# EARTO INNOVATION AWARDS 2022

**Technology for a better world**

EARTO
IMPACT DELIVERED

www.earto.eu

**EARTO - European Association of Research and Technology Organisations**

Founded in 1999, EARTO promotes Research and Technology Organisations and represents their interest in Europe. The EARTO network counts over 350 RTOs in more than 32 countries. EARTO members represent 150.000 highly-skilled researchers and engineers managing a wide range of technology infrastructures.

CONTRIBUTE
EU RD&I PROGRAMMES
GLOBAL CHALLENGES
EUROPE'S
INDUSTRIAL COMPETITIVENESS
EUROPEAN RESEARCH AREA

**www.earto.eu**



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# EARTO INNOVATION AWARDS 2022

From the lab to your everyday life. RTOs innovate to improve your health and well-being, your safety and security, your mobility and connectivity. RTOs' technologies cover all scientific fields. Their work ranges from basic research to new products and services' development. RTOs are non-profit organisations whose core mission is to produce, combine and bridge various types of knowledge, skills and infrastructures to deliver a range of research and development activities in collaboration with public and industrial partners of all sizes. These activities aim to result in technological and social innovations and system solutions that contribute to and mutually reinforce their economic, societal and policy impacts.

**The EARTO Innovation Awards celebrates this year its fourteenth edition.**

**14 EARTO INNOVATION AWARDS YEARS**

## IMPACT DELIVERED

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are today on the market and have proven their impact.

## IMPACT EXPECTED

For this category, the rewarded innovations (product or services) have social and/or economic relevance, innovative originality, are not yet on the market as a final product/service but promise to have a great impact.

## THE AWARD COMPETITION IS ADJUDICATED BY AN INDEPENDENT JURY

**Anna Panagopoulou**
Director,
DG Research & Innovation,
European Commission

**Simon Edmonds**
Chief Business Officer,
Innovate UK

**Christian Ehler**
Member of the
European Parliament

**Jana Kolar**
Executive Director,
CERIC-ERIC & Chair,
ESFRI

**Juan Antonio Tébar**
Director, CDTI

**335** APPLICATIONS **54** RTOs **23** COUNTRIES

**NUMBER OF APPLICATIONS SO FAR**

**63** WINNERS **17** RTOs **14** COUNTRIES

**NUMBER OF WINNERS SO FAR**

# IMPACT
# DELIVERED

Discover
more innovations
from RTOs

IMPACT
**DELIVERED**

# HELMHOLTZ

**Helmholtz is Germany's largest scientific organisation.**

**With more than 43.000 employees at 18 research centres, it contributes to solving major societal challenges.**

HELMHOLTZ
www.helmholtz.de

INERATEC
www.ineratec.de

PRIZE 1ST

# A sustainable substitute for fossil crude oil: e-Fuels made by INERATEC

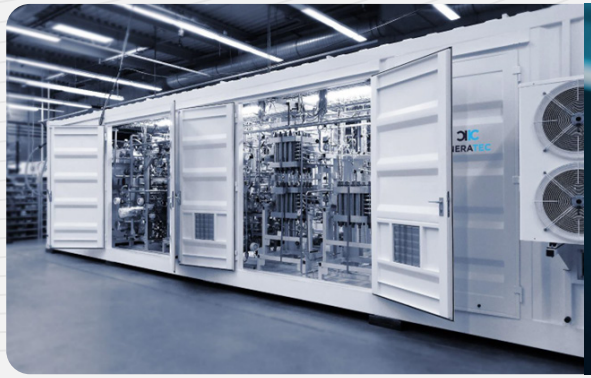
**Every day, we use products that are based on fossil raw materials. We are heavily dependent on fossil oil, causing massive $CO_2$ emissions each day. As a society, we have decided to move towards a $CO_2$-neutral world with fewer emissions and have recorded these decisions in the Paris Climate Agreement.**

## INNOVATION

INERATEC provides modular chemical plants for Power-to-X and Gasto-Liquid applications and supplies sustainable e-Fuels and chemicals: hydrogen from renewable electricity and greenhouse gases like $CO_2$ are converted into ekerosene, $CO_2$-neutral gasoline, clean Diesel or synthetic waxes, methanol or SNG. They are fully compatible with global infrastructure and vehicle fleet due to their drop-in compatibility. The innovative reactors provide a high load flexibility as well as quick start-up and shut-down times. Therefore, the plants are perfectly suitable for fluctuating renewable energy applications, e.g. wind or solar. Additionally, with this reactor concept a cost-efficient, modular numbering-up and technology scale-up becomes possible, meaning that standardised modules are multiplied to reach higher capacities.

## IMPACT DELIVERED

INERATEC actively contributes to a more sustainable future with lower emissions by providing a sustainable solution for hard to defossilise sectors.



IMPACT
**DELIVERED**

# FRAUNHOFER

**The Fraunhofer-Gesellschaft is a German RTO, which has a clearly defined mission of application-oriented research, with a focus on key technologies of relevance to the future.**

Fraunhofer
www.fraunhofer.de

Fraunhofer IWU
www.iwu.fraunhofer.de

PRIZE 2ND

# SEAM - Screw Extrusion Additive Manufacturing

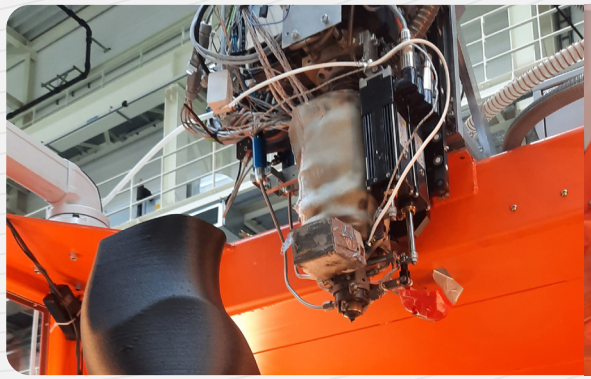
**In recent years 3D Printing has developed rapidly and opens up entirely new product and manufacturing approaches. However, many 3D printing processes are too expensive and too slow for industry. Therefore R&D activities focus on producing large quantities in a short time at competitive costs.**

## INNOVATION

EARTO member Fraunhofer-Gesellschaft – Institute for Machine Tools and Forming Technology (IWU) has developed the Screw Extrusion Additive Manufacturing 3D process (SEAM). For this purpose, an innovative machine tool (hexapod) and a patented plasticizing unit were combined. By using the SEAM process the cost-effectively and resource-efficiently production of large-size, load-bearing plastic components is possible. Elastomers and ceramic feedstock systems can be processed into complex structures as well.

## IMPACT DELIVERED

The process speed of the SEAM 3D printing process is 8 times faster and 200 times lower in cost than conventional manufacturing processes.
SEAM opens up completely new fields of application for 3D printing, e.g. in aircraft or railway industries. With the spin-off of the company 1A Technologies and the close cooperation with Metrom, a flagship for the Saxony region was created, which generates jobs through growing sales opportunities on national and international markets.



IMPACT
**DELIVERED**

# RISE

**RISE is Sweden's research institute and innovation partner.**

**Through international collaboration RISE ensures business competitiveness and contributes to a sustainable society.**

RI.SE
www.ri.se

PRIZE 3RD

# Holistic Cooling of Data Centres

**When the use of digital services grows, the needs for data centres hosting the server running digital services increase. The operations of data centres use energy for running the servers and the energy system equipment such as coolers, i.e. the overhead. The target of this innovation is to reduce the use of energy in data centres and achieve the same amount of digital services with less energy. The challenge for energy efficiency in data centres is to overcome the operation silos.**

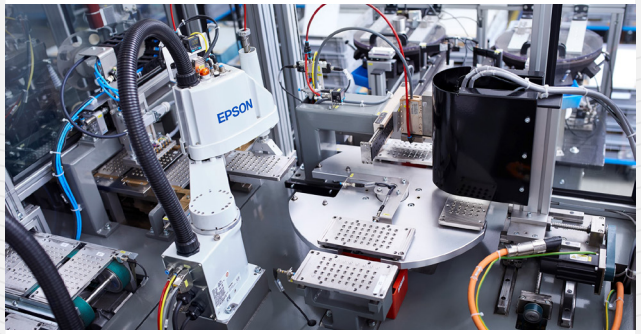
## INNOVATION

EARTO member RISE developed this innovation to enable holistic control of the cooling. The term holistic is used since the fans, cooling unit and servers in the whole data centre, are controlled as one system and not separately as in state-of the-art data centres. A central cooling control works on shared data from the cooling system, servers and environmental sensors to optimise fan speeds for record low energy use.

## IMPACT DELIVERED

The pilot implementation project of the solution in a data centre achieved a record low Power Usage Effectiveness (PUE). The result from this project and supporting solution is a record low ISO PUE of 1,015. That translates into large savings 10-50 times in energy use compared with state-of-the-art, implying also large economical savings.

## High-speed 3D in-line inspection




Microtechnical components require high precision quality control. The 3D-measurement of such parts is demanding. Manual quality control in production lines has become unviable in a highly competitive global market. The requirements for automated inline inspection are high: zero defects and a shorter process cycle time. CSEM applied its vision and AI know-how to unlock the potential of a century-old 3D imaging concept in a high-speed industrial application for the first time.

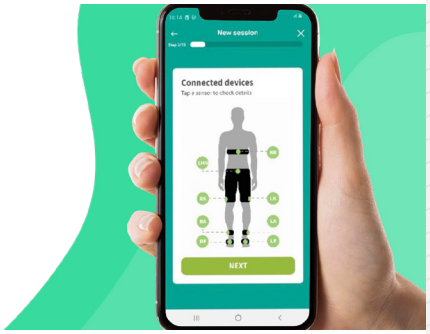
**Innovation:** The world's first industrial implementation of 3D lightfield cameras (Raytrix) in a high-speed production process. CSEM's software performs multiple tasks in parallel: 3D images acquisition, reconstruction, processing with speeds up to 50parts/s, µm-range measurements, robust anomaly detection based on neural networks, multi-GPU and OPC-UA communication. The system is designed for 24/7 operation.

**Impact Delivered:** Renata AG (battery manufacturing) has installed the new 3D image sensor system on its first high-volume production line. With no need for human intervention, the system achieves an unprecedented 90 percent reduction in throughput time. The single shot technology allows for on-the-fly 3D-aquisiton and with precisions better than 10µm, no defect is missed. The combination of light field technology with intelligent data analysis pioneered in this collaboration is also a powerful toolbox for greater production efficiency in many industries.

CSEM is a Swiss private, non-profit research and technology organisation (RTO) with 35 years of Deep Tech development and transfer to industry.

www.csem.ch

## AI-based platform to develop and deploy digital clinical measures of patient functional capacity




Duchenne, Becker and Myotonic are three of the main Muscular Dystrophies that severely affect mobility of children and adults. No cure exists, but treatments can delay the effects of the disease. The pharmaceutical industry has recently developed several potential drugs that are currently under evaluation in clinical trials. With ongoing clinical trials and several new treatments on the horizon, clinical physicians have a strong need to accurately measure the evolution of a patient's mobility to ascertain the efficacy of new treatments. The current functional tests are insufficiently accurate to satisfy this need.

**Innovation:** Ephion Health has developed a digital platform to integrate health data from multiple wearables, analyse the raw data with artificial intelligence, and give the health professional a single readout that is easily understandable as a measure of patient health status. The platform offers a one-stop shop solution for the adoption of wearables in healthcare that integrates the currently fragmented and disharmonious market.

**Impact Delivered:** Ephion's objective is to expand the number of diseases that the platform can monitor and offer this new valuable tool to Hospitals and Rehabilitation Centres, Pharmaceutical companies and Health Insurance companies.

Eurecat is the largest cross-sectoral and trans-national RTO in Catalonia, Spain, with 700 professionals covering all technological specialities to deliver added value to our society.

www.eurecat.org

## Obtaining fabrics applicable to footwear from mushrooms

This RD&I project arises from the increasing environmental awareness on the part of customers. In this case, the innovative proposal focuses on the use of waste and its conversion into high-value resources, in order to extend the life cycle of the product. La Rioja is the leading mushroom-producing region, with 40.000 t/year, generating a cost of €200.000 in terms of its management.

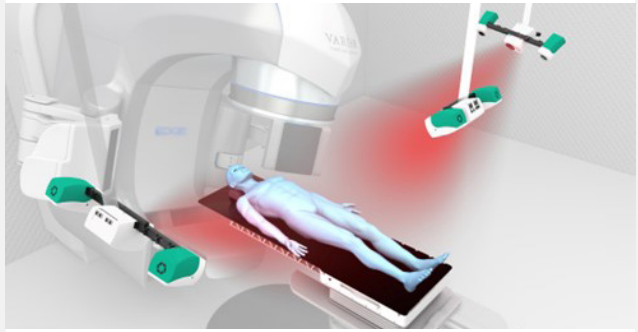
**Innovation:** The progress achieved has allowed us to obtain an innovative biomaterial, developed from a 40% post-culture substrate from mushrooms, SPCH, allowing us to practically halve the consumption of virgin textile fiber. For this purpose, waste from the Pleurotus mushroom substrate was selected and adapted, since its bioactive compounds have a marked antimicrobial activity. These wastes were mixed with hemp and PET fibers to produce a textile biomaterial.

**Impact Delivered:** Its antifungal and antibacterial particularity was the fundamental value that the entrepreneur demanded to satisfy the demand of footwear users; the end customer would thus see the need to control, prevent and/or mitigate the growth of bacteria in the foot satisfied. In addition, it has an economic effect on mushroom growers who previously had to assume a cost for the management of SPCH, since the production itself has a large amount of this waste associated with it.

Fedit is a Spanish association of research and technology organisations whose main mission is to boost and encourage innovation, technological development and private research.

www.fedit.com - www.aitiip.com

## Continuous Multi-sensor near-infrared 3D scanning system for patient monitoring in radiation treatment



The growing life expectancy also leads to increasing numbers of cancer patients. The health care system therefor needs innovative solutions to handle the rising number of patients more efficient and effective.

**Innovation:** EARTO member Fraunhofer-Gesellschaft – Institute for Applied Optics and Precision Engineering (IOF), together with Varian Medical Systems developed an innovative 3D-based system for patient monitoring in radiation treatment. This optical measurement system tracks the patient's body position accurately with submillimetre precision. The 3D data rate is 20 frames per second. Three individual sensors continuously contribute to an adequate view of the patient even in the presence of occlusions. Easy system calibration and irritation-free and eye-safe operation make the system comfortable both to the clinic staff as well as for the patient.

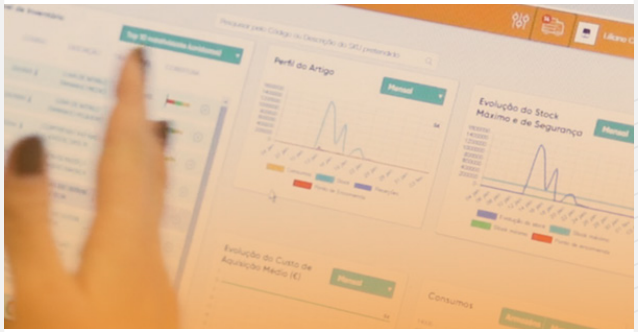
**Impact Delivered:** The innovation leads to improved patient setup accuracy, enabling higher radiation doses and fewer treatments. Furthermore, radiation exposure to healthy surrounding tissue, and radiation-based imaging can be reduced and replaced with harmless and irritation-free optical imaging. This innovation is currently in clinical evaluation and is expected to reach the market within the next year. It has a worldwide target market.

Fraunhofer Fraunhofer IOF

The Fraunhofer-Gesellschaft is a German RTO, which has a clearly defined mission of application-oriented research, with a focus on key technologies of relevance to the future.

www.fraunhofer.de - www.iof.fraunhofer.de

## INESC TEC - KnowLogis Efficient Healthcare Logistics



Currently, a medium/large hospital manages more than 20.000 reference items, including medicines and clinical material. This large number, in addition to making the logistics circuit very complex, accounts for around 80% of the costs with materials in a hospital unit.

**Innovation:** EARTO member INESC TEC developed KnowLogis, an intelligent reporting system comprising an advanced AI software and a user-friendly and handheld dashboard that, in integration with the databases of the current systems, actively and dynamically monitors and tracks the costs of hospital logistics products, automatically analyses the evolution of its stocks, incorporates historical data and suggests corrective and improvement measures to warehouse management.

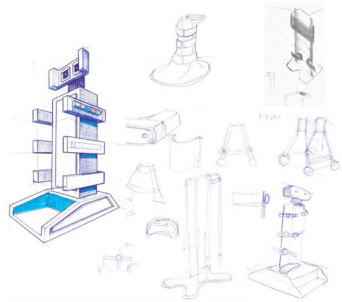
**Impact Delivered:** Cost savings up to 10% while ensuring high quality healthcare service to patients by avoiding the stock out of critical drugs, medical devices and consumables. KnowLogis mitigates treatment cancellations while directing critical assets to priority tasks, helping hospitals, payers and suppliers at saving costs by reducing the stock on hand up to 10% (€700K for a medium-size hospital). Since it's smart, KnowLogis saves up to 20% the time required for managers to detect, predict and solve logistic problems to other high value tasks.

INESCTEC

INESC TEC - Institute for Systems and Computer Engineering, Technology and Science is a major Portuguese RTO dedicated to R&D and tech transfer of digital innovations.

www.inesctec.pt

## MTC supports Start-Ups and SMEs to bring innovative new products to market



The MTC Product Manufacturing Incubator (PMI) team realised that the Start-Ups and SMEs approaching them for support in bringing innovative new products to market, often had over-optimistic expectations of both the duration and complexity of the manufacturing readiness journey.

**Innovation:** The MTC PMI Product Design Pathway was developed for those Entrepreneurs and Start-Ups. It marries best-practice design thinking methodology to gated stages, to bring new products successfully to market. The PMI Pathway balances managing customer expectations of both the number of steps, and the iteration required, while maintaining their confidence in a proven process. To date, over 70 entrepreneurs and smaller companies have benefitted from a PMI Product Design Discovery workshop.

**Impact Delivered:** Over thirty have continued beyond that first discovery project with PMI. To date, MTC has recorded £2M of investment by Start-Ups/SMEs in PMI support. Each customer has accepted a commercial value proposition showing return on his or her investment; often through reduction in risk, and time taken to successful project launch. At least a five-fold return is usually expected, so an economic impact of c. £10M can be extrapolated. Projects have spanned medical, construction, communications, energy and leisure markets, bringing new products to market to benefit our wider society.

mtc Manufacturing Technology Centre

The MTC is an independent RTO bridging the academia-industry gap. MTC PMI offers entrepreneurs and businesses expertise, tools and space to develop products in a de-risked environment.

www.the-mtc.org

## Salmonella spp. viable cells detection by qPCR

Society and food companies are increasingly becoming aware of the importance of hygienic-sanitary quality control of food, as well as the correct labelling of products, to avoid the appearance of food-related hazards. It is essential to adopt effective control measures that facilitate the early detection of these pathogens throughout the food production and distribution chain, in order to avoid harmful consequences to health and the economy.

**Innovation:** AINIA, EARTO member through REDIT Innovation Network, has developed an innovative technique, V-qPCR Salmonella, on which, DNA-intercalating agents were effective for the detection of viable Salmonella spp. cells in food matrices, in a process of one step PCR. The confirmation phase is not necessary, giving negative or positive results after approximately 24 hours.

**Impact Delivered:** This innovation can help companies in the meat industry to guarantee the food safety of their products and with current legislation. The analytical response time goes from 4-5 days to 24 hours, which represents an improvement in the commercial useful life.

REDIT INNOVATION NETWORK ainia

The Network of Technological Centres of the Valencian Community (REDIT) is a private non-profit association that integrates and represents the 11 technological centres of the region.

www.redit.es - www.ainia.es

## SHOP - Short-term Hydropower Optimisation Program

SHOP is a software that determines optimal use of hydropower resources. Hydropower will have an important role in the future energy system due to its ability to store energy and ensure the stability of the power grid in the face of more intermittent production. But determining the optimal utilisation of hydropower in complex, cascaded watercourses is difficult because the use of resources is interconnected in space and time.

**Innovation:** SHOP solves this problem by using advanced optimisation techniques that also considers the watercourse topology, inflow uncertainty, price and demand for energy and system services, long-term resource cost of water, as well as all technical and environmental restrictions in order to determine optimal market bids, production schedules and water discharge.

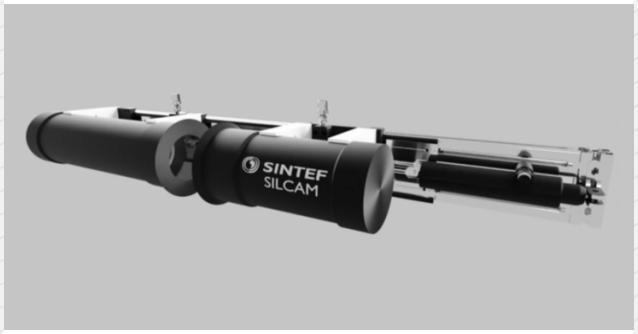
**Impact Delivered:** SHOP is currently used in the daily operations of 25 hydropower companies in the Nordics, Switzerland, Italy, Austria and Chile. SHOP has been estimated to give a 2% increase in the value of Norwegian hydropower resources. By considering environmental restrictions, SHOP also contribute to mitigating the adverse effects hydropower production may have on local ecosystems in and along the rivers. More efficient scheduling further increases hydropower's contribution as an enabler for a sustainable energy system.

SINTEF

SINTEF is an independent, not-for-profit research organisation dedicated to creating innovative technology solutions for a better society.

www.sintef.no

## SilCam - The most powerful instrument for the observation of a healthy ocean




We are often challenged by research questions about small particles in the ocean: how big are they, what are they, and how do they move. These are tricky questions to answer because accurate measurement of small particles suspended in the water is technically demanding due to their complicated, delicate structures which cover a wide range of sizes, concentrations, and movement characteristics.

**Innovation:** Since 2014 EARTO member SINTEF has been developing new in-situ particle imaging techniques to help answer questions surrounding the nature of suspended particles in the marine environment. Conventional lens-based imaging of suspended particles often suffers from limitations related to depth-of-field, particle occlusion, and perspective errors.

**Impact Delivered:** For more than 70 years, SINTEF has developed solutions and innovation for society and customers all over the world by developing knowledge and technologies that are brought into practical use. The perspective errors from the conventional lens-based imaging of suspended particles can be overcome by the use of holographic imaging or restricted path length telecentric systems such as the SINTEF SilCam.

SINTEF

SINTEF is an independent, not-for-profit research organisation dedicated to creating innovative technology solutions for a better society.

www.sintef.no

## ACUSTRAIN - Low barriers for Railway Noise by Tecnalia

Railways lines crossing urban areas usually have significant noise impacts, with the peculiarity of their proximity to dwellings and the complexity of applying traditional solutions that do imply a visual impact.

**Innovation:** EARTO member Tecnalia developed a new low noise barrier product, to be placed alongside and between tracks. Design considers requirements for railway maintenance. The solution improves environments where the distance between the railway infrastructure and the buildings does not allow the installation of traditional acoustic barriers without producing visual impact. This system has been installed and verified at the municipality of Ermua. The noise reduction levels measured, applying insertion loss tests, at this area are greater than 10 dB in the residential area. In addition, its installation does not require additional foundation and the installation works involve short times. The works can be carried out in general without affecting railway circulation and causing very low acoustic impact.

**Impact Delivered:** This innovation will lead to the improvement of the existing noisy urban environments produced by trains. ACUSTRAIN company is on the market with this solution. ACUSTRAIN will respond to the corrective measures defined in the railway Noise Action Plans and the corresponding investments. This project is expected to reach the market in this year, 2022, being mainly aimed to the European market.

tecnal:a
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

TECNALIA is a Spanish RTO aiming to transform technology into GDP, helping companies to be more competitive and generate wealth and employment.

www.tecnalia.com

## Accelerating drug development with high throughput biomedical AMS

Drug development is expensive, time consuming and there are no guarantees for success. However, new drugs are essential for the health of European Citizens. During the development of a new drug, information of its distribution and its metabolism in the human body is crucial to establish whether the drug is safe. The classical approach to this is by performing animal experiments and – much later – studies in human volunteers. This approach is very expensive, may cause serious delays and requires animal experimentation.

**Innovation:** EARTO member TNO has developed a unique technology that accelerates drug development. It involves microtracing in combination with Accelerator Mass Spectrometry (AMS) and an automated sample introduction interface. By the exceptional sensitivity of the methodology, the technology allows studies to be performed in humans much earlier in a safe manner.

**Impact Delivered:** In turn, the process of drug development is more predictable and thereby considerably cheaper (up to $100M). Last but not least, thanks to TNO's innovation new drugs can be made available sooner to patients.

TNO innovation for life

TNO connects people and knowledge to create innovations that sustainably strengthen the competitiveness of companies and the well-being of society.

www.tno.nl

## MOEMS-based NIR inline chemical concentration measurement

In the industrial production of many widely used resins, formalin is one of the main ingredients and its formaldehyde content is the most important parameter to achieve an optimum product. By optimizing the mixture of educts in the reactor, as well as optimally utilizing available reactor volume, process efficiency can be maximised while at the same time optimizing product quality.

**Innovation:** For the inline monitoring of the amount of formaldehyde during the filling process of batch reactors for the resin production process, the Research Center for Non- Destructive Testing GmbH (RECENDT), EARTO member through UAR, developed a specifically optimised costefficient sensing solution. Based on cost-efficient micro-opto-electromechanical systems (MOEMS) technology, combined with state-of-the-art machine learning algorithms, it predicts the formaldehyde concentration in formalin in real-time.

**Impact Delivered:** This innovation increases both the efficiency of the production process as well as the product output and furthermore decreases the $CO_2$ emission of the resin production process and significantly enhances working conditions and workers' safety. An extended testing period was already completed at the Austrian resin production plant of the company partner Metadynea, with no out-of-spec batches and a reduction of reference measurements by 92%.

UAR Upper Austrian Research GmbH
RECENDT RESEARCH CENTER NON DESTRUCTIVE TESTING

UAR (Upper Austrian Research Gmbh), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

www.uar.at - www.recendt.at

# IMPACT
# EXPECTED

Discover
more innovations
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IMPACT
**EXPECTED**

# VTT

**VTT Technical Research Centre of Finland is a visionary research, development and innovation partner. It is one of Europe's leading research institutions.**

VTT
www.vttresearch.com

PRIZE 1ST

# Carbonaide, an innovative technology to utilise carbon dioxide to manufacture negative emissions concrete

**Currently, 6-8% of the global carbon dioxide ($CO_2$) emissions originates from the concrete industry. Due to accelerating urbanisation, the share is anticipated to rise drastically. An irreplaceable component of concrete is cement, which is also mainly responsible for high $CO_2$ emissions due to its chemical nature.**

## INNOVATION

EARTO member VTT Technical Research Centre of Finland has developed a technology to reuse $CO_2$ in the precast concrete industry. The technology transforms gaseous $CO_2$ into solid carbonates at the concrete hardening process, decreasing the carbon footprint of the products. In addition, due to the formation of carbonates less cement is needed for the similar properties of the concrete, which improves the economic and resource efficiency of the production process. With highly blended cements, VTT's technology enables the production of $CO_2$ neutral concrete. If a binder does not contain traditional cement, the carbon footprint of the concrete becomes negative. In carbonates, $CO_2$ is stored infinitely.

## IMPACT EXPECTED

When fully deployed worldwide, the technology will be capable of annually bounding 0,82 gigatons of $CO_2$ permanently. The total anticipated climate impact is an approximately 1,4 gigaton reduction of $CO_2$ emissions. For comparison, the European Union produced 2,54 gigatons of $CO_2$ emission in 2020.

IMPACT
**EXPECTED**

# TNO

**TNO connects people and knowledge to create innovations that sustainably strengthen the competitiveness of companies and the well-being of society.**

TNO innovation for life

www.tno.nl

PRIZE 2ND

# ZE H2-ICE: 100% $CO_2$ reduction for the maritime sector

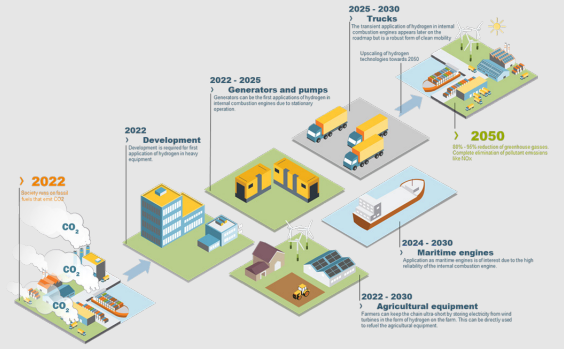
**Maritime transport accounts for ~13.5% of all greenhouse gas emissions from transport in the EU and ~24% of $NO_x$ emissions. Furthermore, the economic lifetime of maritime propulsion and power generation systems is very long. Following regular replacement schemes is therefore not desired, as it slows down sustainability.**

## INNOVATION

The ZE H2-ICE provides the solution to these important issues by retrofitting existing engines into near zero emission hydrogen engines. Starting from an existing diesel or gas engine and introducing dedicated hydrogen technology, the lifetime of an existing maritime engine is extended while simultaneously completing the energy transition in an acceptable timeframe. Applied hydrogen combustion technology has the potential for near zero engine-out pollutant emissions.

## IMPACT EXPECTED

The ZE H2-ICE enables 100% $CO_2$ reduction while simultaneously meeting most stringent relevant EU pollutant emission legislative limits. It delivers cost-efficient conversion of existing power systems currently including costly and complex exhaust gas aftertreatment technology into a near zero emission engine without aftertreatment. The ZE H2-ICE extends the lifetime of existing maritime propulsion systems while fulfilling the sustainability goals on Climate action and Good health and well-being.

IMPACT
**EXPECTED**

PRIZE 3RD

# SINTEF

**SINTEF is an interdisciplinary non-profit research organisation.**

**For more than 70 years, SINTEF has developed solutions and innovation for society and customers all over the world. SINTEF's vision is "Technology for a better society".**

SINTEF

www.sintef.no

# I Hear You2 - Screening Children's Hearing in low and middle-income countries

**Hearing loss is a global health challenge, and the World Health Organisation (WHO) states that nearly 80% of people with hearing loss live in low and middle-income countries (LMICs) where 60% of childhood hearing loss is due to preventable causes. Traditionally, hearing services are provided by specialists at centralised clinics, using expensive equipment, making the services inaccessible for most people in LMICs. Consequently, children in LMIC are not assessed and left unidentified.**

## INNOVATION

EARTO member SINTEF with its partners have developed an easy to use and cost-effective tool for community-based screening of children's hearing. The game-based tablet audiometry is utilizing the concept of gaming, commercially available tablets, headphones, and dedicated software. The innovation enables the establishment of local hearing services helping children with hearing loss to attend school and participate in the community. Thus, contributing to reduce poverty and supporting the United Nations strategy; "Leave No One Behind".

## IMPACT EXPECTED

WHO has estimated that unaddressed, hearing loss imposes a global cost of about $980B annually, and potentially risks the global goal to end poverty. Our innovation enables equity and participation for children with hearing loss in LMICs. The innovative screening tool has been successfully piloted in selected primary schools in Tanzania, and it is expected to be certified by end of 2023.

## Solutions to remove plastics from the sea


The OCEANETS project aims to develop technological solutions that are in line with the circular economy model for disused fishing nets. New methods are being researched to prevent the wastage of these nets and instead enable them to be recovered and reused as new recycled textile products with high added value.

**Innovation:** EARTO member AIMPLAS recently conducted research that showed that an additive that acts as a tracer can be successfully incorporated into the material o f fabric. This tracer reveals itself in the fabric when exposed to infrared rays. This research has made it possible to demonstrate for the first time the traceability of the raw materials from which the fabric has been made. In this case, the fabric has been made from fishing tackle. As a result, samples of this fabric and final real products such as t-shirts and leggings made from the fabric have been produced.

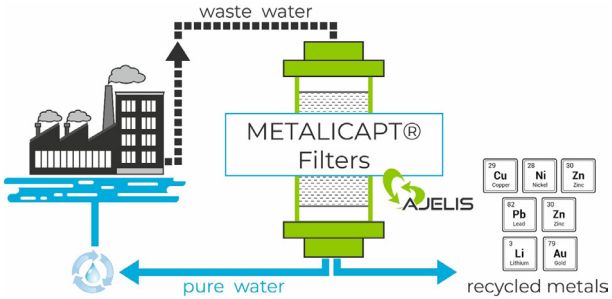
**Impact Expected:** As a result of our net recovery projects, fishermen will now be able to identify areas where obstacles that could trap their fishing nets have been detected, as well as places where they have lost nets. The project´s next steps involve work in the mechanical recycling field, recovering polyester and polyethylene fishing nets to manufacture new woven and non-woven products. The environmental, economic, and social impact of the project and its progress have been also monitored.

AIMPLAS
INSTITUTO TECNOLÓGICO DEL PLÁSTICO

AIMPLAS, the Plastics Technology Centre, provides solutions to companies throughout the value chain, from raw material manufacturers to plastic processors and end users.

www.aimplas.es

## Fiber sorbents for hydrometallurgical operations of toxic waste treatment and metal recycling




Climate change and the growing need for critical materials are forcing companies and governments to reconsider the environmental impact of industrial production in order to develop greener and more circular alternatives. This innovation meets both of these objectives in line with the recent ambitious legislation on discharge standards.

**Innovation:** This innovation aims to revolutionise the treatment of industrial effluents thanks to new features in the field of filtering fibres. These fibres, developed by EARTO member CEA and AJELIS, clean effluents of toxic metals, pesticides and radionuclides without generating negative externalities. Moreover, this technology allows the recycling of critical metals that are omnipresent in the modern economy. This new generation of filters is either polymer-based or carbon-based allows an efficient decontamination of industrial discharge. These fibres provide a very rapid capture, a rapid regeneration, and a stability, whatever the pH or temperature of the solution.

**Impact Expected:** This innovation will have a considerable impact in the industrial sector due to the ability of the fibres to decontaminate industrial effluents from pollutants for which current techniques do not allow treatment. It also permits to create completely new tools or in specific fields such as treatment of nuclear waste or e-waste recycling.

cea

The CEA is a French scientific research and technological organisation in the fields of energy, defence, ICT, material sciences, life sciences and health.

www.cea.fr

## Miniature flash LiDAR for 3D imaging for space and underwater applications

Miniature LiDARs are considered as a key enabling technology for autonomous mapping and navigation, such as in the automotive industry for self-driving cars. Despite available commercial solutions, certain niche applications require specific features for which only a limited number of products, or even no solution at all, exist today.

**Innovation:** EARTO member CSEM developed an innovative flash LiDAR for 3D imaging and mapping dedicated to challenging niche applications that share similar constraints: space rendezvous and underwater surveys. Apart from the flash architecture that offers high reliability and resolution, our miniature LiDAR benefits from crucial differentiators. For space, relying on the New Space approach allows achieving a low-cost system. For underwater, our green laser maximises transmission. Complemented with a unique time-gating feature, our system attains unprecedented depth. The ability to process data on-board in real-time brings added value to both applications.

**Impact Expected:** Upon successful technology transfer to industrial companies, by 2030, we expect an annual revenue above €30M for future LiDAR manufacturers. The technology will have positive impacts on the environment, as well as the safety of persons and installations, as it will provide a viable solution to tackle the issues of space debris and underwater mines and plastic waste in sea.

csem

CSEM is a Swiss private, non-profit research and technology organisation (RTO) with 35 years of Deep Tech development and transfer to industry.

www.csem.ch

## Innovative characterisation and modelling techniques driving the sheet metal forming industry towards a zero-defect production

High-strength sheet metals are fundamental for the development of new lightweight concepts in sectors such as transport, machinery, household appliances, cosmetics, energy and chemical products, among others. However, they have also introduced new challenges to sheet metal stampers and components manufacturers related to their cracking susceptibility, leading to cracks and the difficulties to predict the metal performance during forming and in operation.

**Innovation:** High-strength sheet metals are fundamental for the development of new lightweight concepts in sectors such as transport, machinery, household appliances, cosmetics, energy and chemical products, among others. However, they have also introduced new challenges to sheet metal stampers and components manufacturers related to their cracking susceptibility, leading to cracks and the difficulties to predict the metal performance during forming and in operation.

**Impact Expected:** The innovation will reach the market by the end of 2022 -beginning of 2023 as a service offered through FormPlanet Open Innovation Test Bed, the first-of-its-kind entity in Europe acting as an single-entry point for accessing the services of leading characterisation organisations. These services will lead to an greater competitiveness in the European sheet-metal forming industry.

eurecat

Eurecat is the largest cross-sectoral and trans-national RTO in Catalonia, Spain, with 700 professionals covering all technological specialities to deliver added value to our society.

www.eurecat.org

## SISTERS - Putting a stop to food waste through innovation

Only in the EU, we generate every year around 89M tonnes of Food Loss and Waste (FLW), accounting for 20% of the total food produced, with costs estimated at €143B, impacting each stage of the Food Value Chain.

**Innovation:** AITIIP Technology Centre, EARTO member through Fedit, proposes a set of systemic innovations addressed to reduce food loss and waste generated in every stage of the Food Value Chain, namely, the 1st European Short Chain Platform for discarded food, Smart and reusable food containers, innovative and sustainable packaging materials and with QR and dynamic labelling incorporated in the packaging.

**Impact Expected:** With the support of the European Commission, SISTERS will reduce FLW by 27.4% and $CO_2$ emissions by around 20% in the case studies. Our interdisciplinary SISTERS consortium consists of 18 partners from 8 European countries will deploy the innovation in the world after its 5 years of development with a total budget of more than €10M.

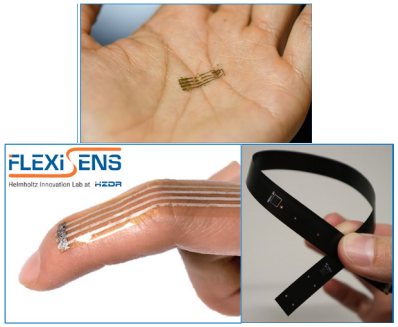
Fedit Centros Tecnológicos de España

aitiip centro tecnológico

Fedit is a Spanish association of research and technology organisations whose main mission is to boost and encourage innovation, technological development and private research.

www.fedit.com - www.aitiip.com

## FlexiSens: Smart sensor technologies




Conventional magnetic field sensors are fabricated on flat substrates and are thick and rigid. The primary duty of magnetic field sensors is motion sensing required for numerous disciplines including industrial robotics, prosthetics, virtual and augmented reality appliances. Extending rigid planar structures into 3D space relying on flexible and printed electronics approaches allows to enrich conventional or to launch novel functionalities of spintronic-based devices.

**Innovation:** Magnetoelectronic devices for emerging application scenarios of Internet of Things, smart home and eMobility. The technology platform relies on high-performance magnetic field sensors deposited or printed on ultrathin polymeric foils. The technology is patent protected. These skin-conformal flexible and printable magnetosensitive elements enable touchless interactivity with our surrounding based on the interaction with magnetic fields, which is relevant for food quality monitoring, realisation of smart wearables and electronic skins, soft robotics and human-machine interfaces.

**Impact Delivered:** These novel technologies are now matured enough to reach TRL 6 and are offered to customers as products or industry-ready prototypes. We are in progress of establishing spin offs to commercialise the **FlexiSens** technologies.

HELMHOLTZ

HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

Helmholtz is Germany's largest scientific organisation. With more than 43.000 employees at 18 researchcentres, (amongst them Helmholtz-Zentrum Dresden-Rossendorf), it contributes to solving major societal challenges.

www.helmholtz.de - www.hzdr.de

## Flair box™: Portable and connected multi-gas analyser dedicated to air quality measurements

EARTO member IFP Energies nouvelles is developing a range of solutions designed to enable industrial and environmental gas monitoring in the atmosphere, on the ground, in the soil and underground. By enabling the real-time analysis of gas present in the air or soil, Flair box™ meets a broad range of needs, such as leak detection, air quality and odours monitoring.

**Innovation:** Flair box™ is a highly portable performant trace gas measurement system. It allows measurement at ppb concentration of several molecules such as H2S, SO2, NH3, mercaptans, THT, NO, etc. It enables environmental pollutant measurements on a much larger scale and in new fields. Industrial and environmental monitoring can now be extended to molecules associated with the main greenhouse gases. Flair box™ is coupled with strong data management called Flair map. It includes a powerful chemometrics algorithm, real-time visualisation of measurements, database and plume algorithm (source location and plume dispersion).

**Impact Expected:** Research and innovation activities driving this project will have a high impact on air quality measurements, helping to track molecules associated to the main greenhouse gas emissions, pollutants or odour nuisances. Measurement information, control and identification of sources of potential leakage of odours will help to a better understanding of the problem and a clearer information towards concerned citizens, which is crucial for industry.

IFPEN, French Research and Technology Organisation, focuses its efforts on bringing solutions to society and industry to support the ecological transition.

www.ifpenergiesnouvelles.com

## New digital solution to support Cognitive and Physical Training at Home

The growth in the incidence of different neurodegenerative diseases that leads to cognitive impairment is a problem worldwide. For instance, dementia affects 8.7M people in Europe alone. Current care systems lack enough resources to address the growing number of patients requiring intervention, highlighting the need for new solutions.

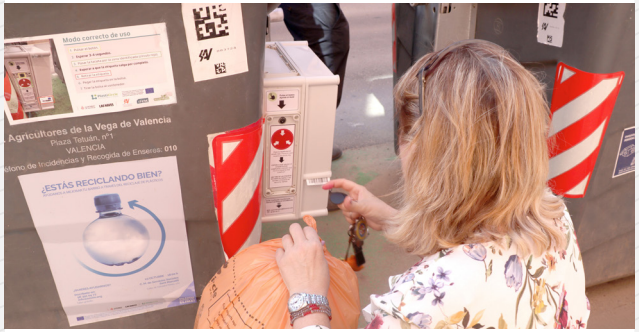
**Innovation:** EARTO member Instituto Pedro Nunes (IPN) co-developed the CogniViTra solution to support cognitive vitality training at home. The innovation integrates components for supporting cognitive and physical exercises – dual-task training – (web-based tools and movement sensors) and a platform that facilitate interface and communication between patients and care providers, which allows extending cognitive and physical stimulation programs performed in the hospital or clinical environments to home.

**Impact Expected:** This innovation aims to fulfil the need of patients to increase session hours while overcoming restrictions imposed by the availability of care resources (i.e. human and physical infrastructures), contributing for reducing the costs of delivery associated healthcare services by ~10%. This innovation is expected to reach the European market by 2025.

IPN – Instituto Pedro Nunes is a Research and Technology Organisation (RTO) which carries out applied research, experimental development and technology transfer.

www.ipn.pt

## Plasticircle – Innovative technologies for Plastics and Circular Economy




The European plastic market is still far from the circularity objectives of EU. More than 25Mt of plastic waste are produced per year and recycling rates are only around 31%. Due to that, Plasticircle aimed to develop new technologies for the adequate treatment of plastic packaging, the main plastic fraction in the EU.

**Innovation:** PlastiCircle aims to improve the Circular Economy of Plastics. The approach is based on innovation in the four stages associated with plastic packaging treatment: (1) collection, (2) transport, (3) sorting and (4) recycling. Several technologies and products have been developed in each of these stages: smart containers, innovative sorting equipment and added-value products from plastic packaging waste.

**Impact Expected:** The implementation of PlastiCircle technologies has a high environmental, economic and social impacts, which were evaluated by means of real pilots in cities. Environmental - climate change (-25%), ozone depletion (-18%) and Acidification (-19%) Economic – Sorting costs (-25%) and revenues for the sales of materials (+12,54%) Social – increases in health and safety (+57%), consumer satisfaction (+131%), transparency (+115%), socio economic repercussions (+140%) and sustainability awareness (+187%).

ITENE, Packaging Transport and Logistics Research Centre, is a Research and Technology Organisation (RTO) which carries out applied research, experimental development and technology transfer.

www.itene.com

## PHIL: A fast cancer detector


Liquid biopsy represents an important tool for modern oncology. Liquid biopsies can detect changes in tumor burden months or years before conventional imaging tests can, making them suitable for early tumor detection, monitoring, detection of resistance mutations, and therapy monitoring. State-of-the-art liquid biopsy systems require blood sample handling and a costly and time-consuming process.

**Innovation:** EARTO member LEITAT jointly with IFAE (Institute for High Energy Physics) developed a fast, easy-to-use, and cheap **technology**, integrated into a point-of-care device, to detect cancer mutation in a plasma sample. This technology enables a safe, personalised, and robust cancer diagnosis and supports cancer treatment selection.

**Impact Expected:** This innovation represents a leap ahead in the field of molecular diagnostics, especially in oncology. The easiness, cost, and time to results in molecular diagnostics are expected to improve quality of life while containing healthcare costs. This project is expected to reach the market within 3 years. Its market is worldwide, starting in Europe and quickly moving to the USA and the rest of the countries.

LEITAT
managing your technologies

Leitat is a Research & Technology Organisation that manages technologies to create and transfer sustainable social, environmental, economic, and industrial value to companies and entities.

www.leitat.org

## Rotating detonation - The future of an aerospace propulsion

When we imagine a detonation, we usually see a powerful explosion, associated with a shock wave that moves at a very high speed and burning everything on the road. For many years, scientists from around the world have been trying to tame this element and use it ... in aerospace propulsion. For years, research has been carried out on a continuous detonation process, most often powered by gaseous fuels (most frequently hydrogen or methane) and gaseous oxidants (air or oxygen). However, gaseous propellants are not prospective for use in aviation and aerospace.

**Innovation:** Recently, at the Łukasiewicz - Institute of Aviation, a number of rotating detonation tests with the use of liquid propellants have been tested. A rocket engine powered by liquid propellants was built, followed by a small experimental research rocket, and the world's first successful launch test of a rocket powered only by detonation propulsion was carried out.

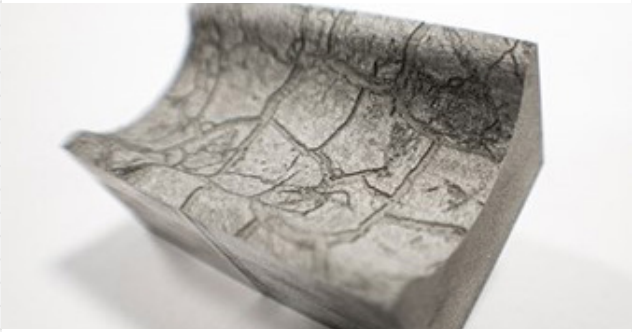
**Impact Expected:** The tested rocket detonation engine used regenerative cooling and it approached the maximum performance theoretically possible for such an engine. Taming and applying detonation process in propulsion systems will allow in the near future to build smaller, lighter and more efficient combustion chambers, and will significantly reduce emissions of NOx as well as $CO_2$.

Łukasiewicz
Łukasiewicz
Institute of Aviation

The Łukasiewicz Research Network is the third largest research network in Europe. It has 8.000 staff and 26 research institutes located in 12 cities across Poland.

www.lukasiewicz.gov.pl - www.ilot.lukasiewicz.gov.pl

## MTC's SHARK project encourages take-up of laser technology



Laser surface texturing (LST) is one of the most promising surface engineering techniques thanks to its excellent repeatability, non-contact process, the ability to achieve small feature size and the possibility of achieving high quality finishing. But the technology suffers from high investment cost, poor productivity, and a lack of knowledge in terms of processing parameters and texture design.

**Innovation:** SHARK aims to industrialise laser functional texturing by boosting the productivity, cost-effectiveness and flexibility of the process. The project will reduce the complexity and unknowns in the functional texturing process by developing a fully digitised knowledge management platform and an advanced end-user interface to enable the industrialisation of the process.

**Impact Expected:** The project will deliver surface functionality for less than 10% cost of the conventional part, more than 20% improvement in product performance, improve processing efficiency tenfold and reduce inspection time by 80-90%.

mtc
SHARK

The MTC is an independent RTO bridging the academia-industry gap. It was established to prove innovative manufacturing processes and technologies in an agile environment in partnership with industry, academia and other institutions.

www.the-mtc.org

## Was it righT


Some goods need to be stored at a certain temperature to be protected from spoilage, while others must be properly heated to develop the desired properties. Temperature control is a challenge, especially when there are many items to control or they are covered or hidden at the time of interest. Existing options for controlling the surface temperature of goods are limited, inadequate and/or unsustainable.

**Innovation:** **MyCol**, the NIC's spin-out company in Slovenia, is developing inks that permanently change colour when heated above the colouration temperature. They can be designed for the colouration temperature on the region from -70 to 200°C. The inks are suitable for printing large quantities of indicator labels that can be used on any reasonably smooth surface, including curved surfaces. Direct application of the ink to objects is also possible. The inks are recyclable with the packaging like a conventional packaging ink. The colour change is visible to the eye and can be included in automatic video control.

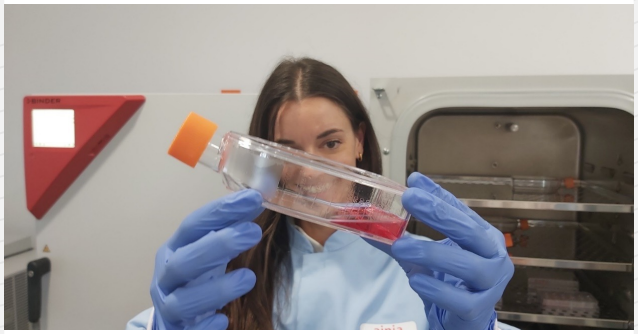
**Impact Expected:** The innovation can improve the cold chain by indicating the handling of goods outside tolerant temperature range, throughout the entire chain, from producer to shelf, and providing evidence that goods have been kept at the correct temperature. The high-temperature versions can verify industrial heating processes and certify the appropriate quality of each item.

NATIONAL INSTITUTE OF CHEMISTRY

The National Institute of Chemistry (NIC) works at the frontiers of chemistry, materials science, life science, engineering and environmental protection, also targeting new technologies and products.

www.ki.si

## Potential of extracellular vesicles as a functional ingredient for the food and cosmetic industry



Extracellular vesicles, small structures surrounded by a membrane produced by the cells of any organism, are a representation of the cell from which they come and serve to communicate with other cells, transporting bioactive substances. This function has great potential in the field of health, for its use in the diagnosis of diseases, as an active ingredient with a biological effect, or as a drug delivery system. It also has great possibilities for the food or cosmetic industry.

**Innovation:** AINIA, EARTO member through REDIT Innovation Network, has designed a system for the separation and concentration of extracellular vesicles, scalable at an industrial level. This type of process could allow their use as functional ingredients in the food, medical or cosmetic industry. For that, extracellular vesicles from three different sources have been selected for their characteristics and potential functionality: a probiotic microorganism of the Lactobacillus genus, tangerine plant cells, and a human (liver) cell line.

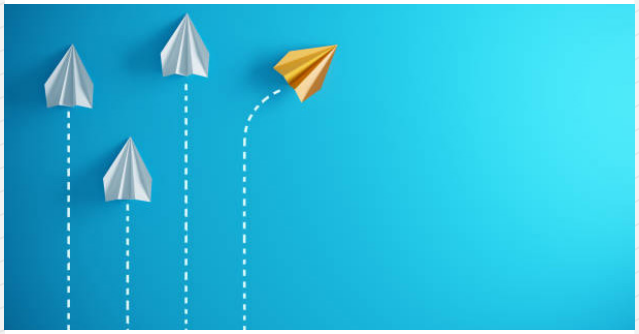
**Impact Expected:** These vesicles offer many possibilities as functional ingredients that could be incorporated into beverages or other types of food, cosmetic creams or as active ingredients in capsules or other formats, to give some examples.

REDIT INNOVATION NETWORK ainia

The Network of Technological Centres of the Valencian Community (REDIT) is a private non-profit association that integrates and represents the 11 technological centres of the region.

www.redit.es - www.ainia.es

## New UMILES NEXT FLYFREE aircraft architecture for urban air mobility in association with TECNALIA



The urban mobility of the future has its eyes set on the sky. It is expected that, over the next decade, we will see vehicles flying in cities around the world, as an alternative to land transport. In fact, it is estimated that in 2035 the "air taxi" business will reach €32.000M, according to Porsche Consulting.

**Innovation:** Currently, several prototypes are being developed worldwide and UMILES Next (a mobility solutions company), together with EARTO member TECNALIA, is working on the first of them developed in Spain. It is a prototype designed for the transfer of a person, in a range of flight time of 15 minutes and a range of around 15km, which would cover the transportation needs of the urban center of 85% of all most populous cities in the world. The UMILES Next and TECNALIA air taxi is made up of an aerodynamic cabin, propelled by four drones placed in the upper and lower part of the cabin, which allow it to move. The main innovation lies in an advanced control system where, these drones move independently and decoupled from the angles of rotation of the cabin, but coordinated with each other, which favours aerodynamic efficiency, stability, precision and controllability of the cabin and, therefore, the comfort inside.

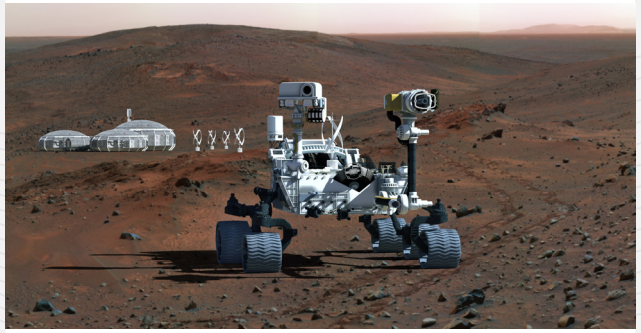
**Impact Expected:** The development of new aeronautical technology is key to mitigating the environmental impact of aviation and to achieving the challenges related to the decarbonisation of air transport by 2050, contributing to the Sustainable Development Goal #13 "Climate Action".

tecnalia
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

TECNALIA is a Spanish RTO aiming to transform technology into GDP, helping companies to be more competitive and generate wealth and employment.

www.tecnalia.com

## First wind turbine for Mars exploration



One of the main constraints of exploratory missions on Mars is associated with extreme environmental conditions on the red planet where storms can rage non-stop for six months. Due to such adverse meteorological conditions, it is crucial to develop systems that deliver energy constantly and reliably to explore Mars properly and build energy-sustainable settlements for humans in the future.

**Innovation:** It is in this context that EARTO member Tekniker Technology Centre has been responsible for leading and developing the first wind turbine for Mars exploration. This initiative started in January 2021 and has been funded by the European Space Agency (ESA). Its main objective consists in developing the first-ever wind turbine generator for Mars to be subsequently built and tested for use in future space missions.

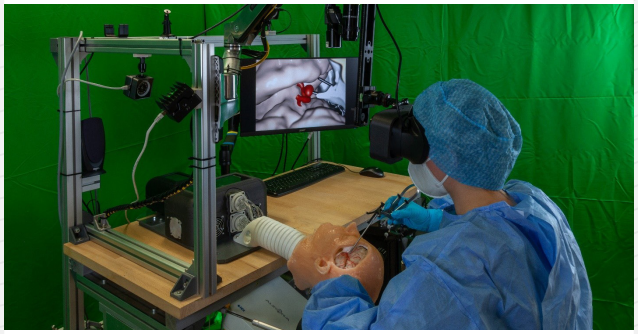
**Impact Expected:** The system intends to make the most of environmental conditions on Mars to transform wind into electricity and use it as a source of energy in addition to conventional solar panels deployed in expeditions on the red planet whenever the latter cannot produce power due to severe Martian storms. This innovative technology uses a tribolelectric effect and electrostatic induction to transform mechanical energy into electricity with the objective to reduce launch costs and implement a multiple generator system.

Tekniker
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Tekniker is a technology centre specialised in Advanced Manufacturing, and member of the Basque Research and Technology Alliance (BRTA).

www.tekniker.es

## MEDUSA: An innovative neurosurgical simulator to protect patient lives



The human brain is our most sophisticated organ. Disease-related damage has serious consequences for patients. Surgical treatment of e.g., brain aneurysms, is extremely difficult because target areas are often embedded in highly functional and complex tissue structures. Successful interventions are only possible with high technology and exceptional neurosurgical skills. Strengthening these components is the focus of the research project MEDUSA (Medical EDUcation in Surgical Aneurysm clipping).

**Innovation:** The MEDUSA consortium creates a revolutionary training and planning platform for neurosurgeons with the ultimate goal to protect patient lives. Based on a hybrid approach, an innovative aneurysm clipping simulator is developed. It consists of artificially manufactured patient models and virtually generated holograms that extend the simulation environment in real time. Complex medical interventions are qualitatively and quantitatively simulated in a realistic environment. These simulations provide optimal training and education opportunities for neurosurgeons, increasing patient safety

**Impact Expected:** **MEDUSA** is expected to lead to the establishment of a simulation and cooperation center in Upper Austria. Core technologies are translated into future medical products, such as surgical planning and navigation systems, multiplicatively expanding the achievable market.

UAR
Upper Austrian Research GmbH

UAR (Upper Austrian Research Gmbh), together with its associated RTO companies, is promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

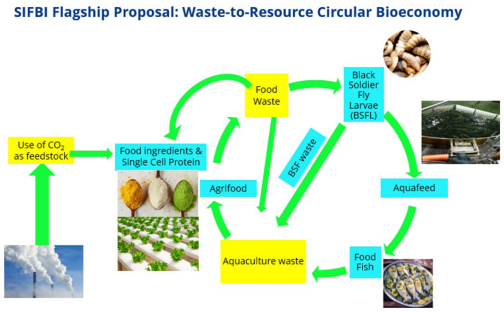
www.uar.at



EARTO
IMPACT DELIVERED

RTOs
INTERNATIONAL
NETWORK
**RIN**

## Tackling food waste more sustainably




Food waste is one of the biggest waste streams in Singapore. In 2019, Singapore generated around 744M kg of food waste*. One way A*STAR helps Singapore tackle food waste more sustainably is by using agri-food sidestreams as feedstock for our microbial production platform to produce higher value ingredients and alternative proteins.

*Towards Zero Waste Singapore

**Innovation:** To help convert waste to usable resources, A*STAR's Singapore Institute of Food and Biotechnology Innovation collaborated with ecosystem partners to develop a microbial consortium that efficiently converts mixed food waste to odourless fertiliser within 24 hours. The institute is also developing a Waste-to-Resource Circular Bioeconomy Flagship Programme which looks at bioconverting lignocellulosic waste and its derivatives into food ingredients and insect feed, for example. These efforts are supported by A*STAR's Natural Product Library, a resource bank with over 160.000 plant, fungal and bacterial specimens for the discovery of novel strains of enzymes. These can be optimised for efficient valorisation and breakdown of agri-food sidestreams to yield alternative proteins or specialty ingredients.

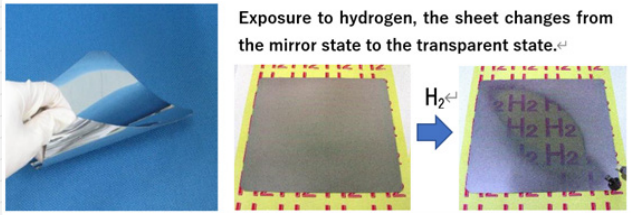
**Impact Delivered:** The intention is to reduce pressure on the environment through combining chemical and biological approaches to capture carbon and convert waste to valuable products, as well as developing technologies to recover resources at the end of a product's life and converting them into reusable products.

Agency for Science, Technology and Research
SINGAPORE

The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector R&D agency and plays a key role in nurturing scientific talent and leaders for the biomedical and physical sciences as well as engineering ecosystem.

www.a-star.edu.sg

## Hydrogen Visualisation Sheet




Hydrogen, the key to achieving carbon neutrality, is attracting a great deal of attention and its infrastructure is being developed at a rapid pace. However, since hydrogen, being colorless, transparent, and odorless poses explosion risks, a leak detection system is indispensable. The Atsumitec's hydrogen visualisation sheet is a material that enables human eyes to detect hydrogen leaks.

**Innovation:** Atsumitec was the first company to successfully commercialize a material developed at AIST, whose reflectance changes with hydrogen. Later, in collaboration with AIST, the company also developed a sheet that changes from blue to transparent, overcoming the disadvantages of conventional materials that were vulnerable to water and humidity, and succeeded in developing and mass-producing water resistant sheets.

**Impact Delivered:** This technology will contribute to the creation of a hydrogen-based society as a useful technology for the development of a safe hydrogen infrastructure, since it enables the construction of an inexpensive system for monitoring large area spaces. The company is also considering overseas deployment to Europe, where hydrogen infrastructure is rapidly being developed.

AIST ATSUMITEC

The National Institute of Advanced Industrial Science and Technology (AIST) is a Japanese public RTO whose mission is solving social problems and strengthening industrial competitiveness.

www.aist.go.jp - www.atsumitec.co.jp

## Mining industry innovator's success backed by strong science and relationships

Australia is the world's second largest gold producer with an annual gold production value of approximately AUD$15B. Analytical services - worth nearly $1B globally - are an essential part of the mining value chain, from exploring for new deposits through to running profitable extraction operations. Australian disruptor Chrysos Corporation Limited (Chrysos) is using cutting-edge material analysis technology to step around centuries-old methods to improve returns to mining companies around the world.

**Innovation:** Chrysos PhotonAssay™ is a quantitative, chemistry-free replacement for slower, more hazardous methods of minerals analysis, and can be delivered either on-site at a mine, or in a mineral testing laboratory. It delivers faster, safer, more accurate and environmentally-friendly analysis of gold, silver, copper and other elements in as little as two minutes. In 2016, CSIRO partnered with experienced investors and industry professionals to form Chrysos and took the technology to market.

**Impact Delivered:** Through the development of PhotonAssay, CSIRO and Chrysos digitised assaying, improved the economics of gold processing and unlocked major environmental, revenue and cost benefits for gold miners. This year Chrysos marked a significant commercial milestone and commenced trading on the Australian Securities Exchange (ASX). At the time of listing, it was the largest IPO on the ASX for the calendar year – raising AUD$183.5M.

CSIRO

CSIRO is Australia's national science agency and innovation catalyst.
CSIRO solves the greatest challenges through innovative science and technology.

www.csiro.au

## Artificial heart lung system to save COVID19 severe patients

During the COVID19 pandemic, a massive number of severe patients faced limited medical assistance resources (lack of professionals and medical devices). With that scenario, a Brazilian medical devices manufacturer, BRAILE Biomédica, partenered with ELDORADO to research and develop a new artificial heart lung system aiming to increase the treatment options and promote a positive impact to the survival rates in hospitals.

**Innovation:** ELDORADO developed a high reliability device that acts as an artificial heart lung, performing the blood circulation and oxygenation out of the patient's body. By leveraging the Model-Based System Engineering technique combined with automated code generation, ELDORADO ensured that all required medical device functionalities could be delivered even before the hardware and firmware integration. That allowed to achieve the coverage of safety-critical requirements of medical standards, for high risk and life support devices, in a very short term.

**Impact Delivered:** As a result of the partnership, the BRAILE Biomédica SOLIS system was developed, approved and launched in less than one year, and it has been used by more than 300 patients in Latin America, Ukraine, India, Israel, Europe. This innovation proved to be a vital resource during the severe phase of the pandemic. Three patents were issued.

ELDORADO
INSPIRAÇÃO PELO NOVO

ELDORADO is a Brazilian RTO with the mission to research and develop innovative, comprehensive, competitive and impactful solutions in different sectors of society.

www.eldorado.org.br

## Immersion cooling edge data center for green computing

As trends in 5G, AI, IoT, and virtual economy are booming, the volume of global data computing continues to grow. Meanwhile, data centers become miniaturised, moving towards edge computing and operating closer to the user side. With this growth comes the demand for green computing, which suggests that a decrease in the power consumption of data centers is crucial.

**Innovation:** To create an energy-saving solution for edge computing, the Industrial Technology Research Institute (ITRI) collaborated with leading telecom operater KDDI to develop the Immersion Cooling Edge Data Center. In this innovation, servers are submerged into a reusable non-conductive liquid coolant, which absorbs heat and is circulated to lower temperature. A unique hot/cold aisle design addresses heat dissipation issues for high-density, high-perfomrance servers, boosting overall energy efficiency and flexibility for the equipment.

**Impact Delivered:** The data center features optimal equipment capacity, assistive free cooling, convinient maintainance, rapid deployment, and a smart monitering system. It can reduce carbon emissions up to 40% and achieves an average power usage effectiveness (PUE) of 1.07, which outshines the average 1.6 of traditional computer machinery rooms. The power consumption of a single server rack is reduced by 43%, and the size of the rack takes up 60% less space. These significant savings will lower operational costs and lead to sustainable development.

ITRI
Industrial Technology Research Institute

ITRI is a world-leading applied technology research institute with more than 6.000 outstanding employees. Its mission is to drive industrial development, create economic value, and enhance social well-being through technology R&D.

www.itri.org.tw

## Ground-Breaking Ink for Wearable Technology


The NRC's Advanced Electronics and Photonics (AEP) Research Centre has created electrically-conductive ink that draw working circuits onto various materials. This eliminates moving parts, ensuring circuits survive unlimited washing, and enabling manufacturers to embed electronic functionality into clothing.

**Innovation:** Most inks are inelastic, leading to fragility and less conductivity. The NRC worked with the Taiwan Textile Research Institute (TTRI) over 5 years to improve ink quality, ensuring it meets industry requirements. This conductive ink can withstand the six main washing tests: twisting, stretching, flexing, extruding, peeling and oxidation.

**Impact Delivered:** This ink enables wearable electronics that make it easier to track and record activity data. The technology could improve quality of life for seniors by monitoring heart failure or managing diabetes and addressing international concerns for aging populations. The ink can also be combined with other substances for different applications, like being printed on flexible film or display goods. It takes wearable electronics to a new level and paves the way for innovation, as new generations of technology arise.

National Research Council Canada
Conseil national de recherches Canada

The National Research Council Canada (NRC) is Canada's largest federal research and development organisation. The NRC partners with Canadian industry to take research impacts from the lab to the marketplace, where people can experience the benefits.

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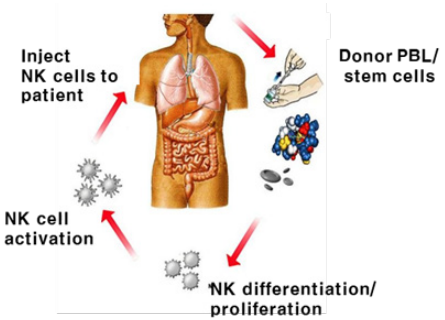
## The Next-Generation Cancer Treatment




Natural Killer (NK) Cells are anticancer immune cells that make up about 10% of our blood immune cells. KRIBB developed the platform technology for NK cell proliferation and differentiation from hematopoietic stem cells to secure large amounts of highly active NK cells. The efficacy and safety of mass-cultured cells was confirmed through non-clinical and clinical trials; and through joint clinical study with Seoul Asan Medical Center on patients with refractory leukemia, it proved that it suppressed cancer progression and dramatically increased survival rates.

**Innovation:** Securing a large number of NK cells and producing anti-tumor cells are challenges that must be addressed in NK cell therapy. A unique technology regulating differentiation of hematopoietic stem cells would maximise cell differentiation and is distinguished from treatments that amplify matured NK cells.

**Impact Delivered:** The novel NK cell therapy technology was successfully transferred to a biotech startup in Korea, and it is hoped that this therapy could be utilised as a platform for various cancer immunotherapies. By combining biomarkers and AI, it will be developed into a more precise and customised cancer treatment technology. The NK cell therapy is rapidly emerging a next-generation anticancer immunotherapy and if this technology transfer succeeds into developing new drugs, it is expected to be a game changer in oncology drug market.

nst National Research Council of Science & Technology

KRIBB Korea Research Institute of Bioscience & Biotechnology

The National Research Council of Science and Technology (NST) supports and fosters 25 government-funded research institutes of Korea in the field of science and technology.

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