



Solving water loss for life

Water network performance solutions

The challenges facing water utilities

Within discussions centered around sustainability, water scarcity, and the conservation of precious resources, one topic regularly covered is how utilities can better solve the challenge of water loss within their network. The need to protect precious resources and reduce water loss to more acceptable levels has made non-revenue water (NRW) one of the most challenging problems for water utility owners and operators to overcome.

Many embrace various mitigation strategies to address the challenge, including better understanding their installed base, the key issues present in their network, and how to devise multi-layered approaches for the future. These include implementing sustainable water solutions that provide pressure management, optimize leak detection, extend the lifetime of new asset networks, and reduce disruptive repair tasks.

Water scarcity and disruption, aging infrastructure, corrosion, and reduced asset lifetime all impact the operations of utilities and the customers of their network and impact the environment. These factors generate additional costs to utilities related to production, maintenance, and obvious revenue losses. They can also affect service levels and impact the water quality provided to the end-users. As well as the negative social impact on a company's reputation.



126 billion cubic meters per year

Water utilities around the globe are estimated to lose 126 billion cubic meters of water at the cost of \$39 billion each year.¹

¹ Roland Liemberger & Alan Wyatt. "Quantifying the global non-revenue water problem"



+GF+
ELGEP Plus

PE 100 003 PU 16 SDR 11



What is non-revenue water?

Non-revenue water is the difference between the water entering a distribution system and the amount billed to water consumers. NRW is not the only actual loss of water, such as leakage or pipe bursts, but it also can impact all levels – from water abstraction to billing. Causes are as diverse as they are complicated to identify and measure, making NRW a major topic to ensure the future of resilient utilities.

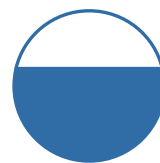
Highlighting the impact of non-revenue water

Current data indicates that non-revenue water has a significant economic impact; on average, 33%², or between 20 to 50% of water in distribution infrastructures, is lost due to leakages in the aging infrastructure at most utilities.

Why do leaks occur?

Physical losses, referred to as 'real losses,' are the annual volumes lost through all types of leaks, bursts, and overflows on mains, service reservoirs, and service connections, up to the point of customer metering.

The most problematic leakages are those that are not visible on the surface. The reason for the leakages are numerous and can include individual or combined factors, including poor installation, accidental damage, corrosion or aging infrastructure, water hammer, earth movements, theft, and many more.



On average 33% of water is lost in distribution infrastructure



Across the globe, millions of people lack reliable access to clean water, with over half of the planet's 7.8 billion inhabitants not having access to enough water for at least one month of the year.³

² Bill Kingdom, Roland Liemberger, Philippe Marin "The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help: A Look at Performance-Based Service Contracting"

³ Mesfin M. Mekonnen & Arjen Y. Hoekstra: "Four billion people facing severe water scarcity"

Solving water loss for life



Preserve what is precious

What if you could save 77 liters of water per day? This is the amount of non-revenue water per capita which is lost down the drain.¹

77 liters
per day



Smart asset management

Complete traceability of your underground assets and documentation. Easy identification from raw material to the final product.



Water
produced

—



Water
billed

=



Non-revenue
water



Make a difference

In the US a 5% reduction of water leakage can save up to 225,000 metric tons⁴ of CO₂ annually, the equivalent to the annual CO₂ emissions of 14,000 US citizens.⁵

225,000
tons of
CO₂

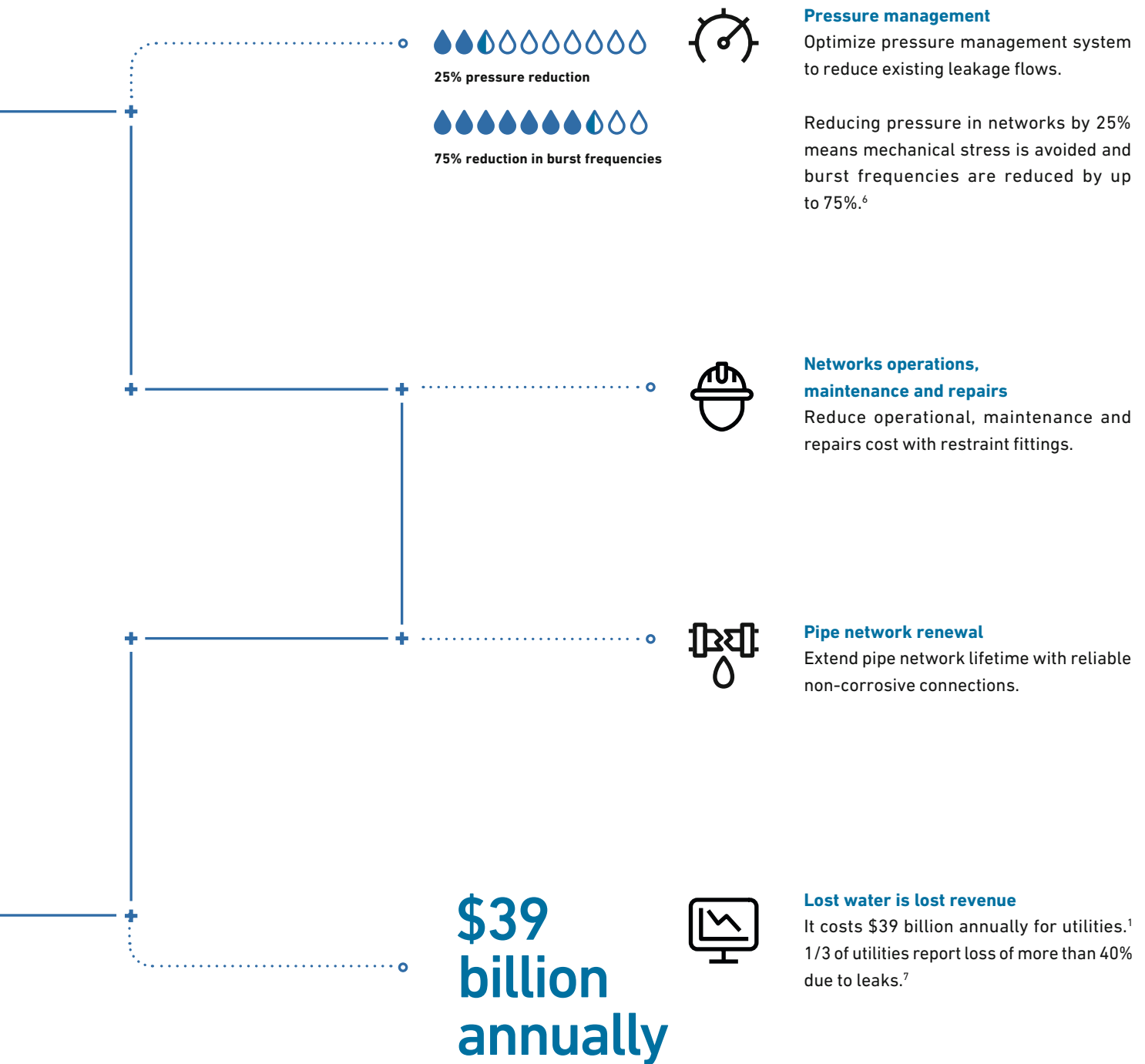
⁴ Bevan Griffiths-Sattenspiel/Wendy Wilson. "The Carbon Footprint of Water"

⁵ Crippa M, Oreggioni G, Guizzardi D, Muntean M, Schaaf E, Lo Vullo E, Solazzo E, Monforti-Ferrario F, Olivier J.G.J., Vignati E, "Fossil CO₂ and GHG emissions of all world countries"

⁶ EU Reference document" Good Practices on Leakage Management WFD CIS WG PoM"

⁷ About Energy-Recovery Turbine for Water Pipes: "Periodic Reporting for period 1 - Pydro Turbine"

Our technology is about delivering the right tools, fittings, know-how and sufficient pressure at any point in the network, at any time.



Your benefits

Preserving what is precious



Water scarcity

Today, freshwater accounts for only 2.5% of the Earth's total water supply,⁸ with more than two-thirds contained within glaciers and permanent snow cover or ice.

2.5% freshwater

⁸ Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick "Water in Crisis: A Guide to the World's Fresh Water Resources"

We strive to conserve natural resources both in our daily business and in how our products are used in customer applications. By focusing on our core competence – water treatment and the safe transport of liquids – we help to ensure that the valuable resource water is used economically.

GF Piping Systems provide innovative products and solutions to help solve water loss and reduce non-revenue water for utilities. State-of-the-art pressure management technologies and long-lasting, corrosion-free polyethylene (PE) plastic piping solutions can help utilities mitigate the worldwide loss of drinking water due to leakages in aging infrastructure.

We are protecting over-pressurized piping infrastructure while delivering stable flow capacity, testing the leak tightness of piping joints using Ultrasonic Non-Disruptive-Testing capabilities, and reducing corrosion with engineered plastic solutions.

Whether combined or individually applied, our goal is to use our pioneering technology and domain expertise to help reduce the estimated USD 39 billion of non-revenue water lost annually¹ and solve water loss for life.



Water loss prevention

Quality provides security and is the basis for trust. Protect your water distribution network from excess pressure and reduce leakage rates and pipe bursts, with high quality engineered solutions.

To help address the growing challenge of non-revenue water, GF Piping Systems enables water utilities to identify opportunities that help improve water network performance across their operations, deliver on water loss reduction goals, extend network life and reduce operational, maintenance, and repair costs.

We use state-of-the-art technology to optimize pressure management, reduce and repair leakages, extend the operational life of networks and provide domain expertise that helps create complete harmony and prevent water loss within utility water distribution networks.

A wide range of valuable benefits

A water loss prevention program helps to mitigate urban water loss and therefore reduce non-revenue water. It can also lead to other important benefits for the water utility and its consumers:

- Reduced stress on the area's water resources, allowing more effective and efficient use of water sources
- Reduced energy consumption for abstraction, treatment, and distribution while still meeting the same demand for water supply
- A more stable water supply as improved performance will provide full pressure distribution 24 hours a day, seven days a week
- Better support for decision-making and customer service due to new management systems
- A strong basis for setting up a long-term rehabilitation and investment plan for the network
- Improved water quality due to optimized water distribution as chlorine content in the distributed water will be better controlled and the risk of pollution related to burst and periods with low pressure or vacuum will be reduced

From planning through to operation and beyond

Solving water loss affects all aspects of the water cycle

As a leading global water technology company, our goal is to solve critical water and infrastructure challenges through innovation. Helping communities globally, we optimize resource and water management, improve water security, and build a more sustainable world. GF Piping Systems serves customer's water needs from utilities to industrial, commercial, and other end-users of water.

By developing highly engineered products and industry-leading technologies, we create solutions that span the water cycle. Our wide array of products and specialized solutions — the most comprehensive in the industry — enable our customers to address their water network performance challenges.



1. Ultimate asset management

Eliminate paperwork, save time, reduce cost and optimize your workforce by registering the precise position of all your components and monitoring the installation progress and quality in real-time with the Track and Trace smart digital asset tool.

2. Specialized education

Instructional courses and on-site support in the local language can help you to teach your customers or installers essential knowledge for the jointing of pipes and piping components.

3. Increased installation quality

Electrofusion couplers, especially with the patented active reinforcement principle (pipe-in-pipe), welding machines, and Ultrasonic NDT (Non-Destructive Testing) provide leak-free and safe installations.

4. Pressure management

Reduce excess consumption, existing leakages, and unnecessary mechanical stress to conserve precious water resources and lower your networks' carbon footprint.

5. Extend lifetime, reduce carbon footprint

PE systems are corrosion-free, weatherproof, UV-resistant, and remain impact-resistant under all climatic conditions, including earthquakes. Reduce the risks of breaks and leaks, keeping the water supply continuous.

6. Safe and flexible trenchless laying

The material-specific flexibility of the PE systems allows trenchless laying. Reduce construction times, costs, and avoids damaging the infrastructure, like cutting roads, increased traffic jams, noise, and pollution in urban areas.

7. Rehabilitate your network

Fast and easy repairs with MULTI/JOINT fittings, compatible with any piping material, offer a wide range for restraint and non-restraint connections.

Rehabilitation of water distribution networks

Solving water loss or reducing non-revenue water requires a long-term rehabilitation strategy for the network. Once constructed, water distribution networks are often continuously adjusted to urban development and new regulatory requirements for drinking water supply. Pipe materials, pressure regulating valves and fittings, and construction methods have also changed over time, and the potential to upgrade to the best available technologies is often quite significant.

Easy and fast installation emergency repair, maintenance, and compatibility with restraint fittings

One hundred twenty-six billion cubic meters of drinking water, which is twice the average final discharge of the Rhine river, are lost into the ground each year around the world due to broken pipes. Proven repair, maintenance, and retrofit solutions suitable for all pipe materials are cost efficient, can prevent water loss for utilities, and contribute to a more sustainable approach to water management.

GF Piping Systems offers various solutions for repair, maintenance, and rehabilitation of all sorts of pipes. Whenever a water leak occurs due to a crack, the repair must be done quickly and efficiently so that the consumers and surroundings experience a minimum of disturbance. As most cracks occur without any prior notification, it is of the greatest importance that the repair products are available ex-stock either at the waterworks, the contractor, or as a minimum at the wholesaler. The repair products must have multi-functionality, flexibility, and wide tolerances. Furthermore, the key demands when conducting repairs are easy and fast installation and reliable functionality. GF Piping Systems offers a comprehensive range of products specially designed for all sorts of bursts and leaks for all common pipe materials for all these specific purposes and demands.

The MULTI/JOINT® 3000 Plus system comprises a wide range of restraint and non-restraint fittings, flange adaptors, reduction pieces, bends, duck foot bends, and end caps in the ranges DN50 - DN825, dedicated and multi tolerance for any pipe and pipe material.



33% drinking water loss worldwide



Pipe networks renewals - Corrosion-free and reliable connection

33% of the world's drinking water is lost due to leakage in the aging infrastructure. The majority of water networks are made of steel, which corrodes. Corrosion results in incrustation, reducing flow and polluting the medium. Furthermore, corrosion reduces wall thickness, causing holes and pipe bursts, leading to expensive damage and water loss.

Using electrofusion to connect PE pipes provides a safe, systematic, economical, and efficient installation for your piping networks. The added value of ELGEF Plus is the system's modularity, and the corrosion-free PE100 material means your networks will have a lifespan of at least 100 years and will stay maintenance and leak-free.

PE welds do not leak as they are fused using butt - or electro-fusion to make a single piece and are weatherproof, UV-resistant, and remain impact-resistant under all climatic conditions. Reliable jointing connection with ELGEF Plus electrofusion couplers ensure perfect welding based on the proven technology of patented active reinforcement principle for large dimensions and are extremely easy and fast to install.



Pressure management – anti-aging for your water network

Effective pressure management contributes to minimizing the loss of the scarce resource of drinking water. Improved pressure control presents dual benefits of reducing leakages and stabilizing system pressures, which increase asset life.

Most pipe bursts occur not only because of high pressure but rather due to ongoing pressure fluctuations that force the pipe to expand and contract continually, resulting in stress fractures.

It's possible to conserve precious water resources by implementing pressure management. Reducing system pressure by 20% reduces flow rates of existing water leaks by 20%¹ or only 1% reduction in average pressure reduces burst frequencies by 1%⁹. It also helps optimize leak detection, construction of new asset networks, and disruptive repair tasks.

The burst pipe networks need to be repaired, or even better, the bursts need preventing. Pressure management technologies are widely considered as one of the most effective methods to reduce non-revenue water. They reduce the flow rates of existing leaks and limit unnecessary mechanical stress on the infrastructure, resulting in lower burst rates and prolonged asset life. Water is conserved, and network durability can be increased. Water networks are repairable: up to 75% of pipe bursts are avoidable, helping to decrease excess pressure by just 25%.¹

A sound non-revenue water strategy with intelligent use of pressure management can help in saving energy and create buffers by conserving water. By reducing water loss, less water needs to be treated and pumped through the system. Consequently, the energy needs decrease efficiently. In the US alone, a 5% reduction of water leakage can save up to 225,000⁵ metric tons of CO₂ annually, the equivalent to the annual CO₂ emissions of 14,000⁶ US citizens.

Benefits of stable pressure:

- Reduced detect and repair activity
- A calm network for Operations and the Customer
- Increase asset lifetime
- Lower carbon footprint – Increases sustainability impact
- Reduced bursts
- Reduced leakage recurrence
- Reduced number of unscheduled network events

Benefits of low pressure:

Pressure management is one of the fundamental elements of a well-developed leakage management strategy. The leakage rate in water distribution networks is related to the pressure applied by pumps or by gravity. There is a physical relationship between leakage flow rate and pressure, and the frequency of new bursts is also a function of pressure:

- The higher or lower the pressure, the higher or lower the leakage
- The utility managers should initially assume a linear relationship (10% less pressure = 10% less leakage), 30% pressure lower = 30% fewer water losses. The relationship depends on multiple factors for a particular network; still, in some cases, the effect of pressure reduction could even give a higher flow leakage reduction (see the chart as reference).

⁹ Allan Lambert. About Leakage reductions: The fundamental role of pressure management

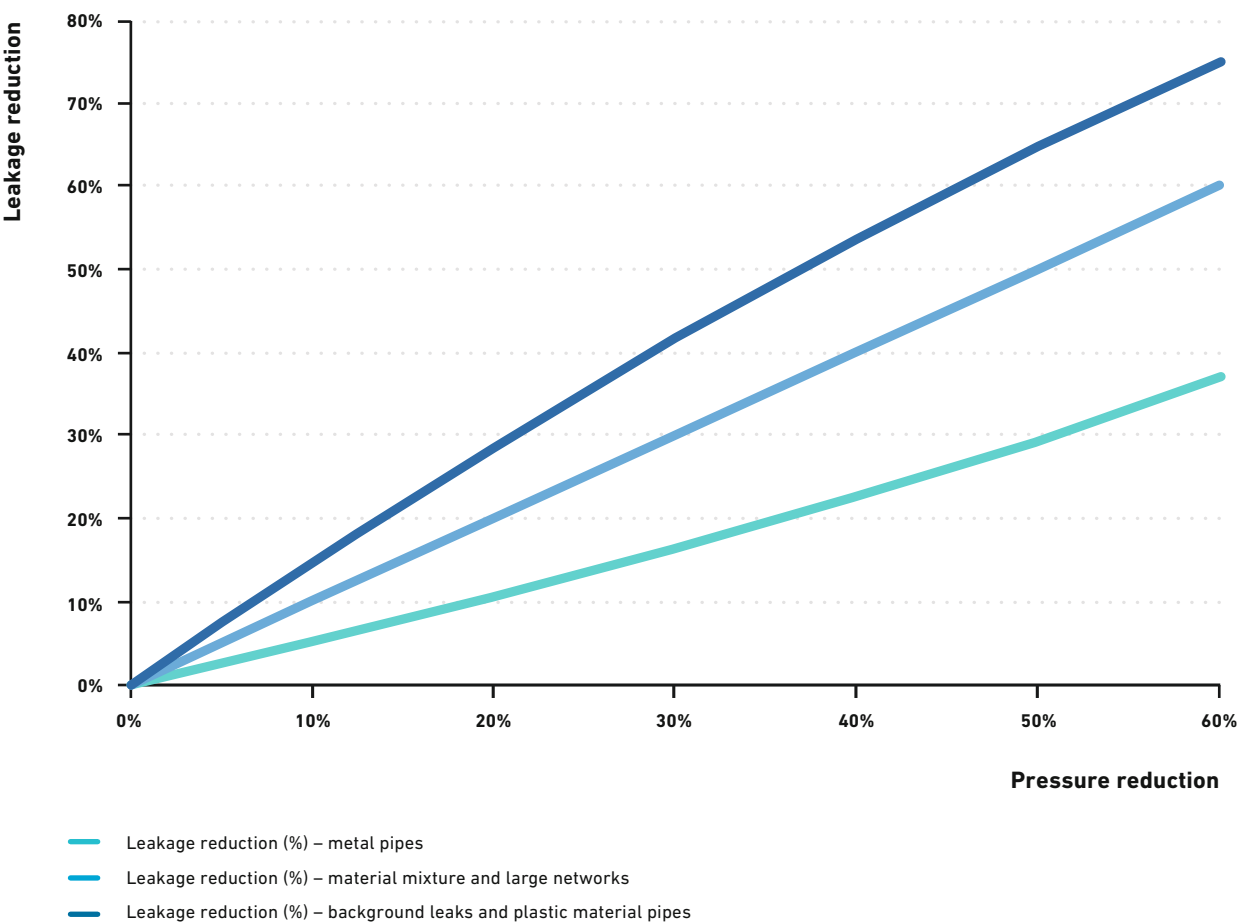
Retrofitting existing water networks with intelligent pressure management systems helps avoid leakages and lost water.

Installing a pressure control device, such as a pressure-reducing valve (PRV), helps reduce pressure throughout the day, stabilize fluctuations, and reduce stress on pipes. Several methods for reducing pressure in the system include variable speed pump controllers and break pressure tanks. However, the most common and cost-effective is the pilot controlled pressure reducing valve.

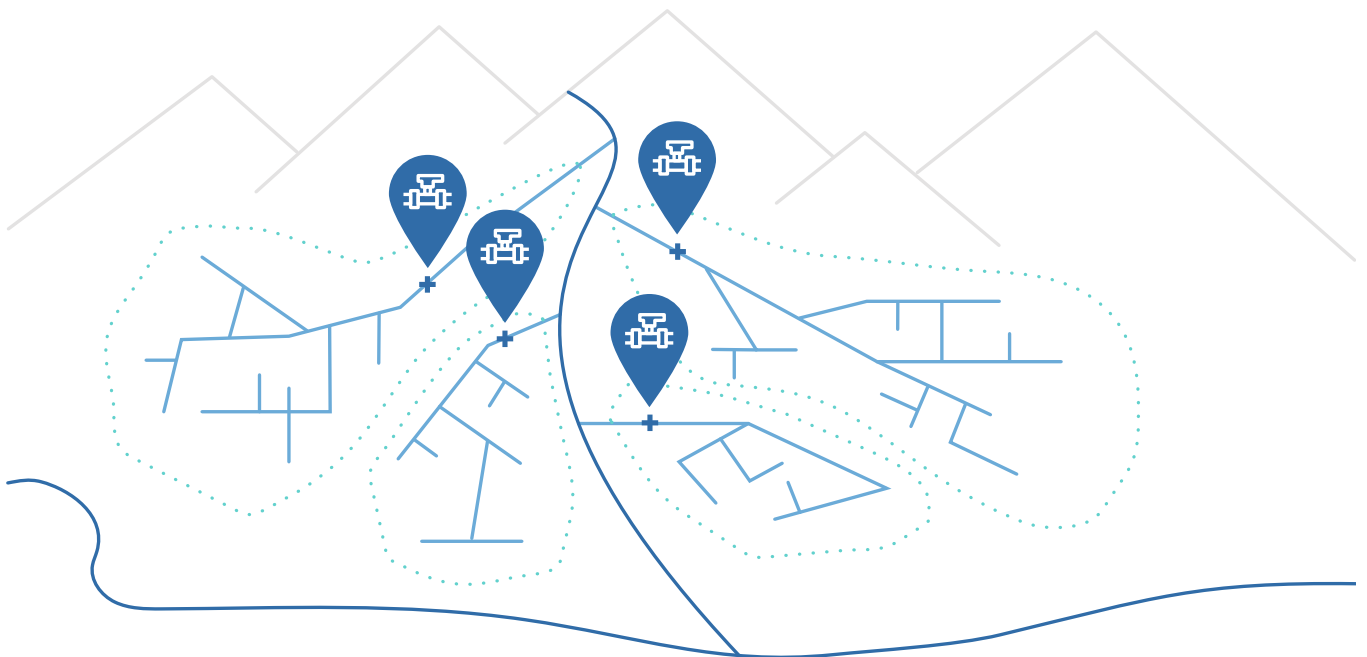
PRVs are installed at strategic points in the network to reduce or maintain network pressure at a set level. Usually sited at the entrance of a pressure zone, next to the flow meter, the valve keeps the pre-set downstream pressure regardless of the upstream pressure or flow-rate fluctuations. The PRV should be downstream of the meter so that turbulence from the valve does not affect the meter's accuracy.



Leakage vs pressure reduction



Pressure management with compact, intelligent, and low maintenance PRV



Pressure management is considered the single most beneficial, essential, and cost-effective leakage management activity. Based on the district metering area (DMA), a defined area with only one inlet for water flow, the aim is to reduce pressure within the area to a minimum without affecting the consumers.

Another aspect is that when the water consumption is low, the pressure in the network increases to the maximum adjustable pressure. When water is consumed, the pressure drops or fluctuates according to consumption. These issues are essential to obtain a comprehensive understanding of water consumption. It means that the pipes are constantly exposed to a variable pressure which will eventually wear out the pipes and cause a rupture. Critical points need establishing to control and vary the water pressure utilizing a control valve in pressure management.

A critical point is a decisive place within the DMA in water supply; it could be an apartment building with the need to deliver water to the top floor or a larger water-consuming industry like a brewery, dairy, or the like. Such critical points can be prioritized according to the daily routines or other parameters important to supply safety. Therefore, the critical points regulate the pressure level in the DMA. One of the major factors that influence the leakage rate is high pressure in the distribution system, and thus, lowering the pressure will save water. It is possible to avoid fluctuating pressure in the distribution system by controlling it at the inlet. The critical points in the DMA observe the pressure and will constantly send signals to the control valve that will automatically adjust the pressure accordingly.

GF Piping Systems offers smart and extremely accurate, and stable pressure regulation under any flow conditions. The NeoFlow Pressure Regulating Valve protects your water distribution network from excess pressure and reduces leakage rates and pipe bursts.

NeoFlow is a state-of-the-art pressure management valve that can prevent your pipes from over-pressurizing while delivering accurate, stable flow and increased flow capacity for utilities. NeoFlow is up to nine times lighter and can decrease installation time by up to 40% compared to standard metal PRVs, thanks to its compact and lightweight polymer body design. Fully customizable, this integrated intelligent valve optimizes pressure regulation in the most cost-efficient way.

Available with an additional pre-fabricated integrated plug and play solution, NeoFlow ensures long-lasting, hassle-free operation even in the tightest manholes.

9x lighter than a standard metal PRV

40% less time to install than a standard metal PRV

5x more compact than a standard metal PRV



We work smarter

Our innovative approach to asset management means that we can monitor a system and measure performance in a way that we have never been able to before.

Track and Trace - Field data collector

In addition to the daily non-revenue water management, successful NRW reduction requires a long-term rehabilitation strategy for the network. The Track and Trace smart digital asset tool is all you need to fully trace your fittings, assets, and valves. The powerful digital tool is an asset management system with a user-friendly mobile app and web portal that provides full traceability for all assets in the water pipe network. Helping to eliminate paperwork, save time, reduce cost, optimize your workforce, and monitor the installation, including traceability of pipe components, welding quality, and GPS positioning of joints.

A cloud-based field data collector for piping systems, Track and Trace full documents all installed fittings, and supports you with a wide range of online functionalities and information. Helping you streamline your decision-making processes and provide your team with product and process data, registering the precise position of all your components, and monitoring the installation progress and quality in real-time.

Track and Trace monitors more than 10,000 assets underground each year, and can help you experience a 15% rise in productivity in just 90 days! Digital transformation of your worksite is easier than you might think, with tools and technology you already have in your hand. Worksite statistics are available any time, meaning trips to job sites can be reduced by at least 30%.



Virtual reality training

GF Piping Systems is pioneering virtual reality training modules that ensure installers can master installation techniques related to our portfolio in a safe environment without wasting materials. With each module, your team of installers can become better prepared for the experience of being on-site or in the trench, installing our world-leading piping systems.



How we're already helping to solve water loss globally

No matter what requirements you have or what digitalization stage you are at, GF Piping Systems can support you in delivering the right technology, tools, fittings, know-how, and sufficient pressure at any point in the network, at any time.



Ultrasonic NDT: Extended weld warranty when passing the "Fit for Service" report

GF Piping Systems supported Belgian water utility FARYS with installing the ELGEF Plus electrofusion system using trenchless installation techniques combined with Ultrasonic NDT that minimized the risks at reduced construction costs.



PE fittings for green utility

GF Piping Systems supported the Finish utility, Helsinki Region Environmental Services Authority (HSY), to operate a reliable water supply system while complying with stringent environmental objectives. GF Piping Systems provided data on the CO2 footprint of ELGEF Plus fittings, PE systems that highlighted the reduction in CO2 emissions by more than 80% when compared to metal systems.



80% CO2 emission reduction



7000
houses



Ecological energy from the lake / sustainable heating and cooling energy network

To meet the requirements of a sustainable energy policy, Swiss municipality EWL is using ecological energy from Lake Lucerne as a sustainable heat carrier for heating and cooling of 7,000 households. Additionally, they are saving up to 10,000 tons of CO2 per year with help of ELGEF Plus couplers with active reinforcement and prefabricated fittings to save valuable installation time and costs.

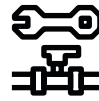


10,000
tons
of CO2



Making your global footprint sustainable

GF Piping Systems is supporting Brazilian water and waste management utility SABESP with its water distribution loss program. By providing reliable ELGEF Plus PE piping systems to replace 761 km of networks, the utility has lowered water losses to 30%. So far, this has resulted in an annual water saving of 75 billion liters in the Sao Paulo region, which is equivalent to 8% of Switzerland's annual drinking water consumption.



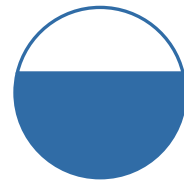
761 km of replaced networks



75 billion liters saved



8% of the annual water consumption in Switzerland



Water loss reduced to 30%



60% reduction



Networks without compromises

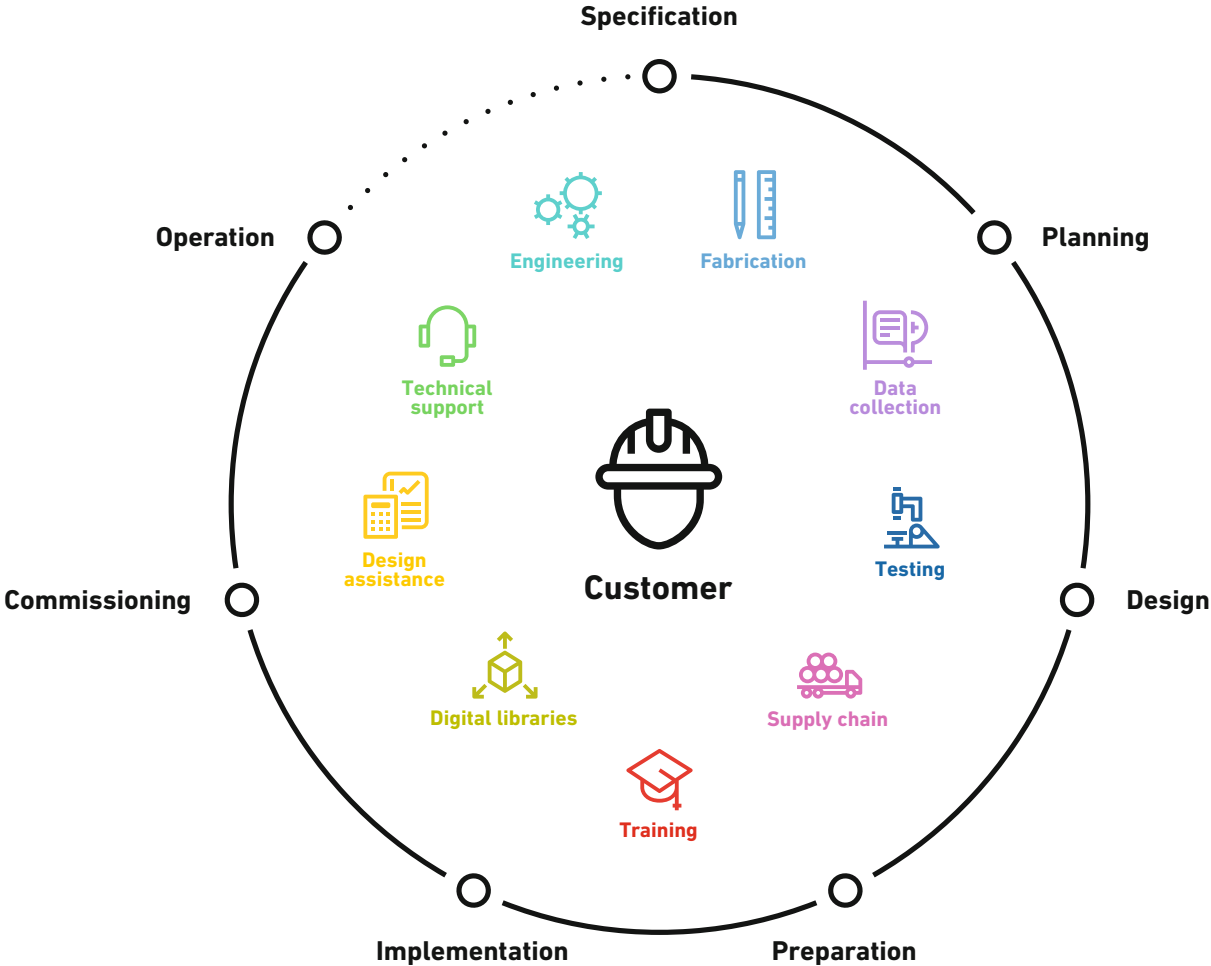
Italian water utility IRETI faced challenges with non-revenue water and with its associated maintenance and asset lifetime. To combat NRW, the reliable and innovative pressure management solution NeoFlow PRV and an effective pressure management system have reduced pipe bursts by more than 60% while decreasing water leakages.



Specialized insight

Lahti Aqua, a Finnish municipal provider of water services (drinking and wastewater), was looking for a deeper understanding of the estimated lifetime left for their piping installations. Thanks to GF's pipe condition assessment they could avoid replacing up to 20 km of their piping network a year.

One partner from planning to commissioning



Ready when you are

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.

Condition analysis

The integrity of a piping system is essential for water utilities. Ultrasonic NDT (Non-Destructive Testing) provides testing options at the point of installation, while Pipe Condition Assessment can be employed during operation to acquire real data about the state of piping systems.

Training

Instructional courses can help you to teach your customers or installers essential knowledge for the welding of pipes and piping components, as well as an in-depth understanding of butt and electrofusion connections. With Specialized Education, we help prevent damage, with well trained and qualified installers and provide you with on-site support in your local language.

Custom Product Design and Prefabrication

Focusing on your individual needs and application, GF's customizing teams forge tailored solutions, developing custom-made parts to complete systems or special solutions produced in small series, individual consulting, and off-site prefabrication. Through our global network, we offer a wide range of comprehensive solutions. Tailored innovation, inspired by you.

More information at

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

gfps.com/solvingwaterloss

Local support around the world

Visit our webpage to get in touch with your local specialist:

www.gfps.com/our-locations



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