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Cast concrete link pipes with plastic inliner as a world premiere

The Perfect Pipe system, realized in Germany in 2012 and comprising concrete and reinforced concrete base pipes of the nominal widths DN300 to DN600, constituted a world premiere. The pipes equipped with HDPE inliners with identical cross sections are manufactured at the Müller concrete works from DN250 to DN600 in the standard construction lengths 3 m and 1 m. Link pipes with special lengths can be manufactured for both types – with or without inliner – in construction lengths from 1 m to 2.5 m. The final length of link pipes delivered ex concrete works can be determined individually by the customer and what will in future reduce the shortening of standard pipes on site. In the past, the cutting to length of pipes with flexural rigidity on the construction site was frequently one of the weaknesses of pipeline construction. Installation was interrupted; the joints of the pipes shortened on site did not always correspond to the quality of the standard pipe joints. The flexibility associated with manual adjustment of construction length compromised the total quality of the pipeline.



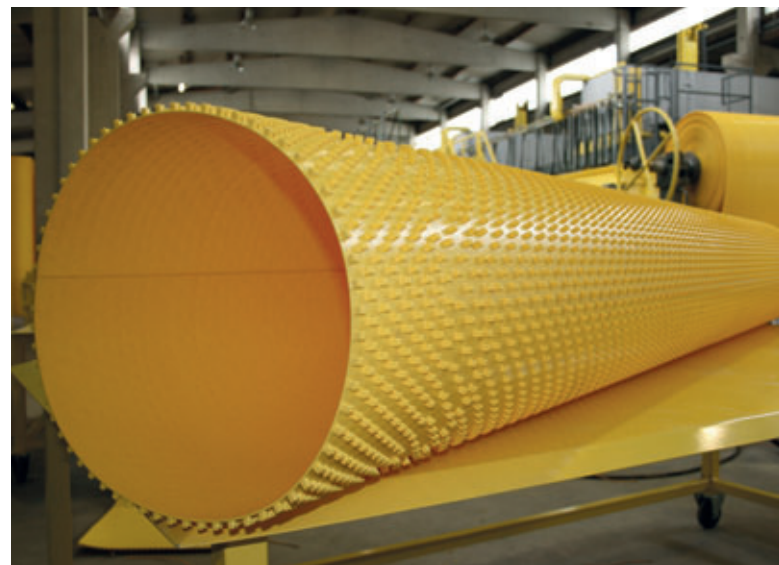
Perfect Pipe, the new base pipe with a central notch is stable and suitable for all customary beddings. Shear loads are assumed by bolts installed at the factory. The pipe connectors with pre-installed seals are also assembled on site at the concrete works before delivery. Due to pipe geometry, deficient benching is precluded. Dependent on local ground conditions, the excavated material can frequently be reused for trench filling. All of these positive pipe or installation properties also apply to the Perfect Pipe link pipe with special length. The geometry defined for the standard overall length of base pipe with a central notch is also used for any link pipe construction lengths in this consistently continued pipe system. This ensures constant laying and the ideal load transfer into the base pipe, point

loads which would otherwise be possible are avoided. The pipe connection is achieved by means of connectors as for the standard pipe, any shearing loads which may occur are assumed by structurally identical bolts which are also already installed at the concrete works.

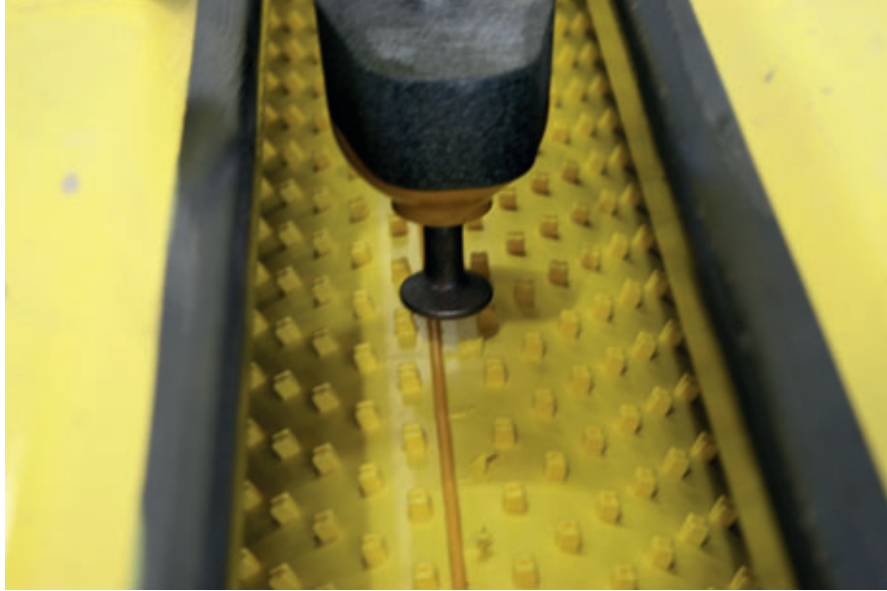
With regard to media resistance, the Perfect Pipe can optionally be universally equipped with an HDPE inliner. Universal means that the pipe is equipped with a lining which is firmly anchored into the concrete and the pipe connection also consists of HDPE. Dependent on manufacture and processing, the wall thickness of the inliner is a minimum of 1.65 mm. A multitude of geometrically optimised anchors on the reverse of the inliner ensure that this comparatively thin plastic film is reliably bound to the con-



The HDPE inliner tracks are cut to length for a perfect fit according to nominal width and construction length.



The inliner track welded to a cylinder is ready for further processing in Perfect Pipe manufacture.



Tailored to the overall length of the link pipes, two spherical head anchors are installed for each product.

crete. The tensile force of an individual anchor is at least 250 N. The pipe connector is able to durably withstand an internal pressure of 2.5 bar. The flexibility achieved for link pipe manufacture enables the manufacturer to produce pipes with and without HDPE liners respectively. Regardless of

whether the new base pipe is designed as a concrete pipe or a pipe with an inliner, link pipes are also available in both variants with and without cage reinforcement. Where lateral intakes in the pipe are already required as part of the installation, these can be efficiently installed in the con-



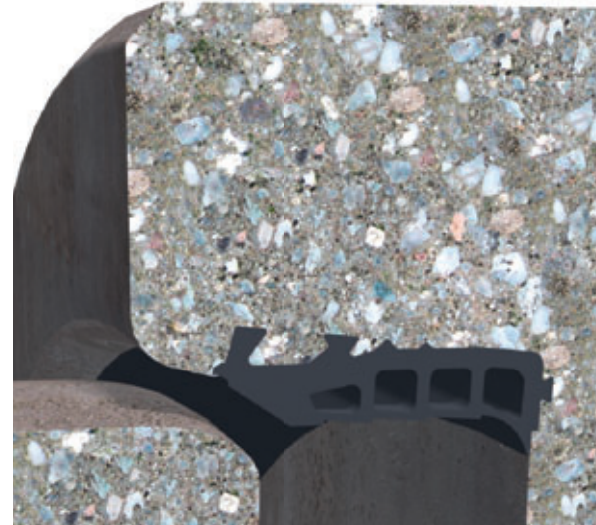
The concreting equipment specifically designed for Perfect Pipe manufacture.



Separate mould equipment is available for the manufacture of link pipes of the nominal widths DN250 to DN600.

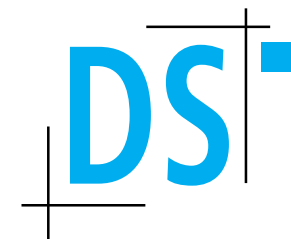


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Perfect Pipe concrete pipes with or without inliners are manufactured as link pipes in construction lengths from 1000 to 2500 mm.

crete works. All variants can be manufactured semi-automated whilst retaining the favourable static qualities of this pipe.

The technologies used in traditional concrete pipe manufacture have been proven for decades. The individual processes are suited to the manufacture of certain pipes to a varying extent, regardless of whether special stability, density or the least possible material use is demanded. The development of the new type of concrete pipe described here and the necessary manufacturing technology is based on increased requirements with regard to statics, density, stability and handling. The new pipe should be able to be laid in a durably media-resistant, highly resilient and simple and safe manner. For economical manufacture it was vital that standard construction length

pipes and link pipes with special lengths could be encased in concrete at one station. The processing of easily compacting concrete in industrial serial manufacture requires uniform concrete processing from both a qualitative and quantitative perspective. The challenge of manufacturing standard products and link elements for this production plant was all the more demanding. A new concreting device was developed for concrete volume dosing which enables uniform entry of the selected concrete quality into the mould equipment. The moulds can also be moved during the concreting for optimisation of the filling process.

A basic range of link pipe lengths at the Müller concrete works will in future ensure that most requirements can be fulfilled at short notice ex warehouse or with a supply ex concrete works in the shortest time. Furthermore, construction companies have the option of ordering link pipes with an individually defined construction length. Link pipes with variable overall lengths from 1000 to 2500 mm are manufactured at the Müller concrete works with immediate effect. Overall lengths in the 25 cm raster, i.e. 1250, 1500, 1750, 2000 and 2250 mm are made available ex warehouse.

In summary, the manufacturing technology now achieved for the first time in Baden-Wuerttemberg, Germany, needed to conform to numerous thoroughly conflicting requirements to attain a satisfactory solution in a single production plant. In order to fulfil increased static requirements, the concept of the base pipe was drawn on. As proof of the actual load-bearing capacity,

reinforced and unreinforced pipes up to a breaking load were investigated which considerably surpassed the compression resistance of known high load pipes. In order to increase corrosion resistance, the use of new types of concrete needed to be possible; another requirement was for the pipes to be reliably lined with an inliner composite material. In order to increase the ease of installation, a central notch was constructed in the base pipe and the link pipe technology described in this report was achieved. The use of flowing concrete in the new pipe profile meant that the pipes needed to be manufactured horizontally, in the installation position and formwork-hardened.

FURTHER INFORMATION



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Individually adjustable lateral seals enable individual construction lengths in Perfect Pipe link pipe manufacture.



View of a link pipe mould with freely adjustable lateral seals.