EARTO INNOVATION AWARDS 2017

EARTO
IMPACT DELIVERED

European Association
of Research and Technology Organisations

Technology for a better world - www.earto.eu

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EARTO INNOVATION AWARDS 2017

From the lab to your everyday life. RTOs innovate to improve your health and well-being, your safety and security, your mobility and connectivity. Their technologies cover all scientific fields. RTOs are non-profit organisations with public missions to support society. To do so, they closely cooperate with industries, large and small, as well as a wide array of public actors. The innovations presented in this brochure give a flavour of their work. They include real life examples which illustrate RTOs' focus on solving real-world problems and addressing today's challenges! The EARTO Innovation Awards are given since 2009.

NUMBER OF APPLICATIONS SO FAR

183 REPRESENTING

42 RTOs IN

20 COUNTRIES

NUMBER OF WINNERS SO FAR

33 REPRESENTING

14 RTOs IN

10 COUNTRIES

Impact Delivered Category

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

The award competition is adjudicated by an independent jury, which in 2017 comprised:

Peter Dröll
Director, DG Research & Innovation,
European Commission

Simon Edmonds
Director,
Catapult Programme,
Innovate UK

Christian Ehler
Member of the
European Parliament

Carlos Härtel
CTO & Chief Innovation Officer,
GE Europe

Jana Kolar
Member of the Governing Board,
EIT

Francisco Marín
General Director,
CDTI

Unni Merete Steinsmo
Corporate Advisor,
SINTEF

IMPACT
DELIVERED

FIRST PRIZE

INDUSTRY IS GETTING SMARTER
TECNALIA

AURA MANAGES OVER
65m
RAILWAY WHEEL MEASUREMENTS
AND
≈10,000
WIND TURBINES,
WITH AN INSTALLED CAPACITY OF OVER
10GW

IN THE WIND ENERGY SECTOR:
AURA DETECTS FAILURE UP TO
1.5 years
IN ADVANCE

IN THE WIND ENERGY SECTOR:
AURA REDUCES WIND TURBINES' DOWNTIME BY
74%
LEADING TO SAVINGS OF
≈2,000/MW

IN THE RAILWAY SECTOR:
AURA OPTIMISES THE MAINTENANCE OF TRAIN WHEELS,
IMPROVING THEIR LIFETIME OF UP TO
30%

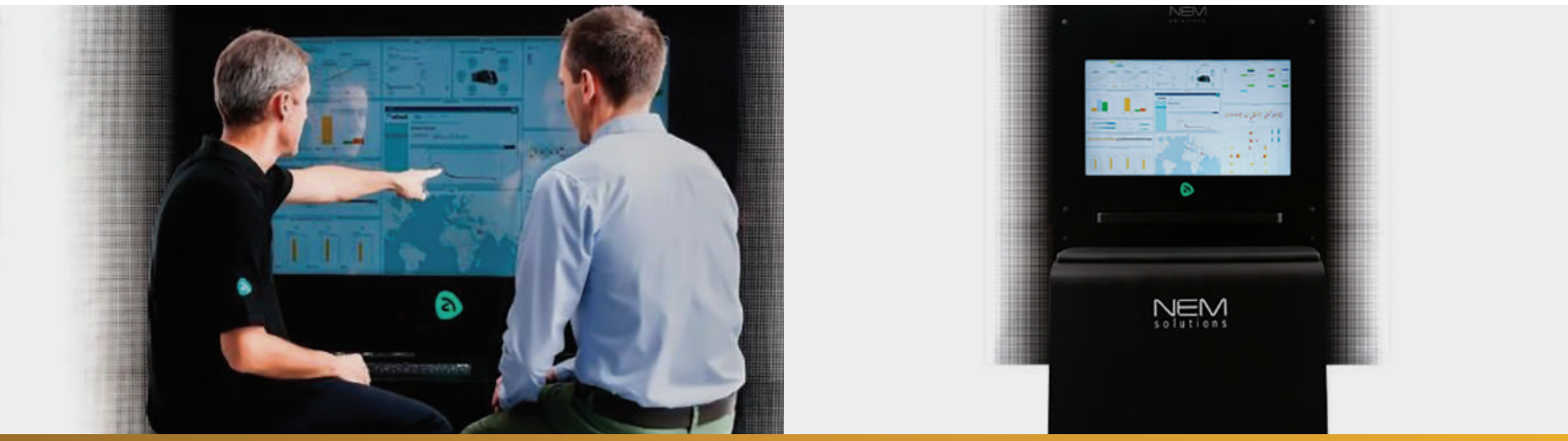
Tecnalia is a Spanish RTO aiming to transform knowledge into GDP by creating business opportunities for companies through multidisciplinary and applied research, improving people's quality of life. Experts of more than 27 nationalities, in 22 headquarters all over the world, visualise, identify and develop comprehensive technological solutions with creativity and imagination for more than 4,000 clients.

tecnalia Inspiring Business

www.tecnalia.com

Making sense of Big Data to plan predictive maintenance strategies

Big Data has the potential to utterly transform our society. Applying big data to the industry offers many opportunities to maximise productivity and competitiveness at global scale. That is what the AURA Technology sets out to do by using Big Data to predict the expected behaviour and detect future failure of the key assets of a company, such as wind turbines. Based on operational data generated by 10,000 wind turbines, AURA enables wind energy companies to plan predictive maintenance strategies and decrease the operational and maintenance costs linked to unplanned shutdowns or energy loss, leading to savings of up to €2,000/MW. This helps making wind energy more competitive, increasing its share in the energy mix. In the railway sector, AURA predicts future failure and prevents accidents while optimising the maintenance of train wheels, improving their lifetime of up to 30%. In short, AURA helps companies make better decisions for the continuous improvement of their business.



AURA Technology uses Big Data to predict the expected behaviour and detect future failure of the key assets of a company, such as wind turbines in the energy sector, or train wheels in the railway sector.

Reducing costs by predicting maintenance needs

Asset owners are increasingly seeking cost reductions in the operation and maintenance of their assets, such as wind turbines or train wheels. For this, operators need access to data to make both good diagnostics and prognostics. Diagnostics today come as a standard feature in the industry and are seen as a mature field. However, forecasting is still at early stages of development and fragmented. Besides, owning assets from multiple vendors is common, while the control and hardware monitoring systems embedded in the assets are unique to each vendor and mostly presented in a way that has a little analytical use. This is where the need for multi-brand monitoring and analytics solutions arises.

Maximising the productivity of your assets

Through their spin-off NEM Solutions, EARTO Member Tecnalia developed the patented AURA technology with the objective to take Operations & Maintenance of such assets to a higher level. It uses advanced BigData solutions for future asset behaviour projection especially in the Railway and the Wind Energy Industry. AURA is able to model the normal behaviour of main subsystems of an asset, offering detailed information of its condition in real time via a smartphone application, to quickly identify those which require attention. Thanks to algorithms developed in-house by NEM Solutions, it is also able to detect any deviation of the behaviour that can represent a failure before it even occurs.

Revolutionising asset management with high impact

Therefore, AURA considerably reduces assets' downtime thanks to a better maintenance planning minimising energy loss and reducing the repair costs. The innovation is already deployed and recognised as one of the most advanced technologies in the market regarding failure anticipation and business management, both in the railway industry and in the wind energy sector. The solution manages over 65 million railway wheel measurements from Metro Beijing to Metro Los Angeles as well as around 10,000 wind turbines. In May 2016, the wind energy company Gamesa acquired 50% of NEM Solutions, the remaining 50% belonging to the train manufacturer CAF, both in the top 10 of equipment manufacturers in each market.

IMPACT
DELIVERED

SECOND PRIZE

TOWARDS AN INTERNET OF COWS?

UAR – LCM

THE EAR MOVEMENT PATTERN ALGORITHM HAS BEEN DEVELOPED USING DATA FROM
≈27,000
CATTLE WITH EAR TAGS

SMARTBOW'S SHARE OF EXPORTS IS
≈98%

WITH A CURRENT TOTAL OF
35
EMPLOYEES,
SMARTBOW GENERATES ANNUAL REVENUES OF
€35m

WORLDWIDE POTENTIAL OF
≈250m
DAIRY COWS AND
1m
CATTLE
ALL THAT COULD BE EQUIPPED WITH THIS EARTAG

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.

Linz Center of Mechatronics GmbH (LCM) is an Austrian RTO for applied mechatronics research enabling the production of prototypes and small lot sizes. One of LCM's shareholders are the UAR.

Smartbow is the project partner of LCM.

UAR Upper Austrian Research GmbH

LCM Linz Center of Mechatronics GmbH

SMARTBOW YOUR COWS. YOUR BUSINESS.

www.uar.at – www.lcm.at – www.smartbow.at

Monitor your cows' health and location from your app!

Is a cow in heat, suffering from a stomach ache or might she become ill? For many years, different systems have been used to monitor the activity of cows and detect heat, mainly using foot or neck tags. With its partner Smartbow, the Linz Center of Mechatronics, EARTO member through UAR, has developed EARTAG, an innovative software linked to sensors not only able to capture the position of the animals, but also to analyse their health status. For this, the positional change of the animals as well as the movement of their ears are recorded to determine typical behavioural patterns by means of algorithms. The Smartbow's eartag can be used simultaneously for official animal identification and behavioural monitoring. It allows customers to recognise germinating diseases and the initial mating behaviour of their animals several days earlier than what is possible today. As a result, veterinary treatments can be improved and optimised, enabling a reaction in time to avoid expensive medications or even disposals.

EARTAG is an innovative software linked to sensors able not only to capture the position of cows in the fields, but also to analyse their health status.

Using an app to locate cows

It is easy for many systems to recognise when a cow is not at the milking parlour, but locating this cow in a herd of multiple animals is quite a challenge and a heavy burden for farmers. With this smart eartag, animals that need to be inseminated or treated, or the ones that have not yet been to the milking robot, can be located much faster via a simple app. This required pushing the tag design all the way to the limits set by the geometry and electrical principles to miniaturise the electronics. The tracking chips in the eartag transmit blinks to base stations attached in the field. An algorithm then takes data from at least four of these stations to calculate the exact position of the cow.

eHealth for cows

In addition to position detection, the eartag provides data about the health of the animal. This is done by an acceleration sensor and an algorithm for detecting ear movement pattern. The software records data such as a cow eating less, lying down less frequently, or walking more, and sends alerts in case of sudden and longer-term changes. This allows early recognition of digestive disorders, or metabolic diseases, and early detection that the cow is in heat. This leads to improved veterinary treatments and better inseminating results, shorter calving intervals and higher milk yield with less work effort for the farmer. It also provides more time for the farmer for other tasks.

Targeting worldwide commercialisation

The eartag is already produced by Smartbow GmbH and sold directly to farmers in Austria and Germany, with cooperations with various sales partners in Europe and the US. Around 250m dairy cows and 1m cattle worldwide could be equipped with this eartag to continuously control their location and health status and recognise diseases and mating behaviour earlier. Through the cooperation with Zoetis, a worldwide market penetration will be sought in the coming years. With a current total of 35 employees, Smartbow generates annual revenues of €35m, and the share of exports is approximately 98%. The collaboration between LCM and Smartbow will continue to develop new functionalities.

IMPACT
DELIVERED

THIRD PRIZE

3

IT'S SO SWEET TO GO SUGAR-FREE!

TNO

THIS INNOVATIVE CAKE CONTAINS
20%
LESS CALORIES
THAN TRADITIONAL CAKE
AND NO ADDED SUGAR

THE TOTAL VOLUME SOLD WAS
1,335 tn
AND AROUND
2.5 m
CONSUMER UNITS

THE HOUSEHOLD PENETRATION REACHED
13%
AND MORE THAN
1 m
HOUSEHOLDS BOUGHT THE PRODUCT

ROYAL PEIJNENBURG
EXPECTS TO GROW TO
A PENETRATION OF
25%
AND A VOLUME OF
3,000 tn
IN 2020 FOR THE PRODUCT

TNO, an independent RTO from the Netherlands, has over 3,000 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 3,000 industrial partners around the world, including SMEs. TNO focuses on 5 domains: healthy living, industry, energy, urbanisation, and defence, safety and security.

TNO innovation for life

www.tno.nl

An innovative solution to make delicious cakes with no added sugar

Obesity, diabetes and cardiovascular diseases dominate the costs of healthcare in our western societies. The increasing consumption of snacks between meals is one of the causes. The food industry is challenged to develop healthier concepts for these types of snacks, usually using a reformulation of food products by gradually reducing the salt and sugar content. But this is not enough to achieve the reductions needed. To reach such goal, TNO and Royal Peijnenburg, gingerbread maker since 1883, jointly developed a tool that uses the molecular properties of different sugar and sweetener ingredients to predict the essential quality features of bakery products. This tool is instrumental to product developers who first define specific requirements with respect to quality and composition, enabling more precise product development and significantly speeding up the innovation cycle. Such effective guidelines enable to make great tasting cakes without any sugar added.

TNO and Royal Peijnenburg developed a tool that uses the molecular properties of different sugar and sweetener ingredients to predict the essential quality features of bakery products.

Innovating to make food healthier

A healthy snack should contain less than 110kcal per portion and less than 20gr/100gr added sugar, but hardly any of the snacks currently in the market meet these two criteria. To reach that goal, the food industry usually uses a reformulation of food products by gradually reducing the salt and sugar content, adapting recipes to contain 5 to 20% less sugar and salt. However, reaching beyond 50% reduction often results in a significant depreciation of the product quality. To counter this, new insights into the functionality of the different ingredients that make up the food are required. However, for complex food formulations, describing the interactions of the different ingredients is not easy.

From sugar to food quality

To create a generic tool, EARTO member TNO and Peijnenburg realised that more basic knowledge was needed to better predict the quality changes that result from reformulating cakes' composition. Using the full scope of a 3-year Public Private Partnership, TNO developed a patented physical model that uses the molecular properties of different sugar and sweetener ingredients to predict the essential quality parameters of bakery products. The model was also converted into a practical tool that calculates proto-recipes on the basis of desired composition and quality. This tool is instrumental to product developers who first define specific requirements with respect to quality and composition.

The healthiest snack

With such tool, Royal Peijnenburg could develop a recipe for a good quality cake with no added sugar and 20% less calories. Selected as the healthiest snack in January 2016 by the Dutch consumer organisation, it is now regularly used by a large client base. The household penetration reached 13%, compared to 40% for the overall brand, and more than 1 million households bought the product. Royal Peijnenburg expects to grow to a penetration of 25% and a volume of 3,000 ton in 2020 for the product, with the objective to replace the traditional product. Royal Peijnenburg and their mother company Lotus continued the development work with TNO to extend the technology for their international product categories.

IMPACT
EXPECTED

FIRST PRIZE

LEATHER TANNING GETS CLEANER

FRAUNHOFER

IN EUROPE
26,000 EMPLOYEES
ARE WORKING IN
1,600 TANNERIES
WITH A TURNOVER OF
€16 bn

COMPARED TO CONVENTIONAL PROCESSING,
98%
OF CHROMIUM-CONTAMINATED
WASTE WATER
CAN BE SAVED,
REDUCTION OF PROCESS TIME
BY A FACTOR
5

THE PROTOTYPE PLANT
WILL HAVEA CAPACITY OF
10tn/batch
REACHING A PRODUCTION VOLUME OF
16,500tn/year

RETURN-ON-INVESTMENT WITHIN
1.5 to 2 years
PLAN TO BRING
5 to 10 plants
IN THE MARKET AT THE END OF 2018

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 annual research budget totalling 2 billion euros, 70% being generated through collaborative research with industry and publicly funded research projects.

Fraunhofer

www.fraunhofer.de

Using compressed CO_2 to tan leather without waste water

Leather is a high performance, high quality and natural material. It has unique properties, from high resilience, protection against water, the capacity to hold liquid from the inside or a high customer acceptance. The negative aspect of leather is its production, characterised by low efficiency regarding chemical usage. This is critical regarding sustainability, environmental-friendly processing and cost efficiency. EARTO Member Fraunhofer developed the CLEANTAN process, making it possible to tan leather with compressed CO_2, using chromium as tanning agent without having waste water. CLEANTAN is easy to integrate in running tanneries of small and large scale, and the return-on-investment can be realised within 2 years. 5 to 10 plants should be brought to the market by end 2018. Using the CLEANTAN technology can help save and even expand the tanning industry in Europe, for high quality leather production for shoes, automotive interiors, furniture and clothing, saving jobs and companies.

CLEANTAN process makes it possible to tan leather with compressed CO_2 without having waste water and is easy to integrate in running tanneries.

Making leather tanning environmentally friendly

In Europe, 26,000 employees work in 1,600 tanneries to produce 2,200km² of tanned leather every year with a turnover of €16bn. It is used in the shoe, the automotive, the furniture and the clothing industry. Over 90% of all leathers are produced by using 500,000tn of chromium sulphate as tanning agent, which makes processing easy for a high-quality product. Regarding performance and price, chromium tanned leathers cannot be substituted in the near future. However, the leather production process could be made more efficient and sustainable: a high amount of chemicals is lost in the waste water. There are ways to treat such waste water, but a more efficient solution would be to have no waste water at all.

Cleaner leather tanning process with high pressure

The main innovation of Fraunhofer's CLEANTAN process is the substitution of water by CO_2 at a minimum pressure of 30 bar. CLEANTAN is a combination of process innovations patented by Fraunhofer UMSICHT. To use just as much chromium as can be bound inside the skin, the water content of the skin itself is used to dissolve the tanning agent. The water is pressed out by conventional mechanical presses existing in every tannery worldwide. This processing and the special plant technology in lab, technical, and pre-industrial scale is worldwide unique. With its 1,700-litre volume and maximum pressure of 300 bar, the pre-industrial plant also enables a full carbon dioxide recycling.

From pilot to market

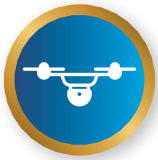
Compared to conventional processing, 200,000tn/year (40%) of chrome, 120,000tn/year (60%) of sulphate and 7bn litre/year (98%) of chromium contaminated waste water can be saved. Process time can also be reduced by a factor 5, from 15 to 3 hours. Fraunhofer gave exclusive license to a company using leather for consumer products, to build up and test a prototype plant and roll out the technology. The prototype will be built and operated in Europe by early 2018 with a production volume of 16,500tn/year. The plant cost in series production is about €500,000 while the cost savings can reach €700,000/year per high pressure plant, for a return on investment in a period shorter than 2 years.

IMPACT
EXPECTED

SECOND PRIZE

SECURING THE 21ST CENTURY SKY

VITO



THE TOTAL ADDRESSABLE MARKET
FOR DRONE-POWERED SOLUTIONS
IS ESTIMATED AT OVER
€110 bn
THE MARKET MATURITY
IS NOT EXPECTED BEFORE 2035

THE LONG-TERM SERVICEABLE OBTAINABLE
MARKET (SOM) FOR UNIFLY IS
€250-500 m

UNIFLY TARGETS
€750 k
REVENUE IN 2017
AND
€13 m
PROJECTED SALES VOLUME IN 2020

TARGET TO HAVE
2,500
PROFESSIONAL DRONE OPERATORS WITH
≈9,500 DRONES
AS PAYING CUSTOMERS
BY THE END OF 2018 AND
25,000
RECREATIONAL DRONE USERS
USING OUR FREE APP

VITO is a Belgium RTO in the areas of cleantech and sustainable development, elaborating solutions for the large societal challenges of today such as climate change, food security, resource scarcity, sustainable energy. With 750 highly-qualified employees, VITO provides innovative and high-quality solutions, whereby large and small companies can gain a competitive advantage.

vito
vision on technology

www.vito.be

A complete solution to manage air traffic in the drone age

Now affordable to the mass market, drone technologies are on their way to revolutionise our industries. Their popularity is on the rise and the total addressable market for drone-powered solutions is over €110bn. This rise will require significant changes to legislation and the development of new platforms to allow safe integration of this emerging drone technology into our lives. Just as the regulatory authorities use the Air Traffic Management (ATM) systems for the safety and security of the manned air travel, there is a pending need for drone air traffic management platforms in the low-altitude airspace. To fill that gap, EARTO Member VITO developed UniflyUTMS, the world's first complete aerial Unmanned Traffic Management Solution. The UniflyUTMS platform connects official entities with operators to integrate drones into the air space safely and securely. It combines several data to validate and manage the flights in real-time, enabling the integration of drones into existing aviation systems to ensure the safety and fluent integration of both in innovative markets.

The UniflyUTMS platform connects official entities with operators to integrate drones into the air space safely and securely.

How to ensure safety in our sky?

The impact of drones in our lives is increasing. Traditionally, air travel has been occupied only by manned aerial vehicles and has been very safe. This safety is largely due to a worldwide accepted set of rules, as well as assistance in all flight stages by interoperating air traffic management systems, which include many functions such as air traffic control or aeronautical meteorology. The drones are not included in the current ATM systems: their flights are not controlled, navigated or managed. With the rising drone market and the growing chance of conflicts between manned and unmanned traffic, which could potentially lead to accidents and deaths, concern for the security of our airspace rises.

Avoiding conflicts between drones and airplanes

VITO developed UniflyUTMS, the world's first complete drone air traffic management solution for all stakeholders who fly drones or control airspace. Built to comply with the international standard for data exchange in the world of air traffic management, UniflyUTMS is the first system enabling the safe integration of drones into existing aviation systems. Drone users and regulatory authorities use tools like mobile apps, to interact with the UniflyUTMS Cloud system. Interfaces for data feeds are used to gather data from existing systems and databases. An open application programming interface (API) enables other manufacturers and system integrators to connect their applications to the UniflyUTMS.

Managing drone air traffic via an app

Unifly N.V. was established in August 2015 as a spin-off from VITO, as a front-runner in the development and implementation of the platforms for managing drone air traffic. To support its growth, Unifly received €1.2m funding in 2015 and another grant of €5m in 2016, involving foreign investors. Europe is an excellent initial market as more than 15 countries have already established drone legislation. In 2016 the free app UniflyLaunchpad was being used by more than 700 drone users, and 10 professional drone operators as paying customers. The target is to have 2,500 professional drone operators as paying customers by the end of 2018 and 25,000 recreational drone users using the free app.

IMPACT
EXPECTED

THIRD PRIZE

GREEN CHEMICALS OF THE FUTURE

VTT

THE TOTAL WORLDWIDE AROMATIC HYDROCARBON MARKET IS
95 m tn
CURRENTLY WORTH
€ 55 bn
WITH A GROWTH RATE OF MORE THAN
4%

THE TECHNOLOGY HAS A NEARLY
20%
MASS YIELD FROM BIOMASS,
WITH AN ESTIMATED MANUFACTURING PRICE IN THE RANGE OF LONG-TERM AVERAGE BTX MARKET PRICE

85-90% of BTX chemicals
ARE CURRENTLY PRODUCED FROM PETROLEUM AND PRACTICALLY ALL ARE BASED ON FOSSIL RAW MATERIALS

WITHIN
5 YEARS
THE CONCEPT SHOULD BE VALIDATED
AND THE PRIMARY COMMERCIALISATION ROUTE WILL BE CARRIED OUT BY A VTT SPIN-OFF

VTT Technical Research Centre of Finland Ltd is among the major research and technology organisations in Europe. Our research and innovation services give our partners, both private and public, all over the world a competitive edge. We pave the way for the future by developing new smart technologies, profitable solutions and innovation services. We create technology for business – for the benefit of society.

www.vtt.fi

Making industrially viable bio-chemicals out of wood & waste

Particularly demanded, BTX chemicals – benzene, toluene and xylene – are the building blocks for a wide range of products of our everyday life, such as plastics, fuels, medicines and paints. These chemicals are now based on fossil raw materials like oil, contributing to CO_2 emissions, oil depletion and local environmental issues. Demand is rapidly growing for chemicals generated from renewable sources, creating a need for alternative, environmentally-friendly production routes. EARTO Member VTT has developed a new highly selective and competitive process to manufacture green BTX chemicals from lignocellulosic biomass such as wood, from wastes or even from captured CO_2, able to replace oil-based BTX. The process will alleviate the dependency on fossil raw materials in the chemical industry, while facilitating the efficient conversion of domestic biomass to valuable products and energy. This process is also flexible enough to be integrated into other industrial processes, like energy production or biorefineries.

VTT has developed a new highly competitive process to replace oil-based BTX chemicals by green-based ones manufactured from lignocellulosic biomass such as wood, waste or even captured CO_2.

Seeking alternative green production routes for high-value chemicals

Pure aromatic hydrocarbons, such as BTX, are one of the most sought-after chemicals, with a total worldwide volume of 95 m tn currently worth €55 bn. In the long run, the future of oil-based chemicals is threatened due to problems of oil availability, rising and highly volatile oil prices and environmental concerns. In the short run, the consumer pull is already there for green and sustainable materials. Chemical and pharmaceutical companies are actively looking for green solvents and renewable raw materials. Many companies are developing bio-BTX processes from biomass, but so far, no commercial processes or products were available.

From biomass to bio-chemicals to end products

The process developed at VTT for manufacturing bio-BTX offers a feasible route all the way from biomass to a wide array of green chemicals. Diverse non-food raw materials are transformed through a unique combination of different steps such as biomass gasification. The products are chemically identical to current BTX and can thus replace them directly and be mixed with them in any proportion. This very flexible process offers the most feasible opportunity to industrially viable, scalable and robust bio-BTX manufacturing. The benefits over other bio-BTX processes are product purity, high total yield from biomass to products, flexibility in raw material intake and products selection, and robustness.

Paving the way to commercialisation

By providing an alternative route to imported fossil raw materials, the process improves security of supply within Europe. VTT has been doing larger-scale development work in its Bioruukki piloting centre to demonstrate the industrial viability of the entire process. The technology has an estimated manufacturing price in the range of long-term average BTX market price. The bio-based BTX product has been further demonstrated in higher-value applications like paracetamol production. Within 5 years, the concept should be validated and the primary commercialisation route will be carried out by a VTT spin-off through technology maturation, licensing, piloting, and developing the next products.

IMPACT DELIVERED

Discover more innovations from RTOs'

From used vegetable oil to renewable low-carbon fuel

To implement the Kyoto Protocol and counter-act global warming, the EU aims to have 10% of the transport fuel come from renewable sources by 2020. However, the existing FAME technology for producing biofuel has many downsides, which can lead to engine problems. It is also costly to produce since there is little integration of biofuels production within the existing petroleum refineries and associated distribution system.

Innovation: Eni, EARTO member through AIRI, developed the Ecofining™ process together with its partner Honeywell. This new process uses hydrogen pressure to convert biofeedstocks like used vegetable oils or animal fats into a biodiesel that is fully compatible with petroleum fuel and free from the disadvantages of FAME. By adapting its Venice refinery to the Ecofining™ process, Eni converted it into a patented Biorefinery producing a new generation of high quality biofuels.

Impact Delivered: With this new process, Eni developed and commercialised a new diesel fuel, Eni Diesel+, with 15% of renewable components. Such fuel preserves the engine efficiency and contributes to reducing CO_2 emissions by 5% compared to the typical diesel fuel in the Italian market. It also enables to start the engine even at low temperature and reduces noise and vibration, promoting smoother driving. Besides, Eni developed a Green F76 fuel for the Italian Navy tested on ships in sea trials.

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

Revealing what the human eye cannot see with innovative infrared technology

By rendering infrared radiation visible, thermal-imaging cameras help humans see what their eyes cannot see, from leaking underground pipes and growth of plants to distant stars and galaxies. To achieve that, infrared detectors must be cooled down to cryogenic temperatures to reduce thermally induced noise. But that increases their size and cost, and in today's drive for miniaturisation in equipment and devices, there is strong demand for cooled infrared detectors that are both compact and energy efficient.

Innovation: In the frame of their joint laboratory DEFIR, EARTO-member CEA and its spin-off Sofradir, have developed infrared detectors that function at higher temperatures, thereby reducing both their size and power consumption. This advance was achieved without compromising the detectors' image quality and performance, making it easier to integrate them into systems such as drones or satellites.

Impact Delivered: The technology has been transferred to Sofradir for industrial production. This innovation is opening the way to many new industrial applications to identify toxic or poisonous materials – such as gas molecules – from kilometres away or assess food quality or photovoltaic panels during industrial process controls. A significant percentage of Sofradir new detectors incorporates this innovative technology. The DEFIR technologies are protected by more than 55 patents.

cea SOFRADIR Sensing your future

The Alternative Energies and Atomic Energy Commission (CEA) is a French government-funded RTO and a leading contributor to the European Research Area.

www.cea.fr

Wherever there are wires, WiN MS has the solution

Nowadays, electrical cables are needed everywhere and their length has been increasing, reaching 4 km in a car, 400 km in an airplane, and 5,000 km in a nuclear power plant. But wires can be subject to aggressive environments that can create defects or accelerate aging, which can have dramatic consequences and generate huge costs. Quickly detecting and locating cable failures is crucial, but it is also really difficult to do for very long and hard-to-reach cables.

Innovation: EARTO member CEA developed an original technology, and easy-to-deploy solution that can accurately detect and localise defects in real time, while requiring only one access point to the wire. WiN MS improves the best diagnosis method currently used, enabling the detection of soft defects and increasing the location accuracy to 1% of the cable length, even on very long cables.

Impact Delivered: WiN MS, CEA spin-off founded in 2012, brought this technology to market, particularly targeting the aeronautics and railways sectors. WIN MS is easy to customise and could also be integrating in many contexts such as cars, buses, trucks, heavy plant machineries, trains, or ships. The detection and location of defects are 4 to 5 times more accurate than in similar systems. It also improves the systems' safety and security, the maintenance processes, and the system's availability, reducing delays for end-users or passengers.

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

www.cea.fr

Rise of the robots in industrial manufacturing

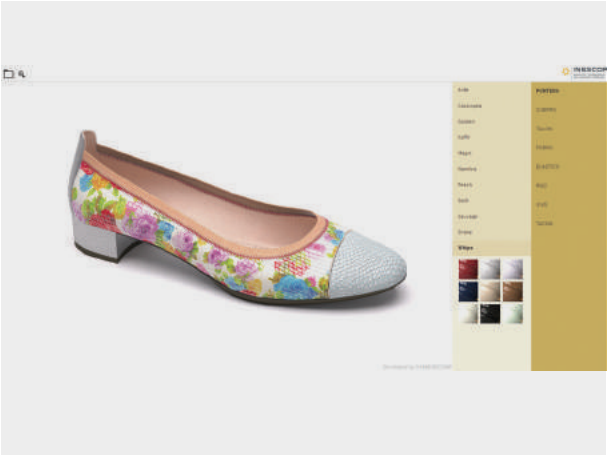
Driven by the global competition, the development of industrial robots is increasing rapidly. By 2018, their sales will grow by 15% every year. But average classical robots are prone to making mistakes as their accuracy is based on mechanical systems. And such errors grow exponentially with the robots' size. Therefore the manufacturing and repairing of large components of more than 10 meters long are still carried out manually today.

Innovation: AITIIP, EARTO member through FEDIT, developed MEGAROB, the biggest robot in the world using a laser tracker for very high level of accuracy. It is able to cover a large workspace by moving through a crane for manufacturing operations in medium and large complex components. A laser track continuously monitors the robot's position with 1,000 scans/second. The operations are controlled by a computer program and tailored to the project environment.

Impact Delivered: This multifunctional robot ensures accuracy, increasing industry's competitiveness by reducing time and production cost. It is flexible and scalable in size to fit other industrial facilities or applications. MEGAROB solutions are in the commercialisation phase. MEGAROB pilot line is currently running in AITIIP facilities and performing milling, drilling and polishing operations on large composite parts, achieving 0.3mm 3D accuracy in dynamic movements.

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

www.fedit.com



Design your own shoes

Companies constantly need to adapt to the changes of society. In the digital age, customers expect products to be customised. To this end, companies need to modernise their manufacturing process and diversify their product range, using for instance computer-aided systems. However, in the footwear sector, very few companies use such systems in an integrated and cohesive way, leaving some potential unexploited.

Innovation: INESCOP, an EARTO member through FEDIT, developed an innovative 3D design system, making it possible to integrate all the footwear production, from the pattern and piece design, through the validation of the virtual model and its materials, to the interaction with the end customer with a 3D photo-realistic online configuration tool to customise shoes, each pair being exclusively produced for each customer.

Impact Delivered: Thanks to this integrated platform, the designs made for the technical manufacturing of the footwear are the same that generate all the virtual content, making footwear production more accurate, shorter, more flexible, and less costly. Being easily adaptable and modular, many companies already use this system, and there are currently over 2,000 licenses distributed worldwide. For instance, one company achieved savings of about 10% in the materials used to produce one million pairs of shoes, with a production time reduced by more than 15%.

Fedit Centros Tecnológicos de España

INESCOP FOOTWEAR TECHNOLOGICAL INSTITUTE

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

www.fedit.com

Taking digital radio to the next level

Digital radio makes spherics and crackling interference in radio broadcast a thing of the past. New technologies from Fraunhofer make it possible for digital radio to replace analogue short and medium wave broadcasting around the world. Even local FM transmissions are being converted to digital, offering critically important advantages to radio listeners, manufacturers and broadcasters.

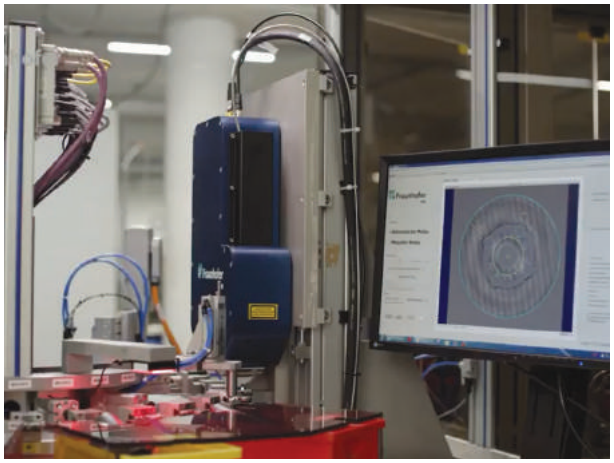
Innovation: EARTO Member Fraunhofer developed and helped standardise many important technologies contributing to the worldwide success of digital radio, from the latest audio coding used for the efficient transmission of audio content, to the data service Journaline, allowing on-demand access to thematically structured text content. Fraunhofer technologies also allow broadcasters to put digital radio programs on air easily, and manufacturers to cost-effectively develop radio devices.

Impact Delivered: By supporting all the major open digital radio standards in parallel with a common set of technology offerings, manufacturers can easily develop unified solutions for the world markets. Listeners benefit from the improvements provided by digital radio including superior audio quality and increased program diversity. In the future, with the worldwide rollout of digital radio and the resulting increasing receiver sales, Fraunhofer expects a continuing increase in revenue thanks to property rights licencing.

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



Inspecting the micro world with 3D holography

Precision and safety demands on machines and components are increasing, especially for high-tech industries such as aerospace, medical or automotive. Delivering a single faulty component can be very costly. However, 100% quality control of many important parameters is only feasible qualitatively. Precise, quantitative measurements are possible only for a small random sample. This is no longer sufficient for the very high demands of quality control for the digitalised production.

Innovation: The holographic 3D inspection system HoloTop developed by EARTO member Fraunhofer is the first system worldwide to measure surface topographies with precision into the micrometer range, fast and reliably. It uses 3D sensor with digital holography for fully automatic inspection of technical components. HoloTop measures the topography of surfaces with sub-micron precision, featuring 100 million 3D measurement points per second, and automatically detecting tiny defects even on complex geometries.

Impact Delivered: The technology has been integrated into production at Werner Gießler, a supplier of precision turned parts to the automotive industry. It provides verifiable data on each single component produced and leads to more efficient production, reduces costs and boosting manufacturers' competitiveness. It is the first system to enable 100% quality control of low-cost, mass-produced parts at production speed.

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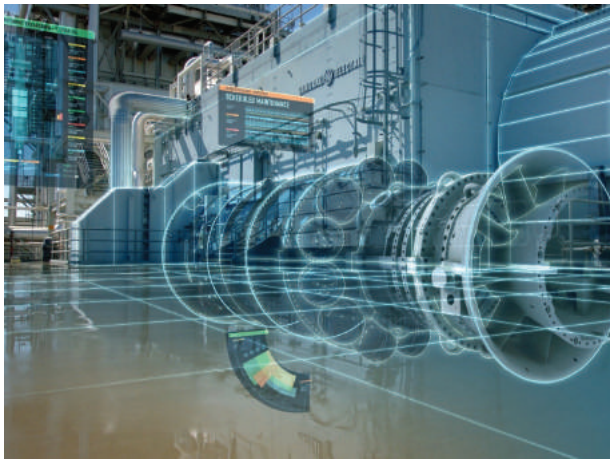
www.fraunhofer.de



Let's go digital to optimise energy production

To cope with Europe's ambitious climate and energy targets, the renewable generation of energy plays an important role. In 2015, renewable energy sources amounted for 15% of the consumption in Europe, and it is rising. However, most renewable energy sources are fluctuating and dependant on weather condition. A more balanced energy production and consumption is required, with the possibility to decide in real-time which energy mix of different renewable sources and convenional plants is most effective.

Innovation: DLR, EARTO Member via the Helmholtz association, developed with its partners cutting edge modelling technologies used by ABB for their online optimisation of renewable and conventional power plants. Such technologies enable to predict, select and distribute the energy power demand to a mix of renewable and conventional power plants, as well as power consumers and storages. It is combined with an online optimisation process to speed-up the start-up phase of conventional power plants, minimising fuel losses and fatigue.

Impact Delivered: 7.5% of Germany's electrical power production was controlled with this technique in 2016. The market for multi-domain physical modelling and simulation tools has a size of about 200-€300m/year. Tools in this market area can for example model and simulate control systems, electrical circuits, hydraulic systems, or power plants.

HELMHOLTZ ASSOCIATION DLR

Helmholtz Association is Germany's largest scientific organisation. It represents more than 38 000 employees working in 18 research centres across Germany.

www.helmholtz.de

Ultrasonic waves for safer energy power plants

Global energy demand is forecast to double in the next 25 years. In the EU, two-thirds of the electricity is generated by thermal power plants, including nuclear and fossil fuel, 70% of which are more than 30 years old. These ageing plants sometimes run at critical temperatures and pressures, increasing the risk of defect and potentially leading to power cuts and catastrophes with environmental and financial consequences. Existing pipeline inspection systems are limited to operate at ambient temperatures, and require planned service outages causing costly energy cuts.

Innovation: These issues prompted EARTO member TWI and Brunel Innovation Centre to develop the Hotscan System to continuously monitor the health of these thermal power plants, even at high temperature. Hotscan technology uses guided ultrasonic waves, which are able to propagate along the length of pipes. It makes it easier to inspect large and innaccessible areas of superheated steam pipes, ensuring early detection of pipe defects without power outage, reducing inspection time and costs.

Impact Delivered: This innovation enables to cut down operations and maintenance costs and increase the annual energy availability by ≈5% through reduction in downtime. When a 600MW plant owner decides to install Hotscan on their 4km network of pipes, they require 40 systems at a total cost of €2m, and the payback is within 3 years.

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

IMPACT EXPECTED

Discover more innovations from RTOs'

No more infections: sterilising medical devices with CO_2

About 4.1 million patients in Europe get infection during their stay at a hospital each year, leading to several thousand deaths. Adequate sterilisation of medical devices could considerably help prevent such infections. In Europe, 730,000 instruments need to be sterilised each day. However, many of these medical devices are too complex to sterilise using current technologies, due e.g. to a sensitivity to high temparture.

Innovation: In a CORNET project, EARTO member AiF developed with its partners from Austria and Germany a new low-temperature sterilisation process for medical devices, enabling fast, efficient and gentle sterilisation. It uses highly compressed CO_2 combined with additives to enhance antimicrobial activity. New nanocomposites were also developed to create new generations of medical devices with innovative properties compatible with CO_2 sterilisation and allowing shorter sterilisation times.

Impact expected: This technology will cut down the time needed for the sterilisation of medical devices from up to 10 days to only several hours and considerably reduce the risks for patients and staff. Beneficiaries of the innovation are professional reprocessing service enterprises. This branch comprises 176,000 companies in Europe of which 86% are SME with less than 50 employees. The estimated annual turnover is more than €300m, and time to market shall be 4 to 5 years.

Forschungsnetzwerk Mittelstand

The German Federation of Industrial Research Associations (AiF) was founded in 1954. The AiF promotes R&D in all industrial sectors on behalf of small and medium-sized enterprises (SMEs).

www.aif.de • www.cornet.online

New treatment for brain disorders on the way!

Neurological and psychiatric disorders are the diseases that come with the highest burden to individuals and society in Europe. Today, it is estimated that 1 billion people are or will suffer from any kind of brain disorder: from chronic pain conditions, to migraine, epilepsy, neurodegenerative diseases, schizophrenia or depression. The cost on a worldwide basis is calculated at €2,000bn/year, or €4m/minute. Despite such high human and monetary costs, innovations in the treatment of such diseases have been scarce, still leaving a cruel lack of effective therapeutic options.

Innovation: EARTO member CEA developed Therapeutic Booster, which constitutes a real paradigm shift compared to current treatments since it takes advantage of the strong interactions between neurons and their partner cells in the brain, called glial cells. CEA's idea is to improve brain disorder treatments by combining a neuron targeting drug with a glial cells targeting drug.

Impact expected: This innovation has the potential to completely revise the available treatments for a broad range of neurological and psychiatric disorders. Thanks to its industrial strategy and only 4 years after its creation, CEA spin-off Theranexus has been able to bring 3 drugs to the development stage. The most advanced is already studied in a phase II clinical trial, and should be registered in both the EU and the US by end 2022.

cea Theranexus

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

www.cea.fr

Disasters' management made easier

Disaster is a very common phenomenon throughout the world, causing widespread human, material, economic or environmental impacts, with serious disruptions for society. With new technologies, the force of disasters is changing. Enhancing location awareness in emergency management allows getting a better "picture" of what is happening, when and where.

Innovation: Rina Consulting and its partners developed the SPARTACUS system, relying on satellite navigation technologies to enhance location awarness of civil operations in crisis management. It enables to precisely track critical assets anywhere and anytime in real time, such as trains and trucks transporting dangerous or relief support goods or people helping on the ground during emergency situations. It provides continuous information updates and reliable communication channels, restoring communication in the field when traditional networks fail.

Impact expected: SPARTACUS integrates different technologies in a mapping portal which allows all actors involved during a crisis to have access to the same information. This unique feature improves the efficiency of operations while reducing the costs. The system is modular and is open to a wide range of applications. Time-to-market is expected in 3.5 years, even though some of the SPARTACUS solutions are already available on the market. SPARTACUS can target a market share of 50-€80m in the €2bn market for security applications by 2025.

RINA CONSULTING

RINA Consulting is the engineering consultancy branch of RINA, and provides a wide range of services to critical industry sectors.

www.rinaconsulting.org

Tracking wind conditions for more wind energy

Wind energy is developing at a fast pace: the size of wind turbines and wind farms is increasing rapidly. Operating in winds at increasingly higher level, wind turbines reach altitudes between 100 and 300m height, in atmospheric conditions that are relatively unknown. Wind measurements at these heights is expensive and unpractical, but knowledge of the wind conditions are crucially important for the power production of the turbines and for the mechanical loads these turbines experience.

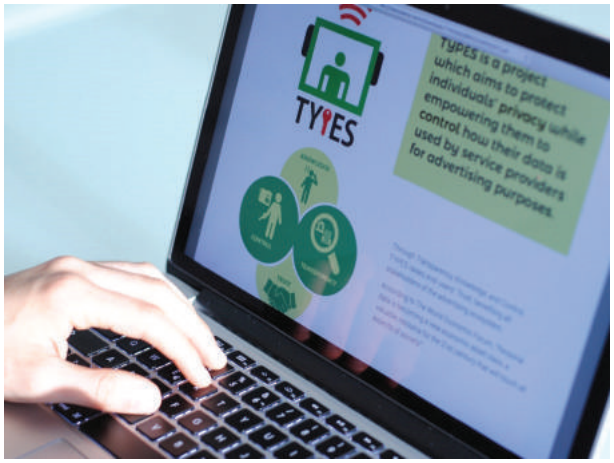
Innovation: Together with its partners, EARTO member ECN developed remote sensing wind measurement devices based on laser technology. Such sensors take measurements 24/7 and publish wind speeds from a range of altitudes from 0 to 300m height at ten minute intervals. The wind studies and multi-year measurements in particular provide reliable projections of the expected wind conditions for project developers. The measured data are published online.

Impact expected: Reducing uncertainty in the wind conditions reduces the costs of offshore wind farms considerably. It also increases transparency in the wind energy industry, leading to higher investor confidence and further reductions in the cost of energy of offshore wind power. ECN has installed several remote sensing wind measurement devices on various platforms in the Dutch part of the North Sea resulting in a considerable drop of the wind energy cost.

ECN
Your energy. Our passion.

The Energy Research Centre of the Netherlands (ECN) is the largest energy research institute in the country. ECN is active in joint projects with industry, government and research institutes

www.ecn.nl



Get control over your online privacy

Although online advertising generated €31bn revenue and more than 3.4m jobs in Europe in 2013, the lack of transparency on the users' data collected is creating increasing concerns. The online advertising market must integrate transparency and privacy preservation as fundamental principles, enhancing users' control over their personal data to keep their trust.

Innovation: EARTO member Eurecat and its partners developed TYPES, a new set of software solutions to protect individuals' privacy and rights and empower the users to control how their data are used by service providers for advertising purposes. Among the tools developed in the project's framework, TYPES includes a web-browser plug-in that informs users about who is accessing their data and protects them against privacy violation. The TYPES solution also includes tools explaining the value of online data and giving control over the personal data generated.

Impact expected: TYPES solutions will enable users to make informed decisions about whether or not to give away their data and what it implies. The tools will also make easier to verify if users' rights are respected online. These actions are targeted at making users re-gain trust online and stimulate a higher uptake of online services. TYPES is now being validated in operational environments by more than 4,000 real users.

eurecat
Centre Tecnològic de Catalunya

Eurecat is the main Technology Centre in Catalonia, Spain. Its multidisciplinary and multinational team of 600 professionals work in some 160 projects of applied R&D.

www.eurecat.org

New eco-shoes made by bacteria

Leather is a durable and flexible material made of animal skin and used to create various goods, like shoes. However, its fabrication presents several environmental issues, mostly due to the use of chemicals, the high water consumption, and the generation of waste. With the growth of the sustainable clothing market, companies look for ways to substitute leather for a material with lower environmental impact, while keeping its quality and physical properties.

Innovation: CTCR, EARTO member through Fedit, studies the use of biomaterials for textile production. The studies confirmed that the cellulose produced by bacteria has better properties than the cellulose from plants, and that it could be used as a substitute for leather. In the next years it is expected that the properties of the biomaterial will be enhanced to obtain better results and to be a competitive material against leather.

Impact expected: This biomaterial will enable the elimination of leather in the manufacture of footwear and its inherent environmental damage. This will result in an environment-friendly, sustainable and renewable bio-material with better physical properties than those of traditional materials. Final prototypes to test the new material in final products are expected in the next 5 years, with important potential to introduce this biomaterial in the market, with accessible production costs.

Fedit
Centros Tecnológicos de España

ctcr
CENTRO TECNOLÓGICO DEL CALZADO DE LA RIOJA

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

www.fedit.com

Smart food: is it fresh?

Worldwide, 30 to 40% of all food is wasted. In the EU that food waste amounts to about 180kg per person annually. Such food waste is not only unethical but also economically damaging, impacting each European household with ≈€1,000/year of losses. Up to 50% of that waste is caused by the misinterpretation of the expiration dates and can be avoided. Food is often still fresh and consumable past this date but disposed of anyhow.

Innovation: The Julich Centre, EARTO member through Helmholtz tackeled that challenge with the Is-It-Fresh technology. A printed ultra-low cost sensor technology, makes food packaging smart by measuring the product freshness via temperature, pH, humidity and other parameters and predicting the expiration date of the product based on these freshness parameters. A freshtag is integrated into the package and communicates wirelessly so that consumers can monitor the product freshness in real time through their smartphone or smart fridges.

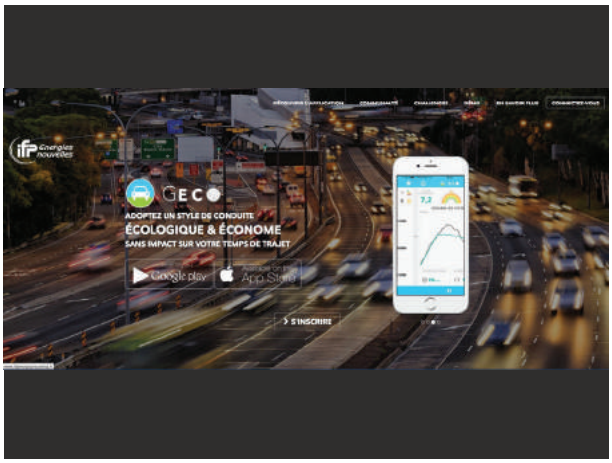
Impact expected: The digitalisation of the packaging industry will stop the enormous wastage of food in order of millions of tons by equipping products with freshtags. We estimate that up to 69% of the food packaging market or 2 trillion units are accessible to wireless freshtags. By integrating a chip into each package, it will also be possible to track a package and verify its origin, location and freshness history.

HELMHOLTZ ASSOCIATION

JÜLICH FORSCHUNGSZENTRUM

Helmholtz Association is Germany's largest scientific organisation. It represents more than 38,000 employees working in 18 research centres across Germany.

www.helmholtz.de



Smartphone app for a cleaner mobility

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 would contribute to decrease CO_2 emissions through improved driving behaviour and habits and foster the development of future standards and infrastructures.

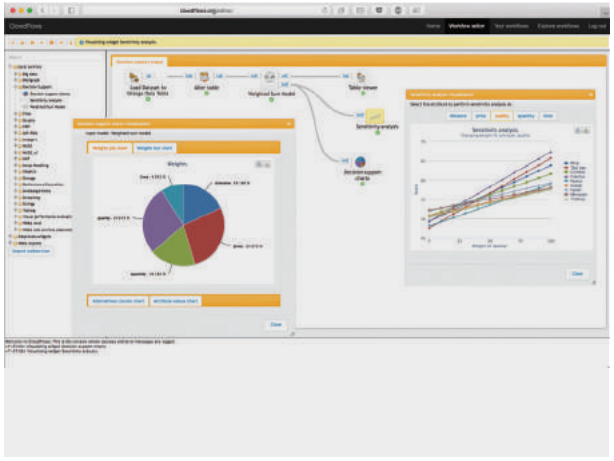
Innovation: To address a growing demand from society for more environmentally-friendly vehicles, EARTO member IFPEN developed an app, GECO Air, which measures how efficiently drivers perform. By coaching the driver in real time, GECO Air has demonstrated a reduction in fuel consumption of up to 14% and of pollutant emissions 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: Since the launch of GECO Air's predecessor in 2014, 18,000 users have travelled on 500,000km and 50 companies in the French Rhône-Alpes region have been involved. GECO Air has been launched in June 2016 and challenges will be organised to boost the deployment of the application, at the scales of companies, cities or more widely.

IFP Energies nouvelles

IFP Energies Nouvelles is a public-sector research, innovation and training centre active in the fields of energy, transport and the environment.

www.ifpenergiesnouvelles.com



Opening the doors of the big data world to SMEs

Big data analytics improve companies' competitiveness by allowing much better awareness of customers, markets, and business mechanics. However, the cost of contracting external consultants or hiring in-house analysts is beyond the reach of most SMEs, who account for 95% of EU's companies and contribute to 58% of the economy's gross added value. If SMEs had easy access to user-friendly analytics about the data they already collect, it could add as much as a 30% increase in European gross added value within the first two years.

Innovation: EARTO member JSI and its partners developed ClowdFlows, an open source web-based software platform for data analysis with an innovative business model. It has a radically simple and user-friendly interface ready to run in any web browser with common data analysis tasks pre-configured. If new types of tasks are needed, the company can post a "bounty" for the developer community to respond to, allowing the business to grow its capabilities without growing its fixed running costs.

Impact expected: ClowdFlows makes it easy for any SME owner to engage with business data analytics and derive value from their data to make their businesses more competitive. The company that is to be created to develop this innovation is projected to reach €1.6m annual turnover at year five, while helping EU businesses to realise an additional €409m gross added value/year.

IJS

The Jožef Stefan Institute (JSI) is the leading Slovenian scientific research institute, covering a broad spectrum of basic and applied research.

www.ijs.si

Breaking down barriers towards cheaper healthcare

Generic drugs are an attractive, cost-effective alternative compared to original drugs. Their use enabled to save $3bn per week in 2010 in the US. But approval is only given to a generic drug which is bioequivalent to the original product: containing the same active substance to the site of action. Contrary to most generic drugs, bioequivalence testing for dermatological drugs, administered to the skin, cannot be carried out through blood testing. For such drugs, only clinical endpoint studies are accepted, which are time intensive, expensive, and associated with a high risk of failure.

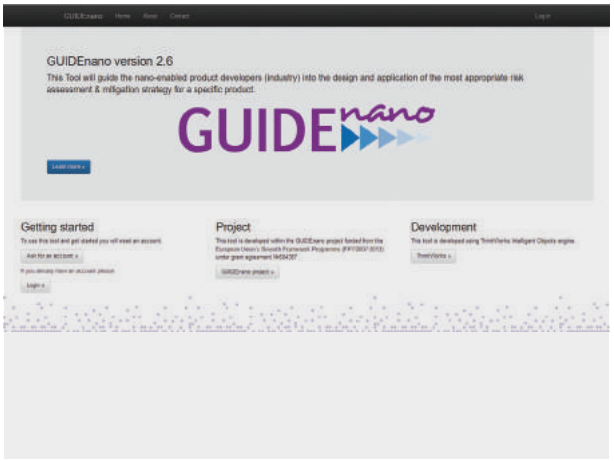
Innovation: EARTO Member Joanneum Research in cooperation with the US FDA developed the first general applicable method to effectively assess bioequivalence of generic dermatological products. A patented technology (OFM) was used to develop a sampling set-up that can measure the active pharmaceutical ingredient of a drug directly in the skin, enabling to assess drug concentration.

Impact expected: This new approach may reduce generic drug development costs down to less than 20% of the current costs and clinical study time to 8 weeks instead of 1-2 years. This will enable pharmaceutical companies to develop new generic drugs more effectively, leading to more affordable medication and a significant reduction in health care costs.

JOANNEUM RESEARCH

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



Using big data to analyse the risks of nanomaterials

Nanomaterials constitute a new category of materials used in society. The identification and mitigation of risks of these materials is crucial, and industries are required to ensure their safe during their production, use and end of life. However, a full risk assessment testing the multiple nanoforms of a material can be very expensive and time-consuming, especially if all data would have to be determined experimentally.

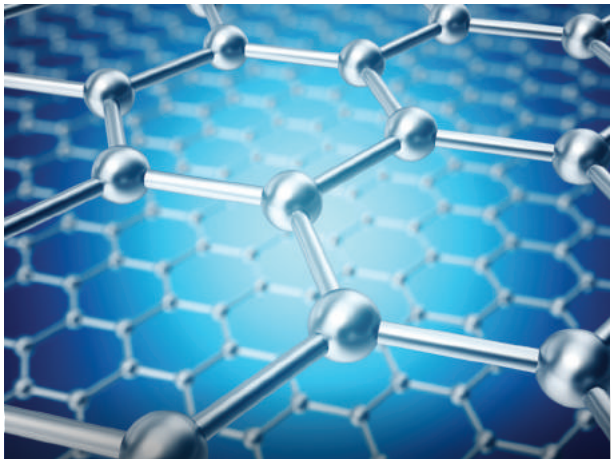
Innovation: EARTO member LEITAT and its partners developed a web-based risk assessment Tool, GUIDEnano Tool, a software for nanomaterial producers and users, to rapidly evaluate and mitigate the risks of nano-enabled products. It integrates a series of databases and advanced algorithms/models to provide support in the prediction of human and environmental risks, as well as, in the application of the most appropriate risk management strategies.

Impact expected: The use of GUIDEnano Tool allows the risk assessment to be made at lower cost and shorter time, which is significant for a company willing to ensure the safety of their nano-enabled product. This tool can help them optimise the developmental phase of a nano-enabled product and reduce the time to market. At a social level, this could help increase societal trust in nano-technologies. The tool will soon be finalised in its current version, which is meant to evolve, and be accessible to end users.

LEITAT managing technologies

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.

www.leitat.org



Harvesting the possibilities of the nanoworld

Today's researchers are intensively investigating the nanoworld in many science and technology fields such as material science, biology, physics, medicine or electronics. The investigation of complex micro and nano-structured samples poses significant challenges both in terms of microscopy and identification of chemical components. There is a pressing need for an imaging tool providing both excellent resolution and high-sensitivity chemical analysis at nano-level.

Innovation: EARTO Member LIST developed VECTOR^{500}, an innovative tool allowing for the first time the investigation of complex micro and nano-structured samples with a world record resolution of 10nm, which is 10,000 times smaller than a human hair and a 5 times better resolution compared to existing instruments. It also enables to identify and analyse the chemical composition of substances with innovative efficiency.

Impact expected: VECTOR^{500} can open new doors to understanding the fundamental questions of how material behave on the nano-scale. During a beta-tester phase, 5 VECTOR^{500} systems were installed all over the world, allowing better, faster and less expensive scientific studies. Within 1 year of operations, they have led to breakthroughs and applications which would not have been possible without it, in various R&D areas such as cosmetics, energy materials, biology, nanoparticles and geology.

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST

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

www.list.lu

Bringing wind energy from the ocean to the shore

Offshore wind farms are important contributors to reaching renewable energy and climate targets. However, their location offshore requires subsea transmission cables to bring the generated electricity to shore. At long distances, Direct Current transmission is commonly applied, but requires costly converter stations. Thus, to cut costs, there is industry interest in applying Alternating Current (AC) transmission also for longer distances, though implying higher electrical losses.

Innovation: EARTO Member SINTEF developed an innovative method to minimise such electrical losses by a system that controls the voltage depending on the offshore wind energy production. The voltage can be controlled through the transformers at each end of the cable, and their optimised operation can be precalculated and specified in a look-up table as a function of the wind farm output power to minimize the electrical losses in the long AC transmission cable.

Impact expected: This innovation represents a significant improvement relative to current industry practice. For a case of a large offshore wind farm connected 200km from shore with AC cables, **the innovation reduces the annual losses with one percentage-point** compared to the case of operating the cables at nominal voltage as per industry standard. This improves the economics of far-offshore wind farms and can result in their further deployment.

SINTEF

SINTEF is a broadly based, multidisciplinary research institute with international top-level expertise in technology, medicine and the social sciences.

www.sintef.no

Industrial chemicals go green

1.3-Butadiene (BD) is an important industrial chemical, crucial in the production of synthetic rubber. 70% of the more than 11 million tons per year worldwide butadiene production is used for manufacturing tyres. However, a BD shortage is expected because crackers are shifting from naphtha to lighter feedstocks in the ethylene manufacturing, making its price very volatile. The market is eager for reliable, competitive and sustainable solution to global BD supply.

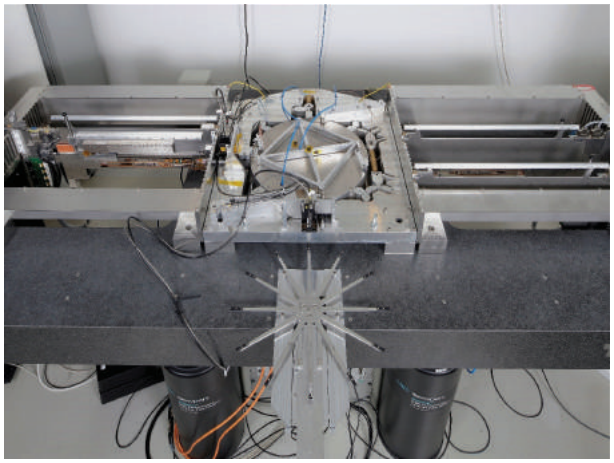
Innovation: EARTO member Tecnalia has developed a low carbon footprint patented technology to solve this scarcity issue by converting non-food lignocellulosic sugars into BD and valuable intermediates: acetoine, 2.3-nutanediol and methyl ethyl ketone, using a combination of fermentation, chemical and electrochemical technologies, together with economically feasible separation procedures.

Impact expected: This innovative bio-chemical provides a way for a more stable market and prices for butadiene, and promotes the shift from Petro-economy to Bio-economy. To carry out the development phase of such technology, Tecnalia together with the equity fund company, Kereon, founded a new deep-tech spin off, Biosyncaucho SL. A pilot plant scale-up has already been operated and the business development process is covered by an EIT grant. The construction of a demonstration plant is scheduled at the end 2018.

tecnalia Inspiring Business

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



Measuring the nano world at high speed

It is difficult to imagine the modern world without electronics. To achieve new functionalities, semiconductors will shrink to atomic scale dimensions, going below 10nm by 2018. In this context, the ability to accurately measure critical dimensions at atom scale has made Atomic Force Microscopy (AFM) an important research nano-instrument in several industrial applications. However, in most of the high-volume manufacturing applications, the single AFM is too slow to fulfill the industry needs in throughput and cost.

Innovation: Addressing this industry gap, EARTO member TNO developed a revolutionary technology, using multiple and miniaturised AFMs in parallel to measure many spots at once. The very high speed of each individual AFM scan head allows the user to measure those spots with the size of tens of micrometers, in only a few seconds. This means a significant breakthrough in AFM throughput of up to 750 times of current commercial AFM systems.

Impact expected: Building on this innovation the semiconductor equipment company Nearfield Instruments B.V. was established to develop, market and support metrology systems to the worldwide chip manufacturing companies. Not only will these systems further enable the development of even smaller, energy-efficient, capable chips but will also add to the strong position of Europe as the leading high-tech system supplier to the world.

TNO innovation for life

TNO, an independent Dutch RTO, has some 3,000 professionals who put their knowledge and experience to work in creating smart solutions to complex issues.

www.tno.nl

Ensuring pipeline safety with ultrasonic technology

Ensuring the structural integrity of pipelines is a key requirement in the oil and gas industry, particularly during the installation and maintenance of safety-critical structures. To carry out such pipeline integrity assessments, automated ultrasonic inspection techniques are commonly used. However, there are numerous inspection scenarios where these techniques fail to satisfy the needs of pipeline operators, like for instance complex pipeline geometry with specific angles of the pipes joints.

Innovation: EARTO member TWI developed Full Matrix Capture, a new ultrasonic inspection technique capable of generating high resolution fully focussed images of pipelines with high inspection sensitivity to small flaws. This technique increases inspection reliability across multiple pipeline geometries and significantly reduces inspection cost for industry. The inspection process is greatly simplified, taking away many of the setup and inspection complexities of existing techniques, with the potential to de-skill the task of the operator.

Impact expected: With trials ongoing, the successful validation of this technology would reduce the inspection costs per project from €0.4m to €0.15m, as well as halving the inspection period from 6 to 3 months. Guidelines on best practice are due for completion mid-2018, and the technology shall reach industrial acceptance and maturity by 2022.

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

How robots help building stronger and lighter planes & cars

Carbon fibre reinforced plastic is increasingly used in the aerospace and the automotive industry for its strength-to-weight ratio, achieved by the very high resistance of carbon fibres. The fibres need to be exactly aligned to fit the strength needed on specific parts, and a deviation of only 5° may reduce the strength by 40%. Such sensitivity can lead to excessive safety factors, lowering the expected benefits. More accurate and automatic measurement systems are needed, and could also enable automated production processes.

Innovation: Profactor, EARTO member through UAR, developed along with its partners an innovative sensor system combined with a robotic arm for automatically measuring fibre orientation on the whole surface of carbon fibre parts of complex geometry. The patented sensor's high speed allows automatic scanning with up to 1m/s, which is quick enough to enable industrial applications of inline quality control in the automotive and aerospace industry.

Impact expected: With this technology, industry can save ≈€400k within three years after the implementation of the technology. On an Airbus A350, the improved production processes would allow a 20% reduction in weight, which in turn would save 64k tons of CO_2 per year per plane. First implementations of the robotic measurements in the aerospace have already been made within 1 year after the end of the R&D project.

UAR Upper Austrian Research GmbH

PROFACTOR®

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.

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EARTO – European Association of Research and Technology Organisations

Founded in 1999, EARTO promotes Research and Technology Organisations and represents their interest in Europe. EARTO network counts over 350 RTOs in more than 20 countries. EARTO members represent 150,000 highly-skilled researchers and engineers managing a wide range of innovation infrastructures.

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