Tractor & Farm Equipment Sales:** India is the world's largest tractor market, producing over 1 million tractors annually, requiring castings for engine blocks, gearbox housings, and axle components. Companies like Mahindra & Mahindra, TAFE, Escorts, and John Deere India are expanding manufacturing, increasing demand for high-precision castings.
- **Government Support & Subsidies:** PM-KISAN and other subsidy programs are making farm machinery more affordable, driving higher production and casting requirements. Custom hiring centres (CHCs) are promoting shared mechanization, increasing the need for durable cast parts.
- **Shift Towards Durable & High-Performance Materials:** Demand for ductile iron (DI), steel, and alloy castings is rising due to their superior strength and wear resistance in plows, seed drills, and combine harvesters. Investment in precision casting technologies like sand casting, investment casting, and shell moulding is improving component durability.
- **Growth in Irrigation & Water Management Equipment:** Increased investments in drip irrigation, borewell pumps, and sprinkler systems are driving demand for cast iron and steel pump casings, valves, and pipe fittings.
- **Expansion of Domestic Foundries & Localization:** Leading casting hubs in Coimbatore, Rajkot, Kolhapur, and Ludhiana are expanding to meet rising demand. OEMs are sourcing more locally to reduce import dependence and optimize supply chains.
- **Export Potential for Agricultural Castings:** India is emerging as an export hub for farm equipment to Africa, Southeast Asia, and Latin America, increasing demand for export-grade precision castings. Companies like Sonalika, VST Tillers, and CNH Industrial India are investing in casting capacities to cater to global markets.

Castings for Pipes & fittings- overview and outlook

Cast iron and steel castings are widely used in infrastructure applications, such as manhole covers, pipes, valves, and structural components for construction machinery. The infrastructure and construction sector are another significant consumer of castings in India, and the demand for castings is expected to increase as the sector continues to grow.

Castings used for Pipes & fittings (Demand in MT)



E: Estimated; P: Projected

Source: Industry, CRISIL Intelligence Consulting

India's castings demand for pipes and fittings for fiscal 2024 is estimated at ~1.2-1.4 million tons. It is projected to increase at a CAGR of ~7.0-8.0% during fiscals 2024-2030 and reach ~1.9-2.0 million tons in fiscal 2030.

Key Growth Drivers of Castings for Pipes & Fittings Industry in India:

- **Increasing Investments in Water Supply & Sanitation Projects:** Government programs like Jal Jeevan Mission (₹3.6 lakh crore investment) and AMRUT 2.0 (₹2.87 lakh crore) are driving demand for ductile iron (DI) and cast iron (CI) pipes. Rising urbanization is boosting the need for municipal water supply, drainage systems, and sewage treatment plants.
- **Rapid Expansion of Urban Infrastructure:** Smart Cities Mission & Housing for All are fuelling demand for plumbing, drainage, and gas pipeline fittings. Metro, railway, and industrial corridors require high strength cast iron and steel pipe fittings for structural support.
- **Growth in Oil & Gas and Industrial Pipelines:** India's natural gas pipeline network (expanding to 35,000 km by 2030) is increasing demand for steel and alloy castings used in pipeline valves, joints, and flanges. Rising demand for petrochemical and refinery expansion is driving investment in high-pressure cast fittings.
- **Rising Demand for Durable & Corrosion-Resistant Materials:** Shift from traditional cast iron to ductile iron (DI) pipes, which offer better strength and corrosion resistance, especially in water and sewage applications. Stainless steel and alloy-based castings are gaining traction in chemical, food processing, and pharmaceutical industries.
- **Growth in Agricultural Irrigation Networks:** PM Krishi Sinchai Yojana (₹93,068 crore investment) is driving demand for cast iron and steel pipe fittings in canal and drip irrigation systems. Rising farm mechanization is increasing the need for pump castings, valves, and borewell fittings.

- **Expansion of Domestic Foundries & Local Sourcing:** Companies like Electro steel Castings, Jindal SAW, Tata Metaliks, and Srikalahasthi Pipes are expanding DI pipe production. Government emphasis on Atmanirbhar Bharat (self-reliant India) is promoting domestic manufacturing over imports.
- **Export Opportunities for Ductile Iron & Steel Pipe Castings:** India is a major exporter of DI pipes and cast fittings to markets in Middle East, Africa, and Southeast Asia. Companies are investing in advanced moulding and precision casting technologies to meet international quality standards.

Castings for heavy industries:

The casting and foundry industry plays a crucial role in manufacturing critical components for various heavy industries, including sponge iron, sugar, cement, power generation, steel plants, and rolling mills.

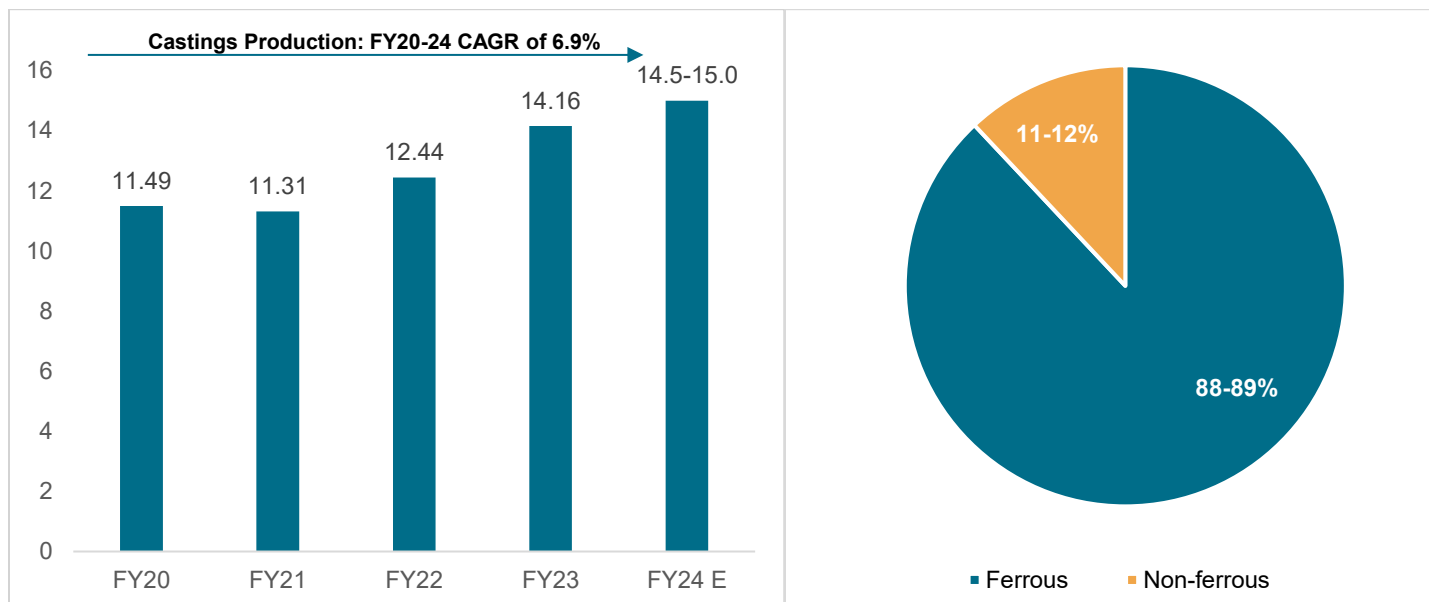
Industry	Castings type/component	Application
Sponge Iron Industry	Kiln Support Rollers & Tyres	Used in rotary kilns for sponge iron production
	Grate Bars	Used in traveling grate systems for efficient combustion
	End Sealing Plates & Bearing Housings	Enhance operational stability
	Ductile Iron Pipes & Fittings	Essential for handling process gases
Sugar Industry	Mill Rollers & Pinions	Crucial for crushing sugarcane efficiently
	Trash Plates & Side Plates	Help guide the cane during milling
	Scraper Plates & Hammers	Used in sugar refining and crystallization
	Boiler Grates & Fire Bars	Essential for efficient boiler operation
Cement Industry	Grinding Media (Balls & Liners)	Used in cement mills for grinding clinker
	Kiln Tyres Girth Gears & Support Rollers	Provide stability and rotation support for rotary kilns
	Clinker Breaker Hammers	Used for crushing clinker postproduction
	Wear Resistant Plates & Impellers	Help with material handling and conveying
Power Generation	Turbine Blades & Housings	Cast from high strength alloys for durability
	Boiler Components (Grates, Tubes, Burners)	Used in thermal power plants
	Coal Pulverizer Parts	Castings used in mills for grinding coal before combustion
	Heat Resistant Castings	Used in high temperature environments of power plants
Steel Plants	Ladle & Tundish Refractories	Crucial for handling molten metal
	Rolling Mill Rolls & Chocks	Used in hot and cold rolling processes
	Slag Pots & Ingot Molds	Essential for handling and shaping molten steel
	Furnace Skulls & Hearth Plates	Used in steel smelting and refining processes
Rolling Mill Industry	Work Rolls & Backup Rolls	Used in hot and cold rolling mills for shaping metal sheets
	Mill Stands & Bearing Housings	Support rolling operations
	Guide Rollers & Cooling Plates	Assist in material movement and cooling
	Wear Plates & Liners	Enhance durability and reduce maintenance costs

Source: Industry, CRISIL Intelligence Consulting

India's castings supply scenario

India is the second-largest producer of castings, with a production of approximately 14.5-15.0 million tons in fiscal 2024.

India's castings production (in million tonnes) and segmentation by type (for fiscal 2024)



E: Estimated

Source: Industry, CRISIL Intelligence Consulting

The Indian foundry market can be broadly classified into two main segments: ferrous castings and non-ferrous castings. Ferrous castings (88-89%), which include gray iron and ductile iron, are widely used in the automotive, industrial machinery, and construction sectors. Non-ferrous castings (11-12%), which include aluminum, copper, and zinc, are used in a variety of applications, including automotive, electrical equipment, and consumer goods.

Global vs Indian ferrous castings

- While global iron casting production accounts for a share of 46%, Indian ferrous castings account for 89% of the country's overall castings. This significant difference can be attributed to the fact that the global casting industry is more diversified, with a substantial share of non-ferrous castings, such as aluminum, copper, and zinc. In contrast, India's casting industry has a strong focus on ferrous castings, particularly gray iron and ductile iron.

India's affinity for ferrous castings can be traced back to its long history of production, dating back to the 1950s and 1960s. Over the years, the country has developed a strong expertise in ferrous casting, with many foundries and casting companies specializing in this area. The availability of iron ore and coal, the primary raw materials for ferrous casting, has also contributed to the growth of the industry in India. The abundance of these raw materials has enabled Indian foundries to produce high-quality ferrous castings at competitive prices, making them an attractive option for both domestic and international markets. As a result, ferrous castings have become a dominant segment of India's casting industry, accounting for 89% of the country's overall castings production.

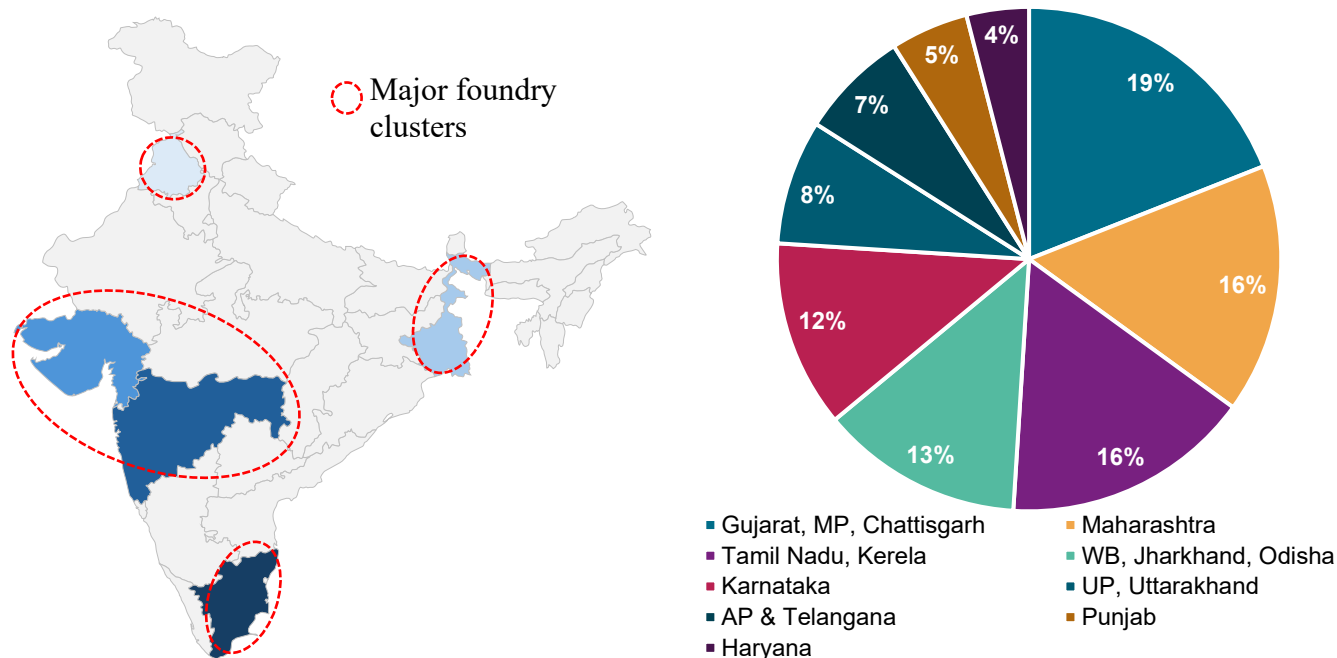
In contrast, the global casting industry is more fragmented, with a wider range of materials being cast, including non-ferrous metals like aluminum, copper, and zinc. This diversification has resulted in a lower share of ferrous castings in global production, at 46%. The difference in the share of ferrous castings between India and the global average highlights the unique characteristics of India's casting industry, which has evolved to specialize in ferrous castings due to its historical strengths, raw material availability, and market demand.

- India's ferrous casting industry is also export-oriented, with a significant share of production being exported to countries such as the United States, Europe, and Japan. This export orientation has helped the industry to grow

and maintain its competitiveness. During fiscal 2021, India exported 7.8 million tons of engineering castings (~69% of fiscal 2021's production).

With around 5,000 foundries in the country, nearly 90% belong to the MSME sector, making the industry highly fragmented yet essential to India's manufacturing ecosystem.

Major foundry clusters and State-wise dispersal of foundry/castings units in India



Source: Industry, CRISIL Intelligence Consulting

Major Foundry Clusters: Batala, Jalandhar, Ludhiana, Agra, Pune, Kolhapur, Sholapur, Rajkot, Mumbai, Belgaum, Coimbatore, Chennai, Shivamogga, Hyderabad, Howrah, Indore, Ahmedabad, Faridabad, Mandi Gobindgarh.

The foundry industry in India is concentrated in several regions, including:

1. **Tamil Nadu:** Tamil Nadu is the largest hub for foundries in India, contributing around 16% of the country's total foundry production. The state has a high concentration of automotive and industrial foundries, particularly in cities like Coimbatore, which is known as the "Foundry Hub of India."
2. **Maharashtra:** Maharashtra, particularly Pune and Nashik, is another key region for foundries, with a focus on automotive and industrial castings.
3. **Gujarat:** Gujarat is a growing center for industrial foundries, particularly for the automotive, energy, and infrastructure sectors.
4. **West Bengal:** Known for its historical manufacturing base, West Bengal has foundries that cater to the iron and steel industries and industrial equipment.
5. **Punjab:** a significant industrial foundry hub in northern India, primarily concentrated in cities like Batala, Jalandhar, Ludhiana, Mandi Gobindgarh, Phagwara. These cities are renowned for producing grey castings, which serve various sectors, including automotive, agricultural equipment and general engineering.

Some of the prominent players in the Indian foundry market include:

SN.	Company Name	Castings capacity (TPA)	Major category industry served
1.	Bharat Forge Ltd.	42,000	One of the largest manufacturers of forged and cast components in India, Bharat Forge is a key player in the automotive, aerospace, and industrial sectors
2.	Sundaram Clayton Ltd.	84,000	Prominent player in the automotive foundry segment, Sundaram Clayton manufactures aluminum die-cast components for automotive applications
3.	Amtek Auto Ltd.	135,000	Major player in the Indian automotive foundry sector, producing castings for engine blocks, cylinder heads, and transmission components.
4.	Kirloskar Ferrous Industries Ltd.	150,000	Significant manufacturer of iron castings, with products used in industrial applications such as pumps, valves, and engines
5.	Isgec Heavy Engineering Ltd	NA	Known for producing castings for industrial equipment, power plants, and defense applications.
6.	PTC industries	~6,000	Major player serving castings to Industrial & Defence and Aerospace industries.
7.	Behari Lal engineering Ltd	56,000	Significant castings manufacturer for aggregate crushers industry

Source: Industry, Crisil Intelligence

Key Trends in the Indian Foundry and Castings Market

- **Growth of Automotive and Electric Vehicles (EVs):** India's automotive sector is transitioning toward electric vehicles, which is driving the demand for lightweight and high-performance castings. Aluminum and magnesium castings are becoming increasingly important for EV components such as battery housings, chassis, and powertrain components.
- **Automation and Technological Advancements:** Indian foundries are increasingly adopting automation, robotics, and AI to improve production efficiency, quality control, and reduce costs. This trend is helping Indian foundries compete in global markets.
- **Sustainability and Environmental Concerns:** Environmental regulations are becoming stricter, and foundries in India are under pressure to reduce emissions, improve energy efficiency, and adopt greener practices, such as recycling and reducing waste.
- **Focus on Quality and Precision:** As India's industrial base becomes more sophisticated, there is an increasing emphasis on producing high-quality, precision castings for advanced applications in aerospace, defense, and machinery.

Challenges Facing the Indian Foundry Market

- **Rising Raw Material Costs:** The price of key raw materials, such as metals and energy, can be volatile, affecting the cost structure of foundries. Foundries often face pressure from global price fluctuations, which impact their competitiveness.
- **Skilled Labor Shortage:** There is a shortage of skilled labor in the foundry sector in India. While the industry is growing, there is a need for more trained workers, especially with the increased use of automation and advanced technologies.
- **Environmental Compliance:** Foundries in India need to comply with stringent environmental regulations regarding emissions and waste management. Many smaller foundries, in particular, struggle to meet these standards, which can result in increased operating costs.

- **Competition from Low-Cost Markets:** Foundries in India face competition from countries with lower labor costs and more advanced technologies, particularly China. This poses challenges in terms of pricing and maintaining market share.

Future Outlook for the Indian Foundry Market

- **Technological Upgradation:** The ongoing adoption of advanced technologies such as 3D printing (additive manufacturing), AI, and automation will help improve production efficiency and quality. These innovations are expected to open new opportunities for Indian foundries, particularly in precision casting for aerospace and defense.
- **Sustainability and Green Casting:** As environmental regulations become stricter, foundries in India will increasingly adopt green technologies, including electric furnaces and waste recycling, to reduce their environmental footprint.
 - Solar Energy Initiatives in Foundries- Many foundries are installing rooftop solar plants to reduce dependence on conventional power sources. For instance, a 570-kW solar plant has been generating 68,400 units of electricity per month, significantly lowering operational costs. Some foundries are also adopting a collaborative model, where 3-4 foundries collectively install solar plants ranging from 1 to 5 MW, ensuring shared benefits and optimized power generation.
 - Green Sand Reclamation- To further support sustainability, many foundries are investing in Green Sand Reclamation Plants to recycle used sand. Foundry clusters in Kolhapur and Belgaum have successfully established common sand reclamation plants, reducing waste and improving resource utilization.
- **Rising Exports:** India's foundry sector is expected to see a growth in exports, particularly to Europe, North America, and other emerging markets. The country's large-scale production capacity and cost advantage position it well to cater to global demand for castings.
- **Increasing demand for specialized castings:** The growth of industries such as automotive, aerospace, and energy has created a need for complex, high-precision castings. Indian foundries are leveraging this opportunity to produce high-value castings, which command premium prices.
- **Value-added services:** Many Indian foundries are now offering value-added services, such as machining, assembly, and testing, which enhance the overall value of their castings. These services not only increase revenue but also provide a competitive edge in the market.
- **High-value castings:**

Some of the examples of high value castings being manufactured in India include:

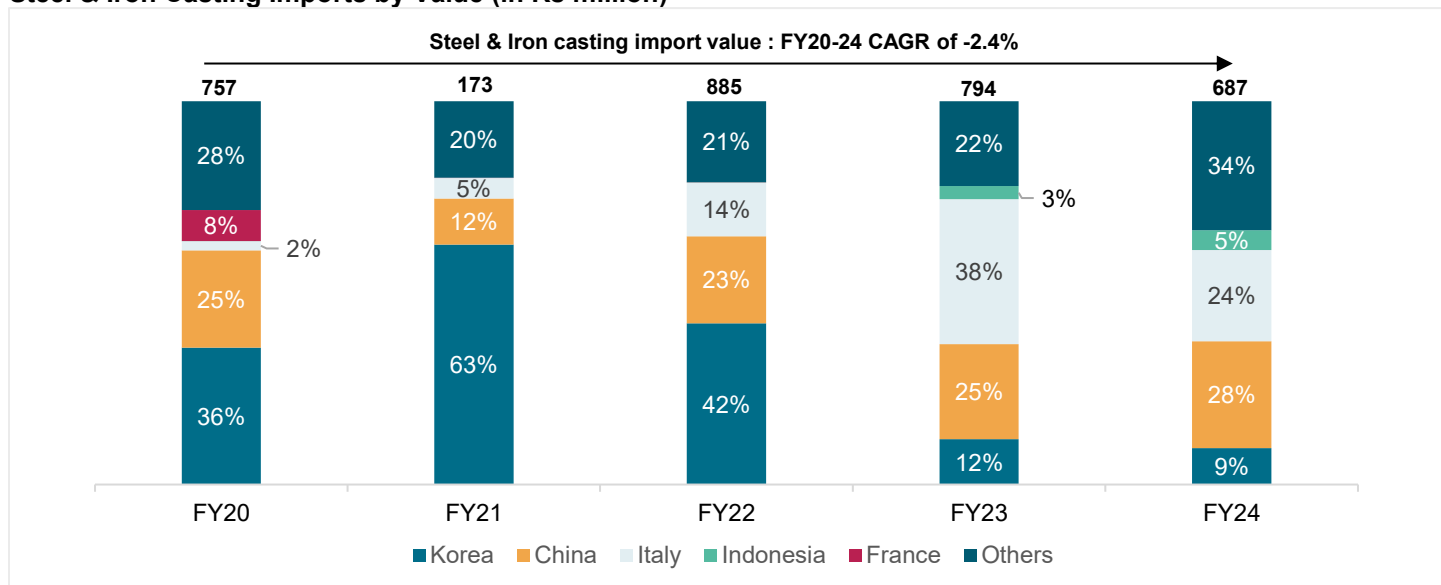
- Engine blocks and cylinder heads for the automotive industry
- Aerospace castings, such as turbine components and engine parts
- Industrial pump and valve castings for the oil and gas industry
- Medical equipment castings, such as implantable devices and surgical instruments
- Wind turbine castings, including hub and base components

By focusing on high-value castings and providing value-added services, the Indian castings industry is able to command better prices and improve profitability, making it a significant contributor to the country's manufacturing sector.

Trade overview (engineering castings)

Imports trend

Steel & Iron Casting Imports by Value (in Rs million)



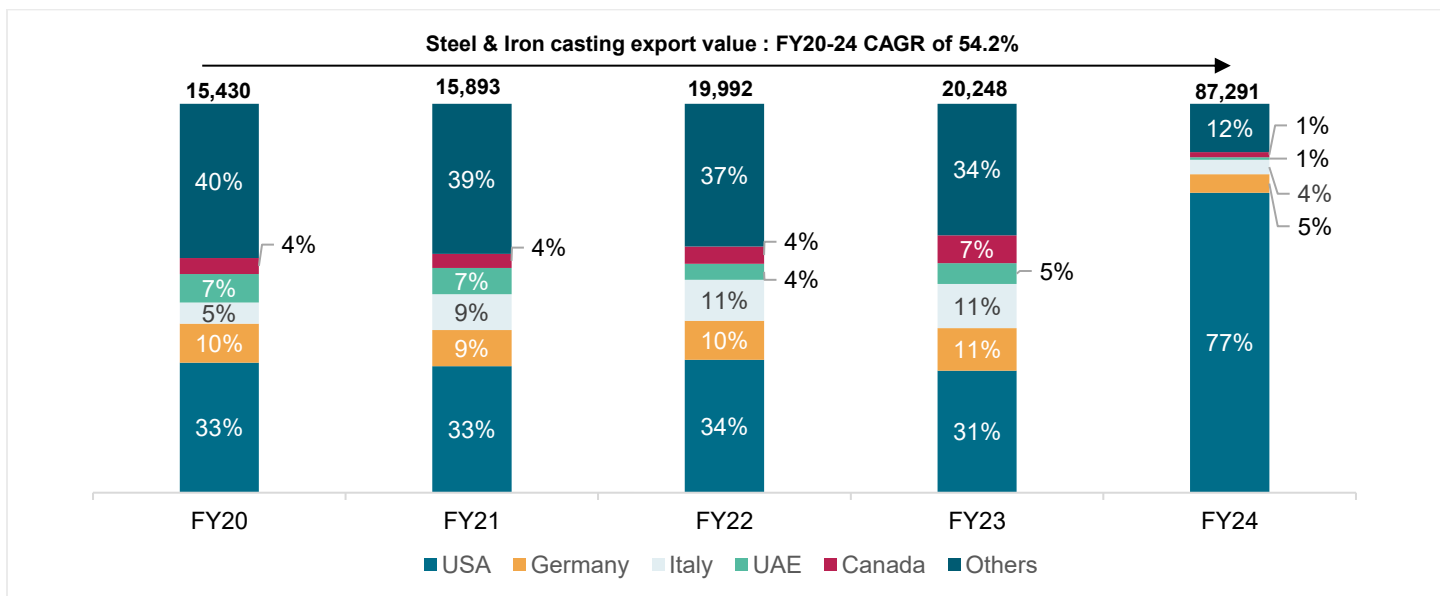
Source: Crisil Intelligence, DGFT

India's steel and iron casting imports decreased from Rs. 757 million in fiscal 2020 to Rs. 687 million in fiscal 2024, registering a CAGR of -2.4% during fiscals 2020-2024. The top 5 countries on the basis of import value were- Korea, China, Italy, Indonesia and France. The distribution of imports from these primary countries has been shifting over the years.

In fiscal 2024, China and Italy together contributed to ~52% of the overall value of steel and iron castings imported. Although Korea accounted for 36% of imports during fiscal 2020, but its share plummeted to 9% by fiscal 2024. Conversely, Italy's share surged from 2% in fiscal 2020 to 38% in fiscal 2023, before settling at 24% in fiscal 2024. China maintained a relatively stable presence, with its share ranging from 25% in fiscal 2020 to 28% in fiscal 2024. Notably, Indonesia emerged as a new source, contributing 5% of imports in fiscal 2024.

Exports trend

Steel & Iron Casting Export by Value (in Rs million)



Source: Crisil Intelligence, DGFT

India's steel and iron casting exports value increased from Rs. 15,430 million in fiscal 2020 to Rs. 87,291 million in fiscal 2024, registering a CAGR of 54.2% during fiscals 2020-2024. USA topped the list of top 5 importers of India's steel and iron casting- USA, Germany, Italy, UAE and Canada.

The country wise export break-up of steel and iron casting shows a significant shift in fiscal 2024, with the United States increasing its share to 77% from 31% in fiscal 2023. In contrast, other countries have seen their shares decline, with Germany's share dropping to 5% (half of fiscal's 2020's share; 10%). The United Arab Emirates and Canada have minimal shares in fiscal 2024, at 1% each, down from 5% and 7% respectively in fiscal 2023.

Overall, US has emerged as a dominant market for steel and iron casting exports, while other countries have lost ground in fiscal 2024. The following are a few reasons:

- **Shift from China (China+1 Strategy):** US buyers are reducing dependency on China due to geopolitical tensions, turning to India as a reliable alternative.
- **Decline in Global Supply:** Exporters from regions like Europe and China faced higher costs or trade barriers, creating space for Indian suppliers. For example, energy crises in Europe and rising production costs reduced EU's competitiveness. India filled the gap by ramping up production and leveraging lower input costs.
- **Rising US Demand:** Sectors like automotive, construction, and machinery in the US saw strong demand, boosting imports of castings.
- **Improved Indian Capability:** Indian foundries have upgraded quality, certifications, and ESG compliance—making them globally competitive.
- **Favorable Forex and Incentives:** The relatively weaker rupee and export schemes like RoDTEP helped Indian exporters offer competitive pricing. Castings being labor-intensive, India retains an edge over developed nations in cost efficiency.

Overview of aggregate crushers industry

The aggregate crushers industry in India plays a vital role in supplying aggregates - gravel, crushed stones, and sand, for the construction and infrastructure sectors. It forms a crucial part of the construction materials industry and serves as the

backbone of infrastructure development in India, which is experiencing a rapid increase in urbanization and infrastructure projects such as highways, bridges, and buildings.

The aggregate crushers and crushing equipments are made up of metal surfaces that are capable of compressing materials, such as stones, quartzite, rocks, iron, etc. Crushers are essential in reducing large rocks and materials into smaller, more manageable sizes for various industrial applications.

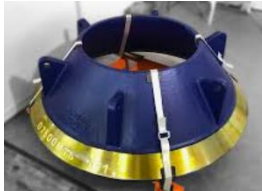
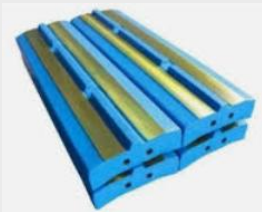
Aggregate crushers or stone crushing machines are used in various fields such as building materials, mining, metallurgy, highways, chemistry, railways, as well as continuous requirement from construction activities, such as highways, roads, canals, buildings, bridges, etc. Growing construction activities, steady growth of economies as well as continuous development of roads and highways is expected to fuel the demand for stone crushing equipment.

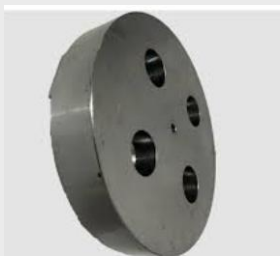
Critical Components used in Aggregate Crushers

The efficiency and durability of these crushers rely on several critical components, which play a key role in the crushing process. These components, such as jaw crusher, jaw plates, mantles, concaves, blow bars, and impact plates, are subjected to extreme wear and impact forces. To ensure their strength and longevity, they are manufactured using the casting process, which allows for high precision, durability, and resistance to heavy loads. Casting enables the production of complex shapes and metallurgical compositions tailored to withstand the harsh operating conditions of crushers.

The quality of these cast components directly impacts the crusher's performance, making them a crucial factor in determining efficiency, maintenance cycles, and overall productivity in aggregate processing.

Application areas and material used for critical casting components used in Aggregate Crushers

Component	Picture	Application	Material used
Jaw Plates		Crush large rocks into small aggregates	Alloy steel, High manganese steel
Cone crusher mantle & bowl liner		Used for secondary crushing	Alloy steel, Manganese steel, Ni-Hard Steel
Hammer & blow bars		Used in Impact crushers to break down the material	High chromium, Cast Iron, Manganese Steel
Crushers liners		Protects crushers chamber from wear	High chromium Iron, Manganese steel

Component	Picture	Application	Material used
Rotors & end disks		Used in impact crushers and hammer mill	High chromium steel, cast alloy steel
Crusher bearings		Supports rotating parts and reduces friction	Metal alloys
Feed tubes & distribution plates		Controls material distribution in VSI crushers	High Chromium cast iron

Source: Industry, Crisil Intelligence

The manufacturing of critical components used in aggregate crusher is a complex, multi-step process involving several stages of design, material selection, component fabrication, assembly, and testing. Major steps include:

1. Fabrication of Crusher Components:

- **Cutting and Shaping:** Metal sheets and billets are cut and shaped into specific parts using tools like CNC (Computer Numerical Control) machines, laser cutting machines, and press brakes. Parts like the crusher frame, feed hoppers, and jaw frames are fabricated in this step.
- **Casting:** Larger or more complex components like crusher heads, mantles, and rotors are often produced using casting techniques. Sand casting or die casting processes involve pouring molten metal into molds to create parts.
- **Machining:** After casting, these parts undergo machining processes such as milling, drilling, turning, and grinding to achieve the required dimensions, smooth surfaces, and tolerances.
- **Welding:** In some cases, parts are welded together to form sub-assemblies, like the crusher's frame, for additional strength and durability.

2. Heat Treatment:

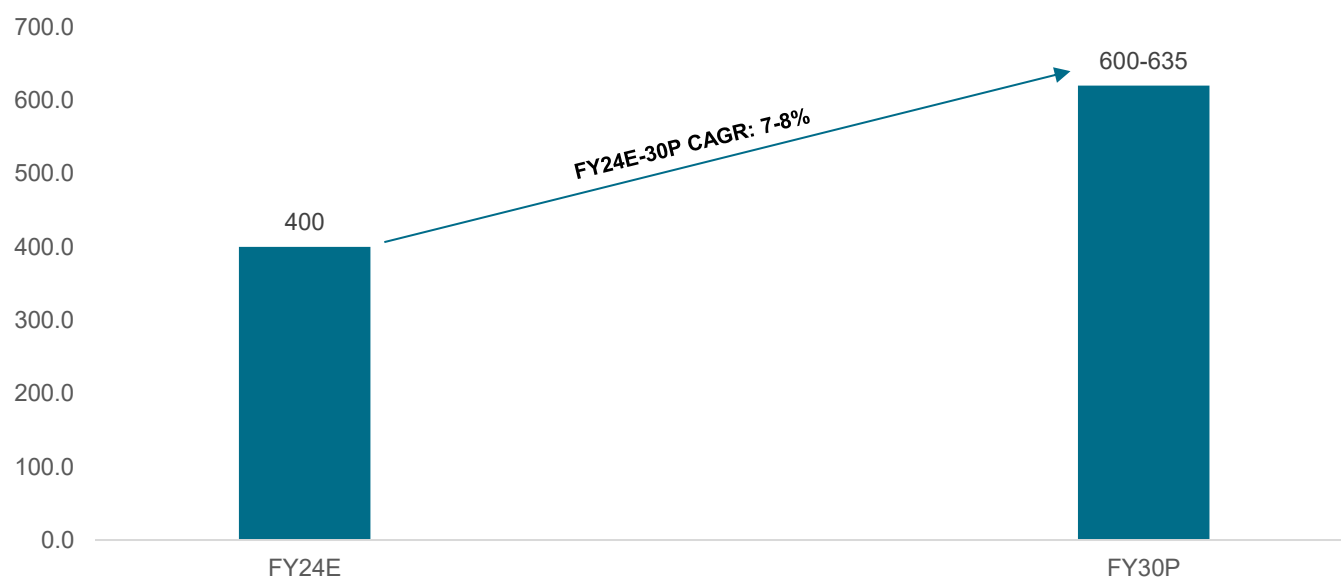
- **Hardening and Tempering:** Many parts, especially jaw plates and blow bars, undergo heat treatment (like quenching and tempering) to increase their hardness and resistance to wear. The metal is heated to a high temperature and then rapidly cooled to harden the material.
- **Annealing:** For some components, annealing (controlled heating and cooling) is done to relieve internal stresses and improve the toughness of the material, preventing cracking during operation.

3. Testing and Quality Control:

- **Wear resistance:** Some parts are subjected to wear tests to determine their expected life in actual field conditions.
- **Quality Control:** Each component is rigorously inspected during various stages of the manufacturing process to meet quality standards. A final inspection ensures that the finished product meets the design specifications and is free of defects.

India's castings for Aggregate Crushers- overview and outlook

Castings used for Aggregate Crushers (Demand in KT)



E: Estimated; P: Projected

Source: Industry, CRISIL Intelligence Consulting

India's castings demand for aggregate crushers industry for fiscal 2024 is estimated at ~400KT.

This demand for aggregate crushers market in India is closely tied to the demand for construction materials, as aggregate crushers are used to produce crushed stone, sand, and gravel that are essential for the construction and infrastructure industries.

It is projected to increase at a CAGR of ~7-8% during fiscals 2024-2030 and reach ~600-635 KT in fiscal 2030.

The market size is driven by factors such as urbanization, infrastructure development, and growth in the construction and real estate sectors.

Key Drivers of Demand:

1. **Infrastructure Development:** India has significantly ramped up its infrastructure development, including highways, smart cities, railways, and airports. This ongoing development generates a steady demand for aggregate crushers, as they are essential in producing crushed stone and sand for concrete, road construction, and other infrastructure projects.

The National Infrastructure Pipeline (NIP), which includes investments of over \$1.5 trillion in infrastructure projects, is a major driver for the market.

2. **Government Initiatives:** Initiatives like the Pradhan Mantri Awas Yojana (PMAY) to provide affordable housing, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), and the Smart Cities Mission are contributing to

the rapid growth of the construction and real estate sectors, which in turn drives demand for aggregates produced by crushers.

- 3. **Construction and Real Estate:** The Indian construction industry, which is growing at a steady pace, remains a major consumer of aggregates produced by crushers. Real estate development, including residential, commercial, and industrial projects, is a key factor driving demand. As India urbanizes rapidly, the demand for sand, gravel, and crushed stone for concrete production and road construction increases, leading to growth in the aggregate crusher market.
- 4. **Mining Sector:** The mining sector in India, which produces minerals such as iron ore, coal, and bauxite, also requires crushers for size reduction and material processing, driving demand for aggregate crushers.

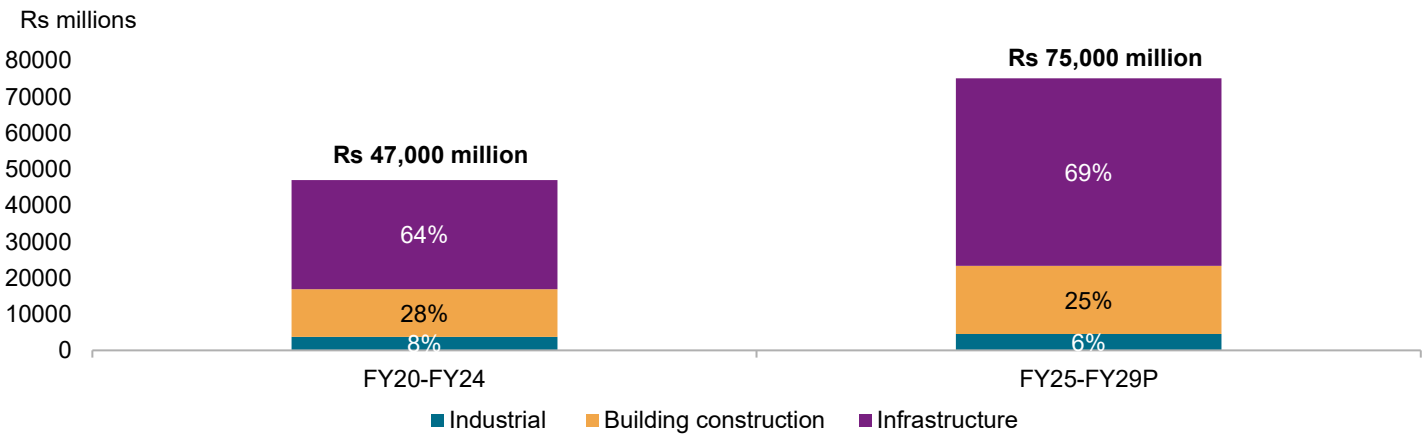
The aggregate crushers industry's growth is directly linked to the Construction and Mining sectors of India.

Construction investment outlook in key infrastructure segments

The construction sector is projected to grow 7-9% in fiscal 2025, with a major contribution from the infrastructure segment, coupled with the increasing pace of progress of schemes such as the National Infrastructure Pipeline (NIP), the National Monetisation Pipeline (NMP) and PM Gati Shakti initiatives.

Construction capex is estimated to have risen 13% on-year to Rs 12,000 million in fiscal 2024 led by a visible increase in central and state budget allocations to meet the infra development target outlined in the NIP.

Construction investment review and outlook



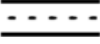
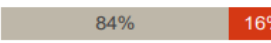
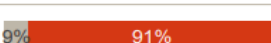
Source: Crisil Intelligence

The overall investment is expected to increase 60% to Rs 75,000 million over fiscals 2025-29P compared with the levels over fiscals 2020-24. The share of infrastructure projects is expected to increase to ~70% over the next five years from ~64% in fiscal 2024, as investments in infrastructure are expected to grow faster than that in other segments due to the government's focus on the NIP, NMP and the PM Gatishakti initiatives. The central government's focus on roads, urban infrastructure and railways will also boost infrastructure investments.

Construction investments are projected to grow at a 6-8% CAGR over fiscals 2025 to 2029, led by the infrastructure segment over the medium to long term as the building construction and industrial sectors record sedate growth rates.

Roads and railways dominated by public funds will lead growth in the infrastructure segment. The key infrastructure sub-sectors will see healthy growth over the medium term, led by the government's infrastructure push and the NIP.

Key infrastructure sub-sectors

	Sector	FY20-FY24 CAGR	FY24A Rs lakh crore	FY25P (growth)	FY26P (growth)	FY25-29P/ FY20-24	Source of funds (FY24E-28P)
	Roads	13%	3.8	11-13%	10-12%	1.8x	
	Power	12%	0.4	9-11%	2-4%	1.5x	
	Railways	15%	1.1	5-7%	5-7%	1.7x	
	Urban infra	33%	1.4	4-6%	4-6%	1.8x	
	Irrigation	11%	0.9	6-8%	6-8%	1.5x	
	Other infra	8%	0.2	6-8%	8-10%	1.2x	
	Total Infrastructure	16%	8.0	7-9%	7-9%	1.7x	

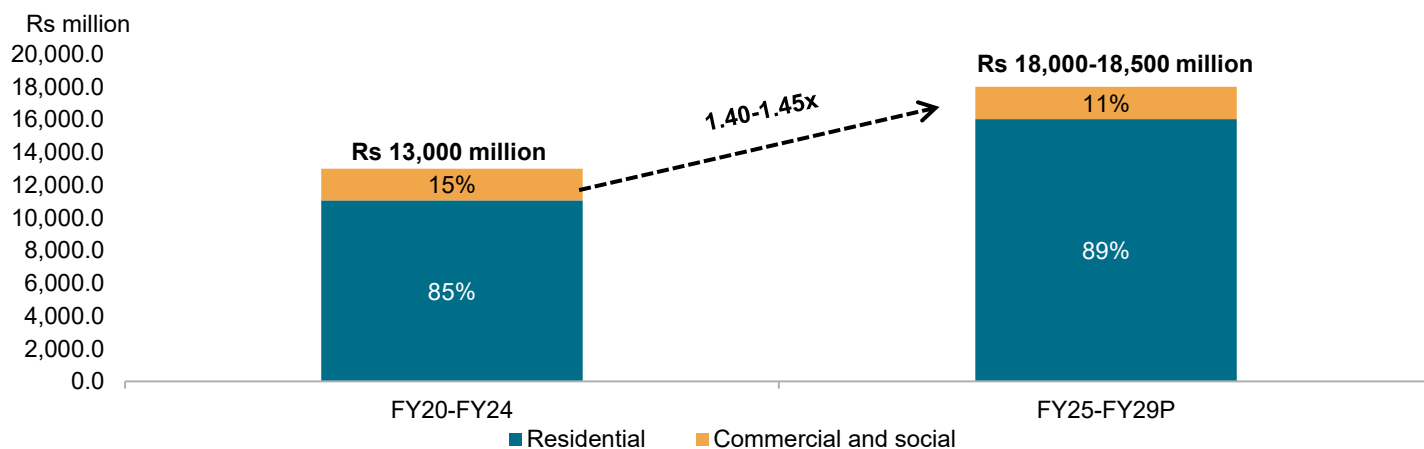
 Center
 State
 Private

Source: Crisil Intelligence

Construction investments are projected to rise ~60% over fiscals 2025-29 compared with those over fiscals 2020-24 with investments in infrastructure expected to rise 1.7 times and building construction and industrial segments lagging at 40% and 30%, respectively, over the same period.

Investments in building construction are expected to grow 4-6% in fiscal 2025 mainly led by urban affordable housing, which currently constitutes ~25% of the incremental urban addition and is expected to slowdown in the coming fiscals as the government approaches its targets.

Construction spending (at current prices)



Note: P: Projected

Source: Crisil Intelligence

Investments in the sector are expected to rise ~1.4 times to Rs 18,000-18,500 million over fiscals 2025-29 from Rs 13,000 million over fiscals 2020-24.

The Union Budget 2025 has unveiled a groundbreaking initiative to transform India's cities into thriving economic hubs. The highlights include:

- ₹1 Trillion Urban Challenge Fund: A massive fund has been allocated to drive innovative urban development, focusing on water and sanitation infrastructure.
- Government Support: The central government will bear up to 25% of the costs for bankable projects, providing significant financial backing for urban redevelopment.
- Urban Growth: The budget emphasizes the importance of cities as drivers of economic growth, aiming to create jobs, stimulate economic activity, and increase tax revenues.

This move is expected to have a profound impact on the construction and infrastructure sector, leading to:

- Increased Investment: The massive fund will attract significant investment in urban infrastructure, creating new opportunities for construction companies and related industries.
- Sustainable Development: The emphasis on innovative redevelopment will promote sustainable growth, reducing the environmental impact of urbanization.

Overall, the Urban Challenge Fund is a game-changer for India's cities, and the construction and infrastructure sector is poised to benefit significantly from this initiative.

Mining sector in India, key govt. initiatives and growth drivers

The main minerals mined in India are coal, iron ore, and limestone, which are intricately linked to the country's power, steel, and cement industries. Coal, the primary source of fuel for India's thermal power plants, accounts for over 75% of the country's electricity generation.¹⁵ Iron ore, a crucial raw material for steel production, is used to manufacture steel, which is a key input for the construction and infrastructure sectors. Limestone, a vital component in cement production, is used to manufacture cement, which is a fundamental building material for the construction industry. The power sector, which is heavily reliant on coal, is also closely tied to the steel and cement industries, as electricity is a critical input for the production of steel and cement.

Power

India's power sector is a vital component of the country's economic growth. Power consumption in India in FY23 logged a 9.5% growth to 1,503.65 billion units (BU), as compared to 1,374.02 BU in FY22. As the world's third-largest electricity market, India's power industry is poised for significant expansion to meet the rising energy demands of its rapidly growing population and economy. However, the sector also faces the daunting task of reducing its substantial environmental impact, with the power sector contributing to around 40-45% of India's total greenhouse gas emissions.

Steel

India's steel industry plays a crucial role in the country's economic development, as the world's second-largest steel producer, India's steel sector is both a cornerstone of its economy (~2% of GDP in fiscal 2024¹⁶) and a major source of greenhouse gas emissions, contributing to 10-12% of India's total emissions in fiscal 2024 (Ministry of Steel). The industry faces the challenge of meeting rising demand, while simultaneously reducing its carbon footprint to align with national and global climate goals.

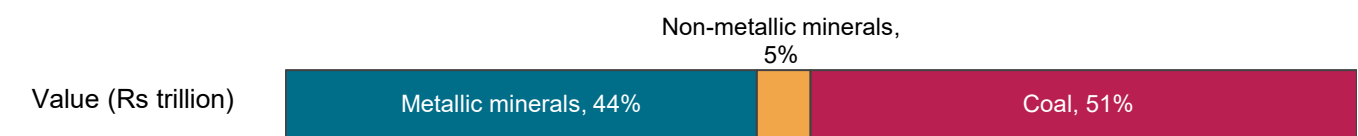
¹⁵ Central Electricity Authority (General Review)

¹⁶ <https://pib.gov.in/newsite/PrintRelease.aspx?relid=153661>

Cement

Cement plays a pivotal role in driving economic growth. India, the world’s second-largest cement producer, accounts for ~8% of global installed capacity, following China. As of fiscal 2024, the country’s installed capacity stood at 637 MTPA, with production at ~459 MTPA¹⁷. Industry is expected to have strong growth in the coming decades, with increased private and public-sector spending on infrastructure in the country.

Figure 0.1: Value of minerals in India distribution



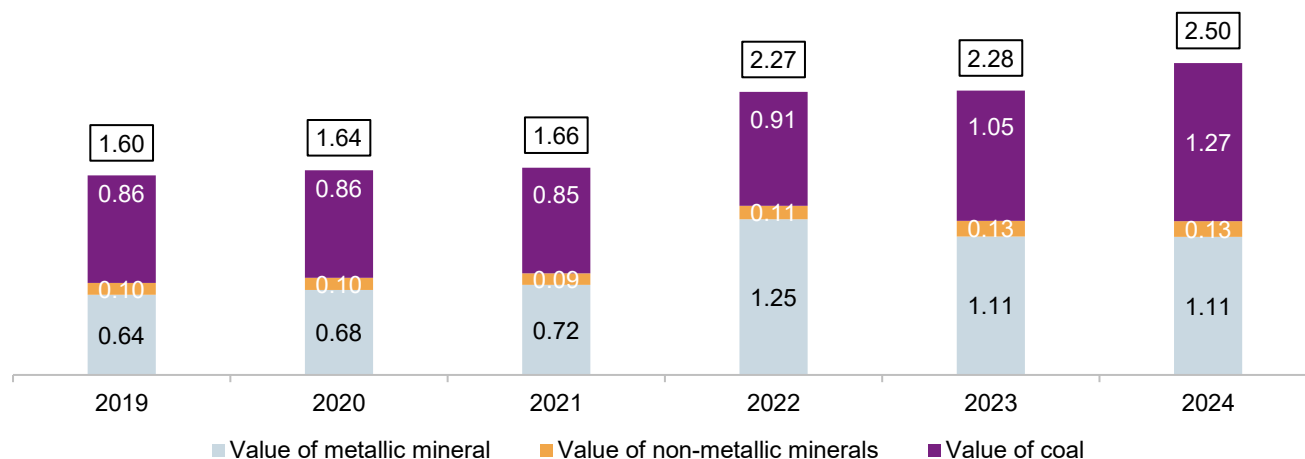
Source: Ministry of Mines, Government of India, total value of mineral production is Rs 2.5 trillion for fiscal 2024.

Coal and iron ore are the bedrock of India's mineral wealth, playing a critical role in driving the nation's industrial and economic progress. These minerals not only fuel the country’s energy needs but also support the backbone of its manufacturing sector, particularly in steel production. The value of minerals mined in India is approximately evenly split between the coal and non-coal minerals. Coal is undeniably the most crucial mineral for India, accounting for ~51%¹⁸ of the total value of minerals mined in the country. Given India's large population (largest country by population in the world with ~1.44 billion people in 2024 according to IMF estimates) and rapidly growing economy (6.5% real GDP growth rate expected from CY2024 to CY2029, according to the IMF¹⁹), the demand for energy is ever-increasing, making thermal coal indispensable for ensuring energy security. The importance of coal is further underscored by its widespread use in various industries²⁰, from cement to chemicals, contributing significantly to India's industrial output. Also coking coal plays a critical role in the steel industry, which is a key sector for infrastructure development. Besides coal, metallic minerals contribute to the country’s mineral wealth significantly, at ~44%²¹ of the value of minerals mined. Iron ore, contributing ~36% to the total value of minerals mined in India, is another essential mineral that underpins India’s economic framework. Approximately 81%²² of the value generated by metallic minerals in India comes from iron ore, reflecting its importance. Iron ore is the primary raw material for steel production; steel, in turn, is fundamental to building infrastructure, from bridges and roads to factories and residential buildings. With India being the second largest producers of steel globally, the demand for high-quality iron ore is ever-growing. Given that the mining industry contributes ~2.1% to India's GVA, coal and iron ore contribute about 86% of this number. Coal, with its 51% share in the value of minerals mined, accounts for a significant portion of this GDP contribution, primarily through its role in power generation (~72% of

¹⁷ Crisil Intelligence
¹⁸ Ministry of Mines, Government of India, total Value of Mineral production
¹⁹ As per International Monetary Fund (IMF)- World Economic Outlook (April 2024)
²⁰ Mentioned the share of coal demand in various sectors in detail in the coal demand & supply dynamics chapter
²¹ Crisil Intelligence
²² Ministry of Mines

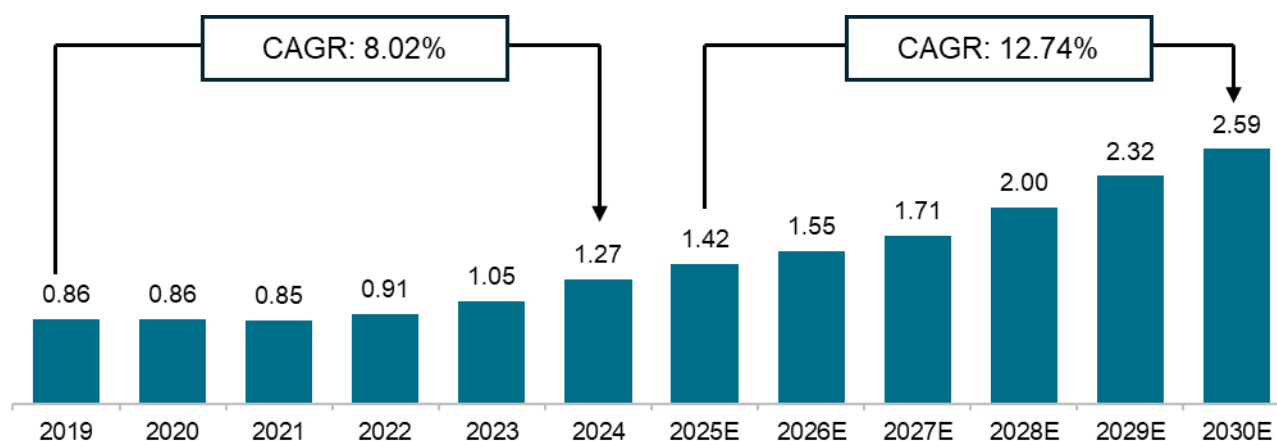
coal demand is from the power sector, including captive power plants²³). Iron ore's 36% share, driven by its critical role in steel production, also makes a substantial contribution to the GDP (~2% via the steel industry²⁴).

Figure 0.2: Value of minerals (coal and major minerals) in India (Rs trillion)



Source: Ministry of Mines and Crisil Intelligence, total value Rs ~2.5 trillion in fiscal 2024; All years are fiscal years

Figure 0.3: Value of coal produced in India and expected future value (Rs trillion)



Source: Ministry of Mines, Crisil Intelligence analysis assuming growth rate of 7.0% in coal supply growth; All years are fiscal years, E: Estimates

On an overall basis, the rise in infrastructure development and automotive production are driving growth in mining sector. Power and cement industries are also aiding growth for the sector. Demand for iron and steel is set to continue given the strong growth expectations for the residential and commercial building industry

Following are some of the government initiatives for mining sector:

- **Vision 2030:** The Ministry of Coal (MoC) is focused on supporting the target of producing 1.5 BT (1,500 MT) of coal by Fiscal 2030 by ensuring that infrastructure development keeps pace with production increases.

²³ Crisil Intelligence and Ministry of Mines

²⁴ National Steel Policy 2017, Ministry of Steel, Government of India

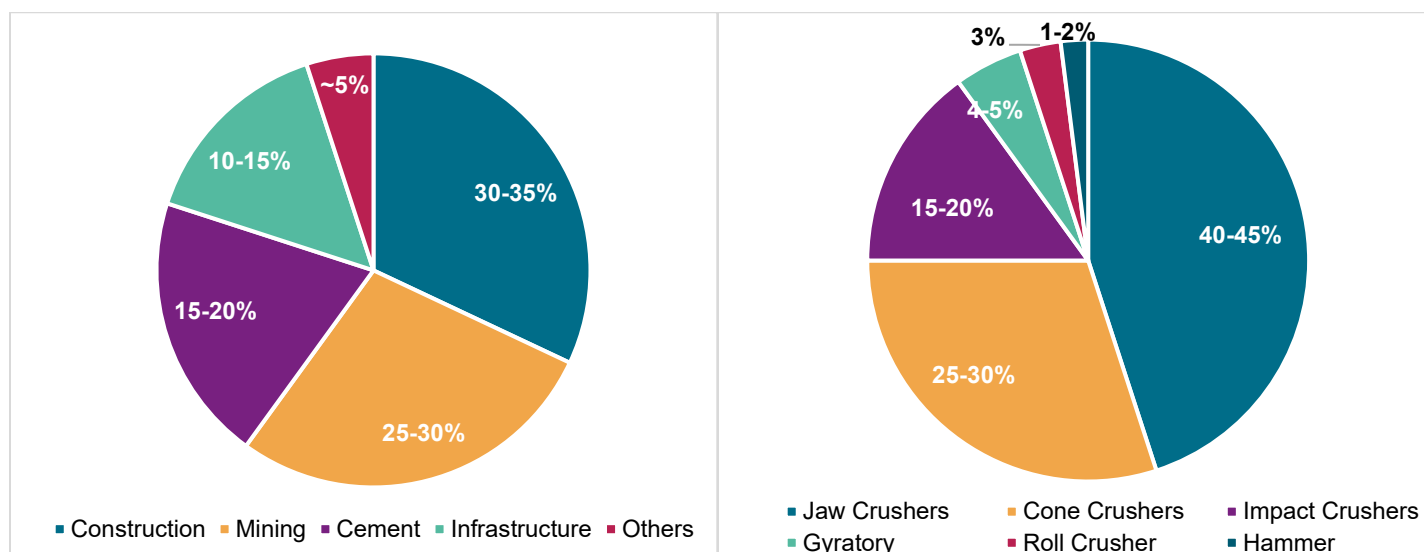
- **Vision 2047:** As per Vision @2047, coal is likely to be the major contributor for energy security of the nation. As per CIL's 1 BT plan, CIL and its subsidiaries target to achieve 1 BT (1,000 MT) production by Fiscal 2027. Further, considering the domestic demand for coal, the tentative long-term production projections for CIL are expected to peak at 1,300 MTPA by Fiscal 2035. It is expected that the company will have to maintain 1 BT (1,000 MT) production until 2047 owing to the domestic demand.
- **Underground vision plan:** CIL has prepared and finalised the underground vision plan document in Fiscal 2023 envisaging 100 MT coal production by Fiscal 2030 from its underground mines. It has planned to introduce more and more Mass Production Technology (MPT) in its UG mines to achieve this milestone.
- **Commercial coal mining:** In Fiscal 2020, the government allowed commercial coal mining, allowing private players to enter coal mining and sales with no restrictions on the end use of the fuel. Until August 2024, a total of nine tranches for commercial coal mining were launched with around 105 blocks successfully auctioned. Currently, tranche No XX (20th round) is being auctioned under the CMSP/ X tranche (10th round) of auctions under MMDR is ongoing with 61 coal mines put up for auction. The government views coal as a pivotal contributor to the vision of becoming a US\$ 5 trillion economy.
- **Indian mining structural reforms 2021:** The Mines and Minerals (Development and Regulation) Amendment Act in 2021 paved the way to increase domestic production and curtail imports, private sector participation and mining employment. The Act facilitates auctions to re allot mining blocks facing legacy cases. Another reform is regarding captive mines for which end use was previously restricted to the mine leaseholder. The provision also allowed the sale of 50% of the mineral production in the open market after utilising the production to be used in the company plant after payment of additional payment.
- **Mission coking coal:** The MoC launched Mission Coking Coal as part of the Atmanirbhar Bharat initiative. Domestic raw coking coal production is expected to reach 129 MT by 2030, as per CRISIL MI&A Consulting estimates. CIL plans to increase production from existing mines and also identify new mines. Until February 2024, the ministry has allocated 16 coking coal blocks to the private sector and most of them are expected to start production by Fiscal 2025.

Some of the major drivers and opportunity in coal demand are:

- **Increased power demand owing to economic expansion, rising population, increasing urbanisation and industrialisation:** Between Fiscals 2019 and 2024, the country's gross domestic product (GDP) logged 4.3% CAGR. The per capita GNI (at current prices) increased from Rs 1.41 lakh in Fiscal 2019 to Rs 1.70 lakh in Fiscal 2023³⁶, largely driven by increased industrialisation, rapid growth of the services sector and urbanisation. During the period, energy demand clocked 5% CAGR, making the country the third largest energy consumer globally.
- **Rise in per capita consumption with increased electrification and deeper penetration of energy intensive appliances such as air conditioning systems:** The per capita electricity consumption rose from 1,010 kWh in Fiscal 2015 to 1,331³⁷ kWh in the Fiscal 2023, clocking a CAGR of ~3.5%, owing to increased power availability, investments in the power sector, reduction in transmission and distribution losses and rising disposable income of households. Even so, the country's per capita energy consumption lags developed economies. In fact, per capita consumption is far lower than the global average of ~3,700³⁸ kWh. But, with consumption levels progressively converging towards those of higher income countries, demand for power will increase.
- **Growth in the manufacturing segment:** Besides power generation, coal is also used directly in industry as fuel and as a reactant in the production of steel (coking coal). Sectors such as aluminium and cement, too, use large quantities of coal.
- **Infrastructure development:** Coal finds application in the manufacture of steel and cement- two critical inputs for infrastructure development. Cement production in Fiscal 2023 stood at 375 MT, up from 328 MT in Fiscal 2019.

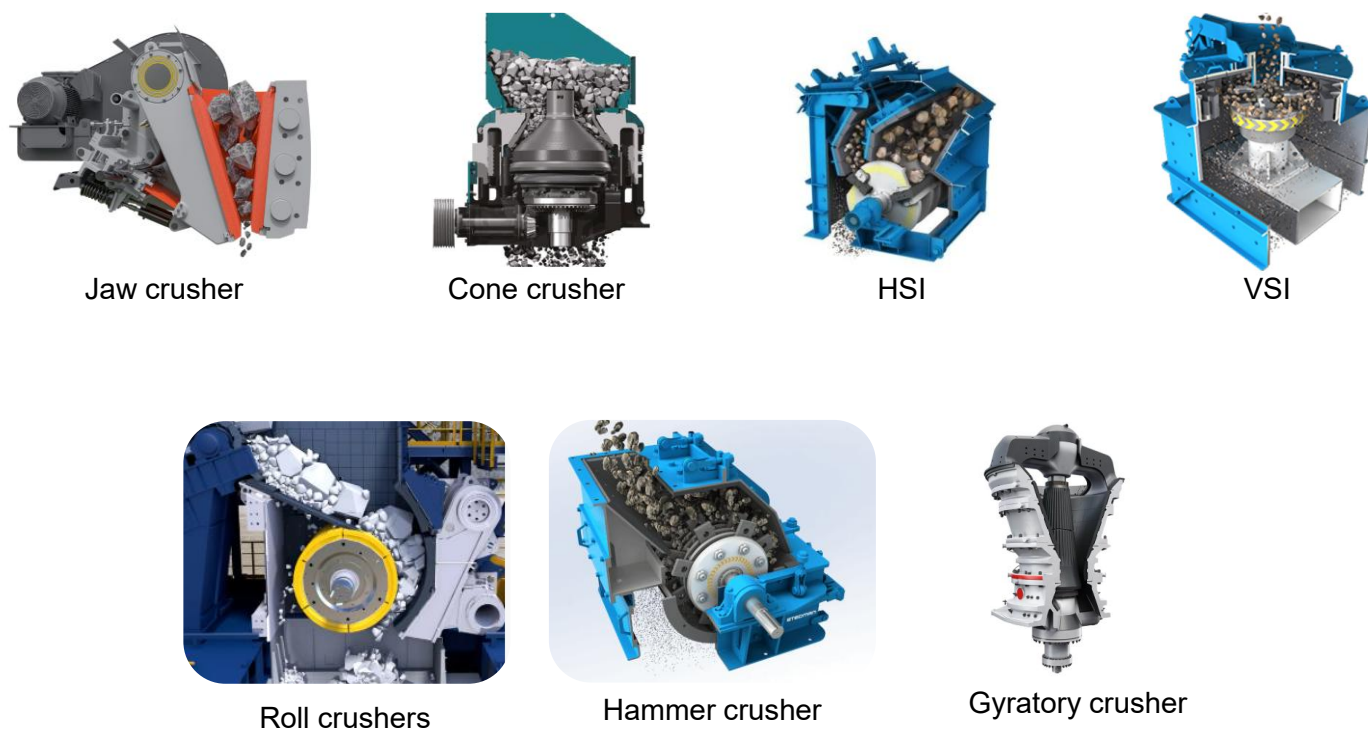
Coal-based sponge-iron production also rose from ~28 MT to 36 MT during the period, logging a 4-year CAGR of 6.5% (from 2019 to 2023) and driving demand for non-coking coal.

Demand segmentation of aggregate crushers by end use industries and type of crusher



Source: Industry, CRISIL Intelligence

Types of crushers



Source: Industry, CRISIL Intelligence

End use industry applications for each type of crushers

Type of aggregate crusher	Type of crushing activity/ Stone sizing	End use industry application
Jaw Crushers	Primary crushing- large size rocks to small	- Construction- for producing aggregates, which are crucial in concrete and road construction - Mining- to break down ores, such as gold, coal, iron ore, and copper, into smaller sizes for further processing - Recycling- Used in demolition projects for recycling concrete and other materials
Cone Crushers	Secondary, tertiary, quaternary- medium size	- Construction and road building- create high-quality aggregate material for roads, highways, and other construction projects - Mining- crush ores like copper, iron, gold, and nickel to produce uniformly sized material for smelting and refining - Aggregate production- Ideal for producing gravel, sand, and crushed stone for use in asphalt and concrete production
Impact Crushers (VSI, HSI)	Secondary, Tertiary- fine aggregates	- Recycling- to crush concrete, asphalt, glass, and construction debris for reuse in construction - Industrial- processing materials like gypsum, salt, phosphate rock, and clay - Production of manufactured sand- to produce high-quality manufactured sand from rocks or gravel for construction use
Roll Crusher	Secondary and tertiary- fine aggregates	- Mining- for crushing materials like salt, coal, gypsum, and chalk into smaller sizes for further processing - Chemical- for reducing the size of sulfur, potassium, and fertilizer materials - Glass- crushing raw materials, including glass cullet
Hammer	Primary as well as secondary	- Coal crushing- to crush coal, lignite, and coke for power generation - Cement- crushing limestone, clay, and other materials used in cement production - Mining- crush hard and soft ores of gold, silver, copper, and iron - Recycling- crushing metal scrap, e-waste, and glass
Gyratory	Primary	- Mining and quarrying- used in quarries and mines to handle larger quantities of rock or ore before secondary or tertiary processing - Aggregates production- high-capacity aggregate production when large volumes of crushed material are required

Source: CRISIL Intelligence Consulting, industry

Rock crushers can be broadly categorized into two primary groups: compressive crushers, which crush material by applying pressure until it breaks, and impact crushers, which rely on rapid impacts to achieve the same result. The compression principle is utilized by jaw, gyratory, and cone crushers, whereas impact crushers employ the impact principle. Alternatively, rock crushers can be classified based on the stage at which they are used in the processing sequence, with jaw and gyratory crushers typically used for primary crushing and cone crushers for secondary crushing.

Primary Crushing: The First Step in Material Reduction

Primary crushing is the first stage of material reduction, typically carried out by jaw crushers. These robust crushers reduce large materials to a size that can be transported to the next stage of processing. Jaw crushers work by compressing materials between a fixed and moving jaw and are effective in recycling operations due to their simple mechanics.

There are two main types of jaw crushers: single toggle and double toggle. Single toggle jaw crushers have an eccentric shaft located at the top of the crusher, which, along with the toggle plate, generates compressive action. Double toggle crushers, on the other hand, have two shafts and two toggle plates, with the first shaft pivoting at the top of the crusher and the second shaft driving both toggle plates.

Gyratory crushers are also used in primary crushing, featuring an oscillating shaft that reduces material in a crushing cavity.

Secondary Crushing: Achieving Fine and Optimized Results

Secondary crushing is typically carried out by cone crushers, which are similar to gyratory crushers but more commonly used in later stages of the crushing process.

Cone crushers are often used in secondary, tertiary, and quaternary crushing stages, although they can also be used as primary crushers if the material's grain size is naturally small enough. Cone crushers are equipped with a hydraulic setting adjustment system, allowing for adjustment of the product gradation.

To optimize operating costs and improve product shape, cone crushers should be choke fed, with the cavity as full of rock material as possible. This can be achieved by using a stockpile or silo to regulate fluctuations in the feed material flow.

Versatile Impact Crushers

Impact crushers can be used in all crushing stages, utilizing the principle of quick impacts to reduce material size. They are classified into two main types: Horizontal Shaft Impact (HSI) crushers and Vertical Shaft Impact (VSI) crushers.

HSI Crushers

- Used in primary, secondary, or tertiary crushing stages
- Reduce material through intensive impacts from rotating hammers or bars
- Produce a finer, better-shaped product through collisions with the crusher chamber and other particles

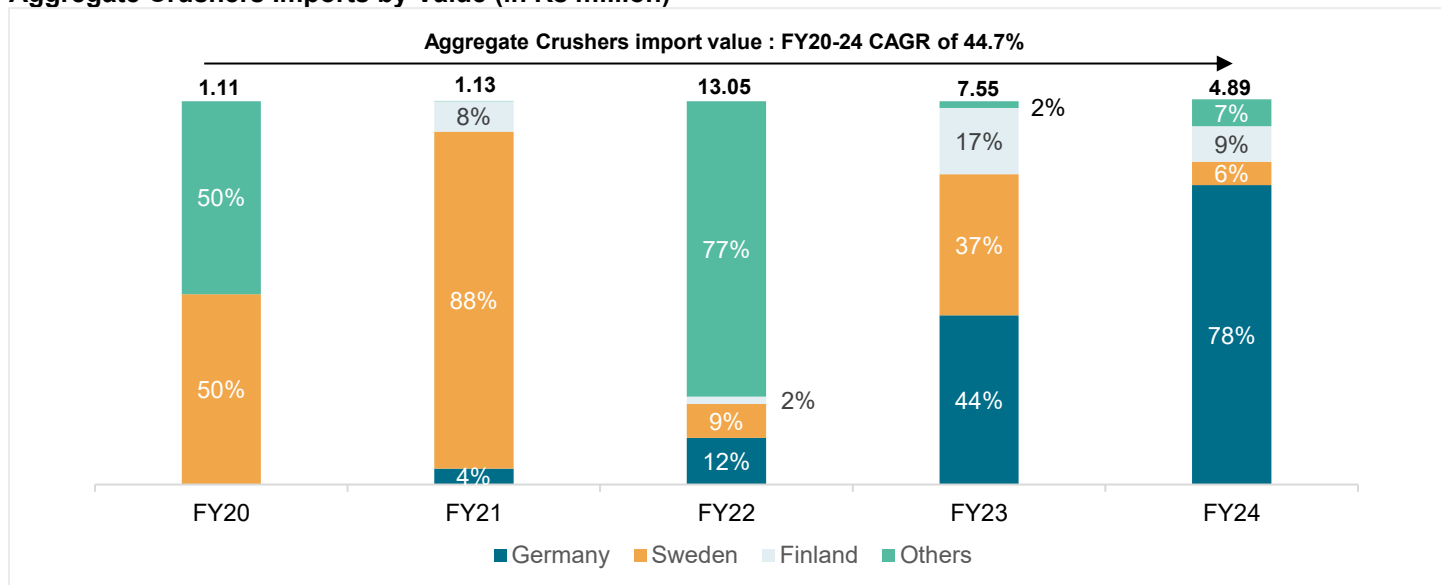
VSI Crushers

- Used in the final stage of crushing, especially for precise cubical shapes
- Operate like a centrifugal pump, accelerating material to high speed before discharge
- Crush material through high-speed impact and rock collisions, producing a precise end product.

Trade overview (aggregate crushers)

Imports trend

Aggregate Crushers Imports by Value (in Rs million)



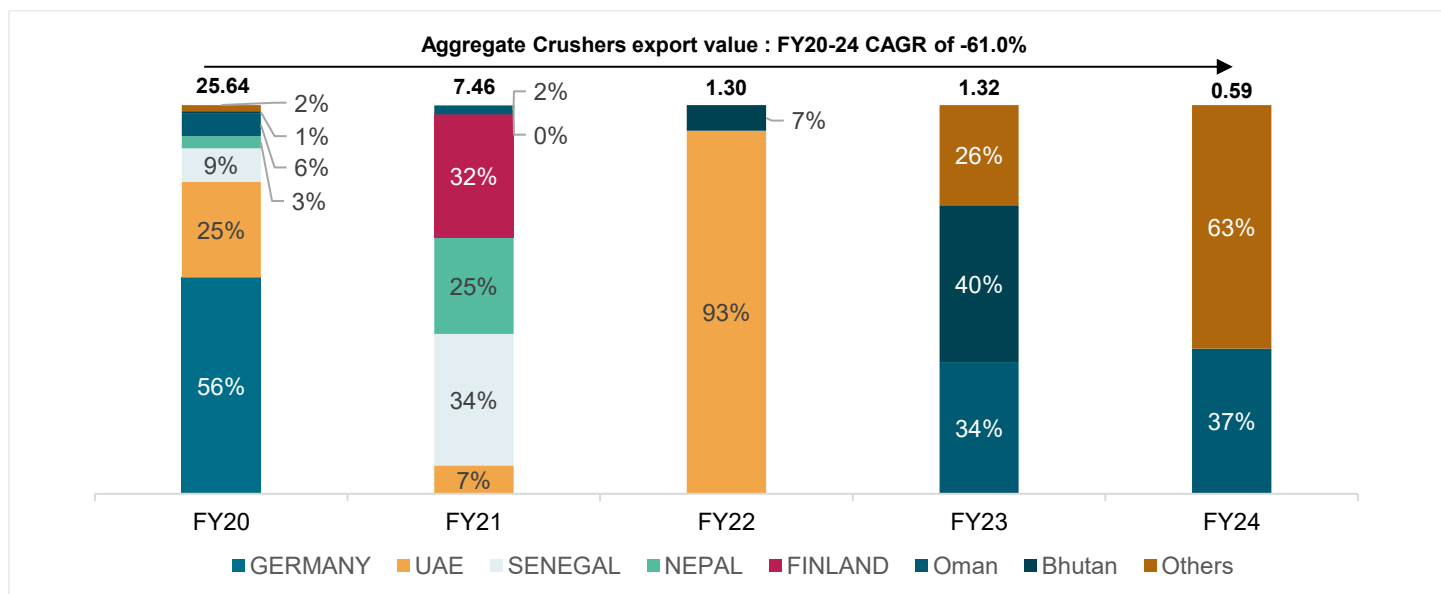
Source: Crisil Intelligence, DGFT

India's aggregate crushers imports increased from Rs. 1.11 million in fiscal 2020 to Rs. 4.89 million in fiscal 2024, registering a good CAGR of 44.7% during fiscals 2020-2024. The top 5 countries on the basis of import value were- Germany, Turkey, Sweden, Finland and Italy.

The data suggests a dynamic trend in the imports of Aggregate Crushers, with significant fluctuations in the proportion of imports from different countries over time. Germany's proportion of imports has increased dramatically, from 0% in fiscal 2020 to 78% in fiscal 2024, indicating a significant increase in imports from Germany. Sweden's proportion of imports was highest in fiscal 2021, at 88%, but has since declined to 6% in fiscal 2024. Finland's proportion of imports has been increasing, reaching 9% in fiscal 2024.

Exports trend

Aggregate Crushers Export by Value (in Rs million)



Source: Crisil Intelligence, DGFT

India's aggregate crusher export industry has experienced a significant decline over fiscal 2020-2024, with the total export value peaking at 25.64 million INR in 2020 and decreasing by 61% annually to reach 0.59 million INR in 2024. The yearly breakup of exports reveals a dynamic shift in the industry's performance across countries, with Germany dominating the exports in 2020 with a 56% share, while the United Arab Emirates and Senegal accounted for 25% and 9%, respectively. However, by 2021, the UAE's share had dropped to 7%, and Senegal's share had increased to 34%, with Finland emerging as a new player with a 32% share. The subsequent years saw Oman and Bhutan gaining prominence, with Oman's share increasing to 37% in 2024, and Bhutan's share peaking at 40% in 2023.

Company profile: Behari Lal Engineering Ltd.

Business profile of Behari Engineering Ltd.

Behari Lal Group was established by Late Shri Behari Lal Garg in Punjab, is a fourth-generation group. What began as a modest family-run business gradually evolved in both reputation and capability. The group expanded its operations under the name Behari Lal & Sons as a steel commodities trading firm based in Mandi Gobindgarh, Punjab. This expansion marked a pivotal shift, as the company entered the trading of steel billets, sponge iron/DRI, and ferro alloys—laying a strong foundation for its current operations.

Building on a strong foundation in trading, BLEL was established in 1995 by its current Chairman and Promoter, Mr. Parkash Chand Garg. With over 30 years of experience in the steel industry, he is known for his influential leadership, integrity, empathy, and commitment to social responsibility. His visionary thinking and strong value system have been central to BLEL's early growth and the development of its governance framework.

The company's growth was further propelled by Mr. Rajesh Garg, Vice Chairman and Promoter, who brings over 28 years of industry experience. Renowned for his ability to build and maintain strong relationships with stakeholders and investors, he has earned a reputation as a trusted leader in the steel manufacturing sector.

Mr. Dinesh Garg, Managing Director and Promoter has played a pivotal role in the organization's continued development. His industry knowledge and strategic vision have been instrumental in strengthening customer relationships and driving the company's long-term success.

In February 2012, the company started commercial production of steel products through their Steel Melting Shop (SMS) and Foundry Division in Mandi Gobindgarh, marking its entry into large-scale production of customized steel products. This strategic expansion transformed BLEL into a full-fledged manufacturing enterprise and established it as a key supplier of engineering-grade steel for a wide range of industries. This growth was further accelerated by the entry of the fourth generation, marked by Lovlish Garg (son of Mr. Rajesh Garg) joining the business. He has played a key role in driving innovation, developing new products, and exploring diverse market segments. In March 2022, Behari Lal group further expanded its manufacturing capabilities by commissioning its state-of-the-art Rolling Mill Division in Mandi Gobindgarh under the Belco Special Steels Pvt. Ltd. (Currently merged into Behari Lal Engineering Ltd). This modern facility significantly enhanced the company's product portfolio, enabling the production of high-quality rolled steel products to meet the evolving demands of the market.

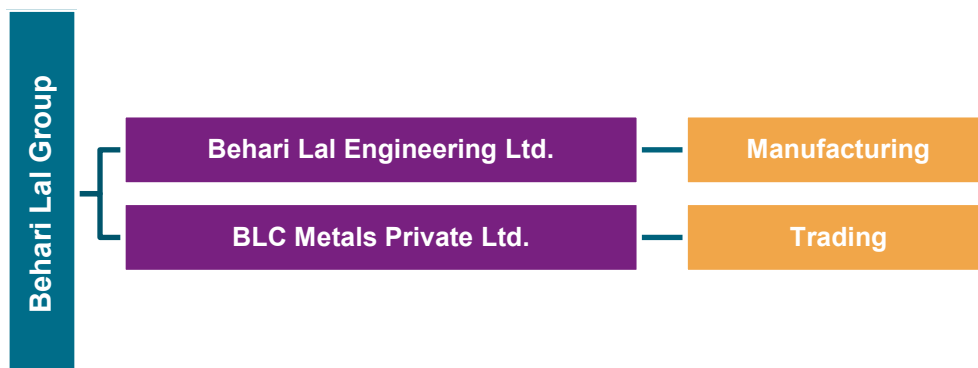
In addition to the Promoters mentioned above, BLEL's Board of Directors includes seasoned professionals with extensive expertise in fields such as engineering, banking, accountancy, and law. They bring a wealth of experience from leading roles in top government bodies, private enterprises, and industry associations. The company's top management team comprises Mr. Bhuvnesh Garg (CEO), Mr. Aakarsh Goyal (CFO), Mr. Kanav Garg (COO) among others.

Today, the Behari Lal Group operates as a fully integrated steel manufacturing and trading enterprise with a pan-India presence. Its group company, BLC Metals Pvt. Ltd., continues to supply steel billets, Coal, sponge iron, and ferroalloys across the country. Meanwhile, its manufacturing arm, Behari Lal Engineering Limited (BLEL), comprising the Steel Melting Shop & Foundry Division and the Rolling Mill Division, produces a diverse range of high-quality iron and steel products tailored for various industrial applications. The company has a rich legacy of delivering products tailored to customer-specific requirements and is recognized as one of India's leading integrated foundries.

BLEL's commitment to reliability and trustworthiness has been consistently demonstrated through its long-standing relationships with over 1600+ customers across the country, including top industry leaders. These partnerships are a testament to BLEL's ability to provide tailored solutions and exceptional service, making it a preferred partner for industries seeking high-quality products and reliable supply chain management. With a pan-India presence, fully integrated manufacturing and trading capabilities, and a customer-centric approach, BLEL is poised to continue its growth trajectory and remain a leading player in the Indian steel industry.

Following are the key companies of the group:

Major group companies



Source: Behari Lal Engineering Ltd.

1. **Behari Lal Engineering Ltd. (BLEL):** BLEL is a manufacturing entity specializing in customized iron and steel products for various engineering applications, with integrated operations across SMS, Foundry, and Rolling Mill divisions.

Recent Acquisition: As per the NCLT order dated 23.08.2024 (effective from 01.04.2022), Belco Special Steels Private Limited (BSSPL), now operating as the Rolling Mill Division, and Parkash Multimetals Private Limited (PMPL), now functioning under Behari Lal Engineering Limited, were merged into Behari Lal Ispat Private Limited. Following the merger, the entity was renamed as Behari Lal Engineering Limited, marking a significant milestone in the company's consolidation and growth journey.

2. **BLC Metals Pvt. Ltd.:** BLC Metals Pvt. Ltd. is the group company as well as a trading entity engaged in the nationwide distribution of steel billets, sponge iron, and ferroalloys.

Infrastructure details

Currently, BLEL operates two plants in Punjab. The group is setting up one additional integrated Metals Rolls facility as well which will enhance production capacity.

The company's manufacturing infrastructure details are as follows:

SN.	Type of Property	Address	Owned/Leased	Installed capacities	
				Product/Activity	Qty (TPA) (FY25)
1.	Manufacturing facility 1- SMS Division and Foundry division	Village Salani, Mandi Gobindgarh, Punjab	Owned	Steel Melt Shop, Foundry & Machine Shop, Manufacture of Alloy & Non-Alloy Ingots, Metal Rolls, Engineering Castings	54,464
2.	Manufacturing facility 2- Rolling Mill Division	Village Turan, Mandi Gobindgarh, Punjab	Owned	Iron & Steel Re-Rolling Mills and manufacturing of Flats, Rounds & Squares etc.	65,000

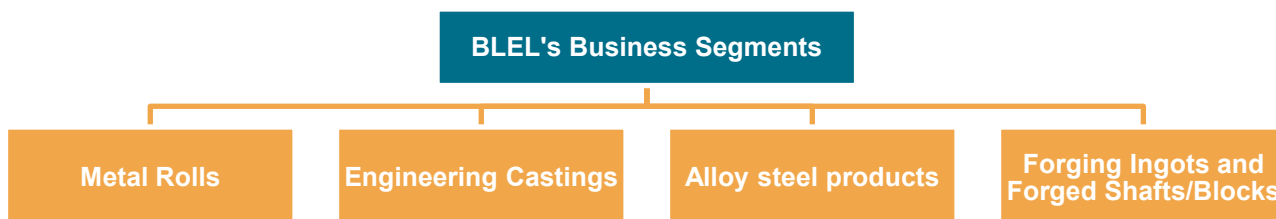
Source: Behari Lal Engineering Ltd.

Existing footprints

BLEL distributes its products across the entire nation, establishing a strong presence in 19 states and 6 Union Territories in India. Additionally, the company has a decent global reach, exporting its products to international markets across 5 continents and in 15 countries viz., Afghanistan, Brazil, Finland, France, Germany, Ireland, Mexico, Nepal, Nigeria, South Africa, Tanzania, Togo, Uganda, UAE, and the USA in the last 3 years.

Past performance review

BLEL derives its revenue from four major business segments: Metal Rolls, Engineering Castings, Alloy steel products and Ingots for Forgings and Re-Rolling. These segments reflect BLEL's diversified product offerings and strong presence across multiple industries.



Segment 1: Metal Rolls

BLEL manufactures high-quality metal rolls for rolling mills, designed to endure the extreme conditions of hot rolling. These rolls are produced using premium materials such as forged steel, cast steel, cast iron, composite metal, or tungsten carbide. They are utilized in rolling processes to produce finished steel products, including TMT Re-Bar, Wire Rod, Angles, Channels, Beams, Rail Strips, and various other sections.

The primary end users are steel manufacturing industries that cater to sectors like Infrastructure, Finished steel manufacturers, infrastructure, automotive and engineering industry. Additionally, cold-rolled steel from these rolls is extensively used in household appliances, aerospace, and automotive engineering.

Segment 2: Engineering Castings

BLEL also manufactures specialized engineering castings with unit weights ranging from 500 kg to 20 MT. These castings are supplied to diverse industries, including:

- Aggregate Crushers for applications in road construction, mining, engineering industry and infrastructure.
- Critical components for Thermal and Hydro-Electric Power Plants, Cement and Steel Plants, machinery structure parts and Heavy Press Dies used in manufacturing automobile body parts.

Segment 3: Alloy Steel Rolled Products

BLEL operates advanced hot rolling mills with roughing facilities to produce a wide variety of carbon and alloy steel bars, available in numerous sections, sizes, and reductions. These bars cater to automobile, bearing, and engineering applications.

Key offerings include carbon, alloy steel, and stainless-steel bars in various sections such as rounds, round corner square, flats and hex, with different sizes and widths 6 mm to 230 mm.

The rolled products are supplied in various conditions, including as rolled, heat-treated, straightened, and bright bar forms, and can be forged, machined, or used directly based on end-user requirements.

Additionally, BLEL has recently introduced value-added grades of alloy steel, such as:

- Tool Steel (with manufacturing capabilities of high-end Grades like D2, D3, H13, DB6) used in manufacturing dies for the plastic, metal, and engineering industries.
- Valve Steel (F Series) used in the oil and gas industry. Additionally, BLEL has recently introduced value-added grades of alloy steel, such as:

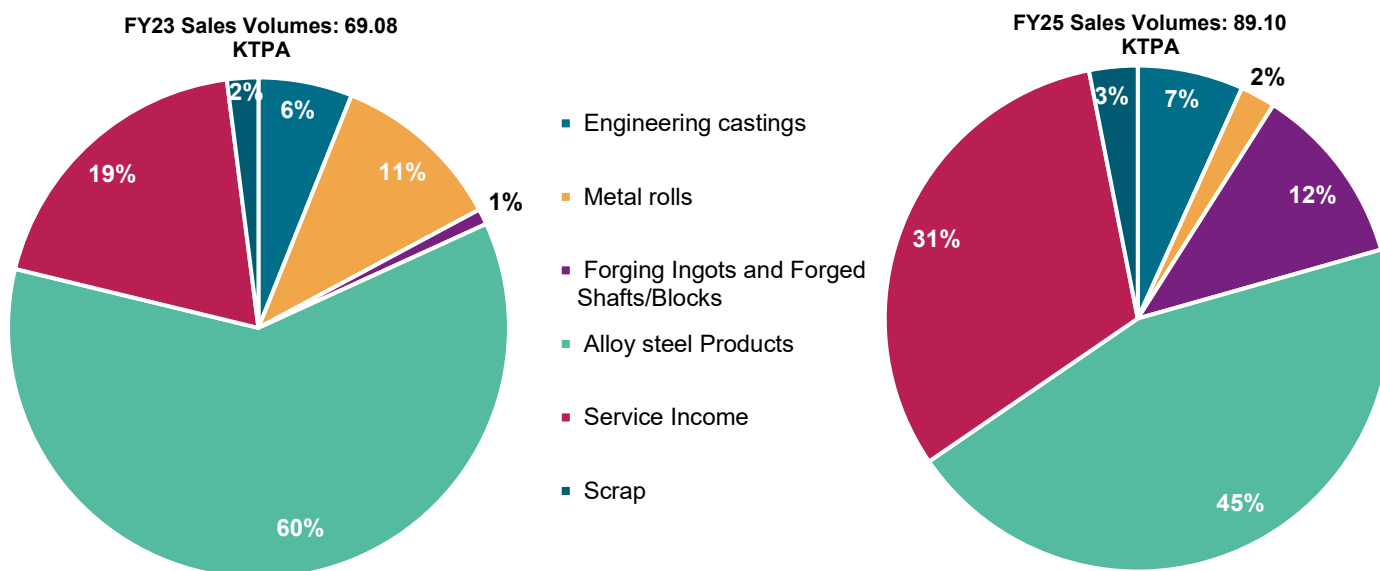
Segment 4: Forging Ingots and Forged Shafts/Block

- BLEL produces high-quality ingots in various dimensions, catering to forging, upsetting, and ring-rolling applications. The ingots undergo rigorous inspections to meet industrial quality standards.
- They are manufactured in both square and octagonal/fluted shapes with weights of up to 15 MT and are available in as-cast or ground condition.
- BLEL offers a wide range of ingot grades, including EN8, EN9, C45, ASTM A105, EN19, EN24, D2, and F series, among others. Custom grades are also developed based on specific customer requirements. These find application in industries such as automotive, aerospace, oil & gas, energy, and heavy engineering

Other revenue streams

Apart from the four core segments, BLEL also generates a small portion of revenue from product services. This diversified revenue base highlights BLEL's robust operations and ability to serve a wide array of industries.

Segment-wise sales volume (fiscal 2023 and 2025)



Source: Behari Lal Engineering Ltd., Crisil Intelligence

Segment-wise sales volume (fiscal 2023, 2024 and 2025)

Particulars	2024-25			2023-24			2022-23		
	Quantity	% of total sale qty	Revenue (₹ million)	Quantity	% of total sale qty	Revenue (₹ million)	Quantity	% of total sale qty	Revenue (₹ million)
Engineering Castings	6,021	6.76%	901.06	5,443	6.63%	796.75	4,218	6.11%	649.85

Ingots and forging ingots	2,009	2.26%	116.28	301	0.37%	21.49	897	1.30%	52.44
Metal Rolls	10,330	11.59%	1,247.67	8,774	10.69%	1,131.91	7,763	11.24%	1,031.61
Alloy steel products	39,952	44.84%	2,582.09	35,720	43.54%	2,277.54	41,335	59.83%	2,786.16
Job-Work Income	28,035	31.46%	132.57	29,019	35.37%	128.88	13,272	19.21%	52.54
Others*	2,756	3.09%	99.45	2,786	3.40%	104.26	1,599	2.32%	56.68
Grand Total	89,103	100.00%	5,079.12	82,042	100.00%	4,460.84	69,084	100.00%	4,629.28

* Others Includes high sea sales traded goods and sale of by products

Source: Behari Lal Engineering Ltd., Crisil Intelligence

Sales volumes of BLEL increased at a significant CAGR of 14% over fiscals 2023-2025, increasing from 69,084 tonnes in fiscal 2023 to 89,103 tonnes per annum in fiscal 2025. Sales Volume for fiscal 2025 increased on year by ~9% from fiscal 2024 level (82,042 tonnes)

Segment volume wise, Alloy steel products accounted for the largest share almost 45% (39,952 TPA) in fiscal 2025. Metal rolls accounted for 12% while engineering castings accounted for 7% of the overall sales volumes.

Segment-wise sales revenue (Rs. Million)

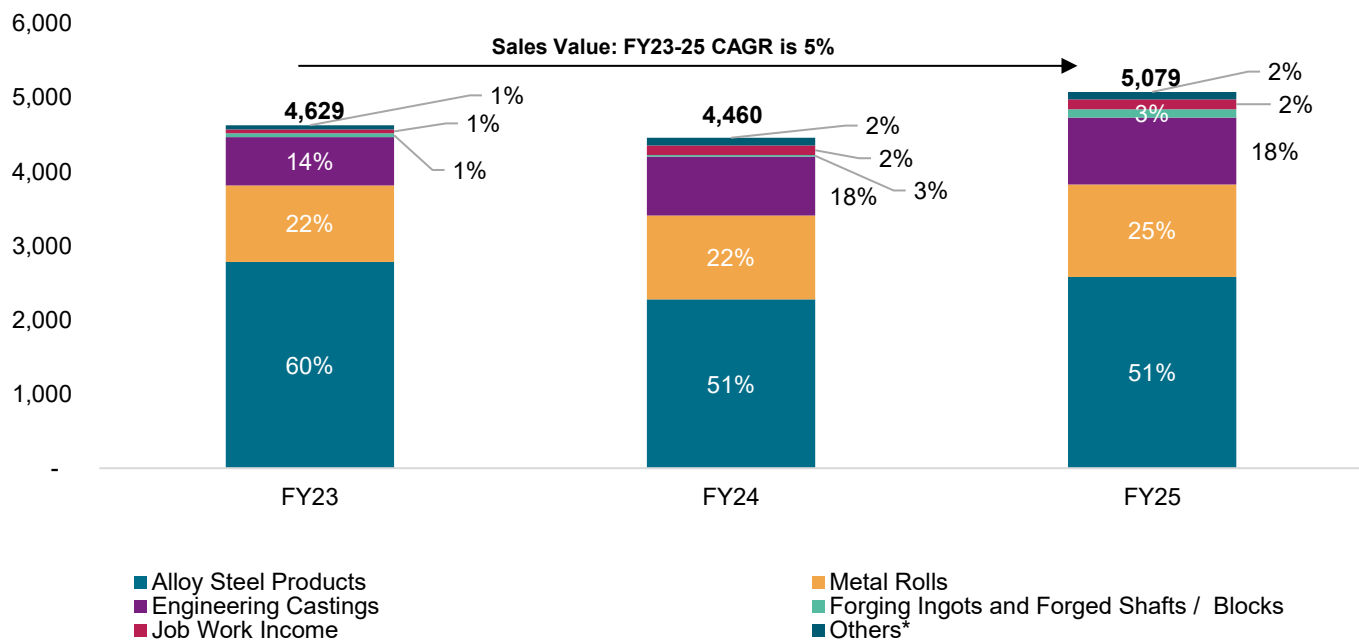
Particulars	Fiscal 2023		Fiscal 2024		Fiscal 2025	
	Revenue (₹ million)	% of revenue from operations	Revenue (₹ million)	% of revenue from operations	Revenue (₹ million)	% of revenue from operations
Alloy Steel Products	2,786.16	60.19	2,277.54	51.06	2,582.09	50.84
Metal Rolls	1,031.61	22.28	1,131.91	25.37	1,247.67	24.56
Engineering Castings	649.85	14.04	796.75	17.86	901.06	17.74
Forging Ingots and Forged Shafts / Blocks	52.44	1.13	21.49	0.48	116.28	2.29
Job Work Income	52.54	1.14	128.88	2.89	132.57	2.61
Others*	56.68	1.22	104.27	2.34	99.45	1.96
Total	4,629.28	100	4,460.83	100	5,079.12	100

* Others Includes high sea sales traded goods and sale of by products

E: Estimated

Source: Behari Lal Engineering Ltd., Crisil Intelligence

Sales Revenue of BLEL increased at a CAGR of 5% over fiscals 2023-2025, increasing from Rs. 4,629.28 million in fiscal 2023 to Rs. 5,079.12 million in fiscal 2025.



E: Estimated

Source: Behari Lal Engineering Ltd., Crisil Intelligence

Segment wise, Alloy steel products accounted for the largest contributor to the revenues, almost 51% (Rs. 2,582 million) in fiscal 2025. Metal rolls revenues accounted for 25% while engineering castings accounted for 18% of the overall sales revenues.

Over fiscal 2023-2025, Metal rolls and engineering castings have shown a disproportionately higher contribution to revenue relative to their volume, implying these are high-value, high-margin products. Alloy steel products, the largest volume contributor, also deliver strong realizations, making them a core driver of BLEL's profitability.

Recent Upgradations to boost sales

BLEL is poised for substantial growth through a series of strategic expansion initiatives and planned investments designed to enhance production capacity, diversify product offerings, and improve operational efficiency.

Recent Upgradations: Fiscal 2024 and 2025

In fiscal years 2024 and 2025, BLEL focused on upgrading its existing facilities to enhance both production capacity and technological capabilities. Key initiatives included:

- Installation of a new melting Furnace with enhanced capacity,
- Addition of a Ladle Refining Furnace (LRF) and Vacuum Degassing Unit (VD) to support the production of high-grade steel products.
- Establishment of a 66 kVA substation to meet increased power demands and ensure stable operations.
- Installation of various Heat Treatment Furnaces with integrated water quenching systems, enabling advanced material processing and expanded product development capabilities.
- Expansion of the Machine Shop with advanced CNC machinery, including CNC Lathes and CNC Vertical Turning Lathes (VTL), to boost machining precision and operational efficiency.
- Acquisition of land for a future project, aimed at further increasing manufacturing capacity.

Competition benchmarking

Operational benchmarking

The table below presents a comparison between Behari Lal Engineering Ltd. and its peers, which manufactures comparable product mix or serves the similar end use industries.

Company-wise product mix and capacities

SN	Product Category	Company Name	Product mix	Capacity
			Main Products	(TPA)
1	A. Alloy Steel products	Jailaxmi Casting & Alloys Pvt. Ltd.	Semi-Finished and Finished Steel Products- Billets and blooms, Angles, Bright Bars, Round Bar, Stainless Steel Billets, Steel Ingots	79,200
2		Jayaswal Neco Industries Ltd	Pellets, Billets & rolled products, pig and sponge iron, Iron & steel castings etc.	1,40,000 (castings); 1000000 (integrated steel plant)
3		Vardhman Special Steel Ltd.	Special steel & alloy steels- hot rolled bars and bright bars	250,000
4	B. Metal Rolls	Bharat Roll Industry Pvt. Ltd.	Metal rolls- steel, iron, alloy, graphite etc., Steel Ingots and metal castings	16,000
5		IFGL Refractories Ltd	Refractory products- Slide Gate Systems, Purging Systems, Ladle Lining & Ladle Refractories, Tundish Furniture's & Tundish Refractories	NA
6		RHI Magnesita India Ltd.	Refractory products- Slide Gate Plates, Nozzles and Well Blocks, Tundish Nozzles, Bottom Purging Refractories and Top Purging Lances, Slag Arresting Darts	500,000
7	C. Engineering Castings	Kennametal India Ltd	Hard materials, cutting tools, tool holders, inserts, blades, disks, crankshafts, cylinder heads etc.	NA
8		Peekay Steel Castings (P) Ltd.	Carbon Steel, Nickel based and SS Steel Castings and Forgings for Oil and Gas, Power, Mining, Earth Moving, Locomotives and other Engineering sectors	22,200
9		AIA Engineering Ltd	High chrome wear parts, high-chrome grinding media, liners and diaphragms, Wear parts for cement plants- High chrome grinding media, mill liners, vertical mill liners, Quarry- Blow bars, hammers, Impellers, anvil, Feed disk, frame liners, Mining- SAG Mill, Ball mill, Verti Mill	520,000
10		Steelcast Ltd	Steel and Alloy Steel Castings- valves & pumps, consumables in steel plants (grate bars), jaw plates, cutters, earth moving equipments, etc.	29,000

Note: Capacity figures are taken as per latest available data on company websites/public domains

Source: Company reports & websites, Industry, Crisil Intelligence

BLEL's product mix and capacities

Particulars	Capacity details	SMS and Foundry Division	Rolling Mill Division	Total
Fiscal 2025	Installed capacity (in MT)	54,464	65,000	1,19,464
	Actual production (in MT)	50,526	57,353	1,07,879
	Capacity utilisation (%)	92.77	88.24	90.3
Fiscal 2024	Installed capacity (in MT)	35,589	65,000	1,00,589
	Actual production (in MT)	30,418	55,559	85,977
	Capacity utilisation (%)	85.47	85.48	85.47
Fiscal 2023	Installed capacity (in MT)	36,129	65,000	1,01,129
	Actual production (in MT)	33,141	43,461	76,602
	Capacity utilisation (%)	91.73	66.86	75.75

Source: Company reports & websites, Industry, Crisil Intelligence

The company's business model stands out from its competitors by adopting a diversified product mix, which optimizes resource utilization and mitigates risks across various industries and geographies. In contrast, many competitors focus on a single product i.e. either rounds or metal rolls or engineering castings, often leading to underutilization of resources, whereas BLEL covers all the three product categories.

BLEL is the only player with the product mix of metal rolls, engineered castings and alloy steel products in India (alloy steel added).

BLEL is one of the few players to have a manufacturing facility fungible enough to manufacture numerous diversified across metal rolls/Engineered Castings and Alloy steel bar.

Behari Lal Group is one of the oldest groups in the steel business with over 79 years of experience in the steel industry.

BLEL is a leading player in India's metal rolls industry, meeting 10% of the country's demand in fiscal 2024. With a strong presence in the organized sector and a customer-centric approach, BLEL is poised to capitalize on the growing demand for metal rolls, expected to increase at a CAGR of 8-10% during fiscals 2024-2030. As a trusted partner to integrated steel players, OEMs, and rolling mills, BLEL is committed to delivering high-quality metal rolls and exceptional service, solidifying its position as a top-tier organized roll manufacturer.

Additionally, the company places a strong emphasis on innovation, constantly developing new grades and products to stay ahead of the competition. This continuous drive for innovation, combined with a focus on product quality and active after-sales service, gives the company a clear edge over competitors.

A significant differentiator is the active involvement of the top management with customers, ensuring an open communication channel that fosters trust and loyalty. Competitors, on the other hand, often lack such direct engagement, which limits their ability to provide personalized service. Moreover, the company enjoys a purchasing power advantage by sourcing raw materials directly from industries in the automobile sector and PSUs. This eliminates middlemen, reduces costs, and guarantees high-quality standards, setting the company apart in terms of efficiency and product excellence.

Financial benchmarking

To benchmark the performance of Behari Lal Engineering Ltd. against its competitors, we have compared the profitability, liquidity and leverage across the peer set. The peer set for financial benchmarking includes companies with operational capabilities and product offerings that are comparable to those of Behari Lal Engineering Limited (BLEL). The benchmarking has been categorized into three distinct groups based on their core businesses, product segments and industries served:

Peer set 1: It comprises three companies namely Jailaxmi Castings & Alloys Pvt. Ltd., Jayaswal Neco Industries Ltd. and Vardhman Special Steel Ltd. These companies specialize in alloy steel products, including rounds and flats, billets, hot-

rolled and cold-rolled products, cast blooms, bars, tools, and valves. They cater to a wide range of industrial applications, showcasing a diverse product portfolio similar to BLEL's alloy steel products business segment.

Peer set 2: It includes three companies, Bharat Roll Industry Pvt. Ltd., IFGL Refractories Ltd. and RHI Magnesita India Ltd. Bharat Roll, which is primarily focused on manufacturing various types of metal rolls. These rolls are essential for steel mills and other industrial processes, aligning closely with BLEL's rolls manufacturing business. RHI Magnesita and IFGL Refractories serves the same end use industries/customers like that of BLEL.

Peer set 3: It consists of four companies namely Kennametal India Ltd., Peekay Steel Castings (P) Ltd., AIA Engineering Ltd. and Steelcast Ltd which specialize in engineering castings. These companies produce high-quality castings for diverse engineering applications, making them relevant for comparison with BLEL's engineering casting business.

The inclusion of these peer sets allows for a comprehensive financial benchmarking analysis across different product verticals, helping BLEL gauge its performance in alloy steel products, metal rolls, and engineering castings.

Comparison of revenues (in Rs Mn)

Year	FY23	FY24	FY25
BLEL	4,629	4,461	5,079
Jailaxmi Casting & Alloys Pvt. Ltd.	5,847	5,586	NA
Jayaswal Neco Industries Ltd	63,429	59,336	59,997
Vardhman Special Steel Ltd.	17,350	16,614	17,644
Bharat Roll Industry Pvt. Ltd.	2,725	2,776	NA
IFGL Refractories Ltd	13,865	16,395	16,530
RHI Magnesita India Ltd	27,263	37,811	36,745
Kennametal India Ltd	10,771	10,999	NA
Peekay Steel Castings (P) Ltd.	5,936	7,526	NA
AIA Engineering Ltd	49,088	48,538	42,874
Steelcast Ltd	4,768	4,098	3,762

Source: Company financials, Crisil Intelligence

BLEL's revenue grew from Rs 4,629 million in Fiscal 2023 to Rs 45,079 million in Fiscal 2025, showing good CAGR of 5% over fiscals 2023-2025.

Compared to its industry peers, BLEL's revenue trend indicates stability despite some market fluctuations. Companies like Jayaswal Neco Industries Ltd., Jailaxmi Castings and Alloys Pvt. Ltd., Peekay Steel Castings (P) Ltd., RHI Magnesita etc. earned higher revenues than BLEL, whereas other players like Bharat Roll Industry Pvt. Ltd earned lesser revenues during all the years.

Comparison of revenues growth (in %)

Year	FY24	FY25
BLEL	-4%	14%
Jailaxmi Casting & Alloys Pvt. Ltd.	-4%	NA
Jayaswal Neco Industries Ltd	-6%	1%
Vardhman Special Steel Ltd.	-4%	6%

Bharat Roll Industry Pvt. Ltd.	2%	NA
IFGL Refractories Ltd	18%	1%
RHI Magnesita India Ltd	39%	-3%
Kennametal India Ltd	2%	NA
Peekay Steel Castings (P) Ltd.	27%	NA
AIA Engineering Ltd	-1%	-12%
Steelcast Ltd	-14%	-8%

Source: Company financials, Crisil Intelligence

BLEL saw highest growth in revenues during fiscal 2025.

Comparison of EBITDA (in Rs Mn.)

Year	FY23	FY24	FY25
BLEL	493	610	813
Jailaxmi Casting & Alloys Pvt. Ltd.	356	403	NA
Jayaswal Neco Industries Ltd	8,040	10,452	9,523
Vardhman Special Steel Ltd.	1,801	1,723	1,772
Bharat Roll Industry Pvt. Ltd.	279	365	NA
IFGL Refractories Ltd	1,661	1,731	1,460
RHI Magnesita India Ltd	3,748	5,783	5,052
Kennametal India Ltd	1,251	2,006	NA
Peekay Steel Castings (P) Ltd.	700	1,263	NA
AIA Engineering Ltd	14,752	16,167	14,808
Steelcast Ltd	1,153	1,199	1,105

Source: Company financials, Crisil Intelligence

BLEL's EBITDA has steadily and significantly improved at a CAGR 28%, increasing from Rs 493 million in fiscal 2023 to Rs 813 million in fiscal 2025. The company has managed cost efficiency better than competitors like Jailaxmi Castings and Alloys Pvt. Ltd. and Bharat Roll Industry Pvt. Ltd.

Comparison of PAT (in Rs Mn.)

Year	FY23	FY24	FY25
BLEL	288	358	530
Jailaxmi Casting & Alloys Pvt. Ltd.	265	283	NA
Jayaswal Neco Industries Ltd	2,269	2,100	1,127
Vardhman Special Steel Ltd.	1,004	916	931
Bharat Roll Industry Pvt. Ltd.	153	214	NA

IFGL Refractories Ltd	792	817	430
RHI Magnesita India Ltd	-4,657	-1,001	2,025
Kennametal India Ltd	877	1,105	NA
Peekay Steel Castings (P) Ltd.	302	658	NA
AIA Engineering Ltd	10,565	11,370	10,601
Steelcast Ltd	705	750	722

Source: Company financials, Crisil Intelligence

PAT is a key measure of profitability, and BLEL has demonstrated steady improvement, increasing at a CAGR of 36% over fiscals 2023-2025, from Rs 288 million in fiscal 2023 to Rs 530 million in fiscal 2025. Overall, BLEL has maintained stronger revenue stability and profitability.

Comparison of Cash Profit (in Rs Mn.)

Year	FY23	FY24	FY25
BLEL	464	592	800
Jailaxmi Casting & Alloys Pvt. Ltd.	300	306	NA
Jayaswal Neco Industries Ltd	2,979	5,561	3,947
Vardhman Special Steel Ltd.	1,615	1,555	1,584
Bharat Roll Industry Pvt. Ltd.	193	249	NA
IFGL Refractories Ltd	15,795	18,912	11,547
RHI Magnesita India Ltd	34,444	52,953	46,235
Kennametal India Ltd	1,612	1,994	NA
Peekay Steel Castings (P) Ltd.	488	869	NA
AIA Engineering Ltd	142,189	152,001	131,980
Steelcast Ltd	1,127	1,183	1,118

Source: Company financials, Crisil Intelligence

BLEL has demonstrated steady improvement, increasing at a CAGR of 31% over fiscals 2023-2025, from Rs 464 million in fiscal 2023 to Rs 800 million in fiscal 2025. Overall, BLEL has maintained stronger cash profits stability.

Comparison of Net worth (in Rs Mn.)

Year	FY23	FY24	FY25
BLEL	1,195	1,937	2,416
Jailaxmi Casting & Alloys Pvt. Ltd.	824	1,110	NA
Jayaswal Neco Industries Ltd	20,581	23,092	23,914
Vardhman Special Steel Ltd.	6,422	7,194	7,979

Bharat Roll Industry Pvt. Ltd.	1,371	1,585	NA
IFGL Refractories Ltd	10,050	10,721	11,070
RHI Magnesita India Ltd	28,910	38,457	39,986
Kennametal India Ltd	6,901	7,344	NA
Peekay Steel Castings (P) Ltd.	4,212	4,849	NA
AIA Engineering Ltd	56,913	66,577	69,272
Steelcast Ltd	2,234	2,793	3,374

Source: Company financials, Crisil Intelligence

BLEL has shown a robust improvement in net worth, increasing at a CAGR of 42% over fiscals 2023-2025, from Rs 1,195 million in fiscal 2023 to Rs 2,416 million in fiscal 2025.

Comparison of Net Debt (in Rs Mn.)

Year	FY23	FY24	FY25
BLEL	617	407	51
Jailaxmi Casting & Alloys Pvt. Ltd.	197	288	NA
Jayaswal Neco Industries Ltd	31,231	31,728	25,975
Vardhman Special Steel Ltd.	3,580	2,914	1,095
Bharat Roll Industry Pvt. Ltd.	(202)	(404)	NA
IFGL Refractories Ltd	1,033	1,044	1,528
RHI Magnesita India Ltd	12,669	4,366	2,830
Kennametal India Ltd	-868	-1,101	NA
Peekay Steel Castings (P) Ltd.	2,996	3,305	NA
AIA Engineering Ltd	1,951	2,807	935
Steelcast Ltd	234	1	0

Source: Company financials, Crisil Intelligence

BLEL's net debt has consistently declined from ₹617 million in fiscal 2023 to ₹51 million in fiscal 2025, highlighting its prudent financial management and focus on reducing leverage. This downward trend reflects stronger cash flow generation and disciplined working capital practices, positioning the company more favorably than several of its peers who continue to show volatile or rising debt levels.

Profitability parameters

Comparison of operating profit margin (in %)

Year	FY23	FY24	FY25
BLEL	11%	14%	16%
Peer set 1	10%	12%	13%

Peer set 2	12%	13%	11%
Peer set 3	19%	24%	32%

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL's operating profit margin improved from 11% in fiscal 2023 to 16% in fiscal 2025. Whereas the operating profits for Peer set 1 and 2 remained lower than BLEL over fiscal 2024 and 2025.

Peer set 3 (engineering castings') showcased better operating profit margins over all the years (fiscal 2023-2025).

Comparison of net profit margin (in %)

Year	FY23	FY24	FY25
BLEL	6%	8%	10%
Peer set 1	5%	5%	4%
Peer set 2	-2%	3%	6%
Peer set 3	12%	15%	22%

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL's net profit margin improved from 6% in fiscal 2023 to 10% in fiscal 2025, surpassing peer set 1 and 2's net profit margins.

Peer set 3's net profit margins remained higher over all the years (fiscal 2023-2025).

Comparison of return on capital employed (in %)

Year	FY23	FY24	FY25
BLEL	28%	22%	28%
Peer set 1	22%	20%	15%
Peer set 2	7%	12%	7%
Peer set 3	23%	23%	25%

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL maintained a healthy and stable ROCE, ~28% in fiscal 2023 and fiscal 2025, showing strong capital efficiency. In contrast, Peer Sets 1 and 2 saw consistent declines over the same period, while Peer Set 3 also dropped to 25% in fiscal 2025.

Comparison of return on equity (in %)

Year	FY23	FY24	FY25
BLEL	30%	23%	24%
Peer set 1	23%	17%	9%
Peer set 2	-2%	6%	5%
Peer set 3	20%	20%	20%

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL has outperformed most of its peers during fiscal 2023-2025 in terms of return on equity, showing superior capital efficiency.

Leverage parameters

Comparison of debt to equity ratio

Year	FY23	FY24	FY25
BLEL	53%	21%	3%
Peer set 1	80%	63%	66%
Peer set 2	30%	14%	14%
Peer set 3	15%	11%	4%

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL has maintained a consistently low debt-to-equity ratio (0.53 in fiscal 2023 to 0.03 in fiscal 2025), highlighting prudent leverage and a strong balance sheet. This is significantly below Peer Set 1 and Peer Set 2 and remains comparable to Peer Set 3, positioning BLEL as financially stable with limited debt risk.

Operational Key performing indicators

Comparison of Inventory Days

Year	FY23	FY24	FY25
BLEL	25	34	42
Peer set 1	65	75	78
Peer set 2	107	100	150
Peer set 3	81	85	73

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL's inventory days moved from 25 in fiscal 2023 to 42 in fiscal 2025. Overall, BLEL's inventory position lies between the most efficient (Peer set 1) and the relatively stretched peers (Peer set 2 and 3), indicating a balanced performance.

Comparison of Creditor Days

Year	FY23	FY24	FY25
BLEL	12	12	26
Peer set 1	36	43	32
Peer set 2	104	70	101
Peer set 3	72	88	81

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL's creditor days remained within a range of 12-26 over fiscals 2023-2025, reflecting faster payments to suppliers. This is lower than all peer sets, which operate between 32-104 days. While peers benefit from longer credit periods, BLEL's approach suggests a conservative stance, ensuring supplier stability but with lower reliance on trade credit. On balance, BLEL's position is neutral, with scope to align closer to peers for working capital flexibility.

Comparison of Debtor Days

Year	FY23	FY24	FY25
BLEL	52	67	56
Peer set 1	35	41	36
Peer set 2	79	73	74
Peer set 3	70	78	82

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

Debtor days for BLEL have remained stable at 52-67 days during fiscal 2023-2025. Compared to peers, this positions BLEL in the middle — tighter than Peer set 2 and 3 (70–82 days) but higher than Peer set 1 (35–41 days). The consistency indicates steady receivable management, without being significantly aggressive or lenient relative to the peer group.

Comparison of Cash Conversion Cycle (Number of days)

Year	FY23	FY24	FY25
BLEL	65	89	72

Peer set 1	65	73	81
Peer set 2	82	104	123
Peer set 3	79	74	74

Note: Fiscal 2025's calculation for Peer Set 1 does not include Jailaxmi Neco Industries Ltd., for Peer Set 2 does not include Bharat Roll Industry Pvt. Ltd. and for Peer Set 3 do not include Kennametal India Ltd. & Peekay Steel Castings (P) Ltd. due to unavailability of financials for fiscal 2025.

Source: Company financials, Crisil Intelligence

BLEL's cash conversion cycle increased from 65 days in fiscal 2023 to 72 days in fiscal 2024–2025. Whereas it was lower for all the other peer sets during FY25. The movement indicates some rise in working capital lock-in, but BLEL's position remains comparable with the peer average, suggesting neither a clear advantage nor disadvantage.

SWOT analysis



Source: Behari Lal Engineering Ltd., Crisil Intelligence

Key strengths

Key strengths that collectively underscore BLEL capability to deliver high-quality products and services, supported by advanced technology and efficient operations, are as follows:

- **Strategic Location**

The company is in Mandi Gobindgarh, a hub for steel production, with excellent connectivity via National Highway 44 and State Highway 12A. The proximity to 2 dry ports (Samrala Inland Container Deposit- Bija Village, near Ludhiana and Senwal Inland Container Deposit- Ludhiana District) is around 40 km and an international airport (Chandigarh International Airport) is 60 km. Not only this, It has easy access to the Railway Freight Corridor (Amritsar-Kolkata Industrial Corridor), ensuring seamless logistics.

- **Logistics and Resource Availability**

Readily available raw materials and foundry consumables along with a strong infrastructure for road transport, facilitates smooth operations and reduced lead time.

- **Economies of Scale**

The company is among the largest producers of Metal Rolls in India, leading to cost efficiencies. More than 90% of plant capacity utilization ensures optimal use of resources.

- **Strong Legacy and Preferred Vendor Status Driving Entry Barriers**

With over decades of goodwill in the steel trading business, BLEL is approved by 50+ marquee clients. It is a preferred vendor to major OEMs, having cleared rigorous audits and testing protocols. These long-standing approvals and trusted relationships create high entry barriers, making it difficult for new players to compete.

- **Customized Solutions for Customer Needs**

The company's strategy of providing tailored solutions positions it well to meet the specific requirements of clients across different industries, strengthening customer loyalty and increasing market penetration.

- **Advanced manufacturing technology**

The company is using advanced and unique manufacturing facilities like Argon Purging Station and Vacuum Degassing Unit to enhance steel cleanliness and quality.

- **Wide Product Portfolio and Market Penetration**

The company has numerous SKUs developed in-house, catering to diverse customer needs. It has a strong penetration with 1,600+ customers across various sectors.

- **Cost and Quality Advantage**

Cost advantage due to bulk purchasing of scrap and directly procurement of raw materials from automobile industries and PSUs, eliminating middlemen and maintaining high-quality standards.

- **Consistent Demand and Order Book**

As of August 31, 2025, the company has ₹ 1,023.86 million of order book, ensuring stable demand.

- **Strong Entry Barriers Due to BLEL's Approvals and Certifications**

BLEL's exclusive approvals and certifications from reputed organizations such as the Research Designs and Standards Organization (RDSO), and Metso Corporation serve as significant competitive advantages. These endorsements not only validate BLEL's technical capabilities and product quality but also act as formidable entry barriers for new and smaller competitors.

Securing such approvals typically involves stringent qualification processes, long gestation periods, and consistent adherence to high quality and compliance standards that deter new entrants. As a result, BLEL enjoys preferential access to regulated and critical-end-use markets, reinforcing its market credibility, customer stickiness, and long-term revenue visibility.

Key weaknesses

- **Dependence on Raw Material Prices**

The company is vulnerable to fluctuations in raw material prices, which could directly impact profitability. While the company books raw materials according to order schedules, significant price increases can still strain margins.

- **High Fixed Operational Costs**

Due to high operational costs tied to machinery, labor, and plant maintenance, achieving consistent profitability may require full plant capacity utilization. Any downtime or lower-than-expected demand could result in inefficiency and reduced profitability.

- **Challenges in Expanding International Market Presence**

Although the company has a diversified sales base, expanding in foreign markets can be challenging due to tariffs, anti-dumping duties, and local market competition, especially in highly competitive steel markets.

- **Skilled Labor Shortage**

Despite a family-like culture, attracting and retaining qualified employees with specialized skills can still be challenging, especially in a competitive labor market for skilled workers in the steel industry.

Key opportunities

- **China + 1 Strategy**

With India emerging as the preferred alternative to China in global supply chains, the company has an opportunity to capitalize on this shift by positioning itself as a reliable supplier to global customers.

- **Global Market Expansion**

Online marketing initiatives and participation in tenders via the GEM portal provide a significant opportunity to expand the company's reach, especially in international markets where demand for quality steel products is growing.

- **Engagement in High-Value Tenders and Strategic Customer Negotiations**

Active participation in tenders with key clients enables the company to secure large-scale projects and strengthen relationships with major industry players.

- **Prototype Development and Technological Advancement**

Collaborations like prototype development in technology offer opportunities for innovation and improvement of product offerings, ensuring the company remains competitive.

- **Forward Integration and Product Customization**

The focus on forward integration and developing made-to-order and ready-to-use products can provide added value to customers and increase profitability through higher margins.

- **New Product Development and Quality Improvement Projects**

Ongoing projects to develop prototypes and improve product quality allow the company to stay ahead of the competition, fulfill customer-specific requirements, and lower production costs.

- **Increasing Demand for High-Quality Steel**

As global demand for high-quality and specialized steel products grows, the company has the opportunity to enhance its product offerings and tap into new market segments, particularly in sectors like defence, infrastructure, and manufacturing.

Key threats

- **Rising Costs of Raw Materials and Supply Disruptions**

Significant increases in the cost of essential raw materials, energy, or transportation, along with potential supply chain disruptions, could negatively impact profitability.

- **Tariffs, Anti-Dumping, and Countervailing Duties**

The company's export products may be subject to tariffs, anti-dumping, or countervailing duty proceedings, potentially increasing costs or restricting market access.

- **Production Disruptions due to Accidents or Equipment Malfunctions**

Accidents, breakdowns, or malfunctioning equipment at production facilities could disrupt operations and negatively impact business performance.

- **Difficulty in Hiring and Retaining Qualified Employees**

Challenges in recruiting and retaining skilled workers may affect operations and overall business performance. Cultivating a family-like company culture will be necessary for the organization.

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Crisil Intelligence is a leading provider of research, consulting, risk solutions and advanced data analytics, serving clients across government, private and public enterprises. We leverage our expertise in data-driven insights and strong benchmarking capabilities to help clients navigate complex external ecosystems, identify opportunities and mitigate risks. By combining cutting-edge analytics, machine learning and AI capabilities with deep industry knowledge, we empower our clients to make informed decisions, drive business growth and build resilient capacities.

For more information, visit Intelligence.Crisil.com

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