

COOPERATION BETWEEN SCIENCE AND BUSINESS. A CASE STUDY IN POLAND

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Resume: The aim of this study has been to characterise component parts of the business activity of the company JANPOL Sp. z o.o., and effects of the company's cooperation with researchers from the University of Warmia and Mazury in Olsztyn, Poland. The cooperation between science and economic practice is gaining importance as well. Such collaboration generates mutual benefits. Entrepreneurs are awarded grants which help their companies to develop and become more competitive. Researchers position their studies closer to practice, thereby contributing to the creation of a positive image of scientific research as having influence on economy and society.

Key words: renewable energy.

Introduction. The onset of the state transformation in Poland and the establishment of legal ground for private business enterprises led to the re-evaluation of the resources available to people in our country. Knowledge, creativity, innovativeness and entrepreneurship have been increasingly important since then.

The cooperation between science and economic practice is gaining importance as well. Such collaboration generates mutual benefits. Entrepreneurs are awarded grants which help their companies to develop and become more competitive. Researchers position their studies closer to practice, thereby contributing to the creation of a positive image of scientific research as having influence on economy and society. For the first time, a significant role of such mutually pursued efforts was taken into account in Poland in 2017-2021, when our country followed the example of West European states (criterion III in the evaluation of higher education institutions, i.e. 'The influence of scientific activity on the functioning of society and economy'). It is therefore pertinent to implement scientific findings in practice and to launch practical courses of studies for university students, in line with the demand on the labour market.

A positive development has been observable in Poland for many years, namely the increasingly stronger bonds between science and economic practice. More and more researchers set up own enterprises and commercialise the results of their research. An important role in the transfer of research and development to economic practice can be played by the business environment institutions, especially ones which are affiliated with research and development centres, centres for innovation and technology transfer and science and technology parks as well as business incubators.

Rational management of resources (human, tangible assets, natural resources) is becoming a driving force of companies as well as local communities, regions and,

consequently, the national economy. Creating entrepreneurial attitudes is an important task for local government on every level, but it should also take place at home and school. An expected positive result of such pro-entrepreneurial measures consists of desirable behaviours in various spheres of human activity, and especially in business.

Shaping and reinforcing the ecological awareness of citizens is essential in any country, and should be manifested in the implementation of environmental protection standards and in the strategic management of a company. Achievement of environmental quality goals is strictly connected with the level of ecological competence demonstrated by the society (i.e. knowledge of the environment, practical skills and eco-friendly motivation to alter attitudes and daily behaviours)¹⁷.

Methodological background. The aim of this study has been to characterise component parts of the business activity of the company JANPOL Sp. z o.o., and effects of the company's cooperation with researchers from the University of Warmia and Mazury in Olsztyn. Attention was paid to opportunities of operating a business in the area of modern technologies within the scope of renewable energy sources. The role of collaboration between science and practice was emphasised.

A face-to-face interview was conducted with the company's president. The research authors became acquainted with the operational procedures applicable to a waste transformation pyrolytic installation. Selected in-company documents were analysed. The theoretical part of the study was based on relevant references. Both descriptive and visual methods were used to present the collected facts and figures.

An example of collaboration between an entrepreneur and scientists in the areas of renewable energy and ecological education. The domestic energy industry in Poland generates about 90% energy from hard coal resources. This explains why diversification of energy sources, including renewable ones, and their development are crucial users (Marks-Bielska, Bielski, Novikova, & Romanekas 2019, Kurowska, Marks-Bielska, Bielski, Kryszk & Jasinskas, Marks-Bielska, Bielski, Pik & Kurowska 2020). Currently, most of biofuels are made from biomass. Biomass is believed to be the least capital intense and the most promising source of renewable energy in the energy mix. The relevant literature furnishes many of definitions of biomass; to quote the amended law on renewable energy of June 7, 2018, biomass is understood as "biodegradable parts of products, waste and biological remains of agriculture, including vegetable and animal substances, forestry, and related industries, including fishery and aquaculture, as well as processed biomass, in particular in the form of pellets, briquette, biochar and biocoal, and biodegradable parts of industrial waste or communal waste of vegetable or animal origin, including waste from

¹⁷ <https://www.gov.pl/web/klimat/edukacja-ekologiczna> (27.01.2021).

recycling installations and waste from water and sewage treatment, in particular sewage sludge, in accordance with provisions on waste related to the qualification of energy recycled from thermal waste processing” (Ustawa ..., 2018).

The European Union declares that it is necessary to develop second generation biofuels, where feedstocks are waste materials, useless for food or feed production, in order to effectively reduce CO₂ emission. Another important consideration is that second generation biofuels are of better quality than first generation ones, which means they are more readily accepted by the motor industry and vehicle users (Marks-Bielska, Bielski, Pik & Kurowska 2020, Marks-Bielska 2021).

Janpol Technologie Sp. z o.o. is a thriving company, busy in the sector renewable energy sources. The company attracted investors who wished to build photovoltaic installations to generate electricity from solar radiation. The company decided to meet the challenge and began to execute photovoltaic projects. Today, Janpol Technologies Sp. z o. o. takes orders and enters in public procurement competitions to install hybrid systems of lights to illuminate streets, pavements, playgrounds, etc. The company's further activities have been orientated towards the acquisition of investors to make small photovoltaic installations for households, i.e. small power plants generating electricity for own use.

In recent years, the enterprise has been concentrating on the development and implementation of a zero-waste pyrolytic installation (wider: Basau 2010, Klein, Kluska, Misiuk & Kardaś 2011) for the conversion of rubber waste, plastic waste and biomass to gaseous and liquid energy carriers, including the possibility of recycling the waste to economically valuable products.

Economic analyses, completed thus far in Poland and worldwide, in which different waste products were processed to be transformed to energy carriers have showed that pyrolysis is the most profitable form of obtaining ecological energy. The technology of pyrolytic conversion of waste and biomass feedstocks characterized by various properties responds ideally to the priorities set for the development of distributed energy systems in Poland.

Janpol Technologie Sp. z o.o. has dealt with pyrolysis since 2010. The firm has developed an innovative, highly efficient technology of conversion of waste rubber, waste plastics and biomass to gaseous and liquid energy carriers with an additional option of recycling them to economically valuable products.

Many people are now aware of the progressing degradation of the environment and try to counteract actively some undesirable changes, not only on the level of single households but also by proposing specific technological solutions, which could effectively help to tackle the problem of household waste. Teams composed of scientists and practicing engineers have been assembled, to develop and test new and often innovative technical solutions, with a wide range of applications in

practice. One of the outcomes of collaboration carried out in such a team was an application for a grant submitted to the National Fund for Environmental Protection and Water Management, to support the project titled *Development of an innovative, universal, zero-waste pyrolytic installation for transformation of rubber waste, plastic waste, sewage sludge and biomass to gaseous and liquid energy carriers, with an option to recycle waste to economically valuable products*, from the programme called Support for innovation fostering resource-efficient and low-emission economy Part 1. SOKÓŁ – implementation of environmental technologies¹⁸ (Marks-Bielska 2021).

The designed pyrolytic installation has been submitted to the Patent Office as the invention called: A way for utilization vehicle tires and plastic waste by pyrolysis. The patent application number 431515 was issued. This innovative solutions have enabled Janpol to achieve a competitive advantage in generating a pro-ecological effect relative to other existing solutions. The reduction in the negative impact on nature, compared with other solutions, is mostly achieved by a much lower energy consumption and consequently much lower emission of pollutants degrading the environment.

The company Janpol Technologie Sp. z o.o., apart from pyrolytic installations, is also involved in installing independent systems for generation of energy from renewable sources (e.g. solar collectors to heat water for household purposes, and photovoltaic panels). Janpol Technologie Sp. z o.o. makes a contribution to the development and dissemination of innovative technologies, but it also raises ecological awareness in society. According to the company's president, it is advisable to start and awake ecological awareness at the earliest possible level of education. The early pre-school years seem particularly appropriate for shaping new, eco-friendly attitudes and habits, as this is aided by the natural sensitivity and curiosity of young children towards the surrounding world, as well as their willingness to learn and act. The most challenging, but at the same time the most important task in ecological education is to break stereotypes and to change habits among children, adolescents and adults.

The most effective methods in education are active teaching strategies, which stimulate children's imagination and encourage them to act. Forms of ecological education and formation, connected with school education but carried out outside school buildings, are worth attention. Examples include shows and talks addressed to children and teenagers at different levels in the education system prepared by the company Janpol and given with the help of a nationwide unique mobile Educational

¹⁸The project was carried out under Grant Agreement no 2361/2017/Wn14/NE-po-ku/D of 9 October 2017 (Menager: Dr habil. Stanisław Bielski).

RES Platform. The inventor of this device (a set of equipment) is the company's president, Mr Jan Falkowski, who patented his invention. The patent's author had assembled different types of energy generating devices (a flat solar collector, a photovoltaic panel, an air source heat pump, a wind turbine and peripheral equipment) and created one, coherent system, which can be used to showcase how renewable energy sources work (Marks-Bielska 2021).

The educational events, organised under the umbrella of the Promyk Energii Foundation, which are dedicated to the issues of RES and conducted by the Janpol Technologie Sp. z o.o. staff members, are attended by employees of the University of Warmia and Mazury in Olsztyn (the authors of this report). An example is a highly popular series of lectures addressed to children and teenagers called 'Let's discover renewable Energy sources'. The lectures were held during the Olsztyn Days of Science, an annual feature in the calendar of scientific events at the University of Warmia and Mazury in Olsztyn. Apart from the theoretical part and workshops, the participants were able to find out about the practical applications of the RES Educational Platform.

Initiatives like the ones mentioned above are extremely important as they help to improve ecological awareness and shape pro-ecological attitudes in the general public, which is one of the key factors that can positively affect the current and future condition of natural resources (including air, water, soil, biodiversity), functions of ecosystems (such as forests, water bodies, mountains, farmland, etc.) and the quality of the environment in which we live (following such issues as waste management, Energy efficiency, adaptation to the ongoing climate change, mitigation measures, development of low-emission Energy sources)¹⁹.

Summary. The company Janpol Sp. z o.o. from Brzozie Lubawskie (Poland) is clearly an innovative firm. It has developed and implemented several sets of equipment and device, in-company designed, for handling and recycling ecologically harmful waste, and for energy recovery from waste. The execution of the project was made possible owing to cooperation with researchers from the University of Warmia and Mazury in Olsztyn, owing to the awarded grant, which provides funds for the planned research. The developed technological line for waste management is not known to exist in any other location. The preliminary results of studies conducted by the authors of this article indicate that the implementation of this solution is feasible. This technology will allow the acquisition of energy and reduction in environmental pollution. The designed installation for gasification and pyrolysis of diverse substrates now works as a demonstration plant, and the company are making efforts to assign to this project the commercial status. Another finding

¹⁹ <https://www.gov.pl/web/klimat/edukacja-ekologiczna> (27.01.2021)

that confirms the creativity of the company's president and managers is the development and commercialisation of the RES Mobile Educational Platform (this invention has been patented). Ecological education is an important component in education (from earliest years of age) aiming to educate a society which accepts interdisciplinary rules of permanent and sustainable growth of their country, able to evaluate the state of ecological safety, to take steps in order to improve thereof, and to care about the shared cultural and natural heritage.

All these priceless initiatives and activities, carried out successfully by the entrepreneur, take place in collaboration with scientists from the University of Warmia and Mazury in Olsztyn and from other R&D centres in Poland. Both the researchers and the company's management and staff highly appreciate this cooperation.

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<https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20160000831/T/D20160831L.pdf> (accessed on 9 July 2020) (in Polish).



Fig. 1. Installation of waste pyrolytic transformation

SOURCE: JAN FALKOWSKI



Fig. 2. Mobile Educational RES Platform

SOURCE: JAN FALKOWSKI