

# Smartpol

materialy inteligentne

Smartpol company was founded in 2006 by Wojciech Klein, PhD, Eng., who during creation of the company was a doctoral student and employee of Department of Applied Mechanics at Faculty of Mechanical Engineering of Silesian University of Technology.

Activity of Smartpol is based primarily on **production and sale of actuators made of alloys with shape memory** such as Nitinol (perfectly suitable for construction of actuators activated by an external source of heat) and Flexinol (indispensable in construction of miniature actuators). The main features of this type of actuators are small size and low power consumption or its complete absence in case of activation by an external source of heat and in addition they successfully replace the previously used solutions. The company's offer also includes magnetorheological fluids (dedicated, for example, to build silencers and couplings). Furthermore, in order to broaden the market, the company offers its clients advice in the area of design and implementation of products based on smart materials and thanks to big experience ensures development of the best solution, which would be cheaper and more reliable than the previous one.<sup>1</sup> In order to show to customers the potential of smart materials, the company has also designed a series of devices demonstrating their physical properties.



## Technology – source of the innovative idea

Smartpol company was created as a result of dynamic development of science in the area of intelligent materials. Wojciech Klein, student and later doctoral student of Department of Applied Mechanics at Faculty of Mechanical Engineering of Silesian University of Technology, became interested in materials with shape memory already during his studies. Then he conceived the idea of continuation of this theme in the doctoral thesis "Optimization of features of dynamic vibration reduction systems made of smart materials", defended with honors on 7 May 2008. Knowledge regarding smart materials and experience gained during researches conducted while writing the doctoral thesis finally led to the creation of Smartpol.

Metal alloys with shape memory are alloys which shape can be programmed and after bending or other deformation of the material it will return to the original programmed shape under the influence of an appropriate temperature. Thanks to these properties, the alloys can be used for various kinds of sensors reacting e.g. to temperature. If we create a valve of the smart alloy, when the ambient temperature is too high, the alloy will change its shape to cause opening or closing the valve. This property can be applied in everyday products such as taps, protecting children from scalding with hot water. Moreover, in everyday life alloys with shape memory can be applied in medicine, robotics, automotive and aerospace industry.<sup>2</sup>

At the time of establishing Smartpol (in 2006) alloys with shape memory have been known to American and Japanese scientists, while on the Polish market they were practically unavailable, not to mention their common and commercial use. The young scientist, who has decided to create a company while still writing his dissertation, wanted to start production of prototypes of "smart" valves as soon as possible, so that others will not overtake him in entering on the Polish market, virgin in terms of their use.

<sup>1</sup> <http://www.smartpol.pl/uslugi.html>

<sup>2</sup> Ciszewska B., *Mieć pomysł i odwagę*, Rzeczpospolita, supplement „Ludzie i gospodarka”, 24.03.2006 and *Interes z wynalazkiem*, Dziennik Zachodni no. 17, 12 June 2006.

## R&D activity and cooperation with the scientific community

Wojciech Klein - founder and owner of Smartpol had no experience in running a business while creating his company. The idea of his own business was the result of Klein's scientific interests and finding a niche related to a small availability of smart materials on the Polish market. Wojciech Klein was convinced that the actuators made of metal alloys with shape memory are able to replace the previously used conventional solutions and can be used e.g. in medicine, robotics, automotive and aerospace industry.

Creation of SMARTPOL was also affected by Klein's participation in two editions of the competition "My business idea" where the young scientist had a chance to check how the experts assess his business project. In the third edition of the competition, the Klein's project "Teaching aids illustrating the physical phenomena of smart materials and their applicability in technique" has been submitted in the category of "students / doctoral students", and has been awarded with honors with a financial prize of 2.500 zlotys. In the fourth edition of the competition, more important for the company, Wojciech Klein submitted the project "Automatic anti-scalding valves and automatic air vents using metal alloys with shape memory in domestic and industrial applications".<sup>3</sup> In the fourth edition of the competition "My business idea" the jury did not award the first prize and Wojciech Klein won the second prize of 20.000 zlotys. The award allowed Klein starting his own business.

The next step was to find a suitable location for the company. Also here the young entrepreneur was lucky, because in 2005 municipality of Gliwice, Silesian University of Technology and Katowice Special Economic Zone established "Technopark Gliwice" which relatively quickly welcomed the first companies including Smartpol of Wojciech Klein. But before the young scientists could start working in "Technopark Gliwice", previously they had to pass through a strict qualification process. In each case, to evaluate an innovative idea two reviewers were appointed, whose task was to assess whether the project is innovative and if the idea has a chance to be commercialized on the market. After receiving a positive opinion the beginning businessmen could count on a grant to implement their business ideas, as well as on training, during which they were taught to develop a realistic business plan and already with a prepared business plan the young entrepreneurs founded their businesses in "Technopark Gliwice".<sup>4</sup> Wojciech Klein says about the opportunities offered by one's own business and its appropriate location: *"I think it is worth to risk and realize your objectives by opening a business. Although the start is not always easy, the subsequent possibilities fully compensate the work invested in creation of one's own business. Technopark is an institution which plays an important role in supporting entrepreneurship and promoting innovative technologies. Modern building of Technopark will be a big asset for me."*<sup>5</sup>

Location of Smartpol company in "Technopark Gliwice" had, as Wojciech Klein emphasizes – one more aim – *"My objective was to better enhance cooperation with the university"*<sup>6</sup>, and also here the young scientist succeeded, because technical universities including Silesian University of Technology became his target group of customers. SMARTPOL permanently cooperates with Silesian University of Technology, where, among others, research and development works on applications of smart materials are carried out. Thanks to cooperation with specialists from Silesian University of Technology the products offered by the company and related technologies can be improved continuously.

Wojciech Klein willingly shares his knowledge about smart materials and their practical use, e.g. through participation in national and international conferences and symposiums, such as: international symposium of the Institute of Mechanical Vehicles and Transport "Improving the structure and methods of exploitation of motor vehicles", VEHICLES 2009, scientific conference "Problems of

<sup>3</sup> [http://forumakad.pl/archiwum/2006/06/04\\_kronika.html](http://forumakad.pl/archiwum/2006/06/04_kronika.html)

<sup>4</sup> Ciszewska B., „Mieć pomysł i odwagę”, Rzeczpospolita. Ludzie i gospodarka. 24.03.2006, <http://forum.gkw24.pl/gkw/forum/phpBB3/viewtopic.php?f=29&t=138&start=20>

<sup>5</sup> "Wyobrażenia tworzą rzeczywistość, Śląski System Innowacji", publication in the framework of the project „Management Unit of the Regional Innovation System in śląskie voivodeship “ project co-financed by European Social Fund and state budget, Katowice 2007, [http://www.ris-silesia.org/pl/pliki/broszura\\_jzris\\_2007.pdf](http://www.ris-silesia.org/pl/pliki/broszura_jzris_2007.pdf)

<sup>6</sup> Polok-Kin M., Trzeba znaleźć niszę, 2007-01-29, <http://koscierzyzna.naszemiasto.pl/artykul/196335,trzeba-znalezc-nisze,id,t.html>

development of working machines" or symposium "Modeling in Mechanics"<sup>7</sup>. In addition, Klein is involved in projects addressed to students, such as "Start in business", in cooperation with six universities: Silesian University of Technology, Karol Adamiecki University of Economics, University of Bielsko-Biala, Czestochowa University of Technology, General Jerzy Ziętek Silesian School of Management and University of Silesia. Within the cycle of classes taking place during the mentioned event, among others during the "Role models" cycle, meetings of those who succeeded in business with those who are just thinking about starting their own business are organized.<sup>8</sup> The strength of the event are both potential of the region's leading universities as well as the possibility to gain practical knowledge from people who have already passed the process of setting up their own company and commercialization of their own scientific ideas and they know both the benefits of owning one's own business, and traps, into which young entrepreneurs can fall, for example, guided by an excessive enthusiasm or a bad assessment of market realities.

### Searching for market niches

In case of Smartpol, finding a market niche turned to be very easy. Wojciech Klein realized, during his research carried out within the doctorate (before starting a business), that purchase of metal alloys necessary for research in Poland is almost impossible, because there is no company - distributor who would be able to import intelligent metal alloys from the United States or from Germany. Smartpol from the very beginning was the only company that allowed it, and in addition offered **production and sale of actuators made of alloys with shape memory as well as individual advisory for clients interested in using products based on smart materials**. It should be noted, however, that a niche where the young company found its place, was very narrow, and although Smartpol was the only company in Poland with such a business profile, able to import the mentioned metal alloys, the circle of customers was and is very narrow, they are mainly technical universities in all Poland and research institutes which can not import the materials handled by the company themselves from abroad due to bureaucratic barriers.

### Development of cooperation with science. Barriers and critical moments.

It is impossible to talk about the first contact between Smartpol company and the scientific community of Silesian University of Technology, because they are connected by the closest cooperation. The company was created by a doctoral student and employee of Department of Applied Mechanics at Faculty of Mechanical Engineering of Silesian University of Technology - Wojciech Klein, who did not want to waste time and wait until the foreign offers will fill the niche for smart alloys noticed on the market and created Smartpol. The company's business profile was a direct result of the scientific interests of Klein and research carried out within his doctoral thesis. Good cooperation with Silesian University of Technology was also connected with the fact that the scientific community of technical universities was Smartpol's target group of customers.

Smartpol was in the top four companies, which started business in "Technopark Gliwice" created in 2006, which statute activity is assumed to combine science and business, giving the opportunity to implement innovative ideas for all the interested units, offering rooms and helping them financially and substantively.

Basically there were no barriers in the company's cooperation with Silesian University of Technology, because Wojciech Klein was not a "person from nowhere", first he was a student, then a doctoral student of prof. Arkadiusz Mężyk, PhD, Eng. He was also one of the first four people whose companies have received a positive opinion of reviewers and could start business in "Technopark Gliwice", an initiative created by municipality of Gliwice, Silesian University of Technology and Katowice Special Economic Zone S.A.

The only barrier that should be mentioned is related to the administrative barriers at universities, which are connected with signing complicated contracts, while ordering to universities, including Silesian University of Technology, performing researches for the company, researches, which can be carried

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<sup>7</sup> Szcześniak A., Smartpol, Gliwice, <http://www.przeznaukedobiznesu.pl/cms/files/upload/files/Bank-Aplikacji-Biznesowych/Smartpol,-Gliwice.pdf>

<sup>8</sup> [http://proregio.org.pl/pl\\_PL/left\\_menu/alias/fundusze-i-nauka/wspomaganie-kompetencji-pracownikow-instytucji-badawczych](http://proregio.org.pl/pl_PL/left_menu/alias/fundusze-i-nauka/wspomaganie-kompetencji-pracownikow-instytucji-badawczych)

out only in university laboratories. Moreover, in case of large orders and contracts all decisions concerning activities and obligations of the university in cooperation with a private company shall be taken at the highest legal and administrative levels of the university, which extends the time of decision making and consequently realization of the project.

After several years of close cooperation with Silesian University of Technology, the company Smartpol was able to accept the existing system of cooperation and develop a methodology of dealing with large projects and though administrative burdens were not decreased, the projects are being realized, but it should be mentioned that in case of smaller contracts bureaucratic responsibilities are smaller and not so onerous.

The most critical moment was connected with implementation of the product, which was assumed to be the first and flagship product of Smartpol. Wojciech Klein was the laureate of the competition "My business idea", under which he presented the project "Automatic anti-scalding valves and automatic air vents using metal alloys with shape memory in domestic and industrial applications". The result of the presented project was implementation in production of a specific product - the automatic anti-scalding valve, for which, in the framework of the competition Wojciech Klein has created a business plan which has been estimated by the organizers of the competition. It turned out that, although good, the business plan developed by Klein and evaluated by the specialists is not feasible for Klein for such a prosaic reason as a lack of sufficient funds. To tell the truth, the determined and undiscouraged scientist later recalculated costs of realization of the project, which turned out to be lower than assumed by the organizers of the competition, but still unattainable for one person and just starting Klein's company, because the rate of profitability was at least 5000 pieces per year. It was an unattainable level for the company, because Smartpol and the product offered by the company were not known yet. The entrepreneur tried to sell the idea in large industrial centers, but no one wanted to devote time and attention to explore the possibilities of the innovative product offered by Klein, which implementation was finally postponed to an undetermined time.

## The milestones

**2005** - start of PhD studies by the owner of Smartpol - Wojciech Klein.

**2005** - participation in the third edition of the competition "My business idea" in the category of "students / doctoral students", in which the project of Wojciech Klein "Teaching aids illustrating the physical phenomena of smart materials and their applicability in technique" has been awarded with honors with a financial prize of 2.500 zlotys.<sup>9</sup>

**2005** - foundation of Smartpol.

**2006** - application of the company Smartpol to "Technopark Gliwice" (obtaining funds within the activity of Technopark, benefiting from trainings, creating business plan and starting business within "Technopark Gliwice" during its creation).

**2006** - participation in the fourth edition of the competition "My business idea" and receiving the second prize of 20.000 zlotys for the project "Automatic anti-scalding valves and automatic air vents using metal alloys with shape memory in domestic and industrial applications".<sup>10</sup>

## Sources of financing

Smartpol, though created by a scientist, had no capital relations with Silesian University of Technology or other universities. The company was established with involvement of private funds of its owner Wojciech Klein. The creation of the company was also facilitated by the financial award in the amount of 20.000 zlotys, received by the young scientist for the second place in the fourth edition of the competition "My business idea". It was also helpful to locate the company in "Technopark Gliwice", where the beginning companies could count on a little financial support, funded by Vattenfall of Gliwice (formerly Upper Silesia Electrical Power Engineering Department). The first four companies, including Smartpol, received a total amount of 100.000 zlotys.<sup>11</sup>

<sup>9</sup> <http://www.kariera.polsl.pl/konkurs/laureaci.htm>

<sup>10</sup> [http://forumakad.pl/archiwum/2006/06/04\\_kronika.html](http://forumakad.pl/archiwum/2006/06/04_kronika.html)

<sup>11</sup> Ciszewska B., Mieć pomysł i odwagę, „Rzeczpospolita.” Ludzie i gospodarka, 24.03.2006.



Wojciech Klein during creation of the company and within the projects implemented by the company did not benefit from EU funds. One of the reasons was the fact that when Smartpol has been created, Polish organizations distributing EU funds were still just beginning. Another reason was the fact that the use of such measures was associated with involving so-called own contribution, which the young entrepreneur while starting his business simply did not have.

### Benefits from the cooperation of business and science

For Wojciech Klein the main advantage of his close cooperation as a doctoral student with Silesian University of Technology was primarily **creation of the company Smartpol**. The company's founder, interested in smart materials, had the opportunity to observe the development of this field of science. This way he noticed an opportunity to commercialize research and development works, which he conducted at Silesian University of Technology. In addition **Silesian University of Technology**, like other technical universities in Poland, **was and is the primary receiver of alloys with shape memory imported by the company**. Thanks to Smartpol **Silesian University of Technology has access to the product (alloys with shape memory)**, which without the Polish company would be difficult or even impossible, among others due to the complicated administrative and legal procedures related to their import.

Thanks to close and good cooperation with Silesian University of Technology, particularly with his parent department, the owner of Smartpol has the possibility **to order at the university these researches**, which can not be carried out within his own business because they can be conducted only by scientists of Silesian University of Technology in its specialist laboratories. Thanks to researches ordered by Klein, employees of the university have the opportunity to participate in researches of innovative products.

Smartpol is a niche company; its offer is addressed to a very narrow circle of customers, though the possibilities of use of smart alloys with shape memory in everyday life are wide and diverse. Unfortunately product development requires above all money, so in the near future Wojciech Klein wants to begin to obtain EU funds for micro enterprises.

In addition, the owner of Smartpol has noticed an opportunity of development in extending his business to another branch and created OPTIMSOFTE company involved in the implementation of applications of engineering support and optimization methods in engineering problems, which is currently being developed and about which the owner has big plans for the future. Within the works carried out in the company OPTIMSOFTE one of the newest ideas in the field of process optimization is planned to be implemented, i.e. to start a set of customer services for the public sector, using the developed algorithms. The system would be adaptive, which means that it could learn. With such a system it would be possible to determine e.g. the number of potential customers (for example at the post office) in a given period or day, or make changes in the way indicated by the system, optimizing operations of the office. Wojciech Klein works on implementation of a new idea together with a group of professionals employed by him. The company OPTIMSOFTE using previously gained knowledge and experience is looking for new customers interested in improving procedures and solutions used by them.

### Key factors of success

The key factors of success include first of all a **huge knowledge** of the founder of Smartpol acquired thanks to his substantive preparation and scientific interests regarding smart materials, i.e. the alloys with shape memory and which enabled the decision to create the company. Establishment of the company required also **courage, determination and extraordinary diligence**, which let Wojciech Klein overcome obstacles occurring on the company's way of development, such as: combining scientific work with running a growing business and personal life, lack of external financial resources necessary to create the company or increasing administrative difficulties connected with signing contracts between Smartpol and universities. Thanks to the **skills to recognize opportunities** and through **development of existing professional interests** Klein has created another company - OPTIMSOFTE of a different than Smartpol business profile, which now draws much of his attention.