WORLD FOUNDRY ORGANIZATION

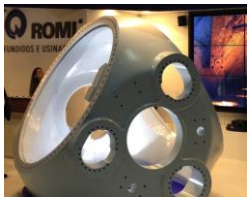
The reference point for the global metal casting industry

WFO GLOBAL FOUNDRY REPORT

2024

ACTUAL SITUATION OF THE WORLDWIDE CASTING INDUSTRY






-Rev 1-

April 2025

WFO

The World Foundry Organization

WFO GLOBAL FOUNDRY REPORT 2024

Actual situation of the worldwide casting industry

-Rev 1 -

April 2025

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 of Foundrymen and Metallurgists of the Belarus Republic
Association Technique de Fonderie
Australian Foundry Institute
Croatian Foundry Association
Czech Foundrymen Society
DSBF - The Association of Danish Foundries
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
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.
Bundesverband der Deutschen Gießerei-Industrie e.V.
Cast Metals Federation
Growth Steel
RISE Research Institutes of Sweden

Dear foundry colleagues,

We are very pleased that the Global Foundry Annual Report, organized and prepared by WFO, is presented again. In recent years, our reports have provided comprehensive, timely and helpful information about the latest trends of the global foundry industry. It includes each country's industrial policies, market demands, trends of output and technological innovation. Our colleagues from the WFO Secretariat and member states have put a lot of effort in preparing this report. Here, on behalf of WFO, I would like to express my heartfelt thanks for your contribution.

In the past year, the world has faced multiple challenges. Economic growth is slowing down, inflation continues, prices of raw materials keep rising, and geopolitical tensions have limited both technology exchange and capital flows. These problems have restricted the development of different manufacturing industries, including the foundry industry. Facing this situation, our new report provides effective solutions for the foundry industry to respond to these global challenges and provides helpful suggestions for green and sustainable development.

Looking towards the future, the trend of digitalization, intelligence and low carbonization will deeply influence the development of the global foundry industry. As the leader who promotes the technology innovation and knowledge exchange in the field of foundry, WFO has the responsibility to make our industry adapt to the new era. We have been working on building connections between new technologies and industry demands. We will continue to organize high-quality academic conferences and create a high-level communication platform for experts all over the world. We will keep fighting to achieve a healthier and more sustainable environment for the development of foundry industry.

In October this year, the 75th World Foundry Conference (WFC 2024) will be held in Deyang, China. We welcome experts, scholars, engineers and all friends in the foundry field from all over the world to gather in China. We will share new technologies and discuss the latest developments of our industry. We will make friends and seek cooperation opportunities for multiple benefits.

Yours sincerely,



Dr. Lou Yanchun

President of the WFO

China Academy of Machinery Science and Technology (CAM), Chief Scientist

Former Vice President of CAM

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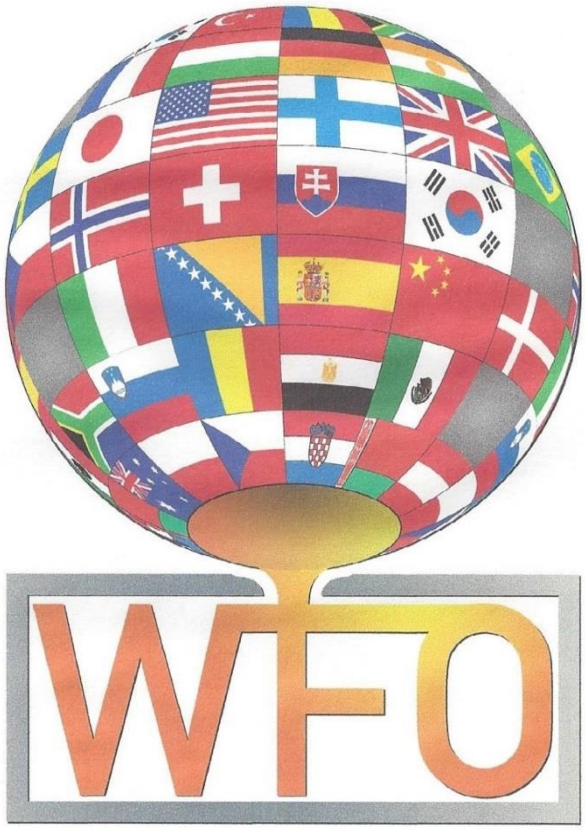
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GLOBAL FOUNDRY PERSPECTIVES

The World Foundry Organization is an extraordinary working frame to interact within an international network that represents companies, technicians, stakeholders and organizations linked to the foundry technology all over the world. This includes the exchange of updated information on the status of the foundry industry from each member country, information available every year through the Global Foundry Report.

In addition to this, next you can also access an exclusive interview which helps visualizing some of the challenges for this industry.



Competitiveness and challenges in the foundry industry



Interview with...

Rafal Danko

WFO Vice President
PROFESSOR, AGH UNIVERSITY OF KRAKOW
PRESIDENT, POLISH FOUNDRYMAN SOCIETY
Poland

Market Trends & Challenges. What are the most significant trends shaping the global foundry market today, and what challenges do industry players face in adapting to them?

The global foundry market is undergoing significant transformation driven by technological advancements, sustainability demands, and supply chain disruptions. One key trend is the increasing adoption of automation and AI, improving efficiency and reducing labor dependency. Additionally, sustainability concerns are pushing foundries to adopt cleaner production methods, including energy-efficient furnaces and recycling initiatives. The rise of electric vehicles (EVs) and renewable energy infrastructure is also shifting demand toward specialized alloys and lightweight materials.

However, the industry faces challenges such as volatile raw material prices, geopolitical tensions affecting supply chains, and stringent environmental regulations. Labor shortages and the need for skilled workers in digitalized foundries further complicate adaptation. Additionally, competition from low-cost producers in Asia pressures traditional foundry hubs to innovate and enhance efficiency. To remain competitive, companies must invest in automation, sustainable practices, and workforce development while navigating economic uncertainties and evolving customer demands.

Supply Chain Disruptions – How have recent global events, such as geopolitical tensions and raw material shortages, impacted foundry supply chains, and what strategies are companies using to mitigate these disruptions?

Recent global events, including geopolitical tensions, trade restrictions, and raw material shortages, have significantly disrupted foundry supply chains. The COVID-19 pandemic, the Russia-Ukraine conflict, and U.S.-China trade tensions have led to delays, increased transportation costs, and reduced availability of critical metals like aluminum, copper, and rare earth elements. Additionally, rising energy prices have further strained production, particularly in energy-intensive foundry operations.

To mitigate these disruptions, companies are diversifying their supply sources, securing long-term contracts with multiple suppliers, and increasing regional production to reduce dependency on international markets. Many foundries are also investing in recycling and circular economy initiatives to reduce reliance on raw material imports. Digitalization, including predictive analytics and real-time monitoring, helps optimize inventory management and prevent bottlenecks. Furthermore, strategic partnerships and reshoring efforts are gaining momentum to enhance supply chain resilience and ensure stable production in the face of global uncertainties.

Sustainability & Green Technologies – With increasing pressure for sustainable manufacturing, how is the foundry industry adapting to environmental regulations, and what innovations are driving greener production methods?

The foundry industry is increasingly adopting sustainable practices to comply with stricter environmental regulations and reduce its carbon footprint. Governments worldwide are imposing tighter emission limits, waste management policies,

and energy efficiency standards, pushing foundries to innovate.

One key adaptation is the shift toward energy-efficient furnaces, such as electric arc and induction furnaces, which reduce reliance on fossil fuels. Additionally, waste heat recovery systems are being implemented to improve energy efficiency. Many foundries are also embracing recycling initiatives, increasing the use of scrap metal to reduce raw material consumption and lower emissions.

Advanced filtration and dust collection systems help minimize air pollution, while digitalization, including AI-driven process optimization, improves efficiency and reduces waste. Some companies are exploring alternative binders and biodegradable molding materials to lower hazardous chemical use. By integrating these innovations, the foundry industry is moving toward a more sustainable, circular economy while maintaining competitiveness in a changing global market.

Digitalization & Industry 4.0 – To what extent has digitalization, including automation and AI-driven processes, transformed modern foundries, and what are the key benefits and risks of these advancements?

Digitalization and Industry 4.0 have significantly transformed modern foundries, enhancing efficiency, quality, and sustainability. Automation, AI-driven process control, and IoT-enabled monitoring systems have revolutionized production by reducing human error, optimizing resource usage, and improving predictive maintenance. Smart foundries now use real-time data analytics to monitor furnace temperatures, material flows, and energy consumption, ensuring consistent quality and minimal waste.

Key benefits include higher productivity, reduced downtime, and lower operational costs. AI-powered simulations enable precise mold design and defect detection, improving casting accuracy. Robotics and automated handling systems enhance worker safety and reduce labor dependency.

However, these advancements come with challenges. High investment costs and the need for skilled personnel in AI and automation can be barriers to adoption. Additionally, cybersecurity risks increase with digital connectivity. Despite these challenges, digitalization is becoming essential for foundries to remain competitive, improve sustainability, and adapt to evolving market demands.

Future Outlook & Competitiveness – How do you see the global foundry market evolving in the next 5-10 years, and what factors will determine which regions or companies remain competitive?

Over the next 5–10 years, the global foundry market will continue evolving through automation, sustainability, and material innovations. The demand for lightweight alloys, driven by electric vehicles (EVs) and aerospace industries, will reshape production priorities. Digitalization and AI-driven manufacturing will enhance efficiency, allowing smart foundries to optimize processes and reduce defects.

Sustainability will play a crucial role, with governments enforcing stricter carbon emission regulations and encouraging circular economy practices, such as increased metal recycling and energy-efficient production methods. Companies investing in green technologies and reducing reliance on fossil fuels will gain a competitive edge.

Key factors determining competitiveness include technological innovation, supply chain resilience, and labor force adaptation. Regions with strong industrial policies, access to raw materials, and skilled workforces—such as China, India, and parts of Europe—will remain dominant. Foundries that embrace Industry 4.0, sustainable practices, and flexible supply chains will be best positioned for long-term success.

Rafal Danko:
MS, Ph.D., Professor at AGH University of Krakow,
Faculty of Foundry engineering, Poland
Vice Rector of AGH University of Krakow.
President of Polish Foundryman Association
Vice President of the WFO
350 research papers
11 patents.

WORLD FOUNDRY INDUSTRY 2023-24

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

Overview

Production Volume

From 2018 to 2019, due to the slowdown in the development of the automotive industry, which contributes a high demand in the downstream castings, the production of China's foundry industry slightly decreased.

From 2020 to 2021, with the recovery of downstream demand in the automotive industry, combustion engines and agricultural machinery, engineering machinery, power generation equipment, and electricity, the total production of various types of castings in China reached 51.95 million tons and 54.05 million tons, respectively, with a year-on-year increase of 6.56% and 4.04%.

In 2022, due to the increasing downward pressure on the national economy, the production of castings experienced a certain degree of decline.

In 2023, the total annual production of castings has reached 51.9 million tons. From the perspectives of materials, the detail is shown in the following. It is observed that a slump in the production of engineering machinery, cast pipes and mining, metallurgical heavy machinery and etc., but a significant increase has been made in the automotive industry. The production is nearly similar to that of 2022 with a slight increase of 0.39%.

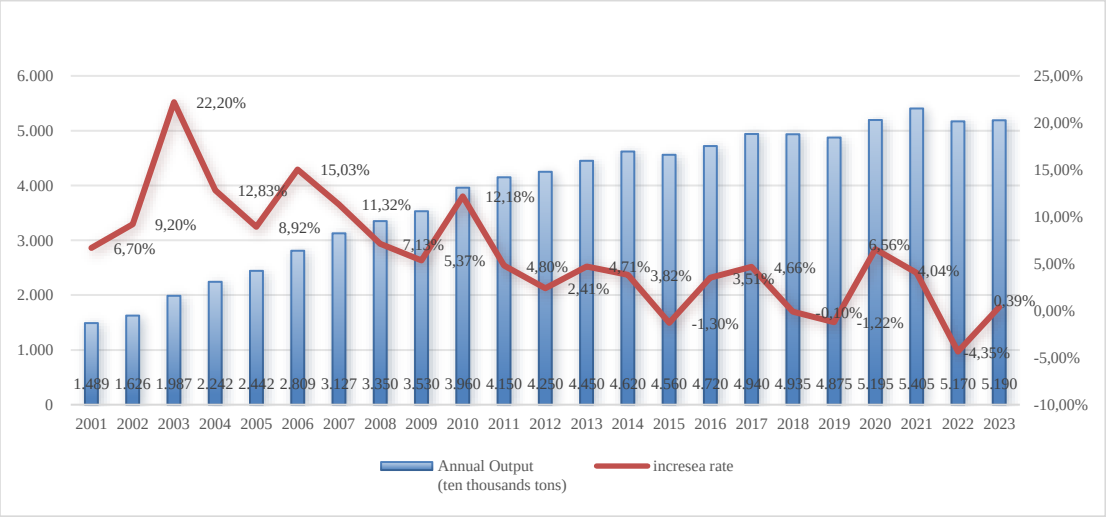


Figure 1. *China's Casting Production and its Share in Global Casting Production (2001-2023)*

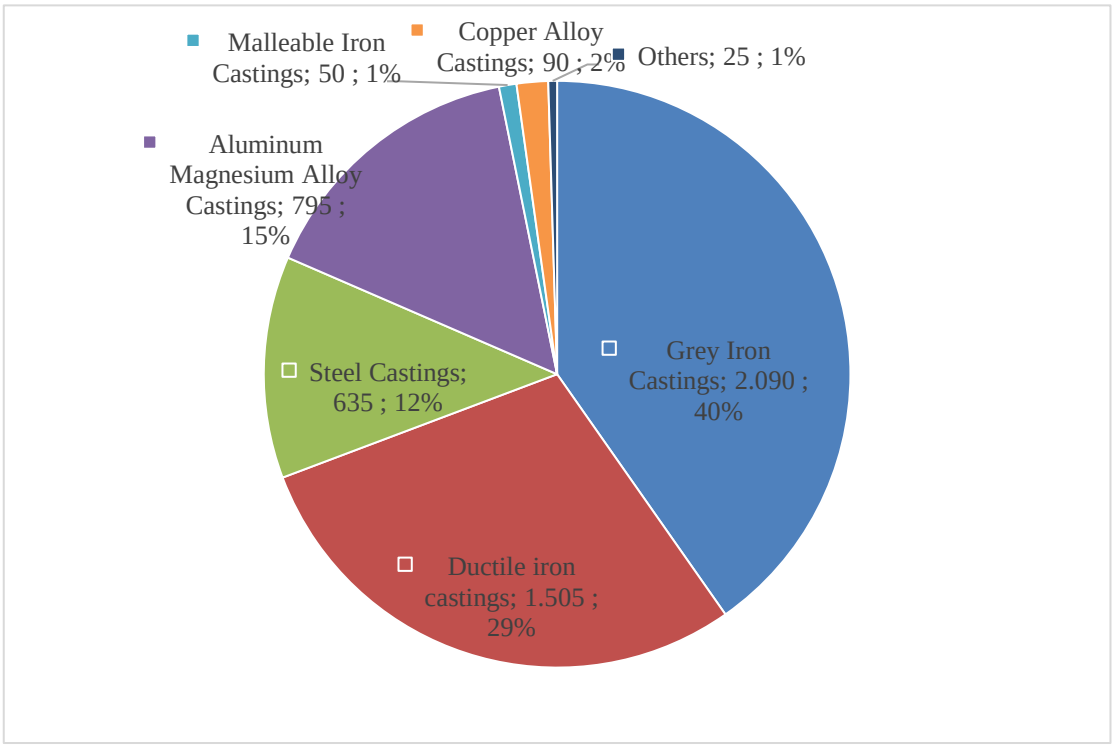


Figure 2. *The proportion of China castings made of various materials in 2023 (unit: ten thousand tons)*

Export promotion

In accordance with the latest data from General Administration of Customs of the People's Republic of China. From Jan. to Oct. 2023, the casting exports from China reached 5.2614 (-2.8%) million tons with a value of 15.59 (-3.9%) billion US dollars. [3]

It shall be noted that in accordance with the statistics rules and regulations of customs department, some castings after mechanical processing, such as some assembled parts or production, are not listed in the statistics.

Market analysis

Castings Demand

From the perspective of demand, the top 5 industries of casting demands in 2023 are automobile, cast pipes, mining and metallurgical heavy machinery, combustion engines&agricultural machinery and engineering machinery.

The downstream demands of castings in China are mainly concentrated in the industries of automobiles, cast pipes, mining and metallurgical heavy machinery, combustion engines and agricultural machinery and engineering machinery. In 2023, the automotive industry accounted for the largest proportion, up to 29.29%.

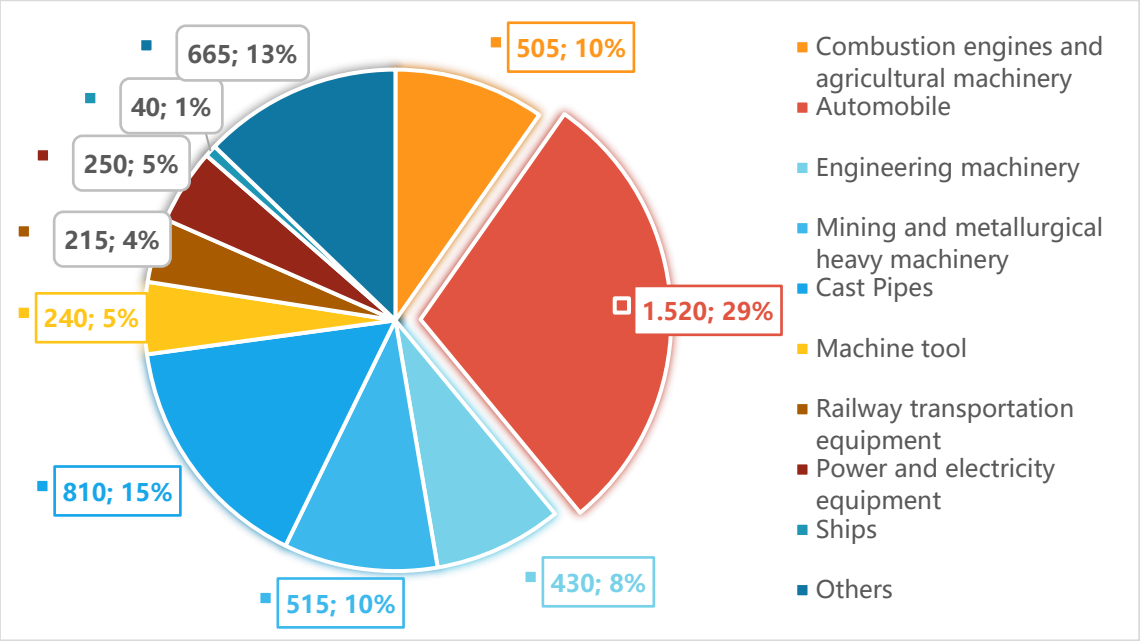


Figure 3. *China's casting production for specific sectors in 2023 (unit: ten thousand tons)*

Analysis on automotive sectors

In 2023, the production volume of automobiles in China has reached 30.16 million (+11.8%). The production and sales in 2024 is estimated to reach 31 million.

In 2023, the export amounts of automotive parts have reached about 88.4 billion USD, In accordance with the data from General Administration of Customs of the People's Republic of China, the amounts of 2023 reached to 88.4 billion USD. The import and export amounts of automotive parts from 2020 to 2023 is shown in the Fig 4.

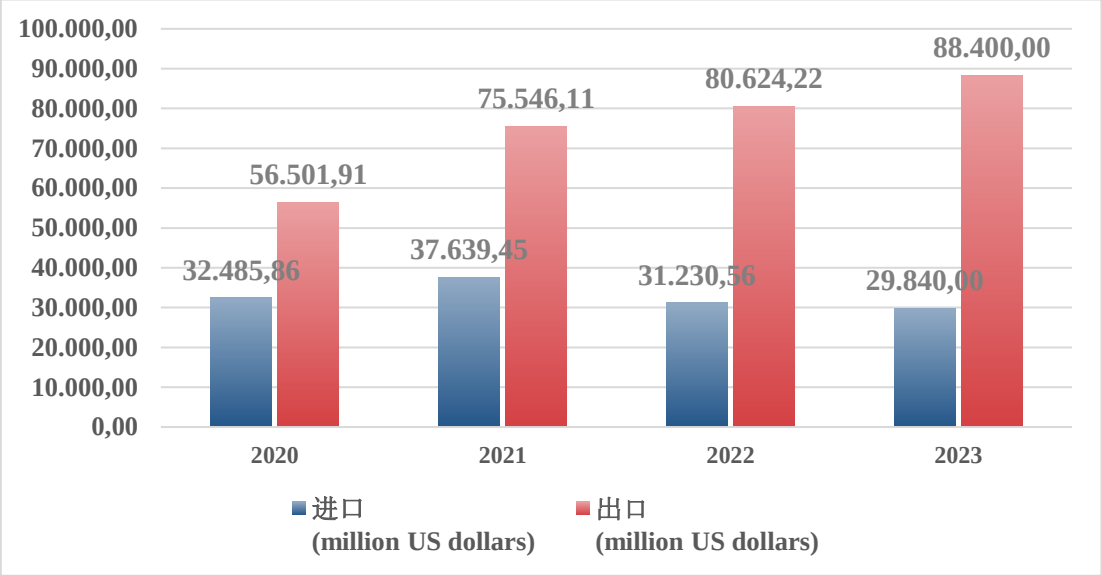


Figure 4. *The import and export amounts of China's automotive parts from 2020 to 2023*

FOUNDRY PRODUCTION IN GERMANY

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

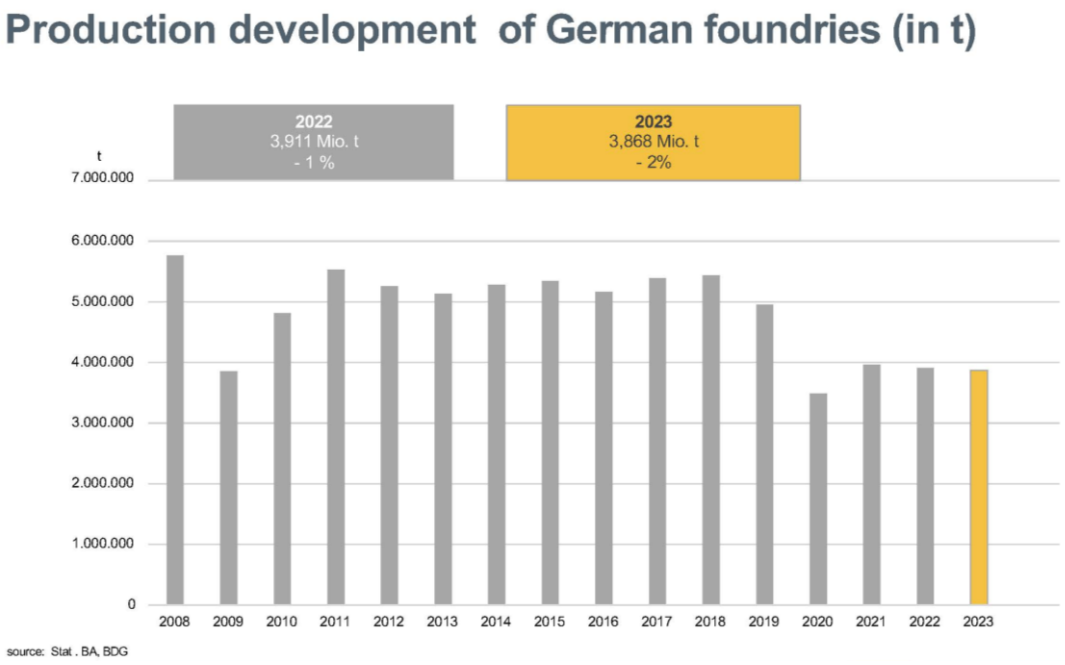


Figure 1. *German casting production development*



Figure 2. *Production development of German industry*

Industry key figures in detail 2023

	Production	Turnover*	Employees
Total	3,868 Mio. t - 2 %	14,043 Mrd. € 2 %	67.600 - 1 %
Fe	3,033 Mio. t - 3 %	7,828 Mrd. € 3 %	34.900 - 0 %
Non-ferrous	0,835 Mio. t 3 %	6,215 Mrd. € 0%	32.700 - 2 %

Source: BDG, Stat . BA, Employees: >50, changes compared to the previous year, * Forecast

Figure 3. *German industry key figures 2023*

Production 2024
January - April

turnover Jan.- Apr. -12,0 %	Cast iron and steel 992 900 t (-11,8 %)	Non-ferrous 293 800 t (-0,2 %)	turnover Jan.-Apr. - 7,6 %
	GJL 611 700 t (-8,5 %)	Aluminium 256 700 t (-0,4 %)	
	GJS 338 000 t (-16,9 %)	Magnesium 3 200 t (-19,9%)	
	Cast steel 43 200 t (-13,7 %)	Copper 25 500 t (9,8 %)	
		Zinc 8 400 t (-11,0 %)	

Source: BDG, Changes comared to the previous period

Figure 4. *German casting production 2024*

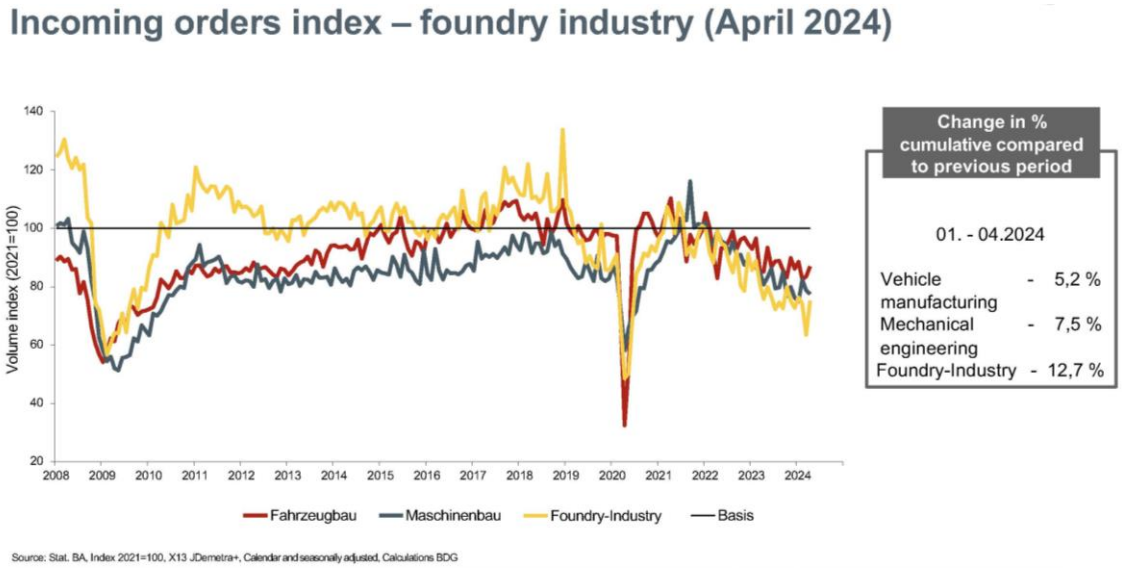


Figure 5. *Incoming orders index foundry industry 2024*

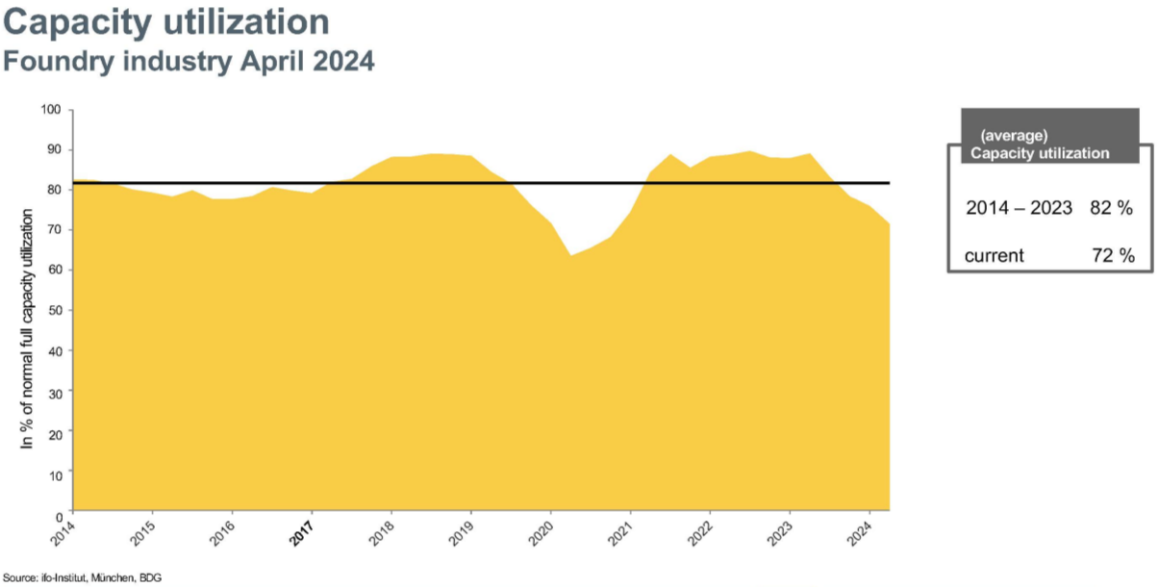


Figure 6. *Capacity utilization*

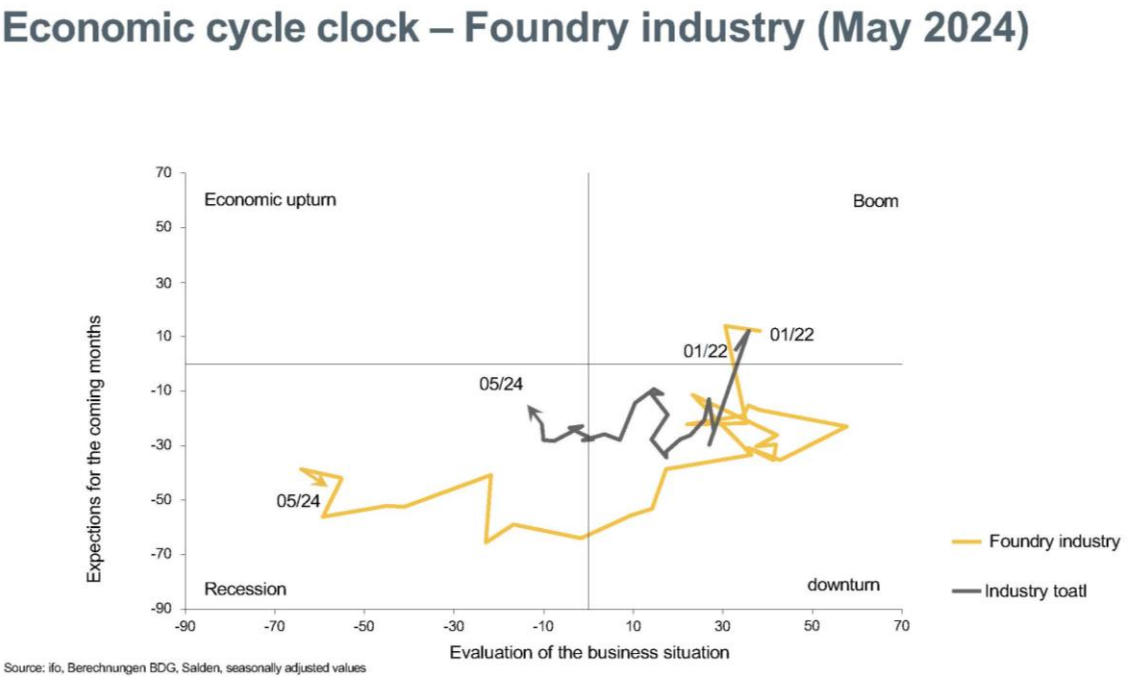


Figure 7. *Economic cycle clock foundry industry*

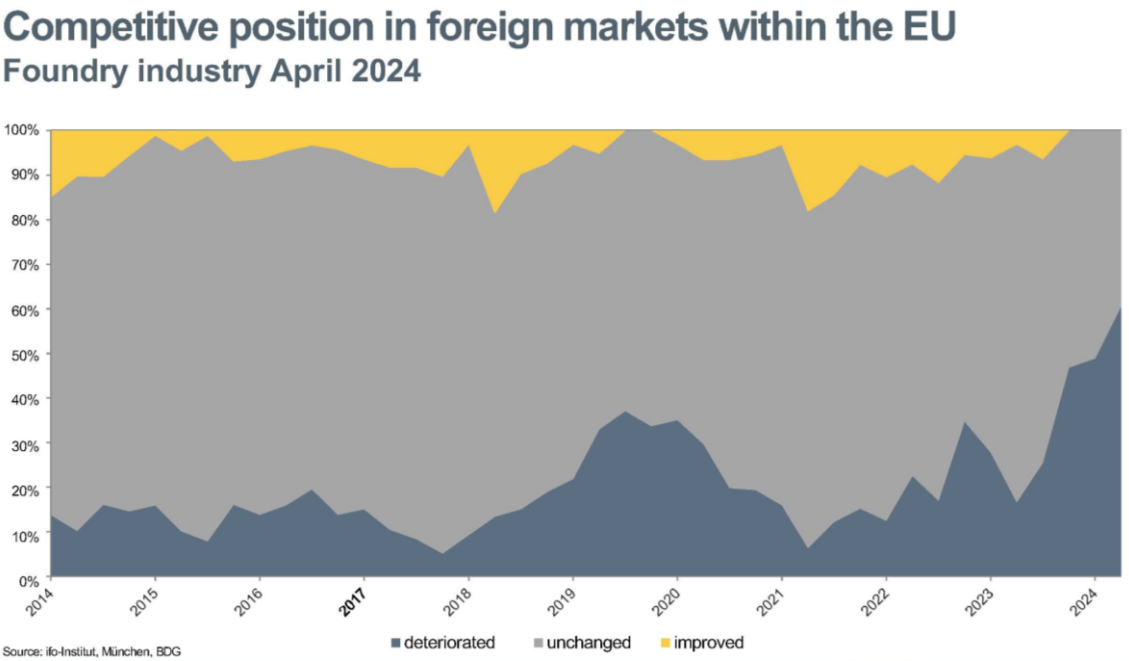


Figure 8. *Competitive position in foreign markets within the EU*

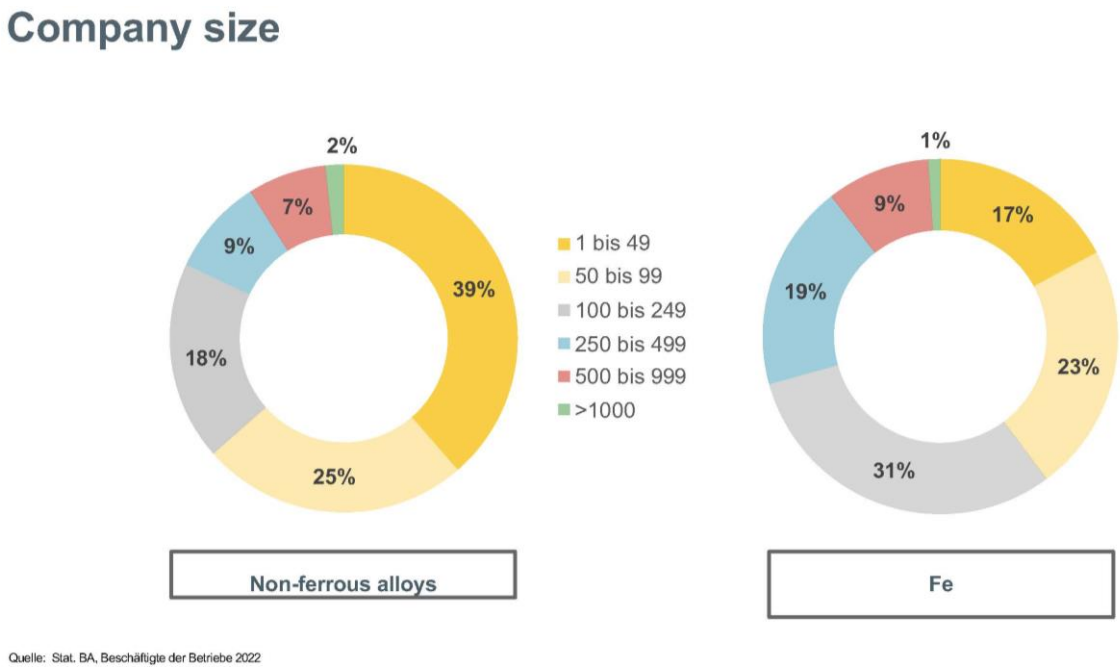


Figure 9. *Company size*

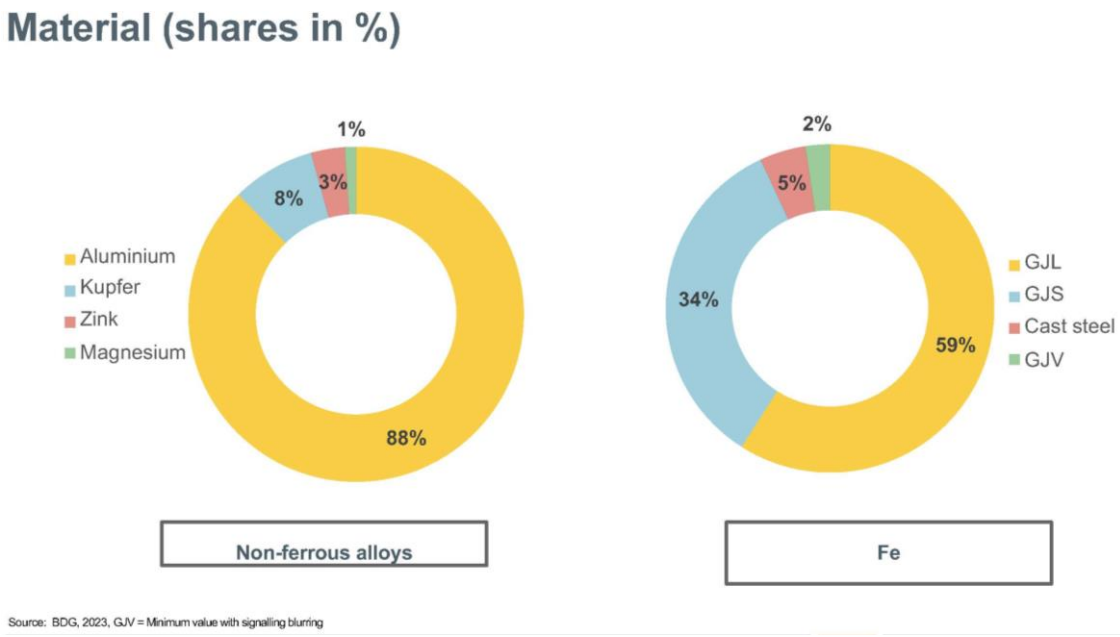


Figure 10. *Material (shares in %)*

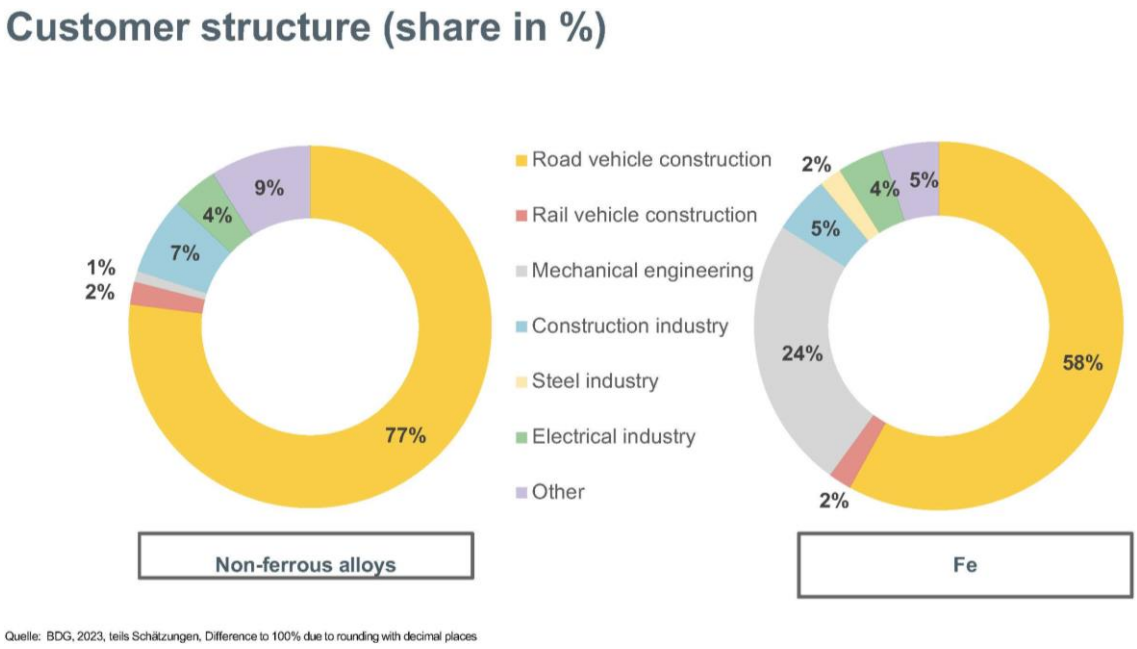


Figure 11. *Customer structure*

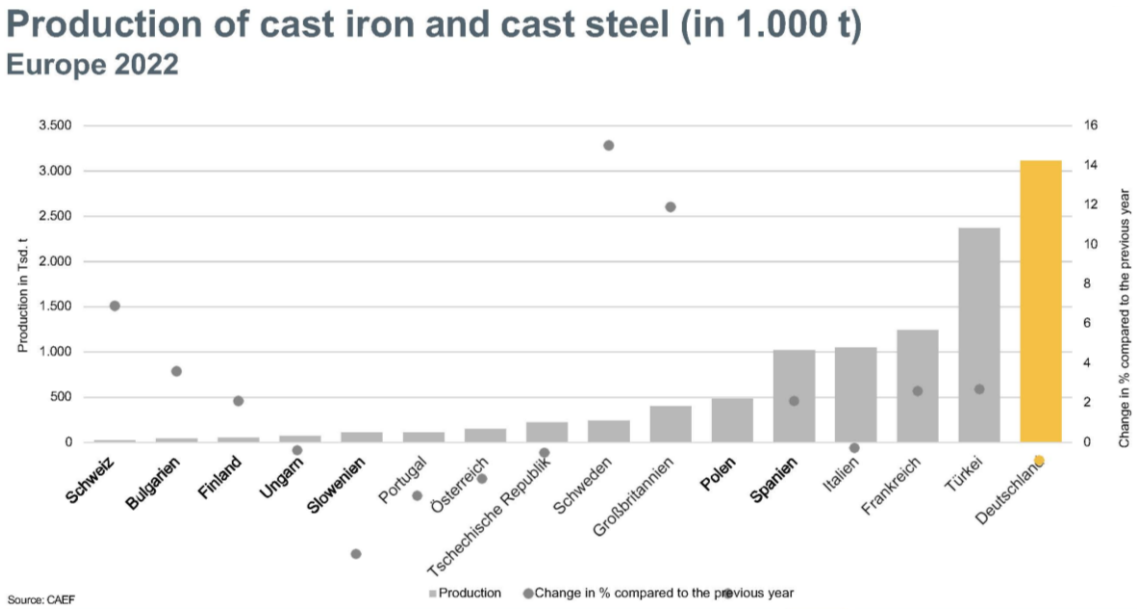


Figure 12. *Production of cast iron and cast steel*

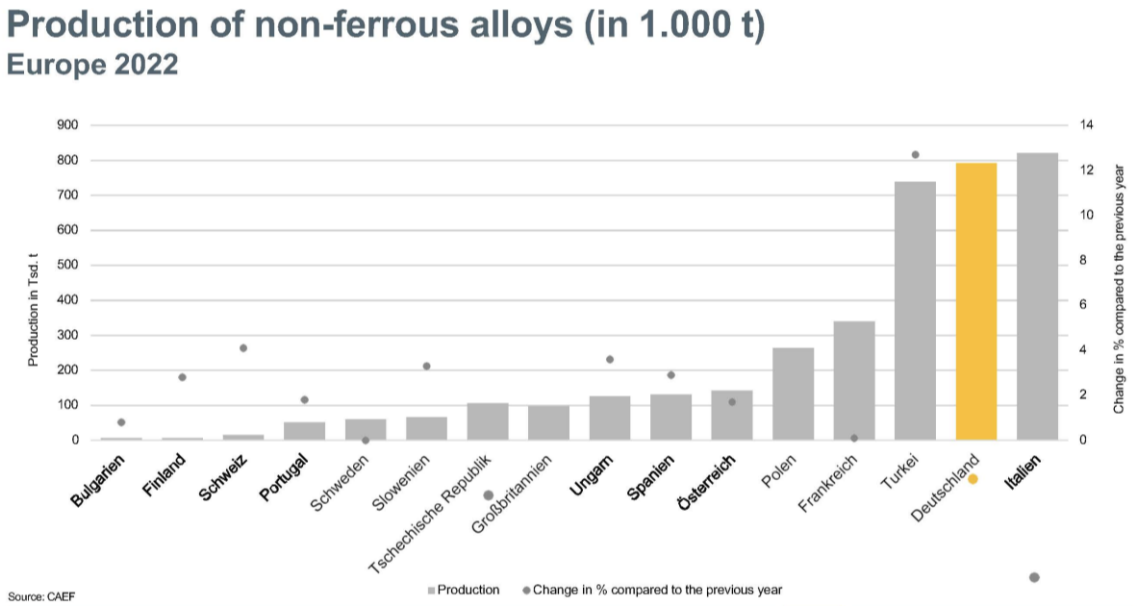


Figure 13. *Production of non-ferrous alloys*

Source: Bundesverband der Deutschen Gießerei-Industrie e.V. (BDG)

FOUNDRY PRODUCTION IN INDIA

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

General Economic Scenario

Despite global uncertainties, India's GDP has demonstrated resilience with incremental progress observed in recent quarters. This growth trajectory, though gradual, provides a foundation for potential policy adjustments. With public investment and consumer momentum being the key drivers of near-term growth, targeted economic policies are required to shape India's trajectory toward achieving its aspirations of being the third largest economy by 2027 and securing sustainable economic growth.

India's GDP growth forecasted for FY 2024-25 is 6.8%

Major Factors Propelling Economic Growth in India:

- Strong Domestic Demand: Robust private consumption growth, driven by rising incomes and an expanding middle class. Private consumption expenditure grew by 3.5% year-over-year in Q3 of FY 2024.
- Robust Investment Activity: Private investment grew by 10.6% year-over-year in Q3 of FY 2024, indicating a strong revival in the private capital expenditure cycle.
- Moderating Inflation: Inflation has been on a downward trajectory, with retail inflation at 4.83% in April 2024.
- Manufacturing Resurgence: The manufacturing sector grew by 11.6% year-over-year in Q3 of FY 2024, driven by initiatives like the Make in India program and PLI schemes.
- The government's push towards self-reliance (Aatmanirbhar Bharat) is boosting domestic manufacturing capabilities.
- Supply Chain Diversification: Amid global supply chain disruptions, India has emerged as an attractive alternative destination for manufacturing investments.

Foundry Industry

Foundry industry is the feeder to various sectors, its output is directly affected by the consumer sectors. The industry has shown signs of growing demand from various sectors such as Tractors, Automobiles & Auto Components, Construction equipment etc. Sectors like Defence, Railways, Energy and Aerospace are opening up for indigenization, which has opened new markets for casting products. However, Auto continues to be single largest sector driving demand for foundry sector.

The production of castings in India from 2015-16 to 2018-19 continued to rise at a CAGR of approx. 6% from 10.8 MT to 13.38 MT. In the year 2019-20 there was a steep fall in the

production by approx. 14%, largely due to fall in demand from Auto Sector. Year 2020-21 saw a marginal fall from 11.49 MT to 11.31 MT.

Since then and from year 2020-21 to 2022-23, the production has been increasing at the CAGR of approx. 12% majorly driven by the growth in the automotive industry. Another significant driver for the Indian foundry market's growth is the increasing government expenditure on infrastructure expansion, stimulating demand for various machinery and equipment such as pumps, cranes, fans, motors, and conveyor belts. This surge in demand, in turn, amplifies the need for metal castings.

Indian foundries are actively upgrading their facilities and technologies to enhance productivity and expand capacity, responding to escalating demand. A majority of these foundries fall under the MSME sector, which has demonstrated consistent growth.

	2018-19	2019-20	2020-21	2021-22	2022-23
Grey C.I.	9.41	7.72	7,91	8.62	9.83
SG Iron	1.31	1.22	1.10	1.26	1.46
Malleable	0.05	0.05	0.05	0.05	0.05
Steel	1.21	1.14	0.91	1.05	1.24
Non Ferrous	1.40	1.36	1.34	1.46	1.58
TOTAL	**13.38**	**11.49**	**11.31**	**12.44**	**14.16**

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

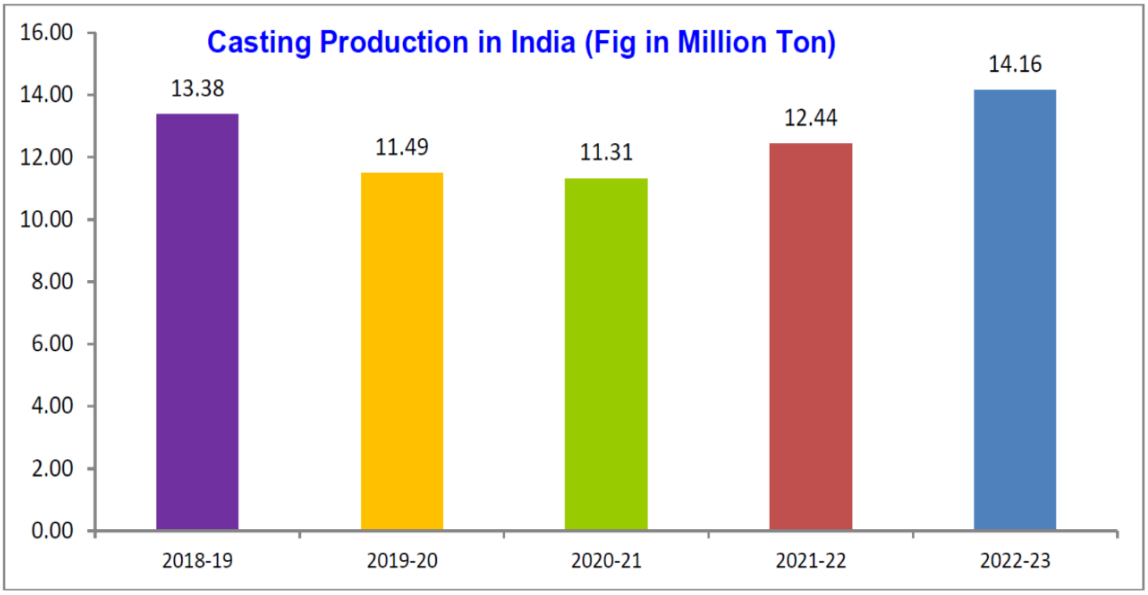


Figure 1. *Casting Production in India (Fig in Million Ton)*
Source: Foundry Informatics Centre, New Delhi

Trends from various Consumer Sectors

Auto industry

Category	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Passenger Vehicles	40,28,471	3,424,564	30,62,280	36,50,698	45,87,116	49,01,844
Commercial Vehicles	11,12,405	7,56,725	6,24,939	8,05,527	10,35,626	10.66,429
Three Wheelers	12,68,833	1,132,982	6,14,613	7,58,669	8,55,696	9,92,936
Two Wheelers	2,44,99,777	2,10,32,927	18,349,941	1,78,21,111	1,94,59,009	2,14,68,527
Quadricycles	5,388	6,095	3,836	4,061	2,897	5,006
Grand Total	**3,09,14,874**	**2,63,53,293**	**2,26,55,609**	**2,30,40,066**	**2,59,40,344**	**2,84,34,742**

Table 2. *Auto industry production*

Source, SIAM, Figures in Units

The Auto industry produced a total 2,84,34,742 vehicles including Passenger Vehicles, Commercial Vehicles, Three Wheelers, Two Wheelers and Quadricycles in year 2023-2024 as against 2,59,40,344 in the previous year, registering a growth of approx. 9.62% percent over the same period last year. Specially the passenger and two wheelers segment performed well.

The Union Cabinet announced the Production-Linked Incentive (PLI) Scheme in the Automobile and Auto Components sectors. The PLI scheme (outlay of $ 3.5 Bn) for the automobile sector proposes financial incentives of up to 18% to boost domestic manufacturing of advanced automotive technology products and attract investments in the automotive manufacturing value chain. With the increase in the auto production, foundry industry will also get benefitted by the increased demand from the sector.

In future, the demand for light weight components is likely to grow. The casting demand for iron & Aluminum castings could grow by 35-40% in next 3-4 years from current levels.

Government is fast tracking of infra projects, there are some green shoots visible in Mining, Earthmoving, Commercial Vehicle, Railways and Defence sectors.

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 Rs 2.81 lakh crore in 2023-24 alone, up 33% from a year ago will give fillip to the construction equipment industry.

Tractor industry

The India Agricultural Tractor Market size is estimated at USD 7.42 billion in 2024, and is expected to reach USD 10.28 billion by 2029, growing at a CAGR of 6.70% during the forecast period (2024-2029).

India's tractor industry is quite large and it also has a good influence in the global agricultural sector. However, in terms of growth in the last one year, the graph of the Indian tractor industry has been quite uneven. Tractor sales & production in FY 2023-24 were lower than in FY 2022-23.

From the previous year (2022-23) the production decreased by 11.6%, domestic sales decreased by 9.8% percent, while exports dropped by 21.5 percent from the previous

year. The decline in domestic sales last year was attributed to a poor monsoon. However, a normal monsoon is expected this year, which is anticipated to boost tractor sales.

Industry analysts note that despite domestic sales ending on a slow note in FY 2023-24, there is a ray of hope in exports. The IMD has also forecast a good monsoon this year, which is expected to boost tractor sales. According to TMA, domestic tractor volumes will improve, and the industry may register a modest growth of 3-5 percent in FY 2025. This optimism is driven by the expectation of a promising monsoon season, which is anticipated to lead to higher farm incomes and a lift in the rural economy.

	2019-20	2020-21	2021-22	2022-23	2023-24
Production	761075	965135	961100	1071310	947143
Sales	781065	988028	970902	1069853	965065
Export	76047	88621	128636	124542	97828

Table 3. *Tractor Sector Data (Figures in Units)*

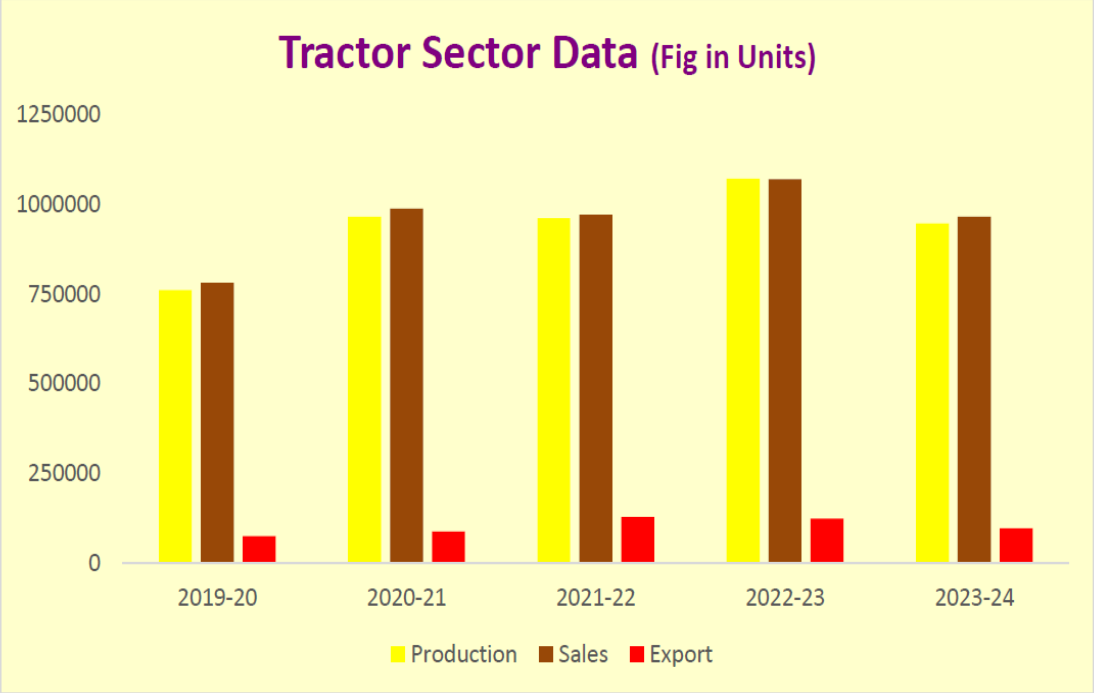


Figure 2. *Tractor Sector Data (Fig in Units)*

Export of Castings

The export of castings from India from the f.y. 2020-21 onward till f.y. 2023-24 has shown significant growth (approx. CAGR 12.84%). 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.

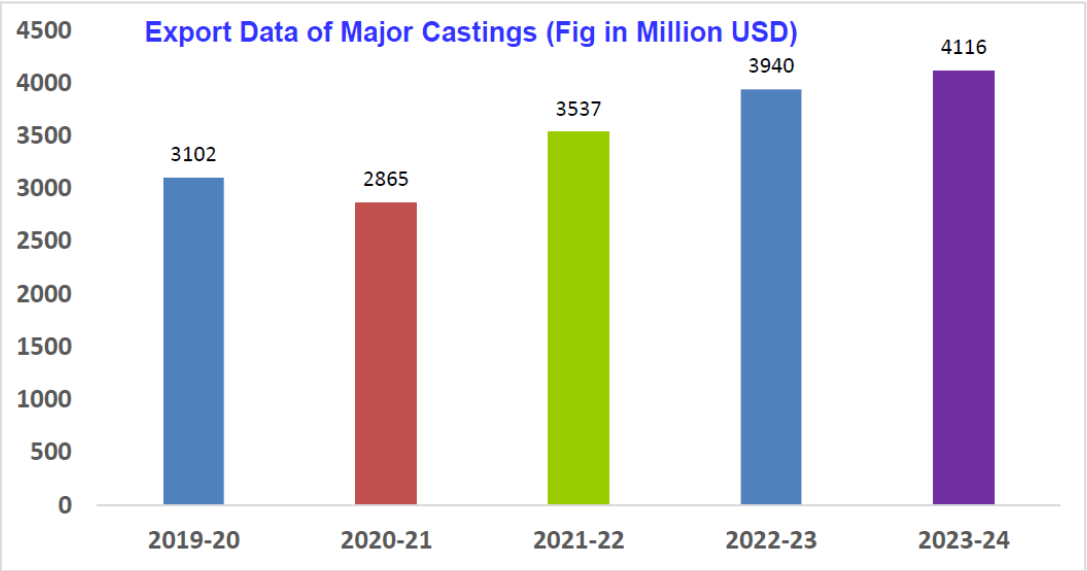


Figure 3. *Export Data of Major Castings (Fig in Million USD)*

Major Challenges

1. Rising input material Costs
2. Skilled Manpower and migration
3. Good quality Power at competitive rates
4. Implementation of Quality Control Orders by the Govt.
5. Sand availability due to mining & environment issues
6. Growing Protectionism & Trade wars
7. Uncertainty due to Lack of clarity of Policy on EV Mobility

Main activities performed

- The **72nd Indian Foundry Congress & Foundry Exhibition IFEX 2024** was organized between 2-4 February 2024 at Bangalore International Exhibition Centre, Bengaluru. This was one of the largest foundry event ever happened in India.

  Key Features:
  - 1600+ Delegates
  - 17500+ visitors
  - 350+ exhibitors
  - 14000+ Sq. mtr of Exhibition Space
  - B2B Meeting
  - MSME Conclave
  - Plenary session & panel discussions on event theme “Unleashing the Opportunities”

  - Industry visits
  - Casting Clinic
  - Special session on "Lost Form Casting" Technology
- Regional Conferences i.e. Sourecon, Eascon, Wescon happened in all the 3 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 CEOs meet at Delhi to decide the future roadmap and action plan pertaining to the issues specific to the foundry industry and for effective policy advocacy by IIF for the sustainable growth of the foundry industry.
- Monthly IIF Journal and weekly IIF Bulletin are being published regularly. Regional monthly e-magazine from western region and southern region are being published regularly.
- Policy issues pertaining to various foundry related matters were taken up with the Government
- Yogyata Vikas training programme conducted for the foundrymen across the country. Approx more than 1500 foundrymen were trained during the year.
- Conducted survey on the MSME status of IIF Members.

Activities planned

- **73rd Indian Foundry Congress & Foundry Exhibition IFEX 2025** is scheduled at Kolkata from 7-8-9 Feb, 2025. Theme of the congress is "Casting the Future – Innovate, Collaborate & Perpetuate".
- Skill Development initiatives to continue.
- 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 conference of North, NCON 2024 scheduled on 24-25 Aug 2024.
- Regional conference of East, West and South will also take place.
- 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.

- 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.
- Create awareness & promote Common Facilities Center programme for creation of common facilities by cluster members.
- Active engagement with stakeholders for policy interventions 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.
- Organizing more CEOs meet in different parts of the country.
- 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, weekly Foundry News Bulletin and monthly regional e-magazines.

FOUNDRY PRODUCTION IN JAPAN

National representation in the WFO:
JAPAN FOUNDRY ENGINEERING SOCIETY
WWW.JFS.OR.JP

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

General overview of foundry industry

Due to the investment by overseas investors for the strong US dollar and the euro against the Japanese Yen on the exchange market, and expectation of better results of many companies, the Nikkei Stock average has recorded over the maximum price recently and a lot of sightseeing tourists have come from many foreign countries. But we have imported a lot of resources, and the general price level has been rising remarkably. The price of electricity, fuel, scrap, etc. are rising gradually in foundry industry.

Although the corona virus has not been exterminated perfectly, the business has almost improved before the corona pandemic as shown in this report. The restrictions of domestic travel and the number of audiences for events have been lifted at all through the government at present. Our business activity seems not to be affected with that now.

Foundry industrial structure and the market

Table 1 shows the amount of casting production over the past 10 years, and Fig.1-6 the monthly amount in 2019 to April, 2024 including the domestic production amounts of automobiles.

Total amount of the casting production in 2023 increased by 0.8% than in 2022. Gray cast iron was down 0.9%, spheroidal graphite cast iron, down 1.5%, malleable cast iron, down 6.0%, steel castings, down 4.4%, copper alloy castings, down 2.5%, aluminum alloy castings, up 7.2%, and die castings, up 7.6%. The production level in these 10 years has been gradually decreasing. (Table 1)

The reason is mainly a decrease in domestic production amounts of automobiles and in 2014 to 2016, the average production was around 7,994,000 cars (* including truck & bus 9,419,000), but in 2021 to 2023, around 6,984,000 cars (8,227,000) and that was a reduction by 12.6%. Those reasons are the demand decrease and the shift to overseas production.

Fig.1-6 show monthly production amount of gray and spheroidal iron castings, cast iron for automobiles, aluminum alloy castings, die casting, copper alloy castings, and production amounts of automobiles from January 2019 to April 2024.

We find that the Covid-19 clearly affected the production on May in 2020. We have a relatively long holiday in January, May and August on one of Japanese customs, and you can see on the figures that the production amount of those months was lower than the other months.

The consumption of castings in 2023 showing in Table 2, around 66% of gray cast iron was consumed for vehicles, 65% of spheroidal graphite cast iron for vehicles, 88% of aluminum die castings for vehicles, 96% of aluminum alloy castings for transportation machines, 34% of steel castings for construction machines and 34% of copper alloy castings for valves and stopcocks.

Fig. 7 and 8 show the production amount of the gray cast iron and the spheroidal graphite cast iron for car industry since 1965. Both cast irons have stabilized at about 1.1 million tons a year for the gray cast iron and 0.8 million tons for spheroidal graphite cast iron for these 4 years. The reasons were for having been transferred the car production overseas and some parts of the gray cast iron had been changed to the spheroidal graphite cast iron in order to get them lightweighted. The production amount of cast iron for car industry had been decreasing gradually.

The production amounts of automobiles recorded 7.83-8.27 million cars in 2014-2016, and had recorded 6.56-7.77 million cars in 2021-2023. The demand of castings has been decreasing according as the car production decrease.

We are worry about the reduction of car industry and think there are 5 reasons, the first is economical factor, a jump in maintenance cost and fuel cost, the second is traffic congestion and a good public transportation development in urban area, the third is the environmental problem, exhaust gas, the fourth is the lifestyle change, remote working and online shopping, the fifth is the new traffic means, car sharing and more bicycle use.

In Japan as well, there are a lot of issues on changing the car industry after due to having arisen the problems of the global warming. A few different types of next-generation cars xEV have been created in every car manufacturer, and they are EV, FCV, PHEV and HEV. They have occupied about 20.6% (1,603,000 cars) in Japanese market in 2023 and the expectation of xEV is 55% in 2030. The car industry, also the casting industry started to do activities for the goal of the Carbon Neutral in 2050.

Some car manufacturers have plans of changing the car power from only internal combustion engine using fossil fuel to the power system of EV, FCV, PHEV, and HEV in 2030. Car companies are thinking about not only Electric but also Connectivity, Autonomous, and Shared & Service in car market of Japan, and they are going to achieve the plan of the Carbon Neutral in 2050.

The casting production of cast iron for cars are going to decrease largely in the near future, because xEV doesn't need much iron castings for engines and transmissions. Managers of almost all of the foundries need to change their basic strategies for the casting productive plans.

The JFS is going to build a long-term vision and path for developing innovative technologies, building a low carbon society, human resources development, technology exchange for industry academia government collaboration, and the structure of skill succession to young researchers, engineers and technicians.

Production amounts of castings over the past 10 years

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
in 2023	36,8%	26,8%	4,0%	0,6%	2,7%	1,2%	8,1%	19,8%	0,1%	100%

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

Monthly production amount of castings and automobiles, January 2019 to April 2024

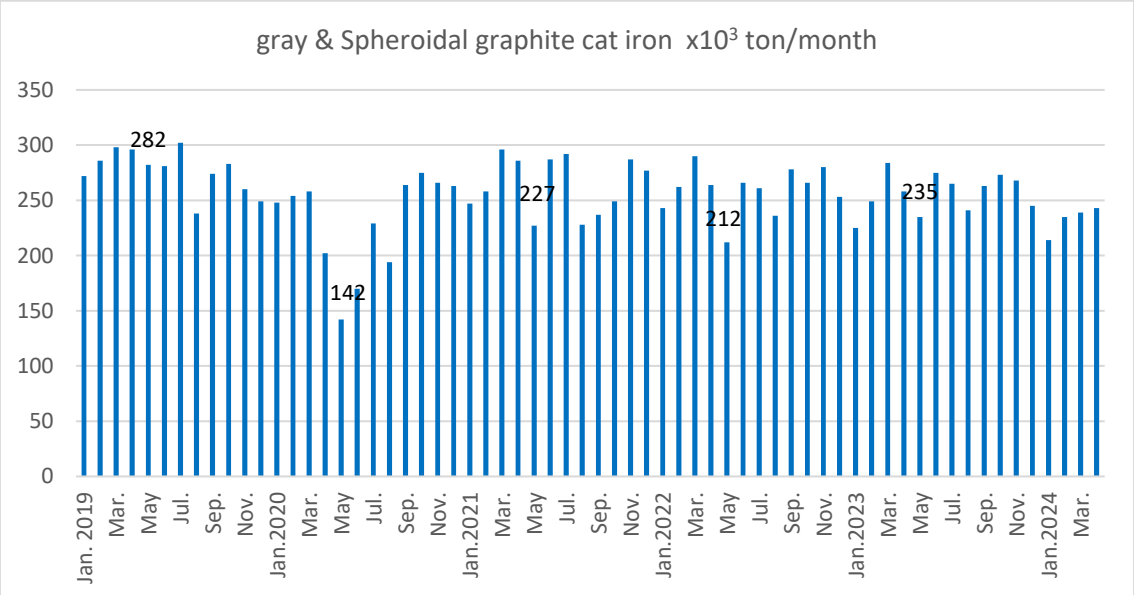


Figure 1. *Production amount of cast iron*

※ data shown are on May in each year

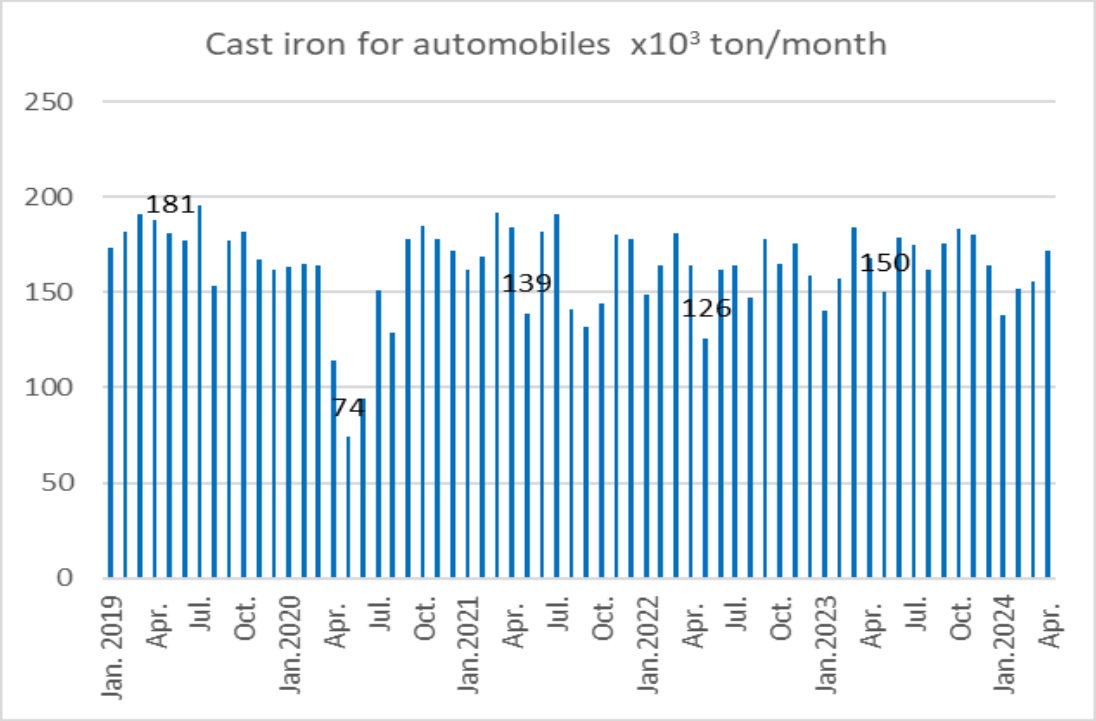


Figure 2. *Cast iron for automobiles*
※data shown are on May in each year

We find a dramatic decrease in Fig.1-6, the production amount by 50～60% in May, 2020 compared with in May, 2019, and in 2021-2023 they are recovered almost as the same production level like these figures.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
A	8,277	7,831	7,874	8,348	8,359	8,329	6,960	6,619	6,566	7,767
B	9,775	9,278	9,205	9,691	9,730	9,684	8,068	7,847	7,835	8,999

Table 2. *Production amounts of automobiles, x1,000 cars/year, (B : including truck and bus)*

The production amounts of Automobiles were down by 62% in May, 2020 compared with May, 2019 (Fig.6), and total production in 2021-2023 was 15.1% less than in 2017-2019, that was because of not only the Covid-19 but also a shortage of semiconductors and particularly decreasing of car usage in urban area. The shortage of semiconductors seems to be because of demand increase not only in car industry but also many kinds of IT equipment like PC, mobile phone, video game, etc. The production amount of cars have affected the production of each castings remarkably, because around 60～70% of castings have been used in the car industry.

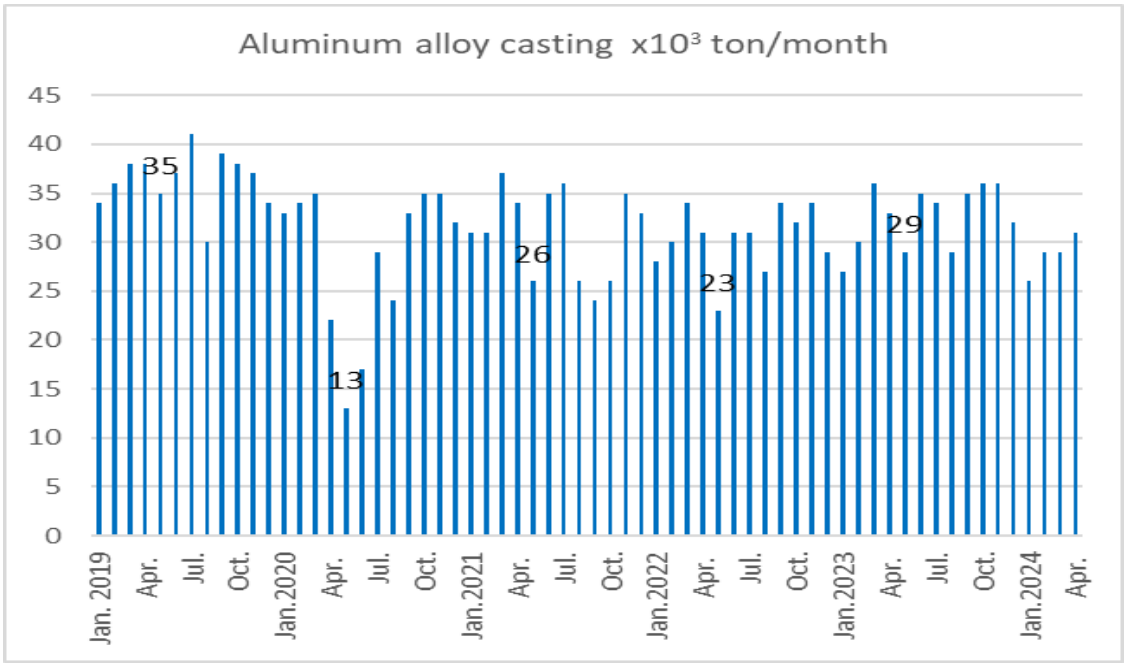


Figure 3. *Production amount of Aluminum alloy castings*

※data shown are on May in each year

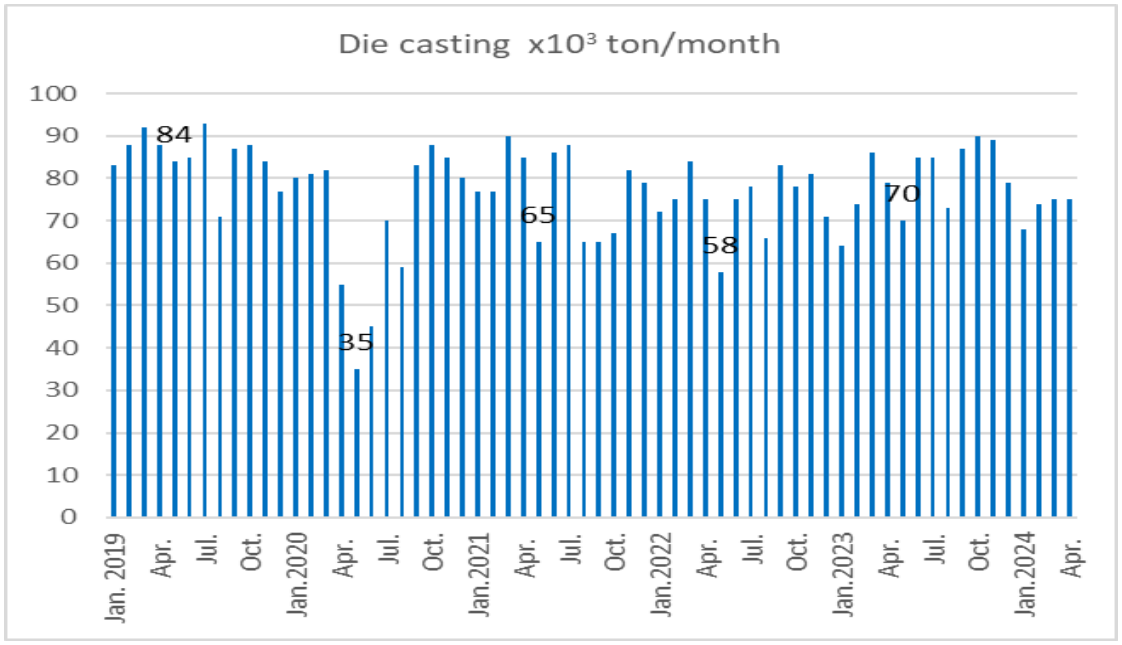


Figure 4. *Production amount of Die castings*

※data shown are on May in each year

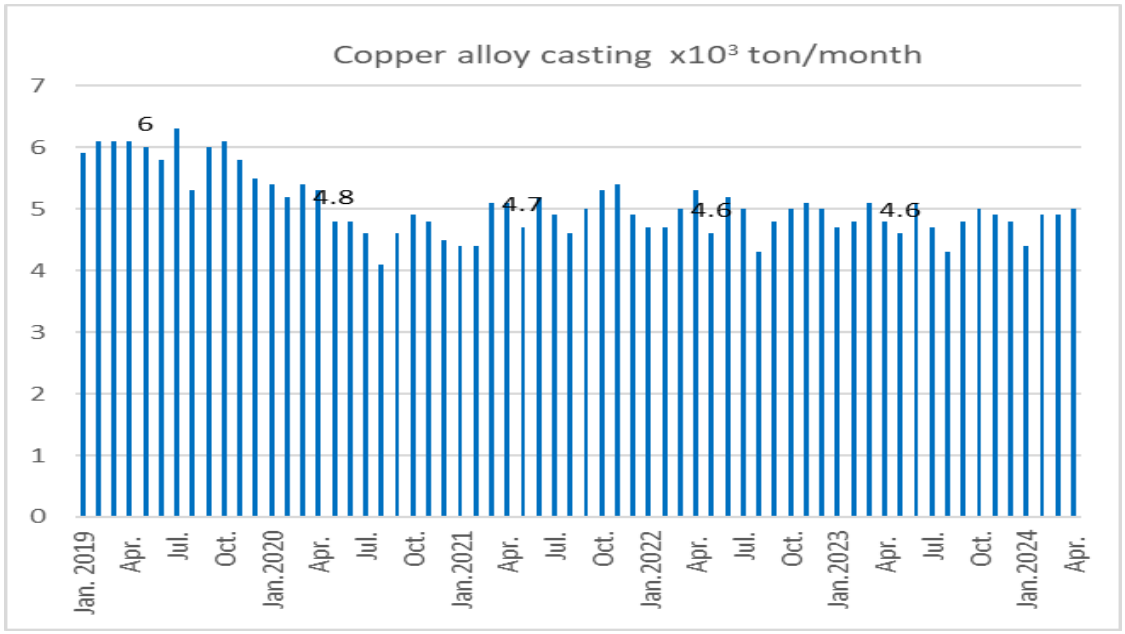


Figure 5. *Production amount of copper alloy castings*

※ data shown are on May in each year

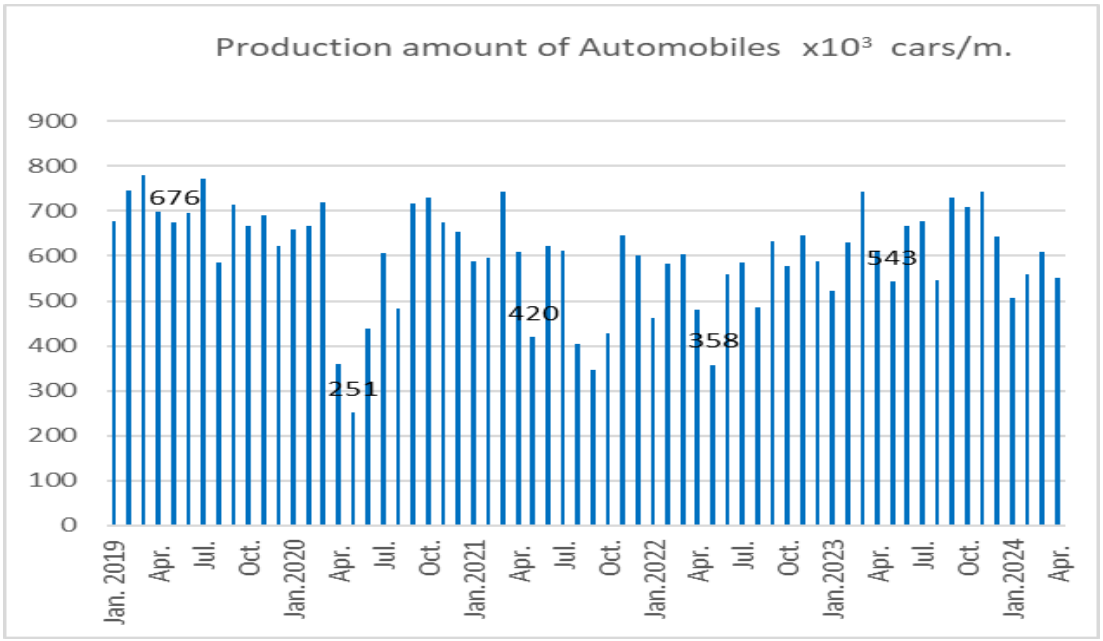


Figure 6. *Production amounts of Automobiles (family cars, 8 manufacturers in Japan) (data from the Japan Automobile Manufacturers Association site)*

Consumption of Castings in industrial sectors in 2023

Vehicle	66,0%
Industrial machines & apparatus	24,8%
Others	9,2%

Table 2.1. *Gray cast iron*

Vehicle	64,8%
Industrial machines & apparatus	25,4%
Others	9,8%

Table 2.2. *Spheroidal graphite cast iron*

Aluminum Die Castings	
Vehicle	87,7%
Other machines	9,9%
Zinc & other Die castings	2,4%

Table 2.3. *Die castings*

Transportation machines	96,0%
Others	4,0%

Table 2.4. *Aluminum alloy castings*

Construction machines	33,9%
Ship industries	16,5%
Vehicle	6,5%
Shredding machines	6,2%
Others	36,9%

Table 2.5. *Steel castings*

Industrial machines	
Valve,stopcock (include coupling joint)	33,8%
Industrial machines & equipments	16,2%
Bearing metal	13,6%
Transportation machines	27,2%
Others	9,2%

Table 2.6. *Copper alloy castings*

Iron casting production amount for car industry

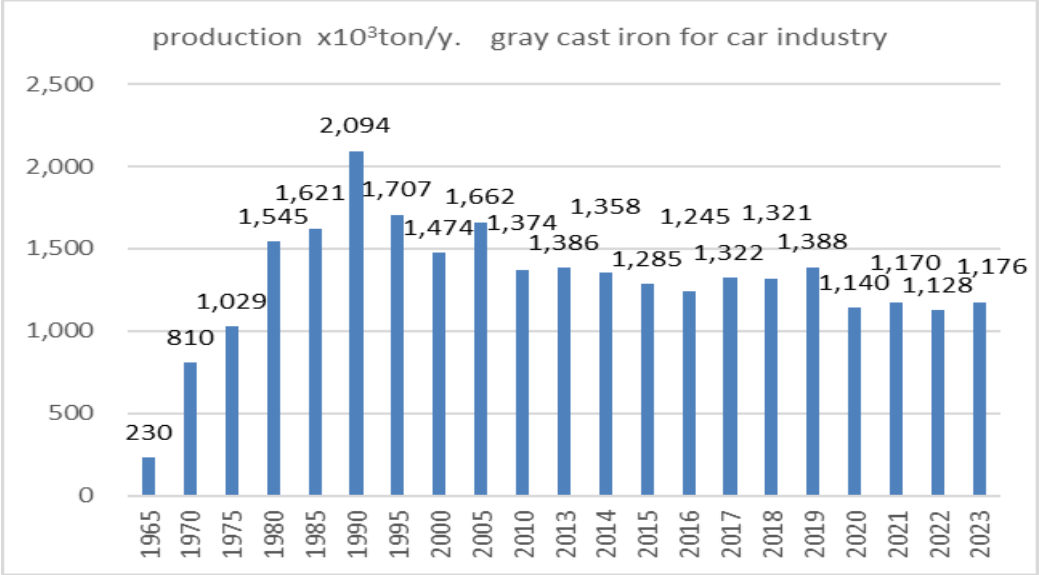


Figure 7. *Gray cast iron for car industry*

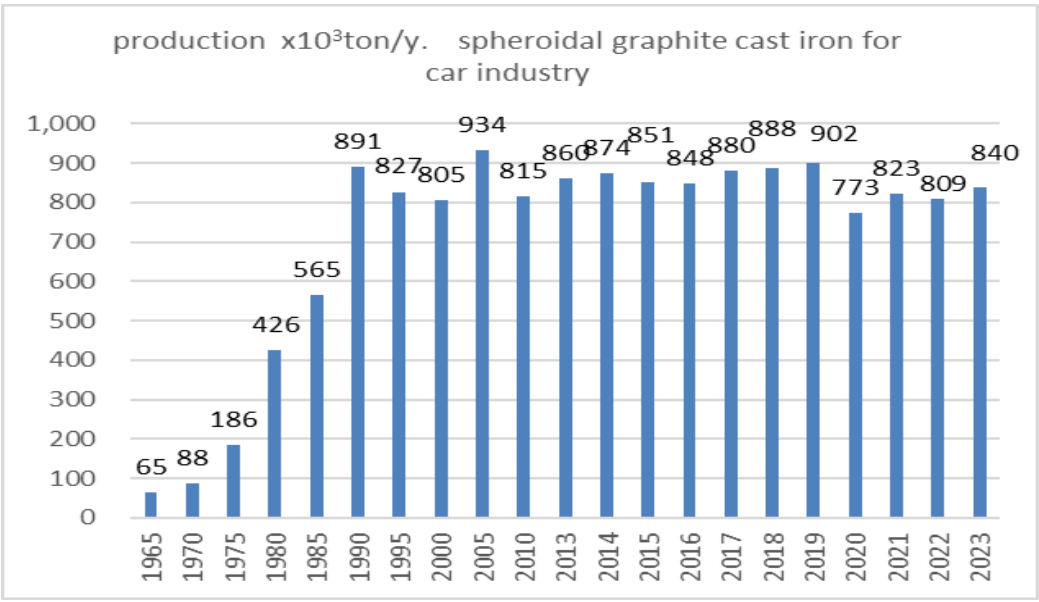


Figure 8. *Spheroidal graphite cast iron for car industry*

The yearly casting production amount for car industry increased a little up by 4.2% in 2023 of gray cast iron and by up 3.8% of spheroidal graphite cast iron like Fig.7 and 8. Iron casting production amount for car industry are decreasing gradually year by year since 1990, and spheroidal graphite cast iron keep amount even level around 8 to 9 hundred thousand tons a year. Although electric car (BEV + PHEV + FCEV, standard-sized passenger car) market share is around 3.6% this year, increasing electric car share of the market, the production of iron castings will certainly decrease.

Number of Foundries and Workforce in 2021

	Number of Foundries	Number of Employees
Cast Iron	797	29,994
Steel Castings	69	7,134
Non-ferrous Castings	520	12,719
Die Castings	614	26,175

***Table 4**. Number of foundries and workforce (for cast iron including cast iron pipe and malleable cast iron)*

Number of Employees per foundry	Number of Foundries cast iron *1		steel castings		non-ferrous castinss *2		die castings	
1～9	302	37.9%	5	7.2%	258	49.6%	230	37.5%
10～19	144	18.1%	2	2.9%	111	21.3%	121	19.7%
20～29	111	13.9%	11	15.9%	57	11.0%	83	13.5%
30～99	182	22.8%	34	49.3%	69	13.3%	116	18.9%
100～299	46	5.8%	12	17.4%	21	4.0%	56	9.1%
300～	12	1.5%	5	7.2%	4	0.8%	8	1.3%
total	797	100%	69	100%	520	100%	614	100%

**1: total number of foundries for gray cast iron, spheroidal graphite cast iron, cast iron pipe and malleable cast iron.*

**2: aluminum alloy castings, and copper alloy castings except die castings*

***Table 5.** Composition by size of foundry workforce in 2021*

Table 4 shows the number of foundries and employees, and Table 5, 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 69.9% for gray iron casting manufacturers, 26.0% for steel casting, 81.9% for non-ferrous casting, and 70.7% for die casting. (Table 5) And also, foundries with over 100 employees being 7.3% for gray iron casting manufacturers, 24.6% for steel casting, 4.8% for non-ferrous casting, and 10.4% for die casting, the Japan foundry business is largely supported by small and medium-sized foundries.

Import and Export on single Castings

year		iron pipe	cast iron tube connector	malleable cast iron tube connector	cupper alloy tube connector	steel castings as cast	other castings		total
2018	import	0.2	15.5	9.1	7.7	17.1	43.3		92.9
	export	50.3	1.4	2.1	1.7	–	9.0		64.5
2019	import	0.2	16.5	10.1	7.3	15.1	45.5		94.7
	export	6.4	0.5	1.5	1.6	–	10.2		20.2
2020	import	0.5	12.4	8.0	5.8	13.1	38.8		78.6
	export	3.1	1.4	0.6	1.5	–	9.3		15.9
2021	import	0.4	11.7	7.3	7.0	11.8	39.0		77.2
	export	2.1	0.4	0.5	2.2	–	10.5		15.7
2022	import	0.1	12.7	8.3	8.0	12.4	40.5		76.2
	export	1.6	0.4	0.7	2.4	–	11.1		16.2

Table 6. *Import and Export on single Castings【x103 ton/year 】*

Table 6 shows the amounts of castings through import and export over the last 5 years, the amount of import in 2022 was 76.2 thousand tons, and export was 16.2 thousand tons. The amounts of castings both in import and export had been reducing year by year, and main castings in import was cast iron tube connector and steel castings, in export was iron pipe as same as every year. The import was mostly from China, Korea, and Thailand, and the export was mostly to China and the USA. The amounts of single castings imported and exported was remarkably low compared with the amount of domestic production.

Import and Export on Foundry Materials (sand and bentonite)

year		silica sand	bentonite
2018	import	1,184,031	168,625
	export	6,054	7,394
2019	import	1,247,629	131,547
	export	4,727	6,777
2020	import	942,240	113,672
	export	4,120	5,610
2021	import	932,657	142,004
	export	5,878	6,886
2022	import	1,070,731	152,787
	export	4,103	7,152

Table 7. *Import and Export on Foundry Materials (sand and bentonite) 【ton/year】*

Table 7 shows the amount of silica sand and bentonite imported and exported over the last 5 years. Around 1.07 million tons of silica sand was imported in 2022 and bentonite, 0.15 million

tons, and the amount of silica sand imported was up about 15% and bentonite was up about 7% from in 2021. The exporting amount of both materials were low in every year.

The ratio of same company's consumption in production (in 2022)

	production	self-consumption	%
gray cast iron & spheroidal graphite cast iron	3,115.1	1,018.7	32.7
malleable cast iron	29.4	29.1	99.1
steel cast iron	136.6	26.5	19.4
copper alloy castings	58.9	18.2	31.0
aluminum alloy castings	363.9	237.3	65.2
die castings	898.7	287.9	32.0
precision castings	4.4	0.6	14.6

Table 8. *The ratio of same company's consumption in production (in 2022)* 【*x103ton/year*】

Many of the casting companies in Japan specialize in castings production, and they mostly don't consume their producing castings for their own company products assembled, and all of their castings are sold to another company. Some larger foundries belong to the car companies, appliance companies or constructing machine companies, are consuming their castings for their own products assembled.

Self-consumption on Table 8 means that after making castings, they are used for assembling their products in the same companies, and self-consumption ratio was 32.7% for cast iron, 99.1% for malleable cast iron, 19.4% for steel cast iron, 31.0% for copper alloy castings, 65.2% for aluminum alloy castings, 32.0% for die castings, and 14.6% for precision castings in 2022.

About 65% (total weight ratio) of castings in Japan was produced by the companies specialized in casting production.

Education for young workers (Senior Foundry Experts and Foundry Experts)

We have been educating young foundry workers with special educational course and advanced educational course on all the casting technologies since 2007, and over 1,000 experts have achieved those courses and have been working in active parts in their foundries. (Fig. 9) This course is carried out by both our society, the Japan Foundry Engineering Society and the Japan Foundry Society Inc. collaborated.

Many foundry workers have got the title of "senior foundry expert" or " foundry expert" after the completion of this specialized educational course. We call this course "Chuzo College" established in 2007 (Chuzo means casting in Japanese). They learn a specific curriculum also with on-the-job training like a technical school for one year. 39 students had achieved this course in 2022, and 83 students in 2023. They are playing a key role in the work as managers and leaders in many foundries of Japan.

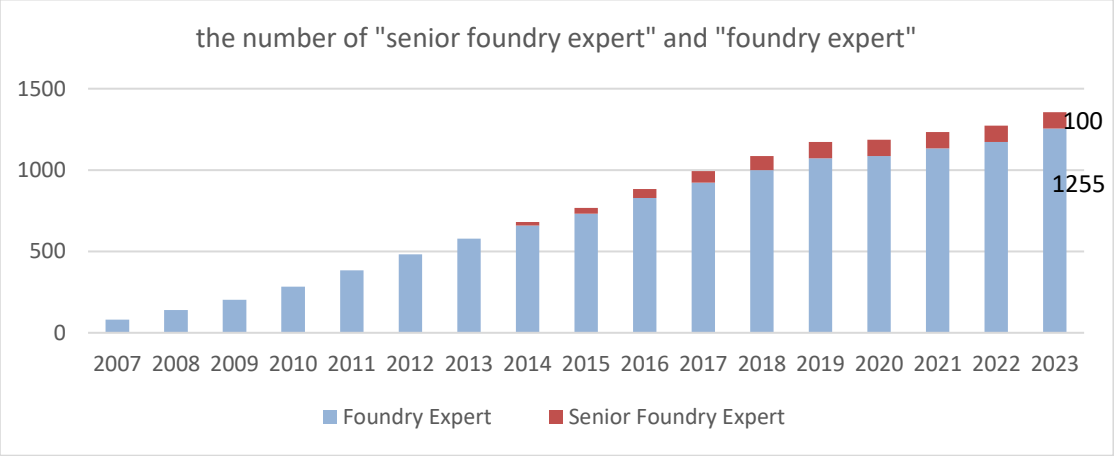


Figure 9. *Education for young workers (Senior Foundry Experts and Foundry Experts)*

Some of the problems in casting industry



Figure 10. *A jump in Iron Scrap Price (data from the Japan Iron and Steel Recycling Institute)*

Scrap price have risen remarkably, because of the reduction of domestic scrap supply due to Covid-19, increase of demand for steel companies with electric furnace, and price increase in international market etc. (Fig.10) Since September 2022, the price is running on the stabilization at a high price.

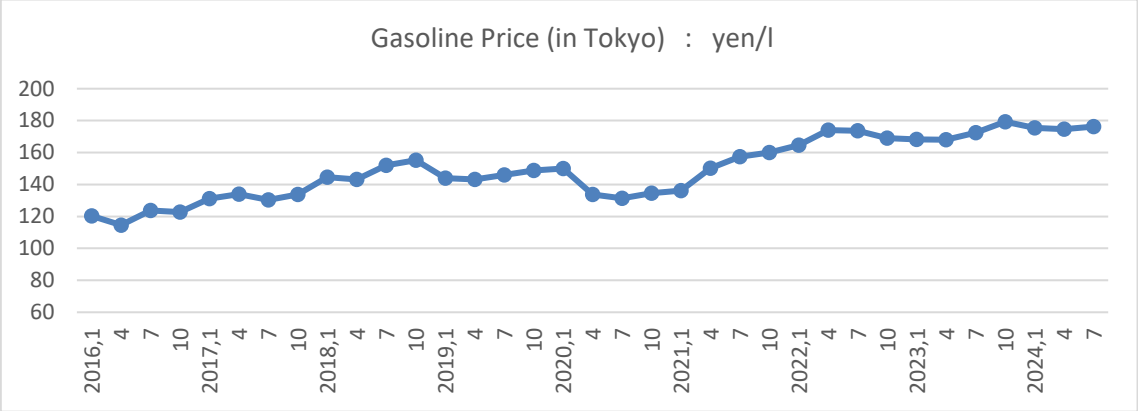


Figure 11. *Gasoline Price in Tokyo*

ref. : Ministry of Economy, Trade and Industry (Agency for Natural Resources and Energy)

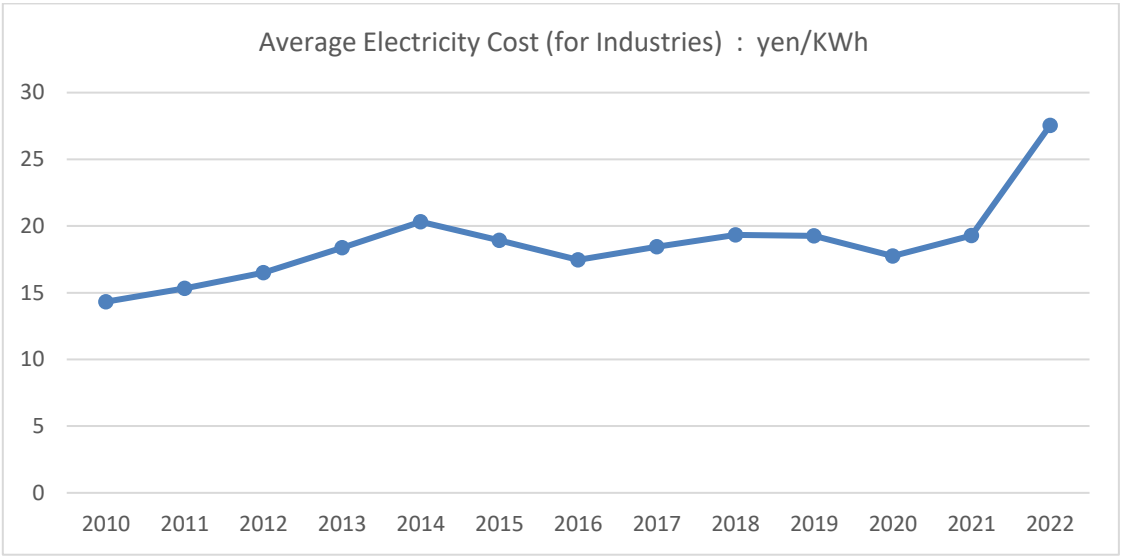


Figure 12. *Average Electricity Cost (for Industries)*

Gasoline price in Tokyo have risen by around 40% than in 2016, and average electricity cost for industries jumped in 2022. Transportation costs have been rising, and energy costs particularly for melting costs in foundry has greatly been influenced.

CO_2 Emission	Cast Iron	Steel	Light Metal	Copper Alloys
per Melting	0.52	0.81	0.78	1.18
per Product	0.94	1.46	1.24	2.00

Table 9. *CO_2 Emission from Casting Manufacturing*

CO_2 Emission amount t-CO_2/t

ref. : General Incorporated Association Japan Foundry Society, Inc., the Committee of the Carbon Neutrality

According to the research in Japan Foundry Society in 2023, CO2 emission from casting manufacturing is as Table 9. As part of the carbon neutrality planning scheme, the carbon neutrality research meeting in the Japan Foundry Engineering Society has been trying and assessing the use of bio-coke and the other alternative energy sources for cupola operation instead of coal coke.

Recent situations on the Japan Foundry Engineering Society (JFS)

The Japan Foundry Engineering Society has 8 branches, 11 research working groups, and the other committees, and hold two big lecture meetings, also the international meeting, the 16th Asian Foundry Congress, 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.

References: SOKEIZAI NENKAN 2023 edition (Annual report on the formed and fabricated materials industries by SOKEIZAI CENTER, General Incorporated Foundation)

The Ministry of Economy,Trade and Industry (Statistical Tables by Industry)

FOUNDRY PRODUCTION IN UNITED STATES

National representation in the WFO:
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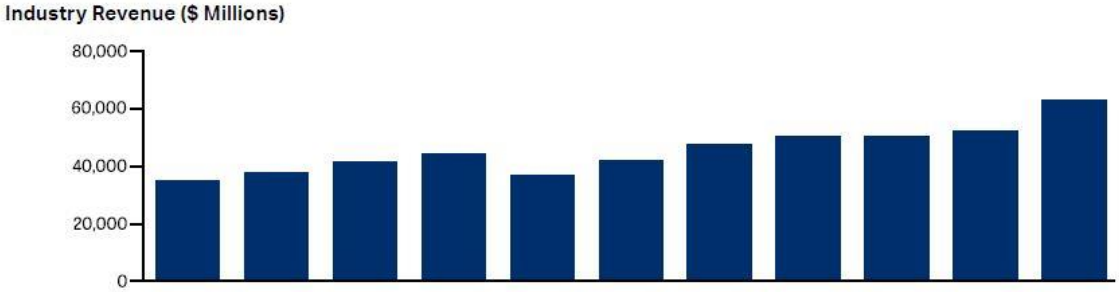
United States Foundry Industry Report

After several years of robust casting sales growth, 2024 was an unusually slow year for the U.S. Sales figures were flat or slightly down across a broad cross-section of metalcasters. However, the most recent AFS Quarterly Metalcaster Outlook Survey shows stronger optimism for 2025 and many foundries report seeing an increase in new orders since the election in November. Those reports are consistent with the *AFS Metalcasting Forecast & Trends* which projects a return to more traditional sales-growth patterns for the next several years.

The American foundry industry experienced a notable 5.3% increase in revenue in 2023, capping a 4-year period of recovery and growth following the disruptions caused by the COVID-19 pandemic and the subsequent global supply chain issues. This uptick in performance is largely attributed to the increasing demand for castings in key sectors such as automotive, aerospace, industrial machinery, and construction. However, despite these positive growth trends, the industry is facing several challenges and implementing new technologies in coming years that will undoubtedly affect its long-term prospects.

Revenue Growth in 2023

In 2023, foundry industry growth was driven by an increased demand for high-quality US made castings, particularly in the automotive industry, which saw a recovery in vehicle production. Likewise, the aerospace and industrial machinery sectors contributed to demand, as companies sought castings for components used in everything from turbines to heavy equipment.



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	50,262	52,373	62,695
Annual Growth		6.2%	9.3%	7.1%	-17.1%	15.2%	12.5%	5.3%	0.4%	4.2%	4.6%
Compound Annual Growth Rate				5.9%	3-Year	2.6%	5-Year				

Figure 1. *Industry revenue*

This revenue boost also reflects a broader trend of reshoring and onshoring manufacturing processes in the U.S. As global supply chains are reevaluated for resilience, efficiency and security, there has been a concerted effort to bring critical manufacturing back to American soil, benefiting foundries that serve critical industries that were disrupted in 2020.

Challenges Facing the Industry

Despite the revenue growth, the U.S. foundry industry continues to confront several challenges that could dampen its long-term prospects, including labor shortages, increasing operating costs and regulation and compliance issues.

Labor Shortages

One of the most significant issues facing the American foundry industry is a persistent labor shortage. Skilled workers, particularly those with expertise in casting, molding, and metalworking, are in high demand but short supply. This gap is exacerbated by the aging workforce, with many experienced workers nearing retirement and insufficient numbers of younger workers entering the field. The labor shortage leads to operational inefficiencies, delays, and increased labor costs, which impact profit margins. A recent survey of AFS corporate member foundries revealed that 30% are facing critical labor shortages.



Year	2016	2017	2018	2019	2020	2021	2022	2023	2024 est.	2025 fcst.	2029 fcst.
Rev. per Emp. ($)	213,207	238,684	257,057	272,025	240,302	257,639	269,750	274,254	274,925	283,731	328,032
Annual Growth		11.9%	7.7%	5.8%	-11.7%	7.2%	4.7%	1.7%	0.2%	3.2%	3.7%

Compound Annual Growth Rate	2.2%	3-Year	0.2%	5-Year



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	184,586	191,124
Annual Growth		-5.2%	1.5%	1.2%	-6.2%	7.4%	7.4%	3.5%	0.1%	1.0%	0.9%

Compound Annual Growth Rate	3.7%	3-Year	2.3%	5-Year

Figure 2. *Productivity*

Operating Costs Rising

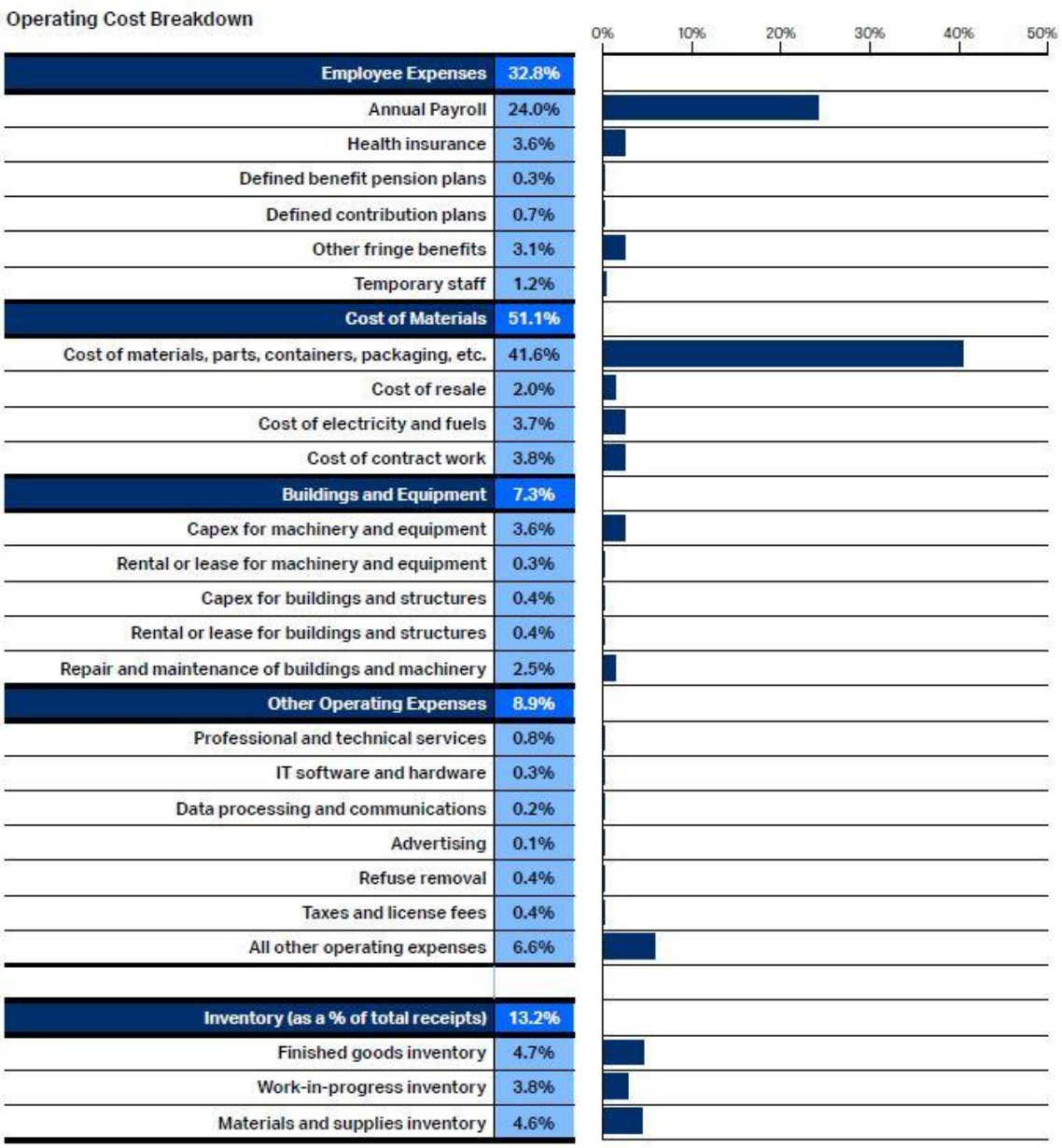


Figure 3. *Operating cost breakdown*

The foundry industry has faced several increasing costs in the past year including energy prices and rising insurance premiums. Energy has always been a major cost center for metalcasters in the U.S. and there is concern that the rise of energy intensive data centers related to Artificial Intelligence will drive up demand and prices. Additionally, property and casualty insurance costs have continued to rise as the number of underwriters has decreased in the past two years. This is one more reason for foundries to modernize, making themselves more efficient, profitable, safer, and more insurable. A recent survey of corporate members of AFS indicates that 65% of foundries will be making capital investments of more than $250k in 2025.

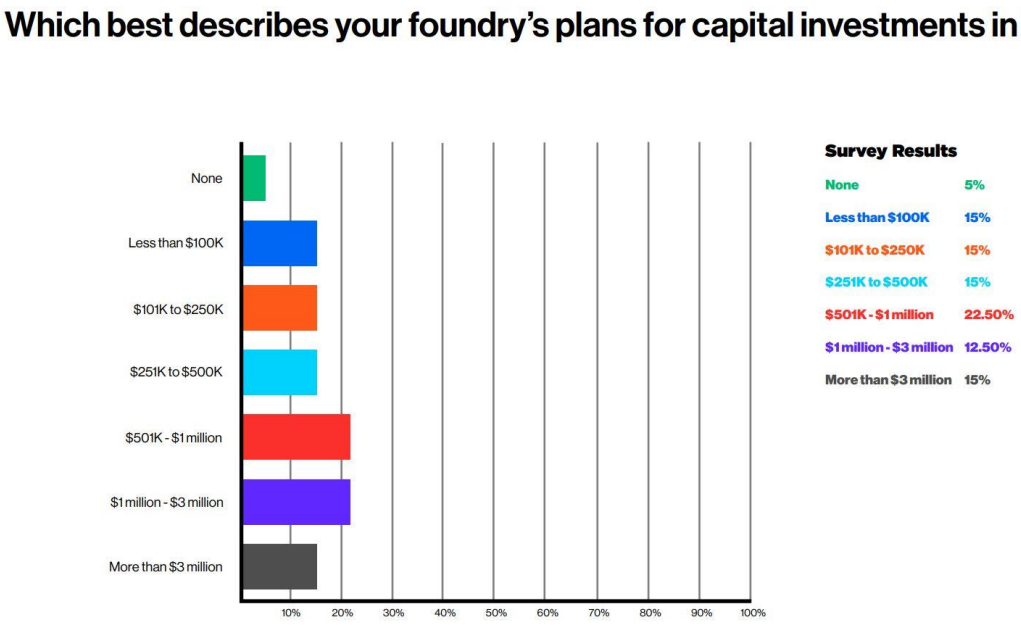


Figure 4. *Survey, capital investments planned for 2025*

Regulation and Compliance

The foundry industry is also under pressure from stringent environmental regulations, particularly those related to emissions and waste management. Compliance with increasingly strict environmental standards, such as those set by the Environmental Protection Agency (EPA), requires substantial investment in technology and infrastructure. Meeting these regulatory requirements can be costly, particularly for smaller foundries that may not have the resources to adopt new technologies or upgrade their facilities. The industry remains optimistic that regulatory compliance will be reduced in the coming years under a new presidential administration.

Opportunities: Industry 4.0, Automation, and Additive Manufacturing

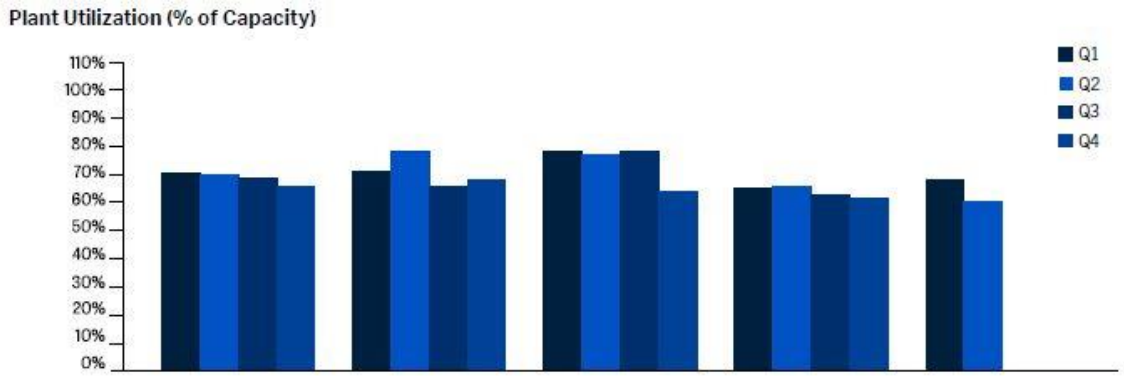
Despite these challenges, there are several key opportunities for gains in efficiency and cost reduction on the horizon for the American foundry industry, particularly in the realms of Industry 4.0, automation, and additive manufacturing.

Industry 4.0

The adoption of Industry 4.0 technologies—such as advanced sensors, data analytics, and cloud computing—offers foundries the ability to optimize operations. Smart foundries are achieving greater efficiency through real-time monitoring, predictive maintenance, and improved supply chain management. Many of these technologies are now being integrated directly into the equipment offered by OEM's and in some cases allow for remote monitoring and maintenance support. By leveraging these technologies, foundries can reduce costs, improve quality control, and increase production.

Automation

Automation is one tool U.S. foundries are using to improve productivity and address labor shortages. Robotic systems, automated material handling, and AI-driven casting processes are significantly reducing the need for manual labor and in the process they are streamlining operations, and minimizing human error.



	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	-
Q4	65.2	68.8	64.9	61.9	-

Figure 5. *Plant utilization*

Additive Manufacturing

Additive manufacturing represents a disruptive force in the foundry industry. At one point additive was a threat to the industry, proposed as a means of creating metal components, but the reality is that it is much better suited as a complimentary tool in otherwise traditional foundry processes. Using 3D printing, foundries are printing sand molds, cores, tooling, prototypes and even shells used in investment casting. Additive manufacturing is reducing costs and production time while also allowing greater design flexibility in some new markets for foundries, particularly in industries such as aerospace and automotive, where lightweight, intricate components are in high demand.

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 99,037.

Employment

Head count has increased 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 improvement in customer orders before committing on 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 critical levels due to energy shortage. Commodities prices have reduced across most products.

Cost development

Increase of wages largest impact on cost of operating Foundries during 2023. Minimum wages increase 3.75%. In general employees are being paid more to retain as many make career changes out of the industry.

Outlook 2025

The reserve bank has stabilised interest rates which has been the biggest concern for business confidence and potential projects over the next 12 months. 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.

FOUNDRY PRODUCTION IN BELARUS

National representation in the WFO:
ASSOCIATION OF FOUNDRYMEN AND METALLURGISTS OF THE BELARUS REPUBLIC
WWW.ALIMRB.BY

ECONOMY AND FOUNDRY INDUSTRY

The Republic of Belarus is an export-oriented country with well-developed manufacturing industry, services sector and agriculture. Belarus adheres to the concept of a socially-oriented market economy, which has proved its viability and efficiency. Overall, in 2010-2023, the country's GDP expanded by 18.3% in comparable prices, with productivity growing by 28.2% over the period. Gross domestic product per capita based on purchasing power parity increased from $15,400 in 2010 to $20,100 in 2019.

The Republic of Belarus improved its positions in a number of international rankings, which are important indicators of the country's development in certain areas for foreign investors and creditors. Belarus has made great progress in sustainable development which is evidenced by the country's high positions on the SDG Index and Dashboards Report prepared by Bertelsmann Stiftung International Foundation and the UN Sustainable Development Solutions Network. Belarus ranked 34th (76.00 points out of 100) and received an above-average rating for Eastern Europe and Central Asia (the ranking covered 166 countries and used about 100 indicators to measure the progress towards the SDGs). On the Human Development Index, which is a well-recognized tool for comparing the living standards in different countries, Belarus ranks 60th out of 191 countries and is in top tier of countries with the very high level of human development, according to the UN classification. Belarus goes 78th (out of 167 countries) in the Legatum Prosperity Index 2013. Belarus ranks 29th on education and 43rd on living conditions. The country's position on economic quality was 45th. The study ranks more than 2,500 universities based on six indicators: research, quality of teaching, employers' opinion and career potential, the number of international students and teachers. Belarus was ranked 58th out of 193 nations on the United Nations E-Government Survey 2022. On the E-Participation index, which assesses the engagement and collaboration between governments and citizens, Belarus was 90th in 2022.

Belarus is an export-oriented country, the export of goods and services in 2020 amounted to about 60% of GDP. The main trading partners are Russia and the European Union.

Belarus has a well-developed industry. A quarter of GDP is created by industry, the country is among the world's leading manufacturers and exporters of large-capacity dump trucks, tractors, road construction equipment, household refrigerators, agricultural machinery. The share in the global production of large-capacity BELAZ dump trucks is about 30%, agricultural combines-about 15%, tractors - about 5%. The production of tractors, large-capacity dump trucks and

other products in 2023 practically did not change compared to 2022, and the production of buses, refrigerators and some other products increased.

The foundry industry is not a separate industry in the Republic of Belarus, but it is the main base of most branches of mechanical engineering and has a significant impact on the country's economy.

In general, there are about 140 foundries and workshops in the republic. The total installed capacity for the production of castings is 303,56 thousand tons.

According to the established annual production capacity of castings, all organizations with foundries can be divided into four groups:

- Group I – 50 thousand tons per year or more: three organizations: Minsk Tractor Plant (OJSC "MTZ"), Minsk Automobile Plant (OJSC "MAZ"), OJSC Gomel Foundry " Centrolit";
- Group II – from 10 to 50 thousand tons: seven organizations;
- Group III - from 1 to 10 thousand tons: 17 organizations;
- Group IV - less than 1 thousand tons.

A distinctive feature of the foundry enterprises of the republic is a large range of castings produced - more than 15 thousand names from 18 grades of alloys, the mass of castings is from 20 g to 15 tons.

It should be noted that most of the castings are made by casting into sand-clay molds. For the manufacture of casting rods, various processes are used, such as Cold-box-amin, hot boxes, the Croning process, various variants of the no-bake process (Alphaset process, Resol-CO_2, etc.). The distribution of casting production volumes by types of alloys is as follows: gray cast iron - 65.6%; steel - 20.2%, high-strength cast iron - 12%, aluminum alloys - 1.6 %, other alloys - 0.6%.

The companies have implemented international quality standards. In 2023, the capacity utilization of the plants was approximately 99 %, or 301 thousand tons were produced in real terms.

According to official sources, the total amount of financing for machine-building enterprises, including those with their own foundry and metallurgical production, will amount to 8.5 billion euros in the period up to 2030.

It is planned to invest $ 500 million for the development of JSC "MAZ". It is planned to invest $ 800 million as part of the investment program for the development of JSC "BelAZ". It is planned to finance other enterprises within the holding of OJSC BelAZ in the amount of $ 234 million for the development of the production of trucks with a load capacity of 90 to 450 tons and other projects.

In order to provide the machine-building industry of Belarus with metal of its own production, it is planned to invest $ 800-850 million in OJSC "BSW" (Belarusian Metallurgical Plant or Belarusian Steel Works).

OJSC " MTZ " plans to carry out a deep modernization of production until 2030, the plant needs investments in the amount of $ 2.0 billion.

The high competitiveness and good price/quality ratio of the products of the foundry industry of Belarus are confirmed by deliveries to the various countries all around the world, which requires the implementation of numerous technical, environmental and other world standards.

In connection with the launch of the Belarusian Nuclear Power Plant (NPP), it is planned to reduce the cost of electricity tariffs, which will allow the energy-intensive foundry and metallurgical production of Belarus to increase the competitiveness of its products.

The Association of Foundrymen's and Metallurgists together with the Belarusian National Technical University has been holding an International Scientific and Technical Conference «Foundry Production and Metallurgy» annually since 1993. Belarus".

These conferences are attended by specialists from many countries of the world, but in connection with the epidemic, the basis is made up of representatives of Belarus, Chine, Russia and other countries – former participants of the USSR.

In 2024, the International Scientific and Technical Conference «Foundry production and Metallurgy. Belarus. 2024» is planned to be held in Minsk on November 21 – 23.

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

In 2023 from middle of Year, Croatian foundries are in general faced with lower order incomes for their productions. 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. View for 2024, is not bright at all. We expect that nothing significantly better situation will not be in first half of 2024. Year.

Additionally important fact is still high inflation in Croatia (lower then in 2022), on yearly base from 4,5%. (source: DRŽAVNI ZAVOD ZA STATISTIKU - REPUBLIKA HRVATSKA (dzs.hr))

Pressure for salary increase growing.

Available workforce (number and qualifications)

The number of employees in the metal casting subsector decreased by 2.4% in 2023 Year. Large companies employ 53.30% of the total workforce in the subsector, medium-sized companies 37.05%, small companies 7.11%, and micro companies 2.54%. (source: HGK Zagreb)

Still is difficult to find any workforce for foundries, especially at least partially educated, even conditions for employees are improving. Foundries in Croatia are more and more oriented to search for workforce out of former Yugoslavia countries, from long distance countries, like i.e. India, Philippines, Nepal.

Trends in industrial and foundries production in 2023 and comparison with the previous year

In 2023, the total revenue of companies within the metal casting subsector amounted to EUR 290,591,588.47, representing a decrease of 3.28% compared to the previous year, where revenues stood at EUR 300,461,086.40. Conversely, the total revenue of the national manufacturing industry saw a growth of 3.52% over the same period, increasing from EUR 34,505,253,268.00 in 2022 to EUR 35,720,067,345.74 in 2023. (source: HGK Zagreb) At the national level, the number of companies within the subsector decreased from 55 to 53. The subsector comprises four large companies, five medium-sized companies, twelve small companies, and thirty-two micro companies.

With continuously increasing interest from Croatian foundries for participating in CroFa questionnaire (now 25 foundries on voluntary base, including practically all big, medium size),

production data show the highest numbers in last four years, when we start again with active polling.

Industrial production comparing with 2022. it was in 2023, with more oscilations. (source: Web | Državni zavod za statistiku (dzs.hr))

Outlook 2024

Like small country, strongly export oriented, we depend a lot on general situation in Europe and the world. Due 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/or lower quantities of orders from customer sides, probably will continue in such environment. Any positive trend(s) are not visible.

Foundry production in Republic of Croatia in 2022/2023

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)*

Analysed year	2019			2020			2021			2022			2023		
Number of foundries (respond on survey)	16			18			19			23			25		
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
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
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
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
TOTAL	74.862.606	100		91.682.253	100		95.752.159	100		70.130.728	100		109.989.608	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
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
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
Malleable iron	9.750	0,03	3	20.667	0,08	3	0	0		465.000	1,29	3	5.000	0,01	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
TOTAL	29.001.800	100		25.624.668	100		34.856.900	100		35.976.000	100		35.054.363	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
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
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
Manganese	9.750	12,66	2	20.667	17,34	4	0	0		5.000	10,42	3	5.000	20,25	4
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
TOTAL	77.000	100		119,168	100		59100	100		48.000	100		24.696	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
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
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
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
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
TOTAL	45.783.806	100		65.938.421	100		60.836.159	100		34.106.728	100		74.910.549	100	

Table 3. *Comparison of foundry production in Republic of Croatia, 2019-2023 Year*

FOUNDRY PRODUCTION IN CZECH REPUBLIC

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

Financial situation overview in the Czech Republic in 2023 [1]

For the full year 2023, GDP fell by 0.3%. Households were struggling with high inflation, so their real consumption fell further. Investment activity was affected by economic problems in euro-area countries and restrictive monetary conditions, but public spending and projects co-financed by EU funds, mainly from the previous financial perspective, had a positive impact. Weaker year-on-year inventory accumulation slowed the economy noticeably. This factor, together with the unwinding of problems in supply chains, boosted exports, while imports declined slightly due to generally weak domestic demand. The contribution of the external trade balance to GDP growth was thus significantly positive – Fig. 1.

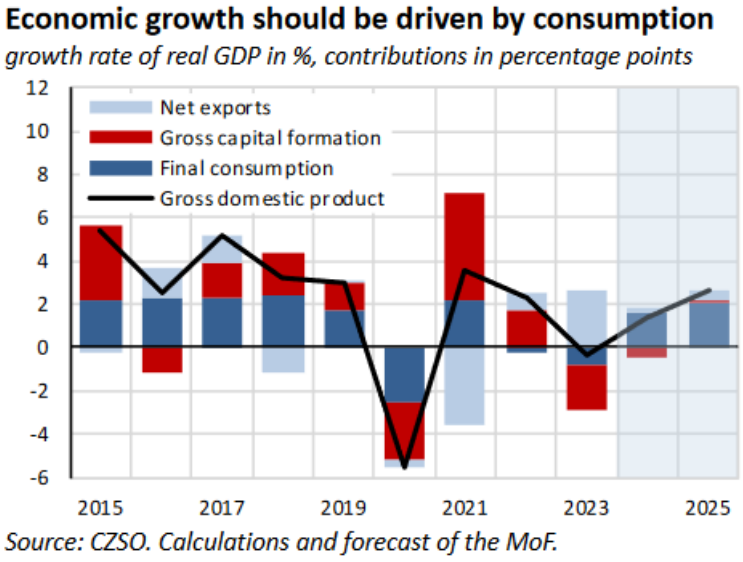


Figure 1. *GDP evolution and forecast in Czech Rep.*

Annual inflation had reached the Czech National Bank's inflation target for the first time in three years at the beginning of this year and should remain below the upper boundary of the tolerance band throughout the year, with the exception of the last quarter. The previously strong inflationary external supply factors have weakened significantly, and domestic demand pressures will be further dampened by higher monetary policy rates during the year, which is further supported by the restrictive effects of the fiscal consolidation package. The average inflation rate could thus fall to 2.7% this year and 2.4% in 2025 – Fig. 2.

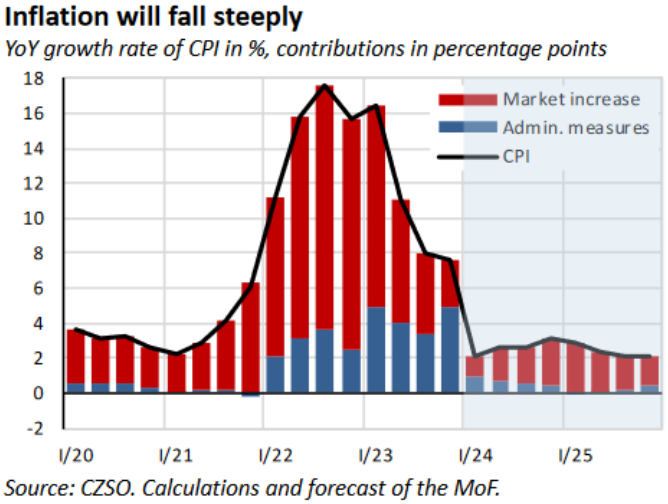


Figure 2. *Inflation evolution in Czech Rep.*

Labour market imbalances related to labour shortages continue to manifest themselves. As a result, despite the weak economic momentum, the unemployment rate should not rise much in 2024. It could increase from 2.6% in 2023 to 2.8% this year, before declining slightly in 2025 thanks to economic growth. The persistent tensions in the labour market will not allow nominal wage growth to slow significantly. Earnings will also rise in real terms after two years of decline.

Industrial production surprised positively in December 2023, rising by a strong 2.8% month-on-month and the year-on-year decline eased from -2.7% in November to -0.7% (Fig. 3) , while the analysts' consensus had expected a decline of 3%. However, December last year had 2 fewer working days than a year earlier and, excluding the aforementioned calendar effects, the year-on-year decline in the industry was 6% and closer to market expectations (-7%). December's month-on-month growth was driven mainly by the production of automobiles, machinery and computers. For the full year 2023, the industry fell by 0.4% (Fig. 4), but if it had not been for double-digit growth in the automotive sector, it would have fallen by around 3%. Thus, a whole range of sectors experienced a noticeable decline in 2023. While the outlook for the industry is more optimistic for 2024, with the consensus of economists expecting growth of around 2% for the time being, the start of the year has so far failed to deliver a turnaround, with the industry continuing to face a decline in production and new orders.

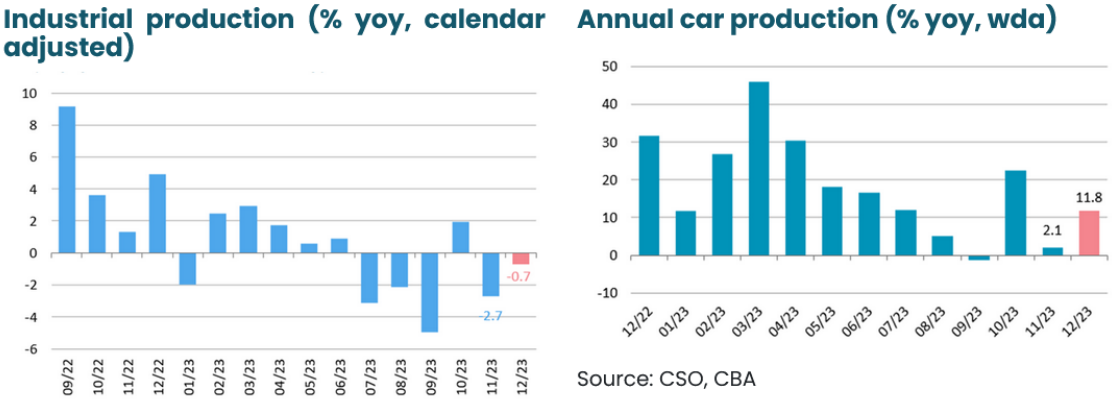


Figure 3. *Industrial production evolution and car production in CR*

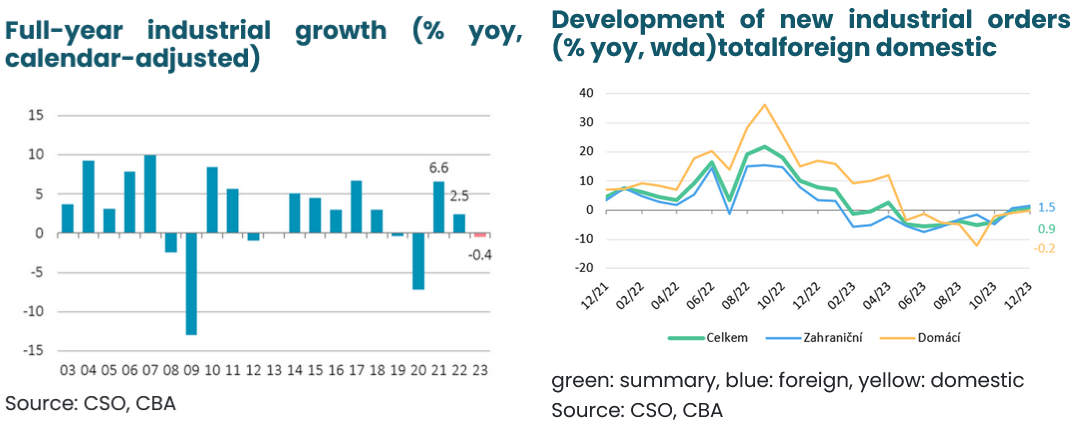


Figure 4. *Industrial growth and new orders development*

Foundry production and trends in the Czech Republic [2]

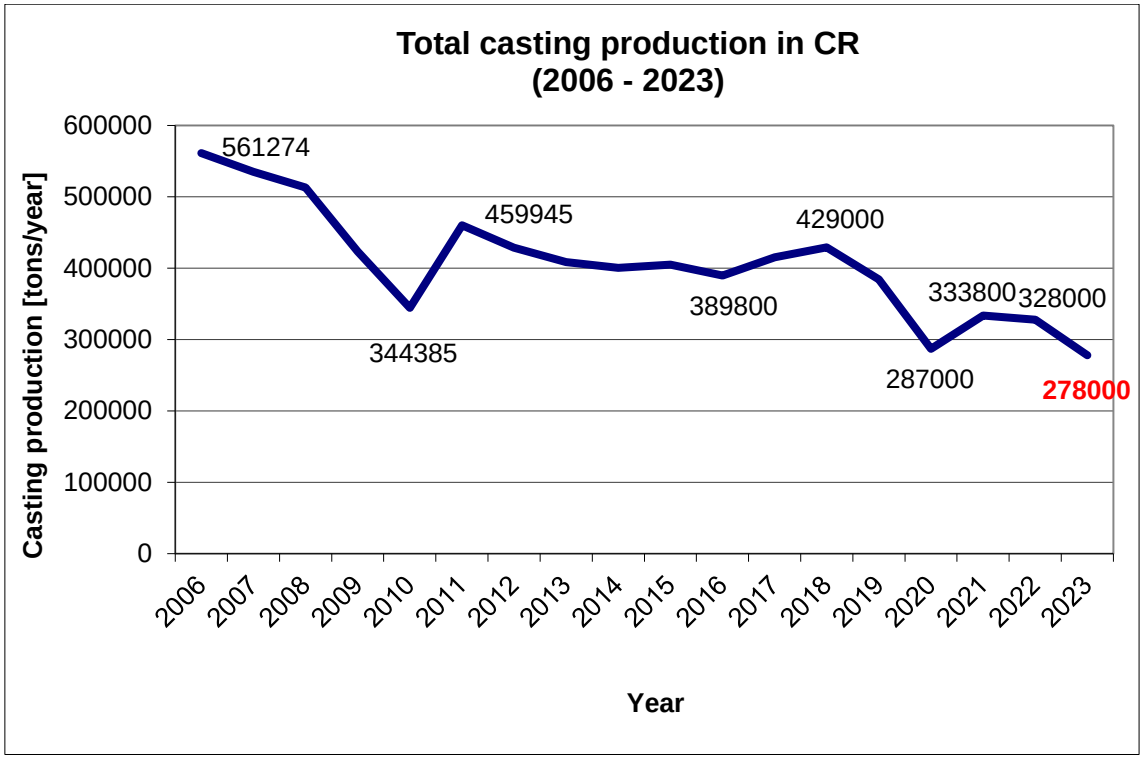
The foundry industry in the Czech Republic experienced a recession in 2023 caused by a slump in order content. Inflation had a strong impact on the competitiveness of our foundries. Last year was not easy at all for the foundry industry and in terms of performance it again recorded a decline of 15% in volume terms – Tab.1. Foundries increased prices, but not all customers accepted them. Gradually, the order content decreased. Thanks to the increase in selling prices, the turnover of most foundries remained at the level of the previous year despite the decrease in production. However, the profitability of foundries has declined compared to 2022. If there are no profits, it is difficult to meet obligations, which is the case of foundries, where the owners decided last year to stop production or sell the company.

Now let's take a look at how individual branches of foundry production performed last year. The total production of Czech foundries was 278,000 tons – Graph 1. The worst situation occurred in the last months of the past year, which foundries dealt with by shortening the working week to three production days or by weekly shutdowns. In December, many of them ceased production in the second week. This year, they didn't start again until the tenth day, which is a

month-long shutdown! It is difficult to make up for this deficit by raising prices. Other foundries in Europe are also struggling with this situation in general, but governments are helping here by introducing "Kurzarbeit" or reducing fees for renewables. It is surprising why nothing like this is happening in the Czech Republic?

Fe metals castings		2023/2022	Non-ferrous metals castings		2023/2022
GJL	110,000 t	-20 %	AL+Mg	83,000 t	- 6 %
GJS	33,000 t	-16 %	Cu	15,000 t	- 12 %
Steel	37,000 t	- 19 %			
Total production Fe	180,000 t	- 19 %	Total production Non-ferrous	98,000 t	- 7 %
Total production	**278,000 t**		**2023/2022**	**-15 %**	

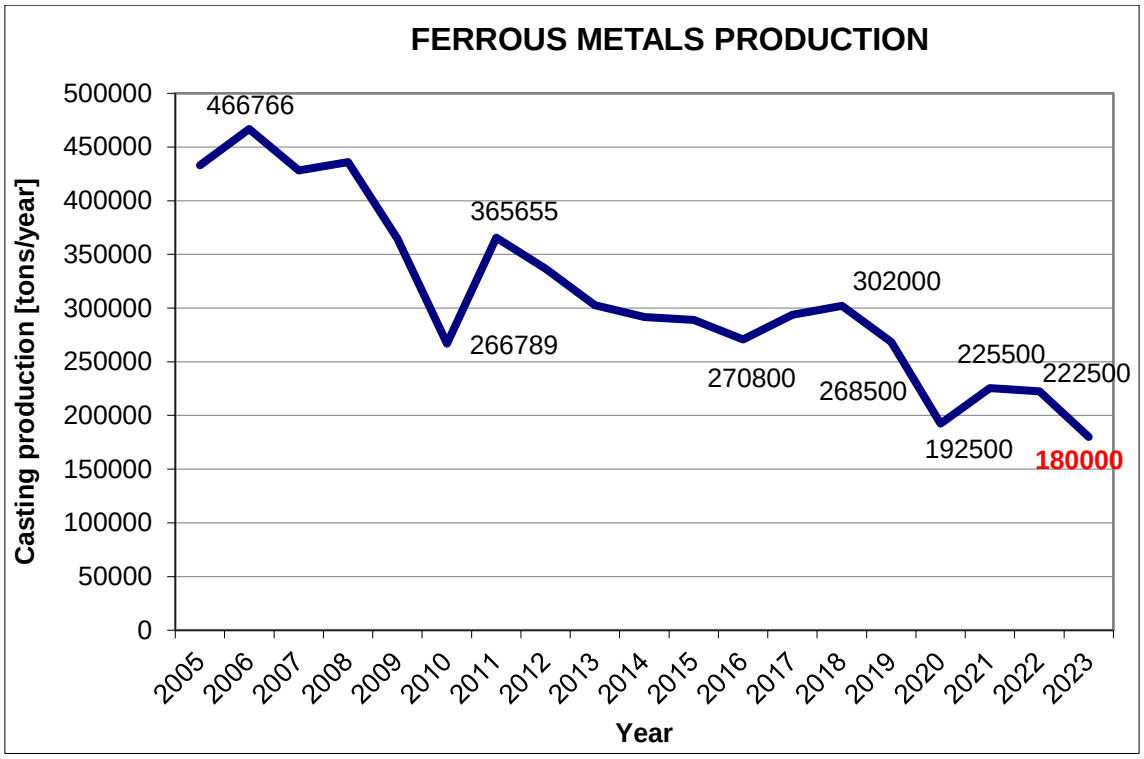
Table 1 *Foundry production in the Czech Republic in 2023*



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

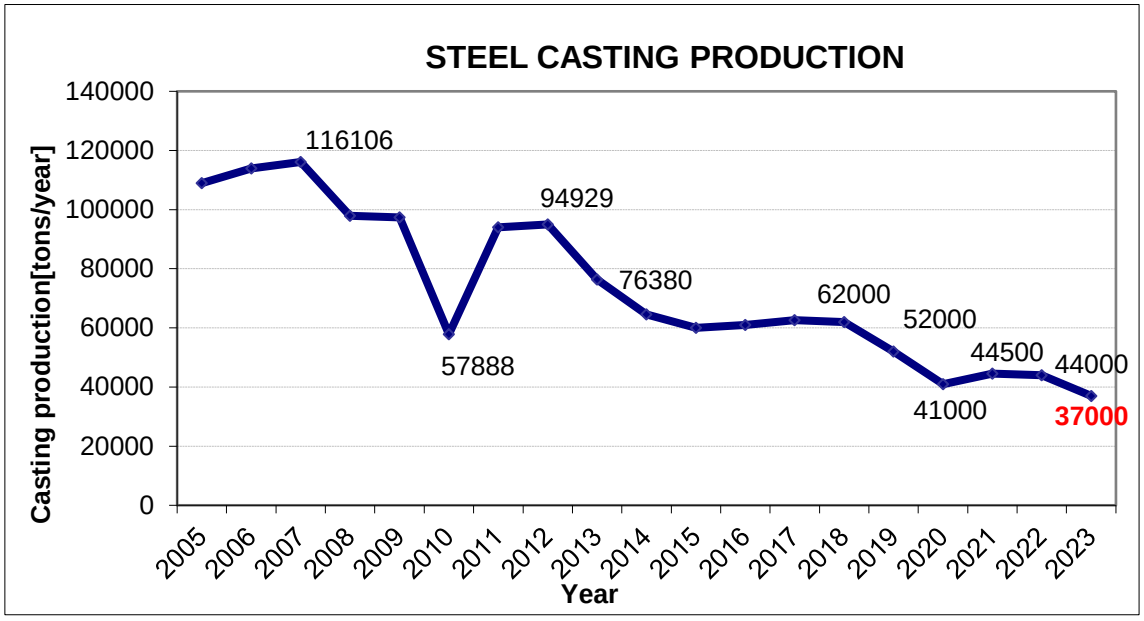
The foundry production of iron-based castings decreased to less than two hundred thousand tonnes last year. This is the second time in the history of the Czech foundry industry. The lack of orders in Europe was reflected in a decrease in the number of small-batch and piece orders heading to the Czech Republic. The piece production of heavy castings, which remained abroad and stopped being ordered from us, was significantly reduced. Orders of the low weight category were sent to the Czech Republic. Czech engineering, which is a major customer of castings, also

stagnated. The production composition of castings in Czech foundries prevented the growth of labour productivity, which is the only way to reduce prices and, as a result, to reduce inflation. The substitution of raw material sources brought about a new phenomenon in the form of chemically diverse and often different inputs, which easily fluctuated the stable quality of production.



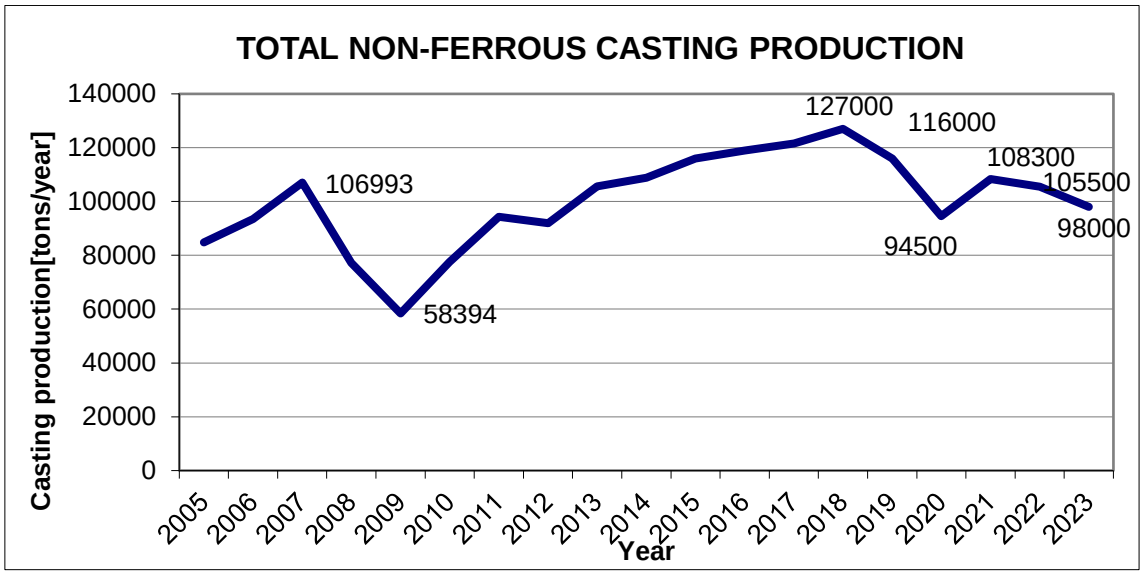
Graph 2. *Total casting production in the Czech Republic – Fe metals (2005 – 2023)*

The production of steel castings (Graph 3) is directed towards alloyed materials. However, the price of alloys for steel is skyrocketing and designers are looking for other solutions. Carbon steel is gradually being replaced by spheroidal graphite cast iron. For the last four years, steel production has been around 40 thousand tons per year. A huge and fundamental impact on the production of steel castings was the termination of the production of the largest giants Vítkovice Heavy Machinery and Pilsen Steel. Heavy castings were obtained by competitors from England and Germany. It was all the worse for us because the castings from these foundries were linked to direct domestic engineering production. Another effect of the decline is the focus of engineering products on Russia, with which trade has ceased. Steel foundries are heading to Western markets, where it is not easy to succeed in terms of price.



Graph 3. *Steel castings production in the Czech Republic (2005 – 2023)*

The future of castings lies in light metals. Aluminum alloys are dominant for the automotive industry and are the workhorse of pressure foundries. The gradual shift to electric mobility is leading to further challenges for the foundry. The demand of automotive manufacturers for structural castings is increasing, but they are very risky in terms of return on investment and the uncertainty of market fluctuations. Automotive manufacturing around the world is increasing the use of magnesium in construction in an effort to continuously reduce the weight of vehicles, especially battery vehicles. In the Czech Republic, 98,000 tonnes of non-ferrous metal castings were produced last year (Graph 4). This meant a decrease of about 10%. For aluminium alloy castings, the decrease was about 7%. For heavy copper-based non-ferrous metals, this drop was about 12%.



Graph 4. *Total casting production in the Czech Republic – non-ferrous metals*

Aluminium alloy die foundries, like others, have to face price pressures. The sustainability of automotive production in Europe has an impact on the order content, as it has to withstand strong competition from Asian manufacturers who are pushing into our markets. Unfortunately, European legislation is playing into their hands. Modern technology in "pressure" foundries has the advantage of high labour productivity, but the market is experiencing a recession and competition is fierce. Companies fight for every order in a similar way as in the case of ferrous casting foundries.

The beginning of 2024 looked good in terms of order content. Foundries experienced an increase in orders. By the end of March, however, this growth had cooled. Due to the decline in production in downstream industries, strong pressure on prices will continue this year. The impact of environmental decisions such as the Green Deal will not make their activities any easier. The general situation in the foundry industry is not helped by the still never-ending war in Ukraine. The instability of energy and raw material prices makes it difficult to set the prices of castings in the long term.

REFERENCES

[1] Czech Republic Economic Snapshot, [Online]. [Accessed: 06-2024] Available at https://www.oecd.org/economy/czech-republic-economic-snapshot/

[2] Foundry Statistics, Internal document of Foundry Association of the Czech Republic 2022

FOUNDRY PRODUCTION IN DENMARK

National representation in the WFO:
DSBF - THE ASSOCIATION OF DANISH FOUNDRIES
HTTPS://WWW.DANSKINDUSTRI.DK/

Overall, we expect a lower production in 2024 vis-à-vis 2023 due to lower demand like our European counterparts. In terms of the missing data for the previous years, please see the required data below.

The first graph is for the ferrous production and the second one is for the non-ferrous.

Produktionsår	Jern i alt (ton)
1996	74.459
1997	75.369
1998	85.845
1999	86.225
2000	96.467
2001	89.567
2002	87.297
2003	87.271
2004	90.604
2005	87.262
2006	78.565
2007	74.414
2008	80.389
2009	34.207
2010	62.579
2011	79.221
2012	73.925
2013	76.164
2014	78.891
2015	77.936
2016	72.832
2017	83.530
2018	91.534
2019	86.912
2020	76.336
2021	78.667
2022	84.322
2023	88.758

Produktionsår	Metal i alt (ton)
1996	3.414
1997	3.535
1998	1.655
1999	3.973
2000	3.969
2001	4.807
2002	4.645
2003	5.598
2004	5.345
2005	6.148
2006	6.505
2007	6.979
2008	7.335
2009	3.673
2010	4.430
2011	4.735
2012	4.544
2013	4.097
2014	3.957
2015	4.348
2016	4.059
2017	4.406
2018	3.976
2019	3.524
2020	3.289
2021	3.613
2022	4.057
2023	3.653

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 TECHNOLOGY INDUSTRY 2023

ECONOMIC BACKGROUND

The Finnish Technology Industry as a whole

The turnover of technology industry companies in Finland decreased by approximately two per cent in 2023 from 2022. Turnover decreased in the electronics and electrotechnical industry and the metals industry. Turnover grew in mechanical engineering, the consulting sector and information technology. Their turnover in Finland amounted to approximately EUR 102 billion in 2023. Last year, turnover began to decline due to lower producer prices. In 2023, average production volumes in the technology industry were on a par with 2022. The monetary value of new orders in the October-December period was 33 per cent higher than in the previous quarter, but 19 per cent lower year-on-year. The large quarter-on-quarter increase is explained by the recovery of order intake from the exceptionally weak intake seen in the third quarter. The balance figure for tender requests in January was -23. Data collected during January indicates that, despite the pick-up in order intake, the overall demand situation in the market remains rather weak. At the end of December, the value of order books was three per cent lower than at the end of September and 16 per cent lower than in December 2022. The value of order books decreased continuously throughout last year. On the basis of order trends at the end of last year, the turnover of technology industry companies is expected to contract over the next six months.

The number of personnel employed by technology industry companies in Finland in 2023 was up 1.5 per cent on average, or 5,000 people, from 2022. On average, the industry employed approximately 335,000 people in 2023. At the end of December, the industry had approximately 334,000 employees. The number of personnel remained fairly stable throughout the year. According to the personnel survey by Technology Industries of Finland, the number of employees affected by lay-off procedures at the end of December was approximately 16,000. The number of lay-offs increased significantly in the fourth quarter. Compared to earlier years, recruitment of new employees remained at a low level in the October-December period. In total, recruitments came to 7,500. Some companies were increasing their payroll, while others were hiring new employees due to retirements and employee turnover. The downturn in the number of personnel at the end of the year and the increase in the number of laid-off employees were expected due to the weaker economic situation. The number of personnel is forecast to keep declining slightly in the first part of the year. It is likely that the number of layoffs will continue to increase.

Mechanical Engineering in Finland

The turnover of mechanical engineering companies (machinery, metal products and vehicles) in Finland increased by four per cent in 2023 from 2022. Their turnover in Finland amounted to approximately EUR 40 billion in 2023. Year-on-year, the value of new orders decreased by 16 per cent. Order intake recovered clearly from the very weak level of the third quarter, but fell significantly short of the previous year. At the end of December, the value of order books was 9 per cent lower than at the end of September and 16 per cent lower than in December 2022. 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 2023, the turnover of mechanical engineering companies is expected to contract over the next six months. The number of personnel employed by mechanical engineering companies in Finland grew by 1.2 per cent in 2023 from the 2022 average. The industry employed 137,500 people on average in 2023, approximately 1,700 more than in 2022. At the end of December, the number of personnel was 137,300.

Metals Industry in Finland

The turnover of metals industry companies (steel products, non-ferrous metals, **castings** and metallic minerals) in Finland decreased by 20 per cent in 2023 from 2022. In 2023, their turnover in Finland amounted to more than EUR 15 billion. Turnover began to fall due to the strong decline in producer prices last year. The total production of steel products, non-ferrous metals, **castings** and metallic minerals in Finland in the January-November 2023 period remained largely unchanged year-on-year. The number of personnel employed by metals industry companies in Finland grew by 0.3 per cent in 2023 from the 2022 average. The industry employed 16,100 people, approximately 100 more than in 2022. At the end of December 2023, the number of personnel was 16,000.

FOUNDRY INDUSTRY IN FINLAND

Foundry industry as a whole

The total production of castings in Finland decreased about 11 % in 2023 from 2022. The production of iron and steel castings was 46.503 tons which is 12 % less compared to year 2022. Iron and nodular iron casting production decreased about 12 % and steel casting decreased about 10 %. Metal castings production was 4.370 tons in 2023, which is about 4 % more than the previous year. The value of the casting production of Finnish foundries in year 2023 was 244 m€, which is 6 % less compared to year 2022. The foundry industry employed 1300 people, 144 less than in 2022.

Grey cast iron sector in Finland

Overview of the Finnish grey cast iron production, year 2023:

GJL	2022	2023	%
Production, tn	20452	16561	-19 %
Export, tn	6054	602	-90 %
Value of the production, m€	46,85	26,39	-22 %
Employees	698	558	-20 %

Table 1. *Finnish grey cast iron production, year 2023*

Ductile cast iron sector in Finland

Overview of the Finnish ductile cast iron production, year 2023:

GJS	2022	2023	%
Production, tn	27051	25042	-7 %
Export, tn	9552	5112	-46 %
Value of the production, m€	83,82	78,06	-7 %
Employees	698	558	-20 %

Table 2. *Finnish ductile cast iron production, year 2023*

Steel castings sector in Finland

Overview of the Finnish steel casting production, year 2023:

Steel castings	2022	2023	%
Production, tn	5428	4900	-10 %
Export, tn	319	968	+300%
Value of the production, m€	68,14	67,46	-1 %
Employees	386	363	-6 %

Table 3. *Finnish steel casting production, year 2023*

Non-ferrous casting sector in Finland

Overview of the Finnish non-ferrous casting production, year 2023:

Non-Ferrous Castings	2022	2023	%
Production, tn	4370	4531	+4 %
Export, tn	1630	1567	-4 %
Value of the production, m€	62,48	61,91	+- 0 %
Employees	361	379	+5 %

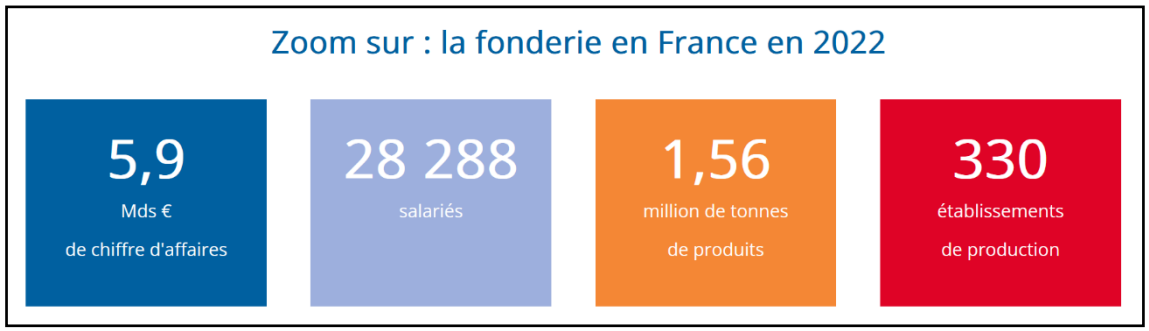
Table 4. *Finnish non-ferrous casting production, year 2023*

FOUNDRY PRODUCTION IN FRANCE

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

Review of French Foundry for 2023 and tendency for first part of 2024

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 5,5 billion euros and employ more than 28,000 talented men and women passionate about their job.



French foundry association networks

The foundry organisation in France is still organised around 3 associations-federation: 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 newspaper "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 newspaper: "La 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.

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/

France: general economic information

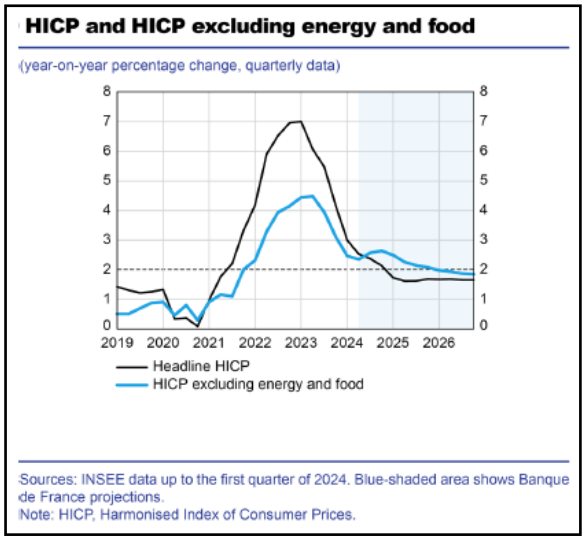
GDP in France for 2022 shows a recovery slowdown of the French economy due to some international issues like the after-pandemic management and nowadays the conflict between Russia and Ukraine and other international issues. The GDP decreased according Insee and Banque de France from +2.6 to +1.1. The forecast of the economists shows us pessimistic projection figures for this and the next years. These estimated figures are expecting to vary according to the political situation between Ukraine and Russia and other difficulties like the energy crisis which made the economy and the activities evolution uncertain for most of the industries:

KEY PROJECTIONS FOR FRANCE

	2022	2023	2024	2025	2026
Real GDP	2.6	1.1	0.8	1.2	1.6
HICP	5.9	5.7	2.5	1.7	1.7
HICP excluding energy and food	3.4	4.0	2.5	2.2	1.9
End-of-year unemployment rate[a)]	7.1	7.5	7.6	7.9	7.6

Sources: INSEE data for 2022 and 2023 (quarterly national accounts as at 31 May 2024 not published at the cut-off date for the Eurosystem projection exercise). Blue-shaded columns show Banque de France projections (based on the quarterly national accounts published on 30 April 2024).
Figures are adjusted for the number of working days. Annual percentage change except where otherwise indicated.
a) ILO, France and overseas departments,% of labour force, value in fourth quarter of every year.

*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.*



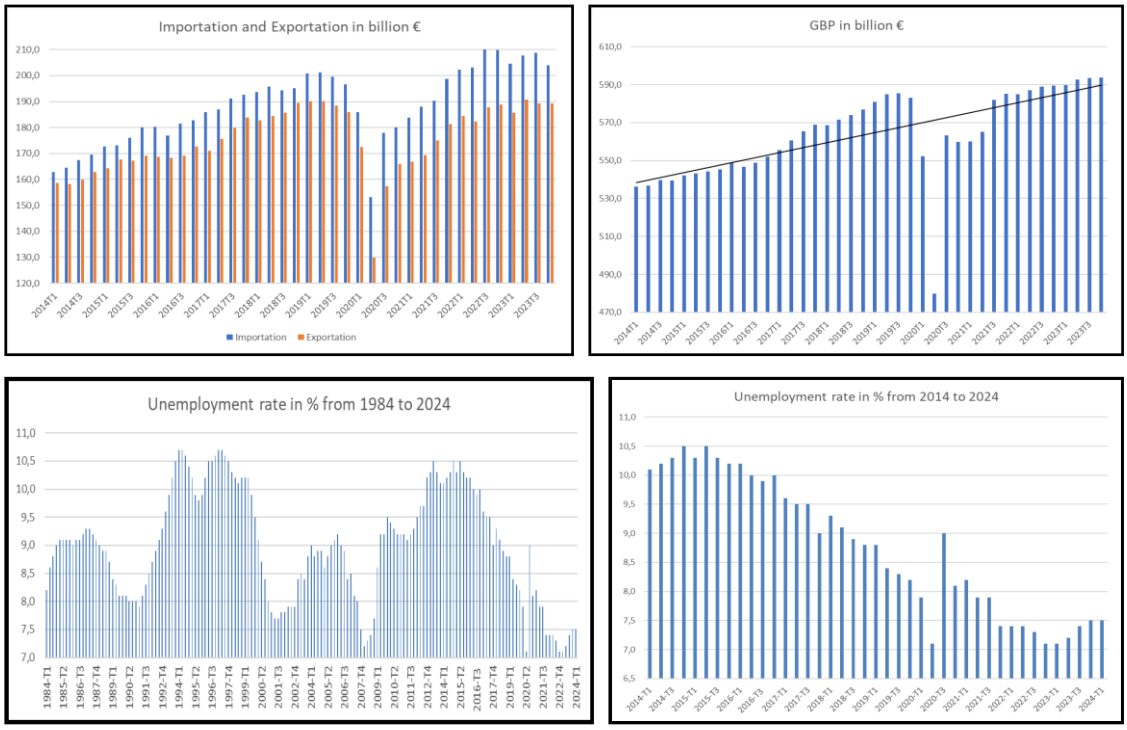
***Figures 1 to 2.** Banque de France predictions: https://www.banque-france.fr/*

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.

Regarding "import-export balance": France continues to be strongly 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 2022 in France).



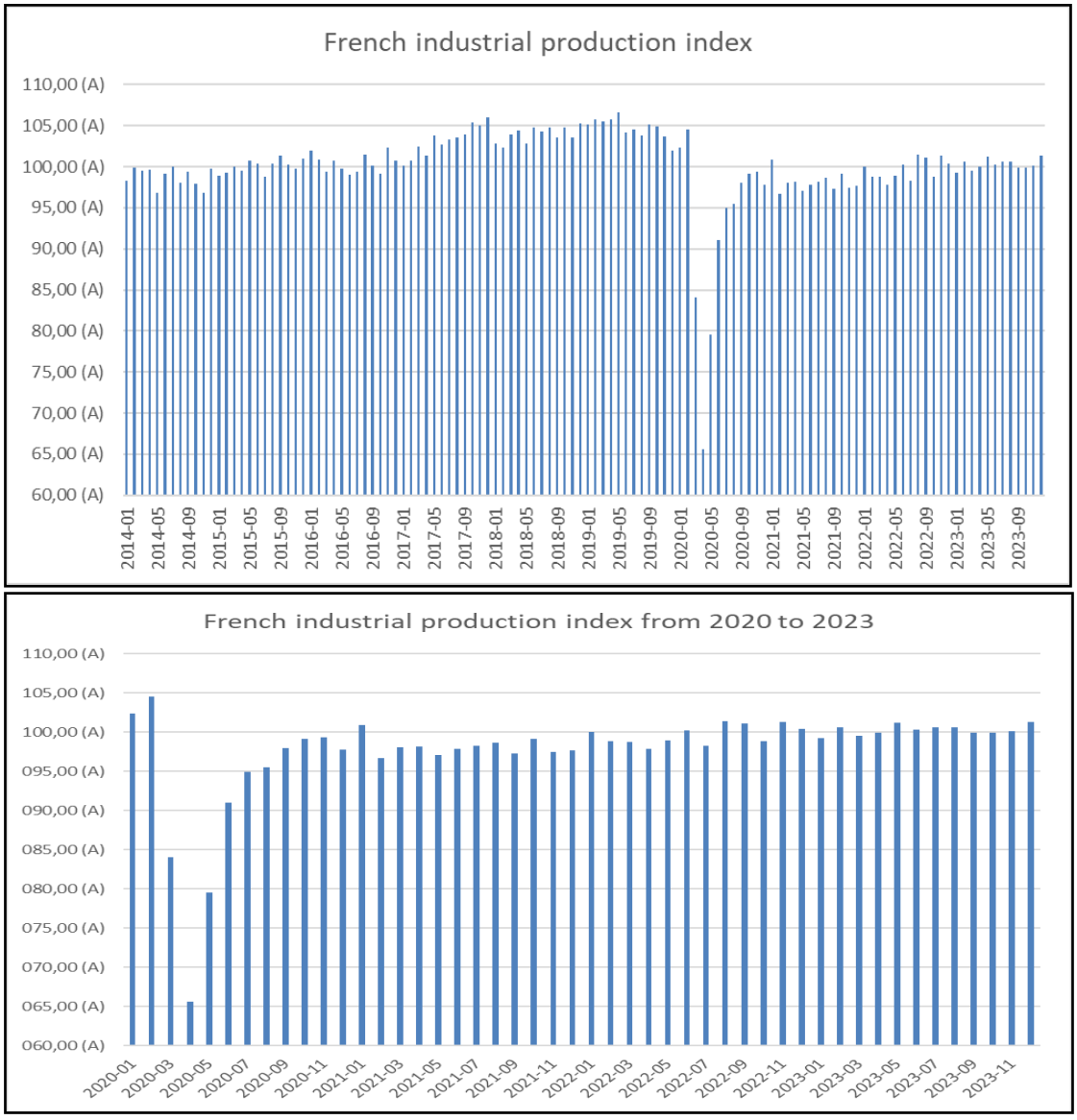
Figures 3 to 6. *(Insee data and charts: CVS & CJO adjustments)*

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 7,5% in the end of 2023. However, the demand for employment in foundry is a little bit less related to the Covid because the problem is still dramatically the following:

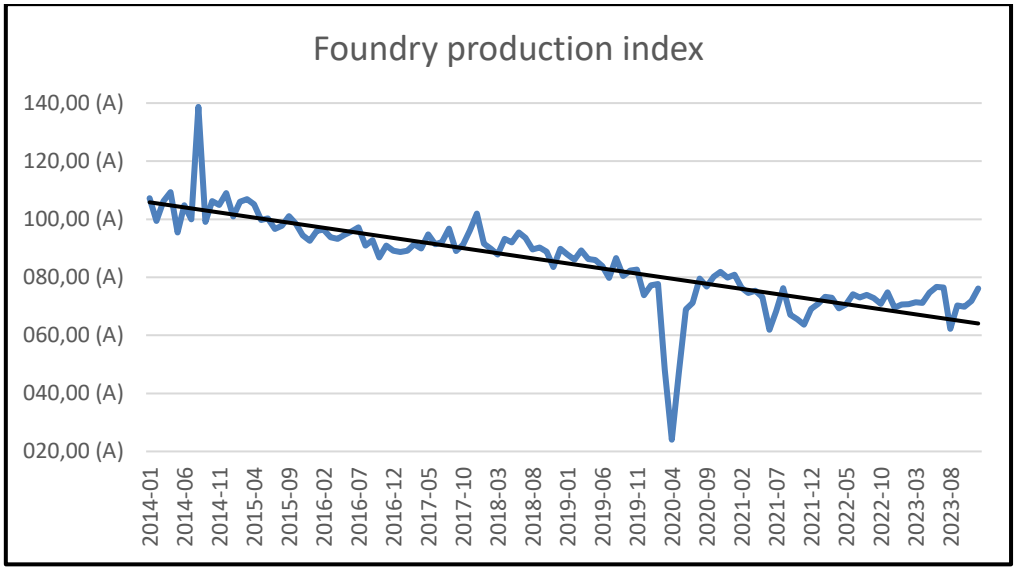
"a lot of foundries cannot find employees or have difficulties to find employees mainly for "hand works" activities and now, more and more frequently for "technical expert" job". Some foundries are also complaining about the impossibility to grow and increase their turnover due to the lack of people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

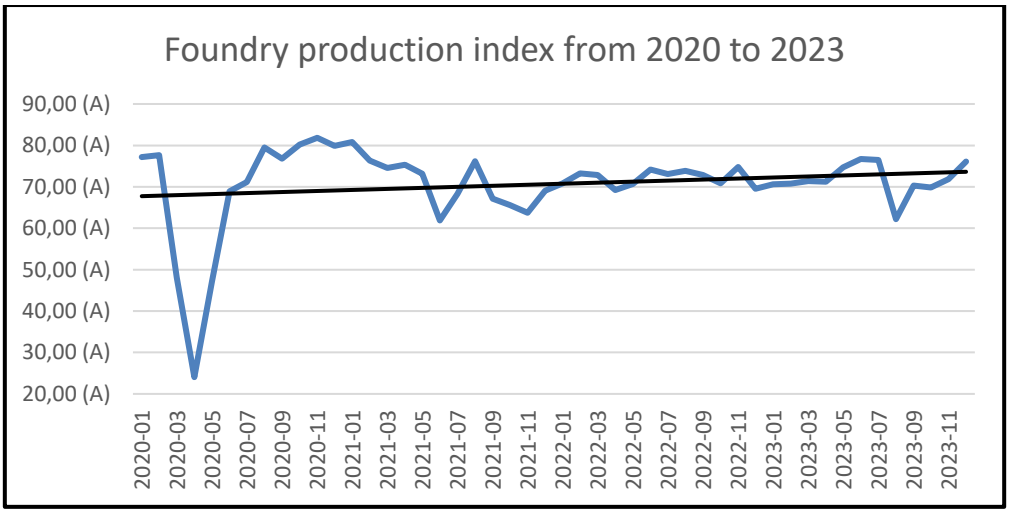
If the French Industrial Production index (all manufacturing industries) presented a general positive increase from 2014, but the lockdown of April 2020 due to the Covid pandemic and some issues to restart the production and the economy for reaching the values prior the Covid. The production index is 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*

French Foundry review for 2020, 2021, 2022 and 2023





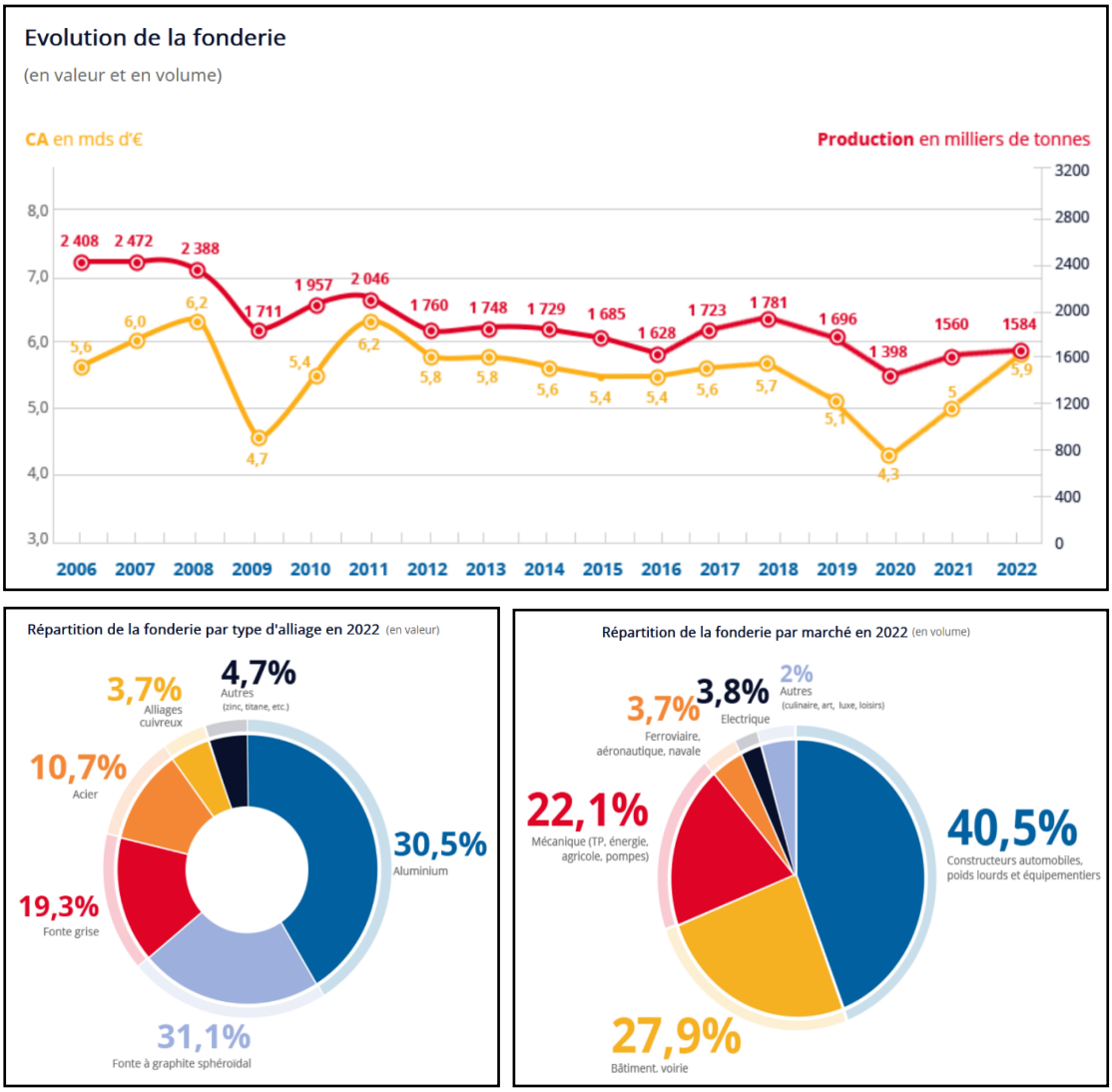
Figures 9 to 10. *Insee data and charts: CVS & CJO adjustments*

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 2023 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 global French production of castings for 2021 is according FFF (French Foundry Federation) and the "Census of Modern Casting" at a level of 1 551 855 tons and the figure for 2022 is constant.

Country	Gray Iron	Ductile Iron	Malleable Iron	Steel	Copper Base	Aluminum	Magnesium	Zinc	Other alloys	2021 TOTAL
France	503,900	665,000	-	43,100	17,705	299,016[A]	-	20,739	2,395	1,551,855

Figure 11. *French foundry production in 2021 (Census – Modern Casting –Jan 2023)*



Figures 12 to 14. *French foundry production in 2019 (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: 54% in volume for iron & steel and 46% for light and "other" alloys in 2021 to 61% for ferrous and 39% for the non-ferrous one in 2022. Automotive continues to represent 40,5% of the orders.

But due to the diesel gate and the future restriction of diesel engine in some cities, the development of electric car and "the low emissions transportation lobbies", the "foundry alloy

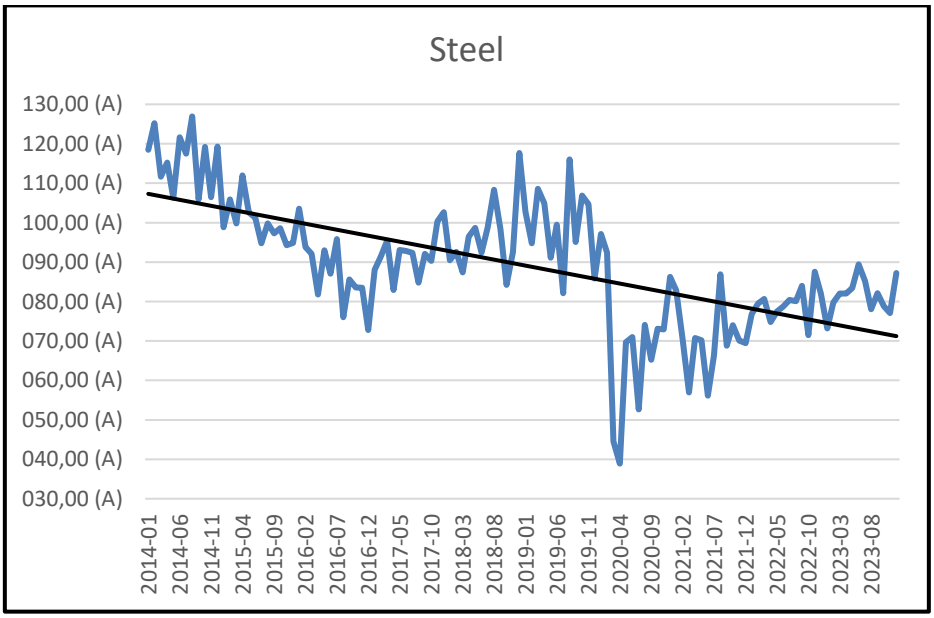
overview" is changing or will change: a certain number of "automotive foundries" decrease their production or are looking for re-organisation including delocalisation-relocation … and two or three are close to a potential stop/shutdown! The automotive industry has been also reached by the electronic industries crisis which stopped automotive factories or reduced drastically their production of vehicles.

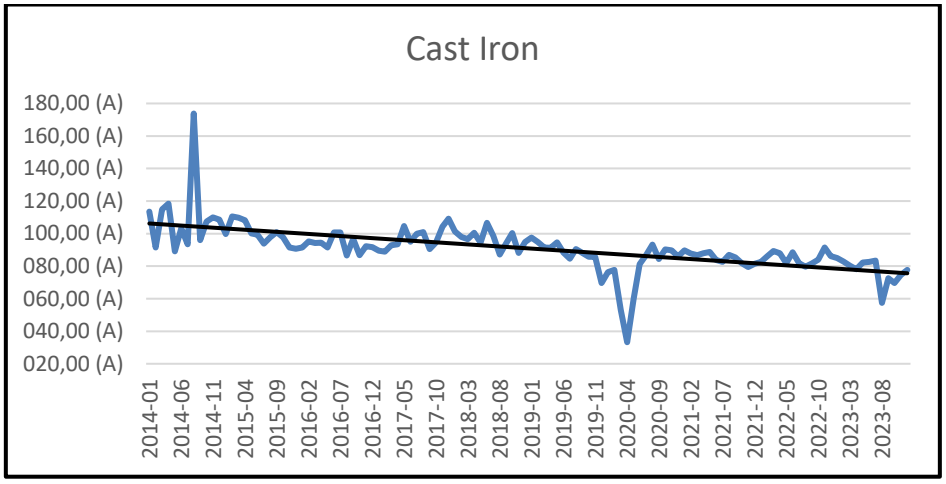
However, the next lines of this paper and analysis alloys by alloys could propose different conclusions:

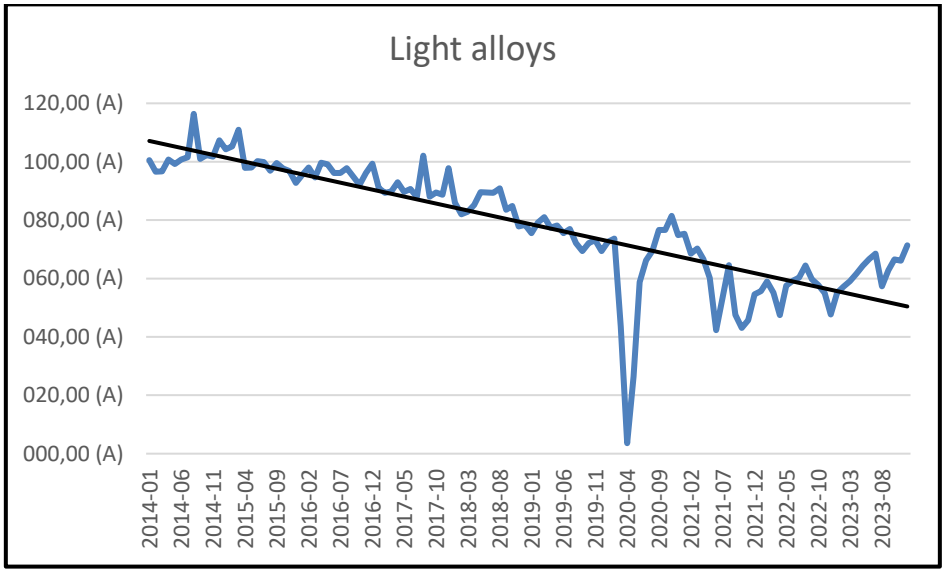
In the overall situation, the lockdown from April 2020 causes a brutal decrease in the production. This tendency is shown in the following figures with the crash in April 2020. After this crash, the situation came to higher figure which are close to production from 2019 for the cast iron. The material crisis causes a decrease in 2023 in the cast iron foundries and the situation remain difficult due to energy cost increase.

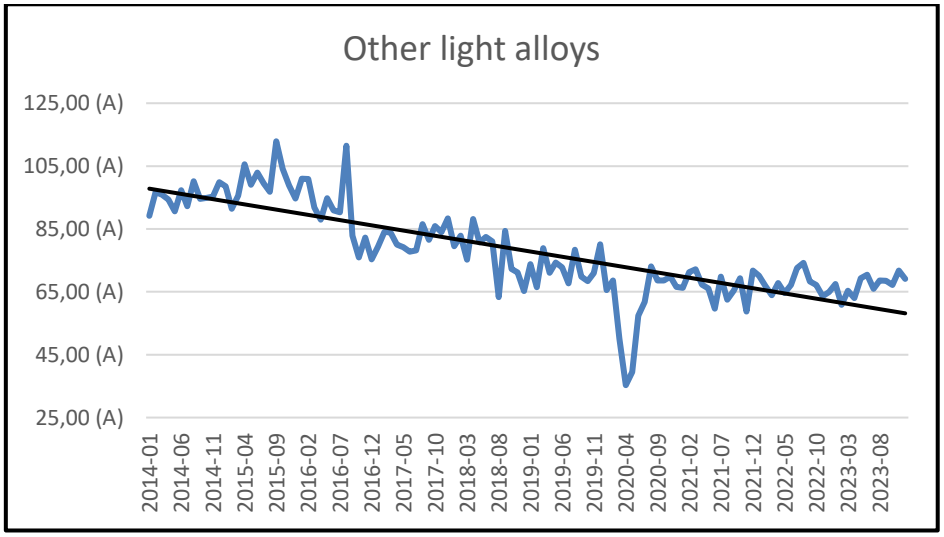
Steel foundries statistics after many years in a deflation situation showed a positive and interesting improvement until the end of 2019. The evolution has been stopped at the beginning of the Covid pandemic in France. In 2021, 2022 and 2023 the steel foundries tried to reach the level prior the pandemic, 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.









Figures 15 to 18. *All the previous charts and Indices of foundry production per alloy (January 2014 – December 2024) 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 "Bâtiment, voirie" in the French statistics"" with a level of 29.9%" versus 22.1% for "Mécanique" 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 "Mécanique" 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 activity. 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 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.

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!

French Foundry Tendencies for 2022

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 remains at the same level in 2024.

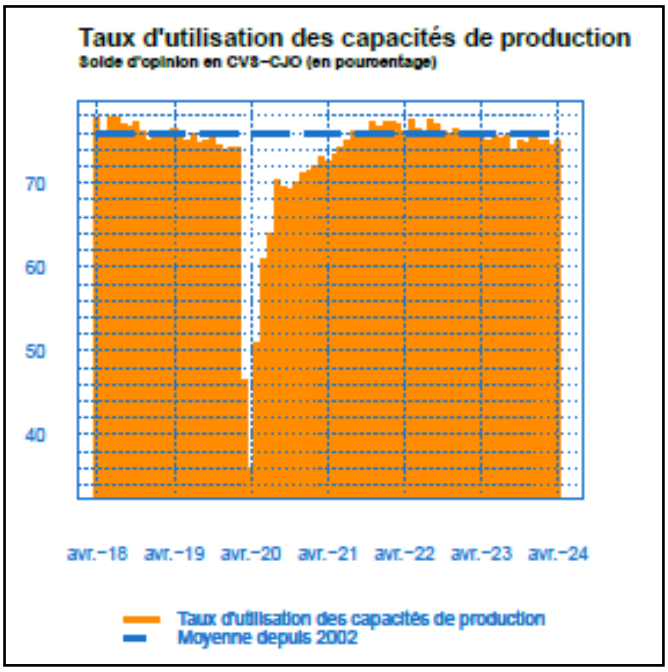


Figure 19. *"output of French foundry capacity – orange band for monthly tendency – blue line for average"*

Conclusion

France, its foundry, and its economy has recovered in 2022 even if some conflicts reduced the increase of the GDP.

The French foundry activity would be not so bad with a global turnover and tonnage slightly lower than the previous years!

That means the French foundries did not accept to reduce their price for bigger volume!

That confirms one again that France continues to maintain its capacity 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/

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,

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

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

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) Karya Hidup Sentosa, CV
12) Pakarti Riken Indonesia, PT
13) Pindad (Persero), PT
14) Riau Baja Indo, PT.
15) Sentana Multi Makmur, PT.
16) Sinar Agung Selalu Sukses, PT
17) Yanmar Indonesia, PT

Steel Casting

1) Asia Raya Foundry, PT
2) Barata Indonesia, PT
3) Cipta Baja Raya, PT
4) Global Mas Abadi, PT
5) Growth Asia, PT
6) Inter Satria, PT
7) Jatim Taman Steel, PT
8) Kaishun Industries Indonesia, PT
9) Komatsu Indonesia, PT
10) Pindad (Persero), 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) 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)

1) Aluzindo Paduan Mulia, PT
2) Astra Daihatsu Motor, PT
3) Central Motor Wheel Indonesia, PT
4) Chemco Harapan Nusantara, PT
5) Metinca Prima Industrial Works, PT
6) Moradon Berlian Sakti, PT
7) Nakakin Indonesia, PT
8) Pakoakuina, PT
9) Prima Alloy Steel Universal, PT
10) Sinar Agung Selalu Sukses, PT
11) Star Mustika Plastmetal, PT
12) Wijaya Karya Industri Dan Kontruksi, PT
13) Yamaha Motor Parts Manufacturing Indonesia, PT

Lead Recycle

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

Ingot Alloy Alluminium

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

Recycle Foundry Sand

1) Tochu Silika Indonesia, PT

Foundry Material / Equipments Suppliers

1) Caprefindo, PT
2) Dover Chemical, PT
3) Foseco Indonesia, PT,
4) HA ASEAN SDN.BHD
5) Indonesia Bentonite, PT
6) Makmur Meta Graha Dinamika, PT
7) Prolimas Utama Jaya, PT
8) QES Indonesia, PT
9) Sinto Indonesia, PT

Kapasitas Produksi (Ton)	Keterangan	Production (Ton) 2023
419.530	Ferro (grey,ductile,steel casting)	194.532
9.420	Investment Casting (Stainless Steel)	4.644
840	Zinc	235
314.340	Aluminium Casting	61.069
99.000	Lead Recycle (Pb)	64.770
298.000	Ingot Alloy Alluminium	215.757
36.000	Recycle Foundry Sand	33.600

Table 1. *APLINDO Production*

It is predicted that in 2024, there will be a decline of around 15-20%

FOUNDRY PRODUCTION IN POLAND

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

Poland's macroeconomic performance in 2022-2023

Indicator	Units	2022	2023
GDP	dynamics	105,3	100,2
Gross capital formation	dynamics	109,2	-
Price index of consumer goods and services (CPI)	dynamics	114,4	111,4
Price index of sold production of industry (PPI)	dynamics	122,4	102,4
Sold production of industry	dynamics	101,0	98,5
Average wages and salaries in the national economy - enterprise sector	PLN	7329	8033
Average employment in enterprise sector	thous.pers.	6505	6529
Unemployment rate (as of the end of the period)	%	5,2	5,1

Table 1. *Main macroeconomic indicators*

The Polish foundry industry

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).

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 economic downturn in Europe led to a deterioration in the situation of industries that are the main recipients of castings.

For foundries, this meant limited orders and short-term contracts, which created a sense of uncertainty about the future. Material and energy prices stabilized compared to 2022, when

they had reached very high levels after Russia's invasion of Ukraine. An additional problem was the constantly rising minimum wage, which resulted in an increase in employee salaries. This whole situation has led to the closure of several foundries in Poland.

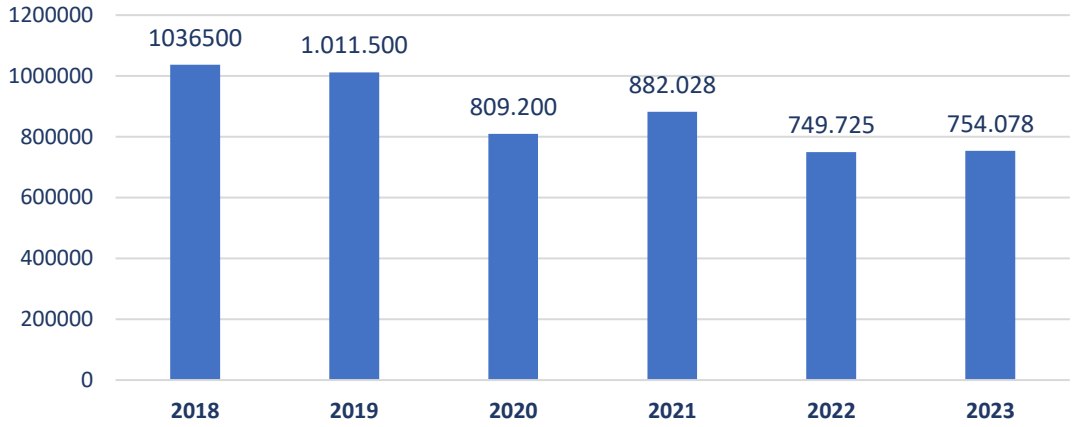


Figure 1. *Changes in the production volume of castings in Poland in 2018-2023 (in tons)*

In 2023, total casting production accounted for 754 078 tons incl. 492 486 tons of ferrous castings, which is 65,3% of total casting production. Production of nonferrous casting was on a lower level of 261 592 tons which consisted 34,7% of total casting production. The total production of castings in Poland in 2023 was 0,58% higher than the previous year.

Material	Output 2022 /estimated/	Output 2023 /estimated/
Total iron castings	335 540	339 540
Total ductile iron castings	114 886	117 886
Steel castings	37 060	35 060
Total ferrous alloy castings	**485 486**	**492 486**
Copper alloy castings	4448	4442
Aluminium alloy castings	252 008	250 000
Zinc alloy castings	5 559	5 050
Other nonferrous alloy castings	2 224	2 100
Total nonferrous alloy castings	**264 239**	**261 592**
Total ferrous and nonferrous castings	749 725	754 078

Table 2. *Total casting production in Poland*

The detailed structure of castings production by materials was as follows: 45,1% - gray iron castings, 15.6% - ductile iron castings, 4.6% - steel castings, 33.2% - aluminum alloy castings, 1.5 % - castings of other non-ferrous metal alloys.

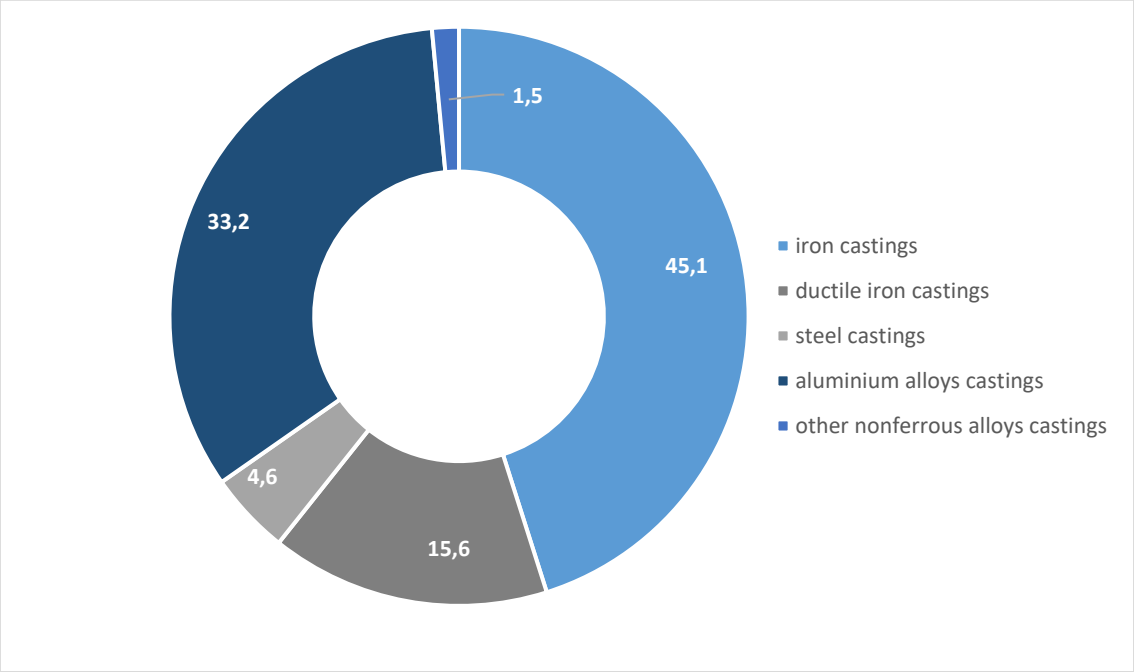


Figure 2. *Structure of casting production in total casting production in 2023*

In 2023, the main sales markets for Polish castings were the automotive industry (65%), construction (9%), machinery industry (9%), iron and steel industry (7%), energy industry (3%) and others (7%).

Employment

Employment in the Polish foundry industry was at an unchanged level for years. In 2023, a decrease in the number of people employed in the foundry industry was noted. It is estimated that around 22.000 people worked in the industry, including the majority in iron foundries. The Polish foundry industry continues to struggle with the constant shortage of qualified foundry staff at the professional and engineering levels. This situation results not only from the lack of vocational schools and the limited offer of education at the engineering level but also from the lack or limited number of candidates.

Export

The casting production in Poland is export-oriented. In 2023, export accounted for nearly 50% of total production and was at a similar level to last year. Exported castings went mainly to western EU countries, but also to the USA. The level of casting exports in terms of materials changed slightly due to changes in the economic situation in the industries and amounted to: iron castings - 55%, non-ferrous metal castings - 43% and steel castings 40%.

Trends and forecasts

While 2023 brought some stabilization, the beginning of 2024 saw a decline in casting production. Foundries are struggling with a significant drop in orders, and the orders placed are mainly short-term.

Since the end of 2023, there has been no increase in material prices, and energy prices have returned to pre-war levels. A slight increase in energy prices has been noted since March 2024.

A further increase in the minimum wage is expected, which will not have a positive impact on entrepreneurs.

The next year brings uncertainty about energy price levels, as well as the problem of CO2 storage and carbon footprint control, and a continuing shortage of qualified workers.

FOUNDRY PRODUCTION IN SLOVENIA

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

MACROECONOMIC INDICATORS FOR SLOVENIA IN 2023

The table below shows the main macroeconomic indicators achieved in Slovenia in 2023.

	Realisation 2023	Assessment 2024
GROSS DOMESTIC PRODUCT (GDP)		
GDP, real growth in %	1,6	2,4
GDP, in EUR billion, current prices	63,1	66,8
GDP per capita in EUR	29.753	31.360
Export of goods and services, real growth in %	-2	1,5
Import of goods and services, real growth in %	-5,1	3,7
External balance with foreign countries, contribution to GDP growth	2,8	-1,6
Private consumption, real growth in %	1,3	1,6
Gross fixed capital formation, real growth in %	2,4	6,8
Gross investment in fixed assets, real growth in %	9,5	4,2
EMPLOYMENT		
Employment, National Accounts statistics, growth in %	1,2	0,7
Number of registered unemployed, annual average, in thousands	48,7	47,7
Registered unemployment rate in %	5	4,8
INFLATION		
Inflation (through December), in %	4,2	3,1
Inflation (annual average), %	7,4	2,7

Table 1. *Macroeconomic indicators achieved in Slovenia in 2023*

In Slovenia, following the strong post-COVID economic rebound, which was also supported by fiscal policy measures, economic growth slowed down and inflation rose during the energy crisis in 2022 and 2023. The impact of rising cost pressures on competitiveness and the reduction in the purchasing power of the population was mitigated by support measures for businesses and households. After a relatively weaker year in 2022, economic growth once again exceeded the EU average last year.

Positive shifts are evident in the acceleration of innovation and investment activities, where Slovenia is advancing faster than the EU average. However, there is still a problem with the speed and intensity of the smart and green transformation compared to leading innovators. Slovenia is also too slow in transitioning to a low-carbon circular economy and in resource usage and addressing the challenges of sustainable transformation. In businesses, a defensive attitude is still too prevalent; they respond to sustainability challenges, but less often see opportunities in them.

On a positive note, in recent years, the educational structure of employees and the share of the knowledge-based economy have been strengthening.

SPRING FORECAST OF ECONOMIC TRENDS 2024 FOR SLOVENIA

Economic growth will pick up this year (2.4%), albeit somewhat more modestly than we forecast in the autumn (2.8%). Economic activity will benefit from continued investment growth, easing of inflationary pressure and a recovery in foreign demand, although this will be somewhat weaker than expected in the autumn. We expect a recovery in goods exports after last year's decline and slightly higher growth in value added in manufacturing, while growth in services exports will be driven mainly by growth in tourism-related services. Growth in the export sector will be restricted by further deterioration in competitiveness as a result of increased domestic cost pressure, particularly in terms of labor costs. We expect investment to continue to grow (4.2%), driven by continued strong government investment activity, which is also linked to the recovery from the floods and the implementation of the Recovery and Resilience Plan, robust growth in housing investment, and a resumption of growth in investment in equipment and machinery as exports recover. Private consumption is expected to rise by 1.6% as real income and employment increase. Private consumption growth will be supported by high employment levels, sustained wage growth, lower price pressures and increasing consumer optimism. The relatively modest acceleration in growth compared to last year is largely methodological and related to the abolition of supplementary health insurance and its transformation into a compulsory healthcare contribution. However, this change will boost the growth of government consumption, which will rise to 6.8% this year.

In the next two years, GDP growth is expected to be slightly higher (2.5% in 2025 and 2.6% in 2026). Higher growth in exports (3.2% in 2025 and 4.2% in 2026) and related activities will follow higher growth in foreign demand. Exports of high-technology industries (pharmaceuticals, ICT equipment) in particular are expected to increase and their contribution to value-added growth in manufacturing will strengthen. Structural changes in the European industrial sector will lead to more modest growth in the Slovenian automotive sector, i.e. in the manufacture of motor

vehicles and some related activities. Private investments in equipment and machinery will recover with higher exports. The investment activity of the general government sector will continue to be high, but we expect somewhat lower growth in housing investments. Growth in private consumption will accelerate to around 2% in the wake of further real income growth and expected slightly lower saving rate, which will nevertheless remain higher than before the epidemic. Higher spending on non-essential goods and services (furniture, electronics, tourism, etc.) will contribute to turnover growth in trade, accommodation and food service activities, and creative, arts, entertainment, personal and sports activities. After being temporarily high in 2024, growth in government consumption will be moderate again in 2025 (around 2%), mainly due to further growth in employment and healthcare expenditure and the gradual implementation of a long-term care system. In 2026, the full implementation of the Long-Term Care Act will lead to a slight rebound in government consumption growth.

The increase in employment and the decline in unemployment will weaken further this year; employment growth will also be limited in the coming years by the labor shortage in connection with demographic developments. Despite the higher projected economic growth, employment growth will average 0.7% this year (1.2% last year) and the average number of registered unemployed will be similar to last year. Employment will not increase significantly in the next two years, though the labor shortage will be somewhat alleviated by certain measures to facilitate the attraction and recruitment of foreign workers, which should be further strengthened. As last year, employment growth will mainly come from the recruitment of foreigners.

The average gross wage will rise by 6.9% in nominal terms this year (by 4.1% in real terms); real growth will gradually weaken towards the end of the forecast horizon. Wage growth in the private sector will remain relatively high this year (7.5% in nominal terms). This will be due to the continued labor market pressures in the face of labor shortages and increased pressures to maintain purchasing power and the January increase in the minimum wage (by 4.2%). In the public sector, wage growth (5.8% in nominal terms), which will be significantly lower than last year, will be affected by the partial adjustment of wages for inflation in the middle of the year. Overall, wage growth will weaken over the next two years. This reflects the easing of price pressures and companies' efforts to improve their cost competitiveness, which has weakened considerably in recent years. The forecast of gross wage growth is subject to considerable risks, particularly in connection with the possible persistence of inflation, increased labor market pressure due to supply bottlenecks and the implementation of the wage system reform in the public sector.

Inflation is expected to gradually decline for most of this year before rising again towards the end of the year and the beginning of next year due to the base effect and the expiry of measures to curb high energy prices; we estimate that it will approach 2% in 2026. For 2024, we expect a further slowdown in the growth of services prices, which will remain relatively high amid continued consumption growth. The growth of food prices will also continue to slow. The rise in non-energy industrial goods prices will be moderate. Assuming that energy prices on the global market are relatively stable, the year-on-year growth in energy prices in the consumer price index will fluctuate considerably due to the expiry of the temporary measures to mitigate

the consequences of rising energy prices. Larger effects are expected in 2025 in particular, when the reintroduction of RES and CHP contributions is taken into account. The measure to regulate electricity prices will expire at the end of 2024, but, given the stabilization of the situation on the energy market, it is unlikely to contribute to inflation. Taking into account the expiry of the above-mentioned measures, average inflation is therefore expected to fall to 2.7% this year and rise to 3.4% in 2025, although price increases for most groups of goods and services will slow. Inflation is expected to fall to 2.2% in 2026.

The realization of the Spring Forecast is subject to a number of uncertainties due to the geopolitical and international economic situation, which may affect the pace of the expected recovery and the moderation of inflation in Slovenia's trading partners. The domestic economic environment is also subject to uncertainties related to the impact of deteriorating competitiveness on the export-oriented part of the economy, the country's capacity to sustain high levels of investment in the coming years and the incomplete planning of certain reform measures; there are, however, also some upside risks to the baseline scenario. Geopolitical uncertainties could slow the economic recovery in Slovenia's main trading partners more than projected in the baseline scenario this year. In particular, an escalation of the situation in the Middle East and in Ukraine could lead to renewed supply shocks, which would also have a negative impact on the export-oriented part of the Slovenian economy. In addition, the latter could also be affected by possible increased cost pressures, which would worsen its already weakened competitiveness. Uncertainties and risks in the euro area and in Slovenia are also related to the possible persistence of inflation, which could further constrain household purchasing power and lead to a stronger tightening of monetary policy or the persistence of elevated interest rates, with negative effects on economic activity and financial stability. The broader economic consequences of last year's floods also remain uncertain, particularly with regard to the pace of reconstruction after the floods due to limited administrative and personnel capacities, including in the construction sector. There are, however, also some upside risks to the economic growth forecast. These arise in particular from a possible faster decline in inflation, more successful attraction of workforce and more efficient absorption of EU funds in conjunction with reform measures.

THE SLOVENIAN FOUNDRY INDUSTRY IN 2022 AND 2023

Overall production of the Slovenian foundry industry (in tons)

The total production of the Slovenian foundry industry in 2023 was 168.253 tons, which is a decrease of 6% compared to the 178.500 tons in 2022. Changing market conditions (decreasing demand or fewer orders), market restructuring and high energy prices, to which some companies had to adapt, were the main reasons for the decrease in production. In general, all branches of the foundry industry experienced a decline in production, with the exception of aluminum alloy foundries and the steel casting branch of industry.

- The production of grey cast iron amounted to 59.019 tons, which is 11% less than last year,
- The production of ductile iron amounted to 36.614 tons, which is 7% less than last year,

- The production of malleable iron totaled 2.700 tons, which is down by 4% from last year,
- The production of copper alloys totaled 1.050 tons, which is down by 7% from last year,
- The production of zinc alloys totaled 5.073 tons, which is less than 29%, by last year.
- The production of aluminum alloys is slightly higher than last year by 4%, which numbers to 57.912 tons produced in the year 2023,
- Finally, the production of steel is higher than last year by 37%, numbering 5.885 tons in 2023.

There are no other castings in 2023, which also corresponds to last year's information, including Mg-alloys, which are not cast in Slovenia.

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**
2022	65.860	39.172	2.800	4.269	1.125	55.576	0	7.103	2595	**178.500**
2023	59.019	36.614	2.700	5.885	1.050	57.912	0	5.073	0	**168.253**
INDEX 2023/ 2022	0.89	0.93	0.96	1.37	0.93	1.04	0	0.71	0	**0.94**

Figure 1. *Foundry production in Slovenia in 2023 (in tons), Slovenian Foundrymen Society 2023*

Production value of the Slovenian foundry industry (in €)

The total production value of the Slovenian foundry industry in 2023 amounted to 1.035.562.987, which is an increase 1,6% compared to last year's 1.018.943.419 €. Export has also risen this year by 1,5%, from 82,4% in 2022 to 83,6% in 2023.

The production value of iron casting (grey iron, ductile iron, malleable iron) in 2023 amounts to 156.758.426 € which in comparison to last year's 170.122.439 € is a decrease by 7,9% and the export rate rising in 2023: 79,3% from last year's 77,9%. The production value of steel casting in 2023 was 41.019.073 €, which is a decrease by 10,4% from last year and the export in 2023 being 69,5%, which is a decrease from last year's 75,1%.

The complete value of light metal casting in 2022 was 729.952.690€ with the value this year growing by 4,4% which amounted to 761.814.300€. The export has grown as well, with the rate of export in 2023 being 87,1% from 85,8% in 2022. The casting of other non-ferrous metals in 2022 reached the value of 73.067.915 million EUR, this year the value is higher by 4%, amounting to 75.971.188€. It's export in 2023 was 63,7% in comparison to the export in 2022 being 63,3%.

PRODUCTION VALUE OF THE FOUNDRY INDUSTRY IN SLOVENIA IN 2023 (in EUR)					
Year	**Iron Casting (grey iron, ductile iron and malleable iron)**	**Steel**	**Light metals**	**Other non-ferrous metals**	**Total**
2022	170.122.439	45.800.375	729.952.690	73.067.915	1.018.943.419
2023	156.758.426	41.019.073	761.814.300	75.971.188	1.035.562.987
INDEX 2023/2022	92,1	89,6	104,4	104	101,6

Figure 2. *Production value of the Slovenian Foundry industry in 2023 [€], Database of the Chamber of Commerce and Industry of Slovenia*

EXPORT RATE OF THE FOUNDRY INDUSTRY IN SLOVENIA IN 2023 (in %)					
Year	**Iron Casting (grey iron, ductile iron and malleable iron)**	**Steel**	**Light metals**	**Other non-ferrous metals**	**Total**
2022	77,9	75,1	85,8	63,3	82,4
2023	79,3	69,5	87,1	63,7	83,6
INDEX 2023/2022	101,8	92,5	101,5	100,6	101,5

Figure 3. *Export rate of the Slovenian foundry industry in 2023 [%], Database of the Chamber of Commerce and Industry of Slovenia*

Sources:

-IMAD – the Institute of Macroeconomic and Development

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

-Slovenian Foundrymen Society

FOUNDRY PRODUCTION IN SPAIN

National representation in the WFO:
TABIRA FOUNDRY INSTITUTE
– INSTITUTO DE FUNDICIÓN TABIRA
WWW.IFTABIRA.ORG

General economic and industry overview

In 2023 and after a good start, Spain had a significant slowdown in the year until a final upturn in its end. Thus, the year 2023 closed with a 2.7% increase in GDP compared to 6.2% in 2022. It should be noted that this growth was much higher than that recorded in the Euro Zone for the same time, which grew by 0.5% (3.6% in 2022). There was a rise in consumer prices which raised the inflation rate to close to 3.2%.

The available short-term and high-frequency indicators point to a timid recovery for the year, particularly in consumption. In contrast to the dynamism of services consumption, there is more sluggishness in the consumption of durable goods, which can be attributed to the persistence of bottlenecks in global supply chains, particularly affecting the automotive sector.

As seen in the projections for the three-year period 2024-26 the Government foresees an initial growth of 2.7%, moderating to 2.4% in 2025 and 2.2% in 2026, which will be supported mainly by private consumption and investment. The Bank of Spain forecasts more moderate values, 2.3% for 2024 and 1.9% and 1.7% for 2025-26 respectively.

As for the performance of our foundry sector, the year 2023 has been characterized by a moderate growth in iron 1.68% and non-ferrous 1.17% amid the difficulties in all the most influential markets, with % variation in annual production.

Industrial sector

The industrial sector in 2023 has recorded a variation in IPI industrial production index of -0.8% compared to the increases of 2.4% in 2022 and 7.1% in 2021.

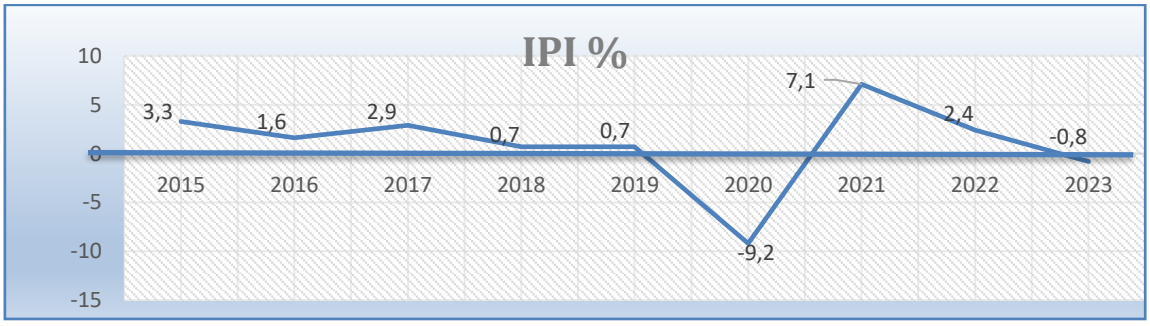


Figure 1. *Annual variation % IPI industrial Production Index (Source: INE)*

Among the sectors with highest growth rates, Information and Communication Technologies (ICTs), Pharmaceuticals, Tourism and Construction stand out above all.

On the other hand, for 2023 as a whole, the General Turnover Index showed a variation of -1.6% with respect to the year 2022 in the corrected series. By geographical destination of sales, all markets presented negative annual rates in December. The decline of -11.4% in the Euro zone of the foreign market stood out. The ITI, the general index of Industrial Turnover, stood at -4.4% in the corrected series as of December 2023 (INE data). For the year as a whole, industrial production was down 0.8%.

Metal sector

In 2023 the Metal sector presented an overall decrease in employment with 320,739 employed, a drop of 6.85% compared to the previous year. This reduction is mainly due to the notable decrease in the Metallurgy subsector, which registered a year-on-year decrease of 14.49%.

Metal exports reached 144,892 thousand euros (increase of 7.4%) and imports 148,565 thousand euros (increase of 2.3%).

Labour market

Spain closed the year 2023 with an increase in the number of employed people to 21,246,900 workers, a growth of 3.8%, three times higher than in 2022.

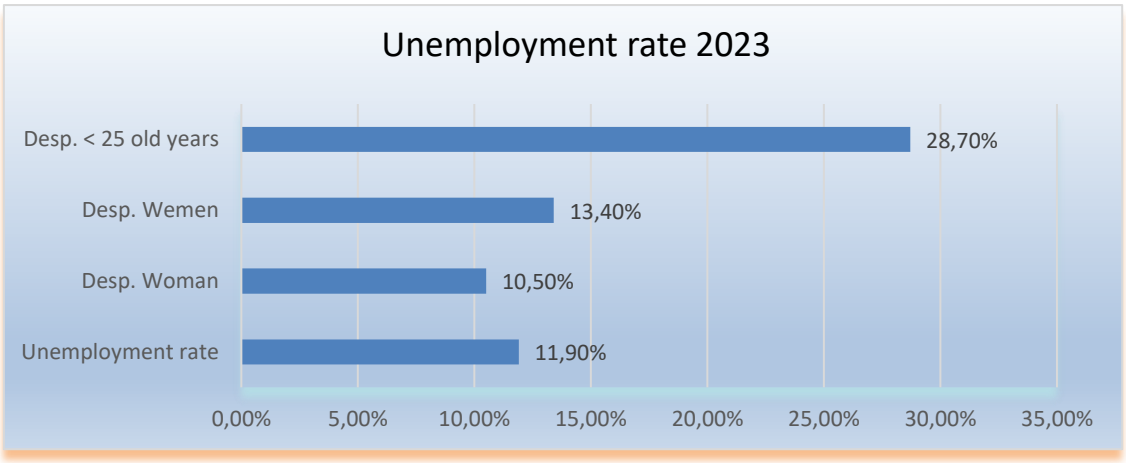


Figure 2. *Unemployment rate 2023*

Unemployment fell by 193,400 people in the last year (-6.4%), a reduction that is more than double that of 2022.

Thus, the total number of unemployed at the end of the year stood at 2,830,600 people and the unemployment rate fell by more than one point to 11.9%, from 13% in 2022.

By age and sex, the reduction in unemployment was affecting more to women, with a decrease of 9.7% with respect to 2022, being this in men slightly less (7.9%) and for young people under 25 years old around 5.6%.

Exports and imports

Spanish exports of goods exceeded 383,688 million euros at the end of Dec 2023, an increase of 4.8% over the previous year (49,538 million euros), the second-best result in the historical series. The main export sectors in 2023 were capital goods (19.5% of the total), food, beverages and tobacco (17.5%), chemical products (16.8%) and the automotive sector (14.1%). The sectors that contributed positively to the annual variation rate of exports in 2023 were the automotive sector (contribution of 2.4 points), capital goods (contribution of 1.8 points) and food, beverages and tobacco (contribution of 0.8 points). These are the most dynamic sectors, which gained the most weight.

The European Union continues to be the main destination for Spanish exports, accounting for 62.7% of the total. Third destinations such as Latin America and others accounted for 37.3% of exports.

In the same period, Spanish imports of goods reached 424,248 million euros, registering a 7.2% decrease compared to 2022 (33,000 million). Energy products decreased by 22.7% year-on-year while non-energy products decreased by 2.6%.

The main import sectors in terms of weight in 2023 were: capital goods (22.4% of the total), chemical products (15.8% of the total), energy products (15.0% of the total) and food, beverages and tobacco (12.5% of the total).

Forecasts, summary

- GDP growth: Spain's GDP is expected to grow by 3.1% in 2024, 2.5% in 2025, 1.9% in 2026 and 1.7% in 2027, according to recent projections. This growth will be driven by domestic demand, which will contribute approximately 2.5 percentage points, while the foreign market could subtract one tenth.



Figure 3. *GDP growth forecast for the next four years 2024 to 2027; Source: INE*

- Consumption and investment: private consumption remains a key driver, with projected growth of 2.4% in 2025, although a slight slowdown is expected compared to 2024. In terms of investment, greater momentum is expected in machinery and capital goods, with growth exceeding 3% in some sectors.

- Labor market: employment has reached historic levels, with an unemployment rate projected at around 11% by 2025. In addition, temporary employment has been significantly reduced, reaching an all-time low of 15.7%.
- Global factors: at the international level, headline inflation in Spain will moderate towards the European Central Bank's target of 2%, although core inflation could remain slightly above. Exports and imports will continue to grow, albeit at a slower pace.
- We are entering a paradigm shift due to energy and environmental transition issues that will set new trends in the coming decades.

Foundry Industry

In accordance with the slowdown trend in 2023 for the most influential sectors there in the value chain of our foundries, being Automotive the most affected, a moderate growth of over 1% has been achieved, except for steel which has seen a reduction of -0.38%.

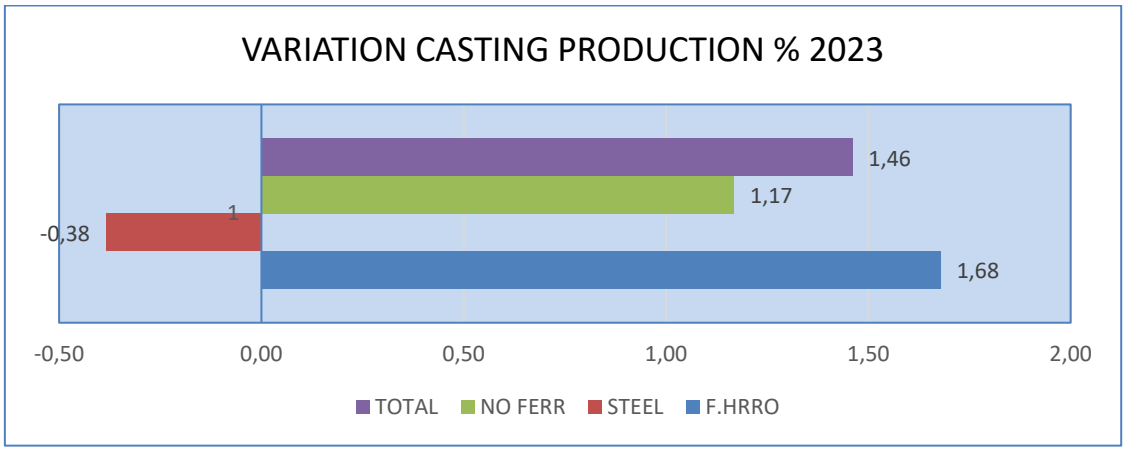


Figure 4. *% variation in production 2023/2022*

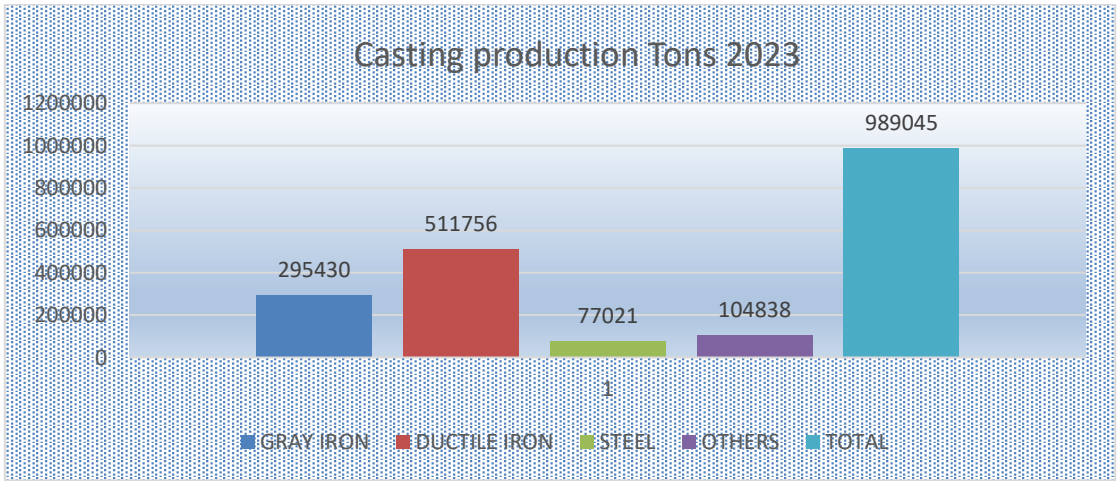


Figure 5. *Spanish casting production Tons 2023*

Distribution by % and types of casting

More than half of the production in 2023 (51.74%) was Ductile Iron (about 512 thousand tons) with an increase of 9 thousand tons in production volume. This is followed by Gray Iron with 29.87% (about 295 thousand tons), but with an increase of 5 thousand tons. Aluminum and others, with 10.6% (105 thousand tons) with an increase of 1.2 thousand tons, mainly due to the reactivation of the automotive market. Likewise, Steel stands at 7.79% (77 thousand tons), having a drop of about 0.30 thousand tons.

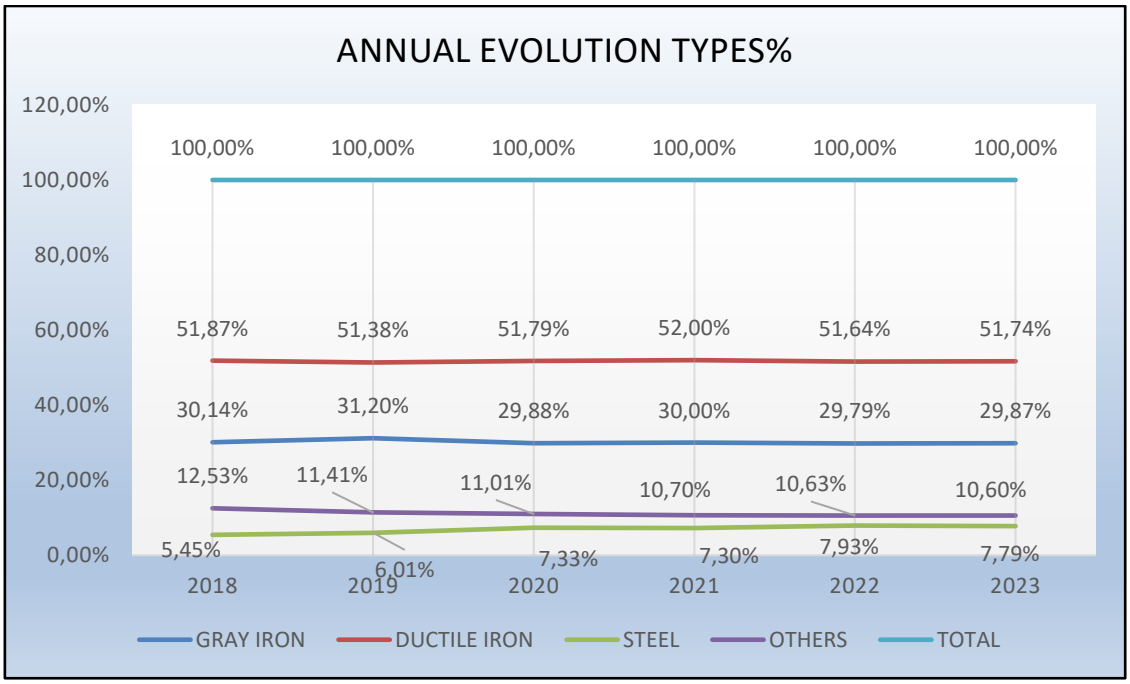


Figure 6. *Spanish annual casting production evolution*

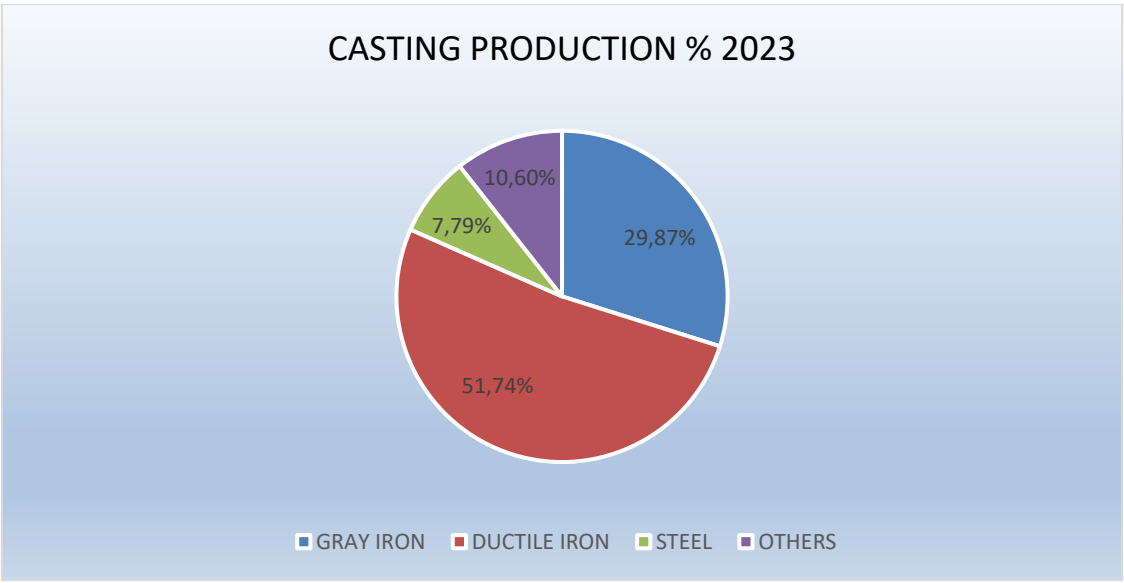


Figure 7. *Spanish casting production % in 2023*

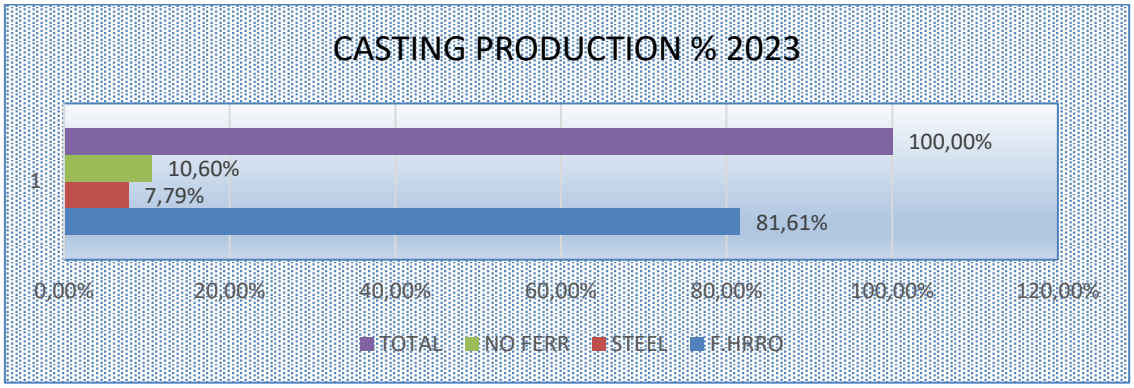


Figure 8. *Casting production ferrous non-ferrous 2023*

The total produced in 2023 is divided in the proportions of iron 81.61%, steel 7.79% and non-ferrous 10.5%. Thus, the total production of cast iron in Spain presents an average increase of 1.46% to that recorded in 2022, although it should be noted that we are 9.3% below the 2018 reference level. The increases recorded for different types of cast iron were -0.38% for steel, 1.68% for iron, and 1.17% in Non Ferrous.

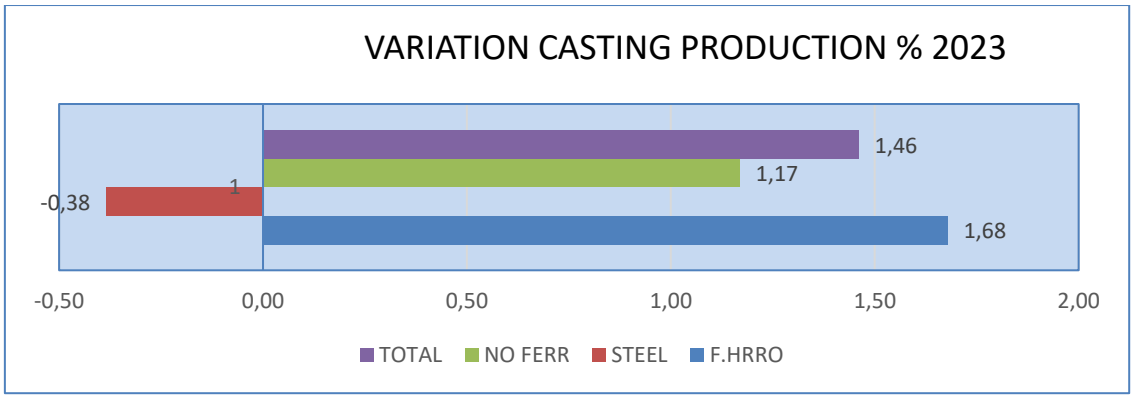


Figure 9. *Spanish casting variation figures from 2023/2022*

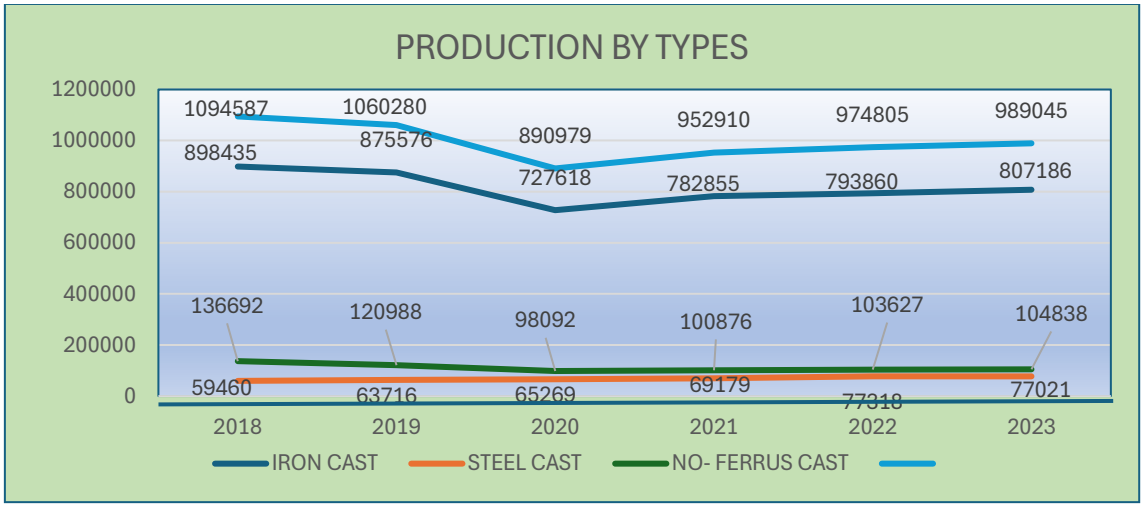


Figure 10. *Production by types until 2023*

We are still below the production achieved in 2018, which reached the maximum production of 1,094,587 ton. The production figure in 2023 has been 989,045 tons, still 10% below the 2018 figures.

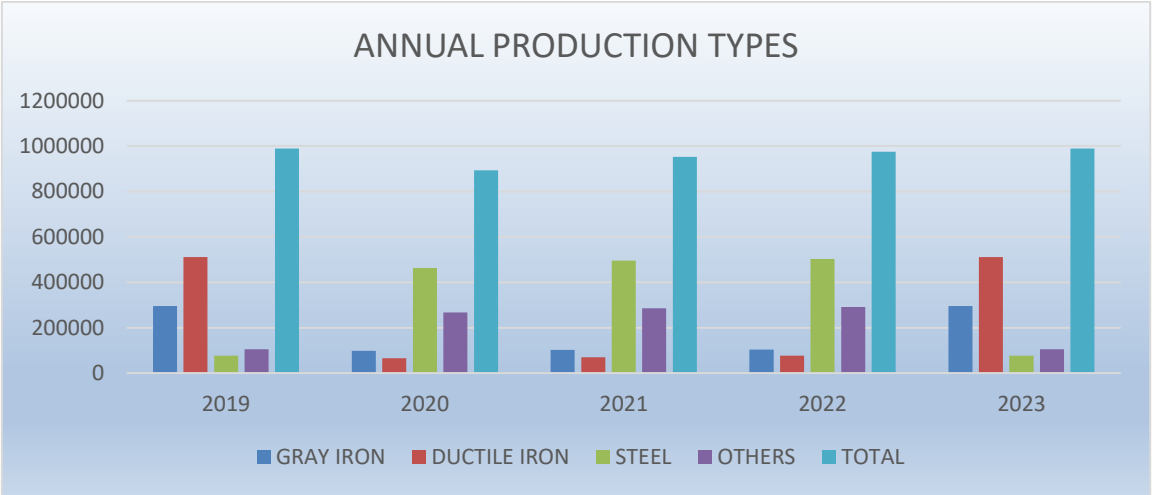


Figure 11. *Annual production per types, ton.*

Main production sectors % 2023.

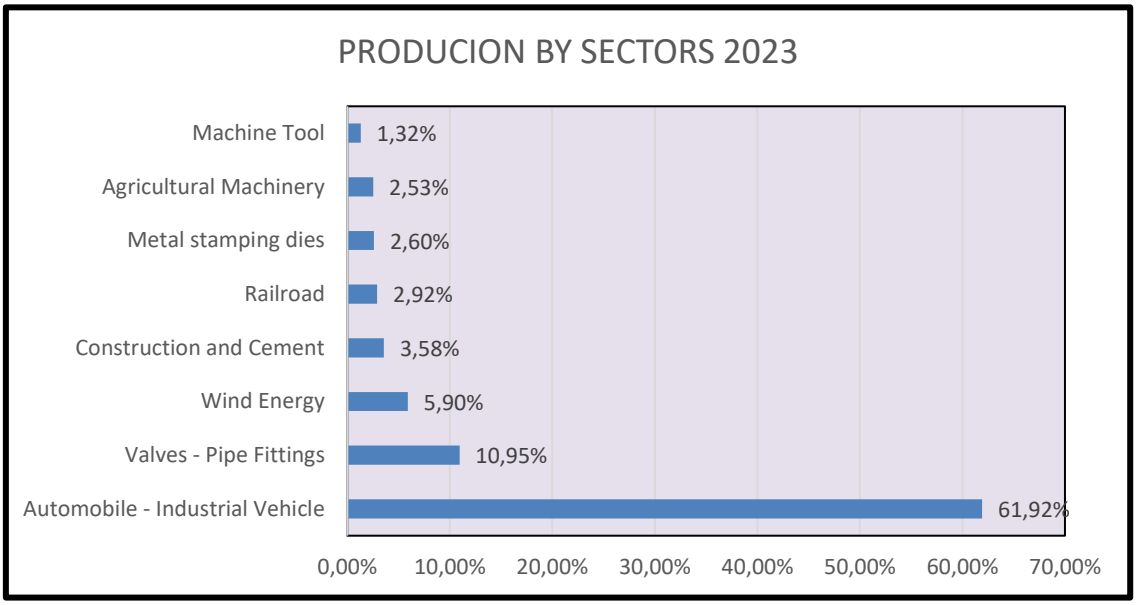


Figure 12. Production by sectors, 2023

The 8 main sectors consuming cast iron products are represented graphically in the corresponding figure. They represent more than 90% of the total production of cast iron in 2023, with the automotive sector accounting for more than 60% of total production.

The rest are followed by valves and fittings 12%, wind power 5.9%, construction-cement 3.6%, railroads 2.9%, die-casting 2.6%, agricultural machinery 2.5% and machinery 1.35%.

Export volumes

Overall exports in 2023 reached 686,627 tons, which represents an average increase of 25.4%, which particularly for iron was 9.6%, for steel 9.8% and for non-ferrous 2.9%.

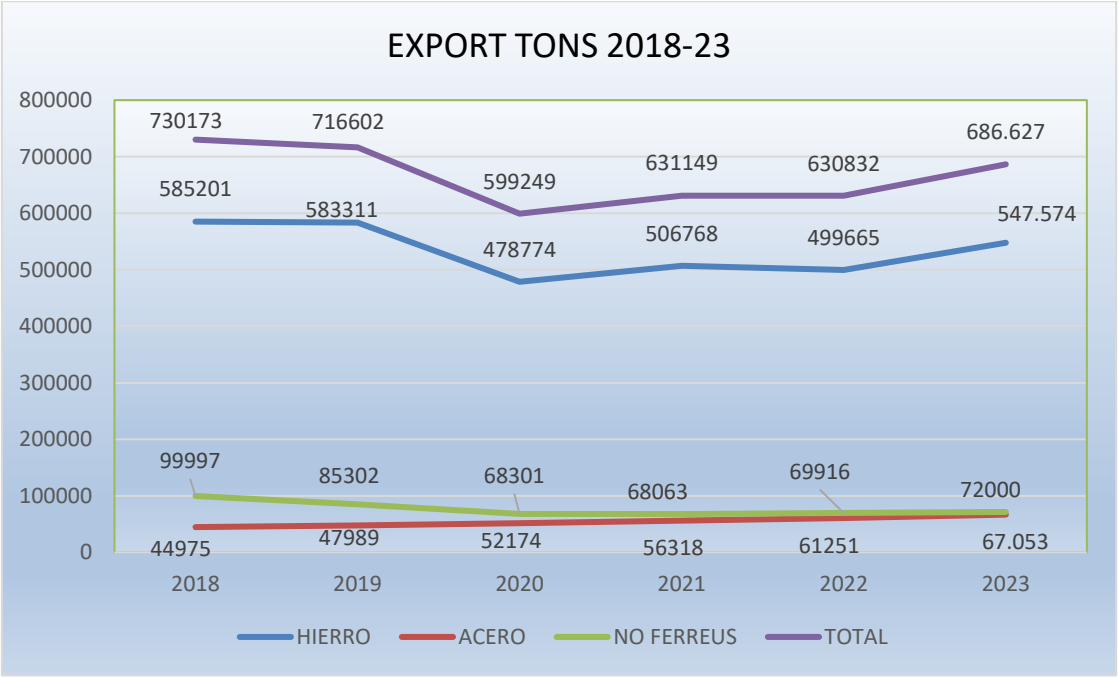


Figure 13. *Export volume figures, 2018 to 2023*

Concerns and challenges

The outlook for the next 3 years, until 2026, will be uncertain, although a slight growth is estimated, improving in mid-2024 over the data for the end of 2023. The new future challenges we face, such as technological changes, decarbonization and the transition to clean energies, changes in transportation systems, development of new materials, etc., entail profound changes that require a certain stability, today altered by geopolitical tensions in Russia-Ukraine and the Middle East. All the processes of change are slowing down and in turn new technologies have their impact once they are perceived as competitive improvements and become established, generating confidence in the market.

The future is worrying in Europe, where the labour problem in companies and absenteeism are notorious. In new contracts, suppliers are already being asked for the measures they are adopting for CO2 emissions, clean energy and carbon footprint in their offers, following of course the New Directives that are being implemented in Europe.

On the other hand, getting and retaining talent is costly and there are challenges that require a firm commitment such as innovation, R&D, energy efficiency, transition to clean energies, occupational risk prevention, all with the aim of making our companies sustainable.

FOUNDRY PRODUCTION IN SWEDEN

National representation in the WFO:
SWEDISH FOUNDRY ASSOCIATION
EN.GJUTERIFORENINGEN.SE

Report provided on their behalf by
RISE SWECAST AB
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General overview

Economic situation

Sweden's economic situation in 2023 was characterized by several challenges, including high inflation, reduced industrial production, and rising interest rates. Inflation was elevated for most of the year, driven by rising energy prices and bottlenecks in supply chains, among other things. Average inflation stood around 8% in 2023, putting pressure on household purchasing power and business costs.

The order situation in the manufacturing industry weakened markedly in 2023, partly due to a slowdown in global demand and uncertainty about energy supply and raw material prices. Companies experienced a significant decline in new orders, which led to reduced production and thus poorer profitability. Some sectors, such as the automotive industry, were affected more than others.

The unemployment rate showed an upward trend in 2023, with the unemployment rate rising to around 7.5%. This was due to a combination of lower demand for labour in the manufacturing industry and a weaker labour market in general. Young people and new arrivals found it difficult to enter the labour market. In 2025, unemployment is estimated to average 8.2 percent.

Sweden’s central bank, Riksbanken, raised the interest rate gradually during the year to combat inflation, which worsened the economic situation for both households and companies. For the second half of 2024 and beyond, some stabilisation of the economy is expected, and inflation is expected to fall.

The foundry industry in Sweden

The Swedish foundry industry has undergone some consolidation in recent years, which has meant that several foundries have a common owner. In total, there are currently about 80 foundries in Sweden. The biggest events in 2023 and 2024 on the iron side are that Scania has inaugurated a completely new foundry nd that AB Volvo has built a completely new line adjacent to its existing foundry. On the light metal side, Volvo Cars has built a new die casting plant and

installed two Bühler die-casting machines for the manufacture of rear floors for future electric cars.

Regarding the annual production of castings in Sweden, there are no reliable figures. This is partly because the annual membership fee to the Swedish Foundry Association is now based on the tonnage that each foundry is permitted to produce – not, as before, the actual production. This means that annual production figures are no longer collected and compiled. However, one assessment is that the total annual tonnage is in the range of 250,000 – 300,000 tonnes, of which iron accounts for about 70 – 80% and aluminium about 15 – 20%.

In 2024, two major industry investigations were conducted, one study on threats and opportunities linked to how the die casting foundries are affected by the automotive industry's transition from ICE to EVs, and one study on the conditions for establishing a new Center for Sustainable Casting (CSC). The investigation into CSC has been carried out together with end customers, academia and suppliers of raw materials and technical equipment for the foundry industry.

FOUNDRY PRODUCTION IN SWITZERLAND

National representation in the WFO:
GIESSEREI-VERBAND DER SCHWEIZ (GVS)
– SWISS FOUNDRY ASSOCIATION
WWW.GIESSEREI-VERBAND.CH

Innovative Swiss Foundries on a sustainable path – prospects for 2024 cautious

At the beginning of last year, the Swiss foundry industry experienced an encouraging upsurge, followed by a con-tinuous slowdown. Overall, the number of tonnages delivered was 2.4% down on the previous year. The current year also looks challenging. The Swiss foundries remain cautiously optimistic in view of the growing demand for sustainable and innovative casting solutions. However, it is not until late 2024 at the earliest that the sectoral association is expecting an economic recovery on a lower level.

2023 went off to a partially flying start for the Swiss foundries. Thanks to the development of numerous new cast parts, along with the extraordinary expertise in the finishing of complex cast components, demand went up in many parts. In this way the Swiss foundries made a strong mark for the production site of Switzerland. In some of our affiliated firms the development departments faced huge demands because of the strong interest.

In the course of the year the positive trend was superseded by a gradual decrease in orders, which became apparent from last autumn on. Production of light metal and non-ferrous casting rose in 2023 by 1.1%, cast iron saw a reduction of 4.1%. Across all materials, total production volume was down by 2.4% at 40,000 tonnes delivered compared to 41,000 tons the previous year. In these results the economic slowdown is reflected in practically every user market of the Swiss foundry industry.

Last year proved to be challenging for suppliers to the automotive industry. A substantial reason for this was the following: in accordance with forecast market demand, Swiss die-casting companies focussed their investments on developing new product lines for electric drives and battery systems. However, in 2023 demand for battery-powered electric vehicles remained well below the planned volumes of European manufacturers.

Forecast for 2024

For the roughly 80% export-oriented Swiss foundry industry, prospects for the current year depend substantially on the economic development in important user markets like Germany and France. The strong Swiss franc is causing competitive drawbacks that cannot be offset in the short term and have severe setbacks for the export business. The earliest recovery on a low level is not expected until late 2024.

Nevertheless, in the longer term the Swiss foundry industry remains confident about the future. The persisting trends in climate protection and lightweight construction in individual mobility promote the increasing demand for sustainable and innovative casting solutions. The global mission to reduce environmentally harmful carbon dioxide emissions by using low-carbon energy sources encourages our industry to carry on investing in new cast parts for electric drives and battery systems. In addition, there are many innovations in sustainability in our affiliated firms. Some foundries, for instance, are into replacing crude oil with natural gas or even CO2-neutral energy sources.

There are already concrete projects for using electricity to do so. Hydrogen is also being tested as a new energy source in the Swiss foundry industry. How innovative the sector is under way is also underlined by the fact that in many places production processes are also being increasingly digitised and employees are also being specially trained in IT security to this extent.

The Swiss foundries are dependent on well-trained skilled workers and managers for being able to reliably produce cast parts in highly automated processes. The lack of skilled workers therefore continues to represent a herculean task for the sector. A current worry for the Swiss foundries is also the juggling act of being able, for instance, to pass on the high energy prices without straining good customer relations.

A compounding factor for the Swiss foundries is the impact of the major economic powers' interventionist policies. China, the USA and the EU are trying to be on a parity in subsidy competition so as to prevent companies moving out because of location disadvantages. Another element is that under the guise of the "European Green Deal" the EU is skewing the markets and therefore price structures. The Swiss foundries have only limited opportunities for competing in this contest. That is why the Swiss Foundry Association is continuing its dialogue with federal Bern to react to these distortions, be it through funding programmes for the energy-intensive industry or, for example, with an industry-wide electricity price.

FOUNDRY PRODUCTION IN TURKEY

National representation in the WFO:
TÜDÖKSAD – THE TURKISH FOUNDRY ASSOCIATION
WWW.TUDOKSAD.ORG.TR

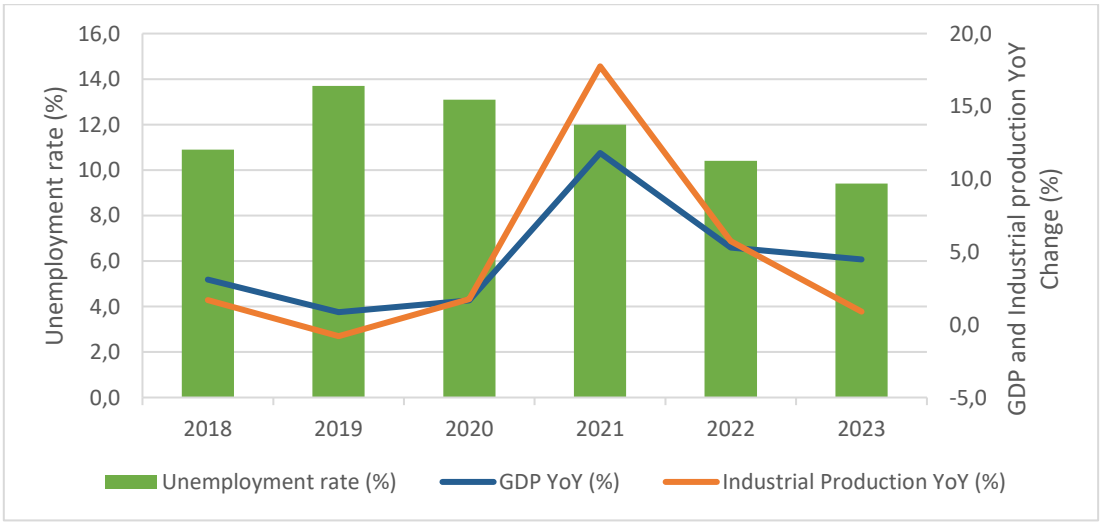
TÜRKİYE DÖKÜM SANAYİCİLERİ DERNEĞİ
THE TURKISH FOUNDRY ASSOCIATION

Macroeconomic Developments

In 2023, Türkiye's GDP expanded a 4.5%, fuelled mainly by robust increases in private consumption (12.8% in real terms), investment (8.9%), and government consumption (5.2%). Exports of goods and services decreased by 2.7%, imports increased by 11.7% compared to the previous year's chain-volume index in 2023. The earthquake and weak foreign demand contributed to the decline trend in the exports. Sector-wise, the service sector grew by 4.8% and construction by 7.8%, benefiting from earthquake recovery efforts. Throughout 2023, industrial production in Turkey faced significant challenges. The initial impact of earthquakes, coupled with weak global demand and volatile production trends, hindered sustained recovery. Despite strong overall economic growth driven by domestic demand and government policies, the industrial sector's contribution remained subdued.

Automotive market growth and investments in machinery and construction offered some support, but persistent imbalances and external pressures limited industrial growth. The challenging conditions in Turkey's manufacturing sector, which emerged in the second half of 2023 due to weakening demand, continued until the end of the year. Challenging market conditions both at home and abroad led to a slowdown in new orders and a decline in production.

Figure 1. GDP and Industrial Production Growth and Unemployment Rate



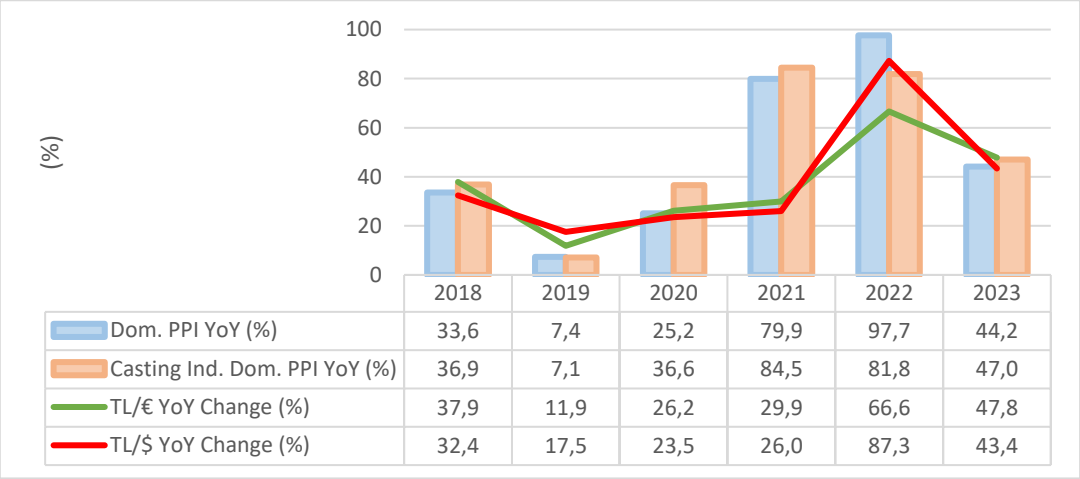
Source: Turkish Statistical Institute

The depreciation of the lira, rising wages and rising raw material prices put upward pressure on input costs and this trend was also reflected in sales prices. On the other hand, firms' tendency to maintain the number of employees gave positive signals for labour markets. The labour market remained resilient, with a 9.1% unemployment rate in January 2024, despite the low labour force participation.

The current account deficit improved to $ forty five point four billion in 2023 (4.2% of GDP) from $ forty nine point one billion in 2022, notably in the latter half of the year. Inflation decreased from 57.7% in January 2023 to 38.2% in June 2023. Still, it escalated to 68.5% by March 2024, driven by factors including the lira's depreciation, significant minimum wage hikes, tax adjustments, and strong demand.

The overall fiscal balance deteriorated to below -5% of GDP in 2023 (from -0.8 in 2022) due to rising expenditures and earthquake-related investment needs, and the primary balance was close to -3% of GDP (from +1.4 in 2022). However, the fiscal deficit is relatively low excluding earthquake-related expenditures. Public debt remains moderate at around 30% of GDP in 2023.

Figure 2. Producer Price Indices vs Currency Rates

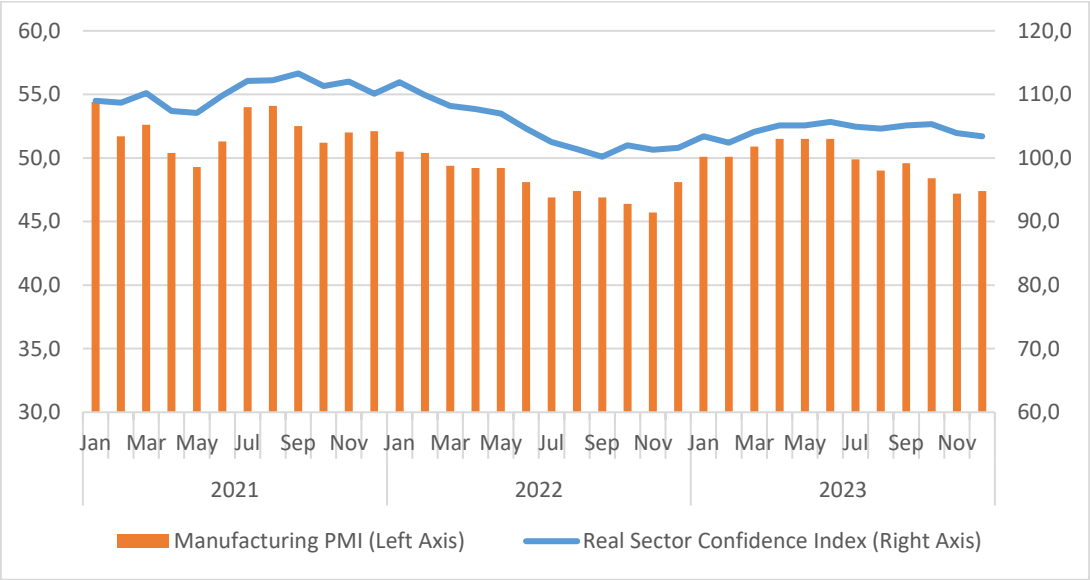


	2018	2019	2020	2021	2022	2023
Dom. PPI YoY (%)	33,6	7,4	25,2	79,9	97,7	44,2
Casting Ind. Dom. PPI YoY (%)	36,9	7,1	36,6	84,5	81,8	47,0
TL/€ YoY Change (%)	37,9	11,9	26,2	29,9	66,6	47,8
TL/$ YoY Change (%)	32,4	17,5	23,5	26,0	87,3	43,4

Source: Turkish Statistical Institute

Looking ahead, economic growth is expected to slow to 3.5% in 2024, on the back of policy tightening and slower global growth, before picking up pace in subsequent years. Total investment will remain strong as earthquake-related reconstruction continues, and as an improved external environment helps restore export growth. Moreover, higher costs arising from further disruptions to transportation and trade could have sizable negative effects on the economy. In contrast, growth could be boosted further by a stronger influx of foreign investment due to possible improvements in fiscal, financial and monetary policy.

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 2023 data, Turkish total motor vehicle production increased by 9% to one million, four hundred sixty-eight thousand, three hundred ninety-three units. Passenger car production, which increased by 18%, reached nine hundred fifty-two thousand, six hundred sixty-seven. Together with tractor production, total production increased to one million, five hundred twenty-five thousand, nine hundred sixty-three units. In the commercial vehicle group, production in 2023 decreased by 5% and 7% in the light commercial vehicle group, while it increased by 16% in the heavy commercial vehicle group.

Compared to 2022, the commercial vehicle market increased by 35%, the heavy commercial vehicle market increased by 17% and the light commercial vehicle market increased by 39%. In the 12-month period of 2023, the total market increased by 55% compared to the same period of 2022 and finalized at one million, two hundred eighty-three thousand, nine hundred fifty-two units. During this period, the passenger car market also increased by 63% and reached nine hundred sixty-seven thousand, three hundred forty-one units.

In 2023, total automotive exports increased by 13% compared to the same period of 2022 and reached thirty-five point seven billion dollars. Exports of the main industry increased by 16% and exports of the supply industry increased by 10%.

According to the national general trade system, exports increased by 0.6% in the January-December period of 2023 compared to the same period of the previous year and reached two hundred fifty-five billion, seven hundred seventy-seven million dollars, while imports decreased by 0.5% to three hundred sixty-one billion, seven hundred seventy-four million dollars. In the January-December period, foreign trade deficit decreased by 3.2% from one hundred nine billion, five hundred forty-one million dollars to one hundred five billion, nine hundred ninety-

seven million dollars. While the ratio of exports to imports was 69.9% in the January-December period of 2022, it increased to 70.7% in the same period of 2023.

In the January-December period, the share of manufacturing industry in exports by economic activities was 94.2%, the share of agriculture, forestry and fishing sector was 3.8%, and the share of mining and quarrying sector was 1.5%.

Germany ranked first in exports throughout the year. Exports to Germany were twenty-one billion, ninety-two million dollars, followed by the USA with fourteen billion, eight hundred twenty-six million dollars, Iraq with twelve billion, seven hundred eighty-six million dollars, the United Kingdom with twelve billion, four hundred sixty-eight million dollars, and Italy with twelve billion, three hundred eighty-one million dollars. Exports to the first five countries accounted for 28.8% of total exports.

According to the consolidated data of the Turkish machinery manufacturing industry, the sector increased its exports, including free zones, by 11 percent at the end of 2023 compared to the previous year and reached twenty-eight point one billion dollars. Exports to Germany, whose machinery imports remained flat throughout the year, increased by 7.6 percent to three point five billion dollars, while revenue from Russia, the second country with the highest exports, increased by 68.3 percent to nearly three billion dollars. Increases of up to 10 percent were achieved in the USA, Italy, and the United Kingdom, where machinery exports exceeded one billion dollars.

The three product groups with the highest exports were domestic and industrial refrigeration machinery, internal combustion engines and parts, and construction and mining machinery, while exports of machine tools increased by 15.3 percent and reached the threshold of one point five billion dollars. The sector's average export price per kilogram also increased from six point two dollars to seven point two dollars.

Based on the construction permits given by the municipalities in 2023, the number of buildings and dwelling units increased by 9.1% and 22.3%, respectively. The floor area of buildings also increased by 14.9%.

The growth in the annual production and domestic sales of the cement industry was 10.5% and 19%, respectively. On the contrary, Türkiye’s cement export declined by 17.6%.

In 2023, Turkey's steel industry output was thirty-three point seven million tons, with a decline of 4% due to worldwide protectionist policies and tough competition in the domestic market. Compared to the previous year, steel exports decreased by 30% in volume and by 40.7% in USD value.

Turkey's total installed electricity capacity, which was approximately thirty-two gigawatts (GW) at the end of 2002, increased to one hundred six point seven GW by the end of 2023. Renewable energy power plants account for 62% of this increase in installed capacity. By the end of 2023, the share of renewable energy in total installed capacity increased to 55%. A total of two thousand eight hundred seventy-three megawatts (MW) of installed capacity was commissioned

in 2023, almost all of which was renewable energy power plants. Of the capacity commissioned in 2023, one thousand eight hundred ninety MW (65.8%) was solar energy, four hundred fourteen MW (14.4%) was wind energy, and three hundred ninety-three MW (13.7%) was hydroelectric power plants.

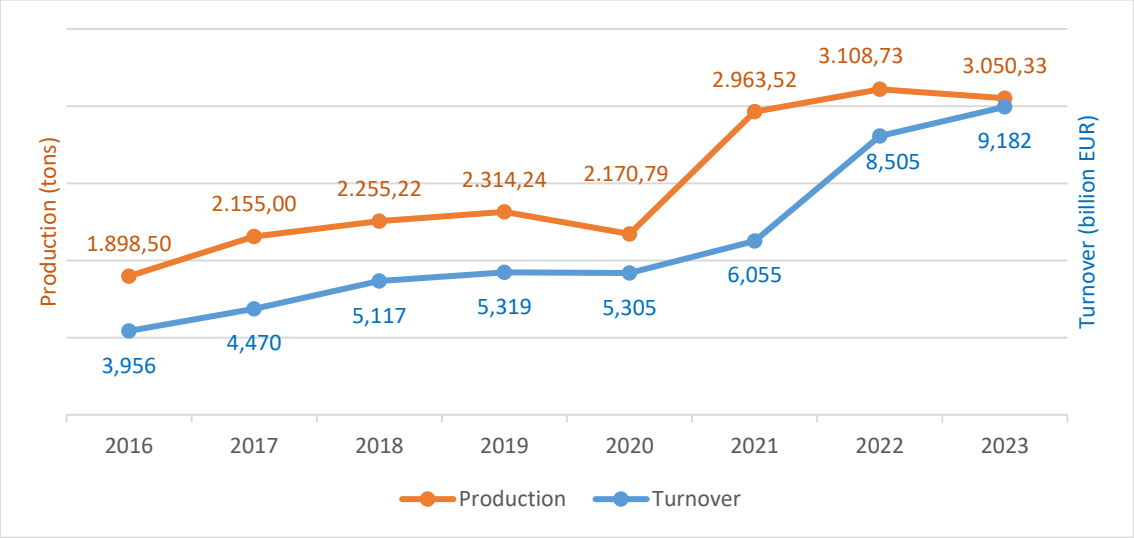
Production in the white goods sector recorded a decrease of 1.5% in 2023; with a decrease of 10% in the export volume.

Developments In the Foundry Industry

Industry Overview

In 2023, the Turkish foundry industry managed to maintain its position despite fluctuating trends in casting buyer sectors and challenging economic conditions. The overall Turkish economy grew by 4.5%, driven by robust increases in private consumption and investment. However, the industrial sector's performance was subdued, with the foundry industry particularly impacted by a 2.7% decrease in the exports of goods and services, alongside weak foreign demand and the February earthquakes.

Figure 4. Annual Metal Casting Production Volume and Turnover



Source: TUDOKSAD – Turkish Foundry Association

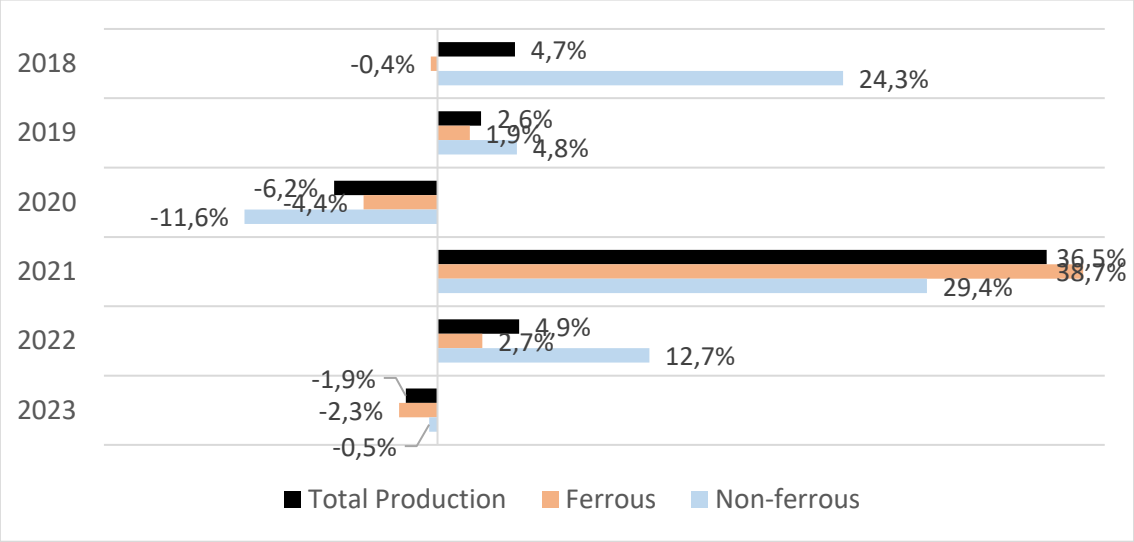
Following the positive trend in the first half of 2023 to catch up on the backlog of orders that had built up in 2021 and 2022 because of the disruptions to global supply chains during and geopolitical tensions, supply chains had largely returned to normal by the middle of the year, so that demand and indicators began to give a better picture of overall demand in the markets.

The sectoral downturns especially in the last quarter influenced the foundry industry's performance, leading to a slight overall decrease in production and exports. Nevertheless, the Turkish foundry industry demonstrated resilience by navigating through these adversities with minimum losses. The ability to sustain its production levels and export activities amidst rising

input costs, weak global demand, and economic volatility underscores the industry's adaptability and enduring strength in a challenging year.

The Turkish metal casting industry experienced a slight decrease of 1.9% in 2022, which brought the total production volume to three million tons.

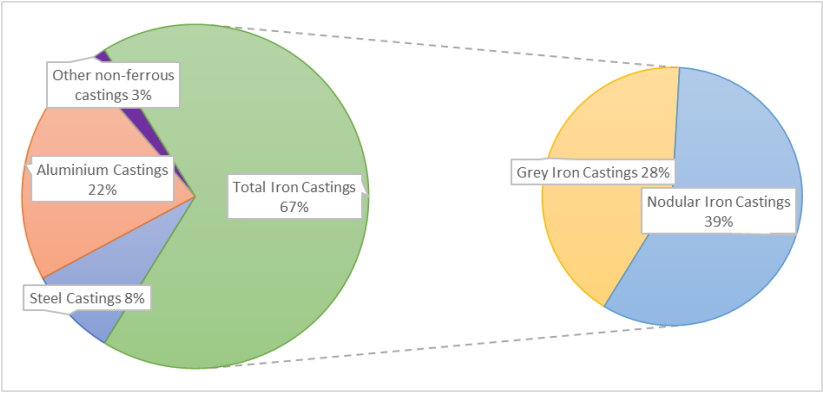
Figure 5. YoY Production Growth



Source: TUDOKSAD – Turkish Foundry Association

Despite the difficulties experienced, in the first three quarter, the industry's performance had been exceptionally well, thanks to the remarkable resilience of the industry. Despite the rising borrowing costs and tightening credit conditions, the sector continued to realize technology investments, especially to increase production speed and efficiency, as well as capacity investments with the aim of maintaining market share and competitive advantage in the international market. Along with the upward pressure in input costs, Türkiye's metal casting export increased by 7% year-on-year to six point eight billion EUR, while the export volume decreasing to two point one million tons by 2.5%.

Figure 6. Casting Production Distribution (2022)



Source: TUDOKSAD – Turkish Foundry Association

The contraction in the production volume was mainly driven by the decrease in ferrous castings production, which declined by 2.3% to two point three million tons in 2023. Gray iron casting production fell by 3.7% to eight hundred sixty-eight thousand tons, while nodular iron casting production slightly increased by 1% to one million one hundred ninety thousand tons.

Together with the effect of high inflation rates, the total production value rose by 8% year-on-year to 9.2 billion EUR. The share of export to total production value finalized as 69%.

In 2023 the share of capacity and technology investments increased to 65% of the total investments; followed by investments in equipment and facility renewal around 16%).

Raw Materials

Relatively lower levels of volatility were observed in almost all the metallic input materials and secondary raw materials prices during 2023 comparing with 2022. But, without any exception, they all kept their sharp rising pace.

YoY average price increases in scrap and different types of pig iron varied between 24% and 8% in 2023 (in local currency) which were between 371% and 296% above the 2020 values. The share of raw materials costs in the cost of castings sold was around 47% in 2023.

Energy

Both electricity and natural gas prices for industrial consumption decreased in 2023, 13% and 32% respectively, which were still up 686% and 668%, respectively, compared to the year 2020, in Turkish Liras.

Labor

Based on the Turkish Statistical Institute reports, the manufacturing industry's calendar-adjusted hourly labor cost index was 109% above the previous year’s figure in 2023. On the other hand, as the industry has been suffering from a lack of labor force at different levels, foundries displayed tendency to maintain the number of employees. Thus, the employment rate remained stable and the average payroll costs are higher than the country averages in the foundry industry. On average, the share of labor costs in the total cost of castings sold increased by 47% percent in 2023.

The Situation in the Material Sectors

Iron Castings

In 2023, the grey iron castings production recorded a slight decrease of 3.7% to eight hundred sixty-eight thousand and three tons, whilst nodular iron castings production increased by 1.1% to one million one hundred ninety-one thousand three hundred fifty-five tons. On the other hand, foreign demand presented an opposite trend; the export ratio of grey iron castings recorded a slight increase from 1.7% in 2022 to 1.8% in 2023; however, the export volume of nodular iron castings decreased by 2.9% and the export ratio fell to 74.1%. Capacity utilization was down 5.6 points to 69.6% due to the increased capacity as a result of ongoing investments.

Steel Castings

In 2023, steel castings production decreased to two hundred fifty-five thousand tons, showing a downward trend of 11.9%. The main drivers were weakening demand from the machinery sectors, both domestically and especially abroad. Capacity utilization deteriorated by around 14.2%, and exports decreased by 9.6% to two hundred three thousand tons.

Aluminium Castings

Aluminium castings production volume, which had been around six hundred sixty-five thousand tons the previous year, remained stable but displayed a slight decrease of 0.8% to six hundred sixty thousand tons in 2023. On the other hand, high-capacity injection moulding machine investments are increasing day by day. In 2023, capacity investments constituted more than half of the total investments for the total non-ferrous castings, which yielded a 4% increase in the total aluminium castings capacity. Consequently, aluminium castings ensured their capacity utilization at around 63.4%.

Other Non-ferrous Castings

In 2023, the production volume of other non-ferrous metal castings increased by 2.3%. Copper alloys, which accounted for 33% of non-ferrous metal castings other than aluminium, increased by 1%, while zinc castings increased by 3%.

Figure 7. Turkish Ferrous Casting Production (volume, ton/year)

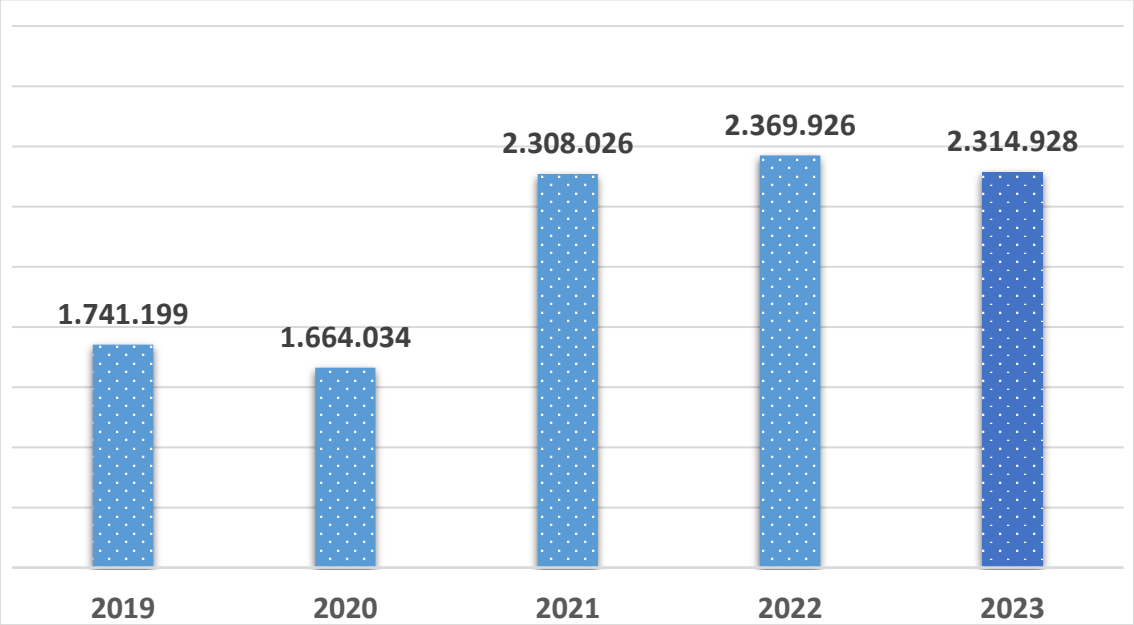
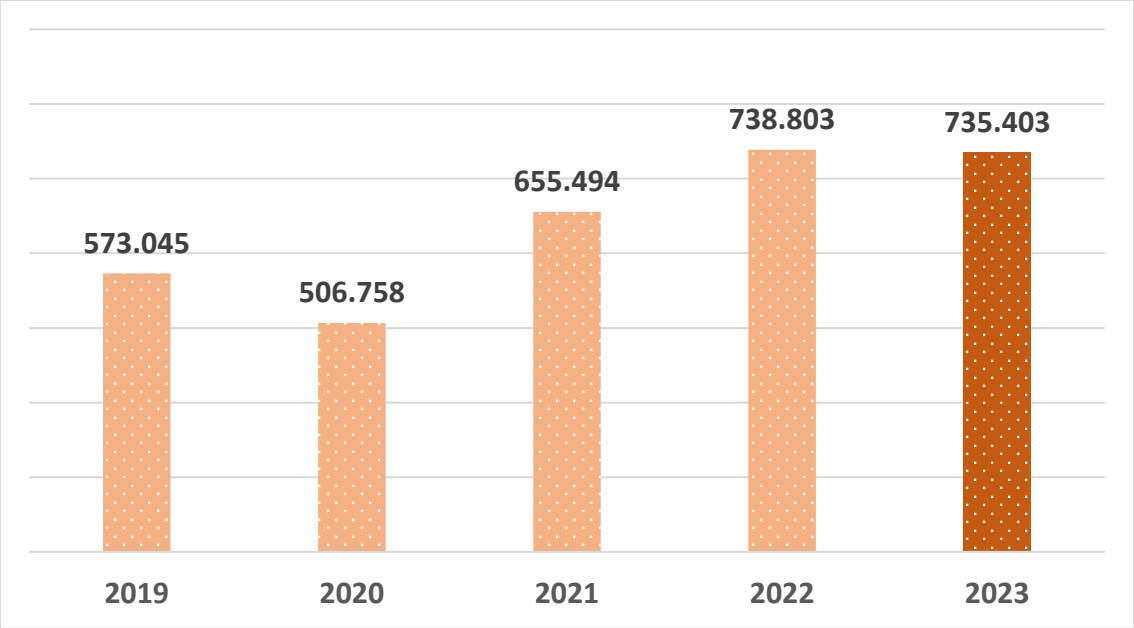


Figure 8. Turkish Non-Ferrous Casting Production (volume, ton/year)



FOUNDRY PRODUCTION IN UNITED KINGDOM

National representation in the WFO:
INSTITUTE OF CAST METALS ENGINEERS
WWW.ICME.ORG.UK

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 2023 was 2.274 trillion British pounds, a slight increase when compared to the previous year, when the size of the UK economy was 2.27 trillion pounds.

Although on an annual basis, the UK economy grew slightly in 2023, the UK entered 2024 in recession following two quarters of negative economic growth at the end of 2023. After a huge 10.4 percent fall in GDP in 2020, economic growth rates were relatively strong during a period of economic recovery, with GDP growing by 8.7 percent in 2021, and 4.3 percent in 2022. This recovery has clearly stalled somewhat in 2023, however, with monthly growth figures indicating that the UK economy has been alternating between contractions and low growth for several months, and as of December 2023, was only slightly larger than it was just before the COVID-19 pandemic[(1).]

Factors contributing to low growth have included political uncertainty, the decision to leave the EU and the single market (although the amount that this has impacted the UK economy is disputed and some companies have report an increase in friction affecting trade with others reporting little or no effect but most analysis report a negative impact), as well as global factors including the Covid 19 pandemic and the war following Russia's invasion of Ukraine.

The UK currently has the second-largest economy in Europe, although the economy of France, is of a very similar size. The UK's global economic ranking will likely fall in the coming years, however, with the UK's share of global GDP expected to fall from 2.17 percent in 2024 to 2.06 percent by 2028 [(1).]

UK Manufacturing

Manufacturing in the UK directly employs 2.6 million workers across the UK, generating an estimated £184 billion in GDP during 2022. But as the MTA report 'The True Impact of Manufacturing'[(2)] notes the sector's impact on the UK economy extends to a complex network

of supply chains with indirect impacts leading to MTA stating that the true value is closer to £348 billion of GDP (15% of the UK economy) and 5 million jobs (14% of the UK total) in 2022.

Further, there is an "induced" impact, which arises when those employed by manufacturers and their suppliers spend their wages in the wider economy leading to a total impact of manufacturing on UK GDP was £518 billion in 2022.

The report summarises as follows:

- Manufacturing accounts for £518 billion of UK GDP and supports 7.3 million jobs,
- 'Making things' accounts for 34.5% of all UK goods and services exports,
- The median wage in manufacturing is 11% above the national average.

Wages in Manufacturing

The average wage in the manufacturing sector was £729 per week in December[3] (but has increased by 7.3% in 2024)[4]

Total annual exports increased by £36.8 billion (4.6%) to £842.6 billion in 2023 with annual imports in goods and services falling slightly by £0.1 billion to £895.6 billion.

The total annual trade in goods and services balance, excluding precious metals, narrowed by £36.7 billion to a deficit of £53.0 billion in 2023. When removing the effect of inflation, total annual imports decreased by £6.5 billion (0.9%) to £741.5 billion and total annual exports increased by £3.9 billion (0.6%) to £690.8 billion in 2023 [5].

Labour remained tight in the UK with employers across all sectors struggling to recruit and reporting skills shortages but the number of vacancies continued to fall throughout 2023, down by 229,000 from the level of a year ago, although they remained 148,000 above their pre-coronavirus (COVID-19) pandemic January to March 2020 levels.

The industry sectors showing the largest annual decreases in the number of vacancies were human health and social work, and professional, scientific and technical activities, which both fell by 34,000 from the equivalent period last year.

The estimated number of workforce jobs in September 2023 was 36.8 million, an increase of 210,000 from June 2023[6].

UK Foundry Industry Performance

2023 was slightly improved picture compared with 2022 for UK foundries but some of the growth due to increased prices rather than increased tonnages.

There were 3 foundry closures and no new foundries opened. The closures were of small to medium sized ferrous foundries: two iron foundries, one in England and one in Scotland and one steel foundry in Scotland closed.

In general, most light alloy foundries were quieter across a wide range of markets but with an improvement towards the end of 2023. Many reported plenty of enquiries, and design or prototyping work for EVs, but not all have translated into firm orders, perhaps due to a lack of business confidence. Inconsistent order levels from passenger vehicle OEMs has also been a factor. Delays in obtaining tooling from the Far East, and then the tooling requiring repair or rectification, was 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 been down and not yet back to pre-covid levels but with continued recovery in IGT work.

CMF members have reported that enquiry levels generally seem to be quite high, but within increased time for these to be converted into orders.

Key challenges for the industry continue to be:

- Energy costs
- 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

Some of these are addressed in the following sections.

Costs and Raw Materials Prices

Raw material prices continued to rise but at lower rates compared with previous years and there were some 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 were increased more, as a percentage, compared with increases for salaried staff.

Net Zero, Energy and Sustainability.

With up to 40% of its energy now from renewable sources, 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 Government is consulting on establishing a Carbon Border Adjustment mechanism for the UK and is investing public money in more renewable energy.

The Cast Metals Federation, CMF, as the trade association for the UK foundry and castings industry established a new Advisory Panel on Net-Zero in 2022 to help the industry transition towards the UK Government's 2050 target for achieving net-zero and published a roadmap for UK foundries in 2023 to help define the key issues and the size of the opportunity for the UK.

Webinars for members on the EU CBAM, and two open seminars for CMF Members from industry on Net Zero, have been held to help share best practice on energy efficiency and new technologies, with a further event planned for 2024.

Whist 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 the CMF has engaged with and relevant events shared with its members.

Waste disposal costs and the availability of landfill has become a concern for some foundries depending upon their geographic location in the UK, with some landfill sites not taking waste sands at least partially and, in some cases, completely. This is therefore increasing transport costs for tackling wastes as well as gate costs at waste transfer stations or landfill sites.

Foundries in the UK are continuing to work with other partners through the CMF, including companies in construction, RTOs and Universities, to help establish better classification of spent foundry sands, and find alternative uses for the spent sands and shells to prevent them from going into landfill.

Skills and Training

To help encourage more young people to consider a career in casting, ICME (with CMF members from industry) is supporting a pilot initiative with some of our foundries and their local schools based around a 'virtual reality' tour of a foundry featuring some young apprentices and technicians speaking about their roles.

A focus is the products that the industry makes that support modern life and the transition to a lower carbon future, the 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 kits which is made available for foundries to use when engaging with their local schools and colleges.

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

Outlook for 2024

The industry outlook for 2024 is generally positive. There is (since early July 2024) a new UK Government in place, with a strong majority in Parliament (providing some stability), and with a greater focus on manufacturing as part of an industrial strategy to generate economic growth.

Sources:

1. *www.statista.com/statistics/281744/gdp-of-the-united-kingdom/*
2. *www.mta.org.uk/trueimpactreport/*
3. *https://tradingeconomics.com/united-kingdom/wages-in-manufacturing*

4. www.statista.com/statistics/800680/wage-growth-uk-by-industry-sector
5. www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/bulletins/uktrade/december2023#:~:text=Total%20annual%20imports%20in%20goods,in%202023%20(Table%203)
6. www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/jobsandvacanciesintheuk/december2023

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 kept to the period between 2019 and 2023.

Worldwide Foundry general research figures

After the stabilization of the scientific production in cast iron technology that was reported after the pandemic, research investment in cast iron has started to drop slightly in the last years. This drop of the publication volume has been observed in general for metallurgy related research from 2022 to 2023. It is not thus a drop only in cast iron research, but a more general background effect.

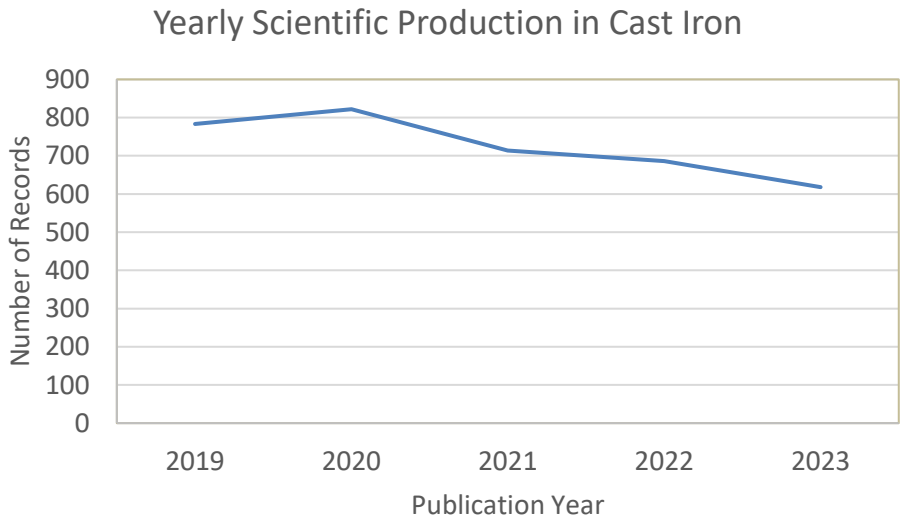


Figure 1. *Scientific production in the field of cast iron from 2019 to 2023 (source: WoS).*

Figure 2 shows the geographical distribution of the scientific production in the period from 2019 to 2023. China, India, USA, Poland, UK, Germany, Russia, Japan, Italy, and Turkey are the top ten result publishers in terms of number of published works. It is remarkable that the relative weight of the production from China has increased from 19% to 28% of the total academic manuscript output when comparing the 2015-2019 and 2019-2023 periods.

Other than that, some minor changes are found in the top ten list: Turkey is a newcomer that was ranked 16th in the last report, India, USA have surpassed the production from Poland that held second position previously and Brazil has dropped to 11th position.

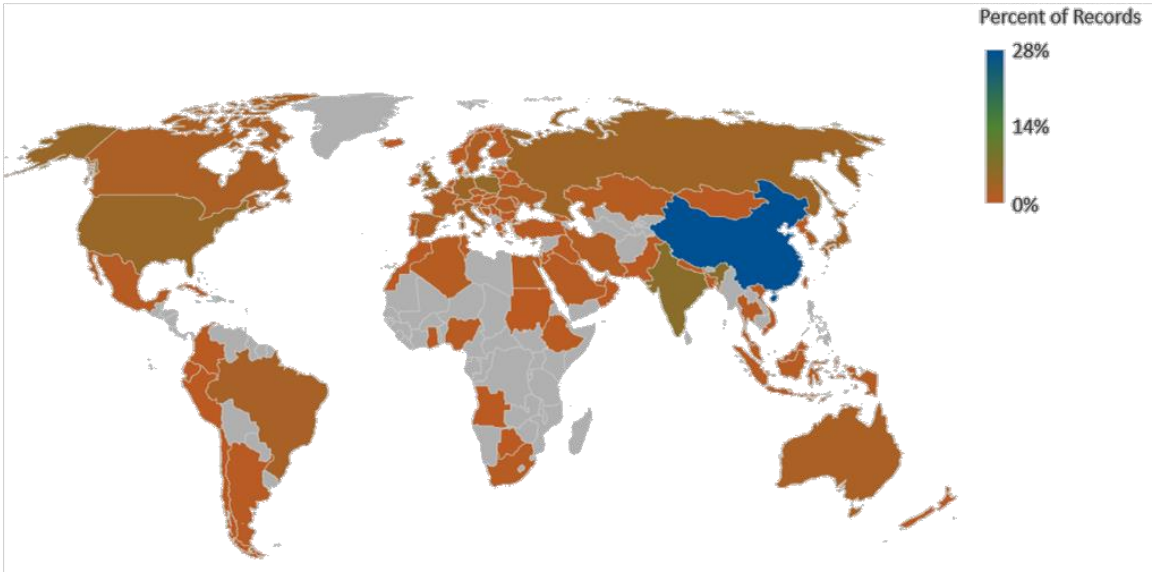


Figure 2. *Geographic distribution of the scientific production in the field of cast iron in the period from 2019 to 2023 (source: WoS)*

In terms of the raw production for the 2019-2023 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 exceeds 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 15% of the scientific output in Asia. This Top 5 cast iron related science production in Asian countries has been consolidated since the first issue of the Academic Research Outlook whose analysis reached back to 2015.

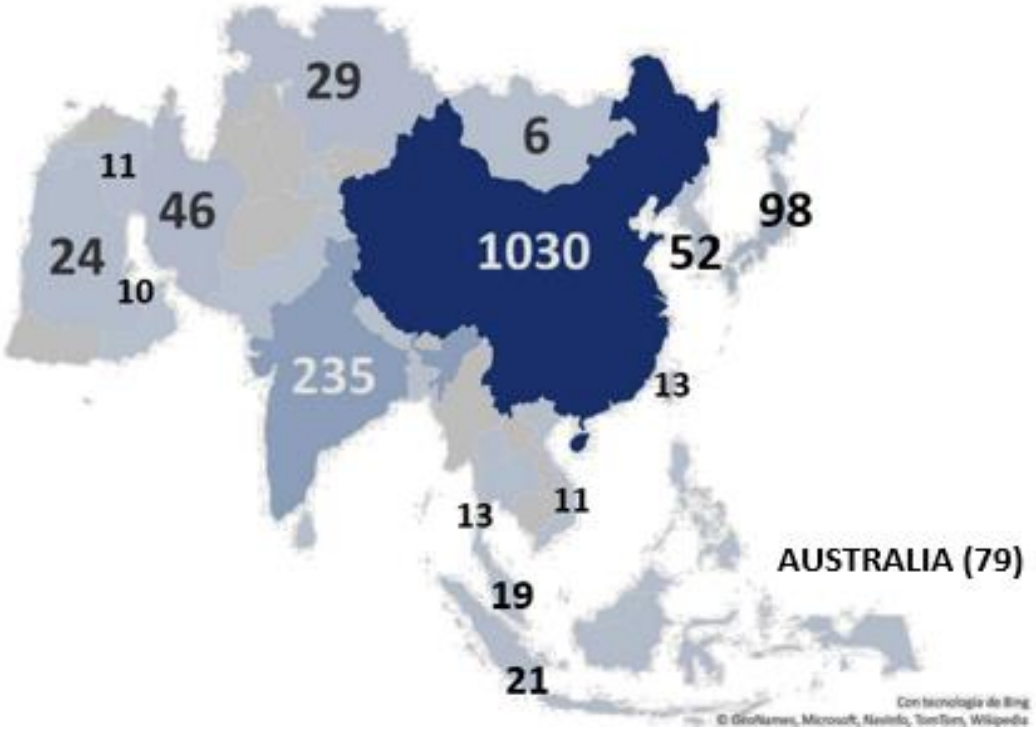


Figure 3. *Scientific output records in Asia in the period 2019-2023 (source: WoS)*

Positioned in second place behind Asia, Europe shows a very distributed scientific production with Poland, UK and Germany as the leaders in the region. Since last report, UK has exchanged positions with Russia, who holds now the fourth position.

The list of the top 10 European science producers in cast iron, accounting altogether same output levels as China, is completed by Italy, Turkey, Spain, France, Sweden, Ukraine and Romania. Italy and Turkey show the same level of scientific production as Japan. Spain, France and Sweden are comparable to Australia and Ukraine and Romania research in cast iron with an intensity close to that of South Korea or Iran. Russia and Turkey have been included in the European region map following the criterion from previous reports.

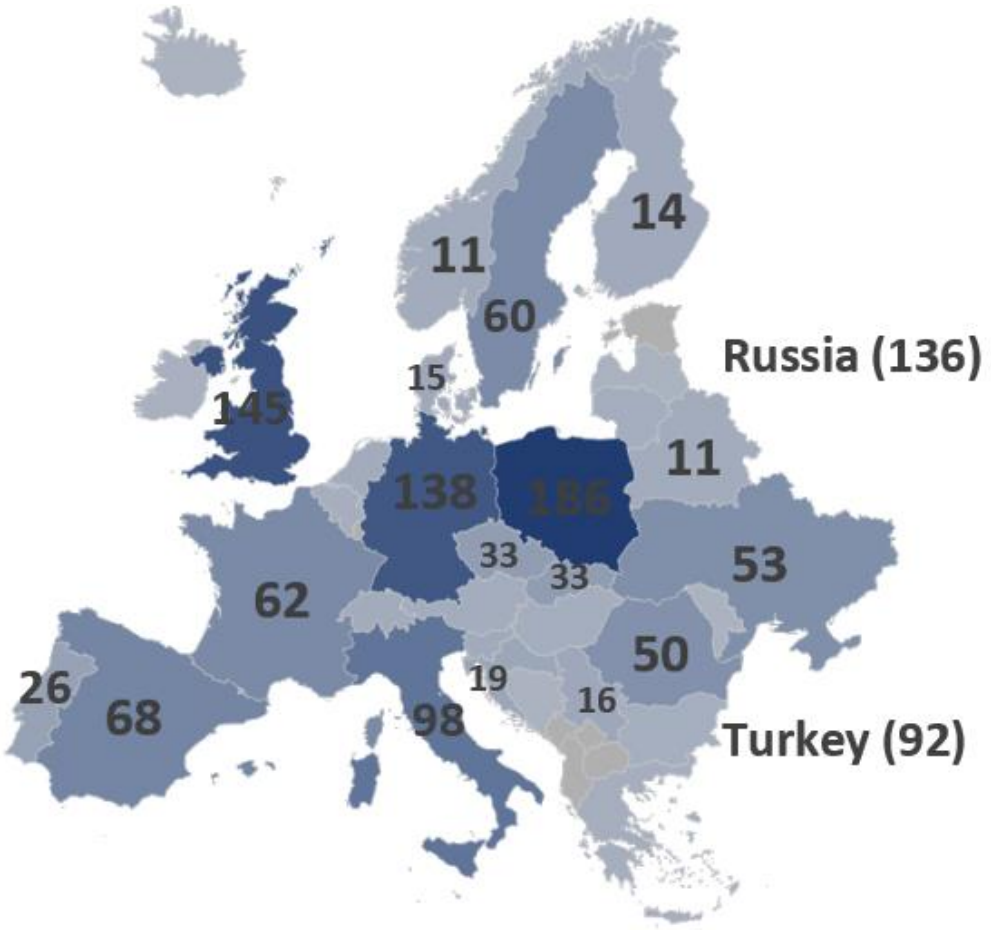


Figure 4. *Scientific output records in Europe in cast iron the period 2019-2023 (source: WoS).*

Shifting to the American continent, USA is the major player. As in the previous two reports, Poland and USA are very close to each other. Brazil is the second in the continent with an output, comparable to Japan, Italy and Turkey. Canada holds the third position at a scientific production level in cast iron which is like Australia and Spain. The whole continent sums approximately half the production of China.

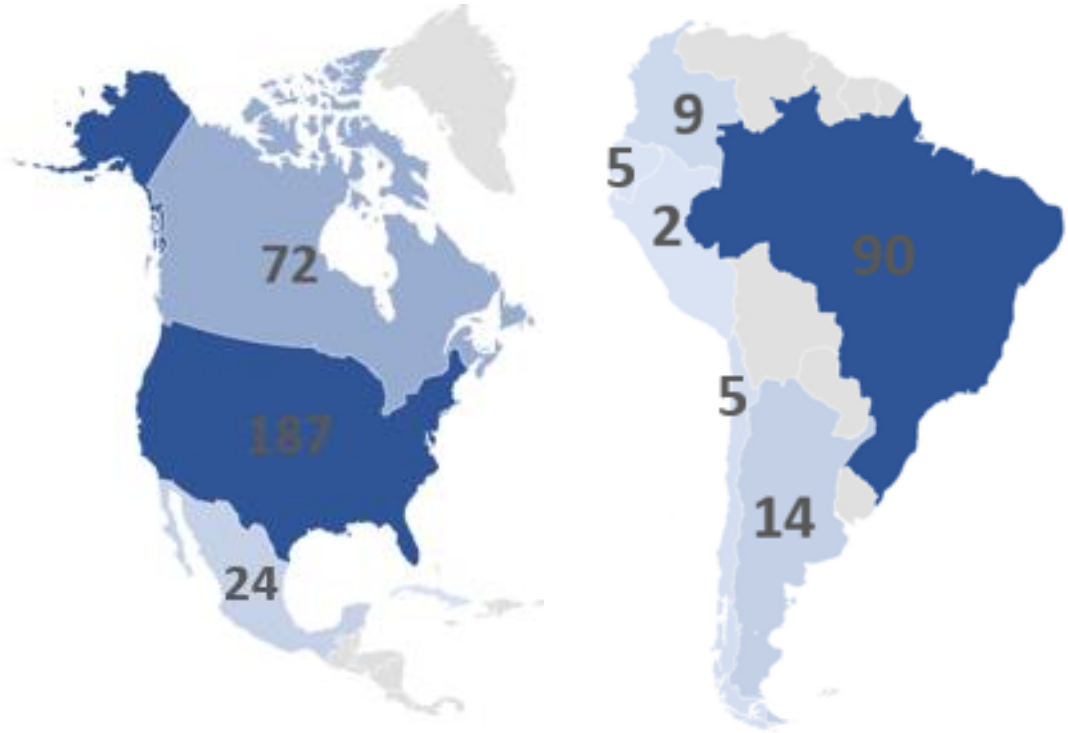


Figure 5. *Scientific output records in America in the period 2019-2023 (source: WoS)*

SUMMARY. Despite a recovery of the scientific production in cast iron being expected after the COVID-19 pandemic, research activity started dropping in the last years. This has been accompanied by a reduction in metallurgy research output, which must be further studied for potential needs of reviewing research policies. The research efforts, measured as number of indexed publications in WoS databases, are led by Asia due to the summed weight of China, Japan and India. In Europe and America, Poland plus UK yield a similar output to that of the joint research of USA, Brazil and Canada.

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 the 2019-2023 period 2037 funding sources have been identified for the 3623 manuscripts identified in WoS. This indicates that 56% of the research in cast iron has been declared to be financially supported by public institutions. This value was 45% in the last assessment performed for the foundry knowledge landscape. This is more attributed to a better declaration of funding, enhanced lately from the scientific editorials, than to a trend in growth of public funds for research in cast iron.

Fig 6 shows the share among the top 11 institutions funding institutions, which are very stable in time and show repeatedly in funding studies. China outstands with the presence of four agents in the share, three of which are strongly University Research oriented. In the Americas, Brazil and Canada appear with concentrated funding sources, as does Australia with strong

administration in supporting cast iron research. On the European side, DFG and European Commission are the top supporting entities but have dropped to ninth and tenth positions. This fits with the R&D policy trends identified in Horizon Europe research topic publication, that don't fit as much as in previous framework programs with foundry technology.

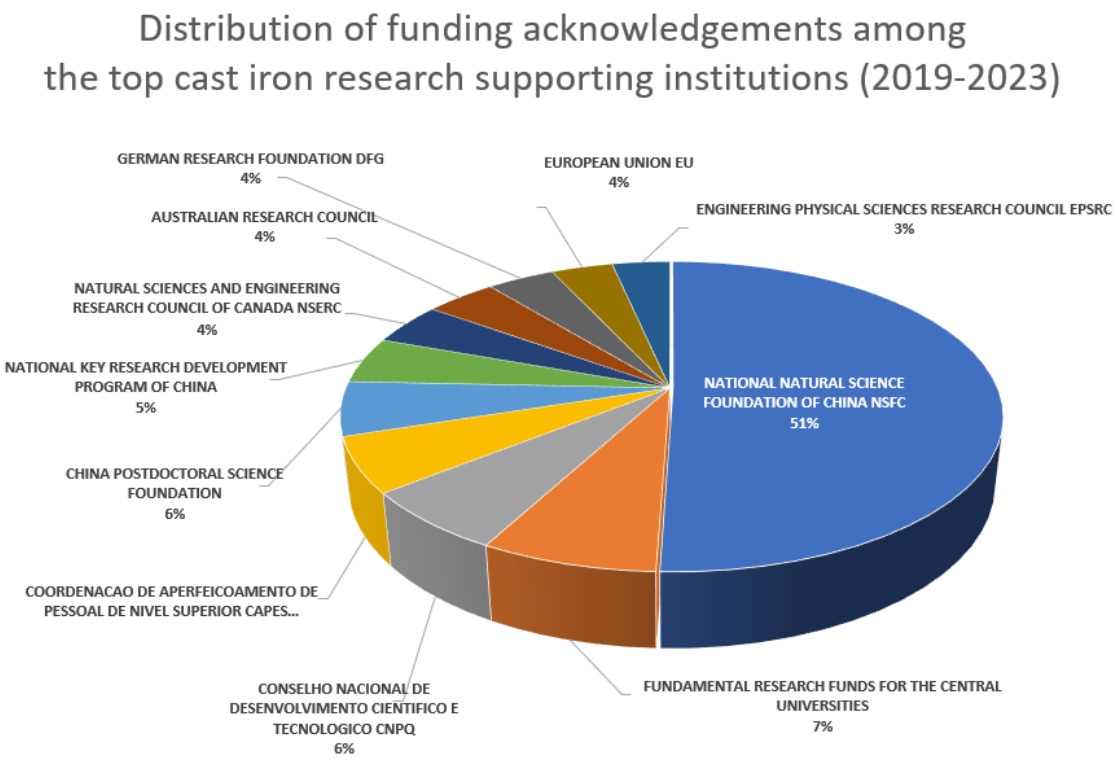


Figure 6. *Share of acknowledgements for funding in scientific publications among the eleven institutions that sum up the highest number of supported works 2019 to 2023 (source: WoS)*

MAIN TRENDS IN INDUSTRIAL FOUNDRY RESEARCH

We all trusted in the future of the markets and thought that we would never face this situation, but it has arrived and now it does not seem to be an easy problem to solve.

On this occasion, we are talking about two aspects that are influencing and will continue to influence substantially the competitiveness of our industries. These are: environmental sustainability and people and talent. We have been concerned for so long with the industrial competitiveness of our companies that we have been relegating certain activities because we did not consider them vital. Probably with good reason, we have struggled to survive other needs. But the time has come to take matters into our own hands and consider these two issues as strategic for the future of our industry.

Within the field of environmental sustainability, it seems important to pay special attention to the challenges related to energy efficiency and sustainability, the reduction and reuse of raw materials and by-products, and the reduction of the environmental footprint.

We should be aware that many of the actions we undertake with environmental objectives will have a direct impact on improving competitiveness. It is true that by default, we tend to think of those actions that generate the greatest profit quickly, but in general, this type of action usually involves significant levels of investment that not all companies are able to assume. However, there are other strategies that are not so closely linked to investments that can help to achieve the objectives set.

These include studies related to the energy consumption of daily processes: melting, transfers, casting temperatures, heat treatments, etc…, with the aim of establishing systems to optimize these processes. The procedures for monitoring these consumptions will help to define the points of greatest interest on which to focus actions.

Indirectly related to energy consumption, but also of great importance, paying attention to non-valuable processes is a relevant strategy. Stabilizing and controlling manufacturing processes, establishing relationships between the different activities, will help to reduce the level of rejection of parts that, although they can be reincorporated as raw material, have an implicit cost of manufacturing, inspection, etc...

Perhaps we should think about the possibility for foundries to share the responsibility in the design of the parts they manufacture, shortening the distance with their customers and improving their capabilities in terms of design. In this way, foundries could go from being sectors with little decision-making capacity in design to providing valuable solutions, reducing the environmental footprint, and/or considering key factors such as lightweighting or devising solutions to reduce rejection or increase performance by considering the geometric and material flexibility offered by foundry technology.

On the other hand, it is important to highlight the effort that foundries and companies in the sector will have to make to attract talent to their industries. Knowledge is a value that is nowadays very dispersed in the industries, poorly systematized and in the hands of people who

are generally close to retirement age. The loss of this intangible value is going to be of vital importance and if we do not take care of this asset, it is very likely that our manufacturing processes and, at the end of it all, the competitiveness of our companies will be compromised.

The key lies in developing a business culture where information and knowledge are valued, managed and shared, but also used efficiently to assist in decision making of any kind.

The information society requires companies to adapt to new changes so that they can leverage information technologies for their own benefit.

Organizations wishing to organize their knowledge so that it will be accessible in the future will have to select people and processes that are important to store the experience in an appropriate way and ensure its accessibility and updating.

This new way of organizing and managing knowledge may prove to be the foundry industry's lifeline.

While the new generations consider a foundry to be an unattractive enterprise, the combination of a highly complex manufacturing process, with a multitude of variables at play and based on a highly experimental and personalized knowledge system, opens new avenues of development for digitalization tools and artificial intelligence systems that can be very attractive for development in the industrial world. These tools already developed for more playful purposes should make the leap to solve much more real problems related to our business interests. That is where the new generation of talented young people with dynamic and creative thinking must flourish and be able to dynamize obsolete and well-established structures, transforming them into flexible, fast systems capable of making real-time decisions that support business competitiveness.

In addition to relying on the expertise of foundries in their manufacturing processes, we should all remain aware of the new technologies and possibilities that the industry offers and brings to the market. These may not be technologies that can solve 100% of our needs, but being able to open our minds and try to combine our established processes with more modern ones to devise an innovative solution to certain needs of our customers is also a strategy that we should not abandon.

Foundries today require innovative minds capable of devising flexible, collaborative and imaginative solutions to customer challenges that are not afraid of failure. There is no greater failure than not allowing oneself to take the slightest risk.

Academic and Industry research outlook section developed with the collaboration of
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FINAL REMARKS

The World Foundry Organization publishes and disseminates the Global Foundry Report on a yearly basis, providing a complete overview of the worldwide scenario linked to the casting industry.

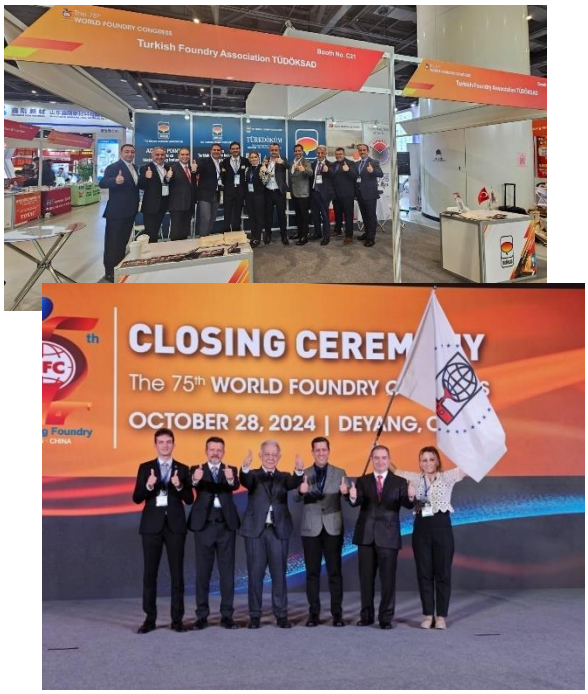
The drafting of the WFO Global Foundry Report 2024 counts with the collaboration of the WFO Member Countries with the compilation and design work from the WFO Secretariat Team

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Save the dates





WFO CENTENARY
WORLD FOUNDRY CONGRESS
ISTANBUL, TURKEY
19th to 25th September 2026

The reference point for the global metal casting industry

The World Foundry Organization Ltd is a partnership of technical foundry associations from over 30 countries working together to develop and enhance the impact of the world's cast metals industry on society at large.



www.thewfo.com

Contact details:

General Secretary: José Javier González

Offices:Winton House, Lyonshall, Kington HR5 3JP United Kingdom

Email:jjgonzalez@thewfo.com

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