

## **INNOVATION ABSORPTION IN POLISH METALLURGICAL ENTERPRISES**

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### **Abstract**

Polish metallurgical enterprises spend significantly less on R&D and innovation than their regional peers. The income and productivity growth in the last 20 years has been much faster than that of its neighbors. It suggests that factors unrelated to R&D and technological progress must have accounted for the boom. Looking ahead, however, Poland needs a transition to innovation- and R&D-driven growth to meet targets defined by the Europe 2020 Strategy and sustain the fast pace of convergence with the EU.

After theoretical background overview and preparation of the absorption of innovation analysis, it was possible to point out the most important areas for changes. The main goal of the paper is to identify absorptions' models and its implementation possibilities in metallurgical enterprises. The research was conducted in years 2010-2015. Presented investigation was partly designed to highlight the possibilities of innovation implementation with special attention to its absorption limits.

**Keywords:** Innovation, R&D, metallurgy, enterprises, Poland

### **1. INTRODUCTION – WORLD PRODUCTION OVERVIEW**

Total crude steel production for the 62 countries reporting to the World Steel Association in January 2013 was estimated to be 125 million tons, which was an increase of just 0.8% on January 2012. If China is excluded, the remaining 61 countries showed a 2.4% decrease in crude steel production.

In the European Union crude steel production for the 27 in January fell by 5% on January 2012 to 13.5 million tons. In Germany, however, steel production rose by 5.4% to 3.5 million tons, while Italian production decreased by almost 20% to 1.8 million tons. French steel production fell by 1.3% to 1.4 million tons, while Spanish steel production was down by 2.5% to 1.1 million tons. In the UK, on the other hand, production increased by 23.5% to 828 thousand tons.

Steel exports by the 27 European Union countries outside the EU have shown a gradually rising trend from about 3 million tons in the first half of 2010 to about 3.5 million tons in the last half of 2012. Imports, on the other hand, have been much more variable averaging just under 2.5 million tons in 2010 peaking to 3.9 million tons in May 2011 and then dropping to 1.7 million tons in December 2011 before rising to 3 million tons and then falling again during 2012. Trade within the European Union showed an almost identical trend between exports and imports with exports averaging 8.7 million tons over the three years period and imports averaging 8.4 million tons.

Germany is the largest importer of steel in the European Union, but in 2012 its imports dropped by 15.4% to 22.9 million tons, although this was just above the 2010 total. 87% of Germany's imports in 2012 came from other EU countries, notably Italy, Belgium and France.

Outside of the European Union, steel production in Turkey decreased by 8.8% to 2.9 million tons, while Bosnian production rose by one third - to 61 thousand tons. Norwegian steel production fell by 4% to 60 thousand tons. Turkish exports of steel rose by 10% in 2012 to 18.7 million tons, while their imports increased by 11.6% to 11.5 million tons. There was a sharp rise of 55% in the imports of semis in 2012 to 3.4 million tons, particularly in slabs, although the majority of semis imported were billets.

In Russia crude steel production was down by 5.7% compared to January 2012 at 5.7 million tons, while Ukrainian production fell by 4.4% to 2.7 million tons. Steel production in Kazakhstan fell by almost one half to 170 thousand tons. Russian steel exports rose by 8% in 2012 to 26.7 million tons over half of which was semis, which rose by 18%. Russia's largest market was the EU27 taking 11 million tons (41%) followed by Asia at 5.6 million tons (21%). Exports to the Middle East fell to 2.5 million tons (9.4%).

In North America January crude steel production decreased by 3%, with US production down by 5.8% to 7.3 million tons. Canadian steel production showed a slight rise of 1% to 1.2 million tons, while Mexican production rose by 5.6% to 1.55 million tons. US imports of steel rose by 16.9% in 2012 to 31.5 million tons following a 19.4% rise in 2011. In fact the 2012 total was the highest since the 2006 peak of 42 million tons. Nearly 7 million tons of the 31.5 million in 2012 were semis with a further 5 million tons of welded tubes. Although Canada supplied 17% of US imports in 2012, some 10 million tons, or 31.5%, came from Asian countries, particularly South Korea, Japan and China. Brazil accounted for 11.5% of total imports in 2012 with Mexico a further 8% and Russia 7%.

South American crude steel production fell by 3.2% in January, with Brazilian production down by 6.1% to 2.6 million tons. Argentinian steel production dropped by 19% to 321 thousand tons, while Venezuelan production jumped by 47% to 250 thousand tons. In South Africa steel production was estimated to be 570 thousand tons in January, 4.5% below the previous January. However, in Egypt, production increased by 15% on January 2012 to 590 thousand tons. In the Middle East Iran's steel production was down 10% to 1.1 million tons while Saudi Arabia only showed a slight decline to 463 thousand tons. Asian crude steel production for the five major countries in January was up by 4% with only South Korea showing a drop. China's increase was 4.6% to 59 million tons, while Japanese steel production rose by 2.7% to 8.9 million tons. Indian steel production increased by 3.8% to 6.6 million tons, and Taiwanese production was up by 5.4% to 1.8 million tons. South Korea, on the other hand, showed a slight drop in steel production to 5.75 million tons.[11]

## **2. MANAGING INNOVATION**

For the Polish companies and economy, innovativeness is a sine qua non condition for achieving a favourable position in the world economy in the future. Even now, when Poland is a member of the European Union [1, 6], the economy of which surpasses the Polish economy with respect to innovativeness, this issue is particularly important. It can generally be stated that management of innovations in prosperous countries has the following characteristics:

- Economy – national/European GNP per inhabitant is above the average, high exports – an open region and high innovativeness, a diversified structure of the economy and industry, the significant presence of high-tech industries, well-qualified workforce.
- Expenses on R&D – the predominance of expenses on R&D by private companies, the region, producer and user of technologies.[4]
- R&D infrastructure – strong and diversified research resources, the structure of intermediary institutions adapted to the needs of the economy.
- Policy – a clear pro innovative strategy and policy based on social consultations, orienting the system.

The majority of organizational units currently functioning in developed countries demonstrate four main challenges, such as[2]:

- Globalization and the freedom of capital flow, which orients an enterprise to the generation of value for the shareholders.
- Market maturity, which results from competitiveness based on effectiveness and innovation.

- The consumer's force, which increases and by means of which the consumer expresses its expectations and participation in a better world and is supported by corporate culture.
- Innovativeness expressed by the ability of an enterprise to introduce changes in marketing and organization.

In the managing of business, definite solutions of legal, organizational, economic and informative character occur, which are in invariable reciprocal relationships that affect the course of the management process. Nowadays, no one should question Drucker's statement, formulated twenty years ago, that "there are no undeveloped countries, there are only countries of undeveloped management" and "the only constant thing is change".[5]

The contemporary management of an enterprise is characterized by:

- The orientation towards company's value;
- The market orientation taking into account the client's expectations and the competition;
- The developed relations with the environment, which constitute a dynamic-interactive system;
- The creation of a model of a network, which takes into consideration three interrelated elements: subjects – actions – resources. Their reciprocal relations, supported by information technology should stimulate the development of a company;
- The creations, in enterprises, of factors stimulate the development of Innovation such as information and knowledge. The manifestation of their development is the generation of new ideas and the effectiveness of processing them into marketing, organizational and financial innovations.

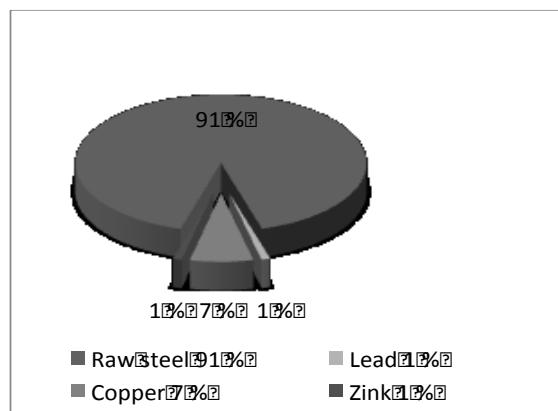
All the changes occurring in the environment have an effect on the company's activity. The proper recognition of these changes and their tendencies enables a company to adapt to the conditions prevailing on the market. There is one important fact lying at the foundations of business management that should be well understood by managing boards; the fact that only those organizations which will appropriately adapt themselves the contemporary business environment can survive and not lose a chance of development.

### **3. CHARACTERISTIC OF THE POLISH MARKET**

Domestic steel production rose by almost 30% y/y in H1/2012 to nearly 4.7mn tons, while steel consumption grew by 18% to 4.1mn tons, according to the estimates by Polish Steel Association (HIPH). During 2012, steel output dropped by 31% and reached 7.1mn tons. Demand for metallurgical products and their prices dropped sharply as well. The total consumption of steel last year amounted close to 7mn tons, the lowest level in ten years.

In year 2012 steel mills increased production encouraged by growth in prices and economic recovery, though as statistics show, they somewhat overestimated demand. As a result, mills have excessive stock and output's dynamics is likely to decelerate in H2/2011. Nonetheless, in the whole year, a significant rise will be reported. According to the Association's data, 62% of domestic consumption is covered by imports, which rose by 17% in H1. At that time, exports increased by 23%. Steel imports exceeded exports by 0.7mn tons. In value terms, negative trade balance amounted to PLN 4.0bn.

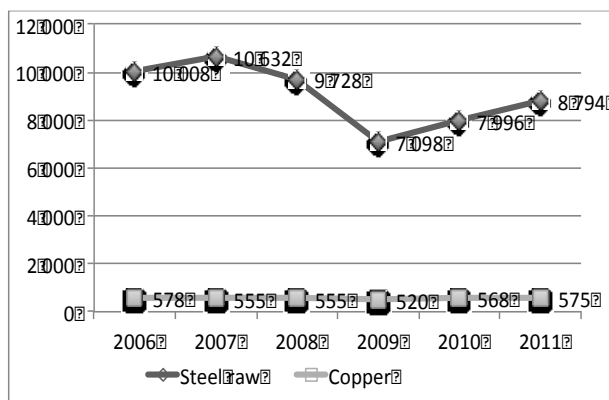
Metallurgical industry is one of the most significant branches of processing industry that deals with preparation of extracted ores to receive pure metal thereof, refining of metals, their heat treating, chemical and heat treating (quenching, etc.), modelling to give them specific shapes, and alloy production. Metallurgical industry may be broken down in ferrous and non-ferrous metallurgy.[9, 10]



**Fig. 1** Metallurgical sector structure in Poland  
Source: own, data Central Statistical Office (GUS).

In Polish conditions a large majority of metallurgical production is constituted by steel (Fig. 1 – 91 %). Copper production is also noticeable (7 %). The share of other metals in the sector amounts to 1 %.

In 2011 production of steel increased by 7,2 % which indicated continuation of a trend from 2010 (increase by 12,3 %). Despite a production growth in the last two years, it did not return to the level from before the crisis in 2009. The future development depends to a large extent on the condition in the automotive industry, which is the key recipient of the Polish steel sector (Fig. 2). Forecasted production growth in this sector, in years 2011-2015, amounts to 5 % a year. Increasing prices of electrical power, which constitute for a large part of steel works costs, create a significant threat. A higher excise duty on electricity entails lower competitiveness of Polish companies, in particular those applying EAF technologies. The output of the copper sector in turn was more stable in the last two years, despite the condition of the world economy. Yearly production of this metal in Poland amounted to 550 thousand tons.[5]



**Fig. 2** Production of steel and copper in Poland (thousand tons)  
Source: own, data Central Statistical Office (GUS).

## 4. CONCLUSIONS

Poland in the time of accession to the EU was forced to restructure steel companies in order for them to properly prepare to operate under conditions of the Community economy. Therefore, the beginning of 21<sup>st</sup> century was the time of changes in economic and development characters, whose continuation was supposed to take until now according to the program of Restructuring and Development of Steel and Iron Industry in Poland until 2006.[8] Reduction in prices for steel products in 2005 caused short-term downturn in steel sector, which was considerably improved after a year, when supply to Chinese market rose

dynamically. In the beginning of 2008, economic crisis emerged in steel market, thoroughly changing strategy of operation of steel companies and their agents. Sudden slump in demand for steel products in 2009 limited production size and caused the decrease in the level of employment. The resultant material reserves caused that initial rise in steel prices slowed down. The collected inventory posed a considerable obstacle to increasing prices for steel products, posing threat of financial loss in the sector. Rise in energy prices made it impossible for Polish steelworks to get out of the crisis, limiting its competitiveness in relation to steelworks from the EU region. In order to reduce costs, a number of steel enterprises decided to close their coke plants and shut off some furnaces.[3, 7]

Downward tendency in steel sector was considerably higher than in the case of other branches of the industry, where crisis was characterized only by a slowdown. However, in consideration of the decision about sector reorganizing in 2012, one can assume that the future of steel sector shows great promise for the domestic economy. Current and future projects and investments in infrastructure and construction impose high requirements on the levels of steel supply and provide an opportunity for revival of Polish metallurgy industry.

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