



SOLUTIONS

FOR A SUSTAINABLE WORLD









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LETTER FROM THE CHAIRMAN

SABINO GARCÍA VALLINA

Once again, I have the pleasure of presenting our company's annual report and describing our management for the year 2022. Throughout this year, we have been able to achieve the goals we had set ourselves. We have done so with prudence, which is the foundation of our company's sustainability. I would also like to begin this year's introductory letter by congratulating and thanking the professional team that makes up TSK on its achievements: thanks to their commitment, effort and dedication we positioned ourselves as a reference in the sector.

We are surrounded anew by a complex environment, aggravated by the current geopolitical tensions. TSK has adapted to changing -often unprecedented- scenarios by strengthening its capacity and operational flexibility. Our highly qualified teams, together with our accumulated experience of over 200 years, built up by the companies integrated in past years, allow us to face new challenges with complete confidence.

In 2022 we saw our activity return to levels comparable to the pre-pandemic period. The recovery in results demonstrates TSK's responsiveness and the flexibility of its business model. TSK is a highly esteemed and well-established brand, as well as a relevant technological actor at a global level. Thanks to innovative approaches we respond to current market de-

mands and anticipate future ones. From Spain, we provide solutions to countries such as Mexico, Dominican Republic, Mozambique, Tanzania, Ivory Coast, Morocco or Great Britain, where our projects ensure an efficient supply of energy and the industrial development and sustainable growth of the countries where we are present, thanks to the state-of-the-art technology we developed over nearly 40 years of continuous innovation.

In the financial year 2022, the company's revenues have increased by 94%, to 976 million euros, and its EBIT rose to 30 million euros. The recovery of operating margins and the improvement of its financial profile through net debt reduction make TSK a competitive and flexible company, ready to steer through the current inflationary environment. The company faces 2023 with a stable balance sheet and a strong financial capacity to successfully execute its ongoing projects and continue to grow.

There is a growing demand for projects related to renewable energy, green hydrogen, digitalization, mineral handling and storage, port equipment, food industry and energy storage, in line with the trend to meet the need for a more sustainable development. TSK continues to advance its technological expertise and develop digital innovation systems and solutions



Cierre de Ciclo de 296,25 MW C.T. LAS FLORES (Perú)

for a low-carbon economy and a clean energy transition, making the most of these opportunities.

At TSK we are committed to a sustainable and socially responsible management in accordance to ESG criteria. This is the driving force behind our actions, to ensure that all our processes and services are managed in a sustainable and socially responsible manner. It is not just a matter of transparency, but the expected result of a responsible industrial activity, our contribution to the society of which we are a part, both in terms of the economic and structural benefits generated by our activity and the CSR work carried out by the company.

To achieve the goals we have set ourselves for the coming year, we rely on the coordinated work of more than 1,300 people who are committed to quality and safety at work. Our lasting relationships are based on trust, equality, commitment and the know-how of each and every professional in the Group. Our main objective remains to ensure an enviable working environment for all, where equal opportunities, non-

"The company faces
2023 with a stable
balance sheet and
high technological
capacity"

discrimination and respect for diversity are guaranteed for everyone.

To conclude, I would also like to express my personal gratitude to our clients, suppliers, subcontractors and partners, as well as the financial institutions who place their trust in our company every day. Such confidence strengthens TSK and confirms its trustworthiness, vision and leadership



CORPORATE STRATEGY

JOAQUÍN GARCÍA RICO - CEO

As this Report shows, we have managed to return to a level of activity close to 1,000 million euros in 2022. The last three years have been extremely complex, but TSK's progress in 2022 has been outstanding, thanks to the efforts and dedication of our teams around the world, which now number more than 1,300 people. In 2022 we completed our 2020-2022 strategic plan, which was significantly impacted by the pandemic and the invasion of Ukraine. We have been able to navigate through it and return TSK to its rightful place, strengthening its leadership in the strategic regions in which it operates.

The financial year closed with record contract figures, 920 million euro, 976 million euro in sales, operation results in 64 million euro and a portfolio worth 2,000 million euro. With the latter, we have designed the new strategic plan 2023-2025, with a leading position in the efforts towards transition to clean energy, the decarbonization of economy and the digitalization of industry.

Last year's awards are very relevant from a geographical point of view, as well as from an economic or technological point of view. In the Energy division, we are leader in combi-

ned-cycle power plants, with 10 ongoing projects in Mexico, Dominican Republic, Mozambique or Ivory Coast. Their combined production amounts to 5,500 MW. A further 500 MW come from photovoltaics contracts.

TSK is nowadays an integral solution provider in the field of industrial and energy infrastructure, with extensive experience in various locations around the world. The company has a proven track record in major transformation efforts and overcoming the difficulties inherent in complex environments.

The strategic key concepts we intend to develop with the new plan are as follows:

1. Reducing risk in our portfolio through alliances and collaborative agreements with partners and technologists, as we improve our capabilities with local construction partners.
2. Developing technology solutions that contribute to a more sustainable world.
3. Promoting investments with our clients in concession projects related to transition to a clean energy and decarbonisation.
4. Applying efficiency programmes in all the activities to reinforce our competitiveness.



Sistema completo de manejo de azufre y rehabilitación de instalación existente. Puerto Jorf Lasfar (Marruecos)

5. Implement a digital platform and cybersecurity measures in all our solutions.

6. Highly qualified and committed teams.

I am convinced that the favourable prospects of growth for 2023, together with a diversified project portfolio will have a positive impact on our results. The outlook for the coming years is based on our position at a global level, from where we count on clear competitive advantages to support our clients and lead the current energy and digital transitions.

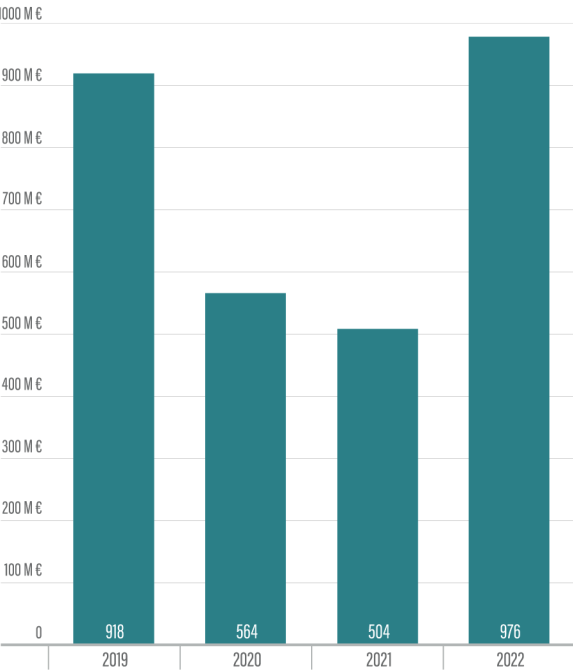
Last but not least, I would like to thank each and every person who are part of our Group. Without them, without their

“The last financial year closed with sales close to 1,000 million euros”

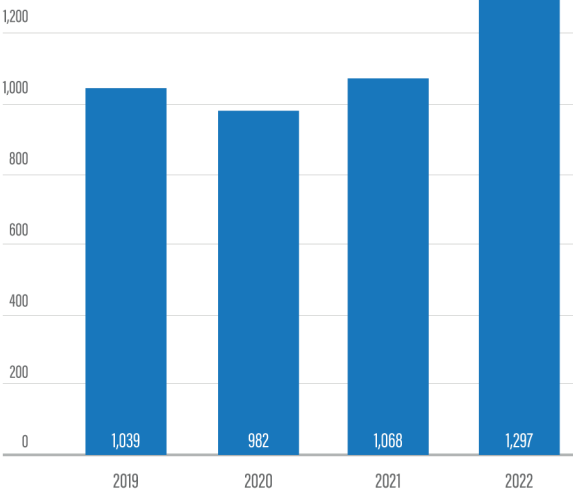
efforts and their commitment, we would not have achieved our goals as we have. Their commitment and dedication are essential to ensure a sustainable, innovative and profitable future for our company.

MAIN FIGURES

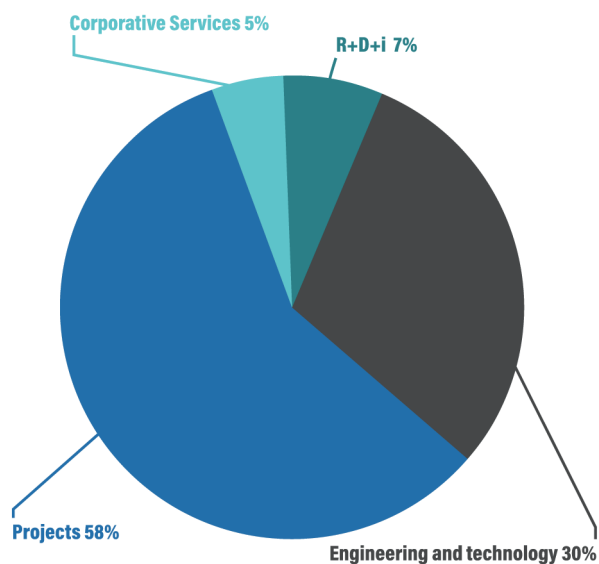
TURN OVER
#MILLION EUROS



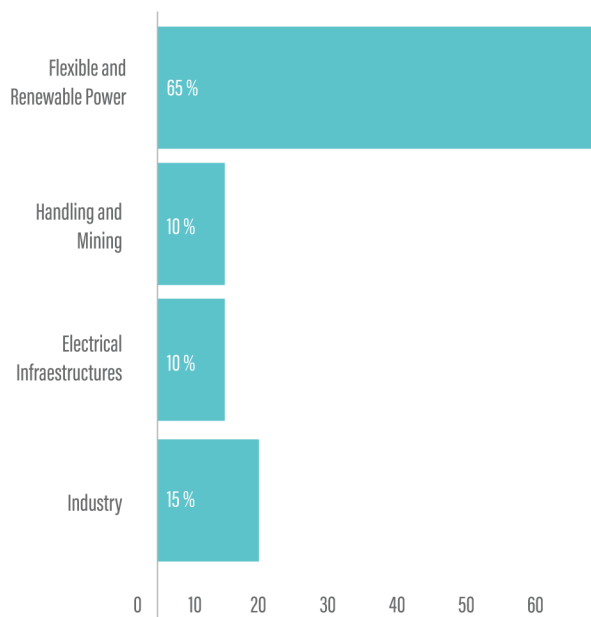
NUMBER OF EMPLOYEES



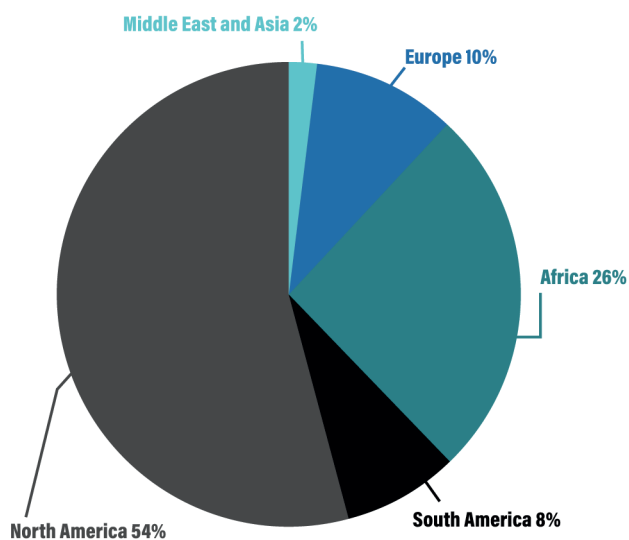
STAFF DISTRIBUTION



SOLUTIONS



SALES BY MARKETS





KEY FEATURES

Over **35 years of experience** in the industrial
and energy sector

One of the international companies with **more references**
in projects in energy, industrial, handling, electrical
infrastructures and environment sectors

Adequate **financial capacity** to handle large projects

Proven technical capacity and
highly qualified personnel

Proven experience in **O & M.** (Operations and Maintenance)
of industrial and energy plants

Balanced **growth** and **compensation**
between business lines

Agreements with the **leading industrial technologists**

Own technology in various fields

OUR MANAGEMENT'S ESSENTIAL IDEAS



CUSTOMER ORIENTED AND FOCUSED

MANAGEMENT COMMITMENT AND LEADERSHIP

PERSONAL DEVELOPMENT OF OUR EMPLOYEES

STRATEGIC PLANNING

PERSONNEL INVOLVEMENT

HEALTH AND SAFETY AT WORK

R&D+i

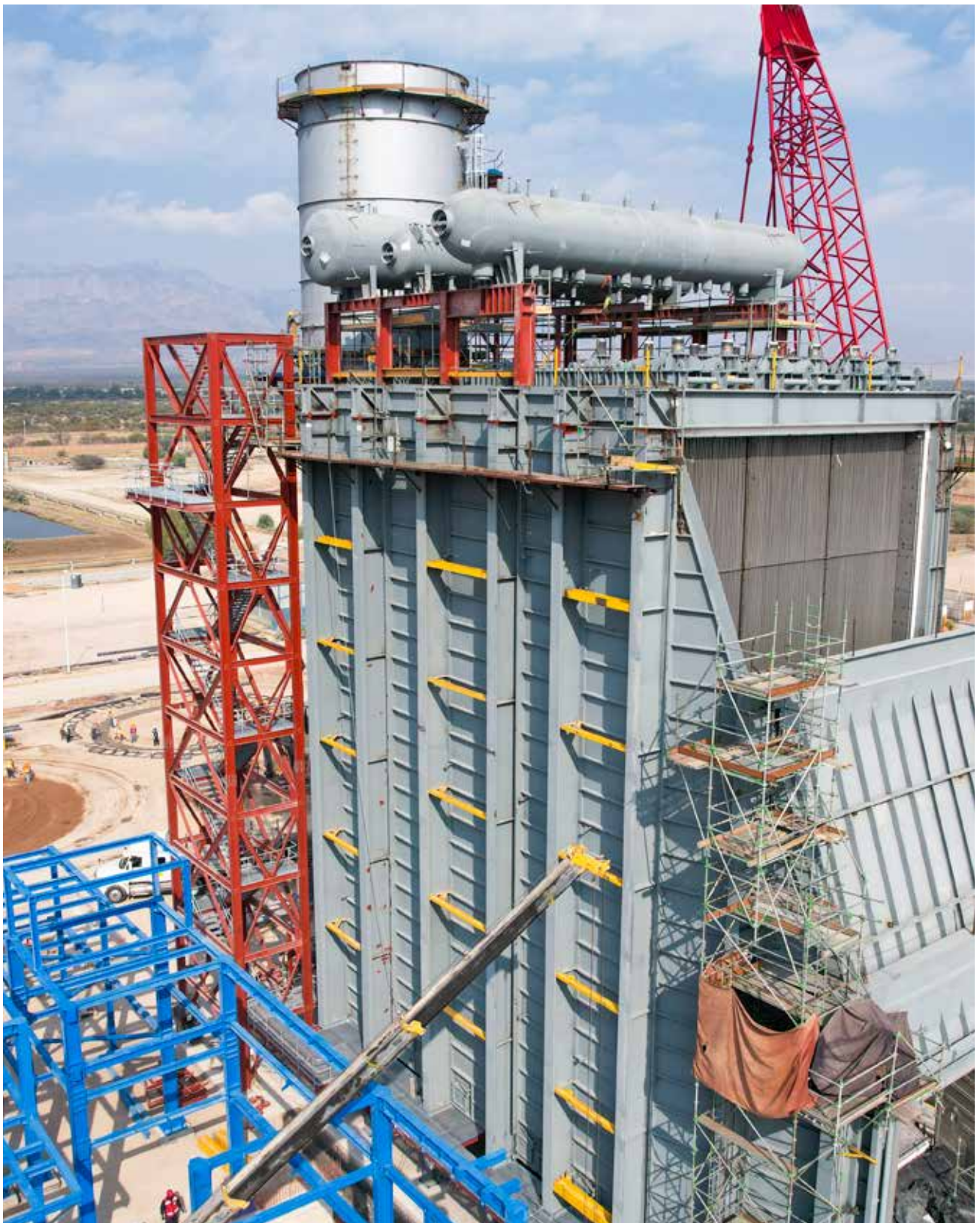
KNOWLEDGE MANAGEMENT

RESPECT FOR THE ENVIRONMENT

COMMITMENT TO QUALITY

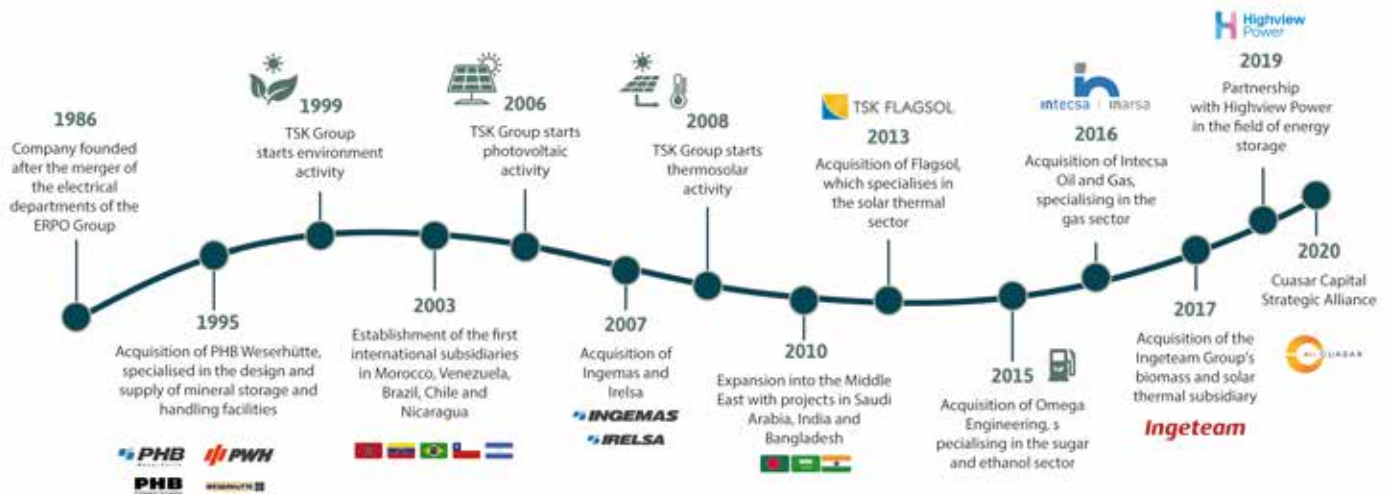


CONTINUOUS IMPROVEMENT



SAN LUIS DE POTOSI 450 MW CCGT (Mexico)

MOST SIGNIFICANT MILESTONES



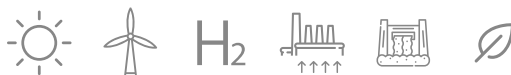
The accumulated experience of the companies incorporated into TSK totals **MORE THAN 200 YEARS**.

More than **1,000 PROJECTS** executed in more than **50 COUNTRIES**.

+ **25.000 MW** executed.

LIDER IN RENEWABLE ENERGY

wind, solar, green hydrogen, geothermal, hydro and biomass



In-house **HYBRID PLANTS** and **ENERGY STORAGE** technology.

Driving **DIGITAL TRANSFORMATION** and **SUSTAINABLE DEVELOPMENT**.

Presence in the **MAIN INDUSTRIAL SECTORS:**

steel, cement, fertilisers, mining, gas to power, food, paper, ports



Bucket wheel stacker-reclaimers for coal and coke. Port Talbot Steel Making Plant (UK)



CORPORATE STRUCTURE



CORPORATE SERVICES

Economic - Financial Management
Talent and Sustainability Management
Legal Services Directorate
Digitisation Management
Commercial Management
R&D+i Management
Purchasing and Subcontracting Management
Business Development Management



ENERGY TRANSITION
DECARBONISATION
GREEN HYDROGEN
DIGITALIZATION
INDUSTRY



HANDLING AND MINING



CONCESSIONS



MANAGEMENT

Sabino García Vallina

Chairman

Joaquín García Rico

CEO

BUSINESS LINES

Arturo Betegón Biempica

PHB Weserhütte CEO

Andrés Cuesta Larré

Managing Director Power & Industrial Plants

Carlos Ruiz Manso

Managing Director Electrical Infrastructures

Pedro Suárez López

Managing Director Technology & Proposals

Ricardo González Martínez

Managing Director Digital Innovation

SERVICIOS CORPORATIVOS

Beatriz García Rico

Chief Financial Officer

Diego Fente Vázquez

Corporate Managing Director

Sara Fernández - Ahuja

Managing Director Talent and Sustainability

Pablo García Fernandez

Chief Commercial Officer

Ana Isabel Bernardo Pérez

Managing Director Internal Audit

Alfonso Targhetta Codes

Managing Director Purchasing

José María González Fernández

Managing Director Chairman's Office

Raúl Nodal Monar

General Manager Legal Services

Carmen Rodríguez López

Compliance Manager

Ignacio De La Puente

Managing Director Risk Management



MAIN PROJECTS IN PROGRESS

200 MW IVIRIZU Hydroelectric Power Plant	ENDE Valle Hermoso	Bolivia
ALPHA 212 MW + BETA 280 MW Wind Farms	EDP Renovaveis	Colombia
MIRASOL 127 MW Photovoltaic Plant + Substation + TL138 kV	AES	Dominican Republic
San Pedro de Macoris 125 MW Combined Cycle Power Plant	ENERGAS	Dominican Republic
ATINKOU 420MW Combined Cycle Power Plant	ERANOVE	Ivory Coast
SAN LUIS RÍO COLORADO 648 MW Combined Cycle Power Plant	CFE	Mexico
GONZÁLEZ ORTEGA 641 MW Combined Cycle Power Plant	CFE	Mexico
MERIDA 500 MW Combined Cycle Power Plant + 230 kV Substation	CFE	Mexico
VALLADOLID 1000 MW Combined Cycle Power Plant + 400 kV Substation	CFE	Mexico
SALAMANCA 950 MW Combined Cycle Power Plant + Substation + TL 400 kV	CFE	Mexico
SAN LUIS POTOSI 450 MW Combined Cycle Power Plant + 230 kV Substation	CFE	Mexico
EL SAUZ 300 MW Combined Cycle Power Plant + Substation + TL 400 kV	CFE	Mexico
Belt conveying system. OCP Fertilizer Plant	Jacobs	Morocco
Coal handling system. Jorf Lasfar Thermopower plant.....	O.N.E.E.	Morocco
Complete Sulfur Handling System Jorf Lasfar Port O.C.P.....	O.C.P. Group	Morocco
CUAMBA 18 MW Hybrid Solar Power Plant	GLOBELEQ	Mozambique
TEMANE 450 MW Combined Cycle Power Plant + 400 kV Substation.....	Globeleq-Sasol-EDM.....	Mozambique
Coke and sulphur handling system Duqm Refinery.....	Petrofac	Oman
FUNDÃO 127 MW Photovoltaic Plant + Substation + TL 220 kV	DOS GRADOS CAPITAL.....	Portugal
270 MW Photovoltaic Plants.....	ENEL Green Power	Spain
Pitch Automation System Santiago Bernabéu Stadium	Real Madrid Futbol Club	Spain
Handling Sytem of agri-food materials Punta Langosteira Port	Grupo Nogar	Spain
Bulk materials reception, storage, transport and ship loading system	Eiffage	Spain
KILOMBERO Sugar Project	Illovo Sugar Company (British Sugar – ABF)	Tanzania
GRETN A Grid Stability Plant	Welsh Power	UK
Maritime bulk terminal for the export of bulk aggregates	Jacobs	UAE



ATINKOU 420MW Combined Cycle Power Plant (Ivory Coast)



ACTIVITIES BY BUSINESS LINES

ENERGY TRANSITION

As an industrial engineering and construction company, TSK offers a comprehensive technical service that ranges from consulting and design activities to the construction and commissioning of turnkey installations for different sectors such as:

Power

The experience acquired in the variety of projects in which TSK has participated, as main contractor or in consortium with the most prestigious technologists in the world, allows us to offer the most appropriate technical, economic and financial solution for each client.

- Gas-fired power plants (simple or combined cycle).
- Cogeneration plants
- Incineration plants
- Biomass
- Waste
- Wind energy
- Solar energy
- Geothermal
- Hydraulic energy

- Hydrogen
- Decarbonisation

#Industrial Plants

The experience and knowledge accumulated during all these years in the most varied technical disciplines (civil works, structural, mechanical, electrical, instrumentation,...), together with the use of the most advanced computer support, allows TSK to tackle industrial projects from process engineering to the installation and commissioning of the different process plants in the Food, Paper, Mining, Steelworks or Cement sectors.

Gas to Power

After the purchase of Intecsa Oil&Gas engineering, with more than 50 years of experience, TSK has acquired the necessary experience and references in the oil and gas sector to execute projects from conceptual engineering to installation and commissioning of complete plants.

- Oil pipelines and gas pipelines.
- Collectors and distribution networks for oil and gas.
- Oil pumping stations.



230 kV Substation. SAN LUIS POTOSI 450 MW Combined Cycle Power Plant (Mexico)



CUAMBA 18 MW Hybrid Solar Power Plant + 110 kV Substation CUAMBA (Mozambique)

- Gas compression stations.
- Metering stations (oil and gas)

Of particular note are the references in compression stations where, in Spain, it has participated in more than 70% of the stations currently in operation and in more than 4,000 km of gas and oil pipelines.

TSK develops complete projects of hydrocarbon storage terminals, in addition to their corresponding oil tanker berthing terminals and the port-refinery interconnections. Likewise, it has the necessary knowledge and experience to design both LNG tanks and regasification terminals.

TSK's references include, for example, the port facilities for berthing methane carriers at the LNG plant in the port of Barcelona, the expansion of the LNG Quintero regasification plant in Chile, the storage tank for Skangas in Finland or the Yela underground gas storage in Guadalajara.

- Oil and gas reception and loading terminals
- Underground gas storage.
- LNG tanks and regasification plants
- Hydrocarbon storage plants.

In order to unify our brands, from 2017 Intecsa Oil&Gas has been renamed TSK Oil&Gas Engineering.

#Environment

TSK is aware that society demands, with increasing insistence, a better quality of life and, therefore, the conservation and preservation of the multiple and valuable natural resources of our planet.

We are convinced that the protection and investment in the environment, water, air and soil, is not a hinderance on development, but the best strategy to achieve economic and social growth in a sustainable way by ensuring the conservation of the most valuable heritage of humanity: Planet Earth.

For various reasons (scarcity of economic resources, water shortages, disasters, etc.), many populations lack clean water

to cover their basic needs, which has a serious impact on the population's own health. Aware of this problem, TSK has a series of products of its own which, based on various treatment technologies, make it possible to cover the needs of drinking water supply to populations.

• Containerized DWTPs (Drinking Water Treatment Plants)

With a flow rate of up to 200 m³/h and a surface area of 200 m², they are capable of supplying towns of more than 25,000 inhabitants. Its design in containerized structures allows the installation of several DWTPs together. Easy to transport, install and operate, they are the ideal solution for the urgent supply or for the supply of drinking water to populations with various problems.

• Modular DWTPs

For flows of up to 10,000 m³/h, designed for minimum civil works requirements, they are suitable for the supply of drinking water to medium and large populations that, due to various circumstances, cannot carry out civil works.

• Conventional DWTPs

Designed in civil works, they are the most widely used water treatment plants to date, given the lack of other satisfactory technical alternatives.

• Upgrade DWTPs

These are redesigns of existing water treatment plants, in which, with minimal modifications, it is possible to extend the treatment flows or improve the quality of the treated water if it is insufficient.

• TSK containerized WWTPs (Waste Water Treatment Plants)

They are included in containment structures, aimed at the treatment of domestic or urban wastewater from population centres of up to approximately 5,000 inhabitants or equivalent wastewater flows.

• Modular WWTPS

They are designed with prefabricated tanks and minimum civil works requirements, aimed at population centres of up to around 100,000 inhabitants or equivalent industrial wastewater flows.



Maritime bulk terminal for the export of bulk aggregates Port of Fujairah. Dibba Bulk Handling Terminal (UAE)

- Conventional WWTPs

They are designed in civil works for the treatment of wastewater from large population centres.

- Upgrade WWTPs

This is an application of great interest for existing WWTPs which, for various reasons, function incorrectly, not achieving the results in terms of treated water quality for which they were designed (increase in flow, increase in polluting water, etc.). With the moving bed technology and with the introduction of small modifications it is possible to tune these WWTPs.

Water supply and purification facilities are common elements

of any production process. Therefore, the sludge generated in these processes are only by-products of these production cycles. Sludge is not, however, a non-valuable by-product; on the contrary, properly treated and following the well-known and current policy of the 3Rs on waste (Reduction, Recycling and Reuse), sludge is a recoverable by-product in today's society.

ELECTRICAL INFRASTRUCTURES

With a track record of over 35 years, TSK has become a leading company in the engineering and electrical equipment sector.

We develop power and control projects associated with new industrial installations, as well as innovations in existing installations.

Throughout all these years we have accumulated proven experience in the development of turnkey electrical projects in the sectors of power, telecommunications, iron and steel, metallurgy, food, paper, petrochemicals, cement, environment, fertilizers, ports and industrial plants in general.

The combination of quality, technical capacity and dedication to our customers has allowed us to achieve a leading position in all sectors in which we are present. We have a large number of highly qualified professionals and are equipped with the most advanced technical means for the design, calculation, assembly and commissioning of all types of electrical installations.

Integrated management of electrical projects

Design and engineering, planning, procurement management, manufacturing and supply of equipment, installation and assembly, quality control, training, commissioning and operation and maintenance.

- Transformer substations up to 500 kV.
- Electrical installations for thermal power stations, solar plants, wind farms, cogeneration and industrial plants in general.
- Automation of industrial installations, control and regulation of processes.
- Environment and waste treatment facilities.
- Infrastructure and building.

Engineering

- H.V., M.V. AND L.V. Electrical Engineering
- Automation, control and regulation of processes.

Assembly

- H.V., M.V. and L.V. Electrical assemblies.
- Instrumentation.
- Assembly supervision.
- Testing and commissioning.

Manufacturing

- M.V. Cells.
- L.V. distribution panels.
- Motor control centers.
- Automation and control panels.

Operations and Maintenance

- Corrective, preventive, predictive, condition-based and/or risk-based maintenance.
- Plant optimization.
- Personnel training.
- Technical assistance.
- Operation.

DIGITAL INNOVATION

We are increasingly aware of the need to digitally transform the industrial processes that our clients manage and, as TSK is well aware of the enabling technologies and solutions for this purpose, the undertaking has been clear and decisive. Thus, a new specialized department has been created, capable of designing, proposing and carrying out projects of this nature that allow our clients to reduce their operating costs and therefore improve their performance.

From TSK we take our experience to other industrial sectors to help our customers be more efficient in their production processes. This work ranges from the digitalization of the client's assets to the digital transformation of the productive processes that use those assets. Through new processes, we manage to reduce losses, production times, energy consumption, minimise stoppages, increase the life of the assets, as well as to ensure the traceability and quality flows of the manufactured products.

In order to do so, we rely on two lines of work:

- Service projects: where, as a result of industrial process consultancy, the best technological solutions are designed and proposed to enable the improvement of processes that directly affect our clients' profit and loss accounts. For this purpose, solutions of the MES (Manufacturing Executing Systems), MOM (Manufacturing Operations Management), Energy Efficiency, CMMS (Computerized Maintenance Management Sys-



65 MW Photovoltaic Plant + 138 kV Substation SANTANASOL (Dominican Republic)

tem), BPM (Business Process Management), BI (business intelligence) type are implemented, which allow and address the digital transformation of the entire Operation and Maintenance process of the plants.

- **Solutions:** where we make available to our customers the set of tools that our R+D+i teams have been developing and testing in our own plants and where we can find today packaged solutions such as:

SISREM: Remote monitoring system for industrial plants. Solution that allows optimizing the supervision of industrial plants through a unified technological architecture and a web platform for remote visualization.

SISDRON: Aerial system for the supervision of industrial

plants. Through aerial missions carried out automatically by means of drones and intelligent algorithms for image and data analysis, specific inspection tasks can be carried out.

SISTER: Electrical substation busbar supervision system based on automatic thermography analysis. By means of real time thermographic analysis, the supervision and monitoring of the state of electrical substations is carried out.

SISMETER: Analogue sensor digitizing system based on automatic image analysis. This tool is specifically designed for the digitalization, supervision and monitoring of analogical sensors of diverse nature existing in any industrial installation.

SIXPERIENCE: Intelligent supervision and training system based on virtual and/or augmented reality. This new set of tech-

nologies is used to create immersive virtual and augmented reality experiences from which to carry out everything from training and coaching tasks to the operation of the plant itself.

IP Infrastructures

From the Information Technology project team, we have specialized in the design and implementation of technological solutions that respond to the contractual technical requirements of our clients. Our experience backs us up as specialists in the execution of turnkey projects that range from the deployment of structured cabling networks and wireless networks to the integration of different technologies such as unified communications systems, public address and industrial intercom systems, VMS (Virtual Management System) solutions for the monitoring and control of production processes, access control systems for people or vehicles, and acoustic warning systems for the population for the sounding of areas affected by disasters.

At the same time, and pursuing a cycle of continuous improvement that responds to the current demand of the industrial technology market, we have specialized in the design, implementation and maintenance of perimeter security systems based on thermal vision technology and temperature control in critical equipment with thermographic vision technology.

It is also important to note that for this type of project, not only do we undertake the design, execution and start-up phases, but we also have a specific area to offer operation and maintenance services.

Cyber security

All these new challenges mentioned imply functional, technical, regulatory and even physical protection requirements, but it is worth highlighting a new challenge that concerns all of them in a transversal way and that is none other than the safeguarding of the data in terms of its confidentiality, integrity and availability.

The current reality of the union of the worlds of Information Technology and Operation Technology implies new risks and given the context in which they occur, such as the industry, with a specific and different need and way of addressing them.

The Information Technology team of TSK has been actively

participating for several years in pioneering work groups in industrial cyber security, carrying out cyber security assessments in industrial infrastructures and of course attending to our own needs. Cybersecurity has become part of the DNA of the business, both out of conviction and obligation, in order to be able to continue executing our projects with excellence as an objective.

We model cybersecurity from the gestation of the projects, including and / or responding to their requirements from the base design, detail, procurement process, engineering, testing, etc. Likewise, we are continuously improving the state of existing plants in terms of cyber security, auditing them and applying measures and procedures aligned with our continuous improvement processes, which in no other technique are as important as in cyber security, where going one step behind can be an unbearable risk.

Data Analytics

As we face new technological challenges, we are also confronted with the constant, growing and inevitable need to work with heterogeneous data sources, as well as the integration of process and business information that, among other things, will make it possible to optimize costs, improve processes, extend the useful life of industrial plants, and even make them safer.

Using all the enabling technologies that we know for this purpose, we are able to execute data and image analysis projects by means of technologies or concepts, such as: big data, machine learning, deep learning, edge computing, virtual reality, augmented reality or digital twin, which together offer our customers dashboards and solutions that accompany them throughout the entire life cycle.

HANDLING & MINING

In 1980 PHB, A.G. and Weserhütte A.G. reach a merger agreement in Germany forming the PHB Weserhütte A.G. Group or PWH. That same year PHB, S.A. and Weserhütte S.A. also merged in Spain, forming PHB Weserhütte S.A.

In 1988 the parent company is taken over by another German industrial group which modifies the structure of PHB Weserhütte



Handling Sytem. Agri-food Terminal South Pier, Cartagena Port (Spain)

te A.G., leading to the independence of the Spanish subsidiary, which retains all the technology, references and brand of the German group, remaining a Spanish-German company with a majority of Spanish capital.

In 1995, TSK acquired all the shares of PHB Weserhütte S.A., leaving the latter integrated in this group.

As port system specialists, our facilities operate with the highest degree of efficiency in many ports around the world, handling all types of solid bulks, such as coal, iron ore, bauxite, fertilizers, clinker, cement and cereals, offering different solutions for sea or river ports.

- Terminals for storage and handling of bulk solids.

- Loaders and Unloaders.
- Cranes.
- Ecological hoppers.

In PHB Weserhütte we also design circular or longitudinal storage yards with a wide range of collecting and combining machines that allow a high degree of homogenization in any type of solid bulk.

- Longitudinal and Circular Stockyards.
- Stackers.
- Scrapers.
- Blenders.
- Bucket Wheel Stacker-reclaimers.
- Conveyors.



TSK'S COMMITMENT

TSK'S MISSION

TSK's mission is focused on being a highly competitive organization in the execution of technological solutions in the infrastructure, energy, industrial and environmental sectors, pursuing the satisfaction of the client and the people who make up TSK at all times, in a commitment to their personal and professional development.

TSK'S VISION

The Group's vision is to be a cutting-edge company, leader in terms of human resources, technology and profitability, in order to offer efficient solutions that contribute to a more sustainable development, ensuring the satisfaction and confidence of our customers, partners, employees and society in general.

TSK'S VALUES

Competitiveness:

As an inherent value of the company for the successful achievement of our vision.

Innovation:

TSK is committed to innovation in its processes and ways of working, offering the customer the most innovative services on the market. We maintain a vigilant and proactive attitude towards opportunities, in a process of continuous development.

Excellence:

Quality is an intrinsic value of the company, which aims to offer products and services that aspire to excellence. Our companies must be perceived by the customer as companies that offer solutions and installations of the highest quality.

Collaboration:

This value is always present in the organisation and culture of TSK, extending to daily relations with customers, suppliers, employees and society in general. Our spirit of collaboration is reflected in our daily actions.

Commitment and Respect:

These are values that are deeply rooted in the organisation. Commitment must be a sign of identity in all our actions, as well as respect for all groups with which we have a relationship.

Flexibility:

The activity of our companies is framed within the services to the industry, so flexibility is a fundamental factor to compete with larger companies and resources. We want to transmit this flexibility in all our companies, being able to adapt to the changes that may occur.

Enthusiasm and Passion:

Only through the enthusiasm and passion we put into our projects, behaviour and actions is it possible to achieve our common goal, to make TSK the leading company and a reference in the market.



SALAMANCA 950 MW CCGT (Mexico)



SUSTAINABILITY

TALENT

The most important aspect about a company with our history is the people who make it up. For this reason, people management has been, and always will be, a key aspect of our business strategy.

TSK considers people as the fundamental pillar of its development and therefore implements policies to promote employment stability and equality policies, career plans and social benefits.

TSK has the best professionals in the sector, with levels of qualification and specialization of recognized prestige. At the end of 2022, TSK had more than 1000 employees. An important group within this staff is the expatriate professionals in the projects; ensuring their commitment and maintaining the sense of belonging is a key aspect for TSK. The company extends to these professionals all the measures it implements in terms of human resources.

The workforce average age is 46,66 years, with an average length of service in the company of around 8,55 years. 97,97 percent of employees have a permanent contract, 74,89% are men and 25,11% are women.

Diversity and equal opportunities

At TSK we promote a working environment that allows equal opportunities and the possibility of making the professional and personal lives of our staff compatible. TSK has established an Equality Committee in order to ensure respect for diversity and equality

TSK has an Equality policy which reflects the clear commitment of the organisation to the people who work for TSK and with society.

In its efforts to promote and implement equality policies in the organization, the management of TSK signed a commitment that establishes:

- Equal opportunities between men and women as a strategic principle
- The promotion and encouragement of measures to achieve effective equality.
- Special attention to situations of indirect discrimination that may occur through the management of human resources policies.
- The projection of a company image in line with this commitment.

To do this, TSK has drawn up its Equality Plan which is intended to be the framework for establishing the strategy and lines



Women's Day Celebration. SALAMANCA Combined Cycle Power Plant (Mexico)

of work of the organisation where positive actions aimed at ensuring effective equality between men and women are included.

Talent management and conservation

In the current context, the human resources function needs to be flexible, adaptable and capable of driving change, and it must provide a rapid and efficient response to business needs and priorities.

TSK promotes the professional and human development of its staff and encourages the exchange of ideas at a global level, with the conviction that this way new concepts are created, especially when professionals from different disciplines and with different backgrounds meet. This unity, guarantees the long term success as the best team, counting on the potentials of each one of the different members of the team.

Another key aspect of preserving and improving the company's human capital is to provide professionals with the necessary training resources and knowledge.

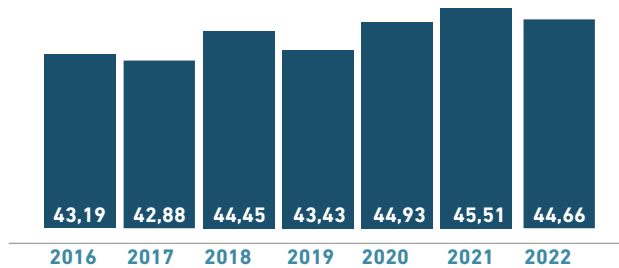
Knowledge management and dissemination

TSK has different tools for information management that facilitate internal communication and the exchange of knowledge and experiences:

- Project database, which makes information and documents on TSK projects available to employees
- Document management tools that allow the coordination of independent working groups for projects. Thanks to these tools it is possible to store and manage documentation, establish permissions, control the versions of documents and allow the immediate use or consultation of them, in the appropriate safety conditions.

AVERAGE AGE

AÑOS



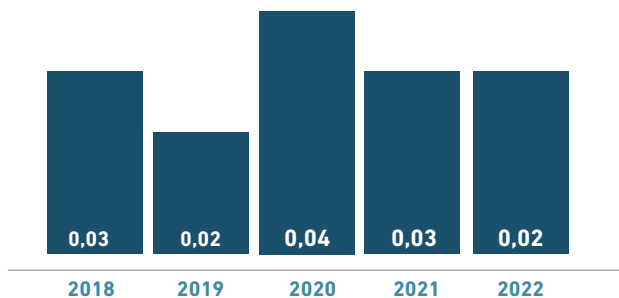
• Requesting services through the intranet. This tool allows requests to be made regardless of where people are physically located, such as requests for holidays, permits, advances, computer equipment, incidents or other general services.

Regarding training, at TSK we have training programs to cover the needs of employees:

- Technical training, provided by external suppliers or by company specialists, who transmit knowledge and experience to the team.
- Language training -English, French, German and Italian- through free programs
- Training in management skills.
- Training in information technology with the aim of improving knowledge of computer tools, both generic and specific to the company.

SEVERITY RATE

$(\text{Lost days} / \text{Worked hours}) \times 1.000$



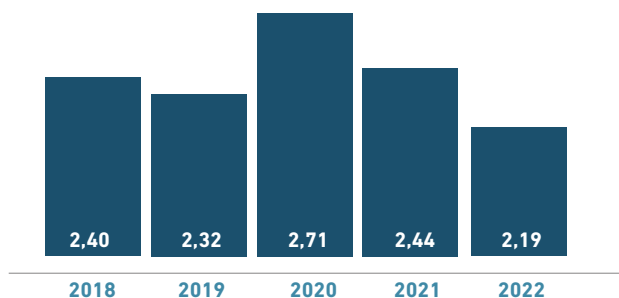
Talent appeal and recruitment

The objective in terms of attracting talent and selecting personnel is to identify and incorporate the best talent available, both great professionals committed to the TSK project who have the necessary skills, and young talent with development potential.

We want to be an attractive company for our employees and we compete for the most qualified, offering a wide range of incentives. The key to success is attractive benefits, performance-related pay and opportunities for international development. We give particular importance to a company culture that is oriented towards dialogue and teamwork. Our selection processes are carried out according to the following criteria: equal opportunities and non-discrimination, respect for the person, honesty, professional ethics and confidentiality.

FREQUENCY RATE

$(\text{LTI} / \text{Worked hours}) \times 1.000.000$



The TSK wage system includes fixed and variable components. On the other hand, we encourage mobility and promote the filling of vacancies through internal promotion, facilitating the voluntary movement of staff to enhance the development of their professional careers, talent management and the better matching of people to positions. This process allows employees to apply for those positions they find attractive, advising

and supporting candidates who show interest in a particular position.

In relation to social benefits, TSK is committed to the continuous improvement of the quality of life of its employees. It makes a special effort to ensure and guarantee their lives, support the integration of the disabled and implement best practices to facilitate the combination of professional and personal life, such as flexible working hours, splitting of holiday periods and reduction of working hours, amongst others.

MANAGEMENT SYSTEMS

At TSK we define ourselves as a company guided by ethical behaviour and committed to Health and Safety at Work, Quality and the Environment. In accordance with our strategic framework, we have evolved based on a process of continuous improvement in all areas of our activity, with a firm commitment to proactively promote an ethical culture, paying special attention to people's safety, the quality of projects, and the protection and conservation of the Environment.

This commitment has materialized in our Integrated Management System, which is externally certified under the ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, ISO 37001:2017, UNE:19601:2017, SR10, ISO/IEC 27001:2013 and UNE 166002:2014 standards and which covers all phases of the project life cycle, extending to our suppliers and subcontractors.

Regarding the current management structure and organization, TSK has a management systems department that designs, measures and evaluates the different process indicators; manages an integrated quality, environmental, occupational health and safety, information security and R&D&I system; and maintains and complies with the legal and regulatory requirements of each project.

In TSK we ensure Quality in the execution of our own projects as well as those of suppliers and subcontractors, which allows customers to have full guarantee of the proper functioning of their plants in accordance with regulatory and contractual requirements.

TSK has an excellent team that allows the Company to overcome the challenges it faces and achieve its objectives in a sustainable, responsible manner and with the quality standards required by the market.

Our priority: health and safety management

At TSK we understand that health and safety is a fundamental and priority issue due to the nature of the activity we develop and therefore we work to maximize health and safety throughout the life cycle of our projects.

We have had an Occupational Health and Safety Management System since 2007, which we are currently certified under ISO 45001:2018, which considers all phases of the project life cycle, from design to construction and commissioning.

Our goal is always "zero accidents" and the guidelines for action are transmitted from the highest levels of the organization. This objective is applicable to all the people involved in our projects (employees and subcontractors), collaborators, suppliers and visitors to our facilities and projects.

TSK has a preventive organisation based on a joint prevention service - made up of professionals covering the preventive specialties of safety in the workplace, industrial hygiene and ergonomics and applied psychosociology - complemented by an external prevention service covering health surveillance. Workers who travel from Spain to international projects are given the necessary medical examinations, explorations and actions.

Within the preventive organisation of TSK, the prevention delegates of the different companies of the group are effectively integrated in representation of the workers, and a health and safety committee has been set up to provide information, participation and consultation on all matters relating to health and safety.

As part of our management system, TSK prepares specific health and safety plans in which the scope of work and the necessary preventive measures in the projects are defined.

So that safety is fully implemented in all our projects, from TSK we work for the standardization of health and safety proce-

dures with the aim of increasing efficiency in the dissemination and assimilation of corporate policies.

Our commitment to health and wellness is a priority and one of the basic pillars of our employee value proposition. We establish programs that focus on three main areas of action: physical activity, emotional well-being and healthy habits and diet.

Medio ambiente

TSK, aware of the responsibility we have with the environment, contributes to sustainable development and to the prevention and protection of the environment. This is a priority integrated in the strategy marked by the Management.

TSK has an Environmental Management System implemented and certified in accordance with the ISO 14001:2015 standard, conceived to maintain an adequate level of environmental management in all our projects. In this way, we guarantee respect for the applicable environmental legislation.

At TSK we offer our clients our technical capacity and know-how to include sustainability criteria in the design, construction and operation of projects, trying at all times to achieve maximum production ratios with the lowest possible energy cost and always maintaining the highest levels of quality.

The value that TSK gives to the strong commitment with sustainability and the environment, makes the company to be always looking for and investing in more efficient solutions and technologies that allow us to reduce to the maximum the tons of CO₂ emitted to the atmosphere.

Compliance

TSK promotes a culture of ethics and compliance in its activity which encourages and strengthens the principles and values established internally. For this reason, we are firmly committed to promoting the ethical behaviour of all our stakeholders, regardless of where we carry out our activity, through the use of the necessary resources in the control of business processes that allow us to differentiate ourselves in the market and ensure competitiveness. In this regard, it has published its

own Compliance Policy and Code of Ethics, in addition to the implementation, since 2013, of a Crime Prevention Plan, which establishes the principles and values that must govern all business relationships and whose review and updating is the responsibility of the Ethics Committee. For the resolution of any doubts in this regard, it has an open communication channel, where any irregular conduct or conduct contrary to the internally established principles and values can also be reported.

The Criminal Compliance Management System is certified in accordance with the UNE 19601 "Criminal Compliance Management Systems" and UNE-ISO 37001 "Anti-bribery Management Systems", the first and most demanding certifiable international standard for developing and implementing management systems in this field. In this way, we guarantee our commitment to strengthening the ethical and compliance culture in the development of our activity.

SUSTAINABILITY

In TSK we wanted to take a further step in integrating the criteria of social responsibility, both economic, environmental, social, ethical management, good governance and transparency, through the development and implementation of a Management System certified by AENOR, based on the standard IQ-NET SR10. This System helps us to systematize, and integrate with other systems in our organization, the criteria and requirements contained in this standard, as well as those contained in the international standard ISO 26000, a guide that provides guidance on the principles underlying social responsibility, recognition of social responsibility and stakeholder involvement, identification of risks and material aspects, and how to integrate socially responsible behavior in the organization, emphasizing the importance of results and improvements in the performance of social responsibility.

Key actions such as the identification, prioritisation and advanced dialogue with our Stakeholders, the identification of our sustainability risks, in the areas of ethics, the community, the environment or people, have allowed us to draw up a Policy, a Code of Ethics, and a Plan of Objectives and Actions, coherent and aligned with our priorities and with the concerns of our



World Day for Safety and Health at Work. GONZÁLEZ ORTEGA 641 MW Combined Cycle Power Plant (Mexico)

stakeholders, aimed at improving our social, economic and environmental performance.

Social progress, environmental balance and economic growth must always go hand in hand.

Our commitment to sustainability is a commitment to our vision, mission and values, incorporating in our Corporate Social Responsibility and business policy the Sustainable Development Goals (SDGs) approved by the UN, whose purpose is to promote economic growth, work for social inclusion, fight against climate change and protect the environment.

In order to identify those SDGs that are relevant to our organisation, we have carried out a materiality analysis, which takes into account both the interests of the organisation and the concerns of stakeholders and the communities where we operate, identifying four improvement plans or main initiatives on which the objectives and actions to achieve them are based, framed within our strategic plan: Talent Engagement and

Loyalty Plan, Transparency and Good Governance Plan, Innovation and New Technologies Plan and Environmental Impact Improvement Plan. These Improvement Plans are related to 5 of the 17 SUSTAINABLE DEVELOPMENT GOALS



Social Action

At TSK we are convinced that social commitment is inherent in business activity, to which the growing level of prosperity and well-being of society is largely attributable. Our main responsibility is to be able to provide a better service to our customers every day. This is what allows us to create value, generate quality jobs, invest in research and development and get involved in activities that benefit society.

Within this social management, we highlight the following activities:

Community Relations. We maintain a constant dialogue with authorities and community representatives during the execution of our projects.

Social impact. Although the company's impacts are mostly positive, TSK analyzes local regulations in order to offer mechanisms for information, complaints and restoration of negative social impacts.

Project implementation

Depending on the needs and expectations of the community where we are, we offer the possibility of carrying out projects to support it.

During the past year we have developed a local project for the improvement of the community near the Antinkou Combined Cycle Project (Ivory Coast). A catering area has been developed for the workers of the plant, with the initial objective of allowing the personnel to have access to healthy food, prepared and in optimal hygienic conditions at a reasonable cost. It also contributes to the development of the local community by allowing them to obtain an economic benefit from the sale of food.

Sponsorships

TSK has sponsored the TSK Roces Sports Club for over twelve years, with a group of over 500 children. In addition, every year TSK sponsors various events and sports clubs, in order to promote sport among the youngest and employees of TSK.

Collaborations with other entities

In TSK we consider that it is also our responsibility to support organizations that work for the improvement of society. For this reason, we collaborate with different associations and organizations related to the environment, culture, research, education and corporate social responsibility with the aim of sharing their business experiences and acquiring the most appropriate and innovative practices. Among the most noteworthy are:

- Sponsorship of cultural exhibitions.
- Collaboration with the University of Oviedo.
- Commitment to Asturian industry and the development of the region.



- Collaboration with the Asturian Quality Club, Asturian Innovation Club, Femetal, Asturian Family Business Association, Ademi, Sercobe and Prodiotec.

Donations to social action entities

Each year TSK allocates a portion of its budget to donations to entities that promote projects and actions related to education, health, culture, sports and international cooperation. Among other institutions, TSK supports the Princess of Asturias Foundation, the Lo que de Verdad Importa Foundation, the Foundation for Biosanitary Research of the Principality of Asturias (FINBA), Caritas, Unicef, the Red Cross and the Global Health Institute Foundation for child vaccination.



Presentation of the book "La Biología Molecular en 7 metáforas" by Pablo Argüelles, to benefit the fight against ALS.



Ecological hopper for agri-food materials TERMINAL GRAINS La CoopFédérée grain terminal (Canada)



TSK, driving company in the V OPEN INNOVATION 4.0

For us, the need to innovate in projects, processes and services is beyond any doubt, understanding innovation as the differentiating factor that allows us to provide greater added value to everything we do.

The great diversity of projects and technological areas in which TSK participates obliges the company to be continuously innovating. That is why, with a plan to bringing together all these initiatives, as well as differentiating itself in the market and placing value on innovation as a strategic line of action, TSK INNOVATION was created.

This concept encompasses all R&D+i initiatives and projects developed by the company, and incorporates actions aimed at involving all market agents in its internal innovation process, fostering knowledge management and technology transference and establishing synergies for the identification and development of R&D+i activities.

Investment in R&D and technological innovation in 2022 exceeded €11.5 million, representing 2% of sales. This year, we have had the opportunity to present our sustainability and digitalization strategy to the President of the Government, and in particular, the projects that have received funds from the Recovery, Transformation and Resilience Plan (PRTR).



We have also received the IMPULSA TIC EMPRESA 2022 Award granted by COLIPA and CITIPA, in recognition of our commitment to investment in research and innovation. As a result of this commitment, we have participated as a driving company in the V OPEN INNOVATION 4.0 organized by IDEPA, CEEI Asturias and other companies.

I+D+I PROJECTS

Our deep identity with innovation is part of our long-term strategy, materialised in strong investments in R&D+i, collaborating with technology centres, universities and companies within the framework of local, national and European programmes. As a result of this intense R&D+i activity, the following projects were carried out in 2022:

PROJECT SUBSIDIZED BY THE CENTER FOR INDUSTRIAL TECHNOLOGICAL DEVELOPMENT (CDTI). THIS PROJECT HAS BEEN SUPPORTED BY THE MINISTRY OF SCIENCE AND INNOVATION.



SOLSTICIA: SOLUTIONS FOR BUILDING CYBER-SAFE AND INTELLIGENT INDUSTRIAL SOFTWARE SYSTEMS BY DESIGN BASED ON ARTIFICIAL INTELLIGENCE TO DRIVE PRODUCTIVITY AND GROWTH IN A CYBER-SECURE ECONOMY AND SOCIETY. MIG-20211006

Industry is incorporating many intelligent systems that need to be secured by design if they are not to increase the surface area of exposure to cyber-attacks. The developers of these intelligent systems are highly competent, but they unconsciously design and develop systems that are prone to vulnerabilities in all domains and use cases, even when operating in tightly controlled development, laboratory and test environments. SOLSTICIA investigates to answer the question how we can therefore build intelligent systems to be robust and secure in complex and ambiguous contexts such as those of the industrial domain where the possible consequences of a

cyber-attack impact lives or large business losses?

The SOLSTICIA project aims to optimise and secure all intelligent software development processes. During the execution of the project, TSK will work on the Industry 4.0 platform that it has developed over the last few years and on which it has built a catalogue of solutions such as SISREM, SISDRON or SIXPERIENCE. The results of the project will optimise the company's intelligent software development process.

This project is led by CAPGEMINI in consortium with TSK, MTP, ATOS, PROXYA, COTESA and THE REUSE COMPANY. The consortium has the collaboration of the Tecnalia technology centre and the Polytechnic University of Madrid.

INNERBOT: RESEARCH IN IMMERSIVE AND SENSORY TECHNOLOGIES FOR COLLABORATIVE INDUSTRIAL ROBOTIC INSPECTION. MIG-20211008

This project arises from the existing limitations in efficient human-robot and robot-robot collaboration in inspection and maintenance environments of industrial facilities. The scope of the INNERBOT project is to advance knowledge of teleoperation and management of multi-robot systems in highly immersive environments for inspection and maintenance applications, which involves research into haptic and robotic technologies, analysis of the environment using various sensors, as well as research into the use of artificial intelligence for mobility, defect detection and reconstruction of the environment based on data from sensors and vision cameras.

The consortium of this project is led by TSK with the participation of ALISYS, COTESA, ECAPTURE, ROBOTNIK, APTICA, GPA SEABOTS and SYLTEC. The ITCL and LEITAT technology centres and the Polytechnic University of Madrid and the University of Oviedo are also collaborating.

TSK is mainly participating in the project by researching immersive technologies (virtual, augmented and mixed reality) for remote operation and interaction with multi-robot systems in industrial inspection scenarios. It will also work on the design of new sensors and artificial intelligence algorithms for the detection of events and anomalies.

SecBluRed: HOLISTIC APPROACH TO CYBERSECURITY IN THE INDUSTRIAL LOT (IIoT). MIG-20221051

Due to the current trend of attacks suffered by industry and considering the wireless technologies to be progressively implemented (substantial savings in the deployment of new systems), the SecBluRed project proposes a holistic research approach to cybersecurity for the Industrial IoT (IIoT, from now on), which could be extended to other industrial technological environments. To this end, three research axes are proposed:

IIoT Securitisation: building secure IIoT systems, based on secure components. The aim will be to identify new mechanisms complementary to the current ones to increase the cybersecurity of IIoT systems. This line of research is oriented towards the development of IIoT systems that consider 5G networks, the post-quantum stage (which is much closer than we think) and guaranteeing the identity of IIoT nodes (self-sovereign identity), among other aspects.

BlueTeam IIoT: IIoT system defence mechanisms. The objective is to provide additional mechanisms to an IIoT system (new or in operation) to increase its defence against cyberattacks from malicious internal and/or external employees in order to stop information leakage or manipulation. This is a line of research on network-level defence mechanisms in the IIoT domain. Specifically, what is proposed is an intelligent network monitoring system that is non-intrusive in deployed systems, running on IIoT hardware designed for this purpose. An OT communication and control unit (wired) with new cybersecurity capabilities is also proposed.

RedTeam IIoT: validate the proposed security and defence mechanisms. The aim is to validate that the new IIoT system construction components are cybersecure, and that the IIoT defence mechanisms proposed in the project are effective. This is the last line of research aimed at minimising the likelihood of a security breach in IIoT systems incorporating the solutions proposed in this project, as there is no way of guaranteeing that there will be no security breaches.

The consortium of this project is led by MÉTODOS Y TECNOLOGÍA DE SISTEMAS Y PROCESOS, S.L. and counts on the

participation of TSK ELECTRÓNICA Y ELECTRICIDAD, S.A., AMPLÍA SOLUCIONES, S.L., EDOSOFT FACTORY, S.L., OPEN CANARIAS, S.L. and SCHNEIDER ELECTRIC ESPAÑA, S.A., OPEN CANARIAS, S.L. and SCHNEIDER ELECTRIC ESPAÑA, S.A. The Polytechnic University of Madrid (UPM), the University of Oviedo (UNIOVI), Tecnalia, the Technological Institute of Castilla y León (ITCL), Ikerlan, Gradiant and AICIA are also collaborating.

PROJECTS CO-FINANCED BY THE CDTI AND THE EUROPEAN UNION THROUGH FEDER FUNDS



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"Una manera de hacer Europa"



DEVELOPMENT OF A LARGE METAL SILO FOR BIOMASS EXPLOSIVE CONDITIONS (ExSILOS) _IDI-20191151



The general purpose of the project is the development of an in-house model of a large (>10,000 m³) tubular flow (core flow) metal silo for the storage of biomass in which its safety against the risk of dust explosion can be guaranteed, in the absence of regulations governing dust protection and which is efficient from the economic point of view; in other words, it uses the minimum amount of steel or metal necessary and reduces the need for venting to a minimum.

PVOLTAI 4.0: RESEARCH AND DEVELOPMENT OF OPERATION AND MAINTENANCE TECHNOLOGIES FOR THE MANAGEMENT OF PHOTOVOLTAIC PLANTS. IDI-20190759

The general purpose of the PVoltai4.0 project is to design and develop an advanced system to assist the operation

and maintenance tasks of a photovoltaic plant with the ultimate goal of improving its performance and optimizing its operation, which will ultimately translate into an increase in the reliability and useful life of the plant. This system will be developed according to the principles of the Industry 4.0 paradigm, especially with regard to the integration of Industrial Internet of Things (IIoT), Big Data analysis and advanced visualization.

**RESEARCH IN EMERGING TECHNOLOGIES TO ACHIEVE INNOVATIVE SOLUTIONS FOR DIGITAL TWINS (READY TWIN)
_IDI-20190974**

The READY TWIN project will facilitate the adoption of technological solutions capable of generating accurate Digital Twins in an automated manner through the use of 3D and IoT modelling technologies; as well as improving Digital Twin Asset Management through the use of Artificial Intelligence, Visualisation Technologies, Virtual Reality and Augmented Reality Simulation Technologies and Blockchain. All of them are disruptive technologies in the international and national technological panorama.

SAID4PV: MODULAR UAVS-BASED SOLUTION FOR DECISION MAKING AND DIAGNOSTIC TASK SUPPORT OF PHOTOVOLTAIC PLANTS USING ELECTROLUMINESCENCE IMAGING, THERMOGRAPHY AND RGB VISION CAMERAS, ELECTRICAL ANALYSIS AND GEOVISUALISATION IDI-20210170

The AID4PV project aims to research, develop and demonstrate in an operational environment a modular solution based on unmanned aerial vehicles (UAVs) for PV plant monitoring and advanced diagnostics. The autonomous UAV platform will capture photographic (RGB), thermographic (IRT) and electroluminescence (EL) images to enable near real-time fault detection, leading to PV plant diagnostics in time and cost. The results will be presented in an advanced reporting and geo-visualisation platform including geospatial analysis and visualisation tools. Decision support capabilities will also be investigated, adding the possibility to perform some kind of predefined actions from the UAV platform, minimising the time from detection of an anomaly to corrective actions.

PROPERPHOTOMILE: PREDICTING THE OPERATIONAL LIFETIME OF PEROVSKITE PHOTOVOLTAIC CELLS. ACCELE-



RATION FACTORS IN THE STUDY OF STABILITY THROUGH THE APPLICATION OF MACHINE LEARNING. IDI-20210171

The overall objective of the ProperPhotoMiLe project is to develop an automated scheme to analyse the stability data of Perovskite Halide Solar Cells (PSCs) generated by standardised accelerated tests. This analysis will determine the most relevant accelerated test for normal operating conditions, as well as the acceleration factor (which relates the measured stability parameters to the operational lifetime of the PSC) and the expected lifetime.

HYBRID PLANT CONTROLLER (HYPER) _IDI-20210809

The overall objective of the project is to develop a novel tool for the real-time control of hybrid technology power plants that allows the operation of this type of plant as a single equivalent plant.

PARAMETERIZATION OF THE FACTORS INVOLVED IN THE DEGRADATION OF SOLAR SALT AT HIGH TEMPERATURE. (LUG) _IDI-20211041

The general objective of the project is to study the differences in solar degradation at laboratory scale versus real scale, as it has been proven that there are substantial differences. Therefore, it is considered essential to know this behaviour in order to better estimate the expected degradation in a real plant and minimise its effects.

PROJECTS CO-FINANCED BY THE GOVERNMENT OF THE PRINCIPALITY OF ASTURIAS THROUGH IDEPA AND THE PLAN FOR SCIENCE, TECHNOLOGY AND INNOVATION (PCTI), AND THE EU THROUGH THE ERDF FUNDS



EVAIR: EVALUATION OF AIR POLLUTION MITIGATION MEASURES AND PREDICTION OF HIGH-RESOLUTION AIR QUALITY LEVELS USING A MULTISCALE METHODOLOGY

IDE-2018-000423

The general purpose of this project is the design of a methodology for the evaluation of the dispersion of atmospheric pollutants in areas close to industrial environments that integrates

different spatial scales of analysis and allows the simulation of the implementation of mitigation measures.

OARO: NEW EFFICIENT WATER TREATMENT SOLUTIONS USING OSMOTIC ASSISTED REVERSE OSMOSIS

IDE/2019/000353

The OARO project arises in response to the current limitations detected in the field of brine regeneration and in water desalination processes using Reverse Osmosis (RO). These limitations are the maximum concentration admitted by the membranes and the high pressure required for their operation.

RE-CARBON: INVESTIGATION OF METHODS OF ADSORPTION OF POLLUTANTS BY REGENERATED ACTIVATED CARBON AND BIOCHAR. IDE/2019/000585

The RE-Carbon project seeks to investigate innovative solutions for the decontamination of liquid and gaseous effluents, based on the use of carbonaceous materials. The research is developed around three main axes: the development of dynamic units of adsorption with activated carbon optimized for the adsorption of target compounds in gas phase and aqueous phase that incorporate sensors that allow the monitoring of the process in real time, the analysis of technical and economic viability of the use of biochar for the purification of fluids and the analysis of technical and economic viability of the regeneration of activated carbon from the adaptation of an experimental plant of pyrolysis of forest residues for its energetic recovery, suitably modified to implement the stages of drying and gasification. The ultimate aim is to take advantage of the environmental opportunity that the industrial use of activated carbon for fluid purification represents, using the competitive advantage that the regeneration of coals in environments close to their use, reducing the costs associated with transport.

SISPECTION: RESEARCH INTO TECHNIQUES FOR THE DETECTION, CLASSIFICATION AND MONITORING OF OBJECTS FOR INSPECTION AND SECURITY PURPOSES IN INDUSTRIAL SETTINGS

IDE/2019/000268

The general objective of the project is to research in Artificial Intelligence (AI) algorithms to process images, in a flexible processing architecture, and adding a layer of interoperability

lity, achieving a significant advance in the state of the art of object detection, recognition and tracking systems in industrial scenarios with the ultimate aim of improving security.

PHOTOASSISTED: RESEARCH IN AUGMENTED AND VIRTUAL REALITY TECHNOLOGIES FOR MONITORING, OPERATION AND MAINTENANCE ASSISTANCE IN PHOTOVOLTAIC PLANTS

IDE/2019/000270

The general objective of this project is to research and develop a monitoring, operation and maintenance assistance tool based on augmented reality and virtual reality systems specifically designed for application in a photovoltaic scenario.

BISOLARRAIL: DEVELOPMENT OF DISRUPTIVE MULTI-METAL PRODUCTS FOR THE RAILWAY AND SOLAR THERMAL INDUSTRIES. IDE/2019/000582

The main objective of the project is to explore the feasibility of developing new bimetallic products processed by hot rolling, for specific applications with high corrosion and wear resistance requirements, in the energy and transport sectors, respectively, with lower manufacturing, installation, maintenance and/or improved properties costs. With regard to the application of renewable energy, the aim is to manufacture a flat bimetallic product that is resistant to the operating conditions of salt tanks in solar thermal power plants, mainly corrosion due to exposure to molten salts, and high temperature (565°C).

SISHOME: DESIGN OF AN INTEGRAL RESIDENTIAL MONITORING SOLUTION ORIENTED TOWARDS EFFICIENCY AND WELLBEING. IDE/2020/000326

The general objective of the SISHOME project is to build a modular solution that allows the integral monitoring of all existing sources of information that influence the home and that allows the extraction and definition of indicators and policies both in terms of energy efficiency and people's well-being and quality of life.

RETRACK: INDUSTRIAL RESEARCH STUDY FOR THE CONSTRUCTION OF RESILIENT SOLAR TRACKERS.

IDE/2020/000345

Due to structural developments in the pursuit of optimisation, the PV tracker structures currently being built are extremely

slender. Although the mono-axis design used today is correctly calculated, dynamic failures are beginning to occur in installations around the world. In particular, the type of breakage associated with aeroelastic instabilities, under the effects of moderate wind speeds. Due to the novelty and complexity of this phenomenon, Eurocode and other international standards do not, at present, contain any valid formulation to cover these problematic events. This fact implies a high economic risk when it comes to providing energy security in production. For the correct calculation of this type of structures, a greater and deeper knowledge of aeroelastic phenomena is required, normally complemented with wind tunnel studies by means of a detailed theoretical and experimental study of the parameters involved in this type of instabilities. This is how the RETRACK project came about, the purpose of which includes experimental studies of various models of solar tracker such as those that TSK frequently incorporates in its plants and which are subjected to adverse weather phenomena that must be considered for their correct operation, once at the final site. Likewise, the methodologies of control and monitoring of characteristic plant parameters will be studied, seeking maximum efficiency.

LEAK: NEW SAFETY SYSTEM FOR OIL LEAKAGE IN HEAT EXCHANGERS FOR HYBRID SOLAR POWER PLANTS.

IDE/2020/000384

The main objective of the LEAK project is to determine a new safety system for oil leaks in heat exchangers in hybrid photovoltaic-solar plants and/or in independent energy storage plants, guaranteeing efficient, reliable and safe energy production and storage. This type of plant presents a new risk that did not exist in previous solar thermal or photovoltaic plants. Conventional solar thermal plants work with oil in the solar field up to 400°C and the salts are stored at the same temperature. The salt tanks are inertised with nitrogen to prevent fires in the event of HTF and to protect the plant. In the new plants, the oil in the solar field is also heated up to 400°C. However, in this case the salts are heated up to 565°C by electric heaters after being heated by the oil. At this storage temperature, the degradation is much higher and therefore the use of an air atmosphere is recommended. On the other hand, in case of a puncture in the HTF-salt exchangers, the HTF could reach the salt tanks, posing a safety hazard.

BIO-TECS: RESEARCH ON THE HYBRIDISATION OF DEEP LEARNING, EDGE COMPUTING, INTERNET OF THINGS, AND MICRO-ENERGY GENERATION TECHNOLOGIES FOR BIODIVERSITY CONSERVATION IN ISOLATED, REMOTE AND POTENTIALLY HOSTILE ENVIRONMENTS.

IDE/2021/000455

The aim of the project is to investigate how far current technology is capable of going in terms of hardware (processing, communications, image capture sensors), image processing algorithms (based on Deep Learning and Edge Computing contemplating approaches for optimisation), intelligent information management (using IoT protocols and technologies such as NB-IOT and/or LoRa), remote monitoring of equipment (consumption, characterisation of devices, detection of theft, etc.), microgeneration systems for the correct supply of energy to electronic elements, and hybridisation procedures for all these components, all applied to a use case for the conservation of biodiversity in isolated environments.), microgeneration systems for the correct supply of energy to the electronic elements, and hybridisation procedures for all these components, all applied to a use case for the conservation of biodiversity in isolated, remote and potentially hostile environments, although the results will be directly extrapolable to other fields in which highly efficient image processing capacities are needed, in real time and with minimum energy consumption, such as industry or security.

DativeHaus: STUDY AND RESEARCH INTO THE DESIGN OF AN ENERGY-OPTIMISED MODULAR DATA PROCESSING CENTRE. IDE/2021/000462

The aim of the project is to investigate a new design for a modular container for edge-type data centres that can significantly improve their energy efficiency and environmental impact through the inclusion of bioclimatic construction techniques and green generation sources.

DAGDA: DESIGN OF A DATA STORAGE AND DATA MANAGEMENT PLATFORM FOR POWER PLANTS. IDE/2021/000384

The general objective of the project is to research the technologies for obtaining a Big Data tool that extracts, consolidates, analyses and presents all the data generated in electricity generation plants. The tool will be capable of adapting to the user to offer the capabilities and analysis that will be use-

ful to them, either by providing daily operating reports, digital twins of equipment and/or systems, availability evaluations or any other study based on real operating data.

DAMTAQ: DATA FUSSION METHODOLOGY FOR REMOTE MONITORING OF WATER QUALITY IN RESERVOIRS

IDE/2022/000558

Controlling and guaranteeing the quality of inland waters is one of the development and sustainability challenges that is currently having the greatest impact. By way of reference, this challenge is recognised by the UN in its 2030 agenda as one of the 17 Sustainable Development Goals, specifically in goal 6 "Clean Water and Sanitation".

One of the most important problems in the field of quality control is the so-called eutrophication process of impounded waters. This process is caused by an excess of nutrients such as nitrogen and phosphorus in the water, mainly due to human activity, which results in the contamination of the water in the reservoir. In Spain, this problem is particularly relevant, given that it has a total of 371 reservoirs and a combined capacity of 56,000 cubic hectometres, making Spain the country with the fifth largest number of this type of infrastructure and the first in the European Union.

In this situation, the use and availability of tools aimed at automation in the diagnosis and prediction of pollutants and water quality can be a great advantage in meeting this challenge. This is precisely what is proposed by the DAMTAQ project, which aims to provide a methodology that allows the management and analysis of multiple sources of information related to the quality of reservoir water in order to derive relevant results. The overall objective is the remote monitoring of water quality in reservoirs, for which a low-cost sensor and communication solution will be investigated and the use of remote sensing and satellite data, the application of data analysis algorithms and the combination and correlation of different sources of information to generate indicators and guide decision-making will be addressed.

IMMERSIVE PHYSICAL SECURITY SYSTEM BASED ON AUTONOMOUS, TELEOPERATED ROBOTIC PLATFORMS (Secu-RAT) _IDE/2022/000605

The general objective of the SecuRAT project is to carry out an experimental development of a new physical security system based on the use of immersive technologies and robotic platforms, addressing three main technological challenges:

- (1) Absolute positioning systems in robots
- (2) Techniques and procedures for the capture and reconstruction of anomalous elements
- (3) Integration of surveillance and teleoperation systems based on virtual reality in mobile surveillance robots.

The project will make it possible to incorporate highly innovative features into current physical security systems, including: (a) remote security, (b) extended security and (c) immersive security. This project aims to provide a new approach to physical security systems through the use of robotic platforms capable of operating in the required installations. Thanks to the sensors and cameras of these robots, together with the one that can be loaded on board, the system will be able to locate and move the robot precisely in such a way that autonomous rounds can be carried out. In addition, from an immersive environment, the operator will be able to view the classic CCTV of the installation together with all the information from sensors and cameras on board the robotic platform, as well as teleoperate it.

INDUSTRIALIZATION OF AUTOMATED CORROSION AND WEAR RESISTANT HARDFACING PROCESSES FOR COMPONENTS WITH HIGH IN-SERVICE REQUIREMENTS (OPEN-CLAD) _IDE/2022/000793

The final objective of this open innovation project is the industrialization of an automated hardfacing process for components with high mechanical requirements, such as those used by PHB in its bulk material handling applications.

PROJECT CO-FINANCED BY THE "PORTS 4.0" FUND OF STATE PORTS



PARVAMAP 3D: GRAPEVINE MAPPING SYSTEM AND INTER-FACE DEVELOPMENT FOR THE OPERATION (project 245)

The overall objective of this project is to achieve the complete automation of bulk solids storage facilities on a real scale and in a real working environment, by developing an innovative system for handling the unthreshed grain based on two new technological tools, such as equipment for fully automated 3D mapping of the unthreshed grain and a communication interface with the material handling equipment that will enable their coordination and operation from the control room itself. This saves operators from having to go to the work area to position the machines and generates significant time savings by eliminating the need for manual handling.

PROJECT CO-FINANCED BY THE BASQUE GOVERNMENT AND THE EUROPEAN UNION THROUGH THE EUROPEAN REGIONAL DEVELOPMENT FUND 2014-2020 (FEDER).



TOWARDS A CIRCULAR ECONOMY IN THE BASQUE PAPER SECTOR: RECOVERY AND USE OF HIGH ADDED VALUE COMPOUNDS PRESENT IN THE INDUSTRIAL PULP AND PAPER MANUFACTURING STREAMS (REPAPEL) _ZE-2021-00013

The main objective of the REPAPEL proposal is the recovery and use of high added value compounds present in the industrial flows of pulp and paper manufacturing, seeking the circular economy in the Basque paper sector. The technologies developed here will serve as a basis for their implementation in other industries at national and international level, as well as in other industrial sectors where the application of waste recovery technologies and the concept of circular economy is also necessary. The implementation of this project will define different technical, economic and environmentally viable solutions that provide a global solution to waste reduction, process improvement and the manufacture of products with better and more sustainable performance.

DARSEDET: ON-BOARD DETECTOR OF ENTRY AND EXIT EVENTS AT BUS STATION DOCKS _ ZE-2022-00152

The main objective of the project is to research, design and

develop an intelligent embedded sensory system integrated in intercity buses that allows automated detection by means of cognitive vision algorithms of the entry and exit events of buses in the station docks. The project will allow TSK to consolidate its position as a supplier of solutions in the smart and sustainable mobility market, which has been growing rapidly in recent years, by tackling and proposing a solution to a deficiency detected at present, related to the monitoring of bus entry and exit events.

PROJECTS FINANCED BY THE GERMAN MINISTRY OF ECONOMY AND ENERGY (BMWi)



DEMONSTRATION OF A SOLAR THERMAL PARABOLIC TROUGH POWER PLANT AND STEAM GENERATION SYSTEM USING MOLTEN SALT AS THE HEAT TRANSFER FLUID (HPS-2)

The use of molten salts as heat transfer fluid has important advantages. The operating temperature can be substantially increased, up to 500°C, and the plant is considerably simplified, since the same fluid is used as both storage and heat transfer fluid. To validate the technology and identify possible problems during operation, a test loop will be built in Évora (Portugal), where the collector developed by TSK-FLAGSOL Heliotrough 2.0 will be installed.

TRANSTES

This project aims to study the possibility of using a single tank for solar salt storage in solar thermal plants in order to reduce costs.

MOVING BARRIER THERMOCLINE (MOBACLINÉ)

The purpose of this project is to study the hot and cold salt separation system in single-tank solar thermal power plants.

AVUSPRO

The objective of this project is to develop a method for predicting the fouling of photovoltaic panels and parabolic trough collectors.

HIGHER TEMPERATURE AND LIFETIME FOR NITRATE SALTS (VENITE)

The objective of this project is to study the physicochemical behavior of molten salts at 565°C to reduce risks in future projects.

SUPEREAF

The objective of this project is the development of a system for heat recovery from an electric arc furnace for storage in solar salt for later reuse.

PROJECTS FINANCED BY THE EUROPEAN UNION (H2020)



SOLVING WATER ISSUES FOR CSP (SOLWARIS)

The SOLWARIS project is a European project led by TSK and in cooperation with 13 other organizations that seeks to reduce water consumption in solar thermal power plants through various innovations in mirror cleaning, power cycle cooling and wastewater recovery. With this project, TSK will be able to offer innovative solutions to its clients to face one of the recurrent problems in new plants, in order to continue consolidating itself as a leader in the solar thermal sector.

www.solwatt.eu (N° Exp. 792103)

PROJECTS FINANCED BY THE EUROPEAN UNION (HORIZON)



TRINEFLEX: TRANSFORMING ENERGY-INTENSIVE PROCESS INDUSTRIES THROUGH THE INTEGRATION OF ENERGY, PROCESS AND RAW MATERIAL FLEXIBILITY.

101058174

TRINEFLEX is a set of integrated tools for the transformation of EIs following the "X-as-a-Service model". For end-users (EIs), TRINEFLEX will function as an end-to-end service that will manage the digital lifecycle of the plant and the transition process towards flexible and sustainable operation.

ration. This process will be enabled through advanced and green data acquisition, Big Data infrastructures, process analytics, model development and finally digital twins with integrated multi-agent decision support systems.

PROJECT CO-FINANCED BY THE MINISTRY OF INDUSTRY, TRADE AND TOURISM, THROUGH THE CALL FOR INNOVATIVE BUSINESS CLUSTERS FOR THE YEAR 2022.



NEW SYSTEM FOR 3D DIGITISATION OF MULTI-ENVIRONMENT INDUSTRIAL PLANTS COMPATIBLE WITH VIRTUAL REALITY SYSTEMS FOR TRAINING, PROCESS CONTROL AND MAINTENANCE IN REAL TIME (i-en3D).

AEI-010500-2022-41



The objective of this project is the design and development of a new solution that allows the generation of realistic industrial environments captured by means of 3D digitalisation, correctly characterising all their details and their subsequent transformation to be used for their visualisation and interaction in a Virtual Reality system. At the end of the project, the aim is to obtain a technologically advanced prototype whose implementation in industrial plants will serve to optimise operation and maintenance by facilitating the supervision of their status (in real time and by means of historical records), and to enable access to technical information and simulations that train the operators of industrial facilities. The capture of real industrial environments will be carried out using

3D digitalisation techniques, for which a set of protocols based on laser technology and Structure from Motion (SfM) photogrammetric reconstruction will be researched and developed. This research and development aims to respond to two major challenges: automated in situ digitisation and the processing of the resulting large volume of data to achieve high quality and realistic 3D models. Once this process has been completed, optimisation of the model will be carried out using a process called retopology, which allows the size of the images to be reduced without losing the quality and detail of the 3D models.

The project will define this process and its associated methodology. In addition, research will be carried out into its automation, one of the main technological challenges that will be addressed.

Based on the different 3D environments captured, we will work on their visualisation in a Virtual Reality solution allowing interaction with them. In this way, the user will be able to interact with the environment (grabbing objects, making use of tools, interacting with panels on machines, etc.) and options for manual actions will be provided, where necessary, by means of virtual panels.

Finally, it should be noted that 6 entities will participate in the project, all of them actively. Two of them are clusters (METAINDUSTRY4 and AIN) registered in the Registry of Innovative Business Groups (AEIs) of the Ministry of Industry, Trade and Tourism. Of the remaining 4 companies, two belong to the industrial sector (TSK and IBERASTUR), one is an expert in digital solutions (TALENTO) and the last one is specialised in 3D documentation engineering (DOGRAM).





INTERNACIONAL EXPERIENCE

The knowledge acquired in the wide variety of projects carried out in more than 50 countries allows us to adapt to the technical and cultural features of each country and successfully complete our international projects. Our international strategy is based on close cooperation with local companies, enabling us to add value for all the countries in which we work, combining technology, experience and resources.

GERMANY

ANGOLA

SAUDI ARABIA

ALGERIA

ARGENTINA

BANGLADESH

BARHEIN

BOLIVIA

BRAZIL

CANADA

CHILE

COLOMBIA

CÔTE D'IVOIRE

CUBA

UAE

ECUADOR

USA

EGYPT

EL SALVADOR

SPAIN

FINLAND

FRANCE

GREECE

GUATEMALA

GUINEA KONAKRI

HOLLAND

HONDURAS

INDIA

IRAN

ITALY

JAMAICA

JORDAN

KUWAIT

LIBYA

MOROCCO

MEXICO

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PORTUGAL

ROMANIA

SENEGAL

SYRIA

SOUTH AFRICA

SUDAN

TANZANIA

TOGO

TUNISIA

TURKEY

UGANDA

UK

VENEZUELA



PLANT 65 MW Combined Cycle Power Plant KEKELI EFFICIENT POWER (Togo)



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