

DEVELOPMENT OF THE FOUNDRY INDUSTRY IN POLAND

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Abstract

Analysis of the world economy and its development trends indicates a constantly increasing share of foundry casting as a technique of processing and manufacturing of metal products. Foundry casting is one of the most important sectors of the Polish industry. Development of an industry is chiefly determined by the condition of sectors that use its production, among other factors. Castings are sold to many industries, mostly to the automotive sector, which is the consumer of over 50 % of the world's cast production. For years, transport, shipbuilding, energy, agriculture, construction, mining, metallurgy, and machine industries have also been significant customers for castings. The article presents developments of the foundry industry in Poland in the years 2011-2015. Its main purpose is to analyse and assess development of the foundry sector in Poland in 2011-2015. General statistical changes are addressed in this discussion. The assessment of the casting market in Poland takes into account the state and ownership structure of Polish foundries, production volumes and exports of Polish castings as well as employment and productivity of foundries. Future directions of change in the context of the ongoing R&D in the industry examined have been identified. The analysis produces an organised view of the changing structure of foundry production and, consequently, development of the foundry industry in the years analysed. Data from the National Office for Statistics and industry specific studies were employed.

Keywords: Foundry industry, development, casting market in Poland

1. INTRODUCTION

The foundry industry, a key supplier of products and components to a range of industrial sectors, plays a major role in development of the Polish economy. The foundry industry is treated as part of metallurgy and metal products sectors. It is not identical with steel industry, however [1]. Analysis of the world economy and its continuing development trends indicates a constantly increasing share of foundry casting as a technique of processing and manufacturing of metal products. The steadily growing output of castings has for years assured a firm standing of the Polish foundry sector in the European Union.

Reindustrialisation processes are currently apparent globally, as is apparent in strategic documents and policies of both the European Union and Poland. Transformation of the domestic industry is to be fostered with industrial policies implementing intelligent reindustrialisation [2]. The reindustrialisation will involve development of innovation that will ultimately help to cut production costs, enhance productivity, improve quality of products, customise ranges on offer, better satisfy needs and faster respond to shifting expectations of consumers, reduce consumption of virgin materials and energy requirements, decrease manufacturing emissions, and boost safety at work.

Regional specialisations are currently a novel approach to development of the European Union regions [3]. Intelligent specialisation is by its very definition an instrument supporting development and competitiveness of regions. When selecting intelligent specialisations, regional innovation potential is evaluated on the basis of resources and opportunities available in a region. These may be both specialisations within a single sector and intersectoral actions that provide for a specific competitive advantage [4]. Regional Innovation Strategies indicate foundry practice as an intelligent specialisation in Świętokrzyskie and Opole provinces in Poland.

The main purpose of this article is to analyse and assess development of the foundry sector in Poland in 2011-2015. General statistical changes are addressed in this discussion. The assessment of the casting market in

Poland takes into account: the state and ownership structure of Polish foundries, production volumes and exports of Polish castings as well as employment and productivity of foundries. The time framework of the analysis is determined by availability of the most current figures (2015) on the one hand and the possibility of using comparable data from an earlier period, on the other hand. The analysis has helped to identify developments of the Polish foundry industry in the period under study.

2. DEVELOPMENT OF THE FOUNDRY SECTOR GLOBALLY AND IN EUROPE - SELECTED ASPECTS

The global output of castings has tended to grow over the years. It has risen by more than 30.0 % (from 80.5 m tonnes in 2009 to 104.4 m tonnes in 2014) since the credit crunch and by approximately 61.0 % since 2000 (from 64.8 m tonnes to 104.4 m tonnes). Figures from 41 countries worldwide demonstrate the output increased from 103.3 m tonnes to 104.4 m tonnes of castings, i.e. by more than 1%. Production of iron alloy castings rose by 0.4 % to reach nearly 85.4 m tonnes in 2014, whereas output of non-ferrous metal alloy castings grew by above 4.0 %, with volumes of more than 19 m tonnes. Production of aluminium alloy castings experienced a particularly substantial rise of almost 6 % [5, 6, 7, 8, 9].

China remains a leading global producer of castings. The share of its output expanded by 1 % in 2014 and accounted for 44 %. The United States with a nearly 10 % share in the global casting production (down from 12 %) rank second. India, the third manufacturer worldwide, holds a share of nearly 10 % on the global scale. Castings made by European Union countries continue to account for 13 % of the world output. The share of the Polish foundry casting remains a steady 1 % of the global output as well [6] (Figure 1).

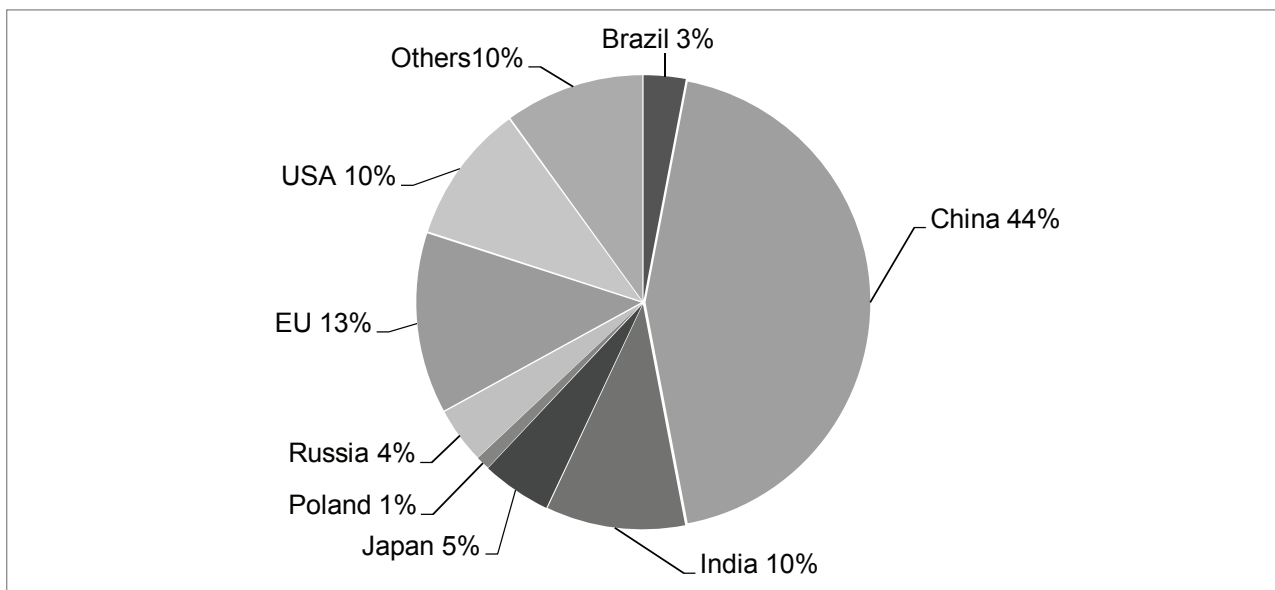


Figure 1 Shares of individual countries in the production of castings worldwide in 2014 (%)

The current figures from 33 countries of the world suggest a majority experienced a growth of casting production in 2014. The production in China increased by 1.7 m tonnes, that is, by 3.8 %. Among the global leaders, growth was also noted by: India (2.2 %), Germany (1.2 %), Russia (2.4 %), Korea (2.7 %), Italy (2.7 %) and, significantly, Turkey (13.4 %), at present the tenth casting manufacturer in the world. The United States and Brazil incurred drops of 11 %. The output in the US fell from 12.25 m tonnes in 2013 to 10.883 m tonnes in 2014. In Brazil, meanwhile, it declined from 3.07 m tonnes to 2.74 m tonnes of castings. The output in Canada suffered a similar drop of 7.6 %.

Grey iron castings constituted the largest share of cast materials in the total global output of castings in 2014. The percentage of production using this material had dropped a little since 2013, from 45 % to 44 % - to amount to 46.4 m tonnes of castings. The share of spheroidal iron castings increased, on the other hand, totalling 27.0 % taken together with malleable cast iron. The output of steel castings remained constant at 11 % (11.2 m tonnes). Aluminium alloy castings form the largest group among castings from non-ferrous metal alloys - 15 %, with the output of 16.2 m tonnes - followed by copper alloys (1.7 m tonnes, 1.6 %). The remaining non-ferrous metal alloys account for approximately 1 % of the overall production of castings.

The value of the global output of castings in 2014 is estimated at US\$ 230.0 bn. Leaders in casting manufacture have for years included: China (46.20 m tonnes), the United States, India, Japan, Germany, Russia, Brazil, Korea, and Italy. In 2014, however, Turkey (producer of 1.75 m tonnes) ranked tenth, overtaking France (1.73 m tonnes). Available data suggest more than 48,000 are operated worldwide, including more than a half in China.

The analysis of the European casting market employed figures concerning 27 countries for the year 2015 [10, 11]. Approximately 7000 foundries work in Europe, with around 40 % casting iron alloys. The output of castings in Europe in 2015 was nearly 1 % greater than in 2014, reaching nearly 21.9 m tonnes. Production of iron alloy castings was comparable in both the years, whereas above 4 % more of non-ferrous metal castings were made, mainly from aluminium and copper alloys. The value of the output of castings in Europe (except Russia since current figures concerning values of casting output by manufacturers like Russia or Ukraine are not available) in 2015 was estimated at € 42.5 bn.

Production of castings in Europe (contrary to the global output) failed to return to its levels before the credit crunch, i.e. 2009. The output of 21.85 m tonnes in 2015 is almost 20 % lower than in 2007 (27.03 m tonnes), the year of top output during the last decade. Production of grey iron castings has diminished in Europe in recent years. Growth trends have been noted with regard to spheroidal cast iron and aluminium alloys.

Output of iron alloy castings fell in most European countries in 2015 compared with 2014. Considerable rises were experienced by Sweden (12.8 %), Spain (5.9) Turkey (5 %), and the United Kingdom (4.4 %). As far as production from non-ferrous metal alloys is concerned, the output reduced in Switzerland (-11.4 %), Poland (-1.4 %) and the UK (-0.1 %). The remaining countries experienced growth. Overall casting output increased in 2015 in countries like Germany (0.4 %), Turkey (5.7 %), Italy (0.3 %), Spain (6.1 %), and the UK (3.2 %). Decreases were noted in: France (-2.6 %), Poland (-1.2 %), and the Czech Republic (-2.7 %). Germany accounts for the most substantial share in casting production among European countries (**Figure 2**).

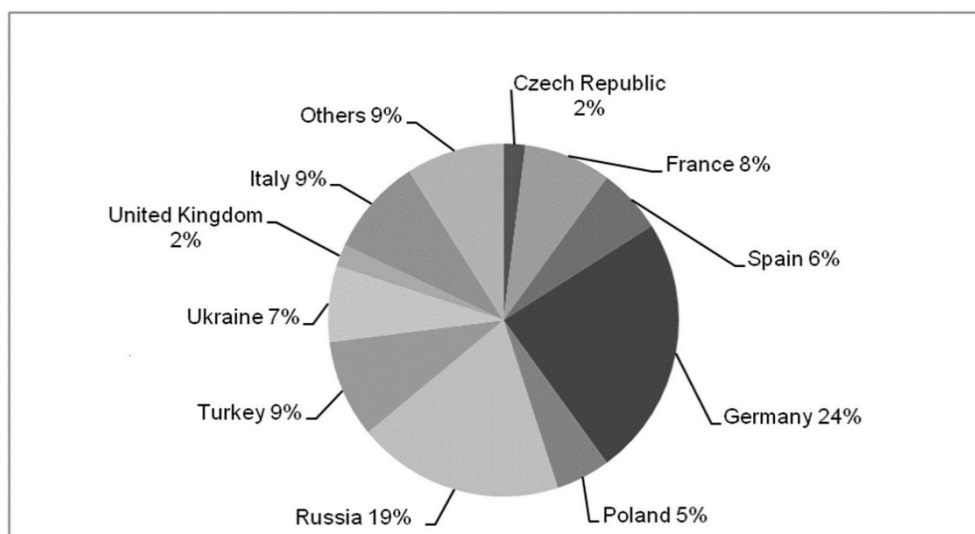


Figure 2 Shares of leading European countries in the production of castings in 2015 (%)

The output of this manufacturer in 2015 - 5.3 m tonnes - constituted approximately 24.0 % of the European output of castings. The second largest European manufacturer - Russia, producing 4.1 m tonnes in 2014 - holds a share of 19.0 %. The share of Turkish castings in the European output increased dramatically in the year under analysis (from 7.0 % to 9.0 %). The Polish output of castings constitutes around 5.0 % of European production.

3. EVALUATION OF THE DEVELOPMENT STANDARD OF THE POLISH FOUNDRY INDUSTRY IN 2011-2015

The state and ownership structure of Polish foundries, production volumes and exports of Polish castings as well as employment and productivity of foundries served to assess development of the foundry sector in Poland. The statistics indicate around 60.0 % of casting plants are independent foundries. The remaining 40.0 % are commonly divisions of larger enterprises. Out of 250 foundries, 18.8 % are co-owned by foreign capital (including 32 with 100.0 % of foreign capital participation) [10, 11].

1 048 800 tonnes of castings (from iron and non-ferrous metal alloys) were manufactured in Poland in 2015, that is, 1.2 % less than in 2014. 2011-2015 saw satisfactory outputs of castings, which have been more than 1 m tonnes for 5 years (**Table 1** and **Figure 3**). The production has grown by 2.0 % since 2011. Grey and alloy iron castings account for the largest part of the overall output - 46.1 %. Spheroidal iron castings constituted 14.8 % of total casting production, whereas malleable iron castings had the minimum proportion of 1.0 % of the overall casting output. Production of all these materials had fallen since 2014 by: 0.3 %, 4.3 % and 6.0 %, respectively.

Output of steel castings, in turn, accounted for 4.8 % of the overall production and had risen by 1.3 % since 2011. Growth trends can be observed in manufacturing of non-ferrous metal castings. Their output had declined by 1.4 % since 2011 and its share constituted 33.2 % of the overall production in 2015. Sales determine the importance of the foundry industry. It is a major supplier of components for the automotive, electrical engineering and machine building, metallurgy and mining, construction, agricultural and rail, shipbuilding, power, and other industries. More than 60.0 % of all castings in Poland are made for the automotive sector [10, 11].

The foundry industry in Poland is export-oriented. Exports of iron and non-ferrous metal alloy castings amounted to 620,600 tonnes in 2015, including 313,600 tonnes of iron alloy castings and 307,000 tonnes of non-ferrous metal alloy castings. The share of exports in the overall output of castings was lower in 2015 than in 2014, accounting for 59.2 %. Exports have increased for several years as considerable manufacturing operations of complicated automotive castings to be exported are based in Poland. The European Union countries, exports to which are estimated to constitute more than 90.0 % of total exports, are the key foreign sales market.

Table 1 Production of castings by material in Poland in 2011-2015 [10, 11]

Cast material	Output (thousands of tonnes)					Dynamics 2011=100% (%)
	2011	2012	2013	2014	2015	
Grey and alloy iron castings	495.0	486.0	488.0	485.30	484.0	-2.3
Spheroidal iron castings	145.8	141.0	118.0	162.15	155.2	6.4
Malleable iron castings	10.0	10.0	9.9	11.70	11.0	10.0
Steel castings	49.4	51.5	52.6	49.85	50.5	2.2
Total alloy iron castings	700.2	688.5	668.5	709.00	700.7	0.07
Total non-ferrous metal castings	329.9	348.3	352.2	352.95	348.1	5.5
Total alloy iron and non-ferrous metal castings	1 030.1	1 036.8	1 020.7	1 061.95	1 048.8	1.8

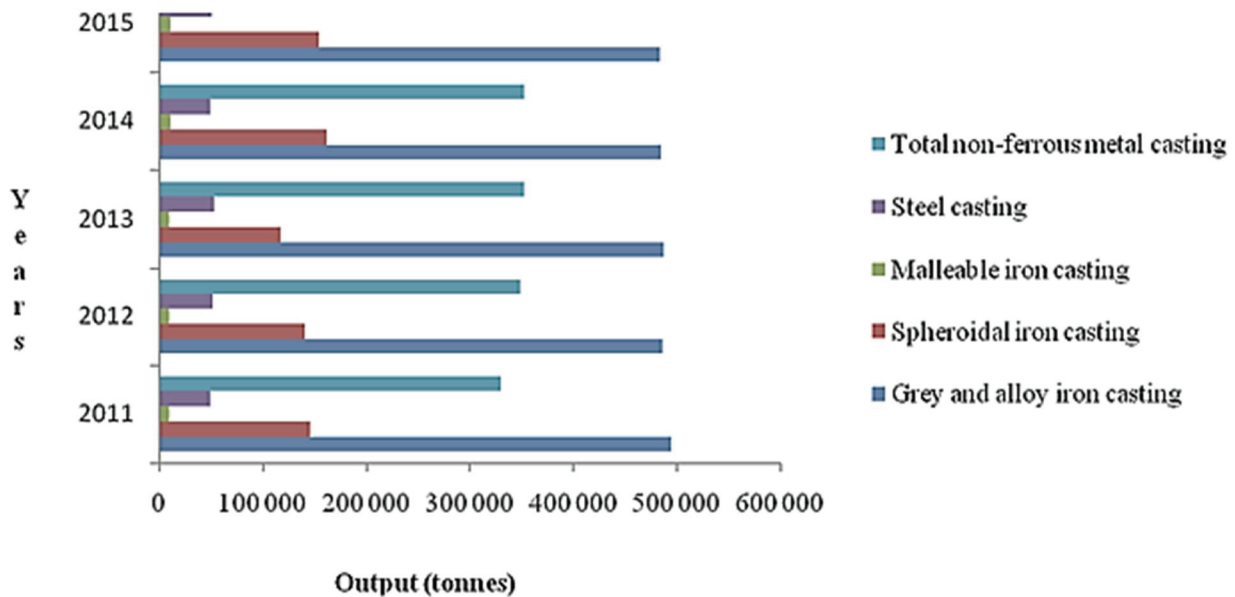


Figure 3 Production of castings by material in Poland in 2011-2015 (tonnes)

At a time of knowledge-based economy, human capital is one of the most important resources in an enterprise. It is important to acquire qualified personnel (starting from designers, engineers, foundry engineers to workers) in the foundry industry [12]. Approximately 24,300 people are currently employed in the sector, the same as in 2014. Direct production workers in steel foundries constitute the largest share in the employment structure (72.5 %). At the end of 2015, there were 400 foundries, including 5.5 % employing more than 250 employees. Productivity of the domestic foundries in 2015 was 43.2 tonnes/1 employee, lower than in 2014 (43.5 tonnes/1 employee), the latter being the highest in the period under analysis.

The analysis implies the foundry sector in Poland developed in 2011-2015, most notably in 2014, where the most castings were manufactured, namely, 1,061,950 tonnes. The demand was chiefly driven by the improved condition of the key industries which use castings, since the foundry industry is a major supplier of components for final products manufactured by basic industrial sectors. Opportunities for development of the sector are noted in cluster links for integration and development of the foundry sector (e.g. the Association of Casting Component Manufacturers COM-KAST) [13].

4. CONCLUSION

The evaluation of development of the foundry industry in Poland in 2011-2015 and of factors characterising the sector can lead to the following conclusions:

- 1) Development based on state-of-the-art and innovative products is the most important challenge to the Polish industry. This is to be fostered by intelligent reindustrialisation. A return to industrial policies and acceptance of modern reindustrialisation is a global trend and an opportunity for development of Poland. Development of the sector may be driven by not only strategic actions in the field of intelligent reindustrialisation but also intelligent specialisations to be identified at the national and regional levels. Actions to enhance competitiveness and innovation of the sector in Poland need to be reinforced.
- 2) Growth tendencies can be noted in the Polish foundry industry and globally alike. The gradual increase of casting production helps to maintain its standing in the global market. In 2011-2015, positive developments could be observed in the industry. Output of castings rose at the time - it only diminished in 2015 by 1.2 % compared with 2014. Exports of castings in 2015 amounted to 620,600 tonnes, with the exports accounting for 59 % of the overall output. The number of casting manufacturers in Poland

reached approximately 400 foundries at the end of the period analysed. SMEs prevail - 94.5 % of all the enterprises. The foundry industry reports a great demand for traditional founding professions. Only adequate professional competences promise stable employment and continuing development of the foundry industry.

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