

## GLOBAL CRISIS AND CASTING PROCESSES IMPROVEMENT ON THE EXAMPLE OF THE POLISH IRON FOUNDRY

Elżbieta WYSŁOCKA, Dorota JELONEK, Joanna NOWAKOWSKA-GRUNT

*Czestochowa University of Technology, Faculty of Management, Czestochowa, Poland, EU,  
[dorota.m.jelonek@gmail.com](mailto:dorota.m.jelonek@gmail.com), [wyslocka@zim.pcz.pl](mailto:wyslocka@zim.pcz.pl)*

### Abstract

The turbulence of the modern environment consists not only in the occurrence of financial crises but also in the appearance of phenomena related, inter alia, to technical progress which influences the growth of the knowledge importance. The rapid development of technology also causes the substitution of production factors and the material and labor consuming products by the areas of production based on modern knowledge and characterized by the use of +computerization and automation, and low energy costs. The global financial crisis that affected the world economy in recent years also had a significant impact on the foundry industry. Polish foundries in order to stay in business and compete effectively not only with the European but first of all Asian foundry products, have to seek new organizational solutions to reduce costs and improve technological processes so that the quality of manufactured products is getting better and product offer is growing wider. In the article, based on the situation in the world, European and Polish foundry, the actions of one of the Polish foundry are presented, which have been taken in response to changes in the environment. By means of partly targeted interview information on the actions undertaken by the Iron Foundry WULKAN joint stock-company in order to improve the competitiveness of products and reduce operating costs were obtained. Moreover, the applied technological solutions are presented together with an analysis of their impact on the financial condition of the tested foundry. In conclusion, it was pointed out that the crisis could become a contribution to the success of the company by taking advantage of the possibility of reconstruction and realization of fundamental qualitative changes, as well as in management processes.

**Keywords:** crisis, casting, investments, financial standing

### 1. INTRODUCTION

The global financial crisis is still a major shock to most businesses. The initial economic downturn, the worst since the Great Depression, had an impact on almost all sectors of the economy. In particular, it influenced companies in the metal industry, which is very sensitive to this type of turbulence. International business is diversified in terms of type of business and countries of economic activity. Thus, the crisis could affect the international business to the extent to which the business is linked to international finance. Due to the effects of the financial crisis and declining investments, profits are decreasing and liquidity is reduced in all economic sectors [1].

The results of a study conducted by Wilson and Eilertsen [2] indicate that the economic crisis has impacted significantly on businesses. Almost half of the respondents reported a decline in revenue by more than 5 percent in the past year. Interestingly, about one-fifth (18 percent), has seen revenue growth of over 5 per cent in the same period. In terms of profitability, these changes were similar, although the magnitude of change in profitability was less severe. For the Polish foundry 2009 was the worst year, when the volume of production of castings in Poland fell to 807 thousand tons compared to 961 thousand tons a year earlier.

The turbulence of the modern environment is not only the occurrence of financial crises but also on the occurrence of phenomena related to, inter alia, technical progress influencing the growth of the importance of knowledge, education workers and the need to create conditions for professional development. The rapid

development of technology also causes the substitution of factors of production and the product material and labor-intensive areas of production-based on modern knowledge and characterized by the use of computerization and automation, and low cost of energy consumed. In today's rapidly changing environment, albeit significantly shortens the time for obtaining and conveying information, but the information is quickly outdated.

Changes taking place in today's turbulent environment, are also associated with an increase in the number of factors influencing the success or failure of the enterprise. Also the complexity of the environment and the market increases, and with the risk of doing business as well. Fast, unpredictable changes in the environment make the period for which such plans can be arranged (with a certain degree of certainty) shorter.

Undoubtedly, the ambient turbulence affects the equilibrium imbalance of company both internally and externally, which is necessary for the efficient operation. In order to maintain internal equilibrium, i.e., matching the components constituting the enterprise, and external balance, which took place when a company can react to changes in the environment without damaging internal balance, it is necessary to carry out certain adjustments to projects, aimed both at the environment and the own resources of enterprise [3]. In modern conditions the company adaptation to changes in the environment must be viewed dynamically. With this approach, the state of the internal and external balance of the company with the environment is an impermanent phenomenon. In order to provide the closest approximation to the equilibrium point, where the company runs smoothly, it is necessary to make radical changes, taking the form of restructuring. Changes in today's environment is a key factor in inducing restructuring.

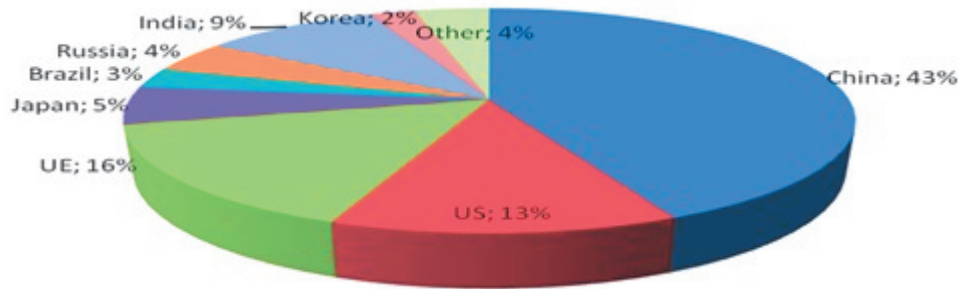
Defining the restructuring as a process of change to ensure a balanced business, it should be emphasized that the changes must be radical (essential, systematic) occurring in the enterprise under the influence of a changing environment, or otherwise in order to bring the company's activities to the requirements of a changing environment [4].

You have to remember that the crisis could also become a kind of opportunity for success for the company by the appearance of the possibilities of reconstruction and carry out thorough qualitative changes in the structure, as well as management processes. The use of positive consequences of the crisis depends on the approach to the management of change in organizations at risk or in crisis circumstances. Therefore, managers should keep in mind that the basis for the effective operation of the company in a crisis situation is the earlier diagnosis and prepare for possible problems.

## 2. FOUNDRY INDUSTRY IN THE WORLD, IN EUROPE AND IN POLAND AFTER CRISIS

Global foundry production in 2012 was 101.3 million tons. Comparing to previous year there has been an increase of about 2.2% (Fe -1.6%, MN 5%). In contrast, the impact of the crisis has been noticed in 2011 when the total production of castings in relation to 2008 was lower than in Europe (by 10%) and North America (by 7%). The largest decline in production was recorded compared to 2008 in Russia and amounted to almost 45%. Significant increases, in the total production of castings as compared to 2008 was recorded in China (23%) and India (47%). [5].

Year 2012 in Europe for the foundry industry was another year of recovery from the crisis, 19 737 thousand tons of castings was produced, which was comparable to the value achieved in the previous year (20 172 thousand tons). However, to reach the quantity of manufactured goods from the time before the crisis, i.e. in 2007 (almost 27 thousand tons) a lot is still missing. There has been a reduction in the production of some of the major manufacturers of castings in Europe such as France (12%), Italy (11%), Spain (10%), Germany (5%). On the other hand the production of castings in Poland, Ukraine, Belgium, Hungary (see **Fig. 2**) has increased. [6]. **Fig. 1** shows the share of the largest manufacturers in the foundry in 2012.



**Fig. 1** The share of the largest manufacturers in the production of foundry in the world

Poland is in sixteenth place in terms of tons of castings in the world, the seventh in Europe and the fifth in the European Union. In 2012, the production volume of Polish foundry was on the same level as in the previous year (an increase of 0.7%). The main recipient of the cast was the automotive industry. Poland is in eighth place in Europe in terms of production of alloy cast iron, in sixth place in the production of non-ferrous cast alloys, and on the fourth of aluminum alloys. In Poland, similarly as in the world, the production of gray iron castings (47%). The production of ductile iron castings has a smaller share in Poland in comparison to the world (15% versus 26%), but higher production of aluminum castings (Poland 32%, 14% in the world). [7] Very important in the evaluation of the development of the foundry industry's production capacity is thousands of tons per foundry. In this respect, Poland ranks sixth in the world after Germany, USA, France, Russia and Korea. Over 90% of the foundry belongs to the SME sector and produces approximately 40% of the national production of castings. Polish foundry products are mainly exported (about 60%). The biggest recipients of Polish castings are countries such as Germany (48%), France, Italy, and the United Kingdom. Polish foundries mainly export aluminum alloy wheels and parts and accessories of the motor vehicles wheels (101 900 tons, which represents approximately 22% of total exports of castings). 62% of production of castings is sold to the automotive industry, 10% for construction and 9% for the engineering industry. [7] Polish foundry industry can be divided into modern foundries belonging to foreign companies, producing often to meet needs of their groups, and Polish foundries, whose efficiency is not too high. The problem of the Polish market is the lack of large machine and automotive industry. Therefore, foreign markets represent main customers.

### 3. STATE OF IRON FOUNDRY WULKAN SA

The main recipients of castings produced in the Wulkan company is the construction industry, but also machine and automotive sectors. Almost three quarters of the company production is exported, mainly to France, the United States, Great Britain and Germany. Wulkan is still looking for customers in Europe, but also for example in Japan. In previous years, a much higher part of the production than it is now was exported, e.g. to Italy and Spain. Markets are constantly changing, and the company tries to adapt to them. Foreign exchange risk is reduced through contained in the contract clauses providing for cases of significant changes in exchange rates. Besides, some form of collateral is selling currencies on forward contracts when future cash flows are contracted. The competitive advantage of the Wulkan company is mainly associated with the flexibility, i.e. the ability to produce short runs, requiring frequent changes in instrumentation. Performance and quality of the Company's products is at the European level, which makes it a reliable partner for foreign contractors. Besides, thanks to the cooperation with the Lawa company, the offer is comprehensive. Lawa company has modern machinery and has its own potential for growth, perhaps even greater than the Wulkan. Speaking of competitive advantage it must also mention that Wulkan is an environment friendly foundry. Caring for the environment is mainly due to the location of the foundry near the city center. The modernization of the plant and changes in the organization of production led to an increase in productivity per employee, which is already higher than the average in Belgium, Norway and Portugal, and approaches the performance in Austria. However, it is still lower than in Germany or France.

Company's development strategy is based on five pillars. Thanks to the investments the company wants to increase capacity, but also expand the range of castings for the larger sizes. The Management Board does not rule out acquisitions, especially if range of sales will be expanded thanks to such movements, but the care for remaining efficiency level will also be important in deciding. The third pillar is the development of export sales. Along with the foreign partners of the Company technologists work on new products that may enter permanently into production. Another aspect of the strategy is to maintain the flexibility of the organization in terms of products and better use of the potential of the company Lawa. The last pillar is continuing to invest in themselves, that is, improving the production process, increasing productivity, the use of the best world standards. Cast iron is a process known for centuries, but still very difficult and not fully recognized. However, the most important goal is to increase sales of castings produced in Wulkan as well as services performed by the company Lawa, where Wulkan has almost 96 % of the shares.

#### **4. INVESTMENTS IN IMPROVEMENT OF QUALITY AND COMPETITIVENESS OF PRODUCTS - CASE STUDY**

An interview with the President of the Management Board of OŽ Wulkan S.A. indicates that the Company continues to improve its manufacturing processes allocating resources for investment in fixed assets. These activities are designed to ensure OŽ Wulkan S.A. foundry market competitiveness, and thus allow for the production of increasingly complex castings with higher quality requirements and reduction of total costs.

Implementation of serial production of castings working under high pressure, which meet the requirements for a suitable surface, tightness and strength, was made possible by the project co-financed by the European Regional Development Fund under the Operational Programme Innovative Economy 2007-2013. The project value was PLN 3 562 569.85, and the amount of funding received PLN 1 576 676.00. The project was implemented in the period 12.12.2011 - 30.06.2013. As part of the modernization of the molding processing, a peripheral molding blender, which is used for the preparation of molding of the fresh ingredients and returnable natural and synthetic. Also control system of molding parameters was modernized. The automated system allows to control on-line of molding parameters. The modernized system of preparing molding ensures the proper molding parameters, making it possible to achieve the proper effect in the form of high quality casting surface working under high pressure, among others. the compressor cylinder head castings. Investment in fixed assets described above was necessary for the implementation of new technology.

The second project concerned ensuring the proper parameters of iron cast. This involved the purchase of control - measuring cupola furnace covering the devices of temperature, pressure and air flow measurement having a decisive influence on the metallurgical process, and thus the quality of the new products implemented under the project. A pneumatic tube transport system that allows for the transport of samples of iron castings directly from the melt to the lab, which is located in the spectrometer also has been purchased. With the implementation of the transport system laboratory tests of samples of new products are available on smelting line in the shorter time. This provides the opportunity to control the current chemical composition of iron and possible rapid implementation of corrective actions. The project also included the purchase of an automatic casting molds, thus avoiding errors due to manual process of flooding control. Automatic flooding also provides a more even penetration of the metal mold. Modification of metal stream is carried out in a precise manner, ensuring optimization of the use of modifier and even dosing modifier into molds. All these elements were necessary and were an indispensable condition for the implementation of the new technology of cast working under high pressure.

Iron Foundry WULKAN SA also carried out a project called Implementation of new production technology of thin-walled castings of complex shape. The project was co-financed by the European Regional Development Fund under the Operational Programme Innovative Economy 2007-2013. The value of the entire project was PLN 1 399 548.56, of which PLN 699 774.28 is the amount of funding received for the project. The project was completed in the period 17.03.2011 - 29.02.2012. Producing castings with thin walls and complex shapes that

comply with the tolerances set by the customers, became possible by the purchase of the molding machine DISAMATIC 2110 MK3. The machine is equipped with a control system that monitors the thickness of the forms and automatically selects the molding chamber depth changes due to compressibility mass. This maintains a constant thickness of the mold. The machine uses bilateral compression increasing uniformity of compaction of mold. Additionally, in order to improve the mass density the two squeeze plates are equipped with vibrators. Thin-walled castings of complex shape are used in the construction industry (for sanitary fittings) and are intended for the EU market. The products that are placed on specific quality requirements (thin walls, tight tolerances).

It turned out that the project Establishment of the Department of Finishing Casting Compressor Station and modernization to increase competitiveness Odlewnia Żeliwa WULKAN SA was extremely important for improving the competitiveness of the products. Also, this project was co-financed by the European Union from the European Regional Development Fund under the Regional Operational Programme of Silesia in 2007-2013. Value of the project: PLN 1 794 071, and the value of financing PLN 735 275. The investment was associated with making a fundamental change in the manufacturing process. After the project a Casting Finishing Department, in which modern grinding machines are installed, thanks to which the company carries out in-house processing which castings grinding has been created in the plant. So far, castings grinding was performed at the plant WULKAN SA using outdated portable grinders. Most of the work associated with grinding was outsourced to subcontractors, equipped with similar devices. This resulted in the need to increase the length of production of castings to include transportation to cooperator and backwards, which in turn increased the costs of production. Subcontractors have not always kept their deadlines, resulting in delays in the implementation of contracts by WULKAN SA, and at the same time sanding quality was quite low and did not always meet the expectations of the end user.

After the investment such problems have been eliminated because the production process will be implemented in two modern grinding machines which are equipped with tools for complete cleaning of the casting cycle which lasts from 30 sec. to 1 min., and consistent quality of treatment is ensured among others by laser measurement and the use of diamond grinding wheels. After the investment products are of high quality and repeatability of the surface of castings. Differences in comparison to other competitors after the investment are seen primarily in the surface quality of castings and their reproducibility. The use of grinding machines allowed to obtain parameters unattainable by most foundries and companies providing services in the field of grinding. Competitors in Poland do not yet have this class of grinding machines, and use mostly manual or automatic older generation grinding machines. Such machines are used in German, French, or Italian foundries, and their products may be comparable to those offered by WULKAN SA.

## **5. ANALYSIS AND ASSESMENT OF THE INFLUENCE OF INVESTMENT ON FOUNDRY'S RESULTS**

In the financial year 2013 the Company's revenues showed a decreasing trend, however, the decrease was insignificant (about 0.8%). Improvements in profitability - operating profit almost doubled its value in 2012, and profitability at the EBITDA level was 12.7% (6.2% a year earlier) should be regarded as the positive sign. Eventually, the company closed the year 2013 with net result of 1.3 million PLN and profitability 4.4% (vs. 1.2% last year). In conclusion, the decision of the Management Board to change its portfolio of more processed, adapted to the needs of customers and thus more valuable, proved to be correct. Company successfully did emerge from the crisis which could be observed at the turn of 2008-2009.

Structure of the Company's balance sheet is correct with the asset coverage with equity ratio at a satisfactory level of 33%. The company to a large extent uses short and long term credits amounting to PLN 7.7 million at total, which represents approximately 34% of total assets. Nevertheless, the Debt / EBITDA ratio despite the collapse in 2012 due to weaker profitability, in 2013 obtained the acceptable value of 2.05 (vs. 3.98 in the preceding year). The period of repayment of loans, the short-term debt prevails (89% whole loan debt), which is actually unfavorable to the company. In the structure of asset majority (55%) are current assets, including

inventory and accounts receivable trade. The Company does not hold significant cash reserves, cash ratio (cash over current liabilities) is low at less than 1%. Nevertheless, the Company has a good flow of positive net working capital (CR = 1.21). Due to the growth and increase in inventories QR has deteriorated and is 0.42 (compared with 0.70 in the previous year). A full assessment of the of the Company's financial situation is hampered by the lack of information about the availability of the revolving credit current and extent of their use, as well as the possible clauses in loan agreements signed. In 2013, as a result of substantial repayment receivables from affiliated companies the ratio of receivables to commercial liabilities has changed. The Company does not longer credit its contractors and itself uses trade credit - receivables turnover ratio declined in August from 71 to 39 with a decline in repayment obligations from 53 to 44 in 2013. The changes should be evaluated positively. Completion in 2013 led to a substantial investment improvement of the financial position of the Company in relation to 2012.

## CONCLUSION

The real advantage of the company, confirming its strength, capabilities, the will to fight and earn the trust is primarily the way it copes with the changes taking place and different problems. There is no ready-made plans or courses of action in emergencies, after that you should go in the event of a problem. Summarizing the results of the study it can be concluded that the example of iron foundries indicates that the adoption of an appropriate strategy for crisis management not only helps to reduce the effects of the global slowdown, but also to seize the opportunities of development. The example in the article indicates that ended in 2013, the implementation of serial production of castings working under high pressure, meet the requirements for a suitable surface, tightness and strength, purchase of control - measuring cupola furnace having an impact on the quality of production, allowing for a significant increase of profitability. However the best investment seems to be the creation of the Casting Finishing Department and modernization of the Compressors Station. This investment allows the recipient to deliver a finished product, requiring no surface treatment, ensuring compliance with the required dimensions. This reduces logistics costs, the recovery of the material during the process and increase in the product range. It seems that Polish companies do well in these difficult times. But still need to closely monitor the situation on the world markets by considering the strategies of the enterprise, depending on what other effects will be brought by the current crisis.

## REFERENCES

- [1] TOPOROWSKI J. International business and the crisis, *Critical Perspectives on International Business*, vol. 1-2. 2009.
- [2] WILSON J.W., EILERTSEN S. How did strategic planning help during the economic crisis? *Strategy & Leadership*, vol. 2. 2010.
- [3] NALEPKA, *Restrukturyzacja przedsiębiorstwa. Zarys problematyki*, Wyd. Nauk. PWN, Warszawa - Kraków 1999.
- [4] BOROWIECKI R. Restrukturyzacja przedsiębiorstw - wnioski i zalecenia wynikające z doświadczeń polskich przedsiębiorstw, *Zeszyty Naukowe nr 532 AE w Krakowie*, Kraków 1999, s. 7.
- [5] 46<sup>th</sup> Census of World Casting Production. The 2011 census shows annual casting production's return to pre-2008 levels. A modern casting staff report. *Modern Casting*, December 2012, <http://content.yudu.com/A1zzul/ModernCastingDec2012/resources/index.htm>.
- [6] 47<sup>th</sup> Census of World Casting Production. Diving Up The Global Market. *Modern Casting*. A modern casting staff report, December 2013, <http://content.yudu.com/A2krxm/ModernCastingDec2013/resources/index.htm>.
- [7] Instytutu Odlewnictwa, Sytuacja odlewnictwa na świecie, w Europie i w Polsce, <http://www.iod.krakow.pl/stronaiod/uploads/1389079730f0859ad.pdf>.