

Growth through innovation





"Where people, knowledge and experience form a perfect combination"



CONTENTS



R+D+I



Sabino García Vallina

LETTER FROM THE CHAIRMAN

TSK closed 2018 surpassing 1,000 million euros in sales for the first time in our history.

Once again, I am thrilled to present our group's annual report taking a look at the management carried out in 2018.

We fulfilled all of our objectives, amongst which profitability, our company's sustainable basis and caution always prevailed.

2018 was special again due to our achievements reached and for having surpassed for the first time ever one billion euros in sales which consolidates us as one of the largest industrial engineering and construction companies in Spain.

Today, TSK is a result of change and diversification in its activities by keeping an excellent competitive position on a global level, being established in an extensive international presence, having a proven technological capability and a solid financial structure, thus allowing us to present quality solutions to our customers in any part of the world.

TSK closed the year once again with positive results, reaching a net benefit of 23 million EUR, 53 % more than in 2017,

and sales of 1,107 million euros which implies a growth of 15 % regarding the year before.

This sales figure enables us to establish ourselves for the third consecutive year at around 1 billion euros which means that we already have enough volumen to compete with guarantees for success in all the areas of our activity.

To accomodate our growth we recently inaugurated a new office building in the Parque Científico y Tecnológico de Gijón, with a capacity of 250 people.

The new building is adjacent to our main headquarters, this building complex is characterised by its natural light, openspaced working areas, gardens and patios as part of the working environment, it was all designed and constructed under demanding credentials which will enable considerable savings, particularly in energy. It is also equipped with numerous restrooms for employees contributing to providing a comfortable atmosphere and enabling work-life balance with two cafeterias, a health clinic for medical checkups, a gymnasium, an auditorium and a training center.



This enlargement highlights our bet for the long term, where the economic crises must not make a difference in our strategy and it also joins the opening of the new offices or additions in other countries like Dubai, Morocco or Panama.

On the other hand, in 2018 we continued investing in TSK's most important trait: innovation. Our research and development activity has meant an investment that surpasses 50 million euros in the last 5 years, with many projects that are already being productive in different fields.

We are living a transition from fossil energy to renewables and from TSK, in addition to participating as an engineering and generation plant construction company, we are also developers and investors through our subsidiary ESERSA (Estudios y Energías Renovables, S.A.) which has been dedicating itself to renewable energy generation for more than 30 years, having currently 50 MW operating solar plants, 300 MW photovoltaic plants under construction and 2,000 MW under development. We have also successfully finished photovoltaic sales of 150 MW in Mexico to the Macquarie investment fund.

I am convinced that TSK has great potential to continue being a benchmark in the industrial engineering and construction sector. I would like to share what is the most relevant in our activities, business, corporate strategies and policies from 2018 through the following pages. You will find for example that we have an agile and flexible organization that promotes excellence, we enjoy the necessary financial resources necessary to be able to efficiently compete on different markets and we have the skill and enthusiasm of more than 1,000 employees distributed in 35 countries.

Finally, I would like to finish this letter by thanking the people at TSK for their effort, we could not have reached our goals without them. Their commitment and dedication are completely necessary in order to project a sustainable, innovative and profitable future for our Company.

> Sabino García Vallina Chairman

MANAGEMENT COMMITTEE

(from left to right.):

Alfonso Targhetta, Raúl Nodal, Carlos Ruíz, Ricardo González, Javier García, Beatriz García, Arturo Betegón, Santiago del Valle, Miguel Ángel Fuentes, Sara Fernández-Ahuja, José María González, Sabino García, Joaquín García and Francisco Martín.



Sabino García Vallina

Chairman

Joaquín García Rico

TSK CEO

Francisco Martín Morales

Managing Director - Power and Industrial Plants

Carlos Ruiz Manso

Production Manager-Electrical Infrastructures

Arturo Betegón Biempica

PHB Weserbütte CEO

Miguel Ángel Fuentes

Managing Director - Handling

Beatriz García Rico

Managing Director - Finance

Santiago del Valle
Managing Director - Corporate Business Development
Alfonso Targhetta Codes
Managing Director - Purchasing and Subcontracting
José María González Fernández
Managing Director - Chairman's Office
Sara Fernández - Ahuja
Managing Director-RRHH and Management Systems
Raúl Nodal Monar
Managing Director- Legal Services
Ricardo González Martínez
Managing Director- IT
Javier García García
Financial Director

Joaquín García Rico

CORPORATE STRATEGY

We are betting on energy storage as technology that will that will revolutionize the renewable sector.

The implementation of a new Strategic Plan, corresponding to the triennial 2019-2021, has meant a huge in-depth look inside TSK on the bases of medium and long- term development.

The strategic axes defined talk about the search of a Company profile that is more and more technological which allows us to stand out from our competition and also to be more selective in the Projects to execute.

In the last years, with this objective always present, we incorporated different engineering companies to TSK that have provided knowledge and technological capabilities in different fields. Consequently, we established a strategic alliance with the British Company Highview Power, global leader in long-term mass storage of energy solutions to fulfill our target. With this alliance we are betting on technology that will be very relevant in the near future facing a continuous growth of renewable energies, combined at the same time with the closing of thermal and nuclear plants.

Accordingly, we have also developed a hybrid solar plant that combines photovoltaic technology with thermosolar technology, enabling the generation of renewable energy 24 hours a day at a very competitive price and which resolves the problem of renewable energy intermittency by having storage of which we are certain to be able to establish in a brief period of time in different countries.

2018 was marked by three events that have strengthened us as one of the benchmark companies in the Industrial engineering and construction sector:

- 1) By reaching sales over 1 billion euros for the first time.
- By strengthening our level of internationalisation that surpasses 90% for the sixth year in a row.
- 3) By increasing our technological capacity considerably.

We closed 2018 with a more diverse activity not only geographically but in sectors as well which allows us to face the following years with guarantee and confidence.

Today we have projects being executed in more than 30 countries on 4 continents, in sectors such as power, en-





vironment, electrical infrastructures, steelmaking, cement, sugar, mining, ports and oil&gas which protect us from potential regional or sectorial crises.

Thanks to the different companies incorporated to our group we can take credit for more that 150 years of experience accumulated with more than 1,000 projects executed around the world.

Our balance continues to enjoy great strength. We closed 2018 with our own capital of more than 345 million euros which places us way above the average in the sector when referring to own capital over sales. This strength enables us to appear on the Alternative fixed-income market (MARF) for the first time and registering an on-going issuance programme of promissory notes which allows us to have an outstanding balance of up to 150 million euros issued on this market, opening a new line for the diversification of our financial sources on a short-term basis.

All of the above makes TSK an international benchmark Company who is prepared to give shape to the future without being conditioned by specific circumstances at any given time. In order to face these challenges of internationalisation, innovation or diversification of activities we have an excellent human team to whom I would like to greatly thank for their commitment and dedication, the same gratitude that I want to transmit to our customers for the trust they have given TSK to execute their projects.

Joaquín García Rico

Chief Executive Officer





#MILLON EUROS







- **Conventional Power**
- **Renewable Energy**
- Handling
- **Electrical Infrastructures**
- Industry

SALES BY MARKETS



10% 7%



Electrical Workshop





KEY FEATUR<u>ES</u>



- # Over 30 years of experience in the industrial and energy sector.
- # One of the Spanish companies with more references in EPC projects in energy, industrial, handling and environment sectors.
- # One of the top 5 national companies in Engineering and Industrial Construction (EPC) in Spain.
- # Greater control and guarantee of deadlines by using own personnel to carry out engineering activities (civil, mechanical, processes, electrical, automation and control), manufacture of electrical switchboards, electrical assembly and commissioning of the installations.

- # Adequate financial capacity to handle large EPC 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.

Customer oriented and focussed	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
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OUR MANAGEMENT'S ESSENTIAL IDEAS

CONTINUOUS IMPROVEMENT

MOST SIGNIFICANT MILESTONES

	1986	#TSK starts as a Company when the electric departments of Erpo Holding merged.
	1995	#PHB Weserhütte, a Company specialised in Handling and Mining was acquired.
	2003	#The first international subsidiaries were established in Morocco and Venezuela, and the ones in Brazil, Chile and Nicaragua followed.
	2006	#The activity in the Solar Photovoltaic field begins.
He. Annually	2007	#The engineering firms Ingemas and Irelsa were acquired.
and the second s	2008	#The activity in the Thermosolar sector begins
	2010	# Expansion to Middle East and Asia began. Projects in Saudi Arabia, India and Bangladesh
	2013	#Flagsol is acquired, a German engineering company spe- cialized in the solar thermal sector.
	2015	# Omega is acquired, an engineering company specialized in Sugar and Ethanol sector.
	2016	#Intecsa Oil&Gas is acquired, an engineering company specialized in the gas sector.
	2017	# Ingeteam ´s Group Power Engineering subsidiary, was acquired.
	2019	#Strategic alliance with Highview Power, a British company with own cryogenic energy storage technology.







1000

Old Harbour Bay II. 190 MW CCGT (Jamaica)

U. U. C. States

Green and Calcined Coke complete Handling SystemSamsung		
Iron Ore Handling System	ArcelorMittal	Germany
Sugar Refinery	Durrah Advanced Development Company Co	o Saudi Arabia
Sulfur Handling System	Hanwha	Saudi Arabia
Complete Green Coke Handling System	Khusheim - Aramco	Saudi Arabia
400 / 220 kV Substation	Sonelgaz	Algeria
208 MW Altiplano PV Plant	Neoen	Argentina
300 MW La Puna Substation, 345/33 KV	Neoen	Argentina
Coke Handling System	Fluor	Belgium
292 MW Ivirizu Hydroelectric Power Plant	ENDE	Bolivia
100 MW Oruro PV Plant	ENDE	Bolivia
500 kV Carrasco Substation	ENDE	Bolivia
Agri-Food Product Management System	FWS - P&H	Canada
475 MW Multisite Engine Power Plant	Prime Energía	Chile
San Andrés Sanitation Project	Fiduciaria Bogotá	Colombia
230 kV Transmission Line	CELEC	Ecuador
138 kV Substations	CELEC	Ecuador
26 MW Kom Ombo PV Plant	NREA	Egypt
140 MW Capella PV Plant	Neoen	El Salvador
125 MW Capella Substation, 115/33 kV	Neoen	El Salvador
Boil-Off Gas Compressor	Enagás	Spain
Coal Handling System	ArcelorMittal	Spain
Construction Materials Handling System	Eiffage	Spain

MAIN PROJECTS IN PROGRESS

Fuel Management System	Técnicas Reunidas	Finland
Coke and Coal Handling System	Tata Steel	UK
138 kV Substations	ENEE	Honduras
250 MW Gas Engine Power Plant	PT PLN (Persero)	Indonesia
190 MW Combined Cycle Power Plant	JPS	Jamaica
Jamalco Cogeneration Plant	NFE	Jamaica
Aqaba Port Expansion	JIPCO & Arab Potash	Jordan
Sulfur Handling System	OCP	Morocco
Phosphates Handling System	OCP	Morocco
140 MW Versalles PV Plant	EOSOL	Mexico
Limestone Handling System	Cruz Azul	Mexico
Coke Handling System	Ica Fluor	Mexico
Wastewater Treatment Plant	Enacal	Nicaragua
50 MW Wind Farm	Masdar	Oman
Coke and Sulphur Handling System	Petrofac - Quqm Refinery	Oman
Gabbro Handling system	Alsarh JV - QPMC	Oman
110 MW Penonome Substation 230/33 kV	Avanzalia	Panama
150 MW Peronome PV Plant	Avanzalia	Panama
Copper Concentrate Handling System	First Quantum Minerals	Panama
Biomass Handling System	Técnicas Reunidas – Samsung C&	TUK
50 MW Wind Farm	Siemens Gamesa	Dominican Republic
34/138 kV Substation	Siemens Gamesa	Dominican Republic
Coke Handling System	CBI - NIS	Serbia
65 MW Combined Cycle Power Plant	ERANOVE	Togo

CORPORATE STRUCTURE

TSK

CORPORATE SERVICES

Finance

Human Resources and Management Systems

Legal Services

Information Technology

Sales

R&D+i

Purchasing and Subcontracting

Corporate Development

ELECTRICAL INFRASTRUCTURES POWER AND INDUSTRIAL PLANTS OIL&GAS

ENVIRONMENT

•TSK

HANDLING -

PHB Weserhütte

RENEWABLE ENERGY GENERATION



BUSINESS LINES

- # Electrical infrastructures # Power and industrial plants # Oil&gas
- # Environment
- # Handling & mining

ELECTRICAL INFRASTRUCTURES

With an experience of over 30 years, TSK has become a leading company in the engineering and electrical equipment sector.

We develop power and control projects associated to new industrial facilities, as well as innovations for already existing installations.

Throughout these years we have acquired proven experience in the development of "turn-key" electrical projects in energy, telecommunication, steelworks, metallurgy, food, paper, petrochemical, cement, environment, fertilizers, industrial ports and industrial plant sectors.

We have been able to reach a leading position in all of the sectors in which we are present due to the combination of quality, technical capacity and dedication to our clients. We have a great number of highly qualified professionals who have the most advanced technical means available for the design, calculation, assembly, and commissioning of all kinds of electrical installations.

INTEGRATED MANAGEMENT OF ELECTRICAL PROJECTS

Design and engineering, planning, purchasing management, manufacturing and equipment supply, installation and assembly, quality control, training, commissioning and operations and maintenance.

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

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 risk based maintenance
- Plant Optimization.
- Personnel training.
- Technical assistance.
- Operation
- Comprehensive Computerized Maintenance Management System (CMMS)

DIGITAL TRANSFORMATION AND INDUSTRY 4.0

The progressive incorporation of the digitalization to industries (Industry 4.0/ Digital transformation), the usage of common infrastructures for management (IT) as well as operation (OT), the fast development of the internet of things (IoT or iIoT in its industrial version), cybersecurity, the analysis of data, etc. have obligated engineering (EPCs) to incorporate profiles and services of high value added to be able to equip projects of all these demands/needs. TSK has been working and researching all these new challenges for years and from TSK Information Technology we are more than prepared to face security and solvency.

IP INFRASTRUCTURES

From TSK IT, we continue to design and implant the most traditional solutions like: Telephone systems, P.A. Systems and interphone systems, solutions of IP video in real time to monitor the production processes, access control systems for people or vehicles, acoustic warning systems to communities in order to publicly address areas about disasters, etc. Moreover and as part of the set of IP services we design, install and maintain security systems monitoring perimeter based on a thermal analysis and/or thermographics.

CYBER SECURITY

All these new challenges that were mentioned imply new functional, regulatory, protective (physical and cyber) or technological requirements, but the new challenges in cyber security can be emphasized as all this IT/OT convergence implies new risks and given the context where they are produced (industry) concrete and different ways to tackle them are needed.

For several years TSK IT has participated actively in work groups and in related entities, carrying out assessments of cyber security of infrastructures and of course meeting our own demands, but at this moment industrial cyber security has become a part of the core of business, by conviction and obligation, to be able to continue executing our projects with the objective of excellence.

We continue to inject cyber security from the gestation phase of projects, including and/or responding to their requirements from the basic design, detail, purchasing process, tests, etc...; Moreover, we are reevaluating the state of the existing plants regarding cyber security, auditing them and applying measures and protocols aligned with our processes of continued improvement.

DATA ANALYTICS

We cannot ignore the need to work with heterogeneous data sources, such as the integration of processing and business information that amongst others allow for the optimization of costs, process improvement, to extend the service life of plants, and even make them safer. By using all the enabling technologies that we know for that purpose, we are able to execute projects of data analytics through technology or concepts, such as: big data, machine learning, edge computing, virtual reality, augmented reality or digital twin, which all together offer our customers dashboards and solutions that accompany them during the whole life cycle.

POWER AND INDUSTRIAL PLANTS

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



Termoeléctrica del Sur. 295 MW CCGT + 80 MW Steam Tailing (Bolivia)

POWER

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

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

INDUSTRIAL PLANTS

The experience and knowledge accumulated over the years in a wide variety of technical disciplines (civil works, structure, mechanical, electrical, instrumentation, etc.), together with the use of the most advanced IT systems, allows TSK to take on industrial projects ranging from process engineering to the construction and commissioning of different processing plants.

F O O D , P A P E R , M I N I N G , S T E E L W O R K S , AND C E M E N T

From equipment, storage installations and transport to the execution of complete turnkey plant projects in collaboration with the main technologists of the world, TSK has been providing innovative industry solutions for over 30 years.

OIL&GAS

After the purchase of the Intecsa Oil&Gas, an engineering company with more than 50 years of experience, TSK has acquired the necessary experience and references in the Oil & Gas sector in order to execute projects from conceptual engineering to the construction and commissioning of entire plants.

OIL AND GAS TRANSPORTATION

• Oil Pipelines and gas Pipelines.



ORMAT Interconnection with Huelva LNG terminal existent facilities.

- Gas and oil gathering systems and distribution networks.
- Oil pumpling stations.
- Gas compression stations.
- Metering Stations (Oil & Gas).

The most significant references are the compression stations, in Spain, it has participated in more than 70% of the stations that are currently in operation and in more than 4,000 km of gas pipelines and oil pipelines.

REGASIFICATION AND STORAGE TERMINALS

TSK develops complete hydrocarbon storage terminals projects, in addition to its corresponding oil tanker mooring terminals and the port-refinery interconnection. It also provides knowledge and experience necessary to design the LNG tanks as well as regasification terminals.

Amongst TSK's references are the port installations for methane carrier mooring of the LNG plant at 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 & Gas Receiving and loading terminals
- Underground Gas storage
- LNG regasification plants and tanks
- Hydrocarbon storage plants

With the objective of unifying our brands, from 2017 Intecsa Oil&Gas is known as TSK Oil&Gas Engineering.

ENVIRONMENT

TSK is aware that society demands, more insistently with every passing moment, a better quality of life and therefore, the conservation and preservation of the multiple and valuable natural resources of our planet.

At TSK we are convinced that the protection of, and investment in the environment, water, air, and soil, is not an obstacle for development, but the best strategy to reach economic and social growth in a sustainable way guaranteeing the conservation of the most valuable human heritage: planet Earth.

For different reasons (lack of economic resources, shortage of water, catastrophes, etc.) there are populations that do not have drinking water to cover their basic needs, this has severe repercussions on the population's health. Being aware of this problem, TSK has a line of own products that, based on different treatment technologies, allows them to cover drinking water supply needs to such populations.

• Containerized DWTPs (Drinking Water Treatment Plants)

With a flow rate of up to 200m3/h and in a surface area of 200 m2, they are able to supply populations of more than 25,000 inhabitants. Their design in containerized structures allows the installation of several DWTPs together. They are easy to transport, install and operate and they are the ideal solution for an urgent supply, or for the provision of drinking water to populations with diverse difficulties.

• Modular DWTPs

For a flow rate of up to 10,000 m³/h. Designed for minimum requirements of civil works, they are suitable for the supply of drinking water to medium and large-sized population centers, which for a variety of circumstances cannot carry out civil works.

10 MW Biomass Power Plant. Reocín (Spain)



Conventional DWTPs

Designed as civil works, these are the water treatment plants which have been implemented most to date, given the lack of other satisfactory technical alternatives.

• DWPTs Upgrade

These are re-designed existing water treatment plants, in which minimum modifications make it possible to increase the treatment flow rates or improve the quality of the water treated if necessary.

• TSK Containerized WWTPs (Waste Water Treatment Plants)

These are included in containerized structures, designed for the treatment of domestic or urban waste waters from population centers of up to approximately 5,000 inhabitants or equivalent waste water flow rates.

Modular WWTPs

These are designed with prefabricated tanks and minimum civil works requirements, suitable for population centers of up to 100,000 inhabitants or equivalent industrial waste water flow rates. Conventional WWTPs

These are designed as civil works for the treatment of waste water for large population centers.

• WWTPs Upgrade

This is an application of considerable interest for existing WWTPs which, for a variety of reasons, function incorrectly, not reaching the results in treated water quality for which they were designed (increase in flow rate, increase in polluting waters, etc.).

With moving bed technology and the introduction of small modifications, the operation of these WWTPs can be set up correctly.

Water supply installations and purification installations are common elements in any production process. This is why the sludges generated in these processes are nothing more than subproducts of these production cycles. The sludges are not, however, a subproduct without value. On the contrary, if treated appropriately, and with application of the well-known current policy of 3Rs in waste treatment (Reduction, Recycling and Reuse), the sludges are a sub-product of value in today's society.



HANDLING & MINING

In 1980 PHB, A.G. and Weserhütte A.G. reach a merger agreement in Germany, forming the group called PHB Weserhütte A.G. or PWH. In that same year, PHB, S.A and Weserhütte S.A merged in Spain to form PHB Weserhütte, S.A.

In 1988 the parent company was acquired by another German industrial group which modified the structure of PHB Weserhütte A.G. This led to the independence of the Spanish subsidiary, which has kept all the technology, the references and the brand of the German group, becoming a Spanish-German company with majority Spanish capital.

In 1995, TSK acquired all the shares of PHB Weserhütte, S.A, and the latter was integrated into this group.

PORT SYSTEMS

Our company's port systems operate with the highest degree of efficiency in many ports around the world, handling all kinds of bulk solids, 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
- Unloaders
- Loaders
- Cranes
- Ecological hoppers

STOR A GEANDBLENDING Y A R D S

At PHB Weserhütte we design circular or longitudinal stockyards with a wide range of reclaimers and combined machines which can achieve a high degree of blending in any type of bulk solids.

- Longitudinal Stockyards
- Circular Stockyards
- Stackers
- Scrapers
- Blenders
- Stacker-reclaimers
- Conveyors

ACTIVITIES BY BUSINESS LIN<u>ES</u>

#INDUSTRY

During the second trimester of 2018, engineering works for the reformation project of the tinplate 3 line located at the ArcelorMittal in Aviles resumed, with the objective of fulfilling the requirements demanded by the European Union regarding the ban for usage of chromium compounds in the food industry. Thus, it was necessary to modify the actual line to adapt it to the new process of chemical treatment, consisting of the application of primer topcoat of the compound Granodine® on the tinplate sheet. The assembly Works and commissioning of the new industrial solution were developed during the shutdown that the Line carried out in January 2019.

Regarding the Yanbu Project, a white sugar refinery, with a production capacity of 750 t/h, located in an important indus-



Sugar Refinery. King Fahad Port, Yanbú. (Saudi Arabia)

trial area of the industrial port Yanbu (King Fahad) in Saudi Arabia, the detail engineering was completed, which allowed for the civil works work progress of up to 50% at the end of 2018. The supply process and metallic structure and equipment assembly is at an advanced stage and is expected to be completed in July 2019, while the piping assembly is expected to be completed in August 2019. The pre-fabrication of piping works is being carried out in a workshop on the east coast.

The plant has a raw sugar linear park stockyard 225 meters long, 120 meters wide and 50 meters high. Hence making it one of the benchmark storage facilities and largest in the world of its kind. In addition to the refining process, the plant has a 40,000 t capacity maturation dome, the infrastructure necessary for handling different materials (including the unloading crane of the barges in the port), the packaging plants, storage and dispatch as well as all the administrative and auxiliary buildings; also the necessary electrical and control buildings are included in the project. The installation is completed with a 12 MW steam turbine to ensure the energy independence of the installation regarding the grid.

In 2019 a sequential start-up of the plant by functional units is planned. The raw sugar stockyard and packaging plant are planned for the end of July 2019. The commissioning of the refinery and the marketable sugar production is planned for December 2019.

#OIL&GAS

Within this sector, in 2018, TSK developed the engineering and construction of the contract with Enagas for the renewal of BOG treatment for the Enagas regasification plant in Barcelona. The purpose of the project is to substitute a compressor that is not cryogenic for a new cryogenic compressor from the supplier IHI along with all the equipment and auxiliary components. With this modification to carry out, an energy savings of 535,500 KWh/year and a reduction of natural gas consumption of 171,500 m³/year will be produced. The supply of the compressor is planned for March 2020 and the construction phase will be developed in a process of 6 months.

POWER

In 2018 the QUICKSTART Project in Chile started in the EPC modality for the Company PRIME ENERGIA, making a partnership with the MTU motor Company from the Rolls Royce group. It consists of five backup power generation plants with a total rated power of 475 MW.

The installations are distributed in five locations and include a total of 265 MTU diesel engines, as well as the auxiliary storage and distribution of fuel installations, refrigeration of engines and electrical installation, including an electrical substation per plant within the EPC. The planned date for grid entry of the projects will be 2020.

In October 2018 the construction work in field for 100MW Jamalco CCHP Project started, located within the Jamalco alumina refinery, in Clarendon, Jamaica. The project, classified as national importance, consists of the construction and installation of two power trains with their respective recovery boilers with settings 1x1. The turbines are made by Siemens, SGT-800 model with gross power of 50,5 MW each and the boilers are HRSG type and include bypass stacks manufactured by Vogt. The plant will have dual capacity, natural gas being the main fuel and will have three diesel tanks as back-up fuel to guarantee the plant's production in case of emergencies and eventualities.

A substation for the plant and a 3 km transmission line are also included in the scope of the project which will incorporate the plant to the national electric transport network of Jamaica. The plant will produce 94 MW of net power (with natural gas) that will be completely exported to the network that manages the local JPS entity while the steam, 140 tn/h will be delivered to the refinery for its industrial process covering 40 % of the steam demand of the refinery.



The delivery of the plant will be done at the beginning of 2020 and when operation starts there will be a reduction of the national generation system costs and it will improve the competitiveness of the local industry.

During 2018 95% of the electromechanical assembly of the Renaissance Project was completed, 195 MW in Old Harbour Bay, Jamaica and the commissioning phase of the Combined Cycle began. The Project consists of the execution in EPC modality of a combined cycle thermal plant in the south of Jamaica for the Company SJPC (subsidiary of Jamaican utility JPS), it will allow for the increase of power generation capacity in Jamaica of approximately 20% (195 MW) as opposed to an actual installed capacity of 941MW, as well as the dismantling and closing of the actual plant in Old Harbour operated by heavy fuel oil.

The net power to be produced by the plant is 195 MW and the COD of the project is planned for mid-2019.

In 2018 the works associated with the Sumbagut II generation plant in the north of Sumatra, Indonesia continued.

The plant, with a generation capacity of 250 MW from natural gas combustion, is in the electromechanical phase of construction, after having completed the associated civil works. It is a milestone worthy to mention taking into account that the region of Aceh is one of the more active seismic areas not only in Indonesia, but in the entire area of the Pacific Ring of Fire. It is estimated that the EPC Project be delivered during the first semester of 2020, keeping the acquired commitments with our customer, the National Electricity Company PLN Persero.

In the field of renewable energy, TSK continued progress in 327 CG Los Azufres III phase II, with the objective to install a geothermal electric plant with a guaranteed net capacity of 25 MW, and that executes for the Comisión Federal de Electricidad (CFE) in the Mexican state of Michoacán. During the



year the works on the different installations of the Plant: 25 MW turbogenerator (Unit 18), BOP and evacuation infrastructure (booster substation and line associated to 115 KV), were completed. During the last months of the year, the Commissioning stage of the plant started whose booster substation is expected to be energized through the National Electric System (Line of 115 KV) during the first months of next year. The first turbine wheeled, synchronization and operation and performance tests will be carried out during the first semester of 2019 for final delivery to the customer.

At the end of 2018, TSK (along with the manufacturer of hydraulic turbines, Rainpower, and the INDAR generators) was awarded Group 3 plot 1 of the Hydroelectric Ivirizu Project, the customer is Valle Hermoso S.A. The Hydroelectric Ivirizu Project is located in the Cochabamba Department, Carrasco Province, specifically in Carrasco National Park, Bolivia. The hydroelectric Ivirizu Project is formed by two hydroelectric plants using cascade system, Sehuecas and Juntas, that are located in the upper basin of the Ivirizu River. Both plants will be connected to the Interconnected National System (SIN) through the Juntas-Sehuencas and Sehuencas-Mizque transmission lines. The Sehuencas Plant captures the water from the Ivirizu River in the Sehuencas Resevoir; while the Juntas Plant captures the water from a basin in which it is stored, on a side, the water that is turbined from the Sehuencas Plant and by another, the water coming from the Juntas intake works located on the Ivirizu River.

The powerhouse of the Sehuencas Plant is located on an esplanade at 1,303.60 m above sea level and is consists of three Pelton turbines, whose power will be a total of 198.66 MW. On the other hand, the powerhouse of the Juntas' Plant consists of two Francis turbines, whose maximum power will be 91.55 MW and is located on an esplanade at 972.72 m above sea level. In Ressano Garcia (Mozambique), the third year of operation and maintenance was completed at the plant in 2018, with a contractual availability of 100,46 %. The total power produced during the year was 871,345 MW/h. It is also important to highlight that for the first 8 months of the year the first large maintenance of the project was completed successfully and the training of the local workers progressed considerably. From the point of view of Health and Safety once again no impeditive accidents were registered, fulfilling the objectives.

In the area of solar thermal energy, the 50 MW Solar Thermal Power Plant, La Africana, with a solar field of 168 loops with parabolic trough collectors, a system of thermal storage of 7.5 hours and a maximum electric power production capacity without the use of natural gas of 152 GWh per year; once again this year exceeded the predictions of the performance model, reaching a production of 136,00 GWh-year, which is a success in the very unfavorable weather conditions the entire year of 2018.

Regarding the operational strategy followed in the thermosolar power station La Africana during 2018, we can state that it was satisfactory yet another year, since it was possible to obtain the maximum economic yield for the sale of energy under the very restrictive new regulatory framework, which does not incentivize production from fossil fuel power and that substantially reduces production premiums. From this strategy of operation, it should be emphasized that there were 42 days of uninterrupted daily operation during an unfavorable summer period that contributed significantly to the annual production achieved.

Also to be highlighted is that the operational and maintenance philosophies implemented since the end of 2013 and during the first quarter of 2014 continue to work very well in view of the availability, reliability and performance demonstrated by La Africana thermosolar power station and also given the production results obtained during 2018. Lastly, we can highlight that by prioritizing the maximum daily uninterrupted operation, this has contributed to reducing significantly the need to carry out unscheduled maintenance on the majority of the equipment at the power station.

In the month of September 2018 the contractual acceptance tests were passed successfully due to the location's environ-

mental conditions, completing the 30-day reliability test on October 17, 2018; which allowed the SHAGAYA Solar Thermal Power Plant to start commercial operation during the last months of 2018. It is a 50 MW Solar Thermal Power Plant, with a solar field of 206 loops with parabolic trough collectors, a system of thermal storage of 9 hours and a maximum electric power production capacity of 180 GWh-year. It was completely and exclusively designed, constructed, commissioned and commercially operated by TSK.

In the photovoltaic field various plants were constructed and put into service, including the transfer of power and the connection to the national grid. It is worthly to mention the following due to their size:

•La Trinidad and TAI VI photovoltaic Plants, for Eosol, in Durango (Mexico), with a total power of 108 MWp installed in fixed structure. The evacuation consisted in a booster substation of 34/230KV, a transmission line of 230 kV and the enlargement of a bay in the substation for CFE. The project was completed in the planned timeframe and once the performance tasks were surpassed, it is in commercial operation.

 Al Safawi Photovoltaic plant for Green Energy PSC (FRV), in Jordan, with a peak power of 66.8MWp installed, with one-axis solar trackers. This plant was executed in a period of 12 months, including the execution of the transformer substation with a capacity of 50MW installed, and the interconnection of this with the NEPCO grid, the Jordan utility.

• Photovolaic Plant Potosí for Fotowatio Renewable Ventures, with a peak power of 342 MWp installed and an export capacity of 300 MW. The project is located in the Mexican area of San Luis de Potosí. In the scope of this EPC the construction of all the interconnection installations, which make up the booster substation of the plant 33/400 kV, the line of transfer with a longitude of 21 km and the enlargement of the substation which is property of CFE, are included. During the construction, up to 1,600 workers from different Mexican and European contractor companies participated. At present, it is in the commissioning phase and the last tests with CFE in the interconnection substations are being completed.



• Photovoltaic Plants Benban in the photovoltaic complex Benban PV Solar Park 1.8 GW, in which TSK has undertaken the execution in EPC format of 6 plots of 50 MW, four of them with a total capacity installed of 254 MWp for Alcazar Energy and two plots with a capacity installed of 127 MWp for Access Power. These projects have entered into partial commerical operation and the commissioning is being completed along with the performances tests for the rest.

Amongst the ongoing photovoltaic projects, the following are worthy to mention:

• The Oruro photovoltaic plant in Bolivia for ENDE with a peak power installed of 100 MWp, in fixed structure. It is situated at a height of 3,742 m, this entails additonal requirements regarding design and equipment performance.

• The Penonomé photovoltaic plant for Avanzalia with a peak power installed of 160 MWp, in fixed structure.

• The Kom Ombo photovolaic plant in Egypt for NREA, with a peak power installed of 26 MWp in fixed structure.

In addition, it must be emphasized that TSK was awarded and recently began the construction of the following photovoltaic projects:

• Capella Solar photovoltaic plant for Neoen in El Salvador with a peak power of 140.3 MWp installed with one-axis solar trackers.

•La Puna and Altiplanto Solar photovoltaic plant for Neoen, in Argentina with a peak power of 208 MWp installed, with one-axis solar trackers. The project is located at an altitude of 4,200m, in the Argentinian highlands. Included are the necessary installations for interconnection, such as the construction of a GIS substation of 345kV.

Also within the activity of photovoltaic plants, operation and maintenance of photovoltaic plants in Spain, Italy, France, Puerto Rico, Jordan and Kuwait took place with a total power of around 150 MW.

In terms of wind power, our activity developed in Oman with the construction in consortium with GE of the "turn-key" Project Dhofar Wind Farm, including the supply, erection and commissioning of 13 GE wind turbines of 3.8 MW, a GIS type substation of 132 kV and a overhead double-circuit line. In the Dominican Republic with the construction of the BoP of the Agua Clara Wind Farm for Siemens-Gamesa, composed of 25 wind turbines of 2.8 MW as well as the booster substation of 33/138 kV and a 7 km transmission line.

In Brazil, specifically in the state of Rio Grande do Norte the following farms were completed and commissioned:

- Jau Wind Farm for EDP Renewables consisting of 42 wind turbines of 3 MW with a total power of 125 MW, including the enlargement of the substation Baixa Feijao of 138/33kV.
- Pedra Rajada Wind Farm for Gestamp Wind, now Echoenergía, consisting of 21 wind turbines of 3.8 MW and a power of 80 MW installed.
- Cabeço Vermelho Wind Farm for Gestamp Wind, now Echoenergía, consisting of 21 wind turbines of 3.8 MW and a total power of 80 MW.

- Ventura 1 wind Farm for EDP Renewables, consisting of 12 wind turbines of 2.8 MW with a total power of 40 MW.
- Boa Esperança Wind Farm for Echoenergía, consisting of 12 wind turbines of 2.8 MW with a total power of 40 MW.

ELECTRICAL INFRASTRUCTURES

The high voltage and electrical substations division developed projects from two points of view: for external customers in the form of EPC and for internal energy projects of the company as an integral part thereof for transmission. The most significant external EPC projects refer to the following:

• Substation Aih Fateh (Algeria) of 400/220 kV which is being commissioned. Customer: Sonelgaz



126,9 MW JAU Y VENTURA I WIND FARM. Río Grande Do Norte (Brazil)



• Expansion 3 substations, El Inga, Yanacocha and Riobamba (Ecuador) of 230/138 kV with 300 MVA, 67 MVA and 100 MVA respectively. Customer: CELEC.

• Refurbishment of the Cañaveral and Río Lindo Substations (Honduras) of 138 kV, with the installation of 2 transformers of 20 MVA and other two 30 MVA, respectively. Customer: ENEE.

• Project Kangan (Iran), which consists of the supply and supervision of the erection of the substation type GIS 400 kV, with four Transformers 33/400 kV 90/150 MVA, sixty four cabins of 33 kV and the corresponding control and protection system.

• Enlargement of the Milagro and Babahoyo Substations (Ecuador) of 138/69 kV, with the construction of 40 km of overhead double circuit line between both. Customer: CELEC.

• Salar substation (Bolivia) of 115 kV, in GIS technology, with two transformers 115/24,9 kV, 4x50 MVA and four compensation reactors in 115kV. Customer: ENDE Transmisión.

The Carrasco Substation Project in Bolivia is worth mentioning for ENDE Transmisión, which is the first substation of 550 kV

of the grid, one and a half breaker scheme for 550kV and single busbar for 230 kV with two autotransformers of 150 MVA.

In the province of Saragossa in Spain four substations of 400kV and 132kV for the Escatrón photovoltaic Project are being executed. They consist of booster substations of 33/132/400 kV, with a total power of 700 MW.

ENVIRONMENT

In San Andrés (Colombia) the execution of the sewage network system continued. During 2018 the pumping station was executed which is expected to be completed by mid-2019 as well as the connection of the discharge drive already executed from mid-2018 with the existing outfall, which has to be coordinated with the customer FINDETER and another Project that is being developed in the area. The sewage system which was finished since the beginning of 2018 consists of more than 15 km of sewage system pipeline, 550 inspection manholes and more than 1,500 residential connections that give service to a community of about 25,000 people.



In Nicaragua and in the city of Masaya a sewage treatment plant is being developed where at the end of 2018 the execution of the civil works of the pretreatment and UASB were completed, in addition to the installation of the main pipeline of the network, key elements for the beginning of the commissioning of the purification. In turn, the installation of a last generation terciary treatment system with ultraviolet rays has been proposed, in contrast to the chemical system, it inactivates a long list of harmful pathogenic bacteria for the environment.

HANDLING AND MINING

TSK continues to be leader in the material handling market through PHB Weserhütte who carries out this activity.

Attention should also be drawn to the success in the arbitration with Voestalpine, regarding the Project in USA that proceeded to regulate the sums that were owed to PHB Weserhütte.

Production activity is still very diverse regarding countries, customers and projects, the main activities carried out in the year are the following:

The shiploader for Minera Panamá (2,500 t/h for copper ore) was commissioned satisfactorily, with just the performance tests remaining which will be carried out in the first trimester of 2019.

In Saudi Arabia, in the Jazan Project for sulfur handling, the supply was completed and progress made on the assembly and installation. The commissioning and testing have been carried out and are operating, the equipment supplied to





Maaden for handling fertilizers (reclaimer, stacker, shiploaders). We are developing a new mobile shiploader for handling sulfur pellets with the capacity of 2,000 t/h for Saudi Aramco. Furthermore, progress in the project for a sugar refinery we are developing for TSK was made.

Also the project that was being developed in Antwerp for Fluor, whose final customer is Exxon Mobile and includes a coke crusher and shiploader with a capacity of 850 t/h, was completed.

In ArcelorMittal, in Asturias the production and assembly of the second barrel type reclaimer for 1,100 t/h of coal made progress. The first entered into production with full satisfaction. The production of the bridge type bucket-wheel reclaimer in Bremen has progressed and its assembly will be carried out in the first trimester of 2019.

The project in Aqaba, Jordan, being developed in a temporary Joint Venture at 50% with Técnicas Reunidas, progressed considerably during 2018. A line of fertilizer exportation of 2,000 t/h for ships of 100,000 tm, and the line of sulfur importation of 1,200 t/h have been put into operation. The difficulties of working with the existing installations and the interferences with production have resulted in unforeseen additional costs and an extension of deadlines, these are being negotiated with the customer. The actual situation of production allows us to consider that work could be completed by mid-2019. The shiploader supplied by PHB of 2,000 t/h for ships of up to 70,000 tm will be commissioned during the last phase of the project.

In Morocco, we are continuing with the OCP projects. The Reception of the projects have been managed and are already in operation and some pending reservations have been completed. The refurbishment of Jorf Lasfar port's infrastructures has progressed regarding civil works and supplies and the assembly will be carried out in 2019. The new Beni Amir flexibility project also progressed in civil works and production and will be completed in 2019 as well.

The new coal park project for ONE was resumed at the end of the year and will make significant progress in 2019.



The Kilpilahti Project was completed for coal and asphaltine handling in Finland for a petrochemical complex and the commissioning has continued over to 2019 due to general project delays.

The Biomass thermal power plant at Teesside, in UK, has progressed considerablely during the year, supplying more than 6,000 tm of structures and equipment, whose assembly is progressing satisfactorily. It must be noted that, we are enforcing high safety standards to avoid fire and explosion problems on what shall be the largest plant of this type in the world and for the inherent difficulties with assembly in an installation where it is necessary to coordinate multiple activities.

In Serbia, the Project for coke handling and crusher installation for the local Company NIS, from Gazprom group has made progress. The supply has practically been completed and assembly started.

In Mexico, activity in the cement sector has been resumed, carrying out technical assistance for Cemex. The develop-

ment of a new limestone circular stockpile has started for Cementos Cruz Azul.

Also in UK, for Tata Steel, we are developing the project of two coal bucket wheel excavators. In 2018, the engineering was completed and the structure production and equipment awarded according to the program established.

In Canada, for the Vancouver port, we are developing a project for the supply of a shiploader with three loading arms for grain (wheat, malt, soy, lentils...) with a 2,000 t/h capacity. The basic engineering has been done and progress made in detail engineering. The equipment will be supplied in 2019 and all the possible tests will be carried out at the port of origin before boarding.

In the Sultanate of Oman, we were awarded with a contract for the turn-key development of an unloading system of lorries, more than 4 km of transport and loading of barges and ships for a gabbro mine, with a capacity of 2,000 t/h. During the year part of the basic engineering of the different solutions of the project have been developed. # Mision, Vision and Values

TSK'S COMMITMENT



TSK'S MISSION

To be a competitive organization carrying out engineering and equipment projects in the industrial, energy, environmental and infrastructures sectors, achieving at all times the satisfaction of customers and of the people who form TSK, in a commitment to their personal and professional development.

TSK'S VISION

To be a cutting edge company and leader in terms of human and technological resources and profitability, to offer efficient solutions in the field of engineering and equipment which contribute to sustainable development, both nationally and internationally, ensuring the satisfaction and trust of our customers.

TSK'S VALUES

COMPETITIVENESS:

A value inherent in the company for the successful achievement of our vision.

INNOVATION:

TSK places a stake on innovation in its processes and the way it works, offering the customer the most innovative services on the market. We remain alert and proactive to any opportunity, in a process of ongoing development.



TSK Campus. Gijón (Spain)

EXCELLENCE:

Quality is a value inherent to the company and our aim is always to offer products and services which aspire to excellence. Our companies must be considered by the customer as companies offering solutions and installations of the highest quality.

COOPERATION:

This is a value which is very present in the organization and the culture of TSK, as can be seen in our daily relations with customers, suppliers, employees and society in general. Our spirit of cooperation must be reflected in our daily actions.

COMMITMENT AND RESPECT:

These are deeply held in our organization. Commitment

must be a trademark of all our actions, as well as respect towards all the groups we relate with.

FLEXIBILITY:

Our companies' activity forms part of services to industry, which means that flexibility is essential if we are to compete with larger companies with more resources.

We must transmit this flexibility in all our companies, and be ready to adapt to any changes which might arise.

EXCITEMENT AND PASSION:

We must transmit excitement and passion in our projects, attitude and actions; only by doing this will we achieve the common goal of making TSK a benchmark company that leads the way in the market.



HUMAN RESOURCES AND MANAGEMENT SYSTEMS

HUMAN RESOURCES, KEY TO OUR GROWTH

The most important thing for a company with our history is the people that form it, and 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 applies policies to promote stability in employment, promotion of equality policies, career plans and social benefits.

DIVERSITY AND EQUAL OPPORTUNITIES

TSK provides a safe, wholesome atmosphere for personal and professional development, in an environment of respect for diversity and equal opportunities for all the professionals performing their work, in which the effort of its employees is recognized and rewarded. To ensure respect for diversity and



2018 Employment Forum. FUO

AVERAGE AGE

Years



SEVERITY RATE

(Lost Days/Worked Hours) x 1.000



FRECUENCY RATE

#(LTI/ Worked Hours) x 1.000.000



equality, TSK has established an equality committee, which holds quarterly meetings to analyze the current situation and possible conflicts and, if so, take appropriate action.

TSK has the best professionals in the sector, with levels of qualification and specialization of recognized prestige. At the end of 2018, TSK had over 1000 employees. An important group within this workforce is the expatriate professionals involved in projects. Securing their commitment and maintaining a sense of belonging is a key aspect for TSK. The company extends to these professionals all the measures it implements in the matter of human resources.

Forty-two is the average age of our personnel, with a seniority average in the Company of around 10 years. 58% of the employees have an indefinite contract, where 83 % of them are men, and 17% are women.

TALENT MANAGEMENT AND RETENTION

In the current context, it is crucial for human resources management to be flexible, adaptable and capable of driving change and, in addition, to respond quickly and efficiently to business needs and priorities.

In TSK we promote the professional and human development of our personnel and we favor the exchange of ideas world-wide; this is how new concepts are created, especially when colleagues with different disciplines and different backgrounds meet together. Together we guarantee long-term success as the best team, relying on the potential of each of the different team members.

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

MANAGEMENT AND DISSEMINATION OF KNOWLEDGE

TSK has different tools for the management of information that

enables internal communication and the exchange of knowledge and experiences:

- A Project database, which provides employees with information and documents on TSK projects.
- 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, set permissions, control the versions of the documents and allow the use or immediate consultation of these, in the appropriate security conditions.
- Request for services through the intranet. This tool allows requests to be made regardless of the physical location where people are, such as: vacation requests, permits, advances, computer equipment and incidents and other general services.
- Internal Training School (ITS).

With regard to training, TSK has training programs to cover the needs of its employees:

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

ATTRACTION AND SELECTION OF TALENT

The objective in attracting talent and selecting personnel is to identify and incorporate the best talent available, both established professionals committed to the TSK project who have the necessary skills, as well as young talent with development potential. We aspire to be an attractive company for our employees and compete for the best qualified, offering a wide range of incentives. The key to success lies in attractive benefits, performance-related pay and international development opportunities. We attach special importance to a business culture oriented to dialogue and teamwork.

Our selection processes are carried out according to the following criteria: Equality of opportunity and non-discrimination, respect for the person, honesty, professional ethics and confidentiality.

The TSK salary system includes fixed and variable components. Additionally, we favor mobility and promote the coverage of vacancies through internal promotion, facilitating the voluntary movement of personnel in order to enhance the development of their professional careers, talent management and the best adaptation of people to positions. This process allows employees to choose those places that they consider to be in their interest, by advising and supporting the candidates who show their interest in a specific position.

In relation to social benefits, TSK maintains a commitment to continuous improvement of the quality of life of its employees and makes a special effort to ensure and guarantee their lives, support the integration of the disabled and implement best practices - to facilitate work-life balance - such as flexible scheduling, split vacation periods and reduced working hours, among others.

MANAGEMENT SYSTEMS

At TSK we define ourselves as a Company committed to Quality, Environment, Occupational Health and Safety. As defined in our strategic framework, we have evolved by basing ourselves on a continuous improvement in all our lines of business, paying close attention to people's safety, to Project quality and the protection and conservation of the Environment. This commitment has becoma a reality in our comprehensive Management System, externally certified under the ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, ISO/IEC 27001:2013 and UNE 166002:2014 standards and deals with all the Phases of the projects' life cycles and extended to our suppliers and subcontractors.

With its spirit of constant improvement and leadership, TSK introduced and certified its Occupational Health and Safety System under the new international ISO 45001:2018 standard during the last trimester, certified by an accredited entity by the National Accreditation Entity (ENAC). Thus, TSK has become one of the first leading companies to obtain this certification. This new standard establishes the requirements for those organizations that wish to maintain prevention management, based on the leadership of Senior Management and the workers' participation to guarantee a safe and healthy work environment. It goes even further than workplace health and safety and relates to more extensive matters such as workplace well-being.

It is key for TSK to count on communicating with its customers and main suppliers to improve Project quality and strengthen the Quality Management System that is established in the Company. TSK provides its customers with information on all the Project phases, from Management and Engineering to Construction and Commissioning, including supply and logistics as its Objective is to maximize customer satisfaction.

TSK is aware of the responsibility it has with the environment and contributes to the sustainable development and Prevention and Protection of the Environment. This represents an integrated priority in the Stategy marked by Management.

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

OUR PRIORITY: HEALTH AND SAFETY MANAGEMENT

TSK understands that health and safety are a fundamental issue and a priority because of the nature of the activity we carry out. Our objective is always "zero accidents" and action guidelines are transmitted from the highest levels of the organization. This objective is applicable to all people involved in our projects (employees and subcontractors), collaborators, suppliers and visitors to our facilities and projects.

TSK has a preventive organization based on a joint prevention service - made up of professionals that include the preventive specialties of safety in the workplace, industrial hygiene and ergonomics and applied psycho-sociology - complemented by an external prevention service that covers health surveillance. Workers who travel from Spain to international projects receive the necessary medical examinations checkups and treatment. This organization includes, in representation of the workers, the effective participation of the prevention delegates of the different companies of the group and a safety and health committee has been established in which information, participation and consultation are given on all matters relating to safety and health.

As part of our management system, TSK develops specific safety and health plans that define the scope of work and the necessary preventive measures in the projects.

In order for safety to be fully implemented in all our projects, TSK works to standardize safety and health procedures with the aim of increasing efficiency in the dissemination and assimilation of corporate policies.

During the year 2018, internal safety and health audits were continued. Ten internal audits were carried out in the construction phase of projects, two internal audits of the Management System and two external audits of the Management System. The results are discussed on site with the client and subcontractor, which increases the effectiveness of the actions taken to correct deviations.

As for the external audits, the result was 0 Nonconformities and 0 Observations.



In TSK, we are aware of our responsibility to the environment and contribute to sustainable development through the rational use of natural and energy resources, minimizing environmental impact, promoting innovation and using the best available technologies.

All TSK projects comply with the applicable environmental legislation, both in the country where the project is located and the contractual requirements with our clients. For each project TSK draws up an environmental management plan that responds to and allows the monitoring of compliance with environmental requirements.

STAMP FOR SAFE MOBILITY WITHIN THE COMPANY

This year TSK was acknowledged by the IAPRL with the Stamp for Safe Mobility within the Company. This Project, which was started last year and intended to improve the management of Occupational Road Safety in Asturias, intends to acknowledge, encourage and incentivize occupational road safety management in companies according to the requirements of the Guide for Safe Mobility within the Company which was created by DGT and the Asturian Institute of Occupational Risk Prevention.

Traffic accidents and their enormous humane, social and economic consequences constitute a problem in public health and safety as well as being a social problem. Accidents are not incidental, they are avoidable and little by little the accident rate results due to traffic provide us with less negative data. The improvement of road safety related with work constitutes a stategic line of action in the policy of road safety as well as the policy of occupational risk prevention, making it a shared responsibility between all the public and private officials. Actions like these that foster road safety practice in companies as good practice in occupational risk prevention, allow for planning, marking objectives and involve all the parties concerned, from Public Administration, companies, specialized organizations and the workers and society themselves whose collaboration as a whole will allow for advancement in achieving the challenge of preventing fatal traffic victims.

Likewise, TSK accepts its commitment and responsibility to the clients, and takes care to develop and offer products and services that meet their expectations while maintaining a constant flow of communication with them as well as suppliers and subcontractors.

For TSK it is important to know the opinions of our customers in order to be able to improve, that is why we periodically measure customer satisfaction. This constitutes valuable information for the improvement of our performance.

Through its R&D+i management system, TSK promotes the development of innovative solutions focused on the efficiency and improvement of the processes we offer, as well as obtaining new products and services that can generate value for customers and other stakeholders.

Regarding the information security management system, it is maintained by the information technology department and is directly dependent on the systems administration management. TSK is fully aware of the need for security of information and is concerned with applying the necessary procedures to ensure the confidentiality, availability and integrity of the information handled in all its projects.

R&D+i

It is beyond a doubt the necessity for TSK to innovate its projects, processes and services, and that is why we are constantly challenged to improve through innovation and applied research as one of our development opportunities, in the search for greater competitiveness both at national level and in the global market, where innovation is the differentiating factor that allows us to provide greater added value to everything we do.

This is reflected in the main R&D+i investment figures for 2018:

Industrial plants: 6,356,666 € Thermosolar energy: 3,466,365 € Material handling: 3,048,415 € Information Technology: 2,771,293 €

The evolution for that last years of our investments in R&D+i has been the following: **2015**: 7,709,000 \in **2016**: 12,218,000 \in **2017**: 15,422,000 \in **2018**: 15,643,000 \in

This adds up to a total of approximately $51,000,000 \in$ in the last 4 years.

Our deep-rooted identification with innovation is part of our long-term strategy, embodied in strong investments in R&D+i, in collaboration with technology centers, universities and companies within the framework of local, national and European programs.

The great diversity of projects and technological areas in which TSK participates forces us to be continuously innovating and developing in the daily performance of all our activities, since a very significant part of our innovations is produced as a result of the multidisciplinary nature of our projects.

2018 reaps an important milestone for TSK since we designed our own innovation ecosystem and named it TSK INNOVATION. This concept encompasses all the R&D+i iniciatives and projects developed by the Company as well as incorporates actions oriented to involving all the market agents in its internal innovative process, promoting knowledge management and technological transfer and establishing synergies for the identification and development of R&D+i performance development. TSK INNOVATION'S ecosystem joins all the Group's innovative activity. It is made up of 4 great iniciatives: Industry 4.0, the open innovation Program, R&D+i projects and innovation applied to the projects being developed.

TSK INNOVATION

OPEN INNOVATION PROGRAM

With this iniciative, TSK intends to promote and back up projects proposed by SMEs (small and medium-sized Enterprise), Startups and Technological centers with the work center in Asturias, as well as Research Groups at the University of Oviedo. The action reveals the strong commitment TSK has to defend and retain talent in the region. It serves as a Company that leads the way for other companies and bets on innovation as a growth and strengthening strategy. In its first calling it received a total of 32 nominations to the technological challenges raised in the different lines of business, from which 11 nominations were selected for the presentation phase in front of the evaluation committee.

#INDUSTRY 4.0

At TSK we are aware that we have to anticipate and participate actively in the digital transformation that we are living at this moment and that is why our stategic objective is to place ourselves as a major figure in our sector in this fourth industrial revolution.

We have started to offer our customers the integration of enabling technologies such as internet of things (IoT), big data, cybersecurity, artificial intelligence or simulation, with the purpose of obtaining smarter, more cybersecure and flexible installations which enable our customers to optimize their processes, reduce costs and take decisions more quickly and with the maximum efficiency. Thanks to our knowledge and experience in all these technologies, we can offer plants that integrate 4.0 solutions which provide our customers with a great differential value not only in the critical infrastructures but in industrial plants as well.

R&D+I PROJECTS

As a result of this intense R&D+i activity, during 2018 the following projects were implemented:

PROJECTS FINANCED BY THE EU IN THE FRAMEWORK OF THE LIFE+ PROGRAM



EUCALYPTUS WOOD PROCESSING PROJECT_LIFE12 ENV/ ES/000913

LIFE EUCALYPTUS ENERGY is an R&D+i project, framed within the LIFE+ policies and program with the objective that demonstrates and innovates the design and construction of a pilot plant for energy recovery of forest biomass. The waste of Eucalyptus globulus forest use will be shredded and pyrolyzed to obtain electric energy. As a sub-product of the process biochar is obtained, with an elevated capacity of improving the ground and atmospheric carbon fixation, contributing to the fight against climate change.

Besides the electric generation (100kW), the project has as an objective, the improvement of the ground after the application of biochar; to do this applied tests will be developed on Eucalyptus globulus saplings (due to their fast growth) with regular measurements to check growth, analysis of the ground before and after application with indicators such as pH, conductivity, organic carbon and the presence of nutrients (N, P, K).

The plant, located in Tineo, first in Europe and pioneer in pyrolysis of forest waste, will pose as a clear reference in the sector of biomass as well as a perfect example of small scale and semiportable energy production with negative emissions, with a great potential to provide energy for example to developing communities.



HYDRAULIC CO-GENERATION SYSTEM IN WATER ABDUC-TION AND DISTRIBUTION NETWORK (HYGENET) _LIFE12 ENV/ES/000695

The overall aim of the project is to generate clean electric energy from the utilization of the kinetic and potential energy currently wasted in the drinking water distribution and supply networks. This will be achieved through a modular electric power generator system built at pilot plant level, in which pressure reduction is carried out by means of a hydraulic turbine.

This system will generate 700,000 kWh of electrical energy, a savings of 188.3 t of CO2 and the non-emission of 403.2 kg of



SO2 and 284.9 kg of NOx and will contribute to compliance with the agreements of the European Commission as regards the increase in the use of renewable energy sources, thereby contributing to the reduction of greenhouse gas emissions and, therefore, in compliance with the Kyoto Protocol and the Government of Spain's Renewable Energies Plan (PER 2011- 2020) which sets the target of reaching 268 MW in facilities of less than 1 MW.

PROJECTS CO-FINANCED BY THE MINISTRY OF SCIENCE, INNOVATION AND UNIVERSITIES AND THE EURO-PEAN UNION WITH FEDER FUNDS



ENERGY EFFICIENCY THROUGH REHABILITATION, SUN AND GEOTHERMAL (REHABILITAGEOSOL)_RTC-2016-5004-3

Started in 2016, this project arises from the need to have effective, easy to access and use design tools, that enable the implementation of energy saving measures, the use of renewable energy sources and clean, safe and efficient sources of heat and cold in the different autonomous Regions of Spain and the companies that constitute this "RehabilitaGeoSol". By obtaining a "marketable end product" that can be exported to other Autonomous Regions, as well as to different countries, this will make the internationalization of the companies and the organizations involved possible, thus allowing considerable technological and business development for this Consortium, and consequently for the economy of the regions and the country. The Project "REHABILITAGEOSOL. Energy efficiency through rehabilitation, sun and geothermal" (RTC-2016-5004-3) is a Project financed by the State Program of Research, Development and Innovation oriented to the Challenges of Society, in the Framework of State Plan of Scientific and Technological Research and Innovation 2013-2016 of the State Agency of Research (Ministry of Economy, Industry and Competitivity) co-financed with FEDER Funds.

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



NEW THERMOSOLAR TOWER CONCEPT WITH OPEN RE-CEIVER (TERRA)_ITC-20151145

The aim of this project is the development of a thermosolar tower plant with an open receiver, where air is heated as a heat transfer fluid, allowing electricity to be obtained by means of a combined cycle. With this new plant design it will be possible to obtain temperatures much higher than in current plants, allowing the use of a gas turbine, which at these temperatures is more efficient.

This project also studies and reassesses all elements of the plant: heat storage, heliostats, central tower or receiver and gas turbine, studying and overcoming the current limitations of solar tower technology to achieve a new optimized concept of central receiver thermosolar plant.

SUPERVISION OF INDUSTRIAL AND ENERGY SYSTEMS BASED ON CLOUD COMPUTING (SISCLOUD)_IDI-20160691

SISCLOUD is a project the aim of which is the development of a unified monitoring and analysis tool that allows the remote monitoring of renewable energy sources. This tool will be designed and developed based on independent modular components built on cloud technologies, facilitating integration with third parties and ensuring flexibility and adaptability. The solution will incorporate real-time data processing (CEP system) combined with advanced machine-learning techniques and historical data processing. The solution will have interactive visualization and analysis utilities such as dashboards in real time.

Last but not least, all services of the solution (intake, storage, processing, visualization, etc.) are individually secured and monitored, ensuring traceability of data and service level agreement (SLA). The inclusion of Information technologies within the industrial world involves the development and application of new functionalities at various levels.

AUTOMATION PLATFORM FOR SOLAR COLLECTOR AS-SEMBLY LINES IN REAL TIME AND REJECTION ESTIMATE (SIGMA) _ IDI-20170751

The SIGMA Project aims to develop an IT platform that allows to automate the treatment and interpretation of large volumes of information during the process of assembly of collectors (SCE) for thermosolar parabolic trough plants, so that it allows for the correct estimate of rejections beforehand in the assembly line as well as facilitate efficient decision making during the assembly phase of the SCE assembly that makes up the solar field from the monitoring of the information as well as afterwards obtaining the conclusions about the level of efficiency reached and the deviations regarding the initial planning.

NEW DESIGN OF SUPPORTS OF THE HCE IN PARABOL-IC TROUGH THERMOSOLAR PLANTS (DAHCE) _ IDI-20171059

In the DAHCE Project a new model support of HCE (Heat Collector Element) is being developed on the parabolic trough collectors of thermosolar plants, which will include a new concept of support tube clamp that prevents breakage of the metallic tube during installation as well as its lifespan. This new support will allow for the use of thinner HCE tubes with the corresponding increase in heat transmission.

INDUSTRIAL INSPECTION AND MAINTENANCE OF COMPLEX OR UNATTENDED FACILITIES (INSPECTOR) _ IDI-20170947

The objective of this Project, approved by the CDTI within the CIEN Strategic Program calling, is the research on technologies to carry out inspection and maintenance on extreme surroundings in an unassisted manner. Through this project the aim is to push the competitiveness of the companies through fomenting business innovation in the industrial engineering area of extreme, complex and offshore installations, in design, manufacturing and commissioning as well as operation and maintenance. In addition, the costs associated to the interventions of extreme operation will be reduced and this will contribute to strengthening the capabilities of the business network that supports the industrial sector.

PROJECTS FINANCED BY MINE-TUR AND THE EU



MONITORING AND PERFORMANCE SYSTEM FOR THE OP-ERATION AND MAINTENANCE OF INDUSTRIAL PLANTS (SI-SPLANT) _TSI-100804-2016-1



Since September 2016 TSK has been implementing the SI-SPLANT project, the main aim of which is to develop a system based on the IIoT concept for the monitoring of industrial plants with the possibility of acting on the plant elements. To this end, the adoption of standards that allow an interaction with the plant elements (monitoring and actuation) will be carried out. In addition, Big Data technologies will be adopted to allow the processing of all plant information, guaranteeing the integrity and security of the processed data. The SISPLANT solution is intended as a generic display platform, "adaptable" to different industrial processes.

This project is financed by the European Regional Development Fund (ERDF) through the Pluri-regional Operational Program for Intelligent Growth 2014-2020 and the Ministry of Energy, Tourism and Digital Agenda, within the Scientific and Technical Research and Innovation Plan 2013-2016 in the framework of the Strategic Economy and Digital Society Action (AEESD).

RESEARCH AND DEVELOPMENT OF ADVANCED COMPUT-ER TECHNOLOGIES DESTINED FOR CYBER SECURITY IN INDUSTRY 4.0 (CS4) _TSI-100200-2017-9

CS4 has the ambitious objective to develop a tool that allows for centralizing and improving cyber security in Industry 4.0, allowing the incorporation and Access in real time and in a simple manner. To do this an ecosystem/architecture of Cyber security will be created that allows to take on all sources of possible vulnerability to those that are exposed to the digital developments of Industry 4.0 and that are being unattended to at present. The new model of cyber security that is intended to be developed during execution of this project will be based on technologies for security of technologies enabling Big Data and IoT, as well as to microservice structures and infrastructures DevOps, from design and construction of flexible, modular and extendible hardware and software that allows for adaptation to possible technological changes and that increases the levels of efficiency and performance of security of Industry 4.0 in a substantial way. This project counts on the funding of the European Regional Development Fund (ERDF) through the "Multiregional Operational Program of Intelligent Growth 2014-2020" and the Ministry of Energy, Tourism and Digital Agenda, within the Scientific and Technical and Innovation Research Plan 2013-2016 in the framework of Strategic Action of Economy and Digital Society (AEESD).

PROJECTS COFINANCED BY THE GOVERNMENT OF THE PRINCIPALITY OF ASTURIAS THROUGH IDEPA AND THE SCIENCE, TECHNOLOGY AND INNOVATION PLAN (PCTI) 2013–2017, AND THE EUROPEAN UNION THROUGH ERDF FUNDS



STUDY OF A SYSTEM FOR AUTOMATED REMOTE MANAGEMENT OF OPERATIONAL AND INDUSTRIAL MAINTENANCE TASKS THROUGH THE AUTOMATIC GENERATION OF AERIAL MISSIONS (UAVInspection) _IDE-2016-000184

This project aims to integrate the aerial data obtained by the UAV into the Big Data platform, along with the data obtained via other sensors, with the aim of improving the results obtained with regard to the detection of incidents and the visualization of the state of photovoltaic plants, as well as the automatic generation of new flight missions and monitoring. In this way it is intended to achieve an autonomous, intelligent use of UAV technology, adapted in real time to the specific needs of each installation, with minimal need for operator intervention.

METHODOLOGY FOR PREDICTION OF RISK EVENTS IN IN-DUSTRIAL ENVIRONMENTS (EventRisk) _IDE-2016-000181

The general aim of the project is the design of a methodology that allows the prediction of risk events in industrial environments through the incorporation of sensors at critical points, with the support of the Emergencies Service of the Principality of Asturias (SEPA) who will take an active part in the project. To achieve this, the construction is proposed of a comprehensive system of analysis of dispersion of pollutants by combining off-line models to create patterns and sensors installed in the field for real time monitoring supported by Big Data technologies and mass data analysis techniques.

RESEARCH AND DESIGN OF INTEGRAL MANAGEMENT IN THE INDUSTRIAL INTERNET OF THINGS ECOSYSTEM (GestorIIoT)_IDE-2016-000178

Through this project, research is centered on a comprehensive system for the management of IoT architectures deployed in industrial systems, which will serve as a fundamental architectural element to take advantage of the new possibilities of interconnection and exploitation of information generated in 4.0 industries. Organized as a modular solution, the IIoT Manager system will be stratified into 5 large functional groups, with which it is intended to solve the complexity and lack of robustness of current systems (acquisition framework, remote management, ecosystem monitoring, simulation and cybersecurity).

SUPERVISION SYSTEM FOR ELECTRICAL SUBSTATION BUSBARS BASED ON AUTOMATIC THERMOGRAPHIC ANALYSIS (SISTER) _IDE-2016-000652



This project aims to address preventive maintenance of the busbars in electrical substations via the automatic analysis of thermographic images. To achieve this, the system will use, on the one hand, image processing algorithms for the detection of hot spots and, on the other hand, it will communicate with the SCADA to obtain the control system data in order to characterize the process and subsequently send the analysis results. In addition, the images will be sent to a remote monitoring system, thus creating a historical knowledge base.

4.0 TECHNICIAN IN THE FOURTH INDUSTRIAL REVOLU-TION: AN AUGMENTED, VIRTUAL, SECURE ENVIRON-MENT_IDE-2016-000834

The overall objective of the project is the use of new technologies to improve the work of the 4.0 technician. Research will center on the development of innovative support and help tools that make it possible to improve the execution of the technicians' work while guaranteeing their safety. Research will explore the creation of an augmented, virtual, secure environment throughout the entire value chain of industry.

STUDY OF WIND-DERIVED PROBLEMS AND METHODS FOR MITIGATION IN THERMOSOLAR PLANTS LOCATED IN DESERT AREAS (EOLO) _IDE-2016-000179

The overall aim of the EOLO project is the development of an expert system to optimize the design, efficiency, performance and durability of a solar thermal plant in desert environments, where solar radiation in these areas is optimal for the location of these types of plants, but where sand, dust and high wind speeds cause the components to fail.

NEW SYSTEM OF STORAGE AND INTELLIGENT ANALYSIS OF CONTROL VALUES FOR BULK HANDLING MACHINES (REHANDA)_IDE-2016-000635

The main objective of this project is to address the development of a new generation of bulk handling machines, incorporating a system of data capture and storage, which, through Big Data technologies and data analysis, makes it possible to boost the competitiveness of a subsector that so far has had a low rate of implementation of these technologies. This means developing a database in the electronic control of each machine, thus enabling the option of storing performance data periodically as from the moment of commissioning.

This database must be unalterable by the client in order to ensure the traceability and usefulness of the data captured. Once this database is created, it will be necessary to develop a virtual platform for access to it, from which intelligent analysis of the data will be possible and its application to the development of new technologies that improve the equipment manufactured by PHB.

NEW ENVIRONMENTALLY SUSTAINABLE SYSTEM FOR THE TREATMENT OF VINASSE BY DIRECT OSMOSIS IN THE SUG-AR- ALCOHOL INDUSTRY (BIOETHANOL) _IDE-2016-000182

The general objective of the BIOETHANOL project is the development of technological solutions capable of industrial scaling for the treatment of the vinasses generated in the sugar-alcohol industry by concentration, as well as the rest of the waste generated in the treatment, via an innovative process based on the complementarity of direct osmosis with other treatment alternatives, such as reverse osmosis, forced evaporation and dumping diluted brine into the sea in coastal areas.

AUTOMATIC HYDRAULIC EMERGENCY SYSTEM FOR THER-MOSOLAR PLANTS (HIDRA)_IDE/2017/000705

HIDRA project's aim is the development of an automatic hydraulic emergency system that carries out the unfocusing of the collectors of a thermosolar plant. HIDRA system will allow the elimination of the SAI of the thermosolar plant, with the consequent cost savings.

RESEARCH FOR THE USAGE OF A WASTE TREATMENT COMPLEX FOR THE PRODUCTION OF MICRO-ALGAE WITH PHARMACEUTICAL AND FARM USES (LandFill4Health) _ IDE/2017/000700

The global objective of the Landfill4Health Project is to research and demonstrate the usage of a non-hazardous waste disposal site and its auxiliary installations to house industrial cultivation of micro-algae intended to produce high-valued active ingredients in the field of nutraceuticals, health and cosmetics. To do this, INGEMAS will be in charge of the design and development of the pilot plant.



RESEARCH AND DESIGN OF A NEW METHODOLOGY FOR THE DESIGN, DEVELOPMENT AND DISPLAY OF ANALY-SIS TECHNIQUES OF BIG DATA INFORMATION ORIENT-ED TO PHOTOVOLTAIC PLANTS (PHOTOANALYTICS) _IDE/2017/000709 For the last few years, TSK has worked on the monitoring of photovoltaic plants through the use of technologies characteristic of the Internet paradigms of things and Big Data. This bet, aligned with the 4.0 Industry initiative, allows TSK to currently have a vast and diverse amount of "plant" information that is being used for remote supervision and monitoring of the installations.

The PhotoAnalytics project comes with the objective to delve into this information, investigating the applicability of advanced modern analytical techniques about extensive IoT/ BigData/I4.0 data sets.

PROJECTS FINANCED BY THE GERMAN MINISTRY OF ECONO-MY AND ENERGY (BMWI)



SILICONE TEST FACILITY (SITEF)

In the SITEF project, a new heat transfer fluid will be tested for solar thermal power plants using parabolic-cylinder technology. This new fluid is based on silicon, as opposed to that which is currently employed with a carbon base. The introduction of this innovative fluid would allow a higher operating temperature (up to 450 ° C) which would lead to an improvement in plant performance. In addition, it would reduce the environmental damage and the risk to health, by not producing benzene. The project will consist of a trial to study its long-term behavior in a test loop at the Almeria Solar Platform, as well as laboratory analysis.

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

The use of molten salts as a heat transfer fluid has important advantages. The operating temperature can be increased substantially to 500 ° C, and the plant is considerably simpli-

fied by using the same fluid for storage and as heat transfer fluid. To validate the technology and identify possible problems during the operation, a test loop will be built in Évora (Portugal), where the TSK-FLAGSOL Heliotrough 2.0 collector will be installed.

OPERATING STRATEGIES BASED ON CLOUD CAMERAS FOR THERMOSOLAR PLANTS (WOBAS)

The aim of the Wobas project is to develop a tool which, using cloud cameras, can predict the direct radiation that a solar thermal plant will receive in a very short term. Cameras record the sky and detect the presence of clouds and their movement to determine when and to what extent they will reach the plant. This very short term prediction will optimize the operation strategy at any given time. During the project, a prototype will be installed in the "La Africana" solar thermal plant to test the system in a real plant.

SILICONE FLUID MAINTENANCE AND OPERATION (SIMON)

The purpose of SIMON is to test the applicability of new heat transfer silicon based fluids to higher temperatures with which are being operated with at present in parabolic trough thermosolar plants and with a faster market introduction by reducing all the obstacles that have been identified. The Project will consist of laboratory testing, fire assessment and testing phases in the loop of the PROMETEO test refurbished in the SITEF project at the Solar Platform in Almeria. Also a viscosity sensor appropriate for these applications and temperatures will be developed, as well as an efficient maintenance concept for separating compounds such as hydrogen, methane and silanes.

PROJECT FINANCED BY THE EURO-PEAN AEROSPACE AGENCY (ESA)



CONCENTRATING SOLAR POWER FORECAST SYSTEM FOR PARTICIPATION IN THE SPANISH ELECTRICITY MAR-KET USING EO AND COM TECHNOLOGIES (CSP-FOSYS) In the CSP-FoSyS project, a new meteorological prediction system based on satellite images is developed. The system consists of software that receives the images obtained by orbital satellites and predicts the direct radiation that the plant will receive in the medium term, for the next hours and days.

PROJECT FINANCED BY THE EUROPEAN UNION (H2020)



COMPETITIVE SOLAR POWER TOWERS (CAPTURE)

The main objective of the CAPTURE project is to reduce the costs of solar thermal plants by implementing an innovative plant configuration. The configuration is based on several independent towers operating with air at 1100 ° C, each coupled to a Brayton cycle. The residual heat of these cycles is used to store thermal energy, which will feed a Rankine cycle. A prototype will be built at the Almería Solar Platform to test the validity of the system. Throughout the project, all the necessary components for the operation of the plant will be developed: receiver, regenerators and heliostat.

SOLVING WATER ISSUES FOR CSP (SOLWATT)

The SOLWATT Project is a European Project led by TSK in cooperation with 13 other organisations that are aiming to re-



TSK, winner of the Quality Innovation Award for the SOLWATT Project

duce water consumption in thermosolar plants through several innovations in cleaning mirrors, refrigerating the power cycle and recuperating waste water. With this Project, TSK shall be able to offer innovative solutions to its customers that face one of the most recurring problems in new plants and to continue strengthening itself in the thermosolar sector. www.solwatt.eu (N° Exp. 792103)

PROJECT FINANCIED BY SOLAR-ERA.NET



OPTIMAL HELIOSTAT FIELDS FOR SOLAR TOWER POWER PLANTS (SOLFIEOPT)

The SolFieOpt project proposes to develop software to design the layout of heliostats in the solar field for a tower plant. The optimization of the layout of all the heliostats will save costs in the solar field and increase the efficiency of the plant. The tool will take into account the configuration of the plant and the mirror cleaning strategy to optimize the route of cleaning trucks.

PROJECT FINANCED BY THE BASQUE GOVERNMENT IN THE ANNOUNCE-MENT OF THE 2018 HAZITEK PROGRAM



THE OPTIMISATION OF ENERGY RECOV-ERY FROM BIOMASS PLANTS

The objective of the OPTIMAS Project is to have a combination of complementary solutions that allow for the construction of biomass plants which are optimised stronger, more resistent and with less maintenance needed and which are more efficient from the point of view of resource utilization and with less environmental impact due to the recovery of generated subproducts. Being able to offer complete solutions that are more competitive in biomass power generation plants. # Projects in 50 countries

INTERNATIONAL EXPERIENCE

TSK is currently executing projects in 35 countries **at the same time**.

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.



A M E R I C A *M E X I C O, C U B A, V E N E Z U E L A, A R G E N T I N A, C H I L E, C O L O M B I A, B R A Z I L,* P E R U, H O N D U R A S, N I C A R A G U A, P A N A M A, U S A, B O L I V I A, E C U A D O R, J A M A I C A, G U A T E M A L A **E U R O P E** S P A I N, F R A N C E, I T A L Y, P O R T U G A L, G R E E C E, P O L A N D, F I N L A N D, U K, R O M A N I A, N E T H E R L A N D S, F I N L A N D **A F R I C A** *M O R O C C O, A L G E R I A, T U N I S I A,* T O G O, I V O R Y C O A S T, E G Y P T, S E N E G A L, A N G O L A, L I B Y A, S U D A N, S O U T H A F R I C A, M O Z A M B I Q U E, U G A N D A **A SI A** J O R D A N, T U R K E Y, I N D I A, I R A N, S A U D I A R A B I A, S Y R I A, B A N G L A D E S H, U A E.

CORPORATE SOCIAL RESPONSIBILITY



November 2018 Congress, LQDVI Foundation. Asturias (Spain)

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 can largely be attributed. Our main responsibility is to be able to give 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 engage in activities that benefit the society where we carry out our projects. At TSK we believe that it is also our responsibility to support organizations that work for the improvement of society. In this sense, we support those working in the cultural and scientific sphere, in international cooperation and solidarity and in the promotion of business and entrepreneurship.

- Sponsorship of sports organizations.
- Preparation and editing of books.
- Sponsorship of cultural exhibitions.
- Co-operation with the University of Oviedo.

- Co-operation with charities and NGOs.
- Commitment to Asturian industry and the development of the region.
- Co-operation with the Asturian Quality Club, Asturian Innovation Club, Femetal, Asturian Family Business Association, Ademi, Sercobe and Prodintec.

At TSK we consider corporate social responsibility as part of our overall strategy with the objective and commitment to improve the well-being of the societies where we are present.

At TSK, we manage the social implications of projects. Although most of these implications are positive (mainly job creation and revitalization of the local economy) we always supervise the development and implementation of projects in order to identify negative social impacts and establish measures that can mitigate them.

Within this social management, the following activities can be highlighted:

- Relationship with the Community. The Project Manager is responsible for maintaining a constant dialogue with authorities and community representatives during the execution.
- Social impact. Although the company's impacts are mostly positive, TSK analyzes the local regulations in order to provide mechanisms for information, claims and restoration of negative social impacts.
- Implementation of projects. Depending on the needs and expectations of the community where we are, we offer the



Old Harbour Bay Community Center (Jamaica)



Collaboration with "Aldeas Infantiles", a non-profit international organization which helps children.

possibility of carrying out projects to support the community.

In 2018 the refurbishment of the Community Centre in the small fishing village, Old Harbour Bay, Jamaica, where we are carrying out a 190W Combined Cycle Plant, continued, which had begun in 2017. This complete reformation Project of the community centre has made it possible for the residents to have a sociocultural meeting place where they can participate in a great number of activities which are beneficial for the community. This Project is tackling the conditioning of the surroundings, improving sports areas, within which a complete reformation of the basketball court and football field has been carried out.

Projects have been developed on the basis of solidarity proposals presented by our own TSK professionals who work in different areas of the world, taking into account the basic needs of the population. In 2018 the following cases were developed:

- Preventive HIV talks and campaigns in countries with the highest incidence.
- Immunization days and medication donations
- The donation of toys to the child population near our projects in Bolivia and Ecuador.



Head office Parque Científico y Tecnológico de Gijón C/Ada Byron, 220 33203 Gijón - Spain Tel. +34 985 13 41 71

Paseo de la Castellana, 149 - 1º izda. 28046 Madrid - Spain Tel. +34 911 25 02 58

grupotsk.com

Parque Científico Tecnológico Ada Byron, 220 33202 Gijón, Spain Tel. +34 984 495 500

