T3N-BSB
TRANSNATIONAL TECHNOLOGY TRANSFER NETWORK for BLACK SEA BASIN

Interreg

NEXT Black Sea Basin

Co-funded by the European Union

TRANSNATIONAL TECHNOLOGY
TRANSFER NETWORK for BLACK SEA BASIN
T3N-BSB PROJECT

Catalogue of
Promising and Mature Technologies and Innovations
in BSB Countries

KTU 1955 KARADENİZ TECHNICAL UNIVERSITY

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

BATTI Ideas transforming the future

UNIVERSITAS GALATIENSIS

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TECHNOLOGIES FROM TÜRKİYE

TECHNOLOGIES FROM GREECE

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TECHNOLOGIES FROM ROMANIA

Interreg NEXT Black Sea Basin Programme

A platform for strengthening connections between the Black Sea Basin (BSB) countries and, creating new cooperations in the fields of research, innovation and environmental protection, bringing together regional actors to contribute to sustainable resource management for the benefit of local citizens.

Interreg NEXT Black Sea Basin Programme aims to develop and deepen cross-border cooperation in the BSB on a transnational basis.

Transnational Technology Transfer Network for Black Sea Basin Project

Within the 2021-2027 period of the program, the project titled "T3N-BSB Transnational Technology Transfer Network for Black Sea Basin" has been entitled to receive support and started to be implemented as of July 2024. T3N BSB Project aims to address the need to develop sustainable transnational network structures and platforms in order to share good practices and knowledge on the use of innovative technological developments.

Project Consortium

TÜRKİYE
Karadeniz Technical University (KTU)

GREECE
Centre for Research and Technology Hellas (CERTH)

BULGARIA
Bulgarian Association for Transfer of Technology and Innovation (BATTI)

ROMANIA
"Dunarea de Jos" University of Galati (UDJG)

Duration	Total Budget	EU Funding
July 2024-January 2026	498.120,00 EURO	448.308,00 EURO

Purpose of the Project

To create sustainable transnational network structures among the Black Sea Basin contries of **Türkiye**, **Bulgaria**, **Romania** and **Greece** and to contribute to the development of the research and innovation capacities of these countries and the adoption of advanced technologies by sharing good practices and knowledge on the use Of innovative technological developments, especially in the fields of **blue economy**, **low carbon economy**, **climate change resilience** and **adoption**.

Project Goals

- To strengthen international cooperation between target groups and organisations in the **Black Sea Basin**, to improve theİr capacities in terms of technology transfer and ecosystem, to support joint research activities and promote innovative solutions.
- To increase the **sharing of knowledge** and experience among regional stakeholders by establishing a sustainable technology transfer network.
- To bring target groups together with successful project outputs and the **T3N-BSB portal**, and to enable them to establish international, new, and technological collaboration.
- To lead the planning and development of **new research** and innovation projects and studies, to improve their competitiveness and innovation levels in the international arena.

Target Groups


Entrepreneurs


Academicians


Technology Transfer Ecosystem


Industrialists


Students


Professionals Functioning on TT Interfaces


Organized Industry Regions


Chambers of Commerce and Industry


Business Support Organizations

About the Catalogue Covering 63 Technologies from BSB Countries

Building a future that is resilient and compatible with climate change is among the priorities of countries today in line with their sustainable development goals. Innovative technologies developed in this context have the potential to provide effective solutions not only at the national level but also on an international scale.

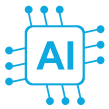
This catalogue is the product of a joint effort by the Project Partner countries. It aims to increase opportunities for international cooperation, knowledge sharing and technology transfer by making visible mature or emerging technologies that each country has developed in its own R&D and innovation ecosystem, but have not yet crossed national borders. The technologies in the catalogue were evaluated according to multidimensional criteria, including environmental sustainability, economic viability, social contribution, and international scalability.

As a result of these analyses and evaluations, innovative technologies were identified, and this online catalogue includes **18** technologies from **Türkiye**, **10** from Greece, **15** from **Bulgaria**, and **20** from **Romania**. As a result, this compilation is a comprehensive and interactive resource that includes 63 technologies in total.

This catalog provides a comprehensive overview of **national technologies** that have demonstrated scalability, resilience and long-term viability across various industries. It aims to be **an inspirational tool** for **investors**, **public institutions**, **private sector actors**, **academia and civil society organizations** interested in the field of climate change adaptation and resilience, and to **support the exchange of knowledge and experience between countries** by providing a starting point for cross-border collaborations.

LEGEND


Information and Communication Technology (ICT)



Artificial Intelligence and Robotic


Environment and Sustainability


Construction and Infrastructure


Education and training


Energy


Agriculture


Water Resources


Transport and Logistics


Healthcare and Biotechnology


Radioactive Material


Carbon Management and Storage Technologies

T3N-BSB Interreg Co-funded by the European Union NEXT Black Sea Basin

LEGEND


Low Carbon Economy


Blue Economy


Resilience and Adaptation to Climate Change


Disaster management


Civil engineering


Smart cities and infrastructure security


Circular Economy


Recycling


Waste management


Climate Change Resilience and Adaptation


Biotechnology


Food


Cosmetic

Apiculture, Innovation in Food Preservation


Eco-Innovation

T3N-BSB

Interreg NEXT Black Sea Basin

Co-funded by the European Union

TECHNOLOGIES FROM TÜRKİYE

KTU 1955

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

BATTI

UNIVERSITAS GALATIENSIS

Fish Pro Gel - Sustainable and Innovative Gelatin, Collagen and Protein Production with Aquaculture Processing Waste

Thematic Area(s)

- Low Carbon Economy
- Blue Economy
- Resilience and Adaptation to Climate Change

Relevance

In order to reduce the effects of climate change, utilisation of aquaculture wastes and ensuring sustainability through a production system with a low carbon footprint make significant contributions to both the economy and the environment. In addition, the rich protein and mineral content of aquaculture wastes can also be considered as a strategic solution to possible food shortages or nutritional problems in the future.

Short Description

Fish Pro Gel produces high quality gelatin, collagen and protein powder from the waste (skin, bones, heads, etc.) of aquaculture processing factories. With its sustainable production model, both environmental waste is utilised and innovative, economical and bioavailable solutions are offered to the food, pharmaceutical, cosmetic and biomedical sectors.
Fish gelatin offers key advantages for pharmaceutical and biomedical use, including biocompatibility, biodegradability, and low risk of immune or infectious response. Its rich amino acid content supports collagen synthesis and tissue repair, while its low melting point enables efficient drug release in pharmaceutical formulations.

Stage of Development

TRL of the Technology is 4.
Value-added products were developed from salmon by-products, including protein powder, collagen, gelatin, fish bouillon, and organic liquid fertiliser. Product analyses showed superior quality over commercial alternatives, particularly in bloom strength and molecular weight, enhancing their industrial competitiveness. In addition, hybrid nanoflower shaped gelatin and collagen based carriers developed by Fish Pro Gel for use in the field of drug release have the following features.

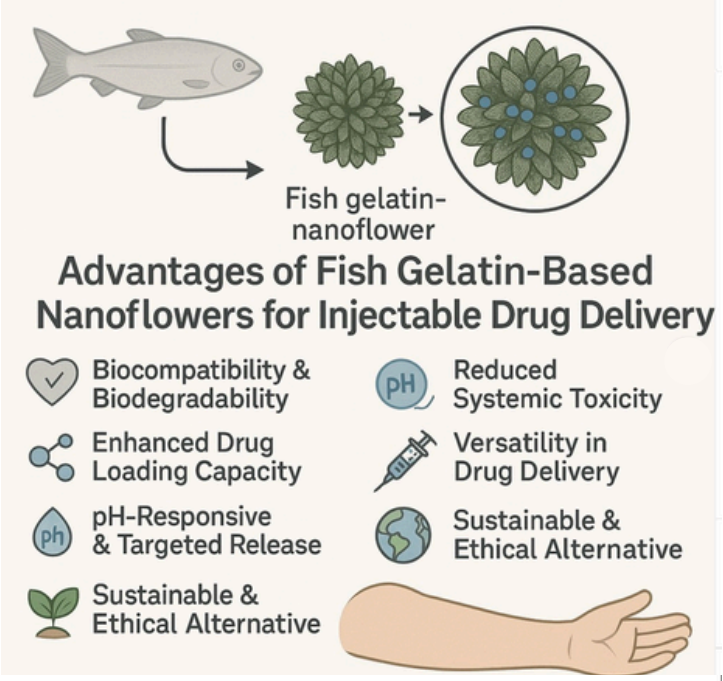
Expected Outputs of the Technology

Fish gelatin-based nanoflower injectable drug delivery system offers an innovative and sustainable approach in the field of nanomedicine. This system stands out as a promising candidate for different therapeutic applications with its biocompatibility, structural stability and controlled release properties.
Future Directions:

- It is aimed to improve production methods to increase reproducibility and ensure process efficiency.
- In vivo studies on living organisms are planned to be carried out in order to better evaluate pharmacokinetic and therapeutic efficacy.
- It is aimed to investigate and apply additional surface modifications for improved targeting and more specific therapeutic purposes.

Scalability Potential

Fish gelatin is a sustainable and biocompatible alternative to mammalian gelatin, with broad potential in food, pharmaceutical, cosmetic, and biomedical industries. It supports scalability across international markets.
Applications include gelling agents in food, capsules and drug delivery in pharma, collagen support in cosmetics, and hydrogels or nanocarriers in biomedicine. Fish gelatin is sustainable, low-allergenic, biodegradable, and dissolves faster than mammalian gelatin-making it ideal for various applications. These features enhance its suitability for diverse industrial applications.
Fish Pro Gel's technology aligns with cultural sensitivities, meets global standards, and offers promising potential in advanced drug delivery through its nanoflower platform. International expansion continues via strategic partnerships and clinical studies.



Applications

- Agriculture
- Environment and Sustainability
- Pharmaceuticals and Medical Devices

Intellectual Property Status

- There is no intellectual property process related to technology.

Contact Person: Ayşe DEMİRBAŞ

Role: CEO and Founder

e-mail: fishprojel2024@gmail.com

website of the technology: https://fishprojel.com/

Kumat Marine Technologies Industry Inc.

Thematic Area(s)

Blue Economy

Relevance

This technology enables accurate, efficient and environmentally frienly mapping of marine and underwater resources, enabling the monitoring, protection and management of marine ecosystems.
Compared to fossil-fuelled vessels used for mapping underwater resources, this vehicle operates on clean energy, reducing carbon emissions and minimising environmental impacts. The technology also enables more precise and safe monitoring of marine resources, making a significant contribution to sustainable development, one of the main goals of the blue economy.

Short Description

The autonomous surface vehicle (ASV) developed by Kumat offers innovative technology that performs bottom mapping operations in water bodies such as seas, lakes, and dams. This vehicle is an electrically powered, portable, low-cost, and highly maneuverable unmanned system. This technology significantly facilitates fisheries, harbor operations, and underwater surveys, especially in coastal areas. Furthermore, it can continuously collect and analyze data, which brings significant innovation and increased efficiency to maritime and underwater applications.

Stage of Development

TRL of the Technology is 6.
The ASV was able to cruise at a speed of 15 knots and operate continuously with a battery life of eight hours. In the first tests, underwater mapping operations using echosounder were successfully carried out and the vehicle was able to collect accurate data in manual and autonomous modes. In addition, NOx emissions have been significantly reduced because the vehicle is powered by electricity. Initial user feedback has favourably evaluated the tool's features such as low operating cost and portability.

Expected Outputs of the Technology

The ASV developed by Kumat aims to achieve important outputs and results in many areas in the future. In the short term, the vehicle will be further tested and will become more efficient with improvements made on engineering designs. For example, it is planned to increase the battery capacity, process underwater data faster and improve the stability of the vehicle. In this way, the operating time and efficiency of the vehicle will be significantly increased. In addition, by improving the user interface on the mobile application, the user experience will be improved and a wider audience will be addressed.

Scalability Potential

The ASV developed by Kumat has a technology that is scalable and adaptable to international markets. This vehicle has a high potential to be successful on a global scale, especially in sectors such as maritime, underwater research, harbour operations and fisheries. The technology addresses similar needs in different geographies; for example, in regions such as Europe, North America, Asia and Australia, there is a huge demand for sustainable management of marine resources and environmentally friendly maritime solutions. In these regions, increasing regulations towards environmental sustainability goals and efforts to reduce carbon emissions are fuelling interest in such environmentally friendly and efficient technologies.

Applications

- Transportation
- Artificial Intelligence and Robotics
- Mapping

Intellectual Property Status

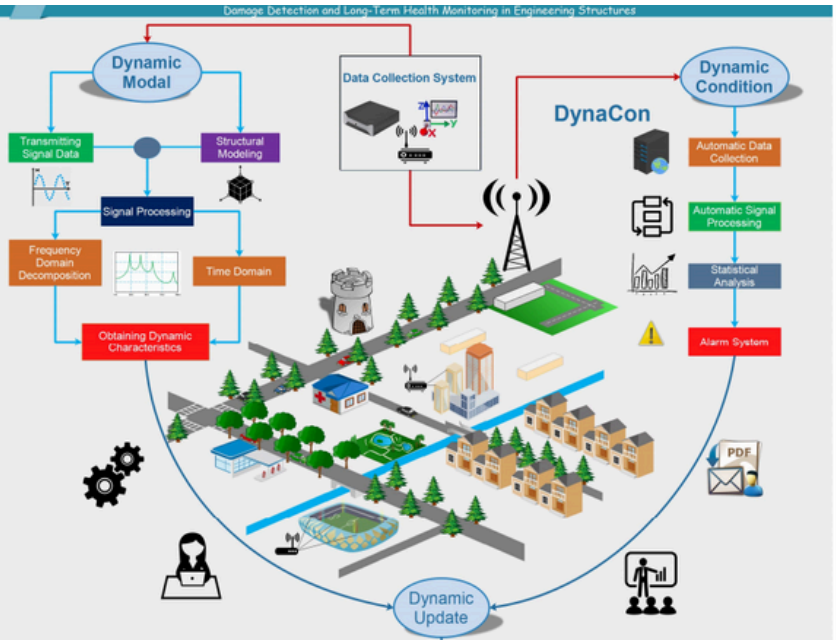
- There is no intellectual property process related to technology.

Contact Person: A. Kaan ÖZTÜRK

Role: Consultant

e-mail: cekaanozturk@gmail.com

Structural Health Monitoring



Thematic Area(s)

- Disaster management
- Civil engineering
- Smart cities and infrastructure security

Relevance

The technology includes digital twin, artificial intelligence and sensor-based data processing methods that make SHM systems more efficient, reliable and scalable. This technology, which falls under the Other category, is transforming the fields of disaster management, civil engineering, smart cities and infrastructure security. Rapid post-earthquake damage detection and the development of preventive maintenance mechanisms increase the resilience of existing infrastructure systems, ensuring long-term sustainability.

Short Description

Structural Health Monitoring (SHM) is developed for real-time monitoring and condition assessment of engineering structures such as buildings, bridges and critical infrastructures. By combining sensor-based data collection, AI-powered analysis and modelling technologies, it aims to detect damage to structures at an early stage and optimise maintenance processes. This innovation offers a faster and more reliable solution compared to traditional methods. This innovative approach has been taken to a higher level with two patented studies. Unlike traditional methods, structural anomalies are automatically detected using the developed algorithms and risk assessment can be performed without the need for human intervention.

Stage of Development

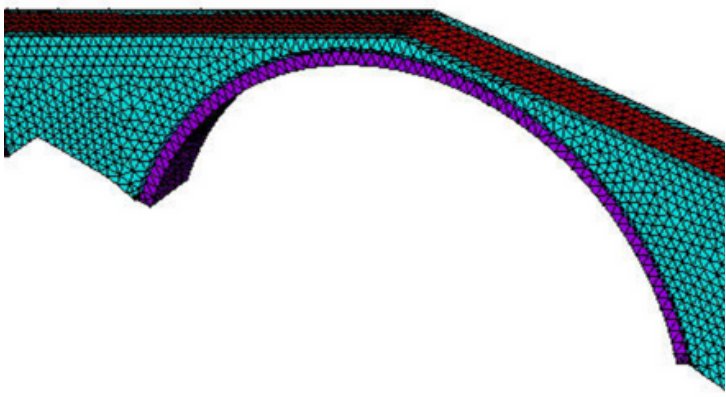
TRL of the Technology is 9.
The SHM and Anomaly Detection System (ADS) provides anomaly and damage detection by continuously monitoring the condition of structures with real-time data collection, AI supported analyses and updated finite element analyses. In the laboratory and field applications carried out so far, the system has been able to detect anomalies with an accuracy rate of over 90%, thus providing early intervention. In post-earthquake rapid assessment processes, it saves 70% of the time compared to traditional methods and accelerates decision-making mechanisms.

Expected Outputs of the Technology

In the coming period, the system's AI algorithms will be trained with more data to increase the accuracy rate above 95% and improve early warning mechanisms. In addition, it is planned to make the system more reliable and sustainable with the Web3-based blockchain-supported data security infrastructure. In the long term, it is planned that this technology will be widely used in monitoring critical structures across Türkiye and integrated with post-disaster automatic risk assessment systems. It is aimed to save up to 40% in annual maintenance costs by optimising the maintenance-repair processes of structures and to minimise loss of life and property by reducing post-earthquake response times by 60%.

Scalability Potential

Countries located in the earthquake zone, European countries that attach importance to the preservation of historical structures and Gulf Countries with rapidly growing smart city projects are among the markets where the technology will be in high demand.
The fact that this technology has features such as cloud-based data management, AI analyses and digital twin integration facilitates its integration with existing systems and protocols in different countries.
Multilingual interface and reporting aim to support widespread adoption in global markets.
Applications to programmes such as EU Horizon 2020, World Bank Disaster Risk Management Fund and JICA are planned to develop international partnerships, pilot applications and funding support for this technology.



Applications

- Energy
- Transportation
- Information and Communication Technology (ICT)
- Construction and Infrastructure
- Environment and Sustainability
- Artificial Intelligence and Robotics

Intellectual Property Status

- TR2023/004086 - Granted Patent
- TR2023/004089 - National Patent Application
- USA18/834,628 - International Patent Application
- TR2023/016105 - National Patent Application
- USA19/026,392 - International Patent Application

Contact Person: Ahmet Can ALTUNIŞIK

Role: Shareholder of the company

e-mail: ahmetcan8284@hotmail.com

website of the technology: http://yapisagligilab.com/

E-Dison AI

Thematic Area(s)

- Low Carbon Economy
- Artificial Intelligence and Robotic
- Transport and Logistics

Relevance

It optimises energy use and makes charging processes efficient by offering AI-supported operation and analysis at electric vehicle charging stations. In this way, it reduces the use of fossil fuels and contributes to the reduction of carbon emissions. By providing uninterrupted and reliable charging service, the system encourages the use of electric vehicles and supports sustainable transport solutions. It also increases the efficiency of green transport infrastructure by reducing maintenance and operating costs.

Short Description

E-Dison AI is an artificial intelligence supported operation and analysis system developed for electric vehicle charging stations. It aims to increase efficiency, reduce operating costs and improve user experience in electric charging infrastructures. The system continuously monitors stations' occupancy rates, device performance, energy consumption and fault conditions with its advanced Visual Detection Camera Module and real-time data analytics. Thanks to artificial intelligence-based predictive models, it identifies maintenance needs in advance, minimises downtime and automates operations.

Stage of Development

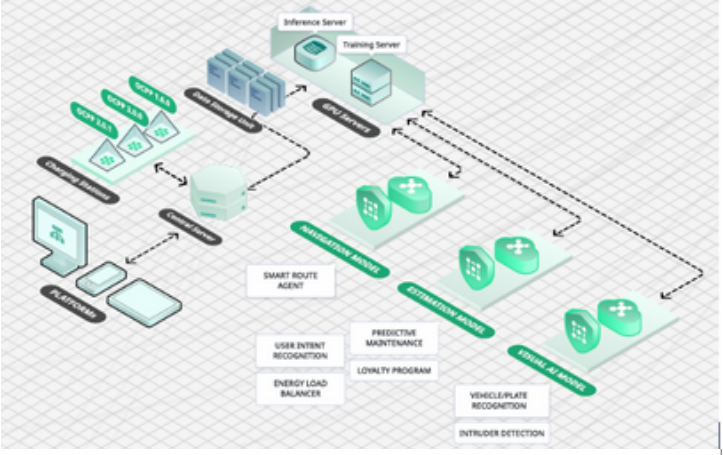
TRL of the Technology is 9.
E-Dison AI is currently in active use at more than 200 electric vehicle charging stations across Türkiye, serving more than 1000 electric vehicle users. The current system enables instant analysis of energy consumption data and fault detection at stations, resulting in lower operational costs and more efficient energy management for operators. Providing users with a faster and uninterrupted charging experience has increased satisfaction. Maintenance and repair times have been reduced through data analysis and automation processes.

Expected Outputs of the Technology

By the end of the first quarter of 2026, we aim to develop our existing system, establish cooperation with 3 new strategic partners, integrate into more than 1000 charging stations and provide services to more than 4000 electric vehicle users.
We plan to complete our NeuroCharge project, which we are developing, and to realise its installation and integration at 30 pilot stations across Türkiye. This system will provide uninterrupted service in different regions with its structure that works without being dependent on internet connection and will make energy management smarter with advanced artificial intelligence models. In addition, by entering the UK market, we aim to expand our solutions globally and contribute to sustainable mobility solutions.

Scalability Potential

Within the TRUK Accelerator Programme, we aim to make a difference in the UK market and reach potential customers. We are actively working on customer acquisition, strategic business partnerships and establishing distributor connections through the programme. By the end of 2025, we plan to integrate with at least one strategic business partner in the UK. We aim to actively deploy our NeuroCharge solution in 30 stations in the UK market by the end of the first quarter of 2026.
In addition, within the scope of the Emerge Estonia programme, we are holding one-to-one meetings with investors and potential customers in Estonia and across Europe, and evaluating cooperation and investment opportunities that will contribute to our growth strategy in the UK.



Applications

- Energy
- Information and Communication Technology (ICT)
- Automotive and Mobility
- Artificial Intelligence and Robotics

Intellectual Property Status

- There is no intellectual property process related to technology.

Contact Person: Sümeyye Reyhan EREN

Role: Co-Founder - General Manager

e-mail: reyhan@e-dison.tech

website of the technology: https://e-dison.tech/

Biological Fire Suppressant Powder

Thematic Area(s)

- Circular Economy
- Environment, recycling, and waste management

Relevance

This technology directly supports the thematic areas of Environment & Recycling and Waste Management by repurposing waste clam shells, preventing environmental pollution, and transforming waste into a valuable resource. Its non-carcinogenic nature provides additional ecological benefits. Fully aligned with the principles of the Circular Economy, it converts waste into a secondary raw material, maximizes resource efficiency, and reduces import dependency, thereby contributing to domestic industry. It presents an integrated solution in line with sustainable development goals.

Short Description

Developed from waste white clam shells, this biological powder offers an effective, eco-friendly, and low-cost fire suppressant for Class B, C, and D fires. It addresses both Türkiye's dependence on imported fire suppressants and the environmental issue of shell waste. Unlike conventional chemical powders, it does not damage electronic devices, is easy to clean, and contains no carcinogenic substances. Through domestic production, it reduces imports while contributing to waste management and sustainable development.

Stage of Development

TRL of the Technology is 6.
The technology, currently at the prototype stage, has been successfully tested in simulated environments. Among its current outputs is a low-cost (60% more economical), eco-friendly biological fire suppressant powder effective against Class B, C, and D fires. Particularly advantageous for metal and electronic fires compared to conventional chemical powders, the product leaves no residue and is manufactured from recycled clam shell waste, ensuring sustainable production.

Expected Outputs of the Technology

This technology aims to reduce Turkey's annual $3 billion fire suppressant powder import dependency through domestic production using 30,000 tons of waste mussel shells annually. Short-term goals include supplying at least 50 companies with 60% cost-reduced biological powder effective against B, C, and D-class fires. Medium-term objectives involve expanding exports to 20 countries and gaining international recognition as a Green Deal-compliant eco-friendly product. Long-term outcomes target Turkey becoming an exporter in this field, utilizing 50% of annual mussel shell waste, and establishing a fully sustainable development-aligned model that pioneers environmental and economic transformation beyond technical solutions.

Scalability Potential

With its eco-friendly and low-cost structure, the technology holds significant scalability potential in international markets. There is strong demand particularly in regions reliant on imported fire safety equipment, such as the Middle East (Saudi Arabia, Iraq), the Caucasus (Azerbaijan), North Africa (Libya, Algeria), and Central Asia (Turkmenistan, Kazakhstan). Its alignment with the European Union's Green Deal goals provides a competitive edge in environmentally conscious markets. Global expansion is targeted through strategic partnerships and access to international funding opportunities.

Applications

- Environment and Sustainability

Intellectual Property Status

- TR2020/09271 - Granted Patent

Contact Person: Hasan BALTAŞ

Role: Director

e-mail: hasan.baltas@erdogan.edu.tr

Korya Marine Technologies Inc.

Thematic Area(s)

- Blue Economy
- Resilience and Adaptation to Climate Change

Relevance

The system directly aligns with Blue Economy goals by promoting sustainable use of marine and aquatic resources to support economic growth. Continuous water quality monitoring and early warning mechanisms help sustainability in aquaculture, ensuring sustainability in food production. By instantly detecting temperature increases and oxygen level fluctuations caused by climate change, it enables aquaculture operators to take timely action, minimizing the adverse effects of climate change.

Short Description

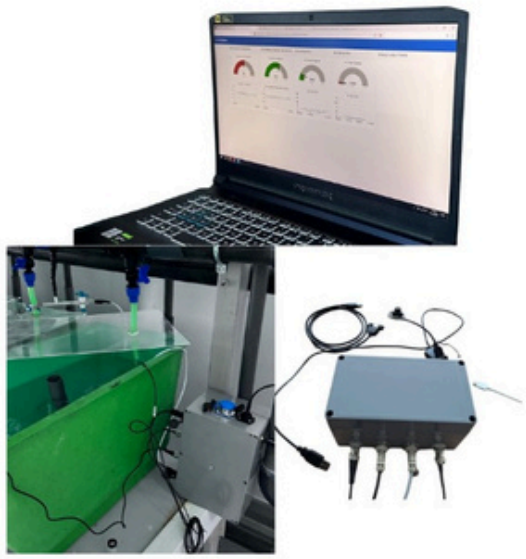
Korya Marine Technologies' Environmental Parameter Monitoring and Imaging System is an integrated solution for real-time water quality monitoring and fish health tracking in aquaculture. The system continuously monitors critical parameters such as water temperature, dissolved oxygen, pH, and water level, providing an early warning mechanism. With a 360° rotating underwater camera, it captures fish behavior in detail. Compared to traditional methods, it offers lower operational costs and higher precision, helping reduce production losses and ensuring sustainable farm management.

Stage of Development

TRL of the Technology is 7.
It has been tested in real-world aquaculture conditions with measurable outputs including real-time water quality monitoring (temperature, oxygen, pH), 360° underwater fish behavior observation, and cloud-based remote farm management capabilities. Current outcomes demonstrate 30% improvement in early anomaly detection, 20% reduction in fish mortality rates, and 15% operational cost savings compared to traditional methods.

Expected Outputs of the Technology

Future goals for this technology include full automation, AI-powered analytics, and advanced early warning systems. In the short term, it is expected to deliver a 40% increase in water quality monitoring accuracy and a 25% improvement in fish growth rates. In the long term, fully integrated systems aim to enhance water resource efficiency by 30%, improve waste management, and reduce the overall carbon footprint.
Planned enhancements include mobile app integration, multilingual support, and the development of sensors adaptable to various water types. These advancements are expected to facilitate the widespread adoption of the technology in both local and international markets.



Scalability Potential

The international scalability potential of this aquaculture technology is high, particularly in regions such as the Mediterranean, Southeast Asia, and Latin America, where water scarcity and sustainable food production are key concerns. The technology maintains its effectiveness across diverse climate and water conditions and can be adapted to comply with local regulatory frameworks. Modifications tailored to language, culture, and local infrastructure are feasible. Large-scale implementation can be supported through strategic partnerships with industry leaders, pilot projects, and access to global funding opportunities.

Applications

- Aquaculture
- Water Resources
- Environment and Sustainability

Intellectual Property Status

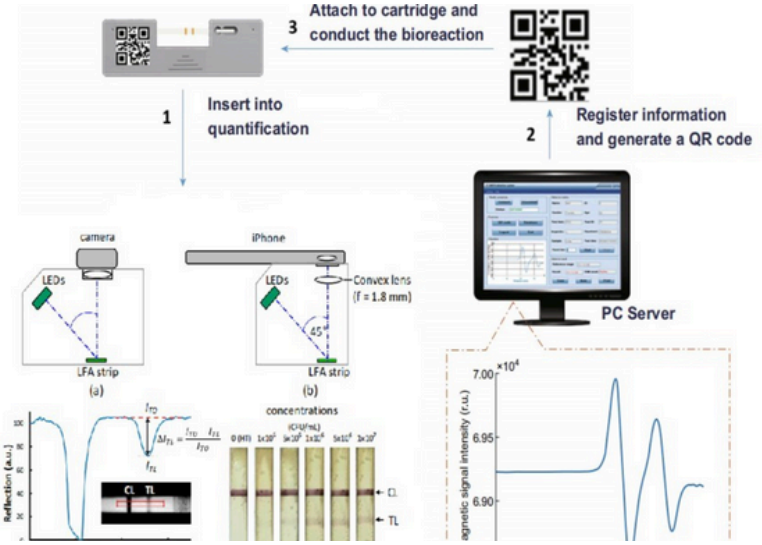
There is no intellectual property process related to technology.

Contact Person: Rafet Çağrı ÖZTÜRK

Role: Company Owner

e-mail: rafetcagriozturk@gmail.com

Gestational Diabetes Diagnosis and Monitoring (GDM) Biosensor



Thematic Area(s)

Biotechnology

Relevance

The developed biosensor is fully aligned with the objectives of the Biotechnology thematic area. By leveraging disciplines such as genetics, molecular biology, and biochemistry, it offers innovative solutions in the field of healthcare. The technology provides a modern biotechnological alternative to traditional diagnostic methods by enabling faster, safer, and more effective diagnostics. Through test strips and image processing software, it measures biomarkers at the molecular level, enhancing the quality of healthcare services while prioritizing patient comfort.

Short Description

The biosensor-based device developed for the diagnosis of gestational diabetes emerging for the first time during pregnancy eliminates the challenges associated with the traditional OGTT test. Requiring only a 3 ml blood sample, it enables a rapid diagnosis at any time of day without the need for fasting. Utilizing a test strip and camera reader system, it provides results digitally. preventing side effects such as nausea and fainting commonly experienced by pregnant women, it offers a comfortable and safe diagnostic process. While reducing costs in the healthcare sector, it protects maternal and fetal health through early diagnosis.

Stage of Development

TRL of the Technology is 4.
Following the proof-of-concept stage, key technology parameters have been analyzed. R&D activities have been completed, while clinical studies are ongoing. A prototype has not yet been developed. The biosensor is designed to operate with just 3 ml of blood without requiring fasting, and integration with a test strip and camera reader is planned. A software infrastructure has been developed to deliver results digitally.

Expected Outputs of the Technology

The biosensor will offer a significantly easier and faster alternative to conventional OGTT methods during the 24th–28th weeks of pregnancy. It can be used at any time of day, regardless of fasting status, requiring only a 3 ml blood sample. The blood applied to the test strip will be recorded by a camera reader and analyzed using advanced image processing software. The biosensor will accurately measure quantitative biomarker levels on the test strip, process the results digitally, and encode them as a QR code. This QR code will provide rapid access to results, allowing for quicker initiation of treatment and enhancing comfort for pregnant individuals.

Scalability Potential

Approximately 140 million births occur globally each year, and the total market size for gestational diabetes testing and treatment is estimated at around $86 billion. Professional organizations such as the American College of Obstetricians and Gynecologists and the American Diabetes Association recommend that all pregnant women be screened for GDM. This global recommendation and widespread need indicate a very high potential for the international scalability of the technology. The likelihood of success in internationalization has been assessed as very high. Given the global prevalence of gestational diabetes and the limitations of current diagnostic methods, the technology holds strong market potential worldwide.

Applications

- Healthcare and Biotechnology
- Pharmaceuticals and Medical Devices

Intellectual Property Status

- There is no intellectual property process related to technology.

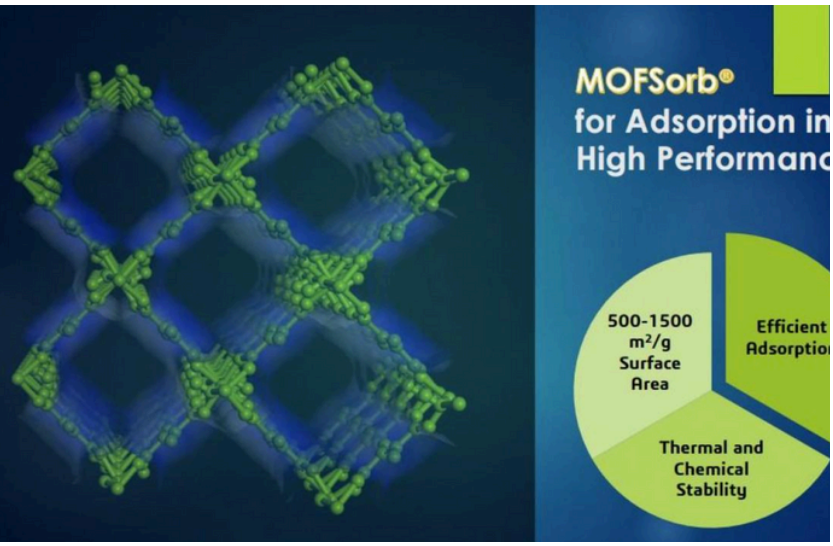
Contact Person: Tuğçe KESKİNER

Role: Founder, General Manager

e-mail: tugcekeskinerr@gmail.com

website of the technology: www.genobedia.com

MOF Filled Hydrogen Storage System



Short Description

Hydrogen energy is a promising solution for extending range and payload in mobile platforms like UAVs, offering lighter and more compact energy storage. The technology uses MOF-filled (Metal Organic Framework) material-based hydrogen storage, which enhances hydrogen capacity via physical adsorption inside steel or composite tanks. This method reduces system weight and volume, enabling platforms to operate longer and carry more.

Thematic Area(s)

- Low Carbon Economy
- Carbon Management and Storage Technologies

Relevance

The hydrogen energy system basically aims to reduce carbon emissions by using hydrogen instead of carbon-based fuels. From this point of view, it fits into the thematic area of “Low carbon economy”. In addition, the MOF-filled tube system proposed for hydrogen storage can also be used for carbon capture thanks to the MOFs used in it. Therefore, it fits into the thematic area of “Carbon Management and Storage Technologies”.

Stage of Development

TRL of the Technology is 7.
We have MOF-filled hydrogen storage prototypes in three sizes, tested for pressure and capacity. However, customer-oriented use showed the need for reverse engineering over ready-made products. Production now focuses on designing new cylinders by calculating dimensions and capacities based on end-user needs.

Expected Outputs of the Technology

It is expected to be used primarily in UAV/UGV and similar mobile platforms, followed by more widespread use in land vehicles with medium small power requirements, including meeting the energy needs of avionic systems of UAV and other aircraft. The main output is a MOF-filled type IV or custom-designed hydrogen storage system.

Scalability Potential

Similar studies are rare, yet sector demand is high. While the need for MOF-filled hydrogen storage—considered 4th generation—is evident, there are almost no specialists in Turkey working on it, especially for mobile platforms. In Europe, most efforts focus on large-scale or built-in systems. Our work addresses a major gap and holds potential for global use, particularly in initiatives like the South Marmara Hydrogen Valley.

Applications

- Energy
- Automotive and Mobility

Intellectual Property Status:

- TR2023/001369 - Granted Patent

Contact Person: Zeynel ÖZTÜRK

Role: Manager

e-mail: zeynelozturk61@yahoo.com

website of the technology: https://www.anadoluarge.com.tr/hydroginmof/

Cherry Mic

Short Description

Cherry Mic develops sustainable microbial fertilizers based on Azotobacter chroococcum to boost productivity in agriculture. Our products enhance plant growth via high siderophore and IAA production, while improving soil nutrient cycling by dissolving phosphate and oxidizing iron. Using encapsulation, immobilization, and lyophilization, we offer liquid, powder, and capsule forms with extended shelf life. Cherry Mic is a green alternative that supports soil health and lowers chemical fertilizer use.

Thematic Area(s)

Resilience and Adaptation to Climate Change

Circular Economy

Relevance

Cherry Mic's microbial fertilizers support climate change adaptation by enhancing plant resilience to drought and salinity, reducing chemical fertilizer use, and lowering carbon footprint. Using nitrogen-fixing and phosphate-solubilizing microbes, soil health and sustainability are improved. Produced from agricultural waste, our fertilizers promote waste reuse, efficient resource use, and natural nutrient cycling, contributing to a circular economy model.

Stage of Development

TRL of the Technology is 9.
Cherry Mic's microbial fertilizers enhance nutrient uptake by oxidizing iron and solubilizing phosphate. Containing *Azotobacter chroococcum*, they boost growth and yield through siderophore and IAA production. Field use reduces chemical fertilizers, supports soil health, and proves effective with partners like Başakşehir Municipality. Farmer feedback shows higher yields.

Expected Outputs of the Technology

Cherry Mic's biotechnology-based microbial fertilizers aim to increase yields by supporting long-term sustainability in agricultural production. Expected outcomes include reducing the use of chemical fertilizers by improving soil nutrient cycling, maintaining ecosystem balance by enriching soil microbiota, and reducing farmers' production costs. Our products will minimize agricultural yield losses by increasing plant resilience to environmental stressors such as drought, salinity and low nutrient levels. In addition, waste management will be optimized by contributing to the circular economy through biotechnological fertilizer production from agricultural waste.

Scalability Potential

Having gained a strong local presence, Cherry Mic aims to scale globally with microbial fertilizers adaptable to various climates, increasing productivity even in drought or salinity. Replacing chemical fertilizers, they offer eco-friendly solutions aligned with global sustainability goals. Advanced biotech methods ensure long shelf life and transport ease. Customizable products and alignment with circular economy and climate targets open paths to international growth and partnerships.

Applications

- Agriculture

Intellectual Property Status

- Patented

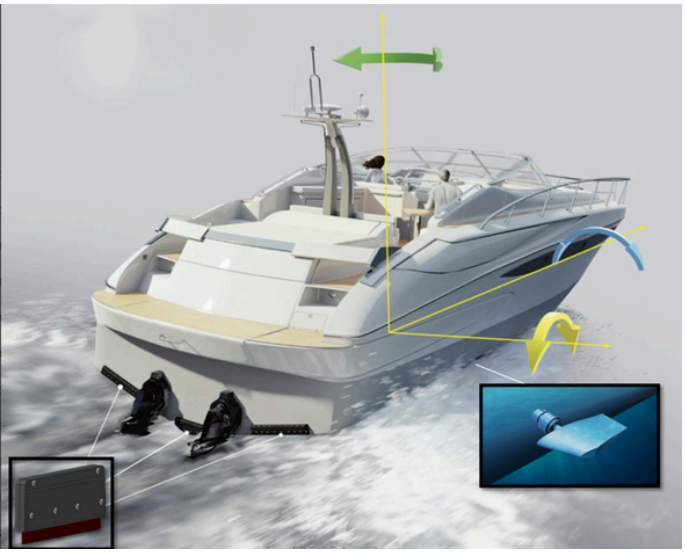
Contact Person: Iraz AKTAY

Role: Founder

e-mail: iraz@cherrymic.com

website of the technology: www.cherrymic.com

Sea Balance - Active Control Ship Stability System



Thematic Area(s)

Blue Economy

Green Transport and Logistics

Short Description

Sea Balance offers solutions to stability problems such as roll, pitch, trim-induced loss of visibility and reduced maneuverability that occur in ships while sailing or at anchor. 200,000 ships launched every year need a stability system. With this system, fuel consumption decreases by 12-15%, speed increases by 15% and seasickness decreases by 90%. It stabilizes the ship in all directions with automatic dynamic wings, controls trim and roll angles, and reduces the roll radius in turns. Provides safer, more comfortable navigation and superior maneuvering.

Relevance

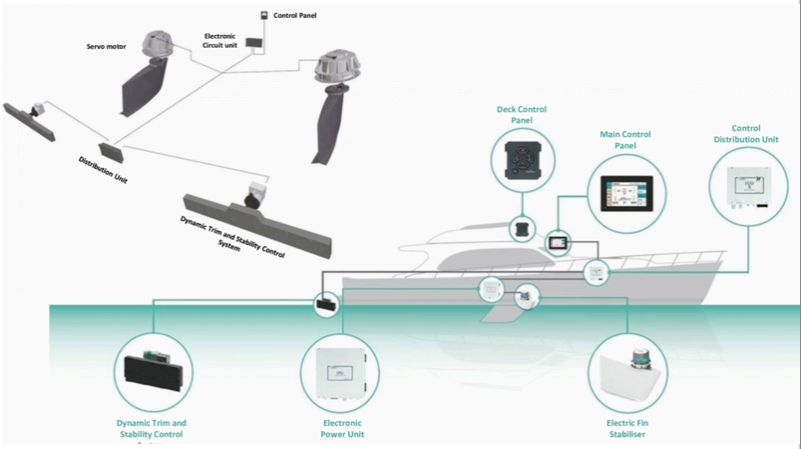
Sea Balance reduces carbon emissions by reducing excess fuel consumption caused by stability problems. Sea Balance is manufactured from natural fiber hemp-based composite instead of synthetic composite. Hemp-based composite with natural fibers will be used to replace plastic-based composite materials due to their low cost, low density, high strength and modulus of elasticity, easy surface modification, easy availability, renewable and biodegradable.

Stage of Development

TRL of the Technology is 6.
15% speed increase
12-15% fuel savings
80% control of trim angles
control of roll angles at 80% mooring
60% control of yaw angles in cruise
Reducing the understeer radius in turns by 50%
Resetting the bending angle in turns
A more comfortable and safe cruise
Improved boat visibility
Increased maneuverability
90% reduction in the rate of seasickness on passengers

Expected Outputs of the Technology

The fin wing system product, which will be produced for the first time in our country and whose similar products are produced by a small number of companies in the world, has the potential to be patented as a result of the innovations made in both design and mechanical and electronic components. The fact that it is a subject that is studied only by our organization in our country in terms of both academic, engineering and R&D studies whose know-how belongs to our organization, and that it has design and software superiorities compared to its counterparts in the world, increases its competitiveness and national gains are foreseen.



Scalability Potential

The project offers a high-tech marine stabilization product with wide application—from military ships to yachts and unmanned surface vehicles. It aims to replace imported systems, offering technical and price advantages. With 90% of equipment in boats being imported, domestic production adds serious value. Proven locally, the product targets global markets, especially in ship-exporting countries. Its originality, broad use, and market potential make it attractive for investment and eligible for establishment loans.

Applications

- Transportation

Intellectual Property Status

- TR2022/014109 - Granted Patent

Contact Person: Ömer Sinan ŞAHİN

Role: General Manager

e-mail: ossahin@smmarine.com.tr

website of the technology: www.smmarine.com.tr

Autonomous Unmanned Underwater Robot Cleaning the Undercarriage of Marine Vehicles

Thematic Area(s)

Blue Economy

Resilience and Adaptation to Climate Change

Relevance

Few firms serve the underwater cleaning robot market. Dominated by Dutch firm Fleet Cleaner, the sector has limited competition. Our business targets commercial shipowners, ports, marinas, and shipyards with a rental-based model. We plan to expand via sub-component and robot sales. Our localized, wireless robots offer easy maintenance, training, and support. The solution also aligns with UN SDGs by reducing marine pollution and harmful organism spread.

Short Description

1- Wireless Use
2- Cost-effective realization of the processes of under-ship cleaning and analysis of the underlying parts of ships.

Stage of Development

TRL of the Technology is 7.
The current outputs and outcomes of the technology are as follows:
Gripper Arm,
Power-Data Transfer Board,
Battery System,
Lighting System,
500m Durable Reservoir,
Power Distribution Board.

Expected Outputs of the Technology

With this project proposal, an autonomous unmanned underwater cleaning robot will be developed to clean the underwater part of an underwater vessel at any time when it drops anchor without 2 compromising the workflow. The robot will also be able to be used with a cable. In the project, first of all, the body design of the robot will be made and the location of the pusher and magnetic adhesion area will be determined. In the following process, electronic control cards, motherboard, thrusters, lighting system, communication and battery system, power distribution cards, subcomponents, robot controller and surface control panel will be produced.

Scalability Potential

Most underwater cleaning robots in the market are tethered. Only five firms offer products in Türkiye, all cable-controlled. Our wireless robot will offer a competitive edge locally and globally, supported by AI-powered image processing and long battery life. Critical subcomponents will be locally produced, reducing costs and enabling fast support. Sales will be through major e-commerce sites and our website. Lower production costs will allow affordable rental. Product diversity will grow via R&D.

Applications

- Energy
- Marine Sciences

Intellectual Property Status

- There is no intellectual property process related to technology.

Contact Person: Ahmet SEVİM

Role: Co-Founder

e-mail: a_sevim@icloud.com

website of the technology:
www.gemesan.com.tr
www.viyalab.com

Food Supplements and Natural Dermocosmetics

Thematic Area(s)

- Health
- Food
- Cosmetic

Relevance

Technology offers safe, natural and highly bioavailable solutions in the health and food fields. Water-soluble propolis provides immune support, while bee silk is valuable in cosmetics and nutrition. Propolis supplements and dermocosmetics are in line with functional food and health trends.
Propolis and bee silk-based technologies indirectly contribute to a sustainable economy by using biosustainable natural resources in selected thematic areas. They create an alternative value for large-scale producers who produce chemical solutions with the efficient use of scarce resources.

Short Description

OKTA ARGE mainly focuses on natural dermocostemics and food supplements. Within the patented technologies, company produce water-soluble propolis extracts, highly bioavailable propolis production machines, natural dermocosmetics and food supplements, and biologically active bee silk. Unique innovative solutions make a difference in the health, food and cosmetics sectors.
Technology offers safe, natural and highly bioavailable solutions in the health and food fields. Water-soluble propolis provides immune support, while bee silk is valuable in cosmetics and nutrition. Propolis supplements and dermocosmetics are in line with functional food and health trends.

Stage of Development

TRL of the Technology is 9.
A cream and propolis drop ready for use by the end consumer have been produced, in which propolis and bee silk components are evaluated. As a result of R&D studies, water-soluble propolis extracts, propolis gum, propolis extraction machine, bee silk, and cosmetics containing bee silk are obtained.
All related products with natural ingredients can be scaled up ready for mass production.

Expected Outputs of the Technology

Propolis extracts are among the long-term investments in areas such as food supplements, pharmaceuticals, cosmetics and dental products, as they can adapt to different sectors. Bee silk can be evaluated for above-segment collaborations with its unique structure that can appeal to the biomedical and luxury cosmetics sectors.
The most important strategic plan is to open up to the national and international markets with a business that will mass produce water-soluble propolis extracts, propolis gum, propolis extraction machine, bee silk and cosmetic products containing bee silk as a result of R&D studies.

Scalability Potential

Propolis and bee silk technologies are scalable to different international markets and adaptable to local regulations.
The EU, US and Asia Pacific markets have strong demands for health and natural products. Formulation, developed in accordance with the criteria of regulatory bodies such as EFSA in the EU and FDA in the US, will provide a competitive advantage in these markets.
Japan, South Korea and China, is showing a growing trend in the functional food and dermocosmetics market. Since propolis and natural ingredients have a strong history in traditional medicine, consumer demand is high.
GCC countries, avoid from alcohol, are particularly notable for their increasing demand for natural health products, while Latin America has a strong market in countries where beekeeping is widespread, such as Brazil.

Applications

- Agriculture
- Healthcare and Biotechnology
- Pharmaceuticals and Medical Devices

Intellectual Property Status

- TR2019/09718 - Granted Patent
- TR2021/019717 - National Patent Application
- TR2023/002535 - National Patent Application
- PCT/TR2024/050193
- TR2023/003114 - National Patent Application
- TR2023/015717 - National Patent Application
- DE2024103015443300 - International Patent Application

Contact Person: Oktay YILDIZ

Role: Manager

e-mail: oktayyildiz29@hotmail.com

Paraffin Alternative Biobased Sustainable Iso Amyl Ester Rosin

Thematic Area(s)

- Low Carbon Economy
- Circular Economy

Relevance

Iso amyl ester rosin synthesis used iso amyl alcohol was obtained by fractional distillation of fuel oil formed as waste in bioethanol production. Rosin was modified with iso amyl obtained from a waste product and here contribution was made to circular economy and a product that would remain as waste was gained to economy and evaluated in the synthesis of an alternative product to paraffin.

Short Description

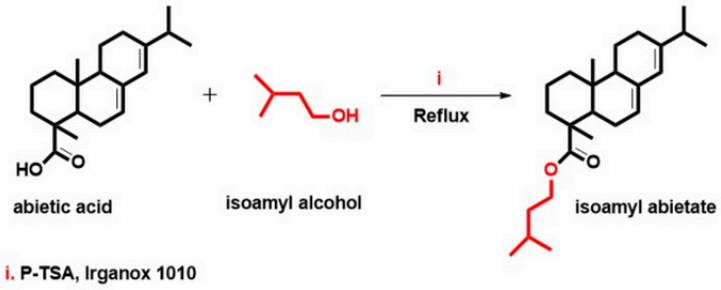
Iso amyl ester rosin is a product developed as an alternative to Paraffin, which is a petrochemical product and is used in the material industry for many different purposes around the world. Paraffin is a chemical used in high volumes as a water repellent material, especially in the production of wood-based panels. Studies have been conducted on the usability of the developed iso amyl ester rosin in the production of medium-density panels instead of paraffin, and the test and analysis results have been concluded that it can be an alternative to Paraffin, and the research results have been published in a scientific journal that is important in its field.

Stage of Development

TRL of the Technology is 5.
Rosin was obtained from natural pine resin and as a result of the reaction it entered with iso amyl alcohol it turned into a substance with very different properties and this transformation paved the way for its use in different sectors.
The polymer structure obtained from natural pine resin has a component that supports different beneficial effects on various surfaces.

Expected Outputs of the Technology

The current technology product is a product that is open to development, like all other new products that are the subject of new beginnings. The product needs current improvements in terms of both its physical structure and the development of its areas of use. In order to develop the product, it is necessary to first produce the product on a pilot scale and observe possible changes in the product's features because of this production and update the recipes in the production method accordingly.



Scalability Potential

The subject of the project is iso amyl ester rosin resin production and trade is high in China, Spain, Portugal and Italy, which can be found in the current market. There is no equivalent of this developed product in the world and for this reason, patent applications have been made for the developed iso amyl ester rosin both nationally and internationally. The natural rosin used in the development of the product is produced from many resin sources in the world. The product is bio-based and cheap. For this reason, it is essential to spread the use of this product in many areas. For this purpose, an international patent has been entered for the iso amyl ester rosin product to enter Italy.

Applications

- Mining and Materials

Intellectual Property Status

- TR2022/016536 - National Patent Application
- IT112024000051796 - International Patent Application

Contact Person: Bilge YILMAZ

Role: Inventor

e-mail: bilgeyilmaz@ktu.edu.tr

Drinkable Cheese with Soy Beverage Additives

Short Description

Drinkable cheese with soy beverage additive is a dairy product that is of interest to all consumers, especially those who are sensitive to lactose digestion, those who prefer a vegan diet, those who want to consume gluten and caffeine-free plant-based milk products, those who want to benefit from both animal and plant protein at the same time, and those who need and are interested in an innovative drinkable form rather than a solid form, contrary to normal consumption habits

Thematic Area(s)

- Functional Foods
- Plant-based Foods

Relevance

Many diseases, physiological and morphological disorders such as diabetes, obesity, oxidative stress, cancer, cardiovascular and severe infections are increasing and affecting the quality of life. Many disorders are related to the abuse of synthetic additives, unbalanced diets, exposure to radiation and strong viruses. To have a healthier and higher quality life, consumers tend to take measures to protect themselves from diseases in addition to seeking solutions to health problems. Developing new functional food is important for food industry.

Stage of Development

TRL of the Technology is 8.
Under the R&D actions shows that drinkable cheese containing antihypertensive, antioxidant, antimicrobial and antidiabetic peptides, which is low in lactose, highly vegan and gluten-free and can be stored at 4 degrees for up to 45 days, was produced. 102 functional peptides were identified. Its dry matter was determined to be between 20-35%. Its sensory properties and consumability were demonstrated.

Expected Outputs of the Technology

With the increasing demand for plant-based milk in recent years, it is thought that this product will also attract attention in the market. In the long term, different cheeses can be designed with different raw plant materials. The product portfolio can be expanded by using different fermentation schemes and culture types.

Scalability Potential

1. Growing Vegan and Plant-Based Food Market: As of 2023, the plant-based food market is growing rapidly and there is a great demand especially in North America, Europe and Asia-Pacific regions.
2. Product Adaptation (Localization) Taste and Texture: Consumer tastes vary across regions. For example, fermented flavors are preferred in Europe, while lighter and sweeter flavors may be popular in the Asian market.
3. Regional Market Entry Strategies: Vegan diet trend is widespread. Fermented and natural flavors are preferred.

Applications

- Agriculture
- Food Industry, Dairy Industry

Intellectual Property Status

- TR2023/017052 - National Patent Application
- PCT/TR2024/051494

Contact Person: Mehtap ER KEMAL

Role: Inventor

e-mail: mehtaper0@gmail.com
mehtaper@ktu.edu.tr

Powder Modifier for Aluminium Casting Alloys

Short Description

The powder modifier we have developed is designed as an alternative to Al-Sr master alloys used for casting Al-Si alloys. While traditional methods add Al-Sr master alloys in solid form to increase the impact strength of parts, our new technology offers a more economical and environmentally friendly modification process in powder form.

Thematic Area(s)

Circular Economy

Stage of Development

TRL of the Technology is 4.
The chemical properties of the product were proved in the laboratory environment and it was seen that it was formed in powdered Al-Sr master alloy grains.

Relevance

The production process we have developed consumes less energy, water and labour force and generates less waste compared to traditional production methods.

Expected Outputs of the Technology

In the following process, patent registration will be provided, which is currently in the evaluation phase, and then TUBITAK 1507 etc. project supports will be developed and field tests will be carried out.

Scalability Potential

Our developed powder modifier shows significant scalability potential in countries with substantial aluminum casting capacity like Turkey, Europe, Russia, Brazil, USA, and China. However, its imitability in Far Eastern markets poses challenges for market entry. Economical, environmentally friendly, and efficient, it offers a competitive edge globally as a robust alternative to Al-Sr master alloys. Compatible with various casting techniques, it targets automotive, aerospace, and machinery sectors. Incentives for eco-friendly production in Europe will boost market adoption. Plans include establishing a global distribution network with international foundry partners, emphasizing minimal language and cultural barriers.

Applications

- Mining and Materials

Intellectual Property Status

- TR2023/006701 - National Patent Application
- BR1120240249263 - International Patent Application

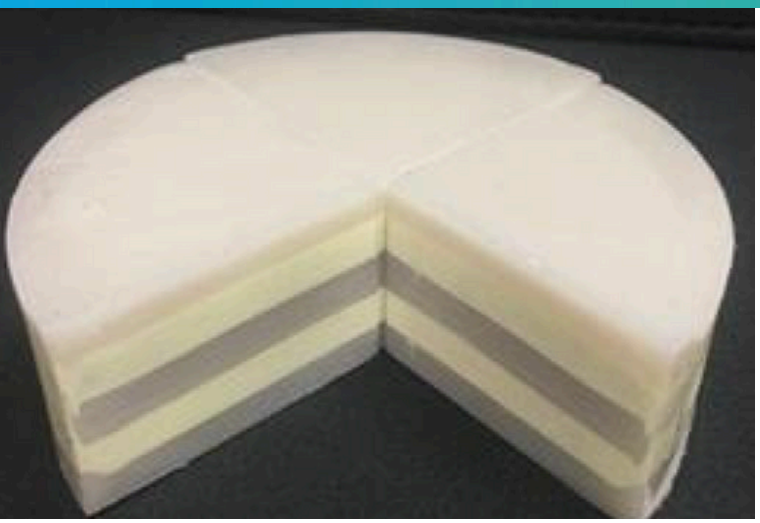
Contact Person: Raşit SEZER

Role: CEO

e-mail: rasitsezer@gmail.com

website of the technology: https://strolabs.com/

Boron Minerals and Bismuthoxide Doped Neutron Absorber Material



Short Description

The invention relates to a material for absorbing a radiation beam for protection against the harmful effects of radiation. The invention relates to an absorbing material which reduces the harmful effects of neutron and gamma rays by absorbing neutron rays and secondary gamma and alpha rays produced by the absorption of neutron rays.

Thematic Area(s)

- Radioactive Material
- Healthcare
- Construction

Stage of Development

TRL of the Technology is 7.
A neutron-absorbing composite was developed using boron minerals (colemanite, ulexite, boron oxide) and bismuth oxide in HDPE. The boron layer absorbs neutrons and emits gamma rays, which are absorbed by the bismuth layer. Tested with Pu-Be and Cs-137 sources, it suits hospitals, labs, and accelerators, meets ASTM standards, and costs 30–50% less than imports.

Relevance

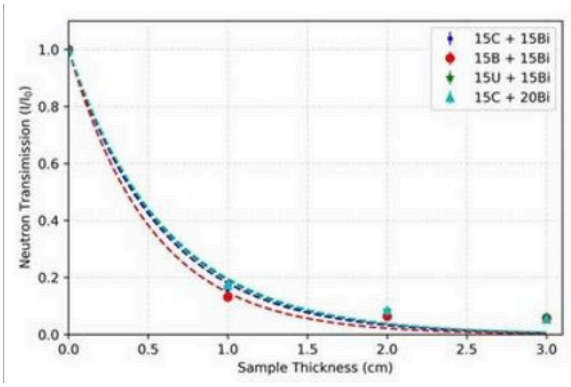
The materials produced will be produced with domestic products. Since the products are made of polyethylene materials, they can also be produced from high density polyethylene collected from the market obtained through recycling.

Expected Outputs of the Technology

In Türkiye, HDPE composite materials not commercially available—5%-10%-15% Colemanite, Ulexite, B2O3 doped HDPE and 15%-20%-30% Bi2O3 doped HDPE—were produced. Their physical and mechanical properties were determined through ASTM-standard tests and compared with pure HDPE. The results support their use in various applications. As a final product, colemanite and Bi2O3 doped HDPE sheets were combined to form a layered structure for neutron and gamma radiation shielding. Given the range of neutron applications (medical, industrial, nuclear), neutron energies differ. Thus, adjusting the layered structure's thickness for the intended environment offers flexibility and provides an effective and practical radiation protection solution.

Scalability Potential

The product emerged from a University-Industry cooperation project. As a result, radiation protective products with high neutron absorption will economically benefit the industrial company and support its future goals. Imported radiation shielding materials will be produced domestically, meeting local demand and enabling marketing to neighboring countries. While various neutron absorbers exist locally, boron-added polyethylene with international standards is not produced. Türkiye holds 72% of world boron reserves. The product costs 50% less than foreign alternatives and, unlike single-layer foreign products, offers a layered structure with superior radiation shielding, making it attractive abroad.



Sample
15C + 15Bi
15B + 15Bi
15U + 15Bi
15C + 20Bi

Applications

- Healthcare and Biotechnology
- Aerospace and Defense
- Mining and Materials

Intellectual Property Status

- TR2022/011564 - National Patent Application

Contact Person: Selcen UZUN DURAN

Role: Inventor

e-mail: selcenduran@ktu.edu.tr

Agripoli

Thematic Area(s)

- Low Carbon Economy
- Resilience and Adaptation to Climate Change
- Circular Economy
- Carbon Management and Storage Technologies

Relevance

Agripoli's biomaterial technology supports low carbon economy and carbon management goals. Our biodegradable plastics reduce the carbon footprint by offering a sustainable alternative to fossil-based plastics. We enhance climate resilience by converting agricultural waste into high-performance bioplastics. Aligned with the circular economy, we recycle industrial waste into valuable raw materials. Agripoli's innovative biocomposites promote green production across various sectors.

Short Description

Agripoli develops biodegradable, high-performance bioplastic raw materials from agricultural waste like tea pulp, hazelnut shell, and apple pulp. Our natural customization method enhances mechanical strength by combining different wastes. This technology reduces carbon footprint and fossil fuel reliance while enabling recycling integration. The durable, flexible, and scalable composite bioplastics serve sectors like packaging, automotive, textiles, and consumer goods, accelerating green transformation and supporting the circular economy.

Stage of Development

TRL of the Technology is 6.
Agripoli's biomaterial technology produces biodegradable plastic granules and optimizes biocomposites for industrial scale. Tests show 5-30% tea caffeine biocomposites have strong tensile strength and thermal stability versus fossil plastics. Outputs include up to 30% CO_2 reduction, 80% agricultural waste recycling, and 20% energy savings via solar integration. Long-term impacts support circular economy, reduce petroleum reliance, and boost green production through brand collaborations.

Expected Outputs of the Technology

Short Term Outcomes: Achieve industrial-scale production with 100 tonnes of bioplastic granules in the first year. Improve durability by enhancing tensile strength, impact, and heat resistance. Obtain certifications like OK Biodegradable, ASTM D6400, and EN 13432. Medium Term Outcomes: Increase renewable energy use to cut carbon footprint by 40%. Produce biodegradable packaging and automotive materials as alternatives to non-recyclable plastics. Establish a production model using 90% of agricultural waste. Long Term Results: Reduce petroleum-based plastics by 50%, lead the biodegradable plastics market, expand internationally, and align with the European Green Deal to support the circular economy.

Scalability Potential

Agripoli's bioplastics technology aligns with global sustainability goals and has strong international scalability, especially in markets like the EU, US, Japan, and South Korea, driven by the European Green Deal and plastic regulations. Market fit includes the EU's single-use plastic ban and carbon tax, US retail chains shifting to sustainable packaging, and plastic bans in China and India. Scale-up strategies involve increasing regional production via local partnerships and licensing, gaining certifications per bioplastic regulations, and targeting high-demand sectors such as packaging, automotive, and textiles for global expansion.

Applications

- Automotive and Mobility
- Plastic Industry

Intellectual Property Status

- TR2024/006940 - National Patent Application

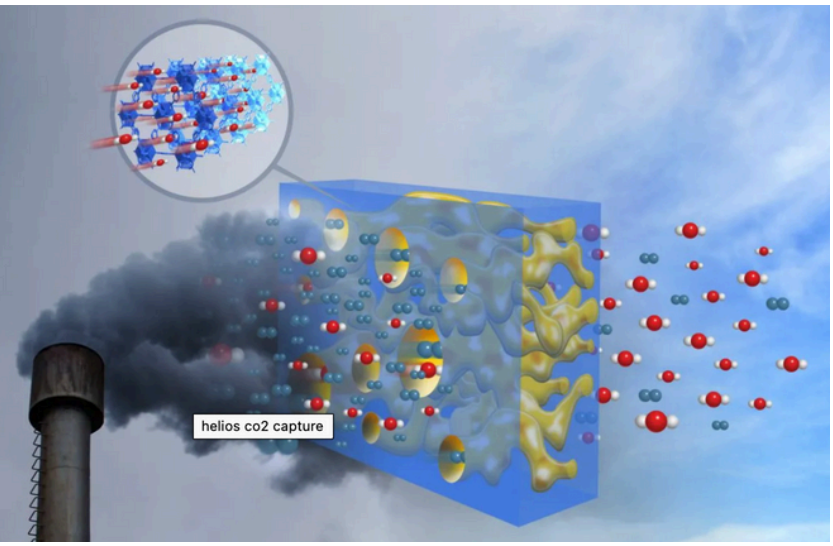
Contact Person: Ebru BARİPOĞLU

Role: Co-Founder & CEO

e-mail: ebru.baripoglu@agripoli.com

website of the technology: http://www.agripoli.com

Capture and Recovery of Carbon Dioxide from Industrial Flue Gases with Metal Organic Frameworks (MOF) Based Solid Adsorbents



Short Description

This technology captures and recovers CO_2 from industrial flue gases using Metal Organic Frameworks (MOFs). Thanks to their ultra-high porosity and large surface area, MOFs adsorb CO_2 with high selectivity and capacity. It requires less energy and causes less environmental impact than conventional methods. The project aims to functionalize MOFs, adapt them for industrial conditions, and test them on real flue gases by pelletizing.

Thematic Area(s)

- Low Carbon Economy
- Resilience and Adaptation to Climate Change
- Carbon Management and Storage Technologies
- Circular Economy

Relevance

The developed MOF-based carbon capture technology contributes to the low carbon economy by enabling the reduction of high emissions from flue gases. At the same time, the circular economy approach is supported thanks to the reuse of captured CO_2. The project is in line with Turkey's goals to combat climate change and offers a sustainable and feasible solution in the field of carbon management and storage technologies.

Stage of Development

TRL of the Technology is 4.
Synthesis, characterisation and production of MOFs at 1-5 gram scale have been successfully carried out in the laboratory environment. Thousands of MOF structures were screened by artificial intelligence assisted analyses and the 5 most suitable candidates were identified. Critical parameters such as CO_2 adsorption capacity, surface area and chemical resistance were characterised. At the prototype level, MOFs have achieved targets such as surface area greater than 1250 m^2/g and CO_2 retention capacity ≥1.5 mmol/g.

Expected Outputs of the Technology

At the end of the project, it is planned to produce MOFs at a scale of 500 grams and test them in a simulated reactor system operating with industrial flue gases. This process will ensure that the material is ready for industrial application. In the long term, it is aimed to reduce carbon emissions, reduce carbon footprint and initiate economic recovery processes in high emission sectors such as iron and steel and power plants.

Scalability Potential

Carbon capture and storage is a rapidly growing global market, expected to reach billions in value. Our project develops MOF-based solid adsorbents tailored to this demand. EU carbon taxes, emission trading, and climate policies drive technology needs, especially in Germany, the Netherlands, and Scandinavia. As Helios, we participate in European projects like Fortissimo Plus, EIT Food Test Farms, and EWA, creating adaptable solutions for diverse climates, infrastructures, and regulations. Our low-impact, scalable, and compliant technology enhances international adoption through technical and strategic collaborations.

Applications

- Construction and Infrastructure
- Environment and Sustainability
- Mining and Materials

Intellectual Property Status

- There is no intellectual property process related to technology.

Contact Person: Gizem UYSAL

Role: Founder

e-mail: gizem@heliosscitech.com

website of the technology: https://heliosscitech.com/

T3N-BSB

Interreg NEXT Black Sea Basin

Co-funded by the European Union

TECHNOLOGIES FROM GREECE

KTU 1955

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

BATTI

UNIVERSITAS GALATIENSIS

Transforming Industrial CO_2 Emissions into Valuable Nanomaterials

Thematic Area(s)

- Low Carbon Economy
- Environment and Sustainability
- Resilience and adaptation to climate change
- Circular economy
- Carbon management & storage technologies

Relevance

The proposed technology directly supports the goals of a Low Carbon Economy by enabling more efficient and cost-effective carbon capture and utilization (CCU). By using a rotating packed bed reactor, the system captures CO_2 emissions from industrial processes with reduced energy and resource consumption compared to conventional methods. Furthermore, it transforms the captured CO_2 into carbonated salt nanoparticles, turning a waste product into a commercially valuable material. This dual function not only reduces greenhouse gas emissions but also promotes circular economy principles, making it highly relevant for industries aiming to decarbonize their operations.

Short Description

This invention uses a compact, rotating packed bed reactor to both capture CO_2 using amines and convert it into valuable carbonated salt nanoparticles. Unlike traditional systems, it significantly reduces equipment size and resource use, lowering both upfront and operating costs. This makes carbon capture more affordable and efficient. The approach not only helps reduce industrial CO_2 emissions but also creates high-value materials, offering strong benefits for the environmental technology and materials industries.

Stage of Development

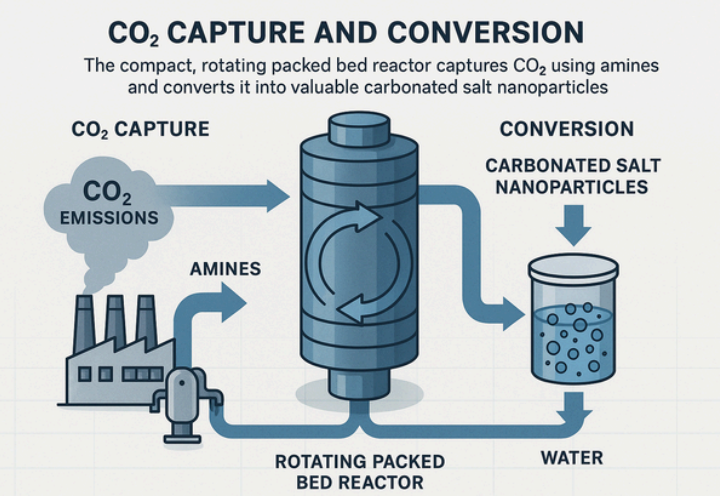
The technology, currently at TRL 5, delivers several measurable and high-impact outcomes. It enables CO_2 capture with over 94% efficiency while significantly reducing equipment size and processing steps. In validated applications, such as the patented single-reactor production of high-purity carbonated magnesite nanoparticles (hydromagnesite), it eliminates the need for secondary reactors and harmful additives, resulting in zero chemical waste. The system achieves up to 30 times higher production rates compared to conventional reactors, while also cutting operational costs and minimizing environmental footprint, making it a highly scalable solution for industrial decarbonization and materials production.

Expected Outputs of the Technology

The use of RPBs does not require additional chemicals. The lower volume of equipment compared to conventional columns or reactors will also result in lower material quantities for the equipment construction. This will generate improved LCA performance upstream, at the materials and equipment construction level, and downstream, at the materials and equipment recycling or scrapping (waste) level.

Scalability Potential

The technology has strong international scalability potential due to its compact, modular design—each reactor unit remains under 2 meters in diameter, allowing for easy deployment and scale-up by adding modules in series. This flexibility enables rapid adaptation to various industrial capacities and settings. With global CO_2 emission regulations tightening—especially within the EU—and the rising cost of emission rights, demand for efficient carbon capture and utilization solutions is expected to surge in the next five years. The technology is geographically agnostic, with no societal or environmental barriers, making it suitable for global deployment. Expansion efforts will target regions with strong decarbonization policies and industrial needs, and partnership opportunities are being explored to support international rollout.



Applications

- CO_2 capture and reuse across key sectors: cement, power, steel, chemicals, waste-to-energy, mining, water treatment, advanced materials, and carbon markets - enabling decarbonization, material recovery, and emissions valorization in a circular economy.

Intellectual Property Status

- PCT/IB2023/059900
- Patent Application No: 20230100390 - GR

Contact Person: Dr. Athanasios Papadopoulos

Role: Senior Reasercher - Centre for Research and Technology Hellas

e-mail: spapadopoulos@certh.gr

website of the technology: http://nanocap.cperi.certh.gr/

Prosthesis3D

Thematic Area(s)

- Recycling
- Environment and Sustainability
- Circular economy

Relevance

Prosthesis3D supports the Circular Economy by enabling sustainable, efficient production through Additive Manufacturing. Its on-demand, localized approach reduces waste, inventory, and mass production. Using recyclable materials and 3D tools, it extends product life via repair and reuse. As a knowledge hub, it promotes skills in circular design, helping users create sustainable products while boosting material efficiency and digital-driven resource use.

Short Description

Prosthesis3D is the gateway to a world of new possibilities. This innovative digital environment allows individual users, companies and organizations to access a range of services after signing up. The user can upload hers/his 3D model and let Prosthesis3D calculate the cost of 3D printing, offering a wide selection of materials and technologies. But that is not all. I4byDesign, through Prosthesis3D, can design 3D parts and products according to user's requirements using advanced 3D design software. Additionally, I4byDesign's high-tech 3D scanner can meet user's needs for scanning real objects, digitize them and offer reverse engineering and prototyping services, providing all necessary CAD, CAE files and physical assemblies.

Stage of Development

The I4byDESIGN platform (TRL 7) offers advanced functionalities: transforming sketches into CAD designs, selecting diverse materials, reusing plastic waste for sustainable printing, prototyping in VR/AR to reduce physical iterations, estimating production costs, and enabling digital cooperation contracts. Key measurable outputs include processed models, material selections, reused plastic, virtual prototypes, cost estimations, and signed agreements—enhancing efficiency, sustainability, and collaboration.

Expected Outputs of the Technology

The platform aims to revolutionize additive manufacturing by enabling fully digital, decentralized product development, reducing reliance on traditional prototyping and mass production. It promotes sustainability through plastic waste reuse, lowers development costs and time-to-market, and supports global collaboration among stakeholders. A secure digital manufacturing database will ensure standardized, reusable design storage. Success metrics include adoption rates, reduced waste, cost savings, and cross-border partnerships.

Scalability Potential

The I4byDESIGN platform has strong global scalability due to rising demand for digital and sustainable manufacturing. It aligns with Industry 4.0, circular economy, and remote collaboration trends. In Europe, advanced Industry 4.0 adoption and recycling policies enhance market fit. North America offers strong demand and infrastructure. Asia-Pacific shows investment in automation and prototyping. The Middle East & Africa support tech-driven growth, while Latin America seeks SME-friendly, sustainable solutions.

Applications

- Applications include healthcare, aerospace, automotive, consumer products, education, architecture, cultural heritage, and industrial design—spanning sectors from medical devices and wearables to research, construction, and manufacturing.

Intellectual Property Status

- No patent

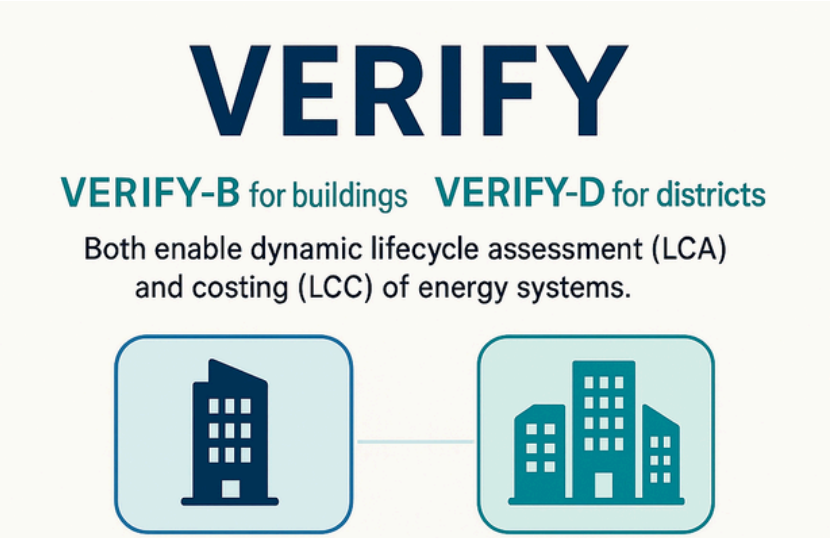
Contact Person: Mr Fokion Tzourdas

Role: CEO

e-mail: f.tzourdas@i4bydesign.gr

website of the technology: https://i4bydesign.gr/en/

VERIFY: Smart Energy Assessment for Buildings and Districts



Thematic Area(s)

- Information and Communication Technology (ICT)
- Artificial Intelligence and Robotic
- Circular economy
- Low Carbon Economy

Relevance

VERIFY platform serves mainly the Low Carbon Economy, providing a comprehensive evaluation of the environmental footprint of energy carriers and systems (incl. carbon emissions, resource use, waste generation, environmental costs), supporting the identification and optimization of energy planning and investment pathways that prioritize sustainable transition to low-carbon solutions and energy efficiency. VERIFY's adherence to EU-wide sustainability frameworks (such as Level(s) and EPBD) ensures regulatory compliance and alignment with de-carbonization targets.

Short Description

VERIFY includes two software suites: VERIFY-B for buildings and VERIFY-D for districts. Both enable dynamic lifecycle assessment (LCA) and costing (LCC) of energy systems. Using a hybrid model- and data-driven approach, VERIFY generates hourly energy profiles (8,760 values/year), integrating real-time data and external factors. Aligned with ISO and EU frameworks, it supports scenario-based analyses, combining environmental, technical, and financial insights to guide strategic energy decisions.

Stage of Development

VERIFY (TRL 6) offers detailed metrics like energy demand, GWP, lifecycle costs, payback time, and LCOE, with user-defined temporal granularity. Results are presented via graphs, time series, and automated reports. Its investment toolkit supports short- and long-term planning (1–30 years), automated LCA/LCC analyses, and sensitivity tests. Integration with the EU Emissions Trading System enables income estimation from CO2 trading, enhancing strategic decision-making.

Expected Outputs of the Technology

Short-term planned improvements:
·user-defined indicators and customizable reporting
·real-time BIM-to-LCA analyses
·interconnection with the upcoming EU Emissions Trading System (ETS 2.0)

Long-term vision: a platform that empowers a broad range of interested stakeholders in meeting their sustainability targets for systemic de-carbonization and RES penetration.

Scalability Potential

VERIFY's scalability and adaptability make it ideal for EU deployment, aligning with decarbonization targets, energy efficiency rules, and digitalization goals. It integrates with BEMS, Smart Grids, and SCADA via RESTful APIs and supports cloud or on-premise setups for data sovereignty. Its broad energy component database fits various regional mixes, while predictive models address data gaps. Multilingual support, national policy alignment, and user-friendly tools ensure accessibility and adoption. Future rollouts include EU project collaborations and partnerships to refine market fit.

Applications

- Applications span energy, construction, urban planning, manufacturing, transportation, environment, IT, research, finance, and asset management—supporting diverse sectors with tailored solutions for infrastructure, sustainability, operations, and innovation.

Intellectual Property Status

- No patent

Contact Person: Dr. Vivi Gkiourka

Role: Senior Researcher

e-mail: pgiourgka@sustenergo.com

website of the technology: https://sustenergo.com/verify

SUSTOURISMO

Thematic Area(s)

- Information and Communication Technology (ICT)
- Artificial Intelligence and Robotic
- Environment and Sustainability
- Low Carbon Economy
- Transport

Relevance

The SUSTOURISMO app aligns with the Low Carbon Economy thematic area by promoting sustainable mobility solutions that reduce tourism-related carbon emissions. By encouraging walking, cycling, public transport, and e-mobility options, the app reduces dependence on private vehicles, directly cutting CO_2 emissions in tourism-heavy areas. Additionally, the app's reward system and data-driven insights support behavioral change toward eco-friendly travel, helping cities transition to a low-carbon tourism model while fostering sustainable economic growth.

Short Description

The SUSTOURISMO mobile application is designed to promote sustainable tourism and mobility within the Adriatic-Ionian (ADRION) region. Developed under the Interreg V-B Adriatic-Ionian ADRION Programme 2014-2020, the app encourages tourists to engage in eco-friendly travel behaviors by integrating active transportation options, public transport information, and lower-carbon mobility concepts. The app has been implemented in various pilot areas across the ADRION region, including Thessaloniki, where it has been well-received by users seeking safe and sustainable travel options during the COVID-19 pandemic. The initiative underscores the potential of digital tools in transforming tourist mobility behaviors towards more sustainable patterns.

Stage of Development

The SUSTOURISMO app (TRL 7) promotes sustainable mobility in 10 Adriatic-Ionian cities, encouraging walking, cycling, and public transport. It offers real-time travel info and rewards low-carbon travel. Long-term goals include CO_2 reduction, improved urban planning via data, and support for local eco-tourism. Aligned with EU Green Deal goals, it fosters low-carbon travel and smart, sustainable tourism. Available on Android and iOS, it has already engaged thousands of users.

Expected Outputs of the Technology

In the future, the SUSTOURISMO app is expected to attract more users and expand its sustainable tourism packages by partnering with local businesses and transport providers. Short-term improvements can include enhanced gamification, AI-powered travel recommendations, real-time information provision, augmented reality functionalities, real-time CO_2 tracking to further encourage eco-friendly choices and online reservation, purchase and booking of services. In the long run, the app aims to reduce carbon emissions, improve urban mobility planning, and support local economies by promoting sustainable tourism. As more cities join, SUSTOURISMO will help create a greener, smarter, and more connected travel experience.

Scalability Potential

The SUSTOURISMO app is built for easy transfer to similar regions and adapts to post-Covid mobility needs. It offers tourism and mobility info, promotes sustainable travel through interactive learning, and provides customizable tour packages. Its simple, extendable architecture supports tailored use. Tourism-mobility packages are developed through collaborative agreements across countries, considering stakeholder needs. The project's network will remain open to all interested parties within and beyond the ADRION region.

Applications

- Applications span tourism, transportation, travel, and smart cities, supporting sustainable mobility and urban development. The app also serves environmental services, IT, public policy, and education by promoting awareness, data-driven planning, user engagement across sectors, marketing & communication and event management.

Intellectual Property Status

- No patent

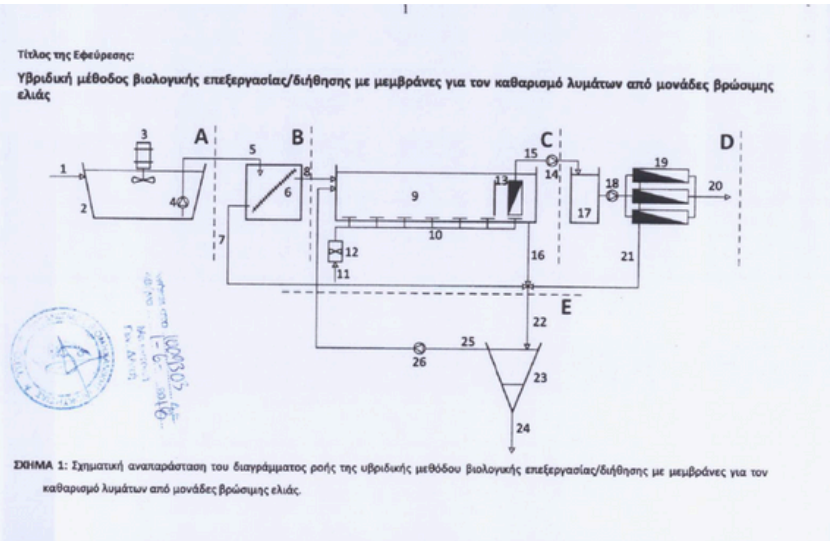
Contact Person: Dr. Maria Morfoulaki

Role: Scientific Responsible

e-mail: marmor@certh.gr

website of the technology:
·https://apps.apple.com/rs/app/sustourismo/id1578469988
·https://play.google.com/store/apps/details?id=certh.hit.sustourismo&hl=el

Purification of wastewater originating from the processing of olives



ΣΧΗΜΑ 1: Σχηματική αναπαράσταση του διαγράμματος ροής της υβριδικής μεθόδου βιολογικής επεξεργασίας/διήθησης με μεμβράνες για τον καθαρισμό λυμάτων από μονάδες βρώσιμης ελιάς.

Thematic Area(s)

- Waste management
- Climate Change Resilience and Adaptation
- Environment and Sustainability
- Circular economy
- Water resources

Relevance

The technology supports the implementation of the Circular Economy Action Plan and the EU's Green Deal growth strategy to reduce pressure on natural resources and create sustainable growth and jobs. They also take into account the EU's commitments under the Water Action Agenda, including promoting a more integrated approach to water resource management across all sectors and promoting the circular economy in the use of water for industry, energy and agriculture by increasing water efficiency and water reuse.

Short Description

The proposed technology treats wastewater from table olive processing through equilibration, optional solids separation, aerobic membrane bioreactor treatment, and membrane post-treatment. It produces high-quality effluent without generating chemical sludge or concentrated waste. Applicable to all table olive wastewater types, it uses naturally acclimatized microorganisms, avoiding synthetic inputs. Modular in design, it suits both centralized and decentralized treatment plants, ensuring cost-effective, eco-friendly operation.

Stage of Development

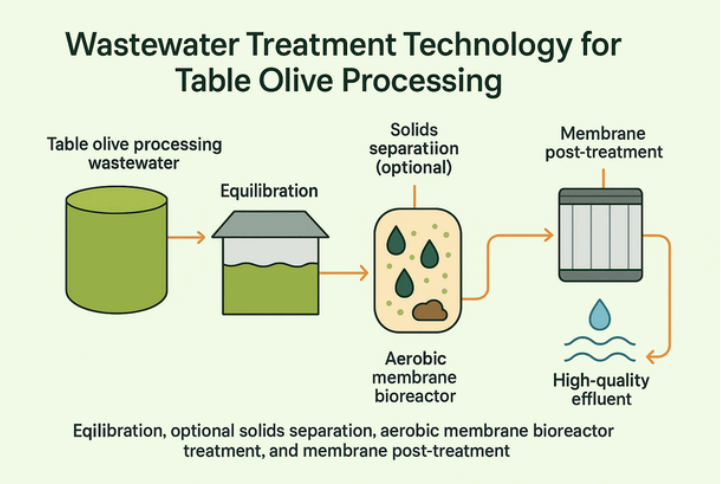
The Technology is classified as TRL 7. The properties of the treated wastewater after the post-treatment stage with nanofiltration membranes exceed the specifications for the reuse of treated wastewater for limited irrigation (Greek Joint Ministerial Decision 145116/2011), after appropriate dilution with irrigation water, to achieve the desired agronomic properties of the treated wastewater reused for irrigation. Construction of a complete semi-industrial system, ready for qualification in the operational environment.

Expected Outputs of the Technology

FThe expected short-term outcomes of the developed technology is related to the improvement of the sustainable performance of the existing treatment processes towards pollution abatement and water reuse in the industrial sector. Minimizing the environmental impact and operational cost per unit of treated water in conjunction with maximizing process reliability to meet societal needs are the planned improvements. Moreover, the breakthrough advances in biology/biotechnology/advanced oxidation are the basis for the further development of novel, hybrid applications, which are another key research area of the NRRE Lab. The new paradigm of recovering, recycling, and reusing valuable materials, including water, energy and added value (bio)chemicals from different (agro)industrial effluents (in the spirit of Circular Economy) are the long-term outcomes.

Scalability Potential

The proposed technology has strong potential both locally and globally, addressing critical water treatment challenges in line with rising global concerns over water access, safety, and sustainability. As water becomes a key driver of environmental, social, and economic change, demand for innovative treatment solutions grows. This aligns with the EU Green Deal and SDG6, supporting directives on water reuse, pollution control, and ecosystem protection. The technology meets future needs outlined in key EU policies, including CEAP, the Water Framework Directive, and industrial emissions regulations.



Applications

- Applications include food processing, agriculture, and environmental services, with a focus on sustainability and resource efficiency. The scope also covers water and wastewater management, chemical and process industries, and public utilities, supporting infrastructure and operational optimization.

Intellectual Property Status

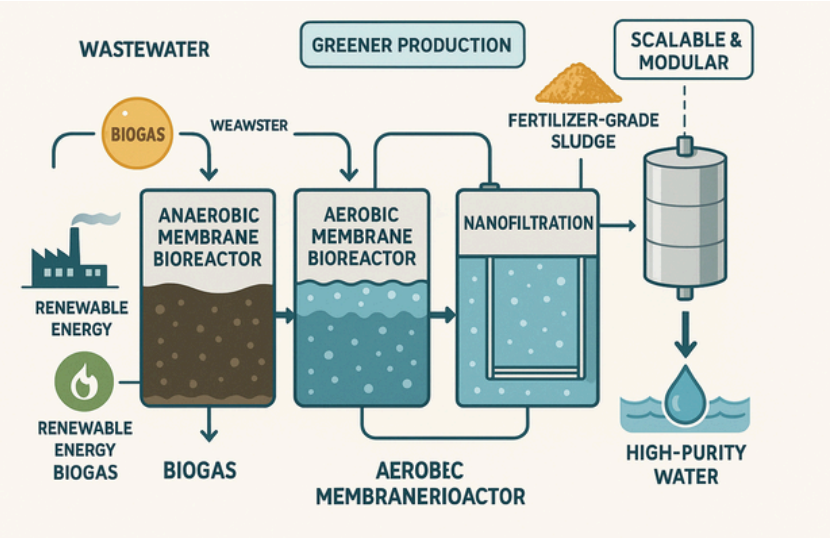
- Patented (No. 1009303-GR)

Contact Person: Dr. Konstantinos Plakas

Role: Director of NRRE lab

e-mail: kplakas@certh.gr

Hybrid membrane processes for the treatment and reuse of wastewater



Thematic Area(s)

- Waste management
- Environment and Sustainability
- Circular economy
- Water resources

Relevance

The technology supports the implementation of the Circular Economy Action Plan and the EU's Green Deal growth strategy to reduce pressure on natural resources and create sustainable growth and jobs. They also take into account the EU's commitments under the Water Action Agenda, including promoting a more integrated approach to water resource management across all sectors and promoting the circular economy in the use of water for industry, energy and agriculture by increasing water efficiency and water reuse.

Short Description

This technology overcomes the limitations of traditional aerobic wastewater treatment by integrating an anaerobic membrane bioreactor, aerobic membrane bioreactor, and nanofiltration. It enables biomass recovery and renewable energy production (biogas), while producing high-purity water for industrial reuse. Scalable and modular, it supports greener production and circular economy goals by converting waste into valuable products like biogas, clean water, and fertilizer-grade sludge. Treatment capacity is easily adjusted by adding or removing membrane modules.

Stage of Development

The technology is classified as a TRL 7. Construction of a system prototype and demonstration in an operational environment (dairy industry, pulp and paper industry). The technology converts low-value wastewater of the target industries into highly valuable products, achieving almost complete waste recycling and valorization.

Expected Outputs of the Technology

The expected short-term outcomes of the developed technology is related to the improvement of the sustainable performance of the existing treatment processes towards pollution abatement and water reuse in the industrial sector. Minimizing the environmental impact and operational cost per unit of treated water in conjunction with maximizing process reliability to meet societal needs are the planned improvements. Moreover, the breakthrough advances in biology/biotechnology/advanced oxidation are the basis for the further development of novel, hybrid applications, which are another key research area of the NRRE Lab. The new paradigm of recovering, recycling, and reusing valuable materials, including water, energy and added value (bio)chemicals from different (agro)industrial effluents (in the spirit of Circular Economy) are the long-term outcomes. Extensive research efforts are taking place in this direction.

Scalability Potential

The proposed technologies address both local and global water challenges amid evolving environmental and social concerns about water access, safety, affordability, and management. Water issues will shape economies, population distribution, and innovation. These technologies align with the EU Green Deal and SDG6, supporting sustainable water use and treatment. They comply with key EU policies, including the Circular Economy Action Plan, water reuse regulations, and directives on wastewater, surface and groundwater protection, industrial emissions, and nitrate pollution control, driving a sustainable water future.

Applications

- Applications span diverse sectors including food and beverage processing, agro-industrial operations, water and wastewater management, and environmental services. They support renewable energy, chemical and process industries, and agriculture and fertilizer production. Key focuses also include sustainability, circular economy initiatives, engineering and infrastructure development, and services for public utilities and industrial parks.

Intellectual Property Status

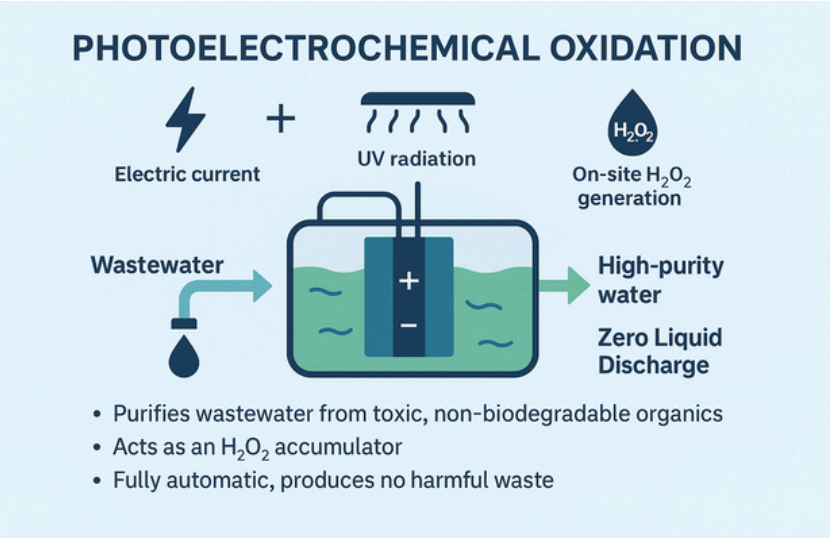
- No patent

Contact Person: Dr. Konstantinos Plakas

Role: Director of NRRE lab

e-mail: kplakas@certh.gr

Photoelectrochemical processes for reuse of wastewater in chemical industries



Thematic Area(s)

- Recycling
- Waste management
- Environment and Sustainability
- Circular economy

Relevance

The technology supports the implementation of the Circular Economy Action Plan and the EU's Green Deal growth strategy to reduce pressure on natural resources and create sustainable growth and jobs. They also take into account the EU's commitments under the Water Action Agenda, including promoting a more integrated approach to water resource management across all sectors and promoting the circular economy in the use of water for industry, energy and agriculture by increasing water efficiency and water reuse.

Short Description

The technology uses photoelectrochemical oxidation combining electric current, UV radiation, and on-site electrochemical H2O2 generation to purify wastewater from toxic, non-biodegradable organics. It acts as an H2O2 accumulator, achieves high pollutant removal via oxidative mineralization, and operates in batch or continuous modes. It enables Zero Liquid Discharge by recovering high-purity water or preparing waste for biological treatment. Fully automatic, it is easy to operate without specialized training and produces no harmful waste.

Stage of Development

The technology enables in situ electrochemical generation of H_2O_2 for oxidative wastewater treatment, removing the need for external chemicals. It achieves over 90% removal of toxic organics, confirmed by COD and TOC reductions. Supporting batch and continuous modes, it produces high-purity water for reuse or safe discharge and enables Zero Liquid Discharge. A fully automated pilot prototype has been validated in real industrial settings, proving technical feasibility, operational ease, and scalability potential.

Expected Outputs of the Technology

The developed technologies, combining advanced redox processes and membrane hybrids, aim to enhance sustainable industrial wastewater treatment by reducing pollution and promoting water reuse. They focus on minimizing environmental impact and operational costs while maximizing process reliability to meet societal needs. Breakthroughs in biology, biotechnology, and advanced oxidation support the development of novel hybrid applications, a key NRRE Lab research area. Long-term outcomes include recovering and recycling valuable resources—water, energy, and bio-chemicals—from agro-industrial effluents, advancing the Circular Economy.

Scalability Potential

The technology meets global demands for sustainable wastewater treatment, excelling in treating heavily polluted, non-biodegradable industrial effluents with Zero Liquid Discharge. Ideal for chemical, pharmaceutical, textile, and agro-industrial sectors, its modular, automated design offers flexibility for diverse operations. Targeting emerging markets in Asia, the Middle East, and Latin America, expansion plans include partnerships with wastewater firms and pilot projects with multinationals aiming for ESG compliance. Interest from Southern Europe and the Gulf supports market entry efforts.

Applications

- Applications cover the chemical, pharmaceutical, textile and dyeing, and agrochemical industries, as well as oil, gas, and petrochemical sectors. They also serve food and beverage processing, mining and metallurgical operations, and landfill leachate treatment. Additionally, solutions are applied in industrial parks and effluent treatment plants (ETPs), addressing complex industrial wastewater and process treatment needs.

Intellectual Property Status

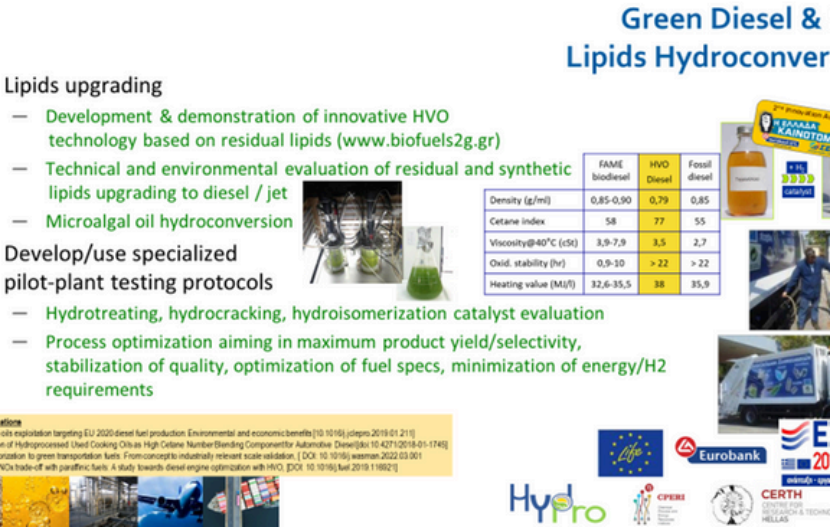
- Patented (No. 1010788-GR)

Contact Person: Dr. Konstantinos Plakas

Role: Director of NRRE lab

e-mail: kplakas@certh.gr

Hydroprocessing of bio-based feedstocks and intermediates for the production of advanced low-carbon fuels



Thematic Area(s)

- Recycling
- Waste management
- Environment and Sustainability
- Energy
- Low carbon economy
- Circular economy

Relevance

The technology enables the cost-effective production of low carbon biofuels therefore is aligned with low carbon economy. Moreover, as the feedstocks are wastes (used triglycerides, pyrolysis bio-oil from agricultural/forestry wastes, etc) the technology promotes Circular Economy. Finally, the technology enables the transition to Green Transport, particularly for sectors that are hard to decarbonize such as aviation and maritime, as it targets to the production of transportation fuels.

Short Description

Hydroprocessing is a catalytic conversion technology using hydrogen to upgrade bio-based feedstocks (e.g., triglycerides, pyrolysis oils) into combustion-compatible hydrocarbons. Our work focuses on process intensification, integration with renewable H_2, and novel catalysts and feedstocks. Backed by TRL3–TRL6 pilot facilities and advanced analytics, we collaborate globally with catalyst developers, biofuel producers, refineries, and the automotive and aviation sectors.

Stage of Development

The technology is classified as a TRL 5. The technology has demonstrated an over 70-90% conversion of the bio-based feedstocks/intermediates to biofuels. Depending on the catalyst and feedstock type, the technology renders 10-30% sustainable aviation fuels (SAF) and 50-70% maritime/heavy duty transport diesel.

Expected Outputs of the Technology

Building on its capabilities and strong industry ties, the hydroprocessing technology is set to play a key role in sustainable fuel production for hard-to-abate sectors like aviation and maritime transport. By 2040, it aims to meet over 50% of the EU's Sustainable Aviation Fuel and maritime diesel demand, using pyrolysis bio-oil and biocrude from waste biomass. Future efforts focus on integrating renewable hydrogen, improving catalysts, expanding feedstock flexibility, and deploying digital optimization. Scaling pilot plants (TRL6+) and strengthening partnerships will drive industrial decarbonization and market readiness of next-gen biofuels.

Scalability Potential

The hydroprocessing technology offers strong global scalability thanks to its compatibility with existing refineries and ability to process widely available bio-based feedstocks. Its modular design suits both centralized and decentralized production, making it ideal for diverse markets—from mature regions like North America, the EU, and Japan to emerging economies in Southeast Asia, Latin America, and Africa rich in agricultural residues. Integration with renewable hydrogen aligns with global energy goals. Backed by international partnerships and regulatory support such as the EU's ReFuelEU and the U.S. SAF Challenge, it's poised for widespread adoption in sustainable fuel markets.

Applications

- Applications span the aviation, maritime, shipping, oil and gas refining, and automotive industries, including heavy transport. They support biofuels and renewable hydrogen production, waste management, and biomass valorization. Additional focus areas include catalyst development and broader applications within the chemical industry.

Intellectual Property Status

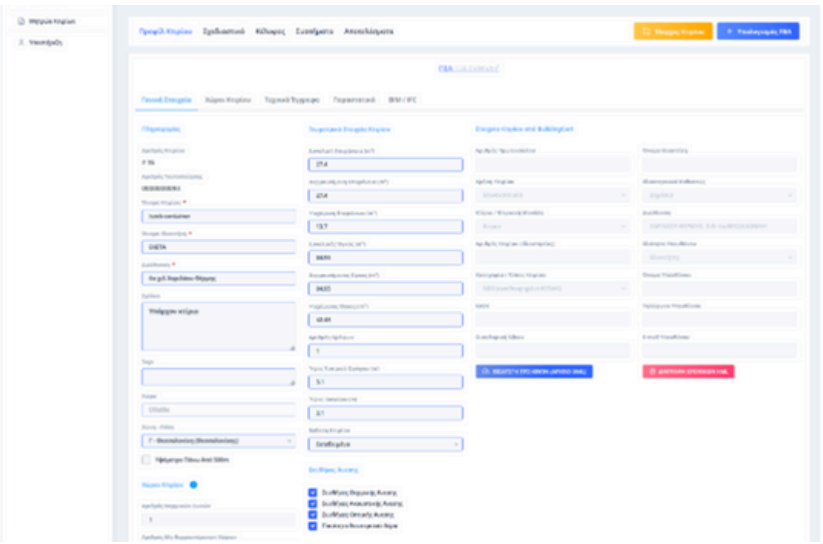
- No patent

Contact Person: Dr. Stella Bezergianni

Role: Research director CERTH/ CPERI

e-mail: sbezerg@certh.gr

IsZEB Certify: All-in-One Platform for Building Energy, Smartness, and Performance Certification



Thematic Area(s)

- Information and Communication Technology (ICT)
- Artificial Intelligence and Robotic
- Resilience and adaptation to climate change

Relevance

The proposed technology enhances climate resilience, supports low-carbon transitions, and promotes sustainable construction through rigorous assessment and energy optimization. The development of the IsZEB Certify tool addresses key needs such as the EU push for Digital Building Logbooks, the introduction of the Smart Readiness Indicator (SRI), a focus on human-centric accessibility, and the need for high-granularity, holistic building performance assessments beyond traditional EPCs and SRI.

Short Description

IsZEB Certify is a complete software package solution, composed of 3 different tools for:
1.Buildings' Energy Performance assessments and Energy Performance Certificates (EPCs) issuance
2.Buildings' Smart Readiness assessments and Smartness Readiness Indicator (SRI) Certificates issuance
3.Buildings' holistic evaluation and certification based on the IsZEB Standard within the following technical levels:

- Energy Efficiency
- Smartness
- Thermal Comfort
- Indoor Air Quality
- Building Shell Properties
- Sound Insulation
- Structural Fire Protection
- Anti-seismic Protection
- Waste Management

Stage of Development

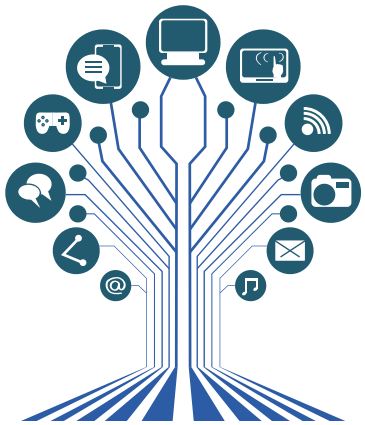
The system is complete and qualified – TRL8. IsZEB Certify has assessed different types of buildings, new or renovated, residential or not (hotels, hospitals, training secters, etc.) offering: Multilevel analysis of a sustainable building under a unified quality label; Additional control levels, designed to provide a thorough assessment ofbuildings' ability to meet modern standards for operation, accommodation and user experience.; A fully dynamic standard, designed with a human-centric approach.; EU SRI Methodology compatibility (EU Regulation 2020/2155).

Expected Outputs of the Technology

The wide adaptation of IsZEB Certify (especially the SRI assessment tool and the IsZEB Standard Certificate) will provide a holistic evaluation of buildings ensuring optimal conditions for thermal, visual, and acoustic comfort, as well as hygiene, safety, and usability.

Scalability Potential

The tool can be adapted to different scales, geographies, and building types. In addition, the scalability of the proposed certification software and its widespread adoption is supported by the easy integration with other tools and the use by multiple stakeholders (architects, engineers, students, building owners, certification bodies). Moreover, the scalability potential is based on international directives and industry needs. EU Countries have the highest and fastest scalability potential - due to the common approaches they use. International scaling is a primary goal of the company. Thus, IsZEB strategically collaborates with various stakeholders (EU, China, etc.), especially for levering funding opportunities for the expansion of the tool's capabilities.



Applications

- Applications include construction and real estate development for building assessment and certification, and architecture and engineering consulting for integrated design evaluations. They support energy efficiency, smart building automation, and facility management through performance monitoring. Government bodies benefit from regulatory and planning support, while certification bodies use standards for green building schemes. Academic institutions apply them in sustainability research, and insurers use them for risk and safety assessments.

Intellectual Property Status

- No patent

Contact Person: Mrs. Zoi Boutopoulou

Role: IsZeb's Coordinator

e-mail: z.boutopoulou@iszeb.gr

website of the technology - https://iszeb.gr/el/iszeb-certify

Co2 Monitoring Platform

Thematic Area(s)

- Information and Communication Technology (ICT)
- Artificial Intelligence and Robotic
- Low carbon economy

Relevance

The platform directly supports green transport, low-carbon economy, and carbon management by enabling real- time CO2 emissions tracking and performance benchmarking for urban freight operations. Through neutralized city- wide KPIs, it helps optimize logistics efficiency, reduce emissions, and promote sustainable transport practices. By providing comparative CO2 performance analysis at both city and company levels, it drives data-informed decisions for emissions reduction, improving urban air quality and fostering a more sustainable logistics ecosystem.

Short Description

The CO_2 Monitoring Platform is a telematics-based system that calculates greenhouse gas emissions from urban logistics using international standards. It aggregates data from multiple sources to generate neutral KPIs reflecting both environmental and operational performance across city freight activities. The platform offers detailed insights into delivery patterns by district and benchmarks logistics demand and efficiency. It also allows for comparative analysis at the company level, enabling performance evaluation against city-wide averages to support more sustainable and efficient logistics decision-making.

Stage of Development

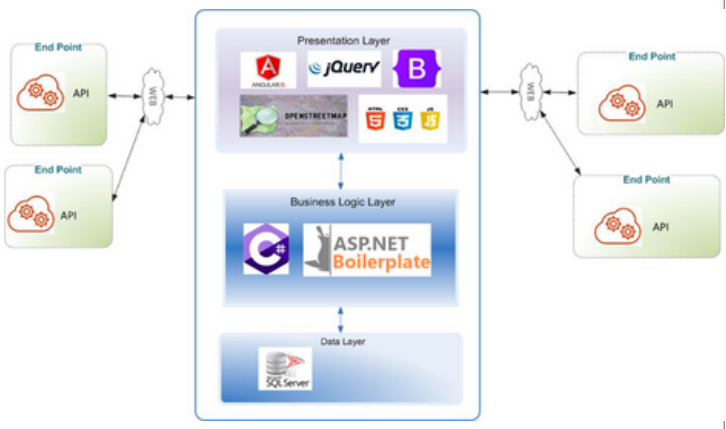
The Platform is classified as TRL 9. It provides long-term KPIs, statistics and benchmarks for cities and companies to evaluate the environmental and operational performance of the logistics sector. It aggregates data from multiple logistics operators, enabling standardized comparisons and facilitating data-driven decision-making mostly focused on CO2 emissions.

Expected Outputs of the Technology

In the short term, the platform will enhance its data analytics by incorporating spatial distribution insights of CO2 emissions and logistics demand within Thessaloniki. In the long term, the platform will refine its benchmarking by differentiating supply chain types (e.g., supermarkets with large vehicles vs. couriers with smaller fleets) to provide more accurate performance and emissions comparisons. Additionally, it is expected to introduce a "green verification" stamp, certifying companies based on their CO2 efficiency, which can incentivize sustainable logistics practices and encourage data-driven decision-making for emission reductions.

Scalability Potential

The platform is designed for international scalability, as it follows standardized emissions accounting methodologies that can be applied in different environments and different levels (local, regional, national). It is particularly relevant for cities and regions with an interest in monitoring logistics performance and emissions trends. The platform's adaptability allows for integration with various data sources and regulatory frameworks, making it suitable for deployment in European, North American, and Asian urban logistics ecosystems..



Applications

- Applications span urban logistics and freight transport, including last-mile delivery, CEP services, and 3PL providers. Retail, e-commerce, and food delivery platforms rely on efficient city logistics. Postal services manage intra-city deliveries, while municipalities monitor emissions and mobility. Construction material suppliers, healthcare and pharmaceutical logistics, and waste collection services operate within urban transport frameworks. Shared mobility providers also depend on optimized city-level fleet management and redistribution.

Intellectual Property Status

- No patent

Contact Person: Mr. Dimitrios Touloumidis

Role: Research Associate

e-mail: dtouloumidis@certh.gr

website of the technology : https://clusterco2.imet.gr/city

TECHNOLOGIES FROM BULGARİA

Conceptual Project for Construction of a Solar Electric Car

Thematic Area(s)

- Information and Communication Technology (ICT)
- Climate Change Resilience and Adaptation
- Environment and Sustainability

Relevance

The concept is to create a lightweight electric vehicle powered entirely by solar energy. The vehicle should have a flat roof with a large area for solar panels, be lightweight to minimize wheel rolling resistance, be a two-seater with functionality and not be too heavy, and have a battery with a small capacity that matches the installed solar power. The battery will buffer the unevenness between solar production and traction energy consumption, provide relative autonomy, enable the vehicle to be used as an electric vehicle, help overcome greater slopes during climbing, and enable regenerative braking. The vehicle should also be a two-seater with some functionality and not be too heavy.

Short Description

Idea for creating a prototype of an electric vehicle using solar panels as an energy source. A rechargeable battery is also provided to provide power in the absence of power from the solar panels due to shading or overcoming a slope. The presence of a battery allows for recuperation (energy regeneration during braking), as well as using the vehicle as an electric vehicle. A charger from the electrical network is also available.
Approximate calculations have been made for some technical parameters, such as:
- solar power,
- battery power
- vehicle dimensions,
- effective solar area on the roof,
- specific power of a glass and polymer solar panel
- solar power per unit area,
- total installed power on the roof of the vehicle.

Stage of Development

This R&D project explores the basic principles of Solar electric car. This Technology is at TRL-2, with concepts focusing on integrated solar panels, lightweight materials, and advanced energy management. Prototypes like those from Aptera Motors can generate up to 40 km of solar range per day and reach 600 km on a full battery. Ongoing analytical studies explore improved photovoltaic integration and system efficiency, aiming to develop self-charging, sustainable vehicles for future mobility solutions.

Expected Outputs of the Technology

Reduction in Carbon Footprint: By harnessing solar energy, SEVs are expected to decrease reliance on fossil fuels, thereby reducing greenhouse gas emissions and contributing to climate change mitigation efforts.
Energy Cost Savings: The integration of solar charging capabilities can lead to significant savings on energy costs for consumers. Additionally, the potential for vehicle-to-grid technologies may enable SEVs to supply excess energy back to the grid, further enhancing economic benefits.

Scalability Potential

Urban environments present challenges such as shading from buildings and trees, which can reduce solar energy capture by approximately 25%. However, this reduction is not deemed a significant barrier to the widespread adoption of SEVs in cities
Government incentives, including purchase rebates, tax exemptions, and infrastructure investments, play a crucial role in promoting the adoption of SEVs. For instance, Norway aims for all new car sales to be zero-emission vehicles, demonstrating a strong policy commitment to electric mobility.
While challenges like urban shading and the need for supportive policies exist, the combination of favourable solar conditions in various regions, ongoing technological advancements, and substantial industry investments positions SEVs as a viable and scalable solution for sustainable transportation worldwide.

Applications

- Applications include the automotive industry, where solar integration supports EV manufacturing, startup innovation, and cost-effective fleet operations. In renewable energy, it drives advancements in photovoltaic technology and energy storage systems, enabling efficient, lightweight, and vehicle-integrated solar solutions.

Intellectual Property Status

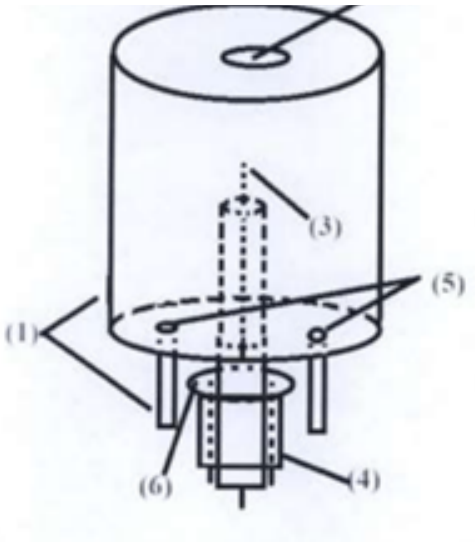
- No patent

Contact Person: Martin Zlatkov

Role: Inventor

e-mail: office@vtu.bg

Device for Creating a Low-Temperatue Plasma Torch



Thematic Area(s)

Energy

Environment and Sustainability

Short Description

The utility model describes a device that creates a low-temperature plasma torch using a microwave spectrum electromagnetic wave at 2.45 GHz. This device is useful in fields like sterilization of medical equipment, surface activation in medicine, and plasma activation of water. It consists of a discharge chamber with a cylindrical resonator structure and an antenna connected via a coaxial cable to a microwave source. The device can have a variable cross-section due to an additional conical part attached. Advantages include ease and affordability, wide range of applications, and standard connector connection to microwave generators. It is also easy to manufacture, especially through three-dimensional printing, and has numerous potential applications.

Relevance

The utility model describes a device that creates low-temperature plasma using a microwave wave at atmospheric pressure. This plasma can be used in various fields, such as sterilizing medical equipment, improving implant adhesion, and stimulating tissue regeneration. It can also be used for water purification, enhancing drinking water and wastewater treatment. Additionally, it can clean deposits from archaeological sites, preserving valuable artifacts and preserving historical and cultural heritage.

Stage of Development

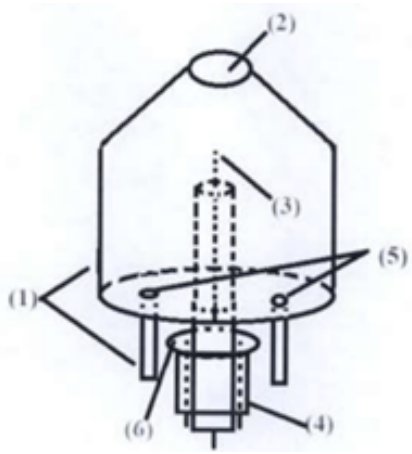
This TRL-6 utility model demonstrates a low-temperature plasma torch device operating at 2.45 GHz in gas environments such as argon or oxygen. It enables sterilization, surface activation, tissue regeneration, and water purification. Applications range from medicine and environmental cleanup to cultural heritage preservation. The prototype has been successfully demonstrated in relevant operational environments.

Expected Outputs of the Technology

The utility model aims to create a low-temperature plasma torch that can be connected to various microwave radiation and gas sources at atmospheric pressure. The device consists of a discharge chamber with a resonator structure and antenna, connected via a coaxial cable to a microwave source. The resonator structure has gas supply inlets connected to a gas source. The device can be a cylindrical discharge resonator chamber with an axially located antenna and symmetrically located inlet pipes for gas supply. The axially located antenna is a continuation of the central strand in the coaxial cable from the connector. The shielding part of the coaxial cable can be connected to a conductive plate at the base of the resonator chamber.

Scalability Potential

The device presents a new approach to creating a plasma torch using 3D printing technology. It allows for the fabrication of complex resonator structures from plastic material, enabling optimal operation at a microwave frequency of 2.45 GHz. This method offers greater precision and efficiency in creating plasma torchs, potentially enhancing applications in biomedicine, sterilization, plasma activation, tissue regeneration, water activation, and cleaning of solutions. The utility model is easy and affordable to manufacture, lightweight, has a wide range of operating conditions, and can be connected to various microwave generators using a standard connector.



Applications

- Applications in healthcare include sterilizing medical tools, enhancing implant adhesion, and supporting wound healing and tissue regeneration. In environmental technology, plasma is used for water treatment and wastewater purification, benefiting both industrial and municipal systems..

Intellectual Property Status

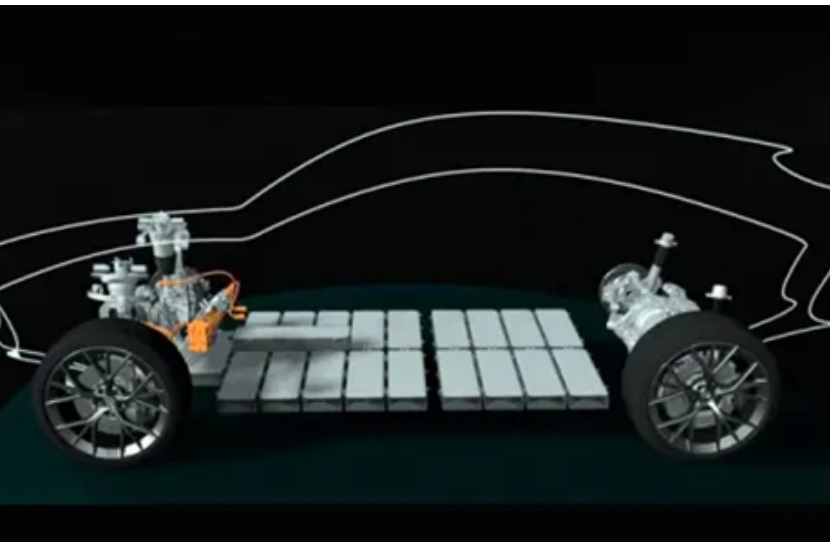
- The patent number is № 4602

Contact Person: Todor Ganchev Bogdanov

Role: Inventor

e-mail: tbogdanov@medfac.mu-sofia.bg

Electric Vehicle Chassis with Modular Battery Pack with Expandable capacity



Thematic Area(s)

- Low Carbon Economy
- Climate Change Resilience and Adaptation
- Environment and Sustainability

Relevance

Modular battery chassis with expandable capacity aligns perfectly with the goals of sustainability, efficiency, and accessibility in the electric vehicle (EV) industry. This innovation directly supports global efforts to reduce carbon emissions, improve resource utilization, and make EVs more adaptable to consumer needs.

Short Description

The utility model of an electric vehicle chassis with a modularly constructed battery pack is a system that consists of a chassis and a battery pack with permanent modules, each with its own power and control electronics and sensor system. This makes the vehicle autonomous. If one or more permanent modules fail, the remaining battery modules continue to function. Additional battery modules can be added to the modular battery pack, located under the rear seat's lower opening, to increase range or reduce weight. Each module has its own power, control, and sensor electronics, and has a quick-connect and disconnect connector for easy connection to the vehicle's electrical system, sensor, and control systems. The number of additional battery modules can be increased based on the desired range between charges.

Stage of Development

The modular battery chassis is a TRL-3 innovation in EVs, enabling scalable, upgradeable energy storage. Individual battery modules are integrated into the chassis, allowing users to adjust capacity based on range needs. This flexible system improves cost-efficiency and vehicle longevity. Current development focuses on lab validation and technical feasibility, transforming research into adaptable energy solutions for next-gen mobility.

Expected Outputs of the Technology

The expected outputs and outcomes of modular battery chassis with expandable capacity are both technological advancements and broader societal impacts. Modular EV Platforms – Vehicles equipped with customizable battery packs, allowing for capacity expansion or reduction. Interchangeable Battery Modules – Standardized plug-and-play battery units that can be swapped or upgraded. Increased Battery Lifespan – Improved energy management systems to extend battery health and reduce waste. Optimized Weight Distribution – Battery integration into the chassis enhances performance, range, and safety. Scalable Energy Solutions – Adaptable battery systems for various EV types (cars, trucks, buses, motorcycles).

Scalability Potential

Modular battery chassis with expandable capacity has high international scalability potential due to growing demand for sustainable, cost-effective electric vehicles (EVs). Standardization of battery modules could reduce production costs and allow automakers to create compatible vehicles across markets. Countries with strong EV infrastructure are well-positioned for early adoption, while emerging markets could benefit from affordable, scalable options. Challenges like charging infrastructure gaps, regulatory differences, and material supply constraints need to be addressed. Successful implementation could lower EV costs, accelerate transport decarbonization, and support a circular battery economy.

Applications

- Automotive Industry:
- Passenger Vehicles: Enables customizable range for different user needs, from city driving to long-distance travel.
- Commercial Vehicles: Fleets (delivery vans, trucks) can scale battery capacity based on route demands, optimizing cost and performance.
- EV Startups: Reduces upfront development costs by offering flexible, modular design platforms.

Intellectual Property Status

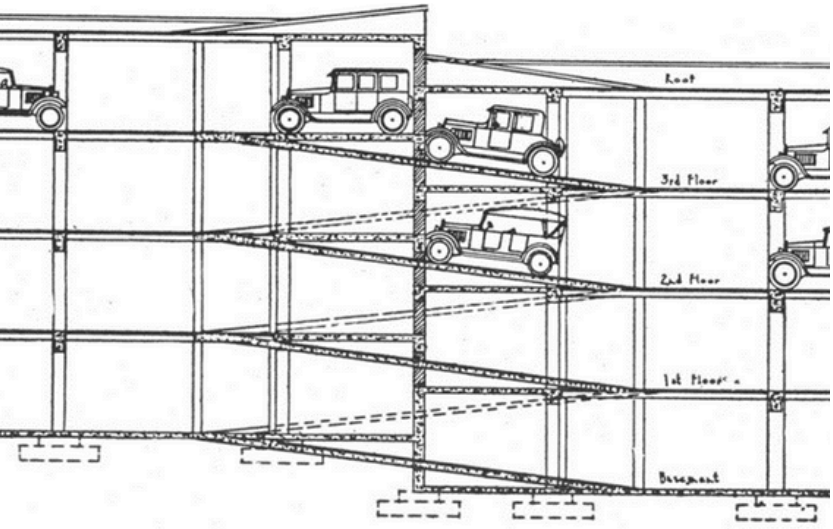
- Patent number № 4999

Contact Person: Georgi Dimitrov Todorov

Role: Inventor

e-mail: info@tu-sofia.bg

First Multy-Storey Above-Ground Parking Facilieties in Bulgaria



Short Description

The initiative of the capital administration for the construction of municipal multi-storey car parks with private investment in the outer districts is examined. The regulatory framework regarding the construction of parking lots and garages in urbanized areas in Bulgaria is studied. Good practices for built multi-storey car parks in Plovdiv are indicated. The functioning of the transport infrastructure market and its possible social impact on the Sofia population are analyzed.

Thematic Area(s)

- Blue Economy
- Environment and Sustainability

Stage of Development

This R&D project explores the basic principles of categorizing and planning parking infrastructure based on average parking duration—short-term, medium-term, and long-term. At TRL-1, the study focuses on the observed patterns of vehicle flow, occupancy rates, and user behavior around commercial, recreational, and residential areas. Short-term parking is typically associated with private investments in commercial centers; medium-term parking serves hospitality venues and strategic city zones.

Relevance

The capital of Bulgaria is addressing the growing issue of parking by building multi-storey car parks. Despite regulations stating a minimum of one parking space per dwelling, only 50% of these spaces are implemented in residential complexes. The city's municipal leadership plans to build municipal multi-storey parking lots with private investment in outer districts in 2020. This new model of public-private partnership will establish a building right for parking lots on municipally owned real estate, with monetary compensation paid against which a temporary real right of construction will be established for the selected person.

Expected Outputs of the Technology

Automated modular metal parking offers advantages over traditional concrete multi-storey and open ground parking lots. On average, a modular metal parking lot requires less space for one car, compared to 10 sq. m for a concrete structure and 26 sq. m for an open ground lot. Construction time is also faster, with an average of 1.3 days for a parking space. This type of parking lot may be of interest to the private sector. he municipal management of the city of Sofia adopted a program for the construction of multi-storey parking lots in the outer districts of the capital in 2020, but such projects existed in 1993-1998, and there are still no built.

Scalability Potential

The transport infrastructure market in Sofia needs to be established by building private multi-storey parking lots for long-term parking, in addition to municipal parking lots. The optimal balance between parking spaces and motor vehicles depends on the transport infrastructure market. The demand and supply of these parking spaces, which can be built on public municipal land for a fee, should be regulated by the municipal administration. The municipality's role is to create a market environment where capital can invest in the construction of private multi-storey underground and above-ground parking lots in Sofia.

Applications

- Urban Development
- City Centers: Helps alleviate congestion in densely populated urban areas.
- Public Transport Hubs: Acts as park-and-ride facilities near metro, bus, or train stations.
- Transport Infrastructure
- Airports: Long-term and short-term structured parking for passengers.
- Logistics Centers: Facilitates truck and employee vehicle parking.

Intellectual Property Status

- No patent

Contact Person: Stoyan Dimitrov

Role: Inventor

e-mail: sc@unwe.bg

Hybrid-Propelled Vessel - HydRUforce

Thematic Area(s)

- Low Carbon Economy
- Waste management
- Environment and Sustainability

Relevance

HydRUforce is an innovative Bulgarian hybrid vessel developed between 2019 and 2021 by a research team from Ruse University "Angel Kanchev," in collaboration with scientists from the Bulgarian Academy of Sciences and the Technical University of Sofia. Funded by the National Scientific Program EPLUS and the Ministry of Education and Science, with additional support from Ruse University. The vessel features a hybrid propulsion system that combines solar energy, batteries, and hydrogen fuel cells, resulting in zero carbon emissions. Its design incorporates energy from both solar panels and hydrogen fuel cells to power the vessel.

Short Description

The vessel is the combination of energy from solar panels and a hydrogen fuel cell for its propulsion. A pontoon with a solar roof was used for the hull of the vessel. The ship has already had one demonstration voyage, but it has not yet been registered, due to the low waters of the Danube River. This is about to happen and then a series of laboratory tests will be carried out, said the Angel Kanchev University. The educational institution added that the expertise gained during the creation of this vessel was used to develop a hydrogen mobility project in Ruse, part of which is the re-equipment of a thruster of the Bulgarian River Navigation with hydrogen propulsion.

Stage of Development

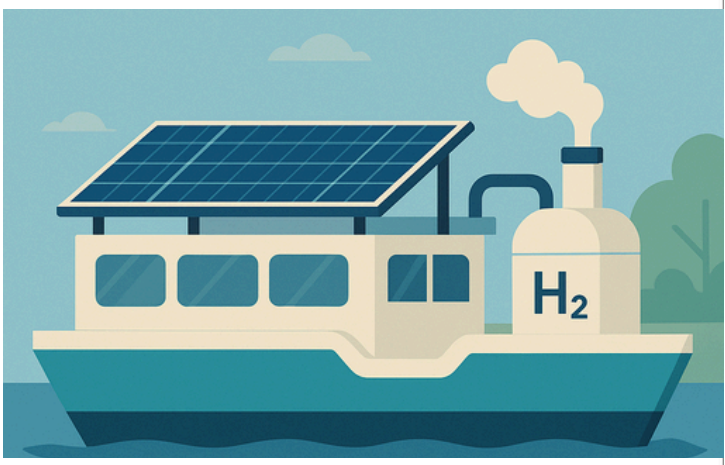
This TRL-7 pilot project features a rectangular vessel (10.5m × 4.5m × 2.5m, 3.5 t) powered by two 10 kW electric motors and 48V 400Ah batteries. It integrates two 3 kW hydrogen fuel cells (eff. ≥ 50%) and solar panels (7 kW) for extended range. Hydrogen is stored in 10L cylinders (0.15 kg H_2, 20 MPa), enabling 50 minutes of fuel cell use. The system prototype is demonstrated in real-world conditions to validate performance and hybrid energy efficiency.

Expected Outputs of the Technology

The HydRUforce vessel is a prime example of hybrid technology in sustainable water transport, combining solar power, batteries, and hydrogen fuel cells for zero-emission navigation. Future advancements could improve energy efficiency and range, with AI-driven autonomous navigation. The widespread adoption of hydrogen infrastructure could lower costs, making it more viable for commercial applications like cargo transport and ferries. As regulations push for decarbonization, hydrogen-powered vessels could become the norm, integrating with renewable energy grids and inspiring innovations in other transport sectors like trains and trucks. With continued technological progress and policy support, HydRUforce could pave the way for a cleaner, greener future in maritime transportation.

Scalability Potential

HydRUforce's international scalability depends on technological advancements, regulatory support, and infrastructure development. With improved hydrogen production and storage, costs decrease, making hydrogen-powered vessels more viable for large-scale deployment. HydRUforce's modular nature allows for adaptation to various vessel sizes and use cases. However, scalability depends on expanding hydrogen refuelling infrastructure, particularly in Europe, Japan, and North America. Stricter emissions regulations in global shipping could drive demand for zero-emission vessels, increasing market potential. Integrating with renewable energy grids could create a sustainable supply chain.



Applications

- Solar-powered marine vessels offer eco-friendly solutions for transport and environmental applications. They reduce emissions and fuel costs in inland shipping, ferries, and water taxis, while supporting research in solar technology. Environmentally, they provide sustainable, low-impact platforms for marine monitoring, oil spill response, and wildlife protection.

Intellectual Property Status

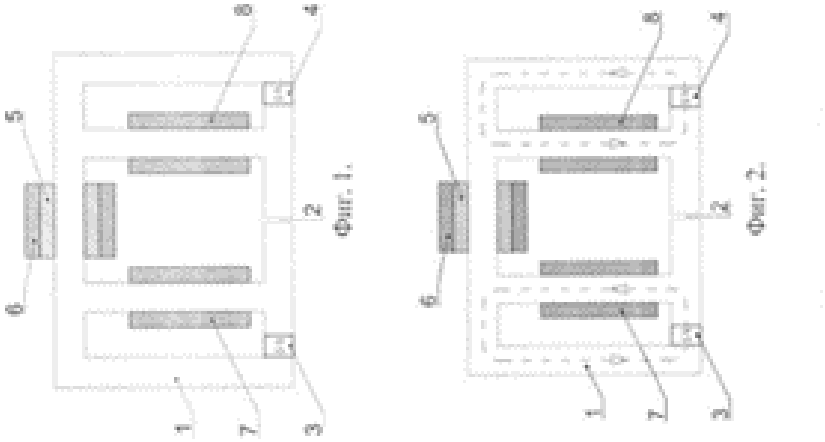
- No patent

Contact Person: Prof. Velizara Pencheva

Role: Project Manager

e-mail: secretary@uni-ruse.bg

Method and System for Magnetic Modulation



Thematic Area(s)

Energy

Environment and Sustainability

Relevance

Magnetic modulation techniques are crucial in energy harvesting, promoting sustainable energy solutions. They convert ambient energy into usable electrical power, reducing reliance on conventional energy sources. Magnetic modulation is used to capture energy from low-frequency vibrations, such as a tunable spring balanced magnetic energy harvester for efficient use at low frequencies and minimal displacement. A magnetic rolling pendulum bistable energy harvester has been proposed for scavenging energy from hand-shaking vibrations.

Short Description

The invention relates to a magnetic modulation method that improves the efficiency of power supply units, control, drive, and hybrid electromagnetic systems in electrical engineering. The method adds additional electrical energy to the output energy generated during the power pulse from bifilarly wound input and output windings. This is created after the end of the power pulse in additional output windings due to magnetic fluxes created by permanent magnets redirected by selected moments of switching on and off the input and output windings. The magnetic modulation system consists of a quadruple core with three windows, an air gap, two permanent magnets, an input coil, and output coils. The input coil is located on the upper yoke of the middle core magnetic circuit.

Stage of Development

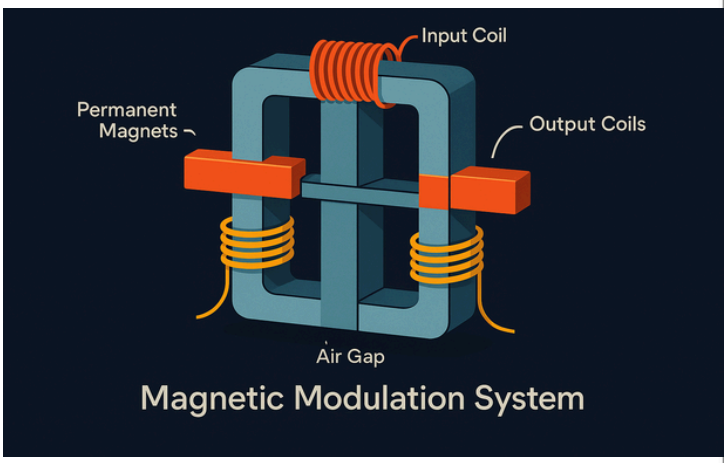
Magnetic modulation technologies are being explored for their potential in biosensing and synthetic biology. At TRL-1, studies focus on the basic principles of using magnetic fields to control molecular behavior. In biosensing, magnetic forces aggregate beads to enhance detection sensitivity. In synthetic biology, fields modulate reactions in synthetic cells, offering novel control over cellular functions and signaling future biomedical applications.
Currently, this technology is at R&D Project Idea (A concept or idea in its initial stages, planned for further development.)

Expected Outputs of the Technology

Magnetic modulation technologies are expected to revolutionize various fields, including enhanced neuromodulation techniques, which improve neuronal network excitability and alter intracellular signaling pathways, potentially leading to novel therapeutic approaches for neurological disorders. Additionally, external magnetic fields can modulate topological electronic states in materials, providing new avenues in condensed matter physics, potentially enabling the development of materials with tailored electronic properties for quantum computing and spintronic devices.

Scalability Potential

Magnetic modulation technologies have significant international scalability potential due to their versatility and alignment with global technological and healthcare advancements. Spin-Orbit Torque Magnetic Random-Access Memory (SOT-MRAM) is a promising alternative to traditional memory technologies, offering non-volatility, rapid read/write speeds, and high endurance. Its scalability is enhanced by the integration of perpendicular magnetic anisotropy systems, making it a viable candidate for replacing charge-based memory devices. Magnetic neuromodulation, particularly through magnetic nanotransducers, allows remote control of cellular processes in vivo, offering non-invasive approaches for treating neurological disorders. These methods' scalability supports their adaptability to diverse clinical settings and patient populations worldwide.



Applications

- Pharmaceuticals
- Targeted Drug Delivery: Magnetic modulation can guide nanoparticles to specific locations in the body.
- Biopharmaceutical Manufacturing: Enhances monitoring and control of bio-processes.
- Food & Agriculture
- Food Safety Testing: Detects pathogens or contaminants in food products.
- Agricultural Diagnostics: Monitors plant diseases or soil conditions using biosensing systems.

Intellectual Property Status

- The status of intellectual property is National patent registration
- Patent number № 67343

Contact Person: Prof. Stefan Stefanov

Role: Inventor

e-mail: info@tu-sofia.bg

Mobile Autonomous Photovoltaic System

Thematic Area(s)

- Low Carbon Economy
- Waste management
- Environment and Sustainability

Relevance

From CN 219420698 U a mobile photovoltaic device for generating electricity is known, comprising a housing, universal wheels and a handle. The wheels are located at the lower end of the housing. The handle is located on the side surface of the housing. A rechargeable battery and an inverter electrically connected to the rechargeable battery and to a controller are located in the volume of the housing. Three solar panels are arranged on the housing. The known device has a small capacity for generating electricity, since it contains only three photovoltaic panels, which are arranged horizontally.

Short Description

The utility model describes a mobile autonomous photovoltaic system used in power plants using renewable energy sources. It consists of a housing with an inverter, battery, generator, and main switchboard. The housing is made of metal profiles and resembles a truncated pyramid shape. Photovoltaic panels are mounted on opposite walls, connected by hinges. A shock absorber and support legs are attached to the panels. Upper metal profiles have eyes for crane gripping, while lower profiles have openings for forklift movement.

Stage of Development

This TRL-6 pilot project introduces a mobile autonomous photovoltaic system with enhanced energy output and portability. It features a truncated pyramid-shaped metal frame housing an inverter, battery, generator, and main switchboard. Photovoltaic panels are mounted on the frame, enabling efficient solar energy conversion. The prototype system has been tested in a relevant environment, demonstrating real-world performance and operational reliability.

Expected Outputs of the Technology

The photovoltaic panels are mounted on the outside of two opposite walls of the housing and are connected to each other by a hinged connection. A shock absorber and support legs are mounted to the photovoltaic panels. The upper metal profiles are provided with eyes for gripping the system by a crane for its movement. It is possible that the lower metal profiles have openings for moving the system using a forklift. The mobile autonomous photovoltaic system can be easily moved to a remote location. The presence of support legs for the photovoltaic panels guarantees their stability in the unfolded state. In the absence of sunlight, the generator charges the battery and thus the user is not deprived of electrical energy.

Scalability Potential

The utility model describes a mobile autonomous photovoltaic system used in power plants using renewable energy sources. It consists of a housing with an inverter, battery, generator, and main switchboard. The housing is made of metal profiles and resembles a truncated pyramid shape. Photovoltaic panels are mounted on opposite walls, connected by hinges. A shock absorber and support legs are attached to the panels. Upper metal profiles have eyes for crane gripping, while lower profiles have openings for forklift movement.

Applications

- Energy & Utilities
- Off-grid Power Supply: Ideal for remote locations without access to central grids.
- Disaster Relief & Emergency Response: Rapid deployment for powering medical stations, shelters, and communication units.

Intellectual Property Status

- The patent number is № 4926

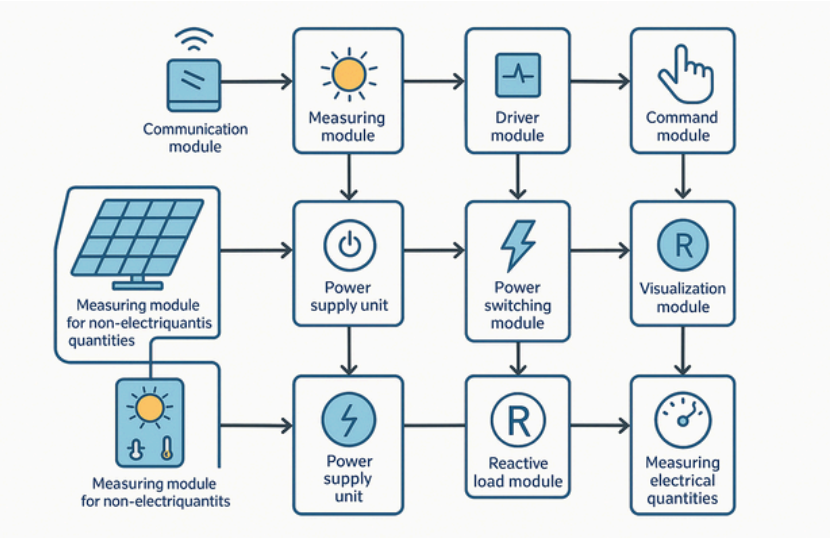
Contact Person: Krasimir Dimov Georgiev

Role: Inventor

e-mail: solarinsruse@gmail.com

website of the technology - https://www.solarinsruse.com/inovacii.html

Photovoltaic Module Tester



Thematic Area(s)

- Low Carbon Economy
- Waste management
- Environment and Sustainability

Relevance

The "Photovoltaic Module Tester" is a device that aids in the precise diagnostics of solar energy modules, enhancing the efficiency and longevity of solar installations. It promotes sustainable energy solutions and reduces dependence on fossil fuels. The device, developed within an academic institution, highlights the role of educational and research bodies in driving technological innovations and provides practical training opportunities for students in renewable energy technologies. It exemplifies the integration of academic research and practical application in advancing renewable energy solutions, aligning with sustainability and environmental stewardship goals.

Short Description

The present utility model finds application in the energy sector in renewable energy sources, directly converting solar energy into electricity. It consists of a power supply unit, a microprocessor control module, a driver module, a power switching module, a visualization module, a command module, a reactive load module, a unit for connection to the PV module and a measuring module of electrical quantities. It also includes a measuring module for non-electrical quantities, which consists of a light sensor and a temperature sensor and a communication module for connection to an external device.

Stage of Development

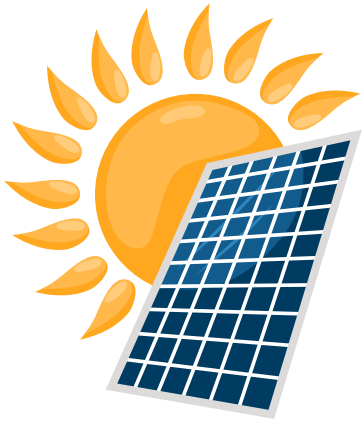
The Photovoltaic Module Tester developed by Todor Kableshkov University of Transport is validated at TRL-4, analyzing PV performance via key parameters like Voc, Isc, Pmax, FF, and efficiency. While specific specs are not disclosed, similar devices measure up to 1000V and 15A, storing characteristic curves and testing insulation. This mature research result confirms lab-based performance validation for real-world application readiness.

Expected Outputs of the Technology

The "Photovoltaic Module Tester" by Todor Kableshkov University of Transport is a device designed to assess and ensure the performance and reliability of photovoltaic (PV) panels. It provides key performance indicators, such as optimized performance, extended lifespan, and data-driven decisions. Regular testing ensures peak efficiency, maximizing energy production. Prompt identification and resolution of issues can prolong the operational life of PV modules. The tester contributes to promoting sustainable and efficient solar energy utilization.

Scalability Potential

The "Photovoltaic Module Tester" is a versatile technology designed for scalability and international adaptability. Its modular architecture allows manufacturers to easily adjust features to meet different market requirements. The technology is built to comply with international standards, ensuring easy market entry across different countries. Originally developed for research and academic purposes, it can be scaled up for industrial use, serving large-scale solar farms or grid-tied systems. It can be calibrated to account for regional conditions, ensuring accurate performance assessments regardless of local climatic variations. The tester provides data-driven insights for global deployment, optimizing PV system performance worldwide. This scalability and adaptability make it an attractive tool for both small-scale installations and large solar power projects worldwide.



Applications

- Renewable Energy Industry
- Solar Panel Manufacturers: Used for quality control and performance testing during production.
- Solar Farm Developers: Assesses module reliability before large-scale deployment.
- Electrical and Energy Engineering
- Testing Laboratories: For certifying PV modules to meet international standards (e.g., IEC 61215).
- Research Institutions: Supports R&D in photovoltaic technology, materials, and module design.

Intellectual Property Status

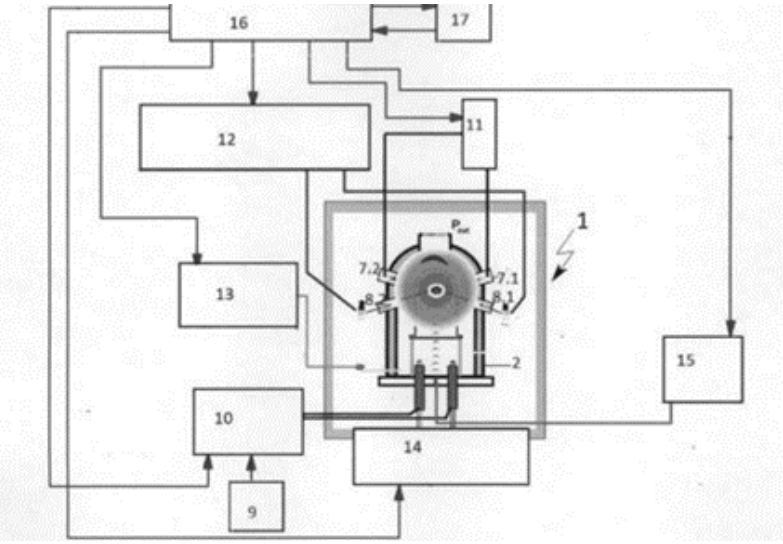
- The patent number is № 4974 U1

Contact Person: Lyubomir Simeonov Sekulov

Role: Inventor

e-mail: office@vtu.bg

Quantum Energy Generation System



Thematic Area(s)

Energy

Environment and Sustainability

Relevance

Quantum Energy Generation Systems use quantum phenomena like vacuum fluctuations or zero-point energy to generate power sustainably. This innovative approach aligns with global initiatives like UN SDG 7 and SDG 13, aiming to transition society towards renewable and low-carbon energy sources. Quantum energy generation does not produce harmful emissions or waste, supporting environmental protection and climate mitigation efforts. This clean energy approach reduces the carbon footprint and promotes long-term ecological sustainability.

Short Description

The quantum energy generation system is used for energy generation and production, particularly thermal energy. It offers increased stability and fast dynamic starting processes. The system consists of a generator with a chamber, a cooling water jacket, a quartz bell, an electric valve, and three base magnetrons arranged in a circle at 120° intervals. A control unit is connected to each base magnetrons and excitation magnetrons, and a vacuum control unit is connected to the chamber. The first and second vacuum and air control units are connected to a bidirectional controller and are connected to a control and signaling panel. This system ensures efficient and stable energy production.

Stage of Development

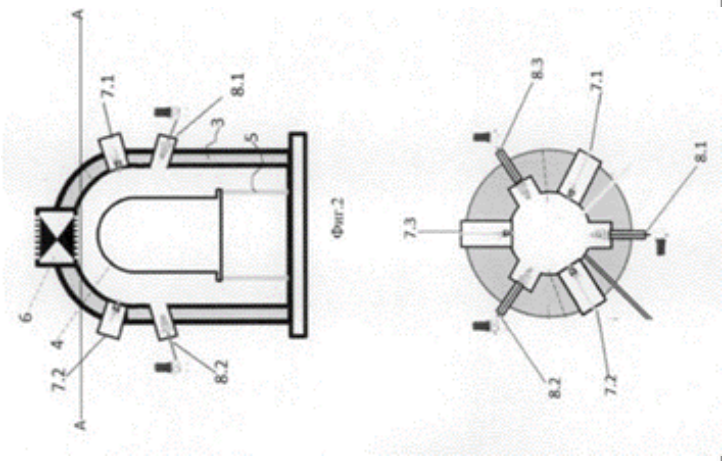
Quantum Energy Generation Systems (QEGs) are experimental devices inspired by Nikola Tesla's principles, aiming to generate power through mechanical resonance without conventional fuels. At TRL-1, they are in the conceptual stage, based on theoretical studies. Preliminary models suggest they could produce 10–15 kW of continuous power, suitable for typical households, with output configurable for 120–240V and 50–60Hz AC. Further development will focus on experimental validation.
Currently, this technology is at R&D Project Idea (A concept or idea in its initial stages, planned for further development.)

Expected Outputs of the Technology

Quantum Energy Generation Systems (QEGs) are in experimental stages, with prototypes demonstrating potential for producing 10 to 15 kilowatts of continuous electrical power for residential use. As research progresses, QEGs are expected to improve power output and efficiency, potentially supporting larger residential or small commercial loads. Additionally, integrating QEGs with renewable energy sources like solar or wind could create hybrid systems that offer consistent and reliable power generation, enhancing energy resilience and reducing dependence on traditional grid systems.

Scalability Potential

Quantum Energy Generation Systems (QEGs) are modular energy generators that can be customized to meet various energy demands, from residential to industrial applications. They can be integrated into existing grid systems or function independently in off-grid scenarios, making them suitable for regions with limited or unreliable electricity access. Quantum Energy Tech offers intermediary services to streamline procurement and technology integration, ensuring QEGs meet local standards and requirements. However, QEG technology is still in the experimental stage, and comprehensive data on performance, reliability, and safety is limited. Further rigorous testing and validation are necessary before QEGs can be considered a reliable energy solution for broader applications.



Applications

- The applications of QEGs include decentralized and backup power for off-grid areas, integration into smart grids, and clean energy solutions for electric vehicles, maritime, and aviation. In agriculture, they support smart farming and greenhouse operations by powering systems without relying on traditional fuels.

Intellectual Property Status

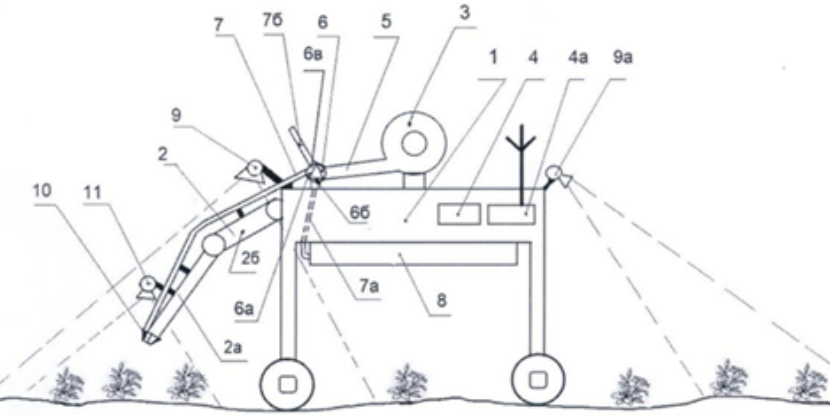
- The status of intellectual property is National patent registration
- Patent number № 67534

Contact Person: Marin Beloev

Role: Inventor

e-mail: info@magbel.com

Weed Control Robot



Фиг.1.

Thematic Area(s)

- Agriculture
- Low Carbon Economy
- Blue Economy

Relevance

Weed control robots are a significant advancement in sustainable agriculture, enhancing efficiency, reducing environmental impact, and promoting eco-friendly practices. They reduce chemical usage by employing mechanical or targeted methods to eliminate weeds, minimizing soil and water contamination. Precision spraying robots apply herbicides directly onto weeds, reducing chemical usage. Mechanical weeding methods prevent soil degradation associated with chemical herbicides, preserving soil structure and promoting long-term agricultural productivity.

Short Description

The invention weed control robot consists of a self-propelled platform with a lithium-ion battery pack, a fan with heaters and a flap with three openings and two hardware. A mechanical arm is mounted in front of the self-propelled platform, at the lower end of which a nozzle with an insulated pipeline for hot air is mounted, and a video camera is mounted above the nozzle. Auxiliary video cameras are mounted on the top, front and rear of the self-propelled platform. The weed control robot will find application in the field of agriculture, in particular in smart agriculture.

Stage of Development

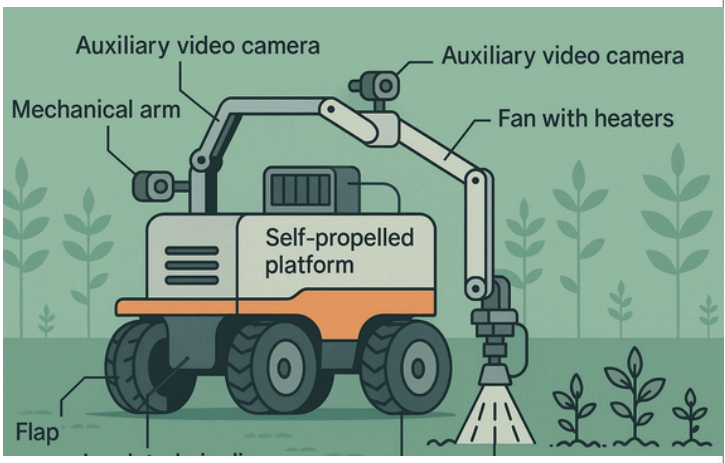
Weed control robots are early-stage technologies aiming to automate weed removal with high precision. At TRL-1, research focuses on basic principles like mechanical or laser-based weeding. Key metrics include weeding rate—up to 100,000 weeds per hour in systems like Carbon Robotics' LaserWeeder—and area coverage, or how much land is processed per hour. These outputs help assess potential efficiency and scalability in future agricultural applications.
Currently, this technology is at R&D Project Idea (A concept or idea in its initial stages, planned for further development.)

Expected Outputs of the Technology

Based on current capabilities and planned improvements, future iterations of weed control robots are expected to achieve significant enhancements in both operational efficiency and sustainability. Here are the anticipated outputs and outcomes:
Increased Weeding Speed and Coverage: Future systems are projected to process even larger areas with higher weeding rates—potentially exceeding 150,000 weeds per hour—enabling them to tackle extensive agricultural fields with minimal human intervention.
Enhanced Precision and Accuracy: With advancements in AI and machine learning, these robots are expected to achieve over 98% accuracy in differentiating between crops and weeds. This will further minimize collateral damage to crops and reduce the need for chemical herbicides.

Scalability Potential

Weed control robots are a promising solution for scalability and adaptation in various agricultural contexts. They use advanced computer vision and AI algorithms that can be customized to different crop types and weed patterns, allowing for a wide range of agricultural practices across different regions. The robots' modular design allows for easy reconfiguration or upgrade, simplifying integration into different farming systems and supporting incremental improvements without requiring a complete redesign. This makes it easier to scale production for small-scale and industrial agriculture, ensuring a sustainable and adaptable solution.



Applications

- Agriculture
- Row Crops & Vegetables: Precision weeding in crops like lettuce, carrots, and onions.
- Organic Farming: Reduces reliance on herbicides, supporting chemical-free practices.
- Large-Scale Farming: Increases efficiency and reduces labor costs on commercial farms.

Intellectual Property Status

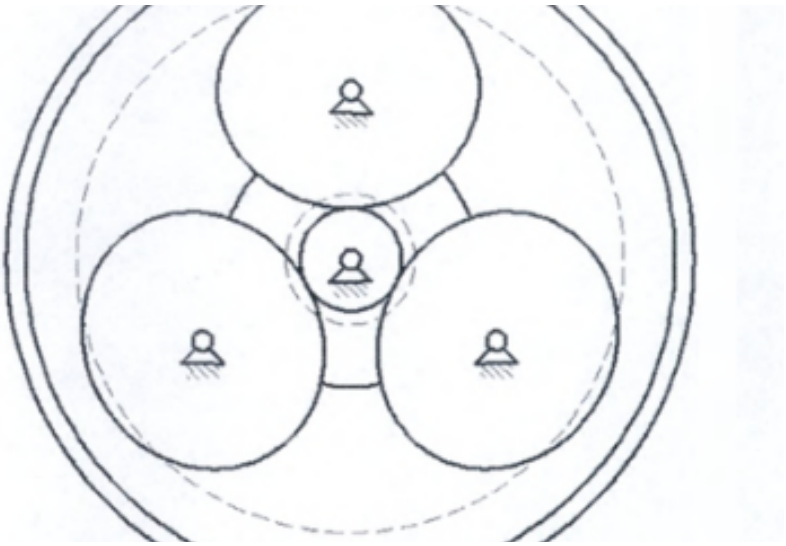
- The status of intellectual property is National patent registration
- Patent number № 67647

Contact Person: Ivan Stoyanov

Role: Inventor

e-mail: agronomy@au-plovdiv.bg

Friction Variator With Increased Load Capacity



Thematic Area(s)

Mechanical Engineering

Relevance

The friction variator technology is a key component in advanced mechanical engineering and energy-efficient transmission systems. Its design improvements, such as increased load capacity and reduced slipping during gear changes, contribute to more efficient power transmission in automotive and industrial applications. Additionally, improved friction control reduces mechanical wear and tear, allowing the transmission system to operate longer with lower maintenance costs, aligning with sustainable engineering goals.

Short Description

The invention relates to a friction variator with increased load capacity and minimized slippage when changing gear ratio. It consists of an input clutch, intermediate clutches, and an output clutch mounted on an input, intermediate, and output shaft. The input shaft is equipped with a driving clutch and unit, connected by a bearing and control system. Friction rollers rotate around the center of spherical pairs between the driving clutch and output clutch, which can move axially along the shaft. A pressure spring is mounted on the shaft, with forming contours K1, K2, and K3 being centroidal and formed by contact between the convex and concave contours of the driving clutch, friction rollers, and output clutch.

Stage of Development

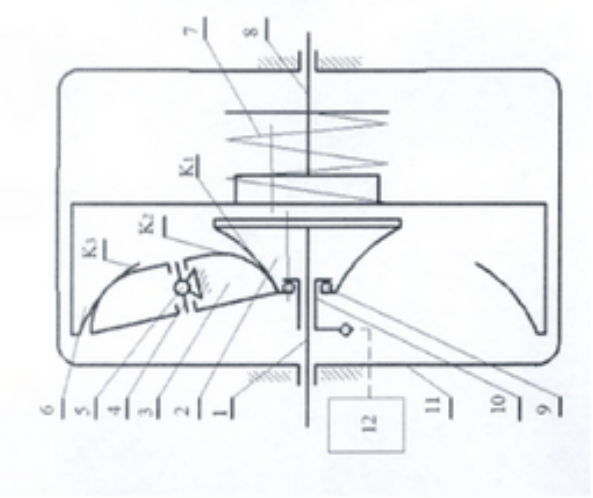
The TRL-1:Basic scientific studies on friction variator technology have identified how surface geometry and material composition influence torque transfer and slippage. Early observations suggest that tailored friction interfaces could improve load capacity and energy efficiency. These insights form the foundational understanding needed for future development of more efficient mechanical drive systems.

Expected Outputs of the Technology

The expected outputs and outcomes of the friction variator technology are projected to significantly enhance transmission performance in several ways:
With improved load handling and reduced slip, overall energy efficiency is expected to rise. This means that less energy is wasted as heat, translating to improved fuel economy in automotive applications or lower operational costs in industrial machinery.
By minimizing wear and tear through controlled friction, the variator is expected to extend the operational life of transmission components, resulting in lower maintenance costs and higher system reliability.

Scalability Potential

The friction variator technology offers international scalability due to its compatibility with existing transmission manufacturing processes and design improvements. It can be adapted for various applications, including high-performance automotive transmissions and heavy industrial machinery. Its ability to handle higher torque and reduce slippage makes it attractive for markets with varying operational demands, allowing it to be tailored to meet the specific requirements of different industries worldwide.



Applications

- Automotive – for advanced transmissions with smoother gear shifts
- Aerospace – in variable-speed drive systems with high load demands
- Industrial machinery – for efficient torque control under variable loads
- Robotics – enabling precise, smooth motion control
- Renewable energy – in wind turbines or other systems requiring adaptive torque transfer

Intellectual Property Status

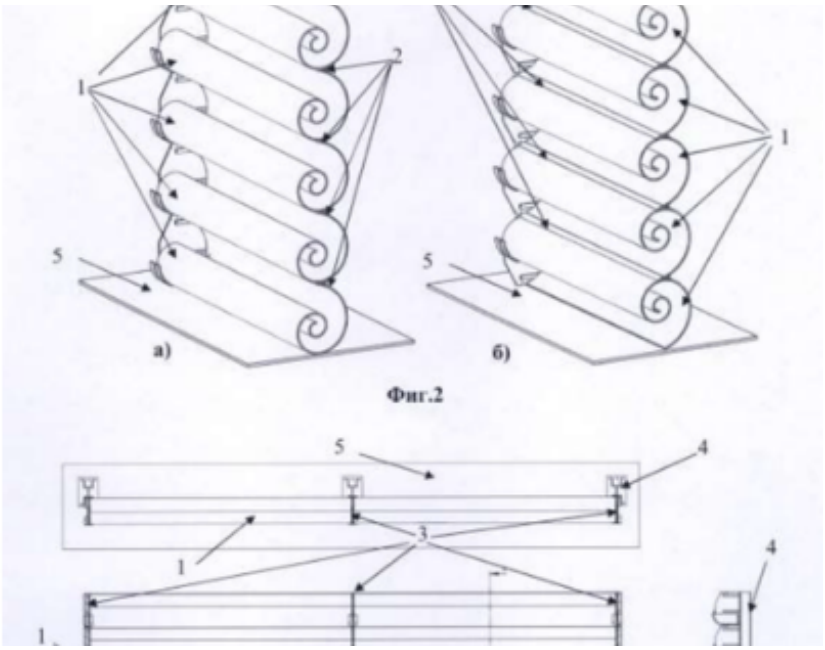
- The status of intellectual property is National patent registration
- Patent number № 113653

Contact Person: ptof. Stefan Stefanov

Role: Inventor

e-mail: info@tu-sofia.bg

Sound Insulating Panel and Sound Insulating Barrier, With Tubular Bodies



Short Description

The soundproofing panel for limiting the propagation and absorption (providing an opportunity for highly efficient conversion of acoustic energy into electrical) of sound waves, according to the utility model, consists of horizontal elongated units, shaped as tubular bodies, fixed by connecting elements. The tubular bodies have a logarithmic or golden spiral profile. One or more soundproofing panels can form a soundproofing barrier by being attached to vertical supports.

Thematic Area(s)

- Construction and Infrastructure
- Environment and Sustainability

Relevance

Spiral-shaped sound-insulating panels and barriers are a promising method for reducing acoustic noise. These structures not only attenuate sound transmission but also have the potential to harvest energy from ambient acoustic vibrations. Studies show that spiral-shaped metamaterials can create multiple band gaps in specific frequency ranges, effectively blocking certain frequencies. Chiral spiral structures have been explored for underwater sound insulation, achieving broadband sound attenuation between 3505 Hz and 5355 Hz.

Stage of Development

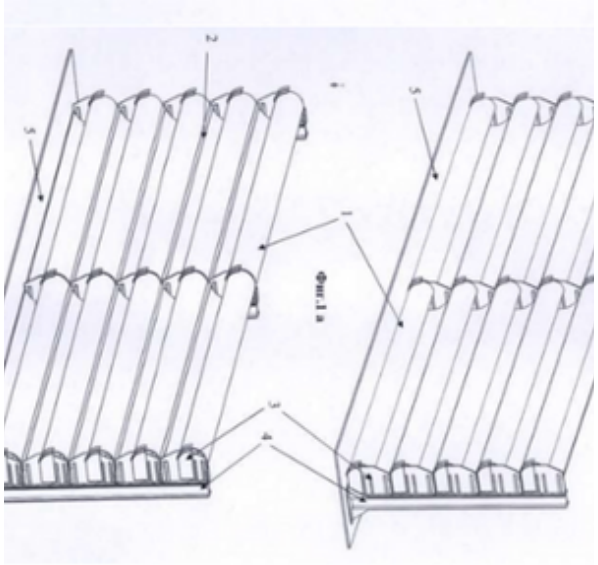
The TRL-1:Basic scientific studies on spiral-profiled tubular structures in acoustic panels reveal strong potential for broadband sound absorption and energy harvesting. Research shows these designs can reduce noise pollution and convert ambient acoustic vibrations into usable energy, laying a foundation for future applications.

Expected Outputs of the Technology

Integrating spiral-profiled tubular structures into sound-insulating panels and barriers offers promising advancements in acoustic noise reduction and energy harvesting. These innovative designs are expected to deliver several key outcomes:
Broadband Sound Absorption: Spiral structures, such as chiral spiral designs, have demonstrated the ability to achieve wide-band sound insulation. For instance, a fixed-pitch spiral structure has been shown to provide sound insulation over a frequency range from 3505 Hz to 5355 Hz, with a bandwidth of 1000 Hz. This design effectively blocks specific frequencies without altering the external profile of the structure, making it suitable for applications requiring targeted noise reduction.

Scalability Potential

The integration of spiral-profiled tubular structures into sound-insulating panels and barriers holds significant potential for international scalability due to advancements in manufacturing technologies, global sustainability initiatives, and the increasing demand for noise reduction solutions. Advanced manufacturing processes, such as additive manufacturing and precision welding, enable the creation of complex geometries with high precision, allowing for customization of acoustic properties to meet international standards.



Applications

- Construction – for soundproofing buildings and infrastructure
- Transportation – noise reduction in vehicles, trains, and aircraft
- Renewable energy – harvesting energy from ambient sound in urban areas
- Consumer electronics – acoustic control in devices and appliances
- Industrial facilities – reducing machinery noise and recovering energy

Intellectual Property Status

- The status of intellectual property is National patent registration
- Patent number № 4563

Contact Person: Ivan Kralov

Role: Inventor

e-mail: info@tu-sofia.bg

Face Mask Filter Against Pathogens And Viruses

Short Description

A face mask filter is a device designed to protect against pathogens and viruses. It consists of a layer of hygroscopic fabric or non-woven fabric with dense meshes made of thin filaments of electrically conductive metal or fabric. The meshes are coated with nanoparticles of different metals, such as silver, platinum, gold, copper, zinc, titanium, magnesium, lithium, and their alloys. In one variant, the metal meshes are connected to the poles of a portable battery for direct electric current. This system is designed to protect against harmful bacteria and viruses.

Thematic Area(s)

Healthcare and Biotechnology

Environment and Sustainability

Relevance

Biodegradable face mask filters offer protection against airborne pathogens and viruses, improving public health. They meet high filtration standards and reduce environmental impact. Produced using biodegradable materials like chitosan and PBS, these masks decompose within weeks, reducing plastic waste and environmental pollution. This sustainable consumption pattern promotes sustainable consumption patterns.

Stage of Development

The TRL-1:Basic scientific studies on biodegradable face mask filters show potential to reduce plastic waste. Unlike conventional polypropylene masks, which take years to decompose, filters made from materials like chitosan nanofibers can fully degrade within hours under specific conditions, offering a sustainable alternative.

Expected Outputs of the Technology

Innovations in biodegradable materials have led to the development of filters that effectively capture airborne particles while maintaining comfortable breathing conditions. For instance, filters made from poly(butylene succinate) (PBS) microfibers combined with chitosan nanowhiskers have demonstrated over 97% removal efficiency for particulate matter larger than 1 µm, with a pressure drop of 59 Pa, ensuring both protection and comfort.

Scalability Potential

Biodegradable face mask filters' scalability and adaptability in international markets are influenced by factors like material availability, manufacturing capabilities, regulatory standards, and consumer acceptance. Biodegradable face masks are typically made from materials like polylactic acid (PLA), hemp, and coffee, with Asia Pacific leading in manufacturing capabilities. In 2023, the Asia Pacific region accounted for 35% of the degradable mask market's revenue, driven by countries like China, India, and Japan. North America and Europe are significant markets for biodegradable face masks due to stringent environmental regulations and consumer awareness. The market in North America is expected to grow at a CAGR of 15% to reach USD 1.2 billion by 2032.

Applications

- Healthcare – sustainable alternatives for medical and surgical masks
- Personal protective equipment (PPE) – eco-friendly masks for general use
- Environmental services – waste reduction solutions for public health sectors
- Biomaterials – development of biodegradable nonwoven fabrics
- Consumer goods – green products for daily personal protection

Intellectual Property Status

- The status of intellectual property is National patent registration
- Patent number № 3922

Contact Person: Koycho Mitev

Role: Inventor

e-mail: secretary@uni-ruse.bg

Ramp For Loading And Unloading Tram Motor Vehicles For Normal Gauge On Transport Trolleys

Thematic Area(s)

Construction and Infrastructure

Environment and Sustainability

Relevance

The technology aims to improve operational efficiency by automating tram motor unit loading and unloading onto transport trolleys, reducing downtime and reliance on traditional methods. It enhances safety and reliability by utilizing a precise movement of tram units, reducing manual handling risks and potential damage. The ramp is relocatable, offering versatility in different rail infrastructure settings and functioning without interrupting power supply to the contact wire. It also supports sustainable urban mobility by facilitating faster maintenance and repair of tram units, contributing to the overall sustainability of the urban transportation network and enabling continuous operation of tram services.

Short Description

The project aims to develop a new technology for loading and unloading tram cars on transport trolleys. The facility is part of a new technology for normal gauge tram cars on a track with a track gauge of 1009 mm to the repair base, pod "Tramkar". The current technology involves partial lifting of cars with an emergency truck crane. The loading and unloading processes require shifting the load by 213 mm due to the combined track having one common rail. The facility can shift the manipulated tram car in the required direction and is movable, allowing it to be positioned anywhere on the combined track without interfering with transport or shunting processes. The ramp consists of several modules, with the displacement of the manipulated train occurring in the horizontal part, with curves provided in both modules.

Stage of Development

The TRL-2: Technology concept formulate a ramp concept enables precise 213 mm lateral displacement of tram motor units for alignment onto trolleys. Finite element analysis confirms load-bearing capacity up to 12,000 kg with safe stress levels. Its modular, relocatable design allows repositioning without disrupting rail or power systems, improving safety and operational efficiency by replacing crane lifts and avoiding power deactivation.

Expected Outputs of the Technology

The ramp is designed to shift a tram motor unit precisely 213 mm, ensuring accurate alignment onto transport trolleys. It has load-bearing capacity and is designed to handle up to 12,000 kg of static load. The structure's modular design allows for precise movement of tram units and repositioning without interfering with rail or power supply operations. This design enhances operational efficiency and safety by replacing the traditional method of sequentially lifting tram units with an emergency crane, reducing the need to deactivate the contact wire during operation.

Scalability Potential

The ramp's modular construction—comprising a horizontal section and a trestle—allows for adjustments in configuration to suit different tram systems. Although originally designed for a 1009 mm track gauge, the concept can be modified to align with other standards (such as the 1435 mm gauge common in many countries) by recalibrating the dimensions and movement parameters. This adaptability supports broader deployment in various international contexts.

The design is intended to be a relocatable installation that can be positioned on combined tracks without interfering with ongoing operations. This feature makes it a flexible solution that can be integrated into diverse rail networks around the world, provided the necessary infrastructure adaptations are made.

Applications

- Railway maintenance – efficient tram and train unit handling
- Public transportation – streamlined vehicle servicing and alignment
- Heavy machinery logistics – precise load positioning systems
- Manufacturing – modular transport and assembly solutions
- Safety engineering – improved operational safety in vehicle handling

Intellectual Property Status

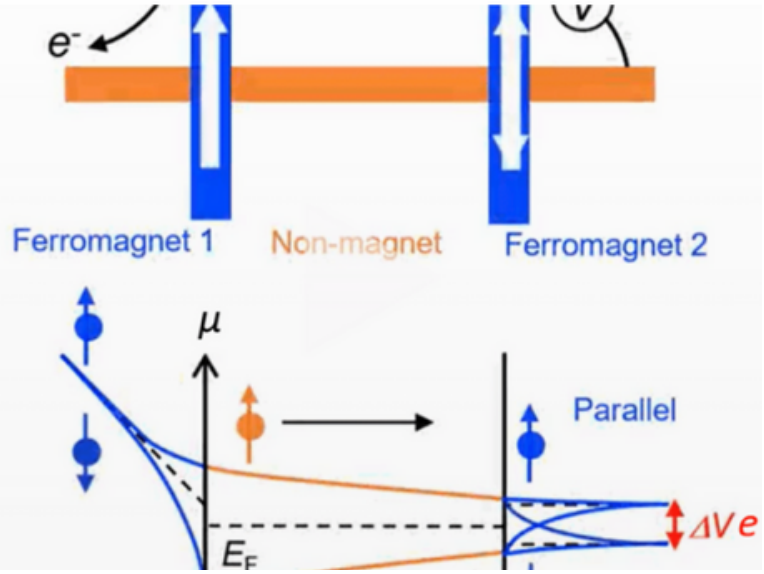
- National Patent application filed and its in evaluation stage.

Contact Person: Emil Mihaylov

Role: Inventor

e-mail: office@vtu.bg

Method For Measuring The Electrical Properties Of Soft Magnetic Ferritical Materials



Thematic Area(s)

Energy

Relevance

The method for measuring the electrical properties of magnetically soft ferrite materials aligns with the goals of precision, efficiency, and advancement in electronic material science. This innovation enhances the accuracy and reliability of evaluating ferrite materials, which are widely used in high-frequency applications, transformers, inductors, and electromagnetic shielding. By providing a standardized and precise measurement technique, this method enables better material characterization, leading to the development of more efficient and high-performance electronic components.maintenance and repair of tram units, contributing to the overall sustainability of the urban transportation network and enabling continuous operation of tram services.

Short Description

The invention aims to measure the electrical properties of soft magnetic ferrite materials used in high-frequency pulse electrical energy converters. The method involves an apparatus measuring the electrical impedance of a capacitor, formed by a sample of the tested material and electrically conductive plates. The capacitor is wound in a spool, and a coil is wound through it. A direct current flows through the spool, creating a static magnetic field with a voltage Hdc. This creates a static magnetic field, suppressing the magnetic permeability of the sample, and increasing the upper frequency limit of the measurement of the inherent electrical properties of the material.

Stage of Development

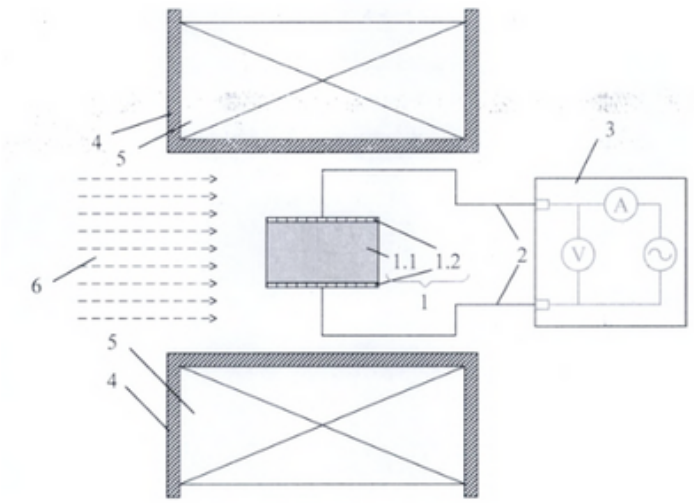
The TRL-1: Basic principles observed the scientific initial research on measuring electrical properties of magnetically soft ferrite materials aims to enhance precision and efficiency. The method improves accuracy in characterizing permeability, resistivity, and core losses, supports standardized testing, and aids in optimizing ferrite-based components like transformers, inductors, antennas, and EMI shields.

Expected Outputs of the Technology

The method for measuring the electrical properties of magnetically soft ferrite materials improves precision, efficiency, and material optimization in electronic applications. It provides precise data on ferrite materials, enabling detailed analysis of permeability, resistivity, and core losses for high-efficiency components. The method also offers a consistent and repeatable testing technique, improving quality control. It supports the design and optimization of transformers, inductors, antennas, and EMI shielding materials in ferrite-based components.

Scalability Potential

The method for measuring the electrical properties of magnetically soft ferrite materials has strong international scalability potential due to the global demand for high-performance ferrite components in electronics, telecommunications, and energy systems. This method can be adopted by research institutions, material testing laboratories, and electronics manufacturers worldwide, benefiting countries with strong electronics, automotive, and renewable energy industries. Challenges include regulatory differences, industry-standard validation, and regional variations in ferrite material compositions. Collaboration with global standardization bodies like IEC or IEEE could drive widespread adoption. This technology supports the development of high-efficiency power electronics, wireless communication devices, and sustainable energy systems.



Applications

- Electronics manufacturing – optimizing ferrite components for circuits
- Telecommunications – improving antennas and signal filtering devices
- Power systems – enhancing transformers and inductors
- Electromagnetic compatibility (EMC) – developing EMI shielding materials
- Material science research – advancing magnetic material characterization

Intellectual Property Status

- National Patent application filed and its in evaluation stage.

Contact Person: Miglenna Todorova

Role: Inventor

e-mail: info@tu-sofia.bg

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Cosmetic and Hygiene Products

Short Description

This technology offers a cosmetic and hygiene product line using deuterium-depleted water (ASD), a marine-derived ingredient. Designed for skin regeneration, hydration, and anti-inflammatory effects, it includes sprays, gels, creams, and lotions. All formulations passed dermatological tests and proved non-toxic. Suitable for both therapeutic and daily use, they support skin recovery in sensitive individuals and chronic skin conditions alike.

Thematic Area(s)

Blue Economy

Relevance

This innovation capitalizes on marine-derived deuterium-depleted water to create eco-friendly, biocompatible skincare. It meets global demand for clean-label cosmetics and targets chronic skin issues without synthetic irritants. The concept promotes marine bioresources' value while aligning with circular economy goals and health-conscious consumer trends, making it relevant to the sustainable Blue Economy framework

Stage of Development

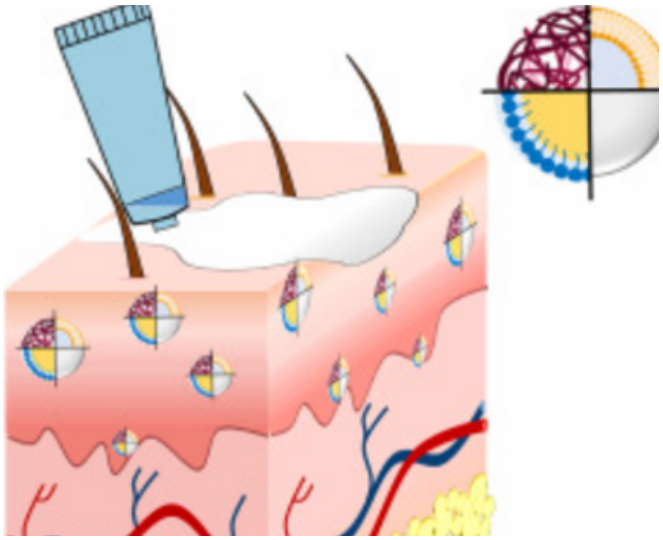
The technology has reached TRL 9. Cosmetic and personal care products using ASD are currently in mass production and on the market. Product efficacy and safety have been clinically confirmed. The line meets EU regulations and receives strong consumer feedback. Research continues to support new formulations for skin repair and advanced care in medical recovery contexts.

Expected Outputs of the Technology

The expected outputs include the development of new product categories, such as targeted anti-aging serums, post-laser and post-chemical peel solutions, and children's dermatological care. Clinical partnerships and certifications (e.g., ISO, GMP) are anticipated to enhance market penetration. Additional outcomes involve increasing awareness of ASD-based therapies through educational campaigns, publications, and participation in international cosmetic expos. The innovation may also stimulate local sourcing and processing of ASD for regional supply chains, fostering sustainable economic growth and scientific collaboration in the Blue Economy sector.

Scalability Potential

The product line is highly scalable due to growing global demand for dermatologically tested, natural cosmetics. The formulations are ready for deployment across multiple markets, including EU, Asia, and North America, supported by favorable legal frameworks. Contract manufacturing and white-label partnerships are possible, and the technology is adaptable to specific cultural and market needs. A digital marketing strategy combined with online retail channels supports fast international dissemination.



Applications

- Dermatology and allergology clinics
- Health and wellness resorts
- Eco-cosmetic retail and e-commerce platforms
- Biotech labs focused on skin regeneration products

Intellectual Property Status

- An international patent application has been filed and is under evaluation. The technology is currently licensed under a non-exclusive agreement for deployment in Romania and the EU. Licensing options for other regions are under consideration depending on clinical validation and market readiness.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

website of the technology: https://drnedelcuioan.ro/apa-echilibrata-in-deuteriu/

Process for Obtaining Ice Cream from Concentrated Whey and Fruits

Thematic Area(s)

- Circular Economy
- Resilience to Climate Change
- Agro-food Innovation

Relevance

The technology supports circular economy goals by valorizing sweet whey, a dairy by-product, and integrating local fruits. It reduces waste, promotes sustainable food innovation, and aligns with eco-friendly food production strategies.

Short Description

This technology enables the production of ice cream from concentrated, delactosed whey—a by-product of the dairy industry—combined with local fruits and traditional ingredients such as eggs and cream. It transforms whey, often treated as waste, into a clean-label dessert that is high in energy, protein, and calcium, free from artificial additives. The process supports sustainability and circular economy goals by valorizing dairy surplus and providing a novel, nutritious frozen product attractive to consumers.

Stage of Development

The technology has reached TRL 9 and is already patented. It has been implemented in commercial-scale production by a licensed Romanian food company. The process is fully operational and has received positive feedback from consumers. The final product shows good stability in texture and taste. Further improvements could aim to expand recipe variants tailored for broader markets and to diversify the product portfolio within clean-label frozen desserts.

Expected Outputs of the Technology

Expected outcomes include national and EU market expansion, reduced waste in the dairy sector, and promotion of functional desserts. The technology may become a model for sustainable valorization and university–industry partnerships. It aims to support innovation in clean-label food segments.

Scalability Potential

Strong international scalability, especially in EU markets with developed dairy industries. Market readiness, consumer appeal, and sustainable value-addition offer global appeal. Tailored branding, regulatory compliance, and strategic partnerships are needed for cross-border adoption.

Applications

- Food Industry
- Dairy Processing
- Functional and Frozen Desserts
- Sustainable Agro-Food Sector

Intellectual Property Status

- National patent application RO134081A2 filed and under evaluation. Licensed to a Romanian food company for commercial produ National patent application RO134081A2 filed and under evaluation. Licensed to a Romanian food company for commercial production and marketing of the patented ice cream product.ction and marketing of the patented ice cream product.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

website of the technology: https://web.facebook.com/profile.php?id=61570142572038

Vegetable Spreadable Product and Process for its Preparation

Thematic Area(s)

Low Carbon Economy

Circular Economy

Relevance

The technology addresses key priorities in sustainable food innovation by reducing the carbon footprint of traditional animal-based spreads and enhancing local agri-food value chains. By utilizing locally grown legumes and minimizing processing waste, it contributes to a circular economy model. It encourages dietary transitions toward plant-based nutrition, aligning with EU climate goals and the sustainable development agenda, while also offering practical alternatives for environmentally responsible food choices.

Short Description

This technology refers to a plant-based, shelf-stable spread designed as a sustainable and nutritious alternative to meat or soy pâtés. It uses legume flour, vegetable oils, fibers, and spices, processed via emulsification and thermal sterilization to ensure food safety and long shelf life. Free from animal products, allergens, and preservatives, it offers a creamy, savory profile. The formulation is optimized for high protein and fiber content, nutritional balance, and eco-conscious production.

Stage of Development

The product is at TRL 9. It has been produced and marketed at industrial scale in Romania for over six years. The process is stable, replicable, and compliant with all food regulations. Consumer feedback confirms consistent quality. Current developments focus on packaging improvements and new functional ingredients to meet market demands and health trends.

Expected Outputs of the Technology

The expected outputs include diversified product lines with new flavors and functional enhancements (e.g., omega-3 enrichment, probiotic variants), broader domestic distribution, and entrance into regional EU markets. Additional outcomes will be the deepening of academic–industry collaborations for co-development and applied research. The technology also enables capacity building in food innovation, supports small-scale producers through licensing, and creates environmentally responsible consumption models. Educational and promotional campaigns targeting young consumers and plant-based diet adoption are planned, alongside technical guides for implementation in SMEs.

Scalability Potential

The technology is highly scalable across European markets with increasing consumer demand for clean-label, plant-based products. Its production process is compatible with existing food processing infrastructure and does not require advanced technological adaptation. It can be replicated by food SMEs or scaled by larger manufacturers under license. Market expansion strategies include co-branding, geographical indications, and adapting recipes to regional preferences while preserving the core sustainable concept.

Applications

- Food industry (healthy plant-based convenience foods)
- Retail and HoReCa sectors promoting sustainability
- Public health programs encouraging plant-based diets
- Export-oriented agri-food innovation hubs

Intellectual Property Status

- The product is protected under Romanian patent RO131180B1. An exclusive license agreement has been signed with a national agri-food company, granting production and commercialization rights in Romania. The licensing model also includes clauses for revenue sharing, technology implementation support, and potential expansion to international markets under sublicensing agreements.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

website of the technology: https://sanovita.ro

Method and Process for Preventing Honey Crystallization

Thematic Area(s)

Agro-food

Apiculture, Innovation in Food Preservation

Relevance

The technology addresses a major challenge in the apiculture and food industry—crystallization of honey during storage and sale. This method supports sustainable, energy-efficient practices and aligns with the increasing consumer demand for minimally processed, high-quality food. It offers beekeepers and honey processors a cost-effective alternative to conventional thermal treatments, while preserving honey's health and nutritional benefits. The approach supports food innovation and enhances the value chain in the beekeeping sector.

Short Description

This non-thermal, clean-label technology prevents honey crystallization using ultrasonic waves, microwave energy, and a rotating magnetic field. Unlike traditional heating, it preserves the bioactive compounds and fluid texture of honey without additives. The system is modular, energy-efficient, and scalable, enabling honey to remain liquid longer. It enhances quality, reduces processing losses, and supports sustainable practices for both small producers and large-scale honey processors.

Stage of Development

The technology is currently at Technology Readiness Level (TRL) 3. Experimental proof of concept has been completed, with laboratory validation confirming the ability to prevent crystallization and maintain honey's biochemical integrity. Trials have demonstrated reduced energy consumption, preservation of enzymatic activity, and protection of organoleptic properties. Further development stages will involve prototype design, testing under semi-industrial conditions, and compliance evaluation with food safety standards.

Expected Outputs of the Technology

Expected outputs include the development of a modular treatment unit adaptable to various production scales, including SME processors and cooperatives. In the short term, this will reduce energy use and processing time, increasing economic efficiency. In the medium term, integration of this technology into honey production lines will ensure product consistency, improved shelf life, and market competitiveness. In the long term, the technology will support industrial-scale deployment, enhancing export potential, minimizing crystallization losses, and contributing to cleaner production practices. Additionally, the innovation will lead to scientific publications, patents, and training materials for the agri-food and apiculture sectors.

Scalability Potential

The method has strong scalability potential across both developing and developed markets with active apiculture industries. Its low energy requirements and modular configuration make it suitable for rapid adoption by SMEs, cooperatives, and industrial processors alike. Regulatory compatibility across the EU and neighboring markets ensures ease of certification and commercialization. Growing international demand for high-quality, unprocessed honey further supports its market readiness and adaptability.

Applications

- Food preservation and shelf-life extension in the apiculture sector
- Export-ready honey processing with quality assurance
- Green and clean-label technology for agro-food innovation

Intellectual Property Status

- The technology is protected by an international patent application (EP3794959A1), currently under evaluation. The application covers the method and device configuration for crystallization prevention using physical energy fields. It is not yet licensed, and partnerships are welcome for prototype development, commercialization, or further co-development under technology transfer agreements.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Process for Obtaining a Fermented Plant-Based Yoghurt from Germinated Legumes

Thematic Area(s)

- Resilience and Adaptation to Climate Change
- Circular Economy
- Agro-Food Biotechnology

Relevance

This technology supports climate-smart agriculture by promoting legumes as sustainable protein sources and reducing dependence on dairy products with high environmental footprints. It aligns with the principles of the circular economy through the valorization of local legume crops and contributes to dietary diversity. By fostering the production of plant-based functional foods, it addresses global health trends and food security goals while enhancing innovation in agro-food biotechnology.

Short Description

This technology describes a biotechnological process to produce a yogurt-like fermented product from germinated legumes such as chickpeas or fava beans. It combines germination with lactic acid fermentation using exopolysaccharide-producing strains to enhance taste, texture, and nutrition. A pre-fermentation heat treatment activates enzymes and reduces antinutritional factors. The result is a plant-based product with improved digestibility, mimicking the sensory and nutritional profile of yogurt, ideal for vegan and lactose-intolerant consumers.

Stage of Development

The technology is currently at TRL 5.
It has been validated in laboratory and pilot-scale environments. Experimental trials confirmed the feasibility of the fermentation process, with optimized parameters for legume germination, microbial inoculation, and fermentation time and temperature. Outcomes showed improved protein digestibility, reduction of antinutritional compounds, and acceptable sensory characteristics. Scaling up the process is underway to assess consistency and performance in small industrial settings.

Expected Outputs of the Technology

The expected outputs include the launch of a new category of fermented plant-based yogurts made from legumes, enhancing the range of dairy alternatives. Deliverables also include technical documentation for industry, starter culture specs, and process protocols. Health benefits like better digestion, improved gut microbiota, and tolerance for lactose-intolerant consumers support adoption. The technology enables local crop use, reduces emissions, and fosters industry-academia collaboration in food biotech.

Scalability Potential

The process is highly scalable at both national and international levels, with applications in regions producing chickpeas, fava beans, or other suitable legumes. It requires moderate investment and can be integrated into existing fermentation facilities with standard equipment. Scalability is further enhanced by consumer demand for dairy alternatives and clean-label functional foods. Strategic partnerships with food producers and retailers, along with regulatory compliance, will support broader market introduction.

Applications

- Plant-based functional foods and dairy alternatives
- Nutritional biotechnology for health-focused products
- Food innovation and local crop valorization strategies

Intellectual Property Status

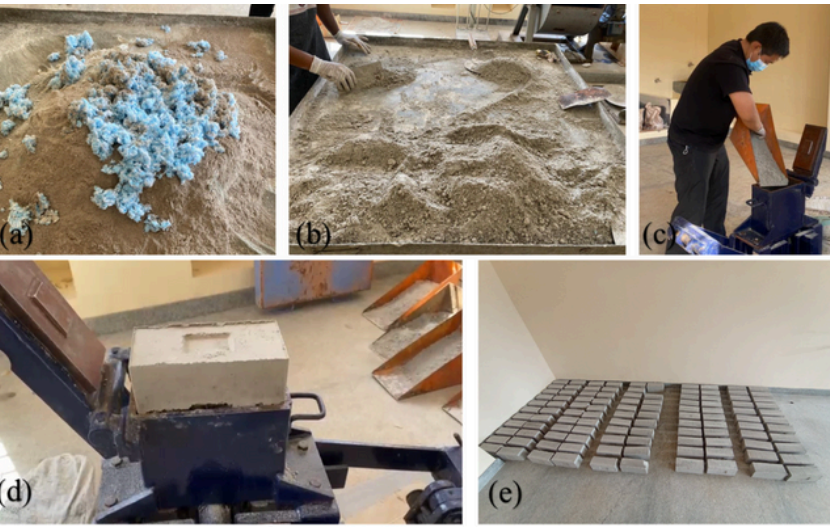
- The technology is protected by a national patent in Romania under the number RO133694(B1). The patent covers the process of producing the fermented product using germinated legumes and specific microbial strains. It is currently unlicensed and open for collaboration, technology transfer, or commercialization under appropriate agreements.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Recycling of Surgical Masks in Hot Asphalt Mixtures



Thematic Area(s)

- Circular Economy
- Eco-Innovation
- Climate Change Adaptation

Relevance

The use of face masks in asphalt aligns with circular economy principles by converting pandemic-related waste into a valuable resource. It reduces the environmental burden of synthetic polymer disposal while supporting low-carbon infrastructure solutions. The innovation responds to urgent waste management challenges and offers scalable green alternatives for sustainable road construction.

Short Description

This technology proposes a method to reuse surgical face masks in road construction by incorporating shredded mask material into hot asphalt mixtures. The inclusion of thermoplastic fibers from masks enhances mechanical performance and elasticity while reducing environmental waste. The processed masks are sanitized, shredded, and blended into the bituminous matrix. The solution addresses both infrastructure resilience and plastic waste valorization, with potential application in high-traffic or urban areas seeking circular economy integration.

Stage of Development

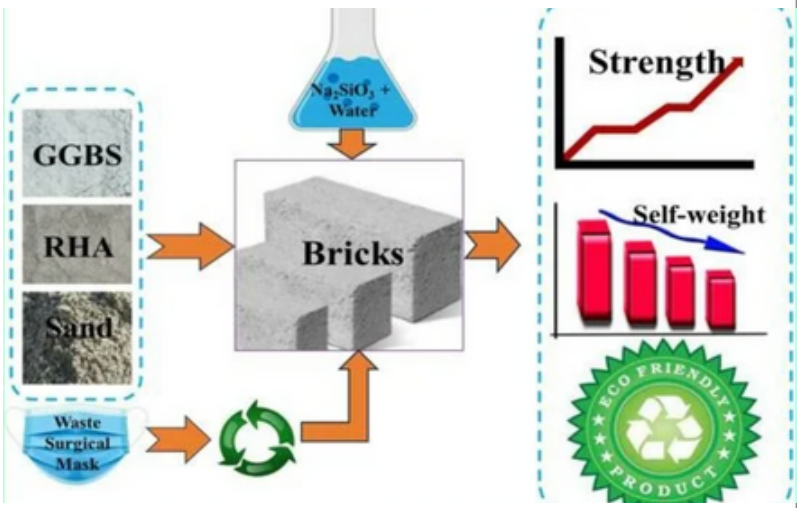
The technology has reached TRL 5. Laboratory testing validated mechanical behavior, thermal stability, and deformation resistance. Optimized mixing protocols and pre-treatment processes have been established. The next step involves small-scale field trials to evaluate durability and environmental performance under real road conditions, with attention to long-term behavior and integration into existing construction standards.

Expected Outputs of the Technology

Expected outputs include technical documentation for civil engineering integration, life-cycle analysis reports, and validation data from field applications. The method is designed to be compatible with existing asphalt production units. Adoption can contribute to reducing environmental plastic loads, diversifying raw materials, and demonstrating EU-aligned sustainability efforts. Public-private partnerships and cross-border pilot projects may expand its relevance and accelerate commercial implementation in infrastructure programs.

Scalability Potential

The process is scalable in any region with asphalt mixing plants and waste mask collection systems. Implementation requires minor adjustments to existing facilities. Widespread adoption is supported by the availability of discarded masks, especially post-pandemic, and increasing demand for sustainable infrastructure. Regulatory support and green procurement policies would enhance market uptake.



Applications

- Road construction and maintenance
- Circular economy models in infrastructure
- Waste valorization in public procurement projects

Intellectual Property Status

- A national patent application has been filed and is under evaluation. The innovation is not yet licensed, offering opportunities for joint development, technology transfer, or testing collaborations. Partnerships are encouraged to advance readiness and deployment at national or EU level.
- Patent No: RO135384(B1)

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Hydraulic Deep Drawing Die With Kinetostatic Control

Thematic Area(s)

- Resilience and Adaptation to Climate Change
- Circular Economy
- Construction and Infrastructure

Relevance

The technology increases metal forming efficiency and reduces material waste, aligning with circular economy goals. It decreases secondary processing, lowering energy use and CO_2 emissions. Relevant for manufacturers aiming to produce lightweight, low-impact components for sustainable mobility and energy-saving systems, this innovation promotes resilience by enabling greener production practices and efficient resource utilization.

Short Description

This hydraulic deep drawing die integrates a kinetostatic control system that ensures balanced force distribution on the metal sheet during forming. It provides real-time control of punch speed and pressure, reducing defects such as wrinkles, tears, or thickness variations. It ensures higher forming precision, dimensional stability, and material flow. Suitable for producing complex industrial and automotive components, this technology delivers consistent results, extended die life, and improved energy efficiency, supporting circular economy and low-waste manufacturing

Stage of Development

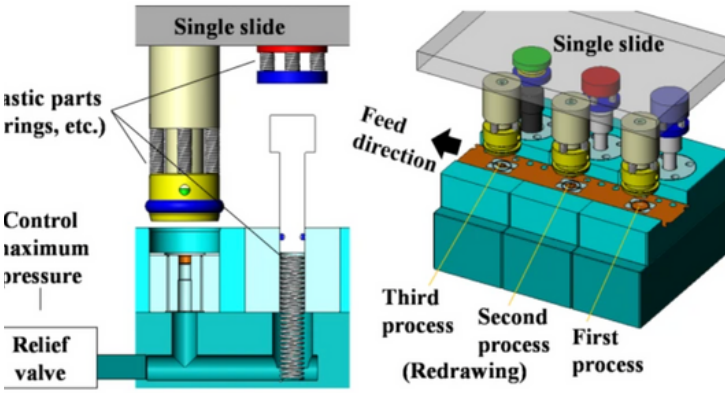
The technology is currently at TRL 5. Pilot-scale tests have confirmed effective control of forming parameters, including punch speed and force distribution. Results show improved dimensional accuracy, material flow, and reduced component rejection. The next step involves testing on industrial hydraulic presses to evaluate behavior under high-volume production conditions and verify long-term performance and system adaptability.

Expected Outputs of the Technology

The system is expected to enhance forming precision, reduce part rejection, and improve material efficiency. Anticipated outputs include industrial integration plans, technical documentation for machine adaptation, and operational manuals for industrial partners. Academic results involve publications and new training modules. By optimizing tool life and reducing defects, it cuts costs and energy use. This fosters industrial competitiveness while strengthening collaboration between research and production sectors, accelerating adoption of advanced forming methods.

Scalability Potential

The system is scalable across regions with existing hydraulic press infrastructure. Modular design enables easy integration with different equipment sizes and industrial standards. It is applicable to automotive, aerospace, and general metal forming industries. Its adaptability makes it suitable for small and medium manufacturers seeking precision improvements. Public and private investment programs can support regional and cross-border scaling.



ingle-action press machine rough sketch] [Progressive die rough sketch]

Applications

- Precision automotive and structural components
- Aerospace panels and lightweight metal parts
- Industrial housings and deep-drawn equipment covers

Intellectual Property Status

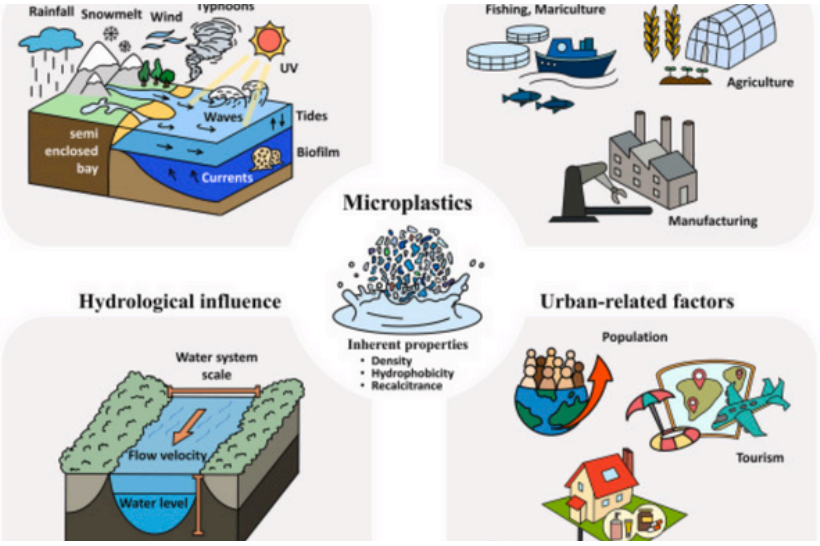
- The technology is protected under Romanian Patent No. RO131777(B1), covering the design and control method for kinetostatic hydraulic deep drawing. It is currently unlicensed and available for collaborative development, technology transfer, or industrial integration under joint agreements.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Microplastics Collector and Sorting Device for Aquatic Environments



Thematic Area(s)

Circular Economy

Blue Economy

Relevance

This device addresses a critical aspect of marine pollution—microplastics—by offering a practical and deployable tool for cleanup and monitoring. It supports sustainable development goals related to clean water and life below water, and contributes to circular economy principles through recovery and potential reuse of collected plastics. The solution is aligned with EU policies on marine waste reduction and climate resilience in coastal areas.

Short Description

This technology is a compact, mobile solution designed to collect and sort microplastics from natural or man-made aquatic environments. It consists of a floatable structure with a filtration mechanism that can retain plastic particles of various sizes and densities. The system includes sensors for monitoring environmental parameters and is powered by renewable energy sources. It is especially suitable for use in rivers, lakes, harbors, and coastal areas. Designed for ease of deployment, it contributes to reducing pollution in vulnerable aquatic ecosystems while enabling data collection for environmental monitoring.

Stage of Development

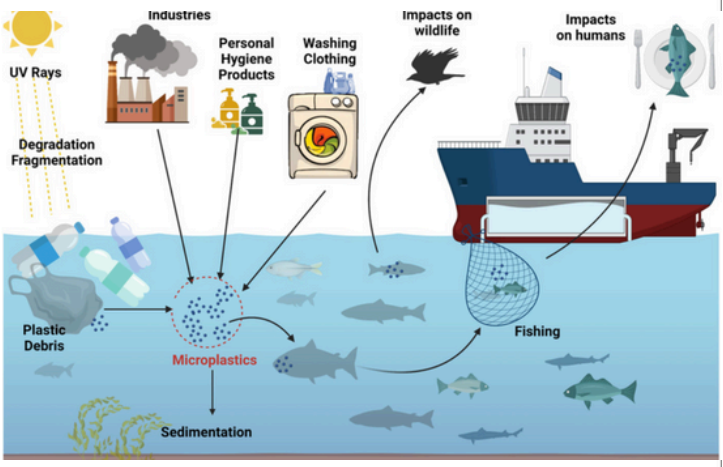
The device is currently at TRL 4–5. Laboratory and small-scale field tests have validated the separation mechanism for microplastics of various sizes and types. Prototype models have been tested in controlled aquatic environments, demonstrating efficiency in collection, filtration, and initial data logging. Further development focuses on improving energy efficiency, adapting to higher water flow rates, and long-term reliability testing in diverse environmental conditions.

Expected Outputs of the Technology

Expected outputs include the deployment of a field-ready version of the collector in pilot locations such as rivers, ports, and protected marine areas. Technical documentation for manufacturers and operators, along with real-time data collection and transmission features, will be made available. The device can be linked to local cleanup initiatives and citizen science programs. Outcomes include reduced microplastic loads, data for environmental research, and public awareness campaigns. It also provides a blueprint for replicable devices adaptable to local needs and environments. Academic outputs may include publications, student training modules, and joint R&D with NGOs and municipalities.

Scalability Potential

The technology can be scaled up for larger aquatic environments or customized for specific pollution types. It can be adopted by local authorities, NGOs, or environmental companies across EU member states or regions affected by microplastic pollution. Low production costs and modular design enhance replicability. Its portability enables cross-border environmental cooperation under EU or Black Sea Basin frameworks.



Applications

- Microplastic cleanup in rivers, lakes, and ports
- Environmental monitoring and research
- Public awareness campaigns and education initiatives

Intellectual Property Status

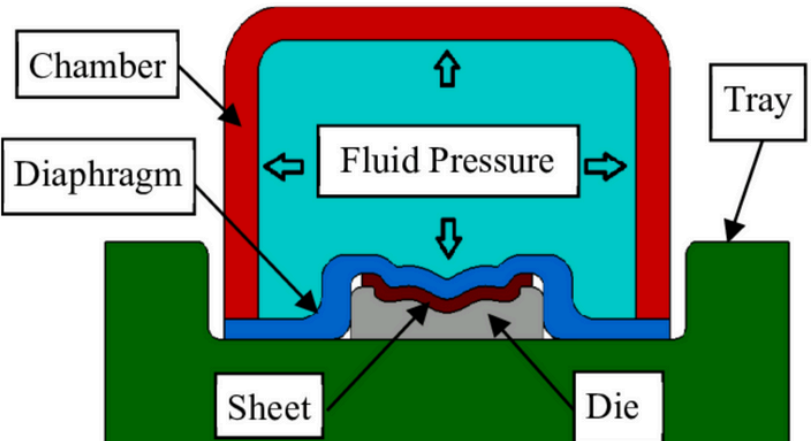
- The technology is currently protected by a national patent filed in Romania under registration process. It is available for licensing, further development, or joint ventures. IP protection ensures commercial exploitation under structured agreements.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Hydraulic Forming Die With Elastic Membrane



Thematic Area(s)

- Circular Economy
- Green Transport and Logistics
- Construction and Infrastructure

Relevance

This technology supports advanced manufacturing techniques aligned with circular economy goals. It enables sustainable production by minimizing material waste and reducing forming defects. It is particularly relevant for sectors requiring lightweight, high-performance parts, such as automotive and aerospace. Its compatibility with energy-efficient hydraulic systems supports lower resource use and EU climate priorities.

Short Description

This technology refers to a specialized elastic membrane die designed for forming sheet metal parts with complex geometries. The tool uses a flexible membrane to distribute pressure uniformly, reducing stress, thinning, and cracking. Unlike rigid tools, the elastic die adapts to surface contours, improving shape accuracy and enabling forming of hard-to-process materials. It is ideal for small series and prototyping in automotive, aerospace, and industrial sectors, enhancing tool life and reducing costs.

Stage of Development

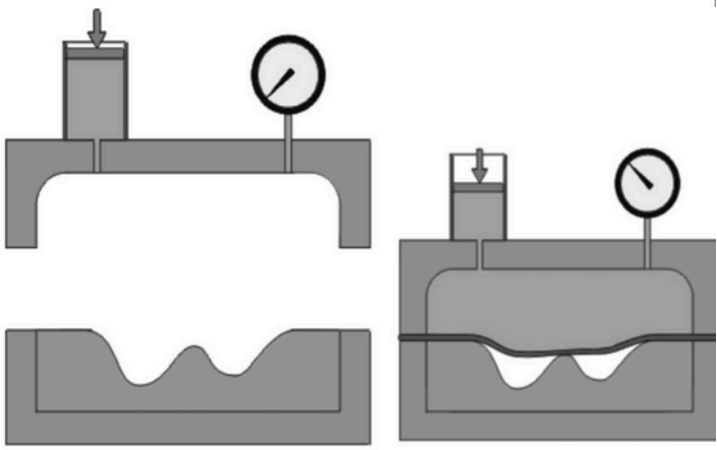
The Technology Readiness Level (TRL) is 4. The elastic membrane die has been validated in lab conditions, and a full-scale prototype was tested. Results showed improved stress distribution and material flow over traditional rigid dies. The prototype successfully formed complex parts while preserving structural integrity. Next steps include pilot testing in industrial settings and gathering feedback from industry users

Expected Outputs of the Technology

Expected outputs include improved dimensional accuracy of deep-drawn components, reduced defect rates, and compatibility with advanced materials. The system allows integration into existing hydraulic press lines, especially in tool-and-die production. A key benefit is reduced tooling wear and maintenance costs. Additional outputs include scientific publications, technical reports, and industry briefs. Adoption may boost SME competitiveness in precision engineering, enabling sustainable manufacturing and training opportunities in Central and Eastern Europe.

Scalability Potential

This forming die technology has moderate to high scalability potential across international markets, especially in regions with a mature metal forming and automotive components industry. It can be integrated into existing manufacturing lines without major infrastructure upgrades. Its modular design supports scaling from laboratory and pilot phases to full production environments. Certification requirements, staff training, and adaptation to local standards will support smoother adoption in multiple countries.



Applications

- Automotive components with high geometric precision and thin walls
- Aerospace and defense applications for lightweight structural parts
- Advanced manufacturing in precision engineering and tooling systems

Intellectual Property Status

- The technology is protected by a national patent registered in Romania under the number RO133326(B1), which covers the mechanical system and the process involving elastic membrane pressure application. There are no licensing agreements in place at the moment. The patent is available for collaborative development or commercialization with industrial partners.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Improved Hot Asphalt Mixture With Waste Grit From Ship Hull

Short Description

This innovation refers to a modified hot asphalt mixture that incorporates two industrial waste materials: abrasive grit from ship hull blasting and polypropylene microplastics. The solution improves the mechanical resistance, elasticity, and weathering durability of road surfaces. It addresses environmental concerns by recycling maritime and plastic waste into road infrastructure, aligning with circular economy goals. The technology enhances asphalt performance while reducing landfill impact and dependence on virgin raw materials.

Thematic Area(s)

- Advanced Manufacturing
- Environment and Sustainability

Relevance

The technology contributes to the circular economy and green infrastructure by integrating maritime and plastic waste into asphalt mixtures. It reduces raw material extraction, promotes waste valorization, and supports EU goals on sustainability, resource efficiency, and climate adaptation. By extending pavement life and lowering environmental footprint, the solution is relevant for green construction, resilience, and infrastructure modernization.

Stage of Development

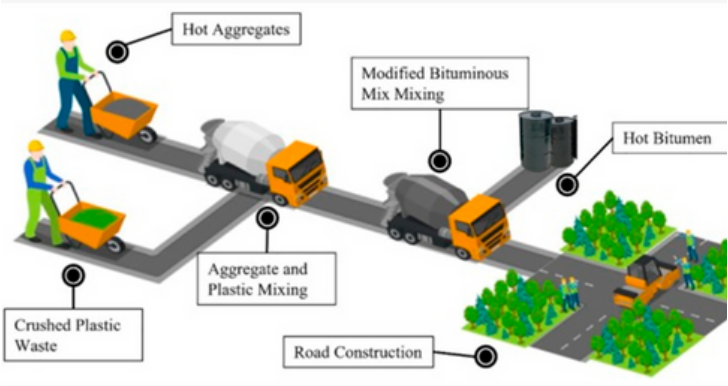
The technology is currently at TRL 4. A proof of concept has been achieved through lab validation. Preliminary tests confirm improved resistance to deformation and enhanced mechanical stability compared to traditional asphalt. The composition demonstrates compatibility with standard asphalt production. Next steps include pilot-scale road testing and certification in accordance with national and EU infrastructure standards.

Expected Outputs of the Technology

Expected outputs include increased road durability, lower deformation under heavy traffic, and extended pavement lifespan. The innovation supports the transition to eco-friendly road construction materials, minimizing waste sent to landfills. Outputs also include technical guidelines, scientific publications, and field validation reports. The use of waste grit and microplastics may reduce material procurement costs and maintenance frequency. The technology can position SMEs as leaders in sustainable civil engineering solutions.

Scalability Potential

The solution can be scaled to countries with strong maritime and recycling industries such as Turkey, South Korea, Italy, or the Netherlands. Adoption requires adaptation to local asphalt standards and pilot tests in various climate and traffic contexts. Collaboration with road authorities, port operators, and recycling firms is essential. EU funding, public procurement frameworks, and policy alignment on circular economy will facilitate international deployment and reduce scale-up risks



Applications

- Construction and Infrastructure
- Road Engineering / Civil Engineering
- Environment and Sustainability
- Waste Management
- Circular Economy and Green Procurement
- Maritime Industry Residue Valorization

Intellectual Property Status

- The technology is protected by national patent RO135159 (B1) in Romania. There are no current license agreements. Intellectual property rights are held by "Dunărea de Jos" University of Galați, with commercialization potential under evaluation.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Medical Gas Mixture

Short Description

This invention introduces a medical gas mixture designed for oxygen therapy. It includes at least 99.8% oxygen and 100–2000 ppm carbon dioxide (CO_2). The mixture corrects physiological imbalances caused by pure oxygen, like suppressed respiratory drive and low CO_2 levels. It improves tissue oxygenation, reduces hypocapnia-related vasoconstriction, and limits hyperoxia effects. It is clinically effective in acute myocardial infarction, ARDS, COPD, and neonatal care. No special equipment is needed.

Thematic Area(s)

- Healthcare and Biotechnology
- Environment and Sustainability

Relevance

The technology is relevant to Pharmaceuticals and Medical Devices and Healthcare and Biotechnology sectors. It provides an improved alternative to conventional oxygen therapy by minimizing complications linked to CO_2 deficiency. Through more efficient oxygen delivery and reduced side effects, it supports Circular Economy goals by minimizing waste in medical gas production and use.

Stage of Development

This medical gas mixture has reached TRL-9, being clinically tested and implemented with success in multiple hospitals. It has been validated through direct patient outcomes in emergency and intensive care. The product is considered market-ready, with its benefits supported by documented physiological improvements over traditional oxygen therapy systems currently in use.

Expected Outputs of the Technology

The technology is expected to enable more effective oxygen therapy in both acute and chronic respiratory care contexts. It may be incorporated into clinical protocols, national health guidelines, and hospital formularies. Broad implementation may lead to reduced complications in oxygen use, faster recovery rates, and cost-effective interventions. Upcoming efforts focus on scaling production, expanding clinical validation across diverse patient groups, and creating partnerships with global healthcare providers to ensure adoption.

Scalability Potential

Due to its simple and adaptable formulation, the gas mixture can be easily produced and distributed using existing medical gas infrastructure. Its clinical relevance in emergency and intensive care creates demand in global healthcare markets. Adoption in countries with stringent oxygen therapy protocols (e.g., Germany, USA, France) is feasible. Scalability will be supported by pilot implementations, licensing agreements, and regulatory approvals aligned with pharmacopeias. The innovation fits global health trends emphasizing safety, precision, and resource efficiency.

Applications

- Emergency Medicine and Intensive Care
- Anesthesiology and Critical Care
- Neonatal Resuscitation
- Pulmonology and Respiratory Therapy
- Pharmaceuticals and Medical Devices

Intellectual Property Status

- The technology is protected by international patent registration across over 40 countries, including EU member states and additional extension jurisdictions. There are currently no active license agreements. The protection status ensures legal security for commercialization and global rollout.
- Patent Application No: EP3666279A1

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Non-Circular Gear for Modifying the Kinematics of a Nail Manufacturing

Thematic Area(s)

Circular Economy

Relevance

This technology aligns with Circular Economy goals by enabling the retrofitting of existing nail manufacturing machines instead of replacing them. It introduces advanced mechanical functionality to legacy systems, increasing output quality and reducing environmental and economic waste. By improving durability and energy use efficiency, the gear supports sustainable industrial production and smart modernization of traditional equipment.

Short Description

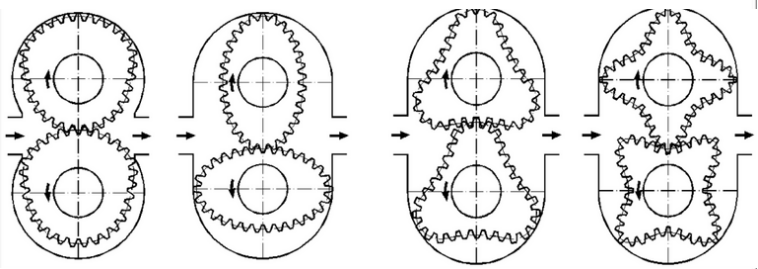
The invention refers to a non-circular gear with a variable transmission ratio, integrated into nail manufacturing machines. Placed between the flywheel and the crankshaft, it modifies the kinematics of the slide, slowing it down during the head-forming phase. This prolongs the application of the deformation force, stabilizes the plastic deformation process, reduces impact noise, and enables the production of nails with larger heads. It significantly improves machine efficiency and extends its functional capabilities without requiring full equipment replacement. The gear retrofits traditional machines, offering a cost-effective modernization solution.

Stage of Development

Currently at TRL-3, the gear has undergone conceptual development, CAD modeling, and laboratory simulations that confirm performance improvements. These include smoother mechanical motion, reduced vibration, and increased head-forming precision. Functional documentation is complete, and the gear's integration into real-world systems is planned through pilot testing, validating its effectiveness under operational conditions.

Expected Outputs of the Technology

The gear is expected to deliver higher product quality, reduced energy consumption, and less machine wear. Future outputs include validated prototypes, integration manuals, and field testing in operational environments. Its implementation aims to improve the production process by enhancing cycle time efficiency, mechanical reliability, and head-forming accuracy. The innovation supports upgrading traditional production lines and reducing operational costs. Outcomes include increased machine longevity and competitiveness. Broader adoption in cost-sensitive markets is also targeted through pilot projects.



Applications

- Mechanical Engineering
- Industrial Machinery Maintenance
- Construction Fasteners Production
- Traditional Manufacturing Automation

Scalability Potential

Designed for modular adaptation, the gear can be scaled to various traditional machines across global regions where outdated systems still dominate. It is particularly suited for Eastern Europe, South Asia, and Latin America. Its lightweight build allows for easy transport and on-site integration. No extensive infrastructure is needed, and the retrofitting process is compatible with local technical expertise. Adoption can be facilitated through partnerships with mechanical workshops, technical colleges, or regional industry clusters focused on sustainable reindustrialization initiatives.

Intellectual Property Status

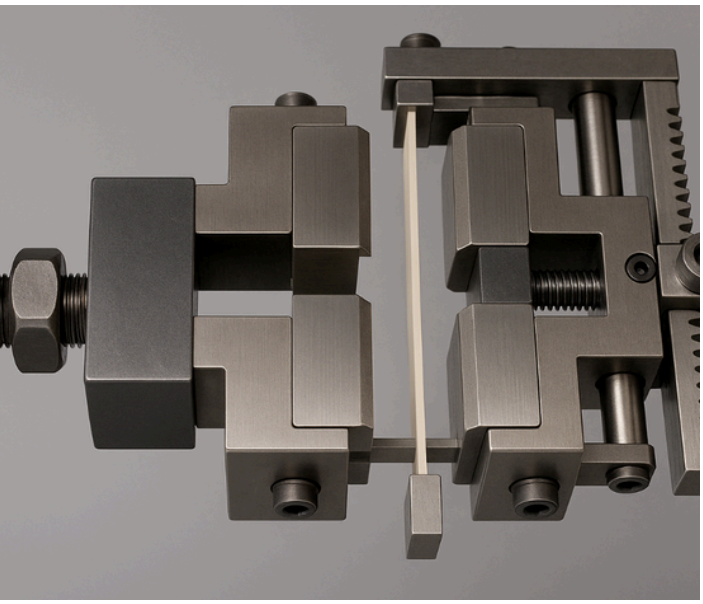
- The invention is protected by a national patent in Romania (RO133080B1). No current license agreements exist.
- The patent secures the novelty and application method, ensuring exclusive rights for exploitation and future commercialization.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Device for Fixing Biocomponent Polymer Specimens in Horizontal Position



Short Description

This device secures bicomponent polymer specimens in a perfectly horizontal position during delamination testing. It ensures accurate force application, enhances testing precision, and eliminates angular deviation, reducing reliance on complex visual tracking. The design includes a rack-and-pinion guiding system to balance displacement forces, even on single-jaw testing machines. The solution improves test repeatability, supports polymer R&D, and is compatible with current standards. It is especially useful for lightweight, multilayer, and recyclable polymer structures in academic and industrial settings.

Thematic Area(s)

Circular Economy

Relevance

Aligned with Circular Economy goals, this device enables repeatable, high-accuracy testing for delamination resistance in bicomponent polymers. It supports the material innovation ecosystem by offering testing reliability without additional complex infrastructure. The device reduces waste, extends the life of test equipment, and supports the validation of recyclable composites.

Stage of Development

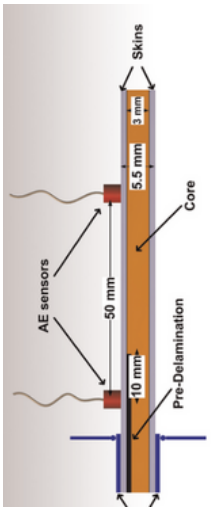
The device is at TRL-3. A working prototype has been modeled, and functional validation has been completed in lab settings. It improves test accuracy for Mode I delamination failure, using a mechanically guided system. The concept has been patented, and documentation supports pilot-scale implementation for research and material testing labs using universal testing machines.

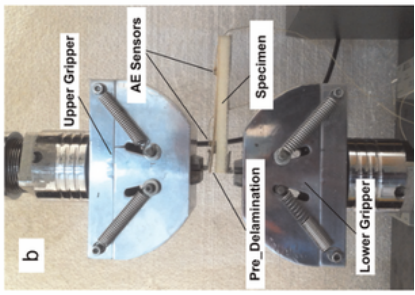
Expected Outputs of the Technology

The device is expected to enhance delamination testing accuracy in polymer labs and testing centers. Anticipated outcomes include prototype construction, pilot testing, and submission for standardization. It enables researchers to eliminate high-speed cameras or complex angular corrections during testing. The solution will improve reproducibility in composite testing workflows, reduce interpretation variability, and support new quality assurance protocols for layered polymer structures. Collaborations with academic and industrial labs are expected to generate real-world feedback and long-term uptake in engineering test benches.

Scalability Potential

The compact, low-cost design allows for rapid duplication across test laboratories worldwide. Key markets include Germany, South Korea, and the United States. The modular setup is compatible with existing mechanical test systems and requires minimal calibration. With minor adjustments, it meets various regulatory contexts. Its utility in quality control and R&D makes it suitable for research centers, universities, and testing labs focused on sustainable materials, particularly multilayered or adhesive-based polymers in automotive and packaging industries.





Applications

- Materials Testing and Research
- Polymer Composites R&D
- Automotive and Packaging Industries
- Laboratory Education and Training

Intellectual Property Status

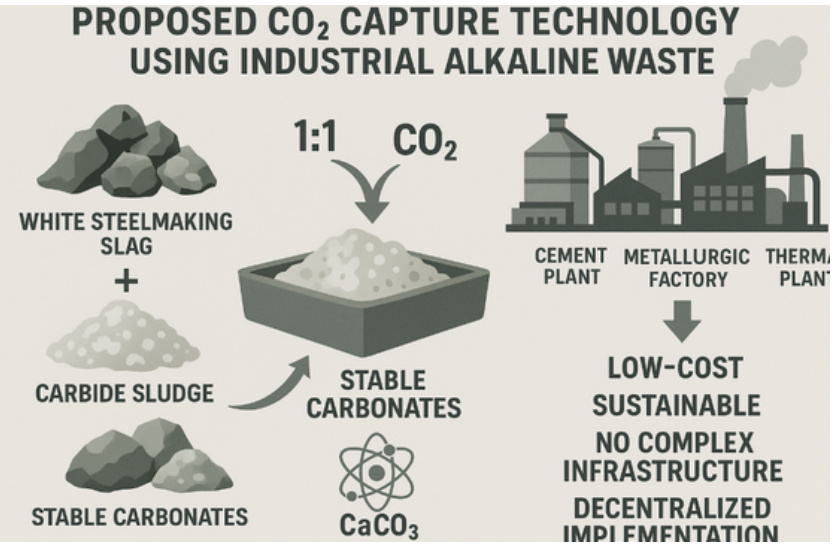
- The device is protected by a Romanian national patent (RO133005 B1). No licensing agreements exist at present. The patent ensures ownership and exclusivity in device deployment for delamination testing setups.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

CO_2 Capture Mixture Using Steelmaking Slag



Thematic Area(s)

- Low Carbon Economy
- Environment and Sustainability

Relevance

The innovation addresses Low Carbon Economy by transforming industrial waste into a reactive CO_2 capturing solution. It also supports climate change adaptation through emission mitigation directly at the source. By aligning with global Carbon Management and Storage goals, it enables localized, low-cost, and scalable carbon capture. Its easy deployment without major infrastructure makes it suitable for industrial use in Eastern Europe, India, Southeast Asia, and regions lacking access to advanced decarbonization systems.

Short Description

This invention proposes a CO_2 capture solution based on a reactive 1:1 mixture of white steelmaking slag and carbide sludge from acetylene production. This alkaline blend reacts with CO_2 in flue gases, forming stable carbonates. It is especially effective near major emitters like cement, metallurgical, or thermal plants. The solution aligns with EU carbon neutrality goals by using industrial waste to reduce emissions sustainably and at low cost. It requires no complex infrastructure and allows decentralized implementation in small or medium factories, facilitating transition toward green industry and environmental responsibility.

Stage of Development

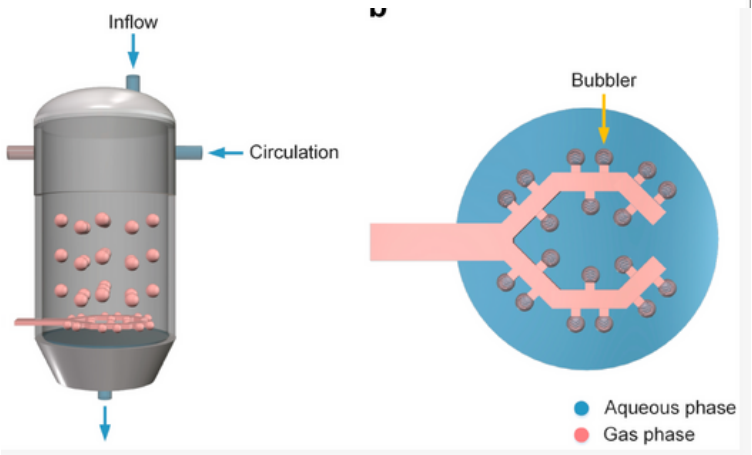
The technology is currently under experimental validation, with laboratory tests confirming promising CO_2 reactivity of the slag–sludge mixture. Initial feasibility studies indicate strong potential for small-scale industrial use. Although not yet adopted at national level, it has gained interest in academic and environmental circles. Local impact remains low, but positively perceived, contributing to job creation, education, awareness, and long-term carbon emission reduction.

Expected Outputs of the Technology

Expected outputs include pilot-scale trials in industrial environments and optimization of the mixture for reactivity and long-term stability. The solution integrates CO_2 capture into production lines using low-cost industrial waste. It targets a short-term return on investment (ROI) of 1–3 years and offers moderate scalability, adaptable to different waste compositions. With appropriate institutional and industrial support, the technology could enable sustainable emission control in metallurgy, cement, and energy sectors. Demonstration projects, validation activities, and communication campaigns will support adoption. Future applications may include integration in circular economy frameworks and environmental compliance systems.

Scalability Potential

The solution has strong international scalability due to its compatibility with global emission-intensive industries such as cement, metallurgy, and energy. Its reliance on widely available waste byproducts (steel slag, carbide sludge) ensures adaptability to different industrial contexts. The technology can be tailored to various regional waste compositions, making it suitable for replication in Eastern Europe, Southeast Asia, and India. Partnerships with environmental agencies and industry actors are being explored for pilot implementations. Future expansion plans include knowledge transfer, licensing, and integration into carbon management programs supported by green funding mechanisms and international climate adaptation initiatives.



Applications

- Applicable in cement and metallurgy plants, power generation units, and industrial zones with high CO_2 emissions. Useful in circular economy projects, carbon offset initiatives, and environmental pilot programs. Also suitable for emerging markets and EU green transition efforts.

Intellectual Property Status

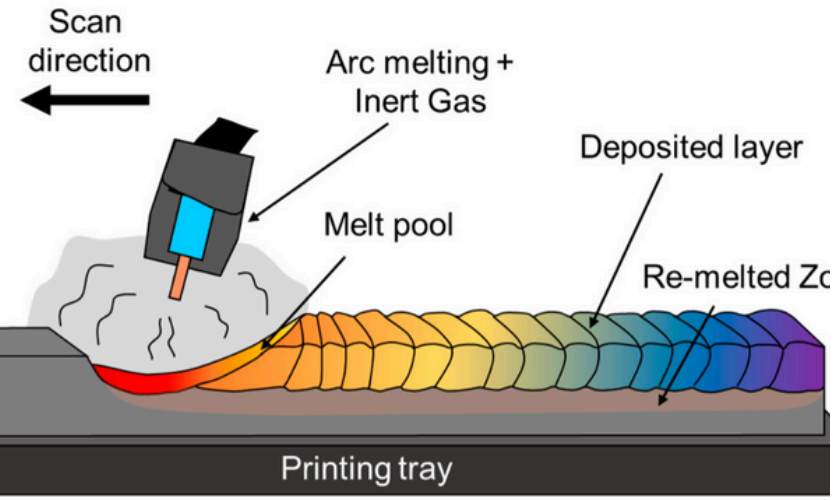
- The invention is protected under Romanian patent RO135812(B1), covering both the formulation and method for carbon capture using slag and sludge. No licensing or commercialization agreements have been signed yet. The intellectual property is held by the inventing academic institution.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Multi-Element Alloy Deposition Process AlCrFeNi via Electric Arc Melting in Inert Gas Environment



Thematic Area(s)

- Circular Economy
- Environment and Sustainability

Relevance

The proposed method aligns with circular economy goals by minimizing raw material waste and extending the service life of industrial parts. Its ability to improve the longevity and reliability of components under mechanical and chemical stress supports climate resilience and energy efficiency. The process fits within existing infrastructure and requires minimal investment in new equipment, making it accessible to a wide range of industries. Moreover, it encourages sustainable innovation in sectors where component degradation imposes high maintenance costs.

Short Description

This technology presents an innovative surface protection method using electric arc melting to apply AlCrFeNi multi-element alloy coatings in an inert gas environment. The process offers exceptional resistance to wear, oxidation, and corrosion, making it ideal for components used in harsh industrial settings. The technique extends part lifespan and reduces downtime by forming high-integrity protective layers without compromising mechanical properties. It is compatible with common arc welding systems and adaptable to different alloy compositions, ensuring scalability. The method supports sustainable engineering and offers an eco-efficient solution for critical infrastructure protection.

Stage of Development

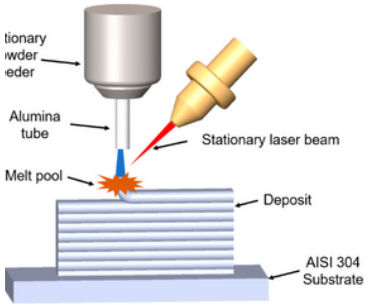
The technology has reached Technology Readiness Level 3 (TRL-3), with the concept validated in laboratory conditions. A patent (RO135988 B1) has been granted, and supporting documentation—including performance simulations and technical feasibility assessments—is available. While commercial deployment has yet to begin, preparations are underway for pilot-scale demonstrations in industrial environments. Potential partners are being identified to facilitate real-world validation and subsequent adoption in manufacturing sectors requiring durable coatings.

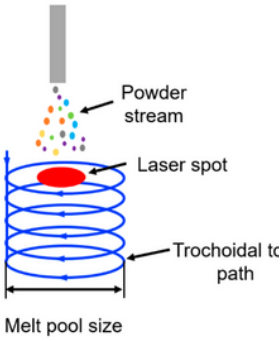
Expected Outputs of the Technology

The expected outputs include licensed application of the patented process, pilot-scale trials, and testing within industrial environments across aerospace, energy, and heavy manufacturing sectors. The coatings are anticipated to deliver improved corrosion resistance, wear protection, and increased operational uptime. Additional outcomes involve the publication of benchmark results, training of technical staff, and establishment of collaborative projects aimed at adapting the process to new alloy variants. Demonstrator kits and industrial manuals will be developed for broader dissemination.

Scalability Potential

This technology demonstrates high scalability due to its compatibility with existing arc welding and coating systems. With minor adjustments, it can be deployed in various settings including offshore, maritime, and high-temperature industrial sites. Its application potential spans markets in Asia, Europe, and North America. Rapid scalability is achievable through academic-industry partnerships, targeted training programs, and public funding initiatives. Modular deployment and digital monitoring tools can facilitate integration into smart manufacturing lines, increasing both process efficiency and material utilization across multiple domains of industrial production.





Applications

- Aerospace & Defense
- Energy & Petrochemical
- Heavy Machinery
- Surface Engineering
- Maritime & Automotive Coatings

Intellectual Property Status

- The technology is protected by Romanian national patent RO135988 B1. Currently, there are no licensing agreements. The process is in the pre-commercial stage, ready for pilot testing and tech transfer discussions.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Method for Obtaining a Functional Dairy Dessert Using Whey Protein

Thematic Area(s)

- Agro-Food Biotechnology
- Environment and Sustainability

Relevance

The technology addresses food waste by valorizing whey and contributes to climate action through resource efficiency. Aligned with the circular economy, it supports functional food development and offers a solution relevant to public health, nutrition, and sustainability. This innovation fits within thematic areas such as sustainable food systems, functional nutrition, and by-product revalorization in the agri-food industry.

Short Description

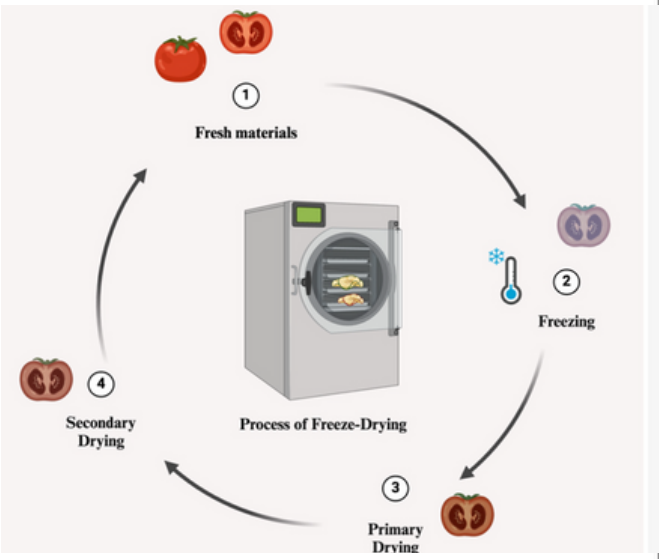
The invention refers to a functional dairy dessert obtained from whey protein concentrate and freeze-dried sea buckthorn. This product combines high nutritional value with a sustainable approach by reusing whey, a cheese-making by-product. The process integrates freeze-dried sea buckthorn, rich in antioxidants and vitamins, enhancing both functionality and organoleptic quality. Through homogenization, pasteurization, and refrigeration, a stable, nutritious dessert is obtained. It targets health-conscious consumers seeking natural and functional food alternatives.

Stage of Development

The process is at TRL 6, validated in a relevant laboratory environment. Experimental results confirm the feasibility and sensory acceptance of the product. A Romanian patent (RO135383B1) has been granted. Current outputs include nutritional profiling, antioxidant capacity analysis, and preliminary shelf-life testing. Further optimization for scaling is underway.

Expected Outputs of the Technology

Expected outputs include prototyping and market-ready formulation development, consumer acceptance testing, and packaging innovation to ensure freshness and shelf-life. Further studies may expand product lines with varying fruit-based ingredients. Partnerships with food manufacturers and nutrition clinics are envisioned. Outputs also include training modules for SME producers, technical documentation, and promotion through food innovation events and fairs. Pilot implementation is projected in dairy cooperatives.



Scalability Potential

Scalability is strong due to the global availability of whey and the growing interest in functional dairy products. The dessert can be adapted to regional markets by incorporating local fruit varieties. Internationalization strategies include engagement with dairy clusters in Eastern Europe, the Nordic countries, and East Asia. Scaling requires modest investment in processing equipment. Technology transfer is feasible through licensing or public-private partnerships. Market interest is supported by consumer trends and health programs.

Applications

- Food Industry: Functional dairy and natural desserts
- Circular Economy: Revalorization of whey by-product
- Public Health & Nutrition: Antioxidant-rich diets
- Education: Teaching sustainable food innovation

Intellectual Property Status

- A national patent (RO135383B1) has been granted for this process. There are currently no license agreements, and the technology is available for commercial exploitation.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

System and Method for Decontamination of Granular Food Products Using UV Radiation

Thematic Area(s)

- Circular Economy
- Agro-Food Biotechnology
- Environment and Sustainability

Relevance

Aligned with the themes of circular economy and environmental sustainability, this UV decontamination technology minimizes the need for chemical agents and high-energy thermal processes. It reduces waste and carbon emissions associated with conventional decontamination methods. The innovation also supports resilient food systems by providing a safe, scalable, and eco-efficient alternative that can improve processing hygiene while reducing resource use in the food sector.

Short Description

This technology introduces a novel method and specialized equipment for the decontamination of granular food products using ultraviolet (UV) light. It is designed to ensure efficient microbial inactivation while maintaining product quality. The UV-based system eliminates the need for chemical or thermal treatments, preserving organoleptic and nutritional properties. Compact and energy-efficient, the system can be easily integrated into existing food processing lines. The invention addresses the growing demand for sustainable, chemical-free methods of food safety assurance and contributes to circular economy goals. It targets the food industry, particularly grain, spice, and cereal processing plants, enhancing both safety and shelf life.

Stage of Development

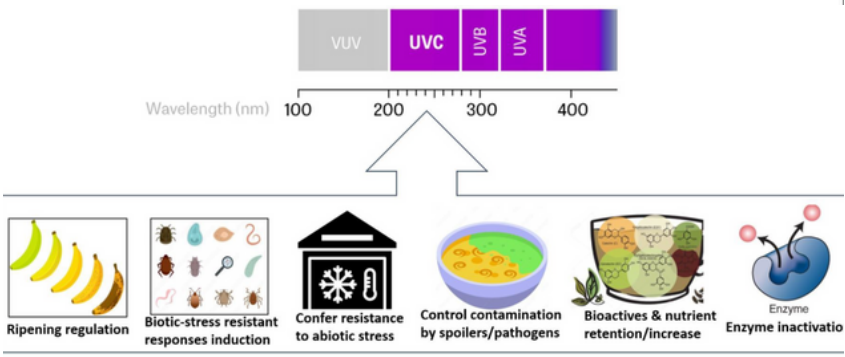
The technology is currently at TRL-5, having been validated in relevant environments through lab-scale demonstrations. It has shown significant microbial load reduction and effective preservation of food quality. Outputs include a granted patent (RO133743B1) and functional prototypes tested on cereal and spice products. Further development is required for full-scale industrial trials, but its integration potential into production chains is promising.

Expected Outputs of the Technology

The main expected output is the adoption of the UV decontamination system in industrial processing plants handling granular food products such as cereals, legumes, and spices. This will allow producers to eliminate microbial risks without compromising quality through chemical or heat-based methods. The system could extend product shelf life, reduce energy and operational costs, and enable more sustainable processing. Additionally, it may open up new export opportunities by aligning with international food safety regulations. With appropriate pilot projects and validation, the technology could be licensed to equipment manufacturers or food processors. A training package may also be developed.

Scalability Potential

The technology is highly scalable across food production sectors that rely on bulk handling of granular ingredients. Its design allows for modular adaptation, facilitating use in small, medium, or large-scale plants worldwide. Countries with stringent food safety standards and high export demands, such as Germany, France, India, and Turkey, represent ideal markets. Scalability requires minimal infrastructure modifications. Support is needed for international regulatory alignment and demonstration trials. Partnerships with food processing companies and support from innovation funding programs would accelerate international deployment and improve visibility for broader market integration.



Applications

- Food and Beverage Processing
- Agriculture
- Healthcare and Biotechnology (for herbal extracts, supplements)
- Environment and Sustainability
- Circular Economy Technologies
- Export-Grade Product Manufacturing

Intellectual Property Status

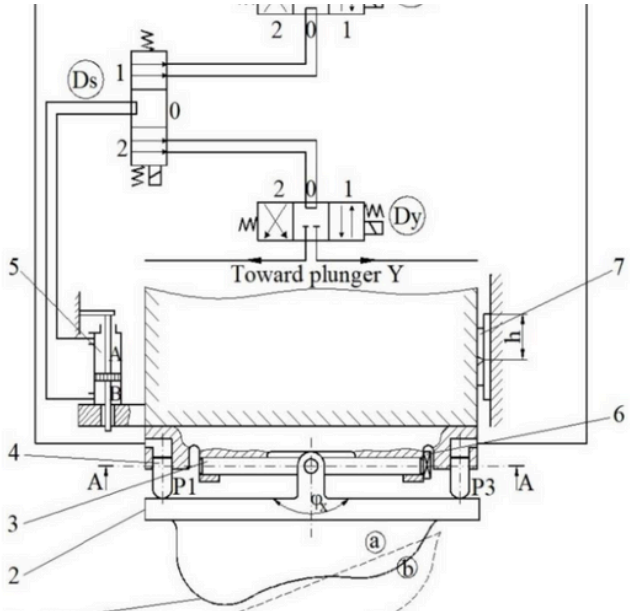
- The technology is patented under number RO133743B1. There are currently no license agreements. The university retains full rights and is open to licensing discussions with industrial partners.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Deep Drawing Die with Kinetostatic Deformation Control



Thematic Area(s)

Circular Economy

Environment and Sustainability

Relevance

This invention refers to a deep drawing die engineered to enhance the manufacturing of thin sheet metal components. It integrates a kinetostatic deformation control mechanism using hydraulic actuators, sensors, and CNC systems to ensure uniform material deformation. The system reduces waste, increases precision, and improves the structural integrity of drawn parts. By offering real-time control and adaptability, the technology is valuable in high-precision sectors such as automotive and aerospace, where consistent quality is essential for safety and performance.

Short Description

This invention refers to a deep drawing die engineered to enhance the manufacturing of thin sheet metal components. It integrates a kinetostatic deformation control mechanism using hydraulic actuators, sensors, and CNC systems to ensure uniform material deformation. The system reduces waste, increases precision, and improves the structural integrity of drawn parts. By offering real-time control and adaptability, the technology is valuable in high-precision sectors such as automotive and aerospace, where consistent quality is essential for safety and performance.

Stage of Development

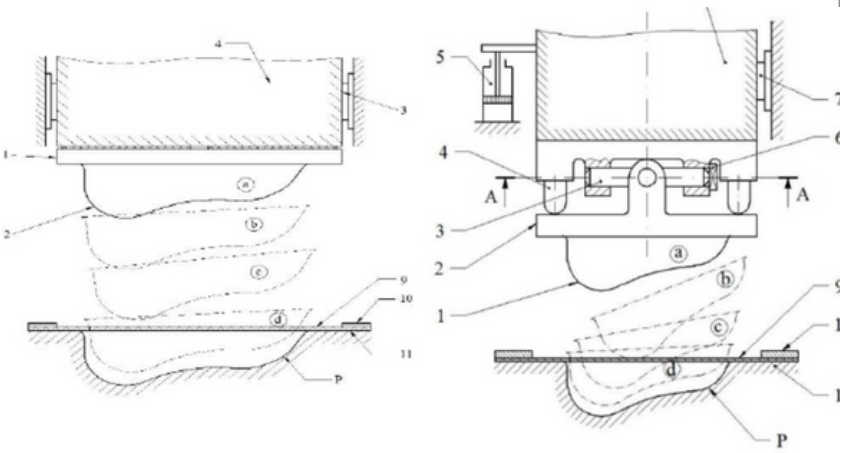
The technology is at TRL-4, validated in laboratory conditions. A prototype of the deep drawing matrix with kinetostatic control has been created and tested, showing reduced deformation variability and improved part quality. Outputs include a national patent, internal RDI reports, and technical documentation. While not yet implemented in industry, the proof of concept demonstrates feasibility and potential for future scaling and commercialization.

Expected Outputs of the Technology

Expected outputs include higher-quality stamped metal components, reduced waste and defect rates, and improved process control in serial manufacturing. It is anticipated that the technology will be adapted to diverse industrial needs, particularly in automotive and appliance sectors. With further development, it could support automated press systems for efficient and sustainable production. Pilot validation, industrial adaptation, and collaborative R&D will facilitate the transition to market-ready solutions, with broader uptake depending on training, funding, and process integration.

Scalability Potential

This technology shows strong scalability potential in industries requiring high-precision sheet forming, especially automotive, aerospace, and home appliance sectors. Its modular design enables integration into existing hydraulic presses with minimal adjustments. Emerging economies like Turkey, Poland, and Romania could localize production for increased competitiveness. Developed markets such as Germany or Italy may adopt the system to reduce waste and improve part consistency. Scalability will benefit from licensing, joint ventures, and regional partnerships in manufacturing innovation ecosystems.



Applications

- Automotive and Aerospace Industry
- Advanced Manufacturing and Engineering
- Machinery and Tooling Equipment Design
- Sustainable Production Processes
- Industrial R&D and Innovation Clusters
- Precision Sheet Metal Component Suppliers

Intellectual Property Status

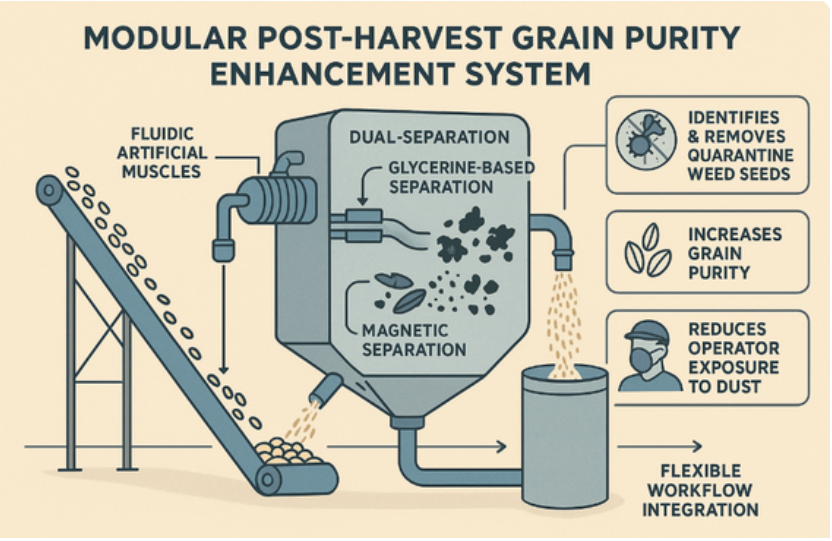
- A national patent for the technology is already registered in Romania.
- There are no existing license agreements.
- Further IP support will be essential for international expansion and protection in other jurisdictions.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Mixed System and Method for Separation of Quarantine Weeds Seeds from Grains



Short Description

This technology is a modular separation system developed for post-harvest grain processing. It utilizes fluidic artificial muscles combined with a dual-separation approach—glycerine-based and magnetic separation—to identify and remove quarantine weed seeds, including those that are damaged or camouflaged. The system increases grain purity and improves food safety while minimizing the operator's exposure to dust and contaminants. Designed for flexible integration into existing warehouse workflows, the technology provides an environmentally friendly solution to an urgent regulatory and trade challenge.

Thematic Area(s)

Circular Economy

Environment and Sustainability

Relevance

The innovation aligns with the EU Green Deal, circular economy, and environmental sustainability by recovering valuable by-products (weed seeds) and reducing pollution and human exposure to grain dust. It improves food quality and safety, particularly in cereal export chains where quarantine weeds are a trade barrier. Compliance with phytosanitary norms fosters resilience in agricultural systems and enables better participation in international markets, particularly for countries with significant grain production.

Stage of Development

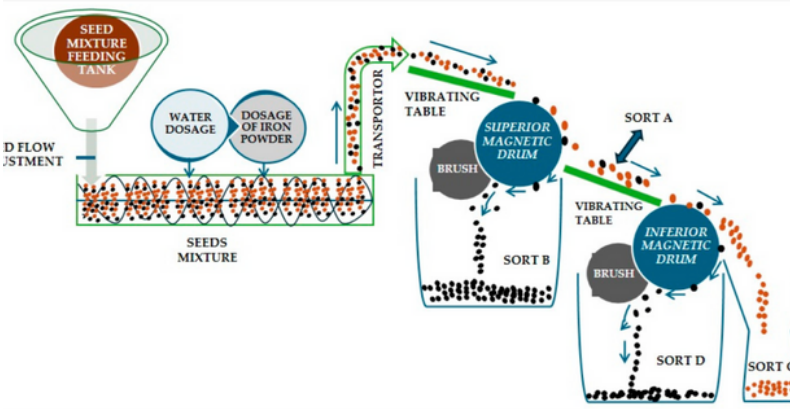
The technology is at TRL 3, validated in laboratory conditions with experimental models. It has received national funding for R&D. The current setup includes vibration and air-flow mechanisms that demonstrate promising efficiency in separating targeted weed seeds. In the next 1–2 years, development will target a physical prototype suitable for pilot testing in agricultural warehouses. Full commercialization is foreseen once adaptability across different grain types is validated.

Expected Outputs of the Technology

Expected outputs include a modular, field-ready prototype compatible with standard grain processing infrastructure. Short-term outcomes focus on pilot integration in post-harvest grain centers and data collection on efficiency across multiple seed and weed types. Long-term results aim at regional and international dissemination through licensing and co-development with industry partners. The system is projected to enhance phytosanitary compliance, support local grain cooperatives, and enable new value chains from weed seeds for bio-based applications.

Scalability Potential

The system targets agricultural warehouses, seed sorting units, and export grain terminals in regions facing contamination with regulated weed seeds. It enhances quality control protocols and reduces trade rejections by improving purity. Besides agricultural relevance, the solution has potential in bioeconomy applications—e.g., weed seeds repurposed as raw materials in immunostimulant production. It supports regulatory compliance and sustainability across diverse agro-ecological regions. Customizations could allow integration into logistics chains, research facilities, and mobile decontamination units.



Applications

- The technology is protected through international patent EP3520910A1, registered in multiple contracting states. There are no existing licensing agreements. Future dissemination will be considered through licensing or public-private partnerships to maximize accessibility and regional adoption.

Intellectual Property Status

- The technology has moderate to high scalability potential due to its modular nature and adaptability to various grain types. With targeted investment and pilot testing, it can be integrated into regional and global markets. Licensing and certification alignment will support adoption.

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

Device for the Automatic Production of Knot Plugs

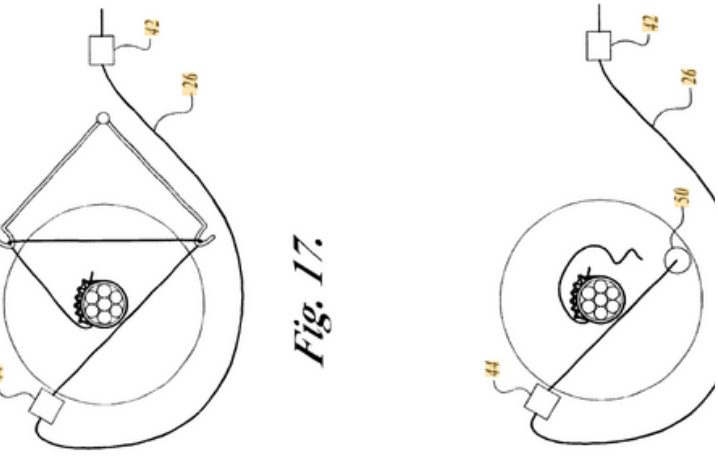


Fig. 17.

Thematic Area(s)

Circular Economy

Environment and Sustainability

Relevance

Aligned with the principles of circular economy and environmental sustainability, this technology valorizes residual wood waste into valuable furniture components. It promotes efficient resource use and helps reduce deforestation by reusing non-structural wood. Through automation, it enhances the quality, consistency, and productivity of wooden plug manufacturing. It supports climate adaptation strategies and resilient supply chains by offering a low-cost, replicable, and scalable solution compatible with widely used metal lathe systems in woodworking industries.

Short Description

This modular invention is designed for installation on a universal metal lathe to fully automate the production of wooden knot plugs, commonly used in the furniture and decorative wood industries. The device transforms raw wooden branches into cylindrical dowels using a pneumatic-electronic feed, press, and turning system. With a processing speed of up to 1,000 pieces/hour, it ensures high precision, product standardization, and operational efficiency. The modular architecture enables flexible reconfiguration, reduces human labor, and improves workplace ergonomics while contributing to sustainable resource utilization and waste reduction in wood processing industries.

Stage of Development

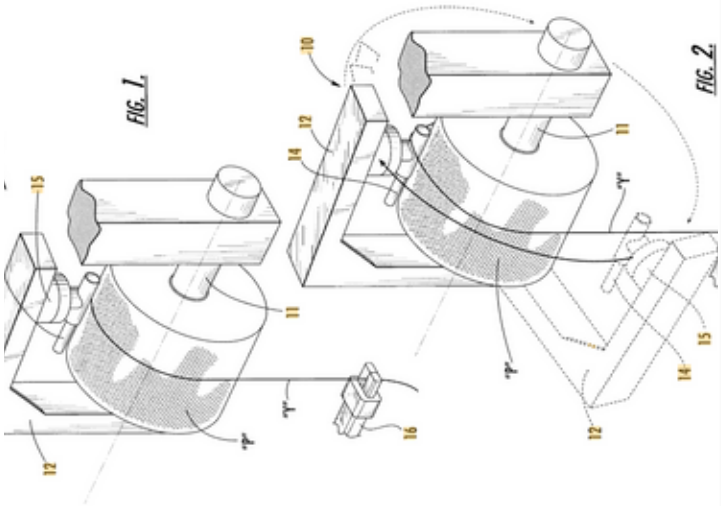
The technology is currently at TRL 7 and has been successfully tested in a laboratory environment, demonstrating full operational capability with a processing speed of approx. 3.5 seconds per dowel. All components function cohesively, confirming high manufacturing precision, reduced labor needs, and compatibility with universal metal lathes. Further minor development and marketing steps are required for full commercial deployment, but the core functions are ready for pilot production and technology transfer at both local and international levels.

Expected Outputs of the Technology

In the short term, the modular knot plug device is expected to support SMEs in reducing manual labor and improving productivity by over 30%. In the medium term, the adoption of this technology will modernize traditional woodworking processes, support export expansion, and contribute to the standardization of wooden dowels. Integration into existing production systems can be done with minimal investment. The estimated return on investment is 1–3 years. Long-term outputs include scalable production, promotion of sustainable forest product chains, and a significant reduction of waste in the industry.

Scalability Potential

The device can be applied in furniture manufacturing, decorative wood processing, and educational institutions focused on automation. It is highly suited for SMEs seeking process automation with low initial costs and existing lathe systems. Internationally, it can be adopted in Central and Eastern Europe, Asia, and Latin America, where cost-effective woodworking solutions are in demand. It supports the reuse of biomass, contributing to carbon emissions reduction. With appropriate marketing, it can become a niche export product for sustainable industrial automation within the woodworking sector.



Applications

- An international patent has been filed, and the invention is protected in designated validation and extension states including RO, DE, FR, IT, ES, and others. The patent ensures exclusive production and commercialization rights, enhancing its value and scalability. No licensing agreements currently exist.

Intellectual Property Status

- The device demonstrates a high potential for scalability due to its modularity, compatibility with existing lathe systems, and minimal infrastructure needs. It can be deployed across various countries and industries. Internationalization may require additional funding and targeted marketing efforts but is feasible with proper partnerships.
- Patent No: EP3967467A1

Contact Person: Assoc. Prof. Dr. Eng. Ciprian Vlad

Role: Institutional Coordinator, "Dunărea de Jos" University of Galați

e-mail: sstanciu@ugal.ro

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Transnational Technology Transfer Network for Black Sea Basin

Karadeniz Technical University
(KTU)

Web: www.t3nbsb.net
E-mail: info@t3nbsb.net
Tel: +90 (462) 377 16 90

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