WORLD FOUNDRY ORGANIZATION

The reference point for the global metal casting industry

WFO GLOBAL FOUNDRY REPORT

2018

ACTUAL SITUATION OF THE WORLDWIDE CASTING INDUSTRY

September 2018
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1. INTRODUCTION

The objective of the World Foundry Organization is to become a reference point for the global metal casting industry and an international network of contacts that provide a direct access to the latest technology and key figures from the most representative industrialized countries. The WFO enables to share very interesting information and facilitates the forecasting of some of the new challenges and opportunities for the global casting industry.

The WFO General Assembly meeting takes place every year as an extraordinary working frame to interact within this international network that represents companies, technicians, stakeholders and organizations linked to the foundry technology all over the world. This fruitful meeting includes the exchange of updated information on the status of the foundry industry from each member country.

Following this directive, the WFO Secretariat Team establishes a yearly contact with all associated countries, with the main objective of drafting the most complete report related to the situation of the Global Casting Industry.

We are now showcasing the final outcome of the 4th edition of this important report. A document that gathers valuable information from most of the WFO Member Countries.

This **WFO Industry Report** is aimed at providing high value information about the global casting industry, including key areas of change within each country (output trends, market strengths and current issues, whether these are environmental, energy or customer focused...), providing updated information from most of the main players in the global casting scenario.

This initiative is part of the WFO Strategic Plan that includes further activities to be set in place for the benefit of its members and the support to the global foundry industry.
2. WORLD FOUNDRY INDUSTRY 2017-18

2.1. FOUNDRY INDUSTRY REPORT FROM AUSTRIA

ASSOCIATION OF THE AUSTRIAN FOUNDRY INDUSTRY

Situation of the foundry industry

According to our own survey, production, sales and employment increased in 2017. The total production in 2017 amounted to about 318,190 tons, i.e. an increase of 1.1 % over 2016. Total sales of the branch increased by 6.9 % over 2016 to a volume of about 1.49 billion €.

Iron castings registered in 2017 a total production volume of 156,589 tons (an increase of 0.8 %). Sales figures rose by 3.4 % to about 408 million €.

The production volume of ductile cast iron amounted to 102,903 tons, i.e. an increase of 1.1 % over the volume of 2016.

Steel castings dropped to 10,764 tons, a reduction of 4.6 % compared to 2016.

The production of grey castings went up by 1.3 % compared to 2016 and reached a volume of 42,922 tons.

Non-iron castings registered a production increase of 1.4 %; sales went up by 8.3 %.

Employment

In 2017 the branch provided employment to a total of 7,098 persons (employees, skilled workers, semi- and unskilled workers), i.e. an increase of 4.0% over 2016.

The number of industrial apprentices trained in professions related to our branch (foundry technology and metal foundrymen) declined with regard to 2016.

Incoming orders

All in all the utilization of capacities was positive. Incoming orders were satisfactory, whereas price pressure continues to increase.

Investment plans

The trend of investment activities remains positive.
Personnel cost

The collective wage agreement establishes an average increase of 3.0 % of the minimum wages and salaries in the different employment groups.

Allowances and apprentice remunerations according to the collective agreement were raised by 3.0 %, expense allowances by 1.9 %.

Supply of commodities and energy

In 2016 commodity prices fluctuated and increased significantly towards the end of the year.

According to the Austrian Energy Agency energy prices increased again. Gas and electricity registered price cuts; fuel and district heating became more expensive. In 2017 the general inflation rate or in fact the consumer price index (CPI) increased by 2.1 %, a little less than the increase of the EPI.

Cost development

Our survey revealed an average cost increase of 2.79 % for the whole branch.

Outlook 2018

Of course, the dieselgate scandal has an impact on the branch and all the suppliers of diesel components are facing downturns. The significant fluctuations of commodity prices are negative for the income from long-term contracts. Despite these circumstances the year 2018 and the capacity utilization show a positive picture. It is generally assumed that the level of 2017 will be maintained.
2.2. FOUNDRY INDUSTRY REPORT FROM BELARUS

ASSOCIATION OF FOUNDRYMEN AND METALLURGISTS OF BELARUS

During Soviet times Belarus was called “Assembling Shop” of the Soviet Union. A number of big enterprises were constructed in Belarus, among them OJSC “BelAZ” – the cluster for production of super heavy dump trucks (approximately 30% of world production of heavy dump trucks), Minsk Tractor works – 6% and many others. Machine building industry is based on foundry and metallurgy, and any changes in machine building always cause corresponding changes in foundry. Belarus is export-oriented country - export in 2017 made more than 60% of GDP.

According to the World Bank study "Doing Business 2017", Belarus was ranked 38 among 190 countries, on "An index of human development" (The program of UNDP) – was ranked 51 among 186 countries of the world.

Belarus GDP decreased in 2015 – 2016 in connection with world crisis, drop in oil prices and the strong decrease in import capacity of domestic market in Russia. Russia is the main trade partner of Belarus (around 50% of foreign trade), second biggest trade partner – European Union. The moderate improvement in economic performance was registered in 2017. GDP – 102,2%, industrial production – 106, 1 %.

Fundamentals of mechanical engineering is foundry and metallurgical industry, well developed in Belarus and providing not only internal requirements but also exporting the considerable proportion of production to other countries. Therefore, the foundry production also increased in 2017.

In General, throughout the Belarus there are about 135 of casting shops and sections with the total installed capacity for the production of castings is around 557,1 thousand tons. In terms of installed capacity of production of castings all organizations with the foundry can be divided into four groups:

- Group I – 50 thousand ton and above: three organizations;
- Group II – from 10 to 50 thousand ton: seven organizations;
- Group III – from 1 to 10 thousand ton: 17 organizations;
- Group IV – less than 1 thousand tons: 32 organizations.

A distinctive feature of the foundry enterprises of Belarus is a large range of manufactured castings, which has more than 15 thousand names of the 18 grades of alloys with a weight of castings from 20 grams to 15 tons. It should be noted that the majority of castings are made by casting in green sand. For the manufacture of foundry
cores there are used different processes such as Coldamin box, Hot-box, Croning-process, AlpHaset-process, the Resol-CO2, etc. Capacities for types of various materials, castings: gray iron – 62%; steel– 15,5%; ductile iron -13,1%; non-ferrous alloys - 3%. The companies had introduced the international quality standards ISO.

In 2017, the real foundry production amounted to 258,9 thousand tons (annual increase of 4, 8%). According to information from official sources the total amount of financing of the enterprises of mechanical engineering with own foundry and metallurgical production in the period 2017 - 2020 years and up to 2030 will amount to 8.5 billion euros. This amount includes own funds, credits and loans of banks, credit resources from China and funds from the Republican budget. For example, for the development of MAZ (Minsk Automobile Works) it is planned to invest 500 million US dollars. In the framework of the investment program of development of BelAZ (large capacity dump trucks) - $ 800 million.

The holding enterprise “Kuzlitmash” in accordance with the strategy plans of the Ministry of industry in the short term will be allocated funding in the amount of 234 million US dollars for the development of production of trucks with capacity from 90 to 450 tons and other projects.

To provide the machine building industry of Belarus with metal of own production it is planned to invest 800-850 million US$ in the BMW (Belarussian Steel Works), which is currently covers 60% of the need in the metal products. MTW (Minsk Tractor Works) makes a deep modernization in 2017-2030, the plant needs investment in the amount of $ 1.1 billion. "Gomselmash" plans to promote the production of the whole range of equipment for agriculture and attract investments of 645 million US dollars.

The holding "Belarusian metallurgical company" plans a number of new projects whose primary purpose will be to ensure Belarus with the basic metal components. To accomplish this, the company invest 1,100 billion by 2030. With the launch of the Belarusian nuclear power plant (NPP) there are plans to reduce the cost of electricity tariffs from the average tariff of 11.3 cents per kWh to 7.9 cents. It will increase the competitiveness of industrial products.

Renovation and reconstruction of industrial entities requires modern knowledge and experience in equipment and technologies. Therefore, Belarusian companies are open to proposals from national and foreign companies. The best way for organization of business links – participation in annual International Conference “Foundry and Metallurgy 2018. Belarus”, which will take place on Oct 17 – 18, 2018, in Minsk – Capital of Belarus.
2.3. FOUNDRY INDUSTRY REPORT FROM CHINA

FOUNDRY INSTITUTION OF CHINESE MECHANICAL ENGINEERING SOCIETY

2017 Chinese Foundry Industry Data

Castings’ output

In 2017, China’s casting output was 49.4 million tons, increasing 4.7% vs. 2016.

From 2002 to 2017, China’s casting output has been growing stably, except a slight decrease in 2015 (-1.3%), moving into a middle- or low-speed development status (an increase of 3.51% in 2016 and 3.8% in 2014).

The yield of different casting materials

In 2017, output of grey iron increased 3.9% compared to 2016 from 20.35 to 21.15 million tons. Ductile iron (includes vermicular graphite cast iron) showed a year-on-year increase of 4.2% from 13.2 to 13.75 million tons, while cast steel showed a relative higher increase of 8.8%, driven by the rapid growth of rail transportation, mining and metallurgical heavy machinery and construction machinery industries, accounting for 11.3% of the total output (10.8% in 2016 and 10.2% in 2015). Due to the demand for light weight, aluminum alloy (includes Mg alloy) grew to 7.3 million tons in 2017, an increase of 5.8%, accounting for 14.8% of the total output (14.6% in 2016 and 13.4% in 2015). Malleable iron, Cu base alloy and others almost kept the same as in 2016.

<table>
<thead>
<tr>
<th>Material</th>
<th>Output (10,000 tons)</th>
<th>Year-on-year growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
<td>2016</td>
</tr>
<tr>
<td>Grey iron</td>
<td>2,020</td>
<td>2,035</td>
</tr>
<tr>
<td>Ductile iron</td>
<td>1,260</td>
<td>1,320</td>
</tr>
<tr>
<td>Malleable iron</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Steel</td>
<td>510</td>
<td>510</td>
</tr>
<tr>
<td>Al alloy (includes Mg alloy)</td>
<td>610</td>
<td>690</td>
</tr>
<tr>
<td>Cu base</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>Others</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>4,560</td>
<td>4,720</td>
</tr>
</tbody>
</table>

Table 1. Output of castings by materials
From the point of view of the downstream industries structure, in 2017, automotive, engineering machinery and rail transportation contributed a lot to castings’ output, which increased by 7.1%, 15.2% and 14.3%, respectively. Among them, the automobile industry directly boosted the output of castings by one million tons; while the internal combustion engine and agricultural machinery drove an increase of 0.8%, and the mining and metallurgical heavy machinery increased by 2.3%.

Concerning about the proportion of various types of castings in the downstream industry in 2017, it is worth noting that the proportion of automotive castings has increased to 30.6% (29.9% in 2016), especially the production of trucks has increased significantly. Attention must be paid to the changes in not only the output but also the structure of vehicles.

Import and export

According to the customs statistics, the export tonnage of castings in 2017 has decreased, and the delivery value has increased. It should be taken into account the changes in the exchange rate between the RMB and the US dollar in 2017. The delivery value of castings imports is five times as that of exports, indicating that most of our imported castings are "high-end castings".

It is worth pointing out that the castings imported and exported with parts and assembly products cannot be accurately separated from the customs import and export commodities; in particular, non-ferrous metal castings are imported and exported along with the above products, so the actual export casting volume should be much higher.

<table>
<thead>
<tr>
<th>Import and export</th>
<th>Unit</th>
<th>2016</th>
<th>2017</th>
<th>Year-on-year growth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export</td>
<td>1,000 tons</td>
<td>1,873</td>
<td>1,823</td>
<td>-2.6</td>
</tr>
<tr>
<td></td>
<td>Billion USD</td>
<td>2.51</td>
<td>2.64</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>USD per ton</td>
<td>1,338</td>
<td>1,450</td>
<td>8.4</td>
</tr>
<tr>
<td>Import</td>
<td>1,000 tons</td>
<td>15.0</td>
<td>19.4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Million USD</td>
<td>114</td>
<td>152</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>USD per ton</td>
<td>7,574</td>
<td>7,844</td>
<td>3.6</td>
</tr>
</tbody>
</table>

*Table 2. Export and import of castings*

Foundry Standard

By the end of 2017, China has a total of 174 foundry standards, of which 95 national foundry standards and 79 industrial standards. Among the national standards, there are 20 standards for cast steel, 21 for cast iron, 18 for nonferrous alloy, 9 for die casting, 7
for foundry raw and auxiliary materials, 6 for general process and 14 for investment casting. One national standard was added in 2017, i.e., GB/T 34904-2017, Ductile Iron Castings Ultrasonic Testing, and a total of 11 national standards were revised. For detail, please see the following figure.

Following is a list of the valid national standards of foundry in China:

General foundation and technology

1. GB/T 5611-2017 Foundry terminology;
2. GB/T 5678-2013 Method for sampling cast alloys for spectrochemical analysis;
3. GB/T 6060.1-2018 Roughness comparison specimens — Part 1: Cast surfaces;
4. GB/T 6414-2017 Castings — system of dimensional and geometrical tolerances and machining allowances;
5. GB/T 11351-2017 Mass tolerances for castings;

Cast steel

7. GB/T 2100-2017 Corrosion-resistant steel castings for general applications;
8. GB/T 5613-2014 Code for representing cast steels;
9. GB/T 5677-2007 Radiographic testing for steel castings;
10. GB/T 5680-2010 Austenitic manganese steel castings;
11. GB/T 6967-2009 Medium and high strength stainless steel castings for engineering structure purposes;
12. GB/T 7233.1-2009 Steel castings - Ultrasonic examination - Part 1: Steel castings for general purposes;
13. GB/T 7233.2-2010 Steel castings - Ultrasonic examination - Part 2: Steel castings for
highly stressed components;

14. GB/T 7659-2010 Carbon steel castings suitable for welded structure;
15. GB/T 8492-2014 Heat-resistant steel and alloy castings for general applications;
16. GB/T 9443-2007 Penetrant testing for steel castings;
17. GB/T 9444-2007 The methods for magnetic particle testing and for specifying quality levels of steel castings;
18. GB/T 11352-2009 Carbon steel castings for general engineering purposes;
19. GB/T 13925-2014 Metallographs for high manganese cast steel;
20. GB/T 14408-2014 Low alloy steel castings for general engineering and structural purposes;
21. GB/T 16253-1996 Steel castings for pressure purpose;
22. GB/T 26651-2011 Abrasion-resistant steel castings;
23. GB/T 31205-2014 Abrasion-corrosion resistant steel castings;
24. GB/T 26652-2011 Abrasion-resistant composite materials castings;
25. GB/T 32238-2015 General steel castings suitable for low temperature and high pressure service;
26. GB/T 32255-2015 General martensitic stainless steel and alloy steel castings suitable for high temperature and high pressure service.

Cast iron

27. GB/T 1348-2009 Spheroidal graphite iron castings;
28. GB/T 5612-2008 Code for representing cast iron;
29. GB/T 7216-2009 Metallographic test for gray cast iron;
30. GB/T 8263-2010 Abrasion-resistant white iron castings;
31. GB/T 8491-2009 Corrosion resistant high silicon iron castings;
32. GB/T 9437-2009 Heat resistant iron castings;
33. GB/T 9439-2010 Gray iron castings;
34. GB/T 9440-2010 Malleable iron castings;
35. GB/T 9441-2009 Metallographic test for spheroidal graphite cast iron;
36. GB/T 17445-2009 Cast grinding balls;
37. GB/T 24597-2009 Cr-Mn-W series of abrasion resistant iron castings;
38. GB/T 24733-2009 Austempered ductile iron (ADI) castings;
39. GB/T 25746-2010 Metallographs of Malleable cast irons;
40. GB/T 26648-2011 Austenitic iron castings;
41. GB/T 26653-2011 Exhaust manifold iron castings;
42. GB/T 26655-2011 Vermicular graphite iron castings;
43. GB/T 26656-2011 Metallographs of vermicular graphite cast irons;
44. GB/T 26658-2011 Evaluation methods of lost foam castings quality;
45. GB/T 28702-2012 Nodularizer for spheroidal graphite cast iron;
46. GB/T 32247-2015 Ferritic ductile iron castings suitable for low temp. service;
47. GB/T 34904-2017 Spheroidal graphite iron castings - Ultrasonic testing.

Cast nonferrous alloys

48. GB/T 1173-2013 Casting aluminium alloys;
49. GB/T 1174-1992 Cast bearing metals;
50. GB/T 1175-2018 Casting zinc alloys;
51. GB/T 1176-2013 Casting copper and copper alloys;
52. GB/T 1177-2018 Casting magnesium alloys;
53. GB/T 6614-2014 Titanium and titanium alloy castings;
54. GB/T 8063-2017 Designation of cast nonferrous metals and their alloys;
55. GB/T 9438-2013 Casting aluminium alloys;
56. GB/T 11346-2018 Radiographical testing for aluminum alloy castings — Defect levels;
57. GB/T 13819-2013 Copper and copper alloy castings;
58. GB/T 13820-2018 Magnesium alloy castings;
59. GB/T 15073-2014 Casting titanium and titanium alloys;
60. GB/T 16746-2018 Zinc alloy castings;
61. GB/T 23301-2009 Casting aluminum alloys for automobile wheels;
62. GB/T 31203-2014 Aluminum alloy wheels castings for passenger car;
63. GB/T 26649-2011 Magnesium alloy castings for automobile wheels;
64. GB/T 26650-2011 Magnesium alloy castings for motorcycle and electric bicycle wheels;
65. GB/T 26654-2011 Casting magnesium alloys for automobile wheels.

Moulding materials

66. GB/T 2684-2009 Test methods for foundry sand and molding mixtures;
67. GB/T 7143-2010 Methods for chemical analysis of silica sand for foundry;
68. GB/T 9442-2010 Foundry silica sand;
69. GB/T 25138-2010 Standard sand for checking foundry binder;
70. GB/T 25139-2010 Ceramic foam filter for foundry;
71. GB/T 26659-2011 Reclaimed silica sand for foundry;
72. GB/T 26657-2011 Evaluation of energy consumption for sand mold baking oven.
Die casting

73. GB/T 13818-2009  Zinc die-casting alloys;
74. GB/T 13821-2009  Zinc alloy die castings;
75. GB/T 13822-2017  Test specimens for non ferrous diecasting alloys;
76. GB/T 15114-2009  Aluminum alloy die-castings;
77. GB/T 15115-2009  Die casting aluminium alloys;
78. GB/T 15116-1994  Die casting copper alloys;
79. GB/T 15117-1994  Copper alloy die castings;
80. GB/T 25747-2010  Magnesium alloys die castings;
81. GB/T 25748-2010  Die casting magnesium alloys.

Investment casting

82. GB/T 12214-1990  Silica sand and flour for investment casting;
83. GB/T 12215-1990  Bauxite sand and flour for investment casting;
84. GB/T 14235.1-1993  Testing method for melting point of pattern materials in investment casting;
85. GB/T 14235.2-1993  Testing method for bending strength of pattern materials in investment casting;
86. GB/T 14235.3-1993  Testing method for ash content of pattern materials in investment casting;
87. GB/T 14235.4-1993  Testing method for linear contraction of pattern materials in investment casting;
88. GB/T 14235.5-1993  Testing method for surface hardness of pattern materials in investment casting;
89. GB/T 14235.6-1993  Testing method for acid number of pattern materials in investment casting;
90. GB/T 14235.7-1993  Testing method for fluidity of pattern materials in investment casting;
91. GB/T 14235.8-1993  Testing method for viscosity of pattern materials in inv. cast.;
92. GB/T 14235.9-1993  Testing method for thermal stability of pattern materials in investment casting;
93. GB/T 31204-2014  Carbon steel investment casting;
94. GB/T 32252-2015  Investment casting process - general technology guidelines;
95. GB/T 32251-2015  Investment casting process - pollutants control.
2.4. FOUNDRY INDUSTRY REPORT FROM CZECH REPUBLIC

CZECH FOUNDRYMEN SOCIETY

Foundry production in the Czech Republic

Values given in the table result from investigations of the Czech Bureau of Statistics and investigations made by the Association of Foundries of the Czech Republic.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Malleable cast iron</td>
<td>9,734</td>
<td>4,068</td>
<td>3,145</td>
<td>6,951</td>
<td>4,307</td>
<td>3,722</td>
<td>4,100</td>
<td>4,000</td>
<td>3,800</td>
<td>4,000</td>
</tr>
<tr>
<td>GJS</td>
<td>73,218</td>
<td>60,106</td>
<td>52,412</td>
<td>67,025</td>
<td>58,058</td>
<td>53,193</td>
<td>53,352</td>
<td>55,000</td>
<td>48,000</td>
<td>52,000</td>
</tr>
<tr>
<td>GJL</td>
<td>255,054</td>
<td>203,238</td>
<td>153,344</td>
<td>197,666</td>
<td>179,394</td>
<td>169,456</td>
<td>169,654</td>
<td>170,000</td>
<td>158,000</td>
<td>176,000</td>
</tr>
<tr>
<td>Steel</td>
<td>97,863</td>
<td>97,366</td>
<td>57,888</td>
<td>94,013</td>
<td>94,929</td>
<td>76,380</td>
<td>64,606</td>
<td>60,000</td>
<td>61,000</td>
<td>64,000</td>
</tr>
<tr>
<td>Fe metals total</td>
<td>435,869</td>
<td>364,778</td>
<td>266,789</td>
<td>365,655</td>
<td>336,688</td>
<td>302,751</td>
<td>291,712</td>
<td>289,000</td>
<td>270,800</td>
<td>296,000</td>
</tr>
<tr>
<td>Light metals</td>
<td>69,982</td>
<td>52,896</td>
<td>65,369</td>
<td>80,049</td>
<td>77,457</td>
<td>88,125</td>
<td>88,826</td>
<td>95,000</td>
<td>98,000</td>
<td>101,000</td>
</tr>
<tr>
<td>Other non-ferrous metals</td>
<td>7,195</td>
<td>5,498</td>
<td>12,227</td>
<td>14,241</td>
<td>14,506</td>
<td>17,482</td>
<td>20,034</td>
<td>21,000</td>
<td>21,000</td>
<td>21,500</td>
</tr>
<tr>
<td>Non-ferrous metals total</td>
<td>77,177</td>
<td>58,394</td>
<td>77,596</td>
<td>94,290</td>
<td>91,963</td>
<td>105,607</td>
<td>108,860</td>
<td>116,000</td>
<td>119,000</td>
<td>122,500</td>
</tr>
<tr>
<td>Total</td>
<td>513,046</td>
<td>423,172</td>
<td>344,385</td>
<td>459,945</td>
<td>428,651</td>
<td>408,358</td>
<td>400,572</td>
<td>405,000</td>
<td>389,800</td>
<td>418,500</td>
</tr>
</tbody>
</table>

Foundry production in graphical evaluation:

Figure 1. Total casting production in the Czech Republic (1994 up to expected for 2017)
After historical minimum of casting production in the Czech Republic in 2010 the stop of slump in 2016 is expected. The year 2017 signals the recovery and a growth of orders.

In 2016 the "mass production" mostly of cast iron and steel castings continue to reduce. In case of spheroidal graphite cast iron, the reduction was slight. Total production was in the amount of approximately 270 thousand tons/year. This decrease was due to the reduction of the weight of structural castings, although from the point of items the amounts are the same as in the previous years, in some cases they are even increasing.

From the spring of 2017 the situation for Fe based castings reverses and demands for castings is growing. Completely new projects are implementing, foundries slowly fill "free" production capacities.

![Production of Fe castings in the Czech Republic (2003 up to expected for 2017)](image)

*Figure 2. Production of Fe castings in the Czech Republic (2003 up to expected for 2017)*

From the spring of 2017 there is a strong recovery in production. Foundries report full production capacities. After seven years, we could return to growth of the foundry production. Lack of foundry workers limits the volume of casting production. The Fe foundries produce about 85 % of technological capacities due to lack of staff.
Figure 3. Production of steel castings in the Czech Republic (2000 up to expected for 2017)

After a dramatic slump in the years 2012 – 2014 the steel casting production has stabilized at about 60 thousand tons a year. In the coming years a significant reversal cannot be expected. Alloyed steels are especially demanded.

Figure 4. Production of non-ferrous metals in the Czech Republic (2003 up to expected for 2017)

In the field of non-ferrous metals castings continued the growth trend of demands for castings especially die-cast from Al alloys. The main driving force of contracts is the automotive industry. Demands for the existing production of components such as units,
axles, gearboxes, lighting technology or air-conditioning continuously grew. Besides this existing production there was a growing demand for structural castings. But the production is technologically demanding, and it needs special equipment of high investments. Structural castings are made in 3 foundries at present. Therefore, the production volumes of these castings are growing very slowly.

The production of non-ferrous metals castings in the Czech Republic in 2017 exceeded again 100 thousand tons. Existing customers filled the capacity limits of the pressure foundries in the Czech Republic to one hundred percent. New projects on new markets our foundries implemented with high limitations and only in the context of new investments in production facilities, which enable them to increase production volumes. Often, however, even these volumes were filled with the existing customers. An important limiting factor is the permanent lack of "human resources", similarly as in Fe foundries.

Production of castings from copper alloys remains at about 20 thousand tonnes. The production volume in the coming years will be oscillating around this value. The aggressive growth of years 2009-2011 is not already expected.

Total production of the Czech foundry industry in 2017 was higher compared to previous years. The increase in the total foundry production amounted to 7 percent. The total production of attacked a border of 420 thousand tons of castings. It's good that the revival in 2017 announced the "cast iron" foundries, which in previous years has repeatedly reported a drop in orders. Filling the production capacities and the growth of production volumes from the spring of the year 2017 in ferrous metal foundries emphasized the internal organisation of work and production planning. The lack of skilled workers complicates the compliance with the supply terms. Despite the growth of orders, the trend of decrease in the weight of castings continued with negative impact on profitability. In the area of production of castings from non-ferrous alloys the dominant ones are "pressure" castings from Al alloys. The main customer is the automotive industry.

From the beginning of the year 2018 the growth of industrial production in the Czech Republic has slowly reduced from the original 3.5% to about 2.5% in the yearly comparison. Similarly, the foundry production at the beginning of the year 2018 signalises "stopping" the growth of production volumes. The increase amounts to only 1% in comparison with the previous period. From this perspective the year 2018 doesn't look too optimistically.
2.5. FOUNDRY INDUSTRY REPORT FROM EGYPT

EGYPTIAN FOUNDRYMEN SOCIETY

Production

The total castings production of the Egyptian foundry industry reached around 350,000 t/year in 2010, but due to political and economic instability, this industry has been witnessing over the past few years, the production declined to around 200,000 t/year in the year 2017. The main castings produced may cover the following categories:

- Ductile iron pipes fittings and valves 100,000t/y
- Grinding media of high Cr- white irons 15,000
- Manhole covers 50,000
- Miscellaneous spare parts 10,000
- Steel castings 10,000
- Aluminum alloy's castings 7,000
- Copper and copper alloys 8,000

The export activities are rather limited and are experienced by only 4-5 foundries, meanwhile the castings imports reached around 300,000/y. The Egyptian foundry industry has missed a very good opportunity for development with the shrinkage of the foundry industry in Europe.

The excellent strategic location of Egypt could have been a very good incentive for the foundry industry to move to Egypt. The lack of proper investment incentives over the past few years may be behind that situation. Nowadays, the continuous improvements in investment regulations will certainly attract more investments to the foundry industry to Egypt.

Development efforts

The foundry industry in Egypt is suffering from the absence of serious plans for HR development and proper links with the R&D organizations.
After a recent initiative of the Academy of Scientific Research and Technology of Egypt together with Central Metallurgical Research and Development (CMRDI), a new national networking project will be launched beginning of October this year aiming at:

- Coordination of applied R&D programs carried out at CMRDI and Egyptian universities to address the challenges facing the Egyptian foundry industry e.g. raw materials, increased scrap levels, the need to produce new casting alloys to replace imports, etc.

- The initiative will make the facilities at the laboratories and pilot plants at CMRDI and the Universities available to the small and medium foundries.

- Online tailored training programs are now being designed to serve the particular HR development needs of those foundries.

It is planned to extend the activities of this Network to cover other countries in Africa. Prof. Nofal of CMRDI is planning to start a lecturing tour around some South African foundries in October this year, organized by the University of Johannesburg, aiming at exploring the training needs of the foundry industry in the country.

Source: Prof. Adel Nofal, CMRDI.
2.6. FOUNDRY INDUSTRY REPORT FROM FINLAND

ASSOCIATION OF FINNISH FOUNDRY INDUSTRY

ECONOMIC BACKGROUND

The Finnish Technology Industry as a whole

The turnover of technology industry companies in Finland grew by 10 per cent in 2017 from 2016. About half of the increase was attributable to volume growth and half to increase in sales due to rising world market prices of raw materials and components. In 2017, the turnover amounted to EUR 74.1 billion. In 2008, prior to the financial crisis, the turnover of technology industry companies in Finland totalled EUR 85.7 billion.

Judging from order trends in recent months, the turnover of technology industry companies is expected to be higher in the spring of 2018 than in the corresponding period last year. The number of personnel employed by technology industry companies in Finland grew by slightly more than two per cent in 2017 from 2016. On average, the industry employed 297,000 people, up 6,400 from 2016. The recruitment activities of technology industry companies picked up markedly in 2017. They recruited a total of 42,500 new employees in 2017. In 2016, total recruitments came to 28,500. Some companies were increasing their personnel, while others were hiring new employees due to retirements and employee turnover.

Mechanical Engineering in Finland

The turnover of mechanical engineering companies (machinery, metal products and vehicles) in Finland increased by eight per cent in 2017 from 2016, amounting to EUR 30 billion. In 2008, prior to the financial crisis, the industry turnover in Finland totalled EUR 33.3 billion. The mechanical engineering companies that took part in the Federation of Finnish Technology Industries’ survey of order books reported that the monetary value of new orders between October and December was 93 per cent higher than in the preceding quarter and 80 per cent higher than in the corresponding period in 2016. At the end of December, the value of order books was 13 per cent higher than at the end of September and 38 per cent higher than in December 2016. Judging from order trends in recent months, the turnover of mechanical engineering companies is expected to be higher in the spring of 2018 than in the corresponding period last year. The number of personnel in mechanical engineering companies in Finland grew by slightly more than three per cent in 2017 from 2016. On average, the industry employed 128,000 people, up 4,200 from 2016.
Metals Industry in Finland

The turnover of metals industry companies (steel products, nonferrous metals, castings and metallic minerals) in Finland grew some 20 per cent in 2017 from 2016, amounting to EUR 10.9 billion. In 2008, prior to the financial crisis, metals industry turnover in Finland totalled EUR 11.1 billion. Most of the growth in the turnover of metals industry companies in 2017 was attributable to the rise in sales prices. This was due to the favourable development in world market prices of steel products and non-ferrous metals after early 2016. Producer prices in Finland were up some 20 per cent in 2017 from 2016.

Total production of steel products, non-ferrous metals, castings and metallic minerals in Finland increased slightly from 2016. Production of steel products remained at the same level while production of non-ferrous metals, metallic minerals and castings in particular increased. The number of personnel employed by metals industry companies in Finland decreased by some two per cent in 2017 from 2016. On average, the industry employed 15,100 people, down 300 from 2016.

FOUNDERY INDUSTRY IN FINLAND

Foundry industry as a whole

In the year 2017 the total production of castings increased remarkably in Finland. The production of iron and steel castings was 66,417 tons which is 15 % more compared to year 2016. Iron and nodular iron casting production increased about 14 %, and steel casting production about 26 %. Metal castings production was 5,896 tons, which is about 24 % more than the previous year.

The value of the casting production of Finnish foundries was 228 m€, which was 7 % more compared to year 2016.

Grey cast iron sector in Finland

Overview of the Finnish grey cast iron production, year 2017:

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of GJL foundries</td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>GJL production</td>
<td>15,268 t</td>
<td>19,523 t</td>
<td>+28 %</td>
</tr>
<tr>
<td>Value of the GJL production</td>
<td>28,69 m€</td>
<td>37,47 m€</td>
<td>+30 %</td>
</tr>
<tr>
<td>Export of GJL castings</td>
<td>5,078 t</td>
<td>5,182 t</td>
<td>+2 %</td>
</tr>
<tr>
<td>Employees in iron foundries</td>
<td>768</td>
<td>741</td>
<td>-4 %</td>
</tr>
</tbody>
</table>
Ductile cast iron sector in Finland
Overview of the Finnish ductile cast iron production, year 2017:

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of GJS foundries</td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>GJS production</td>
<td>33.541 t</td>
<td>36.251 t</td>
<td>+ 9 %</td>
</tr>
<tr>
<td>Value of the GJS production</td>
<td>70,08 m€</td>
<td>76,68 m€</td>
<td>+ 9 %</td>
</tr>
<tr>
<td>Export of GJS castings</td>
<td>17.564 t</td>
<td>18.656 t</td>
<td>+ 6 %</td>
</tr>
<tr>
<td>Employees in iron foundries</td>
<td>768</td>
<td>741</td>
<td>- 4 %</td>
</tr>
</tbody>
</table>

Steel castings sector in Finland
Overview of the Finnish steel casting production, year 2017:

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of steel foundries</td>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Steel casting production</td>
<td>8.423 t</td>
<td>10.643 t</td>
<td>+ 26 %</td>
</tr>
<tr>
<td>Value of the GS production</td>
<td>60,66 m€</td>
<td>66,30 m€</td>
<td>+ 9 %</td>
</tr>
<tr>
<td>Export of GS castings</td>
<td>1.108 t</td>
<td>1.471 t</td>
<td>+ 33 %</td>
</tr>
<tr>
<td>Employees in GS foundries</td>
<td>474</td>
<td>577</td>
<td>+ 22 %</td>
</tr>
</tbody>
</table>

Non-ferrous casting sector in Finland
Overview of the Finnish non-ferrous casting production, year 2017:

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of non-ferrous foundries</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Non-ferrous production</td>
<td>4.830 t</td>
<td>5.896 t</td>
<td>+ 22 %</td>
</tr>
<tr>
<td>Value of the non-ferrous prod.</td>
<td>53,90 m€</td>
<td>62,48 m€</td>
<td>+ 16 %</td>
</tr>
<tr>
<td>Export of non-ferrous castings</td>
<td>1.681 t</td>
<td>2.469 t</td>
<td>+ 47 %</td>
</tr>
<tr>
<td>Employees in non-ferrous foundr.</td>
<td>330</td>
<td>413</td>
<td>+ 25 %</td>
</tr>
</tbody>
</table>
2.7. FOUNDRY INDUSTRY REPORT FROM FRANCE

ASSOCIATION TECHNIQUE DE FONDERIE (ATF)

Review of French Foundry for 2017 and tendency for first half of 2018

In 2017, France maintained its position as a major foundry country in Europe behind Germany but close to Turkey and Italy. France continues to be on the top 15 countries in the world for the foundry activity with a volume close to 1.7 MTons.

French foundry association news

FFF, the French Federation for Foundry and Forge (professional organisation for foundry and forge) decided to continue alone the publication of “La Revue Forge & Fonderie” previously in collaboration with ATF (the representative of France at the WFO). So, ATF started a new e-revue called “Tech-News-Fonderie” available on its website: www.atf.asso.fr

In parallel, FFF has reduced its taskforce and as a consequence, the foundry’s statistic previously published by FFF will arrive later this year, and therefore are not yet available for this present report.

ATF has taken also similar decision to minimize its fixed cost and has re-arranged its staff to be closer of its members and main activities being training with its monthly technical sessions and communication with its e-revue.

So, by end of 2018, France, with ATF & FFF, will have stronger foundry organisation without forgetting the CTIF (foundry institution for R&D and investigations), the ESFF (Foundry and Forge Engineer School) and its "past graduated member’s academy - AAESFF". All these institutions/organisations can be tracked thanks to their web-side or their Twitter and/or Facebook accounts!

Consequently of the re-organisation of FFF, this paper will be mainly documented with data from INSEE (the French governmental statistical institute which publishes a lot of data each month or each quarter, or each year): www.insee.fr/fr/statistiques

France: general economic information

GDP in France continues a stable and positive growing month by month and 2017 presented a nice value for growth around + 2.2%. However, beginning of 2018 would be less exciting and “specialists” of economy looks for a number around 1.7% for the present year.
Regarding “import-export balance”, France continues to be strongly penalized by import of energy supplies and by all imported industrial goods like machine tools, industrial machines and lay-out ...which are unfortunately consumers of foundry castings from foreign countries!

However, and in opposition of the deficit of export/import ratio, the French foundries continue to present a good activity at the export due to their strong knowledge and their capacity to produce difficult castings and that for all end users as for all domains.

![Imports & Exports in € billions](image1)

![GDP in € billions](image2)

**Figures 1 and 2. (Insee data and charts: CVS & CJO adjustments)**

If the index of Industrial Production (all manufacture industries) presented a positive and significant increase in 2017 to arrive at a similar level of 2011, beginning of 2018 decided for one another model: a tendency for decreasing!

Raisons could be, level of stock by end of 2017, amorphous restart in January, pessimistic view for first semester of 2018, risks of international conflicts between east & west (new business and commercial exchange’s rules), or north & south (present immigration situation and strong unbalanced incomes). All these parameters have direct effects on
French activities for the first months of 2018 due to position of France in the international discussions and its implication in a lot of international items.

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

French Foundry detailed review for 2017

French foundry activity presented a respectable increase during the past months of 2017. Increase was more than sensitive and showed an evolution of 10 points (75 to 85 – 100 is the 2005 ‘s reference). But, unfortunately, beginning of 2018 would be more conservative with a lower increase.

The official unemployment rate (number of people officially registered and receiving unemployment allowances) continues its decrease to arrive around 9%. That number had been obtained by a better global economy but also by a certain number of unemployed persons who became retired so “out of statistics
In the meantime, the French foundries continue to struggle and find manpower! One solution for them consists on sub-contacting activities mainly for fettling. A second way consists to integrate the entire numeric road from customer’s needs to the “end use” of the castings: that means robot and automatization (like in the fettling department or in the core shop or on the remoulding area, ...) and all the other possibilities which include 3D printing, CNC for pattern-plate or machining of mould cavity, simulation for all foundry and machining processes without forgetting “artificial intelligence”: the Foundry 4.0 is a way for the close future to minimise the lake of technicians, to improve productivity and finally to maintain, if possible whenever possible, a positive margin!

As a side effect, the French foundry organisations (CTIF, ATF, ...) are more and more requested for “basic” foundry training courses in order to provide education program as well for new foundrymen as for new employees which came from different industry!

The global French production of castings for 2017 can be estimated close to 1.7 million Tons, so a bit higher than 2016 results. The past Census statistics from “Modern Casting” (the 3 below tables) and the last INSEE indices (charts at the end of this paragraph) would confirm this higher volume of castings in 2017 for France.

<table>
<thead>
<tr>
<th>Country</th>
<th>Gray Iron</th>
<th>Ductile Iron</th>
<th>Malleable Iron</th>
<th>Steel</th>
<th>Copper Base</th>
<th>Aluminum</th>
<th>Magnesium</th>
<th>Zinc</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>566,154</td>
<td>745,155</td>
<td></td>
<td>82,278</td>
<td>17,864</td>
<td>297,117^</td>
<td>-</td>
<td>18,083</td>
<td>2,754</td>
<td>1,729,405</td>
</tr>
</tbody>
</table>

Table 1. French foundry production in 2014 (Census – Modern Casting – Dec 2015)

<table>
<thead>
<tr>
<th>Country</th>
<th>Gray Iron</th>
<th>Ductile Iron</th>
<th>Malleable Iron</th>
<th>Steel</th>
<th>Copper Base</th>
<th>Aluminum</th>
<th>Magnesium</th>
<th>Zinc</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>504,400</td>
<td>761,200</td>
<td></td>
<td>62,400</td>
<td>18,344</td>
<td>316,931</td>
<td>-</td>
<td>18,083</td>
<td>2,533</td>
<td>1,684,291</td>
</tr>
</tbody>
</table>

Table 2. French foundry production in 2015 (Census – Modern Casting – Dec 2016)

<table>
<thead>
<tr>
<th>Country</th>
<th>Gray Iron</th>
<th>Ductile Iron</th>
<th>Malleable Iron</th>
<th>Steel</th>
<th>Copper Base</th>
<th>Aluminum</th>
<th>Magnesium</th>
<th>Zinc</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>531,500</td>
<td>675,200</td>
<td></td>
<td>57,000</td>
<td>17,724</td>
<td>324,102</td>
<td>-</td>
<td>20,329</td>
<td>2,340</td>
<td>1,628,195</td>
</tr>
</tbody>
</table>

Table 3. French foundry production in 2016 (Census – Modern Casting – Dec 2015, 2016 & 2017)

For more details, the hereunder charts (coming from INSEE) present past and future tendency for the production of the different alloys like steel, iron (grey, ductile, malleable and vermicular), aluminium, magnesium, copper and other alloys (zinc, titanium, ...). Note these data represent mainly the “jobbing & commercial” foundries activity and not production which is coming from integrated foundry of a group like automotive car manufacturers or heating facilities producers.
“New car registration index or index of new construction would provide a relative and good idea for the global tendency for the demand of castings... presently both are positive. However, castings for car manufacturers (the main end-user/customer for castings in France) are more and more produced close to the machining and assembly lines so that means more for local foundries. Pipes and manholes (a huge French activity) are more dedicate for export so depending of the worldwide business including stronger and stronger competition. Steel castings are historically more depending of export and activity like mining, construction, cement and earth works: these business niches would be more active in 2018.

In France, aluminium is mainly connected to automotive like a certain part of grey iron for engine blocks parts, although diesel exist generates iron engine block maker’s adaptations. France has also a certain and relatively good recognized capacity for special alloys like magnesium, titanium, special steel, zinc and copper alloys used in many domains like aeronautic, special pumps, valves and castings for nuclear and chemical plants, ships & boats, railways and train, medical implants, arts, ...

To summarize this “alloys paragraph”, all the indices demonstrate a positive tendency after a tough time and also confirm a good activity recovery for French foundries and their present and future production.


French Foundry Tendencies for 2018
The tendency for 2018 would be slightly. As previously noticed, the global politics and economic mood create a relatively pessimistic trend including foundry activity!

However, the French foundries have productivity, flexibility, technical and quality arguments and they can now adapt their tools, their machines, their working time and their taskforce according volumes of the orders (as everywhere in the world).

2018 will be certainly the year of the transition:

The Dieselgate and the “end of love” for this energy in France modify the market share between light alloys and iron: gasoline allows using mainly aluminium engine blocks. Some automotive foundries are presently looking to modify as quick as possible their foundry lay-out to absorb new castings for gasoline engine!

The new fashion and the tendency for electric cars will also affect the foundry activity. However, this modification will take a certain time according the effective low % of electric car versus mineral energy! (J.LeGal – Tech_News_Fonderie n°4 – pg 13 – www.atf.asso.fr).

Anyway, these two factors will have effects in the next ten years in France and of course in each country where foundry is working for automotive industry.

Conclusion

2017 year was, for France, a relatively acceptable and good year for foundry production. The tendency will continue in 2018 but with a lower global increase for all alloys. Some alloys will have a better prospective certainly like aluminium and special alloys (steels, magnesium, titanium, ...). End users of castings like automotive and construction will continue to drive the French foundry demands, needs and orders.

2017 was not so bad for France and would be similar but at a lower level for 2018.

Reference:

http://www.insee.fr/fr/bases-de-donnees/

http://www.atf.asso.fr
2.8. FOUNDRY INDUSTRY REPORT FROM GERMANY

CLAUSTHAL UNIVERSITY OF TECHNOLOGY

Key Figures German Foundry Industry 2017

Production: 5,440 m t  Fe: 4,162 m t  / Non-ferrous: 1,278 m t

Turnover: ca. 13,180 bn € *

Employees: 77,700 employees*  Fe: 41,800  / Non-ferrous: 35,900

* (Companies >50 Empl.)

Source: Stat BA, BDG

German Foundry Industry 2017 by Material (Production)

Positive development for all materials.

Iron and steel castings

- 4,162 m t  +6,2 %
  - Iron castings: 2,410 m t  +7,9 %
  - Ductile castings: 1,576 m t  +4,3 %
  - Steel castings: 175 800 t  +0,9 %

For vehicle industry  +7,8 %

For general engineering  +8,1 %

Non-ferrous castings

- 1, 278 Mio. t  +1,1 %
  - Aluminium: 1,119 mt  +0,5 %
  - Magnesium: 18 200 t  +4,6 %
  - Copper: 79 200 t  +0,9 %
  - Zinc: 62 200 t  +10,6 %

Source: BDG, Daten vorläufig
German Foundry Industry 1-6 2018 by Material (Production)

NF has reached the peak, Ferrous with stable growth.

Iron and steel castings

- 2,299 m t +4,9 %
  - Iron castings: 1,313 m t +4,4 %
  - Ductile castings: 0,890 m t +5,2 %
  - Steel castings: 96400 t +9,5 %

For vehicle industry +3,3 %
For general engineering +5,4 %
Other +9,2 %

Non-ferrous castings

- 0,636 m t +0,9 %
  - Aluminium: 0,551 mt +0,7 %
  - Magnesium: 9 700 t +6,5 %
  - Copper: 42 400 t +0,7 %
  - Zinc: 33 300 t +4,0 %

Source: BDG, statistical inexactness between “general engineering” and “other”

Capacity Utilisation German Foundry Industry III. Q. 2018

Near by 90 %

In % of full capacity
Source: ifo, München, BDG
Foundry Industry Incoming Orders Germany

From recovery to boom.

Quelle: Stat. BA, Index 2015=100, kalender- und saisonbereinigt, Berechnungen BDG, 04 2018

Incoming Orders Iron castings

Overshooting but holiday impact!

Quelle: Stat. BA, Index 2015=100, kalender- und saisonbereinigt, Berechnungen BDG
Incoming Orders Steel castings

Positive but unbroken high volatility!

Quelle: Stat. BA, Index 2015=100, kalender- und saisonbereinigt, Berechnungen BDG

Incoming Orders Non Ferrous castings

Peak passed!

Quelle: Stat. BA, Index 2015=100, kalender- und saisonbereinigt, Berechnungen BDG
Business Climate German Foundry Industry July 2018

Perspectives with Uncertainties.

Current perspectives for the Foundries

Passenger cars

- USA weak;

- Europe: 2018 stagnation on a high level or positive impulses from Southern Europe?

- Recovery in Russia and South America;

- China just before the start in the new area of electromobility!

General Engineering

- 2018 chance for plus three percent (+x) after start of recovery in 2017;

- Positive: automation, robotics and rubber- and plastic machines, building machines, paper machines;

- Peak passed: agricultural;

- Negative: wind turbines under pressure, USA TCP? 2018 negative;

- Recovery: mining.

Source: Ifo-Institut, Munich, BDG
Further Impulses possible from the Building Industry

Risks

▪ Neverending story: overcapacities – hard price competition – structural change;
▪ “Trump” impact;
▪ Brexit is dumpening investments.

Open Questions and Uncertainties

USA

▪ Results of NAFTA renegotiations?
▪ Investment boom with temporary positive impact for European plant manufacturer?
▪ Direct tax penalties;
▪ Modification of the tax system (border adjustment tax);
▪ First steps of new tax and tariff policy: “USA Punitive Tariffs”.

China

▪ Real growth vs. official data;
▪ Reduction of capacity or delaying tactic and start of new capacities? – Foundries?
▪ Intensive penetration of the European markets because of closed US market?

EU/ Brexit und Co.

▪ Impact of Brexit;
▪ = dumpening effect for investments or impulses driven by relocation processes?

Other

▪ Russia: Rusal has stopped Aluminium Exports (US Sanctions), Elektromobility, Exchange rates.

Source: Federal Association of German Foundry Industry (BDG)
2.9. FOUNDRY INDUSTRY REPORT FROM HUNGARY

ASSOCIATION OF HUNGARIAN FOUNDRIES

The tendencies of the Hungarian foundry industry in 2017 showed a smaller but still significant average growth of the total Hungarian foundry industry than in 2016. Some sectors especially iron and steel (even the two biggest iron foundries have increased the performances were forecasted before) and castings of cupper-based alloys in average have reduced the production in 2017.

For the Hungarian foundries all together 2017 was successful year again. It is visible that the Hungarian foundry industry is in a moderate growth and together is stable supplier for the automobile and vehicle industry of EU – first of all in the sectors of aluminium. Together the above mentioned situation of the iron and steel foundries’ production the group of companies are involved at investment castings is slowly increased year after year. The productions of steel, heavy metal, zinc and magnesium castings are stagnating or even a little bit reduced like during the last decade. The foundry supplier companies at the sector increased their activities. The biggest problem is constantly the missing well-educated skilled workers (foundrymen) and university level educated foundry engineers. After 15 years in 5 different regions have started again the skilled foundryman education in secondary school so from 2018 some 40-45 students will finish every year the secondary schools. At the Miskolc University the so-called dual BSc education has started in 2015 with a large interest of students and foundries too - the dual MSc education is already under developing too.

![Casting production of Hungary](image)

**Casting production of Hungary**

*(2002 – 2017)*

- **Total**
- **Iron**
- **Steel**
- **Aluminium**
- **Heavy metal**
- **Zinc**
- **Magnesium**
The basically export orientated Hungarian foundries still continuously have relative steady market position. It is more than average that the budgets for 2018 are created on an optimistic basis because of the very strong Hungarian export dependence at the foundry sector: everything is depending of the market situation of the countries to where appr. 85% of the Hungarian casting export is stationary fulfilled. The Hungarian casting performances in 2017 were in figures as follows:

<table>
<thead>
<tr>
<th>Denomination</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey iron casting</td>
<td>24 210</td>
</tr>
<tr>
<td>Nodular iron castings</td>
<td>37 783</td>
</tr>
<tr>
<td>Compacted graphite iron castings</td>
<td>16 740</td>
</tr>
<tr>
<td>Alloyed iron castings</td>
<td>389</td>
</tr>
<tr>
<td>Malleable iron castings</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total iron castings</strong></td>
<td><strong>79 132</strong></td>
</tr>
<tr>
<td>Unalloyed steel castings</td>
<td>2 216</td>
</tr>
<tr>
<td>Alloyed steel castings</td>
<td>911</td>
</tr>
<tr>
<td><strong>Total steel castings</strong></td>
<td><strong>3 127</strong></td>
</tr>
<tr>
<td>Aluminium gravity die castings</td>
<td>61 328</td>
</tr>
<tr>
<td>Aluminium pressure die castings</td>
<td>61 450</td>
</tr>
<tr>
<td>Aluminium sand castings</td>
<td>124</td>
</tr>
<tr>
<td><strong>Total aluminium castings</strong></td>
<td><strong>123 902</strong></td>
</tr>
<tr>
<td>Bronze castings</td>
<td>417</td>
</tr>
<tr>
<td>Brass castings</td>
<td>1 305</td>
</tr>
<tr>
<td>Zinc castings</td>
<td>1 717</td>
</tr>
<tr>
<td>Other heavy metal castings</td>
<td>76</td>
</tr>
<tr>
<td><strong>Total heavy metal castings Incl. investment cast.</strong></td>
<td><strong>3 515</strong></td>
</tr>
<tr>
<td>Magnesium castings</td>
<td>327</td>
</tr>
<tr>
<td>Investment casting all together in total, inclusive</td>
<td>753</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>210 003</strong></td>
</tr>
</tbody>
</table>

*Table 1. Hungarian Casting production 2017*
2.10. FOUNDRY INDUSTRY REPORT FROM INDIA

**THE INSTITUTE OF INDIAN FOUNDRYMEN**

**Actual situation of the casting industry**

**General Economic Scenario**

India to become fastest growing economy >7.5% YoY as per forecasts of leading International Institutions. However, the growing Tradewars & protectionism in several leading economies is negative for world economy. Due to good forecast for monsoons in India, the domestic demand is expected to be robust.

**Foundry Industry**

Since the foundry industry is the feeder to various sectors, its output is directly affected by the consumers. The industry has shown signs of growing demand from various sectors such as Tractors, Automobiles & Auto Components, Construction equipment. The sectors eg Defence will open new markets. However, Auto continues to be single largest sector driving demand from foundry sector. Due to lack of clarity on EV mobility, the future of foundries supplying castings to Auto is not very clear.

The production of castings as for 2016-17 was approx. 11.3 Million Tons which is approx. 6% growth as compared to previous year:

![Production of Castings in Million M.T. (2016-17)-INDIA](image)

**Figure 1**
Auto Sector Production Trends

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Vehicles</td>
<td>3,231,058</td>
<td>3,087,973</td>
<td>3,221,419</td>
<td>3,465,045</td>
<td>3,801,670</td>
<td>4,010,373</td>
</tr>
<tr>
<td>Commercial Vehicles</td>
<td>832,649</td>
<td>699,035</td>
<td>698,298</td>
<td>786,692</td>
<td>810,253</td>
<td>894,551</td>
</tr>
<tr>
<td>Three Wheelers</td>
<td>839,748</td>
<td>830,108</td>
<td>949,019</td>
<td>934,104</td>
<td>783,721</td>
<td>1,021,911</td>
</tr>
<tr>
<td>Two Wheelers</td>
<td>15,744,156</td>
<td>16,883,049</td>
<td>18,489,311</td>
<td>18,830,227</td>
<td>19,933,739</td>
<td>23,147,057</td>
</tr>
<tr>
<td>Grand Total</td>
<td>20,647,611</td>
<td>21,500,165</td>
<td>23,358,047</td>
<td>24,016,068</td>
<td>25,329,383</td>
<td>29,073,892</td>
</tr>
</tbody>
</table>

Table 1

Auto & Auto Component Sector is one of the major consumers of Castings and is showing good growth which augurs well for foundry sector. Due to various policy initiatives of the Government and fast tracking of infra projects, there are some green shoots visible in Mining, Earthmoving, Commercial Vehicle, Railways and Defence sectors.

Auto, Auto Components & Capital Goods Industry have drawn up ambition plans to grow three folds in next 10 years, which will drive the demand for metal casting industry. The Capital Goods Policy of Govt. envisages the sector to grow from USD 35 Bn to USD 115 Bn Industry by 2025. Whereas the auto sector as per Automotive Mission plan 2016-26 envisages auto sector to grow 3.5 to 4 times of the current value of USD 74 billion to USD 260 billion to 300 billion. Even if these plans are realized by 75-80%, it will augur well for the Indian Foundry Industry. The casting demand for iron & Aluminium castings could grow by 35-40 % in next 3-4 years from current levels.
There is focus on infrastructure in India. Construction of roads & rural housing etc. which will push demand from earthmoving & allied equipment. Good monsoons augur well for agricultural sector which will drive demand for tractors. The tractor industry grew by 21% in 2016-17 & by 15% in 2017-18 as compared to previous year after registering a decline of approx. 6.5% in 2015-16 compared to 2014-15.

Total Production of Tractors in India:

<table>
<thead>
<tr>
<th></th>
<th>2014-15</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>612994 Nos</td>
<td>570791 Nos</td>
<td>691361 Nos</td>
<td>790673 Nos</td>
</tr>
</tbody>
</table>

**Table 2**

Exports

The exports of castings from India in 2017-18 have shown significant growth after showing declining trends for last few years as per following trends:

![Figure 2. EXPORT/IMPORT DATA OF MAJOR CASTINGS - (in Million USD)](image)

**Major Challenges**

1. Rising input material Costs;
2. Skilled manpower;
3. Good quality Power at competitive rates;
4. Sand availability due to mining & environment issues;
5. Weak demand;
6. Challenge from slowdown in China & threats of dumping;
7. Growing Protectionism & Tradewars;
8. Uncertainty due to Lack of clarity of Policy on EV Mobility.
Main activities performed in the last six months

▪ The 66th Indian Foundry Congress & Foundry Exhibition IFEX 2018 were successfully organized in Gandhinagar Ahmedabad from 9th to 11th Jan 2018. The 66th Indian Foundry Congress was well attended by approx. 1400 delegates & over 250 Exhibitors. The highlights of the event were well attended technical sessions, Cast Source Meet, interaction between CEOs & Sr. Govt officials to discuss the roadmap for sustainable growth of the foundry sector in India.

▪ Detailed Energy audits were conducted in various foundry units across the country who reported good outcomes. The energy audit was supported under UNDP/GEF Special Grants Programme. The detailed audit involved studies of electricity bills, the power demand & production trend over the past 12 months. Detailed study was also carried out of various auxiliary induction furnaces, transformers, capacitors, DG sets, cooling towers, motors, compressors, lighting & air conditioning etc. to assess the potential areas for improvement in energy efficiency. After the audit recommendations were incorporated at the unit, it resulted in improved power factor, improved compressor & cooling tower efficiencies, streamlined production for reducing hold time for furnace. In most of the cases, there was possibility to save Rs 3-4 lakhs annually in energy bills in lighting only, in addition to other areas.

▪ End to End 4E Energy Efficiency programme was promoted for foundries.

▪ Modular exams in foundry technology have been conducted for candidates.

▪ Several programmes on various technical topics were organized through various chapters/regions throughout India including efficient energy management with focus on environment. Other programmes organized included works visit to top foundries in India, Technical Seminars on various topics of importance, workshops etc.

▪ Organized CEOs meet 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.

▪ Lean Manufacturing programme for MSMEs is being promoted in mini clusters (A group of 8-10 units). The objective is to improve overall competitiveness of the units.

▪ Monthly IIF Journal and weekly IIF Bulletin are being published regularly.
IIF has developed a book on Energy Saving in Foundries’. The books will be a very useful reference book and will support foundries in conservation of energy and improving their competitiveness.

Activities planned

▪ 67th Indian Foundry Congress & Foundry Exhibition IFEX 2019 at India Expo Centre, Gr Noida, Near Delhi NCR.

▪ Skill Development:
  o A new initiative planned by IIF for training of shop-floor workers at their door-steps. In the coming year around 5000 shop-floor workers will be given training under this programme.

▪ 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.
2.11. FOUNDRY INDUSTRY REPORT FROM ITALY

ASSOFOND – FEDERAZIONE NAZIONALE FONDERIE

The Italian economy and the casting customer industries

Macroeconomic developments

In 2017 the Italian economy consolidated its recovery, under way almost with no interruption since the second quarter of 2013. Growth exceeded the forecasts made at the start of the year by leading analysts and was observed in all the macro-areas, but especially in the northern regions. All components contributed: foreign trade, household consumption, the accumulation of capital goods and investments in construction, which are still far lower than they were prior to the crisis, in part owing to reduced investment by general government. Exports accelerated more than imports, meaning that foreign trade made a positive contribution to GDP growth for the first time since 2013. The current account surplus reached its highest level since the mid-1990s.

Fiscal policy continued to be moderately expansionary for the fourth year in a row, nevertheless general government net borrowing came down. The debt-to-GDP ratio also declined slightly; less favourable financial conditions should not have a significant impact on debt sustainability, as long as the fiscal stance remains prudent and the economy continues to grow at the current pace.

Thanks primarily to the recovery in payroll employment, household disposable income continued to increase, driving the expansion in consumption under way since mid-2013. Consumer confidence also improved in the second half of the year, reflecting more favourable labour market expectations.

In 2017 economic activity strengthened in every sector except agriculture. Value added accelerated in manufacturing and in services and increased significantly in construction for the first time since 2006.

The demographic balance of firms improved thanks to a reduction in the business mortality rate.

Investment accelerated, especially in plant, machinery and transport equipment, thanks to the tax incentives, the favourable monetary and financial conditions, the reduction in uncertainty and the increase in business confidence about demand prospects.
Innovation and the propensity to adopt new technologies, though low by international comparison, also strengthened, buoyed by the support measures introduced in recent years. Labour productivity in the private sector returned to growth, rising to pre-crisis levels: in industry the increase under way over the past ten years continued, albeit at a lower rate than the euro-area average, while in services it started to climb again.

Financial conditions improved overall for both households and firms.

In 2017 firms' profits continued to grow. Leverage decreased again, largely on account of the increase in net equity.

Employment continued to expand in all the main economic sectors in 2017.

The unemployment rate fell but only slightly, remaining at historically high levels; youth unemployment fell more markedly, but it was still triple that for the population as a whole.

In 2017 the increase in contractual earnings was modest, as in the previous year. However, the collective contracts signed in the second half of 2017 and in the first few months of 2018 signal that wage growth might be strengthening as a result of a firmer anchoring to inflation expectations and the increase in those expectations.

Consumer prices in Italy returned to growth, buoyed by the most volatile components. Core inflation, though recovering gradually, remained low by historical standards (more than in the euro area), mostly on account of the still ample margins of spare capacity. Inflation expectations showed signs of a still uncertain recovery.

Wage growth was also weak, hampered by the continuing slack in the labour market and by the fact that some agreements signed between the late months of 2015 and the early months of 2016 introduced pay rise indexation to the previous year's low inflation.

The price competitiveness of Italian firms was unaffected by the appreciation of the euro due to the fact that the increase in production prices was lower in Italy than it was for its main competitors. The gain vis-à-vis other euro-area countries offset the loss vis-à-vis non-euro-area competitors.

The current account surplus increased further. Exports accelerated, driven by the growth in demand caused by the favourable international outlook. In the services sector, spending by foreign tourists in Italy continued to grow for the eighth year in a row. Italy's investment income returned to surplus.

In 2017, the fiscal policy stance remained moderately expansive, consistent with the goal of not hindering the strengthening economic recovery. The primary surplus, which
remained unchanged at 1.5 per cent of GDP, according to the European Commission's estimates fell by 0.6 percentage points of GDP on a cyclically-adjusted basis. Thanks to the further reduction in interest expense, net borrowing continued to contract, declining from 2.5 to 2.3 per cent. The debt diminished marginally to 131.8 per cent.

The situation in the major casting customer industries

Automotive

The 2017 was the fourth consecutive year in growth for the Italian automotive industry. In the whole 2017, the production volumes amounted to 1,142,210 units, namely up by 3.5% on the previous year; broken down by: passenger cars 742,642 (+ 4.2%), 332,112 commercial vehicles (-3.6%) and 67,456 industrial vehicles (+46.7%). Domestic and export demand has driven the production of cars in Italy also in 2016 and the automotive industry as a whole.

Mechanical and Engineering akin

In 2017 46,7 were the billions of euro in technology products, machinery and equipment by the Italian mechanics, of which 27 billion euro sold abroad. The companies of mechanics in 2017 produced a +3,8% compared to 2016 and exported +2,9%.

Machine tool orders index. On a yearly basis, the Italian machine tool manufacturers registered a 13.7% growth versus 2016. Foreign orders went up by 4.7%, totally recovering the downturn reported last year. Domestic orders highlighted a 45.9% upturn, as a testimony to the great propensity to invest shown by the Italian market.

With regard to the domestic market the provisions included in the Plan Industry 4.0, and in particular Super- and Hyper-Depreciation, had a clear impact on the trend of sales and on the order collection.

The confirmation of the two main incentives of the Government programme Industry 4.0, i.e. Super- and Hyper-Depreciation, also in the Plan "Enterprise 4.0", included in the Budget Law 2018, despite a small amendment to the Super-Depreciation (whose incentive coefficient changes from 140% to 130%) is the evidence that the Government authorities have well evaluated the action scope started one year ago, thus understanding that an abrupt and sudden interruption would have been really deleterious for the whole system"
Agricultural Machinery

The Italian Agricultural Machinery market grew strongly in the year 2017. During the year as a whole were built in Italy 947,040 tons (+5.6%). The turnover, 7.8 billions, grew up by +7.5% compared to the previous year.

Crude steel

In 2017, the output of crude steel in Italy was registered with a volume of 24,069 million tons, with a growth of +3%.

Building sector

The index of construction production, corrected for calendar effects, shows an increase of 0.8% in the average of 2017 over the previous year. In particular, in the last three months of the year, positive trend results were observed (+1.8% in September, +1.9% in October and +0.6% in November 2017 on the similar months of 2016), not sufficient however to compensate for the strongly discontinuous trend of the previous months.

Developments in the Foundry Industry

The Italian Foundry industry in 2017 experienced a more extensive recovery condition among the various production sectors and much more encouraging than 2016.

Last year the weight of castings produced by Italy’s ferrous and non ferrous foundries amounted to 2,236,843 tons. Compared to the previous year this correspond to a growth in production volumes of +7.1%. The turnover trend in the same period increased of +8.6% (7,011 million of euros).

The highest growth (+7.8%) was seen in the production of iron castings, while among the non-ferrous metals the output of aluminum castings increased by 7.4%. Recovery is still characterized by strongly diversified dynamics between the various metal sectors, but often with high spreads even within of the same market segment.

The average result hides these trends:

- +7.8 Iron castings (grey and ductile);
- -5.0% Steel castings;
- +10% Investment castings;
- +7% Non-ferrous castings (Aluminum, Magnesium, Copper, Zinc, October, Bronze).

Capacity utilization in the iron (grey and ductile) foundry industry amounted to 76% in 2017; steel foundry 56% and non ferrous foundry to 80%.
Foreign trade continues to produce very positive signals. In 2017 the direct exports of ferrous castings recorded a growth (+7% in volume and +4% in value).

Structure of Foundry Industry

The employment situation

In 2015 (this is the last available data from ISTAT Italian National Statistics Institute) the total number of operating foundries was 1,038, of which 862 units (83%) were non ferrous foundries and 176 Ferrous.

Structural business statistics (year 2015)

<table>
<thead>
<tr>
<th>Number of enterprises</th>
<th>Total Foundries</th>
<th>Iron Foundries</th>
<th>Steel Foundries</th>
<th>Light metal non ferrous foundries</th>
<th>Other non-ferrous metals foundries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,038</td>
<td>1,038</td>
<td>139</td>
<td>37</td>
<td>522</td>
<td>340</td>
</tr>
<tr>
<td>Number of persons employed</td>
<td>28,029</td>
<td>6,873</td>
<td>2,314</td>
<td>12,538</td>
<td>6,294</td>
</tr>
<tr>
<td>Turnover - thousands of euros</td>
<td>6,458,803</td>
<td>1,549,110</td>
<td>511,084</td>
<td>2,752,063</td>
<td>1,656,546</td>
</tr>
<tr>
<td>Production value - thousands of euros</td>
<td>6,509,643</td>
<td>1,571,662</td>
<td>496,632</td>
<td>2,800,771</td>
<td>1,643,578</td>
</tr>
<tr>
<td>Value added at factor cost - thousands of euros</td>
<td>1,712,972</td>
<td>433,766</td>
<td>154,722</td>
<td>750,747</td>
<td>373,737</td>
</tr>
<tr>
<td>Gross operating surplus - thousands of euros</td>
<td>533,930</td>
<td>136,410</td>
<td>42,759</td>
<td>235,035</td>
<td>119,726</td>
</tr>
<tr>
<td>Total purchases of goods and services - thousands of euros</td>
<td>4,842,084</td>
<td>1,128,577</td>
<td>351,199</td>
<td>2,062,985</td>
<td>1,309,323</td>
</tr>
<tr>
<td>Personnel costs - thousands of euros</td>
<td>1,179,040</td>
<td>297,355</td>
<td>111,964</td>
<td>515,710</td>
<td>254,011</td>
</tr>
<tr>
<td>Wages and salaries - thousands of euros</td>
<td>824,415</td>
<td>206,090</td>
<td>76,743</td>
<td>362,371</td>
<td>179,211</td>
</tr>
<tr>
<td>Gross investment in tangible goods - thousands of euros</td>
<td>289,700</td>
<td>87,700</td>
<td>19,069</td>
<td>124,416</td>
<td>58,511</td>
</tr>
</tbody>
</table>

The Situation in the material Sectors
Grey cast iron

In 2017, the sector’s output grew by +5.8% to 755,773 tons. The production of motor-vehicle components expanded by +1.1% to 253,184 tons. The volume of mechanical-engineering components increased by +7.7% to 352,643 t, while the output of building components increased by +6.9% to 38,210 t. Roll manufacturers logged a production of 14,002 t, marking a growth of 7.3%. Miscellaneous grey iron components reached a production volume of 97,734 t (+11.6%).

Ductile iron castings (nodular and malleable)

The weight of ductile iron castings produced in 2017 amounted to 425,122 tons. Compared to the year before, this marks an increase of +11.5%. Manufactures of mechanical-engineering was up by +15.3% with a volume of 224,815 t. At 128,245 tons, the output of motor-vehicle components was up by +2.4%. Components for the building sector went up by 14.6% at a volume of 52,338 tons. While the output of rolls grew by +29.7% to 19,724 tons.

Steel

In 2017, steel foundries had a worse performance than the others material sectors. Production declined by -5% to 54,135 tons mainly due to the downturn in the downstream sectors, particularly as regards investments in oil and gas and mining sectors.

Non-Ferrous Metal castings

In 2017, the Italian non-ferrous metal foundries were in a position again to continue the recent fourth positive trend and to achieve another production increase (+7.0%) and a total volume of 1,000,095 tons. For the current year, it is expected that production and turnover will increase again. In detail, growth rates are underpinned by the intensive demand for light alloy castings (aluminium), representing about 85% of total non ferrous metal castings. In this sector, castings production increased to 848,380 t (+7.4%), while the magnesium output increased by +8.4% to 8,001 tons. The good performance of non ferrous sector was the result of the ongoing high demand of lightweight materials in the automotive industry. This industry is the most important customer for non ferrous castings in Italy, in 2017 it absorbed about 57% of the total non ferrous output!

Good the situation for the other heavy-metal casters. Production of Zinc achieved to 72,007 tons with a growth of +2.2%; while brass, bronze and copper logged an output increase of +7.5% and a volume of 71,007 tons.
Outlook 2018

The forecast for the current year is optimism for all ferrous and nonferrous sectors. There is a highest percentage of those who declare that the coming months will get better than previous year.

Production costs trend

The main metal inputs for ferrous castings production in the 2017 came up following these prices evolution on annual averages:

Steel Packages 30X30 – Monthly average – Euro/t -

- Bales of deep drawing steel 30x30 = +25% (+65 € / t)

Pig iron (Hematite) – Monthly average – Euro/t -

- **Pig Iron** (hematite) = +24% (+86 € / t)
Pig iron (for ductile iron) – Monthly average – Euro/t -

- **Pig Iron** (for ductile iron) = +20% (+74 € / t)

**Evolution other Direct transformation inputs**

<table>
<thead>
<tr>
<th>Material</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recarburising graphite</td>
<td>+3%</td>
</tr>
<tr>
<td>FeSiMg</td>
<td>+3%</td>
</tr>
<tr>
<td>Other materials (FeSi)</td>
<td>+35%</td>
</tr>
<tr>
<td>Metallic charge excluding Pig iron &amp; steel scraps</td>
<td>13%</td>
</tr>
<tr>
<td>Electrical power</td>
<td>+2%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>+7%</td>
</tr>
<tr>
<td>Foundry Coke</td>
<td>+15%</td>
</tr>
<tr>
<td>Energies (Foundries using electrical furnace)</td>
<td>+2%</td>
</tr>
<tr>
<td>Energies (Foundries using cupola furnace)</td>
<td>+9%</td>
</tr>
<tr>
<td>French sand</td>
<td>+2%</td>
</tr>
<tr>
<td>Core binders</td>
<td>+45%</td>
</tr>
<tr>
<td>Green sand binders</td>
<td>+5%</td>
</tr>
<tr>
<td>Other consumables (consumer prices index)</td>
<td>+1%</td>
</tr>
<tr>
<td>Auxiliary materials</td>
<td>+10%</td>
</tr>
</tbody>
</table>

**2017 VS 2016**
# 2.12. Foundry Industry Report from Japan

## Japan Foundry Engineering Society

**Industry Report of Japan Foundry Business**

### Production amount since the year 2000

<table>
<thead>
<tr>
<th>Year</th>
<th>Gray cast iron</th>
<th>Spher. graphite cast iron</th>
<th>Cast iron pipe</th>
<th>Malleable cast iron</th>
<th>Steel castings</th>
<th>Copper alloy castings</th>
<th>Aluminum alloy castings</th>
<th>Die castings</th>
<th>Precision castings</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2,629.3</td>
<td>1,367.3</td>
<td>580.8</td>
<td>97.8</td>
<td>264.2</td>
<td>87.0</td>
<td>408.7</td>
<td>823.3</td>
<td>7.4</td>
<td>6,265.8</td>
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<tr>
<td>2001</td>
<td>2,376.9</td>
<td>1,253.7</td>
<td>564.1</td>
<td>92.8</td>
<td>258.7</td>
<td>86.6</td>
<td>380.9</td>
<td>788.7</td>
<td>7.4</td>
<td>5,809.8</td>
</tr>
<tr>
<td>2002</td>
<td>2,339.8</td>
<td>1,272.3</td>
<td>477.3</td>
<td>80.6</td>
<td>232.4</td>
<td>86.7</td>
<td>406.0</td>
<td>854.4</td>
<td>6.5</td>
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<td>1,347.2</td>
<td>585.8</td>
<td>81.2</td>
<td>235.4</td>
<td>100.6</td>
<td>403.9</td>
<td>904.3</td>
<td>6.5</td>
<td>6,122.1</td>
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<td>1,440.0</td>
<td>452.9</td>
<td>77.3</td>
<td>258.3</td>
<td>105.5</td>
<td>396.5</td>
<td>984.5</td>
<td>7.5</td>
<td>6,380.4</td>
</tr>
<tr>
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<td>2,784.2</td>
<td>1,516.4</td>
<td>402.8</td>
<td>66.5</td>
<td>232.4</td>
<td>105.5</td>
<td>434.0</td>
<td>1,064.8</td>
<td>7.4</td>
<td>6,629.3</td>
</tr>
<tr>
<td>2006</td>
<td>2,834.2</td>
<td>1,590.9</td>
<td>444.9</td>
<td>56.4</td>
<td>281.2</td>
<td>105.8</td>
<td>434.5</td>
<td>1,122.3</td>
<td>7.2</td>
<td>6,876.9</td>
</tr>
<tr>
<td>2007</td>
<td>2,854.8</td>
<td>1,629.8</td>
<td>417.6</td>
<td>53.3</td>
<td>292.9</td>
<td>106.9</td>
<td>434.5</td>
<td>1,158.4</td>
<td>7.4</td>
<td>6,955.6</td>
</tr>
<tr>
<td>2008</td>
<td>2,807.3</td>
<td>1,560.7</td>
<td>435.1</td>
<td>48.1</td>
<td>298.7</td>
<td>98.9</td>
<td>415.1</td>
<td>1,091.1</td>
<td>7.5</td>
<td>6,762.5</td>
</tr>
<tr>
<td>2009</td>
<td>1,656.8</td>
<td>963.8</td>
<td>404.8</td>
<td>37.2</td>
<td>202.1</td>
<td>75.4</td>
<td>291.9</td>
<td>758.2</td>
<td>4.3</td>
<td>4,394.5</td>
</tr>
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<td>2010</td>
<td>2,156.7</td>
<td>1,309.7</td>
<td>320.0</td>
<td>39.6</td>
<td>206.7</td>
<td>79.2</td>
<td>386.9</td>
<td>981.1</td>
<td>5.9</td>
<td>5,485.8</td>
</tr>
<tr>
<td>2011</td>
<td>2,189.5</td>
<td>1,335.6</td>
<td>299.9</td>
<td>39.5</td>
<td>218.2</td>
<td>83.1</td>
<td>375.2</td>
<td>925.8</td>
<td>6.4</td>
<td>5,473.2</td>
</tr>
<tr>
<td>2012</td>
<td>2,216.0</td>
<td>1,385.6</td>
<td>329.9</td>
<td>37.6</td>
<td>202.7</td>
<td>79.6</td>
<td>420.4</td>
<td>1,002.2</td>
<td>6.4</td>
<td>5,680.4</td>
</tr>
<tr>
<td>2013</td>
<td>2,135.8</td>
<td>1,339.7</td>
<td>343.6</td>
<td>45.3</td>
<td>182.4</td>
<td>77.0</td>
<td>421.7</td>
<td>985.4</td>
<td>6.4</td>
<td>5,537.3</td>
</tr>
<tr>
<td>2014</td>
<td>2,118.6</td>
<td>1,362.7</td>
<td>360.0</td>
<td>44.1</td>
<td>172.3</td>
<td>77.1</td>
<td>417.7</td>
<td>1,000.3</td>
<td>6.7</td>
<td>5,559.5</td>
</tr>
<tr>
<td>2015</td>
<td>2,022.9</td>
<td>1,305.1</td>
<td>398.7</td>
<td>43.1</td>
<td>157.0</td>
<td>78.0</td>
<td>418.5</td>
<td>975.7</td>
<td>5.9</td>
<td>5,404.9</td>
</tr>
<tr>
<td>2016</td>
<td>1,933.7</td>
<td>1,301.3</td>
<td>290.3</td>
<td>41.0</td>
<td>150.1</td>
<td>77.4</td>
<td>423.7</td>
<td>980.4</td>
<td>5.4</td>
<td>5,203.3</td>
</tr>
<tr>
<td>2017</td>
<td>2,032.1</td>
<td>1,403.6</td>
<td>248.9</td>
<td>42.0</td>
<td>161.9</td>
<td>75.4</td>
<td>441.8</td>
<td>1,042.4</td>
<td>5.5</td>
<td>5,453.6</td>
</tr>
</tbody>
</table>

| In 2017 | 37.3% | 25.7% | 4.6% | 0.8% | 3.0% | 1.4% | 8.1% | 19.1% | 0.1% |

**Consumption of castings (in 2017)**

1. **Gray cast iron**
   - Industrial machines & apparatus: 11.2%
   - Machine tool: 4.8%
   - Other machine: 10.0%
Vehicle 65.0%
Other transportation machine 6.1%
Others 2.9%

(2) Spheroidal graphite cast iron

- Industrial machines & apparatus 18.6%
- Other machine 9.0%
- Vehicle 62.3%
- Other transportation machine 3.1%
- Other 7.0%

(3) Die castings

- Aluminum die castings
  - Vehicle 89.9%
  - Other machines 7.8%
- Zinc & other die castings 2.3%

(4) Aluminum alloy castings

- Transportation machines 95.5%
- Others 4.5%

(5) Steel castings

- Construction machines 25.9%
- Ship industries 17.9%
- Shredding machines 6.7%
- Generating apparatus 3.6%
- Vehicle 9.2%
- Steel casting pipe 3.7%
- Valve, stopcock 5.1%
- Others 27.9%

(6) Copper alloy castings

- Industrial machines
  - Industrial machines & equipments 16.6%
  - Bearing metal 12.6%
  - Valve, stopcock (include coupling joint) 37.1%
- Transportation machines 23.1%
- Others 10.6%
2.13. FOUNDRY INDUSTRY REPORT FROM KOREA

KOREAN FOUNDRY SOCIETY
Report provided on their behalf by ANYCASTING SOFTWARE CO., LTD

Despite a high-profile corruption scandal that led to the President’s impeachment, the economy got off to a good start in 2018, as it remains unchanged compared to the same quarter of the previous year. However, unlike the Q1 2018, South Korea will contend with a gradual slowdown in economic growth, in the 2-3% range, for this year and beyond.

Listed below are some crucial facts about the casting industry of South Korea:

Current Status

More than 2.3 million tonnes of castings are produced in South Korea annually, which occupies the tenth place in the world and the average production per plant is 2,600 tonnes every year, the fifth largest after Germany, the United States and France. About 90% of the castings are ferrous metals, such as cast iron and cast steel. There are about 550 iron and steel foundries and 100 non-ferrous metal foundries.

Trends in the Casting Simulation Industry

As increasing the number of cores in the central processing unit (CPU) of the computer gained popularity since 2010, casting simulation software companies that originally require large amounts of computation and long calculation time have also worked on multi-core processors. At the same time, there have been continuing efforts to further improve the calculation speed of the software by applying the computational distribution employing the GPU used in the graphics card, speeding up through the introduction of SMP (Symmetric Multi-Processor) using OpenMP (Open Multi-Processing) method, and via applying MPP (Massively Parallel Processing) with domain decomposition of calculation area.

Future Demand

Along with the market penetration of electric cars, Korea is also gearing up to replace gasoline and diesel fuel. Consequently, it is anticipated that the demand for aluminum and magnesium components will increase sharply rather than cast iron castings.
2.14. FOUNDRY INDUSTRY REPORT FROM MEXICO

SOCIEDAD MEXICANA DE FUNDIDORES (SMF)

Mexico has become one of the strongest industries in the world in the foundry market, after the global crisis of 2008. The foundry industry is one of the base industries of the entire productive chain and it is positioned among the top 10 countries in the international production ranking of the sector.

The Mexican foundry sector closed 2017 with an approximate turnover of 7.8 billion dollars, an approximate production close to 3 million metric tons (2017) generating more than 50,000 direct employees and another 100,000 indirect jobs that manufactures ferrous and non-ferrous products for various customer sectors in the country such as: automotive, railway, aerospace, pumps and hydraulic systems, construction, machine tool, metal-mechanical, agriculture and mining, among others.

About SMF

The Mexican Foundry Society (Sociedad Mexicana de Fundidores) is an active organization representing the foundry industry for more than 70 years and it is recognized as well worldwide for its significant performance in its sector.

Chaired by José Luis Grajales Zaldívar, the entity brings together the main Mexican foundry companies with the aim of encouraging the sustained growth of the sector, generating and participating in the necessary actions to make it stronger and more competitive. In addition to promoting the technological development of the foundry companies, the SMF stimulates debate on environmental, economic and social issues for the defense of the national sector and its commercial growth, as well as technical training for the companies aimed to improve their competitiveness level.

Top 10 – Ranking of the world foundry industry up to 2017

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Metric/Tones</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>47,200,000</td>
</tr>
<tr>
<td>2</td>
<td>India</td>
<td>11,350,000</td>
</tr>
<tr>
<td>3</td>
<td>USA</td>
<td>9,395,305</td>
</tr>
<tr>
<td>4</td>
<td>Japan</td>
<td>5,203,300</td>
</tr>
<tr>
<td>5</td>
<td>Germany</td>
<td>5,167,824</td>
</tr>
<tr>
<td>6</td>
<td>Russia</td>
<td>3,900,000</td>
</tr>
<tr>
<td>7</td>
<td>Mexico</td>
<td>2,909,461</td>
</tr>
<tr>
<td>8</td>
<td>Korea</td>
<td>2,610,000</td>
</tr>
<tr>
<td>9</td>
<td>Brasil</td>
<td>2,103,000</td>
</tr>
<tr>
<td>10</td>
<td>Italy</td>
<td>2,079,684</td>
</tr>
</tbody>
</table>
In the last 3 years (2014-2017) Mexico has advanced 2 positions within the worldwide ranking, derived from the European and Brazilian deceleration, the installation and expansion of new casting facilities and the increase of installed and assembly plants of car and truck manufacturers.
Official production figures of the Mexican foundry sector 2017 (SMF)

- Cast Steel: 373,965 metric tons (13% of the total production)
- Nodular iron: 526,897 metric tons (18% of the total production)
- Gray Iron: 892,188 metric tons (31% of the total production)
- Aluminum base alloys: 817,911 metric tons (28% of the total production)
- Zinc base alloys: 81,300 metric tons (3% of the total production)
- Copper base alloys: 217,200 metric tons (7% of the total production)

Total production in 2017: 2,909,461 metric tons

Percentage of ferrous and non-ferrous casting production in Mexico 2017 (SMF source)

Sales trend. 6% average increase in sales is consolidated from 2014 to 2017, with a growth record between 2016 and 2017 derived from the exchange rate MXN-USD.
72.2% of the casting production is directly linked to the automotive sector, from which 42.5% is national consumption and the rest is exported abroad, mainly to the US, Japan, Germany, Korea, Central America and the rest of Europe.

Nodular iron and aluminum die casting experienced the highest growth.

Main customer sectors, with the biggest opportunity in the automotive sector in the next 10 years. Percentage of castings consumption produced in the country and main customer sectors. 72.2% of the production of the foundry industry is directed to the automotive sector, followed by the construction activities.

**Ranking of Mexico by number of foundry companies installed by location**

Currently there is a decrease of companies called SMEs (small and medium) in our country registered from 2009 up to date, but since 2012 there is a growth of large companies or global industrial groups that have invested in the expansion of their local facilities, as well as in investments abroad.

Therefore, this means a clear increase of the installed production capacity, along with the establishment of foreign companies with capital investment of over 700 MDD between 2015 and 2016.

Most Mexican companies offer as well additional machining services. SMF has registered about 80% of the foundries from the country. The staff employed directly is about 52,000 workers (a similar number as in 2016), and indirect personnel raises up to approximately 100,000.
Today we have a strengthened industry, with more competitive prices, competitive technology and a more stable cost of energy, although skilled labor is scarce, but taking into consideration that the labor cost is below the global average.

More than 600 national companies were in operation in the last census of the Mexican foundry industry, with an increase of industrial groups and large companies. Despite the remarkable decrease in the number of SMEs, the total number of foundries is estimated in around 800 companies, that manufacture ferrous and non-ferrous castings.
Value of the demand not produced in Mexico by the automotive sector

The value of the demand not produced in the metal production market is estimated in around 50 billion dollars, only in the automotive sector. The activities with the highest consumption demand are:

- Die casting: 3.3 billion dollars
- Ferrous casting: 9.7 billion dollars
- Machining: 7.7 billion dollars
- Forming and stamping: 9.7 billion dollars
- Forging: 9.1 billion dollars

Total market value and business opportunity in 10 processes that represent 70% of opportunities in the supply chain of the Mexican automotive sector

Fundieexpo 2018

One of the main foundry activities in Mexico is linked to the celebration of FUNDIEXPO, that will bring together the main national companies producing castings, along with an important number of international organizations, suppliers, machine-tool manufacturers and additional services for the foundry industry. The Congress is promoted by the Jalisco Region of the Sociedad Mexicana de Fundidores (SMF) and will be held on the 24th-26th of October 2018 in the City of Guadalajara, Mexico.

The exhibitors of the 21st FUNDIEXPO will bring innovations in technology, equipment and supplies. Among the highlights of this event, will be the participation of representatives from 20 different countries with the presence of more than 500 national and international companies related to the foundry sector.
2.15. FOUNDRY INDUSTRY REPORT FROM NORWAY

NORWEGIAN FOUNDRY TECHNICAL ASSOCIATION
Report provided on their behalf by the FEDERATION OF NORWEGIAN INDUSTRIES

The Norwegian economy experienced an economic upturn throughout 2017. Going forward, the upturn will be driven by an increase in investments in the petroleum industry and higher international growth, but will be slowed down by falling housing investments, higher interest rates and a stronger currency (Norwegian krone).

The Norwegian salaries are the highest in Europe. The salaries for 2018 are expected to increase by 2.8 %.

There has been a decrease in production and in the number of foundries over the last years.

The capacity utilization in 2017 was approximately 57% which is a slight improvement from 2016.

The foundry industry expects positive development for the year 2018. They expect an increase in both profits and produced volumes.

The weak Norwegian krone is an advantage for the foundries as the sector export 54% of their production.

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>tonnes</th>
<th>Value million Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey iron</td>
<td>8 310</td>
<td></td>
<td>10,3</td>
</tr>
<tr>
<td>Nodular iron</td>
<td>21 138</td>
<td></td>
<td>55,5</td>
</tr>
<tr>
<td>Steel</td>
<td>n.a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>n.a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>5 883</td>
<td></td>
<td>58,0</td>
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</table>
Poland’s macroeconomic performance in 2016 – 2017

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Units</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>dynamics</td>
<td>102,9</td>
<td>104,6</td>
</tr>
<tr>
<td>Gross capital formation</td>
<td>dynamics</td>
<td>98,1</td>
<td>104,2</td>
</tr>
<tr>
<td>Price index of consumer goods and services (CPI)</td>
<td>dynamics</td>
<td>99,4</td>
<td>102,0</td>
</tr>
<tr>
<td>Price index of sold production of industry (PPI)</td>
<td>dynamics</td>
<td>99,9</td>
<td>102,9</td>
</tr>
<tr>
<td>Sold production of industry</td>
<td>dynamics</td>
<td>103,6</td>
<td>106,2</td>
</tr>
<tr>
<td>Average wages and salaries in the national economy - enterprise sector</td>
<td>PLN</td>
<td>4 277</td>
<td>4 530</td>
</tr>
<tr>
<td>Average employment in enterprise sector</td>
<td>thous.pers.</td>
<td>5,760</td>
<td>6,017</td>
</tr>
<tr>
<td>Unemployment rate (as of the end of the period)</td>
<td>%</td>
<td>8,2</td>
<td>6,6</td>
</tr>
</tbody>
</table>

*Table 1*

**Polish foundry industry**

According to the data by Foundry Research Institute, in Poland there are about 455 foundries incl. 240 non-ferrous foundries, 180 iron foundries and 35 steel foundries.

The foundry sector is formed mainly by foundries which belong to small and medium sized enterprises (SMEs) producing about 40 % of total casting production.

Poland was the 16th producer of castings in the world and the 8th in Europe. Casting production accounted for **1 036 500 tons** and it was lower by 1,2% than in 2015. Production of aluminium castings is on the same level as in year 2015. At present Poland is the 5th producer of aluminium castings in Europe.
### Material Output [T]

<table>
<thead>
<tr>
<th>Material</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total iron castings</td>
<td>480 000</td>
</tr>
<tr>
<td>Total nodural iron castings</td>
<td>160 000</td>
</tr>
<tr>
<td>Steel castings</td>
<td>50 000</td>
</tr>
<tr>
<td><strong>Total ferrous alloy castings</strong></td>
<td><strong>690 000</strong></td>
</tr>
<tr>
<td>Copper alloys castings</td>
<td>6 100</td>
</tr>
<tr>
<td>Aluminium alloys castings</td>
<td>330 000</td>
</tr>
<tr>
<td>Zinc alloys castings</td>
<td>7 500</td>
</tr>
<tr>
<td>Other nonferrous alloys castings</td>
<td>2 900</td>
</tr>
<tr>
<td><strong>Total nonferrous alloy castings</strong></td>
<td><strong>346 500</strong></td>
</tr>
<tr>
<td><strong>Total ferrous and nonferrous castings</strong></td>
<td><strong>1 036 500</strong></td>
</tr>
</tbody>
</table>

*Table 2. Total Polish output in 2017*

Structure of casting production by materials used in total production:

- 46% - grey cast iron;
- 15% - nodural cast iron;
- 5% - steel castings;
- 32% - aluminium alloys;
- 2% - other nonferrous alloys.
The employment in foundry industry is estimated on the same level as in 2015 – 24,300 employees, incl. 8,300 employees in non-ferrous foundries, 12,500 employees in iron foundries and 3,500 employees in steel foundries. More than 50% of total employment concerns SMEs sector.

In 2017 Polish foundries produced castings mainly for automotive industry, construction industry and machine industry.

Foundry industry in Poland is still export oriented. In 2017 export of castings reached 59% of total production. The main recipients were Germany (about 50%), Italy, France, Czech Republic and the United Kingdom.

<table>
<thead>
<tr>
<th>Material</th>
<th>Export [T] 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron castings</td>
<td>216,000</td>
</tr>
<tr>
<td>Nodural iron castings</td>
<td>79,000</td>
</tr>
<tr>
<td>Malleable iron castings</td>
<td>900</td>
</tr>
<tr>
<td>Steel castings</td>
<td>16,000</td>
</tr>
<tr>
<td><strong>Total ferrous alloy castings</strong></td>
<td><strong>311,900</strong></td>
</tr>
<tr>
<td>Copper alloys castings</td>
<td>5,300</td>
</tr>
<tr>
<td>Aluminium alloys castings</td>
<td>290,000</td>
</tr>
<tr>
<td>Zinc alloys castings</td>
<td>6,600</td>
</tr>
<tr>
<td>Other nonferrous alloys castings</td>
<td>2,500</td>
</tr>
<tr>
<td><strong>Total nonferrous alloy castings</strong></td>
<td><strong>304,400</strong></td>
</tr>
<tr>
<td><strong>Total ferrous and nonferrous castings</strong></td>
<td><strong>616,300</strong></td>
</tr>
</tbody>
</table>

*Table 3. Export of castings in 2017*
Trends and forecasts

The Polish foundry industry benefits from the good economic situation due to the dominant role of exports. It follows a gradual improvement in infrastructure (roads, energy) which should also facilitate the development of enterprises. From 01.07.2018, the entire country has been assigned as a special economic zone (tax exemption up to 15 years) which should attract new investors.

It is necessary to assess negatively the lower effectiveness in the use of funds provided by the European Union, which affects the lower rate of modernization and investment. Changes in the role and ways of acting (new legal and personnel solutions) in the scientific and educational infrastructure also have a negative effect. The problem of recruiting employees for the growing industry is also a serious problem.

As a positive factor, we assess the decision of locating the 73rd WFC in Poland. It allows to give the Foundry Industry a higher rank.
2.17. FOUNDRY INDUSTRY REPORT FROM ROMANIA

ASOCIAȚIA TEHNICA DE TURNATORIE DIN ROMANIA
ROMANIAN TECHNICAL FOUNDRY ASSOCIATION

General Overview

Romania GDP Growth Rate - Forecast

GDP Growth Rate in Romania is expected to be 0.80 percent by the end of this quarter, according to Trading Economics global macro models and analysts’ expectations. Looking forward, we estimate GDP Growth Rate in Romania to stand at 0.60 in 12 months’ time. In the long-term, the Romania GDP Growth Rate is projected to trend around 0.60 percent in 2020, according to our econometric models.

Romania GDP from Industrial Production

GDP sourced by manufacturing in Romania increased to 9183.10 RON Million in the fourth quarter of 2017 from 8509.70 RON Million in the third quarter of 2017. GDP From Manufacturing in Romania averaged 6638.77 RON Million from 1995 until 2017, reaching an all-time high of 9183.10 RON Million in the fourth quarter of 2017 and a record low of 4750.70 RON Million in the third quarter of 1999.
**Romanian Metal Casting Industry**

In Romania are acting about 100 Foundries, with much diverted range of turnover. Range of castings starts from magnesium parts for automotive industry, with weights of grams and ends to steel castings designated to the energy or shipping sector, with weights up to 200 tones. Over the last years the metal casting production stabilized, but structural changes are visible: non-ferrous increasing while iron alloys decrees. A general view of the Romanian metal casting industry reveals two main directions:

- Automotive industry, with aluminium and magnesium castings manufactured in high serial processes; leader Dacia (Group Renault-Nissan) followed by Altur;
- Hand moulding parts, designated to machine building, energy, transportation or shipping sectors, with castings produced in grey or ductile iron, as well as in steel, or also in aluminium.

Most relevant technologies used in Romanian foundries:

- Hand moulding NO BAKE process (NBFA);
- Full mould process (also NBFA);
- Gravity Die Casting for aluminium alloys;
- High Pressure Die Casting for aluminium or magnesium alloys;
- Centrifugal Casting / Ferrous and Non-ferrous alloys;
- Investment Casting.

Main Foundries:

- Doosan IMGB Bucharest: 6.000 mt/year / steel
- SATURN Alba Iulia: 15.000 mt/year / iron
- Automobile Dacia Pitesti: > 25.000 mt/year / aluminium HPDC

Romanian Casting Production 2003 – 2018:
A detailed view of the last seven years production may be observed in the following chart:

<table>
<thead>
<tr>
<th>Year</th>
<th>Iron</th>
<th>Steel</th>
<th>Non Ferrous Alloys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grey &amp; Alloyed</td>
<td>Ductile</td>
<td>Malleable</td>
</tr>
<tr>
<td></td>
<td>31.669</td>
<td>22.955</td>
<td>35.272</td>
</tr>
<tr>
<td>TOTAL</td>
<td>88.896</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28.313</td>
<td>21.656</td>
<td>52.037</td>
</tr>
<tr>
<td>TOTAL</td>
<td>102.006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>36.812</td>
<td>2.075</td>
<td>927</td>
</tr>
<tr>
<td></td>
<td>39.814</td>
<td>23.111</td>
<td>57.769</td>
</tr>
<tr>
<td>TOTAL</td>
<td>120.695</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35.235</td>
<td>24.853</td>
<td>55.751</td>
</tr>
<tr>
<td>TOTAL</td>
<td>115.839</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>29.852</td>
<td>18.381</td>
<td>58.355</td>
</tr>
<tr>
<td>TOTAL</td>
<td>106.588</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30.603</td>
<td>14.218</td>
<td>63.578</td>
</tr>
<tr>
<td>TOTAL</td>
<td>108.398</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>24.186</td>
<td>3.924</td>
<td>685</td>
</tr>
<tr>
<td></td>
<td>29.795</td>
<td>12.212</td>
<td>93.081</td>
</tr>
<tr>
<td>TOTAL</td>
<td>134.089</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.926</td>
<td>7.593</td>
<td>76.900</td>
</tr>
<tr>
<td>TOTAL</td>
<td>110.419</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>20.000</td>
<td>3.500</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>23.500</td>
<td>7.000</td>
<td>82.250</td>
</tr>
<tr>
<td>ESTIMATED TOTAL</td>
<td>112.750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>19.000</td>
<td>4.500</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>23.500</td>
<td>7.500</td>
<td>86.800</td>
</tr>
</tbody>
</table>

PREVISIONED TOTAL 2017, [mt]: 117,600

![Distribution of Casted Alloys in...](image)
Production trends:

**Conclusions and predictions**

The Romanian Technical Association estimates and predicts the metal casting production in our country as follows:

- The metal casting production in Romania stabilized at a very low level, but knew a slow increase; the prevision for 2017 / 2018 is prudent, and shows a slight increase;

- Structural changes occurred: while production of non-ferrous castings increased significantly (especially aluminium), production of ferrous alloy decreased, resuming mainly to hand and mechanical moulding process in chemical bounded sands;

- Green sand moulding is still present in a very limited number of foundries;

- High Pressure Die Casting is the dominant process in non-ferrous casting production, followed by Gravity Die Casting; hand moulding of big castings in aluminium is also present in one foundry;

- In 2018, we estimate that the increase trends will be continued due of aluminium HPD casting.
2.18. FOUNDRY INDUSTRY REPORT FROM SERBIA

SERBIAN FOUNDRYMEN’S SOCIETY

Condition on the Foundry Industry in Serbia

General characteristics of cast production

Cast parts production in the foundries in Serbia has been performed under extremely complex and difficult conditions after disintegration of Yugoslavia and changes in the foreign market, eastern European countries in particular, which were significant buyers of cast parts.

The foundries sold 15 to 17% of their products onto the foreign markets. Production connection with metal complex in terms of castings placement has been disrupted, and consequently, functions of supplying with foundry raw and auxiliary materials.

In present business ambience, metal casting industry of Serbia placed castings to metal complex and civil engineering in accordance with the following scope:

<table>
<thead>
<tr>
<th>Scope of Castings</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal processing activity</td>
<td>7%</td>
</tr>
<tr>
<td>Machinery production</td>
<td>18%</td>
</tr>
<tr>
<td>Transportation - auto parts, agricultural machinery and devices</td>
<td>40%</td>
</tr>
<tr>
<td>Shipbuilding</td>
<td>1%</td>
</tr>
<tr>
<td>Production of electrical machines and devices</td>
<td>12%</td>
</tr>
<tr>
<td>Civil engineering (installation materials)</td>
<td>12%</td>
</tr>
<tr>
<td>Other consumption of cast parts</td>
<td>10%</td>
</tr>
</tbody>
</table>

*Table 1. Scope of castings*

Production capacities of the foundries in Serbia have been constructed predominantly in period between 1975 and 1985 for eminent consumers of the time for producing mainly cars and tractors. Significant investments were performed by the 15 biggest main foundries. During the transition period, most of these foundries is passed into private hands with unfortunately poor outcome. Many no longer exist and the rest are working with reduced capacity.

Of the remaining capacity, once planned for the production of 350,000 t / ear, today they are used to produce only 60,000 t / ear. The approximate schematic representation of the employment of these capacities is given in Table 2.
Casts for transportation means and tractors 24,000 t
Casts for machinery production 10,800 t
Casts for civil engineering (installation materials) 7,200 t
Casts for metal processing activity 4,200 t
Casts for shipbuilding 600 t
Casts for electrical machines and devices 7,200 t
Other cast parts 6,000 t
Total 60,000 t

Table 2. Planned capacities of foundries in Serbia

A review of the quality is shown in Table 3:

<table>
<thead>
<tr>
<th>Gray Iron</th>
<th>Ductile Iron</th>
<th>Malleable Iron</th>
<th>Steel</th>
<th>Cooper Base</th>
<th>Aluminium</th>
<th>Magnesium</th>
<th>Zinc</th>
<th>Other Non-Ferrous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>26,300</td>
<td>3,100</td>
<td>18,150</td>
<td>3,100</td>
<td>10,120</td>
<td>1</td>
<td>30</td>
<td>1</td>
<td>60,601</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Scope of the quality (metric tons)

In accordance with well-known events (civil wars in the former Yugoslavia and international sanctions, etc.). production of cars, tractors, tool machines, machines for civil engineering and mining, investment and apartment construction, and ship building have been reduced to symbolic level in Serbia reflecting on cast production.

Cast production drastically dropped and situation for the past for years as shown in the magazine Modern Casting and the AFS (“Census of Global Casting Production”). Named data don’t include cast parts produced at handicrafts foundries without defined assortment. Their participation in total cast production is approx. 8%. It is expected that handicrafts cast parts production share will increase over the period of time.

The total production of castings in Serbia in 2017 amounts to around 60,000t.

Scope of achieved production comparing to available capacities is rather unfavorable with all resulting consequences:

- Non-profitable production;
- Low income level;
- Product quality decrease;
- Low equipment maintenance level;
- Non-following technological development;
- Non-competitiveness on foreign market;
Personnel loss;
For survival modality in difficult times, many foundries introduced to the production program assortment not corresponding to technological profile of the foundry.

**Foundry supply**

One of major limiting factors of cast production is related to supplying with basic and auxiliary metal casting materials in current conditions. The reasons are as follows:

- Non-existing domestic production for majority of reproduction materials;
- Insufficient quality of production;
- Dispersed supply from import;
- Uncontrolled sales of overtaken reproduction materials, secondary raw materials, even semi-finished products in period under sanctions and during disintegration of former Yugoslavia through both, legal and illegal channels.

**Cast production is practically fully dependent on import.**

Domestic materials are: Sand, steel chips, copper and aluminum alloys, some incombustible materials, silicate binding agents, coatings and synthetic resins, steel buckshot for sandblasting.

All other materials are imported, as follows: All Ferro-alloys and pure metals, grey raw and low manganese iron, electrodes for arc furnaces, electrodes for cutting, coatings, synthetic resins, agents for carbonizing, refiners, degasification agents and modifiers, smelting pots, chromite sand, bentonite, graphite, incombustible materials, etc.

**Personnel-related problems**

- Extremely difficult financial situation in numerous foundries, resulting in low incomes, therefore decreasing interest for metal casting occupations;
- Poor to none payment of most engineers and technicians in our foundries, which unfortunately applies as well for those with complete privatization with foreign partners;
- Wore and out-of-date technological equipment in plants causing many troubles during operation;
- Inability to solve residential needs of university-level educated personnel in any manner;
- Poor equipment of researching and laboratories for control of cast products quality;
Lack of policy for mastering personnel, departures to specialization abroad and similar; 
- Permanent drain of engineering personnel abroad.

General evaluation of cast production in Serbia

1. Imposed economic sanctions, disintegration of Yugoslavia and changes in Eastern European countries conditioned huge drop of cast production in Serbia, in particular in relation to installed capacities.

2. Drastic reduction of markets for casts due to reduced production of metal complex and needs of other domains of cast consumption.

3. Export reduced to a symbolic level. Should 30% export necessary for raw material and spare parts supply provision isn’t achieved, the foundries encounter permanent business problems.

4. Symbolic following of metal casting production on part of business banks and enormously high interest rates on short-term loans had significantly adverse impact on all business segments.

5. Current high dependence on metal casting semi-finished products import, resulting in foundry supply with import basic and auxiliary semi-finished products with very high expenditures. Imported materials are in many cases of insufficient quality.

6. Production capacities of some foundries are blown out of proportions and without objective options to engage in realistic time frame. This refers in particular to foundries producing casts for cars and tractors.

7. Low productivity, high price and lack of competitiveness on domestic and foreign market.

8. Foundries engaged in production of installation materials cast group, part of channel fittings program and pipes have aged equipment and low technology level adversely affecting business rentability and lack of competitiveness on foreign market.

9. Foundries didn’t create development programs with outlined emphasis on estimating production options in terms of the market. Experiences from industrially developed countries are not used.

10. Cooperation program between foundries as a basis for production specialization is not established.
11. Non-efficient and in some cases fraudulent ownership transformation as a condition for adequate additional investments and connecting with the market.

12. Adequate business cooperation with surrounding countries and states, where once major export markets were, is not established.

13. Weak links between the foundry industry and institutions engaged in research in this area.

14. A number of foundries (not all) didn’t introduce internationally recognized norms on product quality.

The future of the casting industry in Serbia

For all the foregoing reasons foundry significant industrial scale in Serbia almost died. This was mainly contributed irregular rather plundering privatization in times of transition. However, some positive developments suggest a brighter future. Flywheel development now gives private foundry of smaller capacity together with some foreign investors with greater production such as: “Sirmium Steel”-Sremska Mitrovica (building construction parts),”Le Belier”-Kikinda and “Meita Europe”-Obrenovac (automotive parts),”Precize Casting Plant”-LPO Ada, etc. Some of the smaller and medium-sized successful private foundries will hope to return to the "old track of fame." Let’s list some of them:

- “Foundry Metalurg”, Prokuplje;
- “Old Foundry”, Čoka;
- “Ligrap”, Topola;
- “Morsad”, Topola;
- “Antal Foundry”, Subotica;
- “Gor Liv”, Čačak;
- “Eling”, Loznica;
- “Termovent SC”, Bačka Topola;
- “Ljig Foundry”, Ljig;
- A couple of Art Casting Foundries.

They need to be given the wind in the back. They should not be polluted by taxes and loads, such as for example some completely ungrounded ecological tax, etc.

The number of Metallurgy students at the Belgrade University has increased lately. Let’s hope that after graduation not everyone will get passports. They should be better paid if the state of Serbia wants to build and develop its industry.
2.19. FOUNDRY INDUSTRY REPORT FROM SLOVENIA

SLOVENIAN FOUNDRYMEN SOCIETY

Macroeconomic indicators and data on achieved foundry production in Slovenia for the year 2017

The economic situation in Slovenia was quite favorable in 2017. Number of economic associations grew by 867 and the number of employees by 27 802. The revenue of the economy increased by 13%, while on foreign markets it grew by 19%. Similarly, there was an evident increase of net added value and in net profit. Compared to 2016, in 2017, companies financed their operations with their own resources to a greater extent. The average monthly salary in the economy was 1,581€, which was 1% higher than in 2016. Gross domestic product grew at a rate of 5%, while the inflation rate was 1.7%.

The table below shows achieved data in 2017 and also the 2018 forecast which is very encouraging. The estimated GDP is at an above-average level for the EU, 5.1%, estimated GDP per capita is 22.563€, real growth of exports, 9.2% and real growth of imports, 9.3%. Employment is estimated to grow by 2.4% and the rate of registered unemployment to be at 8.0%.

From the table shown in continuation is evident growth of GDP and prices, labour market and external trade.

<table>
<thead>
<tr>
<th>GDP and prices</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross domestic product (growth in %)</td>
<td>5.0</td>
<td>5.1</td>
</tr>
<tr>
<td>Gross domestic product (in EUR m)</td>
<td>43.3</td>
<td>46.6</td>
</tr>
<tr>
<td>Gross domestic product per capita (in EUR)</td>
<td>20.951</td>
<td>22.563</td>
</tr>
<tr>
<td>Inflation</td>
<td>1.7%</td>
<td>1.5%</td>
</tr>
</tbody>
</table>
Labour market

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment (growth in %)</td>
<td>2.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Registered unemployed (rate in %)</td>
<td>9.5</td>
<td>8.0</td>
</tr>
</tbody>
</table>

External trade

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports (real growth in %)</td>
<td>10.6</td>
<td>9.2</td>
</tr>
<tr>
<td>Imports (real growth in %)</td>
<td>10.1</td>
<td>9.3</td>
</tr>
</tbody>
</table>

*Macroeconomic data acquired from the institute RS of Macroeconomic Analysis and Dev.

The economic situation in 2017 was relatively favorable for all of the industries. Including the foundry industry. Foundry production, in tons, has increased otherwise only by 2% and the reason for that is in marketing or programme restructuring, followed by our foundries. The objective now is to longer to focus on tons, but on the higher added value.

---

### Foundry production in Slovenia in 2017*

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>INDEX 2017/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey Iron</td>
<td>74.235</td>
<td>74.255</td>
<td>1.00</td>
</tr>
<tr>
<td>Ductile Iron</td>
<td>30.986</td>
<td>38.588</td>
<td>1.25</td>
</tr>
<tr>
<td>Malleable Iron</td>
<td>3.100</td>
<td>2.950</td>
<td>0.95</td>
</tr>
<tr>
<td>Steel, Fe-granulate</td>
<td>31.344</td>
<td>27.250</td>
<td>0.87</td>
</tr>
<tr>
<td>Cu-alloys</td>
<td>947</td>
<td>842</td>
<td>0.89</td>
</tr>
<tr>
<td>Al-alloys</td>
<td>47.584</td>
<td>47.452</td>
<td>1.00</td>
</tr>
<tr>
<td>Mg-alloys</td>
<td>26.0</td>
<td>25.7</td>
<td>1.00</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.494</td>
<td>3.732</td>
<td>1.07</td>
</tr>
<tr>
<td>Other Nonferrous</td>
<td>65</td>
<td>20</td>
<td>0.33</td>
</tr>
<tr>
<td>Total production of casting</td>
<td>191.781</td>
<td>195.114</td>
<td>1.02</td>
</tr>
</tbody>
</table>

*Statistical data acquired from Slovenian Foundrymen Society and Chamber of Commerce and industry Slovenia

In the table above showing achieved foundry production in 2017 it is evident that in Slovenia there was produced:

- 74.255 tons of Grey iron (on the same level as in 2016);
- 38.588 tons of Ductile iron (25% increase);
- 2.950 tons of Malleable iron (5% decrease);
- 27.250 tons of Steel and Fe-granulate (13% decrease);
- 842 tons of Cu-alloys (11% decrease);
- 47.452 tons of Al-alloys (on the same level as in 2016);
- 25.7 tons of Mg-alloys (on the same level as in 2016) and
- 3.732 tons of Zinc (7% increase).
2.20. FOUNDRY INDUSTRY REPORT FROM SOUTH AFRICA

NATIONAL FOUNDRY TECHNOLOGY NETWORK

The National Foundry Technology Network (NFTN) is an initiative of the Department of Trade and Industry and hosted by the Council for Scientific and Industrial Research (CSIR) of South Africa. The NFTN has a mandate to manage, coordinate and facilitate transformation and development in the casting industry sub-segment through focused interventions designed to enable local South African foundries to become more competitive.

Situation

The South African manufacturing index has recorded a 1.1% year-on-year (YoY) decrease. The foundry industry order book is contracting due to decreased demand from the manufacturing industry. The highly affected foundry sectors are those supplying into the automotive and mining sectors, as they contribute 35% and 32% respectively.

General Industry Structure

The foundry industry in South Africa is well diversified as compared to other countries and constitutes of the following types: Ferrous (Iron and Steel), Non-Ferrous (Aluminum, Brass and Zinc), High Pressure Die Casting and Investment Casting.

The total number of foundries according to South African institute of foundries (SAIF) published in 2016 is approximately 165.

According to the SAIF figures these foundries supply into major economic sectors such Automotive, Manufacturing and Mining. All sectors combined contribute over 80% of the foundry industry in South Africa.

The NFTN is currently in the process of developing the foundry industry database for the country to update the statistics and better inform the industry as there has been many changes in this industry.
**Actual Industries**

**Automotive**

The Automotive sector presence in South Africa is as follows:

OEMs manufacturing plants in South Africa – BMW, Ford, Isuzu, Mercedes-Benz, Nissan, Toyota and Volkswagen.

Main developments in Automotive to stimulate the foundry industry:

- New BMW X3 is being build in South Africa from this year.
- New assembly plant for Mahindra pick up bakkies was launched recently at KZN – Dube Tradeport (SEZ)

In addition, a number of heavy commercial and bus manufacturers assemble vehicles

There are approximately 500 automotive component suppliers including diversified manufacturers.
Mining

Mining production decreased by 4.3% year-on-year (YoY) in April 2018.

Iron ore, PGMs and "other" metallic minerals were the largest negative contributors in this industry.

The decreased production has had a direct impact into the foundry industry as this sector contributes 32%. Some foundries supplying into this sector have reduced their production shift to cope with the reduced demand, those who supply mainly to this are operating on ad hoc basis.

Challenges to the industry

The foundry industry is under severe pressure due to their inability to compete internationally. The resulting in import leakage and reduced exports creates a vicious spiralling effect of reduced volumes and lower asset utilisation, resulting in inflated cost which negatively affects the sustainability of the foundry industry.

Challenges experienced are increasing electricity tariffs, exchange rates which erodes the margins, skills shortages impacting on the quality of products thus making the foundry uncompetitive, regulatory compliance causing instability as foundries are issued with exorbitant fines.

Forecast for the future foundry industry is promising with the interventions the NFTN will be supporting to boost the industry. The NFTN is supporting the Skill development in the industry to bridge the skills shortage currently experienced and product development to revitalise the industry and improve on its competitiveness, regulatory compliance to ensure that the industry complies with the national and international standards.
2.21. FOUNDRY INDUSTRY REPORT FROM SPAIN

TABIRA FOUNDRY INSTITUTE

**Overall assessment**

The global situation of the Foundry Industry in Spain has evolved in a moderately good direction during 2017, reaffirming the positive perspective foreseen after the stabilization of previous years. This has been favored by the general recovery of the Spanish economy, both in the domestic and foreign markets. Despite the production slowdown from the national Automotive car manufacturers in the last part of the year (the main Foundry customer sector in Spain), other sectors have compensated this impact in different growth rates, with a general activity increase compared to 2016.

In comparison with the global figures from 2016 (-1% in Ferrous Metals and +5.7% in Non-Ferrous Metals), the Spanish Foundry production has almost maintained production levels in the first case, and as it happened globally, it has experienced a significant growth in the production of Non-Ferrous castings. Foundry facilities have had a high occupation average along 2017. Though a growing tendency has been maintained during 2017 in the Foundry production in Spain, the sector has also experienced a reflection of the slight slowdown in Spanish economy at the beginning of 2018.

**General industry overview**

The economic perspective for the next years is cautiously optimistic, with good references in the short and medium term, also for the industry. The crisis initiated in 2007 has been almost overcome. A greater stability is expected for the industry based on these forecasts for the coming years, which will lead as well to new investments.

Following the trend anticipated in recent years, there is a positive evolution of the macroeconomic industrial indexes in Spain: some indicators such as those who deal with the contribution of industry to GDP, the rate of industrial production or New Industrial Order Index, have been evolving positively during last year, showing clear signs of recovery for the Spanish industry. The growing trend of the GDP has been confirmed, standing at 3.1% by the end of 2017 (higher than the Eurozone level). There is also a positive forecast for 2018, with estimations for a GDP growth of about 2.8% (higher once again than the 2.1% predicted for the Eurozone).

The figures of the Spanish metal production in 2017 show a growth, both in exports and imports, and the Metal Industry Turnover index shows an 8.1% growth, highlighting the
good evolution. The labor market has experienced also a positive trend. The unemployment rate has decreased down to 16,5% by the end of 2017, coming from 18,4% in the previous year. Further reductions are expected in the unemployment rate for the next few years, with a forecast to get down to 11%.

**Foundry Industry**

According to the general economic situation in Spain and following the evolution of the production trends in relevant customer sectors, the Spanish casting production remains in a positive output curve, though within a moderate growth in comparison with the past two years.

Thus, the total casting production in Spain presents an increase of nearly 1,3% in 2017, continuing with the positive trend predicted after the stabilization phase post-crisis, but with a slowdown in the growth curve. Most part of this positive figures is due to the still good situation of the Automotive sector, as well as the machine tool and the wind energy sectors, the good evolution of internal consumption and exports, along with the new investments and increase in the production capacity of lightweight castings.

The production figures from 2017 is divided in the following materials:

![Figure 1. Spanish casting production figures from 2017](image)

More than half of the casting production in 2017 was on Ductile Iron (close to 0,7 million metric tons, increasing the production level from the previous year), followed by the Gray Iron with a 30% share (nearly 0,38 mil.t). Continuing with previous years’ trend, there has also been a growth in the production of Aluminum castings (with new facilities and increased capabilities in the existing ones, which have been developed by important Foundry Groups as strategic response to the growing interest for lightweight materials).
The positive trend in strategic customer sectors has helped to this growth (4.6% increase with respect to the same month of the previous year).

Ferrous castings represented 87% of the total Spanish Foundry production during 2017, and non-ferrous materials got close to 13%. The tendency in 2017 continued to be as in previous years, with a very similar split between these two groups and with a bigger increase in the production of non-ferrous castings. As it can be seen in Figure 2, the tendency in the last years remains constantly positive in terms of production growth on both, having a higher increase in the Non-Ferrous, mainly by the increase in the production of Aluminum cast components. The graph shows as well, the moderate growth rate from 2017 in comparison with the previous years.

![Figure 2. Production growth of Ferrous and Non Ferrous castings](image)

As shown in Figure 3, Aluminum production growth rates remain above Ductile Iron and Gray Iron. As these last ones have been also positive, the relative weight of Aluminum production kept a similar share, with a constant tendency during 2017.

![Figure 3. Evolution of annual production growths](image)
Though the different circumstances and the recent economic crisis, the characterization of the Spanish production has remained in very similar levels, as can be seen in next figure, showing a mature and stable market.

The tendency of maintaining the specific weight of Iron castings is accompanied by a reduction in the production of cast Steel (due to the global crisis in the sector) and a bigger presence of the Non-Ferrous materials.

![Production share by materials](image)

**Figure 4. Production share by materials**

Though 37% of the Foundry factories are Iron Plants, they represent more than 50% of both turnover and labor market in the sector, as well as nearly 80% of the exports.

Main cost for Foundry plants are raw materials, followed by workforce, representing both together more than 60% of the total cost.

The number of foundry plants remains quite constant, with a yearly increase of their efficiency and a positive rise in the average production per plant every year.

Since 2003, some companies have suffered from restructuration or closure. For this reason, the number of facilities has had a significant reduction in the last 10 years. However, because of restructuring, modernization of facilities and efficiency improvements, the general production levels have remained quite positive.

In 2017, the average labor cost was over 40,000€, with direct labor over 65%, according to sectorial information. The number of employees has increased in 2017, especially in Non-Ferrous plants (+4,9%), and reached more than 15,000.
During the 2008 crisis, production figures had dropped 30% from a total of 1.3 million metric tons. On the basis of the recovery started from 2013, a moderate increase in the annual production of castings is expected in Spain until 2018, up to the pre-crisis levels and it is expected to keep on growing overcoming the 1.3 million tons by 2019. The biggest production increase has been in Gray Iron and Aluminum (more than 1,2% in both cases), followed by Ductile Iron (close to 1%). Steel, however has suffered an important reduction of about 1%, slowing down the bad tendency from the last two years.

General production figures show a slowdown in the growing tendency (as it happened in 2017), but maintaining the rising curve, especially in Iron and Aluminum. This is also the forecast expected for the actual year 2018, with a similar behavior in the expectations of the final production levels.

Approaching the Spanish situation by sectors, we find a good response from casting plants producing for the Automotive industry. More than 60% of the total production is directed to the Automotive sector (in the Non-Ferrous materials, this figure goes up to more than 80%). The manufacture of casting components for the Automobile industry has been increased by nearly 2,6% in 2017. The stability in the industrial and commercial vehicle market sets this sector as the key driver for Foundry companies, though the production and exports from the Automotive industry have seen a respective final drop of 1,5% and 1,1 %.

In general terms, the Spanish casting production has reached during 2017 a growing trend value particularly clear in some customer sectors as the Automotive industry (+4,6% in December 2017 compared to 2016), Forming/Stamping dies production (first part of the year) or Valves. Other sectors, such as Wind Power or Machine Tool, have had also a slight increase or maintained the demand level of cast components. Sectors like Construction, Railway, Agricultural Machinery, Mining or Cement plants do not show such a positive trend from the demand point of view.

In general, both internal and external markets showed a good behavior for the Spanish foundry industry during 2017.

**General concerns**

Despite the positive trend experienced in the last years, there are some main concerns in the Spanish Foundry industry which affect production costs and competitiveness, which we try to describe more into detail.
Energy costs

It remains as one of the most important concerns for the Spanish foundries, as oil, electricity and gas prices have experienced continuous rises. The EU has seen continued growths in electricity prices, being Spain one of the countries where more extra taxes are applied.

In the case of electricity and for the periods 2007-2009 and 2010-2014, Spain has moved from €113 / MWh to 140€; in Germany, from 152 to 188 and in France, from 88 to 105, as average data. In comparison, there are exemptions in some EU countries, with final costs lower than Spanish industries.

The evolution of energy prices (electricity, gas and other fuels), has been accompanied, in the case of Spain, with a low relative increase in the prices of the products. The impact/effect of energy prices is remarkable in the sub-sectors related to foundry industry in this country. In short, the rate paid by Spain is 22% higher than the European average and reaches 30% on Germany.

Unemployment

The unemployment level in Spain by the end of 2017 was 16.5%, two times higher than the average of the Eurozone countries (7.6%) but improving since 2008. The previous crisis forced to reduce labor in many foundries and this meant as well the loss of experienced professionals. Spanish Foundry requires new qualified people, but it is necessary to carry out training programs to improve the knowledge in the companies. Educational Centres are training professionals with the aim of improving the skills of the staff from the industry and bringing knowledge to the companies, with an special mention to the technologies and skills required by the introduction of 4.0 technologies in the foundry industry.

Investment in R&D

The crisis has affected unequally the different industrial sectors in Spain, with a general trend of R&D activities. The following charts show the continuous R&D investment from the Automotive sector (1.37% of its business volume), compared to the decreasing metallurgical sector efforts that reached only a 0.27%.
Impact of Electromobility in Foundry

Electromobility is changing (still at a low level) the Automotive industry and in the near future it will also have a direct influence in the Foundry sector, with new power and transmission concepts in the future lightweight vehicles that will affect the demand of certain families of cast components. Spanish Foundries are really interested in this topic.

Challenges

The Spanish Foundry industry faces especially two main challenges linked to its efficiency: the digitalization and advanced management of the casting processes and the prediction and defect control on real time production. Thus, the sector is looking for the application of predictive control systems in the foundry shops and to the introduction of 4.0 technologies.

There are as well several additional challenges that the Spanish Foundry Sector identifies as a priority for next years:

- Access to advanced technical knowledge on international basis;
- Process automation;
- Attraction of new qualified professionals to the industry;
- New skills required linked to 4.0 technologies;
- Additive manufacturing;
- Advanced materials (optimization of mechanical properties, weight reduction ....)
- Good practices for a more efficient use of energy;
- Reduction of the environmental impact (emissions, silica quarz)
- Advanced reclaiming solutions for used sand;
- Increase in the proximity to the design of manufactured casting components.

Some of the new technologies and areas that the Spanish Foundry industry highlights with a higher impact on the most relevant challenges for its activity are:

- Artificial vision;
- Automatization and collaborative robots;
- Sensors;
- Automatic defect detection;
- Expert management systems.
2.22. FOUNDRY INDUSTRY REPORT FROM SWEDEN

SWEDISH FOUNDRY ASSOCIATION
Report provided on their behalf by SWEREA SWECAST AB

Swedish foundry sector 2017

During 2017 Sweden had just less than 100 foundries (about 25 iron foundries, about 10 steel foundries and some 60 metal foundries, mainly aluminum). As shown later in this report, the production was more or less stable compared to 2016. The automotive industry is, as usual, dominating as end user, mainly because the fact that the truck manufactures Volvo and Scania, but also Volvo Cars are all producing on an all-time high level. It was also announced that Scania will build a brand new iron foundry with double capacity and 50 % reduced energy consumption compared to the present one. The change-over to new drive-trains, e.g. electrical, has started to influence the foundry industry, mainly HPDC and some foundries already have parallel production lines, one for combustion engines and one for electrical.

Production

The total production has increased with 2,9 % between 2016 and 2017. In table 1 below you can see the figures for the total production.

<table>
<thead>
<tr>
<th>Material</th>
<th>2017</th>
<th>2016</th>
<th>Diff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron, total</td>
<td>214 931</td>
<td>209 102</td>
<td>2,8</td>
</tr>
<tr>
<td>Steel</td>
<td>21 750</td>
<td>21 215</td>
<td>2,5</td>
</tr>
<tr>
<td>Non-ferrous total</td>
<td>63 724</td>
<td>61 600</td>
<td>3,4</td>
</tr>
<tr>
<td>Total production, all materials</td>
<td>300 405</td>
<td>291 917</td>
<td>2,9</td>
</tr>
</tbody>
</table>

*Table 1. Total foundry production in Sweden, 2016 and 2017*

As we all know, the measurement in tons/year is becoming more and more irrelevant, due to the fact that we both use topology-optimization to reduce component-weight, and also replace e.g. iron with aluminum in several parts for the automotive industry. This means that the total tonnage goes down at the same time as the foundries produce a larger amount of components and also add more and more value along the value chain.
There are two major challenges for the Swedish foundry industry at the moment. One is the lack of skilled personnel, which means that more than 50 % of all foundries in Sweden from time to time have to say no to new customers/orders.

The other one is the fact that production on such a high level as today means much higher costs for overtime, less productivity and in worst case, an increasing scrap rate, which all together ends up in an unsatisfactory profitability.

**General economic situation and labor**

The population in Sweden recently passed 10 million. The unemployment rate is 6,5 % and the inflation rate according to CPIF is 2,0 %. During 2017 the hourly earnings of manual workers in the private sector increased with 2,4 %. The amount of new orders to the industry increased with 1,3 %, and the export increased with 2,5 %.

As mentioned before the demand for skilled people in the foundry industry remains high, and therefore big efforts are being made to also get women interested in a job in the foundry sector. During 2017 the new program “Foundry Master” was released, a one-year on-line foundry education on master level. Also, the digital tool for validation of foundry knowledge was improved and complement modules also for automation and maintenance were developed. In order to secure skilled personnel on a long-term basis, we have seen a trend that foundries decrease the number of hired personnel and instead give them a permanent employment.
The Swiss foundry industry generated sales of 595 million Swiss francs in 2017. That equates to an increase of 2.6% on the previous year. In terms of tonnages processed, the 47 companies amalgamated in the Swiss Foundry Association (SFA) together achieved an increase of 3% to 53,100 tonnes. Further growth is expected for the current year.

The sectoral association’s annual figures reflect the dynamism of the Swiss foundry industry in a positive economic environment. Altogether the advantageous factors were the ongoing investments in developing new technologies and in automation at the Swiss sites – despite the preceding years of crisis – as well as the outsourcing of large-scale production to production sites abroad. The weaker Swiss franc also gave an added boost and increased competitiveness.

The crucial factors, however, were the high standard of quality, the innovativeness and reliable adherence to delivery deadlines of the Swiss foundry industry, which persuaded both SME customers and large companies alike to once again place increasingly more new orders. Unlike the delivery bottlenecks throughout Europe, Swiss foundries with the more flexible working time regulations operating in this country and greater scope for production in multi-shift operation, coupled with an altogether stable political environment, gained a growing edge on the international competition.

The major driving force behind this encouraging development was the good economic situation in the existing sales markets of Europe, China, and increasingly North America as well. A huge upward trend was evident in every segment in 2017. Series production also increased markedly last year. Even the mechanical engineering and textile industries, whose orders were still on a stagnating/low level to a large extent in the previous year, were able to record high levels of incoming orders again in 2017. Only demand for high-voltage technology saw severe fluctuations and decline.

The largest growth rates in the strikingly high double-digit range were evidenced by complex cast parts, particularly for use in the transport sector, primarily in the automobile industry for top-of-the-range private motor vehicles and for commercial vehicles like lorries.

In the iron and steel foundries, tonnages delivered in 2017 were up 3% on the previous year at 36,500 tonnes. The Swiss light metal foundries recorded a 3.7% rise in tonnages.
processed to 13,400 tonnes. Only copper alloys saw a 2% reduction on the previous year to 3,200 tonnes. Across all material groups the Swiss foundry industry as a whole closed 2017 with an increase of around 3% to 53,100 tonnes. Total sales last year were up 2.6% at 595 million Swiss francs compared to 580 million Swiss francs in 2016.

The majority of forecasts for 2018 are positive. Continuing growth is expected. The order books of most foundries in this country have filled nicely. Whether the turnaround will be long term remains to be seen in the coming months. Unfortunately, key decision-makers on the geopolitical stage are too unpredictable for there to be immunity from unpleasant surprises, as shown by the import tariffs on steel and aluminium now imposed by the USA.

Uncertainty about “surprises” in globalised competition is one of the biggest problems facing the entire supply industry. This calls for enormous flexibility from companies and employees alike, representing a huge challenge in view of the prevailing shortage of skilled workers.

Price pressure continues to be enormously high as well. That is why the Swiss foundry industry is already investing again in new plant for modelmaking and for the manufacture of complex special cast parts, and is pressing ahead intensively with automation processes to enable it to produce more cost-efficiently. This is also the result of expansion caused by acquisitions of additional foundries and joint ventures at home and abroad. In 2018, heavy investments are being made especially in China, with the aim of developing a technology centre and production sites there. “Even closer to the customer” is the motto.

It is with these diversified measures that the Swiss foundry industry is well on its way to developing a strategically vital pan-European/global added value network, enabling it to keep up with international competition.
2.24. FOUNDRY INDUSTRY REPORT FROM TURKEY

TURKISH FOUNDRY ASSOCIATION

Macroeconomic Developments

Following a slow growth in 2016 Turkish economy showed a strong performance throughout 2017. Achieving the greatest year over year growth rate in the last six years with 11,1% in Q3 2017, the recovery of the economy was really strong with 7,4% annual growth (Figure 1). In calendar-adjusted terms, GDP increase was similar in 2016 and 2017; 3,2% and 7,4% respectively.

GDP has increased by 19% in 2017 at current prices but due to the increasing value of dollar against lira by 21%, a slight decrease of 2,6% in Per Capita GDP has been observed.

Private consumption, investments, and exports aided growth during the year, highlighting a very good scenario of strong domestic and external demand, which was stimulated by fiscal measures and a Credit Guarantee Fund for small and medium enterprise (SME) financing in 2017.

Household spending had been limited since the failed coup of July 2016 which had an indirect impact on demand for businesses and hence, production and investment. Such
concerns have likely been assuaged, especially by Q3 and households have propped up spending on both goods—durable and nondurable—and services, which had been buoyed by a tax relief on major appliances and furniture. Turkish household consumption, which makes up about two-thirds of the economy rose 6.1% and public spending on purchases of goods and services rose 5.0% in 2017.

Strong growth in the last two quarters of 2017 has positively affected the labour market and restrained the deteriorating employment statistics since early 2017. The unemployment rate remained stable as compared to previous year (10.9%) while employment rate increased by 980 thousand persons to 47.1% (Figure 2).

Reviving consumer demand led to a momentum in manufacturing, where the year over year change in calendar adjusted industrial production index reached the highest in the last five years with 8.9%. The manufacturing Purchasing Managers’ Index (PMI) recorded a back-to-back increase to 54.9 in December from 52.9 in November. The PMI lied further above the 50-point threshold that separates expansion from contraction in the manufacturing sector, where it had been for ten consecutive months (Figure 3).

Although the number of tourists and tourism income were still less than five years ago, a rise in foreign tourist arrivals is boosting Turkey’s tourism industry. The sharp losses of 2016 were compensated for in 2017.

On the other hand, strong demand resulted in high consumer price inflation, which averaged 11.1% in 2017. Domestic producer price inflation has reached its highest level
since 2003 with 15.8% (Figure 4). Increasing inflation rates, thus rising costs and declining real wages, together with the volatility in foreign currency are expected to limit the growth rate to its potential rate of around 4.5–5% in 2018.

Figure 3: Turkey Manufacturing Purchasing Managers’ Index
Source: Istanbul Chamber of Industry (ICI) and IHS Markit

Figure 4: Consumer Price Index and Domestic Producer Price Index Year Over Year Changes
Source: Turkish Statistical Institute

Despite continued export growth driven by the recovery in the EU, the import amount is likely to remain large, due in part to rising commodity prices. Imports were up a noticeable 22.7% in annual terms in the fourth quarter, the largest increase since Q1 2011 and above the 15.0% expansion recorded in the previous quarter. Although shipments overseas benefited from improved external demand, export growth
decelerated to 9.3% in the fourth quarter from a 17.9% leap in the third quarter. As a result of import growth outpacing that of exports, the annual export to import ratio decreased from 71.8% to 67.2% in 2017 (Figure 5).

Even though 2016’s losses in tourism were compensated for in 2017, the increase in the energy bill and the gold import led to an increase in the current account deficit which has widened from 3.8% of GDP in 2016 to 5.6% in 2017 (Figure 6).
Portfolio investments played an important role in financing the current account deficit throughout the year. Even though the maturity structure of the foreign financing is positive, it remains high in comparison to the country’s foreign exchange reserves.

As some of the growth-friendly measures ended, and thanks to strong tax collection, the deterioration in public deficits seems to have somewhat stopped in 2017. Even some partial savings in spendings were observed. But this trend seems to be unlikely for the election period in 2018 that will be held on June 24th.

The current account deficit is expected to put further pressure on the lira, which has been weakening since September 2017 against the US dollar after recovering some lost ground earlier in the year (Figure 7).

![Figure 7: Effect of Lira depreciation to inflation](image)

*Source: Turkish Statistical Institute & Central Bank of the Republic of Turkey; Deloitte Services LP Economic Analysis*

Together with the increased inflation, exchange rate volatility, geopolitical tensions and a widening current account deficit are the main downside factors to limit the growth in 2018.
Foundry Industry Overview

Structure

Turkish foundry sector acts an important role in world casting production, as well as in Europe. If we evaluate the level of casting production in 2016, after Germany and Italy, Turkey has taken the 3rd place in Europe. According to AFS’s 51st Census of World Casting Production, which was published in December 2017 issue; Turkish foundry industry production in 2016 constitutes 1.82% of the world production (Figure 8). Accordingly, Turkey is globally ranked 11th.

![Figure 8: Share of Turkey In Global Casting Production](image)

Source: AFS 51st Census

The Turkish foundry production of 2,155,000 tons and valuation of 4.5 billion Euros in 2017 is produced by 932 foundries operating in the country (Figure 9).

![Figure 9: Growth of Casting Production In Turkey](image)

Source: TÜDÖKSAD - Turkish Foundry Association
The Turkish foundry sector export value was more than 3 billion Euros with an export volume over 1.3 million tons in 2017. There are 34 thousand employees in the sector. Most of the production in the foundry sector was made by privately owned companies. Foreign investment in Turkish foundry industry is actually below the expected level. There are currently 5 foreign investors operating in the sector (Nemak, Çelik Granül, Maxion, Federal Mogul and Schweiser).

In 2016 Nemak, one of the leading aluminium casting suppliers in the world, has acquired 100% share of Cevher Aluminium Foundry.

**Developments**

In 2017, the total number of operating foundries was 932; of which 162 were big foundries. The number of SME’s is 375 and of micro foundries is 395. There are also 17 public and military foundries, but their production is negligible (Figure 10).

![Figure 10: Number of Foundries Operating in Turkey](source)

Source: TÜDÖKSAD - Turkish Foundry Association

Total foundry production in 2017 has increased by 13.5% as compared to 2016 (Figure 10). Figures of year 2017 are calculated from the data collected from the members of TUDOKSAD.

<table>
<thead>
<tr>
<th>Castings Production</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>'17-'16 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>625</td>
<td>610</td>
<td>600</td>
<td>650</td>
<td>675</td>
<td>650</td>
<td>720</td>
<td>10,8</td>
</tr>
<tr>
<td>Nodular</td>
<td>485</td>
<td>510</td>
<td>508</td>
<td>610</td>
<td>645</td>
<td>655</td>
<td>825</td>
<td>26,0</td>
</tr>
<tr>
<td>Steel</td>
<td>153</td>
<td>140</td>
<td>135</td>
<td>140</td>
<td>150</td>
<td>166</td>
<td>170</td>
<td>2,4</td>
</tr>
<tr>
<td>Aluminum</td>
<td>145</td>
<td>157</td>
<td>270</td>
<td>300</td>
<td>325</td>
<td>370</td>
<td>380</td>
<td>2,7</td>
</tr>
<tr>
<td>Other Non-Ferrous</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>50</td>
<td>55</td>
<td>58</td>
<td>60</td>
<td>4,3</td>
</tr>
<tr>
<td><strong>Total Production</strong></td>
<td><strong>1,434</strong></td>
<td><strong>1,445</strong></td>
<td><strong>1,543</strong></td>
<td><strong>1,750</strong></td>
<td><strong>1,850</strong></td>
<td><strong>1,899</strong></td>
<td><strong>2,155</strong></td>
<td><strong>13,5</strong></td>
</tr>
</tbody>
</table>

**Figure 11: Census of Casting Production In Turkey In 2017 (thousand tons)**

Source: TÜDÖKSAD - Turkish Foundry Association
Overview of Major Casting Customer Industries

Vehicle

- Passenger car; increased in 2017 as compared to 2016,
- Light Commercial vehicle; remained stable in 2017 as compared to 2016,
- Light trucks; increased in 2017 as compared to 2016,
- Heavy trucks; increased in 2017 compared to 2016.
- Agricultural Tractors; increased in 2017 compared to 2016.

General Engineering and Machinery

- General Machinery; local demand is stable,
- Rolls for steel mills; recovery in steel industry, increased in 2017 as compared to 2016,
- Castings for electricity production; waiting for energy investments.

Construction, Mining, Roads, Railways

- Cement industry; stable,
- Earth moving machines; stable,
- Crushers, mining equipment; stable,
- Railway heavy and light cabins; expecting future business.

The Situation in the Material Sectors

Grey and Nodular Iron Castings in 2017

- Automotive orders from foreign and local customers higher than expected,
- New capacity investments with modern moulding machines, machining/finishing capabilities,
- Heavy competition of neighbouring countries,
- Ductile castings with high value increasing its share in total production,
- Calculated settled capacity over 2 million tons.

Steel Castings in 2017

- Average capacity utilization %50, similar to 2016,
- Steel foundries looking for new customers and new markets,
- Local demand is stable,
- Investments on moulding lines, sand reclamation, simulation softwares and energy efficiency,
- Strong competition on local market.
Non Ferrous Light Alloy Castings in 2017

- Local demand growing steadily on HPDC,
- New orders mainly from automotive part and component producers of EU and Turkey,
- Investments on new HPDC machines.

**Investment Plans**

- A new aluminium HPDC foundry and a sand casting foundry with new investments and growing demand from automotive industry,
- Ductile and ADI production are expected to keep increasing with new machining, finishing investments of foundries,
- A new Greenfield steel foundry and an iron foundry started up in 2017.

**Cost Development**

Manufacturing costs of foundries are mostly based on foreign exchange rates due to the fact that the raw material price imported from abroad is on USD or EURO basis. 23% increase in the €/TL exchange rate yielded a profound effect on the cost development (Figure 12).

*Figure 12: Domestic Producer Price Index vs. Turkish Lira Exchange Rate Year Over Year Increase*

*Source: Turkish Statistical Institute & Central Bank of the Republic of Turkey*
Metallic Input Materials

In 2016 raw materials price rates were declined to the level of five years ago. But a sharp increase was observed in 2017 as compared to previous year. In general, the extra cost of raw materials exceeded 50% for all type of raw materials (Figure 13).

Figure 13: Metallic Input Materials Price Development
Source: TÜDÖKSAD - Turkish Foundry Association

Energy

Although there is a slight decrease in natural gas prices, industrial electricity prices have been increasing steadily since 2014 on TL basis (Figure 14).

Figure 14: Electricity and Natural Gas Price development
Source: Turkish Statistical Institute
The new legislation regarding the Organized Industrial Zones started pushing up the energy costs of the foundries operating in these areas as of 2018 Q2. An additional rise in the prices is expected after the Parliament and Presidency Elections in June 2018.

**Wages**

The collective agreement concluded between the employer and employee unions in metal industry, effective as of Q3 2017 resulted about 25-30% increase in wages. It is expected to result in a similar increase as 2016, when the Minimum Wage was increased by 30% as promised by the government during the 2015 elections period (Figure 15).

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1. By production approach with chain linked volume index [2009=100]
2. Mid-year populations; according to the annual results of Address Based Population Registration System
3. Turkish Statistical Institute
4. 12 month average rate of changes
5. Calculations based on the year end indices and Exchange rates.
6. Average prices paid by industrial consumers for 1 kWh electricity / 1 m³ natural gas including all taxes.
7. Labour cost is the cost incurred by the employer in relation to employment as earnings and labour cost excluding earnings. Hourly labour cost is calculated by dividing the labour cost by the number of hours worked.
8. Annual average indices are used for calculation.
2.25. FOUNDRY INDUSTRY REPORT FROM THE UNITED KINGDOM

INSTITUTE OF CAST METALS ENGINEERS

Report provided on their behalf by the CAST METALS FEDERATION

General Economic Overview

UK gross domestic product growth increased by 1.7% between 2016 and 2017, which was slightly lower than the 1.9% growth seen between 2015 and 2016.


The construction output dropped by 1% and continues to be weaker. Household spending also dropped by 0.3% with consumer facing sectors suffering particularly. On the high street there was continued pressure from on-line retailers.

Although UK GDP growth continues to be driven by services output, UK manufacturing growth improved in 2017 and was reported to be at a 30 year high.

“The manufacturing sector directly employs 2.6 million workers across the UK, who collectively generated an estimated £177 billion in GDP during 2016. This means manufacturing companies directly contributed nine percent of GDP and eight percent of employment in that year. However, the sector’s impact on the UK economy extends far more widely than manufacturing companies themselves. In particular, manufacturers rely on a complex network of UK-based supply chains. Purchases from these suppliers generate “indirect” impacts which ripple out across all sectors of the economy. Once these indirect impacts are included within our calculations, we find that manufacturing supported £301 billion of GDP (15 percent of the UK economy) and five million jobs (15 percent of the UK total) in 2016. On this basis, we estimate that the total impact of manufacturing on UK GDP was £446 billion in 2016. For every £1 million that the manufacturing sector contributes to UK GDP itself, a further £1.5 million is supported across the wider economy through indirect and induced multiplier effects. On the same basis, manufacturing supported a total of 7.4 million jobs in 2016. For each job in the manufacturing sector itself, a further 1.8 are supported in other sectors of the UK economy.”

(Source: The true impact of UK manufacturing, pub MTA, April 2018.)
UK Manufacturing has benefited from global growth and weaker sterling which has boosted exports. The contribution of net trade to GDP growth increased, with the contribution of exports growing from 0.6 percentage points in 2016 to 1.4 percentage points in 2017 and the contribution of imports slowing down from 1.4 percentage points in 2016 to 1.1 percentage points in 2017. This in part reflects rising fuel prices throughout 2017, along with increased exports of machinery and transport equipment.

EU markets dominated exports at around 48%, and looking ahead, the continued uncertainty related to the UK’s exit from the EU is expected to affect confidence and investment levels in manufacturing.

In terms of employment, there were 1.42 million unemployed people, 46,000 fewer than for October to December 2017 and 116,000 fewer than for a year earlier. The unemployment rate was 4.2 percent, down from 4.6 percent for a year earlier and the joint lowest since 1975. The unemployment rate for 16-24-year-olds was 12.1%, down 0.4 percentage points from a year ago. The UK’s youth unemployment rate of 12.0% in October-December 2017 compared to a rate of 16.2% for the European Union as a whole.

(Source: https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN05871)

Net migration to the UK fell by over 100k in the year November 2017 with three-quarters of the reduction was accounted for by EU nationals returning home.

(Source: https://www.theguardian.com/uk-news/2017/nov/30/net-migration-to-uk-shows-largest-annual-fall-since-records-began)

Economic growth is anticipated by be modest at around 1.5% in 2018. (Source: https://www.pwc.co.uk/services/economics-policy/insights/uk-economic-outlook.html)

Foundry Industry

For the UK foundry industry, 2017 was more positive year with most foundry sectors seeing an increase in turnover and orders. The non-ferrous sector benefited from the continued growth of the automotive industry which resulted in strong demand levels and increased orders. The ferrous sector saw increases in enquiries and orders with delivery times stretching out. The aerospace has improved with increases in orders and the Defence sector also remained strong. However, offshore oil and gas projects have seen only a small recovery and continued to suffer, due to the global economic situation and lack of investment and foundries looking to diversify into other markets.
The investment sector in particular remains strong, with the UK being responsible for 50% of the market share for the EU.

With regard to castings production in 2017 compared with 2016, the estimated output for each material was:

- Grey Iron – Increase of 10%;
- Ductile iron – Increase of 10%;
- Steel – Increase of 8%;
- Light alloy – Increase of 8%;
- Non-ferrous – No change.

UK foundries invested in new equipment and increased capabilities to improve their efficiency and competitiveness.

Foundry salaries and wages increased on average by 3.5% from Dec 2015 to Dec 2016. Overall business costs increased around 10% over 2016, with large increases in the costs of coke and resins as a result of the changes in exchange rates.

Comparing changes in the Producer Prices index, factory gate prices (output prices) rose 0.1% in December and 2.7% on the year to December 2016, which was the sixth consecutive period of annual growth.

Prices of imported materials and fuels was the largest driver of input price growth, which was largely a result of sterling depreciation and a recovery in global crude oil prices.

The Producer Price indices for ferrous castings grew slowly during the first half of 2017, then increased sharply by over 6% in July before falling back by 3.5% castings in January 2018. For light alloy castings there was steady growth of 3.2% through the year. These figures sit either side of the UK general manufacturing ‘factory gate price’ of 3.3%. Prices for materials and fuels rose 4.9% on the year to December 2017.

**Outlook for 2018**

The picture for 2018 remains positive. UK foundries are reporting that there are increased order levels both domestically and for export. In some cases, foundries have reported the best Q1 order book in living memory. There are still some areas struggling however and the steel sector continues to find market conditions tough.
The automotive sector has continued its strong performance, with UK car production hitting 1.67M in 2017. Car exports remained at historically high level, with 1.33m shipped worldwide – 79.9% of total production. Exports provided a counterweight to domestic market challenges, up 4.8% in the month and 12.1% YTD and for Q1 2018 demand remained 5.0% above 2017 levels, with more than 780,000 engines made in Britain so far this year. UK engine production dipped -3.7% in March however, as demand from UK car plants fell for a second month.

(Source: https://www.smmt.co.uk/2018/04/british-engine-manufacturing-dips-in-march-but-q1-output-still-up-5/)

For the aerospace sector, the outlook for the industry as a whole is generally positive, with recent growth in output expected to continue as demand for aircraft increases around the world. The UK industry has a strong pipeline of work, and trade bodies are reporting optimism in manufacturers.

(Source: http://researchbriefings.files.parliament.uk/documents/)

The Oil and Gas sector in 2017 was a tale of two halves with settled oil prices during the early part of the year but an increase in the second part of the year - and ‘saw Brent surpass $70/bbi in early 2018 for the first time in three years. Although the oil price has since fallen back to $65/bbi.

Gas also received a boost last year with ‘local factors such as a cold winter, a reduction in the UK gas storage capacity and unplanned outages across Europe which drove the gas price up beyond expectations during the 2017/18 winter months.’ ‘Although caution remains over longer term price expectations it is encouraging that a new mix of investors in the UKCS have already shown a willingness to deploy capital as they look to generate maximum value from their newly acquired assets.

(Source: https://oilandgasuk.co.uk/businessoutlook-2/).

The weaker pound is making exports easier but is leading to a rise in the costs of certain raw materials. The ongoing uncertainty of the future trading relations between the UK and its various allies in Europe and worldwide does not seem to have affected the UK’s confidence in the short term.

The UK industry is feeling positive currently, enjoying some favourable trading conditions in most markets that seems to be progressing with new orders and growth. But the UK is aware that market conditions will be changing in the near future and the outcomes of these changes are far from certain.
According to the 2018 Metalcasting Industry Forecast and Trends report published by the American Foundry Society (AFS), U.S. metalcasting industry sales are forecast to increase by 4.7% to reach $33 billion in 2018 after hitting an estimated $30.6 billion in 2016. Growth in 2019 is expected to be 1.8%. In the short term, from 2017-2020, the U.S. metalcasting industry has a forecasted annual growth rate of 2.3%. Through 2026, this report is estimating a 2.9% long-term annual growth rate for the industry.

The U.S. metalcasting industry is made up of 1,952 facilities, with an industry capacity of 15.2 million tons and a forecast capacity utilization of 72% in 2018. Top casting industries include motor vehicle manufacturing (NAICS 3361), aerospace product and parts manufacturing (NAICS 3364), transportation equipment manufacturing (NAICS 336), iron pipe, fittings, ingot molds, and etc. (NAICS 331511), engine, turbine and power transmission (NAICS 3336), pump and compressor manufacturing (NAICS 33391), and railroad rolling stock manufacturing (NAICS 3365). Those industries account for nearly 40% of all casting sales.

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Metric Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray Iron</td>
<td>3,210,350</td>
</tr>
<tr>
<td>Ductile Iron</td>
<td>2,490,970</td>
</tr>
<tr>
<td>Malleable Iron</td>
<td>1,245,790</td>
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<tr>
<td>Steel</td>
<td>205,444</td>
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<tr>
<td>Copper Base</td>
<td>1,686,230</td>
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<tr>
<td>Aluminum</td>
<td>142,740</td>
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<tr>
<td>Magnesium</td>
<td>322,230</td>
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<tr>
<td>Zinc</td>
<td>51,040</td>
</tr>
<tr>
<td>Other Non-Ferrous</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>9,395,305</strong></td>
</tr>
</tbody>
</table>

*U.S. 2016 Casting Production in Metric Tons*
3. FINAL REMARKS

As established within the yearly working plans of the World Foundry Organization, this international industry report is to be published and disseminated by the WFO on yearly basis, as part of the different activities carried on by the organization.

These networking initiatives require the necessary compromise and collaboration from the different WFO member countries, which provide a complete overview of the worldwide scenario linked to the casting industry, with a positive feedback to be shared among the different stakeholders on a clear value proposition.

In order to facilitate the elaboration of the next report, official call and release of the full document will remain fixed in time:

- Nation reports to be sent to the Secretariat Team: Deadline 31st of May
- Layout design and format publication: Deadline 15th of June
- Presentation and approval from the WFO Executive: Deadline: 30th of June
- Dissemination among WFO Member countries: Deadline 15th of July

*The drafting of the 2018 WFO Industry Report counts with the collaboration of 26 WFO Member Countries with the compilation and design work from the WFO Secretariat Team*

Additional information:

The 2019 General Assembly meeting will be held at the WFO Technical Forum of Portoroz (Slovenia) in September 2019.

This extraordinary technical framework will allow the interaction and the access to the latest technical developments from the foundry industry on international basis.

*All information contained in the WFO Global Foundry Report 2018 is provided by its Member Associations and relies on the cooperation compromise from all the involved parts.*

*The WFO is not responsible for any possible errors and omissions and gives no warranties concerning the accuracy, completeness or up to date nature of the information provided, as well as for the results obtained from the improper use of this information.*
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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.

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