ECONOMIC SECTORS OF WROCLAW AND LOWER SILESIA

Mechanical engineering
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The machinery industry in Poland is characterized by dynamic development, which results from the growing number of domestic and foreign investments. Applied innovations increase the sector's attractiveness, as evidenced by the presence on the market of such giants as: ABB, Alstom, Robert Bosch, Bombardier Transportation, Whirlpool, GE Power Controls or Sauer-Danfoss. The share of international companies on the Polish machinery market confirms its compliance with global standards.

In Poland, all branches of the machinery industry are developed. Their dynamic development results from the presence of both domestic and foreign sales markets. Manufactured machines and devices are used in other industries, contributing to their development. Mutual stimulation of sectors results in general economic progress. Related industries supporting the development of mechanical engineering include automotive, aerospace, shipbuilding and rail vehicle manufacturing industries. With machinery industry products, these industries can improve their operations. In addition, the presence of the mining and metallurgy industries in Poland creates a demand for mining and processing machinery and equipment.

The main industrial centres, including the machinery sector in Poland, are the following provinces: Masovian, Silesian, Greater Poland and Lower Silesian. The largest number of machinery industry entities operate in Upper Silesia. This is due to the strong collaboration of machinery manufacturers with the mining industry.

**Industry location in Poland in 2016 by sold production [in PLN bn]**

The value of the sold production of machinery and equipment in individual years consists of the value of sold production of product groups according to the previously presented Polish Classification of Activities (PKD). In 2015, more than half of the Polish engineering industry was general-purpose machinery (64%). 19% of the sector are special purpose equipment. Machines designed for agriculture and forestry, as well as mechanical machines and tools accounted for 12% and 5% respectively.
Internationalization is the main characteristics of the machinery industry in Poland, which is reflected by the presence of foreign entrepreneurs on the market, as well as production for export. The total value of sales of exported machines and devices in 2016 amounted to over PLN 196 bn. It was significantly higher than in other industries, accounting for 24.46% of total Polish export, which constituted the largest percentage among all exported products (Central Statistical Office).

The main recipients of the Polish machinery industry products:

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>34 thousand</td>
</tr>
<tr>
<td>Russia</td>
<td>32 thousand</td>
</tr>
<tr>
<td>France</td>
<td>28 thousand</td>
</tr>
<tr>
<td>Norway</td>
<td>21 thousand</td>
</tr>
<tr>
<td>Belarus</td>
<td>19 thousand</td>
</tr>
<tr>
<td>Poland</td>
<td>17 thousand</td>
</tr>
</tbody>
</table>

Large volumes of sold production and the dynamic development of the machinery industry in Poland are due to the production of high quality machines. This is fostered by access to qualified research staff and research and development centres. In Poland, over 1.3 million students learn at state universities, and more than 250,000 of them study at engineering and technical faculties. Every year, the number of graduates is growing. In 2016, almost 69,000 new employees were graduates of engineering and technical faculties.

The largest technical universities in Poland:
Selected examples of companies from the mechanical sector operating in Poland

**Bombardier Transportation**

Bombardier has been operating in Poland since 2001 and is currently the largest international investor in the rail transport industry in the country. It employs over 1,500 people in four plants located in Katowice, Łódź, Warsaw and Wrocław. The company is involved in the production of railway and tramway rolling stock and railway equipment in Poland.

**UTC Aerospace System**

UTC Aerospace Systems is one of the world's largest suppliers for the aerospace and defense industries. Four plants operate in Poland in Wrocław, Kalisz, Krosno and Rzeszów. They manufacture, among others, fuel systems for aircraft engines and hydraulic components for flight control.

**Wabco**

Wabco is a global provider of technologies that improve the safety and efficiency of heavy goods vehicles. Wabco Polska consists of two production plants and R&D centre in Wrocław and a product regeneration plant in Stanowice near Oława. A total of more than 2,400 people is employed in both plants.

**Alstom**

An international brand involved in power engineering and transport infrastructure. In Poland, Alstom operates through two companies: Alstom Konstal S.A. with headquarters in Chorzów and Alstom Power S.A. with headquarters in Warsaw and branches in Wrocław and Łódź. Alstom Konstal manufactures trams, subway cars and components for high-speed trains, while Alstom Power manufactures steam and gas turbines, generators as well as turbine and ship casts.

**Pojazdy Szynowe PESA Bydgoszcz**

A Polish company from Bydgoszcz that manufactures rail vehicles: locomotives, multiple units, rail cars and trams. The first factories were established in 1851 as Zakłady Naprawcze Kolei Wschodniej Bydgoszcz. The company has been operating under its present name since 2001, focusing mainly on manufacturing rail vehicles. Currently, it employs over 3,000 workers. Vehicles manufactured by Pesa operate in 12 countries – Italy, Bulgaria, Romania, Russia and the Czech Republic among others.
Lower Silesia is one of the regions of Poland where the machinery industry develops the most dynamically. The attractiveness, great potential of growth and rich traditions of the region guarantee its leading place in the country. Many years of experience are the basis for expanding the activities of the currently thriving sector. Over the years, Wrocław companies, such as the Państwowa Fabryka Wagonów (Pafawag) or the still operating Fabryka Automatów Tokarskich (FAT), played a significant role in the Polish industry, and their current owners are foreign corporations that are world leaders in the machinery industry. The functioning of the Legnica-Głogów Copper District (LGOM) and the former hard coal and lignite basin in the vicinity of Wałbrzych also have a significant impact on the development of the regional industry. In Lower Silesia, a leading Polish company – KGHM – is also rapidly growing. Its activity, development strategies and technological innovations are dynamizing the sector. Currently, the Lower Silesia region is an ecosystem where both international corporations and domestic manufacturers of lifting equipment and grippers as well as mining and construction machinery operate.

The main products of the machinery industry in Lower Silesia:

- Mining machinery
- Engines and turbines
- Refrigeration and ventilation equipment
- Bearings
- Gear units
- Drive elements

In addition to the traditions of the region, access to qualified personnel is the foundation for the dynamic development of the mechanical engineering sector. In Wrocław, there are 26 universities where specialists in various fields of industry are educated. Wrocław University of Technology is a leading educational institution in Wrocław. It is considered one of the best technological state universities in Poland, where 34 thousand students study. The Faculty of Mechanical Engineering operating at the university was ranked by the Ministry of Science and Higher Education as one of the best faculties of this type in the country. Approximately 4,000 students are educated at the faculty. Technical faculties are also available at the University of Wrocław, University of Life Sciences and private colleges. In Lower Silesia, there are 96 vocational schools and 189 technical schools, in which almost 50,000 students are educated. The following Wrocław schools are worth mentioning: Technical School No. 23 (500 students, specialization: transport, logistics) and Technical School No. 6 (250 students, specialization: aviation, logistics, mechatronics).

In Wrocław, there are numerous scientific institutions of the Polish Academy of Sciences operating in the region as well as research and development centres. Their creation and development are possible due to the pro-innovation policy of territorial self-governments, access to qualified human resources, low labour costs and the region's attractive location. Lower Silesia is home to R&D centres of international tycoons (including Hewlett-Packard, Siemens, Volvo) and Polish enterprises (including KGHM Cuprum). The activity of the Wrocław Technology Park is also important. Among other facilities, Laboratory and Mechanical Prototype Shop, as well as the EIT+ Research Centre involved mainly in material engineering operate there.
Mechanical industry in Lower Silesia

Concentration of innovative products and services in the region and the development of industry through technological innovations are the purpose of their operation. Their potential is created by the so-called intelligent specializations including also mechanical engineering, which owes much to a large number of innovative enterprises (over 50%). Innovation means improving production and processes in the enterprise, as well as introducing new or modernized products to the market. Other advantages of mechanical engineering as a smart specialization include access to qualified personnel and modern research centres, the presence of both small and medium-sized enterprises, international tycoons as well as the region's experience and industrial traditions.

Clusters are an important element of innovation in Lower Silesia that provide production, educational, R&D and advisory services. Supporting the development of the region's economy and strengthening the competitiveness of enterprises operating in the manufacturing industry are also important task of the existing clusters. Clusters related to mechanical engineering in Lower Silesia include:

**CINNOMATECH**
It comprises of 21 members. The main goals of the cluster include: creating cooperation networks, increasing the innovative character of enterprises and manufacturers, developing and marketing innovative products and services.

**LOWER SILESIAN AUTOMOTIVE CLUSTER**
It is the first cluster of this type in Lower Silesia. It operates within special economic zones and is based on the collaboration of research units and manufacturing enterprises. Its task is to exchange experiences and information between members to support the innovative character of the Polish automotive industry.

**LOWER SILESIAN AVIATION CLUSTER**
It is formed by science centres and corporations that manufacture subassemblies for aviation. The cluster is supported by Lower Silesian Special Economic Zones. It also promotes the Polish aviation industry both nationwide and worldwide.

**LOWER SILESIAN METAL CLUSTER**
It gathers 13 companies from the metal industry from the Legnica-Głogów Copper District. It conducts promotional and R&D activities and international cooperation.

**LOWER SILESIAN NANOTECHNOLOGICAL CLUSTER**
It consists of nine companies involved in nanotechnology research. It aims at continuous improvement and introduction of innovations in the Polish economy.
The vast majority of the companies in the mechanical engineering sector are located near Wrocław, which – as the capital of the region – is the largest economic centre. Therefore, access to research units and qualified personnel with knowledge of foreign languages is easier. Infrastructure, which is very well developed in Wrocław, also plays a big part. In addition, such a location of enterprises is also conditioned by the ability to establish cooperation with other industries and access to markets. Wrocław dominates the production of locomotives and rolling stock, motor vehicles as well as general and special-purpose machines. Another large production centre in Lower Silesia is the area of KGHM’s operation. This activity concerns mainly the area of the Legnica-Głogów Copper District (LGOM), one of the leading copper mining sites in the world. This region creates a demand for machinery designed for mining and processing of materials. There is also the Legnica Technology Park where research and development centres operate.

**Distribution of companies from the machinery sector in Lower Silesia**
<table>
<thead>
<tr>
<th>Company</th>
<th>Production</th>
<th>Location</th>
<th>Country of origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB</td>
<td>Switchgear and power engineering systems</td>
<td>Wrocław</td>
<td>Switzerland</td>
</tr>
<tr>
<td>KGHM ZANAM</td>
<td>Mining machinery</td>
<td>Polkowice</td>
<td>Poland</td>
</tr>
<tr>
<td>ALSTOM POWER</td>
<td>Generators and stators for turbine units</td>
<td>Wrocław</td>
<td>France</td>
</tr>
<tr>
<td>GE POWER CONTROLS POLSKA</td>
<td>Drivers, sensors and switches</td>
<td>Kłodzko</td>
<td>USA</td>
</tr>
<tr>
<td>LEGRAND POLSKA</td>
<td>Instrumentation for control, protection, measurement and transformers</td>
<td>Ząbkowice Śląskie</td>
<td>France</td>
</tr>
<tr>
<td>BOMBARDIER TRANSPORTATION POLSKA</td>
<td>Multiple units, locomotives, tram and subway car frames</td>
<td>Wrocław</td>
<td>Canada</td>
</tr>
<tr>
<td>UTC AEROSPACE SYSTEMS WROCŁAW</td>
<td>Hydraulic systems for aviation</td>
<td>Wrocław</td>
<td>USA</td>
</tr>
<tr>
<td>PAFAL</td>
<td>Measuring devices for gas and electricity</td>
<td>Świdnica</td>
<td>Poland</td>
</tr>
<tr>
<td>SAUER-DANFOSS</td>
<td>Steering systems and hydraulic motors</td>
<td>Wrocław, Bielany Wrocławskie</td>
<td>USA, Denmark, Germany</td>
</tr>
<tr>
<td>PRZEDSIĘBIORSTWO HAK</td>
<td>Cranes and accessories</td>
<td>Wrocław</td>
<td>Poland</td>
</tr>
<tr>
<td>CHOFUM</td>
<td>Castings for machines used in industry</td>
<td>Chocianów</td>
<td>Poland</td>
</tr>
<tr>
<td>DOLNOŚLĄSKA FABRYKA MASZYN ELEKTRYCZNYCH</td>
<td>Machines and generators</td>
<td>Wrocław</td>
<td>Poland</td>
</tr>
<tr>
<td>MINE MASTER</td>
<td>Mining machinery</td>
<td>Złotoryja</td>
<td>Poland</td>
</tr>
<tr>
<td>RUDA TRADING</td>
<td>Mining machinery</td>
<td>Polkowice</td>
<td>Poland</td>
</tr>
<tr>
<td>METAL MASTER</td>
<td>Steel structures and their parts</td>
<td>Podgórzyn</td>
<td>Poland</td>
</tr>
<tr>
<td>DELAVAL</td>
<td>Machines and generators</td>
<td>Wrocław</td>
<td>Sweden</td>
</tr>
<tr>
<td>BOART LONGYEAR</td>
<td>Mining machinery</td>
<td>Kąty Wrocławskie</td>
<td>USA</td>
</tr>
<tr>
<td>ALUWIND</td>
<td>Steel structures and their parts</td>
<td>Bielany Wrocławskie</td>
<td>Denmark</td>
</tr>
</tbody>
</table>
Advantages of the Wrocław Agglomeration

1. LOCATION
Central location in Europe and favorable transport infrastructure (motorways and expressways) ensure good communication with the region.

2. INNOVATIONS
High level of Lower Silesia’s economic development and dynamic R&D facilities.

3. ACADEMIC CENTRE
The Faculty of Mechanical Engineering at the Wrocław University of Technology is considered one of the best faculties of this type in Poland.

4. HUMAN RESOURCES
Access to young, qualified personnel (over 11 million Poles are under 25 years of age).

5. EXPERIENCE AND TRADITIONS OF THE SECTOR
Rich traditions and experience of the machine industry in the region, particularly well developed mining and copper processing.

6. BUSINESS SUPPORT
Functioning of business support institutions and special economic zones.
The study was based on the following sources of information:

1) Statistical data and sectoral studies of the Central Statistical Office (GUS).
2) Data, analyses and sector presentations of the Polish Investment and Trade Agency (PAiIiH).
3) Data and information of the Wrocław Agglomeration Development Agency (ARAW).
4) Analyses, forecasts and information of the Ministry of Economy.
5) Information from the websites of Bombardier, Alstom, Pesa, UTC Aerospace System and Wabco
7) Information from the websites of scientific clusters: CINNOMATECH, Lower Silesian Automotive Cluster, Lower Silesian Aviation Cluster, Lower Silesian Metal Cluster, Lower Silesian Nanotechnology Cluster.
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