EADIPS®
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European Association for Ductile Iron Pipe Systems

Fachgemeinschaft Guss-Rohrsysteme

NEWSLETTER

04/2020

Dear Readers,

The year 2020 is coming to an end and will certainly be remembered for a lifetime. As a year in which a pandemic affected the lives of humanity worldwide and showed us the risks to existing structures. But it also showed how important regional production, the resources cycle, short distances and partners with vision are in times of crisis to provide the best water via #reduceplastic pipe systems with maximum security and for cooler cities. In total there are eight good reasons for choosing pipes, fittings and valves from European production!

Already in January 2020, the members of EADIPS FGR had set out together to spread these eight good reasons for pipe systems made of ductile cast iron pipes in the campaign "The best ground - a solid reason" to protect soil and water. We are sure that after the pandemic has subsided, demands from European and national politicians for a circular economy in distinction to the linear economy or recycling economy will further increase the importance of the solid reasons.

I therefore recommend that you visit the website **solid-reason.org** and hope that you enjoy reading the three articles in this newsletter:

- A Challenge: Leak detection on pipelines
- Implementing the sponge city principle
- Quality leap for TRM cast iron pipes

I wish you and your families a peaceful Christmas, a good start into 2021 and stay healthy!

Yours

Christoph Bennerscheidt
Managing Director (MD) of EADIPS FGR

Always topical, always informed

The online Newsletter published periodically provides professionals in the field with up-to-date information about interesting European pipeline projects as well as the many and varied activities of EADIPS®/FGR®.

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Imprint

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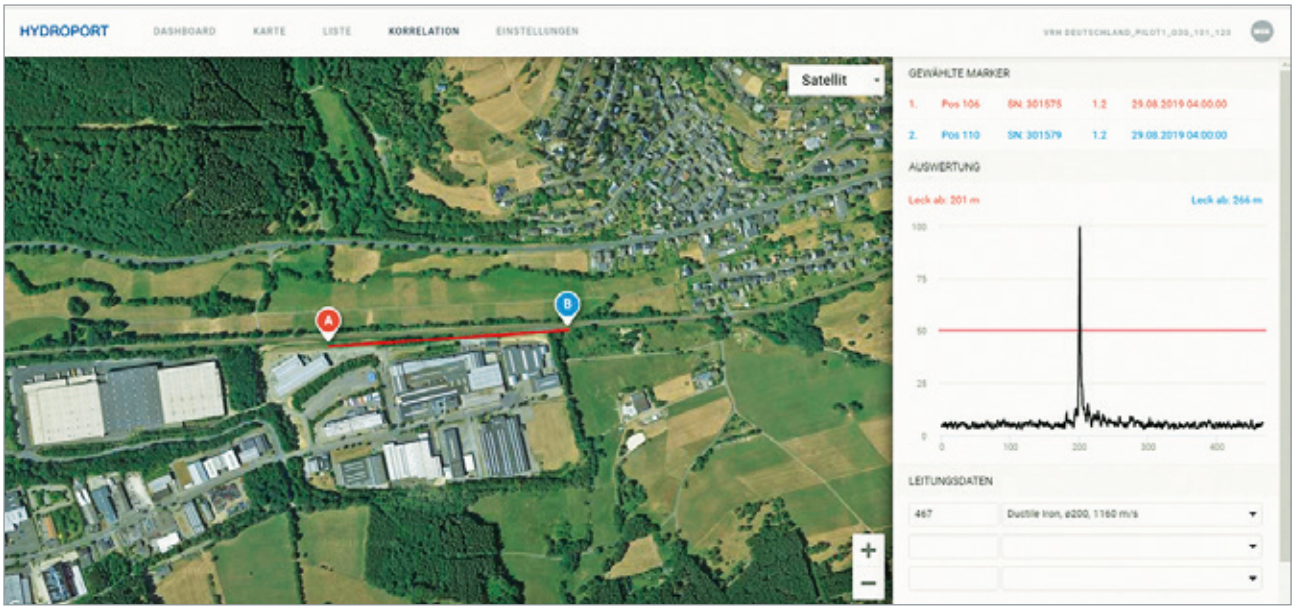
A challenge: leak detection on long-distance pipelines

Astonishing results

The locating of leaks on long-distance pipelines is one of the major challenges for service providers and measuring instruments. With the "Ortomat MTC" correlating datalogger and the Hydroport system from the vonRoll hydro company some astounding results can be achieved. In contrast to local networks, there are usually only a few access points to the pipeline, meaning that measurement sections can extend over extremely long distances. In the circumstances, leak noises are not picked up or, because of the insufficient radio range of the correlators, cannot be measured. A role is also played by the different operating states of the pipelines – from standstill to high volume flowrates, occasionally also with widely fluctuating pressure ratios.

Transfer structures with interference noise from pumps or pressure reducers represent further challenges. Additionally, smaller losses of water are usually not recorded at all by the water meters as these fall below the measurement range of the metering devices.



Correlation along the railway line in the Hydroport.

On-the-spot confirmation of measurement results with a ground microphone.

Correlation with noises

The "Ortomat MTC" correlating dataloggers offer several advantages which make leak detection on such pipelines easier – and, in fact, possible in some cases where it was previously not possible at all. Correlation is done with noises which are recorded at night. This means that ambient noises from traffic and similar are minimised. A direct line of sight, as needed by normal correlators between the two transmitters, is not necessary thanks to the automatic synchronisation of the datalogger. This means that the dataloggers can also be used independently of each other and so bridge long distances.

The following data are recorded by the noise loggers:

– lowest noise level at night
– noise level every 30 min
– nightly noise recording at 2 am to listen and correlate

The first step is to evaluate the noise. Are there any particularly loud sections in the pipeline? However, especially with long measurement distances, often over 1,000 m, the noise level is only one indicator of a leak. In this case, correlation of the noise

recorded at night is particularly helpful. Under good conditions (ambient noises, pressure in the pipeline) the correlation makes some astonishing measurement results possible with pipeline lengths of up to 2,000 m. On the basis of the measurement results, a rapid pinpoint location of the leaks can then be carried out on the spot, for example using ground microphones.

Example: The Oberfranken water supply company (FWO) in Kronach

There was a known leak on a DN 500 (ductile cast iron) transport pipeline with a small volume of water escaping to the surface. The measurement points were located 924 m and 1,066 m from the leak. Measurement conditions were good: the pipeline is in a rural, field area and the pressure was approx. 6 to 7 bars. Once the measurement section had been installed and set up in the Hydroport, good measurement results were able to be achieved even by the 2nd day. In the end it turned out that the leak was just 2 m away from the correlation result; with a measurement distance of almost 2,000 m, a creditable result! For the human ear, however, there was no perceptible leakage noise at either of the measurement points, even with a listening device. After excavating it was found that a collar with screwed socket joints had started to leak, probably because of subsidence. The water loss was around 2 to 5 m³/h.

Example: The Siegen-Wittgenstein water association (WVS)

A pilot project has been carried out by the Siegen-Wittgenstein water association in which numerous sections of pipeline were checked. But here again, good measurement results were able to be achieved. The first leak was measured on a section of pipeline which crosses a motorway and a very busy main road between two access points. Despite two changes of material (AZ-GGG-AZ) and radio connection being made impossible by buildings and noise protection barriers, a leak was successfully able to be detected. The "Ortomat MTC" was set up in the existing manholes by the motorway and in the main road; the pipe cover depth was approx. 6 m. Meanwhile the WVS has repaired the leak. The point along the trench determined by leak detection lay precisely above the damage location.

A second leak was able to be detected with pinpoint precision alongside a railway line; the distance between the measurement points here was 467 m. This was a pipeline of DN 200 ductile iron pipes of the first generation with inadequate corrosion protection. The repair, which was initiated immediately, was successfully achieved.

Conclusion

Correlating noise loggers make effective monitoring of drinking water transport pipelines possible. This means that, in the context of noise transmission, amazingly long measurement distances are investigated, which would have been unthinkable with previous methods.

The measurement results are continuously documented in the Hydroport. If it should actually come to cases of major damage, the constant monitoring of the pipeline can be documented for insurance purposes.

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The article was slightly shortened by the editors. You can find the complete article with various illustrations as a PDF in the download area under Downloads Annual Issues EADIPS FGR.

Implementing the sponge city principle

It is time to act

The effects of climate change have been more noticeable than ever before in Europe and also in Germany over the last couple of years. Long periods of high temperatures in combination with low rainfall in the spring and summer of 2018 and 2019 put a strain on us humans and also had visibly harmful effects on the natural world.

The summers of 2018 and 2019 from a meteorological viewpoint

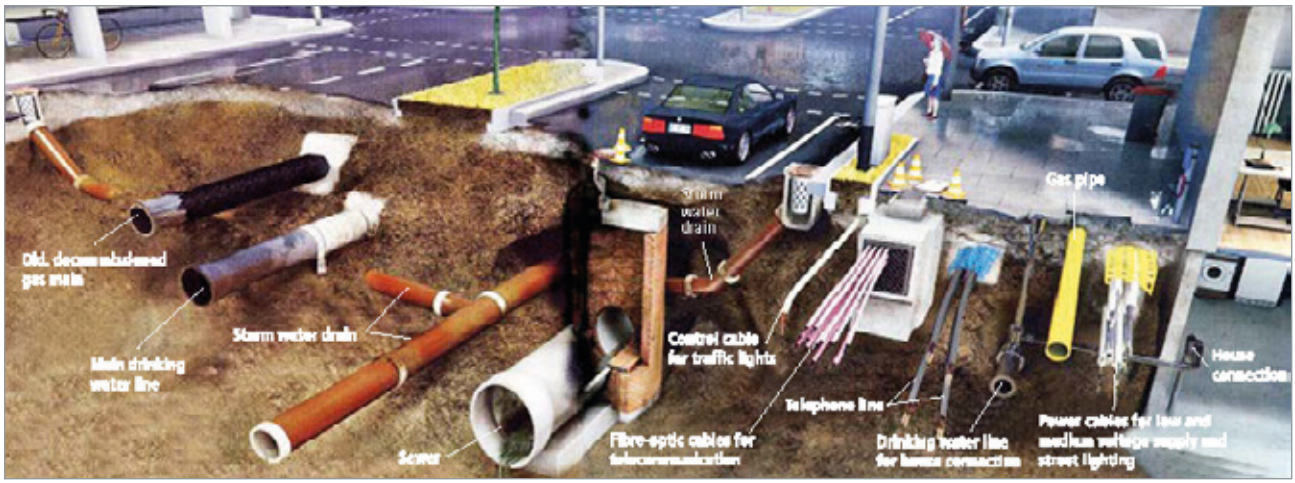
With a mean temperature of 10.5 °C, 2018 was the hottest experienced so far in Germany since regular records began in 1881. What is striking was the long-lasting drought from February to November. The combination of high temperatures and low precipitation makes 2018 a particularly exceptional year; The 30°C mark was often exceeded. By the end of November 2018, the total precipitation figures were also on the way to setting a record: the year 2018 takes 4th place for dryness after 1959, 1911 and 1921 in the records since 1881.

In 2019 a new national record was set for heat in Germany: from 24 to 26 July an exceptional heat wave prevailed in the West of the country over three consecutive days with maximum temperatures of over 40°C; the first time in this country since systematic weather records started to be taken. New record figures have been set at various measurement stations with a national all-time record of 42.6°C on 25 July 2019 at the Lingen weather station in Emsland. In other countries in western Europe too, e.g. in the Netherlands, Belgium and Luxembourg, numerous local and other regional records have been registered. Precipitation levels: also back on a deficiency record course.

The long-term effects of too little rainfall in 2018 and the lack of precipitation in 2019 will have long-lasting effects – not only for agriculture and forestry a disaster of the century.

The effect of drought on urban trees

Even more severely affected by drought were urban trees in parks and along roadsides. It was obvious that the trees were in bad shape, so that local authorities were calling on townspeople to water the trees in their street. Both municipal employees and residents irrigated the trees with drinking water. Using tankers and buckets, water was poured directly around the trunk so that trees, whose roots had not yet managed to leave the far too meanly dimensioned planting pit, could be safely supported. Older trees, for which it can be assumed that they too were planted in tree pits which were too small but whose roots have nevertheless managed to extend beyond the planting pit, definitely did not benefit from this irrigation water! In addition, the deeper lying layers of soil in towns and cities dried out, with this effect being reinforced by the high degree of sealing and reduced groundwater formation.



An example of use of the underground street space.
(Picture source: RWE-Magazin June 2006, modified by K. Schröder)

The effect of construction methods for tree pits on urban tree vitality

At an early stage, a great pioneer of the sponge city idea, Klaus Schröder, already pointed out the consequences, and also the background, of tree pits which are designed to be too small. He did this in a speech at the Austrian tree forum in Vienna on March 2009:

Naturally, and particularly in times when the coffers are not exactly overflowing with money, the question is posed of whether the expense needed today for optimising the location of trees makes sense. But such planting, done for reasons of sustainability and durability, is only "expensive" at first glance. Because: who is not familiar with the sight of those pitiable specimens in "cheaply" prepared locations which waste away after just a few years, in the proverbial "too little to live, too much to die" situation, in order finally, a few years later, to need replacing. If one really thinks about the false investment in this type of tree planting, the return on the capital employed, the cost of years of pointless care and finally one takes account of the expenditure for replacement with new trees, one must become convinced that the outlay for providing the best growth conditions is, even under economic aspects, a good capital investment. Even disregarding the unfulfilled function for which the trees were originally planted.

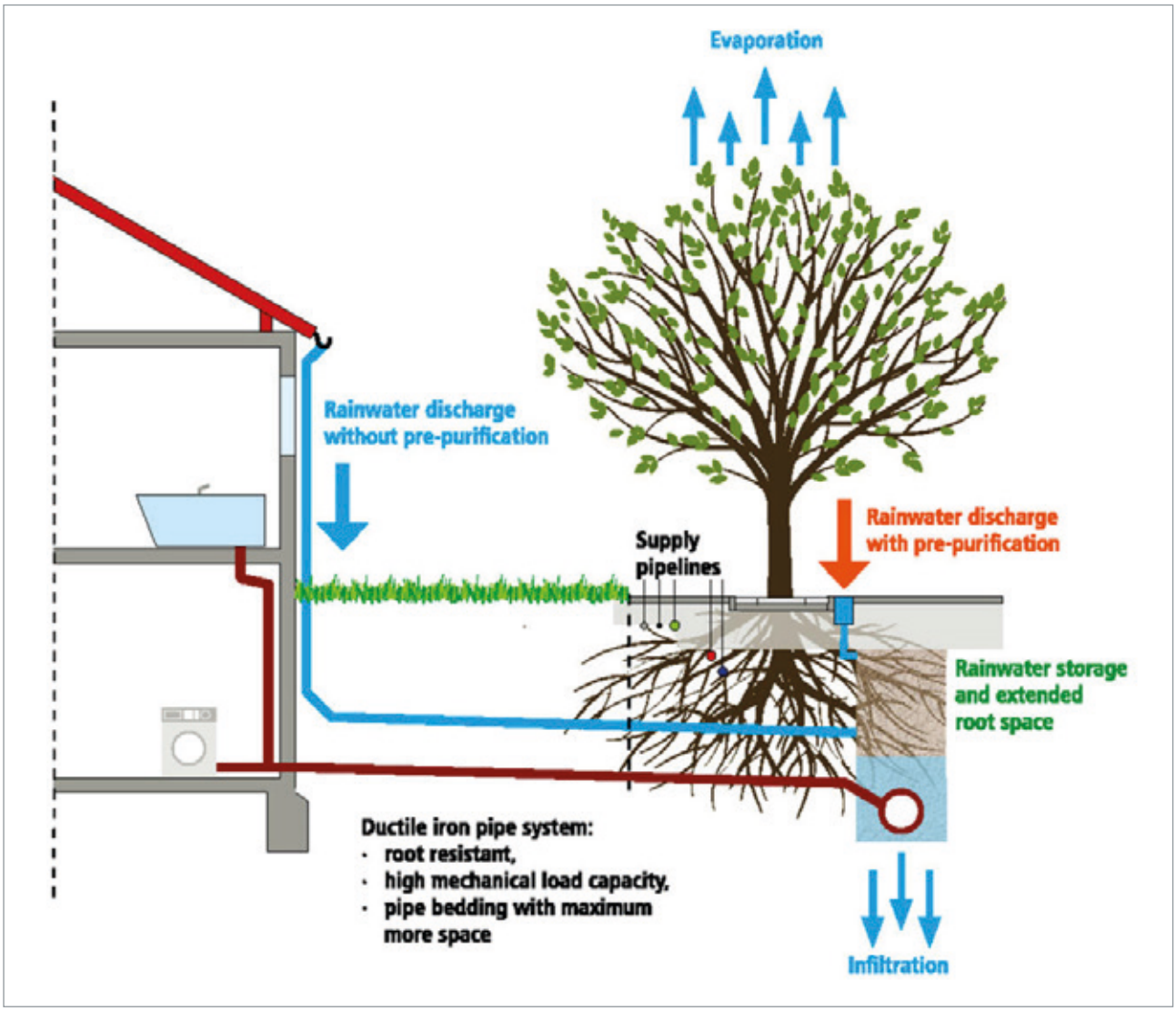
Vital trees and reduced maintenance costs are achievable targets which make up for the additional initial expenditure for optimally planned planting. However, the necessary investments should be made at the time of planting and not some time afterwards in order to correct mistakes. When planting trees in towns and cities, the latest findings as regards planting technique / construction technology must be taken into account and put into practice!

Presentations like these have also contributed to the fact that planting techniques for trees have developed further. Tree pit methods have been developed for planting trees with substrates which ensure ideal soil aeration in the root space. The fact that rainwater can be used to irrigate the urban trees planted in this way is obvious. The so-called "Stockholm solution", a synonym for a method of planting in tree pits in which highly compactable coarse ballast forms the support structure, combines the elements of root space and storage space for rainwater. As a result, the maintenance costs for urban trees are already reduced.

The sponge city principle

But this method goes much further: in a report by the Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) on provisions for flooding and hot weather by means of urban development, these methods are described as the so-called sponge city principle. It is the aim of these modified applications to make the surfaces of towns and cities more suitable than ever for taking up and storing rainwater. By this type of nearly natural rainwater management, green spaces can become natural "refrigerators" for the town, in that they have a sufficient supply of water. This cooling capacity can be increased by the storage of rainwater, measures to improve the soil and a constant supply of water to the vegetation. The promotion of the sponge city principle and the development of sustainable storage and irrigation systems are therefore described as central tasks for the future for climate-adapted towns and cities.

With a view to the effects of long-lasting dry periods on urban trees described in the introduction it seems logical to enlarge the root spaces and their space for storing rainwater further. A seemingly unsolvable task in the urban underground space if one thinks of the intensive uses to which this is put. However, it does become solvable if this construction method can be used in the pipeline trenches of drains and sewers.



The sponge city principle in the street space. By the use of large-grain, broken materials with a large storage volume, the soil in the pipeline trench becomes a rainwater storage space and provides extended root space.

Ductile iron pipe systems – solutions with a robust soil-pipe system

A pipe system which is able to be installed in this coarse bedding material is produced from ductile cast iron and protected with a cement mortar coating against corrosion and mechanical loads. The TYTON®, type push-in joints used are root-resistant and impervious to external water pressure.

Cement mortar coating can be used in broken bedding material with a maximum aggregate size of up to 63 mm and individual pieces of max. 100 mm diameter.

With the soil-pipe system, the pipeline trench with the ductile iron pipes beneath the road becomes a means of storing rainwater. Water from non-polluted surfaces, such as roof areas (with the exception of roofs with copper or zinc coverings), can be directly fed into this storage space. Polluted rainwater will first be treated and then introduced into the rainwater storage space. For example, DIBt-certified systems which are available on the market can be used for treating the water. The water is either used to irrigate the tree roots growing in the pipeline trench or it trickles away as in an infiltration ditch system.

The civil engineering for the planting of urban trees has been further developed and, with the soil-pipe system for ductile iron pipes as described, a possibility has been demonstrated for incorporating the so far unused large volume of pipeline trenches into the planning as well. We have to act now in order to make the urban infrastructure climate-proof too. With the inclusion of urban green spaces in the planning of underground infrastructures, there will be room to manoeuvre which must be put to good use.

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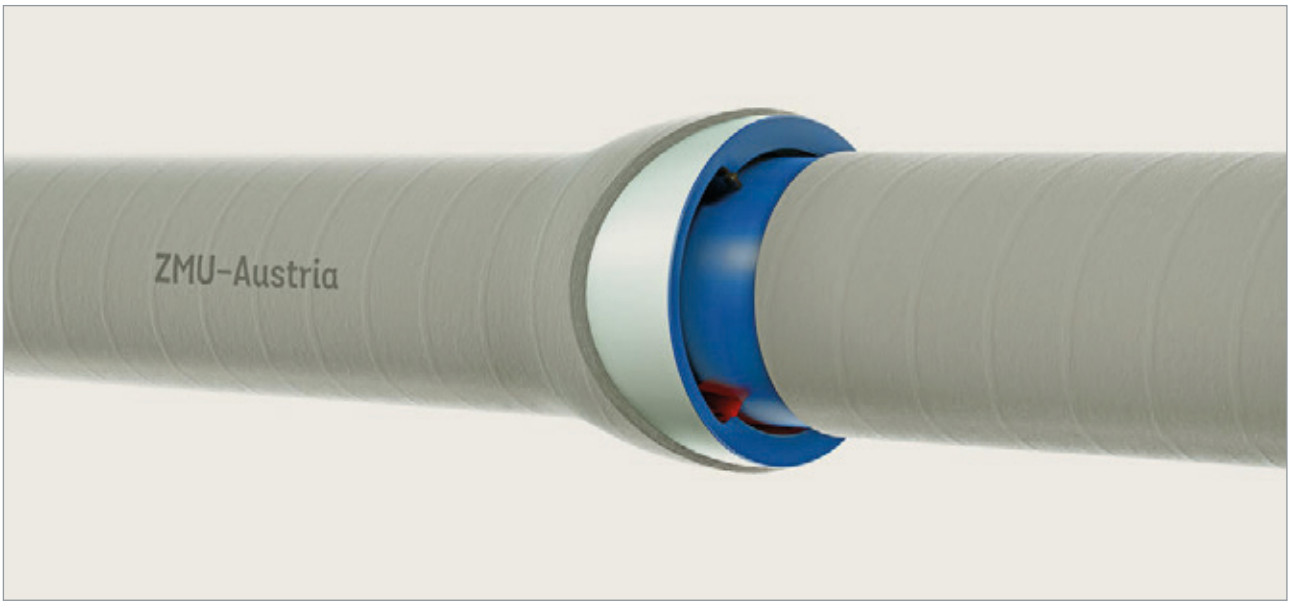
The article was slightly shortened by the editors. You can find the complete article with various illustrations as a PDF in the download area under Downloads Annual Issues EADIPS FGR.

Quality leap for TRM cast iron pipes

Innovative coating technology

For the traditional manufacturer of ductile iron pipes based in the Tyrol – Tiroler Rohre GmbH – the emphasis is consistently placed on innovation and further development. For two years, the TRM research department was working together with an Austrian cement producer on a new type of fibre cement mortar for the external coating of pipes. Since autumn 2018, two machines have been set up in the factory in Hall, Austria which make the almost fully automatic wrapping of pipes with the new type of fibre cement mortar possible. With this new type of coating, the pipe system offers not only the highest level of chemical and mechanical protection, but also some tangible economic advantages.

The so called "ZMU-Austria" (ZMU is the German abbreviation for cement mortar coating) is a technique developed by the company for applying the coating to the pipe using the extrusion process. This has made it possible to develop a cement mortar which, on the one hand, offers the highest degree of external protection for the pipe and, on the other hand, is easily implemented in production.



Together with a partner from the Austrian cement industry, TRM has developed an innovative fibre cement coating. Meaning that, once again, the Tyrolean company is setting the standard in matters of resistance and durability.

Adhesion without adhesives

The fact that the new pipes with the "ZMU-Austria" cement mortar coating are produced entirely without bonding agents is so far a unique selling point on the market. In its production, the special cement mortar is extruded over a mesh bandage on the pipe and smoothed out at the same time. Special machines were acquired for this production step, and these were adapted to the needs of the production process in close collaboration between TRM and the Austrian machine manufacturer.

Complex composition – profound protection

The fibre cement coating is applied in a thickness of 5 mm in a fully automatic extrusion process.

The cement mortar layer is partially removed for attaching the TRM tapping sleeve.

If we consider the ductile iron pipe with the new ZMU-Austria cement mortar coating in terms of its composition, we can talk about three layers which go around the pipe: on the inside it is lined with a cement mortar produced from Portland, blast furnace, alumina or plastic-modified cement. Outside this, the first layer consists of a fine zinc overlay applied at in 200 g/m2. The outermost protective layer now presents the new, 5 mm thick fibre cement mortar coating. The socket end-face and spigot end remain free of cement mortar and instead are provided with the tried and tested PUR or epoxy coating.

Obviously, they did not want to have one of the greatest strengths of the ductile iron pipe – namely its flexibility – restricted by the cement coating. Even in the ZMU-Austria version, the pipes still have an elastic deformability of 3 % to 5 %, depending on the diameter.

Chemical resistance

Another important characteristic which they wanted to give the new fibre cement mortar is found in its chemical resistance. Specifically, this concerns a highly alkaline composition which, beyond a pH value of 10, prevents corrosion of the iron. *"The fibre cement mortar which we have developed also has a very high sulphate resistance. This means that the new pipe system offers maximum protection in very aggressive, contaminated soils with a high sulphate content"*, explains Christof Mairinger. Thanks to its safe electrochemical properties, the ZMU-Austria pipe can also be used in the area of influence of stray currents.

Mechanical protection

However, the obvious quality lies in the mechanical protection provided for the pipe. The 5 mm thick layer of fibre cement mortar makes sure that the pipe does not suffer any damage during storage, transport and, naturally, also during installation. The last point also has a role to play with trenchless installation above all – The cement mortar coating surface protects it against damage.

The multitalented ZMU-Austria is absolutely predestined for use in Alpine and mountainous areas. Thanks to its high mechanical robustness, almost any excavation material can be used for the bedding zone, where the inclusion of stones in sizes up to 100 mm are permissible. The advantages:

– no additional bedding or filling material necessary
– no disposal costs for the excavated material (because it is recycled)
– by recycling the original excavated material, the natural soil structure is preserved

Because of its outstanding suitability for pipeline construction in Alpine areas, the ZMU-Austria is the pipe of choice when it comes to pressure pipelines for hydropower stations, but also for snowmaking equipment.

Urban applications

But, of course, it is not only for the construction of pipelines in mountainous areas that extreme resistance and long working life are advantages which are increasingly in demand. *"There is one thing here which should not be forgotten: naturally it makes a difference whether trees are cleared in a forest area because a pipeline has to be replaced after just 20 years or perhaps only after 100 years. But the question becomes more delicate in highly built-up urban areas. One only has to think about the fact that simple plastic pipes in urban areas often need to be replaced after less than 20 years – with all the consequences which that brings for traffic and the entire infrastructure. Therefore, in this area too, the kind of durability offered by the TRM pipe plays an important role"*, argues Christof Mairinger.

In the urban environment, the very useful application for the new pipes could be the "sponge city principle", which is a solution model for cooling in the increasingly hot urban centres (see also article "Implementation of the sponge city principle"). Of course, only pipes which are 100 % root resistant can be used here – such as the new ZMU-Austria pipe. A pilot project of this kind should be launched in the near future in a large city in Austria.

Improved ecological footprint

With all innovations in the TRM company, questions of sustainability and the ecological footprint play a major role. Of course the new ZMU-Austria pipe also sets standards in this respect. Basically, for their ductile iron pipes, TRM exclusively uses recycling material which is obtained from the immediate vicinity. In addition, thanks to its photovoltaic system with a 9,000 m² collector surface (the largest rooftop system in the Tyrol), TRM uses the energy generated itself, thus making a considerable contribution to environmental protection. Any by-products are utilised: the waste heat is fed into the Hall district heating system.

All dimensions available

The most recent result of this research and development work, the new ZMU-Austria pipe is, thanks to its high resistance, ideally suited for both pressurised and gravity applications. All approvals and certificates are available for this. At the moment, the factory in Hall has two coating units at its disposal: one for dimensions DN 300 to DN 1000 and the other for DN 80 to DN 600. Since the middle of the year, all pipe sizes within this range are available with ZMU-Austria coating.

Also new here is an improvement in traceability and the recording of process data. Currently, each individual pipe which leaves the factory in Hall bears its own QR code, which makes automatic identification possible. This means that there is seamless documentation and traceability providing information on when and in which series the pipe was produced. The ZMU-Austria pipe from Tiroler Rohre GmbH is a further milestone in the technical development of the cast iron pipe in Austria.

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