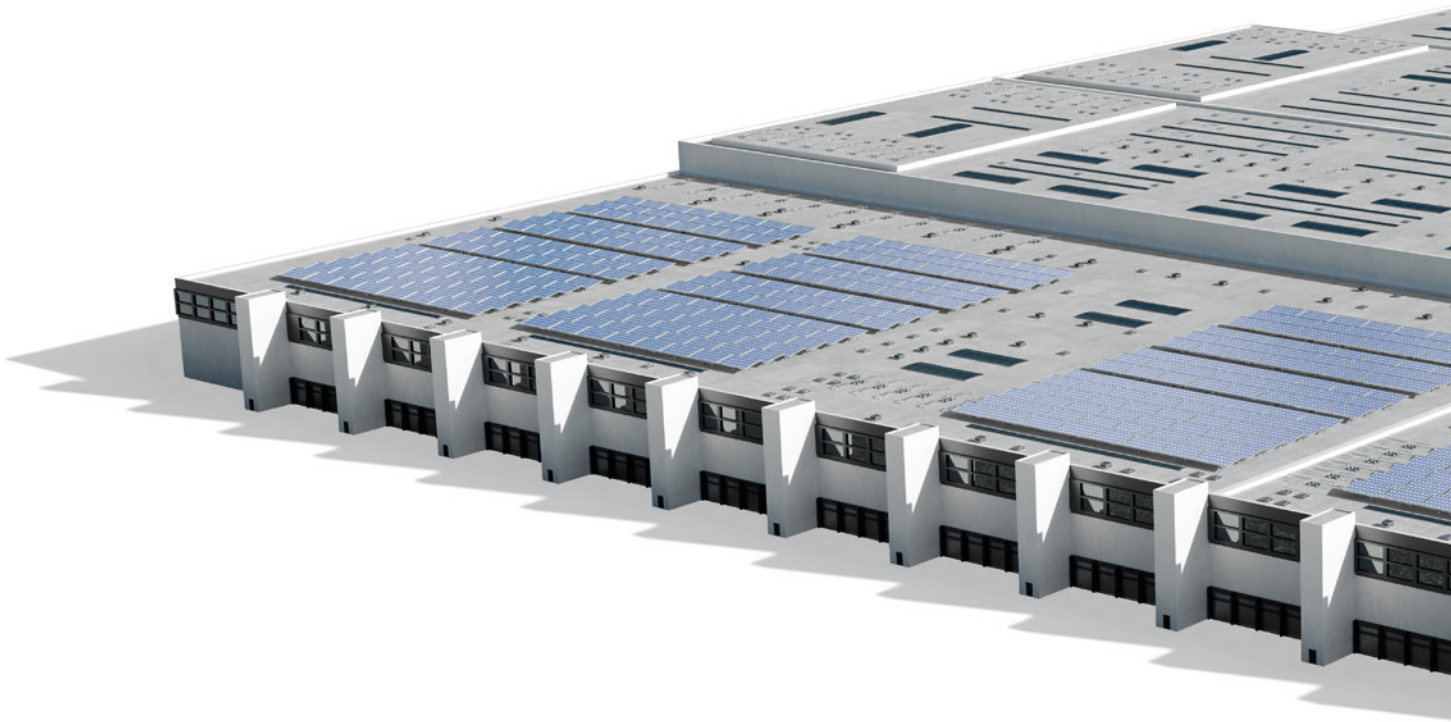


# Empowered solutions

Industry leading flow solutions  
for sustainable battery production



# Rapid battery market expansion

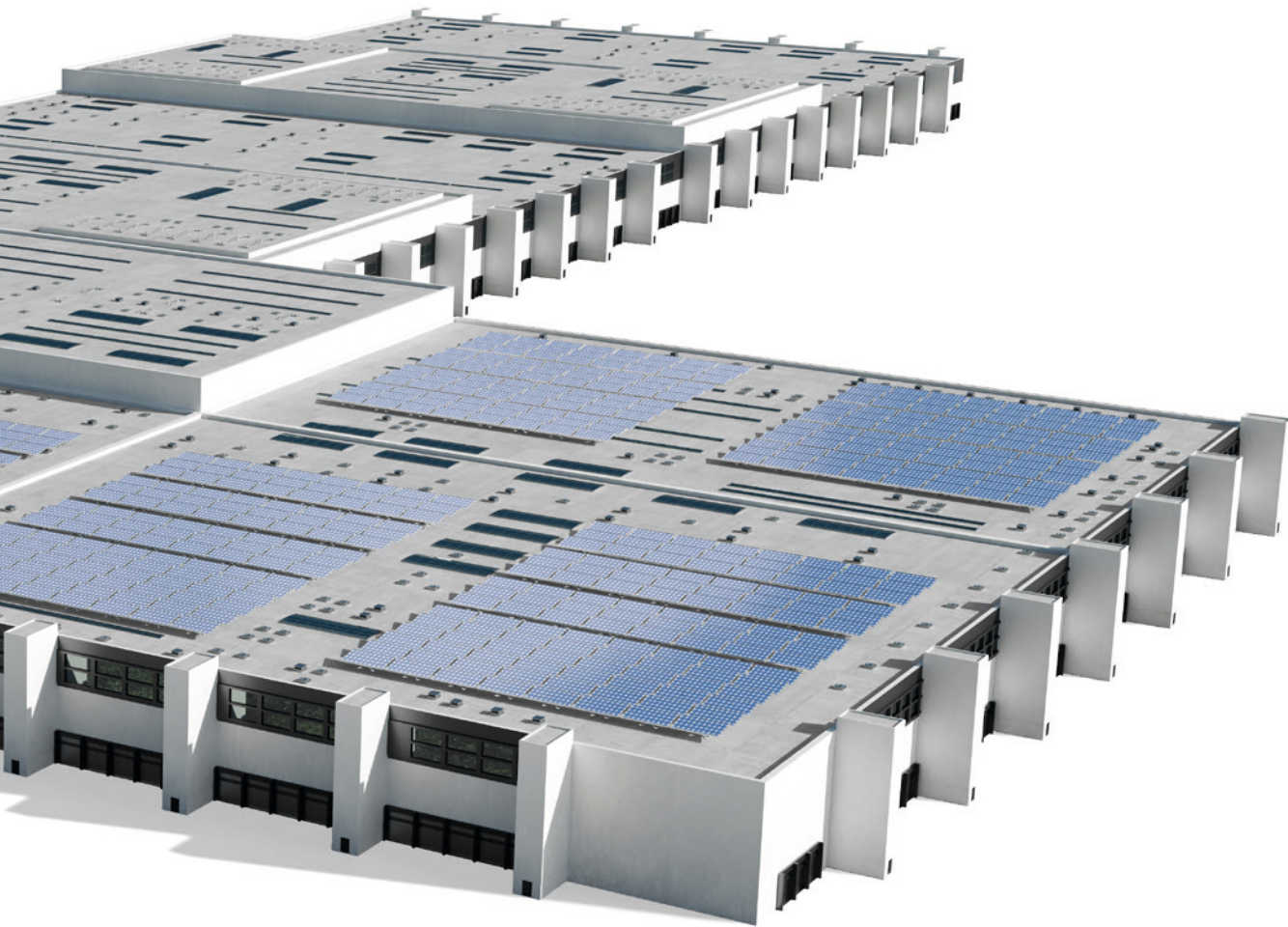


Welcome to the era of positive change. As the world unites to combat global warming, we are witnessing an exciting expansion of electromobility and renewable energy generation. This incredible momentum, driven by political and economic activities, is creating a surge in demand for battery cells.

A leading factor driving market change is the global commitment to reaching net-zero CO<sub>2</sub> emissions. The net-zero initiative is significantly impacting how the mobility and energy markets operate. The e-mobility and renewable energy sector will drive the need for reliable and sustainable battery supply to new heights.

To fulfill this growing demand, new mega and gigafactories are being built worldwide. In Europe alone, by 2030, we anticipate the introduction of approximately 1.4 TWh of battery cell capacity per year.

Considering the scale and high technical demand for accurately controlled production environments in battery production, the market needs an innovative approach to process optimisation and building technology. One of these areas is piping systems within the building, dry and clean room technology, and process equipment.



Piping systems have always been an essential part of the industry, and the selection of appropriate materials and providers can significantly impact the safety and quality of production processes. High-performance thermoplastics are copper-, zinc, and nickel-free and a corrosion-free alternative to traditional metal solutions. Highly resistant polymer piping systems ensure an interruption-free production process and reduce downtimes.

Full solution provider

# Empowered system confidence

GF Piping Systems supports the battery production and recycling industry's efforts to build the most sustainably managed factories. Our global teams help the industry manufacture some of the world's most advanced technologies while supporting their mission to use water resources more sustainably, reduce their carbon footprint, and lessen their impact on the environment.



## Empowered performance

High-quality, metal-free piping systems manufactured for longevity. Produced in certified production facilities (91% of GF's production facilities have Environmental Management Systems (EMSs) in place, and most sites are certified to ISO 14001).



## Empowered sustainability

Thermoplastic piping systems are up to 60% lighter and result in lower CO<sub>2</sub> emissions than steel. Environmental Product Declarations help plant designers and engineers to understand the overall environmental impact of piping systems.

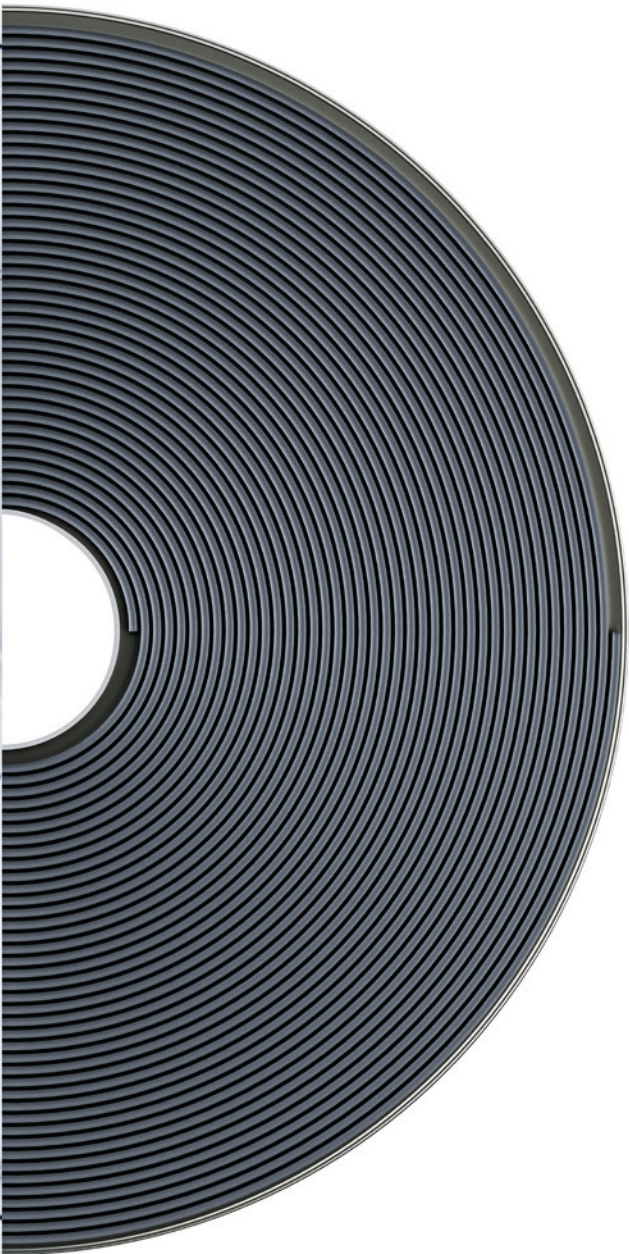


## Empowered efficiency

Lightweight materials, pre-insulated solutions, easy jointing, and process automation technologies help to reduce operational costs and increase the overall efficiency of media transportation loops.







#### **Empowered installation**

Reduced project and operation lead times through fast and easy installation technologies. State-of-the-art jointing technologies such as plug-and-play solutions or electrofusion enable fast, replicable, and reliable installation, even in confined spaces.



#### **Empowered Design**

3D libraries, engineering support, and off-site prefabrication help tailor the piping systems to each customer's individual needs for fast and reliable project execution and a long system service life.



#### **Empowered time to market**

With a presence in more than 31 countries and 36 production sites, GF Piping Systems ensures project support at every step of the process to achieve construction excellence and reduce time to market.

Everything is connected

# Empowered sustainability

GF Piping Systems is committed to enabling the safe and sustainable transport of water, gas, and chemicals, enabling key players in the battery cell production industry to optimize their flow solutions. Sustainably sourced and renewable raw materials, energy-efficient solutions, and innovative jointing and automation technologies are supporting our customers worldwide to reduce their carbon footprint.

The production of battery cells is highly energy intensive. As a company that is active worldwide, it is GF Piping Systems' mission to show our commitment to sustainability by supporting our customers' success with innovative, energy-saving solutions reducing the collective global footprint.

Plastic piping systems offer numerous benefits that make them an excellent choice for various applications in the battery cell manufacturing process. Their corrosion resistance ensures a high degree of efficiency throughout their operational lifespan. Furthermore, these systems are remarkably durable, with certain applications exhibiting a lifespan of over 25 years. Additionally, plastic piping systems possess a lower carbon footprint when compared to their metal alternatives, thus signifying their environmental viability. They also align with green building standards and certifications, positioning them as a compelling option for sustainable construction projects. Moreover, owing to their reduced weight, they require less transportation and installation effort, culminating in cost savings.







# 60%

lighter than steel

Plastic piping systems are lighter than steel and reduce the environmental impact on transportation significantly.

# 25

years service life

The corrosion- and maintenance-free solutions have a long service life of 25 years or more.

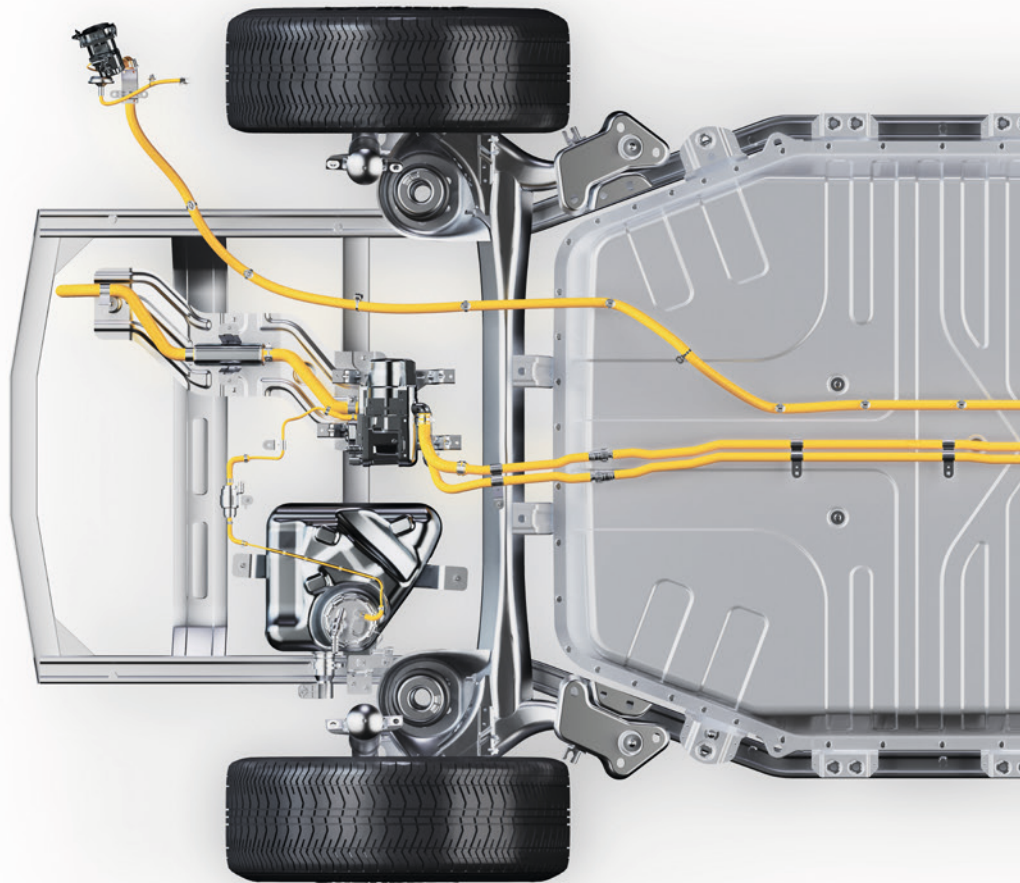
# 50%

faster installation

Installation of piping systems can be done 50% faster thanks to electrofusion, innovative jointing and insulation technologies.

Elevate your performance

# Empowered efficiency

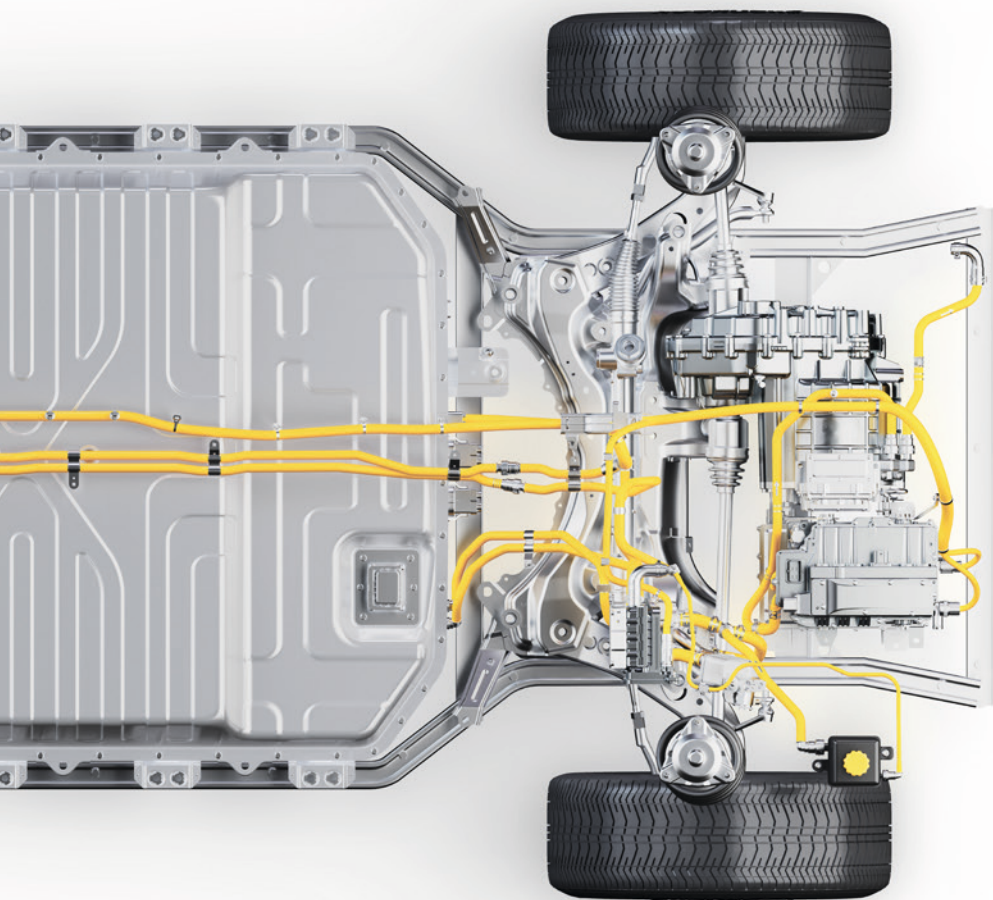


The critical clean and dry room technology is in focus when it comes to efficient processes. GF Piping Systems' customers rely on more than 60 years of experience in thermoplastics.

We develop our products with a focus on maximum safety, reliability, and performance to guarantee efficient planning, installation, and operations in critical applications.

Plastic pipes can enhance battery cell manufacturing efficiency. Material flow, pressure, and flow rates can be optimized thanks to the smooth inner surface of plastic pipes, and a pre-insulated solution helps to maintain the required temperature. Also, double containment systems and measurement and control devices help improve the wastewater management cycle through an extra layer of protection and constant monitoring of the flow while minimizing environmental impact. Using GF products and solutions lowers costs, improves quality, and reduces the risk of spills and contamination.



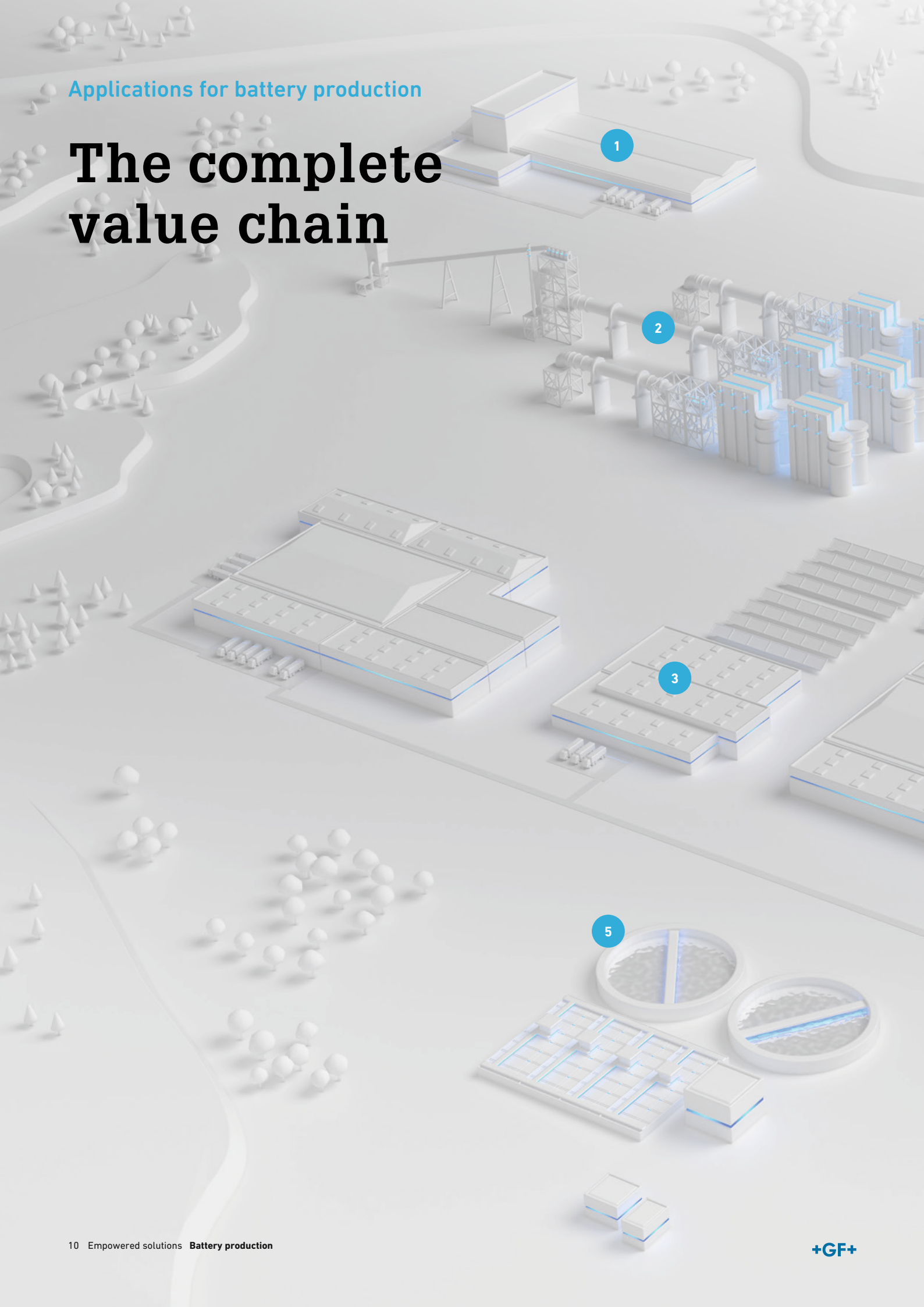


In the critical area of clean and dry room technology, a controlled environment is key. Insulation and material performance of the piping system can significantly impact the energy input needed for maintaining a stable ambient temperature. Pre-insulated solutions with high-grade pre-insulation can help to enhance energy efficiency by up to 30%, positively impacting the plant's energy consumption.

Enhance energy  
efficiency by:  
**30%**

Applications for battery production

# The complete value chain



### 1. Lithium extraction

Plastic piping systems and process automation capabilities help to safely and reliably transport water and chemicals in the demanding lithium extraction process. Measurement and control solutions help to improve the water quality and to guarantee the most efficient extraction process.

### 2. Material preparation

Material preparation requires precise control over various parameters, such as composition, purity, and particle size, to ensure consistent and reliable battery performance. High-quality plastic piping solutions are chemically resistant and can handle highly abrasive media and are corrosion-free, which makes them an all-round solution for complex material preparation processes.

### 3. Battery assembly

Assembly in lithium-ion battery production refers to the process of assembling the various components of a lithium-ion battery to create the final product. In this process, reliable cooling systems are necessary. GF's piping systems are free of copper, zinc, and nickel and can be installed in any environment with open cell production where material deposition is a concern.

### 4. Post assembly

Aging and formation are two important processes in the production of lithium-ion batteries which require a stable ambient environment. GF's piping systems are available in many materials, enabling fit for application hook-up, exhaust, and drainage installations.

### 5. Water recycling

Water recycling is critical to sustainable battery production and demands new advanced treatments, such as membrane and physicochemical treatments. GF Piping Systems' comprehensive offering is optimally adapted for improving water quality to reduce its impact on processes and the environment.

### 6. Battery recycling

In a market where material supply is critical, retrieving valuable metals and materials from used batteries is a critical step towards a clean circular economy. Plastic piping solutions have a reduced environmental impact compared to metal and help to pave the path toward a greener future production.









# Efficient cooling

Only a fraction of cooling solutions in use today are highly power-efficient. Upgrading these could considerably increase energy efficiency and reduce building-associated CO<sub>2</sub> emissions. GF Piping Systems offers a fully pre-insulated plastic solution that helps avoid metal contamination in clean manufacturing areas and to minimize heat losses and, thus, energy costs.

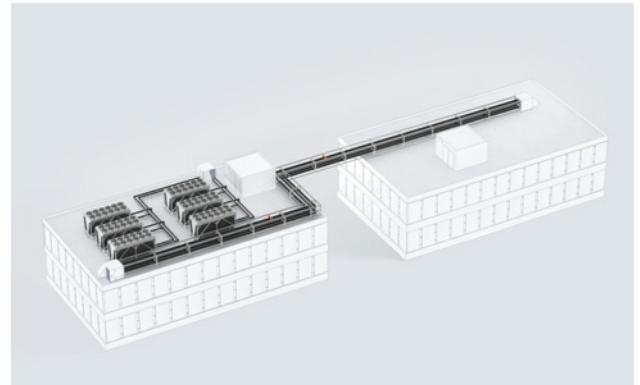


## Dry room

The dry room application takes approximately 40% of the whole energy consumption of a production process. With COOL-FIT, the engineered pre-insulated piping system, we offer an easy-to-install, a corrosion-free alternative to post-insulated metal for efficient cooling.

## Cleanroom

We provide cutting-edge technology to meet the high, conditioned standards of battery cell production. Pre-insulated pipes, fittings, valves, and process automation help with a fast installation and maintenance-free operation in clean environments without compromising energy efficiency.



## HVAC

GF Piping Systems offers high-performance piping systems for distributing heated and chilled water in climatization applications that meet the latest building standards in terms of sustainability. When a shortage of space is an issue, jointing technologies like electrofusion ease the installation process.

## Process cooling

The harsh environment in a production area makes insulation protection mandatory. COOL-FIT 4.0 from GF Piping Systems optimizes any industrial refrigeration set-up. Choose corrosion-free plastic piping systems to avoid metal contamination in clean manufacturing areas and reduce heat loss.

**View all applications online:**  
[www.gfps.com/batteryproduction](http://www.gfps.com/batteryproduction)









# Water quality

At GF Piping Systems, we offer deep application knowledge of the entire water treatment process, including guaranteeing high water quality and system availability, providing reliable measurements, fulfilling stringent regulations, and helping customers to automate their operations. We provide comprehensive systems that help reduce maintenance and operation thanks to cutting-edge process automation solutions for media filtration, nanofiltration, or ion exchange.



## Media filtration

Media filtration is a water treatment process that can be used as a pre-treatment or polishing step in battery production applications. Due to the need for several flow processes (activated carbon, backwash, rinsing), choosing appropriate piping systems, automated valves, and actuators and using adapted measurement and control techniques are important. Doing so will increase your productivity.



## Ion exchange

Water purification, separation, and decontamination are important in water and wastewater treatment areas. The compact construction of ion exchange plants requires flexible piping solutions and components. GF Piping Systems provides complete solutions of high-quality piping systems warranting maximum flexibility while ensuring an entirely safe plant operation with maximum uptime.

View all applications online:  
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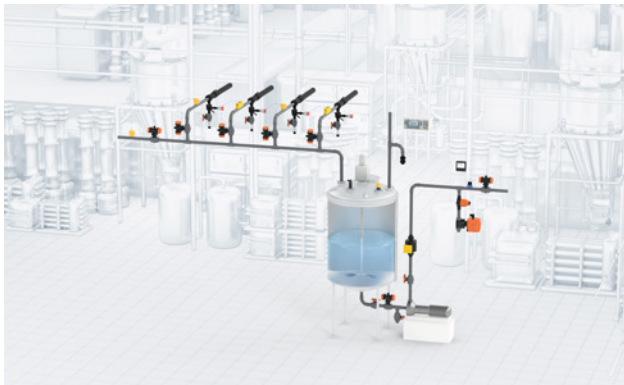






# Chemical distribution

As a leading global piping systems company, one of our goals is to help our customers improve operational safety and overcome environmental safety challenges through innovation. By developing highly engineered products, pioneering jointing technologies, and industry-leading training capabilities, we create solutions for chemical distribution that will enhance operational safety and enable our customers to avoid accidents and leakages.



## Mixing – batching control

When mixing a range of chemicals, batching is a cost-effective method to consider. In this process, each chemical line is equipped with an actuated valve and flow meter connected to a controller. By controlling the opening times of each line, the GF controller ensures an accurate mixture of chemicals based on a pre-determined recipe.



## Dilution plant

Diluting chemicals requires highly specialized and reliable workflows, especially when working with aggressive media. With a selective combination of pressure control valves, actuators such as Pneumatic Actuators, PPA, flow meters, and control instrumentation, media flow is under constant control.

View all applications online:  
[www.gfps.com/batteryproduction](http://www.gfps.com/batteryproduction)







**+GF+**  
ELGEE PLUS

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ELGEE PLUS

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ELGEE PLUS



# Water and gas distribution

GF Piping Systems solves water and gas transport challenges worldwide by offering safe, reliable jointing solutions for large-diameter pipelines for installations above and below ground. We prioritize operational safety and sustainability, reducing water loss within your network. Our innovative services cater to the specific needs of the battery production industry, conserving resources for a better future.



## Utilities

GF Piping Systems offers a range of solutions for water and gas distribution in battery production plants. Our services cover secure water transportation lines, ensuring the safe and reliable connection of large-diameter pipes, fittings, and valves. We also provide non-destructive testing for underground water distribution lines, custom-made parts, and off-site prefabrication to reduce work and time on-site. In addition, our state-of-the-art pressure management technology and welding machines ensure economical, reliable, and safe operations for underground fire protection. With our expertise in large-dimensioned piping systems, we can provide the right solutions for varied installations in water and gas transport applications.

## Hookup systems

Hookup systems in battery production involve connecting equipment and machinery to various utilities, including water, wastewater drainage, process cooling, compressed air, vacuum, and gas through application-appropriate pipes and fittings. GF Piping Systems provides lightweight, safe, and maintenance-free plastic piping solutions that ensure a safe and efficient hookup system, helping battery producers improve operational safety and process reliability.

View all applications online:  
[www.gfps.com/batteryproduction](http://www.gfps.com/batteryproduction)



We make process automation easy

# Together as one

We offer a true partnership with a unified vision toward active water conservation. Our solutions for automated flow processes ease the way toward intelligent integration.



GF Piping Systems offer deep application knowledge of the entire process within the water treatment industry. Depending on the application area, there are different water treatment process challenges, ranging from ensuring high water qualities and providing reliable measurements to ensure stringently regulations. Plastic piping solutions from GF Piping Systems provide higher efficiency around the water cycle with increased productivity and lower operational and overall costs.



## One user experience across the whole control loop

GF Piping Systems is your experienced partner with a full portfolio of measurement, control, and actuation components, which are easy to install and use and have local support throughout all project phases. We offer the full package with our products and solutions, providing top-quality installation, a highly skilled team of experts standing by our customers' side every step of the way worldwide, and digitalized services ensuring a project is at the forefront of the market.



### Design (Planning phase)

Easy planning thanks to application-specific solutions making an effortless combination around the complete control loop.



### Select (Ordering phase)

Easy to select and order via configurators and matching components throughout the whole portfolio.



### Install (Building phase)

Easy planning thanks to application-specific solutions making an effortless combination around the complete control loop.

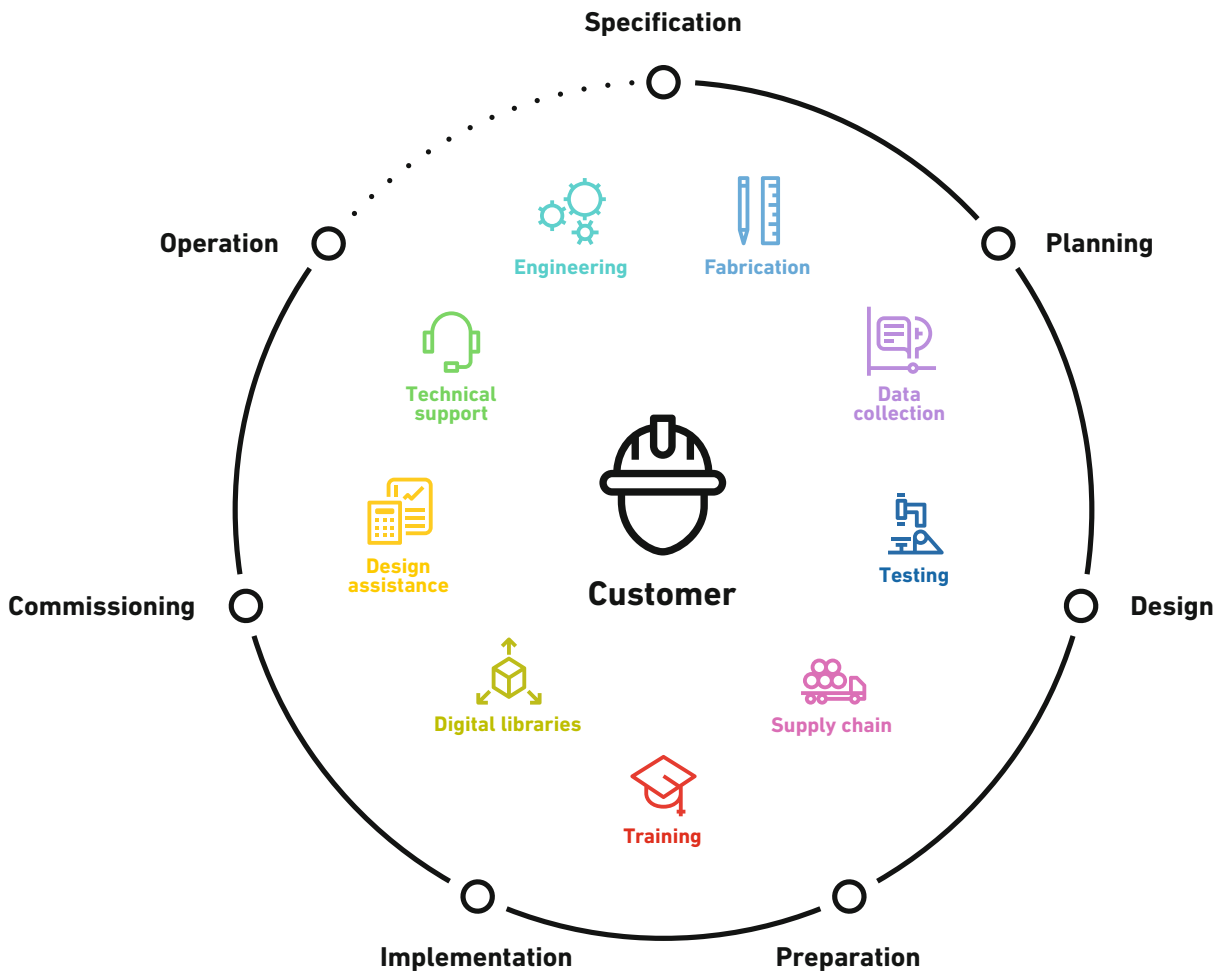


### Own (Operation phase)

Easy monitoring once installed, including spare part availability. Long lifetime and low maintenance make for low downtimes.

# One partner from planning to commissioning

With Specialized Solutions, the global leader GF Piping Systems provides project support every step of the way to achieve construction excellence. Allowing owners and planners to concentrate on their daily business without interruption.





### ProSite

ProSite from GF Piping Systems is the logistics solution that reduces the administration effort of ordering, reordering, and accounting of piping system components. It simplifies the stock management of installation projects, reducing necessary workforce and related costs, supporting your team and project design process from the outset to ensure that a sustainable and efficient solution is achieved. Material flow, ready when you are.



### Training

GF Piping Systems instructional courses to help you teach your customers and their installers essential knowledge for the welding of pipes and piping components, as well as in-depth knowledge of butt and electrofusion connections. With Specialized education from GF Piping Systems, we help prevent damage before it occurs, with well-trained and qualified installers. Trusted training, empowering you.



### Condition Analysis

Having your individual needs and application in focus, our customizing teams forge the solution that fits you best, developing custom-made parts to complete systems or special solutions produced in small series, individual consulting and off-site prefabrication.



### Design Assistance

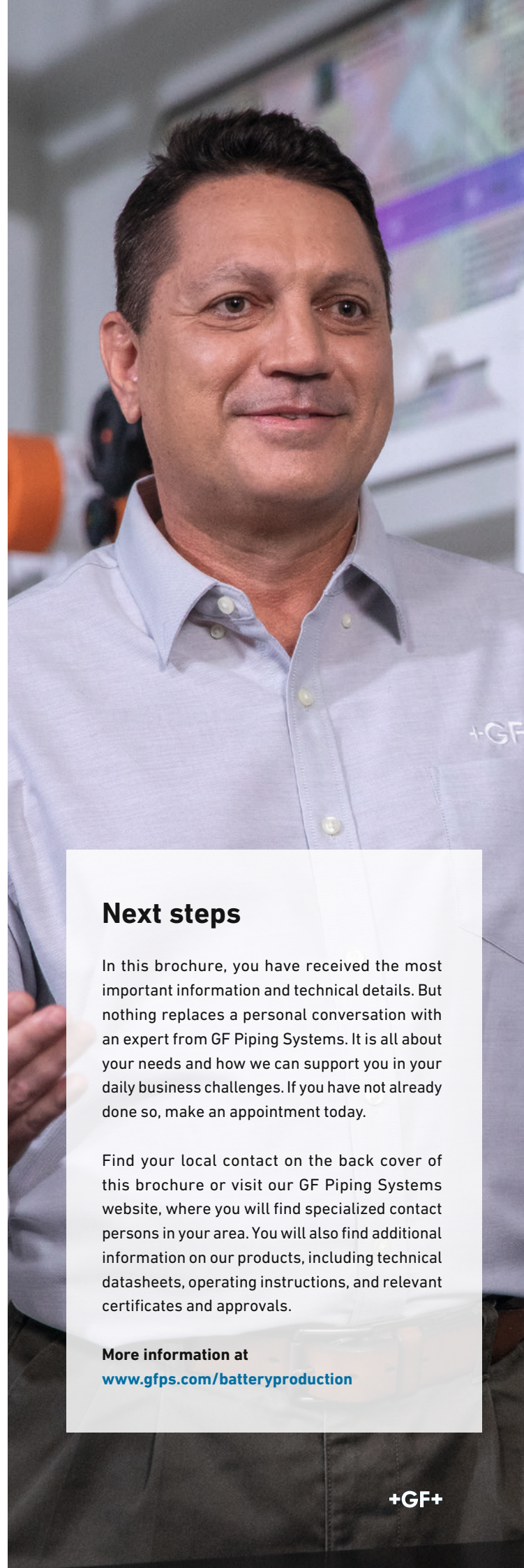
Our Design Assistance includes providing technical manuals on a multitude of topics and an extensive CAD library. From detailed information on products, systems and materials to practical online calculation tools and personal assistance, we back you with our expertise. Valuable insight, the tools you need.



### Technical Hotline

Our customer support comprises an international team of experts, which works closely with local sales companies. This pool of highly trained individuals is available to resolve any questions or problems that may arise as your project comes to life. Superior help, when you need it.

[www.gfps.com/specialized-solutions](http://www.gfps.com/specialized-solutions)



## Next steps

In this brochure, you have received the most important information and technical details. But nothing replaces a personal conversation with an expert from GF Piping Systems. It is all about your needs and how we can support you in your daily business challenges. If you have not already done so, make an appointment today.

Find your local contact on the back cover of this brochure or visit our GF Piping Systems website, where you will find specialized contact persons in your area. You will also find additional information on our products, including technical datasheets, operating instructions, and relevant certificates and approvals.

More information at  
[www.gfps.com/batteryproduction](http://www.gfps.com/batteryproduction)



## Local support around the world

Visit our webpage to get in touch with your local specialist:  
[www.gfps.com/our-locations](http://www.gfps.com/our-locations)



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