Polski
Produkt
Przyszłości

2023

Produkt Przyszłości

Awards Catalogue

25 th Annual Competition Polish Product of the Future

PARP
PFR Group

NCBR
National Centre for Research and Development

The Polish Agency for Enterprise Development (PARP) is a government agency reporting to the Minister for Regional Development. The agency's goal is to implement economic development programmes supporting the innovative and research activity of small- and medium-sized enterprises (SMEs), regional development, increased export, human resource development, and the use of new technologies in business activities. PARP is an active participant in the creation and effective implementation of the country's policy regarding entrepreneurship, innovation and adaptability of human resources, being the key institution responsible for creating an environment that supports entrepreneurs.

The National Centre for Research and Development (NCBR) is a government executive agency. For over 15 years, the Centre has been combining the world of science and business, creating the right conditions for research and development work to be carried out. By co-financing R&D processes, it supports domestic entrepreneurs, significantly decreasing their business risk associated with the implementation of ground-breaking research projects. The mission of the National Centre for Research and Development is the implementation of tasks supporting the social and economic development of Poland and solving specific civilisation problems of its inhabitants.

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and Development

Co-financed with

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Ladies and Gentlemen!

We present to you the catalogue of the unique, jubilee edition of the Polish Product of the Future Competition, which has been identifying and promoting innovative products and technologies of our domestic entrepreneurs and scientists for a quarter of a century. Over the Competition's 25-year history, over 1,600 innovative projects have been submitted. From these, we've chosen the most progressive ones with a chance to make it on both – the domestic and global markets. To date, 64 projects have received awards, and 168 have been recognised. For years, the Competition has experienced unwavering interest. Thanks to this, the winners can successfully develop their products and technologies. Almost 150 innovative projects have been submitted in the 25th edition. The dominant ones were from the area of industrial processing and the production – e.g. electronic and medical products or devices, machinery, as well as chemical products. Software-related solutions were also represented in large numbers. Each edition of the Polish Product of the Future Competition confirms our belief that Polish entrepreneurs and scientists adapt to the changing reality at a rapid pace and create solutions that meet the needs of modern people and the world. We hope you enjoy reading it, and encourage you to participate in the next editions of the Polish Product of the Future Competition.

Dariusz Budrowski
President of PARP

dr Jacek Orzeł
NCBR Director

About the competition

History

The 25th edition of the Competition has seen 148 entries. The best ones – which were awarded and recognised – are outlined in this catalogue. The profile of the projects submitted in this edition of the Competition is very extensive. Using the PKD classification and codes specified by Competition participants for submitted products, we can see that the biggest group is solutions in the area of industrial processing and those related to the production of various goods (72 solutions). The largest part concerns the production of computers, electronic and optical products, the production of medical equipment, instruments and devices, the production of machinery and equipment, as well as the production of chemicals and chemical products. There are also many solutions in the area of information and communications (32), in particular, those related to software. Another large group revolves around professional, scientific and technical activities (20 solutions), including scientific research and development works in the field of natural and technical sciences, and biotechnology. The goal of the Polish Product of the Future Competition is to identify and promote

innovative goods and technologies that have been developed in Poland and have the potential to make it not only on the domestic market, but also globally. The project is co-organised by the Polish Agency for Enterprise Development and the National Centre for Research and Development. PARP supports the innovation and research activities of small- and medium-sized enterprises, while NCBR backs the development of Polish scientific units and businesses. The winners are selected by a jury consisting of representatives of the most important institutions in the country: Chancellery of the President of the Republic of Poland, Chancellery of the Prime Minister, Ministry of Development Funds and Regional Policy, Ministry of Development and Technology, Ministry of Education and Science, Patent Office of the Republic of Poland, Polish Development Fund, Polish Federation of Engineering Associations, Industrial Development Agency, Polish Agency for Enterprise Development, National Centre for Research and Development, Warsaw University of Technology, and the University of Warsaw.

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Special awards

Safe hybrid hydrogen storage with high energy density and continuous leak monitoring.

Description of the solution

IHPP PAS participates in the NCBiR Hydrogen Storage program, implementing the project entitled: “Safe hybrid hydrogen storage with high energy density and continuous leak monitoring”.

As a result of the project, a high-pressure double-shell hydrogen storage tank with a HDPE liner was created, in which the hydrogen tank is placed inside an additional tank that forms a “supporting volume”.

Here are the basic parameters of the presented tank:

- capacity of the basic module of the tank = 30 dm^3,
- “supporting” capacity = 30 dm^3,
- total mass of the container without hydrogen = 75 kg,
- total volume of the tank = 100 dm^3,
- maximum hydrogen pressure in the working volume = 150 MPa,
- maximum hydrogen pressure in supporting volume = 70 MPa,
- quantity of hydrogen stored = 3,1 kg,
- mass energy density ρm = 1,37 kWh/kg,
- volumetric energy density ρv = 1,00 kWh/dm^3.

Pic. KUKA robot during tank winding.

Introduced innovations

The use of a unique double-shell tank design and an innovative tank pumping system cause that the “supported” tank with max. hydrogen pressure of 150 MPa is stressed like a single-shell tank with a pressure of 70 MPa.

Use

The target recipient of the product can be:

- manufacturers of cars, trucks, buses, aircrafts, helicopters, drones, etc.,
- large companies that use tanks as part of a hydrogen storage system at wind or photovoltaic farms,

- small customers using a hydrogen tank for home energy storage,
- producers and owners of stationary and mobile hydrogen distribution points.

The presented double-shell tank can be used in:

- mobile devices such as cars, trucks, buses, planes, trains, forklifts, drones, etc.,
- stationary energy storage,
- mobile energy storage.

Implementation status

The product has reached (at least) the TRL6 technological readiness level. During the design of the tank, a patent application was filed, which was accepted. The creators of the solution received patent No: P.436842.

Benefits of using the product

A wide range of applications of the described solution generates numerous benefits associated with its use. These include:

- reduction of greenhouse gas emissions,
- air purification,
- solving the problem of energy deficits,
- full use of the gift of nature in the form of solar energy,
- diversification of access to energy resources by creating an alternative energy source that makes us independent of classic fossil fuels.

The IHPP PAS has developed a high-pressure double-shell hydrogen storage tank with an HDPE liner with a maximum working volume of 60 dm^3.

Comparison with the current state of the art

The creators did not note the functioning of construction solutions that can be compared in terms of features and properties to the reported product.

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HydroGEN – Innovative solid oxide electrolyser for emission-free hydrogen production.

Description of the solution

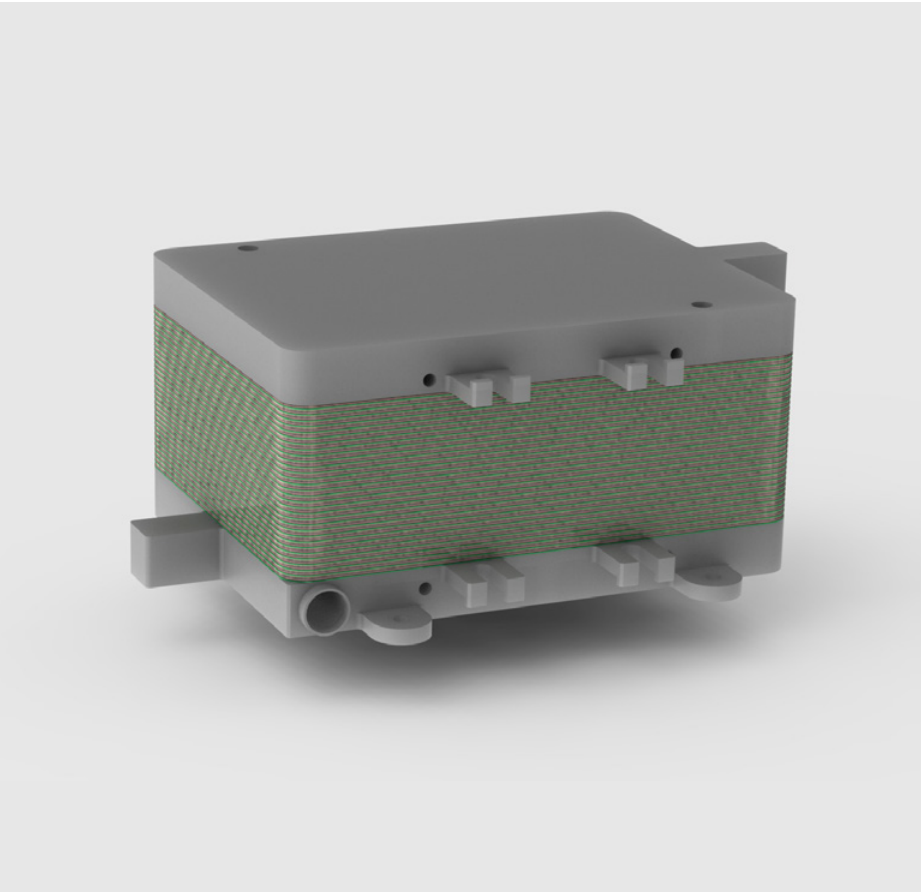
HydroGEN – solid oxide electrolyser – is a technology enabling high-efficiency production of zero-emission hydrogen. HydroGEN can be successfully implemented in various sectors of the economy, including energy, chemical, and petrochemical industries as well as transport. The product is characterized by high efficiency as it requires the lowest energy input to produce 1 kg of H2 compared to other types of electrolysers. Furthermore, the technology is able to use surplus energy from intermittent RES by converting electricity into chemical energy stored in the form of hydrogen or its derivatives (synthetic fuels).

Introduced innovations

The key innovation of HydroGEN is the use of novel methods for production of components, i.e. application of 3D printing and high-pressure injection molding of ceramics. These techniques are efficient, repeatable, and waste-free. HydroGEN helps to reduce the use of critical raw materials. This is a novelty at the domestic and European markets.

Use

HydroGEN can stimulate the decarbonization of the chemical, petrochemical, and other emission-intensive industries, including hard-to-electrify sectors. The implementation



Pic. Electrolyser SOE containing dozens of SOC cells connected to each other

of SOE electrolysers allows not only to reduce CO2 emissions but also to increase the overall energy efficiency of numerous industries supporting the efforts in establishing green economies.

Implementation status

In 2022 the 10 kW-class system based on HydroGEN was commercially delivered and integrated with a large-scale biomass-fuelled CHP plant within a joint activity of CTH2 IEn and Faraday's Research Center (ORLEN Group). Another 30 kW-class installation is currently under construction and will be commissioned and integrated with an industrial installation in 2023. The work is part of the VETNI project (financed by the NCBR, Poland) carried out in cooperation with the ORLEN Group and AGH University of Science and Technology.

Benefits of using the product

HydroGEN powered by RES produces emission-free H2, stimulating the development and growth of hydrogen market across industries, which is one of the pillars of a climate-neutral economy. The use of HydroGEN offers the following benefits: social and ecological (reduction of CO2 emission, improvement of the overall efficiency of processes, minimization of waste during production of electrolysers), economic (support of the development and energy diversification of industries and the energy sector, reduction of the dependency on fossil fuels, lower energy consumption, lower levelized cost of H2, maximization of the energy efficiency of various processes).

Comparison with the current state of the art

In comparison with alternative solutions (alkaline and PEM electrolysers), HydroGEN offers outstandingly high efficiency, therefore lower energy consumption. There is no need for deep purification of water which is supplied to the device. SOE does not require expensive catalysts based on precious metals. Device can be thermally integrated with industrial and power installations, which gives additional economic benefits as the coupling helps to reduce process inefficiencies.

HydroGEN – a technology that enables decarbonisation of key industry sectors, supporting the development of the hydrogen economy.

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Hogweed – a device for microwave destruction of invasive plants.

Description of the solution

The device has its own drive, and it moves on a caterpillar chassis, so it can be used in areas with difficult access. Such a drive system does not damage the ground, because the rubber tracks exert low unit pressures on the terrain. The vehicle is remotely controlled by a radio remote control, from which you can start mowing or irradiation with microwaves of the indicated area overgrown with unwanted plants. Its operation via the remote control is intuitive and safe in terms of being in close proximity to plants, e.g. Caucasian hogweed, which are dangerous to human health and even life, due to photoactive compounds, mainly furanocoumarins, causing severe burns in humans and animals.

Use

The constructed device is completely innovative due to its effectiveness, while being environmentally friendly. Microwaves, acting on the soil, also cause its purification, e.g. from allelopathic compounds secreted by IAS. The developed microwave technique for controlling these plants can be used in environmentally protected areas.

Pic. Hogweed – a device for microwave destruction of invasive plants – photo from the side

Implementation status

The creators established cooperation with the Ministry of National Defense, where the mentioned microwave technology was highly appreciated, which resulted in the signing of a letter of intent between the Ministry of National Defense and the UR in Krakow to write a LIFE project, the purpose of which is to combat Caucasian hogweed in areas under the jurisdiction of the Ministry of National Defence. The microwave device was implemented i.a. in field conditions for the destruction of IAS in the area belonging to the Municipality of Krakow.

Benefits of using the product

The main advantage of the developed self-propelled device and the method of its application is effectiveness.
If the device is used, there is certainty that burdensome IAS will be eliminated

without the introduction of harmful and dangerous chemicals. A single microwave irradiation of undesirable plants is enough to completely eliminate them.

Comparison with the current state of the art

Currently, herbicides dominate the control methods of IAS, but due to concerns about their negative impact on habitats and human health, producers are under constant pressure from legal requirements. Mechanical methods, on the other hand, are labor-intensive and ineffective. Both chemical and mechanical methods of IAS elimination are highly cost- and time-consuming. The mechanical fight against these plants consisting in repeated cutting may not be very effective, because they can regenerate from underground parts and seeds. Thus, mechanical and chemical methods eliminate the symptoms, i.e. growing plants. They do not eliminate the causes, which for many species are seeds and underground shoots. The microwave IAS control technique reduces the population of these plants also from seeds, inhibiting the germination, growth, and development of new plants. So far, there are no known devices on the market with a similar effect, so this device is highly innovative.

HOGWEED – a self-propelled robot for microwave destruction of plants of invasive alien species (IAS), in particular Caucasian hogweed.

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UNIWERSYTET ROLNICZY
im. Hugona Kołłątaja w Krakowie

W2H2 Waste to Hydrogen.

Description of the solution

The patented reactor is a sealed and insulated steel tank where the waste is pyrolysed (decomposed, not burned) at temperatures up to 850°C.
At the inlet of the reactor, the raw material, i.e. waste, is fed continuously, at the designed rate of 200 kg per hour. In the same way, high-calorific syngas is collected at the exit. Laboratory tests of gas samples obtained in the prototype reactor confirm that the syngas composition is dominated by H2 (about 50%) and other combustible gases (about 45%).

Introduced innovations

The key and unique feature of the reactor is its tight construction, which forces the flow of pyrolysis gas through the hot char with catalytic properties and allows for gas purification in the reactor. The innovativeness of our technology consists in directing pyrolysis to obtain syngas with the maximum amount of hydrogen, without the need for additional purification devices.

Implementation status

After testing our prototype, we are currently building a reactor on an

Pic. Reactor prototype during trials in spring 2022

industrial scale. It will not differ in shape and principle of operation from the previously tested prototype, but its dimensions will have to be larger due to the assumed higher efficiency. At the same time, the feeder is also tested for different types of raw materials and safe working conditions. The complete reactor with industrial efficiency will be ready for trials and tests in the second half of 2023.

Benefits of using the product

We suggest using our technology as W2H2 (Waste to Hydrogen) farms located in waste processing plants. The benefit for the local community will be the management of waste without

incurring additional fees and the use of energy contained in waste through the production of hydrogen, which can be used to power local public transport. Therefore, we are talking about local, decentralized hydrogen production, thanks to which we will save on transport costs. In addition, nothing stands in the way of the reactors' energy demand being covered by renewable energy, which will fit our solution into the idea of sustainable development.

Our technology is to change the way the waste industry is managed and, unlike many other breakthrough technologies, it will not harm economic entities working in this branch of the economy. Our product will make it a circular economy in the full sense of the word.

Comparison with the current state of the art

There are, of course, competing methods for processing waste into hydrogen. They are based on plasma gasification or pyrolysis combined with pyrolysis gas purification installations.

However, the processing of waste at a temperature of around 1300°C is a more energy-intensive process than its decomposition at a maximum temperature of 850°C.

It is also worth underlining that our technology ensures syngas purification directly in the reactor, which does not require additional equipment and saves time and energy.

Our vision for a circular economy is to turn waste into hydrogen and energy in a sophisticated and innovative way.

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The SARUAV system for detecting persons in aerial images as a tool for supporting searches for missing people.

Description of the solution

The first module of the system enables planning a search mission with the use of drones. It offers the opportunity of modelling the maximum walking zone based on terrain models and land cover maps. The second and concurrently the most important module of the SARUAV system processes big sets (hundreds) of images taken by cameras installed onboard drones in order to rapidly (a few minutes) indicate potential places where persons are present.

Introduced innovations

The SARUAV system detects persons in terrestrial and water conditions. The computer program works based on artificial intelligence methods trained on an extensive and original training dataset which distinguishes the software from other solutions available on the market – they usually utilize statistical methods. The user interface of the SARUAV system has been designed specially for rescuers and in cooperation with them, e.g. making use of eye-tracking research. The solution works with a considerable number of

Pic. Mobility model launched in the SARUAV software

drones that are available on the market, equipped with various cameras and dissimilar systems for recording flight elevation.

Use

Due to the SARUAV software, rescue services are provided with reports from the analysis of hundreds of photos along with accurate coordinates of potential places where a lost person might be present. As a result, many precious hours are gained and skills of detection are ensured, the latter being unbeatable when compared to visual analysis of imagery. The SARUAV system may also be applied for monitoring state borders.

Implementation status

The SARUAV software has been implemented for services and units which are specialised in searches for lost

persons in Poland, Germany, Romania, Switzerland, Spain, and Italy. It was successfully utilized in real search and rescue missions.

Benefits of using the product

Thanks to SARUAV, extensive terrain – including unavailable areas, such as for instance marshes, which are often impossible to reach overland by rescuers and rescue dogs – may be rapidly and thoroughly searched. It reduces the risk of life and health losses to which rescue personnel is exposed, and it increases the probability of locating a lost person. The application of the SARUAV system may also lead to the decrease in utilizing resources, the reduction of mission costs, and – in extreme cases – the reduction of air pollution and noise (e.g. when a helicopter is replaced by a drone).

Comparison with the current state of the art

The system processes RGB imagery. Apart from skilful detectors, suitable for terrestrial and water searches, elaborated on the basis of the original and extensive training dataset, the SARUAV system provides coordinates of a place where a person is located, and it does it without a need for long-lasting process of generating the orthophotomap. SARUAV is the world's first IT system which, due to the automated detection of humans, directly contributed to rescue the missing person (June 2021, Beskid Niski, SE Poland).

SARUAV. To arrive on time.

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MesoCellA-Ortho – an advance therapy medicinal product for applications in orthopaedics.

Description of the solution

MesoCellA-Ortho is a biological advanced therapy medicinal product (ATMP) containing human autologous adipose tissue-derived mesenchymal stem/ stromal cells (AT-MSCs) as the active substance. MesoCellA-Ortho is fully characterized in terms of composition and biological properties, as well as manufactured in accordance with standardized procedures of GMP requirements. Moreover, a treatment protocol with MesoCellA-Ortho (including rehabilitation cycles) has also been developed for patients with osteoarthritis.

Introduced innovations

The MesoCellA-Ortho medicinal product was developed as a result of research conducted within the BioMiStem project (Strategmed; NCBiR). Thanks to the combining of biotechnological and medical knowledge with the applicable provisions of the pharmaceutical law, MesoCellA-Ortho constitutes a globally novel “cell-based medicinal product” increasing technological advantage of the Polish medical and biotechnology sector on the international market.

Pic. Manufacturing process of the MesoCellA-Ortho medicinal product in ATMP manufacturing facility.

Use

The developed advanced therapy medicinal product is dedicated for applications in orthopaedics, in the treatment of cartilage and bone defects in patients with osteoarthritis.

Implementation status

Currently, the safety and effectiveness of the MesoCellA-Ortho product are being experimentally confirmed in a clinical trial (Phase I/II) involving patients with osteoarthritis of the knee joint. When the study is completed, the product will be at the 7th level of readiness for commercialization (TRL7). Further steps of commercialization and subsequent registration of the MesoCellA-Ortho medicinal product in the European Medicines Agency (EMA) have been also planned.

Benefits of using the product

MesoCellA-Ortho has the potential to impact on regeneration of intra-articular structures, reduce pain and improve joint mobility after administration in patients suffering from osteoarthritis, and thus improve their comfort of life and psychophysical condition.
Importantly, tissue regeneration within the joint may eliminate or delay the need for an artificial knee joint implant (endoprosthesis) in such patients.

MesoCellA-Ortho may regenerate the joint tissue structures in the course of osteoarthritis.

Comparison with the current state of the art

Products commonly used in orthopaedics contain heterogeneous cells isolated from adipose tissue, blood, or bone marrow and are administered to patients on the day of their isolation. They are not characterized in terms of potency and stability and the effects of their activity varies and depends on many factors, including the effectiveness of cells isolation protocols or the patient's health condition at the time of tissue collection. On the other hand, the products containing hyaluronic acid create a three-dimensional structure after administration to the joint, which temporarily reduces the friction of the joint surfaces, exerting an analgesic effect, but does not lead to the regeneration of damaged tissues, which may be provided by the MesoCellA-Ortho product.

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UNIWERSYTET JAGIELLOŃSKI
W KRAKOWIE

GALEN

EndoRNA qRT-PCR test.

Description of the solution

EndoRNA – a medical device of Diagendo is used to quantify the relative level of expression of the FUT4 gene – a marker of endometriosis in relation to the expression of the GAPDH reference gene in material taken from the endometrium of the uterus of a patient in the secretory phase of the menstrual cycle, in whom endometriosis needs to be confirmed or excluded.

Introduced innovations

During research on the pathogenesis of endometriosis at the Medical University of Warsaw, conducted by two of the four founders of Diagendo, it was discovered that endometriosis is associated with statistically significantly increased expression of mRNA of FUT4 gene encoding fucosyltransferase 4. The technology makes it possible to quantify the relative level of expression of this gene – a marker of endometriosis in relation to the expression of the GAPDH reference gene in material taken from the endometrium of the uterus of a patient in the secretory phase of the menstrual cycle, in whom endometriosis is suspected or must be excluded.

Pic. EndoRNA qRT-PCR test for the diagnosis of endometriosis

Use

Diagendo, using a breakthrough discovery, has developed a test revolutionising the diagnosis of endometriosis, which affects about 10% of women of childbearing age, which is nearly 200 million women in the world. Endometriosis is a very common, hormonally dependent, chronic disease of the female reproductive system associated with the presence of foci of endometrial tissue outside the uterine cavity. The condition may be accompanied by increased menstrual pain, pain during intercourse or chronic pain in the pelvic area. These ailments can be a factor limiting women's professional and social activity and causing serious depressive disorders. In addition, endometriosis can also be the cause of reduced fertility (about 50% of all cases of female infertility).

Implementation status

The EndoRNA test is an in vitro diagnostic medical device that has undergone conformity assessment and was submitted to the Office for Registration of Medicinal Products, Medical Devices and Biocidal Products. The test will be available for sale in the second quarter of this year in Poland and in the UK.

The first partner entity in Poland is the network of Diagnostyka laboratories. Further partners are currently undergoing an implementation process. Negotiations with other countries are also ongoing.

Benefits of using the product

The use of the EndoRNA test significantly speeds up the diagnosis of endometriosis. Diagnosis, depending on the occupancy of the laboratory, can take from 48 hours to several weeks compared to the average time of diagnosis currently, i.e. about 5-6 years. This will positively impact the physical and mental health of patients and their social and professional functioning. It will also bring financial savings for the patient and the state budget thanks to such a significantly shortened diagnostic path.

Diagendo, using a breakthrough discovery, has developed a test that revolutionises the diagnosis of endometriosis, which affects about 10% of women of childbearing age.

Comparison with the current state of the art

The diagnostic methods currently recommended by the European Society of Human Reproduction and Embryology are:

- symptom-based interview and clinical examination,
- imaging methods, e.g. USG, MRI – its negative result does not exclude endometriosis.

In addition, the equipment's quality and the doctor's experience performing the examination and its description count. Availability (waiting time) to specialised imaging centres is limited in some regions.

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diagendo

MMB Drives Ltd – MMB SmartGridEnabler – voltage regulator and current symmetrizer in low voltage networks.

Description of the solution

MMB SmartGridEnabler is an active voltage regulator and current symmetrizer designed for low-voltage distribution networks with a large number of PV micro-installations connected. The tasks of the MMB SmartGridEnabler are voltage regulation on the connection point and symmetrization of phase currents flowing from the transformer.

Introduced innovations

MMB SmartGridEnablers are designed on the basis of modern technology of power electronic devices. Silicon carbide diodes and transistors were combined with control algorithms based on deep scientific knowledge. Integration of ordinary distribution line wires with high-tech devices transforms low-voltage lines into modern intelligent networks prepared to control and manage bi-directional energy flow.

Use

MMB SmartGridEnablers are used

Pic. MMB SmartGridEnabler installed on a pole

in distribution networks with micro-installations to regulate the voltage at the connection point. They affect the voltage in the depths of the network or at the end of the distribution line, regardless of the direction of electricity flow. The result is the full use of micro-installations, which are turned off without voltage regulation despite favorable conditions for energy generation.

Implementation status

MMB SmartGridEnabler has been tested in cooperation with the distribution network operator and led to the production of the first commercial series.

MMB SmartGridEnablers have been designed taking into account production, operational, and service requirements.

Benefits of using the product

MMB SmartGridEnablers increase the use of existing micro-installations, bringing measurable economic benefits to prosumers and grid operators. At the same time, they significantly contribute to the reduction of CO2 emissions by enabling the generation of additional energy previously blocked by distribution networks not adapted to two-way operation.

Comparison with the current state of the art

The offer of devices designed to regulate energy parameters in distribution lines includes technical solutions based on simple electrotechnical methods. The available devices are expensive and do not ensure the achievement of the required quality of electricity. Currently, there are no solutions based on the use of modern power electronic converters on the global market. Only fragmentary scientific publications are known.

Electricity converters connected to distribution networks change the electric power industry from traditionally central to modernly distributed.

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Large-scale 3DCP (3D Concrete Printing) printers that automatically produce reinforced concrete structures with aggregate.

Description of the solution

The concrete printing process involves the controlled application of layers of concrete and aggregate mix one on top of the other. The mortar is characterized by high viscosity, so it does not spill like ready-mix concrete, but keeps its shape after leaving the nozzle. The 3D concrete printer allows for a significant reduction in the need for human labor, and provides much greater accuracy and repeatability.

Introduced innovations

The technology has been under development globally for several years, and its widespread implementation has not been possible due to the limitations that exist at this stage. One of them is the ability to lay continuous reinforcement. REbuild has patented and is implementing in its equipment a nozzle that automatically lays glass fibers in an epoxy matrix.

Implementation status

DTo date, two large-scale 3D concrete printers have been developed:

REbuildV3 is tailored for large-scale projects. It allows the printing of

Pic. Photo of Poland's first building printed at a construction site in Wyszków. The print was realized in close proximity to a transformer station.

functional buildings and prefabrication of larger concrete elements. The maximum working area of this printer is 15mx13mx5m.

REbuildV2 was created for small and medium-sized projects. It is ideal for creating custom garden architecture, benches, pots, ornaments, and prefabrication of small concrete elements.

Two projects have been successfully completed. In May 2022, the first on-site printed building in Poland was made – an arbor at the McDonald's restaurant in Wyszków. Another printing took place in October 2022 in the production hall. Three pieces of prefabricated houses for the Institute of Building Technology were made.

Benefits of using the product

The presented technology for the automatic manufacturing of objects carries a number of potential benefits, such as reducing the need for human labor (which means reducing costs and increasing safety on the construction site). Another aspect is the problem of the lack of educated construction personnel, which is particularly evident in the countries of the so-called “old EU.” In Poland, this problem is not yet very visible due to the influx of workers from the East. The end of the war in Ukraine and the need to rebuild the country will soon cause an outflow of construction workers from Poland.

Other benefits of 3DCP include increased product assortment and production capabilities, as well as the great freedom of shape characteristic of 3D printing. For architects, with more complex, visually appealing shapes, the cost of producing components is often a challenge.

Comparison with the current state of the art

The main competitor for 3DCP technology is the classic construction model, which is becoming more and more financially as well as time inefficient with each passing year. Currently, there are about 70 players in the global 3DCP market, but only 12 of them widely present information about their technology, and they are the real group of main competitors.

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REbuild

Wood Pack – Ready-to-assemble structures.

Description of the solution

Wood Pack is a complete and perfected system of structures, consisting of modular elements with all the necessary connecting elements and a clear assembly instruction. It is a response to current economic, social, and ecological challenges in the construction industry. Wood Pack meets the needs of architects, investors, developers, and construction companies to build durable, fast, and eco-friendly constructions. Wood Pack is a new quality in construction.

Introduced innovations

Wood Pack is an author's solution created for modern and ecological wooden construction. The system consists of 20 specially designed typical modules, including half, full, window, and door modules. The essence of the product was to create a construction system available for every segment of construction. The company, as the only one in Poland, has been researching the system's parameters with the Silesian University of Technology for over 3 years, from a single element to the strength of the entire construction on a real scale. Research has shown that the constructions are durable and resistant to hurricane-force winds.

Use

Wood Pack is the ideal system for every

Pic. Modularity – cross-section of the Tatrzański project

segment of construction, allowing for the construction of any building area. Ready-made constructions are offered within 4 groups:

- Wood Pack 1 – constructions for year-round recreational houses, small shops, service points, garages.
- Wood Pack 2 – single-family houses, as well as housing estates in various types of construction.
- Wood Pack 3 – multi-story apartment buildings.
- Wood Pack 4 – office and conference buildings, as well as public utility buildings – schools, kindergartens, nurseries.

Implementation status

The product is already implemented, and customers can use ready-made house

projects or design individually. Due to its universality, ease of assembly and transport, the structures are offered in the Polish and foreign markets.

Benefits of using the product

The most important benefits of using the system include:

- a positive impact on the natural environment (the use of renewable raw materials, a negative carbon footprint, and almost zero water consumption during the construction process),
- very good thermal insulation properties,
- the possibility of using underfloor heating, photovoltaics, etc.,
- fast and easy construction – maximum optimization of assembly work,
- the possibility of construction at any time of the year,
- cost optimization – e.g. no heavy equipment transport costs,
- fast availability – constructions available for pick-up in a few days,
- the possibility of combining and expanding the wood-masonry technology within one building,
- freedom in choosing the assembly company,
- proven quality confirmed by research – each element is certified, and the system has a 50-year warranty.

Design and build quickly, safely, and environmentally friendly.
Our offer is addressed to Investors, Construction Companies, Developers, and Architects.

Comparison with the current state of the art

Wood Pack significantly changes the functioning of the existing market of wooden structures. It is an alternative to masonry and modular construction, which consists of delivering ready-made walls or rooms to the construction site. It is a response to the need to optimize construction costs, providing safe and durable structural modules, which, after quick assembly, are ready for further construction and finishing to the developer's state.

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WOOD CORE HOUSE

Platform for non-invasive diagnostics of coronary artery disease.

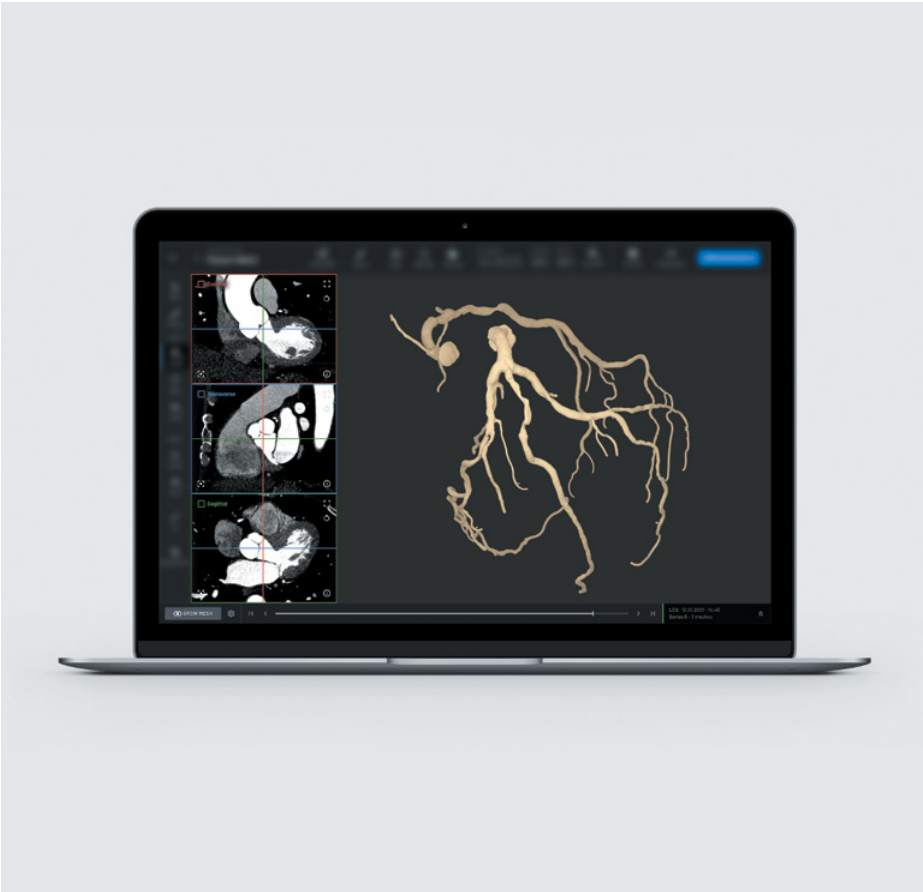
Description of the solution

The solution is an innovation on a European and global scale medical device software for non-invasive diagnostics of coronary artery disease. Hemolens' technology makes it possible to produce a 3D model of the coronary arteries, allowing for a detailed anatomical and functional evaluation of these vessels and delivering patient-specific values of coronary Fractional Flow Reserve (FFR). The diagnostic test from Hemolens may help avoid unnecessary invasive procedures during the diagnostic work-up of coronary artery disease.

Introduced innovations

The project is based on breakthrough solutions combining:

- computer vision for analyzing DICOM images generated by CCTA in order to create a virtual twin of the patient's heart,
- proprietary Computational Fluid Dynamics algorithms based on Continuous Non-invasive Blood Pressure monitoring (CNBP) which make it possible to generate a personalized diagnosis by calculating FFR-CT (Fractional Flow Reserve) values in the main coronary vessels.



Pic. System overview photo

Implementation status

The initial stage of the development project involved designing the first generation of the product and obtaining a CE certificate to confirm compliance with the MDD. The product, while finished, has not been widely launched on the market due to the need to make it more scalable and to take into consideration expected market needs and new legislation. Currently, research is underway to collect more evidence of effectiveness, in collaboration with leading cardiology institutions across Poland. Active involvement is taking place in the pre-launch preparations for the product to reach the stage of commercialization. Abroad, the product

will be introduced in collaboration with a Dutch subsidiary which will be responsible for distributing our device in Western Europe.

Benefits of using the product

The platform is designed for ambulatory diagnostics, without the need of hospitalization. It is a wholly non-invasive CAD diagnostic tool, ensuring patient safety during the examination. The method bears no risk of adverse events or complications associated with invasive diagnostic techniques such as coronary angiography.

With 3D modelling of the coronary arteries, physicians can easily and successfully explain the results to their patients. The platform delivers a unique and patient-specific image of the condition of the main arteries of the heart, ensuring diagnostic precision, supporting therapeutic decision-making and reducing the risk of error. This makes it possible to reduce invasive testing, and, importantly, it is suitable for patients with contraindications to angiography.

Our goal is to change the face of diagnostics, fostering the transition from invasive to ambulatory methods.

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HEMOLENS DIAGNOSTICS

Osmia 4.0. Project.

Description of the solution

The Osmia 4.0 project is a globally unique system for pollinating and improving work in an orchard farm. Many years of experience and research in our own orchard farms have allowed us to create a solution consisting of three elements that facilitate both the optimization of the pollination process and everyday work in the production of fruit or vegetables.

Introduced innovations

The bee habitat designed by the creators is a patented solution that is to guarantee better pollination for fruit growers by creating a place for mason bees as close as possible to their natural habitat (e.g. reed tubes) while automating its cleaning, disinfection, and extracting the cocoons of the next bee population. In addition, the BeeGrow mobile application will allow the grower to modernize and improve the management of his farm. The application was created mainly to optimize pollination on the farm. During its creation, we added a few additional functions so that fruit growers could use it on a daily basis. However, its main

Pic. OsmiaBox hives in the orchard

function is to help in planning the spacing of hives, i.e. it virtually selects the number of hives per hectare and shows where the plots should be placed. The application takes into account such aspects as: cultivation intensity, species, plot shape, climatic conditions. The habitat is made in such a way that each one serves for many years and is exceptionally bee-friendly. At the same time, it has been designed to protect each population of new solitary bees against the harmful effects of Plant Protection Products used by fruit growers. OsmiaBox hives are rented to growers every year, for each flowering season. After the season, the

habitats with the new generation of bees are returned to us, where we service them using a specially designed machine. This machine is specially designed by us for this particular habitat. The first such solution for servicing mason bee habitats in the world allows for virtually 100% automation of this process, which is a huge benefit for fruit growers, because traditional habitats are usually cleaned manually. Appropriate and professional service allows both to save our customers time and ensures a healthier and larger next generation of bees.

Osmia Future – more than pollination!

Benefits of using the product

Thanks to the modernization and automation of the pollination process, it is possible to increase the population of solitary bees from year to year, as well as the quality and quantity of crops in fruit farms. The BeeGrow application and OsmiaBox hives are already used by dozens of fruit growers in Poland and Europe, from whom the creators receive very positive feedback regarding this solution. As Osmia Future, we offer – we are not afraid to use this statement – the most professional, innovative pollination optimization system in the world. Why? Red mason bees are very grateful pollinators, but with their growing population, servicing the hives and preparing the bees for the next season is becoming more and more laborious. In order to automate these activities and optimize pollination in the orchard, the Osmia 4.0 project was created.

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Holo4Labs – innovative software in Augmented Reality technology, using AI (Voice Recognition, Computer Vision, Spatial Anchoring) algorithms to support laboratories in conducting research efficiently.

Description of the solution

Holo4Labs is a state-of-the-art process innovation. Researchers no longer need to memorize or print out procedures. All the information they need is displayed "step-by-step," right before their eyes, at the right time and in the right context. Holo4Labs protects the company's time and budget from inefficient and tedious tasks. With an option such as rapid sample scanning, we get the data we need faster and without errors. With our hands-free, we can focus on our tasks without being distracted from our workstation.

Holo4Labs brings precise assistance to lab personnel while integrating data with proprietary systems in two-way communication. Using voice commands (Cortana), we can dictate the results of experiments. With possible integration with IoT devices in the lab, we reduce

Pic. Holo4Labs – presentation of the solution

the amount of waste due to the need to constantly move around in the lab.

Introduced innovations

The most innovative solutions used in Holo4Labs include:

- ability to collaborate remotely with other users by sharing “live” images in first-person mode,
- holographic imaging responsive to the physical space in the lab,
- intelligent voice assistant – Cortana.

Use

H4L helps lab technicians and scientists in their daily work by guiding them step-by-step through task lists, sample management, and by automatically

assigning appropriate methods and procedures.

Implementation status

The product is globally available. Currently is used by 6 companies in the top 10 of the big pharma industry.

Benefits of using the product

This solution brings a number of benefits, such as:

- environmental protection by reducing resource consumption (elimination of paper, saving energy, and water),
- cost minimization (the costs of reagents, equipment, and substances associated with the above process are enormous),
- reducing barriers to employment (by taking advantage of remote work opportunities).

Augmented reality technology that helps laboratories improve quality and efficiency by digitizing processes.

- minimization of errors (which is a critical aspect, e.g. in clinical laboratories and virology),
- waste minimization/environmental protection (in chemical laboratories about 19% of samples are disposed of due to mistakes),

Comparison with the current state of the art

The international market currently lacks direct competition for Holo4Labs. Patent application is underwriting.

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Polski
Produkt
Przyszłości

Blees autonomous electric minibus to complement public transportation.

Description of the solution

The vehicle will use a state-of-the-art remote control and monitoring system, an innovative passenger information system and a passenger-centred on-demand transportation management system.
The company's ambition is to build the world's first certified electric autonomous minibus, in accordance with strict standards for the automotive industry.

Introduced innovations

Blees has introduced a number of innovations, including:

- carbon-free minibus with SAE Level 4 automation,
- intelligent active monitoring system,
- intelligent passenger information system. Blees will offer a higher data update frequency and accuracy in terms of vehicle location,
- innovative fleet management system based on artificial intelligence and used in demand responsive transport (DRT).

Use

The key issue the Blees minibus solves is inefficient and inconvenient access to public transportation. This applies to urban areas in general, but even more so to sparsely populated suburbs. Suburbs have public transportation services but

Fot. Blees – an autonomous, electric minibus

they are both not tailored to passenger needs (since routes are fixed) and are costly.

Convenient, affordable, safe and sustainable public transportation is the foundation for building and maintaining urban communities. At the same time, municipalities face a multitude of problems: from challenging projects for sparsely populated suburban areas, through having to balance the needs of the inhabitants with budget constraints, to a shortage of drivers.

Implementation status

The autonomous minibus is ready for its first deployments. In May 2022, Blees made a prototype of the target vehicle. Between June 2022 and November 2022, the company tested the advanced prototype under near-real conditions, consistent with TRL6. The fully-fledged

vehicles will be available around June 2023 and the first deployments are planned for August 2023.

Benefits of using the product

The benefits of the solution in question include:

- to enable to deliver on the promise of making public transportation available to everyone,
- to reduce the cost of addressing transportation blank spots,
- to improve public transportation where it is inefficient,
- to increase the number of public transportation users,
- to enable the resolution of driver shortage issues,
- to increase the number of electric vehicles in the transportation fleet,
- to contribute to improving urban air quality and reducing the carbon footprint.

Comparison with the current state of the art

The key differentiators of the Blees vehicle include vehicle parameters that influence its daily use and readiness for deployment, such as battery capacity, charging speed, range, speed and readiness for approval certification that is significantly more advanced than similar products on the market.

Blees is launching a groundbreaking product: an autonomous electric minibus to complement public transportation.

The strategic advantage of Blees is the timing of its launch on the market. Blees makes extensive use of mature components, as the advancement of autonomous technology is much better today than it used to be, which minimises the capital outlays required to achieve a public transit-ready minibus with Level 4 automation.

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