
EARTO
Innovation
Awards 2016
EARTO
Technology for a better world | www.earto.eu

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Investment in research, technology and innovation is essential to enable sustainable recovery

Frank Treppe | EARTO President

At a time when the European Union is facing economic and societal challenges, with budgets under growing pressure and a GDP growth forecast below 2% for the years to come, it is crucial to remember that investment in research, technology and innovation is essential to enable sustainable recovery. The latest European Innovation Union Scoreboard reveals indeed that Europe has an innovation performance score of only 81% of the US score, while China is catching us up fast. On R&D private expenditure, the EU is lagging behind significantly, with a private R&D-to-GDP ratio of 57% of the US level. Europe's overall R&D-to-GDP-ratio continues to stand at 2%, which is significantly lower than the US, Japan and South Korea. We are still far behind our EU 3% target. The OECD actually puts those three countries far in the lead in a new generation of disruptive technologies, laying the foundations for profound transformations in how we will work and live in the future.

Europe needs to catch up fast with challenges that cannot be solved by an excellent science policy alone. Europe needs to combine it with a much stronger collaborative R&I policy based on a sound understanding of our regional innovation ecosystems, coupled with an ambitious industrial policy supporting our global industrial value-chains.

Today, EU's main target should be to maintain Europe's technological sovereignty, using our already existing excellence science base. We need more than ever to step-up our investments in collaborative R&I while leveraging private R&I investments. Europe's Research and Technology Organisations (RTOs) already picked up the challenge, bringing excellent science to the market with high economic and social impact. Recognised over the years among the world's most innovative organisations by Reuters, European RTOs bring together powerful resources with their advanced research & innovation capabilities and infrastructures. Europe needs to further capitalise on the resources and great potential that RTOs represent.

EARTO 350 RTOs members are addressing today's challenges such as the next industrial production and manufacturing revolution, yielding cheaper and cleaner energy, and novel responses to social and environmental challenges such as ageing, social exclusion and climate change. Real life examples of their work are set in the next pages. They are sometimes revolutionary, sometimes evolutionary, but as always: they do deliver impact!

EARTO Innovation Awards 2015

The EARTO Innovation Awards are given since 2009 to shed light on RTOs' work. Two categories have been created: Impact delivered and Impact expected. The Impact Delivered Award is given to an innovation already in the market and which has proven its impact on Europe's economy and/or society, while the Impact Expected category rewards an innovation which is not yet on the market but has great potential. These innovations illustrate RTOs' focus on solving real-world problems and delivering innovations that have real-world value.

Number of applications so far	**151** Representing	**35** RTOs in	**19** Countries

Number of winners so far	**27** Representing	**13** RTOs in	**10** Countries

Impact Delivered Category

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 Category

For this category, the rewarded innovations 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, which in 2016 comprised:

Clara de la Torre
Director, DG Research & Innovation, European Commission

Simon Edmonds
Director Catapult Programme, Innovate UK

Christian Ehler
Member of the European Parliament

Jana Kolar
Member of the Governing Board, EIT

Erkki Leppävuori
Former President and CEO, VTT

Jan-Eric Sundgren
Senior Adviser, AB Volvo

Impact **delivered**

FIRST PRIZE

UAR - PCCL

www.uar.at

The first UV-light production line provides a production capacity of > 20 million pairs of gloves per year, preventing allergenic reactions related to medical & surgical gloves.

UAR Upper Austrian Research GmbH

PCCL Polymer Competence Center Leoben

UAR is an Austrian Association of RTOs promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to R&D of the highest quality.

Member of UAR, the Polymer Competence Center Leoben GmbH (PCCL) is the leading Austrian "Center of Excellence" for cooperative research in the area of polymer engineering and sciences.

With UV-light towards the next generation of low-allergenic surgical gloves

The prevention of allergenic reactions related to medical gloves was the driving force in the joint research work of the Polymer Competence Center Leoben (PCCL), EARTO member through UAR, and Semperit, producer of medical gloves. By developing an innovative chemistry for the crosslinking of latex with a cutting-edge production process, the worldwide first low-allergenic glove is commercially available since 2013.

These new gloves may improve the quality of life of 1 to 3 million healthcare workers in Europe, while the social, health and economic impact for the general population could go much beyond.

Healthcare is one of the largest economic sectors in the EU, accounting for around 17 million jobs. Employees in such industry have to face critical operational safety risks, some of which are due to the frequent use of latex gloves and contact with other rubber-related medical products like syringes. The adverse health reactions to these latex products range from serious skin reactions to asthma and it can even be lethal in some cases.

17m people
work in the healthcare
sector in the EU

Up to 6%
of the general population **exhibit**
a sensitivity to latex-related products

New gloves commercialised
in 2013 may
improve the quality of life of
1 to 3m
health care workers in Europe

First UV production line provides
production capacity of
> 20m pairs
of gloves per year

Cutting-edge UV fabrication process

Currently, natural rubber is widely used in the production of medical gloves due to its availability, excellent physical properties and low cost. Latex allergies are typically caused by natural rubber proteins and by some chemicals used in the conventional fabrication process. Some latex allergies can be prevented by replacing natural rubber with a synthetic raw material, but without a change in the fabrication process itself adverse health reactions remain a problem. To solve this, PCCL and Semperit have developed an innovative two-step fabrication process by exploiting UV-light, a completely new idea in the scientific community, protected by national and international patents.

Unique product performance & production efficiency

Such an innovation enables the manufacture of extremely low-allergenic gloves without sacrificing wearer comfort and sensitivity of touch: operating room staff was easily conquered. Furthermore, the energy efficiency of the new fabrication process lowers considerably its carbon footprint. Indeed, whilst conventional processes are carried out at 60-80°C for several hours, the new UV process is accomplished at room temperature within minutes. The innovation also allows a continuous manufacture of gloves with higher production rates than conventional techniques, further facilitating the industrial implementation of the innovation.

Unique selling position & versatile process

Sempermed Syntegra UV gloves are now commercially available since 2013, and the product is on the way to gain a substantial share in the market for synthetic surgical gloves which amounts to 400 million pair of gloves per year. Highly versatile, this innovative process can also have a wide range of applications, from other segments of the global gloves market like industrial safety, cleaning, beauty or food but also other latex products like condoms or baby articles.

Impact **delivered**

SECOND PRIZE

Fraunhofer

www.fraunhofer.de

Coated piston rings show a reduction in fuel consumption of 1.5%, or 3g CO_2/ km emission. High volume series production already started in 2015.

Fraunhofer

The Fraunhofer-Gesellschaft is a leading research and technology organisation. Its activities are conducted by 66 Fraunhofer Institutes and research units located throughout Europe. Fraunhofer employs a staff of around 24,000 who work with an annual research budget totalling 2 billion euros, 70% are generated through contract research on behalf of industry and publicly funded research projects.

New coating technology process for more energy efficient cars

Making cars more energy efficient has become a necessity today. Indeed, reducing the consumption of fossil fuel, whose prices are rising, and limiting the emission of greenhouse gases and the impact on climate change are at the top of the European agenda. This is why EARTO member Fraunhofer developed a new coating technology process to reduce energy losses due to friction in cars' engines. For instance, Fraunhofer's coated piston rings show a reduction in fuel consumption of up to 1.5%, corresponding to 3g CO_2/km emission.

To comply with EU targets of reducing automobile CO_2 emission to 95g CO_2/km by 2020, a prominent approach is the application of coatings in cars' powertrain to reduce friction losses. Low friction carbon-based coatings, also called diamond-like coatings, have been used in mass-production for several years. Recently, hydrogen-free diamond-like coatings have attracted great interest since they offer a much higher hardness and more than doubled wear resistance compared to common carbon coatings, with a friction coefficient up to 10 times lower. However, a broad application of these hydrogen-free coatings has been prevented by the absence of an efficient production process.

The EU aims to **reduce the average emission** to

< 95g CO_2/km by 2020

Coatings can lead to savings of

117 bn litres / year **of fuel,**

or 290m tonnes CO_2 emission

Piston rings contribute to

~25% total **friction losses,**

or 6% of **fuel consumption**

Coated piston rings show a reduction in fuel consumption of

1.5% or 3g CO_2/km emission

High volume series production already started in

2015

An innovative production process

To enable the broad application of these superhard hydrogen-free coatings, Fraunhofer developed an innovative deposition process. For the formation of diamond-like bonds, essential for the high hardness, carbon ions with high energy must hit the component and penetrate into the first atomic layer. This can be realized by short laser pulses, resulting in a well-controlled but costly process, or by an arc discharge, which is very efficient but hardly controllable and has a short lifetime. Fraunhofer's patent-protected innovation, the laser arc process, combines these two technics.

An industrially viable technology

For the industrial use of the laser arc source, a specific module has been constructed, which can be used with any kind of commercial deposition chamber. Such a technology makes the application of hydrogen-free coatings on piston-rings and other parts of automobiles' powertrain industrially viable, with good quality at acceptable costs. Furthermore, due to extreme wear conditions large coatings thickness is necessary, which can be made most efficiently by the laser arc process.

Adopted by European car manufacturers

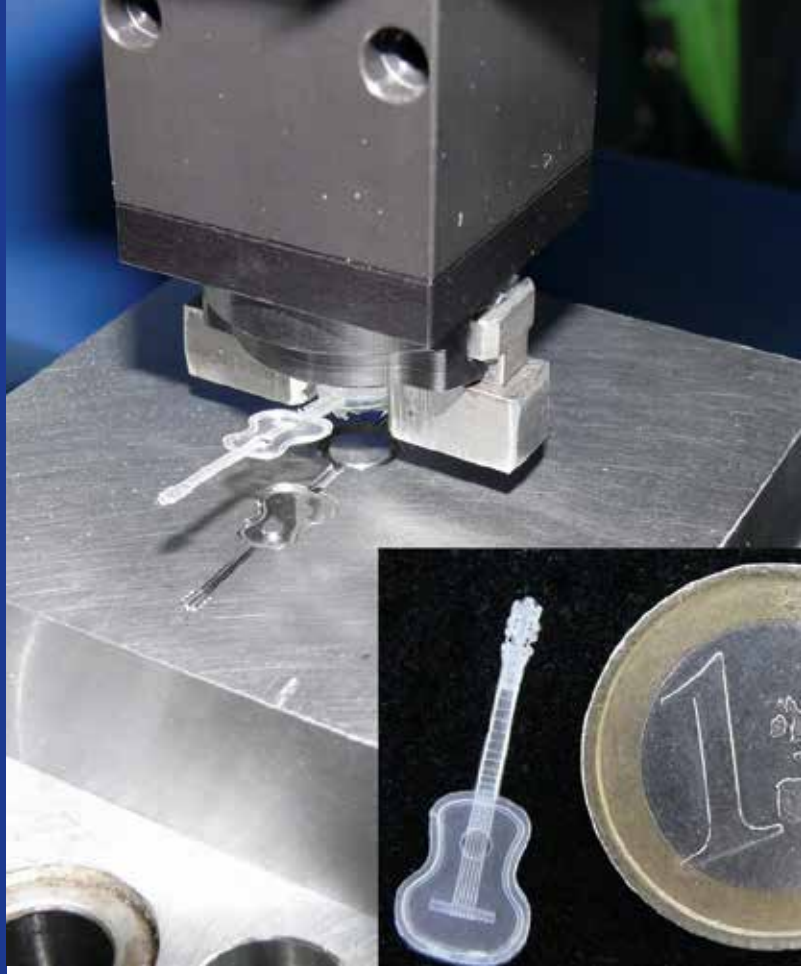
To exploit this innovation, Fraunhofer built several laser arc modules in 2015 and series production started in the same year at Federal Mogul, leading manufacturer of piston rings. Based on the high interest of the automotive industry, a very fast market introduction is expected, leading to a production volume of around 3 million hydrogen-free carbon coated piston rings in the next few years. All major European car manufacturers have adopted or initiated testing these rings. Besides, this new generation of coating can also be applied to many other components in the powertrain, for even more energy-efficient cars.

Impact **delivered**

THIRD PRIZE

eurecat

www.eurecat.org



Ultrasonics micro moulding allows for outstanding precision with 15mm long and 0.075mm thick parts. Manufacturers reported up to 300% increase in productivity.

eurecat
Technology Centre of Catalonia

Eurecat is the main Technology Centre in Catalonia, Spain, with revenues of €36 million a year. Its multidisciplinary and multinational team of 450 scientists and technologists works in more than 160 projects of applied R&D, aiming at the acquisition of new knowledge for transfer to specific applications and solutions that meet the needs of the industrial fabric.

Ultrasonics for high precision micro moulding

An upward trend in a number of industrial sectors today, like electronics, medical or telecommunications is miniaturisation.

This is why moulders need a cost-effective, accurate and efficient technology for the manufacture of functional micro pieces with complex shapes. After many years of research, EARTO member Eurecat has developed such technology using ultrasounds for material melting. The result has been materialised in the Sonorus 1G, the first high precision thermoplastic micro moulding machine based on ultrasounds, which is being commercialised by Eurecat's spin-off Ultrasion since 2013.

Injection moulding is a technology that has been around in the manufacturing industry for decades. As the demand for miniaturisation has grown, the conventional macro process has been progressively scaled down and adapted to micro moulding. However, such process exhibits many drawbacks such as energy inefficiency, material waste and expensive tooling. To overcome these challenges, Eurecat has specifically designed and developed an innovative technology for micro moulding, applying the high-frequency ultrasounds technology, already used in other sectors like welding, to the moulding process.

Ultrasonics micro moulding allows for outstanding precision with

15mm long 0.075mm

thick parts easily achievable.

Reduced energy use by

up to 90%

compared to alternative technologies.

Reduced material waste of

up to 50%

Savings of

up to 35%

in **tool-related expenses**

Manufacturers reported

up to 300%

increase in productivity using Ultrasion technology.

Moulding the impossible

Sonorus 1G increases the quality standard of micro scale components. The optimised properties of the melted plastic, like its reduced viscosity, make it possible to reach outstanding precision with longer (15mm) and thinner (0.075mm) micro parts previously impossible to manufacture. This opens up enormous innovation potential for manufacturers, and for new applications such as an eye retina surgery tip weighing 0.1g or a filter for an ear protection device of 0.02g, which were previously impossible to make.

Small footprint technology

Ultrasion's approach to micro moulding was to develop a machine with sustainability as one key driver. Instead of conventional electric heaters, this new micro moulding process uses ultrasonic waves as the main energy source, reducing the energy use up to 90% and minimising the deterioration risks of the plastic. The transmission of vibrations by ultrasounds makes it also a low-pressure process, enabling savings in tool-related expenses up to 35%. Additionally, the ultrasonic technology minimises the material waste that is often associated with moulding micro parts. Consequently, microinjection based on ultrasounds can be particularly suitable in medical applications where the cost of raw materials is often extremely high.

Worldwide commercialisation

This technology is patented and commercialised in the form of Sonorus 1G by Eurecat's spin-off Ultrasion. Sonorus 1G, the first high precision thermoplastic micro moulding machine based on ultrasounds, is available in the market since 2013. Ultrasion's customers are spread worldwide and fall into all industrial sectors. However, first sales have been primarily directed towards medical, aerospace, electronics, and military sectors where precision and accuracy are key factors. Manufacturers reported up to 300% increase in productivity using Ultrasion technology.

Impact **expected**

FIRST PRIZE

CEA

www.cea.fr

3D LEDs produce 3 times more light and they can also produce coloured light. By end 2017, Aledia should commercialize 3D LEDs at 50% below average selling price.

Revolutionary 3D LED technology: more light, less cost

LEDs have many advantages over traditional light sources: they are more efficient, emitting more light while consuming less energy and with a longer life-time. A broad LED deployment would therefore have huge environmental and economic benefits, but their high retail price is still an important barrier. This is why EARTO Member CEA has developed the wireLED™ technology, a new generation of 3D LEDs with drastically reduced production costs. This new LED technology should be commercialized by CEA spin-off Aledia in 2017.

The CEA - Alternative Energies and Atomic Energy Commission - is a French government-funded RTO and a prominent player in the ERA. The CEA is active in four main areas: low-carbon energies, defence & security, information technologies and health technologies. The CEA maintains a cross-disciplinary culture of engineers and researchers, building on the synergies between fundamental and technological research.

Lighting represents 20% of all electricity usage today. The development of LEDs would thus have a major environmental and financial impact. Indeed, replacing all traditional lamps by LEDs would reduce the energy consumption in Europe by 9%, equivalent to €60bn, and the carbon emission by 42m tons/year. Moreover, the LED lighting market is forecasted to grow from €15bn today to €65bn in 2020, representing 60% of the worldwide lighting market. Nevertheless, as a prerequisite for such perspectives, LEDs' prices must be significantly reduced.

The LED lighting market is forecasted **to grow to**
€65bn in 2020,
representing ~60% of total lighting market

Replacing all traditional lamps by LEDs would **reduce Europe's energy consumption** by
9% or €60bn
and **carbon emission** by
42m tonnes/year

In 2015, Aledia totalled
€28.4m **investment**

By end 2017, Aledia should commercialize 3D LEDs at
50% **below** average selling price

High production capacity at low cost

The CEA developed the next generation of LEDs, affordable to everyone thanks to a high production capacity at low cost. Indeed, this technology enables the use of a larger and more economical substrate than for the exiting 2D LEDs, reducing the production cost per individual LED chip. Material costs are also two third lower than for conventional LEDs. Furthermore, while 2D LEDs need specific manufacturing plants, this new technology is fully compatible with high-volume manufacturing in existing silicon foundries: no additional investment is needed. 3D LEDs should therefore be about four times cheaper to produce than conventional LEDs.

Revolutionary performance advantages

Additionally, in going 3D, LEDs produce three times more light with lower risk of defects. This technology also follows the advanced semiconductor industry which makes 3D LEDs easy to integrate with existing electronics. Furthermore, while today's LEDs require expensive phosphors to obtain white light, which greatly reduces efficiency, 3D LEDs will be phosphor-free and will have a wider spectrum of performance. They can for instance produce coloured light and obtain different types of white light using the same material.

Opening up a wide range of possibilities

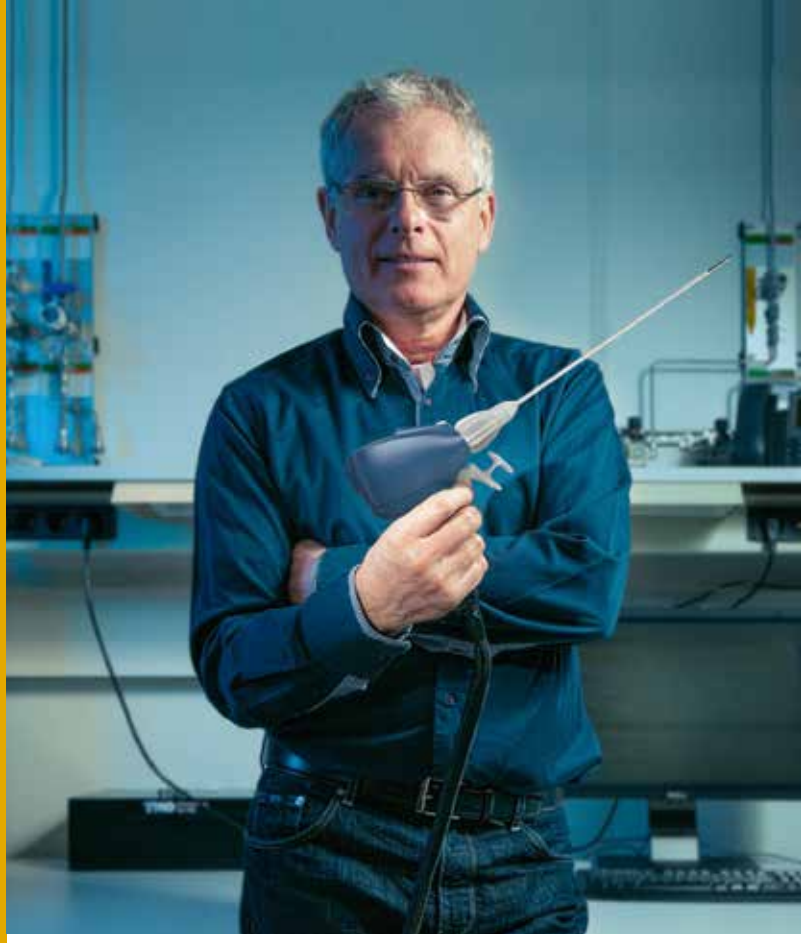
Aledia LEDs enable smart lighting and many other possibilities. They can be integrated in all areas, from domestic lighting to the automotive sector, or public buildings. New ALEDIA investors, IKEA and VALEO, show the interest of these completely different market sectors. CEA spin-off Aledia received exclusive worldwide rights to all CEA patents on the 3D LED technology applied to lighting. The first Aledia product will be commercialized by the end of 2017, and Aledia expects revenues of €300m to €400m in 2027, reaching then 5 to 7% market share in the high value-added professional lighting world market.

Impact **expected**

SECOND PRIZE

TNO

www.tno.nl



The force applied with the OptiGrip is reduced 3 to 4 times compared to standard instruments. The first human endoscopic intervention with the OptiGrip took place in April 2016.

TNO innovation for life

TNO, an independent RTO from the Netherlands, has over 3000 professionals who put their knowledge and experience to work in creating smart solutions to complex issues. These innovations help to sustainably strengthen industrial competitiveness and social wellbeing. TNO has some 3000 industrial partners around the world, including SMEs.

The organisation focuses on 5 transitions: healthy living, defence, safety and security, industry, energy, and urbanisation.

Giving back the sense of touch to endoscopic surgeons

Since the end of the 20th century, minimally invasive surgery has taken over a large part of open surgical interventions, increasing patients' well-being. However, surgeons had to cope with the loss of their sense of touch. To recover it, a surgeon invented the concept of the OptiGrip and EARTO member TNO enabled its development. This innovative instrument feeds the actual force applied to patients' tissues back to surgeons' fingers in real time, for safer and faster surgeries.

The number of endoscopic interventions is still growing today, enabling shorter hospitalisation, smaller wounds and fewer infections. However, the mechanical nature of conventional instruments allow limited tissue feelings to surgeons, causing them to apply much higher forces than needed and leading to unintended damage. To compensate, surgeons guess the tissue forces by looking at camera images, but this feedback is poor and strongly dependent on each surgeon's skills and experience. Besides, surgeons are hesitant to carry out certain operations with endoscopic instruments as they cannot feel the difference between cancerous and healthy tissues for instance.

The force applied to tissue with the OptiGrip **is reduced**

3 to 4 **times**

compared to standard instruments

The first human endoscopic intervention with the **OptiGrip** took place in

April 2016

The worldwide market for this instrument is

1m **instruments/year**

and the Optigrip's market share is estimated at

20.000/year

by 2021

Innovative sensing technology for safer tissue manipulation

The OptiGrip overcomes this lack of tissue feeling: a fibre-optic sensor measures the tissue gripping force which is then fed back to the surgeon's hand, enabling him to feel the tissue characteristics and even dynamic forces like pulsations in arteries. Due to the natural, feeling the force applied on tissue is reduced 3 to 4 times compared to standard instruments Moreover, if the surgeon mistakenly applies still too much force on the tissue, it will be automatically optimised, without the surgeon noticing, guaranteeing safety in all situations. Adding a sense of touch will also shorten the learning curve, typically quite long in endoscopic surgery.

Increasing control to improve patients' well-being

This technology also enables to set different sensitivity levels for the manipulation of delicate tissues or for microsurgical applications, offering surgeons a more controlled performance. Besides, while most conventional instruments use a scissor-like grip, the OptiGrip is equipped with an ergonomically designed pistol-shaped handgrip, allowing surgeons to operate with less strain. Moreover, two trigger sizes will enter the market to comply with different hand sizes. Such a design secures an optimal fit creating unrivalled control for faster handling with greater precision.

Clinically validated instrument

The OptiGrip has been clinically validated and is supported by medical publications. The Optigrip's market share is estimated at 20.000 instruments/year by 2021. Despite 30% higher costs, a Health Technology Assessment study shows that the overall health costs will not increase thanks to lower complication rates and increased surgeon performance. Besides, the increased ergonomics will give surgeons greater confidence in carrying out endoscopic surgery for cancer or cardio-vascular interventions for instance. This technology can also be transferred for use in robotic micro-surgery systems in the fields of plastic surgery or eye surgery.

Impact **expected**

THIRD PRIZE

VITO

www.vito.be

VITO's Carbstone energy-efficient production process transforms alkaline waste and CO_2 into high-value construction materials, with a negative CO_2 footprint.

vito
vision on technology

VITO is a Belgium RTO in cleantech and sustainable development, elaborating solutions for the large societal challenges of today. This results in 5 research programmes: sustainable chemistry, energy, health, materials management and land use. Each programme builds up a strong base of knowledge and skill, with added value for industry and society. The 750 employees are working hard on sustainability and transition thinking as binding factors between the 5 research programmes.

CO_2 negative construction materials from recycled resources

The steel industry produces massive quantities of waste materials with no or at best low-value applications, creating serious environmental issues. On the other hand, the construction industry is responsible for a large amount of global CO_2 emissions and drastically needs to improve its environmental impact. To address these two problems, EARTO member VITO developed the Carbstone process that transforms waste materials and CO_2 into high value construction materials with drastically reduced environmental impact.

In the steel industry, massive quantities of alkaline waste materials such as steel slags or construction and demolition waste are produced each year. For instance, 170-250 million tonnes of steel slags were produced worldwide in 2014. Besides, in the construction industry, concrete assumes an eminent role with a production of 30-35 bn tonnes/year, making it the second-most used material by mankind behind water, while concrete manufacturing is responsible for up to 8% of global CO_2 emissions. A better and more efficient processing of alkaline waste and CO_2 into high value products therefore provides large environmental benefits.

The market targeted by Carbstone is **estimated to grow by up to**

1.2%/year,

reaching 16bn tonnes by 2050

The **«breakthrough scenario»** estimates a worldwide production **of**

50m tonnes

of Carbstone materials by 2040

Significant economic value:

€335m investments

and 17.500 jobs

Considerable environmental impact:

10m tonnes CO_2

reduction

and 40m tonnes

waste recycling

Breakthrough technology

VITO's Carbstone process transforms alkaline waste and CO_2 into high value construction materials. The process uniquely combines existing technologies, using accelerated mineral carbonation by treating various types of waste with CO_2 at elevated pressure and temperature. The CO_2 is sequestered inside the products by transforming CO_2 gas into solid carbonate minerals that cement the slag particles together. This flexible technology allows for the production of a range of products, from paving bricks to roofing tiles, with the same technical properties as conventional concrete products.

Reduced environmental impact

Carbstone's considerable environmental benefits turn this technology into a disruptive innovation. Indeed, Carbstones have a negative CO_2 footprint, 200kg CO_2/kg lower than conventional concrete construction products, mainly due to a highly energy-efficient production process and the incorporation of CO_2 inside the materials. CO_2 emissions are also avoided by a decreased use of primary raw materials. Besides, around 800kg of secondary raw materials can be recycled to produce a tonne of Carbstone material, an extremely high ratio compared to the 28% substitution rate of current concrete based construction materials. Carbstones therefore avoid landfilling, save on primary raw materials and reduce global warming.

From pilot to market

To further develop this patented technology, a pilot plant was created in 2014 and large-scale industrial trials are conducted. The target is to set up a production plant for the Belgian market in 2017, while developing a licensing model to commercialise the technology worldwide. The market targeted by Carbstone is estimated to grow by 1.2%/year, reaching 16bn tonnes by 2050. The «breakthrough scenario» estimates a production of 50m tonnes of Carbstone by 2040, while recycling 40m tonnes of waste and saving 10m tonnes of CO_2, with a total investment of €335m and 17.500 full-time jobs created.


Discover
more innovations
from RTOs'
Impact
Delivered

Large-scale production of ice-patterned glass

For more than 100 years, ice-patterned glass has been used to produce nonuniform decorative glass surfaces with typical structures, known as ice-flower effect. The creative uniqueness of such textured glass makes buildings architecturally attractive, while preserving their surroundings from mirroring effects. However, it is impossible to sufficiently regulate the form and size of specific patterns by using the current manufacturing process. This leads to a high rejection rate of glass products, which in turn creates production and scheduling problems.

Innovation: V-Research, EARTO member through ACR, **has developed a first-time industrial scale production using technically conditioned bone glue and optimised parameters for a high reproducibility of ice pattern.** Such technological development has enabled the adaptation of textured glass to today's market requirements and has systematized the application of this glass for various construction designs

Impact Delivered: This innovative process decreased the manufacturing costs (up to 40%), as well as the rejection rate and the energy consumption. A wide variety of ice-patterned glass products are already commercialised, including both outdoors applications like large-surface glass in facade construction and indoor applications such as anti-slippery glass floor or bath screens.

ACR

AUSTRIAN COOPERATIVE RESEARCH
KOOPERATION MIT KOMPETENZ

ACR is an Austrian association of RTOs in the areas of building, energy, food, materials and economic studies. It maintains strong links with SMEs.

www.acr.ac.at

Reliable battery-less solar coolers to store vaccines

About 1.5 billion people are living in areas without electricity from grid, where maintaining a temperature between +2°C and +8°C for the storage of vaccines is very challenging. For many years, photovoltaic power has been used for vaccine refrigerators with a lead-acid battery to provide the necessary start-up current. However, the limited-lifetime of the battery due to its deep discharging during periods with low sunshine makes this technology quite costly.

Innovation: Since 1999, EARTO member DTI has been developing the solar direct drive refrigerators, where the photovoltaic energy is stored in ice instead of a battery, thereby eliminating the expensive and recurrent budgetary constraints of battery replacement.

Impact Delivered: As of February 2016, **24 direct-drive vaccine coolers from 8 different manufacturers are listed on the WHO Performance Quality Safety website, ensuring the quality of vaccines stored in these products.** They are more reliable than previous systems, with a lower vaccine wastage and reduced ecological impact, making it one of the fastest growing technologies in the vaccine cold chain.

DANISH
TECHNOLOGICAL
INSTITUTE

DTI is a Danish RTO focussing on innovation and competitiveness, management and training, sustainable exploitation of resources, and cost-effectiveness in companies and society.

www.dti.dk

Emo-scan: reading emotions from facial expressions in real time

Emotions are spontaneous reactions affecting all of our daily decisions such as the evaluation of products or brands. **Analysing emotions has been used in the market research context to evaluate the effectiveness of advertisements.** However, existing methods are either highly subjective, time-consuming or very costly.

Innovation: EARTO member Fraunhofer and its partners created an easy-to-use software, based on the Fraunhofer SHORE™ technology, that **automatically recognizes and analyzes subtle emotions from facial expressions in real time.**
The analysis can be carried out with a simple webcam and a computer, which makes it cheaper than alternative methods.

Impact Delivered: The SHORE™ technology has been licensed to over **400 customers and generated €2.4 million revenues by 2015.** Apart from the advertisement sector, EMO Scan and SHORE™ can also be used in other fields like in the automobile sector to analyze drivers' stress and fatigue, in the health sector to help people with autism read other people's emotions, or more generally to improve the interactions between humans and machines.

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.

www.fraunhofer.de

Increasing energy efficiency in supermarkets

Supermarkets consume 5% of all electricity used in industrialised countries, around half of which is used by the display and keeping the food refrigerated. Energy can be saved through energy-efficient equipment and systems such as cabinet glass doors, thereby reducing environmental impact and increasing competitiveness.
However, retailers are usually reluctant to invest in energy-efficient systems with very long payoffs, especially if they serve as a barrier for the customers while purchasing.

Innovation: To tackle this problem, EARTO member SP developed with its partners a variety of innovative solutions with a short payoff. On top of retrofitting cooling cabinets with glass doors, which is the approach taken by some supermarkets today, the central refrigeration unit and compressors are adapted to fit the lower cooling demand. Besides, the condensing heat from refrigeration units is used for heating the supermarket, making heating contracts unnecessary.

Impact Delivered: This system enables to reduce the annual electrical demand for this refrigeration unit by 75%, and the payoff for the investment is less than 3 years. As a comparison, only putting glass doors on cooling cabinets lowers the electric demand by only 16%.

SP

SP Technical Research Institute of Sweden is an RTO which develops, tests and evaluates technologies, materials, products and processes for national and international customers.

www.sp.se

Smartscan 3d: scanning & analyzing the structure of plants

World trade of horticultural products amounts to €67.5 billion, but this sector is under pressure. To be more competitive, growers need a reliable quality measuring system, for instance in the orchid sector where parameters like the number of stems, buds and flowers determine orchids' sale prices. Existing methods are not accurate enough due to the obscuration of objects in 2D pictures or the lack of objectivity and capacity due to the human factor.

Innovation: EARTO member TNO and its partner WPS developed the SmartScan 3D, a breakthrough sensor technology automatically scanning and analysing the 3D structure and components of plants with great accuracy, enabling better plant classification based on features like height, volume or number of flowers.

Impact Delivered: This patent-protected technology enables growers to increase their revenues and to lower the costs of packaging, maintenance and energy consumption. **Launched in 2015, the first system has already been sold by WPS and an investment breakeven is expected within 3 years. 15 to 25 units are expected to be sold in Europe over the next 5 years.**

TNO innovation for life

TNO, an independent RTO from the Netherlands, has some 3000 professionals who put their knowledge and experience to work in creating smart solutions to complex issues.

www.tno.nl

Optimised fast-charging electric bus system

Road transport contributes to 20% of the EU's total CO_2 emissions, a quarter of which are due to heavy-duty vehicles including trucks and buses. To reach emission reduction targets, the share of green public transport solutions like electric buses needs to be increased.

Innovation: EARTO member VTT developed with its partners a unique and complete **electric bus system combining energy optimised drive lines, light aluminium construction and automatically fast charging electric buses.** Batteries can be charged in 2 to 6 minutes at the termini when new passengers are boarding the bus. Batteries' fast-charging capacity and smaller size reduce charging and maintenance costs as well as investment needs.

Impact Delivered: VTT and its partners help municipalities accelerate the move towards e-buses by supplying the technology and providing support in transition planning, sharing best practices and creating a shared knowledge base with an innovation line concept and a network of partners. 12 of these e-buses worth €5 million have already been sold. In Helsinki, **a total cost reduction of €300 million could be achieved if a fleet of 1300 conventional buses was changed to e-buses.**

VTT

VTT Technical Research Centre of Finland Ltd is the leading multi-technological Research and Technology Organisation in the Nordic countries.

www.vtt.fi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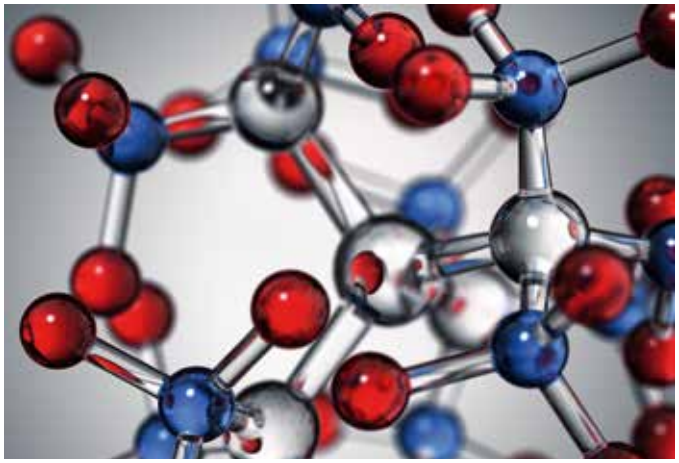
Expected

High-sensitivity & cost-efficient radiocarbon detection



Radiocarbon (^{14}C) is a radioactive chemical element with very low concentration levels, making its precise measurement challenging. The detection of radiocarbon content in CO_2 molecules has a promising social impact, from climate-change control to precise radiocarbon dating or nuclear sites' safety monitoring. However, high-sensitivity radiocarbon detection today is highly costly and confined to a few large facilities, preventing its effective deployment.

Innovation: CNR-INO, EARTO member through AIRI, developed an original instrument for ultra-sensitive radiocarbon detection, 100 times smaller than the current ones, and 10 times cheaper with much lower running costs. Reliable and fast, this instrument directly analyses gaseous CO_2 samples, making it ideal to use for continuous monitoring operations. It can analyse 10 samples per day and it can be customized to detect different gas species.

Impact expected: Covered by three filed international patents, this technology is at the stage of concept validation. The spin-off company ppqSense is preparing to scale up, looking for funding to start the production of a pre-industrial prototype. First contacts with potential customers and investors have been already established. **Potential market value is $1 billion per year.**

Wattway: upgrading roads to harvest solar energy

The energy need is expected to double by 2050. Photovoltaics are among the fastest growing energy resources that produce local, clean and renewable electricity. Since roads are occupied by vehicles only 10% of the time, upgrading them to produce photovoltaic electricity prevents the misuse of farmlands and natural landscapes. The challenge is to deploy robust photovoltaic panels without reworking the floor.

Innovation: EARTO member CEA developed the Wattway solar panels, robust enough to bear one million truck tire passes, with good adhesion and good interconnection between panels and able to be directly integrated to existing roads. The light 7mm thick composite material enables a 10-15 years lifespan, the same as any road today. 1km road paved with Wattway panels can provide the electricity to power public lighting in a city of 5.000 inhabitants.

Impact expected: **Industrial-scale manufacturing is scheduled for launch by Colas in 2016 and €360 million revenues per year are expected by 2019. In France, the goal is to cover 1000km of roads with Wattway panels by 2022.** Further opportunities for development include the integration of sensors providing traffic information or allowing the road to self-diagnose maintenance issues.

Airi ASSOCIAZIONE ITALIANA PER LA RICERCA INDUSTRIALE

AIRI is an Italian association of RTOs, industries and financial institutions, promoting industrial R&I and fostering co-operation between the private and public sectors.

www.airi.it • www.ino.it

cea

The CEA - Atomic Energy Commission - is a French government-funded RTO and a prominent player in the European Research Area.

www.cea.fr

Towards total safety management: web solutions for companies

Businesses of all sizes and across many industries have already experienced crises and accidents, sometimes harming people. While methods and tools exist to assist businesses in planing and mitigating risks in safety-critical activities, they are not widely used, often too difficult or disconnected from other planning activities. The fragmented structure of the safety services market is also very challenging.

Innovation: Through the EU-funded TOSCA Project, EARTO member D'Appolonia coordinated the consortium that developed new web solutions that can lift such barriers and achieve higher productivity and safety management. Focusing on critical activities, the developed methodology vertically integrates and bundles together all the services needed, including modelling approaches, methods and IT tools. User-friendly, customizable and offering return on investment, Tosca solutions can be sustainably adopted by clients thanks to a mentoring and virtual reality training program.

Impact expected: The spin-out company Tosca Solutions is to commercialise **some of these web solutions in the safety services market, which should grow to $5.24 billion by 2016.** Tosca Solutions will follow a simple go-to-market strategy, providing unique services and software towards total safety management.

D'APPOLONIA

D'Appolonia is an Italian organisation supporting public and private clients from concept to decommissioning, through consultancy, design, management, operation and maintenance.

www.dappolonia.it

A unique medial device preventing clinical drug resistance

Hospital-acquired infections are the fourth largest cause of death in the Western world, affecting millions of patients annually. Catheter-associated urinary tract infections (CAUTI), which develops in patients requiring a urinary catheter, is responsible for 40% of these infections. Present treatment is large doses of systemically applied drugs, with the risk of developing clinical drug resistance. Each year, 386.000 infections are caused by antibiotic resistant bacteria, with a costs for the EU estimated at €1.534 billion.

Innovation: To tackle this problem, DTI and its partners developed a new generation of antimicrobial devices preventing infections in the BacAttack project. It can reduce the infection rate and provide for local treatment with long-term effect instead of systemic treatment, combating the development of multi-drug resistant bacteria.

Impact expected: The global market for urinary catheters should reach €3.5 billion in 2016, and the partner companies anticipate up to a 10% market share for the new devices. Several hospitals have already indicated their interest. For their patients, the key benefit of using the catheter is to avoid getting an infection, which results in fewer hospitalisation days and reduced mortality.

DANISH TECHNOLOGICAL INSTITUTE

DTI is a Danish RTO focussing on innovation and competitiveness, management and training, sustainable exploitation of resources, and cost-effectiveness in companies and society.

www.dti.dk

Improving the efficiency of visual effects' tasks in film post-production

The demand for visual effects and 2D-to-3D conversion in film post-production is rising, whereas financial resources and production time are being reduced. Not having the resources for their own algorithm and software developments, small and medium post-production companies rely heavily on the tools provided by commercially available software products with limited functionalities.

Innovation: Through the EU-funded project Autopost, EARTO member EURECAT is developing a close-to-market set of tools by integrating cutting-edge technologies into plugins for standard post-production software platforms. AutoPost's objective is to automate major parts of the daily workload in audio-visual post-production, increasing efficiency by reducing time-consumption and costly manual processing. A user-centred approach is being adopted to ensure the plugins' commercial acceptance.

Impact expected: The AutoPost Plugin Suite brings together innovative features specifically addressing the needs of European post-production houses. **AutoPost tools can provide 80% of time savings in retouching work, leading to 20% reduction of the post-production costs, while increasing the quality of the results. Such innovative solutions will boost the competitiveness of the European post-production industry.**

eurecat
Centre Tecnològic de Catalunya

Eurecat is the main Technology Centre in Catalonia, Spain. Multidisciplinary and multinational, its team of 450 professionals works in more than 160 projects of applied R&D with high strategic value.

www.eurecat.org

Innovative health-promoting bakery products

Nutritional iron deficiency affects up to 2 billion people worldwide. In industrialised countries, this is mainly due to highly-processed micronutrient-poor diets. Iron fortification is a practical and sustainable solution to combat iron deficiency, but iron compounds are often deteriorated by reacting with other food components, also affecting products' taste.

Innovation: AINIA, EARTO member through FEDIT, has participated to the BAKE4FUN EU-funded project, which developed novel technologies to improve the nutritional profile of widely consumed foods like bakery products through the microencapsulation of iron. Such technique uses a thin coating of inert material to protect and isolate the iron in the food to avoid reaction with other food components and to mask the taste of iron.

Impact expected: Such technique gave good results of iron absorption at the intestinal level, while responding to consumers' demand of healthy and nutritional products with good taste and sustainable production. **The increase of production costs for fortified bread compared to standard bread is less than 0.01€/100g.** The products based on this technology will be launched in 2016 with a high expected impact and 3 new products could be launched in the next 3 years.

Fedit
Centros Tecnológicos de España

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

www.fedit.com

Innovative fireproof & eco-friendly rubber for firefighters' footwear

Today, the rubber used for firefighters' footwear contains halogen additives or compounds very resistant to the flame. However, during the combustion of these materials toxic by-products are released, presenting serious health and environmental threats. These compounds are usually banned in Europe but an exception is made because of the lack of alternative.

Innovation: The CTCR, EARTO member through FEDIT, developed an innovative halogen-free rubber sole which contains new materials of low toxicity and not harmful towards the environment. These new materials enable the replacement of hazardous compounds used for firefighters' footwear and provide all the necessary properties to fulfill the current regulation.

Impact expected: By eliminating the harmful effect of hazardous compounds, this new technology makes an environmental impact reduction of 74.2% compared to current fireproof soles according to relevant ISO standard, with a carbon footprint 30% lower. The sale of this new product should start in 2017. A growth in sales of around 100% and a complete return on investment is expected within the next 3 years. This innovative rubber can also be applied to other sectors.

CTCR, the Footwear Technology Centre of La Rioja in Spain, is an RTO member of FEDIT. Its main mission is to increase the competitiveness of businesses creating added-value.

www.ctcr.es • www.fedit.com

Storing biogas through cost-efficient co_2 separation

In contrast to other renewable energy sources like solar or wind energies, biogas is produced continuously. The storage of biogas into the natural gas pipeline system could enable constant electricity production. However, biogas contains up to 50% of CO_2 and a CO_2-separation from the biogas is necessary for storage to be possible, but conventional technologies for doing so are too expensive and energy-consuming for most biogas plants.

Innovation: EARTO member Fraunhofer developed an innovative process that allows the CO_2 separation from biogas by a simple filtering process. This technology is robust and independent of gas compositions and impurities. It is also much less energy-consuming and cost-efficient, making it accessible for small and medium sized biogas plants.

Impact expected: The new technology was successfully tested and economically evaluated on real biogas plants. **In comparison to conventional gas cleaning systems, this technology would save up to €4.8 billion/year in Europe.** The amount of biogas feeding into the natural gas systems could be increased by a factor of 10 in the next 10 years. The same technology can also be applied to several other gas separation tasks.

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

Moriarty: prototyping smart solutions for big data

Organisations and people generate and consume large and complex amounts of digital data, but humans are unable to extract all knowledge from it on their own. Different tools exist focusing on specific aspects of Big Data Analytics and Artificial Intelligence for creating, storing and sharing this data, but not in a holistic way. Extracting useful knowledge from huge digital datasets requires smart and new tools.

Innovation: EARTO member ITAINNOVA developed Moriarty, which gathers all the artificial intelligence-related knowledge in one single set of software tools and libraries to create rapid prototypes of solutions for Big Data. It can capture and analyse a massive amount of data in a flexible, precise, and simple way for strategic decision-making, allowing collaboration between data scientists and software engineers.

Impact expected: ITAINNOVA has already entered a joint exploitation and development agreement with a company for Moriarty. **Big data market forecast for 2016 is $50 billion and growing.** Easily integrated into existing information systems reducing time-to-market, new functionalities can also be developed to avoid traffic jams in smart cities or to help doctors identify best treatments.

ITAINNOVA is a Spanish RTO from Aragon whose mission is to help companies, technology leaders and institutions to achieve a new future through innovation and technological development.

www.itainnova.es

Geco air: an app to reduce pollutant emissions

Air pollutants, especially due to vehicle usage, represent a major health challenge. Pollutants' emission level is strongly linked to driving behaviour, whatever the vehicle and its technologies. A better knowledge and monitoring of vehicle usage will positively impact the decrease of emissions through improved driving behaviour and habits and foster the development of future standards and infrastructures.

Innovation: To address a growing demand from society for more environmentally-friendly vehicles, EARTO member IFPEN developed an app, GECO Air, which measures how efficiently drivers perform. **By coaching the driver in real time, GECO Air has demonstrated pollutant emissions decrease of up to 60%.** GECO Air's web service tool can also be used for prospective studies as its modelling is more relevant than a statistical approach.

Impact expected: IFPEN has first launched the eco-driving GECO app in 2014. 18.000 users have travelled on 500.000 km and 50 companies in the French Auvergne-Rhône-Alpes region have been involved. The same success is expected with GECO Air that will be launched in Autumn 2016. Challenges will also be organised to boost the deployment of the application, at the scales of companies, cities or more widely.

IFP Energies Nouvelles is a French major research and training player in the fields of energy, transport and the environment.

www.ifpenergiesnouvelles.com

Futurol: simple & integrated 2nd generation ethanol production

Climate change and environmental issues are pushing for the development of more sustainable fuels. The renewable ethanol sector and the production of second generation ethanol are important to help Europe achieve its goal of renewable energy by 2020 and 2030. Ethanol production can be costly and complex as different steps need to be integrated and optimised.

Innovation: EARTO member IFPEN has been deeply involved in the Futurol project, aiming at developing a simple, robust and efficient second generation ethanol production process. This novel solution reduces the number of production stages and optimises the process while minimizing material degradation. Such process' integration and overall optimisation are conducted thanks to a dedicated pilot plant in operation since 2011 at the scale of 1 tonne per day, which allows for testing of different feedstock.

Impact expected: Since the start of the 8-year project, 27 patents application have been filed. An SME has been created to support the development of this technology: Procethol 2G. **In 2030, the introduction of ethanol as biogasoline should reach 2 million barrels worldwide and the FUTUROL technology is expected to take a large share of this market.**

Innovative system to support insulin dosing for diabetic patients in hospitals

Diabetes is one of the most common chronic diseases worldwide. People with diabetes are hospitalized more frequently and require continuous control to keep blood glucose levels low without causing dangerous hypoglycemic events. Bad glucose control of type 2 diabetes patients increases the risks of mortality.

Joanneum Research's Innovation: EARTO member Joanneum Research developed with the Medical University of Graz the GlucoTab® system, which provides support for hospital staff involved with insulin therapy of patients with type 2 diabetes. The system improves the clinical workflow and automatically suggests the correct insulin dosage. GlucoTab® runs on a tablet computer and is thus highly mobile, allowing to treat patients directly at the bedside.

Impact expected: Using GlucoTab® saves time for health care professionals and improves patients' glucose control, increasing their safety. **Clinical validation confirmed indeed that average blood glucose concentration was reduced by up to 20% compared to standard care.** Such system is CE-labelled and a GlucoTab® deployment is being prepared in routine care hospitals in Austria. A spin-off company with an exclusive licence for GlucoTab® exploitation has been launched.

IFP Energies Nouvelles is a French major research and training player in the fields of energy, transport and the environment.

www.ifpenergiesnouvelles.com

Joanneum Research is an Austrian RTO which focuses on application-oriented research and development projects to promote technology transfer into the economy.

www.joanneum.at

Innovative battery technology for more efficient electric cars

The cost and supply constraints of electric batteries are the most limiting factors for the wide scale introduction of electric vehicles. The current battery technology used in hybrid vehicles has reached a high maturity but also many limits. A new affordable and efficient generation of battery is needed to increase the use of greener energy storage and improve energy efficiency.

Innovation: EARTO member LEITAT is leading ALISE consortium, aiming to develop a new battery that will reach twice the energy storage of current technologies by incorporating nanotechnologies, chemistries and advanced materials together. ALISE will bring significant improvements in usability of hybrid and full electric vehicles with longer driving range, safer battery and longer battery life.

Impact expected: With mass production and by taking advantage of recycled material used in its development, the ALISE battery may be developed at competitive cost compared to actual technologies. **The battery should be integrated in a passenger car and tested on circuit by 2019 and sold on the market as of 2021, with expected sales of €150 million by 2023.**

LEITAT is one of the leading Catalan RTO bridging academic knowledge toward industrial market applications by adding technological value for both products and processes through industrial innovation.

ipo.leitat.org

Indoor positioning technology with high accuracy

With the affluence of smartphones and tablets, unrestricted mobility has become a key prerequisite today. But contrary to outdoor localisation, which is successfully dominated by the GPS technology, finding the accurate location of mobile devices indoors is a great challenge. The process must indeed be both cost-efficient and operational in a commercially viable timeframe.

Innovation: EARTO Member LIST developed the TILT System, allowing the indoor positioning of smartphones by using existing Wifi infrastructure without requiring access to the communication networks or needing any additional infrastructure. The technology uses the Wifi signal strength to build a reference map of the building in a drastically reduced time through the use of robots. Contrary to most similar market solutions with accuracy between 3 and 7 meters, the TILT System promises an accuracy of 1.5 meters for 90% of positions.

Impact expected: The indoor location market was worth $935 million in 2014 and is expected to grow by 36,5% by 2019. The targeted markets for this patented technology include planning and monitoring safety evacuations, finding spots in a parking lot or tracking skilled workers and equipment and reasigning them for higher productivity.

LIST is an RTO from Luxembourg conducting interdisciplinary and impact-driven research in the fields of materials, environment and IT.

www.list.lu

Innovative treatment for lung and skin infections

Infectious diseases account for millions of death worldwide and incur tremendous healthcare costs. The development of new antibiotics has dramatically declined over the last decades despite the huge clinical need due to the development of multidrug-resistant bacteria. **Only in the EU, 25.000 deaths each year are related to drug-resistant bacteria, while healthcare costs amount to at least €1.5 billion a year.**

Innovation: EARTO member SP develops innovative treatment for diseases such as lung and skin infections based on biodegradable antimicrobial solutions within the FORMAMP project. As a sustainable alternative to conventional antibiotics, FORMAMP will allow more efficient treatments and larger possibilities for local administration of antibiotics, thus reducing hospitalisation period and costs.

Impact expected: Efficient treatments via FORMAMP have the potential to dramatically reduce costs related to infections currently involving some 4 million patients in the EU. SMEs in the consortium are expected to grow in personnel and turnover by developing the first product prototypes. Due to the extensive timeframe of pharmaceuticals products and current regulatory requirements, European market launch is expected for 2028.

SP Technical Research Institute of Sweden is an RTO which develops, tests and evaluates technologies, materials, products and processes for national and international customers.

www.sp.se

Cable-driven handling system with smart crane

Robotization of production is one of the main solutions to lower manufacturing costs and keep Europe's production competitive. However, the use of robotic systems in industrial applications is often limited due to the fact that they are labour intensive, expensive and unsophisticated.

Innovation: EARTO member Tecnalia has developed CABLECRANE, a fully automated handling system based on a cable driven robot mounted on a smart crane. Thanks to this novel technology it is possible to fully control very heavy parts, handling and placing them with high accuracy. The CABLECRANE system has a wide range of applications, such as naval construction, civil engineering, aeronautics or nuclear industry.

Impact expected: CABLECRANE ensures handling and assembly time reduction by 50% for an increased productivity of 50% as well. Investment costs are reduced by 20% and work accidents by 50%. **The European market for production of cranes and related lifting equipment is worth €9.000 million per year. The CABLECRANE solution can cover 5% of this market which represents a potential market of €450 million per year. The commercialization of the solution is expected at the end of 2016.**

Tecnalia is a Spanish RTO aiming to transform knowledge into GDP by creating business opportunities for companies through multidisciplinary and applied research, improving people's quality of life.

www.tecnalia.com

Dynamic decision support for disaster management

Recent weather and nuclear disasters illustrate the need to respond rapidly and in a coordinated way to major emergencies. Fast assessment of the actual situation can help to put in place the right measures to protect people or reduce damage.

Innovation: SCCH, EARTO member through UAR, developed the INDYCO system, an integrated and dynamic decision support system for disaster management adaptable for a wide range of catastrophes. **Such system is based on machine learned and expert defined models and interpretation of sensor data.** It can react rapidly to changing situations, detect disasters in an early stage, inform emergency teams and handle new disasters for which no contingency plan exists.

Impact expected: The INDYCO solution's selling point is based on the integration of different information systems and a model with overall accuracy of 95% and easily adaptable to different types of disasters.
A marketable product could be developed by 2018 and about 300 INDYCO licenses could be sold in the EU between 2018 and 2024. Main target groups are fire brigades, control centers and governments worldwide.

Portable & automated inspection system for carbon composites

Carbon composite are cutting-edge materials used to make modern aircrafts, cars, or ships tougher while promising significantly better fuel efficiency, reducing environmental impacts. However, these materials are susceptible to internal impact damage such as holes, cracks and bubbles not visible with an unaided eye, and manual inspections are costly, time-consuming, and require skilled personnel.

Innovation: The Comp-Health Consortium developed a portable and automated inspection system for detecting critical defects in these new carbon composites. The aim is to launch a reliable, quick to deploy and cost-effective commercial product, providing 100% coverage on the inspection area with high detection sensitivity.

Impact expected: The primary market targeted by Comp-Health is the aerospace industry worth €25 billion in fabrication and inspection costs. **Such system will reduce both labour costs and inspection times by 75% compared to actual systems, which could save the aerospace industry €3 billion with a payback time of 3 inspections per airline. The expected time frame to market is about 2 years. A cumulative profit estimation of €12.7 million is expected over 5 years, for a return on investment of 353%.**

UAR Upper Austrian Research GmbH
scch software competence center hagenberg

UAR is an Austrian Association of RTOs promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

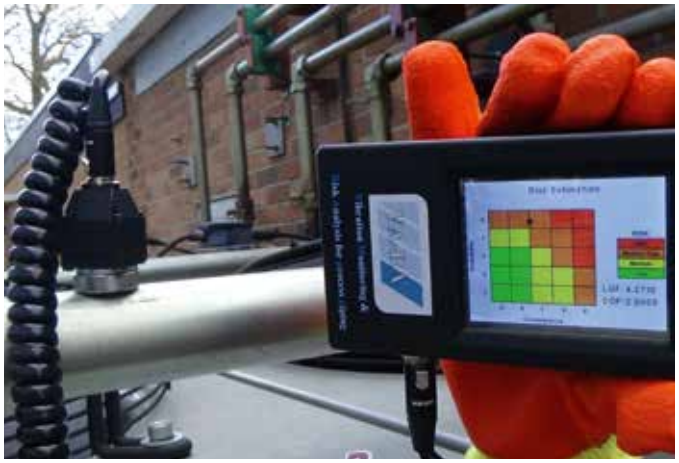
www.uar.at

TWI

TWI is a UK-based RTO specialised in innovation, knowledge transfer and in solving problems across all aspects of manufacturing, fabrication and whole-life integrity management.

www.twi-global.com

Vara: vibration assesment & risk analysis system for oil & gas pipework



With more than 95,000 oil and gas structures worldwide, the world demand for pipes is increasing. **The probability of a pipe failure can be high and it can have catastrophic effects if an explosion occurs or hazardous chemicals are released, while being very costly for the company.** It is necessary to ensure that appropriate safety management programs are in place.

Innovation: EARTO member TWI developed the VARAsystem which provides maintenance strategies with a link between vibration analysis of pipework and the likelihood of fatigue crack initiation. Low cost and user-friendly, VARA continuously collects and analyses data in real time, sending immediate warning when critical levels are reached.

Impact expected: VARA drastically reduces the risk of operational failure and the potential of major incidents due to vibration induced fatigue. **Potential savings from pipework failures and environmental impact are estimated at €14 million after 5 years.** The inspection market for oil and gas is expected to reach $10.2 billion in 2020. 800 VARA systems are expected to be in service in 5 years, providing historical data to predict maintenance operations.

TWI is a UK-based RTO specialised in innovation, knowledge transfer and in solving problems across all aspects of manufacturing, fabrication and whole-life integrity management.

www.twi-global.com

Solaroad: the road of the future

In order to reach its sustainability targets, Europe needs to embrace every option to generate renewable energy. Solar panels installed on roofs provide a good alternative but in many countries such energy production is not enough to cover energy demand.

Innovation: A consortium initiated by EARTO member TNO developed SolaRoad, a road with integrated solar panels which can convert solar energy into renewable electricity. As safety must be ensured under all weather conditions, researchers developed a translucent, non-slippery and easy to clean road coating able to resist enormous pressure. The first pilot is being performed on a cycle path, but the SolaRoad has been tested to handle the pressure of a fully loaded fire truck.

Impact expected: The first generation of SolaRoad can create 75 to 80kWh electricity per square metre of road surface per year under Dutch climate conditions. Generation two is expected for 2017 and will be able to generate over 100kWh annually. This means that a 10m length of SolaRoad will generate enough renewable energy for an average Dutch household. By 2017, SolaRoad is expected to be applicable to bus lanes, streets in residential areas and parking places.

TNO, an independent RTO from the Netherlands, has some 3000 professionals who put their knowledge and experience to work in creating smart solutions to complex issues.

www.tno.nl

Virtual neurosurgical training simulator for treating aneurysms

The training of neurosurgical students is limited to plastic models, animals, cadavers or real patients under careful supervision. All these methods are both very expensive and need long preparations without the possibility to be reproduced. The lack of training possibilities has become a huge problem for neurosurgical education institutions, and with the emerging endovascular treatments, the need is growing.

Innovation: RISC Software, EARTO member through UAR, created Virtual Aneurysm, a virtual simulator that enables repeatable trainings of the neurosurgical procedure to treat aneurysms for young neurosurgeons. It includes aneurysm models based on real patient data, as well as a library of 50 different neurosurgical clips and real surgical instruments allowing realistic interaction with the different virtual tissues. The trainee can repeat the complete procedure as often as necessary and at different difficulty levels to reach the required skills.

Impact expected: The market for medical simulators is growing worldwide and interest in these new technologies for education and operational planning is increasing. Virtual Aneurysm has been sublicensed to a worldwide distributor for commercial distribution and a professional simulator is under development.

Renewable & recyclable bags made of wood fibre

The era of plastics has lasted for decades, causing considerable stress on the environment with adverse impact on human health and food chains. To face this challenge, renewable and easily recyclable alternatives to plastics are needed, especially in short lifespan products like carrier bags and packaging. The EU targets a 55% reduction in plastic bags' use by 2019.

Innovation: EARTO member VTT developed the Paptic bag. **Made of a novel wood fibre based material, it combines the recyclability and renewability of paper with the resource efficiency and functionality of plastics.** The patented Paptic technology can be 100% bio-based and its production process is more energy-efficient than that of kraft paper. Strong and pocketable Paptic bags can be re-used more than 10 times.

Impact expected: Established in 2015 and based on a €10 million research portfolio, VTT's spin-off Paptic Ltd targets sales value of €60 million in 2018, equivalent to replace 1.5 billion plastic bags. Commercial market entry was done in June 2016 and discussions with over 20 European companies are ongoing. Very versatile, the Paptic material can be further developed in a multitude of plastic replacing applications.

UAR Upper Austrian Research GmbH — RISC Software GmbH

UAR is an Austrian Association of RTOs promoting innovative solutions at the crossroads where fundamental research meets applied research and offering businesses access to high quality R&D.

www.uar.at

VTT

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