The latest news fresh from the pipeline 2020 | 05

stream

"We can't meet tomorrow's needs with today's deficiencies"

Low-impact GRP sewer rehab on the banks of the Elbe River

A magazine issued by Amiblu®

Dr. Alexander Frech, CEO Amiblu Group

A long-term vision for water security

If we have learned one thing of the turbulent months of 2020, it's that water security, wastewater treatment, and other fundamental needs of urban human agglomeration are at risk and ask for our urgent response. Due to extreme weather events and urbanization, much of our existing infrastructure is no longer suitable. Pipe networks need to be expanded and repaired, and new structures for unprecedented challenges need to be designed.

In this edition of the Stream magazine, you find several examples for innovative responses to these pressing issues. What they all have in common is a) people with a long-term vision and highest quality demands, and b) GRP – a highly flexible material that challenges shortcomings of existing solutions and lasts for generations.

In a world that is constantly transforming, those who are able to adapt and make the most out of changes are the ones who will come out victorious. This is why we at Amiblu strive for cutting-edge solutions to keep our precious water safe and design pipelines that last for generations.

Best wishes from Klagenfurt,
Alexander Frech

Contents

Relining with GRP drainage pipes at Düsseldorf Airport

400 m Flowtite GRP pipes DN 1500 - DN 2000 were installed via relining to make the local stormwater drainage sewer fit for the next generations of planes and air travellers.

Gates, security control, duty free shops, runways – airports consist of these and many more things most of us have experienced several times. But there is another dimension that is largely unseen. It's dark and uncomfortable, but essential for all airport operations: the sophisticated underground drainage pipe system.

At Düsseldorf Airport, Germany's third-largest airport, this pipe system is more than 100 km long and as complex as the infrastructure of a small town. The network is regularly inspected, and its capacity evaluated. With a changing climate and frequent heavy rainfalls, these procedures get increasingly important. "Our airport absolutely needs a modern rainwater drainage system. Without regular inspections and rehabilitation works, the security of airport operations would be at risk", says Boris Opolka, who is responsible for sewer operations and renovation at Düsseldorf Airport.

The airport's drainage system includes three main channels, the biggest of which is called "RW Sammler Mitte" ("stormwater collector center"). It drains large parts of the maneuvering area, taxiways, runways, as well as the terminal roofs. Built in the 1960s, the collector has been in continuous trouble-free operation for 60 years. To maintain its structural capacity and leak-tightness also in the future, it was decided to rehabilitate the channel in 2019. The parts of the pipeline directly below the runways required special attention due to the extremely heavy aircrafts. →

The contractor Aarsleff Rohrsanierung GmbH chose to manage this challenge by relining the concrete structure with Flowtite GRP pipes. Tested and approved by the German Railway for usage under rail tracks, the pipes handle loads and vibrations very well, and these properties are similarly important for airport applications. Thanks to the relatively thin yet extremely stiff pipe walls, the diameter loss is minimal, and the collector's capacity is hardly affected. On top of this, the material is very durable and, thanks to its light weight, easy to install.

This last point was crucial, since the circumstances under which the rehabilitation took place were extremely challenging. The flight schedule was not to be affected by the renovation, so construction works always started after the last plane had landed and all daily operations were completed. This was usually around 11:30 p.m., and the "worknight" ended around 5 a.m.. The pipe supply was also very different. "All deliveries had to be registered beforehand and arrive at strictly defined times. Since the pipes were stored on the airport area, each arriving truck had to pass a security checkpoint where the cargo was checked in detail", says Holger Hörnemann, project coordinator of pipe supplier Amiblu.

In total, 400 m of the old concrete drainage channel were relined with Flowtite GRP pipes DN 1500, DN 1800, and DN 2000. Other, less critical parts of the stormwater collector outside the runways were pretreated by water-jet cleaning and then newly profiled with a special mortar.

All involved parties are very pleased about the successful outcome of the project. "Special projects require especially good communication between all partners to be successful. This was definitely the case here", concludes Hörnemann. Düsseldorf Airport is now well prepared for future stormwater challenges.

PROJECT DATA

Country | City	Germany | Düsseldorf
Year of construction	2019 / 2020
Application	Stormwater drainage
Installation	Trenchless / Relining
Technology	Flowtite FW
Total length of pipe	400 m
Nominal diameters	DN 1500, DN 1800, DN 2000
Nominal pressure	PN 1
Nominal stiffness	SN 10,000
Client / investor	Flughafen Düsseldorf GmbH
Contractor	Aarsleff Rohrsanierung GmbH
Designer	ISAS GmbH

Click on the image below to watch a short video about the challenging rehabilitation of the "RW-Sammler Mitte" at Düsseldorf Airport!

bit.ly/Relining-DUS

New sewer network for growing Skopje

More than 8500 m GRP pipes make the sewer system of North Macedonia's capital fit for future generations.

Skopje lies right in the heart of the Balkan Peninsula, in the Skopje Valley along the Vardar River, which is the biggest river in North Macedonia. In the past 30 years, the city's population has doubled, and the old sewer network's capacity was no longer sufficient. Therefore, the national Ministry of Finance decided to build a new sewer system and wastewater treatment plant so the increased amount of wastewater can be safely handled.

The new system with a length of more than 8.5 km was planned on the left and right side of the river Vardar, in depths of up to 6 m. Part of the pipeline route runs through a former landfill site bedded on gravelly soil. Due to Skopje's location in a river valley surrounded by mountains, the land around Vardar River has several flood-prone and wet areas that have no road infrastructure and are therefore hard to access.

In view of the challenging site conditions, the investor required a pipe material that was easy to install and at the same time durable with a long service life. GRP had it all, and Amiblu was commissioned with the production and supply of 8,538 m CC-GRP pipes, fittings, and manholes in diameters ranging from DN 800 to DN 2000.

Thanks to the products' light weight, the contractors were able to use small trucks for transporting them from the storage yard to the trench across the difficult terrain. Neither the laying depth nor the challenging soil were an issue for the installation. The GRP pipes were easily installed, and the trench filled with grain sized 16-32 mm.

Construction works started in February 2018 and are scheduled to be completed by summer 2020. The citizens of Skopje can then count on a fully functioning sewer system that is fit for future generations.

PROJECT DATA

Country | City	North Macedonia | Skopje
Year of construction	2018-2020
Installation method	Open trench
Application	Sewer system
Technology	Hobas CC
Total length of pipe	8,538 m
Nominal diameter	DN 800 - DN 2000

Nominal pressure	PN 1
Nominal stiffness	SN 10,000
Client / investor	Ministry of Finance, North Macedonia
Contractor	Consortium: Guintoli S.A.S / Bauer BG LTD / NGE Constructing S.A.S
Designer	Suez Consulting / Saffege

"We can’t meet tomorrow’s needs with today’s deficiencies"

Low-impact sewer rehab on the banks of the Elbe River

Since the early 2000s, the two major interceptor sewers in the German city of Dresden, located on the right and left bank of the Elbe River, are being continually rehabilitated. The most recent section has been completed in March 2020: 935 m non-circular GRP pipes were installed by means of trenchless pipe relining. We spoke to Torsten Seiler of the client Stadtentwässerung Dresden about the project progress and the challenges of sewer rehabilitations in a metropolis like Dresden.

Mr. Seiler, how does the Stadtentwässerung Dresden decide whether a pipeline needs to be renovated?

Seiler: Each rehabiltation starts with a number of questions. What's the condition of the pipeline and how long can it remain in operation? Large-diameter pipelines are inspected and their status evaluated in periods of 1 to 5 years. We record damages and monitor their development. In fact, not every old channel is automatically a bad channel: Several pipelines that were built of concrete or vitrified clay before 1945 are still operating very well and show only minor deficiencies.

When talking about sewer rehabilitation in Dresden, it's primarily large profiles with diameters of more than 1.2 m that are in the focus of attention. Two among these channels are of particular importance: The Altstädter Abfangkanal and the Neustädter Abfangkanal (interceptor sewers) which run alongside the Elbe River and transport all of the city's sewage to the main local wastewater treatment plant Dresden-Kaditz. The channels are almost 25 km long and have profile heights of up to 3.6 m.

When choosing a pipeline rehabilitation method, we need to consider the hydraulic reserves with regard to demographic developments and climate change.

– Torsten Seiler
Stadtentwässerung Dresden

What did the inspection of the two interceptor sewers reveal?

Seiler: The channels were built of tamped concrete already before World War I, between 1906 and 1914, and still look quite acceptable. However, we have extracted specimens from the pipe walls which show that the quality of the concrete is no longer optimal. Since these sewers are the main arteries of Dresden's wastewater network, the rehabilitation has a high priority. In general, once we decide to renovate, the next question is: can we opt for trenchless or do we need to reconstruct in open trench?

Dig or no-dig: which criteria determine this decision?

Seiler: This primarily depends on the hydraulic conditions. Apart from hydraulic calculations, we monitor the situation of our network very closely by means of rain gauges and water meters. They help us identify overloads and evaluate these events. When calculating and designing the hydraulics of a pipeline, we need to consider a very long time horizon of up to 100 years. This entails a relatively high risk in view of the forecast climate change with frequent heavy rains, the demographic development, and the resulting increase in urban area.

For the most recent renovation section of the Neustädter Abfangkanal, Amiblu produced 935.5 m non-circular GRP pipes which were installed by means of relining.

This sounds very complex and seems to boil down to the sewer capacity?
Seiler: Correct. Whenever we renovate a channel with trenchless technologies, the diameter decreases, and this is often critical. We need certain reserves for rehab methods like pipe relining. If there are no reserves, or in case of doubts, we will definitely opt for a new construction in open trench, in general with a larger diameter. We just can't meet tomorrow's needs with today's deficiencies.

Due to insufficient hydraulics, a 9 km long section of the interceptor sewers has been newly built with larger-diameter pipe profiles. Trenchless renovation was no option in this case. The remaining 16 km were rehabilitated by means of trenchless relining with non-circular GRP profiles.

So if sufficient reserves are available, trenchless rehabilitation is a good solution?
Seiler: Definitely. The trenchless method is much more economical than a new construction. Relinling is more cost-efficient than digging trenches and building new channels, let alone the non-monetary factors: environmental impacts, traffic obstructions, and in this particular case also the danger of flooding due to the nearby river. I assume that we will renovate 80-85 % of Dresden's old pipe network with trenchless methods throughout the next years. This is a pretty high share and possible thanks to our well-developed, generously dimensioned pipe network.

Let's assume you have decided in favor of a trenchless installation. What's the next step?
Seiler: Next, we need to focus on reducing the loss in cross-section to the absolute minimum. In doing so, the differentiation between small and large diameters is important. While hose lining is optimal for smaller dimensioned pipes, this method is not recommended for large pipes – the hose liners would get too heavy, and the number of construction pits very high.

The optimal choice for the trenchless rehabilitation of large pipe profiles is GRP. I can really recommend the material.

– Torsten Seiler
Stadtentwässerung Dresden

One alternative would be an internal lining with cast-in-situ concrete, but also here the disadvantages prevail – thicker pipe walls, worse hydraulics. The optimal choice for the trenchless rehabilitation of large-diameter pipe profiles is GRP, I can really recommend the material.

In the most recent renovation section, the old channel was examined and calibrated with a template in order to determine the pipe dimensions and minimize the loss in diameter. Amiblu custom designed and supplied the required non-circular profiles in cross-sections of 1900/1820 mm, 2060/2010 mm, and 2240/2180 mm, and lengths of up to 3 m. A bypass pipeline was built to maintain the sewer network operation during construction works. →

A temporary bypass pipeline helped maintain the sewer network operation during the renovation works.

With about 5 cm wall thickness and 5 cm space for inserting the pipes, the new pipeline's diameter is only slightly smaller than before.

The annular space between the old and the relined channel was filled with liquid grout...

What makes GRP the optimal material for relining large profiles?
Seiler: There's only little loss in cross-section and the pipes' light weight facilitates the installation. With about 5 cm wall thickness and 5 cm space for inserting the pipes, the diameter of the „new" Neustädter Abfangkanal is only 10 cm smaller than before. That's very acceptable. Another thing I was very happy about is the technical and general support from Amiblu, both by the regional representative Mr. Schulz and all people in the background.

The single NC pipes were lowered into the old channel through a number of construction pits, transported to their final position with a special wagon, and then connected with a hydraulic coupling device. Finally, the remaining annular space between the old and the new channel was filled with liquid grout.

How about GRP in new constructions – have you realized any such projects yet?
Seiler: We have already implemented a couple of GRP storage chambers with large diameters, in projects where limited space was a particular issue. Of course, concrete comes with lower costs, but GRP scores with its easy handling and smaller wall thickness. If you have GRP pipes with a wall thickness of 5 cm, comparable concrete pipes can be very thick-walled. This means that they require more space and are more difficult to install.

... resulting in a new sewer pipeline with full structural stability.

Another advantage of GRP are the custom manufactured fittings such as tangential manholes which require minimum space. The design was always precise and consistent. For me, that's another ideal application for GRP.

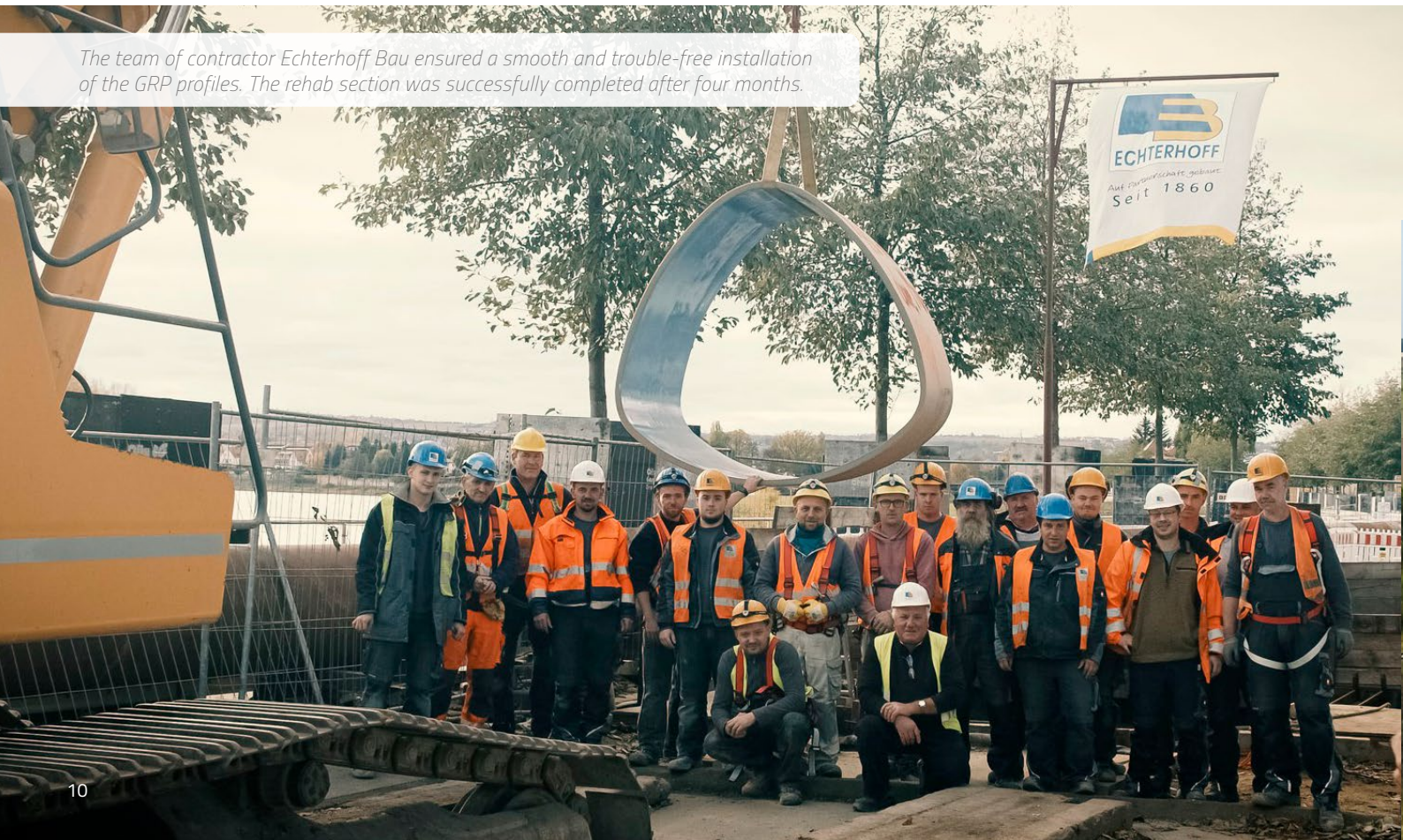
The trenchless renovation of the next part of the Neustädter Abfangkanal will start in summer 2020. The 1500 m long section involves channel heights between 2.6 and 2.8 meters.

Torsten Seiler is head of the investment division at the Stadtentwässerung Dresden. He is part of the company since 2006, previous as team leader for general planning. Before this, he worked as a planner in an engineering office, which is why he knows planning processes from different perspectives.

PROJECT DATA

4th RENOVATION SECTION NEUSTÄDTER ABFANGKANAL

Country | City	Germany | Dresden
Year of construction	2019
Installation time	4 months
Installation	Relining
Technology	Amiblu NC Line
Total length of pipe	935.5 m
Pipe diameters	1900/1820 mm (294 m) 2060/2010 mm (174 m) 2240/2180 mm (467.5 m)
Nominal pressure	PN 1
Client	Stadtentwässerung Dresden
Contractor	Echterhoff Bau GmbH Dessau
Designer	DAR - Deutsche Abwasser Reinigungs GmbH Berlin



The team of contractor Echterhoff Bau ensured a smooth and trouble-free installation of the GRP profiles. The rehab section was successfully completed after four months.

By bike under rail tracks: Special XL GRP culvert jacked in Parczew

Parczew is a charming town located in the northern part of the Polish Lublin region. Clean forests, beautiful lakes, as well as many kilometers of hiking and cycling paths invite people to relax and exercise outdoors in nature.

As part of the modernization of the DW815 provincial road in Parczew, it was decided to create a safe pedestrian and bicycle tunnel under the LK30 railway line. After considering several options and materials, the client decided to realize the tunnel with large-diameter CC-GRP pipes with a diameter of 3600 mm.

The advantage of this solution was above all the possibility to install the tunnel by means of trenchless pipe jacking, which allowed for constant train traffic. GRP pipes provide several benefits for applications under railway tracks: they have full resistance to stray corrosion and a relatively low weight at high strength, which facilitates the installation and enables their use also under high loads.

PROJECT DATA

Country | City	Poland | Parczew
Year of construction	2019
Application	Tunnel for pedestrians and cyclists
Installation	Pipe jacking
Technology	Hobas CC
Total length of pipe	53 m
Pipe specifications	DN 3600 / PN 1 / SN 64,000
Client / investor	PKP PLK S.A. / Strabag
Contractor	Intop Tarnobrzeg / Motyl Przedsiębiorstwo Przewiertowe
Designer	Transprojekt Gdańsk

Two parallel pipelines De 3600 with a nominal stiffness of SN 64000 were jacked under the operating train tracks in about one month. To align the tunnel ends with the slope of the embankment, custom bevelled pipes were installed at the tunnel ends. Eventually, the pipe bottom was paved with concrete, lights as well as protective barriers were installed, and the pedestrian and bicycle paths were prepared for usage.

The project is the first of its kind in Poland and makes the beautiful area around Parczew even more attractive for bikers and hikers.

Renewable energy boost with highly resistant GRP

At the newly built hydropower plant "Illerursprung" in Germany's southernmost municipality Oberstdorf, a 2350 m long GRP penstock with 1800 mm diameter connects the point of diversion at the river Iller with the plant itself. The highly impact resistant and lightweight pipes outscored reinforced concrete product alternatives also thanks to their optimal hydraulics.

Four times as much energy than before – that's the impressive output of the newly built hydropower station Illerursprung in Oberstdorf. The ambitious project started in April 2019 and involved complex planning and construction works: building a modern inflatable dam, a new powerhouse, and a new penstock with increased dimensions. Reinforced concrete was initially considered as pipeline material but soon ruled out due to insufficient hydraulics caused by the rough inside surface as well as the pipes' heavy weight.

The construction company Geiger Hoch- und Tiefbau eventually decided to realize the penstock with Flowtite Grey GRP pipes by Amiblu. The highly impact resistant pipes allow for coarser gravel to be used for backfilling of the trench, saving time and costs in the construction. "The pipes were easy to handle and install, regardless of their large diameter of 1800 mm and lengths of up to 12 meters", says site manager Mathias Geiger.

For economic reasons, the GRP penstock was to be installed in open trench with little coverage – an approach that resulted in various high and low points over the entire pipeline length. Venting facilities were provided at the high points, while the low points allow for pumping the water out of the pipeline for inspection purposes.

Another challenge was the crossing of the river Trettach, which was also implemented in open trench. In order to install the penstock in 1.5 m depth below the Trettach, the river water had to be diverted by means of a bypass built of sheet pile walls and shoring elements. A geotextile in combination with an erosion control blanket provide buoyancy protection and ensure that the Trettach can't wash out the penstock over time.

Geiger Hoch- und Tiefbau installed the 2350 m long GRP penstock within 15 weeks. The power produced by the plant Illerursprung boosts the share of renewable energies serving the municipality.

PROJECT DATA

Country | City	Germany | Oberstdorf
Year of construction	2019
Application	Hydropower penstock
Installation	Open trench
Technology	Flowtite FW (Grey)
Total length of pipe	2350 m
Pipe specifications	DN 1800, PN 6
Client / investor	Energieversorgung Oberstdorf GmbH
Contractor	Geiger Hoch- und Tiefbau
Designer	Ingenieurbüro Dr. Koch

New GRP penstock for hydropower plant Ovadas

In the district of Viseu in central Portugal, an old concrete penstock has been replaced with GRP. The challenging installation works were carried out in two phases, allowing for the unhindered operation of the plant during peak production periods.

The run-of-river hydropower plant Ovadas is located at the Cabrum river, a tributary of the larger Duoro river, in the central inland of Portugal. After 25 years in operation, the plant's original concrete penstock suffered structural damage, which led the energy company Energia de Portugal (EDP) to replace the pipeline. The renewal involved 2100 m of buried pipe between the water intake connection of the dam and the concrete transition block.

Several circumstances regarding the site and pipe route made the installation challenging: the space on site was limited, the area hard to access with heavier construction machinery, and the exact route and profile of the old buried pipe was in many spots unknown. What the client needed was a pipe material that was easy to install and flexible enough to recreate a new penstock along the same route and with the same longitudinal profile as the old one.

The solution was found in GRP. Unmatched benefits such as the pipes' light weight, the possibility to realize curves via angular deflections in the couplings, and the availability of tailor-made pipe lengths and accessories enabled the team to successfully tackle all project conditions. With an extensive experience in penstock projects, Amiblu was commissioned to design and supply the 2100 m long pipeline.

Flowtite GRP pipes DN 1000 in pressure classes of 6 to 20 bar, elbows, tees with flanges for air vacuum valves, and inspection manholes were installed in two phases during the summers of 2017 and 2018. This allowed for an unhindered operation of the plant during peak production periods.

The GRP pipes' excellent hydraulic properties guarantee maximum energy output, and thanks to the material's corrosion resistance the penstock will improve the production performance of the Ovadas hydropower plant over many decades.

PROJECT DATA

Country | City	Portugal | Viseu
Year of construction	2017/2018 (summers)
Installation method	Open trench
Application	Hydropower penstock
Technology	Flowtite FW
Total length of pipe	2100 m
Nominal diameter	DN 1000
Nominal pressure	PN 6 - PN 20
Nominal stiffness	SN 5000
Client / investor	Energias de Portugal
Contractor	Construções Gabriel A.S. Couto
Designer	Noraqua

Click on the image on the left for an impressive bird's eye view of the GRP penstock installation in Viseu!

bit.ly/Ovadas-HP

Strong alliance across the English Channel

In February 2020, some of Anglian Water's @One Alliance team visited the Amiblu production plant in Dąbrowa Górnicza, Poland. During 2019, Amiblu successfully supplied 360 m of sliplining pipe to an @One Alliance project in Norwich, and as a result the two companies have been discussing another sliplining project to take place later this year.

The next project is a complex, large diameter scheme that comes with a new set of challenges; the team is researching a long-term solution for rehabilitating H_2S corroded sewers with the opportunity to work with live flows. To understand in more depth what bespoke solutions and potential cost savings can be created in GRP, Amiblu invited the team to come see for themselves.

Anglian Water is the largest water and sewerage company in England and Wales by geographical area. The @One Alliance is a collaborative organisation of consultants and contractors, working toghether to deliver more than half of Anglian Water's capital investment programme.

During the visit, the team was able to see examples of past projects which gave food for thought for future projects. As with all contracts, the team always faces challenges to improve efficiencies and think 'outside the pipe'.

– Peter Halsall
Senior Category Buyer
@One Alliance

I got a good impression from the technical team, they showed their willingness to work with us to find solutions.

– Abigail Stevens
Project Delivery Manager @One Alliance

Amiblu aligns well with the @One Alliance's code of conduct, particularly in supporting the health and wellbeing of its workforce.

– Peter Halsall
Senior Category Buyer
@One Alliance

The visit opened my eyes to the possibilities that are available to us in respect of bespoke fittings and systems in GRP.

– Dominic McDermott
Operations Manager
@One Alliance

From left to right: Peter Halsall (@One Alliance), Jarle Hausberg (Amiblu Sales Director Northern Europe), Lee Forth, Dominic McDermott, Abigail Stevens (all @One Alliance), Leon Woods (Amiblu Sales England), Colin Handley (@One Alliance).