INNOVATION
PROJECTS

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INNOVATION PROJECTS

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1.

LARGE INTERNATIONAL PROJECTS

ITER
EUROPEAN SPACE CENTRE
LARGEST OPTICAL TELESCOPE IN THE WORLD
EMBRAER WING TESTS
CERN
IXV
PASSARO
MARS SAMPLE RETURN

ITER | CLEAN ENERGY

ITER is the largest scientific investment at present, in which ISQ takes part within its areas of expertise. It results from the international agreement between the USA, Japan, Russia, South Korea, China, India, and the European Union.

The ITER - International Thermonuclear Experimental Reactor project, with its estimated value of 20 billion euros, aim to build the first experimental nuclear fusion reactor in a Tokamak configuration, capable of generating positive energy output, thus demonstrating the scientific and technical viability of nuclear fusion as a source of clean energy. It will simultaneously test and enable the industry in the field of the technologies needed to operate a commercial reactor of this type.

ISQ is positioned as one of the few national first-line suppliers, cooperating with ITER ORG and F4E (Fusion for Energy) by providing services in training, inspection, testing, development of non-destructive testing technology, connection process engineering, and base engineering support services (design and analysis). ISQ's contract portfolio, including completed and ongoing projects, for ITER ORG and F4E totalled over 22 million euros as of May 2018.

The services already implemented and currently under way are all very important for final construction results, and are either: i) innovative (including basic design, engineering support, development of new technology or methodologies), or ii) aimed at ensuring a level of quality and specification compliance for manufactured products or components.

In the area of technological development, we can highlight nine projects in the field of non-destructive testing and welding solutions related to the machine's most important components (such as the Vacuum Vessel or Magnets). These works culminated in a four-year framework contract being awarded towards the end of 2016 for engineering services, establishing ISQ as a benchmark company in Europe in this field.

In the field of Quality Assurance and Control in manufacturing, ISQ is F4E's main partner by means of a framework contract that entrusts ISQ with the responsibility for monitoring the manufacturing of components made in the EU in plants across Spain, Italy, Germany, France, the United Kingdom, Finland, and China, among others. ISQ is also part of F4E's Quality Assurance teams.

EUROPEAN SPACE CENTRE

For around 15 years, ISQ has been providing Quality Assurance/Quality Control (QA/QC) services at the European Space Centre (ESC) in French Guiana.

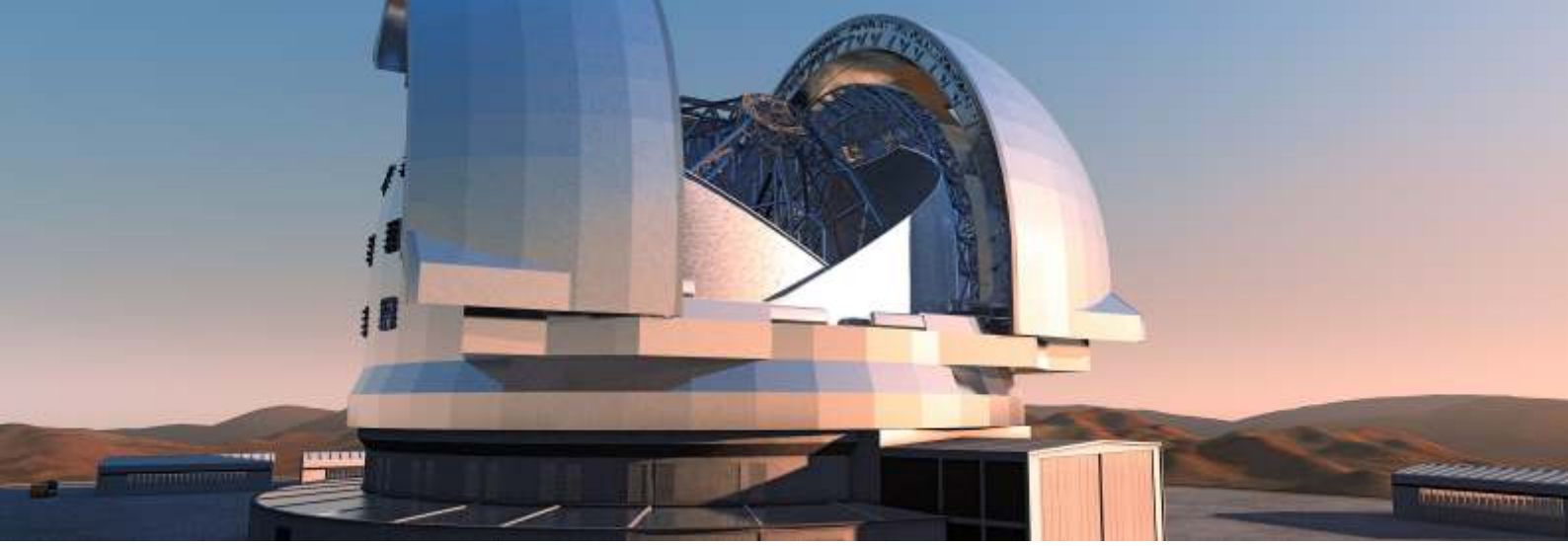
Many of ISQ's engineers working at the Space Centre are also experienced in other demanding projects, such as CERN (European Organization for Nuclear Research), ITER (International Thermonuclear Experimental Reactor), the European Southern Observatory, and the Petroleum Institute.

The partnership between ISQ and ESA, the European Space Agency, was also crucial in technology development, providing services in the fields of materials, inspection, testing, and measuring for ESTEC (European Space Research and Technology Centre). These projects are based on contracts for providing services in technology development.

Meanwhile, the Portuguese government decided to enlarge its participation in the ESA to the optional project dedicated to developing space vehicles of the future, the Future Launchers Preparatory Programme. This decision opened the door for Portuguese companies and academies to join the big European players developing the space vehicles of the future.

Today, ISQ still has a presence in French Guiana through a permanent team at the Kouru space base and has taken part in several European Space Agency projects. What started with one engineer now involves a team of seven people, with further growth in sight.

Portugal has all the conditions to grow in this sector and the work undertaken is recognized worldwide for its excellence.



LARGEST OPTICAL TELESCOPE IN THE WORLD

ISQ is involved in building the **European Extremely Large Telescope (E-ELT) at the European Space Observatory (ESO)**. It is the world's largest optical telescope, with a diameter of 32 metres, enabling it to capture images of a higher resolution than the Hubble space telescope. The E-ELT entails an investment of around 1 billion euros.

ISQ is a Quality Assurance consultant across the whole project and its involvement spans a wide range of activities. This includes support for building the quality system for each project core area and monitoring the manufacture of systems and subsystems.

ISQ's consultancy focuses specifically on quality and safety, quality system analysis and review resulting in improvement proposals that were largely adopted by the ESO (European Organisation for Astronomical Research in the Southern Hemisphere) and that are now part of the project's Tender Specifications.

ISQ's participation in building this telescope arose after a wider collaboration with the ESO in projects such as the VST Survey Telescope, the latest to be installed at the ESO's Paranal Observatory, designed to map the sky in visible wavelengths. The two organisations also collaborated in making the cryostats for the Atacama Large Millimetre Array - a state-of-the-art telescope that studies the radiation produced by some of the Universe's coldest objects, formed by 66 antennae and installed in Atacama, Chile.

ISQ has also collaborated in designing and supporting the implementation of a safety manual at ESO headquarters in Garching, Germany. Another highlight in this field is the contribution to the construction of the world's largest particle accelerator, CERN's LHC, during which 26 highly qualified engineers worked across 11 European countries over a period of six years.

ISQ's vast experience also includes taking part in inspecting the new cover for the Chernobyl plant, as well as a number of European Space Agency projects, namely the ARIANE rocket launcher.

EMBRAER WING TESTS

ISQ was in charge or designing and executing a number of tests **on a demonstration model for the structural part of a wing** (half-wing) made mostly of composite material. The half-wing was developed by Embraer and is for use on next generation commercial passenger aircraft. Embraer carried out ground tests on this half-wing at the ISQ Group laboratory in Castelo Branco.

The project included carrying out a number of static fatigue tests on the half-wing, dynamic and impact tests on composite panels and on the air structure, as well as materials inspection tests. Advanced non-destructive testing techniques were used, as well as preliminary mechanical and impact testing work.

This project required involvement from seven different areas of ISQ and from Optimal Structural Solutions, an engineering SME. The test preparation stage also included the participation of some metal metalworks companies.

From the outset, many tests have been carried out for both national and international clients in the automotive, satellite component and electrical equipment industries; Air Force aircraft device certification; military equipment and cold production units.

CERN | PARTICLE ACCELERATOR

CERN is the world's largest particle physics laboratory, located in Meyrin, Geneva.

The services provided by ISQ over the course of six years has involved work in a number of countries, namely: England, France, Germany, Spain, Portugal, and Italy.

The project involved the manufacture of components and assembly of the Cryo Dipoles to complete the 27 km of the Large Hadron Collider (LHC) accelerator ring.

ISQ's roles and responsibilities included reviewing the technical specification of the quality of cryogenic magnets; providing consultancy for organizing CERN's Quality Assurance System, including the control IT system, and monitoring inspections and tests to ensure traceability.

ISQ also conducted quality inspection for the manufacture of cryogenic magnets, including the different components (cables, superconducting magnets, cryostats and cryogenic components) and their installation at CERN and in the tunnel itself.

This project required the participation of 26 qualified ISQ engineers and inspectors from various fields, who together carried out over 200,000 hours of inspections and tests.

IXV

ISQ participated in the qualifying tests on the **heat shield for the IXV - Intermediate Experimental Vehicle** - **the european space agency's unmanned experimental vehicle** - developed to serve as a prototype spaceplane. Its missions consisted of: observation of the earth, satellite service in orbit, demonstration and validation of technologies in orbit.

ISQ carried out the development trials at its testing centre in Castelo Branco and also at its main laboratories in Oeiras.

The development of this mini spacecraft had strong Portuguese involvement almost from the beginning, with around 30 Portuguese engineers from ISQ who worked on the ablative (non-burning) heat shield, the main innovation in the IXV. This involved around 15,000 working hours and an investment of about EUR 2,000,000.00.

The main function of thermal shields is to protect vehicles from very high temperatures, such as those generated by the re-entry of a spacecraft into the Earth's atmosphere.

The implementation of the IXV is of great importance at the European level. On the one hand, it validates technologies for future use and, on the other, it reaffirms Europe's desire to maintain access to space independent of other world powers.

The aim of the launch was to test a whole range of technologies that ESA considers important to keep Europe at the forefront of space development.

PASSARO

The PASSARO project (Capabilities for Innovative Structural and Functional Testing of Aerostructures) was selected by Clean Sky 2 (Cs2)* as a Core Partner for this project. ISQ was one of the organisations responsible for coordinating the project with Airbus Defence and Space (ADS) in Spain. The project involves financing of 4.5 million euros.

The aim is to contribute to the development of multifunctional, intelligent aerostructures and the automation of productive processes and technologies linked to maintenance, structural health monitoring (SHM) and functional systems tests, using an Industry 4.0 approach. This technology will be applied to two specific life-size models - cockpit and wing - as part of the activities planned at ITD Airframe. It will contribute to the IADP (Innovative Aircraft Development Platform) of the Regional Aircraft of CS2.

The ISQ Group has a very active participation in this project, especially in the cockpit model, taking on the leadership of all activities related to Tests and Inspection, and takes part in developing the tools related to the ecological efficiency of production processes. It further intervenes in supporting the development of new composite materials and aerostructure solutions. The objective is greater impact and acoustic resistance, the safety of aircraft and their ergonomic comfort.

ISQ also collaborates in developing electromagnetic compatibility models at the materials level, and for the cockpit itself with a view to virtual certification in the future. Thus, the project includes the collaboration of various operational and developmental groups, namely the Materials Laboratory, the Non-Destructive Testing Laboratory, the Electricity and EMC Laboratory, Metrics, and the ISQ Group companies (dbWave and SO).

We highlight the size and significant complexity of the structural tests for the final assessment of these new materials, which are already included in the life-size model (a C-295 cockpit), which include acoustic testing, Bird Strike, Lightning Strike and EMC (electromagnetic compatibility) tests.

* the largest european program for research and industry leadership in the aeronautics industry

MARS SAMPLE RETURN

ISQ has completed a project for Mars exploration. This is a project developed for the European Space Agency (ESA), coordinated by Amorim, and involves the participation of ISQ, PIEP and Critical Materials. Under code name cTPS, the outcome has already been assessed by ESA and its objective was to develop the thermal protection system for a capsule that will bring samples of Martian regolith back to Earth for analysis.

A solution by Portuguese engineering that takes cork (a raw material that Portugal is a world leader in producing and transforming), adds engineering and innovation, and creates an atmosphere re-entry capsule that promises to be significant in new developments for space missions.

Portuguese engineering thus offers ESA a simpler solution, i.e., lighter (25% lighter than the maximum weight permitted), and guarantees a reduction in production costs.

The probe will launch after 2020, the mission will last around five years and will bring regolith (rock fragments) back from Mars.

The purpose of the two missions, Mars Sample Return (NASA and ESA) and Phootprint-Phobos Sample Return (ESA) is to send probes to Mars, collect regolith and then transport it back to Earth.

The aim of the project is to develop a thermal shield and shock absorption system for landing, to be incorporated in both missions. The work involved components of engineering, construction and testing of the working model of the thermal and shock protection for landing.

ISQ was in charge of development tests and final validation tests of the working model, carried out at its facilities in Castelo Branco.

2.

INFRASTRUCTURES

OECUSSE
25TH APRIL BRIDGE

OECUSSE

The ISQ Group was invited by the Timorese authorities to oversee the construction of the n**ew Oecusse - Timor Leste airport** which shall have a 2,500 metre-long runway, a passenger terminal and a cargo terminal. The project is valued at over 5 million dollars (4.206 M€).

The invitation extends to supervising construction of the new ferry to make the link between Díli and Ocusse and redesigning the passenger and cargo terminal, representing over 1.3 million dollars (1.093 M€).

This is a strategic project that includes road infrastructure, ports, airports, hospital facilities, basic sanitation facilities, energy distribution networks and telecommunications, which will help to attract quality foreign investment and long-term business initiatives.

Local authorities are committed to transforming the area into a special administrative region, creating a free economic zone and taking advantage of the natural resources the territory has to offer, in particular for tourism.

The ISQ Group will contribute its expertise and experience in supervising new works, including assessment during and after the warranty period, and ensuring delivery of the completed project.

25 TH ABRIL BRIDGE

ISQ has been working at **25 de Abril Bridge since 1988** and has been involved in all the technical inspections and projects for widening the roadway and installing the railway.

ISQ, in collaboration with the designer of the Bridge project and under guidance of the owner (GECAF), carried out the first large-scale inspection for assessing the general state of the bridge, essential for developing the roadway widening and railway installation project. The company assessed the general state of the bridge's anti-rust protection, inspected the main cable and suspensions, the brace pins for the cables and the submerged portion of the pillars.

It also monitored the works for installing the railway, widening of the roadway and general improvements to the bridge in all its aspects, including planning, cost monitoring and quality and safety monitoring.

ISQ was responsible for inspecting all elements comprising the bridge and access viaduct. ISQ's remit also includes monitoring the maintenance and conservation works needed to maintain function and safety of the Bridge.

3.

AEROSPACE

MICROSATELITES

MICROSATELITES

The Infante Project aims to demonstrate Portugal's capacity to design, build, integrate, test and operate a working model of a low-orbit microsatellite (altitude of around 500 km). This is a key project that will impact future plans. It involves an overall investment of 9.2 million euros over the next three years and will be in orbit in 2020. The project is approved by the National Innovation Agency and will be co-financed 60% by Portugal2020 and 40% by the consortium comprising 150 researchers from renowned Portuguese companies and research universities and laboratories.

The project is led by TEKEVER, supported by a group of organisations responsible for various work streams, including ISQ, Active Space Technologies, Omnidea, and others. Additionally, ten research and development centres at universities and research laboratories from around the country, connected to the aerospace industry, are involved, including ISQ, CEIIA, FEUP, FCT-UNL, INL, IPN, IPTomar, ISR Lisboa, IT Aveiro and UBI.

ISQ will be responsible for ensuring quality throughout the project; it will develop a quality assurance service for the assembly, integration and testing process of microsatellites. It will also be in charge of systems technology development tests.

This pioneering project will enable the process of manufacture and operation of similar constellations to be replicated during a second stage. It will be the first satellite to be fully designed and built in Portugal for earth observation with a special focus on maritime applications.

ISQ possesses has extensive experience in the aerospace and aeronautics industry. For over a decade, it has been developing quality assurance activities at the European Space Port in French Guiana, as well as taking part in processes for developing aerospace vehicle technology by carrying out tests, ranging from material studies to the qualification of technological systems and models.

4.

SMART CITIES

LIFE SWSS
SUREFIT
CLIMACT

SMART CITIES

ISQ has three mobile monitoring laboratories, or LABARs, to measure environmental air quality. These laboratories are fully equipped with analyzers that continuously measure the concentration of all pollutants listed in the current legislative framework.
These laboratories are a market benchmark, with technologically advanced equipment that remotely (via modem) collect results and detect deviations from normal operation.

ISQ also provides a service for initial diagnosis and evaluation of the city's performance under Standard ISO/NP 37120 - Sustainable development of communities – Indicators for city services and quality of life.
The indicators within Standard ISO/NP 37120 (Economy, Education, Energy, Environment and climate change, Finance, Response to fires and emergencies, Governance, Health, Recreation, Safety, Housing, Solid waste, Telecommunications and Innovation, Transportation, Urban planning, Wastewater, and Water and sanitation) provide a uniform approach as to what to measure and how.
ISQ uses a holistic and integrated approach to sustainable development that includes indicators for urban services and quality of life and indicators for smart cities and indicators for resilient cities. This methodology ensures a continuous analysis of the city's performance, allowing for more effective strategic planning and supporting decision making in the development of public policies and the definition of priorities, with the option of sharing best practices that have been implemented, as part of a policy of transparency towards citizens.

LIFE SWSS

Life SWSS – Smart Water Supply System – is a project led by ISQ that aims to demonstrate an innovative digital management and decision-making platform that through simulation, forecasting and optimization models, supports the operation of Water Supply Systems (WSS).

Water Supply Systems (WSS) are responsible for capturing, treating and transporting water to consumers over vast areas. It is crucial that this operation is carried out in a safe and efficient manner.

Their energy consumption means that these systems have a very high operating cost, which has a knock-on effect on the price of water and causes significant environmental impacts as a result of substantial energy consumption, greenhouse gases (GHG) emissions, and leaks.

With the challenge of improving WSS efficiency, the LIFE SWSS project aims to make them more efficient and optimized, contributing to both financial and environmental gain, since it reduces water losses, energy consumption (-15%) and greenhouse gas emissions.

The consortium of this project, includes ISQ partners are Águas de Portugal Group, ADP LVT/EPAL, Águas do Algarve (AdP), Instituto Superior Técnico (IST) and Hidromod.

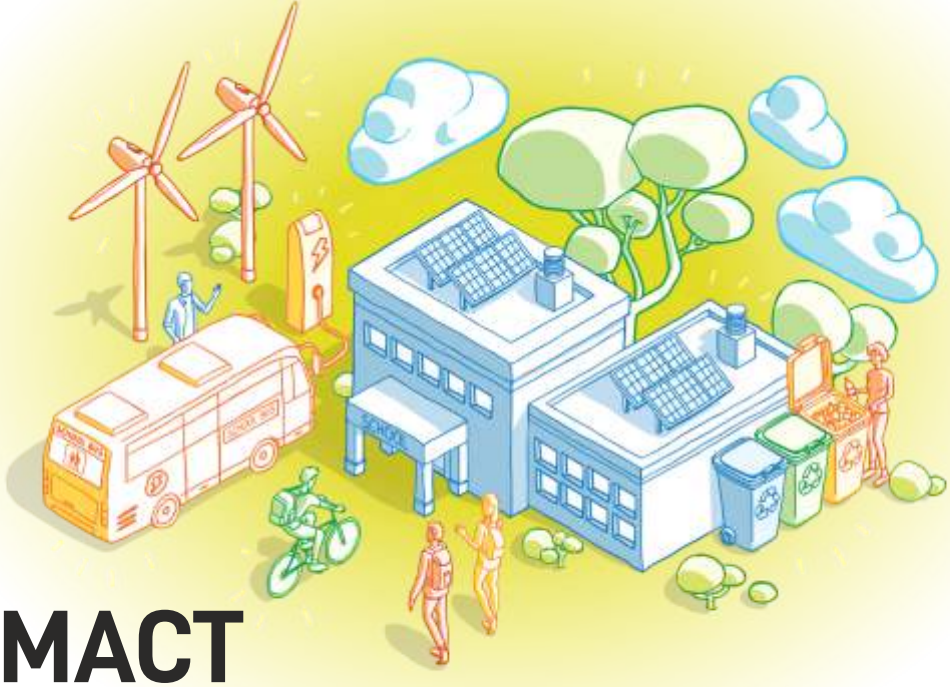
SUREFIT

ISQ is coordinating the recent approved H2020 Project "SUREFIT – Decarbonisation of EU building stock: innovative approaches and affordable solutions changing the market for buildings renovation" project.

With a global investment of 4 million euros, SUREFIT aims to enable European industries to pioneer the development of new, advanced building rehabilitation technologies. The main aim is to provide environmental and economical solutions that significantly reduce building energy consumption and CO2 emissions by proposing new business models, markets and job opportunities in a wide range of manufacturing, energy and construction industries in Europe.

The project will not only contribute to European excellence in combating energy poverty, but also to improving quality of life for its citizens, strengthening the European Union through collaboration between industries and academic and innovation institutions. This fosters complementary skills and encourages the training of young researchers.

Besides the project coordination, ISQ supports the development of technologies (heat recovery and evaporative cooling). Additionally, in conjunction with Mota Engil, ISQ will support the in-depth rehabilitation of the Portuguese pilot building located in the municipality of Mafra and develop a guide of good practices for the rehabilitation of buildings with a view to the future development of business models for different types and geographical areas in Europe, hoping to support the Green Deal recently published by the EC.



CLIMACT

ClimACT – Aimed the transition to a low carbon economy in schools, development of support tools – aims to promote the transition to a low-carbon economy in schools through the development of training tools and methodologies. At stake are the various domains of school sustainability, namely in the sectors of energy, water, indoor air quality, waste management, green purchasing, mobility and green spaces.

The project arises from the realization that in the regions covered by the SUDOE program (Portugal, Spain, France and the United Kingdom) schools operate in old buildings, with a low level of comfort and energy efficiency.

ClimACT assessed the state of the schools and develops tools that allow the transition to low-carbon energy. The project is supported by two Spanish entities and one from the United Kingdom and will be implemented in 35 pilot schools in Portugal, Spain, France and Gibraltar.

5.

INDUSTRY 4.0

SIM 4.0
SHIFT
LUBSYSTEC
PRODUTECH
HI2TRUST
MAESTRI
INDUCE 4.0
DRONES

INTELLIGENT MONITORING SYSTEMS

The ISQ Group is developing the **SIM 4.0 project, which aims to transfer scientific and technological knowledge of Intelligent Monitoring Systems (abbreviated SIM in Portuguese) to SMEs** within the Portuguese industrial network, specifically within three traditional target sectors: equipment goods, components and food agriculture.

The project's main purpose is to accelerate the ability of SMEs to adopt the i4.0 paradigm by transferring knowledge obtained while developing R&D projects at the national and European levels.

SIM 4.0, Intelligent Monitoring Systems, will provide tools that help to reduce information and knowledge gaps on the use of digital technologies in real contexts and traditional industries.

The project was presented with a number of generic workshops covering the paradigms and challenges facing industry in the 21st century, with a view to raising awareness of industry in general. Over the course of 2018, special sessions are planned in Portugal for the three target sectors of SIM 4.0.

COMPETE 2020 PORTUGAL 2020 UNIÃO EUROPEIA Fundo Europeu de Desenvolvimento Regional

SHIFT

SHIFT 4.0 is a pilot project, which resulted from a tool (i4.0 maturity diagnosis) developed by ISQ within the scope of the SIAC – SIM4.0 project. This tool is promoted by IAPMEI (the Portuguese Agency for Competitiveness and Innovation) and, together with several national entities of the Scientific and Technological System and Technological Centers, it enabled the evaluation of over 100 SMEs from different sectors and regions. The SHIFT 4.0 tool makes a diagnosis the company's i4.0 maturity status and produces guidance on the initiatives to be promoted to increase its maturity. The tool can be used in auto mode, automatically issuing a report at the end of the diagnosis, or in assisted mode (ie, supported by a consultant), which will allow a more detailed analysis of the company and devising concrete action plans in view of the results obtained in the diagnosis.

SHIFT 4.0 has proved fundamental for uncovering the key needs of Portuguese businesses as a whole in relation to i4.0, for raising awareness of SMEs to new challenges, and for creating new initiatives and measures that meet real ones business needs in order to accelerate their digital and i4.0 transformation.

This initiative also contributes to the objectives of the Strategic Program for Industry 4.0, namely in its "Generalize" and "Empower" pillars.

LUBSYSTEC

LubSysTech – Integrated lubrication management and condition analysis system based on monitoring the quality and performance of industrial lubricants – aims to develop an integrated management system for condition and lubrication analysis based on monitoring and evaluation of fluid lubricants in industrial machines. This tool will allow an improved and automated analysis of lubricants, planning of machine maintenance operations, and predictive analysis of lubrication conditions. The aim is to achieve a conditioned lubrication rationale that: lubricates according to equipment requirements, replaces lubricants only when needed, and checks that lubricants are adequately fulfilling their role.

LubSysTech will be supported by a portable oil analysis manifold (prototype) and management software. The portable oil analysis collector prototype consists of a set of sensors that analyze the oil. The management software incorporates an algorithm that assesses oil condition and provides information on what the potential real cause of fluid degradation might be. Lubricant analysis algorithms are based on analytical and empirical models. In more complex scenarios, they can be based on predictive models using machine learning for predictive maintenance analysis.

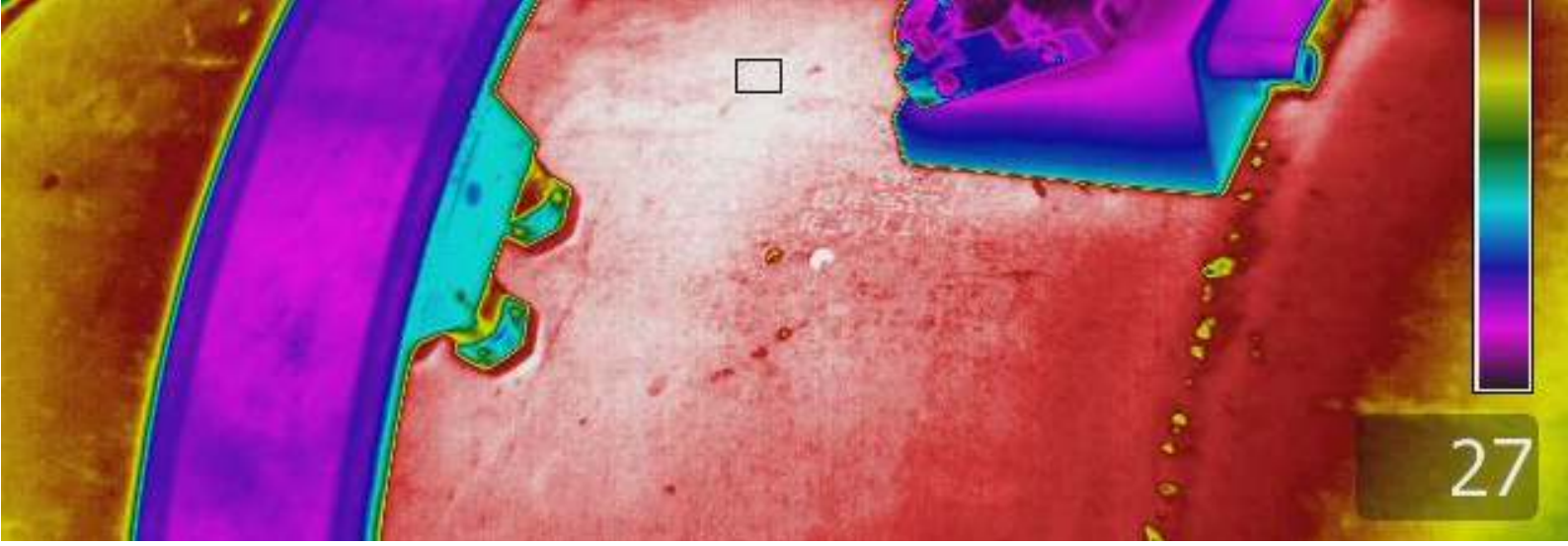
The project is led by ISPT - Industrial Services SA, is co-sponsored by Portugal2020 and is in partnership with the University of Coimbra and ISQ.

PRODUTECH

The PRODUTECH SIF - Solutions for Future Industry project - is a mobilizing project that aims to develop and demonstrate new concepts of intelligent, flexible and adaptive manufacturing in different industrial scenarios based on the Industry 4.0 paradigm.

In this project, ISQ is coordinating the sub-project "Basic technologies for Cyber Physical Production Systems" that will allow the development of the basic components for implementing i4.0 approaches in companies, thus participating in other sub-projects related to the application of non-destructive testing in the area of ornamental rocks and in the development of industrial symbiosis methodologies in order to reinforce the competitiveness and sustainability of the industry.

PRODUTECH SIF brings together a large national consortium in the field of Production Technologies and capital goods.



HI2TRUST

Hi2TRUST is an advanced system for the inspection and monitoring of critical in-service components (piping, boilers) under high temperature operating conditions of up to 550°C. At its core, it consists of an "ultrasound scan" to determine the condition of the equipment's welding. The purpose of this project is to overcome the physical limitations of EMAT (Electromagnetic Acoustic Transducers) inspection technology. In this context, advanced ultrasound inspection techniques using Induced Currents and an automated visual inspection module are developed.

This project includes the volumetric inspection aspects, using Phased Array (ultrasound inspection technique) and TOFD (Time-Of-Flight Diffraction), surface inspection using Induced Currents, and remote Visual Inspection using advanced high-definition cameras and a laser alignment system.

The final result of the integration of these technologies will be a product that includes radically innovative aspects, combining several advanced techniques of non-destructive testing that will allow the inspection of all typical defects of the target components under the referred high temperature operating conditions.

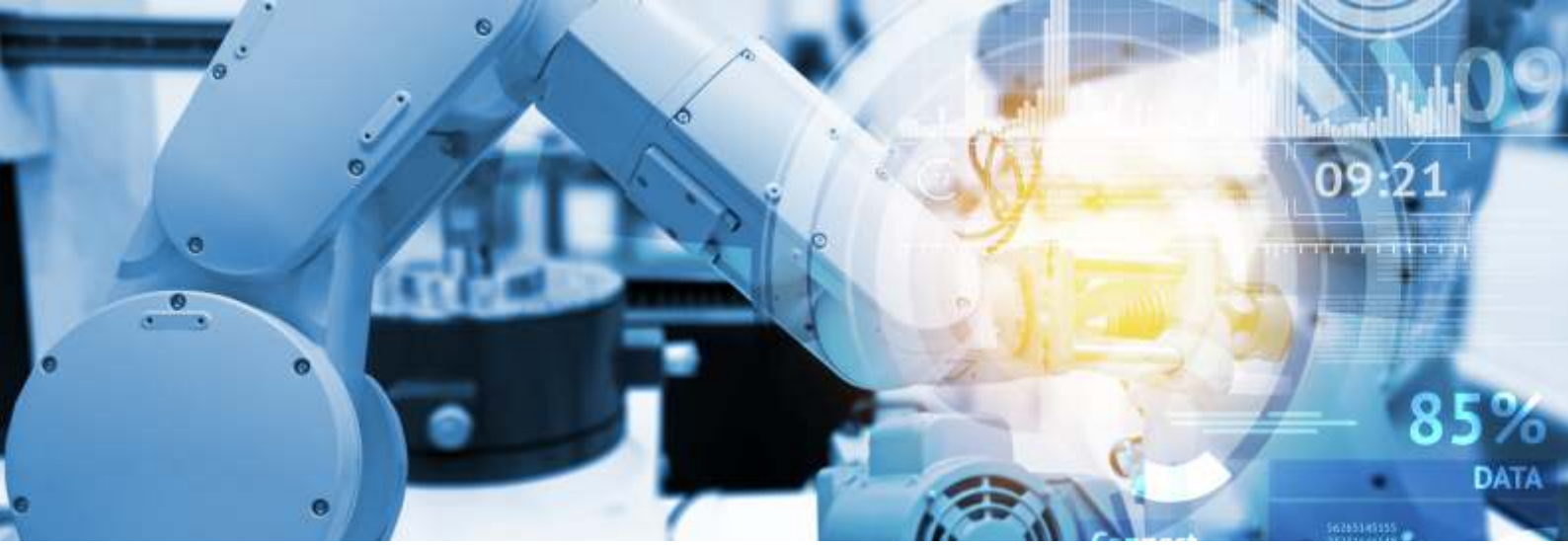
The Hi2TRUST project is a fundamental tool to continue the development cycle started by the sponsors and to contribute decisively to the competitiveness of the sponsor leading in the inspection of operating components and to support its internationalization in benchmark external industrial sectors.

MAESTRI

MAESTRI – Energy and Resource Management Systems for Improved Efficiency in the Process Industries – consists of a European research and development project for creating an integrated energy and resource management system, with the aim of developing and applying methods to promote eco-efficiency in industry: doing more (value) with less (fewer resources).

This project, funded by the European Commission as part of Horizon 2020, the Community Framework Programme for Research & Innovation, was led by ISQ and is the first and only project coordinated by a Portuguese company within the SPIRE — Sustainable Process Industry through Resource and Energy Efficiency contest.

MAESTRI was developed by a consortium of 15 European entities from five Member States (Portugal, Germany, Italy, Poland and the United Kingdom). The project's developments were tested at four industrial facilities in Europe: two in Portugal and two in Germany. Their aim was to reduce consumption and save around 20% over four years.



INDUCE 4.0

Using easy-to-understand language and a technically elementary approach, ISQ developed Induce 4.0, an e-learning course that covers some of the key concepts of the new industrial revolution. As the work starts "from the inside out", ISQ decided to provide this training to all its employees first to ensure that this transition to the progressive and growing incorporation of i4.0 technologies will result in a more effective increase in their competitiveness and innovative nature.

This course was developed as part of a European project supported by the ERASMUS+ program, in the field of promoting lifelong Education and Training. It allows trainees to carry out the training course at their own pace and assess their own progress.

The training includes 4 modules that were developed within the ISQ Research team, in partnership with four other European benchmark organizations in this field.

Induce 4.0 complements other solutions provided by ISQ for Portuguese organizations. This is the case of SIM 4.0, a technological solution that makes a diagnosis of the degree of maturity of an organization in terms of i4.0 technologies, proposes a plan for implementing measures that allow the company to re-align itself to better incorporate these technologies and define its vision and strategy.

DRONES

Development of **algorithms for inspection of Wind Turbines, Gas Pipelines, Oil Platforms and other industrial structures** using drones, with gains in effectiveness and efficiency, and lower costs for companies.

The use of the drones increases the effectiveness of the operation, since this gives access to higher altitude areas and makes it possible to conduct inspections without the need to stop the equipment, therefore not affecting production.

In Brazil, for example, we have already carried out inspections of metallic structures that support a network of lifts used for transporting ore at Anglo Gold. In this service we used drones to obtain images of the most inaccessible points.

6.

DIGITAL

DIGITAL INNOVATION HUB
VIRTUAL / AUGMENTED REALITY
DIGITAL SME
DEEP SEA MINING
INTELICROP
LIFT

DIGITAL INNOVATION HUB

In 2018, ISQ pioneered the creation and launch of a Digital Hub for Agriculture in Portugal: **Hub4Agri**.

This **hub aims to create an ecosystem with innovative solutions for developing the competitiveness of the agricultural, food processing, forestry, animal production and rural development sectors**, capable of providing a cross-cutting response to the major challenges currently facing us.

This is an initiative coordinated by ISQ which is aligned with the National and European Strategies for Digitising Industry and involves more than 15 entities that cover the entire value chain in the food processing sector.

Hub4Agri aims to connect the demands and needs of farmers with technological solutions and responses for the digitising of agriculture. This is because in the near future current production techniques will not be able to respond to the environmental, climatic and technological challenges. The creation of cooperation networks and infrastructures capable of accelerating the digital transformation of the agricultural sector is a necessary measure to support improvements in sector competitiveness by increasing productivity and promoting growing environmental performance.

The HUB brings all companies, large and small, wherever they are based, within reach of the services required to increase their productivity and sustainability, through improvements in processes and the adaptation of productive models supported by technology and digital tools.

Entities involved:
Confagri, Crédito Agrícola de Portugal, University of Évora, University of Trás-os-Montes and Alto Douro, IPS - Polytechnic Institute of Santarém, IPVC - Polytechnic Institute of Viana do Castelo, IPB - Polytechnic Institute of Bragança, COTR - Centre for Operations and Irrigation Technology, CVRA - Alentejo Regional Wine Commission, TICE.PT - Information Technology, Communication and Electronics Unit, AIFF - Association for the Competitiveness of Forest Industries, Inova +, Labiagro - Chemical and Microbiological Laboratory, Agritaurus - Agricultural Society and StartUP Portugal.

VIRTUAL/ AUGMENTED REALITY

The ISQ Group develops **digital skills that are applicable to welding training with the immediate advantage of improving the efficiency of the training process**, reducing waste with expensive materials and consumables, and reducing risks. This enables technology to conduct an ongoing assessment of each trainee's performance. The game-like aspect of this simulator makes welding training more appealing, offering augmented reality gaming.

ISQ also has a training, research and development laboratory - Ecotermolab - that encompasses almost two thousand square metres. The lab is certified according to energy certification regulations for buildings and air quality, and is equipped with technology and innovative solutions for climate control, renewable energy and energy efficiency. It is especially directed to training in thermal and photovoltaic solar power, telecommunications installations in buildings, and heating, ventilation and air conditioning (HVAC).

In short, it provides human resource consultancy solutions made to measure, including 4.0 training, enabling greater process efficiency and product innovation, creation of added value in the value chain and support for digital technology and automation.

The welding simulator is not a project but rather a tool for learning using virtual reality.

DIGITAL SME

ISQ, in partnership with TICE.PT – Centre for Information, Communication and Electronic Technologies, and ESMAD – Higher School of Media, Arts and Design of the Polytechnic Institute of Porto, developed the Digital SME Project. At stake is support for digital transformation in the automotive, materials, raw materials and trade sectors and the promotion of disruptive changes in business models, products and production processes.

Digital SME is an initiative that aims to support digital transformation within companies and to empower, provide information and increase the entrepreneurial skills of SMEs to adopt i4.0 measures, technologies and tools, encouraging the acceleration of the Portuguese economy towards a digital economy .

The project comprises several stages and aims to establish a current diagnosis regarding the digital maturity of SMEs and the extent of use of i4.0 tools to identify possible digital solutions and to demonstrate the benefits of adopting methodologies and technologies of the fourth digital revolution.

This project aims to facilitate interaction between companies and the scientific and technological system, with a view to exchanging experiences and knowledge and promoting cooperation.

DEEP SEA MINING

ISQ is developing the **SAGRES project**, based on remote detection services and big data analytics, **collecting information from earth observation satellites belonging to the European Space Agency**.

The aim of the SAGRES project is to develop an innovative service to support deep sea mining decisions. The SAGRES project's innovative decision support system is based on earth observation data and uses advanced artificial intelligence algorithms. This system has been tested on a small, representative sample with very promising results.

The intention is to meet the increasing need for raw materials to supply the world economy.
This project includes new skill areas for ISQ, ranging from knowledge of satellite instrumentation to geographic information systems and big data analytics, as well as basic skills in geology and oceanography.

ISQ is supported in this project by University of Lisbon's Faculty of Sciences and Portuguese Task Group for the Extension of the Continental Shelf (EMEPC).

INTELICROP

ISQ has created InteliCROP, an integrated decision support system for sustainable agriculture, which helps carry out preventive actions using Earth Observation satellite and Data Science methods.

This innovative project is part of the European Space Agency's "ESA SMALL ARTES" initiative and is funded by IPN - Instituto Pedro Nunes, with the support of the Foundation for Science and Technology and ANACOM.

ISQ is the only Portuguese partner in the project and is responsible for creating and testing artificial intelligence algorithms to analyze satellite data, thus preventing the appearance or spread of Xylella in olive groves, a very critical problem in European cultures. The aim is to find patterns and correlations in climatic and agronomic variables, which are otherwise very difficult to detect by way of conventional human analysis or analytical models, enabling action to be taken against phytosanitary problems, for example.

The agricultural sector faces several challenges related to the increasing variability of climatic conditions, directly associated with crop growth dynamics, crop health, diseases and pest effects. InteliCROP will provide technological resources and services to support decision making for sustainable agriculture. This is possible by analyzing information and forecasts about crop production and health, with adequate decision time as well as contingency plans.

The InteliCROP decision support structure arises from joining the capabilities of earth observation methods and data with predictive modeling from artificial intelligence methods, to search for patterns and correlations in specific agricultural climatic variables, enabling the mapping of agricultural occurrences.

LIFT

The **LIFT – Ladies Code Their Future** – project attempts to eliminate the main barriers blocking access of women to quality training in the Information and Communication Technologies (ICT) sector with a focus on coding and programming.

Based on a program focused on mentoring principles, with the main target audience being women with low levels of knowledge of the digital fields, a training curriculum for the development of programming and coding skills, a teaching timetable, to be used as a tool to guide women towards committing to becoming professionals in the digital sector, and an inspiring video tour about five success stories of women who stand out in the ICT sector, were developed. This training course can be studied through an open access educational resources platform.

By promoting digital literacy and basic skills in programming / coding for socially disadvantaged women, the project also aims to reinforce transferrable skills such as creativity, interpersonal cooperation, intercultural cooperation, communication, problem-solving, making use of ICT, and in particular coding, for learning.

The project is financed by the ERASMUS+ program.

7.

OIL&GAS

OIL&GAS

With a long experience of intervention in the oil and gas market, ISQ provides inspection, technical consulting, testing, human resources training and asset management services at all stages of the process.

As this sector is one of ISQ's priority areas in the international market, exporting ISQ services has provided technological support to various companies and projects in different areas and continents, which means that the foreign market now represents half of the Group's business volume.

In this sector, we have already worked in the training of professionals in Africa (Angola, Mozambique) and the Emirates (Abu Dhabi).

In Norway, we conducted non-destructive tests at Norway's largest gas and condensate processing unit, to check pipes and equipment for **North Sea platforms**.

In Angola, through our subsidiary ISQApave, we are running the Falcão project to increase the use of gas as an energy source in Angola, with the creation of infrastructures to supply natural gas to future industrial projects to be created in the Soyo region. In this region of the globe we have also done inspection and certification for the **SONANGOL Group** and for other oil companies such as **TOTAL**.

In the United Arab Emirates, ISQ Sultan has set up a new research laboratory at the Petroleum Institute to provide technical support to operators by attracting and training the next generation of scientists and engineers.

In Algeria, ISQ's subsidiary secures the group's largest business, amounting to 25.7 million euros, with SONATRACH, the group responsible for large oil & gas projects in the country. With the Sahara Desert as its workplace, the task of the teams is to assess the condition of equipment and piping, from the area of the extraction holes to the gas and oil treatment units.

8.

HEALTH

HEALTH

ISQ has innovated in this area by investing in the storage of pharmaceutical and cosmetic samples through its subsidiary Bluestabil, providing stable storage services according to demanding procedures that ensure the traceability/safety of the samples and rigorous continuous control of stability conditions.

Bluestabil is the result of an alliance between ARALAB and ISQ. Each of the companies contributes their specific assets to this project, and ARALAB introduces its strong know-how in the construction and maintenance of climate equipment. Meanwhile, ISQ contributes its long-time experience in the implementation of quality management systems and know-how in test validation.

Bluestabil is recognised by INFARMED (National Authority for Medicines and Health Products I.P.), and has extended the service of stable storage to samples of veterinary drugs.

Productivity gains

Portuguese pharmacists that focus on the outsourcing of stable storage include names such as **Hovione, Atral Cipan** and **Iberfar**, as well as Pharmaceutical Laboratories like LEF. These companies have numerous advantages: **the elimination of high investments in equipment; mapping, calibration and maintenance of chambers; reduction of energy consumption and other resources; elimination of the growing need for space**; elimination of costs with specialised external technical services for classification of chambers; **elimination of backup chambers in the event of unavailability due to failure**.

9.

SUSTENTAINABILITY

E-BRICK

ISQ, in partnership with Guimarães City Council (Laboratório da Paisagem) and the Waste Recovery Center (WRC), developed E-brick, a project that aims to incorporate cigarette butts into construction materials, namely, bricks. Advantages: A lighter product with better insulation properties and a 60% reduction in the energy consumption required for its production.

This innovative project aims to include cigarette butts in the production of traditional bricks - sourced from the EcoPontas scheme run by Guimarães City Council - using manufacturing processes implemented at the Waste Recovery Centre. The basis is the reuse and recycling of municipal waste, leveraging related activities which may lead to new products through research and development.

Several international scientific studies have shown that the characteristics of cigarette butts confer advantages when incorporated into bricks, namely, reducing the amount of clay needed to manufacture the bricks and the reuse of the cigarette butts once they have been produced as waste. In addition, the cigarette butts reduce the energy expenditure of the brick production process, which improves their energy efficiency.

In short, they can reduce energy consumption required for the production of bricks by nearly 60%, making the final product lighter and with better insulation properties, that is, it reduces future costs with heating and cooling buildings.

SCALER

The **SCALER project – SCALing European Resources** with industrial symbiosis – aims to promote the adoption of Industrial Symbiosis (IS) on a large scale in Europe. The innovation consists initially in identifying the main factors involved in the implementation of Symbiosis processes and the development of tools and methods aimed at the various stakeholders (industries, industrial and business associations, as well as regional and national authorities) in order to facilitate the identification of potential, feasibility analysis and implementation of synergies that allow a collective and shared management of resources and waste.

One of the objectives of the ISQ-led project is the design of an inter-sector database of IS-facilitating technologies and procedures and the development of guidelines to support the transition and implementation of symbiotic processes on an industrial scale.

CIRCULAR ALENTEJO

The **CIRCULAR ALENTEJO** project arises from a partnership between ISQ and the University of Évora and its main objective is to raise awareness and mobilize economic agents in the Alentejo region in the olive, wine and pork production lines for the adoption of a Circular Economy model. The aim is to promote the creation of value in agricultural and agro-industrial farms, and consequently in the region, through the transfer of knowledge about practices and technologies for the efficient use of resources and the recovery of waste.

Based on a mature diagnosis in the field of Circular Economy in Alentejo, and on the most recent knowledge at international level, ISQ and the University of Évora undertake awareness-raising, training and mobilization actions for companies aimed at the realization of circular logics in these ranks, seeking to establish the basic conditions for the future development of circularity initiatives by companies in the region.

This project is part of the Support System for Collective Qualification Actions, within the scope of PT2020.

URSA

The URSA project – from Alqueva By-products Recirculation Units, in Portuguese – consists of the implementation of an innovative and disruptive business model and aims to create a unit for the collection and transformation of organic by-products of agricultural origin into organic fertilizer for use in the soil.

The aim is to produce organic fertilizer, to be delivered to farmers in exchange for their agricultural by-products, with a view to increasing the resilience of the territory in the face of climate change, promoting water quality and the economic and environmental sustainability of irrigation.

Based on the exchange of agricultural by-products for organic fertilizer for agricultural use by farmers, this project, led by EDIA, allows the circular economy to materialize in the agricultural context, with direct and indirect environmental benefits.

NATURAL VALUE

The ValorNatural mobilizing project seeks to identify and develop natural ingredients with high added value for applications in industry. The consortium has strong skills and capabilities in the domain of food and agriculture, in which harm to human health, linked to synthetic additives, has driven the increase in demand for food free from synthetic additives.

In this context, using a high level of innovation, the Valor Natural project aims to mobilize a value chain based on the development of natural ingredients in the dye, flavour and bioactive categories as alternatives to synthetic additives and to test and validate new processes for extracting, refining and storing these ingredients. More specifically, the project will develop naturally-sourced dyes by extraction of vegetable matrices and bio-waste; natural flavours and flavour templates; bioactive substances of natural origin by extraction of bio-waste from Agaricus bisporus L .; innovative processes for extracting and refining ingredients from natural raw materials.

ISQ is responsible for the environmental, economic and eco-efficiency assessment of natural additives and processes under development as we have relevant experience in this area. The objective is to support the decision with an integrated vision supported by life cycle assessment methodologies, in order to increase the value of new products to be developed, mitigating potential environmental impacts.

Project title: Valor Natural – Increasing Value of Natural Resources through the Extraction of High Added-Value Ingredients for Applications in the Food Industry.

ECOTERMIP

EcoTermIP aims to effect the transfer of scientific and technological knowledge, good practices, methodologies and technologies to promote the ecoefficiency of thermal processes in Portuguese industry by rationalizing thermal energy consumption, the use of renewable energy sources for the direct supply of thermal energy to industrial processes, recovery of residual heat and optimization of energy management.

The project aims to contribute to increasing the competitiveness and sustainability of Portuguese industry in the metalworking, ceramics, dairy and manufacture of meat products sectors.

EcoTermIP proposes to reduce the thermal consumption of Portuguese industry through specialist visits to industrial installations, analysis and sectorial mapping of the main technologies and processes that use thermal energy, and the presentation of improvements to reduce such use based on technical and economic feasibility studies.
Generally, the measures studied and proposed include direct or indirect incorporation of renewable energies, recovery of residual heat, storage of thermal energy and / or improvement of operating conditions.

This project also includes various informative actions with a view to expanding the knowledge of these measures with the Portuguese industrial fabric.

EcoTermIP is developed in co-promotion between INEGI (Institute of Mechanical Engineering and Industrial Management) and ISQ.

TRUST

TRUST aims to boost excellence in research and development in the area of INDUSTRIAL SUSTAINABILITY through the increase of scientific and technical knowledge, which will support and involve European industries on their way towards the achievement of the Sustainable Development Goals.

The project will allow long-term cooperation for the development of excellent research at the service of European industry and will create a joint research agenda beyond the project's three years' duration, with the aim of contributing to a more balanced development of scientific performance in the European Union.

The TRUST concept will be achieved following an approach based on an active shared learning strategy: training on campus, online courses and webinars; exchange of researchers, joint supervision, experience of different research and organizational cultures, scientific review, organization of summer schools and joint scientific publications; and annual workshops and forums to promote the identification of new partnerships and industrial research opportunities.

ISQ, as the coordinator of TRUST, works in partnership with two benchmark European organizations in this field: the University of Cambridge (United Kingdom) and the University of Chalmers (Sweden). The project aims to increase excellence in research and development through the establishment of strategic partnerships and is committed to knowledge transfer.

SAIS SPIRE

The Skills Alliance for Industrial Symbiosis project – A Cross-sectoral Blueprint for a Sustainable Process Industry through Resource and Energy Efficiency – aims to develop a European strategy for the continuous anticipation of needs in terms of workforce skills, as well as training programs needed by the European Intensive Industries sector, as a facilitating factor for the large-scale incorporation of industrial symbiosis and energy efficiency practices.

Along with technological developments in the fields of industrial symbiosis and energy efficiency, which will contribute to a more sustainable European process industry, it becomes central to the process of endogenizing these technologies and practices, anticipating the needs for the development of European workforce skills and develop curricula, modules and resources to provide a timely response to the needs of the industry. ISQ takes part in this project, not only because of our knowledge accumulated in several European research projects in these fields of industrial symbiosis and energy efficiency (ex. SCALER, MAESTRI), but also as a specialist in the field of surveying and developing skills, qualifications and technical training.

Regarding the concept of industrial symbiosis: it is a form of innovative collaboration and interaction based on the principles of a circular economy, which promotes sustainable growth, and the development of ecologically innovative solutions between companies, which finds ways to use the by-products generated by one organization as a raw material by another. This reduces the consumption of "virgin" raw materials and waste production.

The SAIS-SPIRE consortium is composed of 24 organizations plus 8 associated partners, taken from over 140 members of SPIRE – "Sustainable Process Industry through Resource and Energy Efficiency", a European public-private partnership created under the European Research program H2020, which promotes the development of enabling technologies and the sharing of good practices. The project is funded by ERASMUS+.

WINDFLOAT

Windfloat is the first offshore floating wind farm in Portugal, installed in Viana do Castelo, which aims to harness wind energy.

ISQ's participation in this project consists of providing monitoring services through non-destructive testing, dimensional control, water-tightness and equipment tests. Based on this new technology, clean energy is obtained through wind farming in a maritime environment at great depths, replacing the traditional fixed tower on the seabed.

This technology allows the exploitation of wind potential in the sea, at depths greater than 40 meters, based on the development of a triangular and semi-submersible floating platform, created for the oil and gas extraction industry, which houses a wind turbine with several megawatts (MW) of production capacity. The project is optimized for the use of turbines of up to 8 MW.

The project is part of the Industrial Strategy for Ocean Renewable Energies, whose main objective is the creation of an industrial 'cluster' exporting these clean energy technologies with a potential to generate 254 million euros in investment, 280 million euros in gross added value, 119 million euros in the trade balance and 1,500 new jobs.

Windfloat is coordinated by EDP through EDP Renováveis and comprises the technological partner Principle Power, Repsol, venture capital Portugal Ventures and A. Silva Matos metal works.

10.

ADDITIVE MANUFACTURE

MULTI-FUN
HIPA2L
SAM

MULTI-FUN

MULTI-FUN – Enabling multi-functional performance through multi-material additive manufacturing – consists of the development of new materials (metallic powders and wires) and equipment to be used in additive manufacturing, through direct energy deposition technologies.

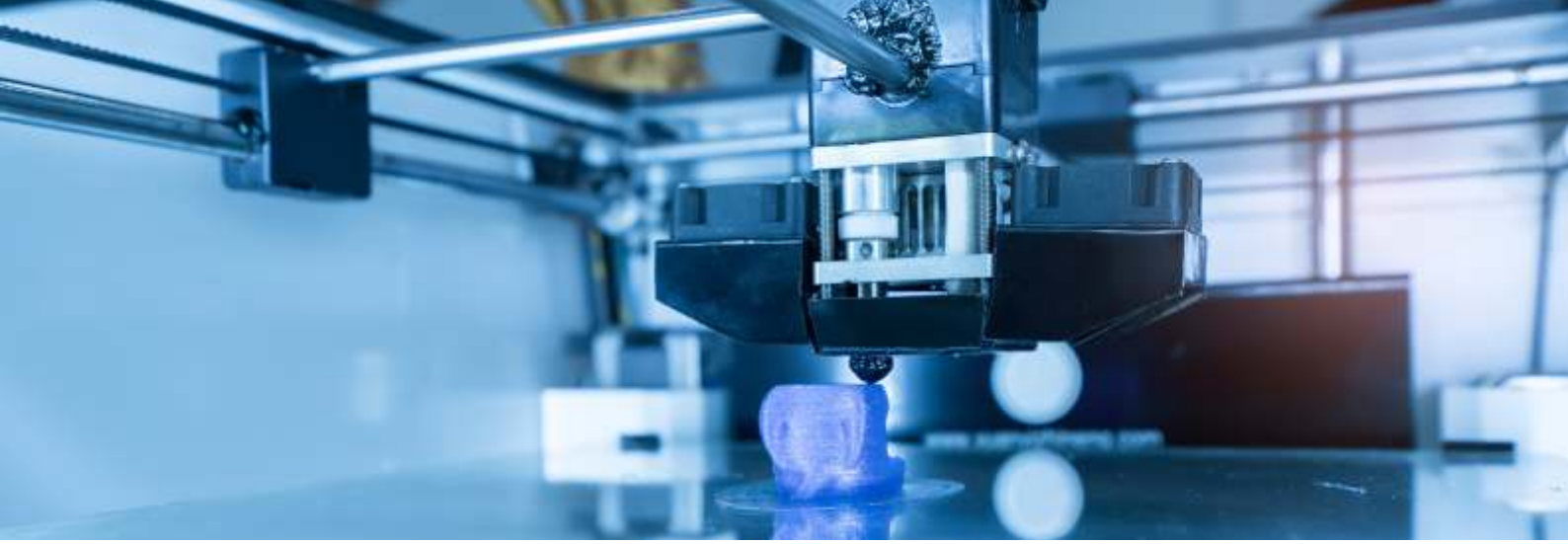
This project aims to promote a significant gain in performance and efficiency in products for metallic additive manufacturing through the complete integration of multifunctionalities, enabling the manufacture of metallic components made of different materials of complex geometry, without size limitation, through additive manufacturing technologies with innovative features.

In this project, ISQ is responsible for assessing the occupational and environmental risk of processes and materials and for the mechanical description and non-destructive testing of the components produced and the evaluation of multifunctionality.

HIPA2L

The HiPA2l project – High Performance Additive manufacturing of Aluminum alloys – aims to develop new aluminum alloys, intended for manufacturing processes or additive manufacturing, in the form of welding wire, for the construction of layer-by-layer components.

Innovation in the development of these alloys includes a set of superior properties in strength, ductility, resistance to corrosion, and the manufacture of new, more complex shapes, which is very important for sectors such as automotive and aeronautics manufacturing.
The expected impact includes new wires developed to improve performance, efficiency and productivity in industries in the sectors in question or others, including also in-depth knowledge of alloy metallurgy, from raw material through to component production.
ISQ's intervention focuses on the description of the components produced using the new alloys developed, using mainly mechanical assays, non-destructive testing and corrosion resistance.
This project, comprising four Austrian partners (AIT-LKR, SinusPro, MatCalc Engineering and TU Wien) and ISQ, is financed by the Horizon 2020 Program, through the Foundation for Science and Technology.



SAM

The end objective of the SAM project – Sector Skills Strategy in Additive Manufacturing – is to define a qualifications strategy for the Additive Manufacturing sector (which includes techniques such as 3D printing) in Europe.

ISQ's Training and Qualifications R&D department was invited to be a involved in this partnership as an Education and Vocational Training organization with significant experience in the Production Technologies sector and as a Project Quality Evaluation and Management expert.

The initiative includes 16 international partners, who are key players in this sector.

PRESENCE IN SEVERAL RD&T AND INNOVATION INTERNATIONAL PROJECTS

PARTICIPATION IN OVER

500 INTERNATIONAL **R&D** PROJECTS

INVOLVING OVER

1.200

NATIONAL AND INTERNATIONAL PARTNERS WITH PROJECTS IN

29

COUNTRIES

ISQ AT A GLANCE

MORE THAN
50
YEARS' EXPERIENCE

16
ACCREDITED LABORATORIES

MORE THAN
225.000
TRAINERS

7
CONTACT POINTS IN PORTUGAL

+250
SPECIALIZED SERVICES

10 INTERNATIONAL AFFILIATED COMPANIES

16
AFFILIATED COMPANIES IN PORTUGAL

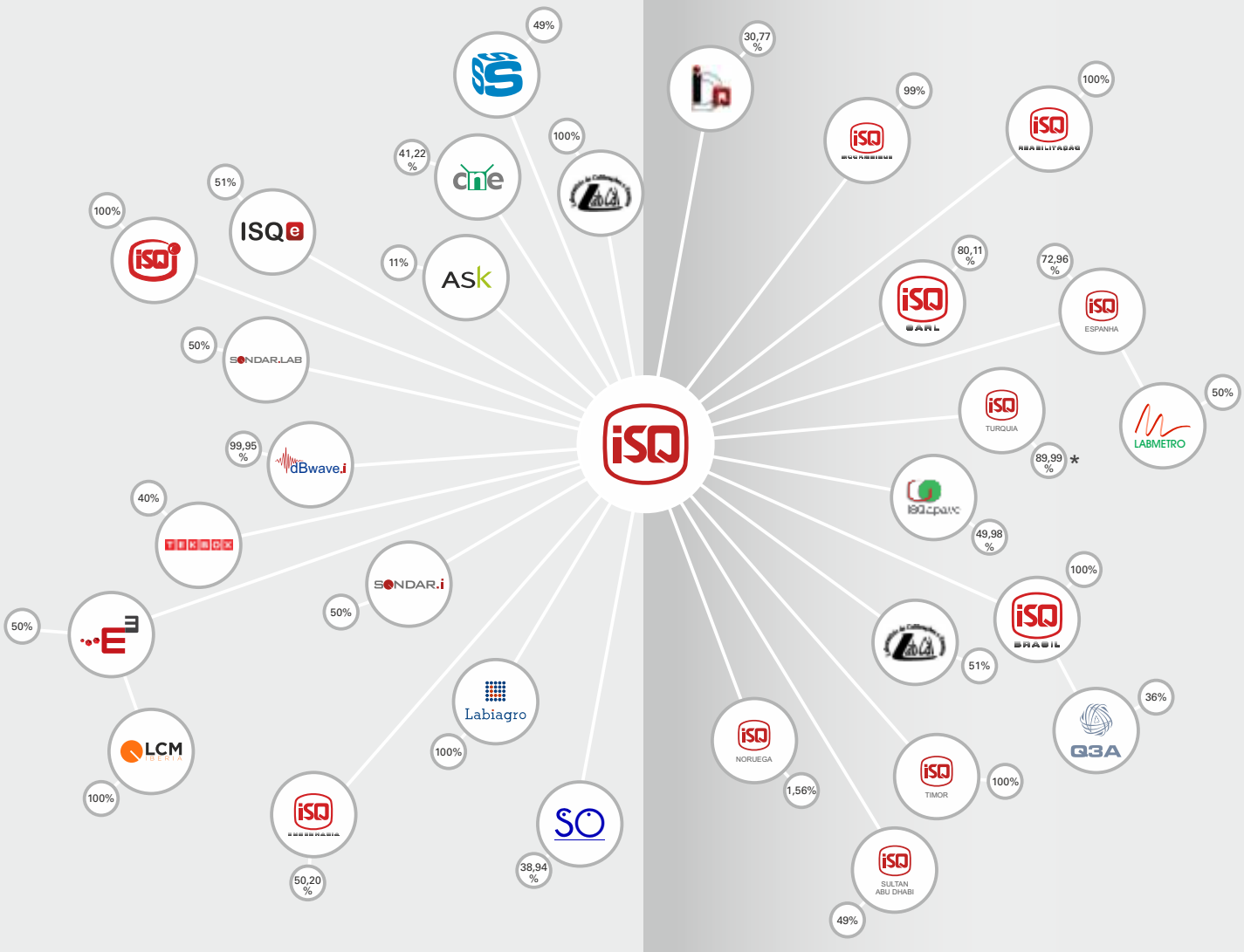
Participation in over
500 PROJECTS WORLDWIDE in **R&D**
involving over
1200 NATIONAL and INTERNATIONAL PARTNERS

1500 **EMPLOYEES WORLDWIDE,** of which
800 in **PORTUGAL**

AFFILIATED COMPANIES

IN PORTUGAL

WORLDWIDE



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