

INDUSTRIAL PLANTS

ITALIAN ENGINEERING, CONTRACTING AND PLANT COMPONENTS SUPPLIERS

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AVEVA™



Worldwide reference in
HEAT EXCHANGER'S WORLD

One partner for all the phases of the production and maintenance
of the heat exchanger bundle's

Open me and discover more





World leading manufacturer of tools and machines for the **PRODUCTION** of heat exchangers

Tube expansion

Electric, pneumatic and hydraulic tube rolling motors

Tube bundle insertion

Special machines for tube bundle insertion and pulling

TIG orbital welding

Automatic & fully automatic TIG orbital welding systems

Baffle flaring holes

Automatic machine for flaring the holes of the heat exchangers baffle

Tube end facing

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Tubesheet preparation tools

Tubesheet drilling, reaming and grooving

Pre-welding

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Maus Italia is the world leader in **tube expanders** production

We use only the highest quality steels and in-house controlled heat treatment. Large warehouse with sales outlets located all over the world to provide immediate service.

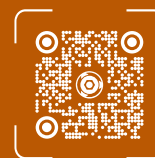


Every day in over **80** country worldwide

In its over 60 years up and running, Maus Italia has built an efficient business organisation and a dense international sales network, with agents and distributors in more than 80 countries all over the world.



MAUS ITALIA SPA IS THE WORLD LEADING MANUFACTURER
OF TOOLS AND MACHINES FOR THE PRODUCTION
AND MAINTENANCE OF HEAT EXCHANGERS



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Tube extraction

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of the tube bundle

Tube cutting

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Tube bundle cutting

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1959

2026



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20 nationalities

200.000
tons yearly handled worldwide

More than
120.000
sqm of stock

More than
12.000
sqm destined to fittings and flanges

Over
30.000
tons in stock

services

Manufacturing
Stock & distribution
Project management

products

Pipes
Fittings
Flanges
Valves
Bars

global presence

Italy	Singapore
Brazil	Spain
China	Thailand
France	UAE
Kazakhstan	UK
Poland	

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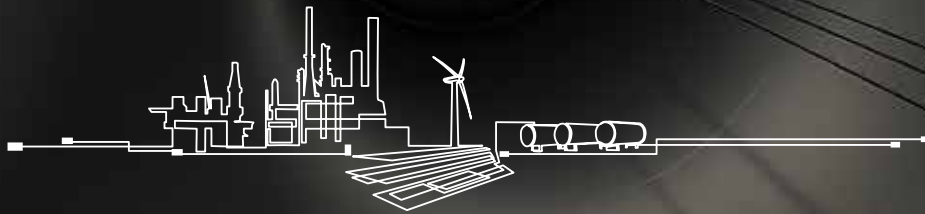
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Bringing value to every project. This is our goal.

Thanks to over 40 years of experience working alongside the most important players in the market, we take care of every detail to make the difference between "doing something" and "doing it well."

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IM-1001



IM-2003



OIL & GAS



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AND QUALITY STANDARDS IN DIFFERENT CONFIGURATION IN HIPPS SYSTEMS**

Thriving in the “Age of Uncertainty”

Flexibility, responsiveness and collaboration will be keys to the continuing success of the Italian industrial plant engineering companies and associated supply system



Marco Villa
Senior Advisor to the
CEO, Technip Energies
President of ANIMP

As the President of ANIMP, the Italian Association of Industrial Plant Engineering Companies, I am pleased to introduce the latest number of *Industrial Plants*, our yearly publication for international audiences.

Our Association with more than 500 members - energy providers, engineering firms and general contractors, plant component manufacturers, service suppliers as well as universities and consulting firms - strives to develop a world-class supply chain, competitive globally in any industrial plant market, as well as to promote growth, development, innovation and international cooperation.

“Our Association with more than 500 members - energy providers, engineering firms and general contractors, plant component manufacturers, service suppliers as well as universities and consulting firms - strives to develop a world-class supply chain, competitive globally in any industrial plant market, as well as to promote growth, development, innovation and international cooperation

The global economy is influenced today by numerous and serious uncertainties. Following the war in Ukraine, which has modified a big part of the global oil&gas trading and transportation pattern, we now have a new and major conflagration in the Middle East. While at the time of writing the long-term consequences of these wars and their eventual outcomes are hard to predict, particularly whether the global energy supply system will ever come back to the pre-war normalcy, we could most likely see the following trends:

- Major investments in new oil&gas fields in new geographic areas or in the ones away from the war zones, as the supply patterns will partially shift away from established routes.
- Natural gas will remain the star player in the foreseeable future, getting the majority of the attention in new investments - the global capex spending is expected to grow to a ten-year high in 2026, according to IEA's *World Energy Investment Report*.
- Oil demand will suffer, since the current jump in oil prices will most likely contribute to a partial but permanent demand destruction - with the global capex spending expected to decline in 2026 for the third consecutive year.
- The 'Energy Transition' will accelerate, since the power production from renewable sources, typically closer to demand centers, can contribute to improving the security of energy supplies, compared to the import of oil&gas from distant locations.



- The 'new' technology applications and related investments will grow very strongly, buoyed by technology development breakthroughs, significant cost reductions and renewed interest: the comeback of nuclear, large industrial batteries, the beginning of the 'hydrogen economy', geothermal power generation, are all poised for a big future. This will create a more complex and diversified energy system, with the benefits of potential fuel switching and more generally of optionality for consumers and of new pathways for producers.
- Last-but-certainly-not-least we live in the Artificial Intelligence world. This area is expanding extremely rapidly, in ways still difficult to fathom completely, but which will acquire an immense importance, in ways still to be seen.

Of course, all of this might change, particularly should there be a widening of the conflicts or a global economic recession.

Looking at the world from the perspective of our ANIMP Association, we are ready for these new challenges. As you know from our reputation and

“Whatever the future will bring us, our ANIMP Associates are ready for the new challenges. Our industry has always been top-of-the-line in technology competitiveness, both in traditional as well as in new market segments, characterized by maximum flexibility and imaginative approaches in the face of uncertainties

as you can see from the articles in this issue, our industry has always been top-of-the-line in technology competitiveness, both in traditional as well as in new segments. In addition, we have always been characterized by maximum flexibility and imaginative approaches in the face of uncertainties. We are therefore ready for the future.

In closing, we remain particularly grateful to the Italian and other partner industries for their strong and continuing commitment and support to our Association.

Marco Villa

Marco Villa

Marco Villa, the President of ANIMP since 2022, is currently the Senior Advisor to the CEO of Technip Energies, after having held the positions of Chief Operating Officer and more recently Chief Business Officer. Prior to these assignments, he was the President of TechnipFMC Onshore / Offshore (now Technip Energies) for Europe, the Middle East, India and Africa. From 2003 to 2017, Marco Villa held various management positions in Technip, including President Europe, Middle East, India and Africa, President and CEO of Region B, Chief Financial Officer of Region B and Head of Export & Project Finance of Technip Italy. Before joining Technip, he had worked as a financial specialist in Finmeccanica, the Italian multinational company specializing in the aerospace, defense and security industries, and as the head of the Finance and Risk Management Division of Telespazio (Telecom Italia Group), a European services company for space flights. He graduated with honors in Economics and Commerce at the University of Rome.

Digital Support for Environmental Monitoring

Thanks to advanced redundancy features, TÜV certified availability above 99% and remote maintenance, ABB's CEM DAS system - a robust and scalable DAHS solution compliant with EN 17255, designed to ensure secure acquisition, processing, and storage of emission data - guarantees operational continuity and regulatory compliance

Marco Civardi, Bid & Proposal Leader – Measurement & Analytics Division
ABB Italy



However, the emissions of waste-to-energy plants are themselves heavily regulated. Many plants operating in Europe will fall under the recent revision of the Industrial Emissions Directive (IED), which aims to reduce the main industrial emissions by 40% by 2050 compared to 2020 levels, and foresees penalties of at least 3% of turnover for noncompliant operators. In the United States, Part 75 of the Clean Air Act has long required continuous emission monitoring for energy producers with power output greater than 25 MW.

Challenges of Continuous Monitoring

In addition to carbon emissions, authorities routinely monitor other pollutants, particularly sulfur dioxide, nitrogen oxides, and particulates. These are generally measured at the outlet of raw gas from the combustion chamber to optimize downstream treatment processes such as filtration, fluegas desulfurization, and denitrification. This is clearly a demanding operating environment: sample handling and conditioning are complex, and harsh conditions can degrade electronic components over time.

Water emissions in the sector are also strictly regulated: continuous water analyzers monitor the output of treatment plants and help operators optimize water quality used in steam generation and distribution systems. Typical measurements include silica, conduc-

Waste-to-energy represents an important route for managing nonrecyclable waste. In Europe, an average of 26% of municipal waste is already treated in this way, generating energy for surrounding communities and diverting waste from landfills—where it would otherwise release methane. Reducing methane emissions is one of the most effective climate change mitigation strategies in waste management, as methane has a global warming potential 86 times higher than CO₂ over a 20-year period.

tivity, pH, turbidity, and hydrazine.

Nevertheless, gas emission monitoring is likely the greatest challenge: regulators require these systems to deliver accurate and continuous measurements for 97.5% of the time. This allows only 89 days per year for scheduled downtime and permitted maintenance, leaving minimal margin for unexpected failures.

This makes effective monitoring more important than ever to remain competitive. ABB's latest service solutions can provide waste-to-energy operators with the support needed to maximize the availability of emission monitoring systems and other analyzers.

“ABB’s latest service solutions can provide wastetoenergy operators with the support needed to maximize the availability of emission monitoring systems and other analyzers

ABB’s CEM DAS System

Companies in the wastetoenergy sector are under strong pressure to guarantee continuous and reliable emission monitoring due to increasingly stringent environmental regulations (such as EN 17255, EN 14181, the Industrial Emissions Directive 2010/75/EU, and the U.S. Clean Air Act). Meeting such requirements demands high availability measurement systems with minimal allowable downtime.

To address this, ABB has introduced the CEM DAS system, a robust and scalable DAHS (Data Acquisition and Handling System) for continuous emission monitoring, compliant with EN 17255.

Technical Features and Functionality

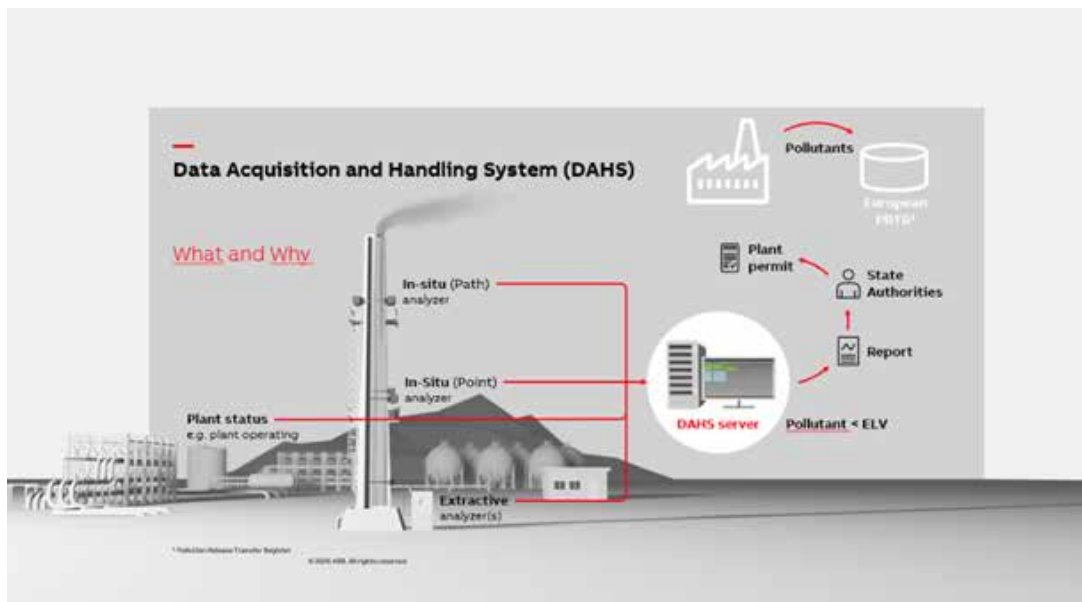
ABB’s CEM DAS is a PC-based data acquisition and management system intended for continuous emission monitoring (CEM) across all industrial sectors. The system provides essential information for the environmental and economic operation of production facilities.

This comprehensive, network-ready system ensures continuous recording and analysis of emission data and is scalable from installations with a single emission line to complex multiblock plants. The system includes the CEM DAS user interface (front-end) and the DAA (Data Acquisition Application) licenses, which can be installed on one or two separate platforms.

Data Acquisition and Processing

Field data from gas analyzers, particulate monitors, and other instruments are acquired via conventional I/O or digital communications such as Modbus TCP/IP. Raw data are averaged over 5 second intervals. These data are then processed into short





and long term datasets according to the requirements of EN 17255.

All results and reports are stored in a database and redundantly backed up on external storage, such as the end user's file system or a NAS (Network Attached Storage).

Redundancy and Operational Continuity

For installations where the CEM DAS server is located in a control room, an optional DAA controller can be added and positioned near the CEM equipment to buffer all field data.

This ensures uninterrupted data collection even in the event of network issues or server shutdowns, preventing data loss and potential compliance problems. When communication is restored, the CEM DAS server automatically retrieves and processes the buffered data.

Thanks to redundancy (data, server, controller) and TÜV tested availability above 99%, CEM DAS ensures operational continuity even in case of network or server issues.

Accessibility and Remote Maintenance

Any client PC with a web browser—typically located in an office—can fully access the CEM DAS server, with the ability to view charts, check alarms, and

generate reports.

The system is designed for simple and immediate remote maintenance: authorized users can access the CEM DAS server remotely for tasks such as commissioning support and normal day-to-day operations.

Available Modules

- EN 14181 / QAL3 module
- CO₂ Emission Trading module
- EFÜ module for installations in Germany

“Thanks to redundancy (data, server, controller) and TÜV tested availability above 99%, CEM DAS ensures operational continuity even in the event of network or server issues

Conclusions

The CEM DAS system represents a complete and reliable solution for continuous emission monitoring in waste-to-energy plants. Compliance with the strictest international standards, combined with advanced redundancy and remote maintenance capabilities, allows operators to ensure operational continuity and meet environmental requirements while minimizing the

risks of non-compliance and associated penalties.
In an ever-evolving regulatory environment, investing
in robust and scalable monitoring systems like

CEM DAS becomes strategic for maintaining
competitiveness and contributing to a sustainable
energy transition.



Marco Civardi

Marco Civardi is Bid & Proposal Leader in the Measurement & Analytics division of ABB Italy, with solid experience in process automation and the management of complex projects for high technology analytical systems. He graduated with honors in Industrial Chemistry from the University of Genoa and began his career in research on advanced polymeric materials. Since 2007 he has worked in ABB – Automation Area, where he has developed expertise in project management, team coordination, supplier assessment, and technical support. He collaborates with strategic customers in the Oil & Gas, Chemical, Waste, Power, and Metal sectors, contributing to solutions for emission monitoring and process optimization.



Synchronous Condensers: strengthening grid stability and energy security

Rotating electrical machines designed to provide essential grid services without producing active power, they deliver effective and accurate voltage regulation, wide reactive power support, large short-circuit current and mechanical inertia

Federico Bonzani, Chief Technology Officer
Ansaldo Energia

As electricity systems evolve at an unprecedented speed, grid stability has become a central pillar of energy security. The rapid deployment of solar and wind generation, by nature non-programmable and discontinuous, combined with the growing role of High Voltage Direct Current (HVDC) interconnections, is profoundly reshaping power system dynamics. In this scenario, the ability to preserve voltage stability, frequency control and fault strength independently

from power generation is increasingly critical. Synchronous condensers are therefore emerging as a strategic asset for modern electricity grids.

“Synchronous condensers are emerging as a strategic asset for modern electricity grids

Novel possible cases for the adoption of synchronous condensers arise with the faster insertion in the

power system of other typologies of assets, such as giga data centres, which are grid-connected by electronic rectifiers and used to operate with very fast and large load swings.

Synchronous condensers are rotating electrical machines designed to provide essential grid services without producing active power. They deliver effective and accurate voltage regulation, wide reactive power support, large short-circuit current and mechanical inertia. Unlike grid-forming inverter-based solutions, they contribute real physical inertia to the system, ensuring immediate response to disturbances and supporting frequency stability during transient events. As conventional thermal plants reduce operating hours, the loss of synchronous inertia has become a structural challenge for many transmission systems. Synchronous condensers effectively address this gap, reinforcing grid robustness in systems with high renewable penetration and extensive HVDC infrastructure.

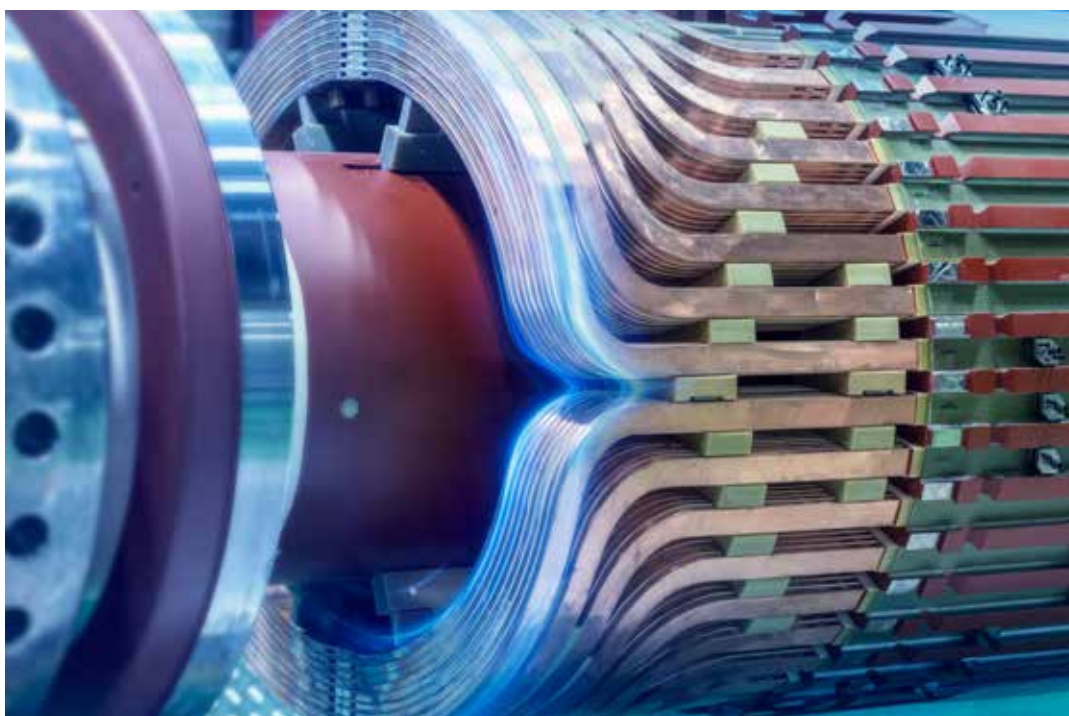
From a system operator's perspective, the value of synchronous condensers lies in their proven reliability and predictability. They enhance system stability under fluctuating operating conditions and enable higher integration of renewables without compromising security of supply. For renewable developers, they facilitate secure grid connections and access to ancillary services such as voltage control and short-circuit capacity, significantly reducing the risk of curtailment. In this sense, synchronous condensers

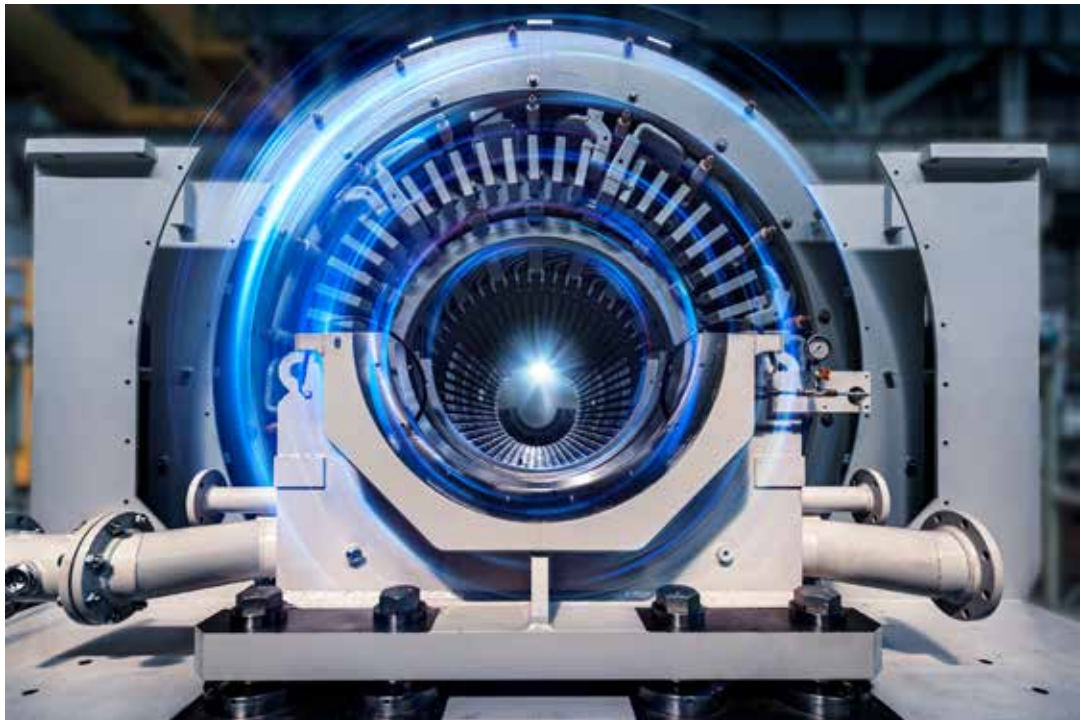
act as an enabling technology for both grid operators and investors navigating the energy transition.

“From a system operator’s perspective, the value of synchronous condensers lies in their proven reliability and predictability

Ansaldo Energia has built a strong position in this market, leveraging decades of experience in the design and manufacture of rotating machines and power generation equipment. Active in the synchronous condenser segment since 2014, the company offers high performance solutions suitable for both standalone installations and integration within conventional power plants. Its designs combine operational flexibility—such as on demand disconnection from the power train—with optional flywheel systems to increase inertia and vacuum housings to reduce losses and operating costs. The result is a robust, efficient solution engineered for long term reliability and ease of maintenance.

Ansaldo Energia's references reflect the growing demand for grid stability solutions across Europe. In February 2026, the company signed a contract with TSK UK to supply a synchronous condenser to Statkraft's Necton Greener Grid Park in Norfolk, United Kingdom. The project, awarded under the National Energy System Operator's Stability Pathfinder





Programme, is designed to strengthen the stability of Great Britain's electricity system as renewable penetration accelerates. The scope of supply includes a TRYL63 synchronous condenser equipped with a flywheel, auxiliary systems, commissioning and training services. The partnership with TSK UK and Necton Grid Solutions underscores our commitment to enabling grid stability solutions in a market scenario where renewable penetration is rapidly accelerating. Through this project, we are leveraging our extensive expertise in synchronous condenser technology to support the UK's energy transition goals.

“In February 2026, the company signed a contract with TSK UK to supply a synchronous condenser to Statkraft's Necton Greener Grid Park in Norfolk, United Kingdom, a project awarded under the National Energy System Operator's Stability Pathfinder Programme designed to strengthen the stability of Great Britain's electricity system as renewable penetration accelerates

This project builds on a strong presence in Italy. In 2025, Ansaldo Energia was awarded two lots of a

Terna public tender for the supply of five synchronous condensers, each rated at 250 MVAR. The project will significantly expand Italy's grid stabilization infrastructure, bringing the number of synchronous condensers installed or under installation with Ansaldo Energia technology to 15. The units, all equipped with flywheel systems, will provide precise reactive power control, short-circuit strength and inertia, contributing to the safe management of the grid and the largescale integration of renewable sources.

In this context, the integration of digital services can further enhance the value proposition. Ansaldo Energia's synchronous condensers are designed to be fully compatible with advanced remote monitoring and diagnostic solutions, such as the company's Integrated Plant Support (IPS) services. By enabling continuous condition monitoring, performance analysis and predictive maintenance, digital services support higher availability, optimized maintenance planning and reduced lifecycle costs. While the core value of synchronous condensers remains their physical contribution to grid stability, digital oversight represents a logical complement, particularly for assets that are expected to operate reliably for decades in increasingly complex network conditions.

As power systems continue to evolve, synchronous condensers are set to play a pivotal role not only in safeguarding energy security, but also in enhancing the value of existing assets. By strength-

“By strengthening grid stability and enabling higher penetration of non-programmable generation, synchronous condensers allow renewable plants to be more effectively integrated into the network, maximizing their contribution and reducing curtailment risks

ning grid stability and enabling higher penetration of non-programmable generation, they allow renewable plants to be more effectively integrated into the network, maximizing their contribution and reducing curtailment risks. Within this broader context, Ansal-

do Energia's proposition extends well beyond grid stabilization technologies. Through advanced operational and fuel flexibility solutions—ranging from hydrogen-ready and HVO-capable turbines to high load-ramp capabilities, efficiency and power-output upgrades, and solutions that enhance operational flexibility—the company supports utilities and grid operators in future-proofing their assets. Backed by extensive engineering expertise, a strong reference base and the ability to combine proven technologies with modern service solutions, Ansaldo Energia is positioned as a trusted partner for navigating the energy transition. In a landscape defined by variability and uncertainty, this integrated approach provides a solid foundation for stable, secure and reliable electricity systems—today and for the years to come.



Federico Bonzani

Federico Bonzani brings 30+ years of experience in power generation and joined Ansaldo Energia in 1995, initially focusing on Combustion Technology. After holding various engineering leadership roles in the Company, since 2020 he has served as Director of the Product and Technology Unit in Switzerland and Italy. In 2024 he has been nominated Chief Technology Officer of the Company, and he is currently reporting to CEO. His current scope oversees gas turbine, steam turbine and generator development and R&D budget management across Ansaldo Energia portfolio.



Strengthening the Global Energy Security

LRQA Italy supports the Energy Transition with its contribution in the certification and inspection services for the nuclear and energy supply chains

Luca Nero, Marketing Executive
LRQA

The global energy landscape is undergoing a profound transformation. Governments, industries, and infrastructure operators are simultaneously facing three interconnected challenges: ensuring energy security, achieving decarbonization targets, and maintaining reliable industrial supply chains.

In this context, nuclear energy — particularly new-generation technologies such as Small Modular Reactors (SMRs) — is increasingly being reconsidered as a key component of the global energy transition. However, the success of this transformation does

“In the global energy context, nuclear energy — particularly new-generation technologies such as Small Modular Reactors (SMRs) — is increasingly being reconsidered as a key component of the energy transition

not depend only on technology or policy. It also relies heavily on robust quality systems, reliable supply chains, and internationally recognized certification frameworks.

This is where organizations such as LRQA Italy, part

of the global LRQA group, play a strategic role. Operating within a globally accredited framework, LRQA provides inspection, certification, verification, and training services across multiple sectors, including the nuclear and renewable energy industries. Through its activities in Italy and worldwide, the company contributes to strengthening safety, quality, and reliability across the energy value chain.

Energy Source	Share of EU Energy Mix
Oil and petroleum products	~38%
Natural gas	~21%
Renewables	~20%
Nuclear energy	~12%
Solid fuels	~10%

(Source: Eurostat Energy Statistics 2024)

Energy Security and the Global Transition

Energy security has become a central issue for policymakers and industrial stakeholders.

The energy crises of recent years have highlighted the vulnerability of economies that rely heavily on imported energy sources. In the European Union, for example, around 57% of total energy demand is met through imports, reflecting a structural dependency on external suppliers.

In Italy, this dependency is even more pronounced, with approximately 73% of energy demand historically covered by imports, making diversification and domestic energy production strategic priorities.

At the same time, the European energy mix is evolving rapidly. In 2024, the EU energy supply consisted mainly of:

While renewable energy is expanding rapidly, the intermittency of wind and solar generation requires complementary sources capable of providing stable and continuous electricity production.

This has led many countries to reconsider the role of nuclear energy within their long-term energy strategies.

According to the International Atomic Energy Agency (IAEA), global nuclear capacity could more than double by 2050, potentially reaching nearly 992 GW compared with 377 GW in 2024.

A significant share of this expansion may come from Small Modular Reactors, which offer:

- smaller scale installations
- modular construction
- enhanced safety systems
- shorter construction timelines



For many energy systems, nuclear energy is increasingly viewed as a complement to renewable sources, contributing to grid stability and long-term decarbonization.

Quality and Safety in the Nuclear Supply Chain

As nuclear energy expands globally, the importance of quality assurance, safety standards, and certified supply chains becomes increasingly critical.

Global Nuclear Capacity Projection (2024–2050)

Year	Installed Capacity
2024	377 GW
2035 (projection)	~500 GW
2050 (high scenario)	~992 GW

Table 1

Source: IAEA

EU Energy Mix (2024)

Energy Source	Share
Oil	38%
Natural Gas	21%
Renewables	20%
Nuclear	12%
Solid fuels	10%

Table 2

organizations supplying products and services important to nuclear safety.

ISO 19443 builds upon the well-known ISO 9001 framework but introduces additional requirements tailored to the nuclear industry, including:

- nuclear safety culture
 - supply chain traceability
 - risk management
 - prevention of counterfeit or fraudulent products
- enhanced documentation and verification processes
- Certification according to this standard has become a key element for companies wishing to participate in the global nuclear supply chain.

LRQA Italy: Supporting the Energy Transition

Within this evolving context, LRQA Italy plays a significant

role in supporting organizations operating in the nuclear and energy sectors.

“Within this evolving context, LRQA Italy plays a significant role in supporting organizations operating in the nuclear and energy sectors

As an accredited certification and inspection body operating at national, European, and international levels, LRQA provides services including:

- certification of management systems
- inspection and verification activities
- supply chain audits
- technical assessments
- training and competency development

Through its activities, LRQA supports companies in meeting the highest international standards required to operate in complex and highly regulated sectors such as nuclear energy.

The company's expertise spans the entire energy ecosystem, including:

- nuclear supply chains
- renewable energy infrastructure
- energy industry manufacturing
- engineering and industrial components

By combining technical competence with global accreditation, LRQA enables companies to access international markets while maintaining compliance with stringent regulatory frameworks.

Case Study: ISO 19443 Certification for Brembana & Rolle

A recent example of LRQA Italy's commitment to strengthening the nuclear supply chain is the ISO 19443 certification awarded to Brembana & Rolle S.p.A.

This certification recognizes the company's commitment to:

- nuclear safety
- quality management
- supply chain excellence

The project represents an important milestone not only for Brembana & Rolle but also for LRQA Italy.

Energy Import Dependency in Europe

Country	Dependency Rate
Italy	~73%
Germany	~64%
Spain	~68%
France	~44%
EU average	~57%

Table 3

The certification process included a comprehensive audit covering:

- management systems
- production processes
- risk management procedures
- traceability and supplier control

compliance with nuclear safety culture requirements. One particularly significant aspect of the project was that the ISO 19443 audit was conducted entirely in Italian for the first time, demonstrating LRQA's ability to support local industrial ecosystems while maintaining global certification standards.

The certification ceremony involved representatives from both organizations, highlighting the collaborative effort required to achieve such an important milestone.

Projected Role of SMRs in Future Nuclear Capacity

Scenario	SMR Share of New Capacity
Low scenario	~5%
High scenario	~24%

Table 4

This achievement reflects the growing role of Italian manufacturing companies within the global nuclear supply chain, particularly in sectors such as:

- precision engineering
- specialized mechanical components
- high-reliability industrial systems

Italy and the Nuclear Supply Chain Opportunity

Although Italy currently does not operate nuclear power plants domestically, the country remains an important industrial player within the international nuclear ecosystem.

Italian companies are already involved in numerous



nuclear projects worldwide, supplying:

- engineering services
- specialized mechanical components
- advanced manufacturing
- safety and quality systems

With the growing interest in new nuclear technologies and SMRs, opportunities for the Italian industrial sector may increase significantly in the coming decades.

Participation in these projects, however, requires strict compliance with international nuclear standards.

This makes certification and inspection bodies essential partners for companies seeking to enter or expand within the nuclear market.

Global Outlook for New Nuclear Technologies

The renewed global interest in nuclear energy is driven by several structural factors:

- decarbonization objectives
- increasing electricity demand
- electrification of industries and transport
- digital infrastructure growth (data centers, AI)
- energy security concerns

Technology innovation is also reshaping the sector. Small Modular Reactors are expected to become a key component of future nuclear deployment strategies. According to international projections, SMRs could represent up to 24% of new nuclear capacity additions by 2050.

Many countries — including the United States, the United Kingdom, Canada, and several European states — are currently developing SMR demonstration projects and regulatory frameworks.

This global expansion will require robust, traceable, and certified supply chains, creating significant opportunities for qualified industrial partners.

The Strategic Role of Certification in Global Energy Infrastructure

As energy systems become more complex and interconnected, trust and compliance become critical

factors in international collaboration.

Certification, inspection, and verification services provide the foundation for this trust.

Organizations such as LRQA contribute by ensuring that companies across the energy supply chain meet internationally recognized standards for:

- safety
- quality
- reliability
- environmental performance

In sectors such as nuclear energy, where safety requirements are exceptionally stringent, these activities are essential for maintaining confidence among regulators, operators, and industrial partners.

Looking Ahead: Building a Resilient Energy Future

The global transition toward low-carbon energy systems is accelerating.

Renewables will continue to play a central role in this transformation. However, many energy scenarios suggest that a balanced energy mix including nuclear power, renewables, and advanced energy technologies may provide the most resilient pathway toward climate neutrality.

In this evolving landscape, the role of independent verification, certification, and inspection bodies will become even more important.

“In this evolving landscape, the role of independent verification, certification, and inspection bodies will become even more important

Through its expertise and global reach, LRQA Italy is positioned to support companies and institutions navigating the complexities of the energy transition, helping ensure that future energy infrastructure is not only sustainable but also safe, reliable, and internationally compliant.



Luca Nero

Luca Nero is an international Marketing Executive based in LRQA's Milan office, where he leads strategic communication and campaign initiatives across the Energy, Construction, and Food & Beverage sectors. In the EMEA region, he serves as Regional Member Campaign Lead, supporting programs that strengthen engagement and promote the value of assurance services. With a strong interest in innovation within the marketing and industrial sectors, Luca combines analytical thinking with a client-focused approach, contributing to the visibility and understanding of certification, inspection, and training services within complex and highly regulated environments. Over the course of his career, he has developed particular expertise in public tenders and in the evolving dynamics of the assurance and compliance landscape. His collaborative and results-driven style enables him to translate market needs into effective strategies that support organizations navigating the challenges of energy transition, quality, and supplychain reliability.

Industrial combustion in the energy transition: integrated solutions for evolving processes

Fives, an international industrial group with more than 200 years of history, develops and applies advanced process engineering solutions to redefine industrial combustion and achieve concrete improvements in efficiency and emissions across industrial plants

Nicolò Zocche, Business Development, Ecology
Fives ITAS S.p.A.

The transformation currently underway in the energy and industrial sectors is redefining the role of combustion systems. In this context, emission reduction has become an integral part of system design and

goes far beyond simple regulatory compliance.

From the conversion of traditional refineries to the introduction of feedstocks from the circular economy, this transformation is increasing operational complexity across plants, making environmental performance, energy efficiency and production continuity ever more interconnected.

Fives ITAS operates in this environment by leveraging over 50 years of experience in industrial combustion, contributing to energy transition projects in environmental solutions, industrial heating systems and the Oil&Gas sector.

“The ongoing energy transition and the increasing complexity of industrial processes are redefining the role of combustion systems, which have become essential for emission reduction and operational efficiency



One of the most relevant applications is the conversion of conventional refineries toward ecofining processes, which transforms biogenic feedstocks (such as animal fats, used vegetable oils, and agroindustrial waste) into advanced biofuels. These processes introduce more complex operating conditions compared to conventional refining, due to the greater variability of streams and the presence of contaminants.

In this context, thermal oxidation (TOX) units are used for the treatment of gaseous effluents and

Fives ITAS develops solutions capable of managing wide variations in composition and flow rate. The heterogeneous nature of the pollutants present in these streams represents a significant challenge, requiring the integration of differentiated abatement systems within multistage configurations. This approach—adopted by Fives ITAS—makes it possible to treat different classes of pollutants by combining thermal oxidation of organic and sulfur compounds, basic scrubbing for acid gases and catalytic stages for nitrogen oxides reduction.

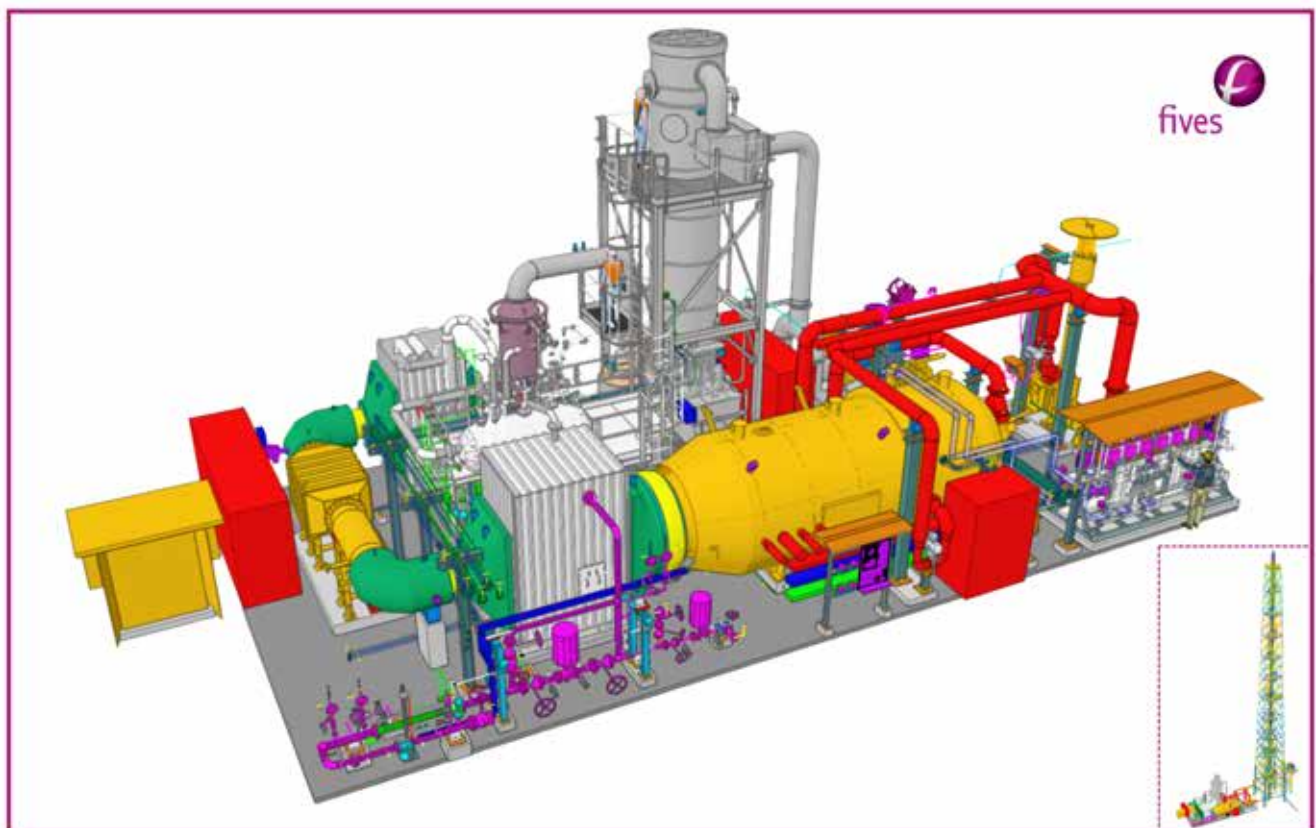
“Fives ITAS contributes to this evolution through solutions for ecofining, multistage TOX units for gas effluent treatment, soot reduction in flare systems, and advanced combustion technologies applied to energy intensive sectors

At the same time, in the Oil&Gas sector, emission reduction in flare systems is becoming an increasingly critical challenge due to evolving regulatory requirements and the growing variability of gases to be treated,



which demand more precise control of combustion. For this reason, Fives ITAS R&D activities focus on soot reduction through combustion assist systems using air, gas, or steam, configured according to operating conditions.

These activities are supported by the Fives European





“Research and development activities at the Fives European Combustion Centre support the validation of technologies under real operating conditions, while the expansion of local operational hubs in the Middle East ensures enhanced service responsiveness and operational continuity

Combustion Centre, the industrial combustion R&D centre located in Piacenza (Italy), where technologies are tested under realistic operating conditions. The centre allows for experimentation across a wide range of scenarios, including applications involving alternative fuels characterized by high variability and stringent emission requirements, with particular attention to NOx reduction and combustion stability. The operating conditions validated during testing translate directly into plant performance, where maintaining efficiency over time requires targeted interventions to manage variations in process parameters and prevent efficiency loss. In this context, service activities are evolving through optimization initiatives, advanced maintenance and specialized support. This capability is further strengthened by the development of local operational structures in key markets.



The Fives Industrial Technologies workshop in Abu Dhabi, located within the KEZAD Metal Park, integrates engineering, manufacturing and service activities, enabling shorter mobilization times, improved spare parts availability and more direct field support. In parallel, the expansion of Fives' combustion business in Saudi Arabia further enhances local presence, facilitating activities in compliance with local content requirements and

“The integration of hybrid burners and advanced control systems enables continuous adaptation to variable operating conditions and increasingly stringent emission requirements, confirming industrial combustion as a key enabler in managing process complexity and supporting the transition toward more sustainable energy systems

improving access to the regional supply chain. This configuration allows for more efficient management of maintenance and field operations, reducing procurement times and increasing plant operational continuity.

The evolution of combustion systems also applies to other energy intensive industries. In gypsum drying applications, the development of dedicated solutions for calcining and drying focuses on

flame stability and reduced specific consumption. In more energy intensive sectors such as paper and ceramics, interventions increasingly take the form of complete revamping projects aimed at optimizing thermal performance, reducing emissions and ensuring operational continuity.

In this framework, hybrid burners integrated with advanced control systems enable fine tuning of process parameters and continuous adaptation to operating conditions. This approach is particularly relevant in scenarios with an increasing integration of alternative energy sources, enhancing environmental efficiency and optimizing energy consumption.

Industrial combustion remains a central element in managing process complexity and emissions: the ability to operate across heterogeneous systems, adapting to variable operating conditions and increasingly strict requirements, is a distinguishing factor. And Fives ITAS operates precisely in this domain, translating operational needs and design constraints into concrete application solutions.



Nicolò Zocche

Nicolò Zocche has built a technical/commercial career in the energy and Oil & Gas sectors, combining advanced scientific training with growing experience in the management of complex proposals and projects. He holds a degree in Chemical Science and Technology with a background in Material Science, and has developed solid expertise in process engineering, emission reduction technologies, and preliminary design of industrial systems. At Fives ITAS S.p.A., he worked as a Proposal & Application Engineer, managing the full proposal cycle for flares, thermal oxidizers, RTOs, and burners supplied to EPC contractors and major international petrochemical companies. He currently plays an active role in business development, supporting the definition of commercial strategies and contributing to the strengthening of relationships with existing and potential clients. This position enables him to integrate market insight, technical competence, and a consultative approach. He is responsible for the technical analysis of specifications, definition of design solutions, coordination with subcontractors, and preparation of commercial offers. He also takes part in contract review and negotiations with clients. He has contributed to several projects in Europe, the Middle East, Asia, and North America, working alongside global industry players. Before joining Fives ITAS, he worked at ApZolution, where he was involved in design and technical consulting activities for fluegas treatment systems, ORC units, and industrial projects in the cement, steel, and waste-to-energy sectors.

Engineering Resilience in Top Level Energy Systems

Our evolving portfolio of solutions highlights IMESA's transition towards a more integrated engineering role in complex international projects

Michele Golfieri, Head Of Sales & Marketing
IMESA



In offshore and marine applications, electrical distribution systems operate under extreme environmental and operational constraints. Platforms, FPSOs and naval units require solutions capable of ensuring continuity under high salinity, mechanical stress and limited accessibility for maintenance.

In this context, design is driven by compactness, structural robustness and safety. IMESA has developed specific configurations, including double-level arrangements and Fault Current Limiter applications to optimize space while maintaining accessibility and operational reliability. These solutions are conceived to contain faults, simplify maintenance activities and ensure long-term performance in environments where system interrup-

tion is not acceptable. And this obtaining a -30% of footprint space especially with the Miniver/C Double Deck solution.

This experience has defined a design approach focused on resilience and sizes, which has progressively extended to other industrial applications.

Extension of Medium Voltage Systems up to 40.5kV

The growing electrification of industrial processes and infrastructures is increasing the demand for higher performance Medium Voltage systems. In response, IMESA has expanded its technological scope up to 40.5kV AIS with JesGear™.

“IMESA's development reflects the evolving requirements of electrical distribution across offshore, industrial and energy applications

These systems are designed to ensure continuity of service, modularity and ease of integration within complex plants without any SF6 gas. Particular attention is given to adaptability across different environmental conditions, from European distribution networks to high-temperature regions such as the Middle East.

The extension of the voltage range represents a technical evolution aligned with the increasing complexity of energy and industrial projects, where reliability and

“Starting from high-demand environments such as platforms and FPSOs, the company has extended its expertise to Medium Voltage systems up to 40.5kV and to SF6-free technologies aligned with new environmental regulations



scalability are key requirements with no compromise on environment.

Transition Toward SF6-Free Technologies

The evolution of environmental regulations is progressively limiting the use of SF6 gas in electrical equipment, due to its high global warming potential. This transition is redefining the design criteria of Medium Voltage switchgear.

IMESA is developing solutions based on alternative insulation technologies, aimed at reducing environmental impact while maintaining performance and safety standards. These systems are intended to support utilities and industrial operators in meeting regulatory requirements and long-term sustainability objectives.

With JesAir™, the SF6-free technologies represents a structural change in the sector, requiring both technological adaptation and a redefinition of engineering practices.

Integration of Monitoring and Predictive Maintenance

The increasing complexity of electrical systems is accompanied by the need for more advanced maintenance strategies. The integration of monitoring devices within switchgear allows continuous control of critical parameters such as temperature, mechanical behavior and environmental conditions.

This enables a transition from scheduled maintenance to condition-based approaches, with early detection of anomalies and reduction of unplanned outages. The availability of operational data contrib-

“The integration of monitoring systems further enables condition-based maintenance and improved asset management



utes to improving asset management and optimizing the total cost of ownership.

In this framework, electrical distribution systems evolve from passive components to active elements within the plant.

An Evolving Engineering Role

The developments described reflect a broader evolution of IMESA's role within the industrial and energy sectors. The company is progressively moving from

a manufacturing-oriented model toward a more integrated engineering approach, where products are designed as part of complex systems.

This transition is supported by continuous research and development activities and by growing involvement in international projects, characterized by diverse technical and environmental requirements.

Across offshore, industrial and energy applications, the objective remains consistent: ensuring continuity, safety and adaptability in increasingly demanding operating conditions.



Michele Golfieri

Michele Golfieri has been the Head Of Sales & Marketing of IMESA since 2024, specializing in sales and marketing for highly technical products for industrial plants. With a degree in Mechanical Engineering, he has developed in-depth technical expertise ranging from Electrical Panels to Fluid Thermodynamics, including process automation. Throughout his career, he has successfully led multidisciplinary sales teams for the Italian and international markets and implemented growth strategies in complex and regulated markets. Today, he coordinates IMESA's commercial development in the Oil & Gas, Marine & Navy, Utilities, and Industrial sectors.

A Strategic Approach to Designing the Energy Networks for the Transition

Techfem contributes today to several large-scale national and European infrastructure projects, supporting the development of strategic energy assets through its multidisciplinary engineering capabilities

Luigi Eusebi, Director, Plants & Pipeline Process Services BU

Marco Begini, Technical Manager, Engineering Business Unit

Roberta Colloca, R&D Technical Leader

Domenico Macri, R&D Project Manager and Technical Lead for Clean Technologies

Alberto Paterniani, Project Portfolio Manager

Luca Mendicino, Management Engineer

Techfem S.p.A.

For over forty years Techfem has been a leader in the engineering of strategic energy infrastructures. In a scenario where security and energy independence have become essential priorities, the company provides advanced technical expertise for the development of systems ensuring supply continuity and operational flexibility. Today, Techfem contributes to several large-scale national and European infrastructure projects, supporting the development of strategic energy assets through its multidisciplinary engineering capabilities.

Techfem's contribution to the CO₂ value chain

Techfem plays an active role in the development of strategic initiatives across the CO₂ capture, transportation and storage value chain, a sector that is increasingly recognized as pivotal to achieving global decarbonization targets.

In this context, the company brings together regulatory expertise and advanced engineering capabilities, supporting both the evolution of technical frameworks and the delivery of major infrastructure projects.

At the same time, the company is involved in selected portions of a major CCS development program, one of the most significant CO₂ storage



Control and safety panel of the Hyround plant in Sestu

initiatives currently under implementation in Southern Europe. This initiative forms part of a broader industrial CCS deployment program expected to reach several million tonnes of annual CO₂ storage capacity.

Techfem is also providing specialist services for the offshore sections, extending its expertise to subsea engineering activities that also support carbon capture and storage (CCS) developments.

These types of infrastructures will be instrumental in establishing an efficient and reliable route for CO₂ transport to permanent geological storage sites.

“Techfem plays an active role in the development of strategic initiatives across the CO₂ capture, transportation and storage value chain, a sector that is increasingly recognized as pivotal to achieving global decarbonization targets

Supporting H₂ infrastructures

Techfem is also involved in the main Italian *Hydrogen Valleys*, designing and providing EPC turnkey solution of green hydrogen production plants, including the “Hyround” project by Italgas in Sardinia, the *Hydrogen Valley Lamezia Terme* and *IdrogeMO*, the *Modena Hydrogen Valley*. The company currently boasts a portfolio of over 60 international hydrogen projects, demonstrating its ability to cover the full lifecycle of hydrogen infrastructure.

For this type of energy infrastructure, as well as for natural gas infrastructures, Techfem offers innovative technological solutions and a highly skilled team supported by a portfolio that includes over 20,000 km of pipeline construction supervision and more than 20 years of experience.

Strengthening energy security through Power Transmission projects

In recent years, the European power system has undergone a big transformation driven by the rapid expansion of renewable energy sources and by the acceleration of the EoE “Electrification of Everything,” due to the digitalization, emerging energy-intensive loads, and growing energy security requirements.

In this context, electricity has become a focal point of the decarbonization, making it essential to strengthen cross-border energy market interconnections and to rethink traditional grid management models.

The increasing penetration of renewable energy sources is a crucial step toward decarbonization, but it also introduces complex technical and operational challenges: from the need for more flexible infrastructure systems to the management of an increasingly dynamic grid balance.

In this scenario, Techfem brings a unique set of engineering, construction management, and project

management capabilities, built over more than forty years of experience and participation in strategic projects supporting major energy TSOs. This consolidated know-how can be effectively transferred to the development of electrical infrastructure, contributing to improve energy security and to the creation of fully integrated energy networks.

The Interconnector 2 project

The CESI - Techfem consortium has been engaged in the development of the Front-End Engineering Design (FEED) for the Interconnector 2 project, a strategic AC power transmission link operating at 220 kV, 50 Hz, connecting the substation in Ragusa (Sicily) with the terminal station in Magtab (Malta). The infrastructure is designed to ensure a nominal continuous transfer capability of 225 MW, supporting grid stability and energy exchange between the two islands.

The interconnector consists of a mixed onshore-offshore cable system. On the Italian side, approximately 22 km of land cable route from the substation to the shoreline. This is followed by a three-core submarine cable of about 100 km, crossing the Mediterranean sea, and finally an additional 2 km of onshore cable linking the Maltese landfall to the Magtab terminal station. Due to the high capacitive contribution of the long AC submarine section, the system incorporates shunt reactor installations at both ends to ensure adequate reactive power compensation and maintain acceptable operating conditions under various load scenarios.

Techfem’s scope comprehensively addressed all technical aspects required for the development of the FEED documentation both for the onshore and offshore cable route. This included defining an overall system architecture, identifying design parameters, establishing installation methodologies, and preparing deliverables to facilitate the initiation of procurement activities. The FEED package was structured to provide a robust engineering baseline for the subsequent EPC phase, ensuring alignment with project specifications, regulatory constraints, and international standards.

Field surveys were carried out along the Italian and Maltese onshore corridors to characterise the environmental, geological and constructability conditions and to support the selection of the most technically and environmentally appropriate solutions for the

shore approach on both sides. These investigations supported the optimization of landfall design, routing strategies, and construction methodologies aimed at minimizing environmental impact and ensuring installation feasibility.

In parallel, specific support was provided to assist a foreign client in navigating the Italian permitting framework. The CESI – Techfem consortium prepared all engineering and regulatory documentation required to obtain the *Autorizzazione Unica*, ensuring compliance with national legislation and facilitating the overall authorization process.

Through its involvement in projects of this scale and complexity, Techfem confirms its position as a trusted engineering partner in the decarbonization, delivering high-value solutions that support industrial decarbonization and long-term sustainability.

Precommissioning in Techfem's international projects

Pre-commissioning is a fundamental phase in the delivery of energy infrastructure, ensuring the mechanical integrity, reliability, and long-term safety of pipelines prior to start-up.

Engineering is the foundation of all pre-commissioning activities. It doesn't just support operations, it helps improve them, allowing procedures to be adjusted to complex projects and enabling the development of tailor made solutions.

This engineering-driven approach ensures that even the most demanding offshore and onshore environments are managed with safety and efficiency.

Over the years, Techfem has consolidated solid expertise in this, supporting major international clients and applying advanced technologies across both offshore and onshore environments.

Thanks to a diversified portfolio of projects, the company has developed a structured and highly efficient approach to testing and preparing pipelines of various sizes and applications.

Techfem's international experience covers a wide spectrum of pipeline systems, with a track record that includes:

- More than 1.000 km of pipelines pre-commissioned in the last 5 years, spanning gas transmission networks, refined product lines,



Equipment layout at Ostsee Anbindungsleitung (OAL) pipeline's pre-comm site

water systems and multiphase flowlines.

- A diameter range from 4" to 48", including high-complexity offshore assets and long-distance pipelines.
- Hydrostatic testing with very high flowrates at pressures higher than 300 bar, using high-capacity pump units and fully digital monitoring systems.
- Innovative technologies, such as advanced intelligent pigging, high-flow modular compression systems for dewatering, next generation nitrogen membrane units, and real-time field control.
- Pre-commissioning of umbilicals, annulus pipelines, fiber optic cables and electrical power cables.

Techfem's methodology focuses on operational efficiency, safety assurance and strict adherence to international standards. The company deploys dedicated spreads integrating pumping units, compressors, filtration and treatment systems, and computerized data acquisition for accurate control and reporting.

Expanding our know-how through R&D initiatives

Within the broader context of the decarbonization, Techfem's research and development activities increasingly focus on technologies that enable carbon circularity through the integration of renewable hydrogen and CO₂ valorization pathways. By combining its engineering expertise with participation

in national and European research initiatives, the company contributes to the development of innovative Power-to-X solutions aimed at transforming captured carbon dioxide into valuable products such as synthetic fuels. These technologies represent a key opportunity to close the carbon loop while supporting the decarbonization of hard-to-abate sectors including aviation and industrial energy use.

A representative example is the “HYMAGE” (HYdrogen-Mediated wAste-to-Green fuEl) project, developed within the Italian National Recovery and Resilience Plan (PNRR) funded Tech4You ecosystem.

In this initiative, Techfem, together with the project consortium, designed and realized a fully containerized pilot plant dedicated to the production of e-fuels from renewable hydrogen

and biogenic carbon dioxide contained in biogas streams. The modular plant enables the production of e-methane at a capacity of up to 1.500 NL/h and e-methanol up to 300 NL/h, demonstrating the technical feasibility of converting waste-derived CO₂ into renewable fuels through flexible and transportable systems. The project highlights how distributed Power-to-Gas and Power-to-Liquids solutions can be integrated with existing biogas infrastructures to valorize carbon streams while producing sustainable fuels.

A further step toward industrial deployment is represented by the “JET-ZERO” project, funded under the PNRR and coordinated by Politecnico di Milano. Within this initiative, Techfem is responsible for the engineering of the pilot demonstrator plant, one of the first facilities of this kind in Italy at this scale.

The plant is designed to produce Sustainable Aviation Fuel (SAF) from green hydrogen and captured CO₂, with a processing capacity of approximately 0.1 kg/h. The project aims to demonstrate inte-

grated Power-to-Liquid pathways capable of supplying low-carbon aviation fuels, contributing to the decarbonization of the aviation sector while advancing technological readiness for large-scale applications.

Complementing these initiatives, Techfem also coordinates the European “BRINE-CARB” project, funded under the “Clean Energy Transition Partnership” (CETP). The project explores an innovative approach to permanent CO₂ mineralization using industrial saline brines. As project coordinator, Techfem is responsible for the engineering and construction of a pilot-scale demonstrator capable of treating approximately 1 m³/day of waste brine, in which carbon dioxide contained in industrial flue gases is mineralized into stable carbonates. This process represents a promising pathway for integrating carbon capture with circular resource management, transforming industrial by-products into materials capable of permanently storing CO₂.

Alongside carbon valorization technologies, Techfem is also involved in projects aimed at improving the operational efficiency and resilience of emerging hydrogen infrastructures. Hydrogen is expected to play a strategic role in future energy systems, acting both as a clean energy carrier and as a key enabler for the decarbonization of the industry sector, long-distance mobility and the integration of renewable energy sources into the energy system.

Unlike gaseous hydrogen, which requires very high pressures to achieve significant energy densities, liquid hydrogen (LH₂) allows a volumetric density that is roughly twice that of highly compressed gas. This makes it a particularly promising solution for the country’s energy future. The use of the liquid carrier also enables a more flexible approach to storage and logistics.

In this regard, maritime transport also presents interesting applications, especially with the evolution of large-scale fuel cells. In this context, the “SmartBOG” project—funded under the Italian PNRR and coordinated by Techfem—addresses one of the key operational challenges associated with LH₂ storage and transport, the boil-off gas (BOG) management. In marine and coastal logistics, today’s dominant practice is routing excess BOG to a Gas Combustion Unit (GCU) or relying on pressure build-up, resulting in energy losses and operational inefficiencies. “SmartBOG” addresses this limitation with



“Hymage” containerized pilot plant for e-methane and e-methanol production

a first-of-a-kind integrated system in which boil-off is recovered by a low-pressure buffer system and converted into electricity through a PEM fuel cell, supported by a predictive control strategy implemented through a PLC-based microgrid.

By enabling the on-demand conversion of BOG availability into useful electrical power, the system minimizes the venting or combustion and allows the dynamic alignment of fuel cell output with variable electrical loads reducing the contribution of the main power generator. The project contributes to reducing hydrogen losses while improving the operational efficiency and resilience of future liquid hydrogen storage and logistics infrastructures.

In parallel, Techfem is developing advanced sensing and monitoring solutions for critical energy infrastructures, including both linear assets such as gas transportation pipelines and concentrated infrastructures such as energy or process plants. For the Trans Adriatic Pipeline (TAP) landfall microtunnel, Techfem designed and installed a distributed Fiber Bragg Grating (FBG) sensor network to ensure continuous assessment of tunnel structural integrity.

The system includes strain and temperature measurements acquired along more than 1 km of optical sensing cables, providing long term, interference free monitoring in a flooded underground environment, thus offering major advantages over traditional electrical sensing. Building on this expertise, Techfem has further extended the use of FBG based monitoring for buried pipelines, exploiting the technology's high sensitivity and robustness to evaluate strain distribu-

tion, detect deformation mechanisms and support predictive assessment of geotechnical interactions affecting pipeline integrity in "PPIM 4.0" project (Plant and Pipeline Integrity Management 4.0), by building an advanced platform which combines GIS based multicriteria analysis with an advanced HW/SW monitoring infrastructure capable of acquiring and remotely transmitting sensor data to enhance integrity assessments and maintenance of strategic infrastructure.

Complementing optical sensing solutions, Techfem has also designed a scalable IoT based multi-risk monitoring system for pipelines exposed to seismic, geomorphological and hydrogen related risks.

Each IoT node integrates different sensing elements (i.e. deformation, vibration, tilting, weather and hydrogen permeation sensing), enabling real time data analysis and early warning functions. This modular IoT architecture supports long distance deployments while enhancing maintenance planning and promoting a transition toward smart, data-driven gas networks.

Together, these initiatives reflect Techfem's strategic approach to energy innovation: combining engineering expertise with advanced research to develop scalable technologies that strengthen the resilience, sustainability and efficiency of energy infrastructures. By bridging infrastructure design, hydrogen integration, carbon valorization and digital monitoring solutions, Techfem contributes to the evolution of energy systems capable of supporting a secure and low-carbon energy future.



Luigi Eusebi

Luigi Eusebi has been with Techfem for 22 years, progressing from piping design to project management. Today he is Plants & Pipeline Process Services BU Director. He is also CEO of RECHALL S.r.l. Società Benefit, a company 50% owned by Techfem and dedicated to recovering unburned methane emissions. He holds certifications including PRINCE2 Foundation, PRINCE2 Agile Practitioner, Specialized Executive Master in Business Management (BiG Academy). His core strengths include strategic leadership, project management, and specialized expertise in plants and Process & Pipeline Services for complex integrated projects. He is coauthor of a 2025 publication on repurposing decommissioned pipelines and coinventor of a 2025 patent on emissionfree gas recovery from pipelines.



Marco Begini

Marco Begini has been with Techfem for 20 years and currently holds the position of Technical Manager within the Engineering Business Unit, with a focus on business development in the Onshore Pipeline sector. He previously worked as Project Portfolio Manager. An Environmental and Land Planning Engineer, he holds certifications in Project and Programme Management (PRINCE2) and a Master in Business Management (BiG Academy). He specializes in managing complex projects, coordinating multidisciplinary teams, and supporting onshore pipeline business development and TSO clients.



Roberta Colloca

Roberta Colloca is a R&D Technical Leader with a strong background in industrial automation, process control systems and data analysis. With a Master's Degree in Biomedical Engineering – Electronic Technologies, she has managed complex projects across the chemical and energy sectors, with expertise spanning software development, commissioning and instrumentation. Currently, she leads innovative projects in Techfem involving digitalization for the energy sector, with a focus on IoT monitoring, predictive maintenance and smart industrial technologies. She has authored scientific and technical publications, focused on machine learning, computer science, monitoring systems and asset management.



Domenico Macri

Domenico Macri is an R&D Project Manager and Technical Lead for Clean Technologies at Techfem, where he has worked for the past 6 years. He holds a Ph.D. in Chemical Engineering from University College London (UCL) and has prior research and engineering experience in advanced energy and process systems. At Techfem, he leads multidisciplinary R&D programmes in sustainable energy and low-carbon technologies, from concept to pilot and demonstration. His expertise includes H₂ and renewable fuels, carbon capture and utilization, and process integration and scale-up. He contributes to international and EU-funded projects and has authored 16 peer-reviewed scientific papers.



Alberto Paterniani

Alberto Paterniani has been with Techferm for 18 years, building his career in the field of energy transportation. He holds a degree in Environmental and Territorial Engineering and he started out as a pipeline designer working on projects in Italy and abroad, later becoming a technical coordinator. He is now a Project Portfolio Manager, overseeing complex international projects and supporting the company's growth in the energy sector. Paterniani also completed several professional certifications, including PRINCE2 Foundation, Management of Risk, and MSP in Programme Management. His main areas of expertise include project management and renewable energy transportation.



Luca Mendicino

Luca Mendicino is a Management Engineer with over 10 years of experience in the energy sector and a Ph.D. in Environmental, Construction and Energy Engineering, specializing in electric power systems and energy economics. He spent seven years as a Research Fellow at the University of Calabria's DIMEG. He is Energy Transition Lead and contributes to strategic initiatives such as Hydrogen Valley pilot projects and regional, national, and EUfunded programs integrating renewables and innovative technologies. His work focuses on sectorcoupling models linking gas and electricity systems, multivector storage, RES, and advanced solutions. He has authored more than 10 scientific publications.

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Base-Load Power HUB Turning EPCIC challenges into success through innovation and passion

Rosetti Marino S.p.A. — an Italian EPCIC contractor renowned for delivering customized solutions in the energy sector to top global clients — successfully addressed and overcame the complex challenges of an innovative EPCIC project

Massimiliano Brunelli, Head of Operations

Claudia Giunchi, Project Engineering Manager

Andrea Marongiu, Project Procurement Manager

Wolmer Borghi, Construction and Offshore Site Manager

Daniele Ricci Piccioni, Project HSE Manager

Anthony Iveson, Senior Commissioning Manager

Rosetti Marino S.p.A.

In July 2023, Crosswind, a joint venture between Shell and Eneco, awarded an EPCIC contract to Rosetti Marino S.p.A. for the construction and delivery of the Base Load Power Hub (BLPH), an integrated solution designed to store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and to release it during periods of low generation. In practice, the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

Awarded summer 2023, the BLPH was scheduled for delivery in summer 2025, fully tested and ready for offshore installation. Although the client later chose an onshore installation, this only affected marine operations after construction. Rosetti Marino S.p.A. finished its work, loaded the hub onto a sea barge, and shipped it from Ravenna, Italy to the Dutch coast in August-September 2025.



The challenges

Rosetti Marino S.p.A. has made managing the various phases of an EPCIC project its core business, consistently tackling the challenges inherent in completing activities within the boundaries of a lump sum contract. However, beyond the typical difficulties of



this contractual model, the project at hand involved an added layer of complexity: integrating technologies that are already established and operated individually, but had never been combined into a single plant, all controlled and coordinated by a custom-designed Integrated Control System, itself developed for the first time. In this context, innovation required a pioneering approach, where experience, flexibility, and creativity were essential to overcoming every obstacle. This complexity of integration was also strongly influenced by the fact that some of the complex packages present were supplied by the client as company-provided items (CPIs), whose interface management was also the responsibility of the contractor.

The second, but no less significant challenge, was the implementation of safety measures, which first had to be designed and then carried out on site during the testing phases. For the first time in its histo-

ry, Rosetti Marino S.p.A. would have to manage the presence of hydrogen at its construction site. The test phases, in fact, required not only the commissioning of all systems present on the BLPH, but also a true integrated operational test. This meant that a remote-control room had to be set up, from which all operating parameters could be monitored and managed under various conditions. These operational conditions included, among others, the production of hydrogen by the electrolyser to supply the fuel cells. Pure hydrogen, as is well known, presents a very high fire risk, as it is extremely flammable, has a wide explosive range, and is difficult to contain.

“The seamless integration of advanced technologies such as the Battery Energy Storage Systems (BESS), electrolyzers, fuel cells, and solar generation were key ingredients that led to the execution of an innovative energy storage hub

Finally, the project schedule: as described above, the contractor’s scope included ensuring that the plant was fully tested and operational as a whole before sailaway. This meant all activities had to be completed well ahead of that date, allowing the testing team to conduct their tasks for about a month during which any physical activity on the platform was prohibited, since the safety measures adopted due to hydrogen production and/or storage prevented access to the module for any activity other than inspections.

Organization and execution strategy

The project approach was oriented from the very beginning to involve key project team members from day one, ensuring that everyone had full visibility of events as they occurred. This facilitated the decision-making process. At the same time, risk analysis and review sessions were carefully planned and conducted, actively involving all project leaders to ensure a shared and transparent assessment of potential issues. During these meetings, a constant flow of communication was maintained with all stakeholders. This approach not only enabled the proactive identification and mitigation of potential issues

but also strengthened trust and collaboration among all parties involved in the project.

On one hand, all the work carried out during the bidding phase was fully capitalized by including in the team the resources who had developed the technical part and some fundamental aspects of the project; on the other hand, new opportunities were sought during the execution phase by abandoning the assumptions made during the tender phase.

Activity planning was pushed to the highest level, managing and reorganizing tasks differently during the various project phases to always focus on priorities: from an initial work development by disciplines, the same PMS was then structured by systems, and work was organized following that breakdown, aware of a potential loss in efficiency but with a sharper focus on tasks. Schedule risk analysis techniques were applied, and dedicated sessions were held, involving the client with complete transparency.

Constructability sessions were held from the very first month.

Prefabrication and outfitting activities were maximized before the assembly phases.

New technical solutions were adopted (such as the use of GRE structural materials for certain specific areas, like supports or some handrails, which are more expensive but lighter and quicker to install).

Formal readiness procedures and workshops were defined and implemented for key project milestones (first cut, major heavy lifting, energization, hydrogen introduction, integrated test, loadout, sailaway, onshore load-in).

Dedicated visits to suppliers were organized throughout all project phases, all FATs were prepared and attended, and in some cases, changes were managed on site.

A great deal of effort was put into fostering good relationships within the project teams, and above all, the model of a single team was always promoted, within which both the client and the contractor had to be included, respecting the various dynamics and prioritizing the collaboration needed to achieve the final goal. Work was done to cultivate a culture of proposing solutions, avoiding entrenchment on positions when they did not bring benefits, adopting a no-blame approach, and analyzing setbacks as leverage to move forward and resolve issues.

Engineering *The system architecture*

As previously mentioned, the main goal of the system is to compensate for the intermittent electricity generation typical of wind and solar farms by storing excess renewable energy produced during peak production periods and utilizing it during periods of



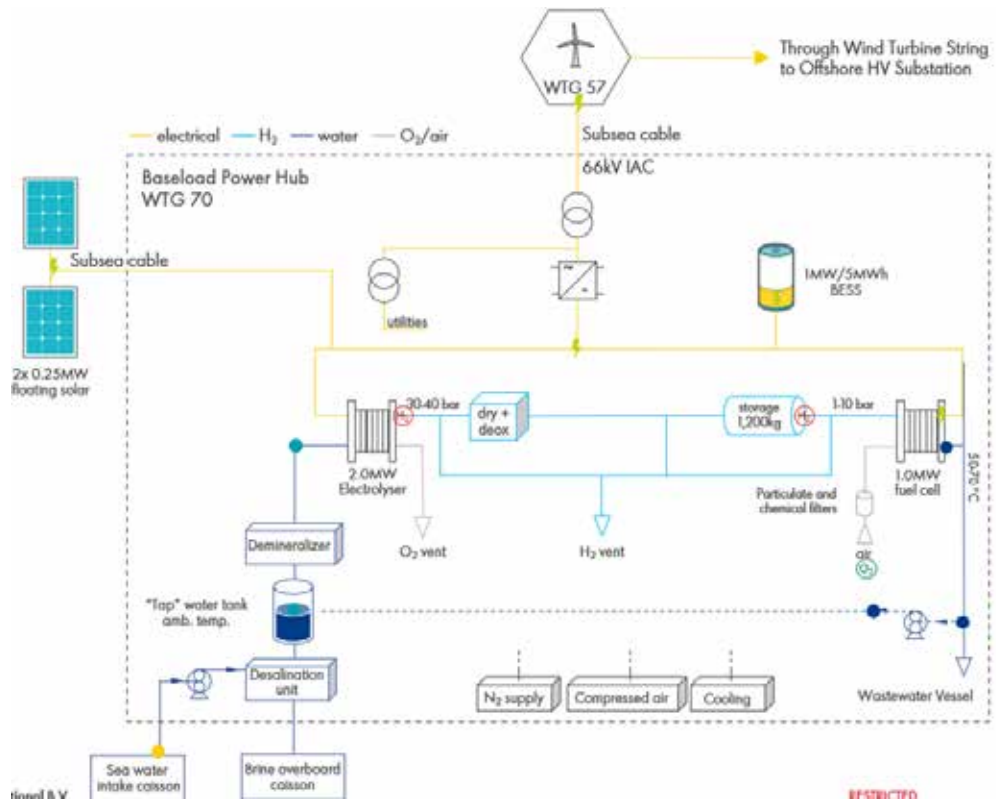


Figure 1 -BLPH System Architecture

low or absent wind and solar generation. To achieve this objective, the Baseload Power Hub, as the name suggests, operates as an energy storage hub in which several innovative technologies are integrated.

During periods of peak renewable energy production, excess electricity that cannot be directly injected into the grid is stored in two forms: lithium-ion battery systems and green hydrogen produced through electrolysis using seawater as the water source.

During periods of reduced renewable generation, the stored green hydrogen is converted back into electricity through a fuel cell system, ensuring a more stable and reliable power supply.

Figure 1 illustrates the functional scheme and the main process features of the Base Load Power Hub.

Requirements and technical specifications

One of the key technical features of the Baseload Power Hub (BLPH) is the simplification of the construction approach through the adoption of “plug-and-play” technologies. The main process packages are containerized and designed to be installed directly on the platform and integrated with the main structure, significantly simplifying installation and commissioning activities.

The Baseload Power Hub includes the following main systems:

- 1 MW Battery Energy Storage System (BESS);
- 2.5 MW Electrolyser;
- 2 MW Fuel Cell system;
- 0.5 MW Floating Solar system.

In the base case scenario, the BLPH was intended to be electrically connected to a single wind turbine (WTG) and to the floating solar system. The excess electricity generated by these renewable sources and not directly injected into the grid would be stored within the BLPH through two mechanisms:

Direct storage in the BESS, enabling short-term energy balancing and time-shifting;
 Conversion into green hydrogen, enabling long-term energy storage.

In particular, excess electricity would power the 2.5 MW electrolyser, producing green hydrogen using treated seawater as the feedwater source. The hydrogen produced would be stored in pressure vessels, with a total storage capacity of approximately 1,200 kg of hydrogen. During periods of reduced renewable energy production, the stored hydrogen would be reconverted into electricity through a 1 MW fuel cell system, providing long-term energy balancing capability.

At a later stage of the project development, the client decided to relocate the BLPH onshore. Under this

revised scenario, the wind turbine functionality was replaced by diesel power generators, which simulate the electrical behaviour and variability of the wind turbine. In this configuration, the floating solar system was no longer included in the overall plant configuration.

In addition to the main energy systems described above, the platform includes the following auxiliary facilities:

- transformers;
- electrical and instrumentation technical room containers housing HV/MV and LV switchgear;
- hydrogen storage vessels;
- nitrogen and instrument air packages;
- air-cooling systems;
- Water treatment package for the production of ultra-pure water to feed the electrolyser package;
- various process and utility water tanks.

Integration design

Ensuring optimized output availability and flexibility with respect to grid demand represented key project challenges. To address these requirements, an integrated power management and control system was developed to interface the different subsystems and manage multiple operating modes.

The facility is designed as an unmanned installation connected to a remote Central Control Room (CCR) via a fiber-optic communication link.

Time-Shifting Operation and Control Architecture

The BLPH enables time-shifting of renewable energy, ensuring continuous power export despite fluctuations in generation. Operation is based on the real-time output of the HNA5 wind turbine.

When turbine generation exceeds 1 MW, surplus electricity is imported to the BLPH to supply platform loads and charge the Battery Energy Storage System (BESS) and/or produce hydrogen via electrolysis. When generation falls below 1 MW, the deficit is compensated by power from the floating solar system, the BESS, or the fuel cell, maintaining a minimum export of 1 MW to the grid. Solar generation is prioritized whenever available.

The CCS supervises all process, utility, and electrical systems independently from the Safety System. Energy management is implemented through a state-machine architecture governed by a control variable (*MODE*), which defines operating states based on inputs such as turbine output, BESS state of charge, hydrogen inventory, equipment status, and switchgear conditions.

Modelling and simulation

The engineering process was managed through a multi-level coordination structure to ensure effective integration between disciplines, stakeholders, and project phases.

An integrated digital representation of the Project was



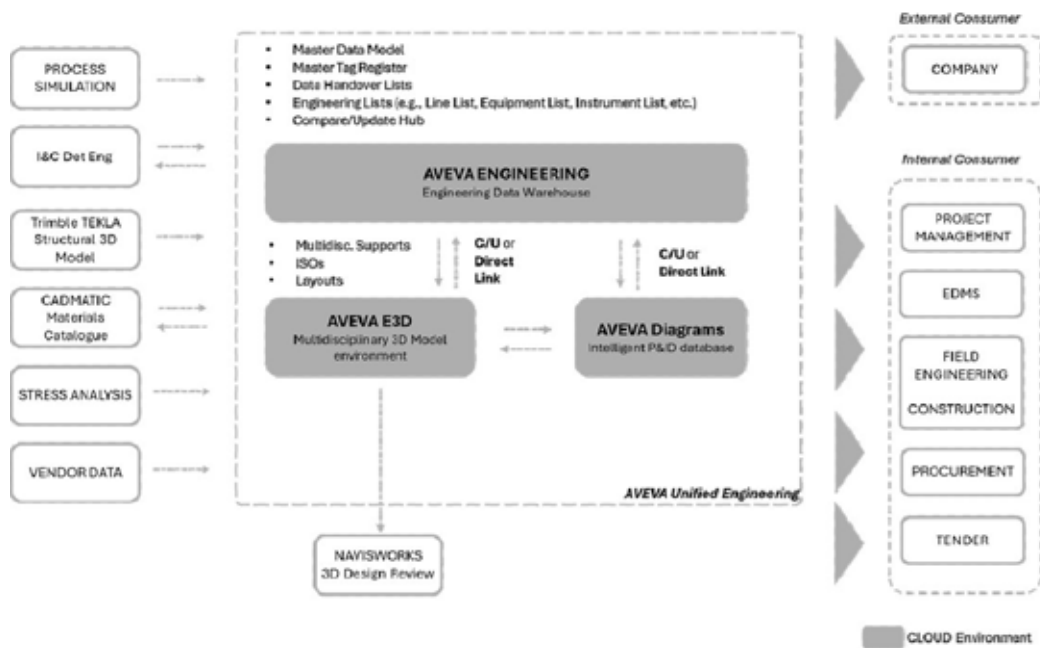


Figure 2 -Project Digital Workspace

established. This digital representation was developed throughout all project phases, encompassing all relevant technical information. The digital model was generated using a suite of Engineering Project Tools, including 3D models, intelligent 2D schematics, and a comprehensive Tags and Attributes Library. These tools were essential for maintaining accuracy and consistency throughout the engineering process. All engineering disciplines were required to make full use of data-centric design tools. This approach was fundamental for the development of the Project's data, documents, and drawings, ensuring a streamlined and cohesive workflow across all teams involved.

“Developed at the megawatt scale, originally engineered for offshore installation in the North Sea, fully embedded within an offshore wind and solar farm, the project stands as a world-first demonstration of its kind

To support these activities, a dedicated workspace within the Aveva Connect Cloud was reserved. This workspace accommodates the Project's 1D, 2D, and 3D tools, as well as the necessary databases.

The use of the AVEVA digital model also streamlined the Handover phase. At the end of the project, the complete set of model information was shared with the client, providing full access to the digital model

and ensuring efficient transfer of all relevant project data.

Procurement and Sourcing Strategies

Supplier selection and critical components

Due to the specialized nature of the market, tight project timelines, and the innovative requirements of integrating advanced renewable energy technologies, a comprehensive global supplier search was launched early in the project. This effort built upon preliminary work from the Commercial Department during contract acquisition and involved close collaboration with the Client to ensure alignment with project needs. The Procurement team often began from scratch to identify and qualify suppliers for critical equipment and components that were outside conventional Oil & Gas sector standards, presenting unique challenges. Major critical components—including Gas Integrated Switchgear SF6 Free, HV/MV Transformers, the Integrated Control and Safety System with the Electrical Management System, and high-voltage cables—were all sourced through rigorous pre-qualification processes, evaluating each supplier's technical and manufacturing capabilities, track record, delivery timelines, and current workload. This proactive approach established a solid foundation for the purchasing campaign, enabling efficient management of technical and commercial

aspects of purchase orders and supporting ambitious quality and delivery goals. The main challenge was selecting technology partners for integrating renewable energy production systems (such as hydrogen from electrolysis, wind, and solar power) with high-voltage infrastructure. Early Procurement activities were crucial in identifying well-qualified partners for these applications. Despite challenges arising from untested technologies during execution, reliance on highly qualified companies allowed successful achievement of project objectives and enhanced Rosetti Marino's expertise and supplier pool for current and future initiatives.

Safety Management During the Execution Phase

Risk Assessment

The project's Health, Safety, and Environmental (HSE) management began with the Project HSE Plan, which identified and assessed risks through a Hazard Identification and Risk Assessment (HIRA) session, and detailed the necessary control measures. This plan covered the safety, health, and environmental protection programs, including policies, training, audits, inspections, and emergency procedures in line with international and local regulations. During the pre-fabrication and construction phases, standard EPC project risks such as hot works, lifting operations, working at height, and SIMOPS were managed. However, the unique introduction of hydrogen on site presented new risks, requiring a dedicated HIRA, specific procedures, and special operating protocols to address this unprecedented challenge.

Special operating protocols

To address new hydrogen-related risks, a detailed safety plan was developed and approved by the Fire Brigade Department after extensive design and specialist consultations. Key safety measures included a 30-meter exclusion zone based on gas dispersion analysis, round-the-clock access control, and continuous firefighter presence with a fire truck. The BLPH was centrally located within the fabrication yard, bordered by two other ongoing projects. The module became an ATEX zone, limiting access to personnel with ATEX-certified equipment. Emergency procedures and evacuation plans were established with Pre-Incident Plans and clear communication protocols,

a temporary muster point, and a provisional alarm system. Emergency drills were conducted during commissioning to ensure preparedness.

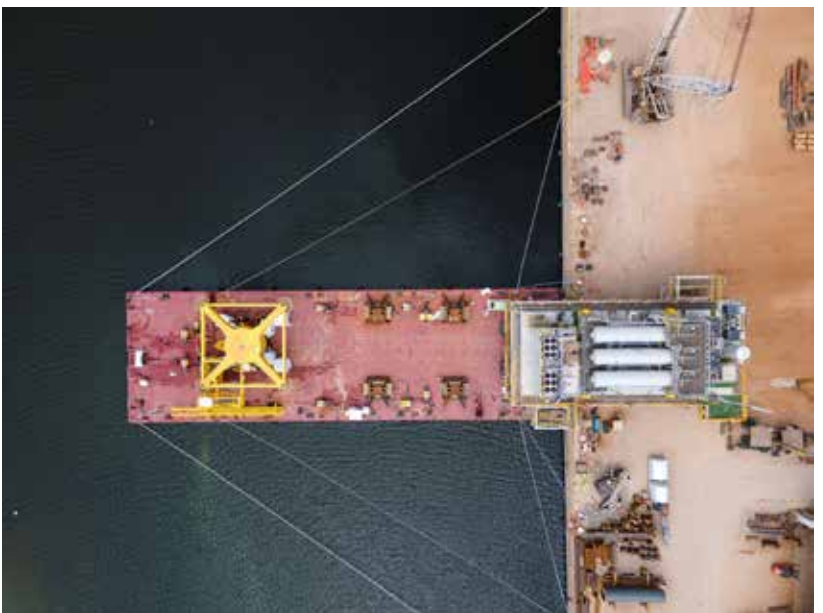
Training and coordination

Effective coordination and strict safety management were ensured by involving both experienced and new subcontractors, vendors, and CPI vendors. Weekly coordination meetings addressed risks during construction, while daily meetings became crucial during commissioning due to simultaneous activities. All work was managed through a permit system, with consistent HSE standards applied to everyone involved, underscoring the non-negotiable priority of safety.

Ongoing training was key to maintaining high HSE standards, with all site entrants—including vendors and visitors—required to complete a safety induction. Regular HSE events, targeted sessions, and hydrogen safety campaigns were held. A special protocol for commissioning and hydrogen risks was mandatory, with trained personnel marked by helmet stickers. A monthly incentive program rewarded exceptional safety behavior, promoting participation and continuous improvement.

Construction Phase: planning, site logistics and holistic approaches

Construction phase planning focused on a detailed constructability analysis to ensure efficient execu-



tion of structural works and integration of process equipment from CPIs vendors. The PMT aligned activities with BOP delivery schedules, enabling smooth operations and early assessment of installation methods and site requirements.

Structural solutions were designed for efficient assembly, welding, and lifting, with increased prefabrication to ease site work. Interfaces with process equipment, especially piping, were managed for compatibility.

The integration of proprietary process technologies from CPIs vendors introduced significant complexity, necessitating close coordination between engineering, construction, and installation teams to ensure correct equipment placement and system compatibility. This complexity also demanded enhanced support during commissioning.

The construction schedule was developed with careful consideration of equipment delivery timelines, installation access, and potential activity interferences. Site logistics were organised to facilitate both construction and plant integration, minimising risks related to space and material handling.

Overall, this integrated and pragmatic approach resulted in a realistic schedule aligned with actual site conditions, enabling efficient management of construction and smooth integration of structural and process systems, thereby meeting the project's original objectives.

During the construction phase, the project faced several challenges, notably managing simultaneous

work activities, site space constraints, and the need to adapt plans to real-time conditions. Effective coordination among construction teams and technical functions was crucial. The team employed a proactive, collaborative approach, analyzing issues systematically and maintaining strong communication with the client. On-site presence of the construction team enabled direct oversight and rapid interventions, helping to optimize installation sequences and resolve interferences promptly. Flexibility in construction management and responsiveness to unforeseen challenges were key to success. An example was overcoming a delay in leak testing by rescheduling tasks and leveraging progress in mechanical completion, which allowed the team to meet schedule and cost targets.

Commissioning *Functional tests of individual subsystems*

The BLPH project's innovative features created specific challenges for both the onshore commissioning plan and platform start-up strategy. To ensure commissioning success, it was essential to clearly define objectives, develop detailed activity plans, identify necessary temporary equipment and facilities, assemble an experienced and unified commissioning team, and strictly follow HSE policies and project directives.



Figure 3 - Heavy Lifting operation

Integrated test

As part of the contractual requirements of the Project in line with the overarching Commissioning mandate to complete Onshore Commissioning to the fullest extent possible in order to reduce the extent of Offshore Commissioning activities, it had been defined that an Onshore Integrated Test Procedure would be prepared, approved and executed prior to BLPH sail away.

The procedure had been prepared to include the necessary detail to demonstrate that BLPH could be fully operated remotely from a temporary yard control room location, and would have the real-time capability to both start-up and shut-down in a safe and controlled manner, and consequently confirm achievement of the principal design premise of 'Innovation and Time Shifting Flexibility' as defined by the energy management design Operating Modes.

Furthermore, all main equipment packages would have to be simultaneously tested to the maximum extent possible with the objective to demonstrate 1 MW of power output to the high voltage electrical grid using the full capacity of the inventory stored on BLPH. The temporary yard facilities required for high voltage power generation and grid simulation together with the potable water feed supply were also required to be available and fully operational.

BLPH Operating Modes are defined according to the various needs (Power Import Only, Able/Not Able to Charge, Ready to Discharge, Discharge, Power Import, Island, Black Out, Maintenance, Research). According to the real-time status of the inventory on BLPH, it was mandatory to demonstrate the seamless automatic transition between respective Operating Modes and consequently the automatic operation of all equipment packages managed directly by EMCS.

Results analysis

The real-time simulations had been broken down within the Onshore Integrated Test Procedure into detailed test steps, allowing the Commissioning team to validate the seamless transition of BLPH Modes of operation (automatic control logic).

Notwithstanding the challenging schedule, the Onshore Integrated Test had been successfully completed prior to BLPH sail-away. The final analysis clearly validated the following major objectives:

- Achievement of the BLPH operating envelope,

the ability to automatically perform and seamlessly transition between the platform Modes of Operation;

- Maximum system electrical output achievement of 1 MW power "EXPORT" including BESS and FUEL CELL packages;
- Maximum charge capability achievement of 1 MW power "IMPORT" for both BESS and H2 STORAGE;
- Remote Start-Up: Confirmed ability to operate remotely, transition between Operating Modes, trip scenarios with recovery and reset, equipment switchover between duty / standby;
- Power Management: Demonstrated power management system integrating controllers between different packages.

Conclusions

The exceptional performance of the Project Management Team (PMT) was formally recognized by the Client, underscoring Rosetti Marino s.p.a.'s capability to meet demanding project requirements and deliver results that align with client expectations. This acknowledgment not only validates the team's technical expertise and dedication but also establishes a strong basis for pursuing future business opportunities and securing additional project contracts.

The solution's scalability is a key advantage, enabling its adaptation and expansion for larger or more complex projects in the future. Its modular design, robust integration capabilities, and proven reliability position it as an ideal platform for ongoing innovation and deployment across diverse operational environments.



Massimiliano Brunelli

Massimiliano Brunelli was the Project Manager of the BLPH Project. He holds a Master's degree in Mechanical Engineering and has been with Rosetti Marino since 2005. Over his career, he has transitioned from specialist roles in heavy lifting and yard operations to Project Engineer and Project Engineering Manager. With over a decade of experience as a Project Manager leading international ventures in Egypt, Qatar, and Russia, he currently serves as Head of Operations. Driven by a lifelong passion for engineering and a commitment to continuous learning, Massimiliano firmly believes that people are an organization's most valuable asset and the true key to project success.



Claudia Giunchi

Claudia Giunchi was the Project Engineering Manager of the BLPH project at Rosetti Marino. She graduated from University of Bologna, holding a Bachelor's degree in Civil and Environmental Engineering and a Master's degree in Civil Engineering. She has been working at Rosetti Marino since 2018, gaining experience across various roles from construction to project engineering. Since 2022, her work has focused on project engineering management for innovation projects, including Green Hydrogen and Carbon Capture and Storage Technologies.



Andrea Marongiu

With over 30 years of experience, Andrea Marongiu brings extensive multidisciplinary expertise in engineering, project management, and procurement to major Oil & Gas projects, both onshore and offshore, worldwide. Following the completion of a Technical Degree in Mechanical Engineering, he demonstrated significant professional growth and versatility, progressing through key operational and management roles, including Document Controller, Project Engineer, Deputy Project Manager, Buyer, and Procurement Coordinator. At the end of 2022, Andrea joined Rosetti Marino SpA acting as Senior Buyer of engineered items then as Project Procurement Manager for BLPH project for Crosswind C.V., and WHPA project for M.O.G. B.V.– Libya.



Wolmer Borghi

Wolmer Borghi is a Construction Manager and Offshore Site Manager with Rosetti Marino since 2006, bringing a construction-driven approach to EPC delivery developed from hands-on experience in steel fabrication. He has led multidisciplinary teams across structural, mechanical, piping and E&I scopes in complex offshore environments. His international experience spans Kazakhstan, South Korea, Norway, Egypt, Nigeria, Qatar and Libya, operating under SIMOPS, critical interfaces and tight schedules. He focuses on aligning engineering with field execution, ensuring safe, practical and deliverable solutions. Womer promotes strong integration between construction, commissioning and material control, driven by disciplined execution, clear communication and a "One Team" mindset.



Daniele Ricci Piccioni

Health, Safety, and Environment specialist, after a Master's degree in Work and Organizational Psychology Daniele Ricci Piccioni started working in the industrial sector as HSE consultant. He entered the Oil & Gas sector and joined Rosetti Marino in 2011, working in various project teams as HSE for major oil companies and for the renewables sector, also gaining various experiences abroad. He currently serves as Project HSE Manager, role he also performed in the BLPH project.



Anthony Iveson

Anthony Iveson is an accomplished Degree qualified Electrical Engineer with over 30 years professional experience, specializing as a Senior Commissioning Manager for the past 12 years with Rosetti Marino, with a proven track record leading high-value international projects across the Oil & Gas, Energy, and Renewable sectors. An expert in mobilizing and managing multidisciplinary, multicultural teams and overseeing the full project lifecycle, with a strong focus on HSE, project controls, and QA/QC excellence. A bilingual leader (English/Italian) known for a methodical "can-do" approach to problem-solving. Dedicated to achieving complex mission critical commissioning objectives through strategic leadership, cost-effective planning, and a steadfast commitment to operational success and client satisfaction.



Cybersecurity in maritime systems: towards more effective protection

Due to the growing digitalization and integration of Information Technology and Operational Technology within the maritime sector, the adoption of cloud computing and other IT solutions has enhanced the efficiency and automation, while simultaneously increasing exposure to cyber threats, particularly in systems involved in navigation, propulsion, cargo management, and SCADA environments

Enrico Salvatico, Partner

Laura Piras, Lawyer

Studio Legale Mordiglia

The growing digitalization and interconnection of maritime systems is significantly changing the operational and managerial approaches of the sector. The integration between information technologies (IT) and operational technologies (OT), together with the spread of cloud solutions, IoT, and the Industrial Internet of Things (IIoT), has enabled new levels of efficiency, automation, and

control, while at the same time introducing vulnerabilities that expose organizations to increasingly complex and pervasive cyber risks. In this context, cybersecurity is an essential element not only from a technological standpoint but also in terms of operational continuity, safety of people, and system resilience.

To understand the nature of such risks, it is useful to distinguish between IT systems and OT systems. The former are responsible for the mana-

“In response to evolving risks, international frameworks such as IMO guidelines, ISO/IEC 27001, and the NIST Cybersecurity Framework have promoted a structured approach to cyber risk management based on identification, protection, detection, response, and recovery

gement and processing of information, while the latter are in charge of the direct control of physical processes. In maritime sector, OT systems include, among others, navigation and communication systems, propulsion and machinery control systems, cargo and bunkering management platforms, and supervisory control and data acquisition systems (SCADA). The impairment of such systems can have direct and immediate consequences on operations, with impacts that may extend to the physical integrity of installations or vessels. Cyberattacks can take various forms, from non-targeted campaigns to more sophisticated and targeted operations carried out for purposes such as sabotage, extortion, or unauthorized access to sensitive information.

At the international level, cyber risk management has been progressively structured through shared guidelines and standards. A key reference is provided by the guidance of the International Maritime Organization (IMO), which introduced the need to integrate cyber risk management within the safety management systems of shipping companies. In particular, the promoted approach is based on a cyclical and continuous model articulated in the



phases of identification, protection, detection, response, and recovery, which is also applicable to industrial contexts characterized by high technological complexity and interdependence between systems. Additional standards and guidelines support this framework, including those developed by BIMCO, the IACS requirements for cyber resilience in newbuilds, and internationally recognized frameworks such as ISO/IEC 27001 and the NIST Cybersecurity Framework, all of which contribute to defining a consistent and shared approach to risk management.

Against this backdrop, Circular No. 177/2025 issued by the Ministry of Infrastructure and Transport, set to come fully into force on November 1, 2026, marks a significant step in the broader process of strengthening the Italian regulatory framework in the field of cybersecurity. The provision reflects the government's growing attention to cyber risk management as a structural component of overall safety, in a context characterized by the continuous evolution of threats and the increasing integration between digital systems and operational processes.

The Circular introduces a comprehensive approach to cyber risk management aimed at systematically integrating cybersecurity within the organizational and operational models of ships and port facilities. This approach follows a cycle that includes prevention activities, threat identification, incident response, and recovery of operational conditions, with particular attention to the distinction and coordinated management of IT and OT systems, as well as the need to account for the specificities of maritime and industrial operational environments.

Among the most significant elements is the expansion of the scope of cybersecurity beyond the traditional confidentiality, integrity, and availability model, with the introduction of functional requirements aimed at ensuring user identification, traceability of operations, and clearer assignment of responsibilities. In this way, the provision strengthens the ability to monitor and verify activities carried out in environments characterized by high operational criticality.

“The Italian Circular No. 177/2025 represents a significant step toward integrating cybersecurity into the governance of ships and port facilities through the introduction of dedicated roles, periodic risk assessments, incident response procedures, and reporting obligations, while also expanding traditional security principles by including requirements related to traceability, accountability, and user identification



Another key aspect concerns the integration of risk management into corporate governance, through the definition of dedicated roles, responsibilities, and processes, and the introduction of specific figures tasked with overseeing cybersecurity. The outlined model also provides for structured procedures for periodic risk assessment, vulnerability management, the preparation of incident response plans, and the evaluation of the effectiveness of implemented measures through audits and exercises.

Particular attention is also given to the management of cyber incidents and related reporting obligations. The Circular establishes a multi-channel notification system involving national authorities competent in cybersecurity as well as those operating in the maritime and infrastructure sectors, with the aim of enabling a coordinated and timely response to cyber events and strengthening the overall resilience of the system.

Alongside technical and organizational aspects, the human factor plays a central role. The increasing complexity of systems and threats makes it

essential to invest in personnel training and awareness, as individuals often represent the first line of defense against attacks based on social engineering techniques such as phishing. The availability of specialized skills and structured training paths, supported by internationally recognized certifications, is a fundamental element.

At the same time, the evolution of cyber risk is also influencing the insurance market, which is required to respond to increasingly specific needs. Traditional coverage policies often present limitations with respect to cyber events, partly due to clauses that exclude certain scenarios or make it difficult to determine the cause of damage.

“We further emphasize the importance of training and awareness as key elements in strengthening cyber resilience, ultimately presenting cybersecurity as a strategic driver for competitiveness, reliability, and innovation in the maritime sector

Summing up, cybersecurity today represents a strategic element for the maritime and industrial plant engineering sectors. The introduction of Circular No. 177/2025 marks a significant step toward a structured and integrated approach to risk management, in line with international standards and the operational needs of complex industrial environments. For companies, compliance with this new regulatory framework represents not only an obligation but also an opportunity to strengthen their competitiveness in international markets, based on reliability, innovation, and security.



Enrico Salvatico

Enrico Salvatico, partner at Studio Legale Mordiglia, has extensive experience in all aspects of maritime, transport and insurance law. He regularly handles disputes relating to charterparties, bills of lading and CMR, as well as cruise and passenger transport matters, and advises on the sale and purchase of ships and yachts. He routinely assists shipowners and P&I Clubs in administrative investigations and litigation arising out of maritime casualties, including personal injury, cargo damage, marine pollution, total loss and wreck removal. He is also experienced in maritime and port concessions, assisting leading shipyards in public procurement procedures and litigation before administrative courts. In addition, he is highly specialised in the “Project Cargo” sector, advising both EPC contractors and international freight forwarders at all stages of projects, including contract drafting, negotiation of tailored insurance coverage, and the management of complex multi-jurisdictional disputes. He serves as Chairman of the Logistics, Transport and Freight Forwarding Section of ANIMP. He has been appointed as an Expert by the Italian Ministry of Justice and has participated, as a delegate for Italy, in the work of Working Group VI (“Negotiable Cargo Documents”) of UNCITRAL, held in Vienna in 2023, in New York in 2024, and again in Vienna in 2025. This work led to the adoption of the International Convention on Negotiable Cargo Documents, approved by the resolution on 15 December 2025.



Laura Piras

Laura Piras graduated in Law from the University of Genoa in 2025, with a dissertation on arbitration in maritime law disputes. During her studies, she enriched her education with a six-month international experience at the Universidade de Lisboa. She is currently doing her legal traineeship at Studio Legale Mordiglia, where she helps with judicial and extrajudicial activities, supporting lawyers with legal research, drafting acts, and analyzing legal matters. She also writes legal articles and collaborates with the journal “Il Diritto Marittimo”.

Reliable Hydraulic Systems for Energy Infrastructure

Italian engineering expertise supporting critical actuation and safety systems in industrial plants

Stefano Ripani, Sales & Marketing Director
Hydroservice S.p.A.



- Hydraulic Power Units (HPUs)
- Valve actuation systems
- Hydraulic skids for industrial plants
- Customized hydraulic solutions for special applications

“In modern energy and industrial plants, actuation and control systems play a fundamental role in ensuring operational safety and process continuity

These systems are widely used in sectors such as upstream and midstream Oil & Gas infrastructure, petrochemical plants, energy facilities, gas compression stations, and industrial automation.

In the industrial plant and energy sectors, reliable actuation systems are essential to ensure safe and efficient plant operation.

In many facilities – ranging from Oil & Gas infrastructure to process plants and energy transportation systems – these functions are performed by hydraulic systems designed to operate under severe environmental conditions and stringent safety requirements.

Hydroservice S.p.A. specializes in the design and manufacturing of advanced industrial systems including:

The Role of Hydraulic Power Units in Energy Plants

Hydraulic Power Units represent the core of actuation systems used in energy infrastructure and industrial facilities.

These systems provide the hydraulic energy required to operate actuators used for the movement of process valves, emergency shutdown valves (ESD) and other critical safety devices.



with international technical standards, and design for harsh environments.

Hydroservice develops fully customized systems according to plant requirements, considering operating pressure, flow rate, actuator characteristics and environmental installation conditions.

Integrated Engineering and Project Management

One of the key strengths of Hydroservice lies in its integrated approach to engineering and project management.



“Hydraulic power units represent one of the most reliable technologies for supplying energy to actuators and safety devices installed on process valves and critical equipment

Designing such systems requires multidisciplinary expertise including hydraulic engineering, integration with automation and control systems, compliance

Hydraulic Systems for Valve Actuation



One of the most common applications of industrial hydraulic systems is the operation of actuators installed on large-diameter valves used in gas transportation infrastructure and energy plants.

In these systems, the hydraulic power unit provides the energy required to operate the valves while ensuring response times compatible with plant safety requirements.

A typical HPU configuration includes:

- Oil reservoir with filtration and temperature control
- Redundant motor-pump groups
- Hydraulic accumulator banks
- Control and safety valves
- Monitoring and diagnostic systems

Hydraulic accumulators store energy in the form of pressurized fluid, allowing the system to operate even in the absence of electrical power and ensuring that emergency valve operations can be safely performed.

Hydroservice, an Italian engineering company



Founded in 1974, Hydroservice is an Italian engineering company specialized in the design and manufacturing of hydraulic power units, actuation systems and customized hydraulic solutions for industrial and energy applications.

The company supports international projects in sectors such as Oil & Gas, energy infrastructure and industrial plants, providing reliable and tailor-made hydraulic engineering solutions.

Hydroservice is continuously evolving through investments in research and development, new production technologies and the manufacturing of specialized hydraulic manifolds. At the same

time, the company is committed to improving energy efficiency and sustainability through initiatives such as photovoltaic installations and programs promoting environmental awareness within the organization.

The company supports clients from the earliest stages of technical analysis and system definition, continuing through:

- Concept design
- Detail engineering
- Manufacturing and assembly
- Functional testing
- Commissioning support

This approach enables the development of highly customized systems designed for complex envi-

ronments such as offshore and onshore installations, gas transportation stations and large-scale industrial plants.

“With more than fifty years of experience in hydraulic engineering, Hydroservice develops customized hydraulic systems for energy infrastructure and industrial plants worldwide



Stefano Ripani

A mechanical engineer by training, Stefano Ripani has developed a professional career combining technical expertise, project management and business development. After an initial experience as a Process Engineer at Foster Wheeler Italiana, he joined Hydroservice, where he has held positions of increasing responsibility before assuming the role of Sales & Marketing Director. In his current position, he is responsible for business development at both national and international level, with particular focus on strategic markets and relationships with key clients. He completed his managerial education with an *Executive MBA* at MIP Politecnico di Milano School of Management.

Trillium's Italian Pump Business Unit Signs Corporate Purchase Agreement with Saudi Aramco

A milestone achievement marking the culmination of 45 years of sustained presence and growth in the Kingdom

Abdullah Albur, Executive Country General Manager
Trillium Flow Technologies, KSA

Trillium Flow Technologies (Trillium) has reached a major milestone in its longstanding relationship with the Kingdom of Saudi Arabia with the signing of a Corporate Purchase Agreement (CPA) with Saudi Aramco. The agreement crowns more than four decades of continuous engagement, investment, and value creation in the region, underlining Trillium's role as a trusted partner to one of the world's leading energy companies.

Four decades of partnership and local growth

Trillium's relationship with Saudi Arabia dates back to the early 1980s, when the company first supplied Termomeccanica and Gabbioneta pumps through major Italian and international EPC contractors. Over the years, Trillium has steadily built a strong reputation across the water, power generation, and oil & gas sectors, leading to the opening in 2010 of a local service center in the industrial district of Al Jubail, in the Eastern Province, further strengthening Trillium's presence in the Kingdom and enhancing its ability to support critical rotating equipment throughout its lifecycle.



Edoardo Garibotti, receives the CPA from Sulaiman Al-Rubaian, SVP of Procurement & Supply di Aramco

“Over the years, Trillium, through its Termomeccanica Pompe and Gabbioneta Pumps brands, has built a strong reputation in Saudi Arabia's pump sector across the water, power generation, and oil & gas industries, leading to the opening of a local service center in Al Jubail's industrial district in 2010



Inauguration Ceremony celebrating the opening of Trillium's new pump manufacturing facilities in Al Jubail

A strategic manufacturing investment in Al Jubail

The latest milestone in this journey is the opening of a new pump manufacturing facility, which has already begun delivering tangible results. The multimillion-dollar project represents an expansion of the existing service workshop, leveraging Trillium's more than 45 years of experience in the Saudi market.

The official inauguration, held in December, brought together key stakeholders and customers, including Saudi Aramco, Saline Water Authority (SWA), Saudi Electricity Company (SEC), and Marafiq, highlighting the importance of the investment for the Kingdom's industrial ecosystem.

The expanded production and service facility covers a total area of 4,400 m². The manufacturing workshop offers 12,000 hours per year of machining capability and 6,000 hours per year of assembly capacity, with a crane lifting capacity of up to 30ton. The site also includes a 300 m² test center, designed to perform performance tests on overhung and betweenbearings centrifugal pumps in full compliance with international standards. The test facility features a 10ton gantry crane, a maximum test power of 1 MW, and the ability to test flow rates of up to 1,200 m³/h.

Localization beyond infrastructure

Trillium's investment extends well beyond physical infrastructure. It includes the transfer of product

and operational technology, together with the development of local talent, embodying the company's strong belief in the importance of enhancing closeness to its customers via localization. By making its advanced pump engineering, manufacturing, and service capabilities available within the Kingdom, Trillium strengthens collaboration with local customers while supporting national industrial development objectives under Vision 2030. Launched in 2016, Vision 2030 aims to build a diversified and resilient economy through localization, technology transfer, sustainability, and longterm value creation.

Corporate Purchase Agreement with Saudi Aramco

The impact of this localization effort has already become evident. During the Saudi Aramco CPA Forum 2026, held in Dhahran on 12 February, Trillium Flow Middle East, Trillium's local company, distinguished itself by signing a Corporate Purchase Agreement with Saudi Aramco. The annual forum focuses on advancing local content through Saudi Aramco's InKingdom Total Value Add (IKTVA) program and on strengthening strategic supplier partnerships.

At this year's event, Saudi Aramco recognized 48 suppliers, including Trillium, with new CPAs collectively valued at USD 8 billion, underscoring the scale and strategic importance of the initiative.

“Trillium has already started to reap the benefit of its manufacturing investment. Its new, expanded local company, Trillium Flow Middle East, distinguished itself last February, signing a Corporate Purchase Agreement (CPA) with Saudi Aramco



Trillium's new pump manufacturing facilities in Al Jubail – test center

Commenting on the achievement, Edoardo Garibotti, Managing Director of Strategic Development at Trillium Pumps Italy, stated: “This agreement reflects the trust earned through our technological expertise and consistent longterm performance. It reinforces Trillium’s role as a trusted partner for Saudi Aramco’s future investment programs under Vision 2030”.

With its expanded local manufacturing footprint and a renewed strategic partnership with Saudi Aramco,

Trillium enters the next chapter of its Saudi Arabian journey—building on 45 years of presence to support the Kingdom’s ambitious industrial and energy transformation.



Abdullah Albur

Abdullah Albur holds an Engineering degree in Industrial Engineering from King Fahd University of Petroleum & Minerals and brings more than 24 years of experience in the rotating equipment sector, with a strong focus on the Oil & Gas industry in Saudi Arabia. His career spans technical, commercial, and executive leadership roles with global companies including Flowserve, GE, and Baker Hughes, where he led turbomachinery and rotating equipment commercial activities across Saudi Arabia and Bahrain. He joined Trillium Flow Technologies in 2024 to serve as Executive Country General Manager, supporting growth, localization, and the company’s long term strategic expansion in the Kingdom.



Simplifying complexity in industrial plant design

ESAIN develops integrated software solutions for industrial plant design, helping engineering teams simplify complexity and improve continuity across process, P&ID, piping and electrical design

Francesco Pais, Head of Business Development
ESAIN

In industrial plant engineering, complexity is no longer defined only by the size of a project. It is increasingly shaped by the number of disciplines involved, the speed of revisions, the need to coordinate data, and the pressure to deliver reliable documentation within tight schedules. In this environment, companies are looking for digital tools that do more than simply produce drawings: they need solutions that help engineering teams work in a more connected, efficient and sustainable way.

This is the context in which ESAIN has built its position in the market. Founded in Italy in 1994, the company has developed ESAPRO, an integrated software envi-

“In industrial plant engineering, complexity is no longer defined only by the size of a project, but rather by the number of disciplines involved, the speed of revisions, the need to coordinate data, and the pressure to deliver reliable documentation within tight schedules

ronment for industrial plant design, supporting key engineering activities such as process design, P&ID development, 3D piping design and electrical design. Today

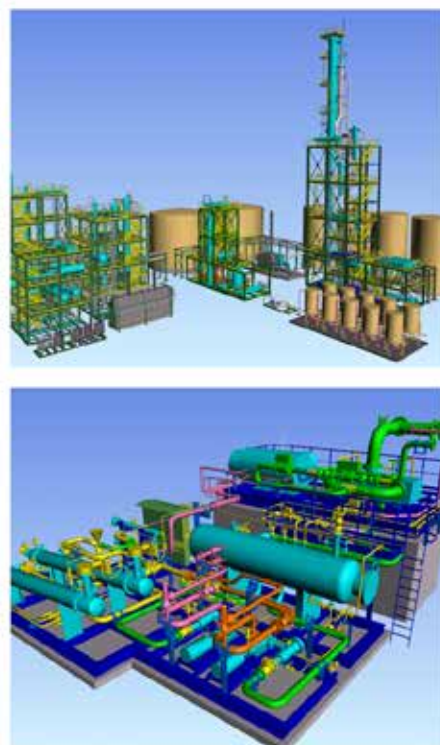
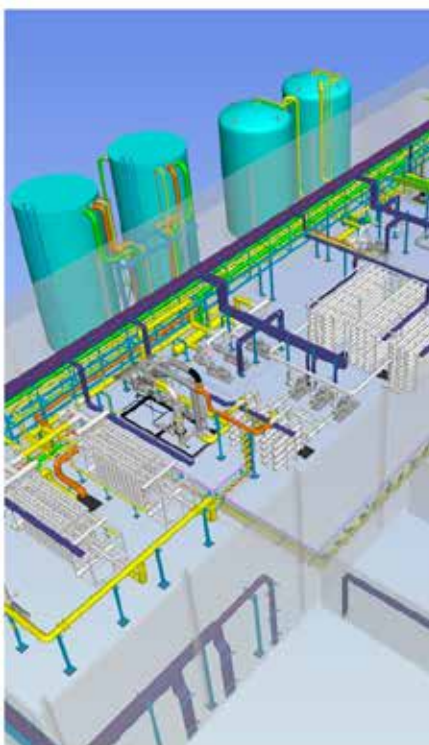
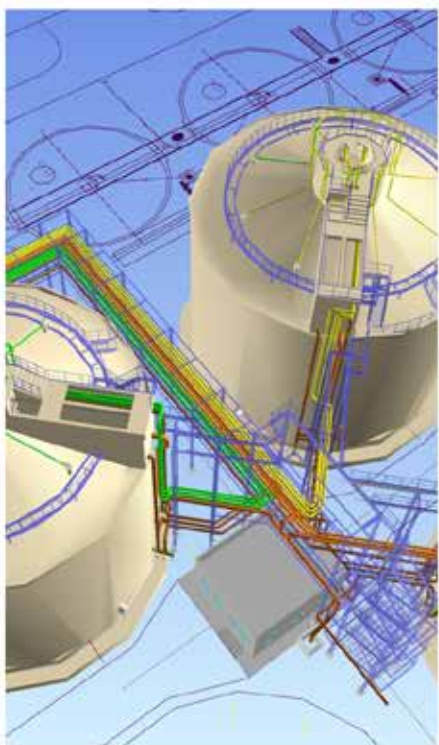
ESAIN serves more than 800 customers worldwide with over 4,000 installed licenses, combining software development with training, technical assistance and direct operational support during adoption and everyday use.

“Today ESAIN serves more than 800 customers worldwide with over 4,000 installed licenses, combining software development with training, technical assistance and direct operational support

What makes this approach especially relevant today is the way the plant engineering market is evolving. Alongside traditional sectors, demand is growing in areas such as biogas, biomethane, hydrogen, water treatment and waste management, where companies often need agile, cost-effective and easy-to-adopt solutions rather than highly complex platforms designed for very large oil and gas environments. ESAIN's positioning reflects this scenario, with a strong focus on medium-small industrial plants, interoperability, productivity and direct support as core competitive levers.

This positioning is also backed by solid market results: ESAIN currently holds approximately 50% market share in Italy, while around 20% of its revenue already comes from international customers. This balance between domestic leadership and growing foreign business helps

explain the company's current strategic objective: expanding further in international markets by replicating abroad the business model that proved effective in Italy. The value of integrated design was also at the centre of “ESAIN Touch”, the event organized by ESAIN in 2025. The meeting brought together almost 200 participants, including customers, partners and industry professionals, around a shared theme: the future of industrial design depends on collaboration between disciplines, interoperability between tools and a clear digital vision. During the event, ESAIN's management outlined a roadmap focused on stronger interoperability, integration with ERP and cloud environments, BIM development and the progressive adoption of artificial intelligence. The company also previewed ESAPRO VX, a new platform designed to improve performance, usability and international scalability, with native SQL Server 2025 support, cloud licenses and a renewed interface. These are not abstract ambitions. They reflect practical needs that engineering firms face every day. One of the most important is continuity between process design, P&ID, 3D piping and electrical design. When information remains fragmented between disconnected tools, the consequences are familiar: duplicated work, slower revisions, inconsistent documentation and greater exposure to error. ESAIN's strategy is built precisely around reducing this fragmentation through interconnected modules for process, plant and electrical design. This same vision is now extending toward another major





driver for the coming years: the adoption of BIM technologies in industrial plant design. ESAIN is also working to improve interoperability even further, while exploring collaborative cloud-based design environments and stronger integration between mechanical engineering and plant design workflows. These developments reflect a broader transformation in the way industrial projects are conceived, coordinated and delivered.

The experience of customers provides concrete evidence of how this translates into results. A significant example comes from Hysytech, an engineering company active in sectors such as biogas, biomethane and hydrogen. Before adopting ESAPRO, the company relied on a 3D mechanical CAD system that proved

poorly suited to the specific needs of plant engineering, making the design process slow and cumbersome. Hysytech then introduced ESAPRO P&ID, ESAPRO 3D Piping, ESAPRO Isometrics and later ESAPRO Cable Trays, with the aim of managing the full workflow more consistently, from process schemes to construction documents. The result was better change communication, easier traceability, smoother interaction with existing documentation and internal management tools, and a 15–20% reduction in the hours required to issue sketches for construction.

These considerations highlight a broader point. In today's industrial market, innovation is valuable only if it becomes operational. Companies do not simply need more features; they need solutions that can be adopted quickly, understood by teams, and integrated into real project workflows. This is where software simplicity, training and direct support become strategic factors rather than secondary services.

“In today’s industrial market, innovation is valuable only if it becomes operational. Companies do not simply need more features; they need solutions that can be adopted quickly, understood by teams, and integrated into real project workflows

As industrial plants become more data-driven, more collaborative and more international, design software must evolve accordingly. The future of plant engineering will not be defined by isolated tools, but by ecosystems that connect disciplines, reduce friction and help companies transform technical complexity into manageable processes. That is the direction ESAIN is pursuing: not only through technology, but through a practical vision of digitalization grounded in usability, integration and long-term partnership.



Francesco Pais

Francesco Pais is Head of Business Development at ESAIN and one of the company's founders. A senior developer with deep expertise in P&ID, piping and industrial plant design, he combines technical knowledge with long-standing industry experience.

When a Warehouse Becomes Smart

A high-tech solution for managing warehouses used to store bulk agricultural and non-agricultural products

Iacopo Meghini, President and CEO
Metalmont Srl

Preserving food is one of the oldest challenges faced by humankind. For centuries, survival depended on the ability to protect food supplies during times of abundance in order to endure periods of scarcity. Techniques such as salting, smoking, or preservation in oil proved effective solutions, but they were not suitable for large-scale storage and management of grains and seeds. With industrialization, the challenge evolved: no longer just preservation, but doing so efficiently, safely, and continuously. This led to the spread of two models that still dominate today: silos and flat warehouses.

Silos or Flat Warehouse? Making a Choice

In agricultural facilities, several storage systems exist: the most common and widespread system involves large-capacity silos (up to 5,000 m³) made of steel or concrete. Alternatively, flat or conical warehouses can be used, with loading capacities that can easily exceed 100,000 m³.

One factor that makes storage in warehouses less efficient is the inability to utilize the entire available volume, combined with the need for human intervention during loading and unloading operations. This impacts both operational efficiency, which is limited by plant operating hours, and the health and safety conditions of workers. Additionally, the quality of the stored product is not easily preserved, as it comes into contact with mechanical handling equipment

and may be exposed to potential contamination from the external environment.

And that's where the Metalmont Robot comes in

“Metalmont has developed a machine for handling bulk products that primarily operates in three cycles: loading → levelling → unloading

Metalmont has developed a machine for handling bulk products that primarily operates in three cycles: loading → levelling → unloading, as shown in Figure 1. The system is fully automated, can operate continuously, and effectively allows for optimal use of the available volume, eliminates the need for human

Metalmont srl

Metalmont Srl, a company based in the province of Treviso, designs, manufactures, and markets machines for handling bulk products in Italy and abroad. In 2008, it developed a system for managing grain storage in flat warehouses, conceived as an alternative to silos, particularly where their use is not feasible (e.g., low-flowability products) or where manual handling systems (e.g., loading and unloading with mechanical equipment) prove economically inefficient and involve demanding operating conditions in terms of product safety and the safety of on-site operators.

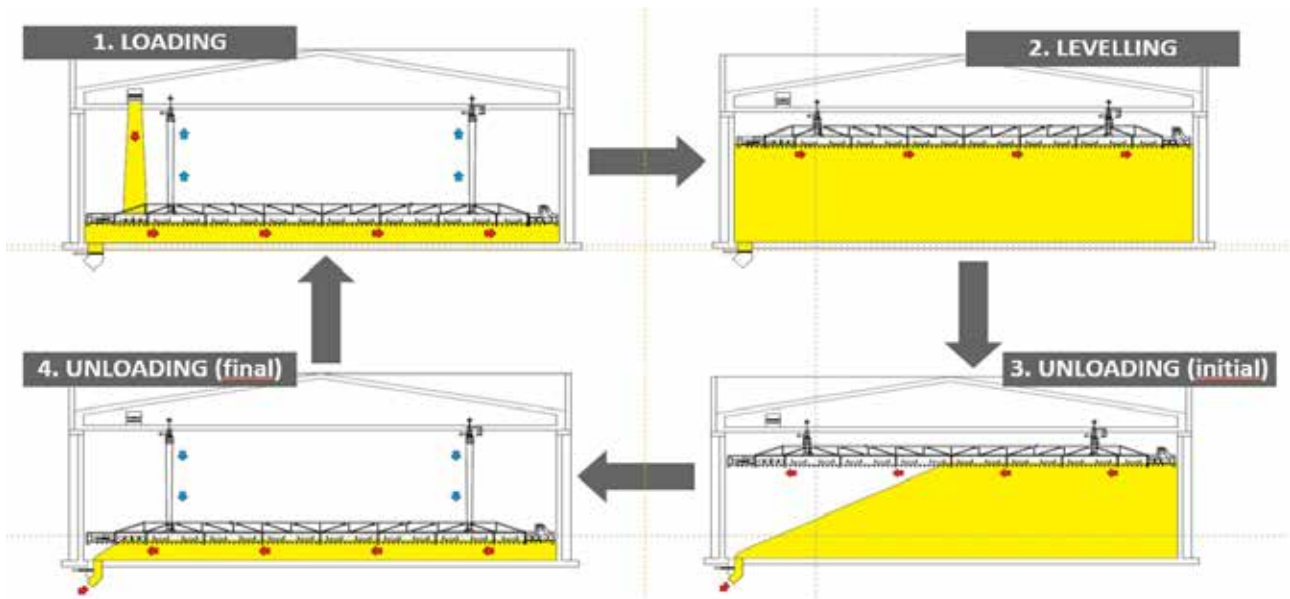


Figure 1

presence, and prevents any form of product contamination.

The robot can therefore be likened to an overhead crane that moves along the length of the warehouse, rises and lowers, and, using a system of paddles, levels the product. During loading, it receives the material from a belt conveyor located at the peak of the warehouse or adjacent to the wall, distributing it evenly. During unloading, the process is reversed: the robot channels the product toward the hoppers at the base of the warehouse, which are connected to one or more chain conveyors. Sensors allow the system to continuously map the amount of material present and move the product while taking its physical characteristics into account.

“Sensors allow the system to continuously map the amount of material present and move the product while taking its physical characteristics into account

Advantages of the Metalmont Automated System

- 24/7 Operation: in industrial facilities (e.g., port terminals, process industries), continuous operation is essential.
- Full Volume Utilization: the warehouse is filled to

its maximum capacity.

- Healthier Environment: using front wheel loaders (e.g., Caterpillars) instead of the robot has a greater environmental impact and exposes operators to dusty and unhealthy conditions (e.g., fertilizer storage).
- Product preservation: for products intended for human consumption, mechanical handling can contaminate stored goods (e.g., tire residue, exhaust fumes, oil leaks), whereas the robot avoids this.
- Gentle handling: material is moved with paddles that handle it gently (drag speed does not exceed 0.7 m/s), minimizing breakage, reducing abrasion, and lowering the risk of ignition from friction.
- Personnel safety: the automated warehouse with the robot is a closed environment, off-limits to personnel.
- Constant throughput: the output flow is regular, continuously feeding downstream operations typical of process industries (e.g., mills, oil extraction plants, fertilizer production systems, feed mills, or direct loading of ships at ports).
- Reduced carbon footprint: the robot is electrically powered, and electricity can come from rooftop photovoltaic panels, consuming significantly less energy than mechanical handling systems.
- Continuous monitoring: software enables monitoring of both the machine and stored product, tracking quantity, temperature, and any anomalies in the warehouse.
- Warehouse maintenance: avoiding mechanical equipment reduces floor wear and prevents acci-



dents from collisions with internal structures, such as walls or dividing partitions.

- **Flexibility:** through warehouse partitions—fixed concrete walls or movable steel panels—it is possible to store different products or, when empty, use the space for machinery and service vehicles.
- **Ventilation:** the system can include mechanical ventilation with floor-mounted air inlets and ceiling-mounted dust extraction, improving the internal environment and reducing explosion risks (some workplaces fall under ATEX 22 classification).
- **Quiet operation:** electrical operation is much quieter than mechanical handling.
- **Total Cost of Ownership (TCO):** simulations in “typical” markets (Italy, Russia, Indonesia, USA) show that, over a 10–15-year horizon considering CAPEX and OPEX, automated warehouses are more cost-effective than silo storage or warehouses using mechanical equipment.
- **Temperature control:** the robot's temperature monitoring system tracks variations across the entire volume, helping detect fermentation and prevent product damage or potential ignition.
- **Versatility:** the robot can handle bulk agricultural and non-agricultural products stored in warehouses, making it extremely versatile. Examples include:

- Agriculture & feed: cereals, seeds, legumes
- Biomass: pellets, wood chips
- Food & industrial oils: byproducts such as DDGs (*Distillers Dried Grains with Solubles*) for ethanol and biofuel production
- Fertilizers

This comprehensive set of advantages highlights why the Metalmont automated system is a cutting-edge solution for modern warehouse management (from top to bottom, a soybean plant in Saudi Arabia, a sea terminal installation in Romania, a high-volume storage facility in Russia).

Conclusion

The Metalmont levelling robot fits into agricultural—and beyond—facility management as a high-tech solution, continuously evolving and innovating, for the storage of large quantities of products intended for preservation, process industries, or port logistics.

“The Metalmont levelling robot fits into agricultural facility management as a high-tech solution, continuously evolving and innovating, for the storage of large quantities of products



Jacopo Meghini

As CEO and President of Metalmont since 2020, I lead engineering, manufacturing, and marketing efforts for innovative machinery and automated solutions for handling agricultural bulk materials in storage facilities. With 20 years of management experience in leading multinational companies (CNH Industrial, Johnson & Johnson, Siemens) and serving as Director at Metalmont since 2018, I bring expertise in project management, program management, and cross-functional team leadership to drive business growth and operational excellence. My mission is to redefine the industry through sustainable solutions and forward-thinking strategies. Focused on fostering collaboration and operational efficiency, I am committed to helping Metalmont deliver impactful results that meet the evolving needs of our clients.



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Fabio Stefanazzi, Account Manager

Audco Italiana

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Fabio Stefanazzi

A professional with over twenty years of experience in consultative sales within the industrial sector, Fabio Stefanazzi serves as an Account Manager at Audco Italiana, a historic brand founded in 1930 and globally recognized for the reliability and technical continuity of its industrial valves in the Oil & Gas, Chemical, Power, Water Treatment, and other heavy industry sectors.

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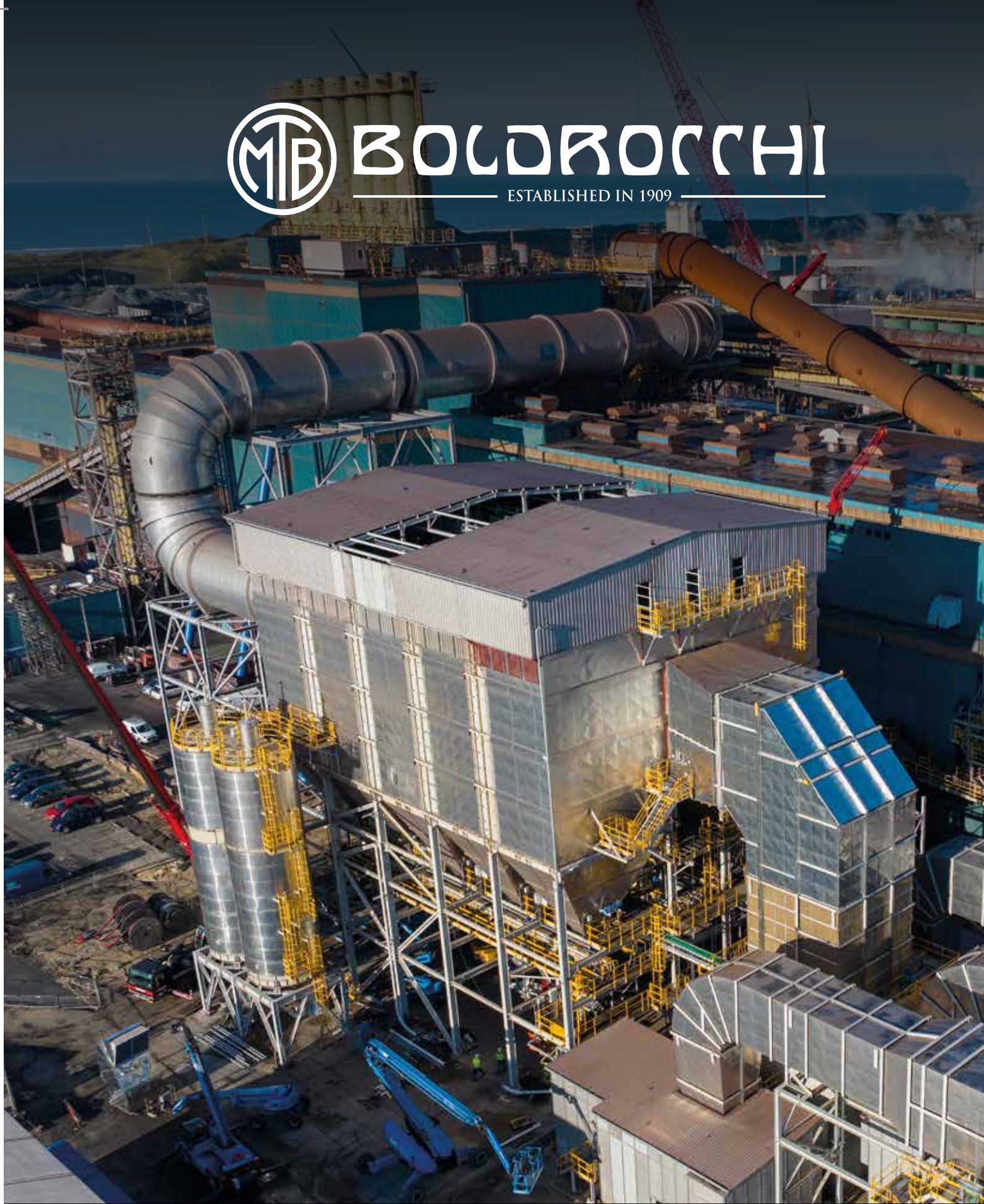
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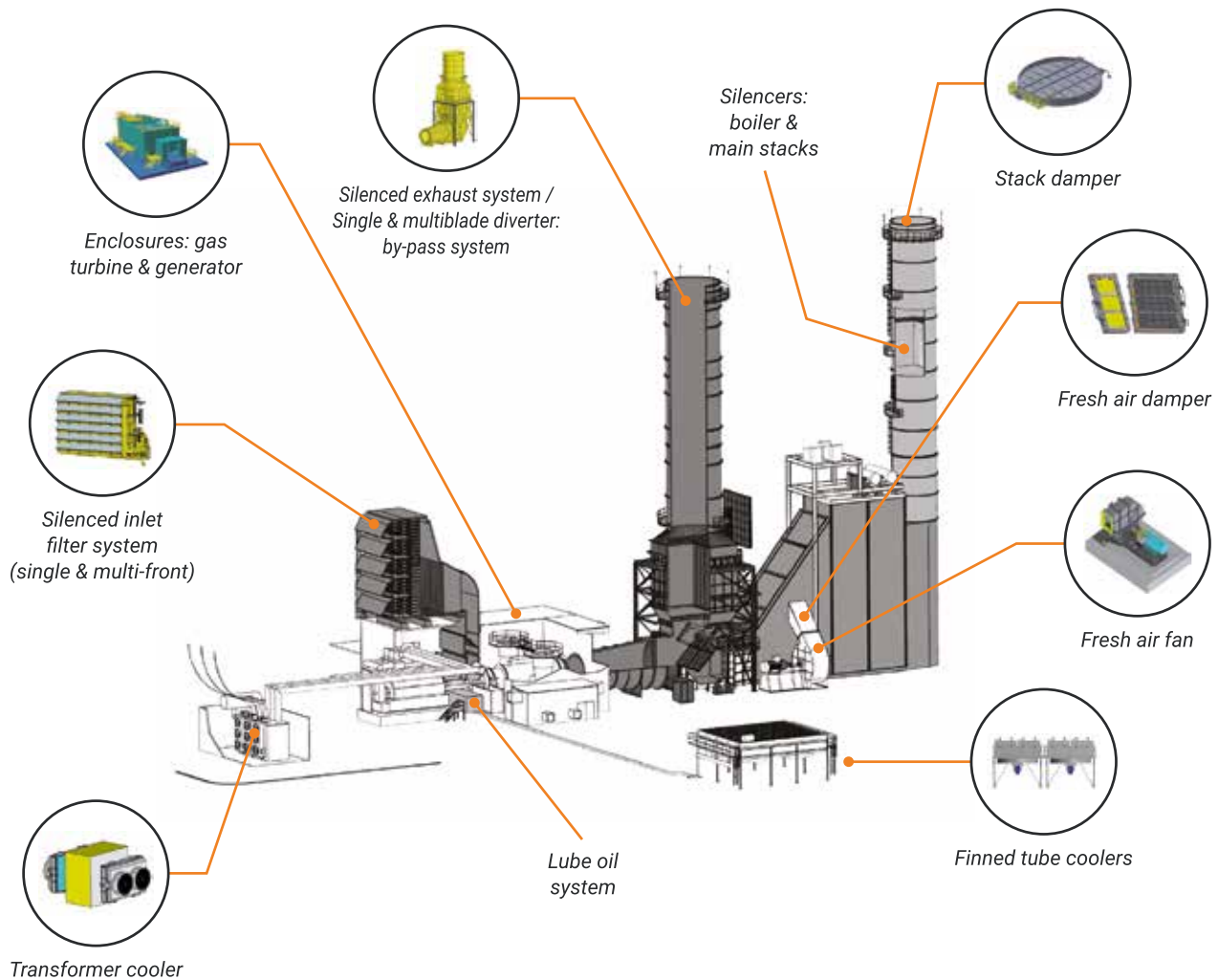


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