

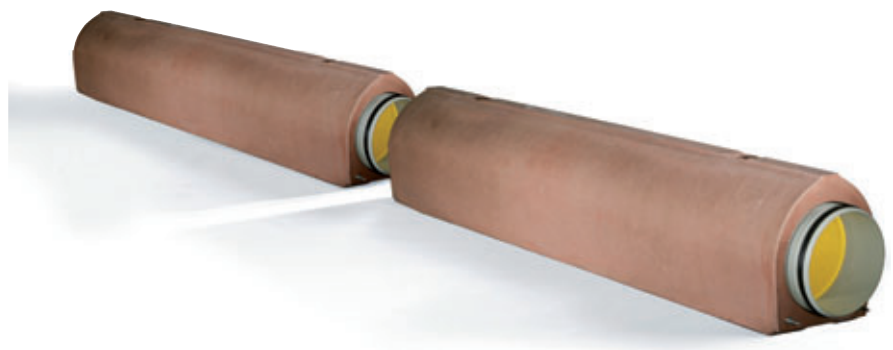
Schlüsselbauer Technology GmbH & Co KG, 4673 Gaspoltshofen, Austria

Cast concrete pipe with internal lining for waste water pipes in tests

One of the product innovations shown at the world's leading fairs in 2010 is now ready to be launched on the market - the concrete-plastic composite pipe Perfect Pipe +. This new pipe system changes construction for wastewater pipes as well as the associated production technology. The pipe has a highly resistant lining anchored firmly in the concrete. In addition, the new pipe with its flat profile has advantages over circular components in terms of stability and installation process. Numerous material and functional tests to be completed in advance of the launch are currently being carried out - with remarkable results, as summarised in this report. Perfect Pipe + doesn't just have those positive features for sewer construction, it opens up entirely new perspectives for the production of prefabricated parts.

■ Christian Weinberger,
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With the market development in pipeline construction, manufacturers of traditional concrete pipes have in recent decades come under increasing pressure to offer either lower and lower prices per running metre or increase product quality even further - two highly contradictory developments. One requirement was the increased resistance to chemical attack, which concrete above a certain threshold could either not meet or could only meet with disproportionate effort or with a protective lining. Even though pollution and acid concentration in municipal waste water as a rule, should not exceed the limits for traditional concrete pipes, the pipe materials to be used are not chosen based on this average load but on the basis of possible peak



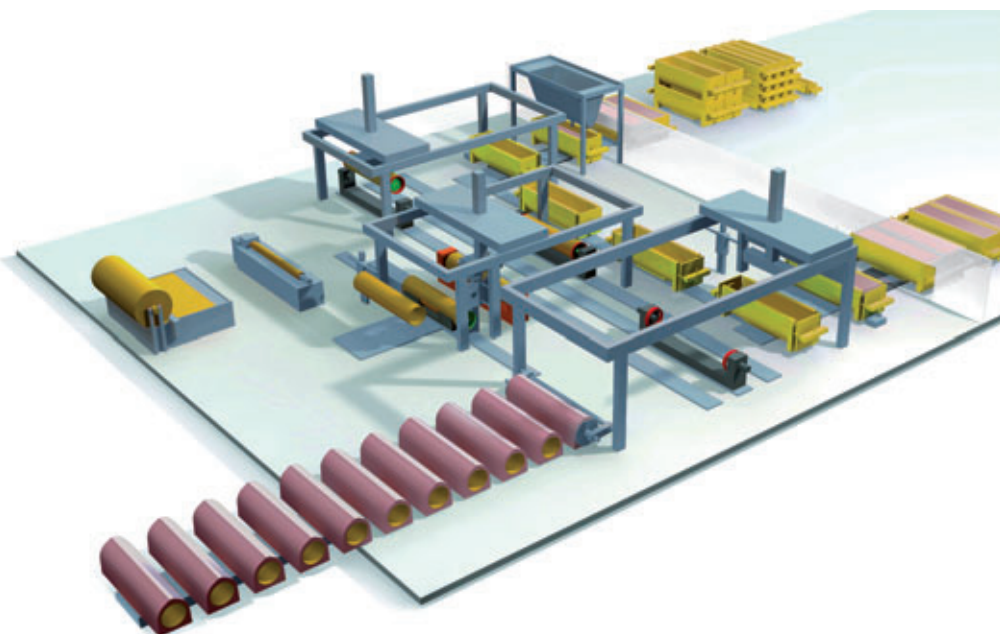
The base pipe Perfect Pipe+ for simple, safe installation

loads. This is a reason why the use of rigid materials in pipeline construction, which are still predominantly used in Central Europe for sewers, is steadily dropping back. Conversely, the use of pliable pipe materials is rising accordingly.

Against this background, the technology provider Schlüsselbauer began to develop manufacturing technology for a concrete-plastic composite pipe, which, in addition to the benefits described in the application, is also an interesting opportunity for product diversification in concrete plants. To meet the requirements of load capacity and durability in waste water pipe runs, the bulk of the new pipe is manufactured from high quality concrete, while a lining of polyethylene is used to meet the actual requirements for chemical resistance.

Safeguarding the added value in concrete pipe production

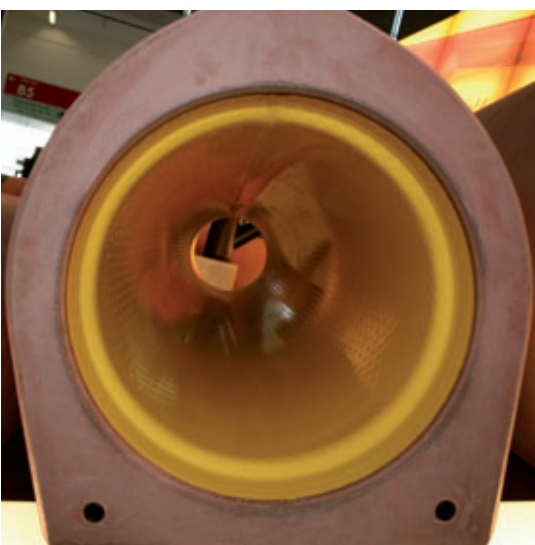
One major reason for the negative development in the concrete pipe market over recent years has been the higher chemical resistance of plastic pipes used more and more. This trend is aided by reduced costs for transportation and installation due to the lower weight of the material. However at the same time, not enough attention is being paid to ever more frequently postulated requirements like reliable statics, enhanced mechanical strength, installation safety and position stability. The new concrete-plastic composite pipe now meets these many different demands on waste water pipes.



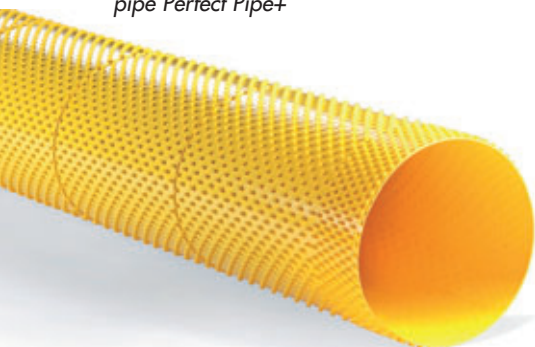
The core of the Perfect Pipe+ production at a glance – economical use of resources and cost-effective processes are crucial



The new pipe system was showcased in the nominal widths DN200 to DN600 at the IFAT 2010



A look at the new concrete-plastic composite pipe Perfect Pipe+



The essential features remain hidden in the finished pipe – the newly developed, multiple anchoring points on the rear of the liner



The new pipe system is equally suitable for trench construction and tunnelling

The fact that until now no pipe type has managed to combine in one product all the features required for reliable, long-term use in wastewater pipes, is what is behind the development of the new waste water pipe system Pipe Perfect +. The concrete-plastic composite pipe showcased at IFAT 2010 has a solid polyethylene lining that is firmly embedded in the concrete pipe at the manufacturing stage in the concrete factory. One feature of the innovation is the enhanced anchoring of the lining in the concrete and another is the use of self-compacting concrete. A variety of anchors on the back of the liner provide a durable connection to the robust concrete pipe.

Cast concrete pipes with PE liner represent a new type of pipe for use in waste water pipes. The production of this new type of pipe can be set up completely independently of existing production lines or can be combined with existing production, in which fluid concrete is processed. Concrete-plastic composite pipes are suitable for any application in waste water and can serve market segments that in some countries are inaccessible to traditional concrete pipes. This means an additional market entry for precast concrete manufacturers with the added value in a very interesting sub-segment of the pipeline industry remaining in the concrete plant.

Permanent compound even when temperature changes

Once a concrete-plastic composite pipe is installed without any damage, there is no longer any real risk to the composite material. The problem of damage to composite products was up to now mostly in the period between manufacture and installation. With different coefficients of expansion in concrete, plastic or PVC, damage always occurred in the past, once a liner had come off the surrounding concrete pipe. The many potential risks included both the storage and retrieval in the concrete plant and the transport to the site. The extent of this

Sealing systems made by Cordes - best connections!



fundamental threat to concrete-plastic composite pipes was thus conditional on a changing ambient temperature. Depending on the season or even the time of day, changing conditions could thus raise doubts about the use of these products predestined for sustainable waste water management.

The lining manufactured from polyethylene and to be used henceforth has multiple anchoring points on the backside. These are cast with SCC creating a connection that overcomes the restoring forces of the material and in addition withstands permanent external pressure of up to 2 bar. Prior to the launch, a wide range of tests have already been successfully completed, most recently a 1000-hour ground water pressure test using the SKZ method and temperature change tests to verify the permanent anchoring of the liner in the concrete, even in extreme environmental conditions like transport in arctic or even mid-summer conditions.

Another series of tests under controlled conditions looked at calculating the force needed to separate the anchoring from the concrete. The pull-out resistance per anchor is more than 250 N, with the separation test being carried out at a speed of 2 mm/min. With the new manufacturing system, solidly lined composite pipes can now be manufactured in a cost-effective process starting from a nominal width of DN200.

The new pipe system in a nominal width range of up to DN1000 that can be used both for trench construction and tunnelling, combines the advantages of plastic pipes in terms of corrosion and chemical resistance

with the benefits of concrete pipes with regard to strength and durability. The PE lining can per se permanently resist chemical attacks up to a pH of 1.0 and meets the requirements of both EN 12666 and ISO / TR 10358.

Safe and cost-effective in installation and operation

The pipe geometry for trench construction, with its base and no need for spigot and socket joints, facilitates installation and also guarantees position stability in the installation and operation. To date most of the problems in both flexible and rigid pipe types have been due to bedding and trench filling. In most construction projects, critical tests reveal defects either in the course of the installation or in the subsequent instability of the line. In addition to the operational safety of the pipeline offered by the robust concrete material, the lining is excellent with its resistance to mechanical stress. With the liner material, PE, high-pressure rinsing stability at an applied pressure of 230 bar has been successfully documented, as has abrasion resistance as per EN 12666 /A6. The ball-head anchors cast in the pipe crown guarantee safe handling and easy installation.

So not only is the new pipe system Pipe Perfect + a working combination of the benefits of two tried and tested materials, but it can be manufactured in synchronised industrial production under normal market conditions. More information on the product can be found on www.perfectsystem.eu.

FURTHER INFORMATION

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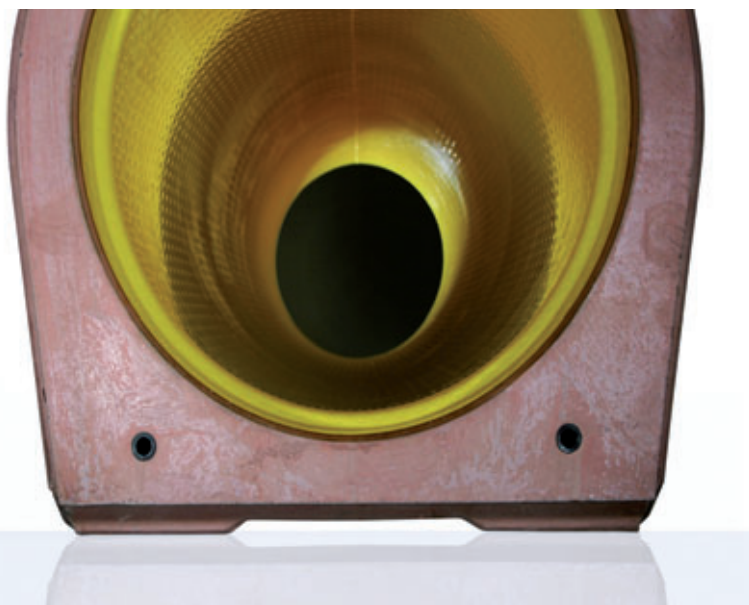
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Position stability and ideal load distribution with base pipe profile.



Use of steel bolts to absorb shearing loads