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The magazine for large **Plastic Pipe Technology** (up to DN/ID 5000mm)
No. 27 / 2022
ISSN 2626-4366

IMPROFIL

ROAD CROSSING

DRINKING WATER RESERVOIR
INSTALLED IN THE GERMAN ALPS

SOCIAL MEDIA
FROM A BUSINESS KIND OF VIEW

IFAT 2022
HOW WAS THE FIRST FAIR SINCE 2019?

Content

Frank GmbH and SystemGroup have been successfully working with Krah machines for many years. The pipes in the project reports shown in this magazine have all been produced on Krah machines.

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Dear Readers,

finally we can report something more positive than in the last issues of ImProfil - the Covid restrictions have been relaxed for the most part (for the time being), so that even trade fairs were possible again. We took advantage of this, of course, and exhibited at IFAT in Munich last month. There was a huge crowd, because after the pandemic everyone was happy to finally experience some normality again and to meet old acquaintances and friends, as well as to make new acquaintances and customer contacts. The fair was a complete success for us, and the next one is already coming up in October this year: the K fair in Düsseldorf. You can already look forward to seeing what theme we will implement for you at our booth this year - it will be completely different from the last few years. We can only reveal this much: the atmosphere will be fantastic! Sustainability was a very big topic at the trade fair in Munich, and you could see that almost all the companies are tackling the issue and aligning their production to make it more sustainable and environmentally conscious. This is not a new topic in our company either. For a long time we have been looking at ways to make our production more sustainable, but also to improve all other economic, social and ecological aspects in the company. We have already done a lot to achieve this, but the list of projects to be implemented in the near future is still long. In order to transparently present the developments and plans to our employees and stakeholders, there will be an annual Krah ESG report from this year onwards, which will be attached to the company's annual report and which can be accessed by anyone. A detailed report on this topic can be found on page 18. But there was more going on than just the fair. We were able to expand our social media team with Alannis Reign Binoya from the Philippines and are very happy to have her as a correspondent and new colleague. Together with the Krah Asia inc. team, she will regularly publish YouTube videos entitled "Alannis asks", in which she interviews customers or employees, visits construction sites or gives insights into our companies. The first videos are already online and can be found on our YouTube channel "KrahTV". We would be delighted if you watched, liked and shared the videos. You are also welcome to tell us what you think of the videos and what topic would interest you. She will also be posting little insights and background information on Instagram, including following our in-house basketball team on their games in Manila and outside. Check the left page for our Social Media channels.

On a more serious note, Covid is far from over, and the economic crisis and the war in Ukraine are also making themselves clearly felt, both privately and in our company. We are currently struggling with very long delivery times for many materials and extremely increased prices, which makes it very difficult for us to produce machines and deliver them on time. However, our main goal still is the same as always - to deliver your requested goods and machines in best quality and without compromises. So, we will keep on giving our best, despite the circumstances.

We hope you enjoy reading this issue. Feel free to let us know if there's a particular topic you'd like to know more about and we'll try to cover it in a report. We are already looking forward to seeing many of you again in October at the K trade fair in Düsseldorf and to celebrating with you.

Best wishes and stay safe!
Alexander

Road crossing with Krah pipes

Project report by SystemGroup, Italy

Today we will see a very interesting solution, which exploits the versatility of SGK technology built on Krah machines, conveniently used in an AIPO road construction site in the province of Milan (Senago) for a road crossing.

The original idea was to use classic box-type concrete blocks to create the siphon. However, a discussion between the client and the company revealed the need to reduce the construction time to a minimum, finding a solution that would guarantee fast execution of the work and maximum safety from the point of view of hydraulic tightness. In this context, we were approached and proposed the solution consisting of the SGK DN 1500 mm spiral pipe siphon. The use of polyethylene spiral pipes and special pieces proved to be a winner due to the speed of laying and the guarantee of the sealing system.

INSTALLATION SPEED
(reduced construction time)

Thanks to the high lightness and flexibility of SGK pipes, it was possible to weld them out of the trench, optimising time and laying the entire pre-assembled siphon inside the trench. All this was possible thanks to the electro-weldable socket joint system between the various elements that make up the siphon.

SEALING SYSTEM

The unique electro-weldable socket sealing system was one of the decisive elements for the choice, as with the polyfusion caused by welding, there are no potential hydraulic leakage points, which are essential to guarantee the stability of the work and the safety of users. Even small leaks, constant over time, when it comes to siphons for road crossings, can cause real disasters caused by chasms in the ground and the consequent collapse of the roadway. I remind you, as always, that if you are interested in learning more and discover all the case studies, you can interact directly with our INTERNAL ENGINEERING TEAM dedicated to design support, here:

SystemGroup
11 Via Foglia, Lunano, 61026 (PU) Italy
Email: info@tubi.net

Sewage treatment plant Karlsruhe

Project report by FRANK GmbH, Germany

Welded large-diameter pipes made of PE 100 in sewage treatment plant construction - new adsorption building - pressure pipes up to DN/ID 1200 and coiled pipes up to DN 2000 with electrofusion welding

Stadtentwässerung Karlsruhe has been operating the central sewage treatment plant for over 100 years, starting in 1913 with a first screening plant. The location was determined in 1908 - at that time, the Baden Grand Ducal Administration commissioned the city to mechanically clean the wastewater from the city area before discharging it into the Rhine. The choice of a location as low as possible, close to the boundary of the Rhine district, allows the wastewater to flow out of the city districts mainly in a free gradient. The catchment area of Stadtentwässerung Karlsruhe covers 4586 ha. The network length in 2009 was 1108 km. The annual inflow to the sewage treatment plant from 2004 to 2009 was approx. 34,000,000 m³ - the design flow rates for the sewage treatment plant are 2.1 m³/s in dry weather and 4.0 m³/s in rainy weather. [1]

Presentation of the construction project:

In order to be able to safely and stably comply with the legally required effluent values, the construction of a fourth purification plant, consisting of a filtration plant for the retention of fine particles and an activated carbon plant, was completed.After completion of the filtration plant, construction of the activated carbon adsorption plant began in 2019. In addition to further improving the effluent values, the adsorption plant will also reduce so-called trace substances. These trace substances, such as medication residues or hormone substances, cannot be treated or removed from the effluent of a wastewater treatment plant with the current state of wastewater treatment. The new adsorption stage contains six contact basins, each with a capacity of approximately 1,870 m³. Here, powdered activated carbon is added to the biologically purified wastewater so that the trace substances still dissolved in the wastewater are bound. The waste water mixed with activated carbon then enters a sedimentation basin with a capacity of 8,200 cubic metres. Here, the activated carbon is separated from the waste water and returned to the process. Some of the loaded activated carbon is discharged from the process and incinerated with the sewage sludge at the plant. The pre-treated

Compaction works on site

effluent is passed through the sand filtration system to remove the final residuals and is discharged into the treatment plant effluent. [2]The six contact basins, the two sedimentation basins as well as a pumping station and several shafts were constructed by Wolff & Müller using in-situ concrete. The connecting pipes between the structures were constructed as PE100 pipelines buried in the ground with welded pipe joints.The engineering office Tuttahs und Meyer (Aachen / Bochum), which was responsible for the planning and tendering of the construction project, planned the following PE 100 pipes for the connecting pipes of the individual structures.

Outlet filtration in contact basins:

- Wound pipes made of PE 100 according to DIN EN 16961 DN 2000 with closed base and cover layer, ring stiffness SN 8, pipe connection with integrated heating coil socket.

Return flow from sedimentation into filtration:

- Wound pipes made of PE 100 as before, but in nominal size DN 1600

Outlet contact basin in sedimentation (incl inlet siphon) and outlet sedimentation:

- Pressure pipes of PE 100 according to DIN EN 8074/75 DN/ID 1200, SDR 17, pipe connection on site by means of heating coil sockets - Pipe connection of the prefabricated pipe elements by means of heating element butt welding

Return coal siphon from sedimentation as well as inlet contact basin from the return coal pumping station

- Pressure pipes made of PE 100 as before, but in nominal diameter DN/ID 900, SDR 17

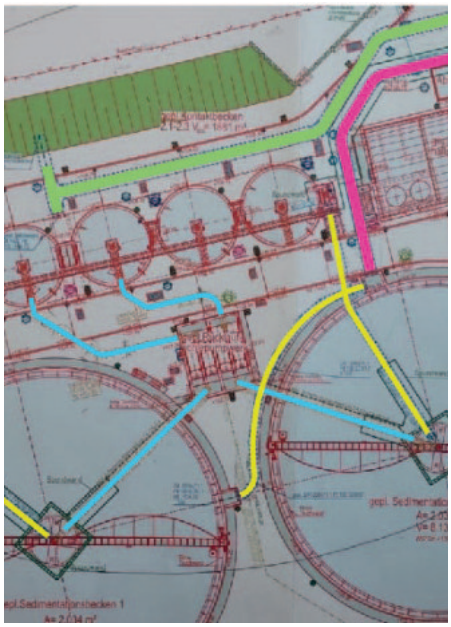

Fig.1 - Overview of the construction project, contact and sedimentation basin with connecting pipes made of PE 100

Pipe material and manufacture of the coiled pipes according to DIN EN 16961:

The production of the profiled DN 1600 and DN 2000 sewer pipes made of PE 100 with integrated heating coil socket as well as the manholes and components was carried out at FRANK Kunststofftechnik GmbH in Wölfersheim, Hesse.

BorSafeTM HE3490-LS black was used as the PE 100 pipe material. Here are some selected material characteristics:

- Density 959 kg/m³ according to ISO 1183
- Melt flow index 0.25 g/10 min according to ISO 1133
- Tensile stress 250 N/mm² - short time according to ISO 527-2
- Modulus of elasticity 1100 N/mm² - short time according to ISO 527-2

Polyethylene (PE 100) is a thermoplastic which, in addition to a low specific weight, also has excellent processability, weldability and formability. Polyethylene is particularly resistant to aggressive media (acids and alkalis). Furthermore, the molecular structure of the material, which is composed of carbon and hydrogen, enables it to be recycled. Polyethylene is 100 % recyclable. For pipes made of PE (100), the proof of long-term strength („durability") is already mentioned in the basic standard. DIN 8074, Pipes made of polyethylene (PE) - PE 80, PE 100 - Dimensions and DIN 8075, Pipes made of polyethylene (PE) - PE 80, PE 100 - General quality requirements, tests contain the following statement on long-term strength:

„The service life previously estimated at 50 years can be extended to at least 100 years of service life for PE pipes at application temperatures of 20°C on the basis of many years of tests and experience." [3]

This ensures that PE100 pipes and fittings are a durable and sustainable solution for transporting wastewater (and other liquid media) over an economically, assured depreciation period of up to 100 years.

Production of coiled pipes:

The PE 100 moulding compound is wound in the molten state as a continuous, overlapping strip in a spiral on a metal drum. (Fig. 2) An additional, functional and/or inspection-friendly inner layer can be applied via a coextruder. A metal drum serves as calibration, which determines the inner diameter (DN) of the pipe. The pipes are cooled slowly by a blower. In this way, residual stresses caused by volume shrinkage and the production process can be reduced.

Fig. 2 - Production of wound pipes on a Krah machine at FRANK Kunststofftechnik GmbH

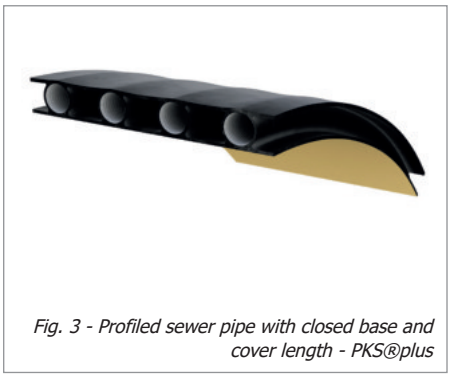

Fig. 3 - Profiled sewer pipe with closed base and cover length - PKS®plus

By winding several layers of the moulding compound on top of each other and varying the amount of material applied, different wall thicknesses and profile geometries can be produced. (Fig. 3) PKS® sewer pipes are available in nominal sizes DN 500 to DN 3500. The base wall thickness is determined in accordance with the minimum requirements of DIN EN 13476-3 or operational requirements. Production and quality assurance are carried out within the framework of the general building authority approval Z-40.26-359.

Welded joints:

In the PKS® pipe system (profile duct pipe system), the individual pipes (but also manholes / components) are welded with the integrated heating coil socket (E-socket) as standard. During the manufacturing process, the socket and spigot end are formed onto the pipe. During installation on site, the spigot end is then inserted into the socket and subsequently welded. (Fig. 4) The welding parameters are transferred to the welding device via a barcode. The welding device automatically logs the welding process.

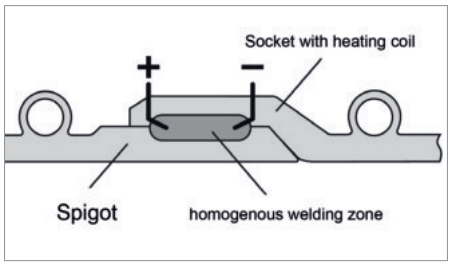

Fig. 4 - Welded joint - schematic representation; integrated E-socket

Pipe material and manufacture of the pressure pipes according to DIN EN 8074/75:

The production of the pipes DN/ID 900 and DN/ID 1200, SDR 17 mm was carried out according to DIN 8074/75 in the Bad Hall plant of AGRU Kunststofftechnik GmbH. As with the coiled pipes, BorSafeTM HE3490-LS black was used as the pipe material. This is a bimodal PE 100. The material is particularly suitable for the production of large diameters, as it exhibits so-called „low sagging" behaviour during manufacture. This means that the material in the plastic state within the nozzle and calibration has little tendency to flow downwards according to gravity. With materials whose properties are not optimised accordingly, it is not possible to produce uniform wall thicknesses with large pipe diameters (Fig. 5).

Production of the heating coil sleeves:

Up to a pipe diameter of 500 mm, the heating coil sleeves are manufactured at AGRU Kunststofftechnik GmbH, Bad Hall in a multi-stage injection moulding process. The „large" heating coil sleeves (currently up to 1400 mm) are produced from thick-walled PE blanks. The PE blank is machined to size in a multi-axis machining centre. The heating coil is then „ploughed in".

Prefabrication of piping components:

In order to facilitate the assembly of the pipes and components on site and to reduce the number of welded joints on site, pipe fittings were prefabricated from the pipes at the FRANK Kunststofftechnik GmbH factory. Care had to be taken to ensure that the components could still be transported and that installation in the excavation pit was still possible.

The welding processes used for the prefabrication were heated-tool butt welding (HS) and hot-gas extrusion welding (WE). After butt welding, the inner bead was removed while the pipe was still partially warm in order to obtain a smooth, homogeneous pipe surface on the inside - Fig. 6 and Fig. 7.

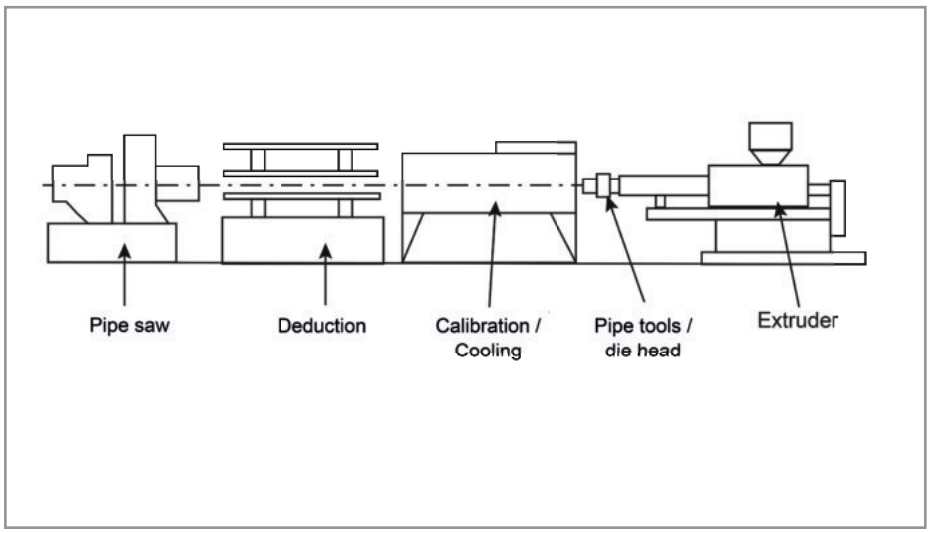

Fig. 5 - Production of PE pipes according to DIN 8074/75 - Pipe extrusion line schematic

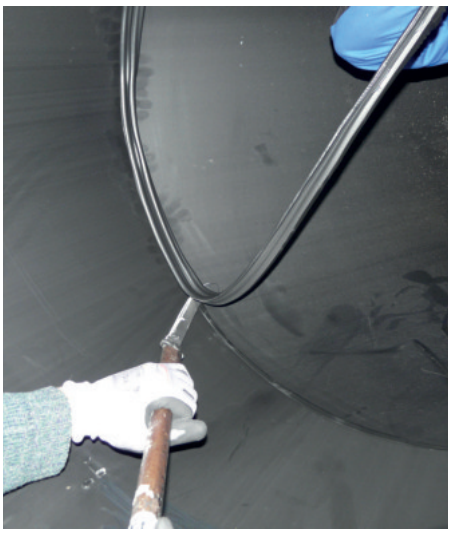

Fig. 6 - Inner bead removal

Fig. 7 - Prefabricated pipe fitting DN/ID 1200 mm

Fig. 8 - Peeling of the pipe surface before electrofusion DN/ID 1200 mm

Installation of the pipes and welding of the joints:

From spring 2020 onwards, the pipes and fittings were installed in sections by van den Hooven Rohrleitungsbau in accordance with the construction schedule. The pipes were inserted into the prepared, shored excavations by means of a tower crane or hydraulic excavator and prepared for welding. The mechanical processing of the pipe surface (the peeling) was carried out on the 900 and 1200 mm pipes with a link peeling device from PF-Schweißtechnologie GmbH - Figure 8. Directly after peeling and cleaning the pipe surface, the heating coil sleeves were then pushed on and pulled onto the pipe end by chain hoists - Fig. 9.

Since the heating coil of the large E-muffs is designed as a so-called „bifilar" coil (two separate welding zones), welding was carried out with two welding machines in parallel in order to keep the processing time as short as possible.

Construction details:

The connection of the PE pipes to the concrete structures was made with a tension-resistant and watertight wall bushing. The „FRANK wall collar" made of EPDM is used here as a sealing element between the concrete and the PE. The required tensile strength is generated by a welded-on, perforated plate collar. In order to be able to safely absorb the occurring forces of thermal expansion in the PE pipes, the component was mathematically designed for a max. temperature difference of 10 K in operation. In order to enable the DN 1600 and DN 2000 pipes to be walked on, DN 1000 tangential shafts were manufactured in the factory in a backwater-proof design. Since the two pipes are „overpressured" during operation (approx. 0.50

Fig. 9 - Mounting the heating coil sleeve

Fig. 10 - Installation of sand in the pipeline zone

Fig. 11 - Flanged transitions from rectangular to round DN/ID 900 mm made of PE sheets

Fig. 12 - Installation of sand in the pipeline zone

bar), a corresponding DN 600 manhole cover was firmly screwed to the monolithic tangential manhole - Figure 10.

To ensure an even inflow into the contact basins from the coal pumping station, flanged transitions from rectangular to round DN/ID 900 mm were manufactured in the factory from PE sheets and installed on site - Fig. 11.

Installation of the pipes:

The DN 1600 and DN 2000 coiled pipes were installed on prepared supports under „dam conditions" - the pipeline zone (bedding) was constructed entirely with sand - an add-on compactor was also used during installation and compaction. The construction management carried out load plate tests to determine the degree of compaction as part of the construction supervision - Fig. 12.

Conclusion

By choosing PE 100 as the pipe material, the construction project presented here could be completed economically and on schedule according to the state of the art. The flexible design and the high degree of prefabrication made it possible to install the pipes and fittings quickly and economically on site. Pipes and fittings made of environmentally friendly polyolefins (PE/PP) can be 100 % recycled after their useful life in just a few process steps: An ecological and economic advantage compared to systems made of conventional materials (e.g. composites), which have to be reprocessed after dismantling with high energy expenditure or disposed of at additional cost. A great advantage for the companies involved (Wolff & Müller as the executing contractor and van den Hooven as the pipeline builder) was that all pipes and fittings as well as the connection

technology - heating coil socket, welding equipment and peeling equipment - were supplied or made available completely by FRANK GmbH. The instruction in the processing of the large heating spiral sleeves as well as the site supervision and assembly support were completely provided by FRANK GmbH. Necessary plastic assemblies and extrusion welding on site were also carried out by FRANK GmbH.

Jochen Obermayer
Frank GmbH

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[1] Brochure Civil Engineering Office
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[2] https://www.karlsruhe.de/b3/bauen/tiefbau/entwaesserung/klaerwerk.de
[3] DIN EN 8074/75
[4] Agru Plastics Technology GmbH, Bad Hall

Scope of delivery

Pressure pipe PE 100:
- da 900, SDR 17 approx. 140 running metres
- da 1200, SDR 17 approx. 120 running metres
Each with pipe fittings and E-muffs.

Wound pipe PE 100:

- DN 2000, SN 8 approx. 80 linear metres
- DN 1600, SN 8 approx. 90 linear metres
Each with pipe fittings and integrated E-socket.

Partner

Planners:
IB Tuttahs und Meyer (Aachen / Bochum)
Construction:
Wolff & Müller Ingenieurbau GmbH
Pipeline construction:
van den Hooven Rohrleitungsbau GmbH
Your contact for further information:
J.Obermayer@frank-gmbh.de

Drinking water reservoir made of PE100
using the example of Aschau (Alpine region)

In autumn 2021, the municipality of Aschau im Chiemgau, Germany, provided the newly founded district of Staffelstein with its own supply. The Staffelstein district is predominantly located in alpine terrain (above 1000 m) and includes the Steinling Alm, the Sonnenalm, the Möslarn Alm and other huts and alpine pastures. For the first time since its foundation in 2012, Staffelstein now has its own sewage disposal and drinking water supply.

Due to this exposed location, the engineering firm Dippold und Gerold from Prien was already commissioned in 2014 to plan its own supply. The further procedure included a route inspection on site, surveying the topography and, in 2015, applying for funding. In 2018, the „grant of the special mountain hut programme" was applied for and the tender for the construction measure was published. After a public tender, the construction company LKS from Schönau am Königssee was commissioned to carry out the work.

The planned details for an optimal supply of the alpine local points:

The installed sewage disposal system is designed for 526 population equivalents (PE) and the drinking water supply covers a demand of approx. 12 m³ per day. FRANK GmbH supplied the following piping material and PE drinking water tanks from its own production.

For the sewage disposal:

- approx. 5,500 metres of PE 100 pipes DN63-DN180 in pressure stages up to PN 16.

For drinking water supply:

- approx. 5,000 metres of PE 100 pipes DN75 and DN90 - partly in PN 25
- 1 pc. high tank DN2000 with slide chamber DN2500 and capacity of 2 x 3 m³ for the „Steinling-Alm"
- 1 pc. Elevated tank DN2500 with slide chamber DN2700 and capacity of 2 x 10 m³ for the „Sonnenalm".
- 2 pcs. feed tank DN2400 with 15 m³ capacity each for „Lochgraben"

Basic design of drinking water tanks according to DVGW worksheet W 300:

The DVGW Code of Practice W 300 describes technical rules for the construction, operation and renovation of drinking water tanks and consists of a total of 6 parts. The worksheets contain recommendations and requirements for the use of materials, the execution and design as

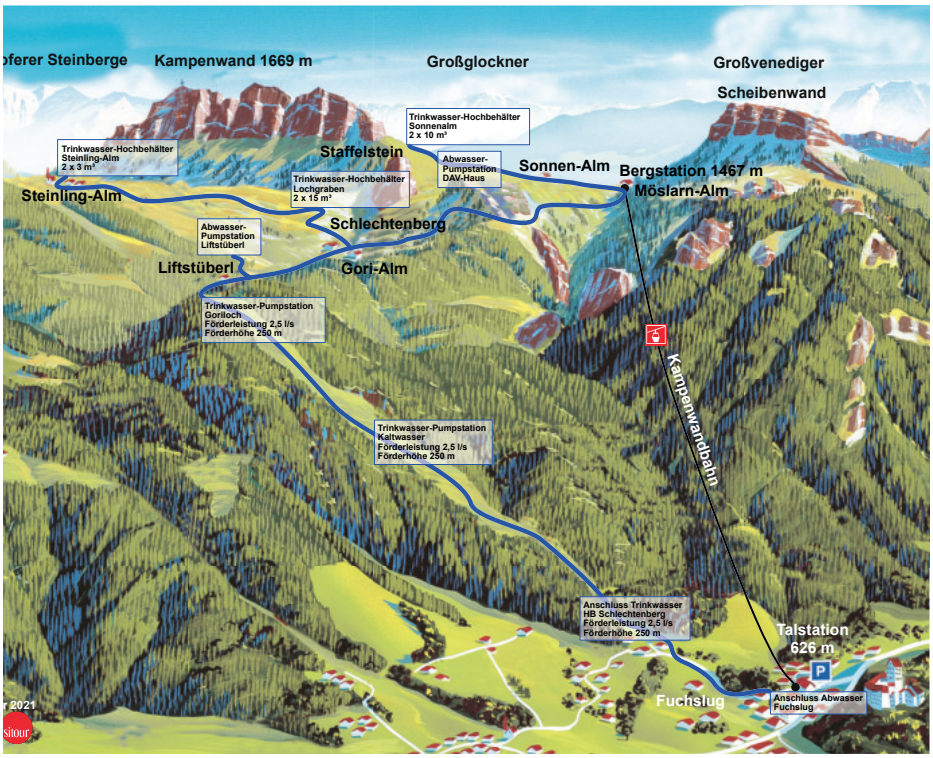

Fig. 1 - Construction panel showing the overall measure [1].

well as the operation and maintenance of drinking water tanks. Parts 1 - 5 have been available and valid as a white print since 2014 and Part 6 since 2016. With the introduction of the current W 300, the material PE was also designated for the manufacture of drinking water tanks. Prior to this, this design was not officially considered a standard design by the DVGW, although drinking water tanks made of PE had been used in many areas for over 25 years.

PE drinking water tanks have also been used successfully in alpine locations in the past. Part 6 deals explicitly with the execution and design of system and prefabricated tanks made of PE as a material.

Essential requirements of the W 300 Code of Practice are fulfilled without exception by PE 100 drinking water tanks. These include, for example:

W 300-1, 5.4 „Selection of materials according to water chemistry".

- Good chemical resistance of PE to raw water attacking concrete

W 300-1, 6.1.3 Tank designs

- Production of prefabricated and system tanks made of PE possible
- Reduction of construction time on site
- Insulation to prevent condensation

W 300-1, 6.1.4 Material issue in relation to drinking water quality

- Smooth, non-porous surface of PE
- Approval and drinking water suitability of PE according to DVGW W 270

W 300-1, 7.2 Functional requirements

- Access via valve chamber, no access above the water surface
- All piping in the valve chamber acces sible
- View of the water surface via sight glass
- Two water chambers for cleaning / in spection
- Object protection via appropriate access door

W 300-1, 10. Checks, testing, initial commissioning

- Leak test for system tank in the factory
- Quality assurance can already take place in the factory for PE containers (see also W 300-6, 5.2)
- Essential requirements for surface quality are already fulfilled by the use of approved materials and do not have to be verified or tested separately.

W 300-6, 5.3 Life cycle management, economic efficiency

- Long service life (see also point 3. DIN EN 8074/75)
- Dismantling and disposal costs - recycling (see also item 6. Conclusion)

W 300-6, 8th pipe tank

- Static proof according to ATV-DWA A 127
- Deformation max. 3
- Slope to the valve chamber min. 0.50 %.

Wound pipes and semi-finished products made of PE for drinking water structures: Profile wound pipes made of PE 100 are used to produce the basic geometry („pipe tank"). Production is carried out in the FRANK Kunststofftechnik GmbH coiled pipe plant in accordance with DIN-EN 16961 using modern PE 100 materials that have been approved by the German Institute for Building Technology (DIBt). The PE 100 pipe material used is, for example, BorSafeTM HE3490-LS black.

Here are some selected material characteristics:

- Density 959 kg/m³ according to ISO 1183
- Melt flow index 0.25 g/10 min according to ISO 1133
- Tensile stress 250 N/mm² - short time according to ISO 527-2
- Modulus of elasticity 1100 N/mm² - short time according to ISO 527- 2

Polyethylene (PE 100) is a thermoplastic which, in addition to a low specific weight, also has excellent processability, weldability and formability. Polyethylene is particularly resistant to aggressive media (acids and alkalis). Furthermore, the molecular structure of the material, which is composed of carbon and hydrogen, enables material recycling: polyethylene is 100 % recyclable. Polyethylene has been used successfully for many decades in gas and water supply in the form of pipes, fittings and manholes. Plates made of polyethylene have also been used for many years in the renovation of drinking water tanks (made of concrete). Producing drinking water tanks entirely from PE is economically advantageous and also environmentally friendly.

The smooth, non-porous surface is excellently suited for the storage of drinking water. For pipes made of PE (100), the proof of long-term strength („durability") is already mentioned in the basic standard. DIN 8074, Pipes made of polyethylene (PE) - PE 80, PE 100 - Dimensions and DIN 8075, Pipes made of polyethylene (PE) - PE 80, PE 100 - General quality requirements, tests contain the following statement on long-term strength:

Fig. 2 - Production of coiled tubing at FRANK Kunststofftechnik GmbH

„The service life previously estimated at 50 years can be extended to at least 100 years of service life for PE pipes at application temperatures of 20°C on the basis of many years of tests and experience." [2]

This ensures that drinking water structures made of PE100 are a durable and sustainable solution for the storage of drinking water over an economically, secured depreciation period of up to 100 years. For the area of the water chamber in contact with drinking water and in the access area of the valve chamber, a blue PE material is homogeneously applied to the inner surface of the coiled pipes using the co-extrusion process (Figure 2). The blue raw material type has the necessary approvals according to the tests of the TZW (Technologierzentrum Wasser) in accordance with DVGW guideline W 270 for drinking water suitability. This process already fulfils the essential requirements of the DVGW with regard to surface quality and hygiene of the surfaces that come into contact with drinking water.

The outside of the coiled pipes is made of UV-resistant black PE 100. FRANK produces coiled pipes up to an internal diameter of DN 3450 mm. With this diameter, the storage capacity in a pipe tank is just under 9 m³ / linear metre. In order to achieve

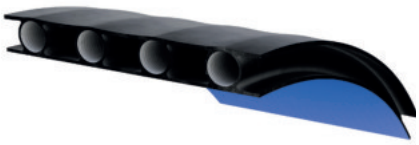

Fig. 3 - Profiled winding tube with closed base and cover layer - PKS®plus

a high degree of stability and good thermal insulation of the coiled pipes, profiled coiled pipes with closed base and cover layers are usually used (Figure 3).
The following semi-finished products / installation parts are used as further components for the tanks:

- PE 100 pressure pipes blue for drinking water according to DIN 8074/75 with DVGW approval
- Plates made of PE blue with TZW certificate for drinking water suitability

• Piping components and fittings made of metallic materials with DVGW approval

Execution and design of PE drinking water tanks:

The design of the pipe structures takes into account the respective requirements of the operators as well as the DVGW guidelines already mentioned. Drinking water tanks are usually designed with two water chambers and a technical room (valve chamber). The usable volume of drinking water tanks made of coiled pipes is approx. 6 m³ to 800 m³. Up to a size of approx. 2 x 40 m³, the structure can be completely prefabricated and delivered to the construction site in one piece - as a so-called „system tank" (Figure 4).

In the case of larger tanks or special requirements for the transport route, the delivery is made in individual parts (prefabricated tanks), which are then assembled and welded on site by DVS- and DVVGW-certified specialist welders. This means that in areas that are difficult to access, a drinking water tank can be delivered in individual components and assembled and tightly welded within a few days. Even transport in difficult terrain is no problem using (tracked) excavators. Figure 6 shows the transport of a drinking water tank (system tank) in steep terrain with a volume of 2 x 20 m³ and a central slide chamber - completely prefabricated in one piece in the factory. All system-relevant components are prepared and installed in the factory to the extent that the completion and final assembly on the construction site can be carried out without any problems (Fig. 6). The valve chamber (technical room) can be equipped with all required components - e.g.

Fig. 4 - PE system container - 2 x 40 m³ - delivery in one piece

Fig. 5 - Prefabricated container made of PE - 2 x 60 m³ - Delivery in 3 individual parts

- Complete piping with armatures for inlet, outlet, drainage, transfer, etc.
- air filter
- lighting
- Pressure boosting
- sampling
- Water treatment - e.g. UV disinfection, ultrafiltration, deacidification
- Underwater access
- Object protection door

Details and special features of the drinking water reservoirs „Aschau-Staffelstein":

The planning office Dippold + Gerold from Prien am Chiemsee had already planned and described PE drinking water tanks for the three tank locations Steinlingalm, Lochgraben & Sonnenalm in the invitation to tender.

The Steinlingalm tank was prefabricated as a system tank with two water chambers of 3 m³ each and a central valve chamber and delivered in one piece. Access to the valve chamber is guaranteed from above via a dome entrance with ladder.

Access to both water chambers is via an underwater entrance with a DN 800 pressure door made of PE. The transport on the last metres in the alpine terrain was carried out by a chain excavator (Fig. 7). At the „Lochgraben" site, a waterworks with two double pumping stations in reinforced concrete construction was built. The two tubular tanks (2 x chamber with 15 m³ each) serve as storage tanks for the pumping operation as well as for the drinking water supply of the Gorialm local network with a total of 5 huts. The HB Lochgraben also serves as the control centre for all drinking water operations. The upper floor of the two-storey concrete structure is clad with wooden panelling to give it the appearance of a „hut". The production and delivery of the two template tanks took place in one piece. On site, the two tubular tanks were integrated into the basement of the concrete structure by means of a tensile and watertight wall connection including FRANK wall collars.

Fig. 6 - Slide chamber with a selection of components (example image)

Fig. 7- Installation of the "Steinlinalm" tank - 2 x 3 m³ with central valve chamber

For the „Sonnenalm" site, a prefabricated tank with a volume of 2 x 10 m³ and a centrally located valve chamber was planned. Access to the slide gate chamber is at ground level via a stainless steel object protection door. The two water chambers are each accessible via a pressure door made of PE DN 800.

As the location of the tank was in alpine terrain just above the tree line at approx. 1500 m above sea level, the transport to the installation site had to be planned in several stages and in three individual parts.

1. Transport by low-loader from the factory to the "Fuchslug" reloading point
2. Transport with all-wheel drive construction site truck to the reloading point in the „Gori-Alm" area
3. Helicopter flight with Puma cargo helicopter of the three individual parts to the installation site (Fig. 8)
4. Moving at the installation site with Liebherr 914 crawler excavator

In order to ensure a smooth flow of the individual transport stages, care was taken at the factory planning stage to ensure that the largest individual weight did not exceed the helicopter's payload of approx. three tonnes. The valve or gate chamber
The valve chamber as the central part of the drinking water tank with connections for the two water chambers was weighed at 2950 kg in the factory. Thus, on a sunny midsummer morning at the beginning of August 2021, the three individual parts could be flown over the approx. two km as the crow flies and deposited at the installation site within one hour.

The height and position of the individual parts was then adjusted and they were pulled together at the installation site with the help of a chain excavator and 2 chain

hoists. Subsequently, the connections between the slide valve and the two water chambers were made materially and tightly by means of hot gas extrusion welding from the inside and outside by a specialist fitter. The flawless, sunny mountain weather and the magnificent view from the Kampenwand into the foothills of the Alps helped with this work.

Conclusion:
All drinking water reservoirs and pipeline components supplied for the „Aschau-Staffelstein" construction project were successfully put into operation in autumn 2021 after leak testing, cleaning and disinfection.

In summary, it can be stated that drinking water tanks made of PE represent a contemporary and economical solution for securing the municipal infrastructure.
In particular, drinking water tanks with smaller and medium volumes (up to approx. 800 m³) can be produced for permanent use. The high degree of factory prefabrication and the flexible design enable user-friendly solutions. Transport to the installation site is feasible even under difficult conditions. Pipes and fittings made of environmentally friendly polyolefins (PE/PP) can be 100 % recycled after their service life in just a few process steps: An ecological and economic advantage compared to systems made of conventional materials (e.g. composites), which have to be reprocessed after dismantling at high energy costs or disposed of at additional expense. A great advantage for the planner (Dippold + Gerold, Prien), the contractor (LKS, Schönau) and the client (municipality of Aschau) was that all pipes, fittings and containers were supplied completely by FRANK GmbH. The instruction in the processing of the heating coil sleeves as well as the site supervision and assembly support were completely provided by FRANK GmbH. The necessary plastic welding on site was also carried out by FRANK GmbH.

List of sources:

[1] Ingenieurbüro Dippold + Gerold GmbH, Prien am Chiemsee
[2] DIN EN 8074/75

Scope of delivery: See page 1
Partner: Planning - IB Dippld + Gerold GmbH, Prien am Chiemsee
Construction - LKS Tiefbau OHG, Schönau am Königssee
Trading partner Richter + Frenzel TBU GmbH, Kolbermoor

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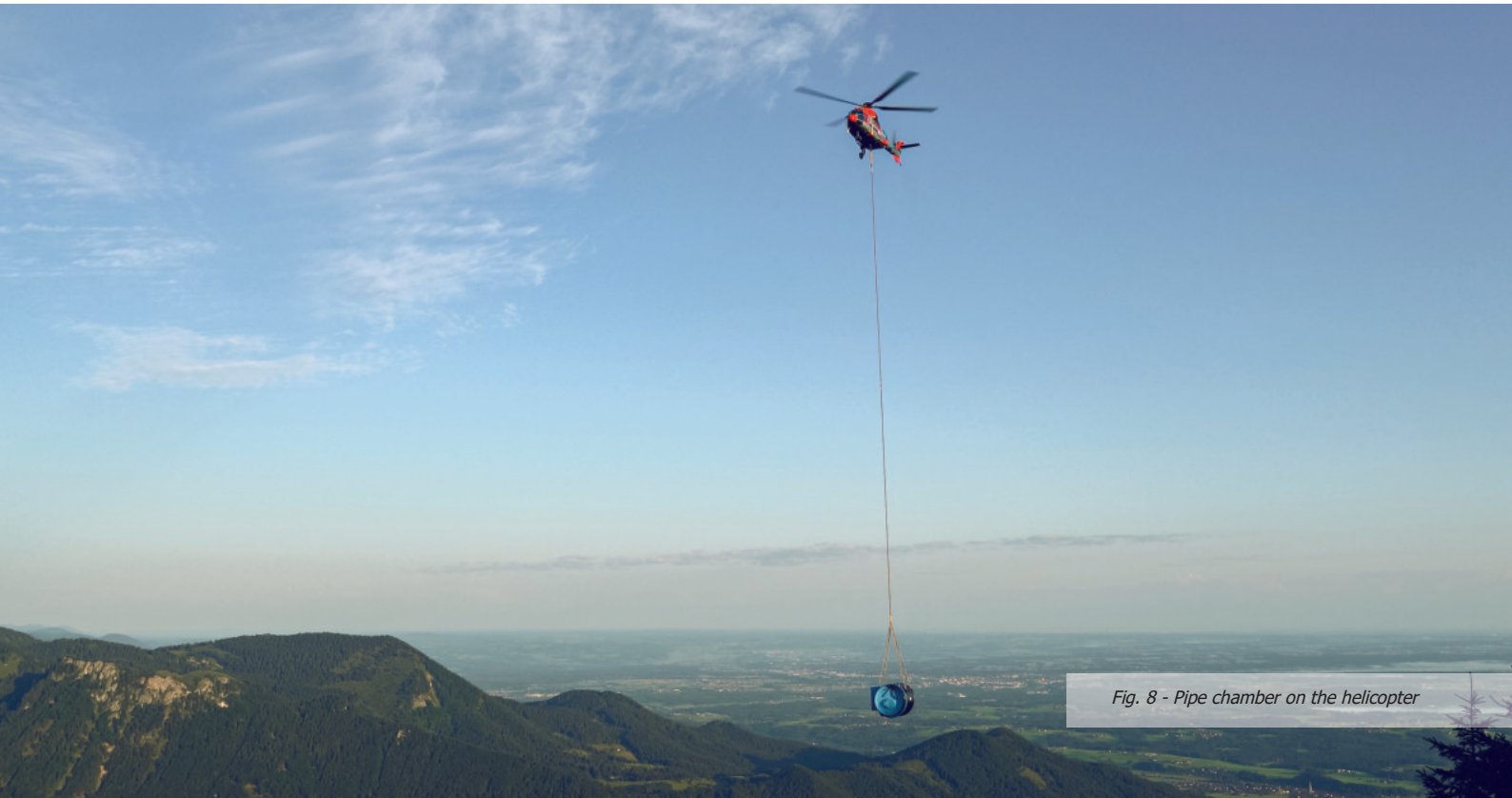


Fig. 8 - Pipe chamber on the helicopter

IFAT 2022

How was the first fair „after" Covid?

Due to Covid, many things were not possible for a long time, or only limited. So we were more than delighted to finally being able again to take part in such a meaningful fair like the IFAT in Munich.

The IFAT is the world's leading trade fair for water, sewage, waste and raw materials management and took place in Munich from 30 May to 3 June 2022.

The Krah pipe bar waiting to be put on the booth

Despite the past two years of restrictions and lockdowns, we were positively surprised to see 2.984 exhibitors from 59 countries and around 119.000 visitors from 155 countries participating. This high level of international participation is impressive at the current time, especially for IFAT. Because it occupies a very important position for a sustainable circular economy and environmental industry. Even German Federal Environment Minister Steffi Lemke explained at the opening of the fair that a functioning circular economy saves primary resources, reduces dependencies and contributes significantly to climate and species protection. More than 300 experts shared their knowledge in lecture programmes, as well as numerous live demonstrations and tours to showcase technologies that address the four special areas of the circular economy. IFAT Munichen occupied all 18 halls at this fair and also a large part of the outdoor area, which is 260.000 square metres in total.

In addition, 49 start-ups from 16 different nations were set up in a designated area. There were also 15 international joint stands, with Europe, Japan, Canada, South Korea and the USA, among others, exhibiting. Furthermore, a number of high-ranking representatives in political positions travelled to IFAT Munich, including Egypt, Belgium and Malaysia, also the environment ministers of Brazil and Singapore, as well as numerous international delegations. It was a pleasure to be part of this incredibly successful world-leading trade fair. It was nice to meet our customers as well as friends again after such a long time, after such a crucial time. Compared to the last years, we found that there were far fewer visitors at the fair, especially in the last days of the fair. There was a lack of visitors and exhibitors from china and russia in particular. this was due to covid on the one hand and the restrictions due to the ukraine war on the other. Nevertheless, it was once again a great platform for us to meet our customers, acquaintances and friends and to promote social interaction. Our latest development, which we presented at the fair, attracted a lot of interest. Over the last few months, our development team has developed a milling machine that can automatically mill holes in the pipes in order to attach connectors. This milling machine can also be used to cut pipes, thus eliminating the work that previously had to be done by hand. This makes the process much safer, more precise and also easier. The machine is programmed so that any shape can be cut. Soon it will be possible to order this machine from us and thus make many steps in production easier. At the trade fair, we exhibited a pipe that had been cut with the milling machine.

A pipe made with the newly developed machine

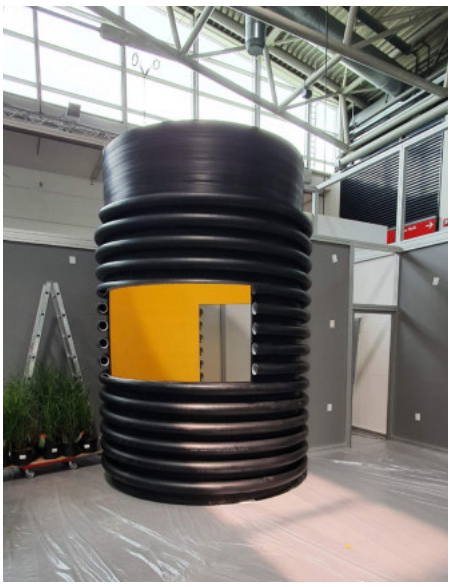
To show how precisely the machine can work, we milled our Krah logo into it. We showed a video of this process. The vi-

sitors were very fascinated by the video and the result, and we have already received several enquiries about the new machine. If you would like to know more, please send us an email. But even though it sounds like a lot of work and exhausting days - it definitely was - the fun was not neglected either. It would have been a shame if we hadn't explored the beautiful city of Munich extensively and spent the summer evenings there after work. All in all, we can say that we enjoyed the days in Munich with our customers very much and we are already looking forward to the next trade fair.

We have also met potential new clients and we will see how the relationships and business develop in the near future. In summary, it was an exciting and informative few days that we spent at IFAT Munich. With that in mind, our anticipation is tremendous, when we think of the next fair. - which will be the K show in Düsseldorf, taking place from 19 - 26 October this year.

We are already planning the booth and some special events during the fair and hope it can still take place like the IFAT. Exhibitions are always something special, it's so nice to see everyone, talk to everyone and experience all of this together - which only works so well because the Krah Community feels like a family.

Jenny & Lena
Krah Group



ESG - An environmental statement

by Krah Group Management

Sustainability is a very important and much discussed topic these days. No one can avoid at least thinking about how to live more sustainable, environmentally conscious and healthy and thus improve their own carbon footprint anymore.

As a medium-sized company, we too have not only been thinking about it for years how to improve economic, social and ecological aspects, but also taking action accounting to it. Because when it comes to the responsible use of our environment and its limited resources, we do not just want to meet the standards, we want to go beyond those. In order to achieve a good climate balance as a company, a strict view of the value chain is necessary. To this end, we pay very meticulous attention to waste separation and, above all, waste avoidance - in the company itself as well as in the production of our raw materials. Switching from fossil fuels to sustainable ones is an essential point that can lead to a better carbon footprint of a company. We will be installing solar plants on our company's roof to ensure our own power supply and to be able to supply other companies in the area with it.

We will completely convert our company cars to those using electric mobility in the coming years. To this end, we have already exchanged the first cars and installed two electric charging stations for them outside the company. Our newly built office extension was constructed in a climate-neutral way and clad with wood from local forests to better integrate with nature. The roof will be greened in the near future so that, on the one hand, a species-rich ecosystem can develop, and, on the other hand, the interior spaces are automatically better insulated. Our development team is currently working on finding various ways to significantly reduce the overall energy requirement in both the company and pipe production. Because we do not just want to improve our carbon footprint in our own company, we also want to ensure that our products are more environmentally friendly and climate neutral with the machines we manufacture. To this end, recycled plastic can also be used for pipe production with our machines. In addition, excess material, such as test pipes or deformed parts, can be crushed with a mill developed by us in order to reuse it for pipe production. This means that our PE pipes not only have a service life of over 100 years but can also

Environmental

Considers how a company performs as a steward of nature

Climate change strategy
Biodiversity
Water efficiency
Energy efficiency
Carbon intensity
Environmental Management System

Social

Examines how a company manages its relationships with employees, suppliers, customers and the community

Equal opportunities
Freedom of association
Health and safety
Human rights
Products & Customer responsibility
Labour management

Governance

Deals with how a company is governed

Business ethics
Compliance
Executive pay
Board diversity
Business Ethics
Shareholder democracy
Corruption

be recycled afterwards and used for the production of new pipes. In recent years, the transformation of analogue products and services in our company has become more and more digitalised and visualised in order to simplify processes and, above all, to remain competitive in the market.

During the Covid crisis, we changed to an AI-supported method of setting up and commissioning as well as maintaining our machines abroad. Previously, our employees travelled to the customers for assembly, commissioning, maintenance and training. These distances are now saved by setting up the machine from here with the help of artificial intelligence, cameras and video calls. This saves us an extremely large amount of air travel and thus emissions, which benefits our carbon footprint. To save further emissions and to support our region, we source most of our raw materials from the surrounding area.

In all our developments, the focus is always on people - everyone with their individual ideas, requirements and goals is taken seriously by us. Ultimately, each and every one of us, with our attitude, decides whether we succeed in protecting the environment and the climate sustainably and in shaping our future positively together. We believe that the typical approach of hiring employees solely on the basis of their qualifications and experience is long outdated, so we take a rather comprehensive approach to the selection of our employees. We make sure that socially disadvantaged people also get a chance and preferably pay attention to their motivation and personality rather than just their qualifications. To facilitate our business goals, we therefore focus on diversity, prefer to hire people from the region and promote everyone in the way that is right for them - always following the motto "we leave no one behind". We do a lot to ensure that our employees feel comfortable and enjoy working here. Among other things, we offer free drinks, regularly organise company events to strengthen team spirit, and offer while also supporting further training.

The shift from pure profit-making intentions of companies will focus more and more on social and sustainable aspects, profit is no longer in the spotlight. As a medium-sized, regional company, we support this and will prepare an annual ESG report for this purpose starting from 31.12.2022, which we will enclose with the annual financial statements of the Krah company.

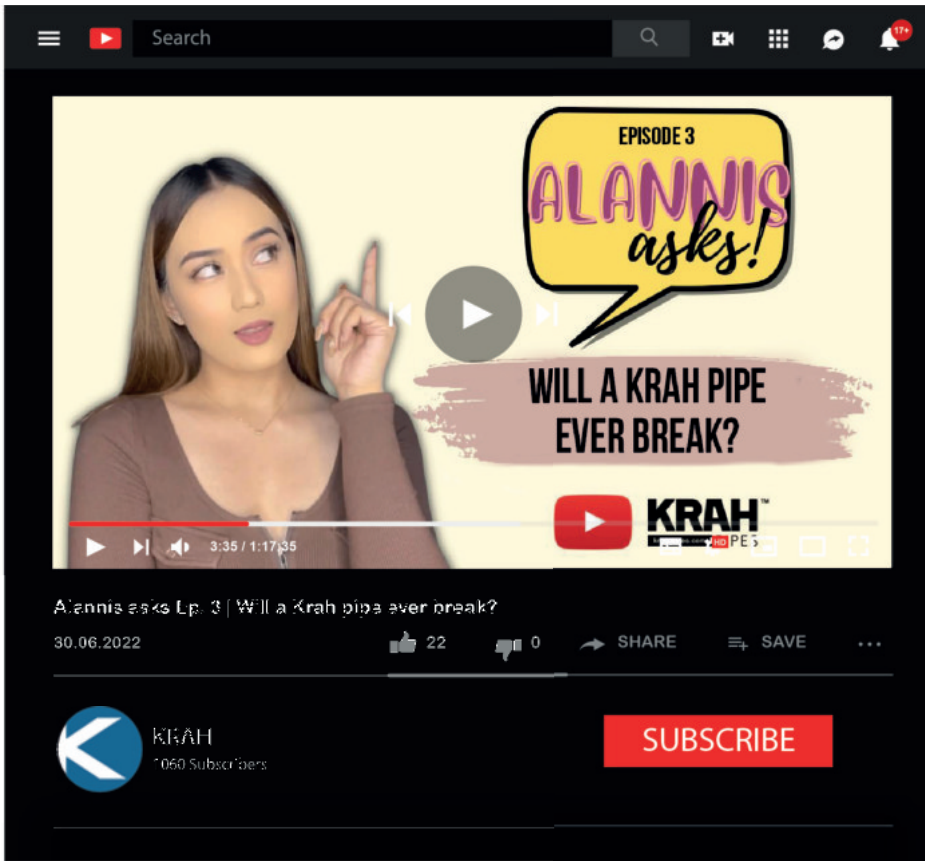
Alexander Krah
Krah Group

Social Media
from a business kind of view

In July this year, we recorded our 1000th subscriber on YouTube. So our increased engagement on the LinkedIn, Instagram and YouTube platforms seems to be paying off!

Especially with our new support Alannis and her new format "Alannis asks" we were able to gain a whole new set of followers and interactions. We currently have the most followers on our Instagram account **@derkrah** - a whole 1400 people follow us there. 70% of them are men, mostly between 18 and 40 years old. Most of them come from Germany, the USA and Brazil. On LinkedIn, the more business-oriented platform, we currently have 1300 followers on **@KrahPipes**, especially after every trade fair the number goes up.

There we have a "Krah Community" group in which every customer is a member. Information is exchanged and in the case of more specific questions or problems, there is always a lively exchange and suggestions for solutions. On our YouTube channel **@KRAH**, theory then becomes practice: our technology, which is explained in brochures and on our homepage, becomes tangible there. In various practical episodes, we take viewers to construction sites or other branches, explain the Electrofusion technology or carry out experiments to show the extraordinary loads our pipes can withstand. This is also where Alannis is at home, producing weekly videos and providing insights and explanations. In order for us to see how well the videos are received by you, what we could possibly do well or better, or what suggestions or video wishes you have, it is important that you subscribe to our "KRAH" channel, give the videos a "Thumbs up" or comment on them - the algorithm of the various platforms works in such a way that interactions are everything. Especially on YouTube, where it takes several hours to edit and finish a video, it is important that you give us feedback to see if we can continue or change something - adapted to your questions and suggestions.



We think that Social Media has become a part of our daily life, and even in business environments it can be an extremely helpful tool to be closer to the customer, to make things more explainable and to have an easier way of communication. Even requests are made through comments or direct messages on these platforms - think about yourself, would you prefer just quicly sending a request through a direct short text message or preparing a long mail, which mostly has to be done on a computer or laptop?

Even personnel recruitment can work through Social Media, by posting your job offer on the "Gram".

So please make sure to stay active on our channels and keep being so supportive, it means a lot to us!

Lisa & Jenny
Marketing, Krah Group

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IMPROFIL