

THE IMPORTANCE OF THE TECHNOLOGICAL CHAIN OF MANUFACTURERS OF WIRES FOR THE ECONOMICAL GROWTH IN THE SECTOR OF THE CZECH REPUBLIC

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Abstract

The article deals with the issue of resources needed for the development of competitiveness in Czech manufacturers based on the increasing level of complexity within closed technological chains. The authors base their results on research which showed that primary manufacturers of raw resources export semi-finished products to long distances with a low total added value. The selected sample of manufacturers that produce rolled and drawn wires from steel and nonferrous metals showed that the primary intake are materials imported largely from countries outside the European Union. The article furthermore contains statistical findings and an economic assessment of the overall growth of logistics costs associated with reaching the end product in a given technological chain. The article is also complemented by aspects of world trends of development in the field of metallurgical production. The aim of the article is to analyze the knowledge from the field of higher evaluation of the available primary sources of rolled wire in the processing chain of the processor within the Czech Republic

Keywords: Rolled wire, drawn wire, metallurgy, steel, nonferrous metals

1. INTRODUCTION

Rolled and drawn wires are significant raw-materials for a wide spectrum of the processing industrial branches. This raw material is especially valuable in conditions of a state, where the economic base is based on a maturity of the industrial structure with very low occurrence of primary raw-material resources [1, 2]. Some informations about problems of drawn and rod wires in the Czech Republic are published in [3].

This paper generalizes knowledge obtained on the basis of the long-term research of the development trends in the sphere of selected segments of wire manufacturers from steel and nonferrous metals in conditions of the industrial structure of the Czech Republic.

2. TECHNOLOGICAL CHAINS OF WIRE MANUFACTURERS

The wire manufacture is a complex technological chain, the result of which is a wide assortment of products, which are significant components for the finalizing functional units with a high added value. A series of these components, parts, details, assemblies and sub-assemblies fulfills an important function in the final aggregates, which ensures mainly [4]:

- lifelong function beyond the limit of a usual life cycle of the product,
- safety of the final product.

In this regard it is very important to be aware of the fact that in a great part of the investigated industrial branches and spheres of using of the production from wires the problem of repairs and replacement of a defect part and a defect product incorporated in a functional complex is very complicated, cost-demanding and can cause a linkage of reactions and limitation of reliability, which we in many cases feel as a matter of fact.

It can be chosen from the wide structure of the obtained knowledge some representatives for the research of the influence of deformation of the technological chain on the output values of the certain processing branches and consequential use of the production. In this regard the following areas of investigation were chosen:

- 1) Relationship between the source possibilities of separate phases of the technological chain (manufacture of rolled and drawn wires).
- 2) An ability of the utilization of source possibilities such as a potential of a demand of the processing and finalizing branches (import and export of the raw-material base for the processing and industries).

On the basis of so-set criteria, can be obtained and analyzed series of factors with the use of methods, especially the analysis of causes, extrapolation of the time lines and methods, which use exact and empiric tools of the marketing analysis. The investigation was solved in the boundary of the technological potential of the disposable manufacturing capacities of the investigated territory of the Czech Republic, economic factors of separate phases of the economic potential, of the added value of the exported products and the marketing potential in the boundary of the elasticity of supply and demand of the world market.

3. CONSEQUENCES OF DISCONNECTION OF THE TECHNOLOGICAL CHAIN OF WIRES MANUFACTURERS

The comprehensive technological chain in the sphere of wire and wire-product processing is a significant economic potential for the given territory and follow-up cooperative and technological interaction. It creates presumptions for the development of a wide spectrum of the bid series and assortment of production as well as an ability to develop technical and technological presumptions for the development and structure of new unique products with a high added value. An example of such a product can be, for instance, development, production and utilization of a unique 90-tonne wire rope of ArcelorMittal Company for the cabin cable-railway in Colorado [2]. A primary raw-resource base and technological capacities for the production of low-carbon and high-carbon rolled wires are situated in the territory of the Czech Republic. It finds an occasion for the development of comprehensive technological chains with a relatively considerable potential in the chosen segments of the building of resources of competitive benefits of the linked processing and finalizing branches and industry spheres.

A basic image of the development trends was obtained on the basis of a sufficiently long-time line and filtration of some data of customs statistics. Simultaneously with the comparison with the chosen industrial countries of analogical range, size and dynamics of the growing potential (South Korea, Belgium, etc.), knowledge enabling us to discover the future occasion and threat resulting from the continuity of the existing development was obtained.

3.1. Selected results of the trend analysis

Based on the performed analysis of the trends of the long-term time line in the given territory, can be able to assess criterion by criterion [4, 5].

- 1) Relationship between the source possibilities of separate phases of the technological chain (manufacture of rolled and drawn wire).

Despite of an apparent continuity, the fact is gradually deepened that the investigated territory will not manage to sufficiently utilize the primary raw-resource base of the rolled wires in technologies and capacities, which are able to develop the bid assortment in a sufficient qualitative structure for the linked manufacturers and final products.

Within technological and economic disconnection of wire rolling plants and drawing plants, a discontinuity of the investment and technological policy of modernization and innovation of the technological capacities, which are necessary for the related branches and industries such as production of cables and wire ropes, production

of springs, production of agricultural and medical equipment, etc. originated during the last period. **Figure 1** shows production of rolled and drawn wires in the Czech Republic in the period since 1999 [6].

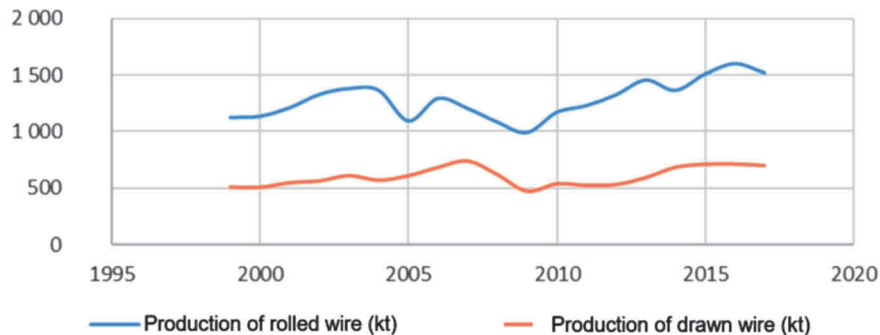


Figure 1 Production of rolled and drawn wires in the Czech Republic in the period since 1999 [6]

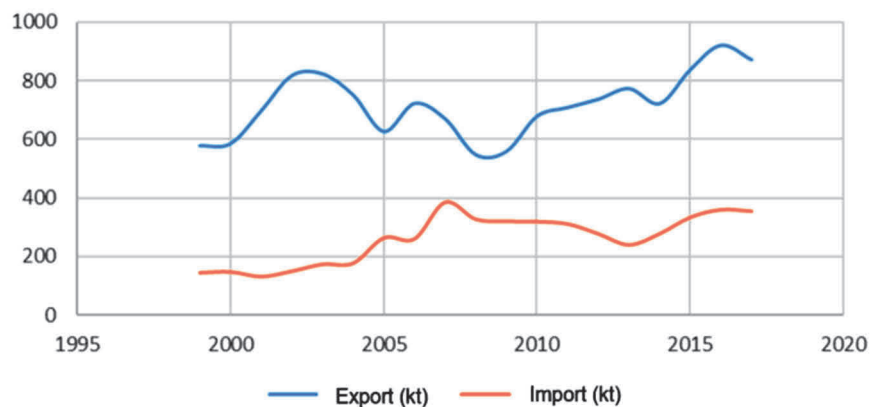


Figure 2 Export and import of rolled wires in the period since 1999 [6]

- 2) An ability of the utilization of source possibilities such as a potential of a demand of the processing and finalizing branches (import and export of the raw-material base for the processing and industries).

The **Figure 2** shows export and import of rolled wires in the Czech Republic in the period since 1999 [6], from here it can be said that:

A high degree of technological and economic autonomy of the rolling plants, drawing plants and primary raw-resource processing plants creates a condition on the investigated territory for the disconnection of the technological chains on the basis of primary profitability of the raw-resource base and semi-finished products and of a low level of finalization of the existing resources.

A high growth of the logistics costs per 1 kilogram of the final production was documented on the selected samples of the assortment structure of the rolled and drawn wires.

3.2. Selected results of the analysis of causes

With help of deeper research of the long-term time line of the development of the technological chains, it can be obtained some causal relationships and create germs of the future strategic solutions for the aborning new branches and micro-parts of the finalizing production, focusing on the innovative potential. The results relate to the relationship of manufacture and utilization of the production in the investigated territory.

Figure 3 shows the rate of rolled wires usage, **Figure 4** shows the rate of drawn wires usage. From here it can be said that:

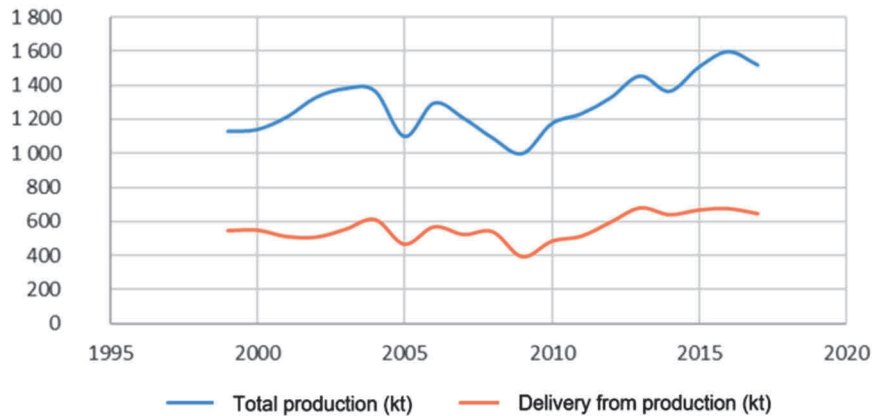


Figure 3 The rate of the use of rolled wires manufactured in the Czech Republic compared to the total production in the period since 1999 [6]

The primary raw-resource base, especially in case of a quality high-carbon wire, requires high continuity of technological and especially material innovations related to the development of prices of ores, alloyed additives as well as energetic and ecological demandingness per 1 tonne of production. Provided this raw material does not find sufficient valuation in a form of the added value in the comprehensive technological chain, in the optimal logistics distance. It becomes a subject of the world commodity market and in its consequence of the price pressure of the development of the world-wide resources and reserves.

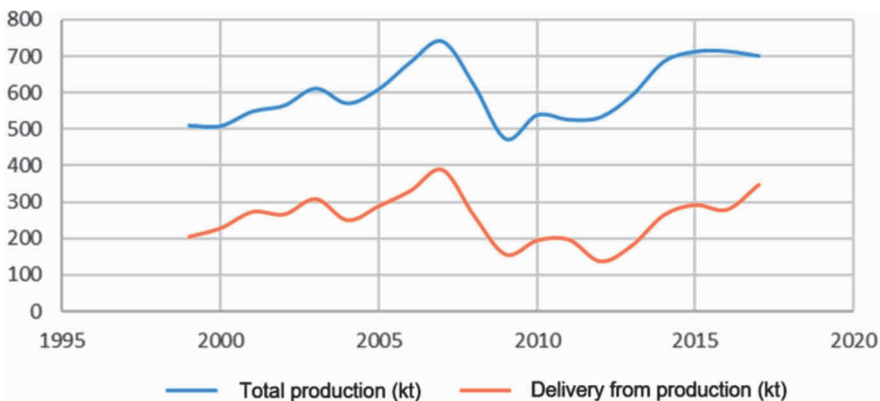


Figure 4 The rate of the use of drawn wires manufactured in the Czech Republic compared to the total production in the period since 1999 [6]

A low share of utilization of the finalized semi-finished products in a form of drawn wires meant in the given developmental period a fact that the given offered assortment due to the disconnection of the technological chain did not find a final customer. In its consequence, it means disappearance of the whole series of small branches complemented the bidding assortment for the final assembly. It is not an exception that the exported wires are returned to the investigated territory after several technological operations back as import of products, for example, for the paper, textile, glass and other industry, which also again builds a base of its future competitiveness.

3.3. Selected results of the marketing analysis

The performed marketing analysis deals, first of all, with sources of the future customer spectrum and sources of the future competitiveness in the investigated territory. The following knowledge was obtained from investigation of the meaning of the comprehensive technological chain within the branch of the products from wire and manufacturers from wire.

As was proved in investigation of sub-suppliers of a series of branches with an assembling character of the production, a big pressure on the reduction of prices due to a jump growing of productiveness of parts and components of the processing industry results in some manifestations of insufficient observance of the technological discipline, especially related to the metallographic structure. Quickly changing conditions and requirements for the material innovation require at the same time also increasing of the quality of the control functions always where input raw materials are being purchased.

Development trends of the world market of wires and products from them shows that these ecologic products have perspective branch in the future not only from the point of view of a wide spectrum of using, but mainly as an occasion for a wide spectrum of technical and technological innovations. The investigated territory is obtaining an occasion for the foundation of comprehensive technological chains, which are able to develop absolutely new material with functional properties, including nonstandard devices in branches with a high added value per one kilogram of production, such as products for medical equipment, components of aviation parts and details, space equipment and special technology in the sphere of textile, paper, glass industry, ceramo-metallic industry and powder metallurgy.

Just an illustrative example of samples of the tested rods from nonferrous metals for the next processing can be shown for documentation in **Figures 5** and **6**. Input material was delivered from the company KGHM Poland. In the structure of copper rod (diameter 8 mm) are visible inclusions (dark points in **Figure 5**) which can influence the next technological processes (forging and drawing of wires) and mechanical properties of final products. Therefore, is very important to use the row material with very high chemical purity for next applications.

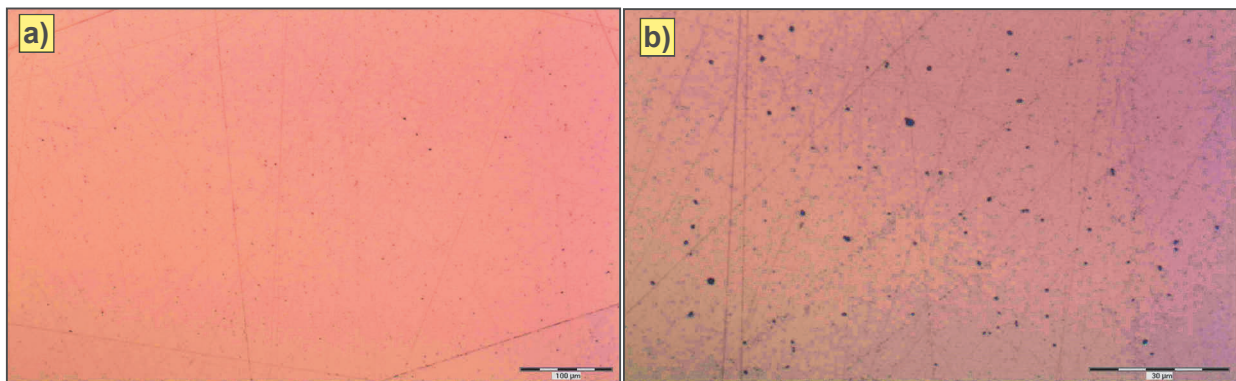


Figure 5 Longitudinal cut across the copper rod (diameter 8 mm) - producer: firm KGHM Poland. State: non-etched. There are visible Cu_2O inclusions with a size of up to $10\ \mu\text{m}$. Scales a) $100\ \mu\text{m}$; b) $30\ \mu\text{m}$ [7].

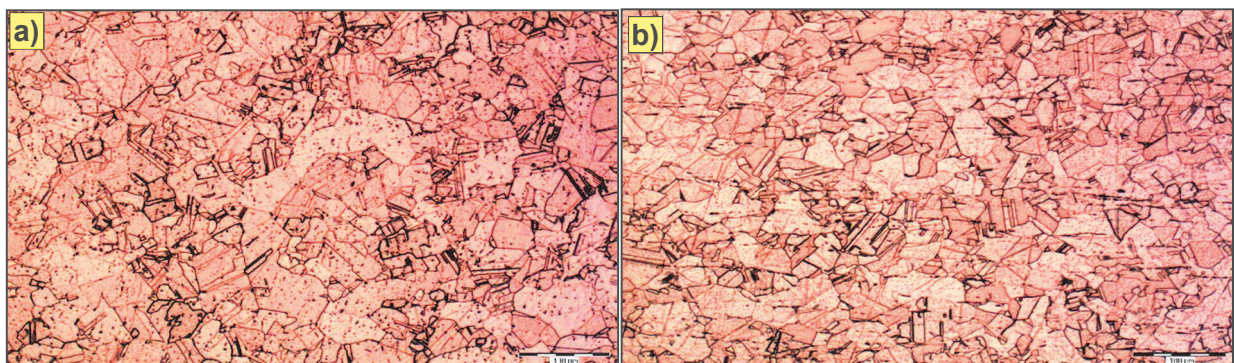


Figure 6 Transversal a) and longitudinal b) cut across of the copper rod, diameter 8 mm, supplier KGHM Poland. State: after etching. Scales: $100\ \mu\text{m}$. Structure has good quality after forming for following drawing of Cu wires for automotive industry [7].

4. CONCLUSION

The investigated territory of the Czech Republic in comparison with the actual and future market misses its own raw-resource base of primary ores and mineral resources essential for the growth of the economic potential. It is very complicated in this country, similarly as it is in countries with a similar structure of the industrial spectrum, to utilize maximally available inner raw materials and semi-finished products for a higher degree of finalization as a germ for the development of the innovative potential. One of the benefits, which we inherited, was an ability to manage in a wide range the technological spectrum of parts and components essential for the final assembly. Professional continuity of knowledge and skills, professional know-how in such branches as brushware manufacture, filtration equipment from wire fabrics, production of wire ropes for special purposes, etc., was gradually lost because of disconnection of the technological chains within the investigated time line. Why bolts used for vehicle assembly should be imported from South Korea (long distance). Despite of these facts, development and research for new branches such as medical equipment, textile and glass industry, aviation equipment, etc. appears to be perspective. A comprehensive technological chain is one of the sources of competitive benefits of small industrial territories in a combat with the Made in Global World products.

ACKNOWLEDGEMENTS

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