WORLD FOUNDRY ORGANIZATION

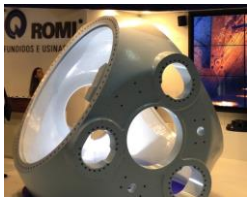
The reference point for the global metal casting industry

WFO GLOBAL FOUNDRY REPORT

2025

ACTUAL SITUATION OF THE WORLDWIDE CASTING INDUSTRY






December 2025

Rev 1 February 2026

WFO

The World Foundry Organization

WFO GLOBAL FOUNDRY REPORT 2025

Actual situation of the worldwide casting industry

December 2025

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Editorial and contents coordination

The World Foundry Organization Ltd.
Winton House, Lyonshall, Kington HR5 3JP United Kingdom
jjgonzalez@thewfo.com

Acknowledgments

The World Foundry Organization is comprised of National foundry organisations or associations representing foundries, suppliers and academia from around the world.

This documentation has been collected and prepared by The World Foundry Organization with the information gathered by the next WFO National Representatives:

American Foundry Society
Association of Finnish Foundry Industry
Association Technique de Fonderie
Australian Foundry Institute
Croatian Foundry Association
Czech Foundrymen Society
Foundry Institute of the Clausthal University of Technology
Foundry Institution of Chinese Mechanical Engineering Society
ICME – Institute of Cast Metals Engineers
Indonesian Foundry Industries Association
Institute of Indian Foundrymen
Japan Foundry Engineering Society
Norwegian Foundry Technical Association
Polish Foundrymen's Association
Slovenian Foundrymen Society
Swedish Foundry Association
Swiss Foundry Association
Tabira Foundry Institute
Tüdöksad – The Turkish Foundry Association

This documentation has also counted with the active cooperation of next organizations:

Association of Friends and Sponsors of Foundry Technology at TU Clausthal e.V.
AZTERLAN – METALLURGY RESEARCH CENTER
Cast Metals Federation
RISE Research Institutes of Sweden

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Dear Global Foundry Colleagues,

It is with immense pleasure to announce the upcoming release of the WFO Global Foundry Report 2025—a cornerstone publication that reaffirms WFO's commitment to being the definitive reference point for the global metal casting industry. For years, this annual report has served as a vital bridge, aggregating timely, comprehensive insights from our member countries and fostering an international network that delivers direct access to cutting-edge technology and critical industry statistics.

The 2025 edition builds on this legacy with enhanced depth and relevance. Compiled from the valuable contributions of WFO Secretariat teams and member associations worldwide, the report offers a multifaceted analysis: from national economic overviews and industrial structure profiles (including foundry counts, core technologies, and production data visualized through intuitive graphs and tables) to in-depth commentary on current trends, emerging challenges, and future opportunities across production, market demand, customer sector dynamics, and key areas like environmental compliance, legislative updates, and technological breakthroughs. Every page reflects the collective wisdom of our global community, and on behalf of WFO, I extend my sincere gratitude to all contributors for their dedication and expertise.

The past year has underscored the casting industry's resilience amid global uncertainties—slowing economic growth, volatile raw material prices, and geopolitical complexities have tested our adaptability, yet they have also accelerated our shift toward digitalization, intelligence, and low-carbon development. This report captures these transformative shifts, offering actionable insights to navigate challenges and seize opportunities in a rapidly evolving landscape. As WFO, we remain steadfast in our mission to facilitate knowledge exchange, drive technological innovation, and build a collaborative ecosystem that empowers our industry to thrive sustainably.

Looking ahead, we continue to champion meaningful connections: from high-quality academic conferences to cross-border collaborations, we strive to unite experts, engineers, and visionaries from every corner of the globe. We invite you to delve into the WFO Global Foundry Report 2025, draw inspiration from its findings, and join us in shaping a more resilient, innovative, and sustainable future for the global casting industry.

Together, we turn insights into action, and challenges into milestones.

Yours sincerely,



Dr. Lou Yanchun

President of the WFO

Chief Scientist, China Academy of Machinery Science and Technology

Director, State Key Laboratory of Advanced Casting Technology for High-End Equipment

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WORLD FOUNDRY INDUSTRY 2024-25

TOP FIVE WORLD PRODUCERS

Alphabetical order

FOUNDRY PRODUCTION IN CHINA

National representation in the WFO:
FOUNDRY INSTITUTION OF CHINESE MECHANICAL ENGINEERING SOCIETY
WWW.FOUNDRYNATIONS.COM

Macroeconomic Overview

In 2024, China's Gross Domestic Product (GDP) reached 134,908.4 billion yuan, representing a year-on-year growth of 5.0 percent calculated at constant prices. In the first three quarters of 2025, China's GDP reached 101,503.6 billion yuan, a year-on-year increase of 5.2 percent at constant prices.

The total value added of industrial enterprises grew by 5.8 percent year-on-year. The share of value added from high-tech manufacturing and equipment manufacturing industries rose to 16.3 percent and 34.6 percent respectively, up 0.6% and 1.0% from the previous year. In 2024, the green and digital transformation accelerated, with the energy consumption per unit of value added declining year-on-year in major energy-consuming industries, such as chemicals, building materials, and steel.

From industrial perspectives, over 90 percent of sectors and 60 percent of products saw growth. In 2024, among the 41 major industrial categories, 39 recorded year-on-year growth in value added. Among the 619 major industrial products tracked, output increased for 395 products.

Industrial capacity utilization rates showed a quarterly recovery. In 2024, the capacity utilization rate for industrial enterprises nationwide was 75.0 percent. By quarter, the rates were 73.6 percent (Q1), 74.9 percent (Q2), 75.1 percent (Q3), and 76.2 percent (Q4), indicating a steady quarterly improvement.

The proportion of equipment manufacturing continued to increase, indicating further optimization of the industrial structure. In 2024, the value added of equipment manufacturing industries above the designated size grew by 7.7 percent year-on-year, accounting for 34.6 percent of all industries above the designated size, an increase of 1.0 percentage points from the previous year. Among the major sectors, electronics, railway/shipping/aerospace equipment, and automotive industries experienced relatively rapid growth, with increases of 11.8 percent, 10.9 percent, and 9.1 percent, respectively. Annual production of new energy vehicles (NEVs) reached 13.168 million units, maintaining the global top position for the tenth

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consecutive year, making China the first country globally to exceed an annual NEV production volume of ten million units.

The nationwide surveyed urban unemployment rate was 0.1 percentage points lower than the previous year. Per capita disposable income of residents increased by 5.1 percent in real terms, keeping pace with economic growth.

Development Status of China's Foundry Industry

Production Volume of China Foundry Industry in 2024

In 2024, China's total casting output reached 50.75 million metric tons, a decrease of 2.2 percent year-on-year. The trend of China's casting output from 2001 to 2024 is shown in Figure 2-1.

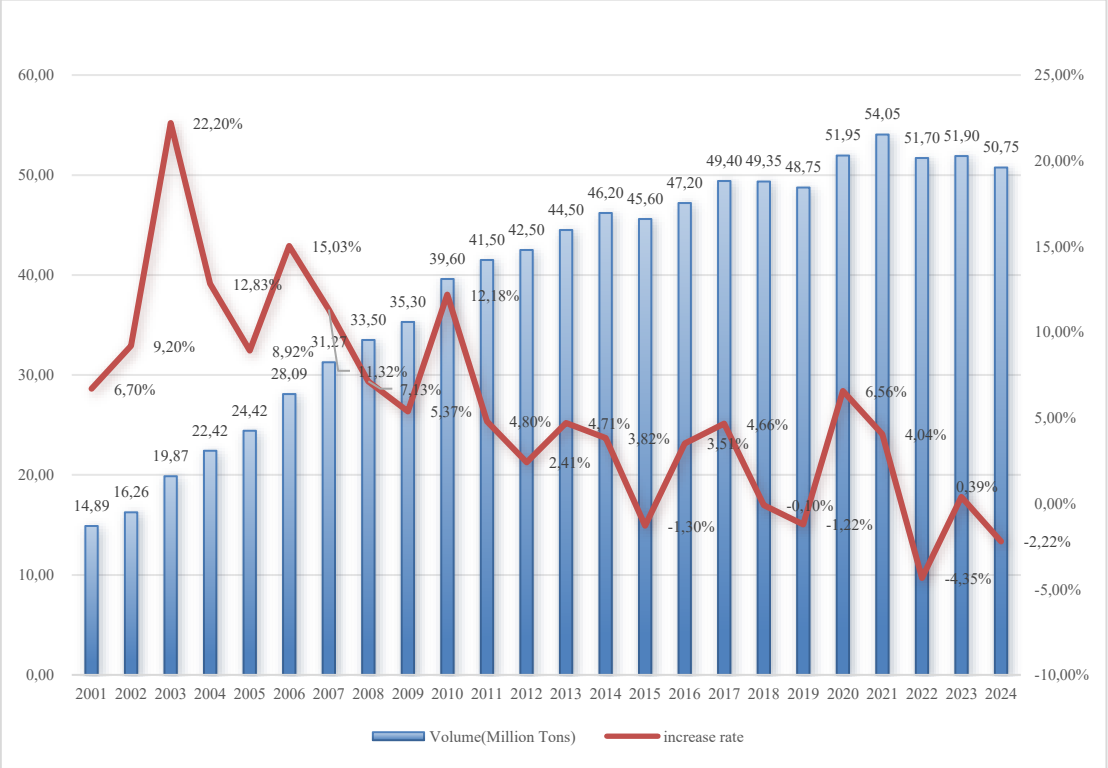


Figure 1. *China's Casting Output, 2001-2024 (Million Metric Tons)*

Performance of the Main Customer Sectors

Among the downstream sectors, the automotive industry remained the largest consumer of castings. In 2024, demand for castings from the automotive sector, along with power generation equipment, machine tools, construction machinery, and rail transportation, increased by 8.1%, 7.5%, 6.3%, 4.0%, and 2.3% respectively. In contrast, demand for cast pipes and fittings saw a relatively significant decline of 14.2 percent, followed by internal combustion engines and agricultural machinery, which decreased by 5 percent.

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Year	Automobile	Combustion Engines and Agricultural Machinery	Engineering Machinery	Mining and Metallurgical Heavy Machinery	Cast Pipes and Fittings	Machine Tools	Rail Transportation	Power Generation Equipment and Electricity Facilities	Vessel	Others	Total
2020	15	5.4	4.9	4.7	8.53	2.27	2.2	2.5	0.35	6.1	51.95
2021	15.4	5.55	5.2	5	8.85	2.6	2.15	2.35	0.35	6.6	54.05
2022	14.75	5.15	4.8	5.2	8.3	2.45	2.1	2.15	0.35	6.45	51.7
2023	15.2	5.05	4.3	5.15	8.1	2.4	2.15	2.5	0.4	6.65	51.9
2024	**15.05**	**4.8**	**4.65**	**5.05**	**6.95**	**2.55**	**2.2**	**2.6**	**0.43**	**6.47**	**50.75**
Increase Rate	-1.00%	-5.00%	8.10%	-1.90%	-14.20%	6.30%	2.30%	4.00%	7.50%	-2.70%	-2.20%

Table 1. *Changes in Downstream Demand for Castings in China, 2020-2024 (Million Metric Tons)*

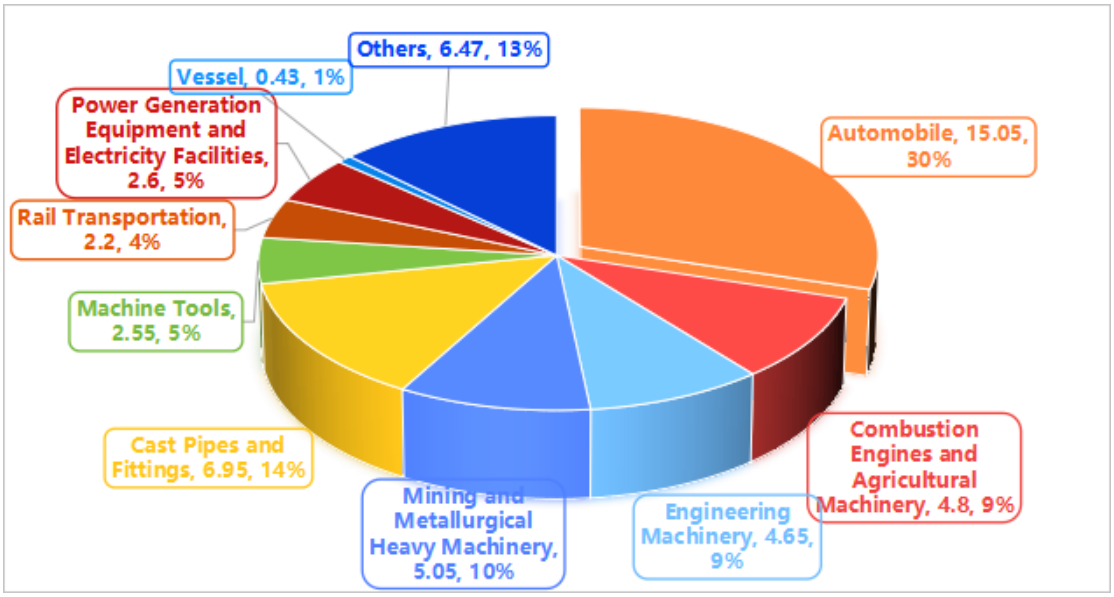


Figure 2. *Share of Customer Sector Demand for Castings in China, 2024 (Million Metric Tons)*

Performance of the Castings by Material Type

- **Gray cast iron:** 20.6 million tons, accounting for 40.6%;
- **Ductile cast iron:**13.95 million tons, accounting for 27.5%(29% in 2023);
- **Steel castings:** accounting for 12.4%, unchanged from 2023;
- **Aluminum (magnesium) alloy castings:** the proportion has increased to 16.4%, driven by the EVs and the trend of lightweight;

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Year	Grey Cast Iron	Nodular Cast Iron	Malleable Cast Iron	Cast Steel	Aluminum (Magnesium) Alloy	Copper Alloy	Others	Total
2020	21.75	15.30	0.63	6.35	6.80	0.87	0.25	51.95
2021	22.55	15.95	0.60	6.60	7.20	0.90	0.25	54.05
2022	21.20	14.90	0.55	6.35	7.55	0.90	0.25	51.70
2023	20.90	15.05	0.50	6.35	7.95	0.90	0.25	51.90
2024	**20.60**	**13.95**	**0.45**	**6.28**	**8.32**	**0.90**	**0.25**	**50.75**
Increase Rate (2024/2023)	-1.40%	-7.30%	-10.00%	-1.10%	4.70%	--	--	-2.20%

Table 2. *Output of Castings by Material Type, 2020-2024 (Million Metric Tons)*

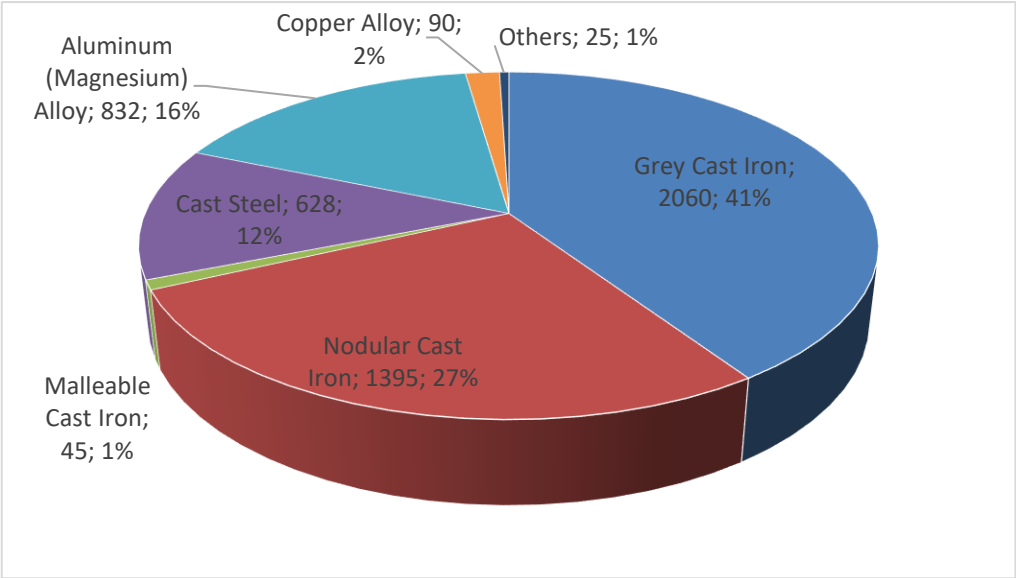


Figure 3. *Share of Castings by Material Type, 2024*

Outlook

China foundry industry is undergoing a fundamental shift in its production model, driven primarily by technological advancement and sustainability requirements. Under the "Dual Carbon" goals, green foundry has become an irreversible trend. Strict environmental regulations are also pushing companies to upgrade emission control systems and adopt cleaner production methods.

"Dual Carbon"-"carbon peaking and carbon neutrality”-China strives to achieve carbon peak before 2030 and carbon neutrality before 2060.

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Driven by the ongoing lightweighting trend, the share of non-ferrous (light) alloy castings in total output will continue to grow. In customer sectors, the explosive growth of new energy vehicles remains a core driver, significantly boosting demand for lightweight die-cast components such as those made from aluminum and magnesium alloys. The trend toward larger wind power equipment is also creating demand for extra-large, high-performance castings. Additionally, emerging fields such as the low-altitude economy and humanoid robots are beginning to generate new demand for castings, characterized by low-volume, high-mix, and high-precision requirements.

Overall, the foundry industry is moving into a new phase of development—technology-driven, green and low-carbon, and focused on high value-added products. Obsolete capacity was steadily weeded out and it led to a decline in total output. While the output of ferrous castings continues its steady decline, non-ferrous castings are accounting for a growing share of total production. Although the Chinese casting market has experienced a slight decline since 2024, affected by the economic climate, trade protectionism and other factors, the foundry industry continues to embrace technological transformation. Guided by policy, companies are actively advancing the development of New Quality Productive Forces, increasingly focusing on niche segments to build a technological edge.

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FOUNDRY PRODUCTION IN GERMANY

National representation in the WFO:
CLAUSTHAL UNIVERSITY OF TECHNOLOGY
VEREIN DER FREUNDE UND FÖRDERER
DER GIEßEREITECHNIK
WWW.TU-CLAUSTHAL.DE

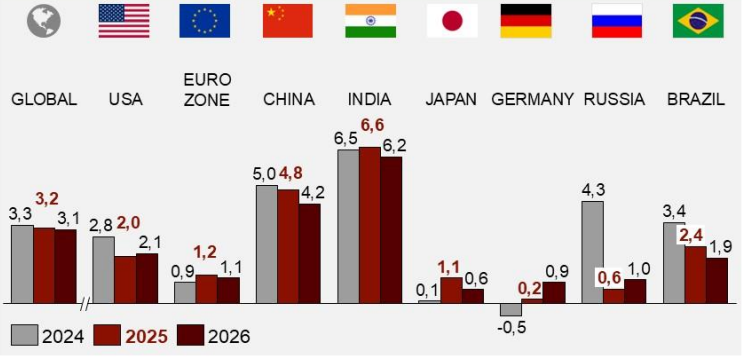
TU Clausthal

MACRO – GDP FORECASTS 2024-2026 (IMF 10/2025)

International Monetary Fund

GLOBAL GROWTH 2025 AND 2026 LOWER THAN IN 2024, BUT HIGHER THAN EXPECTED IN JULY

GDP GROWTH YOY IN %



KEY ISSUES

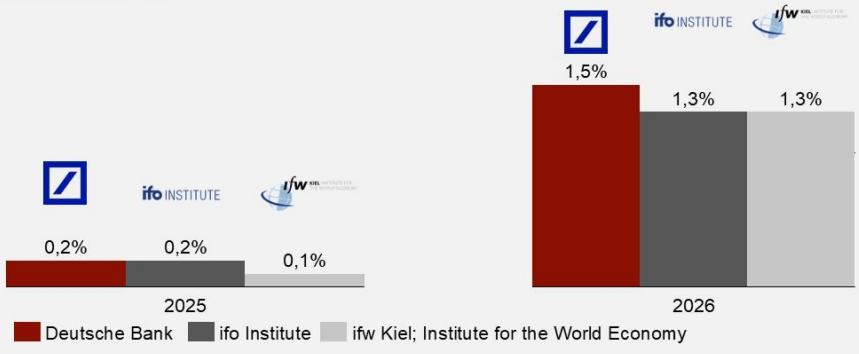
- Global growth of 3,2% is expected for 2025, which is an improvement of 0,2% compared to the 07/2025 forecast. The forecast for 2026 remains unchanged at 3,1%
- However, expected growth is well below the historical average (2000-2019) of 3,7% and below the growth rate for 2024
- Ongoing trade conflicts and US tariffs are weighing on the economy, but effects have been lower than expected so far thanks to exemptions and flexible supply chains
- Escalating trade wars, financial market corrections due to exaggerated AI expectations, uncertainty, and high debt pose significant risks, while eroded economic policy buffers weaken resilience to future shocks

Sources: IMF, World Economic Outlook October 14th, 2025, HA Strategy Analysis

MACRO – GDP FORECASTS 2025/2026 (GERMANY)

GERMANY REMAINS THE SLOWEST-GROWING MAJOR ECONOMY

GDP CHANGE YOY IN %



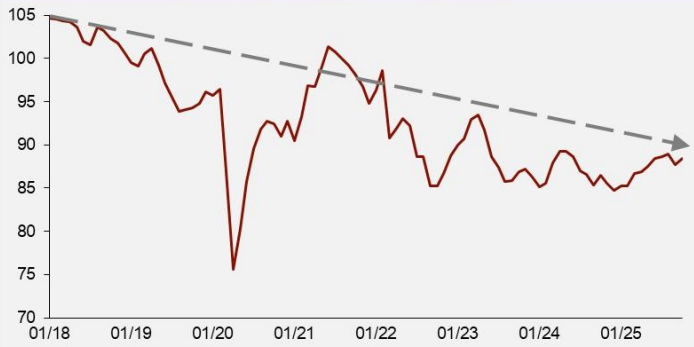
Sources: Deutsche Bank, 06.10.2025, ifo Institute, 04.09.2025, ifw Kiel, Institute for the World Economy, 05.09.2025, HA Strategy Analysis

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MACRO – IFO BUSINESS CLIMATE INDEX IN GERMANY (OCTOBER 2025)

BUSINESS CLIMATE IN GERMANY BRIGHTENED IN OCTOBER, LONG-TERM TREND STILL NEGATIVE

IFO BUSINESS CLIMATE INDEX (OCTOBER 2025)



MANAGEMENT SUMMARY

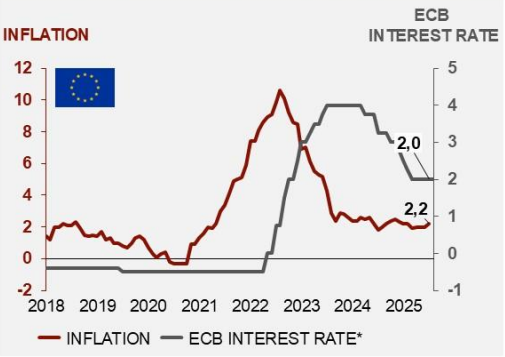
- Business sentiment in Germany has improved in October. The ifo Business Climate Index rose to 88,4 points in October, up from 87,7 points in September
- This was due to improved expectations for the coming months. However, the current business situation was assessed as slightly worse
- The German economy continues to hope for an economic upturn in the coming year

Sources: ifo Institute October 27th 2025, HA Strategy Analysis

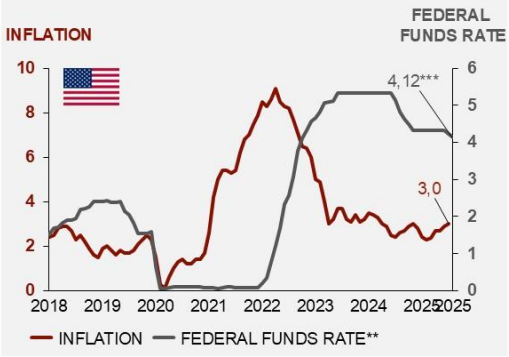
MACRO – INFLATION AND CENTRAL BANK BASE RATE 2018-2025

CENTRAL BANKS LOWER INTEREST RATES AS INFLATION RATES FALL

EURO ZONE INFLATION/ECB INTEREST RATE IN %



USA INFLATION / FEDERAL FUNDS RATE IN %



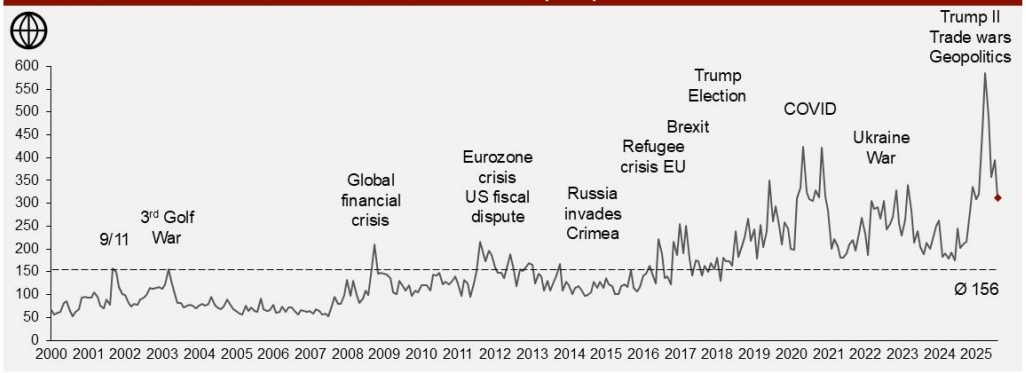
*Deposit facility rate (DFR) for overnight deposit **Effective federal funds rate (EFFR) *** Target Range 3,75% - 4%
Sources: European Central Bank, US Bureau of Labor Statistics, Federal Reserve Bank (all as of October 30th 2025), HA Strategy Analysis

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MACRO – GLOBAL ECONOMIC POLICY UNCERTAINTY INDEX

AFTER PEAKING IN APRIL, UNCERTAINTY DECLINED SLIGHTLY BUT REMAINS EXTREMELY HIGH

GLOBAL ECONOMIC POLICY UNCERTAINTY INDEX (PPP)

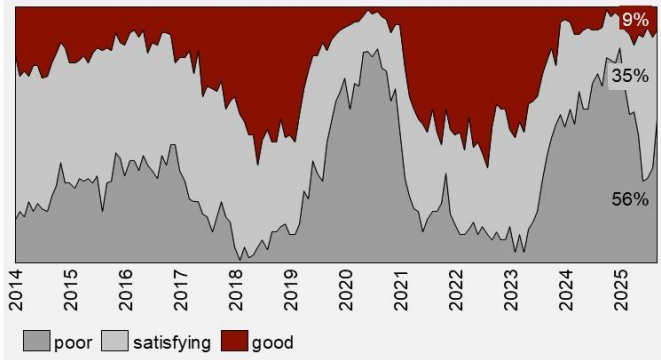


Sources: Economic Policy Uncertainty.com (latest data August 2025), HA Strategy Analysis

FOUNDRY MARKET – BUSINESS CLIMATE FOUNDRY INDUSTRY GERMANY (09/2025)

BUSINESS CLIMATE FOUNDRY DETERIORATED FOR THE THIRD CONSECUTIVE MONTH

BUSINESS SITUATION FOUNDRY INDUSTRY GERMANY (09/25)



MANAGEMENT SUMMARY

- Business climate in the German foundry industry declined for the third consecutive month in September 2025, reaching its lowest level since February 2025
- Only 9% of foundries rated their situation as good, 35% as satisfactory, and 56% as poor
- Both the current situation and expectations were assessed as worse than in the previous month

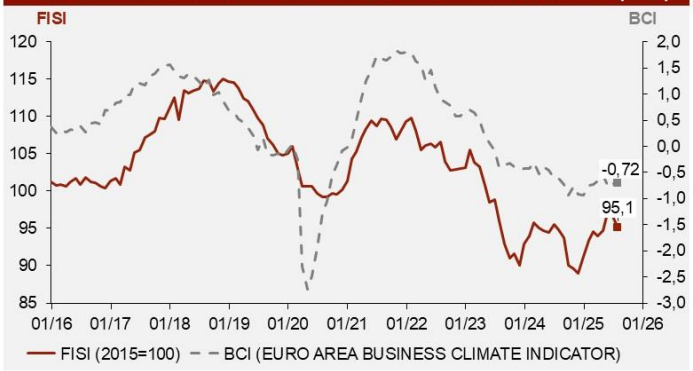
Sources: Ifo Institut Munich, bdg September 30th 2025, HA Strategy Analysis

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FOUNDRY MARKET – EUROPEAN FOUNDRY INDUSTRY SENTIMENT (FISI) 08/2025

BUSINESS CLIMATE IN THE EUROPEAN FOUNDRY INDUSTRY DETERIORATES

EUROPEAN FOUNDRY INDUSTRY SENTIMENT INDICATOR (FISI)



MANAGEMENT SUMMARY

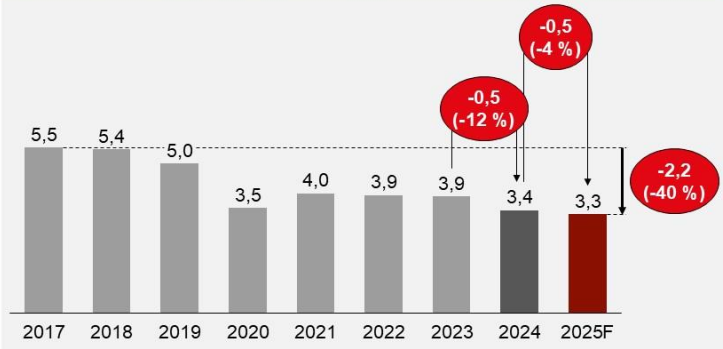
- Business climate in the foundry industry in Europe fell to 95,1 points in August 2025, down from 96,6 points in July 2025
- The BCI comparative indicator, which reflects the general economic climate in Europe, also fell from -0,71 points in July to -0,72 points in August
- The production of cast iron and cast products made from non-ferrous metals declined, with only cast steel recording a positive trend

Sources: European Foundry Federation (FISI) September 29th 2025, European Commission (BCI), HA Strategy Analysis

FOUNDRY MARKET – CASTING PRODUCTION 2017-2025F (GERMANY)

GERMAN CASTING PRODUCTION CONTINUES TO FALL: −12% IN 2024, −4% EXPECTED IN 2025

CASTING PRODUCTION GERMANY IN MILL. TONS



KEY INFORMATION

- Since 2017, the production volume of German foundries has declined by an average of 6% p.a.
- The Association of the German Foundry Industry (BDG) expects a 4% yoy decline in volume for 2025
- From 2017 to 2025F, the volume of castings produced would thus have fallen by almost 40% or 2,2 million tons

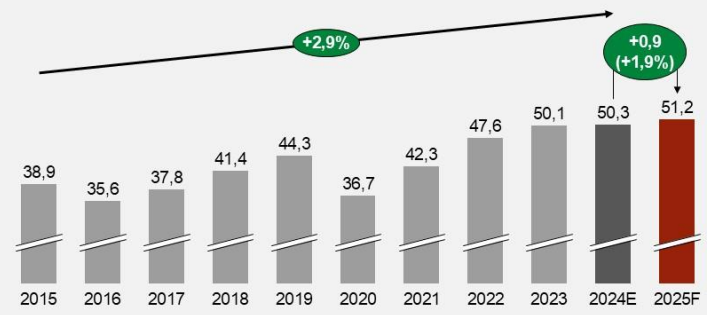
Sources: Bundesverband der deutschen Gießerei-Industrie e.V. 09/2025, HA Strategy Analysis

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FOUNDRY MARKET – US FOUNDRY INDUSTRY 2015-2025F

U.S. FOUNDRY INDUSTRY EXPECTED TO GROW BY +1,9% YOY IN 2025

FOUNDRY INDUSTRY[1] REVENUE IN USD BILL.



SUMMARY

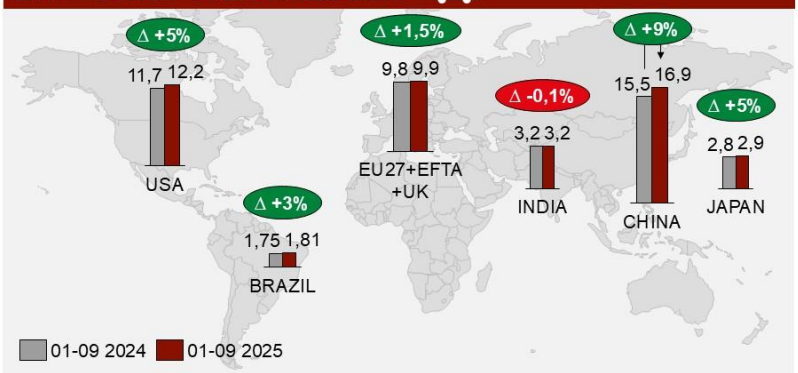
- The American Foundry Society (AFS) has lowered its revenue forecast for the foundry industry in 2025 to +1,9% yoy
- In January 2025, the forecast was +4,2%
- From 2015 to 2024 industry revenues have been growing by 2,9% per year

[1] Metalcasting w/o art foundries and educational foundries
Sources: AFS, Metalcasting Forecast & Trends 07/2025 and earlier, HA Strategy Analysis

AUTOMOTIVE – GLOBAL LIGHT VEHICLE[1] SALES 01-09/2025 YOY

GLOBAL SALES INCREASED FOR THE MOST PART, INDIAN MARKET SLIGHTLY WEAKER

LIGHT VEHICLE[1] SALES IN MILL. UNITS



SUMMARY

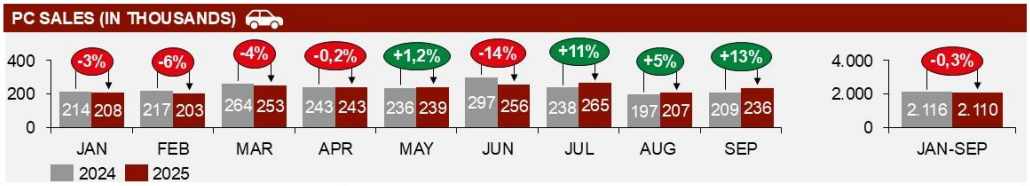
- Global automotive markets developed predominantly positi-vely in the first nine months of 2025
- However, the positive figures must be viewed in context. Firstly, last year's figures were weak in most regions. Secondly, markets in the US and Europe are still far below their 2019 pre-crisis levels.

[1] VDA figures vary depending on country/region: light vehicles (= passenger cars and light commercial vehicles <3.5 t) or passenger cars only.
Sources: VDA October 28th 2025, HA Strategy Analysis

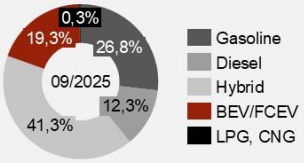
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AUTOMOTIVE – PASSENGER CAR SALES GERMANY JANUARY - SEPTEMBER 2025 YOY

SALES SLIGHTLY BELOW PREVIOUS YEAR AND STILL SIGNIFICANTLY BELOW 2019 LEVEL



POWERTRAIN SHARE



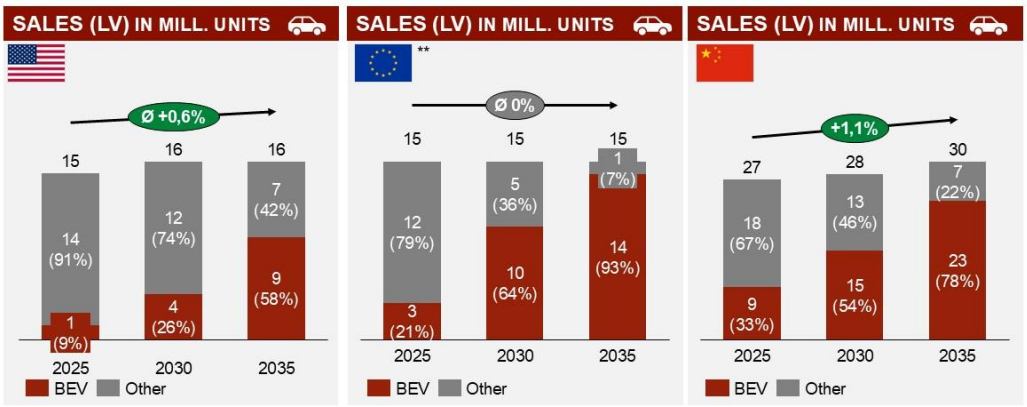
MANAGEMENT SUMMARY

- In the nine months of 2025, ~2,1 million new cars were registered in Germany. This is a decrease of 0,3% compared to the same period in 2024
- In the first nine months of 2019 around 630k or 23% more cars were registered
- In September 2025, conventional combustion engines continued to lose importance (Gasoline: -5,9% year on year; Diesel: -7,2% year on year), while alternative drives grew significantly (Hybrid Vehicles: +28,9% year on year; BEV: +31,9% year on year).

Note: Differences in sums and calculated numbers shown may occur due to commercial rounding of figures and percentages in graph
Sources: Kraftfahrt-Bundesamt (KBA), October 6th 2025, HA Strategy Analysis

AUTOMOTIVE – LIGHT VEHICLE (LV*) SALES 2035F POWERTRAIN SPLIT (MAJOR MARKETS)

AUTOMOTIVE GROWS IN CHINA AND BEV – EUROPE FORECASTS SIGNIFICANTLY CORRECTED

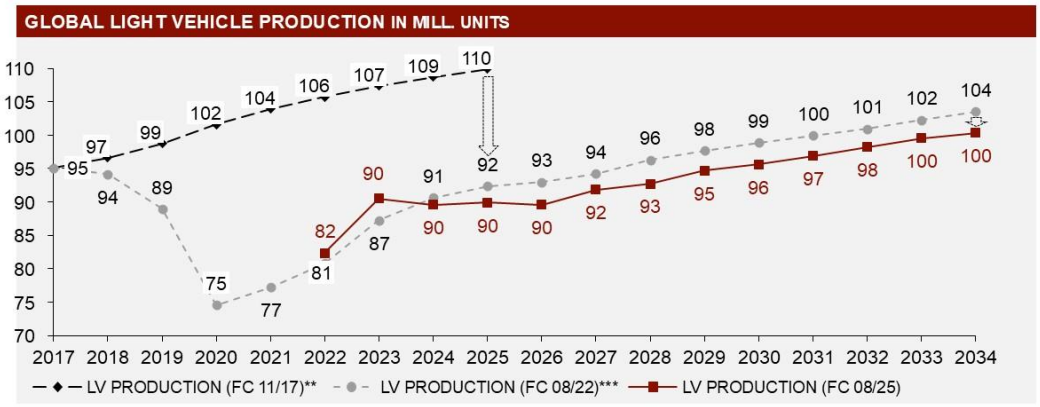


* Passenger cars and light commercial vehicles ≤6t ** EU27+UK+EFTA
Sources: PWC Autofacts analysis 08/2025 (based on IHS LV Production Forecast), HA Strategy Analysis

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AUTOMOTIVE – GLOBAL LV* PRODUCTION 2034F (FORECAST DEVELOPMENT)

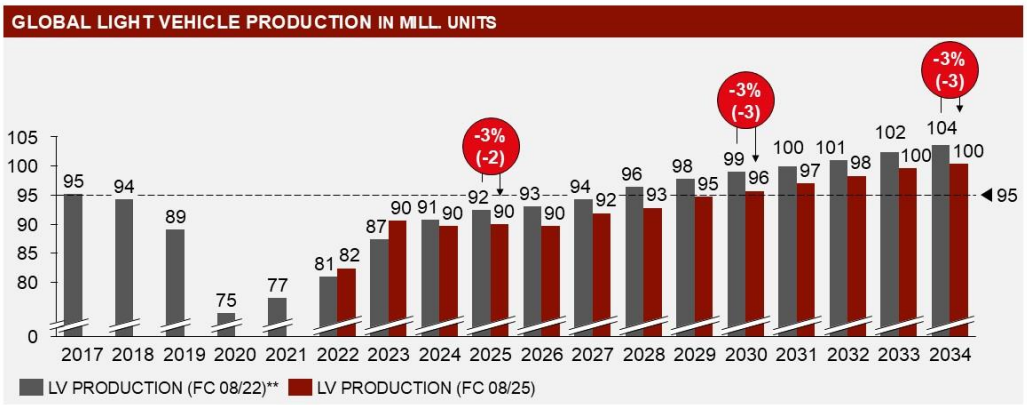
PAST GLOBAL AUTOMOTIVE PRODUCTION FORECASTS WERE OVERLY OPTIMISTIC



*LV= Light Vehicles (Passenger Cars and Light Commercial Vehicles ≤6t) **Data for Strategy 2025+, ***Data for Strategy 2030+
Sources: IHS 08/2025 and earlier, HA Strategy Analysis

AUTOMOTIVE – GLOBAL LV* PRODUCTION 2034F (FORECAST DEVELOPMENT)

2017 PRODUCTION LEVELS WILL NOT BE REACHED AGAIN UNTIL 2030

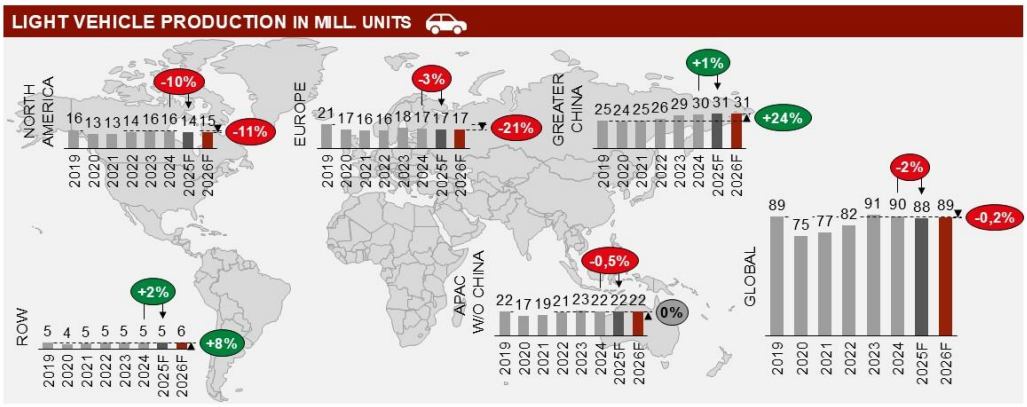


*LV= Light Vehicles (Passenger Cars and Light Commercial Vehicles ≤6t) **Data for Strategy 2030+
Sources: IHS 08/2025 and earlier, HA Strategy Analysis

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AUTOMOTIVE – GLOBAL LV* PRODUCTION 2026F (REGIONAL SPLIT)

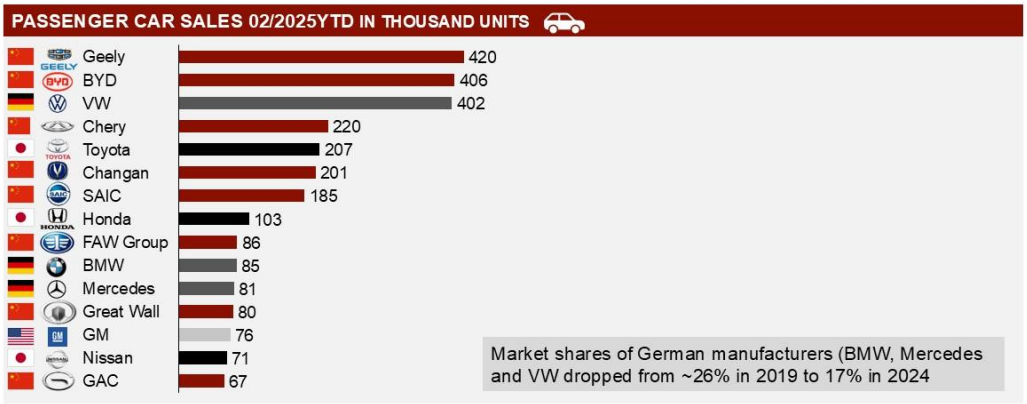
PRODUCTION 2025F AND 2026F GLOBALLY BELOW PRE-COVID LEVEL BUT CHINA WITH 24% PLUS



*LV= Light Vehicles (Passenger Cars and Light Commercial Vehicles ≤6t)
Sources: IHS 04/2025, DB Research, HA Strategy Analysis

AUTOMOTIVE – PASSENGER CAR SALES CHINA

SIX OF THE BIGGEST MARKET PLAYERS IN CHINA ARE LOCAL MANUFACTURERS

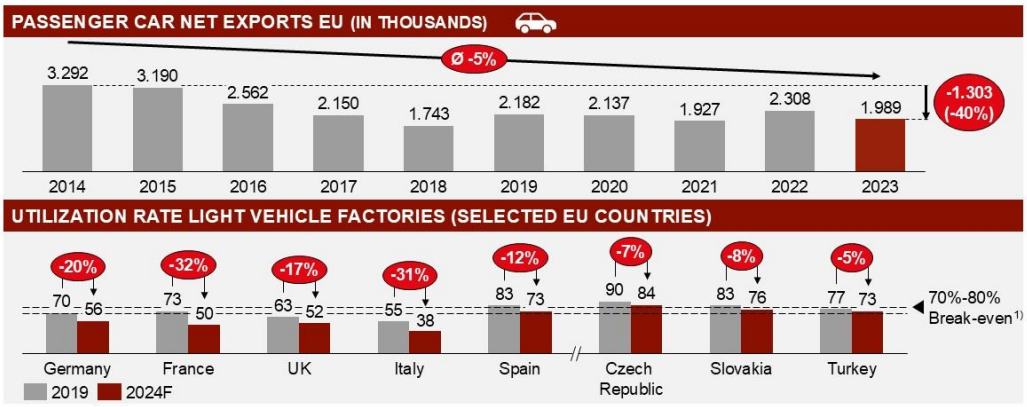


Sources: Deutsche Bank Corporate Finance 09/2025 (Company Filings, Press, Industry Reports), DB Research 04/2025, HA Strategy Analysis

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AUTOMOTIVE – PASSENGER CAR PRODUCTION EUROPE

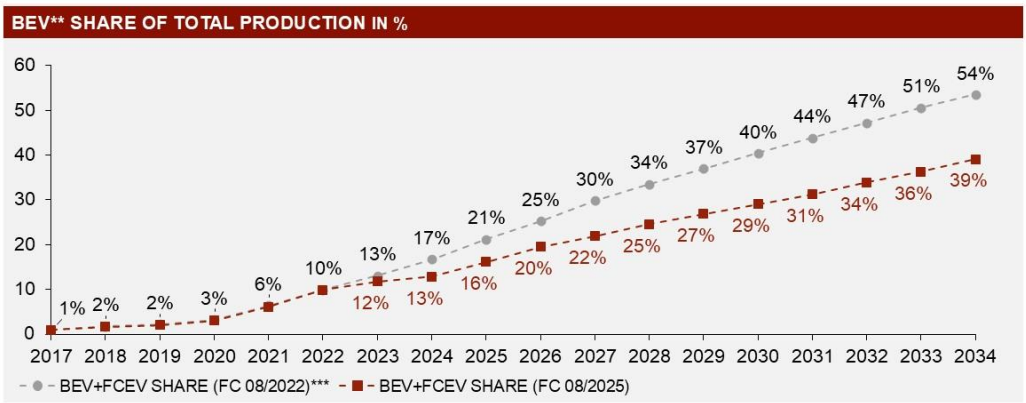
OEM UTILIZATION DROPS AS EXPORTS FALL, IMPACT STRONGEST IN HIGH-WAGE COUNTRIES



1) Break-even point according to industry experts (e.g. CAR-Center Automotive Research, Schmalenbach Journal of Business Research)
Sources: Deutsche Bank Corporate Finance 09/2025 (DB Research, Press, Industry Reports), HA Strategy Analysis

AUTOMOTIVE – GLOBAL LV* ELECTRIFICATION SHARE 2034F (FORECAST DEVELOPMENT)

SPEED OF ELECTRIFICATION SIGNIFICANTLY SLOWER THAN ASSUMED THREE YEARS AGO

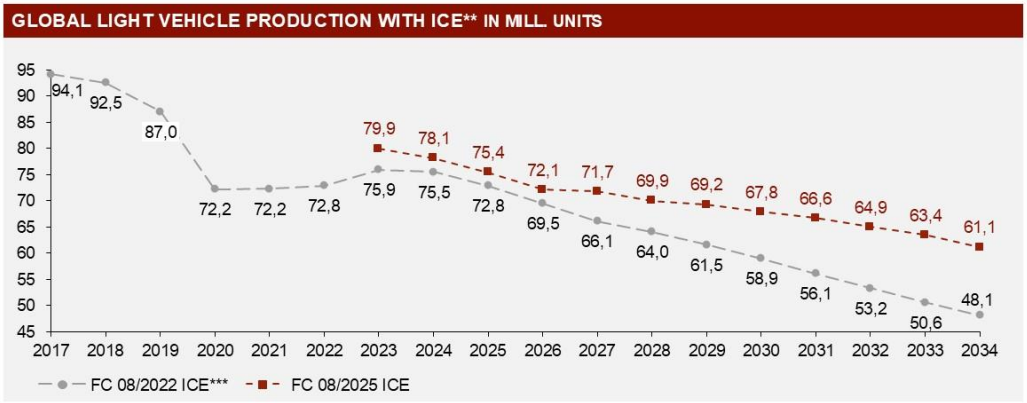


*LV=Light Vehicles (Passenger Cars and Light Commercial Vehicles ≤6t),**Light Vehicles w/o combustion engine (BEV+FCEV),***Data Strategy 2030+
Sources: IHS 08/2025 and earlier, HA Strategy Analysis

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AUTOMOTIVE – GLOBAL LV* PRODUCTION 2034F (LV WITH ICE)

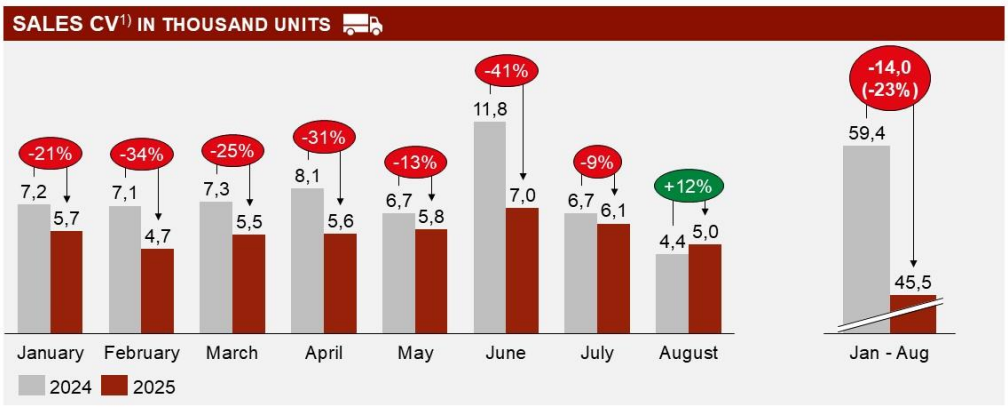
PRODUCTION VOLUME OF LV WITH ICE >10 MILL. UNITS ABOVE 2022 FORECAST AFTER 2030



*LV=Light Vehicles (Passenger Cars/Light Commercial Vehicles ≤6t),**LV with combustion engine (ICE,HEV,MHEV,PHEV,REX) ***Data Strategy 2030+
Sources: IHS 08/2025 and earlier, HA Strategy Analysis

COMMERCIAL VEHICLES – SALES GERMANY JANUARY–AUGUST 2025 YOY

GERMAN CV SALES DECREASE THROUGHOUT 2025, TEMPORARY REBOUND IN AUGUST



1) CV = Commercial Vehicles, CV >6t – 16t, CV >16t
Sources: VDA/KBA Monthly Report, January-August, 2024/2025, HA Strategy Analysis

Source: HA strategy analysis

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FOUNDRY PRODUCTION IN INDIA

National representation in the WFO:
THE INSTITUTE OF INDIAN FOUNDRYMEN
WWW.INDIANFOUNDRY.ORG

General Economic Scenario

The Indian economy is projected to expand at a rate of 6.3 per cent to 6.8 per cent in the financial year 2025-26 (FY26), according to the Economic Survey presented in Parliament by Finance Minister Nirmala Sitharaman. The survey cites strong domestic economic fundamentals, a declining unemployment rate, stable inflation, and the need for further reforms to sustain growth momentum.

Key Drivers & Strengths:

- Domestic Demand & Consumption: Strong private consumption — both rural (supported by agriculture) and urban — remains the backbone of growth.
- Investment & Government CapEx: The expectation is that government capital expenditure (infrastructure, public works, etc.) along with corporate/private investment will support growth for 2025-26.
- Resilient Services & Manufacturing Sectors: Mixed but fairly solid performance in services and manufacturing sectors provide a diversified support base, rather than growth being overly reliant on one sector.
- Favorable Global Conditions: Lower global commodity prices (particularly energy) help control input costs and inflation; also domestic supply-chain improvements (e.g. agriculture) help stabilize food prices.

Risks & Headwinds:

- Global Economic & Trade Uncertainty: Global trade tensions, tariff dynamics, weak global demand — especially for exports — could drag on India's export-oriented sectors, hurting external demand and investment sentiment.
- External Sector & Currency Risk: With global volatility, currency fluctuations may pose challenges for imports (especially crude), capital flows, and external balance.
- Uneven Sectoral Recovery: While services and consumption are doing well, manufacturing or agriculture may face volatility (weather, global demand slump), which can cause uneven growth across sectors.
- Fiscal & Policy Headwinds: Sustaining high public investment without stoking inflation, and managing fiscal deficits while keeping reforms going, will be a delicate balancing act.

2025-26 appears to be a year of stable growth for India, with a base case of ~6.5–6.8% GDP growth, low-to-moderate inflation, and supportive demand dynamics. If domestic consumption,

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investment, and government spending stay strong — and global headwinds don't intensify — there's a reasonable chance India could edge toward the optimistic ~7% growth mark.

Foundry Industry

For 2025-26, the foundry industry in India appears to be in a favorable growth phase, supported by tailwinds from automotive, infrastructure, defence, aerospace, industrial manufacturing, and a trend toward modernization and higher-value casting. The potential is considerable — but realization will depend on how well the industry balances input costs, technology upgrade, and market shift (towards lighter alloys, precision castings, sustainable practices).

Outlook for 2025-26

Moderate to strong growth, likely outperforming or at least keeping pace with broader industrial growth — driven by automotive demand and increasing domestic manufacturing. In parallel, rapid infrastructure development, urbanization, construction and heavy-machinery demand (for transport, construction equipment, railways, etc.) are boosting demand for cast metal components.

Emerging Defence Sector - India's defence sector is undergoing rapid transformation, driven by indigenization, private-sector participation, technology modernization and rising geopolitical needs. It is one of the fastest-growing strategic industries in the country and is central to the government's goal of achieving self-reliance in defence manufacturing. The foundry industry is a critical backbone of the defence manufacturing ecosystem. Defence platforms—whether land, air, naval, or space—depend extensively on cast components for strength, durability, precision, and performance.

Modernization of Railways: India's railway sector is undergoing one of the largest modernization drives in its history. Key developments include High-Speed & Semi-High-Speed Trains, Rolling Stock Modernization with focus on Safety, Automation & Technology. Foundries play a critical role in the railway manufacturing and infrastructure ecosystem by providing Heavy-Duty Structural Castings and Non-Ferrous & Special Alloy Castings for Modern Trains.

Growing share of higher-value castings — especially non-ferrous (aluminum, light alloys) and precision die-cast parts — as demand for lightweight, fuel-efficient automotive parts (incl. EVs) rises, and infrastructure/industrial projects need better quality components.

Gradual consolidation and modernization — larger or more capable foundries investing in automation, new processes, improved quality control; smaller players may struggle unless they upgrade or specialize (niche, small-volume castings, scrap recycling and bespoke parts).

Sustainability & recycling will become more important — as raw material costs, environmental regulations, and corporate ESG demands rise; foundries that adapt with energy-efficient, low-waste, scrap-based processes may gain cost and regulatory advantage.

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Export potential on rise — with global demand for cast components (especially from emerging markets), and India's cost advantage + improving quality, Indian foundries could capture more export orders for cast components.

	2019-20	2020-21	2021-22	2022-23	2023-24
Grey C.I.	7.72	7,91	8.62	9.83	10.42
SG Iron	1.22	1.10	1.26	1.46	1.61
Malleable	0.05	0.05	0.05	0.05	0.05
Steel	1.14	0.91	1.05	1.24	1.36
Non Ferrous	1.36	1.34	1.46	1.58	1.72
TOTAL	**11.49**	**11.31**	**12.44**	**14.16**	**15.16**

Table 1. *Casting Production in India (in Million Tons)*

Source: Foundry Informatics Centre, IIF

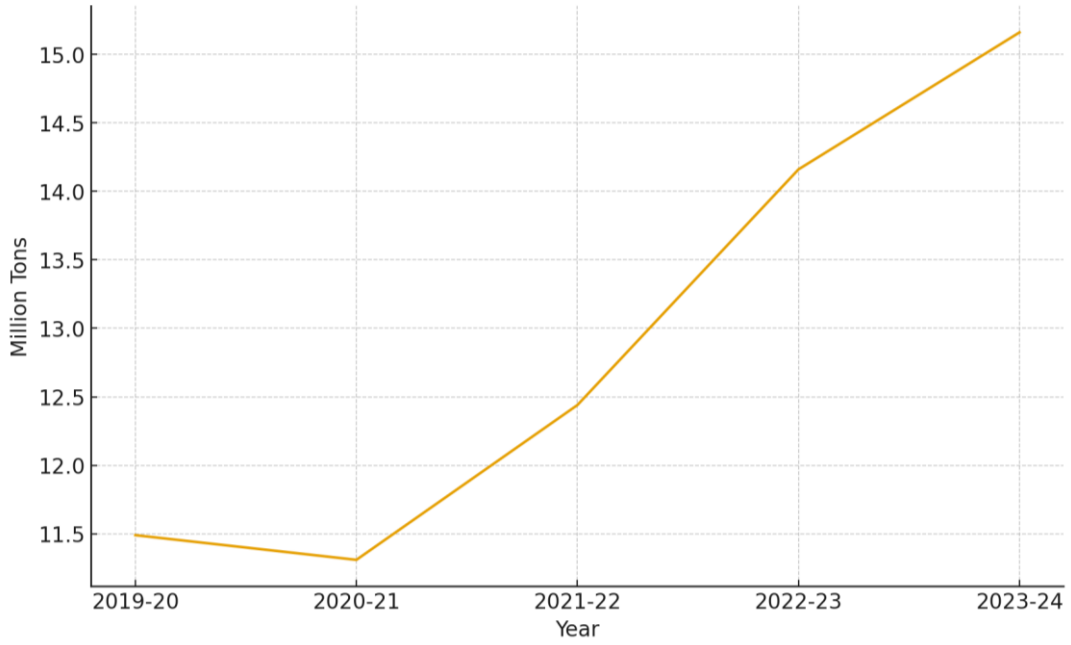


Figure 1. *Casting Production in India (in Million Tons)*

Source: Foundry Informatics Centre, IIF

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Trends from various Consumer Sectors

Auto industry

Category	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Passenger Vehicles	3.425	3.062	3.651	4.587	4.902	5.061
Commercial Vehicles	0.757	0.625	0.806	1.036	1.068	1.033
Three Wheelers	1.133	0.615	0.759	0.856	0.996	1.050
Two Wheelers	21.033	18.350	17.821	19.459	21.469	23.884
Quadricycles	0.006	0.004	0.004	0.003	0.005	0.006
Grand Total	**26.353**	**22.656**	**23.040**	**25.940**	**28.439**	**31.034**

Table 2. *AUTO INDUSTRY PRODUCTION*

Source: SIAM (Figures in Million Units)

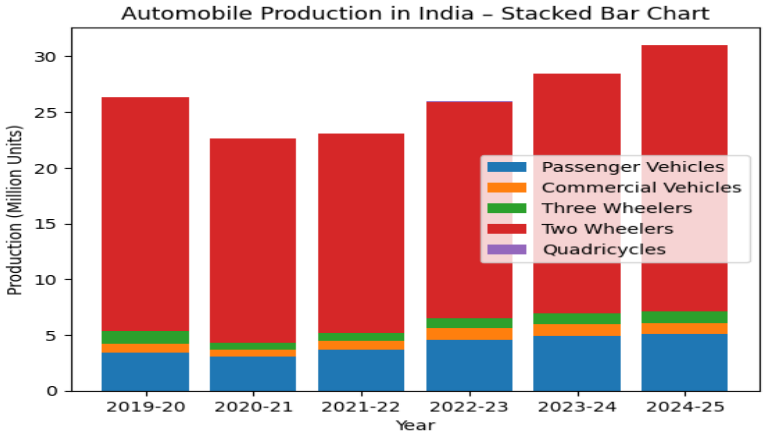


Figure 2. *Automobile production in India*

The Auto industry produced a total 31.034 million vehicles including Passenger Vehicles, Commercial Vehicles, Three Wheelers, Two Wheelers and Quadricycles in year 2024-25 as against 28.439 Million vehicles in the previous year, registering a growth of approx. 9.12% percent over the same period last year. Especially, the passenger and two-wheeler segment performed well.

The Indian automobile industry is entering a strong multi-year expansion cycle driven by manufacturing revival, export momentum, and rapid technology adoption. The sector is expected to remain one of the fastest-growing across all major segments - PV, CV, 2W, tractors, and EVs.

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Demand in the sector is supported by rising disposable incomes, premiumization, and growing urbanization. SUVs now form over 50%+ of PV sales, expected to touch 60% by 2027. Exports to Africa, LATAM, Middle East expanding steadily.

CONSTRUCTION EQUIPMENT INDUSTRY

Construction equipment industry

India is envisaging a revolution of sorts in infrastructure sector in the next quarter of a century riding on Prime Minister Narendra Modi's vision to make India a 'Developed Nation' by 2047. By building sustainable and modern infrastructure that can match that of any developed country, particularly through advanced transportation networks, including roads, railways, ports, and airports, India intends to accomplish the overall goal of over 8% growth, in future.

The Central Government has launched Gati Shakti programme with a vision to bring under one umbrella, all the major mobility infrastructure projects of various ministries and state governments, such as Bharatmala (roads & highways), Sagarmala (a string of ports), inland waterways, dry/land ports and Ude Desh ka Aam Nagrik (UDAN) or a slew of regional airports enabling air travel access to a common man.

Already India has made a headway in building national highways in a big way connecting all passenger, trade and freight points. About 13,800 km of highways construction is envisaged with an outlay of INR 2,810 Billion will give fillip to the construction equipment industry.

Tractor industry

The Indian tractor industry has achieved a record milestone, with over 1 million units sold and produced in the year 2024-25.

A favorable 2025 monsoon with above-average rainfall has improved crop prospects, boosting farm incomes and tractor demand. A GST reduction on tractors to 5% has made tractors more affordable for rural buyers and supported sales growth.

Anticipation of new TREM V emission standards from April 2026 is encouraging some farmers and fleet buyers to purchase tractors earlier (a pre-buying effect), supporting volumes in FY2026.

Ratings agency ICRA has forecasted continued expansion, upgrading outlooks for FY2026. Earlier estimates projected 4–7% growth; recent analysis suggests a stronger 8–10% expansion due to monsoon support, GST cuts, and pent-up demand.

Category	2020-21	2021-22	2022-23	2023-24	2024-25
Production	0.965	0.961	1.071	0.947	1.008
Sales	0.988	0.971	1.070	0.965	1.039
Export	0.089	0.129	0.125	0.098	0.099

Table 3. *Tractor Sector Data Source: TMA (Figures in Million Units)*

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Export of Castings

The export of castings from India from the f.y. 2020-21 onward till f.y. 2024-25 has shown significant growth (approx. CAGR 10.77%). India has achieved a momentous growth in casting exports due to a strong domestic manufacturing landscape. India is also experiencing growing demand from new markets, which is leading to considerable export gains. Additionally, India has been proactive in signing Free Trade Agreements (FTAs) with strategically significant countries to boost economic activities.

Indian casting exports are on a sustained upward trajectory, with USD ~4+ billion already achieved and solid growth drivers in place.

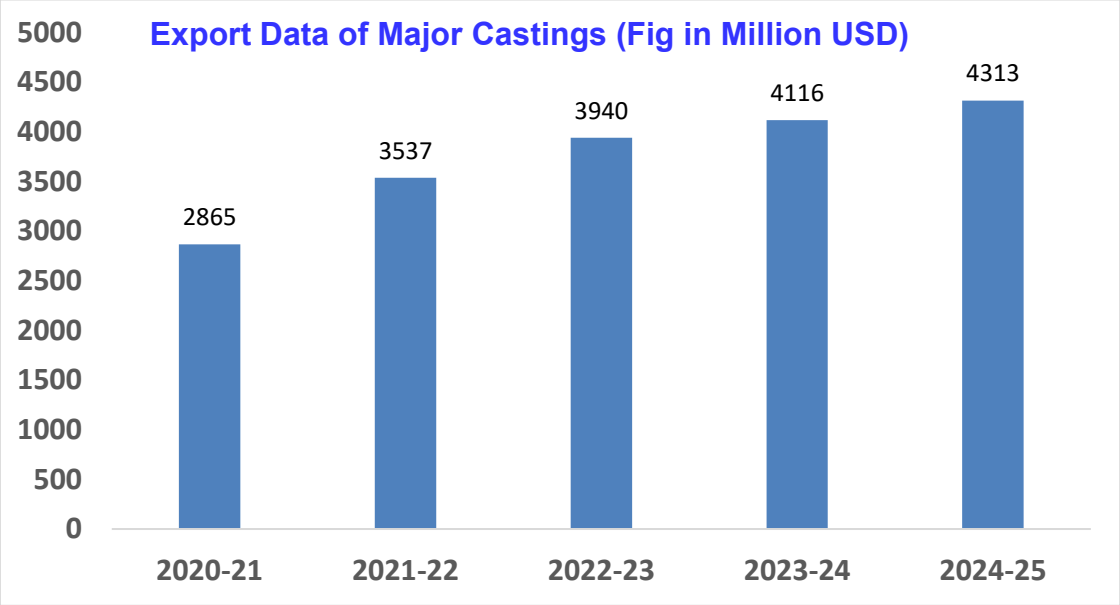


Figure 3. *Export Data of Major Castings (Fig in Million USD)*

Major Challenges

1. Raw Material & Energy Cost Volatility
2. Environmental Regulations & Compliance Burden
3. Technology Gap & Low Automation
4. Skilled Manpower Shortage
5. Finance & Capital Constraints - High-interest rates and limited access to affordable credit, especially for MSMEs
6. Lack of common facilities, R&D access, testing labs, and shared technology centers.
7. Supply Chain Disruptions
8. Energy Efficiency & Carbon Reduction Pressure

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Main activities performed

- The ***73rd Indian Foundry Congress & Foundry Exhibition IFEX 2025*** was organized between 9-11 February 2025 at Biswa Bangla Mela Prangan, Kolkata. This was one of the largest foundry event ever happened in the Eastern Part of India.

  Key Features:

  - 1000+ Delegates
  - 10000+ visitors
  - 250+ exhibitors
  - 10000+ Sq. mtr of Exhibition Space
  - B2B Meeting
  - Plenary session & panel discussions on various topics of interest to the foundry industry
  - Industry visits
  - Technical Sessions

- Regional Conferences i.e. **SOURECON, EASCON, WESCON & NCON** happened in all the 4 regions.

- Modular exams in foundry technology under the Grad IIF Programme have been conducted for candidates at various centres.

- Several Webinars/ Seminars/ Technical programmes on various topics were organized through various chapters/ regions/ COEs throughout India including efficient energy management with focus on environment.

- Organized **DEFCON** at Delhi that brought together senior government officials, Defence leaders, policymakers, industry captains, technology innovators, and financial institutions. The discussions revolved around unlocking opportunities for MSMEs in the Defence sector, advancing technology for precision manufacturing, leveraging government policies, and ensuring financial and infrastructural support to strengthen India's Defence manufacturing ecosystem.

- Monthly IIF Journal and **FIC DARPAN** are being published regularly. Regional monthly e-magazine from western region and southern region are also being published regularly.

- Organized Vendor Development Program in Jallandhar, Noida, Batala.

- Policy issues pertaining to various foundry related matters were taken up with the Government through Policy Advocacy Committee.

- Yogyata Vikas training programme conducted for the foundrymen across the country. Approx. more than 1500 foundrymen were trained during the year.

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Activities planned

- ***74th Indian Foundry Congress & Foundry Exhibition IFEX 2026*** is scheduled at Mumbai from 12-14 Feb, 2026. Theme of the congress is "Gateway of Foundry Industry".
- Skill Development initiatives to continue through National Centre for Skill Development.
- Strengthen & upscale the foundry simulation software services to foundries by IIF's National Center for Technical Services as more & more SME foundries are using the service to their benefit.
- Casting export promotion and participation in various international foundry exhibitions to be facilitated by National Centre for Export Promotion.
- Policy advocacy initiatives to continue through Foundry Informatics Centre.
- Promote "**Yogyata Vikas**" an in-plant training programme designed for shop-floor workers. IIF provides training at the door-steps of foundry units. In the coming year more than 2500 shop-floor workers will be given training under this programme.
- Regional conferences **SOURECON, EASCON, WESCON & NCON** will be planned and organized.
- National Conference on **INDO-ASEAN** casting business prospects planned in the month of April-May 2026.
- Upscale energy audit programme in foundries for improved energy management specially in SME units.
- Promote & Organize Lean Manufacturing programme in foundry clusters with the objective of improving the overall competitiveness.
- Promote and organize the Vendor Development Programmes across the country with the support of the Min of MSME.
- Create awareness & promote Common Facilities Center programme for creation of common facilities by cluster members.
- Active engagement with stakeholders for sustainable growth of the sector.
- Conduct modular examinations in foundry technology.
- Organizing seminar/ events on various technical topics in co-ordination with various chapters/ regions throughout India for the benefit of foundries.
- Continue dissemination of information, latest industry news, reports, Govt. Notifications, event information, technical articles etc. to members and other stakeholders through monthly Indian Foundry Journal, FIC Darpan and monthly regional e-magazines.

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FOUNDRY PRODUCTION IN JAPAN

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公益社団法人 日本鋳造工学会
Japan Foundry Engineering Society

General overview of foundry industry

The Nikkei Stock Average has recently hit record highs due to the yen's depreciation against the US dollar and euro in the foreign exchange market, investment by overseas investors, and expectations for improved corporate earnings. Many foreign tourists are visiting Japan. However, we import many resources, and the price level has risen significantly. In the foundry industry as well, electricity costs, fuel expenses, and scrap prices are gradually increasing.

Although the industry declined in 2020 due to the impact of the Covid-19, business is now in the process of recovering to levels seen before the pandemic.

Foundry industrial structure and the market

Table 1 shows casting production volumes over the past 10 years. Total casting production in 2024 was approximately 4.5 million tons, 7% decrease compared to 2023. Gray cast iron decreased by 8%, spheroidal graphite cast iron by 6%, cast iron pipes by 11%, malleable cast iron by 6%, steel castings by 12%, copper alloy castings remained unchanged, aluminum alloy castings decreased by 7%, and die castings decreased by 6%. Although production has recovered from the impact of the COVID-19 pandemic, production levels over the past decade have been gradually declining.

Figures 1 to 5 show the percentage of consumption for each type of casting in 2024. For gray iron, 73% is for automotive use; for ductile iron, 69% is for automotive use; for aluminum alloy castings, 96% is for automotive use; and for aluminum alloy die castings, 92% is for automotive use. Casting consumption is strongly influenced by automobile production volume. For copper alloy castings, 34% is for valves and stopcocks, while 29% is for transportation machines.

Figure 6 shows the production trends for passenger cars, trucks, and buses. In 2022, automobile production decreased by approximately 20% compared to 2019. This decline is attributable not only to the impact of the novel coronavirus but also to semiconductor shortages and reduced automobile usage, particularly in urban areas. The semiconductor shortage appears to stem from increased demand for various IT devices, including PCs, mobile phones, and video games, affecting not just the automotive industry. Production recovered in 2023 but declined again in 2024, failing to return to 2019 levels. These automotive production figures significantly impact the production volume of castings.

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Year	Gray cast iron	Spheroidal graphite cast iron	Cast iron pipe	Malleable cast iron	Steel castings	Copper alloy castings	Aluminum alloy castings	Die castings	Precision castings	Total
2014	2.118,6	1.362,7	360,0	44,1	172,3	77,1	417,7	1.000,3	6,7	5.559,5
2015	2.022,9	1.305,1	398,7	43,1	157,0	78,0	418,5	975,7	5,9	5.404,9
2016	1.933,7	1.301,3	290,3	41,0	150,1	77,4	423,7	980,4	5,4	5.203,3
2017	2.032,1	1.403,6	248,9	42,0	161,9	75,4	441,8	1.042,4	5,5	5.453,6
2018	2.064,3	1.440,8	249,0	39,9	167,7	74,6	454,1	1.075,3	5,1	5.570,8
2019	1.953,0	1.362,6	230,8	37,9	153,0	70,9	437,5	1.025,8	4,2	5.275,7
2020	1.596,1	1.168,1	233,3	29,4	121,7	58,3	343,7	840,7	4,4	4.395,7
2021	1.833,1	1.338,2	223,6	29,8	132,1	59,1	374,5	924,3	4,7	4.919,4
2022	1.800,3	1.316,3	205,0	29,4	136,6	58,9	364,6	894,3	4,3	4.809,7
2023	1.783,6	1296,7	192,7	28,9	130,6	57,4	390,9	961,9	4,2	4.846,9
2024	1,647.5	1,218.6	171.1	27.1	115.1	57.5	363.8	906.8	4.1	4,511.4
Ratio in 2024	36.5%	27.0%	3.8%	0.6%	2.6%	1.3%	8.1%	20.1%	0.1%	100%

Table 1. *Production amount of castings over the past 10 years 【x103 ton/year】*

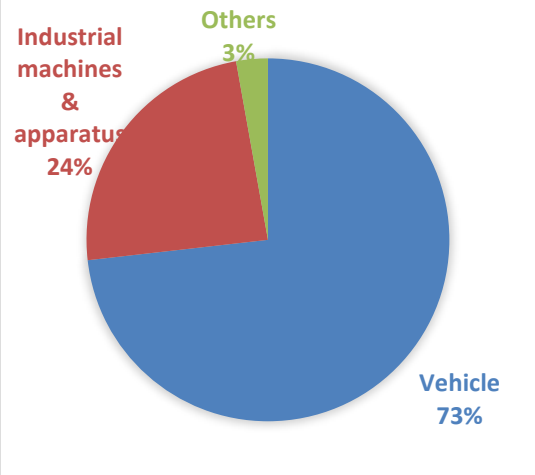


Figure 1. *Consumption ratio of gray cast iron in 2024*

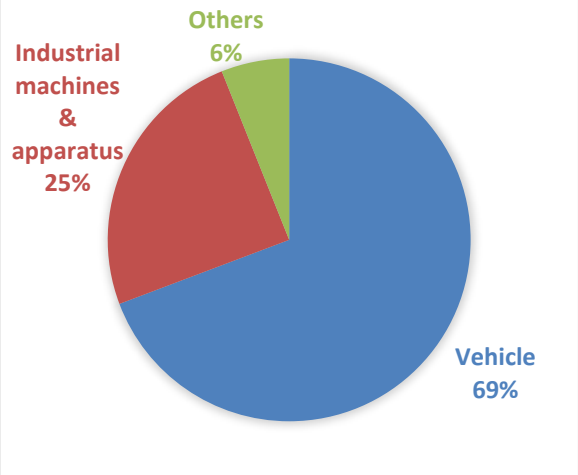


Figure 2. *Consumption ratio of spheroidal graphite cast iron in 2024*

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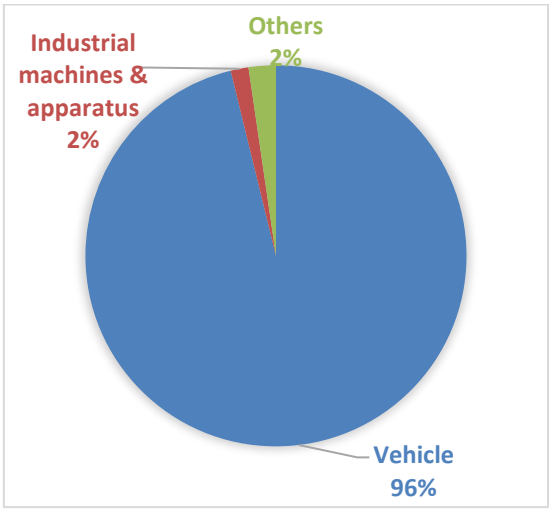


Figure 3 . *Consumption ratio of aluminum alloy castings in 2024*

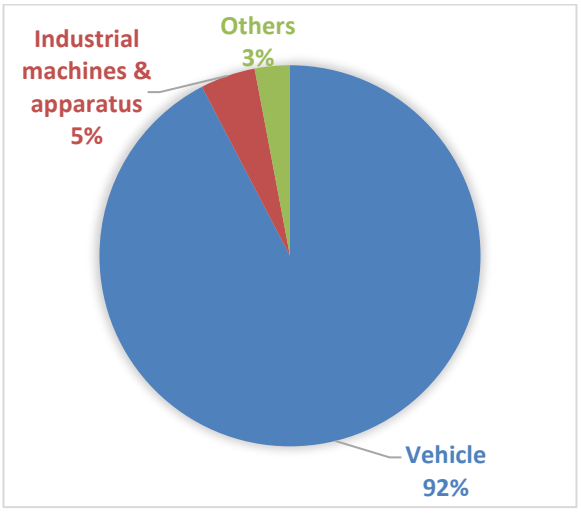


Figure 4. *Consumption ratio of aluminum alloy die castings in 2024*

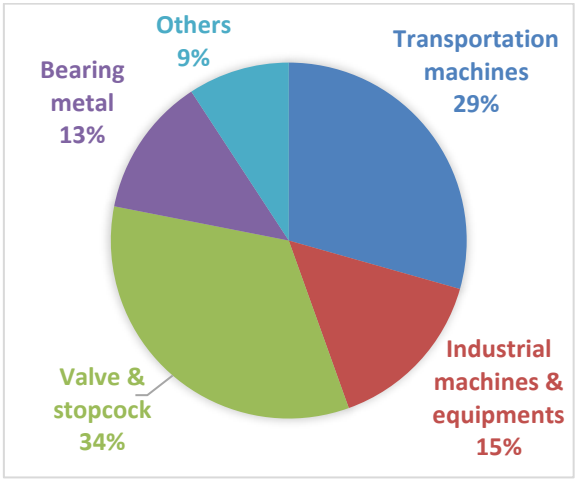


Figure 5. *Consumption ratio of copper alloy castings in 2024*

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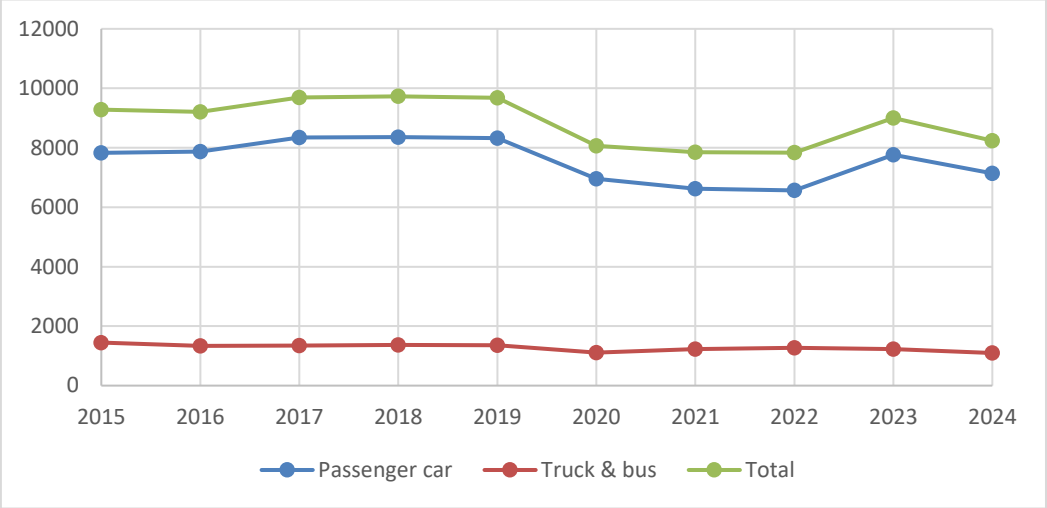


Figure 6. *Production trends for passenger cars, trucks and buses over 10 years (x1,000 cars/year)*

Trends in the Casting Industry Since 1970

Figures 7 to 11 show the production trends by application for each material since 1970.

The production volume of gray cast iron, shown in Figure 7, has gradually decreased since 1970. Production for industrial machines decreased, while production for automobiles increased until 1990 but then began to decline. Production of spheroidal graphite cast iron, shown in Figure 8, increased until 1990 and has shown little change since then. This is due to increased production for automobiles.

Figure 9 shows the trend in production volume of aluminum alloy castings. Production of aluminum alloy castings increased until around 2000 and has remained largely flat since then. Production of aluminum alloy die castings, shown in Figure 10, increased until 2005 and has remained flat since then. For both aluminum alloy castings and aluminum alloy die castings, the proportion of production for the automotive sector exceeds 90%.

Automobile production stood at approximately 5.29 million cars in 1970, increased to about 13.49 million cars by 1990, and subsequently declined to approximately 9.63 million cars in 2010. Consequently, castings production increased sharply from 1970. Although castings production decreased as automobile production declined, aluminum alloy castings and aluminum alloy die castings continued to increase until 2005. This was due to the substitution of cast iron parts with lighter aluminum alloy parts. Since then, production has trended downward as automobile manufacturing shifted overseas.

Figure 11 shows the production trend for copper alloy castings. Production of copper alloy castings has been gradually declining, largely due to reduced production of valves and stopcocks.

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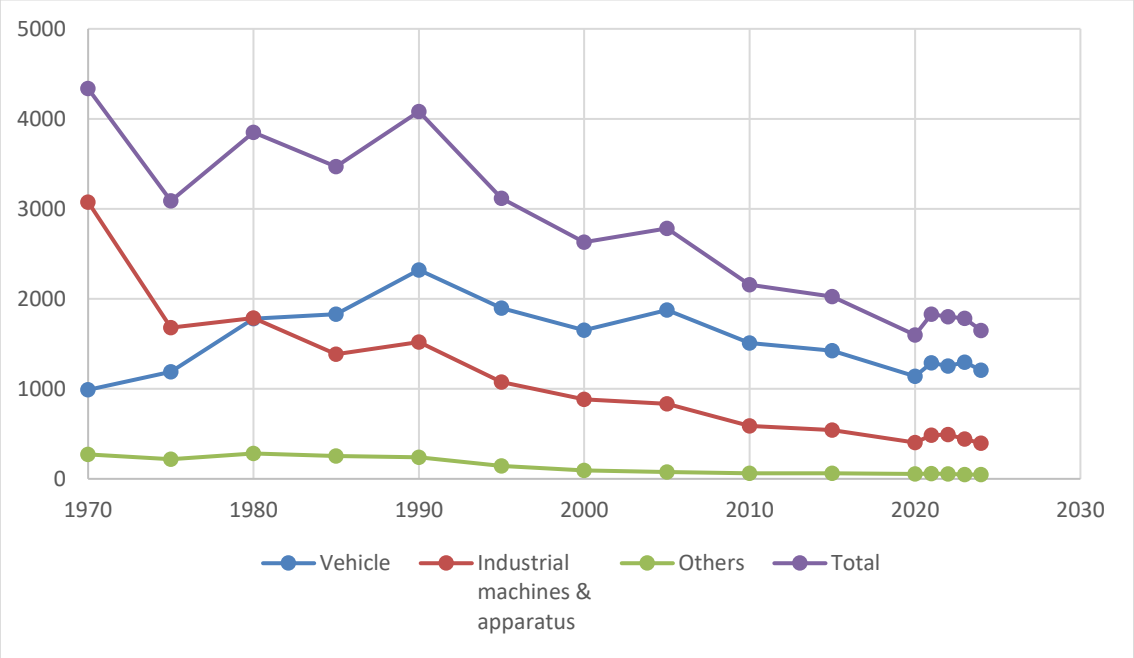


Figure 7. *Production trends by application for cast iron since 1970 (x10^{3}ton)*

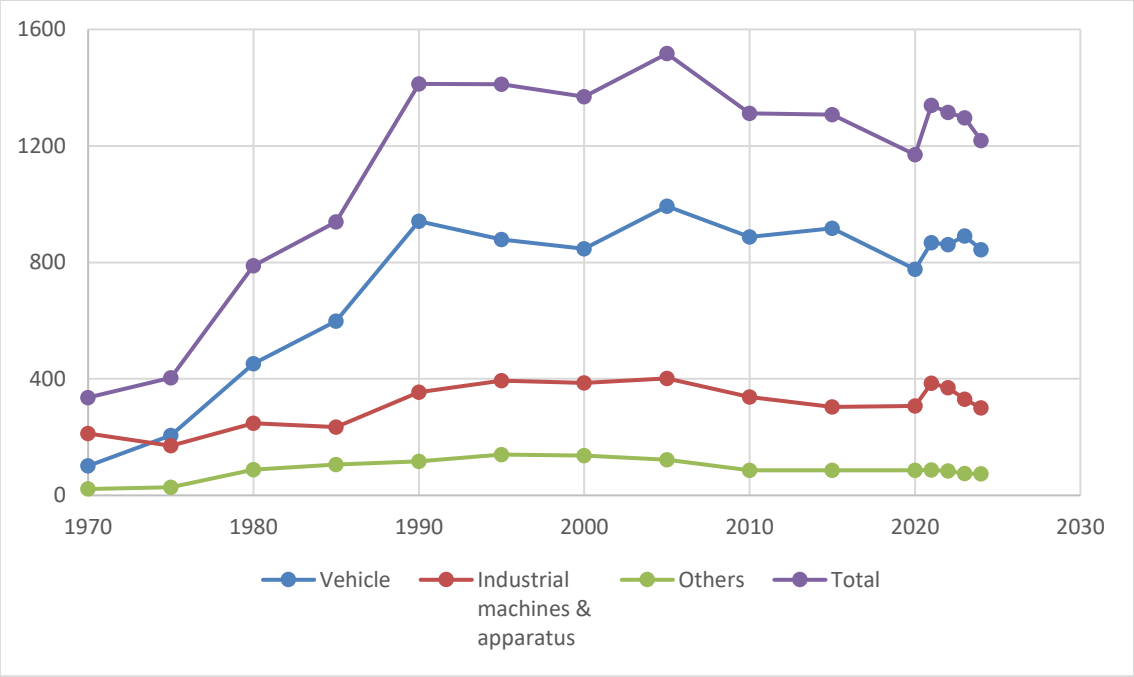


Figure 8. *Production trends by application for spheroidal graphite cast iron since 1970 (x103ton)*

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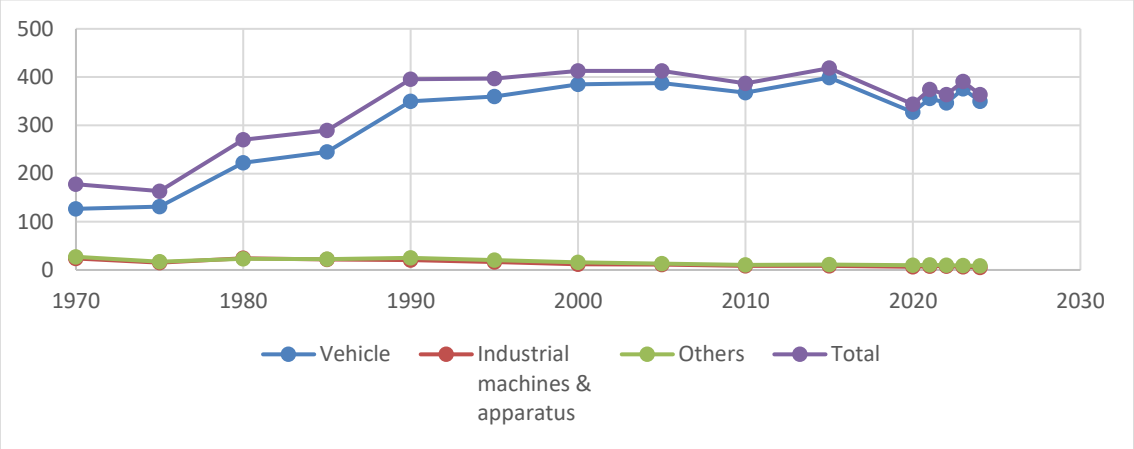


Figure 9. *Production trends by application for aluminum alloy castings since 1970 (x10^{3}ton)*

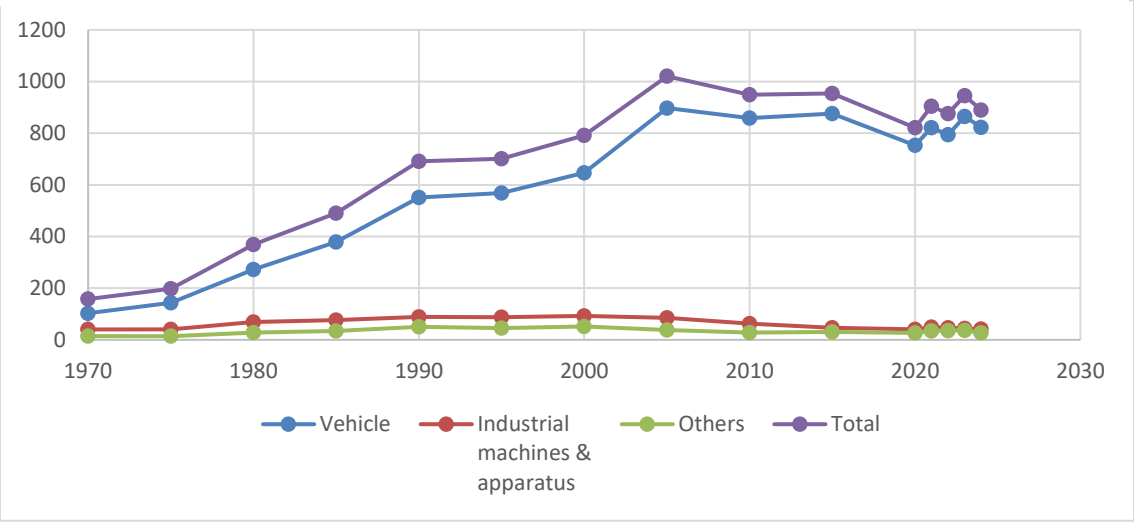


Figure 10. *Production trends by application for aluminum alloy die castings since 1970 (x10^{3}ton)*

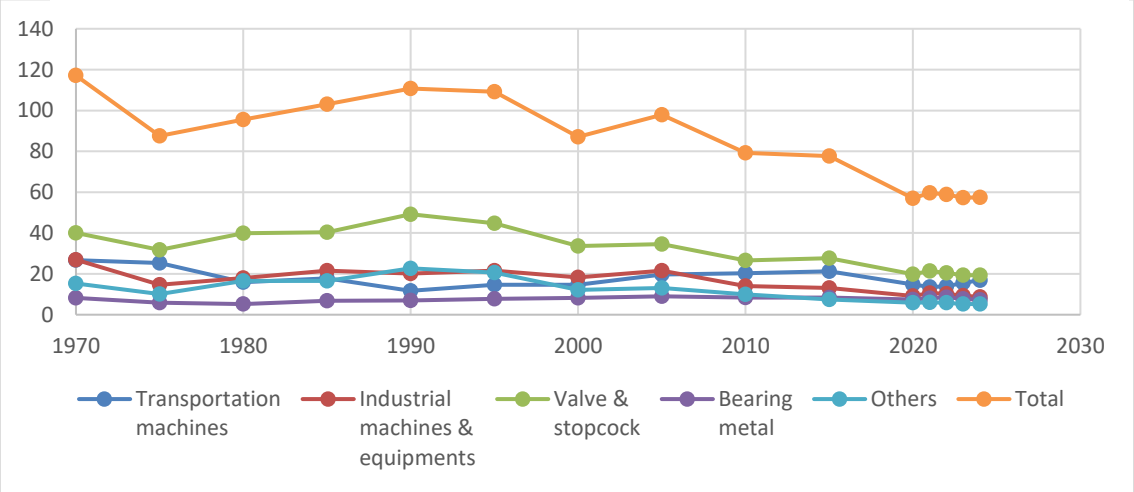


Figure 11. *Production trends by application for copper alloy castings since 1970 (x10^{3}ton)*

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Number of Foundries and Workforce in 2022

Table 2 shows the number of foundries and employees, and Table 3, the composition of the number of foundries by the size of workforce and the number of foundries has been decreasing year by year. That is because of aging of not only workers but also managers, and fewer young people has been getting jobs in foundry industry. On the composition by the size of foundry workforce, foundries with under 30 employees is 71.1% for gray iron casting manufacturers, 25.3% for steel casting, 82.9% for non-ferrous casting, and 70.4% for die casting. (Table 3) And also, foundries with over 100 employees being 7.1% for gray iron casting manufacturers, 23.9% for steel casting, 4.3% for non-ferrous casting, and 10.6% for die casting, the Japan foundry business is largely supported by small and medium-sized foundries.

	Number of Foundries	Number of Employees
Cast Iron	803	28,141
Steel Castings	71	7,085
Non Ferrous Castings	514	12,032
Die castings	613	26,476

Table 2. *Number of Foundries and Workforce in 2022*

Number of Employees Per Foundry	Number of Foundries							
	Cast Iron		Steel Castings		Non-Ferrous Castings		Die Castings	
1～9	305	38.0%	5	7.0%	259	50.4%	231	37.7%
10～19	151	18.8%	2	2.8%	106	20.6%	120	19.6%
20～29	115	14.3%	11	15.5%	61	11.9%	80	13.1%
30～99	175	21.8%	36	50.7%	66	12.8%	117	19.1%
100～299	46	5.7%	14	19.7%	19	3.7%	53	8.6%
300～	11	1.4%	3	4.2%	3	0.6%	12	2.0%
Total	**803**	**100%**	**71**	**100%**	**514**	**100%**	**613**	**100%**

Table 3. *Composition by size of foundry workforce in 2022*

Recent situations on the Japan Foundry Engineering Society (JFS)

The Japan Foundry Engineering Society has 8 branches, 10 research working groups, and the other committees, and hold two big lecture meetings, also the international meeting, a lot of technical classes and lecture meetings in each branch, and publish the journal of the Japan Foundry Engineering Society every month mainly by the editorial meeting held once a month by real meeting and online simultaneously. We changed to carry out through online system since 2020, every meeting has been completed by hybrid method, namely in person and through on line, and attendee has increased before meetings. We decided to hold annual meetings and many meetings through hybrid method, in person and online, for the present.

Future Trends

Japanese foundry industry is significantly influenced by automotive trends.

With the growing prominence of global warming issues, numerous challenges have emerged concerning the transformation of the automotive industry. Automakers are developing various

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types of next-generation xEV vehicles, including EV, FCEV, PHEV and HEV. By 2024, these accounted for 57.6% of Japanese vehicle sales. Both the automotive and foundry industries have initiated activities to achieve carbon neutrality by 2050. Trends in these components will increasingly impact the foundry industry. There is a trend toward reduced cast iron parts and increased casting of lightweight metals like aluminum alloys.

Efforts toward carbon neutrality within the foundry industry are also progressing, with research and development advancing in areas such as cupola operations using bio-coke and aluminum alloy recycling. It will be necessary to keep a close eye on these trends going forward.

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FOUNDRY PRODUCTION IN UNITED STATES

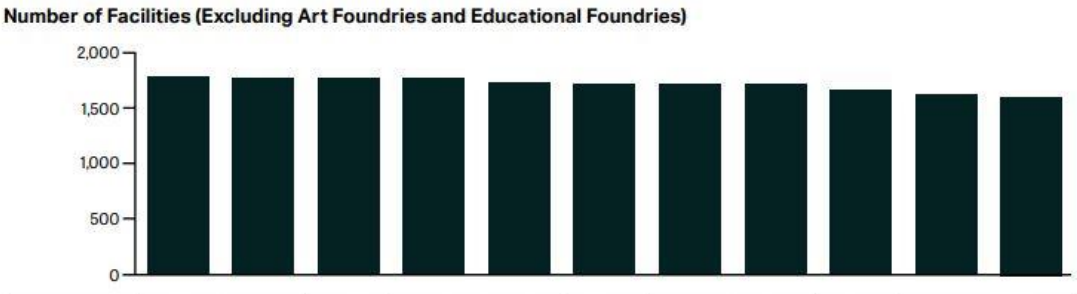
National representation in the WFO:
AMERICAN FOUNDRY SOCIETY
WWW.AFSINC.ORG

Overview

The casting market in 2025 stood at $52 billion compared to $35 billion in 2016. The U.S. metalcasting industry saw moderating demand for castings in 2024 and 2025 following several very strong years of sales growth. AFS anticipates casting sales in 2026 will rebound with an anticipated 4.2% sales growth. Contributing to stronger casting sales in 2026 will be the recently adopted tax policy improvements, lower interest rates and increased public infrastructure spending for highways, roads and other public improvements. Sectors showing growing demand for castings in 2026 should include defense, aerospace, as well as water and transportation infrastructure. Fully 96% of foundries indicate they will be making capital investments in 2026. A significant share of foundries anticipate increasing their employee count in 2026.

Industry Census

The U.S. experienced continued consolidation in the overall number of metalcasting facilities, with approximately 1,700 foundries in late 2025. Over the past 10 years, the number of foundries has declined by an average of about 12 per year, reflecting the long-term trend where some small, family-owned foundries are closed or sold to larger companies when the current owners are ready to retire.



Year	2016	2017	2018	2019	2020	2021	2022	2023	2024 est.	2025 fcst.	2029 fcst.
Facilities	1,787	1,780	1,772	1,765	1,731	1,725	1,719	1,720	1,708	1,701	1,667
Annual Growth		-0.4%	-0.4%	-0.4%	-1.9%	-0.4%	-0.3%	0.0%	-0.7%	-1.1%	-0.3%
	Compound Annual Growth Rate			-0.3%	3-Year	-0.7%	5-Year				

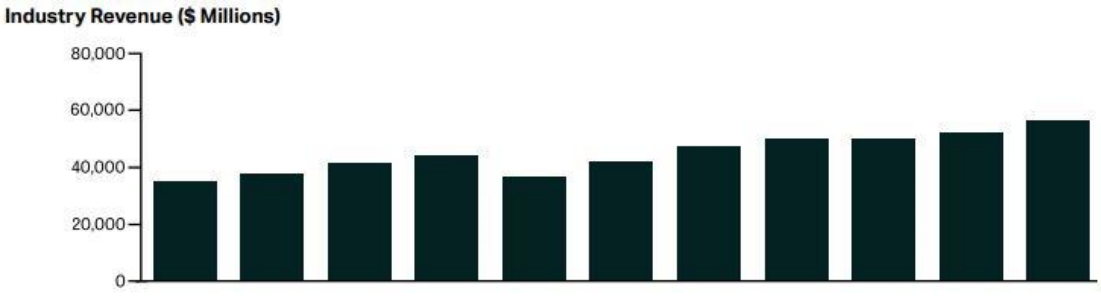
Figure 1. *Number of facilities*

Financial Analysis

Total casting sales were estimated to have grown for a fourth consecutive year reaching an estimated $51 billion in 2024, a 1.1% increase from a strong 2023, which saw 5.3% growth. The

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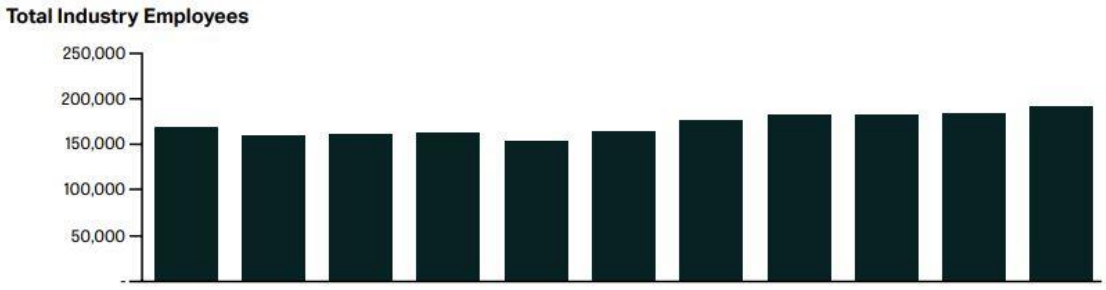
three-year growth rate of the foundry industry places it in the top 40% of all U.S. manufacturing industries.



Year	2016	2017	2018	2019	2020	2021	2022	2023	2024 est.	2025 fcst.	2029 fcst.
($ Millions)	35,640	37,835	41,354	44,290	36,716	42,297	47,584	50,086	50,662	51,626	59,932
Annual Growth		6.2%	9.3%	7.1%	-17.1%	15.2%	12.5%	5.3%	1.1%	1.9%	3.8%
Compound Annual Growth Rate				6.2%	3-Year	2.7%	5-Year				

Figure 2. *Industry revenue*

Overall foundry employment increased for the fourth consecutive year to 182,628, the highest industry total in the past nine years.



Year	2016	2017	2018	2019	2020	2021	2022	2023	2024 est.	2025 fcst.	2029 fcst.
# of Employees	167,162	158,516	160,874	162,816	152,793	164,173	176,401	182,628	182,820	184,106	187,124
Annual Growth		-5.2%	1.5%	1.2%	-6.2%	7.4%	7.4%	3.5%	0.1%	0.7%	0.4%
Compound Annual Growth Rate				3.7%	3-Year	2.3%	5-Year				

Figure 3. *Industry employees*

Industry Challenges

In a recent AFS survey of U.S. metalcasters, inflation is now a top concern for 34% of foundries, trailing only demand for castings as the top concern. Only 7% of respondents noted their top concern for the future was labor shortages, down from 64% a year ago. Insurance rates and federal regulations were also leading concerns in 2024. Electricity costs are a rising concern, as data centers continue to be built throughout the country, driving up the costs of energy and testing electrical grid infrastructure.

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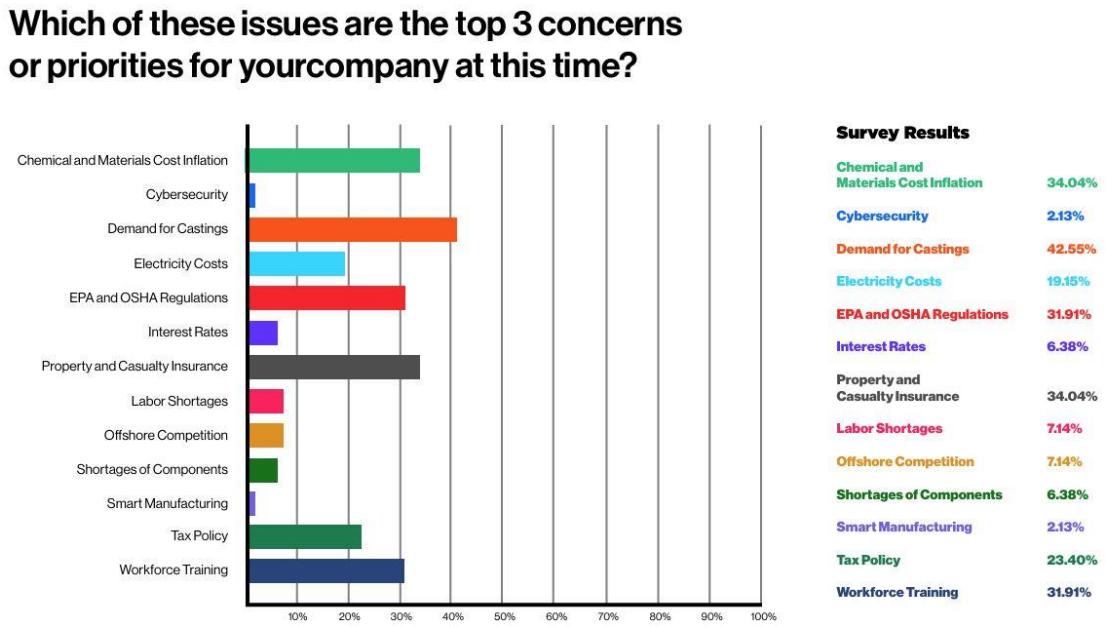
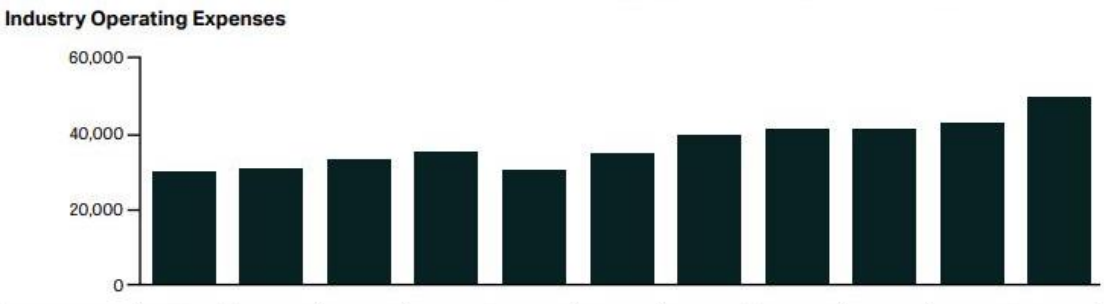


Figure 4. *Priorities*

Operating Benchmarks

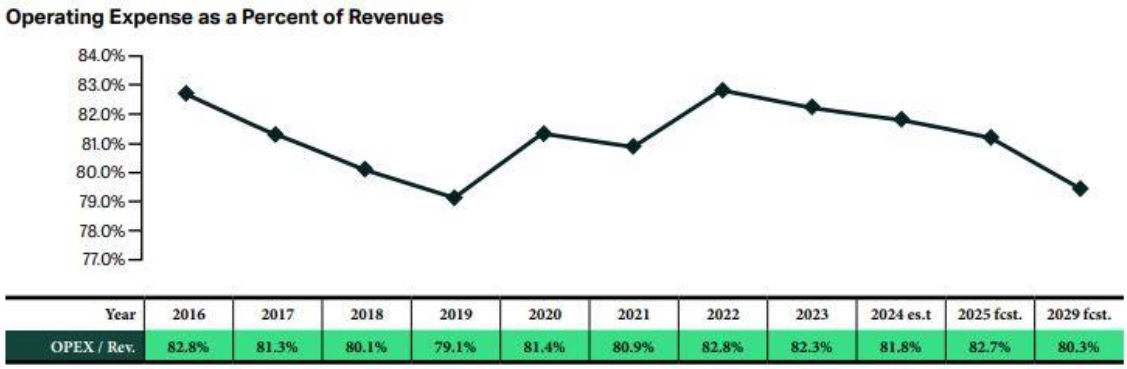
Operating expenses continue to increase along with revenues, with many foundries reporting the rising cost of raw materials as the primary expense driver. Employee expense was the second largest cost, at an average operating cost of 32.8%. Total operating expenses dropped significantly to .5%. Property insurance rates have risen sharply across the industry in recent months due to contracting market options.



Year	2016	2017	2018	2019	2020	2021	2022	2023	2024 est.	2025 fcst.	2029 fcst.
($ Millions)	29,504	30,768	33,134	35,043	29,887	34,219	39,400	41,221	41,441	42,692	48,138
Annual Growth		4.3%	7.7%	5.8%	-14.7%	14.5%	15.1%	4.6%	0.5%	3.0%	3.0%
Compound Annual Growth Rate				6.6%	3-Year	3.4%	5-Year				

Figure 5. *Industry operating expenses*

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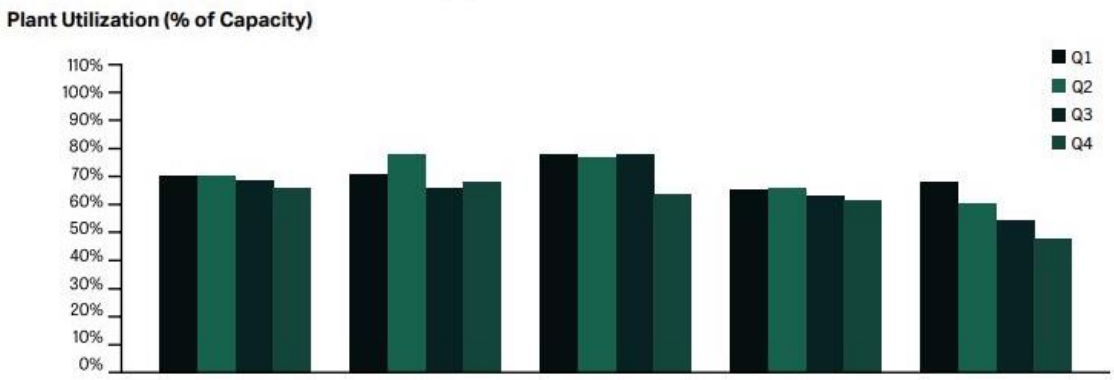


Year	2016	2017	2018	2019	2020	2021	2022	2023	2024 es.t	2025 fcst.	2029 fcst.
OPEX / Rev.	82.8%	81.3%	80.1%	79.1%	81.4%	80.9%	82.8%	82.3%	81.8%	82.7%	80.3%

Figure 6. *Operating expenses as a percent of revenues*

U.S. Casting Production

American foundries have a current capacity of 19 million tons. Plant Utilization in 2024 saw a steady decline from 68.8% early in the year to 49.8% by years end.



	Average	2021	2022	2023	2024
Q1	70.7	70.9	78.0	65.2	68.8
Q2	70.3	78.0	77.4	65.8	60.0
Q3	69.0	65.2	78.4	63.3	55.9
Q4	65.2	68.8	64.9	61.9	49.8

Figure 7. *Plant utilization (% of capacity)*

Foundry casting production in 2024 totaled 11.3 million metric tons across all alloys, with gray iron leading the way at 4.3 million metric tons.

Historical Tonnage Data

Year	Gray Iron	Ductile Iron	Malleable Iron	Steel	Copper-Base	Aluminum	Magnesium	Zinc	Other Nonferrous	Total Tonnage	Ferrous	Nonferrous
2024	4,324,273	3,131,372	32,688	1,184,386	334,022	1,647,926	141,945	404,281	53,327	11,254,219	7,488,333	3,765,886

Figure 7. *Historical tonnage data*

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NATIONAL REPORTS

Alphabetical order

FOUNDRY PRODUCTION IN AUSTRALIA

National representation in the WFO:
NATIONAL AUSTRALIAN FOUNDRY INSTITUTE
WWW.AUSTRALIANFOUNDRYINSTITUTE.COM.AU

Situation of the foundry industry

Majority of Foundries have noticed reduction of customer orders. Foundries supplying the Mining Industry continue to have lead times out to several months. Total tonnage cast 78,040. This is a 15% decrease over the last 12 months.

The cast metal industry in Australia generates more than $0.67 billion in sales annually, and directly employs 2300+ people, including 72+ interns / trainees / apprentices.

Employment

Head count has decreased for majority of foundries. Skilled Foundry trades remain challenging to obtain. It is now extremely difficult to obtain new staff in all areas. Some Foundries have commenced the process of obtaining skilled employees from overseas on an approved working visa. Other Foundries have employed high levels of apprentices.

Incoming orders

New customer orders have reduced for majority of Foundries.

Investments plans

Investment plans are mixed across the foundry industry with many waiting improvements in customer orders before committing to investment. Much investment is replacing existing equipment aging and past the current use by date.

Personal cost

The range of increase to employee wages has been from 3% to 10% on average.

Supply of commodities and energy

Steel Scrap and Pig Iron are at high levels over the last 12 months. Energy costs are rising and at critical levels due to energy shortage. Commodities prices have reduced across most products.

Cost development

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Increase of wages largest impact on cost of operating Foundries during 2025. Minimum wages increase 3.5%. In general employees are being paid more to retain as many make career changes out of the industry.

Outlook 2026

The reserve bank has stabilized interest rates which has been the biggest concern for business confidence and potential projects over the next 12 months. Inflation at high levels is currently a concern and could create higher interest rates. Skilled employees availability and the continuing energy supply uncertainty will be a challenge. The Foundry Industry in Australia will be reliant on Government decisions and addressing Foundry Skill shortages for a solid future.

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FOUNDRY PRODUCTION IN CROATIA

National representation in the WFO:
CROATIAN FOUNDRY ASSOCIATION– HULJ
CROFOUNDRY.SIMET.HR/EN/

Assessment of difficulties and/or advantages in the business of Croatian foundries

Trend from 2023 continue also in 2024; Croatian foundries are in general faced with lower order incomes for their productions, in some cases with a truly dramatic lack of orders. Additionally, still active war in Ukraine and in some another world areas, are not safe environment for business and makes different negative influences on it, and obviously this will continue. New President in USA will have big influence, and time will show in which direction world will go. View for 2025, again, is not bright at all due to all the facts mentioned and comments. A better situation will not be in first half of 2025.

Additionally important fact is strong salaries growth in Croatia, especially in state and public institutions, what makes to private company's difficulties in already traditionally problematic area of workforce shortage. *(source: https://podaci.dzs.hr/en/)*

More information about inflation and industry progress i.e., you can see at upper link also.

Available workforce (number and qualifications)

Employees in general change their positions/companies often, so, from this point of view metal casting subsector unfortunately follows this trend.

Still is difficult to find any workforce for foundries, especially at least partially educated, even conditions for employees are improving.

Foundries in Croatia, but also other companies related to foundries, are more and more oriented to search for workforce out of former Yugoslavia countries, from long distance countries, like i.e. India, Philippines, Nepal, and now, even from African countries.

Trends in industrial and foundries production in 2024 and comparison with the previous year

With very good interest from Croatian foundries for participating in CroFa questionnaire (now 24 foundries on voluntary base, except one aluminum foundry, all big, medium size foundries are included), production data show the big decreasing comparing with 2023 Year, and similar values to 2019, after we restart active polling.

Industrial production has a lot of oscillations. *(source: https://podaci.dzs.hr/en/)*

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2024 in the copper alloy casting segment was for part of foundries actually a year of solid growth, both in the tonnage segment and in the productivity segment; year of price stabilization in all cost segments and then in sales as well. But, in general copper production also was decreased.

In the same copper segment, there was a reduction in the workforce, some modernization, and a necessary increase in employee salaries.

Outlook 2025

Like small country, strongly export oriented, we depend a lot about general situation in Europe and in the world. Do to still active war in Ukraine and in another parts of world, we expect more instability and a lot of challenges for Croatian foundry industries. Missing and lower quantities of orders in general from customer sides, probably will continue in such environment.

2025. in copper segment will probably be marked also by stagnation in terms of sales due to instability in international trade, but as far as it is possible to forecast, perhaps at least for few foundries, the second half of the year can be better in some industrial sectors (utility equipment, glass)

Foundry production in Republic of Croatia in 2022/2023/2024

Gray Iron	Ductile Iron	Malleable Iron	Steel	Other Ferrous	Copper Base	Al	Mg	Zinc	Other nonferrous	Total
29.461	6.011	465	48	40	223	33.817	/	63	4	70.132

Table 1. *Total foundry production in 2022 (t)*

Gray Iron	Ductile Iron	Malleable Iron	Steel	Other Ferrous	Copper Base	Al	Mg	Zinc	Other nonferrous	Total
28.346	6.673	5	25	30	209	74.652	/	47	2	109.989

Table 2. *Total foundry production in 2023 (t)*

Gray Iron	Ductile Iron	Malleable Iron	Steel	Other Ferrous	Copper Base	Al	Mg	Zinc	Other nonferrous	Total
18.218	5.386	/	2.2	50	182.4	52.454	/	/	0.8	76.293

Table 3. *Total foundry production in 2024 (t)*

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Analysed year	2019			2020			2021			2022			2023			2024		
Number of foundries (respond on survey)	16			18			19			23			25			24		
Casting alloy	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production
Ferrous alloys	29.001.800	38,74	2	25.624.667	27,95	2	34.856.900	36,4	2	35.976.000	51,3	1	35.054.363	31,87	2	23.653.986	31,00	2
Steel	77.000	0,1	3	119.167	0,13	3	59.100	0,06	3	48.000	0,07	3	24.696	0,02	3	2.173	0,01	3
Nonferrous alloys	45.783.806	61,16	1	65.938.420	71,92	1	60.836.159	63,54	1	34.106.728	48,63	2	74.910.549	68,11	1	52.637.206	68,99	1
TOTAL	74.862.606	100		91.682.253	100		95.752.159	100		70.130.728	100		109.989.608	100		76.293.365	100	
Ferrous alloys	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production
Grey iron	22.037.750	75,99	1	19.464.667	75,96	1	23.812.400	68,31	1	29.460.500	81,89	1	28.346.565	80,86	1	18.218.205	77,02	1
Ductile iron	6.944.550	23,95	2	6.118.667	23,88	2	11.024.500	31,63	2	6.010.500	16,71	2	6.672.798	19,04	2	5.385.781	22,77	2
Malleable iron	9.750	0,03	3	20.667	0,08	3	0	0		465.000	1,29	3	5.000	0,01	4	0	0	4
Other	9.750	0,03	3	20.667	0,08	3	20.000	0,06	3	40.000	0,11	4	30.000	0,09	3	50.000	0,21	3
TOTAL	29.001.800	100		25.624.668	100		34.856.900	100		35.976.000	100		35.054.363	100		23.653.986	100	
Steel	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production
Unalloyed	9.750	12,66	2	24.667	20,7	3	3.100	5,25	3	11.000	22,92	2	5.545	22,45	2	1.643	75,61	2
Low alloyed	28.750	37,34	1	41.667	34,96	1	29.000	49,07	1	5.000	10,42	3	5.530	22,39	3	0	0	
Manganese	9.750	12,66	2	20.667	17,34	4	0	0		5.000	10,42	3	5.000	20,25	4	0	0	
Stainless	287.50	37,34	1	32.167	26,99	2	27.000	45,69	2	27.000	56,25	1	8.621	34,91	1	530	24,39	1
TOTAL	77.000	100		119,168	100		59100	100		48.000	100		24.696	100		2.173	100	
Nonferrous	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production	kg	%	Rank in total production
Brass	44.750	0,1	3	50.325	0,08	4	25.716	0,04	4	106.000	0,31	3	76.000	0,1	3	57.800	0,11	3
Bronze	43.250	0,09	4	151.728	0,23	2	35.300	0,06	3	116.895	0,34	2	133.100	0,18	2	124.600	0,24	2
Aluminium	45.485.956	99,35	1	65.605.701	99,5	1	60.715.143	99,8	1	33.816.633	99,15	1	74.652.449	99,66	1	52.454.006	99,65	1
Other	209.850	0,46	2	130.667	0,2	3	60.000	0,1	2	67.200	0,2	4	49.000	0,07	4	800	0,00	4
TOTAL	45.783.806	100		65.938.421	100		60.836.159	100		34.106.728	100		74.910.549	100		52.637.206	100	

Table 4. *Comparison of foundry production in Republic of Croatia, 2019-2024 Year*

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FOUNDRY PRODUCTION IN CZECH REPUBLIC

National representation in the WFO:
CZECH FOUNDRYMEN SOCIETY
WWW.CESKASLEVARENSKA.CZ

Overall economic performance in the Czech Republic in 2024

Gross domestic product (GDP) grew by 1.0% in 20244. The economy thus followed up on the stagnation of 2023 with moderate growth. The higher growth was mainly due to strengthening household and government consumption. By contrast, investment activity lagged behind the 2023 level, and GDP growth was also negatively affected by changes in inventories. The effect of external demand was slightly negative overall. During the year, the annual GDP growth gradually strengthened (0.3%, 0.5%, and 1.4% in Q1 to Q3) to 1.8% in Q4. The year-on-year growth of household consumption strengthened at the end of the year and the change in inventories started to have a positive effect. On the contrary, the investment activity and external demand had an adverse effect on the year-on-year GDP growth. Quarter-on-quarter GDP dynamics strengthened to 0.7% in Q4. Household consumption and change in inventories were higher. Investment and external demand had a slightly anti-growth effect – Fig. 1.

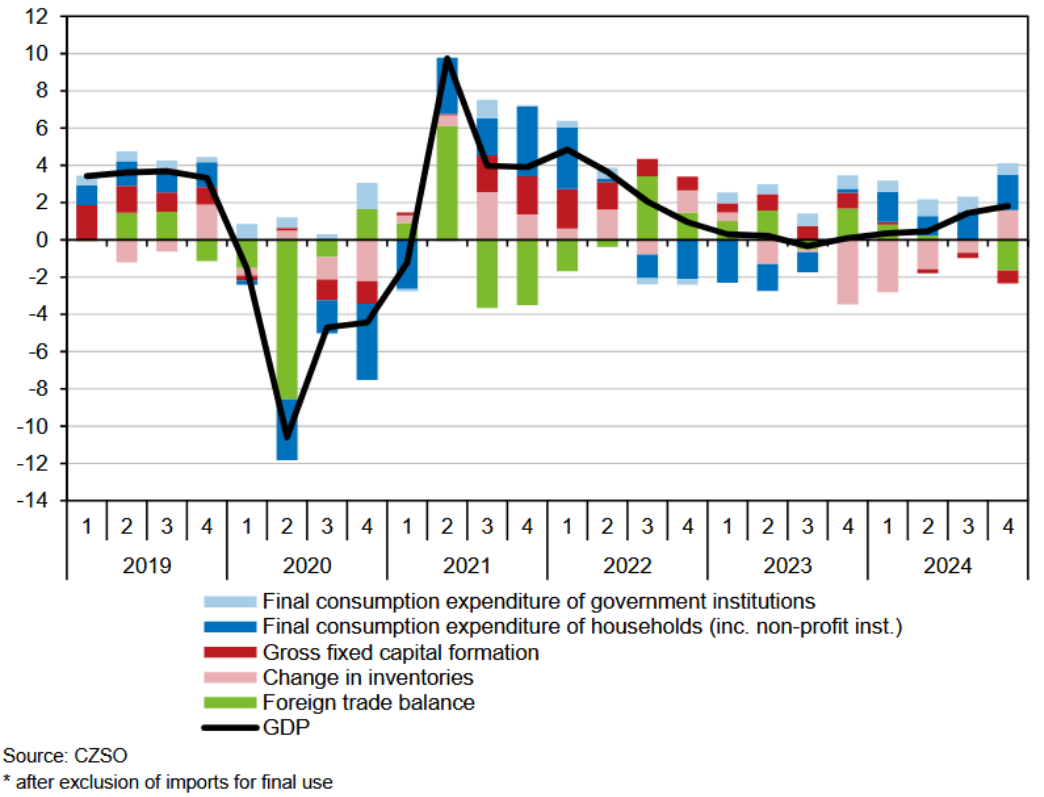
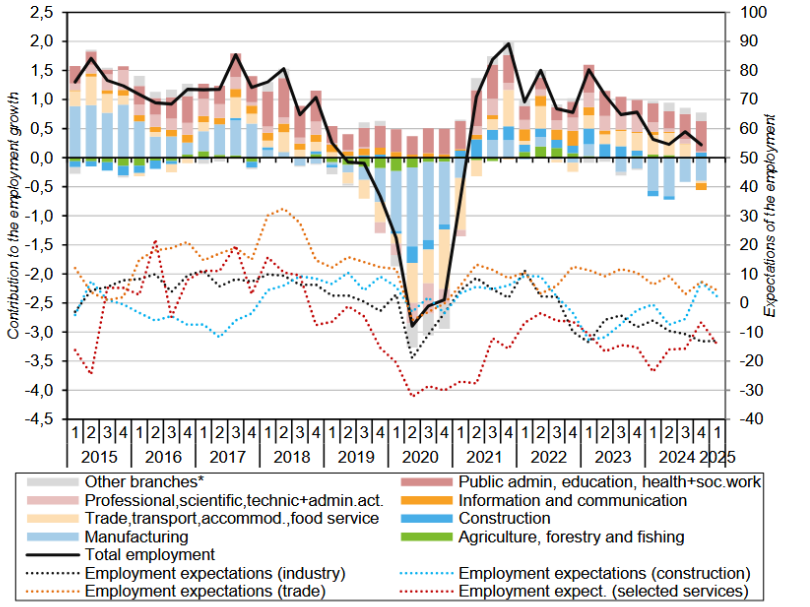


Figure 1. *Contribution of expenditure items to real GDP change* (volume indices, year-on-year growth, contributions in p.p., GDP in %)*

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In 2024, inflation returned close to the central bank's target. Data published in early 2025 indicate that the average CPI inflation rate for the year was 2.4%. According to the Czech National Bank's monetary-policy report, inflation remained near 2% for much of 2024, with some months registering exactly 2%. This more stable inflationary environment, combined with the easing of previous supply-side pressures, pointed to a gradual stabilization of prices.

The labour market was still experiencing the reverberations of the mild recession in 2024, that hit the economy in the previous year. Simultaneously, however, signs of recovery were becoming increasingly apparent, especially in branches that benefited from the strengthening domestic demand. Moderate, rather differentiated employment growth persisted – Fig. 2. Businesses slightly improved short-term employment expectations in most economic branches at the end of year 2024. Nevertheless, the situation remained difficult in the industry. Despite the uncertain economic outlook, companies still intensively demanded cheaper labour from abroad, and at the same time, the integration of Ukrainian refugees into the Czech labour market continued, which partially addressed the longer-term shortage of the available labour force in the country. The unemployment remained unchanged at a very low level. In most cases, workers made redundant from industrial enterprises could find a new job in other branches without any significant difficulties, also thanks to the higher activity of labour offices (LO) in the field of retraining. Relatively rapid nominal wage growth, driven mainly by market branches of services, continued. This, given the stabilisation of the price level in the economy, led to renewed growth of real wages, which had occurred in all major branches in the annual perspective. However, the purchasing power of employee earnings still did not even reach the level of 2019.

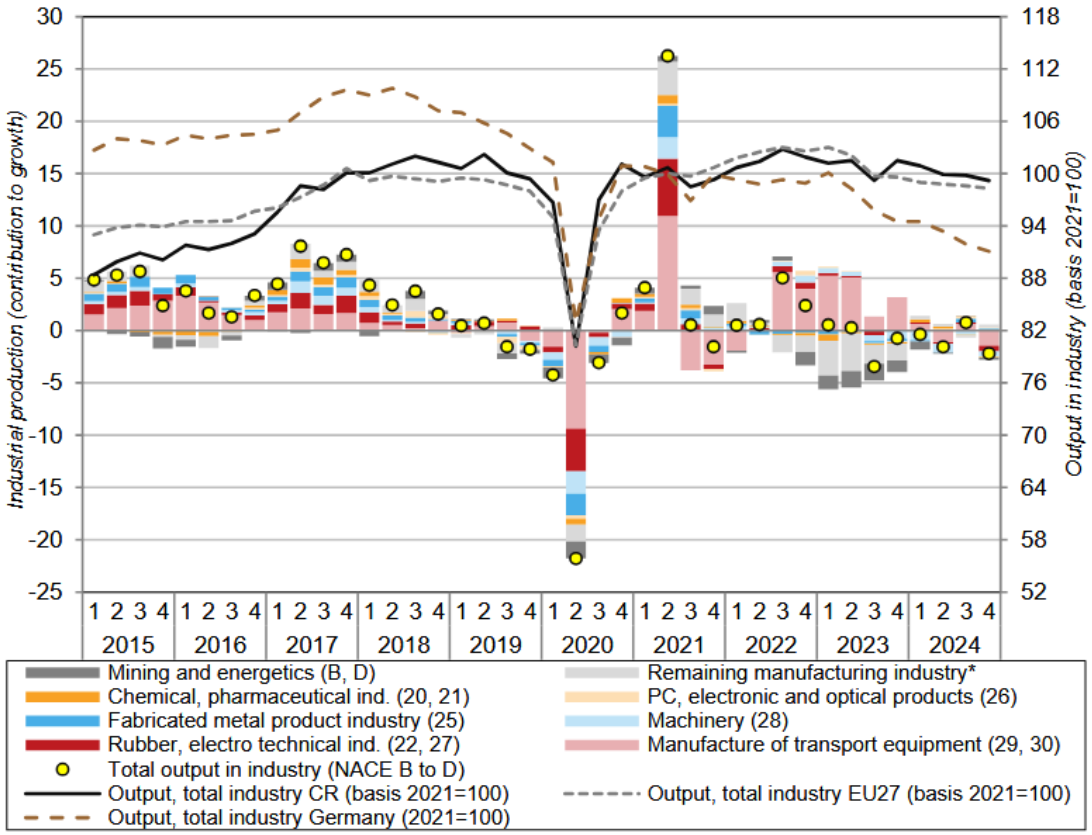


* This category includes branches: Mining and energetics; Financial and insurance activities; Real estate activities; Arts, entertainment and recreation activities.
Note: Balance of expectations expresses the difference in p.p. between categories growth vs. decrease of employment in the nearest three months. Data are seasonally adjusted and relate to the second month of the given quarter.
Source: CZSO (national accounts), Eurostat (business cycle surveys).

Figure 2. *Total employment (year-on-year in %), contributions of branches to year-on-year change of employment (in p.p.), expectations of employment (balance in p. p.)*

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In 2024, industrial production in Czechia fell by 1.4 % year-on-year, marking the sharpest drop since the COVID-19 crisis. Statistika+1 The decline was driven primarily by a 10.2 % drop in machinery and equipment manufacturing, and an 8.3 % decrease in basic metals production — highlighting a weakening in metal-working, metallurgy and associated heavy-industry sectors. Simultaneously, the automotive sector showed resilience: production of passenger cars reached a historic high, at 1,452,881 units — a 3.9 % increase over 2023. This record car output helped partly offset the broader industrial decline, despite decreases in other metal-intensive or machinery-based industries.



*Contribution of the remaining manufacturing industry also includes the effect of the overall methodological discrepancy stemming from the change of weights.
Source: CZSO, Eurostat

Figure 3. *Contributions of sub-branches to the year-on-year change of the industrial output in the CR (adjusted for calendar effects, real, in p.p.) and output in the entire industry in the CR, Germany and EU27 (seasonally adjusted, level of year 2021=100, right axis)*

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Foundry production and trends in the Czech Republic

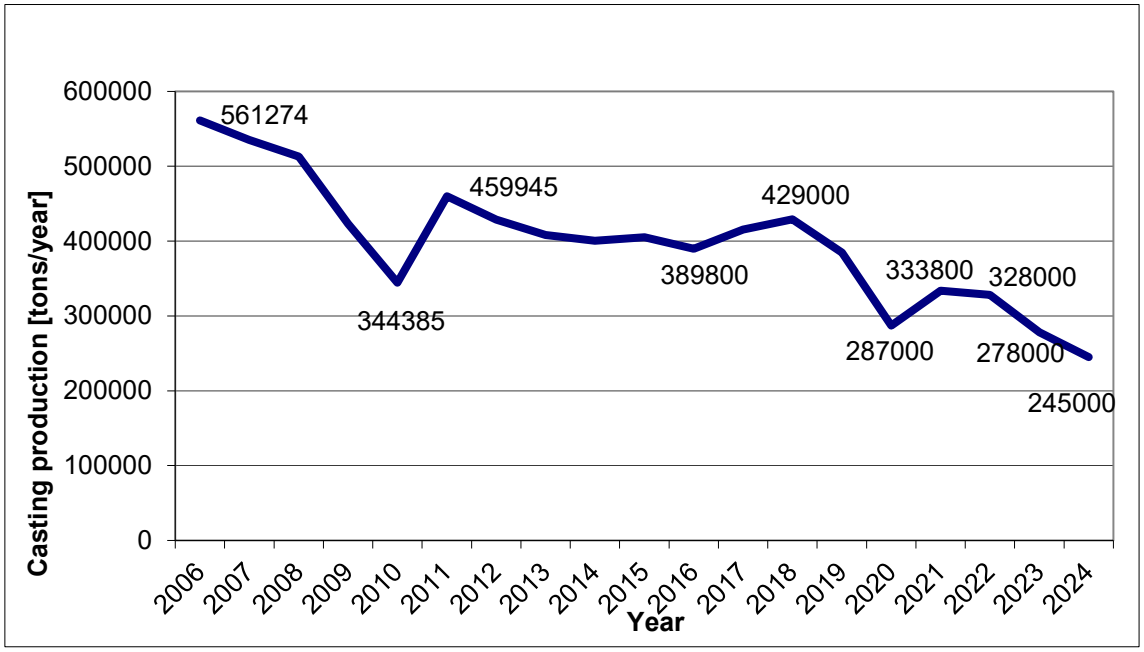
In recent years, the Czech Republic's manufacturing sector, and particularly the foundry industry, has faced intense headwinds primarily stemming from the ambitious and, poorly conceived implementation of the European Green Deal. The aggressive pursuit of a "green" transition by the European central authorities has placed a severe burden on all energy-intensive industries, including foundries, which fundamentally rely on carbon as a basic element in their production processes, rendering the practical goal of carbon neutrality unachievable for this sector. This push for green ideology and ill-considered regulations has severely hampered and stifled industrial growth, creating a substantial competitive advantage for non-European manufacturers and leading to a profound weakening of Europe's economic foundation. The policy's original premise, which relied on the assumption of access to cheap raw material resources, was destabilized by geopolitical events, and European central management failed to adequately adjust, leading to fatal impacts primarily manifested in soaring energy prices and persistent inflation. The loss of competitiveness among all energy-intensive European industries is evident; in the Czech Republic, an industrialized economy generating approximately 30% of GDP, high energy costs directly contributed to a significant loss of orders. Foundries were forced to respond through restructuring and reducing production capacity, reflected in the final output for 2024, with total casting production amounting to approximately 245 thousand tons—a substantial year-on-year decrease in mass production of about 13%. However, the year-on-year decline in foundry companies' turnovers was only approximately 2%, a disparity that strongly underscores the high inflation driven by energy prices, rising wage costs, and the compulsory costs associated with green investments and fees such as emission allowances and renewable energy contributions (POZE).

The table shows total casting production in the Czech Republic for 2024, compared with 2023.

Fe metals castings (tons)		**2024/2023**	**Non-ferrous metals castings (tons)**		**2024/2023**
GJL	98 000	89%	AL+Mg	79 000	95%
GJS	29 000	73%	Cu	12 000	80%
Steel	27 000	86%			
Total production Fe	154 000	86%	Total production Non-ferrous	91 000	93%
Total production	**245 000 t**		**2024/2023**	**88 %**	

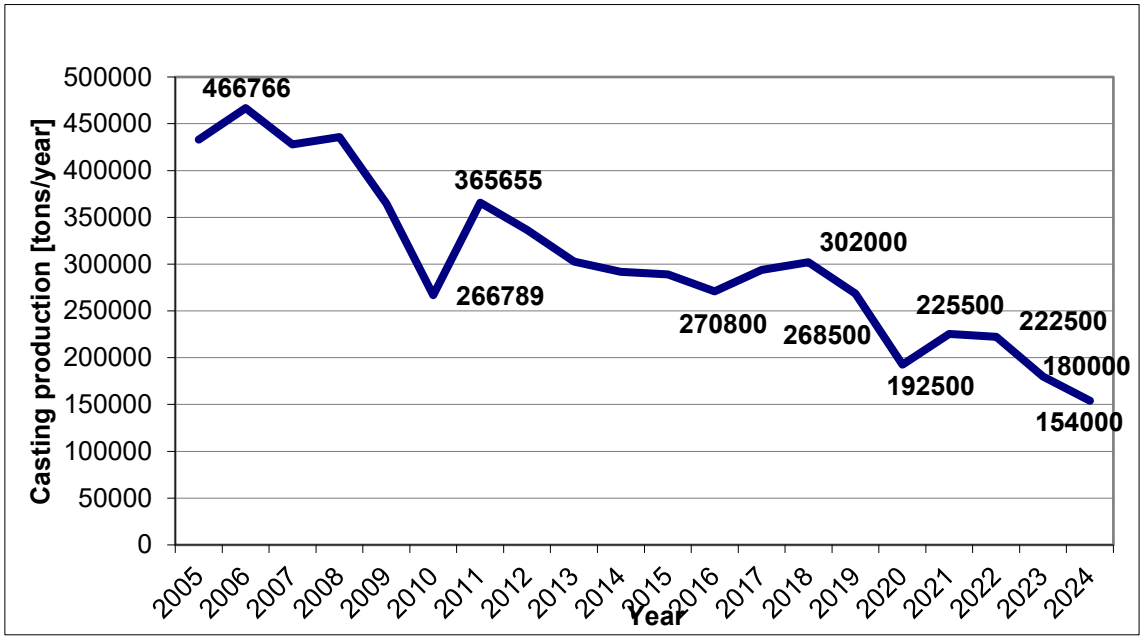
Table 1. *Foundry production in the Czech Republic in 2024*

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Graph 1. *Foundry production in the Czech Republic since 2006*

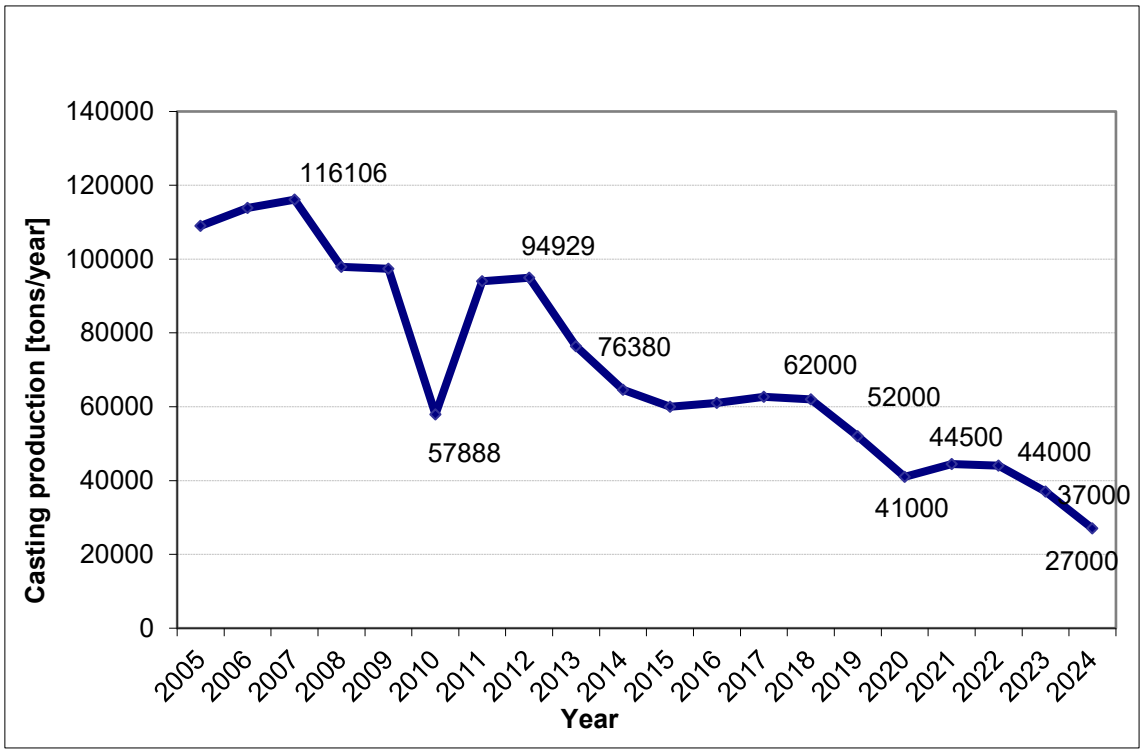
Energy prices play a crucial role in the production of Fe-based castings. The threefold higher energy costs in Europe, compared with non-European competitors, encouraged imports from Asian markets. Deliveries of castings to Germany, on which our foundries were partially dependent, declined. Another negative factor affecting Fe casting production was the slowdown in engineering output within the Czech Republic. Conversely, certain volumes of production were secured by government contracts for infrastructure projects and regional construction initiatives.



Graph 2. *Total casting production in the Czech Republic – ferrous metals (2005 – 2024)*

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High energy prices pose a fundamental challenge for steel casting production, more so than for other types of castings. At the same time, carbon steel production is becoming increasingly attractive due to lower raw material costs. These castings are primarily used in the construction industry, construction machinery, and welded engineering components. Production of alloyed steel castings, however, faces significant metallurgical and economic constraints, as the cost of alloying elements has reached record highs, prompting designers to seek alternative, more cost-effective solutions. A major factor contributing to the decline in steel casting production in the Czech Republic has been the closure of key industry players, including Vítkovice Heavy Machinery and Pilsen Steel, leading to a shift of heavy casting production to India and China. Additionally, the Russian embargo has disrupted established production channels and further reduced output at domestic steelworks. Emerging opportunities for Czech steel producers are appearing in Europe's defence and armaments sector; however, this market is highly demanding, and pricing continues to play a critical role in determining the competitiveness and success of Czech steelworks.

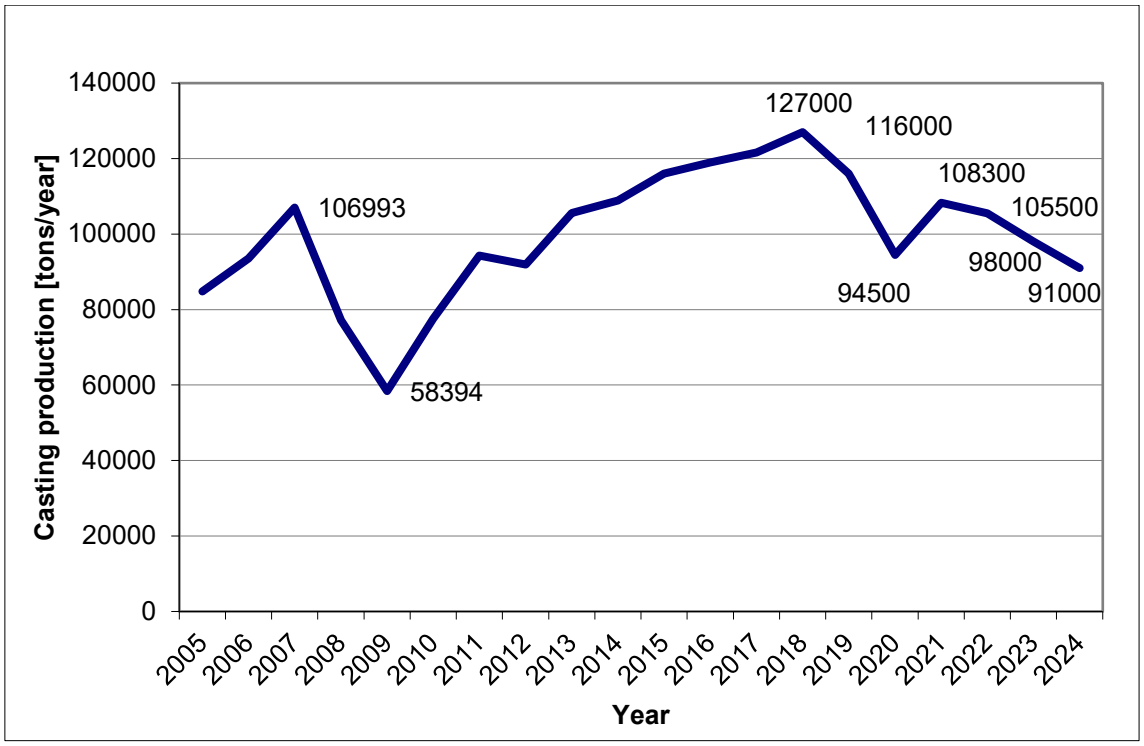


Graph 3. *Production of steel castings in the Czech Republic (2005 – 2024)*

The future of shaped parts lies in light metals, with aluminium alloys dominating the automotive sector. Despite pressure to reduce costs and meet high technical demands, these materials remain the mainstay of die casting foundries. The gradual shift toward electric mobility is creating additional challenges for foundries. While automotive manufacturers' demand for structural castings has stabilized, uncertainties in future demand and market fluctuations make these investments highly risky. Amid the European crisis, automotive production is increasingly relying on simple, cost-effective solutions, maximizing the use of sheet metal components and moulded plastics, with car price remaining the top priority. Efforts to implement energy-saving

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solutions are essential to remain competitive against Chinese car manufacturers, who benefit from simpler and more economical electric vehicle production. In 2024, Czech foundries produced 91,000 tonnes of non-ferrous metal castings, representing a decline of approximately 7% compared with 2023. Production of light aluminium and magnesium alloy castings decreased by about 5%, while heavy non-ferrous, copper-based castings fell by roughly 10%.



Graph 3. *Total casting production in the Czech Republic – non-ferrous metals (2005 – 2024)*

At the beginning of 2025, foundry production was slightly higher than in the same period of the previous year, although growth remained in the single digits. Beyond high energy prices and insufficient orders, the most significant challenge for foundries is the pressure to implement "ecological investments," which cannot be passed on through product pricing and pose a severe strain on operations. This issue affects the broader manufacturing sector as well. The rigorous and uncompromising application of Green Deal legislation in foundry operations represents the greatest threat to the sector's sustainability, not only in the Czech Republic but across Europe. The Green Deal's original assumptions were based on access to low-cost Russian energy and a stable geopolitical environment, conditions that no longer exist. Consequently, urgent adjustments are needed—not in foundries, but in the legislative framework. Europe's security and industrial stability will continue to rely on energy-intensive sectors, which remain strategically critical for the continent.

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FOUNDRY PRODUCTION IN FINLAND

National representation in the WFO:
ASSOCIATION OF FINNISH FOUNDRY INDUSTRY
WWW.TEKNOLOGIATEOLLISUUS.FI/EN/FEDERATION/BRANCH-ASSOCIATIONS

Teknologiateollisuus

RECENT DEVELOPMENT IN THE FINNISH FOUNDRY INDUSTRY 2024

ECONOMIC BACKGROUND

The Finnish Technology Industry as a whole

The economic situation of the Finnish technology industry around the turn of the year was rife with contradictory signals. The European export market has remained very weak. At the same time, global uncertainty has mounted significantly, and companies' outlooks, as measured by various barometers, remain quite pessimistic. However, order intakes in the technology industry saw substantial growth in the fourth quarter of the year 2024. Although the increase in order intakes is largely explained by a handful of very significant individual orders, this could be interpreted as the first tangible sign that the economic cycle is closer to an upswing. However, it is too early to declare that there has already been a turn for the better. According to the evidence, it is all too clear that the economic climate has remained weak.

Mechanical Engineering in Finland

The turnover of mechanical engineering companies (machinery, metal products and vehicles) in Finland decreased by around 5 per cent in 2024 from 2023. Their turnover in Finland amounted to approximately EUR 38 billion in 2024.

At the end of December 2024, the value of order books was 3 per cent higher than in December 2023. It should be noted that shipyards have an exceptionally large share of the total value of order books. On the basis of order trends at the end of last year, the turnover of mechanical engineering companies is expected to start rising gradually this year.

Metals Industry in Finland

The turnover of metals industry companies (steel products, non-ferrous metals, castings and metallic minerals) in Finland decreased by approximately 9 per cent in 2024 from 2023. In 2024, their turnover in Finland amounted to slightly more than EUR 13 billion. Last year, revenue was burdened by producer prices that were substantially lower than in the previous year, and by industrial action in early 2024.

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FOUNDRY INDUSTRY IN FINLAND

The production of iron and steel castings was 35.282 tons which is 24 % less compared to year 2023. Iron and nodular iron casting production decreased about 24 % and steel casting decreased about 23 %. Metal castings production was 3.526 tons in 2024, which is about 19 % less than the previous year. The value of the casting production of Finnish foundries in year 2024 was 212 m€, which is 13 % less compared to year 2023. The foundry industry employed 1365 people, 55 less than in 2023.

The main reason for the sharp drop in production was the unstable global situation. Due to uncertainty, foundries' customers invested in excessively large inventories in previous years, which were then depleted in 2024. Also investments in the engineering industry, which is very important sector for Finnish foundry industry, were frozen in 2024. Production is expected to grow by 10-20% in 2025.

Challenges for the Finnish foundry industry include the availability of labor, foundry technology education, the availability of raw materials, and EU regulations such as SF BREF. On the other hand, the availability or price of energy is not a problem in Finland, thanks to abundant renewable energy (water, wind, solar) and nuclear power.

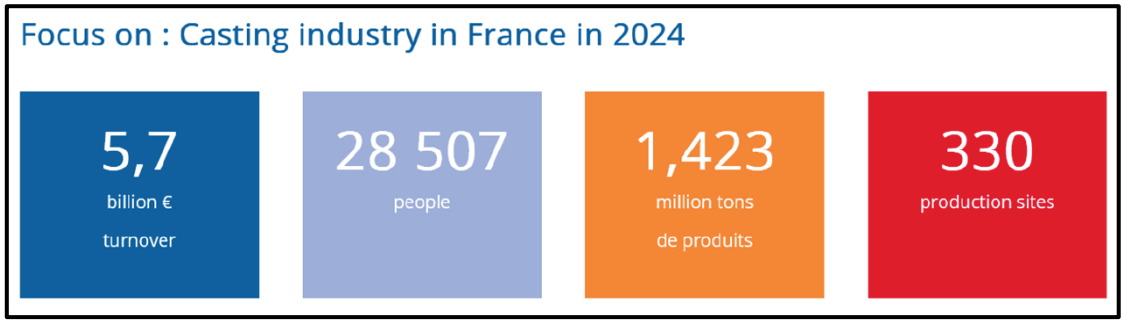
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FOUNDRY PRODUCTION IN FRANCE

National representation in the WFO:
ASSOCIATION TECHNIQUE DE FONDERIE (ATF)
WWW.ATF.ASSO.FR

Review of French Foundry for 2024 and tendency for first part of 2025

According to the FFF, Forging and casting industries are strong actors with a great economic and commercial clout. In France, which is the 3rd largest manufacturer on the European market, they represent a turnover of more than 5,7 billion euros and employ more than 28,507 talented men and women passionate about their job.



French foundry association networks

The foundry organisation network in France is still organised around 3 pillars : ATF – FFF & AAESFF. ATF (www.atf.asso.fr), representative of France at the WFO, continues to federate the foundry technicians including students, researchers, engineers, technicians, foundry owners or managers, suppliers and foundry retired persons: ATF is the publisher of the foundry digital magazine "Tech News Fonderie" (see below). FFF (www.forgefonderie.org/en), is the official representative of Foundry Industry to the French governmental institutions and federates a certain number of French foundry companies. FFF is representative of France at the CAEF and publishes 4 to 5 times a year the digital magazine : "Revue Forge et Fonderie". AAESFF (https://www.aaesff.fr) is the association of past graduated Foundry Technicians and Engineers from "ESFF": the French foundry engineer school, one of the rare foundry engineer schools in the world: (http://www.esff.fr/).

For the education and for foundry training & "foundry refreshment", ATF organises different training courses which cover the different foundry process and metallurgy. https://atf.asso.fr/media/technews/53/fiche-agenda2025.pdf

And to finish this French overview, ATF is publishing an e-revue: « **TECH News FONDERIE** » which proposes 7 - 8 times per year, a national, local, international, technical and scientist review of the foundry and metallurgy: http://atf.asso.fr/wordpress/tech-news-fonderie/

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France: general economic information's

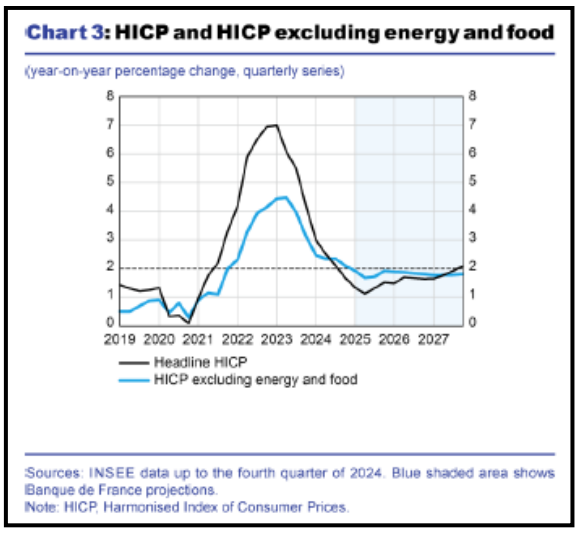
GDP in France for 2024 shows a recovery of the French economy after international issues like the after pandemic management and nowadays the conflict between Russia and Ukraine and other international issues. The GDP remains stable according to the Insee and Banque de France at +1.1. The forecast of the economists shows us pessimistic projection figures for this year but better figures the next years. These estimated figures are expecting to vary according to the political situation, other issues like the energy crisis which made the economy and the activities evolution uncertain for most of the industries:

KEY PROJECTIONS FOR FRANCE

	2023	2024	2025	2026	2027
Real GDP	1.1	1.1	0.7	1.2	1.3
	–	*0.0*	*-0.2*	*-0.1*	*0.0*
HICP	5.7	2.3	1.3	1.6	1.9
	–	*-0.1*	*-0.3*	*-0.1*	*0.0*
HICP excluding energy and food	4.0	2.3	1.8	1.8	1.8
	–	*-0.1*	*-0.4*	*-0.1*	*0.0*
ILO unemployment rate (France and overseas territories, % of labour force)	7.3	7.4	7.8	7.8	7.4
	–	*0.0*	*0.0*	*0.0*	*0.0*

Sources: INSEE data for 2023 and 2024 (quarterly national accounts as at 28 February 2025). Blue shaded columns show Banque de France projections.
Figures are adjusted for the number of working days. Annual percentage change except where otherwise indicated. Revisions to the December 2024 forecast are shown in italics. They are based on the quarterly accounts at 30 October 2024, calculated in percentage points and rounded figures. Projections are based on the quarterly accounts at 28 February 2025, prepared using technical assumptions established as at 6 February 2025.

In the euro area, consumer price inflation is measured by the **Harmonised Index of Consumer Prices (HICP)**. It measures the changeover time in the prices of consumer goods and services acquired, used, or paid for euro area households.



Figures 1 to 2. *Banque de France predictions : https://www.banque-france.fr/*

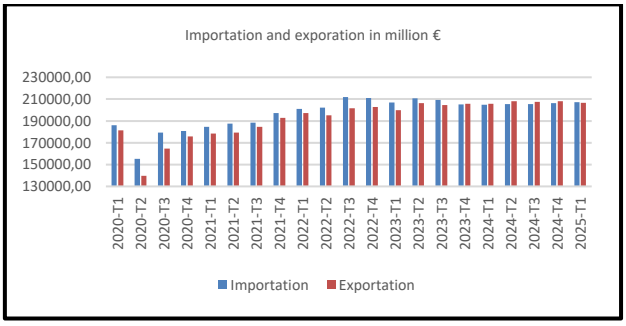
GDP and IPCH evolution in % and future estimation for France

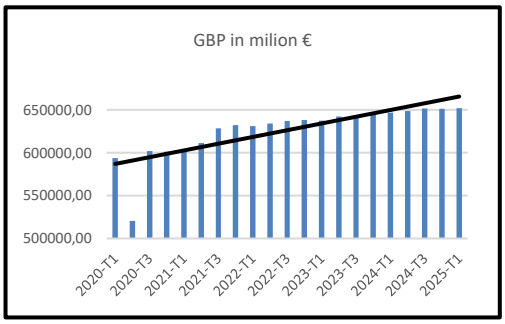
For inflation rate increase very quick in 2023 to reach 7% (HICP was at a level at 4% in 2022) this factor is expected to decrease and reach less than 3% in 2024. This increase is due to the very quick evolution of the Brent and the gas prices coming from the political crisis with Russia and the petrol extraction reduction in Saudi Arabia. In 2024, the situation became less critic and the inflation begun to decrease quickly with de deflation forecast.

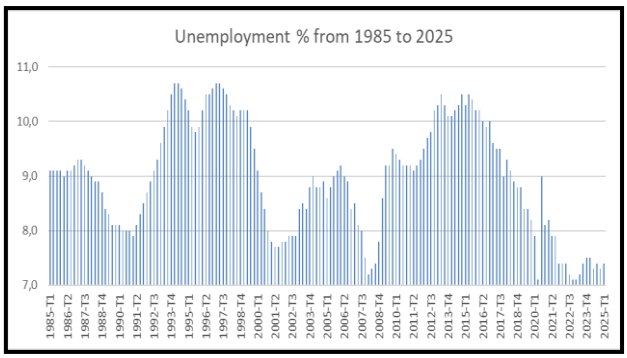
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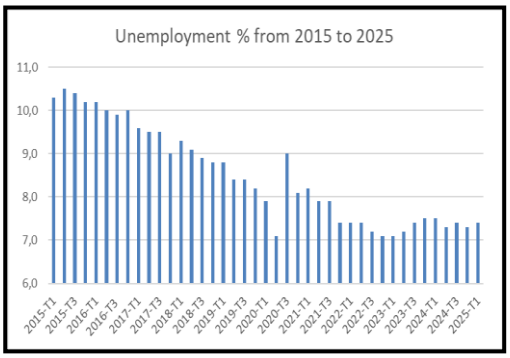
Regarding "import-export balance": France continues to be penalized by import of energy supplies and by all imported industrial goods like machine tools and for foundry, robots for any domain as core making shop, remoulding, fettling, are a typical example!

But the imports/exports rates which remained stable since 2018 and desynchronized with GDP increase has been due to the latest commercial strategies from the national & international companies which are looking more and more for local suppliers for their assembly lines. The French foundries continue to present a respectable activity at the export due to their strong and technical recognized knowledge and their capacity to produce difficult and technologic castings. The figures show an encouraging increase since the lockdowns which occurred in 2020. This trend illustrates a slow recovery of the economy after the COVID-19 pandemic and how robust the French economy is against crisis. However, we must notice that about 50 foundries in France went to bankrupt due to the pandemic situation (380 foundries in activity in 2019 and there is still 330 in activity in 2023 in France).









Figures 3 to 6. *(Insee data and charts: CVS & CJO adjustments)*

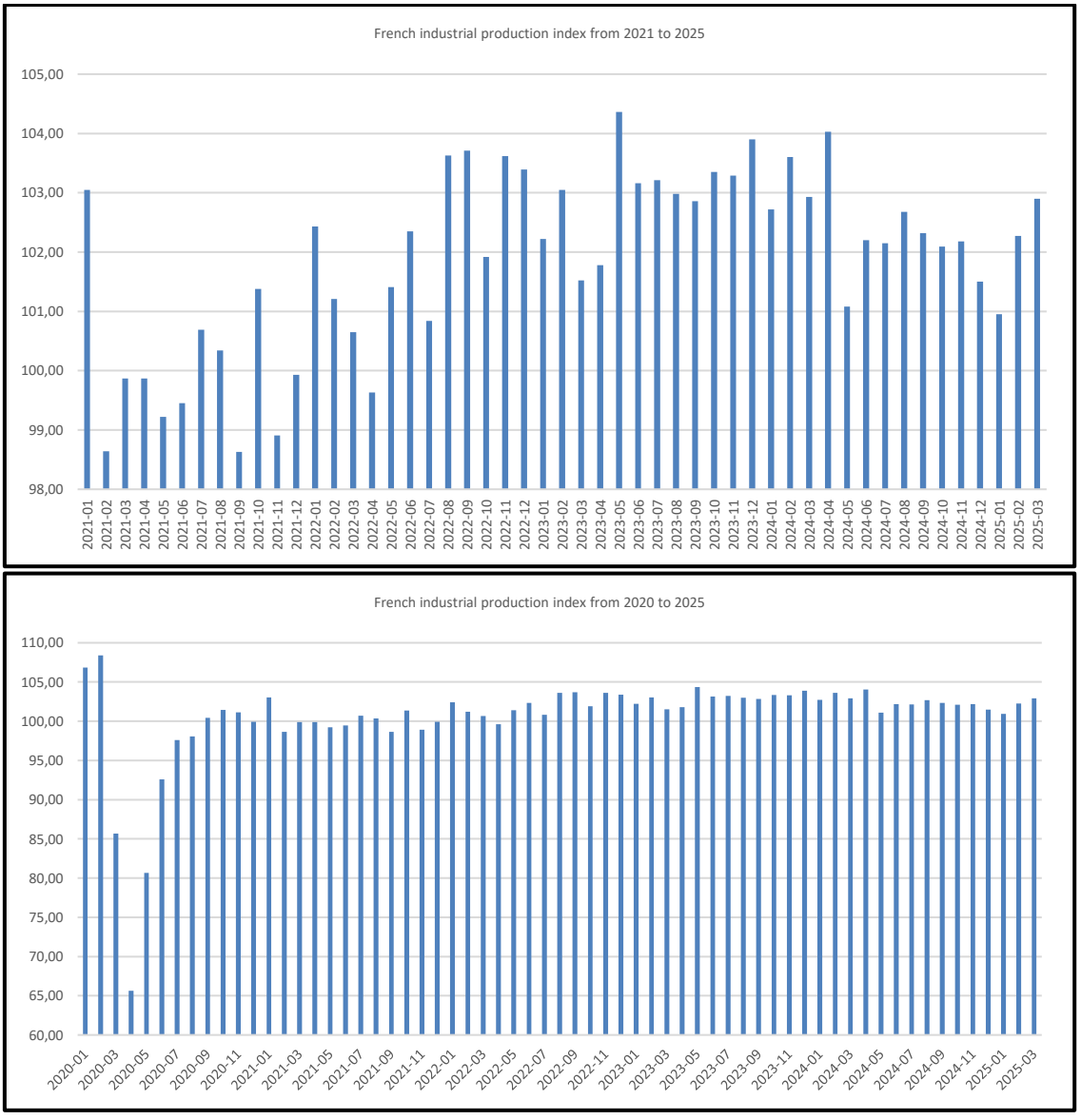
Unemployment: this parameter takes in consideration all people who is looking for a job and receive a subsidiary from the government. This data may not have the same perimeter than in other countries … so the comparison must be moderated.

The tendency was looking for a decrease until the first half of 2020 prior the temporary lockdowns/shutdowns which caused a lot of bankrupts in France. The figures are showing a positive progression from 9,1% after the lockdown to 7,3% in June 2022 and closer to 7,3% in the end of 2024. However, the demand for employment in foundry is a little bit less related to the Covid, the crisis with Russia and Ukraine and the issues which occurs after because the problem is still dramatically the following:

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"a lot of foundries cannot find employees or have difficulties to find employees mainly for "hand works" activities and now, more and more frequently for "technical expert" job". Some foundries are also complaining about the impossibility to grow and increase their turnover due to the lack of people wishing to work in the foundry industry. This issue will be more important due to experimented people who are going to retirement.

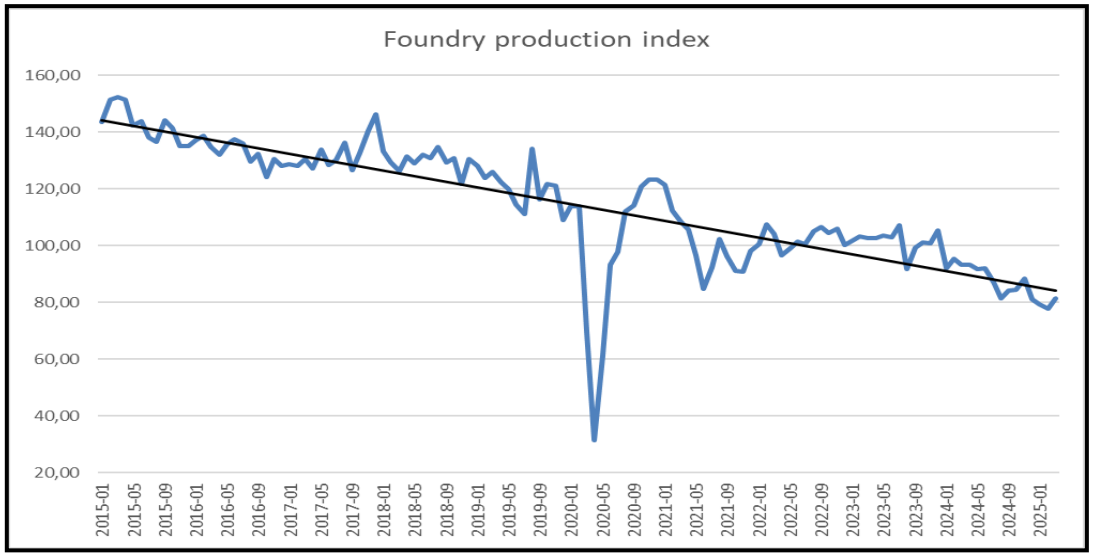
If the French Industrial Production index (all manufacturing industries) presented a general positive increase from 2014, but the lockdown of April 2020 due to the Covid pandemic and some issues to restart the production and the economy for reaching the values prior the Covid. The production index is showing a recovery after the pandemic like the Import/Export figures. However, the progression isn't so optimal due to the crisis in Russia which put the French industry in a defensive situation and make the after COVID recovery slower than expected.

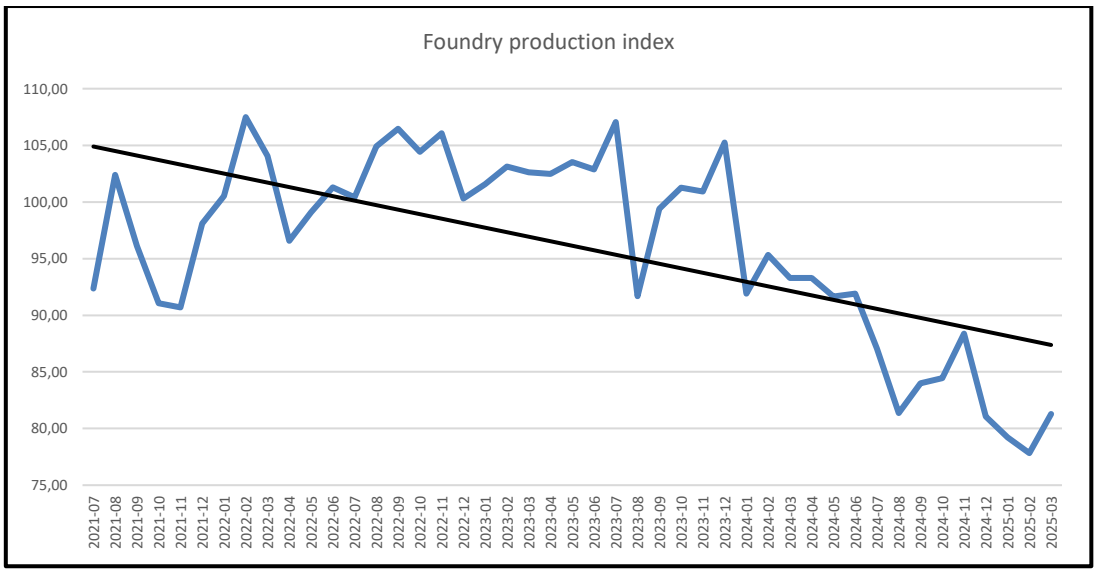


Figures 7 to 8. *French Industrial Production*

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French Foundry review for 2021, 2022, 2023 and 2024

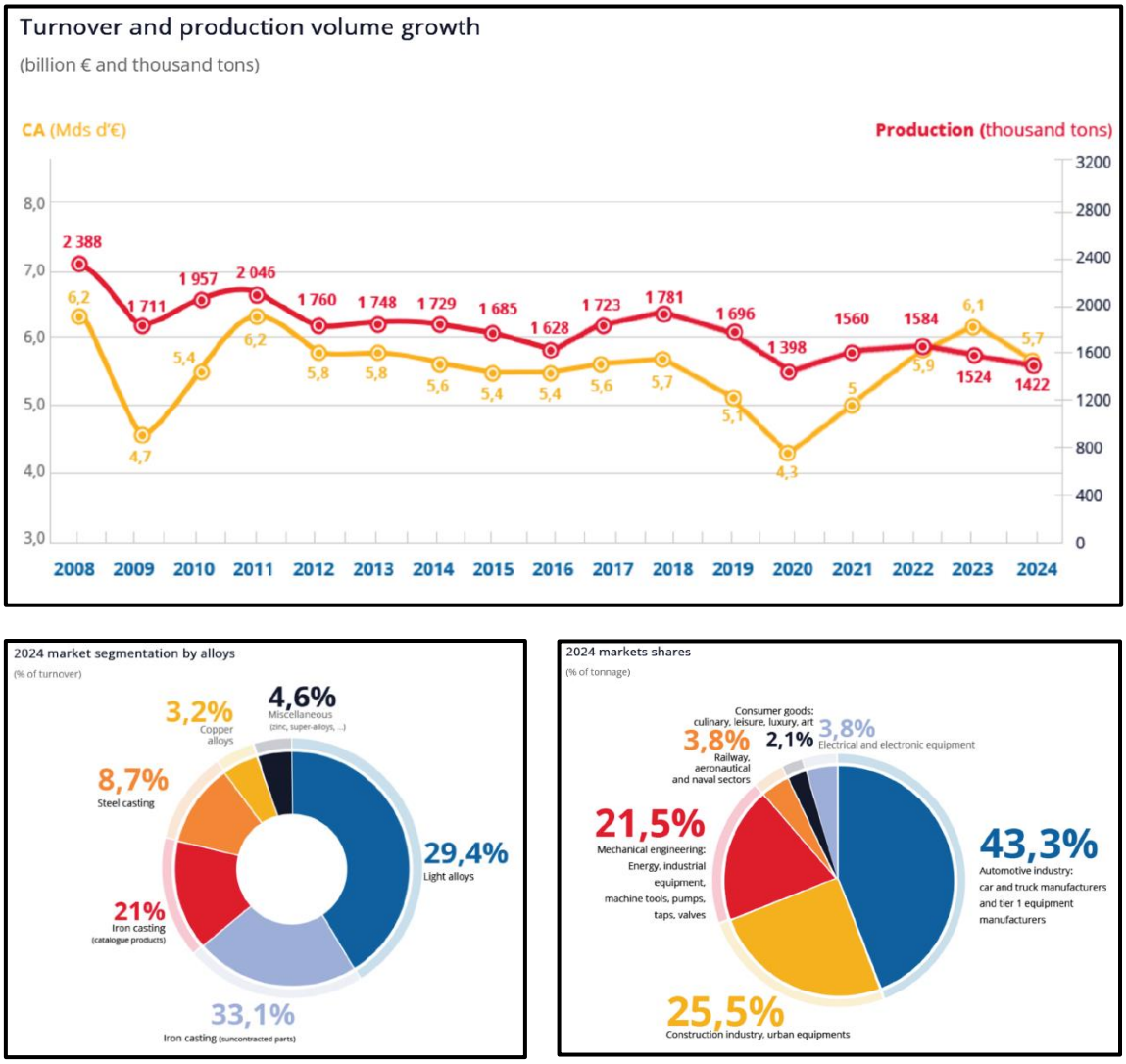




Figures 9 to 10. *Insee data and charts: CVS & CJO adjustments*

The French foundry activity, in term of index (http://www.insee.fr), but not in term of volume, continues to present a decrease since 2011 despite of some peaks in 2012 and 2014. But for the period January 2020 – March 2025 shows as for the French industry a recovery after the COVID pandemic and slowing down progress due to the crisis in Russia which also provoke an increase of the raw material costs. That effect is mainly due to the reorganisation of the market; some old and no "efficient foundries" (for an economic aspect) were closed (about 50 foundries closed in the 4 previous years), and others invested and invest for automatization like robot, simulation, new automatic lay-out, computer integrated chain including "3D printing" and Foundry 4.0! The charts are showing a slowdown in 2024 due to the raw material costs and availability which made the situation worse.

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Figures 12 to 14. *French foundry production in 2023 (Federation Forge et Fonderie). First graph for turnover in € & production in tonnage – second graph for the spread of the different alloys – third for the end users market*

In detail and according to the upper charts (www.forgefonderie.org) the French foundry still presents a slight evolution from an half –half business between ferrous or non-ferrous activity to an increase of the ferrous activity: 63% in volume for iron & steel and 37% for light and "other" alloys in 2024 to 60% for ferrous and 40% for the non-ferrous one in 2023. Automotive industry weight 43,3% of the orders.

These figures show a kind of come back to the 90's market share which was half oriented also to the automotive industry.

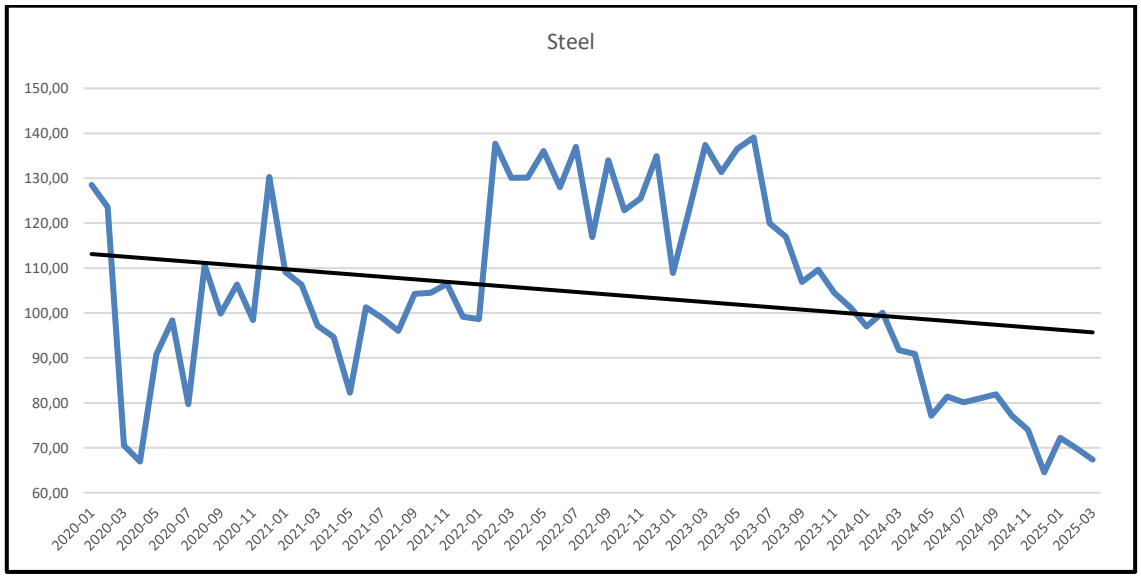
However, the next lines of this paper and analysis alloys by alloys could propose different conclusions:

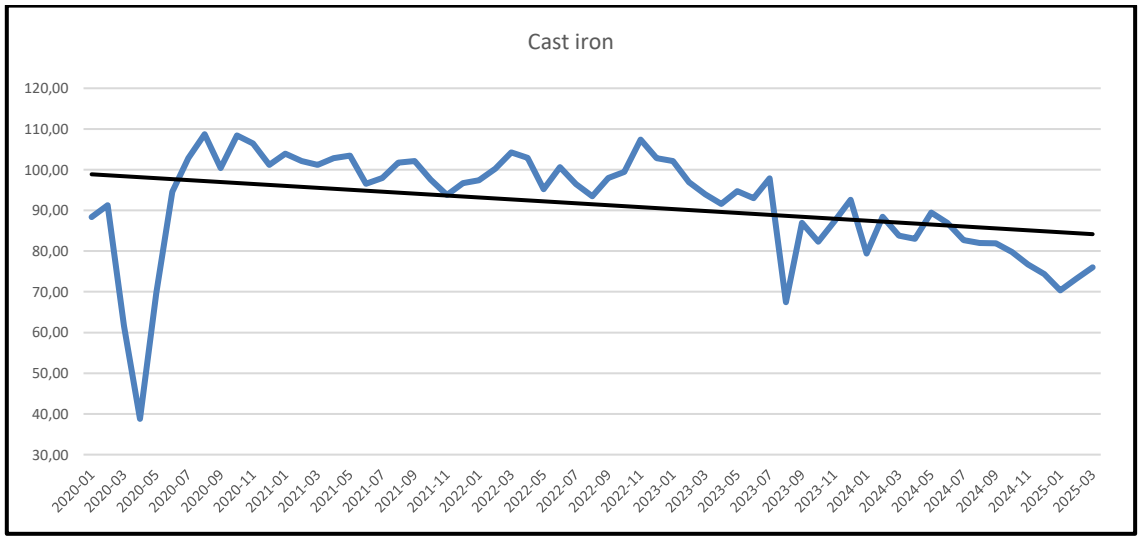
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In the overall situation, the lockdown from April 2020 causes a brutal decrease in the production. This tendency is shown in the following figures with the crash in April 2020. After this crash, the situation came to higher figure which are close to production from 2019 for the cast iron. The material crisis causes a decrease in 2024 in the cast iron foundries and the situation remain difficult due to energy and material costs increase.

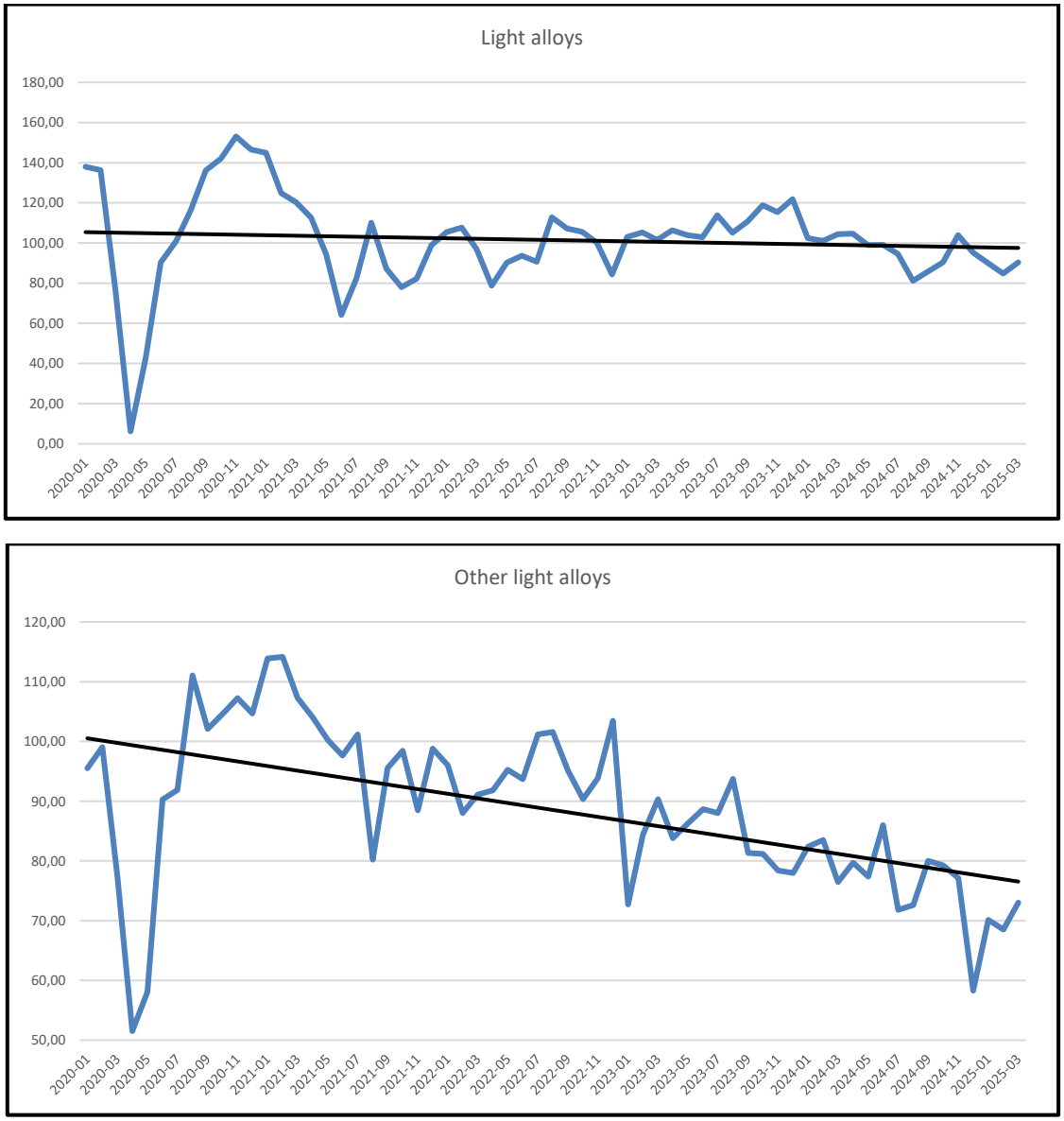
Steel foundries statistics after many years in a deflation situation showed a positive and interesting improvement until the end of 2019. The evolution has been stopped at the beginning of the Covid pandemic in France. In 2021, 2022 and 2023 the steel foundries tried to reach the level prior the pandemic, but the uncertain situation as the crisis in Russia and the raw material/energy costs holds this industry in a low level.

Few steel foundries went to bankrupt during the lockdown compared to the other industries. The slowdown in 2024 drove the production to the level of the COVID pandemic.





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Figures 15 to 18. *All the previous charts and Indices of foundry production per alloy (January 2015 – January 2025) are coming from Insee website (Insee data and charts: CVS & CJO adjustments)*

Iron evolution in France is strongly depending to ""pipe, street, heating parts, named "Mechanical equipment" in the French statistics"" with a level of 26.3%" versus 21.5% for "Construction industry" as described in upper picture from FFF. The last estimations and tendencies show stability and a potential stabilization for the next years. The increase of the demand for "Mechanical parts" parts comes from foreign customers who had find other suppliers due to some bankrupt in the foreign countries.

Light alloys business, mainly aluminium, is directly connecting with automotive and aerospace activities. Due to demands for reducing working capital plus the huge number of new models, the volume of production for automotive must be adjusted at the demand. And by same time, the demand for local suppliers to reduce time of deliveries had a direct effect of French foundries

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involved in international market. That is not new, but that is more and more stick to the final area's demand for car! Some car manufacturers decided to cancel and discontinue some purchase orders to French foundries and mostly for the die casting aluminium parts, this situation explained the reason of the decrease of the light alloys due to crash of the new cars selling. The aluminium supply has been also challenges due to embargo on Russian products, most of the aluminium foundries has to buy product from Norway or Brazil to insure the production but the price is much higher. After an uncertain situation, the French foundries could find the way to maintain the production at an acceptable level.

For other alloys, France has a good and well recognized technical knowledge for these special alloys like magnesium, titanium, zinc, and copper alloys used in many domains like aeronautic, special pumps & valves, nuclear and chemical plants, ships & boats, railways and train, all medical domains, arts, … but the business is confronted at a low-price completion. Only aeronautic with Mg & Ti business could present a potential increase to compensate the other alloys deflation but this situation is uncertain due to the huge losses from the biggest actor form this industry and the pandemic which will strongly reduce the demand for new planes during some months and made the production index reaching the level of the index of the COVID time.

French Foundry Tendencies for 2024

After many conflicts, lockdowns and crisis, the French government decided to protect the health of French people by using temporary closure of industries or by developing work at home while giving subsidies or proposing loans to preserve the companies against bankruptcies would be positive/effective. Despite these aids, some companies went bankrupt, that is why the number of unemployed (people benefiting from a government subsidiary) increased in the second half of 2020.

To restart the production and encourage the companies to invest in new equipment, the French government starts the "France Relance" project since 2020. The aim of this project is to assist the industries to make them more competitive and environmentally friendlier.

But the economic situation of the mechanical and metal industries at the end of June 2022 according to the Bank of France shows a positive recovery. The example of the "utilization rate of production facilities in the metalworking industries" (data from the Bank of France) in France encouraging! After a peak at the end of 2018, the industry (metallurgy) has a current capacity utilization at about 77% better than two years ago but in a decreasing trend. Temporary company closures have also had a huge impact on capacity with a crash to less than 40% in April 2020 and went up progressively to reach 80% in June 2023 and decreased during 2024.

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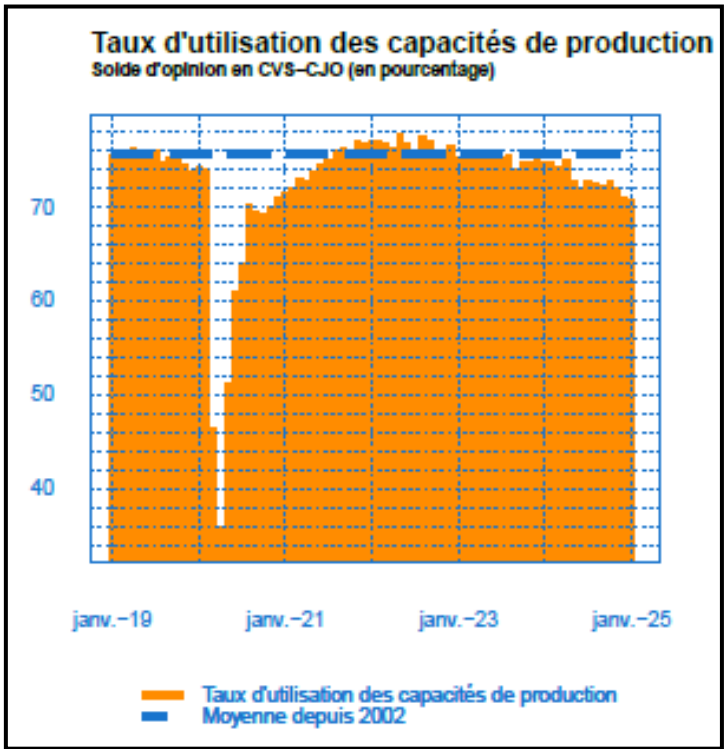


Figure 19. *"output of French foundry capacity – orange band for monthly tendency – blue line for average"*

Conclusion

France, its foundry, and its economy has recovered in 2024 a higher level than 2022 (in turnover) even if some conflicts reduced the increase of the GDP.

The French foundry activity would be not so bad with a global turnover slightly higher with however a lower tonnage (certainly due to the mix of the alloys) than the previous years!

That means the French foundries did not accept to reduce their price for bigger volume and they continue to maintain their capacity and leadership with a strong R&D investment including IA to produce difficult castings with a high ratio: price – weight - mechanical demands and quality despite of the previous and current economic situation.

Reference:

http://www.insee.fr/fr/bases-de-donnees/
http://www.atf.asso.fr
http://www.forgefonderie.org
https://www.banque-france.fr/

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FOUNDRY PRODUCTION IN INDONESIA

National representation in the WFO:
APLINDO (Indonesian Foundry Industries Association)
WWW.APLINDO.WEB.ID

Report provided with the collaboration of
GROWTH STEEL
WWW.GROWTHSTEEL.COM

WHAT is APLINDO

INDONESIAN FOUNDRY INDUSTRIES ASSOCIATION (Asosiasi Industri Pengecoran Logam Indonesia), abbreviated as APLINDO, established on December 9, 1981 is an organization that is used as a tool of struggle to create a healthy industrial climate in Indonesia, striving for industry to grow and develop towards a self-reliant industry that is strong and efficient so that its products can compete strongly in the global market.

Vision

To place the Indonesian foundry – a strategic up-stream industry – in a strong and firm position and to become the foundation for developing machinery and metal industry, so that it will be able to help accelerate the national economic growth.

Mission

To assemble companies which are working on foundry and those involved with foundry. To strengthen relationship, to initiate cooperation and to harmonize common steps among foundry industries. To realize a self- supporting machinery and foundry industry. To apply valuable and appropriate technology, so that the products are able to compete on the global market.

Secretariat Address

Apartemen Taman Semanan Indah, Blok Anggrek, Lantai 2 Unit 3

Jl. Taman Semanan Raya, Duri Kosambi, Kec. Cengkareng,

Jakarta Barat 11750

WhatsApp: +62 878-1564-8881

Members Association

Aplindo's members consist of the ductile and steel casting industry, aluminum casting and die casting, lead recycling dan smelter aluminum which are engaged in automotive components,

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heavy equipment, weaponry, medical devices, Agriculture, mining, manufacturing tools and equipment.

Note: not all foundry industries in Indonesia are registered as APLINDO members

APLINDO MEMBER 2025

Ductile Iron

1. Asia Raya Foundry, PT
2. Asian Isuzu Casting Center, PT
3. AT Indonesia, PT
4. Bakrie Autoparts, PT
5. Barata Indonesia, PT
6. Bina Usaha Mandiri Mizusawa, PT
7. Geteka Founindo, PT
8. Growth Asia, PT
9. Hansa Pratama, PT
10. Indoprima Gemilang, PT
11. Pakarti Riken Indonesia, PT
12. Pindad (Persero), PT
13. Riau Baja Indo, PT.
14. Sentana Multi Makmur, PT.
15. Sinar Agung Selalu Sukses, PT
16. Yanmar Indonesia, PT

Steel Casting

1. Asia Raya Foundry, PT
2. Barata Indonesia, PT
3. Cipta Baja Raya, PT
4. Commonwealth Steel Indonesia, PT
5. Global Mas Abadi, PT
6. Growth Asia, PT
7. Indoprima Gemilang, PT
8. Inter Satria, PT
9. Jatim Taman Steel, PT
10. Kaishun Industries Indonesia, PT
11. Komatsu Indonesia, PT
12. Pindad (Persero), PT.
13. Victorindo Ferro Nusantara, PT

Investment Casting (Stainless Steel)

1. Lingga Sakti Indonesia, PT
2. Metinca Prima Industrial Works, PT
3. Pelopor Teknologi Implantindo, PT
4. Peroni Karya Sentra, PT
5. Stainless Steel Primavalve Majubersama, PT
6. Trieka Aimex, PT
7. Victorindo Ferro Nusantara, PT
8. Zenith Allmart Precisindo, PT

Forging

1. Barata Indonesia, PT
2. Growth Asia, PT
3. Komatsu Undercarriage indonesia, PT
4. Pindad (Persero), PT

Non Ferro Casting (Aluminium)

5. Aluzindo Paduan Mulia, PT
6. Astra Daihatsu Motor, PT
7. Central Motor Wheel Indonesia, PT
8. Chemco Harapan Nusantara, PT
9. Langgeng Makmur Alumunium, PT
10. Metinca Prima Industrial Works, PT
11. Moradon Berlian Sakti, PT
12. Nakakin Indonesia, PT
13. Pakoakuina, PT
14. Sinar Agung Selalu Sukses, PT
15. Star Mustika Plastmetal, PT
16. Wijaya Karya Industri Dan Kontruksi, PT
17. Yamaha Motor Parts Manufacturing Indonesia, PT

Lead Recycle

1. Indra Eramulti Logam Industri, PT
2. Muhtomas, PT
3. Non Ferindo Utama, PT

Secondary Alumunium (Ingot Al)

1. Daiki Aluminium Industry Indonesia, PT
2. Indonesia Smelting Technology, PT
3. Molten Aluminum Producer Indonesia, PT

Zinc

1. Aluzindo Paduan Mulia, PT
2. Star Mustika Plastmetal, PT

Recycle Foundry Sand

1. Tochu Silika Indonesia, PT

Foundry Material / Equipments Suppliers

1. Foseco Indonesia, PT,
2. HA ASEAN SDN.BHD
3. Indonesia Bentonite, PT
4. Makmur Meta Graha Dinamika, PT
5. Prolimas Utama Jaya, PT
6. QES Indonesia, PT
7. Sinto Indonesia, PT
8. Tsuchiyoshi Hosana Indonesia, PT

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APLINDO PRODUCTION

Capacity (Ton)	Description	Production (Ton) 2024
257.340	Ferro (grey,ductile,steel casting)	155.626
10.020	Investment Casting (Stainless Steel)	4.179
132.340	Aluminium Casting	48.855
311.500	Secondary Alumunium (Ingot Al)	172.606
204.000	Smelter Lead Recycle (Pb)	51.816
900	Zinc	188
36.000	Recycle Foundry Sand	26.880
72.000	Ingot (Cu)	72.000
110.000	Forging	93.200

It is predicted that in 2025, there will be a decline of around 15-20%

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FOUNDRY PRODUCTION IN NORWAY

National representation in the WFO:
NORWEGIAN FOUNDRY TECHNICAL ASSOCIATION
WWW.STOPERI.NO

Casting Production

The number of foundries and employees in the Norwegian industry is so low now, that it has been decided not to issue annual production figures. This is because the figures would be too transparent, identifying each foundry's situation and turnover.

There are 4 iron foundries and some 8 non-ferrous foundries.

These foundries produce castings for various customer markets, only one foundry supplies to the automotive sector.

The iron foundries produce castings for various customer markets. The main markets road/drainage and domestic goods, iron stoves and fire places.

Our annual congress in 2026 will be in Mandal, May 8st and May 9th. (Norwegian language only).

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FOUNDRY PRODUCTION IN POLAND

National representation in the WFO:
POLISH FOUNDRYMEN'S ASSOCIATION
WWW.STOWARZYSZENIE-STOP.PL

Poland's macroeconomic performance in 2023-2024

Indicator	Units	2023	2024
GDP	dynamics	100,2	102,9
Gross fixed capital formation	dynamics	112, 6	101,3
Price index of consumer goods and services (CPI)	Dynamics	111,4	103,6
Price index of sold production of industry (PPI)	Dynamics	102,4	93,2
Sold production of industry	Dynamics	98,5	100,2
Average wages and salaries in the national economy - enterprise sector	PLN	8033	8821
Average employment in enterprise sector	thous.pers.	6529	6454
Unemployment rate (as of the end of the period)	%	5,1	5,1

Table 1. *Main macroeconomic indicators*

The Polish foundry industry

In 2021–2023, some of the published statistics were based on incomplete information from foundries. This year, the situation has improved significantly. The survey involved companies whose total production accounts for over 90% of the domestic production of castings. This has provided us with reliable and representative performance data for 2023 and 2024.

The analysis of this year's more complete data allowed to obtain a more complete and precise picture of the situation in the industry. Naturally, it also revealed areas where the previous statements needed to be updated in order to maintain the highest level of consistency and transparency of statistics. Therefore, appropriate additions and clarifications to the archival data have been introduced, adapting them to the currently available, wide information base.

Casting production

The Polish foundry industry consists of about 449 foundries. The largest percentage are foundries of non-ferrous metals (238), followed by cast iron (176) and cast steel foundries (35).

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The foundry sector is formed mainly by small and medium-sized enterprises (SMEs), which employ up to 250 employees. Despite the fragmentation of the foundry industry, SMEs foundries play an important role in the total production of castings, accounting for about 40% of total production.

In 2023, the total production of castings in Poland amounted to approx. 844 thousand tones, which was estimated to be an increase of approx. 0.5% compared to the previous year. After a decline in casting production in 2022 as a result of the armed conflict that began, record-high energy and raw material costs, which resulted in a decline in margins and reduced investments, 2023 and the first half of 2024 brought temporary stabilization and an increase in orders. In 2024, the first symptoms of a rebound were recorded, but growth was still limited by high energy costs, staff shortages and weakening exports to the automotive sector.

Estimated data indicate that the overall production of castings in Poland in 2024 amounted to 758 thousand tones, which meant a decrease in the production of castings by 10% compared to 2023 (table 3).

The domestic production of ferrous metal castings amounted to approx. 604 thousand tons, of which: grey cast iron – 414 thousand tons, ductile iron – 177 thousand tons, cast steel – 13 thousand tons. This meant a decrease in the production of ferrous metal castings by 11% compared to the previous year, including a decrease in the production of grey iron castings is estimated at 13.6%, ductile iron castings at the level of 7.2%. Among ferrous metal castings, the production of steel castings (alloy and carbon steel) is estimated to increase by 22% in 2024.

In turn, the production of light alloy castings (aluminum, copper, zinc and others) reached a total of 154 thousand. tons, which, despite the decline in the overall production volume of these castings, confirms the growing role of lightweight construction materials in the economy. The production volume of non-ferrous metal castings in Poland decreased by approx. 5.5% compared to 2023, including a decrease in the production of aluminum castings is estimated at the same level – 5.5%.

Material	Output 2023[1]	Output 2024[4]	Change [%]
Total iron castings	479 504,00	414 341,00	-13, 6%
Total ductile iron castings	190 653,00	176 842,00	-7,2%
Steel castings	10 594,00[2]	12 931,00[2]	+22,0%
Total ferrous alloy castings	680 751,00	604 114,00	-11,3%
Aluminum alloy castings	**162 860,85[3]**	**153 925,00[3]**	**-5,5%**
Other nonferrous alloy castings	698,70[2]	687,00[2]	-1,7%
Total nonferrous alloy castings	**163 548,00**	**154 612,00**	**-5,5%**
Total ferrous and nonferrous castings	**844 310,55**	**758 726,00**	**-10,1%**

Table 2. *Total casting production in Poland**

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presented data represented the production of foundries whose total production amounts to over 90% of the total casting production in Poland, 1 data revised, 2 estimated data, 3 without the production of aluminum rims

As in the previous year, the material structure of the foundry industry was dominated by grey cast iron castings – approx. 54.6%, ductile iron castings – approx. 23,3%, and aluminium castings – approx. 20.3% .

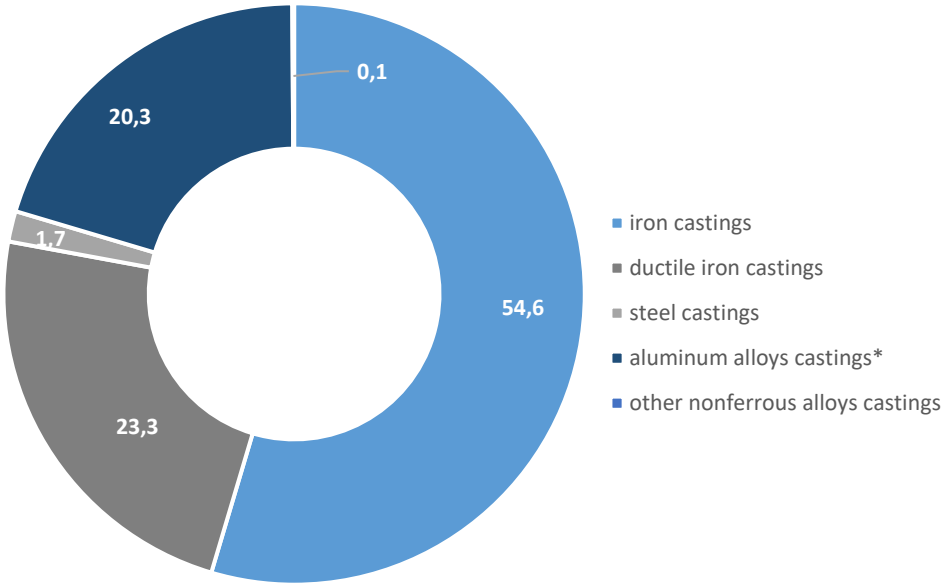


Figure 1. *Material structure of casting production in Poland in 2024 (%)*

**without the production of aluminum rims*

Casting recipients

The main markets remained unchanged: automotive (65%), machinery (9%), construction (9%), metallurgy (7%) and energy (3%) remained key customers.

In recent years, due to political conditions, Polish foundries have been increasingly actively involved in acquiring a new recipient of castings – the defense industry.

Export

The share of exports in total production was over 70%, and the main trading partners remained Germany, France, Italy, the Czech Republic and the USA.

Employment

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The industry has employed about 22 thousand people in recent years, although this number is gradually decreasing. In 2024, it is estimated that the volume of employment in the foundry industry has fallen at 20 thousand.

The shortage of qualified workers, the limited number of vocational schools educating in foundry professions and the lack of people willing to take up apprenticeship in foundry professions continue to be a challenge.

Investments and modernization

As many as 67% of foundries carried out investments in 2024, with the most frequently implemented projects being the modernization of machinery (56%), investments in environmental protection (33%), implementation of production software and ERP systems (17%) and investments in human resources potential (17%).

Industry 4.0 solutions – automation, robotization and the Internet of Things (IoT) – are becoming increasingly important. However, only about 30% of plants have implemented them, to varying degrees. The most commonly used Industry 4.0 technology in foundries is process automation. Robotization and 3D printing are also used. Solutions based on the Internet of Things (IoT) and artificial intelligence (AI) are used much less often – only a few large, modern foundries with advanced production systems use them.

It is worth noting that about 15% of foundries have not implemented any technology from the Foundry 4.0 concept, which shows the still existing gap between modern plants and those with a traditional production profile.

The most frequently indicated obstacle in the implementation of digital solutions is high investment costs. Other barriers are: lack of adequate technological knowledge among employees, resistance of employees to changes and fear of losing their jobs, as well as technical limitations related to the nature of production and the specificity of castings.

This indicates that digital transformation requires not only investments in hardware and software, but also in the development of human resources competencies and a change in the organizational culture of enterprises

Economic situation of the iron foundry industry in Poland in 2023–2024

Data from 2023–2024 clearly show the deterioration of the economic situation of the Polish foundry industry, especially in the SME segment. While large iron foundries managed to maintain a stable level of profitability, despite a decline in revenues in 2024, the small and medium-sized business sector (iron foundries) was under significantly greater cost and market pressure. Declining margins, shrinking orders from key industries, and rising energy and labor costs are rapidly weakening the profitability of smaller plants, almost half of which were unprofitable in 2024.

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Challenges and opportunities

Today, Polish foundry industry is on the verge of a major transformation. On the one hand, they are limited by growing environmental requirements and the pressure of climate neutrality, high prices of energy and raw materials, a shortage of specialists, and strong competition from Asia.

High electricity prices and rising capacity fees are currently one of the most serious factors limiting the competitiveness of Polish foundries. The foundry industry is one of the most energy-intensive sectors of industry, with the cost of energy in many plants accounting for up to 20–30% of total production costs.

The capacity fee has further increased the financial burden on businesses, especially those operating in a continuous system, where it is not possible to reduce energy consumption during peak hours. High energy prices also cause a decrease in margins and a loss of competitive advantage over foundries from countries where energy is cheaper.

In the light of the current regulations and the economic development plans of the European Union for the coming decades, the foundry industry must face the challenge of decarbonization. According to the documents about BREF and BAT, foundries (installations with a capacity of more than 20 tones of metal per day) will have to adapt their emissions at the plants to the limits set by the European Commission by December 2028.

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FOUNDRY PRODUCTION IN SLOVENIA

National representation in the WFO:
SLOVENIAN FOUNDRYMEN SOCIETY
WWW.DRUSTVO-LIVARJEV.SI

FOUNDRY PRODUCTION IN SLOVENIA

The table below shows the main macroeconomic indicators achieved in Slovenia in 2024 and assessment of 2025.

Indicator	Realisation 2024	Assessment 2025
GROSS DOMESTIC PRODUCT (GDP)		
GDP, real growth in %	1,6	0,9
GDP, in EUR billion, current prices	66,97	70,28
GDP per capita in EUR	31.490	32.868
Export of goods and services, real growth in %	3,2	2,6
Import of goods and services, real growth in %	3,9	2,7
External balance with foreign countries, contribution to GDP growth	-0,4	0,1
Private consumption, real growth in %	1,6	2,2
Gross fixed capital formation, real growth in %	8,5	2,7
Gross investment in fixed assets, real growth in %	-3,7	1
EMPLOYMENT		
Employment, National Accounts statistics, growth in %	0,1	0,1
Number of registered unemployed, annual average, in thousands	46	45,4
Registered unemployment rate in %	4,6	4,6
INFLATION		
Inflation (through December), in %	1,9	2,7
Inflation (annual average), %	2	2,3

Table 1. *IMAD, Institute of Macroeconomics and Development.*

After a rapid post-pandemic recovery, economic activity growth moderated in 2024 and was the lowest since 2020. GDP growth was lower than earlier expectations, mainly due to reduced investment activity—especially in construction-related sectors. Lower construction and housing

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investment resulted from the completion of several state-funded projects from the previous EU financial perspective, a slowdown in real-estate transactions, and a slower-than-expected post-flood reconstruction following the 2023 floods. Export demand was weaker in the first half of the year than previously expected. In the third quarter, export growth recovered, foreign trade contributed positively to GDP growth again, and even exceeded the projections for 2024. Nevertheless, economic growth remained modest, and the achieved 1.6% GDP growth was lower than the projected value in last year's WFO report.

Services and trade continued to support positive economic growth under favourable private-consumption conditions. Activity in manufacturing also recovered.

Reports on Slovenia's development, similar to previous years, show that the key policy areas requiring priority inclusion in the fiscal framework include productivity growth, transition to a low-carbon circular economy, reforms of social-protection systems (healthcare and pensions), and improvements in strategic governance of public institutions.

Priority action areas critical for long-term sustainable development and quality of life include:

Trend productivity growth remains weak; several factors have gradually improved, but significant productivity increases require accelerated investment in smart and green transformation and expanded and deepened business-transformation processes.

The education level of the population has been rising for years, but human-capital development for high-quality public services and green and smart economic transformation remains too slow; some indicators of primary and secondary education quality have worsened.

Public-health outcomes have nearly returned to pre-pandemic levels, but access to public healthcare and long-term care faces growing challenges.

Despite **major labour-shortage pressures due to demographic change** and the highest labour-market participation rate to date, access to quality employment remains difficult for some groups.

The transition to a low-carbon economy remains too slow, especially due to lack of progress in transport and renewable-energy use; the circular-economy indicator of processed-materials use remains relatively low.

SLOVENIAN FOUNDRY INDUSTRY IN 2023 AND 2024

Total production of the Slovenian foundry industry in 2024 was 150.665 tons, a 10% decrease from 168.253 tons in 2023.

The reasons for reduced production volume in 2024 were the same as in 2023: changing market conditions (lower demand or fewer orders), market restructuring, and high energy prices, which required adaptation by several companies.

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FOUNDRY PRODUCTION IN SLOVENIA IN 2023 (in tons)										
Year	**Grey iron**	**Ductile iron**	**Malleable iron**	**Steel**	**Cu-alloys**	**Al-alloys**	**Mg-alloys**	**Zinc**	**Other casting production**	**Total production of casting**
2023	59.019	36.614	2.700	5.885	1.050	57.912	0	5.073	0	168.253
2024	43.020	34.478	3.000	4.133	922	56.680	0	4.946	3.486	**150.665**
INDEX 2024/ 2023	0.73	0.94	1.11	0.70	0.88	0.98	0	0.97	/	0.90

Table 2. *Foundry production in Slovenia in 2024/2023 (in tons), Database of Slovenian Foundrymen Society*

Production by material type compared with 2023:

- The production of grey cast iron amounted to 43.020 tons, which is 17% less than last year.
- The production of ductile iron amounted to 34,478 tons, which is 6% less than last year.
- The production of malleable iron amounted to 3,000 tons, which is up 11% from last year.
- The production of steel amounted to 4.133 tons, which is 30% less than last year.
- The production of copper alloys amounted to 922 tons, which is 12% less than last year.
- The production of aluminium alloys amounted to 56.680 tons, which is 2% less than last year.
- The production of zinc alloys amounted to 4.946 tons, which is 3% less than last year.

As can be seen from the above data, production in all types of foundries — except in foundries of malleable cast iron — was lower than in 2023.

ASSESSMENT OF MACROECONOMIC INDICATORS FOR SLOVENIA IN 2025

Forecasts by international analysts for the euro area at the beginning of this year anticipate slightly higher GDP growth than last year, followed by gradual strengthening—though slower than expected in autumn projections, especially in Germany. This year sees record-high indices of trade-policy uncertainty. Euro-area growth is now projected at only 0.8% for this year, rising to 1.1% in 2026 and 1.2% in 2027. Germany—Slovenia's key trading partner—is expected to experience the slowest recovery: GDP growth of only 0.8% in both 2026 and 2027. This could

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slow Slovenia's economic growth as well. OECD's December forecast for Slovenia already reflects this trend, as the initial GDP growth forecast has been revised downward for the second time, now to only 0.90%.

In Slovenia, exports declined sharply in the first half of this year, significantly affecting economic activity. In the third quarter, year-on-year growth reached only 0.8%. Growth would have been even weaker without domestic demand, supported by investment and spending for post-flood reconstruction following the catastrophic 2023 floods.

This year has also seen heightened uncertainty caused by US protectionist measures and retaliatory measures by affected countries. This is slowing the expected gradual recovery of growth and inflation easing in Slovenia's trading partners. The escalation of tariffs, including on non-EU states, further increases the risk of slowing global trade. At the same time, European (and Slovenian) economies face growing exposure to foreign competition due to new and increased tariffs on automobiles. Geopolitical uncertainty—particularly relating to developments in the Middle East and Ukraine—along with structural challenges in manufacturing, high energy prices, rapid technological changes, shifting consumer preferences, and global competition (especially in the automotive sector) further contribute to growth slowdown.

The labour market continues to experience labour shortages. Excess demand, combined with the public-sector wage reform, resulted in 7.2% year-on-year nominal wage growth in the first half of the year. Wage growth caused a sharp increase in service prices, which rose 3.7% year-on-year in October. Overall inflation reached 3.1%, driven also by higher food and energy prices. Real wage growth exceeded productivity growth, reducing competitiveness.

Given that economic conditions deteriorated during 2025 and no signs of improvement are evident on the horizon, it is to be expected that foundry production will not recover in 2025 either. We therefore anticipate that most Slovenian foundries will again record a decline in production this year.

Sources:

-IMAD – the Institute of Macroeconomic and Development

-Chamber of Commerce and Industry of Slovenia, Association of Metals and Non-metals

-Slovenian Foundrymen Society

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FOUNDRY PRODUCTION IN SPAIN

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General economic and industry overview

The year 2024 was characterized by a strengthening macroeconomic backdrop, a stabilization of the labor market, and a notable decline in inflation, all of which fueled a strong resurgence in Spanish industry.

According to the Ministry of Industry and Tourism's annual report, the data on Spain's industrial sector highlight its leading role in Europe's ongoing transformation. These achievements mark a significant qualitative advance, especially given the major challenges confronting the industry—such as decarbonization, geopolitical uncertainties, technological disruption, and the push for reindustrialization. Following a solid beginning and even stronger momentum in the latter part of the year, Spain's gross domestic product (GDP) expanded by 3.2% in 2024. This outperformed the 2.5% growth recorded in 2023 and significantly exceeded the eurozone's modest 0.9% increase. Key drivers of this robust performance included vigorous private consumption, rising investment in capital equipment, and sustained progress in the labor market. Employment reached a record high of 21.8 million people, while the unemployment rate dropped to 10.8%—the lowest level since 2008—reinforcing the trend toward a durable and sustainable recovery.

Regarding the performance of our foundry industry, 2024 saw a drop in iron output, while steel production maintained modest positive growth. Meanwhile, non-ferrous metals experienced a decline. These trends stem from unstable conditions in the key global markets.

Industrial sector

Spain's Industrial Production Index (IPI) experienced a modest rebound in 2024, rising by 0.7% after contracting by 1.6% in 2023.

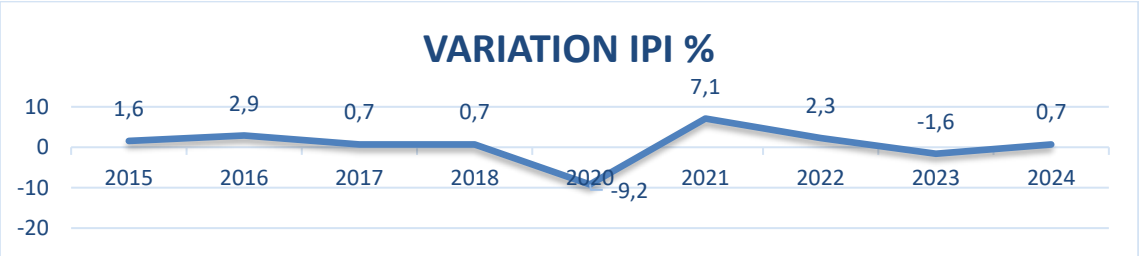


Figure 1. *Annual variation (%) IPI industrial production index Spain*

Source: INE

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This rebound stands in contrast to the broad-based declines recorded in Germany (-4.6%), Italy (-3.5%), France (-0.2%), and the Eurozone overall (-3%). Looking ahead to 2025, a year-on-year contraction of 0.7% is expected, reflecting a moderation in global trade driven by weaker external demand.

Production trends in 2024 reveal marked differences across sectors. Output of consumer goods increased by 1.8% and intermediate goods by 0.8%, whereas capital goods and energy production declined by 0.9%. These developments point to a recovery in consumption and stronger processing of raw materials, offset by reduced investment in machinery and industrial infrastructure. The improvement in consumer goods production is closely associated with better employment conditions and rising purchasing power.

By industrial sector, we can identify different growth rates:

Higher growth:

- Electronics and telecommunications +17.7%;
- Chemical industry +6%;
- Electrical machinery +3%;
- Rubber and plastics +1.6%.

Decrease:

- Motor vehicles -3.2%;
- Textiles -1.9%;
- Non-metallic minerals -0.9%.

This suggests that technology-related sectors are gaining momentum and expanding their market presence, while traditional industries—particularly automotive—continue to face sustained challenges.

Metal sector

In 2024, Spain's metal sector demonstrated moderate recovery and resilience. The Metal Production Index (IPIMET) recorded positive growth of 0.8% over the year, despite ongoing economic uncertainty and rising production costs. The manufacture of metal products outperformed basic metallurgy, supporting employment stability and reinforcing investment in vocational training.

While employment declined in metallurgy, the manufacture of metal products remained resilient. The sector is characterized by a high share of permanent contracts, accounting for 91% of total employment, with metal product manufacturing representing approximately 79% of jobs in the industry.

Steel production in Spain reached around 11.9 million tonnes in 2024.

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Labour market

By the end of 2024, employment in Spain had risen to 21.8 million, representing an increase of 460,000 jobs.

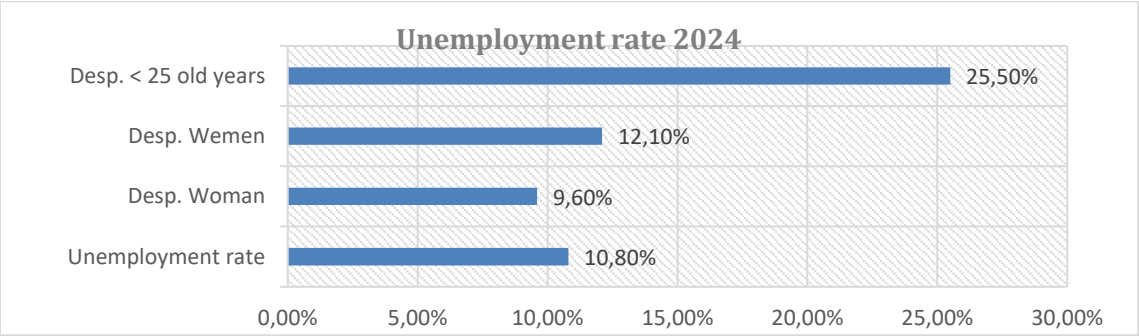


Figure 2. *Unemployment rate 2024*

Significant wage increases are anticipated. In Spain's metal sector, for example, a cumulative rise of 10% has been agreed for approximately 200,000 employees in certain regions through 2027. Strong demand for skilled labor and technical training persists, driven by both workforce shortages and higher absenteeism. Over the past year, unemployment fell by 265,300, bringing the total number of unemployed to 2,595,500. The unemployment rate improved to just above 10%, down from 11.76% in 2023, marking a notable milestone in the ongoing economic recovery. The service sector, which accounts for roughly 70% of the workforce, contributed most to this reduction, although industry and agriculture also recorded positive employment gains throughout the year.

In terms of job quality, progress is evident, particularly in achieving greater job stability. Female unemployment decreased by 80,000 compared to December 2023, while youth unemployment fell to 25%, a 12% improvement from the previous year. Although this represents significant progress, the target remains to reduce youth unemployment to a maximum of 20%.

Exports and imports

Spanish exports ended 2024 with year-on-year growth of 2.7%, reaching €384.465 billion and marking the second-strongest performance in the historical series. Imports totaled €424.741 billion, resulting in a trade deficit of €40.276 billion, down slightly by 0.7%. The export coverage ratio stood at 90.5%.

Key developments

- Energy balance: The energy trade deficit continued to narrow, declining by 8% compared with 2023, thereby supporting the improvement in the overall trade balance.
- Trade surplus with the EU: Spain recorded its fourteenth consecutive year of trade surplus with the European Union, amounting to €30.2854 billion. The largest surpluses were generated in trade with France, Portugal, and the United Kingdom.

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- Market diversification: Exports to non-EU markets represented 38.2% of total exports and increased by 2.4%. Particularly strong growth was observed in Oceania (15.1%), Africa (6.4%), and Asia (3.5%), with record export levels achieved in markets such as Morocco, Turkey, and Mexico.
- Leading surplus sectors: The largest trade surpluses were recorded in food, beverages, and tobacco—reaching an all-time annual high—followed by the automotive sector and non-chemical semi-manufactured goods.
- Expanding exporter base: The number of regular exporters rose by 4.8% in 2024, underscoring the strength and stability of Spain's export base.

In December 2024, Spanish exports increased by 2.7%, while performance among comparator countries was mixed. France posted growth of 5.5%, whereas German exports declined by 0.2%. Outside the EU, exports fell in the United States (-1.1%), while China and Japan recorded notable increases.

Spanish ports handled close to 58 million tonnes of cargo in 2024, a year-on-year increase of 2.6% and a record level for container traffic. Germany, China, and France consolidated their positions as Spain's main trading partners. The United States also played a significant role, with imports exceeding €6 billion in specific sectors.

Forecasts, summary

- Economic growth projections: Spain is expected to maintain positive GDP growth between 2025 and 2027, though at a gradually moderating pace. Growth is projected at around 2.9% in 2025, driven by strong domestic demand, slowing to 2.2%–2.4% in 2026, and further moderating to approximately 1.9%–2.0% in 2027. These figures exceed earlier forecasts, reflecting the resilience of the Spanish economy.
    - 2025: GDP is expected to expand by 2.9%, a revision upwards by the Bank of Spain and institutions such as the OECD, supported by robust private consumption and a strong labor market.
    - 2026: Growth is projected to slow to 2.2%–2.4%, maintaining solid domestic demand but at a more moderate pace than 2025.
    - 2027: Expansion is expected to moderate further to around 1.9%–2.0%.
- Drivers of growth: Private consumption and investment will continue to underpin economic activity. Consumption is projected to grow by 2.4% in 2025, slightly slower than in 2024, while investment in machinery and capital goods is expected to accelerate, with some sectors exceeding 3% growth.
- Labor market outlook: Employment creation is anticipated, with the unemployment rate declining to 9.2% by the end of the period.

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- External factors: Geopolitical tensions and trade-distorting tariffs may have a moderately negative impact on growth, though domestic demand remains the primary engine of expansion.

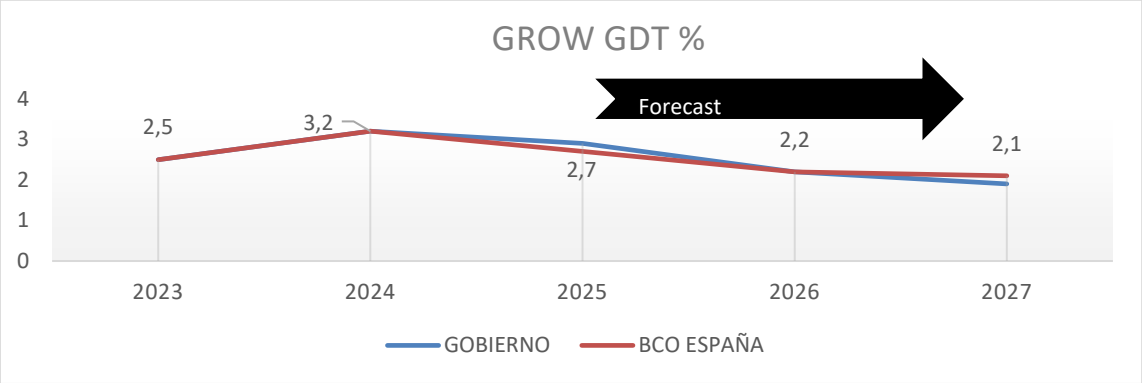


Figure 3. *GDP growth forecast for the next years 2025 to 2027*

Fuente: INE

Foundry Industry

2024 proved to be a pivotal year for Spain's foundry sector, shifting from a period of steady expansion to a notable downturn. Following three straight years of moderate increases (2021–2023), the industry faced a clear setback, driven by domestic challenges as well as difficult external conditions—particularly across Europe and in key markets like Germany.

Production volumes dropped by 2.07% in 2024 after those prior years of gains. Plant capacity utilization declined from 78% to 71%, while average order delivery times lengthened from 71 to 80 days. On the employment front, projections pointed to a reduction of 1.09% by December 2024, followed by a further expected decrease of 0.91% through June 2025.

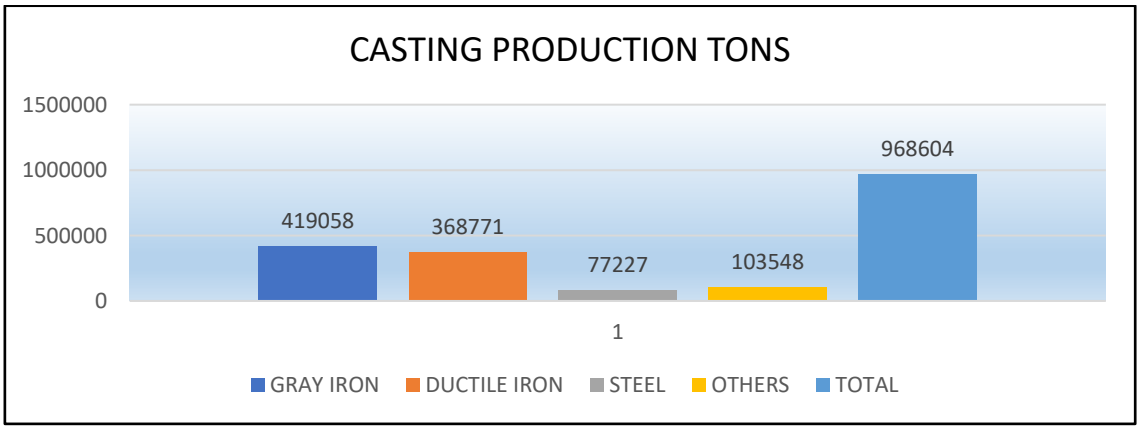


Figure 4*. Spanish casting production in tons 2024*

In 2024, the market showed stronger results during the first six months, but then underwent a marked downturn in the latter half of the year. The automotive industry, representing over 60% of sales, saw an anticipated 9% drop in iron foundry output. The wind energy sector also faced

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substantial reductions. Only a handful of segments, such as stainless steel, managed to hold relatively steady. This broad decline led to lower capacity utilization and thinner order backlogs, resulting in 2024 finishing below the levels recorded in 2023. Research and development efforts stayed consistent throughout 2024, with expectations of heightened engagement in innovation initiatives and projects during 2025.

The 2024 assessment of the foundry industry reveals historically low order intake and fragile business sentiment, as the prevailing view frames the situation as a structural rather than a cyclical downturn. Nearly every foundry identifies insufficient orders as the primary barrier to any rebound.

Mirroring the 2024 slowdown across the key customer sectors driving our foundries' value chain—most notably automotive—overall production volumes fell by 2.07%. Steel showed modest expansion of 0.27%, while iron declined by 2.40% and non-ferrous metals dropped by 1.23%.

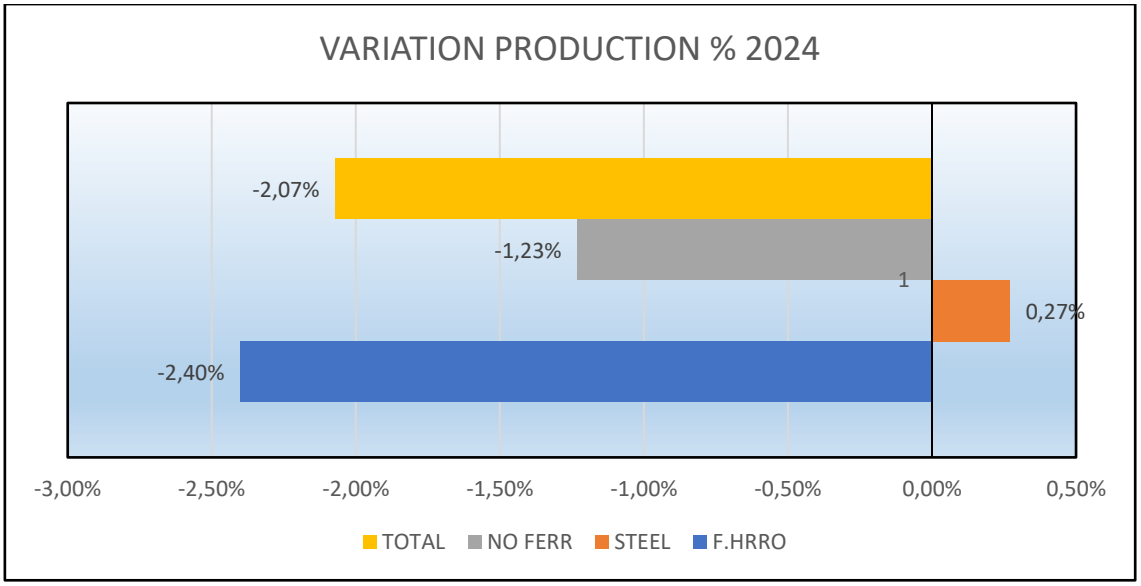


Figure 5. *Variation (%) by production types 2024/2023*

Distribution by % and types of casting

In 2024, Spain's total metalcasting output was distributed as follows: iron accounted for 81.3%, steel for 7.9%, and non-ferrous metals for 10.7%. Breaking down the iron production further, ductile iron represented 38%, grey iron 43%, steel 7%, and non-ferrous metals 10%. The actual volumes smelted reached 787,000 tonnes of iron, 77,000 tonnes of steel, and 103,000 tonnes of non-ferrous metals. Overall, this resulted in a 2.07% decline in Spain's total smelting production compared to 2023.

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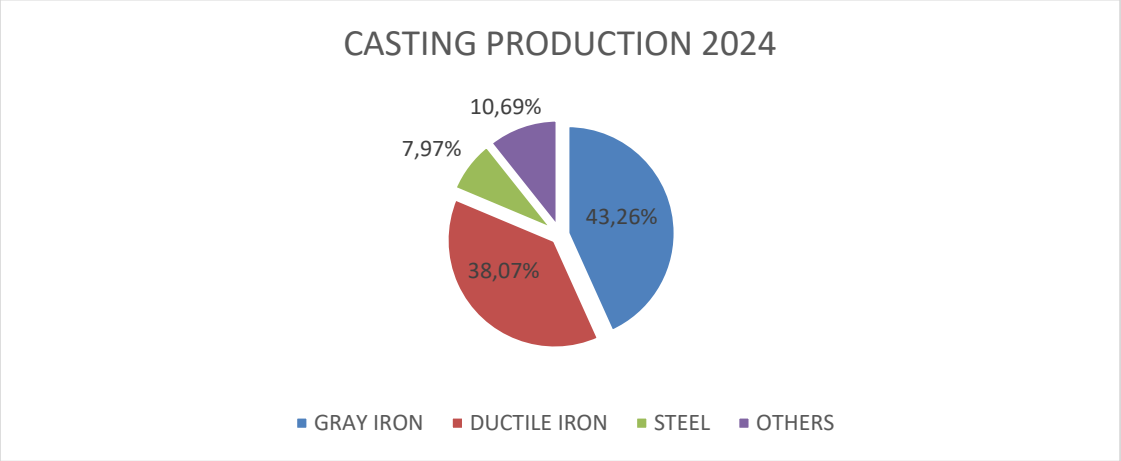


Figure 6. *Spanish casting production (%) in 2024*

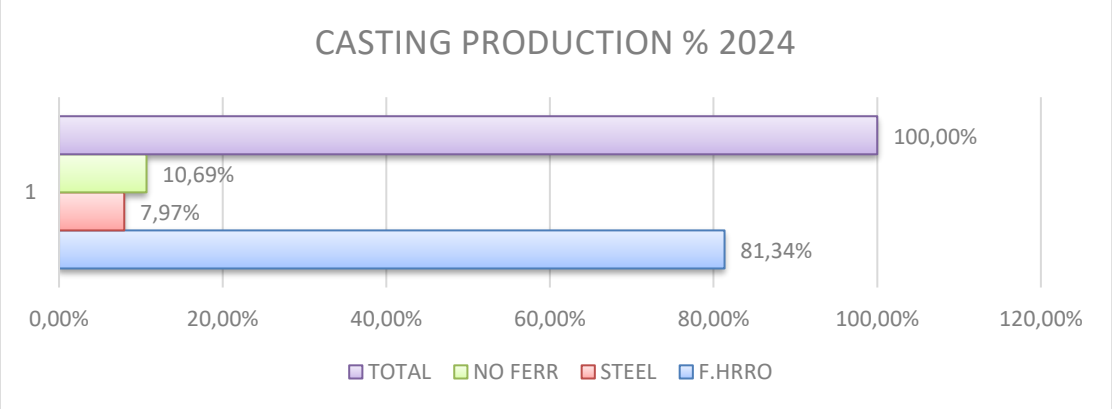


Figure 7. *Casting production Ferrous-NonFerrous 2024*

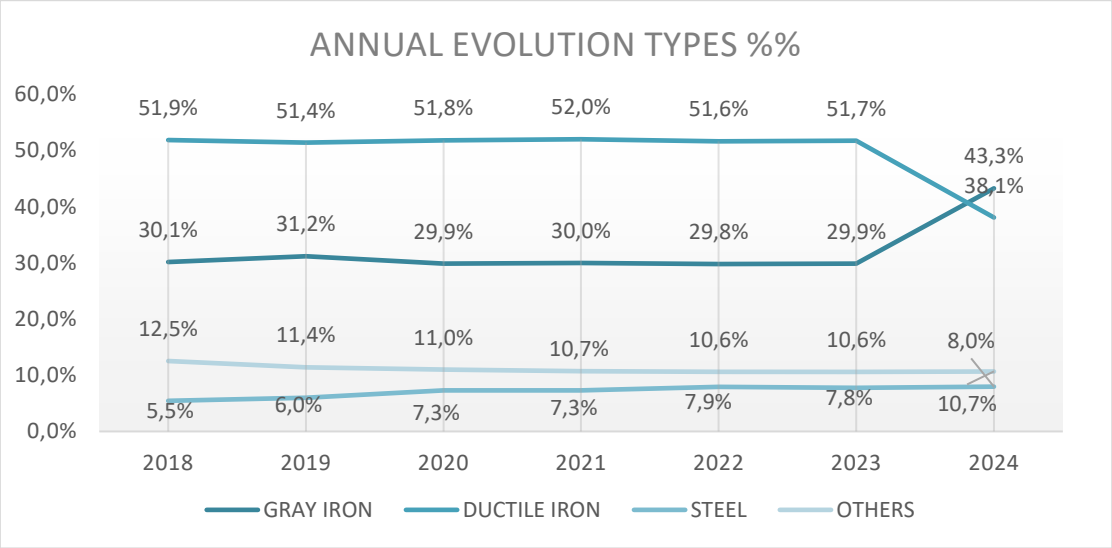


Figure 8. *Spanish annual casting production (%) to 2024*

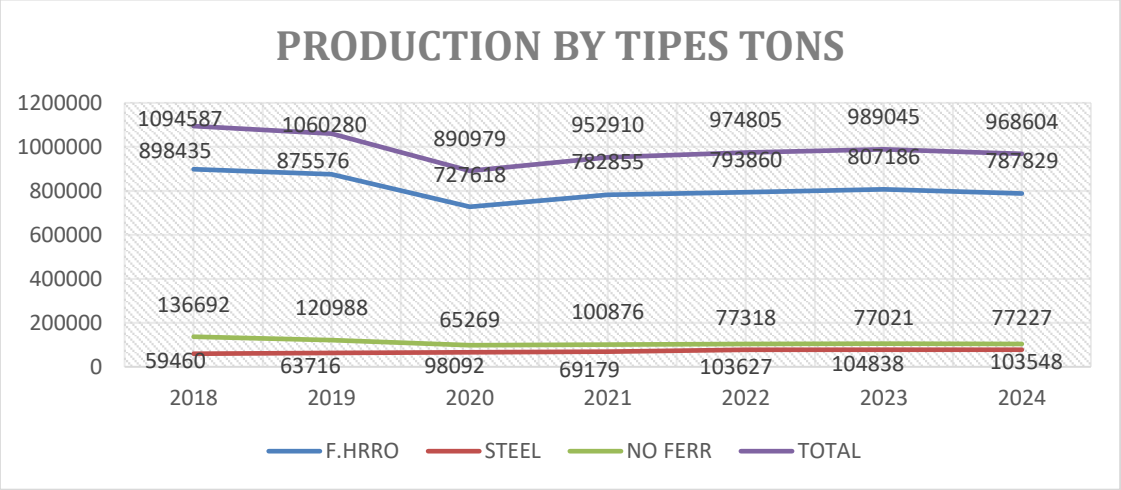


Figure 9. *Production by types until 2024*

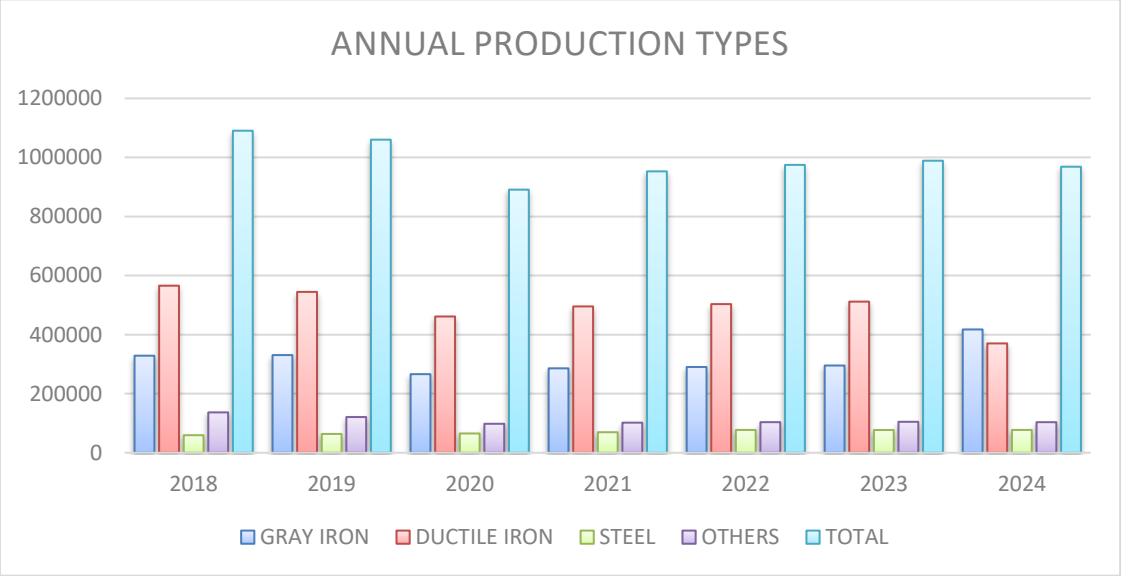


Figure 10*. Casting production (%) types 2024*

Main production sectors % 2024

In 2024, the eight primary sectors driving demand for foundry products represented over 90% of overall production. Among them, the automotive industry was particularly dominant, contributing more than 60% of total output, even though it experienced a modest temporary decline of 2%.

Valves showed strong performance, whereas die-cutting suffered a significant drop, falling sharply by 2%.

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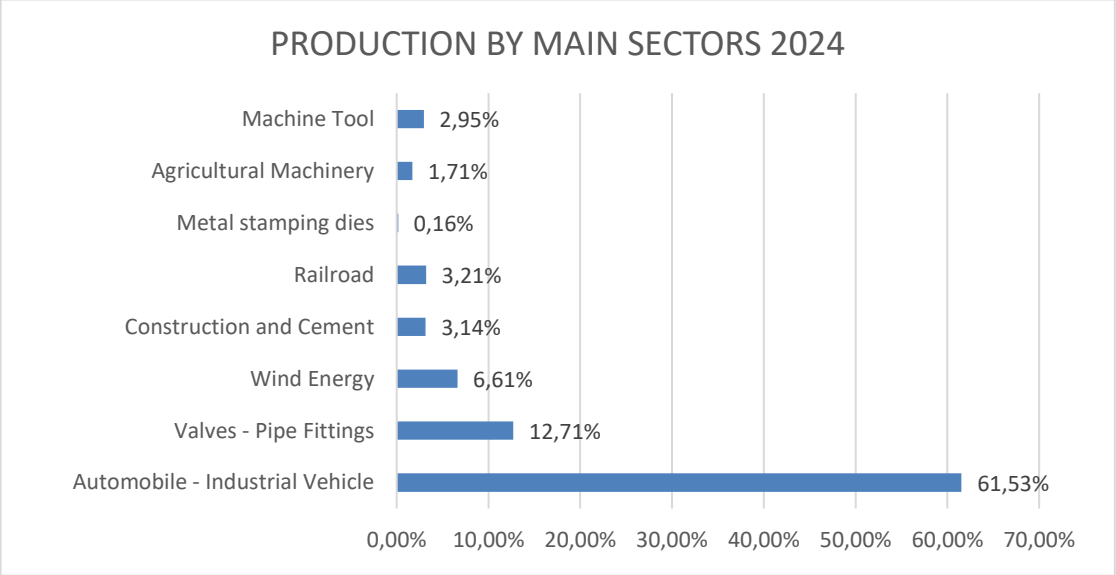


Figure 11. *Production casting main sectors % 2024*

Export volumes

Total exports in 2024 amounted to 668,152 tonnes. As illustrated in the graph, this marked a decrease of almost 18,500 tonnes compared to the previous year. The forecast for 2025 points to a subdued start during the early months, with a gradual recovery anticipated toward the latter part of the year.

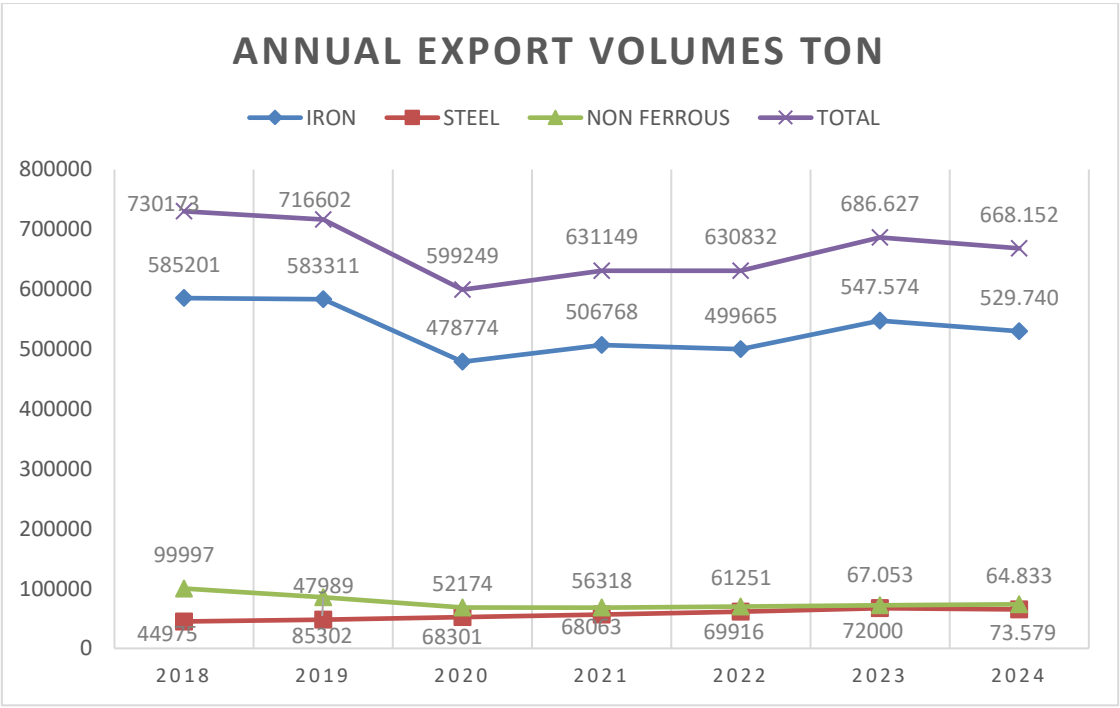


Figure 12. *Export volume figures, 2018 to 2024*

The sector continues to rely heavily on exports, primarily directed toward the EU and above all to Germany. Economic weakness across Europe, most notably in Germany, resulted in a drop in export volumes, with the downturn becoming especially sharp during the second half of the year. For the second year in a row, the German economy experienced contraction. Industrial output currently stands around 13% below its 2018 high point. Among the main drivers of this weakness are elevated energy prices, burdensome regulatory requirements, and ongoing political instability. These issues have translated into reduced investment activity, weaker domestic consumption, and fewer orders in critical industries such as automotive manufacturing and mechanical engineering.

Concerns and challenges

Key challenges facing the sector include decarbonization, the fight against climate change, and the shift toward a new energy model; the move to electric, self-driving, and connected vehicles, together with evolving mobility patterns; and digital transformation, which plays a central role in creating value and driving efficiencies across the entire value chain.

In the Spanish foundry sector, two critical priorities stand out for improving competitiveness: advancing the digitalization and intelligent management of foundry operations, and the real-time detection and control of casting defects. For these reasons, the industry is actively pursuing the implementation of predictive control solutions in foundry plants and the adoption of Industry 4.0 technologies.

In addition, there are several challenges that the Spanish Foundry Sector identifies as priorities for the coming years:

- Access to advanced technical knowledge at an international level;
- Process automation;
- Attracting new qualified professionals to the industry;
- New skills required in relation to 4.0 technologies;
- Additive manufacturing;
- Advanced materials (optimisation of mechanical properties, weight reduction, etc.);
- Die casting and high-pressure casting of light metals, light and resistant structures;
- Best practices for more efficient energy use;
- Reduction of environmental impact (emissions, silica and quartz);
- Advanced solutions for used sand recovery;
- Increased proximity to the design of cast components.

Some of the new technologies and areas highlighted by the Spanish foundry industry as having the greatest impact on the most relevant challenges for its activity are:

- Artificial vision;
- Automation and collaborative robots;
- Sensors: Automatic defect detection;
- Expert management systems;
- Artificial intelligence (AI).

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FOUNDRY PRODUCTION IN SWEDEN

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General overview

Economic situation in Sweden

The year 2024 meant a shift from high inflation and energy shocks to a situation with a lower rate of price increases but weak economic activity. After the inflation peak in 2022–2023, when CPI inflation was around 8–9%, average inflation in 2024 fell to around 2.8 per cent, close to but still slightly above the Swedish National Bank's target.

At the same time, real economic development was weak. Swedish GDP is estimated to have grown by around 0.6 per cent in 2024, implying a cautious recovery after stagnation and technical recession in 2023. Household consumption remained subdued, impacted by earlier price increases, high indebtedness and higher interest rates, while the export industry fared relatively better.

The labour market weakened in 2024. The average unemployment rate is estimated at just over 8.5 percent, compared with about 7.6 percent in 2023, and is expected to be around 8 percent in 2025 as well. Young people and foreign-born people are overrepresented among the unemployed.

In 2025, indicators indicate that economic activity will gradually improve. The government's and government agencies' forecasts indicate GDP growth of around 1–2 per cent in 2025 and up to just under 3 per cent in 2026, from a low level in 2024. At the same time, there is considerable uncertainty, linked to global trade, geopolitics and developments in the euro area.

Business-cycle indicators and manufacturing

For manufacturing, the development in the purchasing managers' index (PMI) is central. The purchasing managers' index for the Swedish manufacturing industry rose in the second half of 2024 and has been above the 50-mark in 2025, signalling recovery and expansion phase. In January 2025, the index stood at 52.9, the sixth consecutive month above 50, and in mid-2025, levels were noted around 54-55, above the historical average. All in all, this means:

The cost situation is stabilised through lower inflation and more normalised energy and commodity prices.

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Demand is still uncertain, but signals of improved order intake in industry are clearer than in 2023.

The interest rate level is expected to fall gradually in 2025, which will improve the willingness to invest in capital-intensive industries such as the foundry industry.

Structure of the Swedish foundry industry

The Swedish foundry industry continues to be an important part of the country's manufacturing sector and the value chains around vehicles, engineering and energy.

Key facts for 2024–2025 are:

- The Swedish foundry industry includes around 90 foundries in Sweden.
- Production volume: Approximately 300,000 tonnes per year, of which approximately 240,000 tonnes are iron and steel and approximately 60,000 tonnes of non-ferrous metals, mainly aluminium.
- Number of employees: approx. 6,000 people.
- Company structure: the majority are small and medium-sized enterprises, often family-owned or part of smaller industrial groups.
- Export and value creation: The SME foundries contribute to an export value of approximately SEK 7.2 billion.
- Customer segments: Automotive industry ~70% of the tonnage, the remainder in wind power, pumps, general engineering industry as well as medical technology, furniture, etc.

In recent years, the industry has undergone a clear consolidation. Several foundries are now part of larger company groups, which provides a better capital base, the opportunity for larger investments and joint investments in technology and skills development. In recent years, the industry has been characterized by new, significant investments; Scania has taken into use a completely new iron foundry, AB Volvo has built a new production line adjacent to its existing foundry and Volvo Cars has built a new foundry for die-casting large structural parts for passenger cars.

Current situation of the Swedish foundry industry (2024–2025)

Demand and production

For the Swedish foundry industry, 2024 has been a year characterized by continued uncertainty, but with large differences between customer segments. The automotive industry – the dominant customer – has generally shown stable volume but has been impacted by weaker demand for heavy vehicles and passenger cars in some markets. The energy sector (e.g. wind power, hydropower, energy infrastructure) and parts of the engineering industry have

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continued to have a need for cast components, which has partly counteracted the decline in other segments. Other industrial customers, such as telecoms, medical technology and furniture, have had more mixed development, often linked to investment cycles and export markets.

Production volumes have not reached previous peak levels but have remained at an overall acceptable level for the industry. Several foundries testify to an uneven order intake, with short notice and thus quick shifts between overtime needs and short-term planning.

Investments, restructuring and ownership changes

Despite the economic uncertainty, the foundries have shown significant willingness to invest in 2024–2025, both to increase productivity, improve the work environment and strengthen their sustainability profile.

Examples include modernization of smelting units and furnaces for higher energy efficiency, investments in automated forming, core manufacturing and post-processing, installation of advanced systems for process control, traceability and quality monitoring.

In 2025, the restructuring has continued: two major iron foundries have been closed due to fierce international competition and insufficient profitability. One specialised in large drying cylinders for the paper industry, the other on large components for wind turbines.

The consolidation of the foundry industry means a loss of capacity in certain niches, such as large iron castings, but at the same time an opportunity for increasing volumes and investments in other foundry companies.

Research, development and industry-wide initiatives

In 2024, two extensive industry studies were conducted.

A study on threats and opportunities for the die casters considering the transition from internal combustion engines (ICE) to electric vehicles (EVs). The study highlights changing requirements for the geometry of the components and new alloys, the demand for larger structural details and generally stricter customer demands for lower climate footprint from materials, processes and products.

The second study investigated the conditions for the establishment of a new Center for Sustainable Casting (CSC). This study was conducted together with end-users, academia and suppliers of raw materials and technical equipment.

The results from these studies are now being used as a basis for strategic decisions on investments in new foundry technologies, digitalisation and climate-smart production, both at company level and in joint initiatives between industry, research institutes and universities.

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Challenges and opportunities for Swedish foundries

The Swedish foundry industry faces several structural challenges, but also great opportunities in the medium term.

Key challenges

Uncertain volumes and fluctuating demand: short contracts, changing customer demands, and globally volatile markets make long-term capacity planning and investments difficult.

Energy availability and power shortages: The availability of electricity is basically good, but regional limitations in power uncertainty about grid expansion can hamper expansion plans in some regions.

Costs and raw material availability: High costs for energy, alloying elements and scrap raw materials are squeezing margins. High price volatility in metal markets increases risks.

Skills supply: Difficulties in recruiting technically trained personnel, both operators and engineers, are a strategic bottleneck. The industry competes with other industrial sectors for the same skill base and has difficulty attracting younger employees, especially to foundries located far from major urban areas.

Climate and environmental requirements: Stricter national and European rules on companies' climate impact, energy use and requirements for traceability of constituent materials, mean increased documentation and administration, e.g. around digital product passports (DPP).

Strategic opportunities

Green electricity mixes and climate profile: Sweden's fossil-free electricity production (hydropower, nuclear and wind power) provides a favourable platform for castings with a low climate footprint, something that is in demand by international customers.

Technology transition, automation and digitalization: Ongoing investments in automation, sensors, data analytics and digital twins create the conditions for increased productivity and quality.

Regionalization and shorter supply chains: Several OEM customers are looking at near-shoring to reduce risk in global supply chains. Swedish foundries with high delivery reliability and good logistics can benefit from this trend.

Circular material flows: The foundry industry is inherently a major user of recycled materials. By further strengthening circular flows and documenting the climate benefits, the industry can position itself as a key player in the climate transition.

Outlook for 2025–2026

The macroeconomic picture points to a cautious but gradual recovery in the Swedish economy during 2025–2026, with:

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- low but positive GDP growth from the weak level of 2024;
- inflation close to the inflation target;
- some improvement in household purchasing power as real incomes stabilise;
- continued elevated unemployment, but with potential for improvement in line with higher industrial production.

For the foundry industry, this means:

Volumes are expected to be at a stable to slightly rising level in 2025, but order intake from the automotive industry will continue to be decisive.

Structural change continues, with likely continued consolidation, selective closures of less profitable units and investments in larger, more automated and energy-efficient plants.

Demands for climate performance, traceability and digitalisation are driving investments in measurement technology, data management and modern production systems. This creates business opportunities for foundries that can combine high efficiency with low climate impact at an early stage.

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FOUNDRY PRODUCTION IN SWITZERLAND

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The Swiss Foundry Industry Encounters Economic Setbacks in Its Major Export Markets

The year 2024 proved particularly challenging for the Swiss foundry industry. Altogether, the volatile demand situation in the 46 member-firms of the Swiss Foundry Association (GVS) led to a severe downturn. Production output, as measured in tons delivered, showed an overall decline of 13.6% from the year before. In 2025 as well, the industry association foresees scant improvement in incoming orders and production volume since the prior year, as a result of continuing low demand from the central user markets.

In the course of 2024, economic conditions deteriorated severely and the unpredictability of the market forced Swiss foundries to adopt even briefer development and production cycles than before. A number of new, sustainable “made in Switzerland” casting solutions were adopted. The challenging market conditions, however, adversely impacted the opportunity for strong earnings.

Problems with Germany

In the general field of machine construction, numerous clients of the Swiss foundries encountered an extreme downturn in demand since the middle of last year. Scarcely any new business could be contracted as a result. This was due especially to the economic weakness of Switzerland’s greatest export market, Germany. Owing to the limited sales of electric automobiles, orders for Swiss light metal foundries from manufacturers in Germany and all of Europe decreased once again, remaining far below estimates. Business activity in this automotive field, which is so important for the Swiss foundry industry, also suffered from the short-term savings programs and unreliable order retrievals of German producers.

On the other hand, the demand climate from the rail vehicle industry remained stable at a satisfactory level, with renewed growth rates. In the construction sector, the lengthy regulatory processes and the prevailing shortages of skilled workers had an adverse economic impact. Fewer construction and renovation projects were completed in 2024 than originally estimated. For all construction materials across the board, production volume declined by 13.6% to a total delivery tonnage of 34,685, compared with 41,006 tons in the preceding year. Production in light-metal and nonferrous casting decreased by 14% in 2024, while iron casting reported a reduction of 13.3%.

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Outlook for 2025 Based on Target Markets

According to a survey among GVS executives, initial incoming orders for the development of new casting parts encouraged optimism among leading companies in the sector with respect to an economic recovery in 2025, or at least promising indicators. Slight improvement was noted as early as late in 2024, causing further rises in utilization levels for the first quarter of 2025. Thanks to long-term project schedules, the rail vehicle market remained a reliable stabilizing factor.

Geopolitical developments such as an end to the Russia-Ukraine war and the conflict in the Near East could be expected to increase the demand for casting parts for infrastructure reconstruction. In the current year we do not yet foresee a clear improvement for the Swiss foundry industry, since that would depend primarily on a recovery in the main export markets, Germany and all of Europe.

Our strengths and weaknesses are determined by our target markets. Just as we, as suppliers, profited from the surge in the past, so do we suffer now from the downturn in the automotive industry. Rising exports of Chinese electric vehicles to Europe, and possible disadvantageous resolutions in the USA, further lower our expectations. Withdrawal, however, is not considered an option. We are convinced that technological trends such as E-mobility and lightweight construction will be decisive factors in our industry. Increased adoption of light-metal casting parts throughout the transport sector and also in the machine construction industry will lead to increased demand in the medium to long term. In Germany and throughout Europe, as well as in North America, it can be expected that the process of recovery will be slower than in Asia.

Despite the significantly disproportionate competitive conditions and the intense price war with European and Asian suppliers, the chief market factor, we believe, is stability: an advantage that we in Switzerland can reliably guarantee in every respect—political, economic and qualitative.

Disadvantages in European Competition

Swiss foundries face an uncertain variable in the new CO_2 law, which has potential consequences for industry that are as yet difficult to foresee. In addition, the numerous reporting obligations, including CO_2 reporting and various compliance certificates, impose a considerable administrative burden on companies that will undoubtedly require staffing increases. Although energy costs have clearly diminished, Switzerland is still considered to labor under a disadvantage in European competition, especially owing to higher-than-average network costs and taxes.

Along with these high costs, the specialized staffing shortage and strong Swiss franc pose the greatest challenges for the Swiss foundry industry in the near future. Persistent economic stagnation in the Euro zone can be expected to exert further pressure on the value of the weak Euro, making exports considerably more expensive and undermining the competitive strength of the Swiss foundry industry..

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FOUNDRY PRODUCTION IN TURKEY

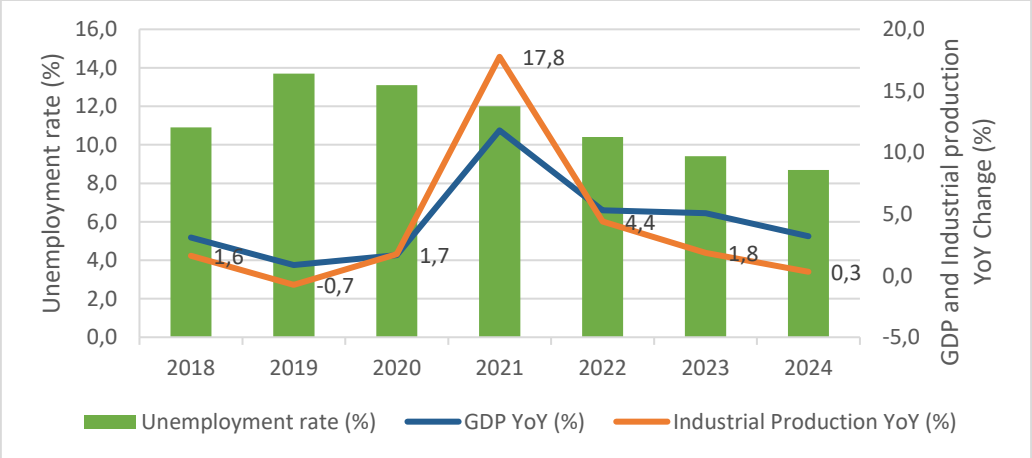
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TÜRKİYE DÖKÜM SANAYİCİLERİ DERNEĞİ
THE TURKISH FOUNDRY ASSOCIATION

Macroeconomic Developments

In 2024, the Turkish economy grew by 3.2%. In the first quarter of the year, the economy grew by 5.7%, mainly driven by strong domestic demand. However, throughout the year, the contribution of domestic demand (excluding inventories) to growth declined to 3.9% from 11.8% in 2023, while the contribution of net exports rose to 1.1% from -3.1%. Quarterly growth followed a volatile course during the year. Growth was 2.4% in the first quarter, 0.1% in the second quarter, -0.2% in the third quarter (slight recession) and 1.7% in the fourth quarter. Aggregate demand remained stronger than supply throughout the year, but this imbalance tended to narrow towards the end of the year.

Figure 1. GDP and Industrial Production Growth and Unemployment Rate



Source: Turkish Statistical Institute

The services sector (excluding taxes) was the largest and most consistent contributor to economic growth over the year. Over 2024, the contribution of services to growth was 1.3 percentage points. The construction sector also recorded significant growth in 2024 and made a positive contribution to economic activity. This contribution, which was more pronounced especially in the first half of the year, was realized as 0.7% points throughout the year.

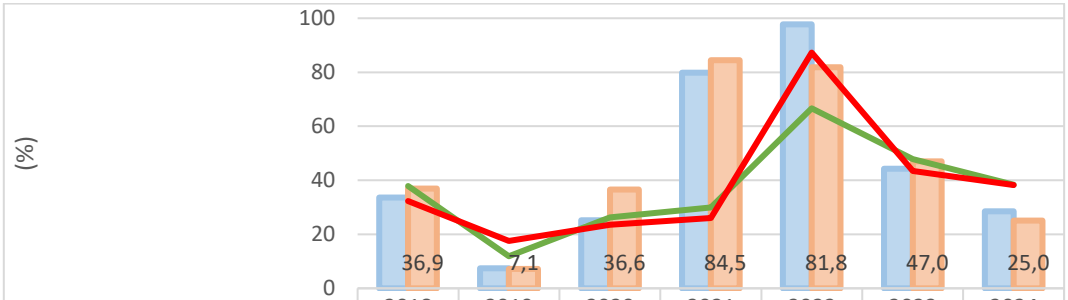
The overall contribution of the industrial sector to growth remained low (0.3%) throughout the year. In the first quarter, the industrial sector made a positive contribution of 1 percentage point to annual growth. However, the industrial sector pulled growth down in the second quarter (-0.4 pp). In the third quarter, the industrial sector contracted on a quarterly basis (-0.8%) and by 2.2% on an annualized basis, pulling GDP growth down by 0.4 percentage points.

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High domestic demand was an important factor supporting industrial production in the first quarter of the year. Moreover, the contribution of net exports to annual growth was positive for the first time in six quarters. However, the slowdown in domestic and external demand in the following quarters had a negative impact on industrial production. Tight financial conditions, restrictive monetary policy and credit growth limits put downward pressure on industrial production, especially in the second and third quarters. Exports declined significantly in the fourth quarter (-3.3%) and the contribution of net exports to growth turned negative.

The decline in leading indicators such as the manufacturing PMI and the capacity utilization rate signalled the slowdown and contraction in the industrial sector earlier in the year. Weak external demand and rising protectionism had a negative impact on industrial exports, particularly in the second and fourth quarters of the year, limiting the sector's growth. The real appreciation of the Turkish lira was also an important factor that hampered exports by reducing the international competitiveness of Turkish industrial products. The slowdown and contraction in machinery and equipment investments also affected the overall performance of the industrial sector.

Figure 2. Producer Price Indices vs Currency Rates



	2018	2019	2020	2021	2022	2023	2024
Dom. PPI YoY (%)	33,6	7,4	25,2	79,9	97,7	44,2	28,5
Casting Ind. Dom. PPI YoY (%)	36,9	7,1	36,6	84,5	81,8	47,0	25,0
TL/€ YoY Change (%)	37,9	11,9	26,2	29,9	66,6	47,8	38,3
TL/$ YoY Change (%)	32,4	17,5	23,5	26,0	87,3	43,4	38,2

Source: Turkish Statistical Institute

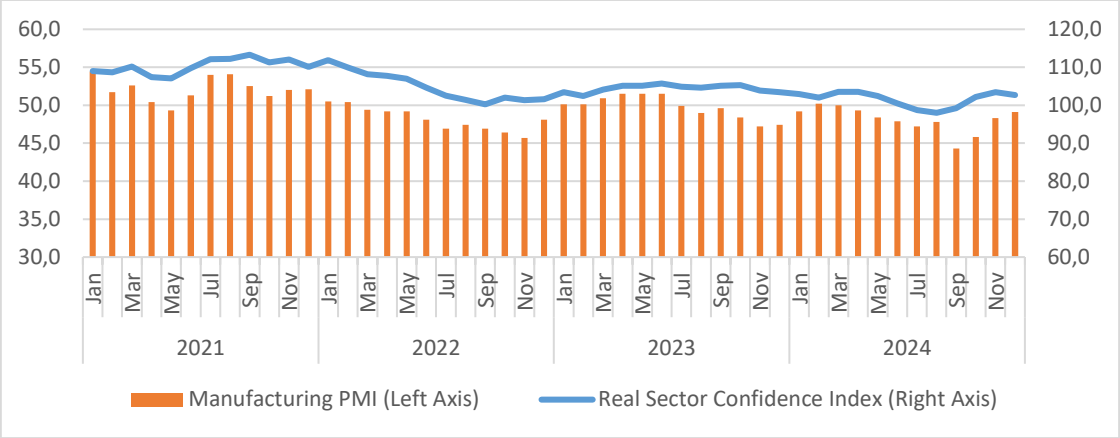
In the fourth quarter, industrial sector grew by 2.6% due to the recovery in domestic demand and some easing in financial conditions. On an annual basis, the industrial sector made a positive contribution of 0.3 pp to growth in 4Q24. However, exports declined significantly in the same quarter (-3.3%) and the contribution of net exports to growth turned negative (-2.3%) due to weak external demand and ongoing real appreciation.

Looking ahead to the first quarter of 2025, there are some mixed signals regarding the industrial sector. Leading activity indicators point to deteriorating conditions in the industrial sector in some indicators such as capacity utilization and PMI. In February, the manufacturing capacity utilization rate remained below its long-term average and fell below the 4Q24 level. Manufacturing PMI also remained in contractionary territory in January 2025.

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On the other hand, the rise in imports of intermediate goods (excluding gold) points to a recovery on the supply side, although this recovery appears to have lost some momentum. Overall, downside risks to global growth (rising protectionism) are likely to weigh on industrial exports throughout the year.

Figure 3. Manufacturing PMI and Confidence Index Evolution



Source: Turkish Statistical Institute, Istanbul Chamber of Industry Turkey Manufacturing PMI

The Situation in The Major Casting Customer Industries

According to 2024 data, Turkish total motor vehicle production decreased by 7% to one million, three hundred sixty-five thousand, two hundred ninety-six units. Passenger car production, which decreased by 5%, reached nine hundred four thousand, five hundred thirteen. Together with tractor production, total production decreased to one million, four hundred ten thousand, nine hundred thirty-three units. In the commercial vehicle group, production in 2024 decreased by 11%, while it increased by 24% and 6% in the minibus and midibus groups respectively.

Compared to 2023, the heavy commercial vehicle market decreased by 8% and the light commercial vehicle market decreased by 3%. In the 12-month period of 2024, the total market increased by 0,1% compared to the same period of 2023 and finalized at one million, two hundred eighty-five thousand, six hundred thirty-two units. During this period, the passenger car market increased by 1% and reached nine hundred eighty thousand, three hundred forty-one units.

In 2024, total automotive exports increased by 6% compared to the same period of 2023 and reached thirty-seven point two billion dollars. Exports of the supply industry increased by 5% in 2024 compared to the previous year and amounted to fourteen billion eight hundred seventy-nine million. The share of the supply industry in overall automotive exports was 40%.

According to the general trade system, exports increased by 2.4% in January-December 2024 compared to the same period of the previous year and amounted to two hundred and sixty-one billion eight hundred and fifty-five million dollars, while imports decreased by 5.0% to three hundred and forty-four billion twenty million dollars. In January-December period, foreign trade deficit decreased by 22.7% from one hundred and six billion three hundred and thirty-nine

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million dollars to eighty-two billion one hundred and sixty-five million dollars. While the ratio of exports to imports was 70.6% in the January-December period of 2023, it increased to 76.1% in the same period of 2024.

In January-December period, according to economic activities, the share of manufacturing industry in exports was 94.1%, the share of agriculture, forestry and fishing sector was 3.6%, and the share of mining and quarrying sector was 1.7%.

In the January-December period, Germany ranked first in exports. Exports to Germany amounted to twenty billion four hundred and thirty-four million dollars, followed by the USA with sixteen billion three hundred and forty-nine million dollars, the United Kingdom with fifteen billion two hundred and eighty-nine million dollars, Iraq with thirteen billion thirty-four million dollars and Italy with twelve billion nine hundred and thirty-three million dollars. Exports to the first 5 countries accounted for 29.8% of total exports.

According to the consolidated data of the machinery manufacturing industry, Turkey's total machinery exports, including free zones, amounted to twenty-eight point three billion dollars in 2024, an increase of 0.3 percent compared to the previous year. The most exported sub-branches were domestic and industrial cooling machines and internal combustion engines and parts, followed by construction and mining machinery and washing and drying machines. The sub-branch with the highest proportional increase in exports was turbines, turbojets and hydraulic cylinders, while the highest decrease was observed in electric motors and generators. Exports to Germany, the largest export market, declined by 5.4 percent to three billion dollars, while the US market, where machinery exports reached one point eight billion dollars with an increase of 5.6 percent, closed the gap.

Based on the construction permits given by the municipalities in 2024, the number of buildings and dwelling units decreased by 12.2% and 11.9%, respectively. The floor area of buildings also decreased by 12.4%.

The decline in the annual production and export of the cement industry was 3.8% and 20.86%, respectively. On the contrary, domestic sales increased by 0.6%.

In 2024, exports increased by 27.6% in quantity to thirteen point four million tons. In terms of value, exports increased by 17.7% to nine point seven billion dollars.

As of the end of December 2024, Turkey's installed capacity reached one hundred fifteen thousand three hundred and fifty-three MW. In 2024, there was a total increase of four thousand three hundred and twenty-seven MW in installed capacity. Turkey's total installed capacity increased by 3.9% in 2024 compared to the previous year.

The share of renewable energy (including hydroelectricity) in Turkey's installed capacity was 59.1%. In 2024, the installed capacity of solar power plants increased by 24.5% (about four thousand MW) compared to the previous year, reaching nineteen thousand five hundred and ninety MW.

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Production in the white goods sector recorded a decrease of 1.6% in 2024; with a decrease of 3.3% in the export volume.

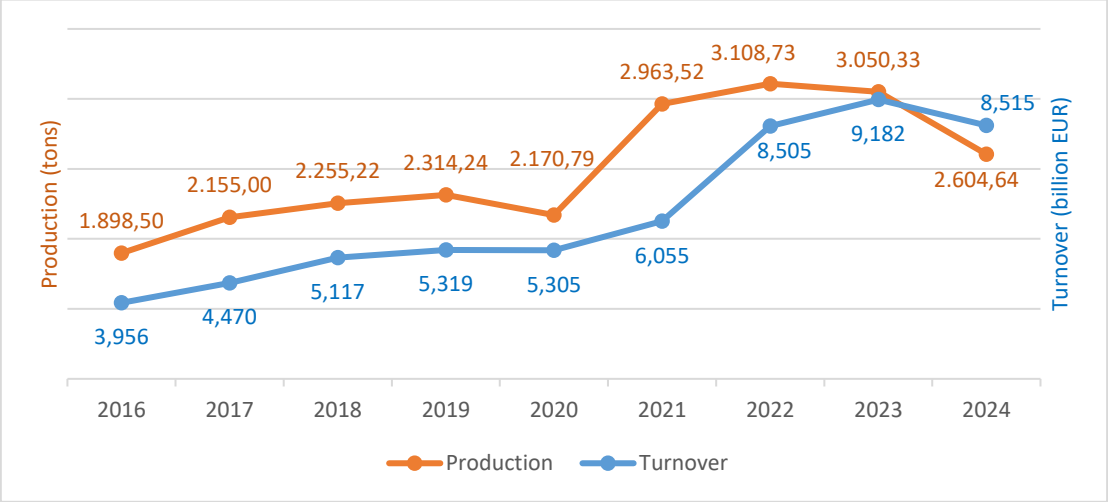
Developments In the Foundry Industry

Industry Overview

2024 was a year of challenges for the Turkish metal casting industry, which experienced fluctuations in a wide range of areas from production to employment and cost pressures. In line with the announced general manufacturing statistics, the trend in the sector was characterized by a contraction in production and a decline in employment, with PMI values hovering below the 50.0 threshold throughout the year.

Production increased slightly in the first quarter of the year, and this recovery was short-termed. Especially in the second half of the year, production volume contracted consecutively and the main reason for this decline was the slowdown in new orders in both domestic and foreign markets. Weak demand created uncertainty in order-taking and production planning, forcing many enterprises to act cautiously.

Figure 4. Annual Metal Casting Production Volume and Turnover



Source: TUDOKSAD – Turkish Foundry Association

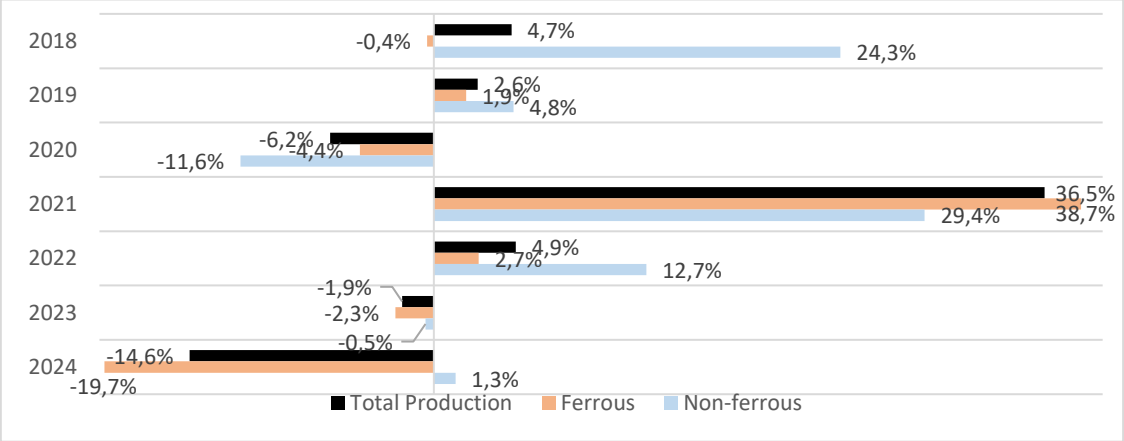
2024 was also a challenging year in terms of employment. While employment volume was generally flat or declining in the first half of the year, firms were cautious in hiring new staff due to difficulties in finding qualified personnel and decreasing workload, leading to job losses by the end of the year with decreasing production capacities.

Cost inflation was one of the main factors keeping the sector under pressure throughout the year. In particular, the minimum wage increase in the first half of the year and exchange rate pressure throughout the year pushed up costs and led to a decline in profitability.

The Turkish metal casting industry experienced a decrease of 14.6% in 2024, which brought the total production volume to two point six million tons.

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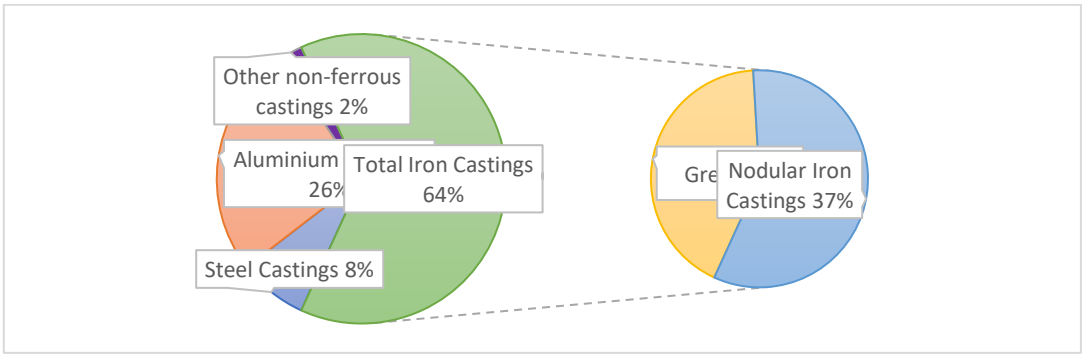
Figure 5. YoY Production Growth



Source: TUDOKSAD – Turkish Foundry Association

Taking all factors into consideration, 2024 was a year of serious struggles for the metal casting sector in terms of production capacity utilization, employment continuity and cost management. The stagnation in demand, especially in the second half of the year, led to a revision of production plans and a decline in capacity utilization rates. Although the partial recovery observed in November-December creates a cautious optimism for 2025, a permanent revival on the demand front will be decisive for a meaningful improvement in employment and production indicators.

Figure 6. Casting Production Distribution (2023)



Source: TUDOKSAD – Turkish Foundry Association

The contraction in the production volume was mainly driven by the decrease in ferrous castings production, which declined by 19.7% to one point eight hundred fifty-nine million tons in 2024. Gray iron casting production fell by 19.3% to seven hundred thousand tons, while nodular iron casting production decreased by 19.6% to nine hundred fifty-seven thousand tons.

Together with the effect of cost fluctuations, the total production value decreased by 7.3% year-on-year to 8.5 billion EUR. The share of export to total production value finalized as 69%.

Raw Materials

Relatively lower levels of volatility were observed in 2024 compared to 2023 for almost all metallic primary and secondary raw material prices. However, without exception, they all maintained their strong upward trend. The average year-on-year price increases for scrap and various types of pig iron ranged from 32% to 22% in 2024 (in local currency), which were 506% to 475% higher than in 2020. The share of raw material costs in the cost of castings sold is around 44% in 2024.

Energy

Both electricity and natural gas prices for industrial consumption remained stable in 2024, 2% and 4.5% respectively, which were still up 700%, compared to the year 2020, in Turkish Liras.

Labour

Based on the Turkish Statistical Institute reports, the manufacturing industry's calendar-adjusted hourly labor cost index was 76% above the previous year's figure in 2024. On average, the share of labor costs in the total cost of castings sold increased by 30% percent.

The Situation in the Material Sectors

Iron Castings

In 2024, grey iron castings production decreased by 19.3% to seven hundred thousand and five hundred seventeen tons, while nodular iron castings production decreased by 19.6% to nine hundred fifty-seven thousand and seven hundred forty-four tons. The export ratios of grey and nodular iron castings remained stable at 50.3% and 74% respectively. Capacity utilisation fell by 19 points to 56%.

Steel Castings

In 2024, the production of steel castings reduced to two hundred one thousand tons, showing a downward trend of 219%. Due to weakening demand, especially from abroad, capacity utilisation deteriorated by around 21% and exports fell by 25% to one hundred and fifty thousand tonnes.

Aluminium Castings

The production volume of aluminium castings recorded an increase of 2.7% to six hundred and seventy-eight thousand tons in 2024. Investment in high-capacity injection moulding machines continued, accounting for 40% of the total, and resulting in a 2.5% increase in the total capacity. As a result, the aluminium foundry industry maintained a capacity utilisation rate of around 65%.

Other Non-Ferrous Castings

In 2024, the production volume of other non-ferrous metal castings decreased by 11%. Copper alloys, which accounted for 33% of non-ferrous metal castings other than aluminium, decreased by 2.7%, while zinc castings decreased by 15.4%.

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FOUNDRY PRODUCTION IN UNITED KINGDOM

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Report provided on their behalf by
*the **CAST METALS FEDERATION***
WWW.CASTMETALSFEDERATION.COM

UK ECONOMIC SITUATION

Gross Domestic Product

The gross domestic product of the United Kingdom in 2024 was circa 2.78 trillion British pounds. This was an increase of only £30 billion compared with 2023, when UK GDP amounted to 2.75 trillion pounds(1).

The general election held in early July 2024 meant that although the rate of inflation in the UK had fallen to the target range for the Bank of England (2%) ahead of the election, down from a high of 10.8%, business and public confidence in the UK economy was below where it was anticipated to be.

The election bought a change of government, promised a sense of optimism, but announcements in the Autumn Budget introducing changes to employer national insurance contributions caused uncertainty with businesses considering whether their current employment levels could be maintained into 2025, once the changes took effect. Inflation had started to climb again by this point, productivity remained flat and other costs such as energy also impacted on businesses' decisions about employment.

Uncertainty over the effects of Brexit remained, and although issues with trade with EU and further afield had eased during 2024, some concerns remained.

Decisions made by the incoming government in line with manifesto promises and early financial decisions taken, impacted on productivity per capita and confidence by business and the financial sectors. While the economy continued to grow after the Covid pandemic, it was at a very low level. Factors impacting on GDP in the second half of 2024 included investment challenges, energy costs that stubbornly remained significantly above that prior to the invasion of Ukraine, and the cost-of-living crisis being felt by UK citizens(2).

Allowing for the increase in population, GDP per capita in the first half of 2024 was circa 1% lower than before the pandemic. In 2024, gross domestic product per capita in the United Kingdom was £40,172, compared with £40,162 in the previous year, which is of no statistical significance(3). Although the UK is currently the world's sixth-largest economy, behind the United

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States, China, Japan, Germany, and India, its share of the global economy, has been steadily falling for several years. The UK's global economic ranking is likely to continue to fall in the coming years, with the UK's share of global GDP expected to reduce from 2.16% in 2025 to 2.02% by 2029.

UK Manufacturing

Manufacturing in the UK directly employed 2.6 million workers across the UK, generating an estimated £217 billion in GDP during 2024 according to Make UK (The Manufacturers Organisation). This is a reduction of 3.13% compared with 2023. In 2024 manufacturing accounted for 16.74% of UK output.

Make UK also stated that manufacturing accounts for 45% of all UK goods and services exports. This is down from 49% in 2023.

The average wage in the manufacturing sector was £38,769 in 2024, an increase of 6.25% compared with 2023. This median wage in manufacturing is 10% above the national average, which represents an increase on the difference in 2023, when the median was 9% higher than the national average.

The unemployment rate in the UK was circa 4.11% in 2024, which was lower than the previous year[4]. However, with changes to worker rights and the increase in the national minimum wage in the latter half of the year, many employers were considering a freeze in recruitment and potentially not replacing employees lost due to natural wastage, such as retirement.

In 2024 Manufacturing accounted for 14% of total UK business investment. This is down from 16% in 2023.

The UK Office for National Statistics suggested manufacturing including 15% of direct and indirect contributions, with the total values of manufacturers product sales being £452.2 billion, which is also reported as a £14.5 billion decrease (negative 3.1%) compared to 2023[5].

UK Foundry Industry Performance

2024 continued where 2023 left off and showed a slightly improved picture for UK foundries. As in 2023, some of the growth was due to increased prices rather than increased tonnages although several sectors showed improvements in demand. There were, however, some foundry closures

Information obtained from the Cast Metals Federation indicates the UK produced circa 446,540 tonnes of ferrous castings, which is an 8.57% increase on 2023. For non-ferrous castings production was down 16.75% at 74,930 tonnes.

There were five foundry closures, with an additional foundry being taken out of administration and being taken over by another foundry group. The closures were of small to medium sized ferrous foundries; three light alloy foundries and two iron foundries. Three of the foundries

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were in England, one in Wales and one in Scotland. The foundry that was taken over was a medium-sized iron company in England. No new foundries were opened.

In general, most light alloy foundries saw slight increase in work compared with 2023, but for many foundries orders were still not at the levels of work reported before the covid-19 pandemic. Many reported plenty of enquiries, and design or prototyping work for EVs, but not all have converted into firm orders, perhaps due to a lack of business confidence. Where orders have been confirmed, there has been an increase in time seen before first volume production orders were placed. Inconsistent order levels from passenger vehicle OEMs have also been a factor. Delays in obtaining tooling from East Asia, and then the tooling requiring repair or rectification, were also reported to be a factor, with price still being the main factor in purchasing decisions.

The steel casting sector has benefited from increased work for the defence sector, as well as from the oil and gas sector, and some continued demand from transport, specifically heavy vehicles.

For both light alloy foundries, and the investment sector more generally, the aerospace sector has seen a recovery in orders, with orders for the defence, oil and gas and IGT sectors also increasing. The automotive sector has experienced a decrease in workloads as fewer components are required in full EV's and automotive sales are down, in part due to manufacturers changing their offerings, coupled with high prices for EV's and the removal of grants towards purchase costs. Fleet purchases of EV's outweighed sales of EV's to private individuals.

CMF members have reported that enquiry levels generally seem to be quite high, however the conversion rate into physical orders was poor for some sectors. Where orders were being won it was with increased time for first production to take place.

Key challenges for the industry continue to be:

- Energy costs, with ever increasing non-commodity charges now being the greatest part of energy bills for foundries.
- Labour costs due to the increase in national minimum wage and the cost-of-living crisis.
- Aging workforce
- Lack of skilled labour and the inability to attract new employees into the foundries. Starting salaries are having to rise to attract new employees, which if forcing higher wages for skilled personnel to keep salary differences.
- Complying with health and safety legislation was increasing, as the UK regulator, the HSE had continued with its proactive campaign for controlling respirable crystalline silica in the workplace, and the increase in expectation of the UK government to address workplace occupational health.

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Some of these are addressed in the following sections.

Costs and Raw Materials Prices

Raw material prices were more stable than in the previous year. There were limited falls in national pricing trends for manufacturing.

Upward pressure on wages continued with inflation and increases in the national minimum wage leading to other wage rises to maintain differentials. In some cases, wages for operators increased more, as a percentage, compared with those for salaried staff. Salary rises increased across every size of foundry from SME's through to large businesses and across all roles within the foundry. Some of the largest increases were for management and technical roles, to avoid personnel being lost to other sectors.

Net Zero, Energy and Sustainability.

With 40% of its energy now consistently being generated from renewable sources (and sometimes considerably more), an increased focus on electrification, and a mature secondary metal infrastructure, the UK should be well-placed to take advantage of any drive to reduce the carbon footprint of supply chains.

The UK has committed to establishing its own carbon border adjustment mechanism (CBAM), similar to that of the EU, which is in progress. It continues to invest public money in more renewable energy via Great British Energy. The new government has committed to changing planning rules to allow an increase in solar provision also to enable more onshore wind farms.

Whilst competitiveness in the UK is generally reported to lag that of other developed economies, there are some initiatives around automation & robotics to support UK manufacturing which CMF has engaged with.

Waste disposal costs, and the availability of landfill sites, continue to be of increasing concern for some foundries, depending upon their geographic location in the UK, with some landfill sites only taking limited volumes of waste sand and, in some cases, sites prepared to take no foundry sand. This is leading to increased transport costs associated with the dealing of wastes, as well as increasing gate costs at waste transfer stations or landfill sites.

The Cast Metals Federation (CMF), the UK trade association for the cast metals sector is continuing to work with other partners, including companies in the construction sector, RTOs and Universities to help establish better classification of spent foundry sands as a bi-product, and find alternative uses for the spent sands and used investment casting shells to prevent them from going into landfill. Results from projects undertaken to date continue to suggest that there could be outlets for these as bi-products suitable for construction materials, however there is little incentive for end users. Standards for materials used for construction products are written with specifications such that it is difficult to find outlets where re-use is economically viable for both the foundry and the end user.

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Skills and Training

The CMF is supporting a pilot initiative in conjunction with some of our UK foundries and their local schools, using a 'virtual reality' tour of a foundry featuring some young apprentices and technicians speaking about their roles. This is aimed at helping to encourage more young people to consider a career in casting and making it easier for foundries to find and recruit apprentices and other employees. This project is being privately funded by a charitable trust and is in collaboration with the industry's professional body, the Institute of Cast Metals Engineers.

A focus for the promotion of the industry is around the products that the industry makes which support modern life and the components that contribute to the transition to a lower carbon future, as well as the wide variety of exciting job roles available and the fact that the industry uses secondary metal (recycling) so is a key part of the circular economy for metals.

The project is building on the Foundry in a Box kit which is made available for foundries to use when engaging with their local schools and colleges. To date there are in excess of 20 kits in use around the county.

The Institute of Cast Metals Engineers (ICME) is now seeing growth in demand for its courses from the industry but also from end users seeking to learn about casting as a route to manufacture.

Occupational Health and Safety

The UK government since the election has continued to place greater emphasis on needing to keep people in work as part of tackling the issue of productivity, and for reducing the social care costs and costs to the National Health Service. This was leading to more visits from inspectors tackling specific areas such as hazardous substances, musculoskeletal disorders, mental health and work-related stress. Across the UK a lot of industrial sectors, not just foundries, were found to be required to do more in these areas, at an overall considerable cost to UK business.

Outlook for 2025

The CMF reported that according to its members the industry outlook for 2025 is generally positive across several sectors and metals cast, with many foundries actively investing in plant and equipment to increase operational efficiencies and improve the working environment (health and safety), although costs (of energy and employment) do affect competitiveness.

Since early July 2024 a new Government has been in place, with a strong majority in Parliament (providing some stability), and with a greater focus on manufacturing as part of a wider industrial strategy to generate economic growth. The government was expected to bring forward further legislation for protecting workers' rights and moving towards a greener energy supply for the UK, both of which may have implications on cost to business and the willingness to recruit new workers.

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Potential opportunities in the green energy sector exist and projects to help reduce waste costs by finding alternatives for spent foundry sands look set to continue. Nuclear energy via small modular reactors, and aerospace growth remain areas for expansion.

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FOUNDRY KNOWLEDGE LANDSCAPE

ANNUAL RESEARCH FIGURES IN FOUNDRY TECHNOLOGY

ACADEMIC RESEARCH OUTLOOK

Objective and methodology

This section highlights some of the current figures and trends in the global research related to the fields of interest for the foundry technology. In addition to the activity of the WFO, its media partners and official journal as a major source of information, it is also relevant to check the scientific production in specialized search engines, such as Web of Science (WoS). Thus, an analysis is made in a yearly basis for the Global Foundry Report based on WoS searches, to see the evolution in these trends.

The next summary has been focused on cast iron and has been restricted to 2024. Articles with authors from several countries are counted several times, once per country involved.

Worldwide Foundry general research figures

Despite the drop in scientific production related to cast iron has been steady from 2020 to 2023, this trend has reverted in 2024 (Figure 1). The volume of published papers in indexed journals has increased 8% compared to 2023. This is interpreted as a sign of recovery in casting technology research investment. Since the average growth per year of all the scientific production worldwide is estimated to be around 6%, any growth below this number reflects a loss in investment in favor of other technologies.

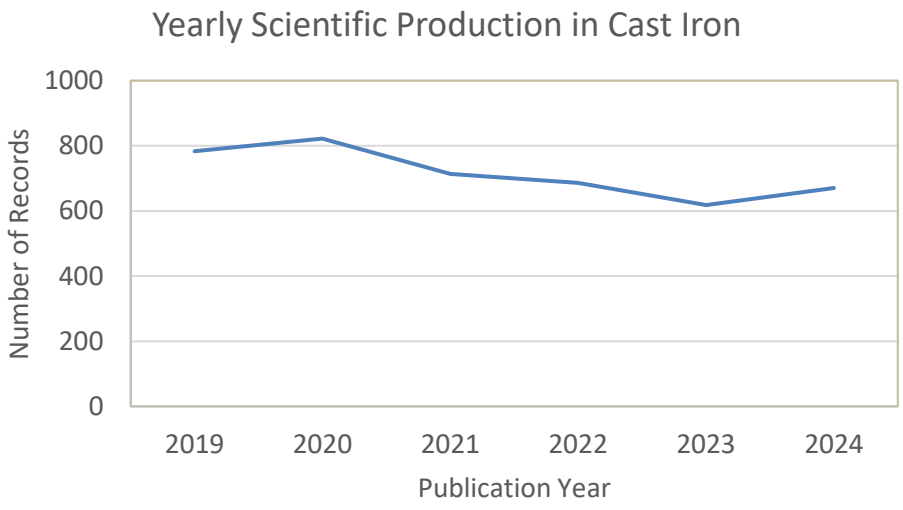


Figure 1. *Scientific production in the field of cast iron from 2019 to 2024 (source: WoS).*

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Figure 2 shows the geographical distribution of scientific production in 2024. China, India, USA, Poland, Germany, Russia and Turkey are at top of number of published works.

This observation has been steady, with minor changes, in the WFO Reports in the last years. It points out that this group of countries has a systematic investment policy in foundry research that allows them to lead, volume-wise, the scientific production statistics.

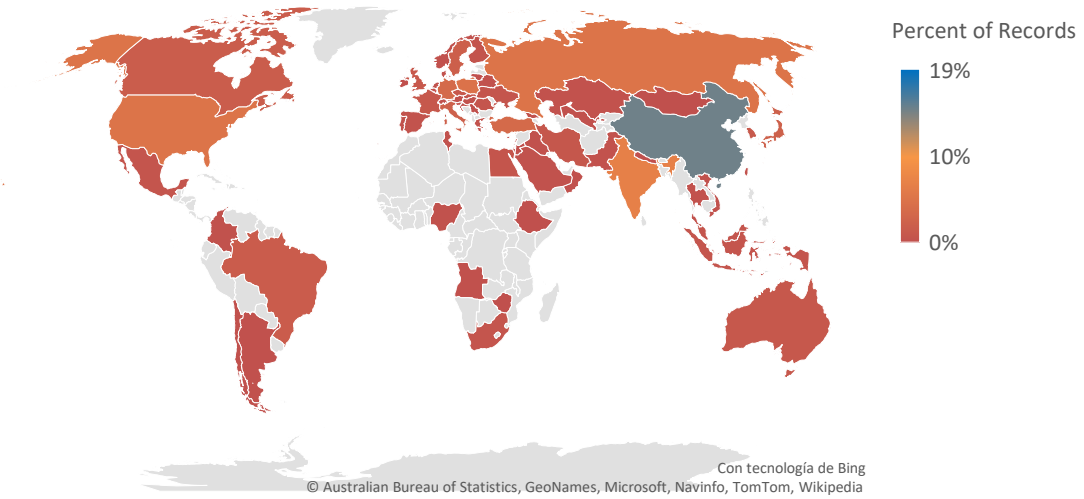


Figure 2. *Geographic distribution of scientific production in the field of cast iron in 2024 (source: WoS)*

In terms of the raw production for 2024 period, Figures 3, 4 and 5 show the research publications distribution depending on the region. Starting with Asia as the highest output region (Figure 3), China is confirmed as the major producer. It more than doubles the sum of the rest of the records of Asian countries altogether.

India, Japan, South Korea and Iran show the next strongest position summing up 23% of the scientific output in Asia. This Top 5 cast iron research investment in Asia has remained since 2015 reflecting a long-term science policy in foundry technologies. Australia's production is shown in the same figure for convenience.

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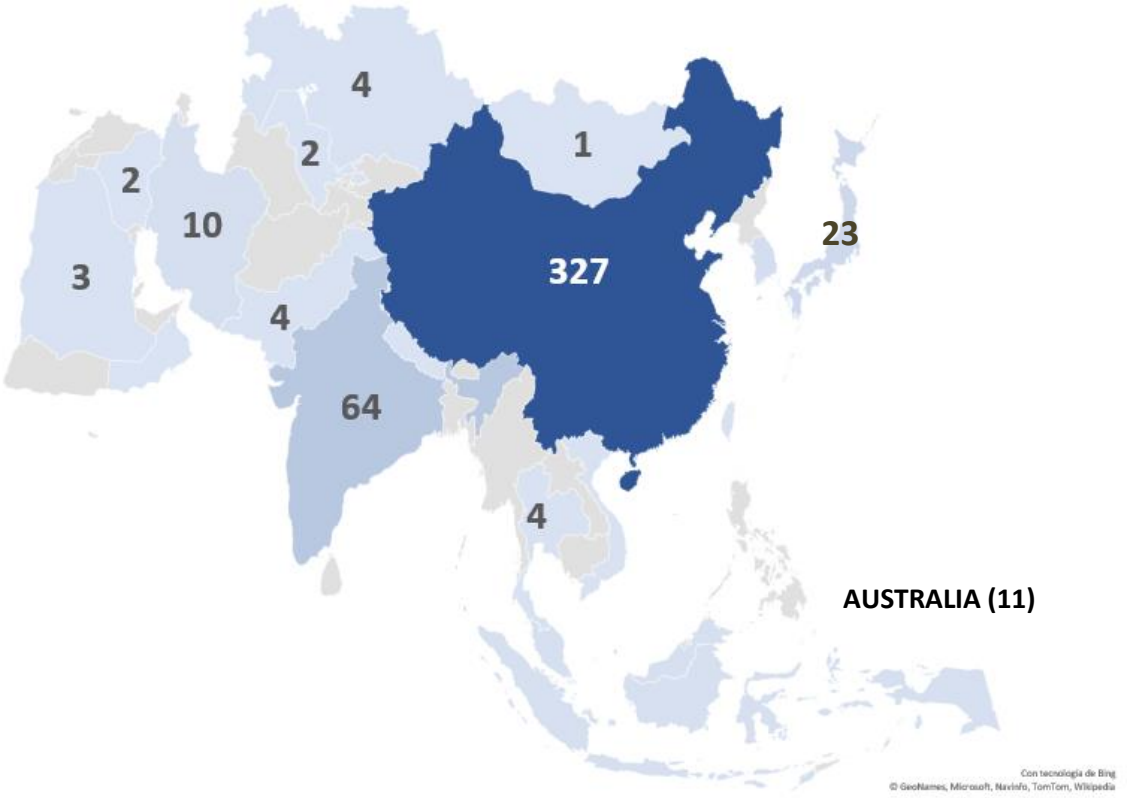


Figure 3. *Scientific output records in Asia in 2024 (source: WoS)*

Positioned in second place behind Asia, Europe (Figure 4) keeps showing a very distributed scientific production with a headcount of records comparable to that of China plus India.

Russia, Poland, UK, Germany and Turkey are the leaders in scientific output in 2024, summing altogether over 50% of the region's records. These five countries are recurrently occupying top positions in the paper counts of this geographical area. Slightly behind the members of the group, Italy and Sweden show activity levels analogue to Japan.

Again, the historical series points to the strong influence of long-term research investment decisions as a key policy element to defend vanguard positions in mature technologies such as cast iron. Russia and Turkey have been included in the European region map following the criterion from previous reports.

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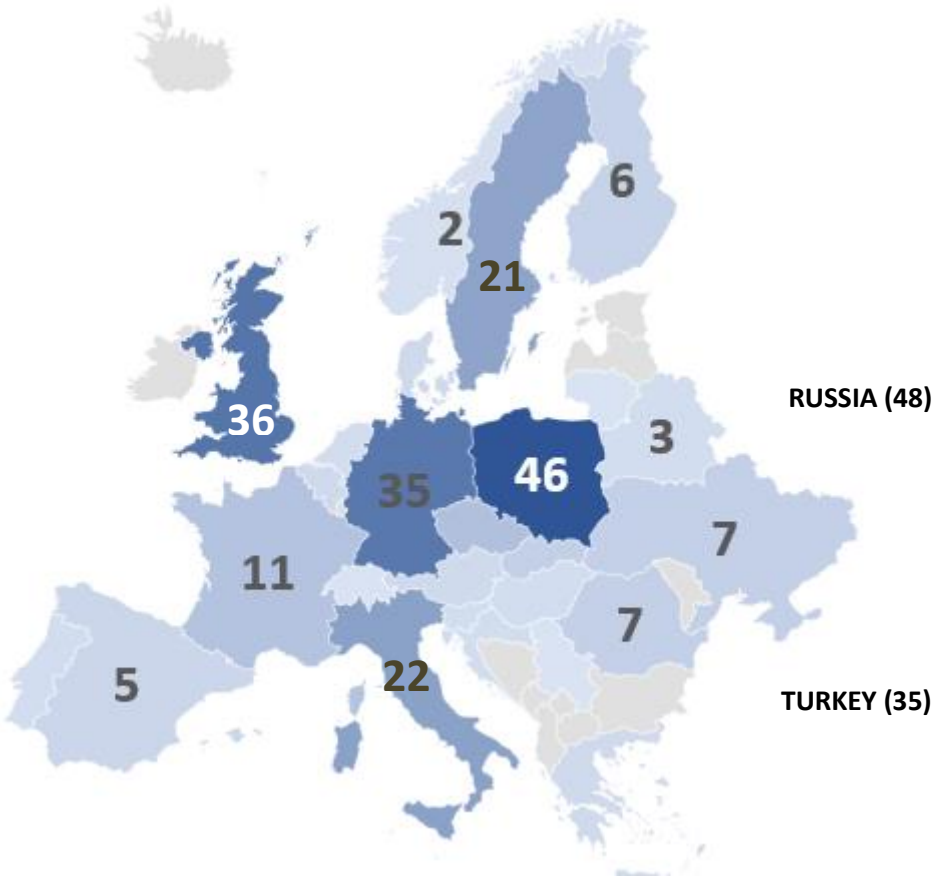


Figure 4. *Scientific output records in Europe in cast iron in 2024 (source: WoS).*

Shifting to the American continent, USA was the major player with a scientific production in 2024, comparable to Russia and Poland. Canada and Brazil follow with an output that is close to that of Japan, Italy and Sweden. It is noticeable that Canada has tripled its output since 2022 while Brazil has been slowly diminishing the production. The whole continent sums approximately the production of Russia or Poland.

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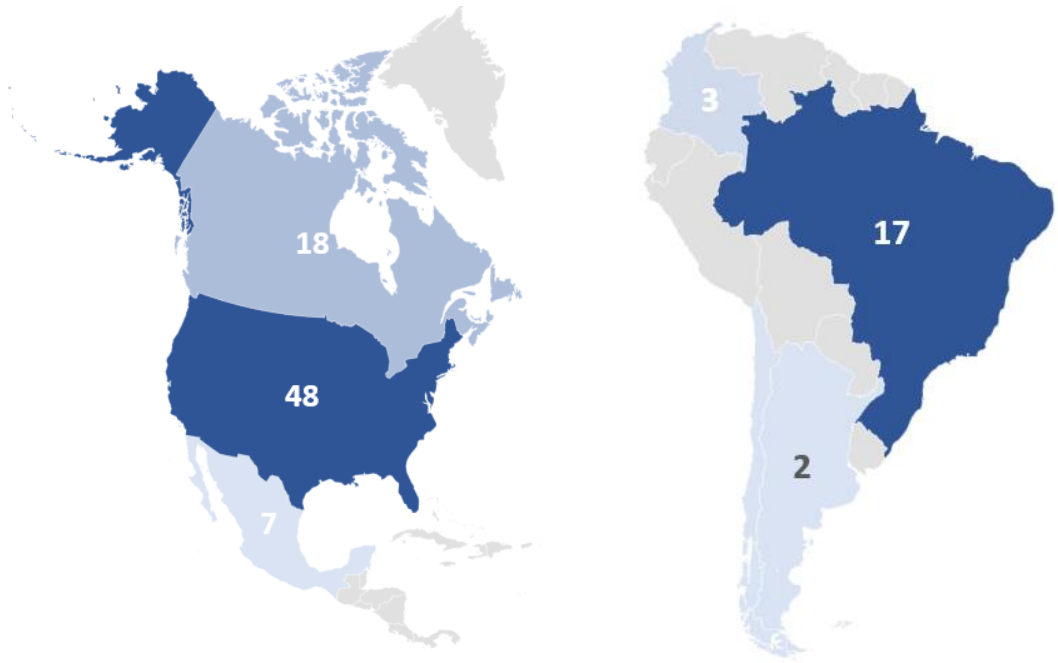


Figure 5. *Scientific output records in America in 2024 (source: WoS).*

Finally, regarding the records for Africa, Egypt and South Africa are the major players in the continent, with numbers like Indonesia, Malaysia, Mexico, Hungary, Ukraine or Finland.

SUMMARY. The overall research investment policies in cast iron seem to be stable worldwide, with signs of recovery after a drop in scientific production that was observed since 2020. Some minor regional changes are identified, such as the increase of the weight of Canada in North America and the slightly decay of Brazil's output in south America. Most research effort is clustered around a reduced number of players, being China, India, USA, Russia and Poland behind over 55% of the papers published in cast iron technology during 2024.

All the maps in this section have been drawn with Bing technology © GeoNames, Microsoft, NavInfo, TomTom, Wikipedia.

Research Funding

When the attention is moved to the source of the funds declared in the published works, the financial support to research is again dispersed, as in previous reports. In 2024 up to 588 funding sources have been identified. This indicates that 87% of the research in cast iron has been declared to be financially supported by public institutions. This value was 56% in the last assessment performed for the foundry knowledge landscape and is attributable to an enhanced declaration of funding promoted from scientific editorials, instead of being attributed to such a significant increase in actual funding.

Figure 6 shows the share among the top 10 institutions, which account for funding around 20% of all results published in 2024. Chinese institutions and European Union repeat their presence from the last issue of the foundry research landscape. Some changes are observed that explain the observation in the previous section. For example, the Brazilian CNPQ has disappeared from

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the top 10 and this matches the progressive reduction in cast iron science output from Brazil, while the presence of VINNOVA and Jonkoping University as funding agents fits the two-fold increase in Swedish production since 2022. This reflects that there is a direct impact of public policies in the progress of foundry science.

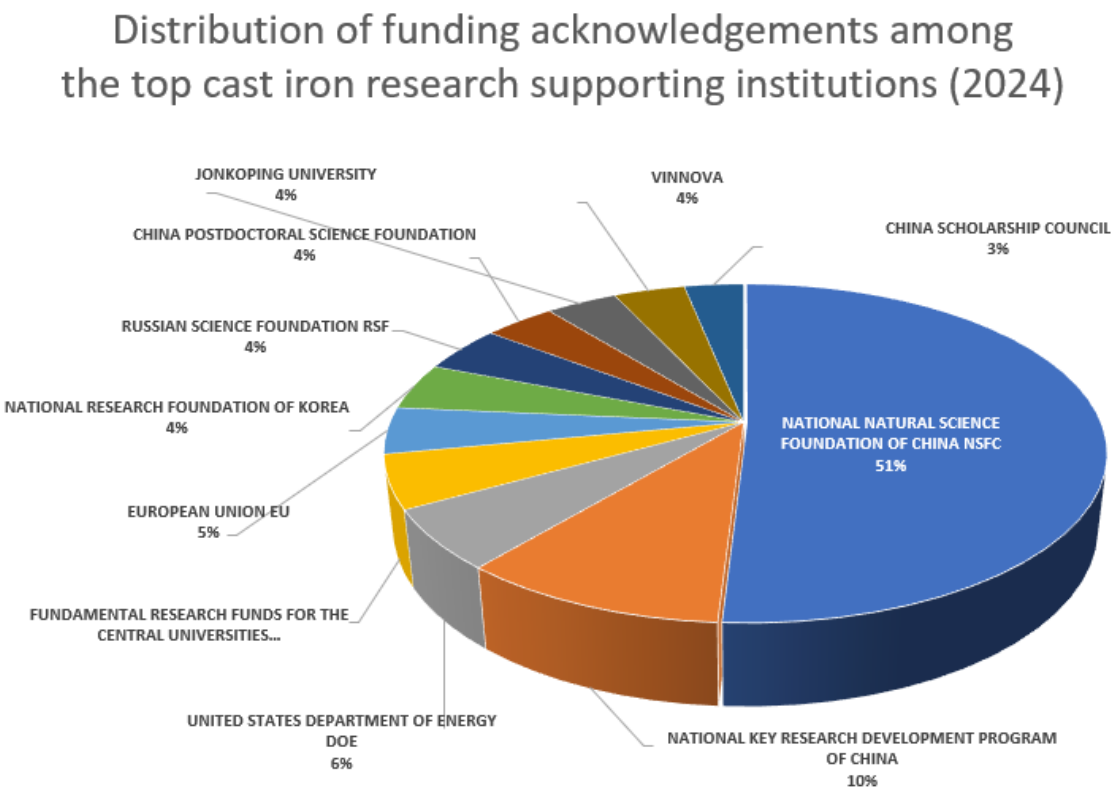


Figure 6. *Share of acknowledgements for funding in scientific publications among the ten institutions that sum up the highest number of supported works in 2024 (source: WoS)*

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MAIN TRENDS IN INDUSTRIAL FOUNDRY RESEARCH

The international geopolitical situation in recent years, characterized by armed conflicts, trade tensions, and increasing fragmentation of global production networks, has had a significant and multifaceted impact on industrial developments and trends in the foundry sector. This scenario has prompted a reconfiguration of supply chains, leading many countries and companies to reevaluate their logistics strategies with the aim of mitigating the risks associated with disruptions in the supply of raw materials, energy, and critical components.

Likewise, the increase in energy and production costs, which has been particularly pronounced in Europe, together with the progressive tightening of environmental regulations, has contributed to a relative loss of competitiveness of local production compared to other markets. This set of factors has directly affected the profitability of operations and the investment capacity of foundries.

In addition, the climate of geopolitical and economic uncertainty has had an adverse effect on business confidence and industrial investment flows, slowing down or postponing strategic decisions related to the expansion, modernization, and technological upgrading of production facilities.

In this context, the main lines of **research, development, and innovation (R&D&I)** in the foundry sector are closely linked to **technological transformation, sustainability, process digitization**, and the strengthening of industrial **competitiveness**.

Improvements in productivity, increased product quality, and optimized operational efficiency are being addressed through the coordinated implementation of **complementary technological strategies** aimed at ensuring the sector's resilience and sustainability in the medium and long term.

Firstly, it is critical to have **reliable, traceable, and high-quality data**, as this forms the basis for reducing rejection rates, improving the quality of manufactured parts, accelerating decision-making processes, and optimizing cycle times. In this context, one of the main current technological trends is the adoption of **architectures based on industrial IoT**, supported by **advanced sensor systems**, **massive data capture, and advanced analytics**. These technologies enable **fault prediction** and the development of **digital twin**s of equipment and production processes, through which it is possible to perform accurate simulations and anticipate deviations or incidents before they manifest themselves in the physical environment.

Secondly, increased productivity, together with reduced human error and improved workplace safety, is primarily based on **process automation** and the incorporation of **robotic systems.** These solutions are primarily implemented in repetitive, physically demanding, or risky operations, ensuring greater repeatability, process stability, and personnel protection.

Finally, the use of **advanced digital tools** for planning, analyzing, and optimizing processes is a well-established and continuously growing trend. Of note is the development and integration of filling and solidification simulation software, which allows defects to be identified and prevented

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before the physical manufacture of parts, as well as modeling tools that facilitate the reduction of design errors. Likewise, the integration of real-time data analysis and visualization systems contributes significantly to improving process control. The impact of these technologies translates into a decrease in reprocessing operations, a reduction in defective parts, and, consequently, a substantial improvement in the overall efficiency of the production system.

A significant transformation is beginning to take place in the traditional approaches to the **design and manufacture of parts and tools** in the industry, driven by the incorporation of additive manufacturing technologies. **3D printing of sand molds and cores** makes it possible to eliminate or substantially reduce dependence on conventional tools, shortening the prototyping and production phases. This technology also enables the manufacture of highly complex geometries that are difficult or unfeasible using traditional molding processes.

At the same time, **hybrid manufacturing systems**, which combine conventional processes with additive technologies, enable higher levels of dimensional accuracy and offer superior flexibility in the production of single parts or short runs, adapting more efficiently to the need for customization and reduced time to market.

This new design and manufacturing paradigm, characterized by greater flexibility and adaptability, requires close, **two-way collaboration** between the design and production departments. The early integration of knowledge and experience from both areas is key to developing more efficient, functional, and competitive production systems, while ensuring the technical and economic viability of the solutions adopted.

Finally, growing regulatory pressure on **environmental issues**, together with market demands, is driving the adoption of more sustainable, efficient production processes with less environmental impact. In this context, companies in the sector are directing their investments towards energy-efficient, low-carbon equipment, as well as towards greater use of recycled materials and light alloys. At the same time, systems and technologies aimed at reducing emissions and optimizing the consumption of critical resources, such as water, energy, and waste management, are being incorporated. These actions not only enable compliance with increasingly demanding regulatory requirements but also reduce operating costs and strengthen the company's competitiveness and market positioning.

However, the effective implementation of the technological strategies described above depends largely on the ability of foundries to **attract, develop, and retain qualified talent**. The digital transformation of the sector requires not only investment in technology but also the incorporation of profiles with specialized skills in artificial intelligence, data analysis, automation, and digital tools, both at the engineering and plant operation levels.

In this process, it is particularly important to leverage the **expert knowledge** accumulated by professionals in the sector, which constitutes a highly valuable strategic asset for the development and training of digital learning and decision-making systems. Integrating empirical knowledge with new digital tools maximizes the impact of technological transformation and prevents the loss of critical experience.

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Finally, it is essential to view technological developments not as an end in themselves, but as **enabling tools** aimed at improving the competitiveness, operational efficiency, and long-term sustainability of foundries.

The foundry sector is undergoing a process of **structural and technological transformation**, geared towards the consolidation of highly automated, safe, and optimized manufacturing systems in terms of operational efficiency. The ability of companies to actively lead and manage this transition, through the adoption of advanced technologies, digitization strategies, and continuous process improvement, will be decisive in realizing the associated benefits and ensuring the sustained competitiveness of the sector.

Academic and Industry research outlook section developed with the collaboration of

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Contact details:

General Secretary: José Javier González

Offices UK: Winton House, Lyonshall, Kington HR5 3JP United Kingdom
Offices Spain: Aliendalde 6 48200 Durango, Bizkaia Spain

Email:jjgonzalez@thewfo.com

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