Amiblu®
Sustainable Water Solutions

Glassfiber reinforced plastics (GRP)

A sustainable material challenging the traditional market

FLOWTITE® HOBAS®

Amiblu Pipe Systems
Engineered for the next 150 years

Glassfiber reinforced plastics - GRP

A sustainable material challenging the traditional market

Today's life without glassfiber reinforced plastics would be difficult to imagine. Discovered for industrial purposes around the beginning of the 20th century, the material has initially been used for insulating houses. Further applications quickly evolved, and today the material is commonly used in the aerospace, automotive, marine, and construction industries.

What it's made of

Glass(fiber) Reinforced Plastic (GRP) is a composite material that consists of a polymer matrix and glass fibers. The polymer matrix is usually an epoxy, vinylester, or polyester thermosetting resin. The resin brings the environmental and chemical resistance to the product, is the binder for the fibers in the structural laminate and defines the form of a GRP part. The glass fibers add strength to the composite. They may be randomly arranged, or conveniently oriented. The most common type of glass fiber used for GRP is E-glass, which is alumino-borosilicate glass. E-CR-glass (Electrical/Chemical Resistance) is also commonly used in applications that require particularly high protection against acidic corrosion.

Why it's so strong

As with many other composite materials, the two materials supplement each other to form a stronger compound. Plastic resins are strong in compressive loading; the glass fibers are very strong in tension. By combining the two materials, GRP becomes a material that resists both compressive and tensile forces very well. Production methods of GRP include filament winding, centrifugal casting, hand lay-up and spray lay-up, and pultrusion.

What the superior advantages are

GRP features many beneficial characteristics. It comes with low weight at high mechanical strength, resistance against chemicals and corrosion (thanks to its non-conductive properties also electrolytic corrosion), UV radiation and temperature stability, and environmental friendliness. GRP is waterproof, making it ideal for all outdoor applications. It can be customized to be fire-retardant by using non-flammable resins. GRP is a highly durable material with a very long lifetime expectancy, ideally suited for a wide range of applications in various industries.

GRP in pipeline construction

Since the 1950s, GRP has gained a firm foothold in the construction of pipelines. The range of applications covered by GRP piping solution today is broad: from sewer systems and potable water lines to storage tanks, drainage pipes, hydropower penstocks, industrial pipe systems, as well as rehabilitation solutions with special non-circular pipe profiles, to name just a few. The methods by which the pipes can be installed are just as manifold and include open trench, above ground, on suspensions, underwater, and by means of trenchless technologies such as relining and microtunneling.

GRP pipes by Amiblu are produced by filament winding (Flowtite technology) or centrifugal casting (Hobas technology). In both methods, sand and fillers are added to the fiber-resin composite to build a sufficient wall thickness and thereby increase the strength and stiffness of the pipe. The filament winding process employs continuous and chopped glass fiber reinforcements, that are applied onto a rotating, advancing mandrel in circumferential direction. The pipe is thereby formed from the inside outwards. In centrifugal casting, the pipe wall is built from the outside inwards in a rotating mold. The raw materials, including chopped glass fibers, are subsequently fed into the mold by means of a feeder arm moving forward and backwards. Either process results in a GRP pipe with defined characteristics, which prevail over other pipe materials in various aspects.

- Reliable operational service life of over 150 years
- Global use and acceptance by major water and sewage authorities all around the world
- Fully automated production process, allowing for each pipe to be manufactured with the specific properties required for its application and operation demands
- High stiffness classes available (e.g. for areas with weaker soils)
- Light weight and convenient length. GRP pipes weigh only 1/4 of ductile iron pipes and 1/10 of concrete pipes. This leads to considerable savings through reduced transport, nesting, handling, and installation costs
- Lower surge and water hammer pressure due to low surge wave celerity
- Corrosion resistance over a wide pH range
- No electrolytic corrosion. GRP pipes require no cathodic or other type of protection
- Ability to withstand high longitudinal compressive loads (2-3 times higher than concrete) that occur during pipe jacking
- Low coefficient of thermal expansion
- Excellent hydraulic flow characteristics. Smooth internal pipe surface, resulting in significantly lower friction than with other materials

What is sustainability?

The World Commission on Environment and Development defines sustainable development as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs".

For complete sustainability, society, environment, and economy must work together. All three factors overlap, they interact, and if any of them is weak, a system cannot be sustainable. We therefore need to look at the many different forces, processes, and actors that shape a system in a holistic way and understand how they influence each other. Compared to other materials, the production of GRP is exceptionally benign and sustainable. This is because the production of base resins and fiber rovings have a much smaller environmental impact than metals like steel. Thanks to the material's very long lifetime expectancy, supreme quality, and environmental friendliness, GRP products are solutions for generations and contribute to each of the three pillars of sustainability.

Environmental sustainability
is the ability to keep renewable resource use, pollution, and non-renewable resource depletion at levels that don't harm the future of our planet. This pillar of sustainable development must be given top priority: It's a prerequisite for both social and economic sustainability.

Economic sustainability
is the ability to support a defined level of economic production indefinitely. It is, in other words, the process of allocating and protecting scarce resources, while ensuring positive social and environmental outcomes.

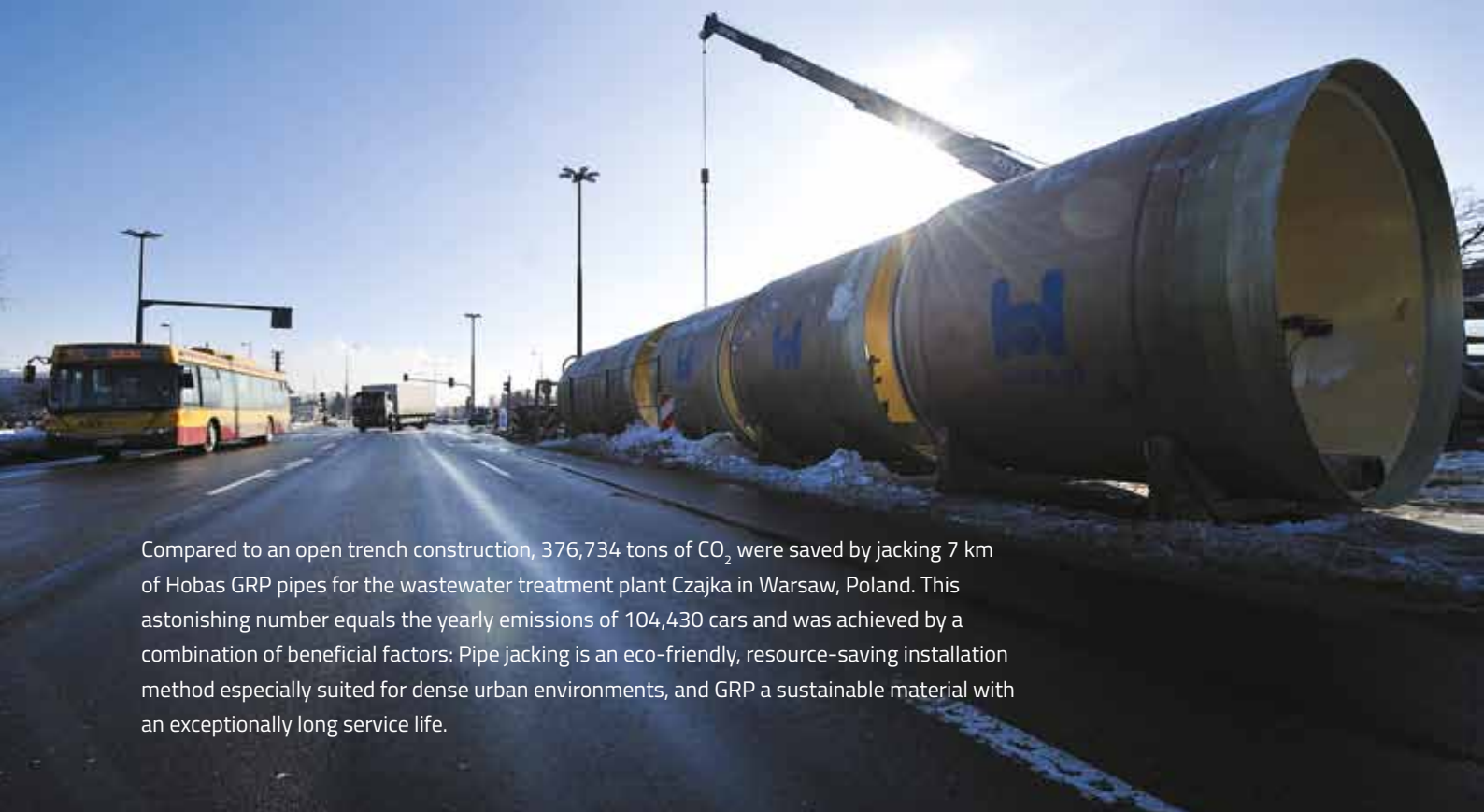
Social sustainability
is the ability of a social system, e.g. a country, to maintain a defined level of social wellbeing indefinitely. Future generations should have the same or greater access to social resources as the current generation. Furthermore, there should be equal access to social resources within a generation.

Environmental sustainability of GRP

In general, plastics are assumed to be unsustainable for the environment. PVA and PVC for example break down very fast in outdoor environments and pollute the ground through their quick absorption into the earth.

The thermosetting resins used in GRP are far stronger and more durable than other plastics: Most GRP products have a lifespan of more than 50 years, Amiblu pipes even last for more than 150 years, which results in the product being considerably better for the environment. At the end of its lifecycle, GRP waste can be shredded and transported to e.g. cement plants to be energetically recycled in a furnace, thus replacing fossil fuels.

GRP pipes are sustainable in manufacturing, transport, and installation. They feature a small carbon footprint in production, low transport costs, and allow for a fast installation and efficient operation. They easily tackle all kinds of challenges such as soil and traffic loads. GRP pipes preserve resources and protect the integrity of networks thanks to their excellent leak-tightness under external and internal pressure, corrosion and abrasion resistance, weather and root infiltration resistance, as well as buckling resistance.



Compared to an open trench construction, 376,734 tons of CO_2 were saved by jacking 7 km of Hobas GRP pipes for the wastewater treatment plant Czajka in Warsaw, Poland. This astonishing number equals the yearly emissions of 104,430 cars and was achieved by a combination of beneficial factors: Pipe jacking is an eco-friendly, resource-saving installation method especially suited for dense urban environments, and GRP a sustainable material with an exceptionally long service life.

Economic sustainability of GRP

The long lifetime and durability of GRP products such as Amiblu pipes and fittings prove beneficial with regard to business budgets: They are a trouble-free long-term investment and a cost-effective solution for all shareholders involved in a project. GRP products save time and money in that they do not require any heavy lifting gear or on-site welding works, feature an exceptionally long and generally maintenance-free service life, and a low lifetime cost.

In the case of GRP pipes, the designer benefits from the pipes' low coefficient of thermal expansion, and if necessary high angular deflection with specially designed flexible joint system for optimizing the pipe route without bends and thereby saving costs. Building contractors profit from the pipes' light weight, their quick and easy jointing, the ability to accommodate small misalignments or settlements, and the uncomplicated installation with trenchless technologies such as relining and microtunneling. Operators enjoy a low-maintenance product with a service life of more than 150 years, minimum consumption of resources, and maximum energy output for e.g. hydropower.

Customized design for most efficient pipe routing

+ Fully automated production process
+ Pipe nesting (pipe-in-pipe) for economic transport
+ Low weight for low transport costs, easy handling, and no need for heavy machinery on site
+ Quick and easy pipe jointing without additional equipment or welding
+ Compact wall thickness for less excavation material at the same inner diameter
+ Outstanding hydraulic characteristics for same flow rate as other materials at smaller diameter
+ Maintenance free service life
+ Lifetime of over 150 years

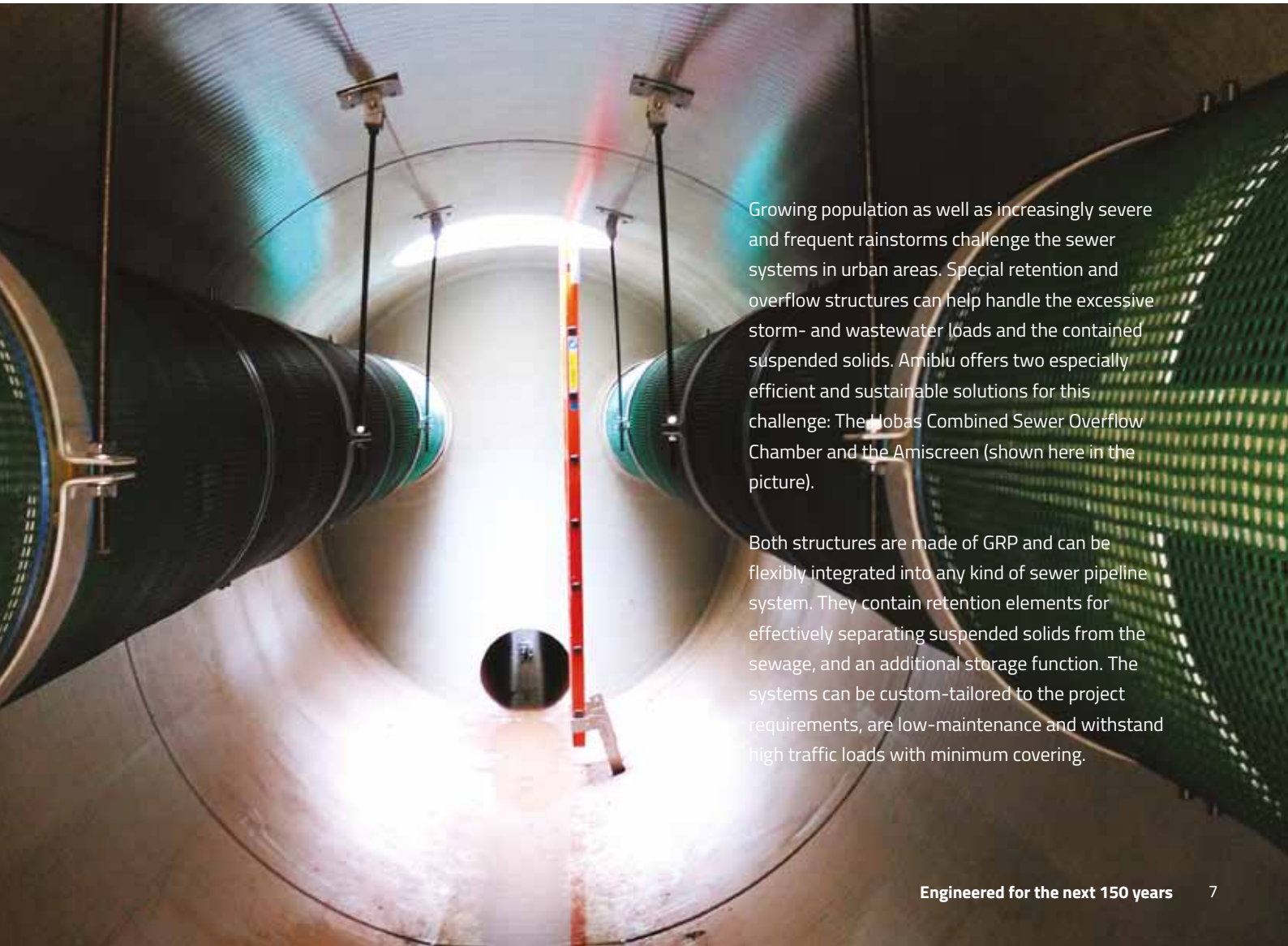
= **Economically the best solution over the entire product life cycle**

Social sustainability of GRP

GRP products and production technologies are designed to meet the demands and abilities of present and future generations.

Being an extremely durable material, GRP is used in a variety of socially relevant applications including among others the automotive and aerospace industry, water and wastewater engineering, housing, construction yards, railways, and sports equipment. It can withstand poor weather conditions with minimal suffering and has a long-life expectancy, regardless of wear and tear.

The contribution of GRP pipes to society and social development is also remarkable: They ensure the secure transport and availability of water, play a significant role in agriculture and industry (the biggest users of water), they form leak-tight sewer networks and help manage floods and droughts through water storage and retention tanks as well as customized solutions for wastewater treatment plants. GRP hydropower solutions generate clean and renewable energy for generations to come. When installed by no-dig technologies, they significantly reduce disturbances from noise, dust, and road closures in cities while providing a structural long-term solution. GRP pipes can be equipped with real-time monitoring systems that improve water and wastewater management and help detect leakages .



Growing population as well as increasingly severe and frequent rainstorms challenge the sewer systems in urban areas. Special retention and overflow structures can help handle the excessive storm- and wastewater loads and the contained suspended solids. Amiblu offers two especially efficient and sustainable solutions for this challenge: The Hobas Combined Sewer Overflow Chamber and the Amiscreen (shown here in the picture).

Both structures are made of GRP and can be flexibly integrated into any kind of sewer pipeline system. They contain retention elements for effectively separating suspended solids from the sewage, and an additional storage function. The systems can be custom-tailored to the project requirements, are low-maintenance and withstand high traffic loads with minimum covering.

Why there is nothing else like an Amiblu pipe system

Engineered for the next 150 years

Service-focused partners to solve your problems

Innovation to challenge the status quo

Amiblu®

Explore more on **amiblu.com** or contact your local partner for sustainable water solutions.