The latest news fresh from the pipeline 2019 | 11

Amiblu® Stream

150 years lifetime of GRP pipes: Expert talk with Högni Jónsson

GRP pipes ready for takeoff: Flowtite penstock in Norway

Flowtite GRP pipes up in the air, on their way to being installed for the hydropower plant Breivikelva in Norway. Read more about the project on pages 4/5 .

Amiblu® Stream

Pipes designed for generations

Pierre Sommereijns, CEO Amiblu Group

Those who make bold claims must prove their credentials. That's a law of nature and, in a world where it's often hard to distinguish between real and fake news, increasingly important. Amiblu is among "those": we claim that our pipes have an operational lifetime of 150 years. But who could ever say they have witnessed such a pipe's life? It takes about five human generations to do so. And besides: Amiblu itself has barely lit the 60th candle of its birthday cake. So where's the proof?

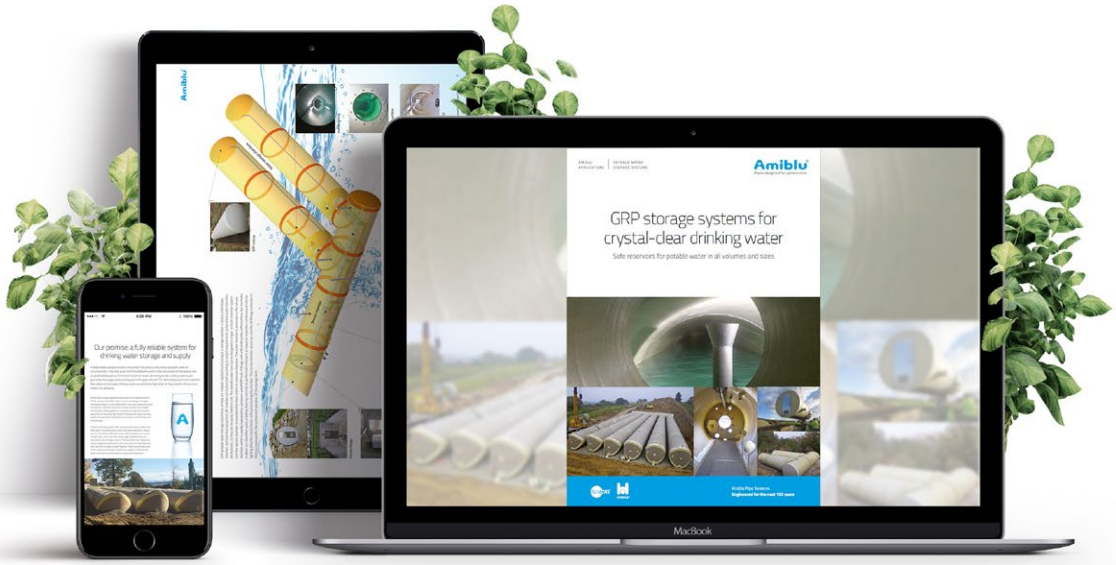
We can in fact provide evidence, and that's thanks to our dedicated team of GRP experts working and researching in Amiblu's certified laboratory in Norway. They literally put our pipes to the acid test, simulating extreme conditions under excessive strain, to then analyze the data and extrapolate them far into the future. These tests are standardized and require a duration of at least 10,000 hours, which is slightly more than one year. We take things far further though: some of our GRP samples are being tested without failure for decades already. But I do not want to anticipate too much – you'll learn everything on how we prove our pipes' extraordinary lifetime from our GRP expert Högni Jónsson on pages 6-9 in this Amiblu Stream magazine.

As usual, this issue also features impressive projects with Flowtite and Hobas GRP pipes as well as Amiblu NC Line from all over Europe. Special highlight is a hydropower project in Norway, where our pipes were spectacularly unloaded from the cargo ship via helicopter – find the case study on pages 4-5. Enjoy reading and learning, and have a peaceful holiday season!

Best wishes from Klagenfurt,
Pierre Sommereijns

New brochure: GRP storage systems for potable water

High-quality, safe, and sufficient drinking water is essential for our daily life. Amiblu offers a wide range of standard and custom-tailored products for the extraction of potable water as well as its storage and supply, thereby providing for a fully reliable system.



Curious to find out more?

Click **HERE** to download our brandnew brochure on GRP storage systems for potable water!

bit.ly/Amiblu-PWT

Sustainable solution for nature protection area

In the south of the Netherlands, a 4000 m long Flowtite pressure pipeline was installed as a bypass during renovation works on an existing sewer channel. The quick and easy construction considerably reduced the work's enviromental impact in the Natura 2000 site.

An aged concrete sewer channel that crosses a sensitive forest terrain and is on the verge to collapse: no time to waste for the city of Eindhoven and the local water board Waterschap De Dommel. The damaged channel had to be urgently renovated. In order to minimize all risks, it was decided to install a reliable bypass line for the sewage as a first and immediate step. Since the affected forest area is listed in the EU's Natura 2000 network, all implemented measures and materials had to be strictly evaluated.

Time was a critical factor, both because of the old sewer's dire condition and the fact that a shorter installation time meant less harmful CO_2 and NO_x emissions by construction machinery. Amiblu GRP pipes provided an ideal solution – they are quick and easy to install thanks to their light weight and the convenient filament wound double-bell couplings. 4000 m Flowtite GRP pressure pipes DN 800 PN 10 were laid in open trench and partly, for the crossing of roads, above ground in up to 4 m height. After four weeks, the new pipeline was ready for operation.

The Flowtite bypass line will stay in place for two to three years. After dismantling, the client Waterschap De Dommel will keep the pipes and use them for further projects. This increases the project's sustainability even further.

PROJECT DATA

Country | City	The Netherlands | Eindhoven
Year of construction	2019
Installation time	4 weeks
Application	Sewer pressure
Installation	Buried & above ground
Technology	Flowtite FW
Total length of pipe	4000 m
Nominal diameter	DN 800
Nominal stiffness	SN 10000
Nominal pressure	PN 10
Client / investor	Waterschap De Dommel
Contractor	GW Leidingtechniek BV
Designer	Kragten BV

Click on the image on the left and watch the Flowtite pressure pipeline being installed in Eindhoven!

bit.ly/Sewer-Eindhoven

From sea to peak: GRP penstock for Breivikelva hydropower plant

1026 m Flowtite GRP pressure pipes DN 1200 are currently being installed as part of the penstock for the new hydropower plant Breivikelva in northern Norway. The challenging geographic conditions called for a special multi-stage delivery approach via ship, helicopter, and trucks.

The municipality of Beiarn is located just north of the Arctic Circle, in the middle of Norway's pristine nature and mountains which offer many outdoor activities to visitors. However, the mountain slopes are not only used for hiking: Since April 2019, a brand-new hydroelectric power plant is being built in Beiarn. Breivikelva hydropower plant is fed by the river of the same name and will have an installed capacity of 9 MW. The penstock was planned in the material combination ductile iron / GRP and Amiblu supplied the required highly durable GRP pipes.

A total of 1026 m Flowtite pressure pipes DN 1200 were transported from the port of Gdynia in Poland to the bay of Beiarn on a cargo ship. Since Beiarn does not have a port, the ship had to anchor offshore and the delivery continued in a really exceptional way: A helicopter lifted the 6 m long pipes one by one and flew them to the storage area close to the building site of the future power plant at the bottom of the mountain. The GRP pipes' light weight and easy handling makes them perfect for helicopter transportation – in fact, the transfer time per pipe was no longer than 3.5 minutes. From the storage area, the GRP pipes are now being moved on to the trench with trucks.

The installation started in April 2019 and works on the hydropower plant are expected to continue until summer 2020, when operations should start. With a head of 305.5 meters and an annual production of 27 GWh, Breivikelva hydropower plant will then produce electricity for approximately 1360 households.

PROJECT DATA

Country | Municipality	Norway | Beiarn
Year of construction	2019/2020
Application	Hydropower penstock
Installation	Open trench
Technology	Flowtite FW
Total length of pipe	1026 m
Nominal diameter	DN 1200
Nominal pressure	PN 20
Nominal stiffness	SN 5000
Client / investor	Salten Kraftsamband AS
Contractor	Fjellbygg AS

Left and below: A helicopter transported the GRP pressure pipes from the ship to the storage area at the bottom of the mountain.

GRP pipes have a lifetime of 150 years. Here's the proof.

"Engineered for the next 150 years": It's quite a bold claim that Amiblu makes about their GRP products. But how can anyone possibly know, given that the company itself is just over 60 years old? We talked to Amiblu Product Development Manager Högni Jónsson who let us in on some interesting research.

Amiblu promises an operational lifetime of one and a half centuries for their GRP products. Where's the proof?

Jónsson: To answer this question, we first need to look at the reasons why most pipes do *not* reach this mature age. These reasons carry names such as Thiobacillus concretivorus and Thiobacillus ferrooxidans – tiny bacteria that decompose sewage and form hydrogen sulphide gas (H_2S). When combined with moist air, the gas forms sulphuric acid (H_2SO_4) which is highly corrosive to materials like concrete, steel, and cast iron. This "microbially induced corrosion" can cause significant damage over time. Corrosion is also a major problem in seawater applications, where the contained sodium chloride eats away at e.g. metals and causes them to fall apart. With GRP products, the situation is quite different.

You're saying that GRP pipes are not affected by corrosion?

Jónsson: Exactly. Plastics are inherently more robust than both concrete and metals in acidic environments. To prove this, we literally put our pipes to the acid test: Several pipe samples are exposed to sulphuric acid (H_2SO_4) for a considerable time, while being subjected to artificially high tensile strains (see Fig. 4). The idea is to simulate the chemical conditions in aggressive sewage, but under an excessive strain in order to cause failure within a reasonable time frame. To determine the pipes' long-term properties, the measured data is analysed statistically and extrapolated into the unknown to predict a limiting strain for use in pipe design.

The test results demonstrate the product performance and reveal a product service life of more than 150 years, including a remarkably high safety margin.

– Högni Jónsson
Head of Product Development and Support
Amiblu Group

***Fig. 1**: Pipelines made of concrete or metals corrode in low-pH sewer environments under the influence of sulphuric acid.*

***Fig. 2**: GRP pipes are inherently corrosion-resistant and feature a long, low-maintenance lifetime also in harsh sewer environments.*

GRP pipe

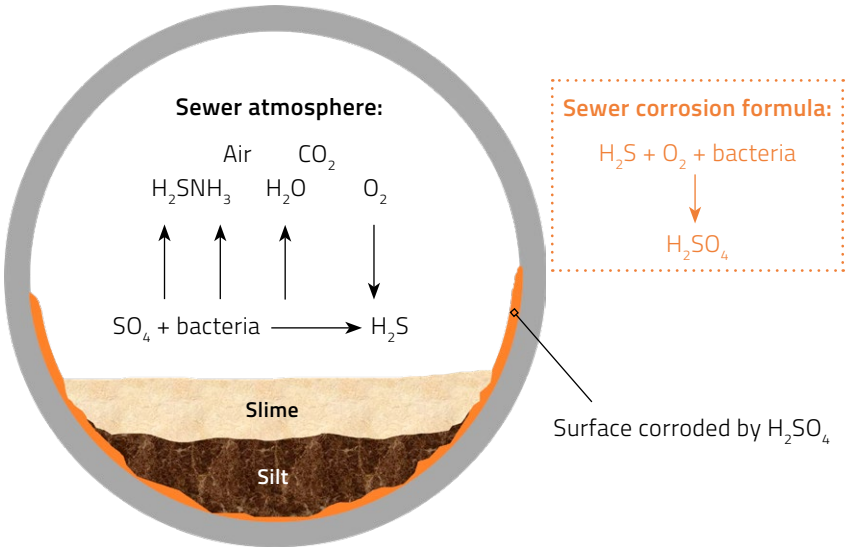


***Fig. 3**: The process of microbially induced corrosion. Slime and silt contain bacteria which break down organic and inorganic sulphur compounds, thereby producing hydrogen sulphide (H_2S). When the H_2S gas comes into contact with the moist surfaces above the water line in the sewer, it can combine with dissolved oxygen (O_2) to directly form sulfuric acid (H_2SO_4). However, most of the H_2S is decomposed into elemental sulfur S, which is a source of energy for the Thiobacillus bacteria family; they are oxidizing the elemental sulfur and their metabolic waste is H_2SO_4. This sulfuric acid lowers the biofilm pH and corrodes concrete, steel, and cast iron.*

Did Amiblu invent this test method?

Jónsson: No. The acid test for GRP pipes was first standardized by the American Society for Testing and Materials in 1978 (test method ASTM D3681) and has been in use ever since. The same procedure is also specified in EN 1120 and ISO 10952. The test method calls for minimum 10,000 hours of testing with at least 18 samples. However, since the test is relatively simple to conduct and does not require much space, a great number of samples have been left exposed to acid for much longer time periods. We studied the results from over 40 years of continuous testing of Flowtite and Hobas GRP pipes, involving more than 1800 test samples.

***Fig. 4**: Strain corrosion tests according to ASTM D3681 in the Amiblu R&D center in Norway.*

This sounds very comprehensive. Please tell us a little more about these samples and the test setting.

Jónsson: Our tests cover a variety of pipe designs which have been in continuous use. The samples, most of them DN 600, were taken from a number of Flowtite and Hobas manufacturing plants. According to ASTM D3681, we subjected each 300 mm long pipe sample to a vertical force causing tensile bending strain in the pipe invert, while exposing it to a 5% concentration of sulphuric acid.

A typical test series consists of 18-25 samples, usually from a single production batch, at various strain levels. The strain is measured after the load has been applied and then the sample is stored under controlled conditions until failure occurs, detectable as leakage through the pipe wall. →

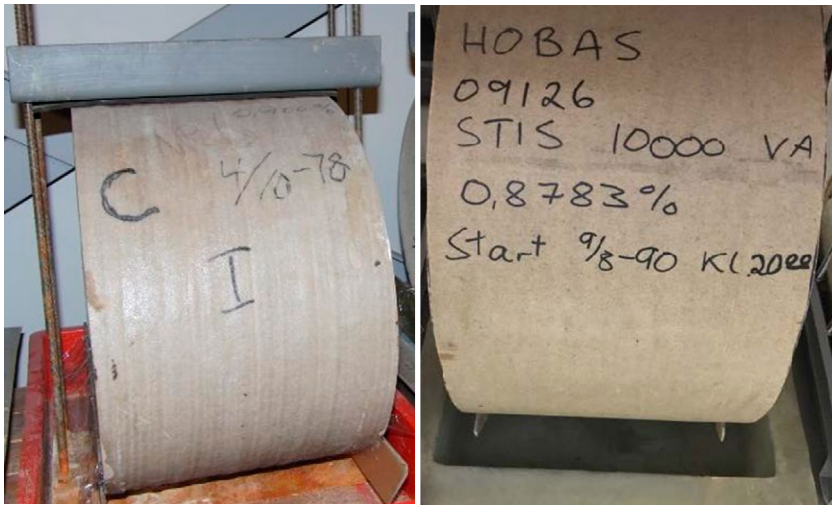


***Fig. 5/6**: Flowtite sample from 1978 (left) and Hobas sample from 1990 (right).*

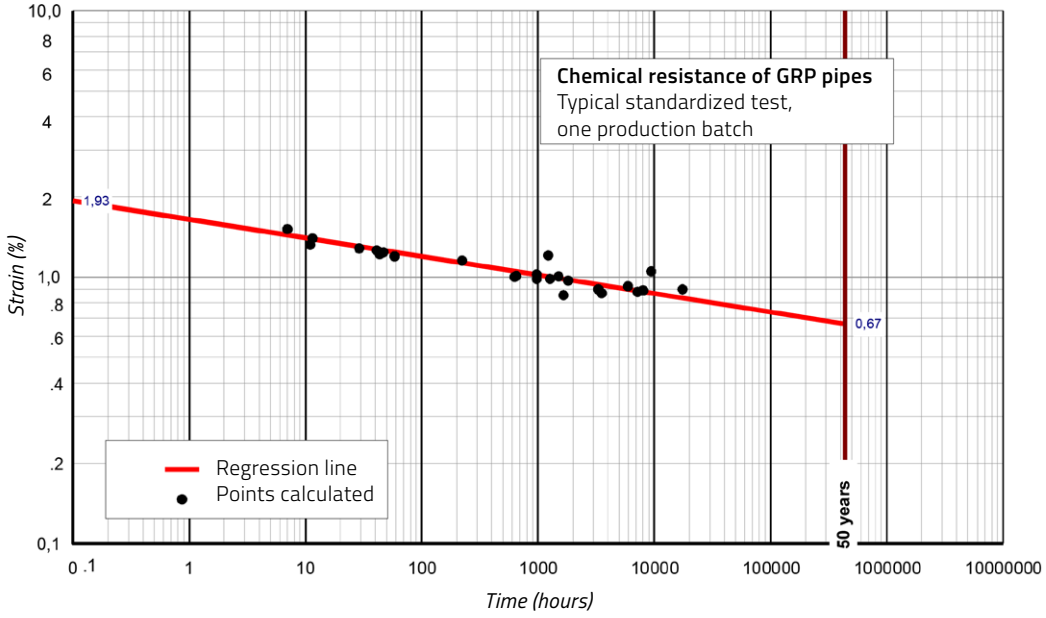


Fig. 7: A typical test series with 25 Flowtite pipe samples. The horizontal axis is the time-to-failure, the vertical axis shows the bending strain at the pipe invert, both on a logarithm scale. Each point on the graph represents a pipe sample that has been subjected to the recorded strain until failure occurred. Having fulfilled the statistical requirements, a straight line that fits the data is computed, using covariance regression analysis. In this case, the extrapolated strain value at 438,000 hours (i.e. 50 years) is 0.67 %. With typical long-term deflection of 3 % (yielding a strain of 0.27 % for current pipe designs), the calculated safety margin is approximately 2.5.

With at least one data point exceeding 10,000 hours and the rest relatively evenly spread over the time range, and with an appropriate coefficient of correlation, the data can be safely used and extrapolated with classic statistical methods.

How about the results?

Jónsson: The shortest measured time to failure is 0.3 hours at 1.35 % strain; the longest is 28 years and 78 days at 1.05 % strain. The longest, still running test was set up on October 4th 1978. The sample has now been exposed to the acid test for more than 40 years at 0.91 % strain. What's really interesting here is the bilinear behavior: up to strains of about 1.6 %, most samples fail within relatively short time periods. At strains between 0.9 % and 1.3 %, the time to failure is much longer. Only a handful of data points fall below this range, meaning that below a certain "threshold strain", the samples simply do not fail. For this set of data, the threshold appears to be around 0.9 % strain. A classic regression analysis of the data points up to 1000 hours results in a line with a mild slope, while regression analysis of data points after 1000 hours through to over 350,000 hours show an almost horizontal line. By extrapolating this line by only ½ of a decade, which is less than one third of what classical statistics allows, we reached a 150-year strain value of 0.93 %.

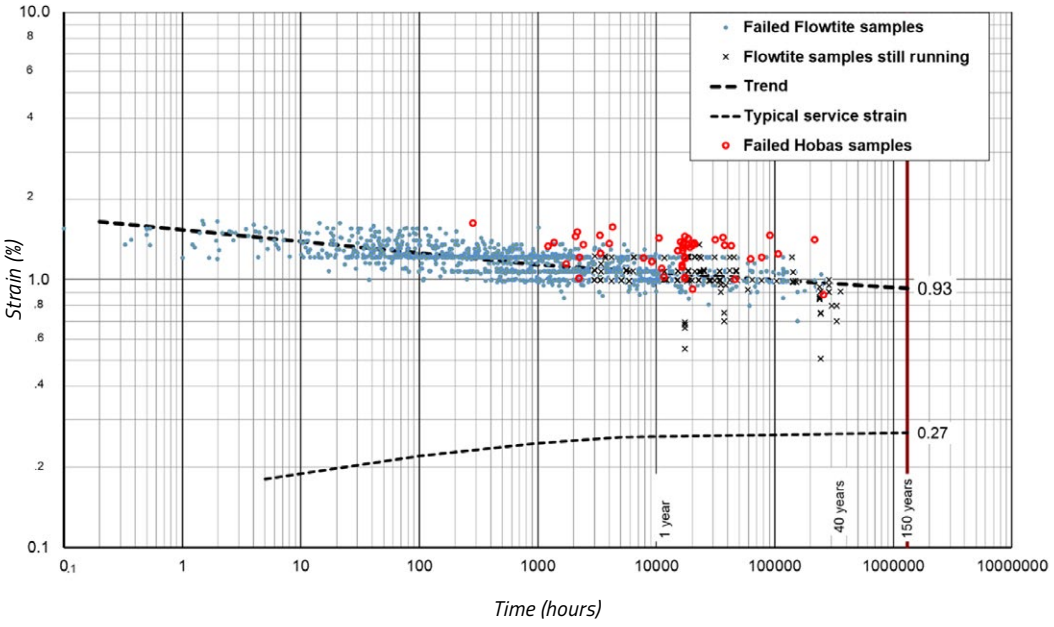


Fig. 8: The complete data of tested Hobas and Flowtite pipe samples over the past 40 years on a log-log scale. The dots on the chart represent failed samples, while the crosses represent samples that are still running. The failed samples are distributed along the whole time scale, clustering together on a relatively narrow strain-band. There are 40 samples that have lasted more than 12 years, with strains ranging from 0.5 % to 1.1 %. Of these, 16 have failed, while 24 are still running.

Is this a typical strain in sewer or similar applications?
Jónsson: No, and that's the fantastic conclusion: The typical long-term operating strain of such a pipe is merely 0.27 %. This means that, in real-life applications, we even reach an excellent safety margin of 3.4.

This sounds really impressive! Any project examples that prove this durability?
Jónsson: In 2004, a pipe DN 1800 that had been in continuous use in aggressive environment since 1980 was unearthed and inspected (Fig. 9-11). The pipe came from the sewage treatment plant belonging to the Water and Sewerage Department in Riyadh. After almost 25 years in service, the pipe showed no signs of degradation or deterioration, only a slight change in stiffness. Another sample taken from a pipe in Norway that had been submerged in sea water for more than 33 years showed no signs of corrosion or visible aging either. The mechanical properties were also well within the initial design requirements (Fig. 12-13).

Bottom line: The 150 years lifetime of Amiblu GRP pipes is a matter of fact!
Jónsson: Indeed. This large database of test results demonstrates the product performance and reveals a service life of more than 150 years with good safety margins. The data shows that, if the strain is below a certain threshold level, the pipes will serve several future generations.

Högni Jónsson is the head of product development and support of the Amiblu Group. Born in Iceland, he manages the Amiblu laboratory in Norway and is responsible for the design and qualification of GRP pipes and fittings as well as customer support. Högni can draw on over 25 years' experience with composite materials and has published several papers in the field. He is the chairman of CEN and ISO standardization committees for glass fiber reinforced plastic pipes.

***Fig. 9-11**: A Flowtite GRP sewer pipe DN 1800 was unearthed and inspected after almost 25 years in service at a sewage treatment plant in Riyadh, SA. The pipe showed no signs of deterioration.*

***Fig. 12-13**: After 33 years exposure to sewage and seawater, a Flowtite GRP diffuser was brought ashore for analysis of its condition and mechanical properties (left). After cleaning parts of it, the pipe looked almost brand-new (right). The pipe showed no visible signs of ageing and its mechanical properties were basically unchanged. Read more about this project on pages 10-11.*

GRP pipes in excellent condition after 33 years in seawater

In 1975, 1500 m of Flowtite pipes were installed as subaqueous marine outfall of the Enga wastewater treatment plant in the Norwegian town of Sandefjord. In 2008, one pipe section was brought ashore to evaluate its condition. The result: A fully functional pipe with very good mechanical properties.

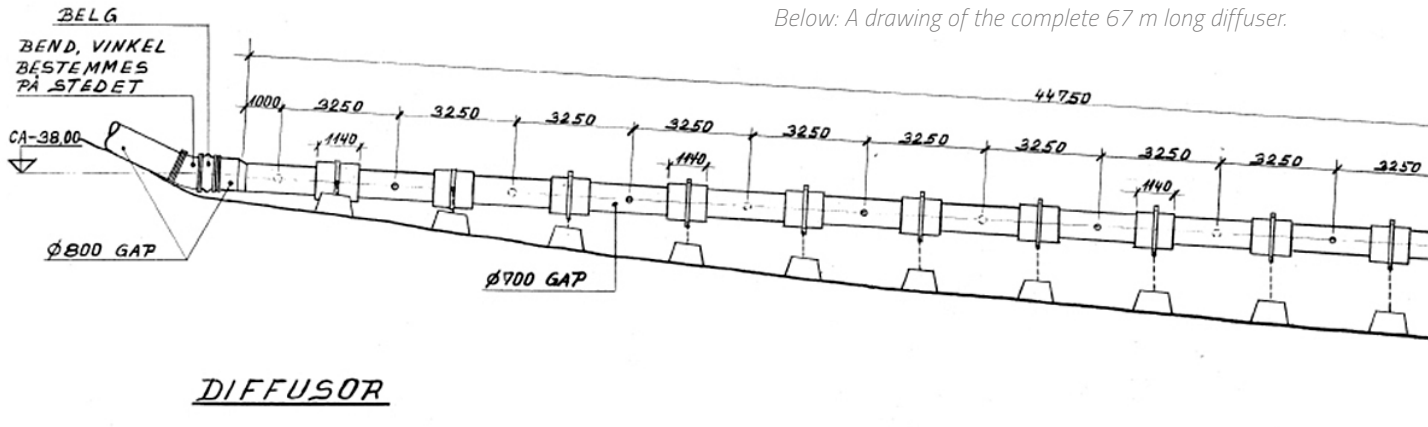
The outfall of the Enga wastewater treatment plant in Sandefjord was installed and commissioned in 1975. Built of Flowtite GRP pipes, the outfall is entirely installed underwater and consists of three different parts:

- The first part is 400 m long and consists of pipes DN 800, buried in the seabed at an average depth of 2 to 2.5 m.
- The next 1055 m of GRP pipes DN 800 are laid directly on the seabed. Flowtite GRP pipes do not float as they have a specific gravity of approximately 2. Horse-shoe anchors are used for additional stability.
- The 67 m long suspended GRP diffusor, DN 700 and DN 500, was installed floating at an elevation of up to 3 m above the seabed and 38 to 42 m below sea level. The diffuser consists of a 45 m long initial section DN 700 and a 22 m long final section DN 500. Both sections are fitted with 180 mm circular ports every 3.25 m along the diffuser's spring lines. The sections are joined with a DN 700/500 eccentric reducer, and all parts connected with GRP butt-wrap joints. A DN 800/700 eccentric reducer joins the diffuser with the main outfall line DN 800 with a rubber bellow. For floatation, the GRP diffuser is fitted with foam-filled buoyancy elements. The buoyancy elements are moored to concrete anchors resting at the seabed.

The outfall was constructed by joining GRP pipes to 50-100 m long pipe strings using GRP butt-wrap joints. The strings were fitted with GRP collars and steel loose flanges at the ends, installed by means of a float-sink procedure, and joined on site using the flanges.

In 2008, a section of the DN 500 diffuser was brought ashore for analysis of its condition and mechanical properties after 33 years of exposure to treated sewage and seawater. Even though there was no chlorination, the pipes showed only very

Above: After 33 years of service in seawater, a section of the GRP diffuser was brought ashore to have its mechanical properties tested.
Below: A drawing of the complete 67 m long diffuser.



DIFFUSOR

limited biological growth. Samples were cut from the pipe and cleaned. A visual inspection did not reveal any signs of ageing, the internal surface of the samples was as shiny as of a new pipe.

The key mechanical properties of the 33-year-old pipe were measured at the Amiblu laboratory in Sandefjord and compared to the design requirements from 1975. The results are listed below:

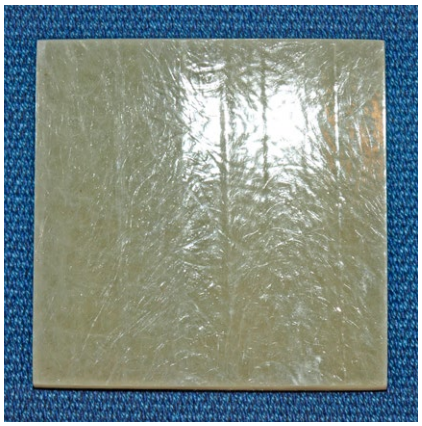
Mechanical properties	Design requirement 1975	Measured result 2008
Specific initial tangential stiffness	1280 Pa	1377 Pa
Axial tensile strength	70 MPa	95.4 MPa
Hoop flexural strength	140 MPa	168.3 MPa

In addition, a pipe section was pressure tested to burst. The pipe busted at 25 bar, which is a very good performance for a PN 2.5 pipe.

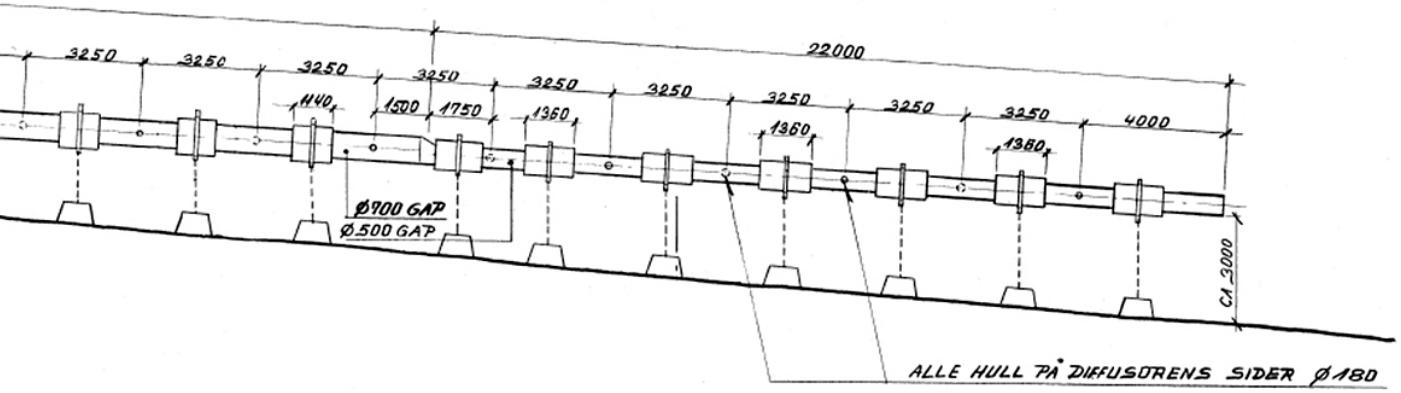
Bottom line: The GRP pipes have proven to be totally resistant to corrosion and had retained the mechanical properties that applied to the products when they were initially manufactured.

PROJECT DATA

Country | Municipality	Norway | Sandefjord
Year of construction	1975
Application	Seawater outfall for WWTP
Installation	Subaqueous
Technology	Flowtite FW
Total length of pipe	1500 m
Nominal diameter	DN 500, DN 700, DN 800
Nominal pressure	PN 2.5
Nominal stiffness	SN 1280
Client / investor	Sandefjord Municipality
Designer	Vlak AS

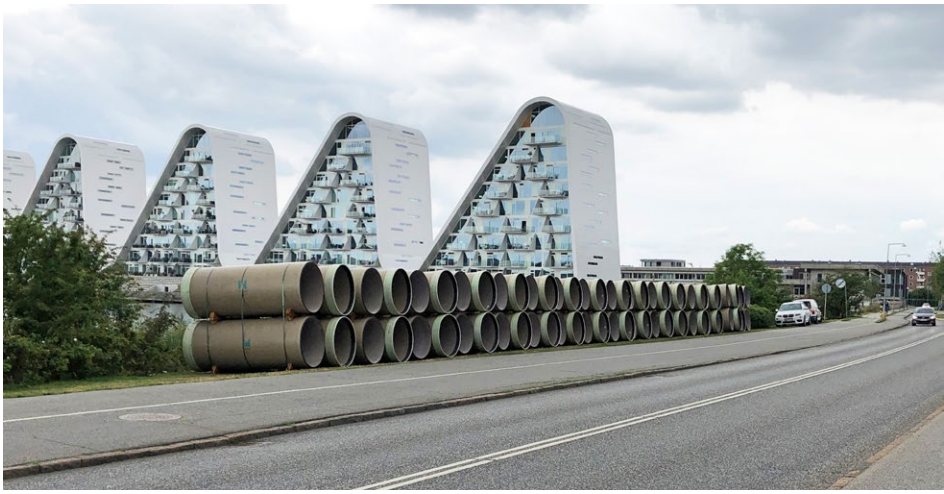


Left: After cleaning the pipe with soap and water, it looked brandnew. There were no signs of ageing. The test results confirmed the excellent condition also with regard to the pipe's performance.



Stormwater sewer for new "wavy" residence in Denmark

In the Danish town of Vejle, 740 m of Hobas GRP pipes DN 1200 are being installed for a new stormwater sewer system by the construction company Nørgaard Anlæg. The surroundings with the Vejle Fjord on the one and the Bølgen (meaning "wave") residential building on the other hand are perfectly impressive - and call for an impressively perfect product! The very high groundwater level, increasing rain, plus incoming sea water make the construction of this new durable pipe system necessary. The project is running perfectly on schedule and will be completed in December 2019.



“Energia verde” thanks to Amiblu GRP in the North of Italy

920 m of Hobas GRP pipes DN 1800, DN 2000, and DN 2200 are being installed as penstock for a new hydropower plant in the municipality of Angolo Terme in northern Italy. Owned by Fen Energia / IDEA Services, the plant will produce 800 KW. The GRP pipes’ smooth inner surface allows for a perfect flow rate of 4 m^3/sec despite a relatively small head of water. The installation is scheduled to be completed by February 2020.

No more detours needed: Convenient GRP tunnel below the rails

In the small Polish town of Parczew, a passageway for pedestrians and cyclists was built from Hobas pipes De 3600 in August 2019. The pipes were jacked underneath the railway line LK30, while the trains kept passing on regular schedule. Paving new ways without interrupting others: an Amiblu specialty!

GRP pipes add value for nature and citizens

Between the cities of Gondomar and Porto in northern Portugal, a 3129 m long Flowtite pressure pipeline was installed to relieve an ecologically sensitive river from excessive sewage discharges.

Rio Tinto river is a small tributary of the river Douro and has a rich biodiversity. Over the past years, flora and fauna have decreased due to discharges from two wastewater treatment plants (WWTP) that were led directly into Rio Tinto's sensible waters. In 2018, the councils of Gondomar and Porto decided to stop the pollution and build a new pipeline to divert the treated and depurated water away from Rio Tinto into the larger river Duoro, which has a much bigger regeneration and assimilative capacity.

The clients Águas do Porto and Águas de Gondomar chose to implement this project with a reliable, sustainable GRP pipe solution. 3129 m Flowtite pressure pipes DN 800, PN 12 were installed in open trench between the WWTPs Freixo and Meiral, alongside the Rio Tinto river. A high groundwater table and strict environmental requirements posed a challenge to the installation works but were easily managed thanks to the GRP material's optimal properties. The client is very satisfied with the completion of the project which created a new natural environment and returned the Rio Tinto river to the population, including a pedestrian and cycling lane that follows the riverbed.

PROJECT DATA

Country | Cities	Portugal | Porto & Gondomar
Year of construction	2018
Installation time	10 months
Application	Sewer
Installation	Open trench
Technology	Flowtite FW
Total length of pipe	3129 m

Nominal diameter	DN 800
Nominal stiffness	SN 10,000
Nominal pressure	PN 12
Client / investor	Águas do Porto, Águas de Gondomar
Contractor	DST Domingos Silva Teixeira
Designer	Hidrofunção-consultores De Engenharia

Click on the image on the left to get a visual impression of this remarkable project!

bit.ly/Sewer-Rio-Tinto

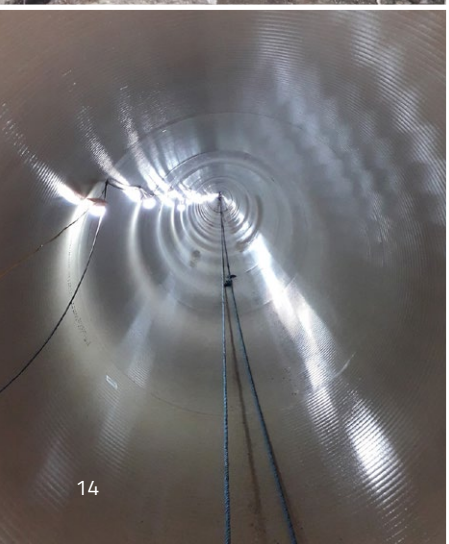
Sustainable sewer rehab with Amiblu GRP in East Anglia

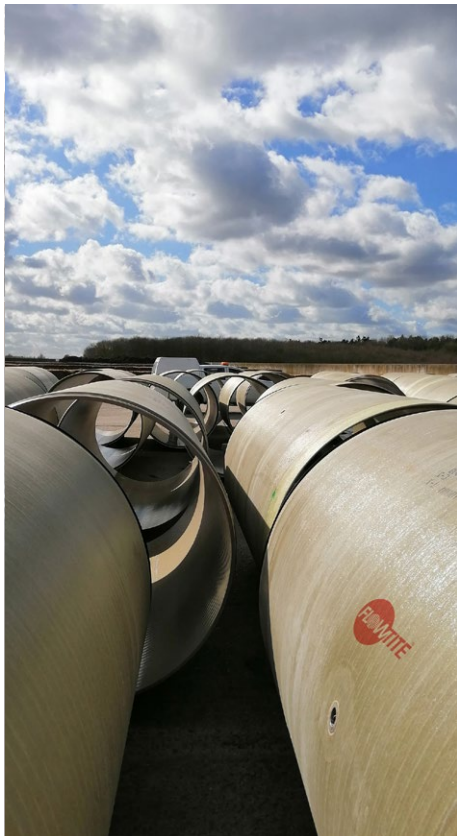
In the British city of Norwich, the life of a corroded sewer has been extended with Flowtite GRP relining pipes. Thanks to the innovative design and a collaborative approach, the initially estimated carbon emissions were reduced by 55 %.

Norwich's main trunk sewer had been found to be in extremely poor structural condition: Hydrogen sulfide gases had corroded the mortar, resulting in large scale brick loss and a high likelihood of collapse. The @one Alliance design team defined the best solution to rehabilitate the 11 m deep sewer DN 1676 to be GRP relining pipes manufactured by Amiblu. Other methods were considered for the sewer renovation but were deemed impracticable due to the depth and condition of the existing pipeline and the need to create a contingency plan to release flows during the construction process. A major challenge was the temporary bypass of foul sewage; up to 2,200 l/s had to be temporarily diverted to facilitate rehabilitation works. The sewage was bypassed to a temporary pumping station by using a bespoke prefabricated system, allowing the renovation to take place

Flowtite relining pipes DN 1500 were delivered to the Whitlingham Wastewater Treatment Works fully cured, in a mix of 1 m and 3 m long sections with in-line joints. A severely corroded manhole was dismantled to create a launch pit through which the GRP pipes were lowered and jacked 300 m downstream and 60 m upstream. The thrust wall was specifically designed with a 1200 mm diameter opening, allowing released flows to pass through in an emergency.

Below / Upper left: The old trunk sewer's very bad condition before the renovation.
Lower left: The shiny new GRP sewer with its smooth inner surface.
Right: Flowtite relining pipes revitalized the corroded pipe systemm, extending its service life by another 150 years.





The pipes were jacked into place and the anulus grouted to restore the full structural condition of the sewer for another 150 years, eliminating any future risk of H_2S attack. With a Colebrook-White friction coefficient of Ks = 0.0029 mm (compared to the current Ks value of 60 mm+ as per the WRC Sewerage Rehabilitation Manual), the new GRP sewer allows for an increased hydraulic performance despite a reduction in cross-sectional area, and a planned future network upgrade to 3,200 l/s.

Following an extensive upfront enabling program, collaborative stakeholder engagement and innovative design, the sewer and connected manholes have been successfully rehabilitated, whilst achieving a 55 % carbon reduction against baseline targets. By July 2019, the sewer was returned to a structural condition grade 1.

Lee Forth, technical manager, Anglian Water @one Alliance: "With tight deadlines to achieve, Amiblu have assisted from design onwards to ensure this project has been a success. Delivery was prompt and, as this was our first project of this nature, their advice to our site team ensured installation went smoothly."

PROJECT DATA

Country | City	UK | Norwich
Year of construction	2019
Application	Sewer
Installation	Trenchless / Relining
Technology	Flowtite FW
Total length of pipe	360 m
Nominal diameter	DN 1500
Nominal pressure	PN 1
Nominal stiffness	SN 10,000
Client / investor	Anglian Water
Contractor	Barhale Ltd / @one Alliance
Designer	Sweco / @one Alliance

Four-line Amiscreen installed in Thuringia

In the city of Geisa in the German state of Thuringia, a combined sewer system was successfully upgraded with a 70 m³ Flowtite storage sewer DN 2800 with integrated Amiscreen solids retention. The GRP sewer features a comprehensive screening system made of four circular elements DN 600 that result in a filter surface of 73 m² and a maximum discharge rate of 1445 l/s. A stormwater overflow shaft DN 3000 is also part of the structure.

PROJECT PARAMETERS

Country | City	Germany | Geisa
Year of construction	2019
Installation method	Open trench
Application	Storage sewer with integrated solids retention system
Technology	Flowtite FW, Amiblu Amiscreen
Specs storage sewer	DN 2800, 12 m length
Specs Amiscreen elements	4 x 10 m of DN 600
Client	Water & sewage board Bad Salzungen
Designer	TTB Werra
Contractor	Baugesellschaft Ulsterstal

Above: Outside and inside view of the Flowtite storage sewer with integrated Amiscreen system.

GRP pipes help modernize combined sewer system in France

Hobas and Flowtite GRP pipes were installed as part of a new storage system in the city of Clermont-Ferrand. They ensure that the combined sewage is reliably discharged without harming the environment.

The French city of Clermont-Ferrand and its metropolitan area are mainly equipped with combined sewer networks that transport both stormwater and wastewater. Whenever it rains, the networks tend to overflow and thereby pollute the rivers Artière, Bédat, and Tiretaine. As separating the combined networks into two networks is impossible, a big modernization program has been initiated to guarantee the sound condition of the watercourses and improve the area's waste- and stormwater treatment. This program is part of the European directive on urban wastewater treatment (91/271/EEC) that aims to protect the environment from the adverse effects of urban wastewater discharges. →

Right: A Hobas pipe system DN 2400 was installed between the intercepting chamber and the storage tank.

The program includes the construction of six big storage tanks with a total capacity of 80,000 m³ by 2025. The first 2,200 m³ storage tank was commissioned in 2018, and a second one with 10,000 m³ should start operations in the second half of 2020. It is made of concrete and named "Belle-Ombre" according to the street it is located in, directly in the city of Clermont-Ferrand. In addition to the tank, various structures were needed to complete the system:

- A concrete intercepting chamber to intercept the flow from the combined network during a rain event and direct it towards the tank.
- A pipe network DN 2400 of 80 meters length installed at 4.60 meters depth, leading from the intercepting chamber to the storage tank.
- An overflow chamber located at the end of the pipeline DN 2400 just before the storage tank to bypass the flow to the river once the water level inside the storage tank reaches a defined maximum.
- A flushing system DN 3000 inside the storage tank.

The client chose Amiblu GRP for the implementation of the pipe network DN 2400 and the flushing chamber DN 3000. The products' very good hydraulic performance, long lifetime, quick and easy installation, as well as the professional support by Amiblu experts were especially important due to a number of challenging circumstances: the construction site is located in an area of protection of historical monuments, there was no storage capacity on site, and the area lies in a moderate seismicity zone as well as in a "flood zone" of the Tiretaine river with a high groundwater level and soils of different nature. Moreover, the discharge into the Tiretaine river had to be maintained throughout the duration of the project.

Amiblu supplied 80 m Hobas GRP pipes DN 2400 that were installed in open trench. Thanks to the very smooth inner liner, the pipeline can handle a flow rate of 12.3 m³/s despite a very small slope of 0.55 %. Additionally, a 7 m long vertical Flowtite pipe DN 3000 was installed directly inside the 10.000 m³ tank. It was lifted with a crane and its lower part cast in concrete thanks to a premounted masonry coupling. The DN 3000 pipe forms the main part of a vacuum flushing system that automatically cleans the tank after a rain event. Client, designer, and contractor are very satisfied with the installation of the GRP products and cooperation with Amiblu in this project.

Above: A 7 m long vertical Flowtite pipe DN 3000 serves as flushing system inside the storage chamber.

PROJECT DATA

Country | City	France | Clermont-Ferrand
Year of construction	2019
Installation time	1 month
Application	Stormwater storage and retention tank
Installation	Open trench & inside tank
Technology	Hobas CC & Flowtite FW
Total length of pipe	87 m

Specs Hobas CC pipe (supply pipeline)	DN 2400, SN 5000, PN 1 80 m length
Specs Flowtite FW pipe (flushing system)	DN 3000, SN 5000, PN 1 7 m length
Client / investor	Communauté Urbaine Clermont Auvergne Métropole
Contractor	NGE - EHTP
Designer	Egis

Renovation of sewer system with Amiblu NC Line in Krakow

In Poland's second largest city Krakow, an aged non-circular sewer was relined with 746 m of Amiblu NC Line pipes. The location close to a main artery and ongoing operations of the existing sewer line made the installation challenging.

The project "Water and sewage management in Kraków - stage V" is co-financed by the European Union and underway in Krakow since 2017. It involves a comprehensive modernization of the municipal water and sewage management system. Over 6 km of sewerage and 3.5 km of water supply lines will be created, and approximately 30 km of the existing network will be repaired and renovated.

Depending on the locations and conditions of the various network sections, different technologies were used to rehabilitate the aged pipelines. For a combined sewer system in Słowackiego Avenue, which is one of the most frequented roads of the city, trenchless was clearly the best option. The 80 year old non-circular collector required structural reinforcement due to its very poor static condition, and it was decided that Amiblu should supply the necessary GRP products for this project.

The rehabilitation plan was challenging: Both the traffic on Słowackiego Avenue and the water flow inside the sewer had to be maintained throughout the construction works. The contractor decided to work 90 % at night, i.e. from 10 p.m. to 6 a.m. in the morning. Amiblu NC Line facilitated the installation in the still operating sewer thanks to the quick and easy way to join the gaskets. 746 m of non-circular profiles in lengths of 1 to 3 meters were fitted inside the old channel to upgrade its structural strength and thereby extend its lifetime. The project was successfully completed in June 2019 and now contributes to a safer, future-oriented wastewater management in Krakow.

Above: 746 m of Amiblu NC Line pipes in various cross-sections were installed in the course of eight months to renovate parts of Krakow's aged sewer system.

PROJECT DATA

Country | City	Poland | Krakow
Year of construction	2018/2019
Installation method	Trenchless / Relining
Application	Combined sewer system
Technology	Amiblu NC Line
Total length of pipe	746 m
Pipe diameters	800/1200 mm, 700/1050 mm, 618/1084 mm, 500/950 mm
Client / investors	Miejskie Przedsiębiorstwo Wodociągów / Kanalizacji Spółka Akcyjna w Krakowie
Contractor	PPRiUS REMKAN Sp. z o.o.
Designer	PPU CPROJECT Kraków

Pipes designed for generations

Now that you read about several recent and ongoing Amiblu showcase projects on the previous pages, we want to close this issue of Amiblu Stream with a few fabulous impressions from earlier days of our pipeline business. Enjoy the flashback!

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Pipes designed for generations