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Concrete pipe with HDPE lining and plug connection instead of weld is internationally successful on construction sites

The Perfect Pipe system invented by Schlüsselbauer Technology has now developed into an international success story. The first pipes with nominal widths of DN250 to DN600 were used in civil engineering in 2013, following commissioning of the first fully-automatic manufacturing plant and obtaining construction approval. Since then, it is not just the quantity of concrete-plastic composite pipes that has greatly increased. In addition to an extension in the range of pipe geometries available, the pipe system was completed by nominal widths up to DN1200, which are necessary for no-men-entry dimensions. After a situation where, during the first two years of introduction to the market, projects were supplied exclusively in Germany by two concrete pipe manufacturers, Perfect Pipe products are now also used successfully in France, Switzerland and Singapore.

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Besides the way in which the thin-walled liner is securely anchored in the concrete, the Perfect Pipe connectors are characteristic of the concrete pipe with HPDE lining. These are plastic plug connectors that mean it is no longer necessary to weld the PE corrosion protection layer for each single pipe joint. Above all, this leads to a significant increase in the installation rate in the no-men-entry nominal widths, while at the same time resulting in a reduction in installation costs. Construction progress is not delayed by welding work, including the preparation and post-processing times for this, and there is no need to commission third party companies that are certified to weld plastic materials when installing Perfect Pipe. In general, the connectors are mounted in the concrete plant already, so that the pipes are ready to install when they are delivered to the construction site and the majority of the value creation for production of the pipe system remains in the pre-cast component plant.

Value creation in the manufacturing plant includes complete manufacture of the liner material and assembly of the plug connectors, as already mentioned. The HDPE film has a wall thickness of just 1.65 mm and is cut to match the pipe's nominal diameter, before being welded to a cylinder in a fully automatic process. This automated work step ensures that a consistently high welding level is maintained, with this being checked immediately following completion of the weld operation. Next, the liner cylinder is applied to a supporting core and the ends undergo thermoplastic moulding. In the subsequent pipe, the connector is inserted into the sleeve that is formed in this manner, without this reducing the pipe cross section. After this forming process, the liner is positioned in a steel mould that is filled with liquid concrete. In this manner, wet-cast concrete or e.g. reinforced concrete pipes are manufactured, in line with project requirements. Thanks to the many anchors located on the backside of the liner, a strong, durable connection is achieved

Liner is welded to create awater-tight cylinder in a fully-automated process.

The lined pipe ends are moulded with recess so that connectors can be installed without any reduction in cross section.

Different pipe and shaft components of various nominal widths, manufactured using the Perfect process.

In the first project in the German state of Hesse, Perfect Pipe is being used in nominal width DN800.

Multiple old ceramic pipelines are replaced by a new DN1000 collector.

Due to the obvious installation benefits of Perfect Pipe, the usage of this pipe was decided extremely quickly.

The advantages of concrete pipes – high structural load-bearing capacity and robustness for day to day work on the construction site – are intensified still further by a pipe wall thickness of 130 mm.

After hardening in the mould, the concrete pipes are demoulded and the connectors are mounted at each pipe end.

between the liner and the concrete pipe. This connection is not even affected by large fluctuations in temperature, for example in the concrete plant's stock or on route to the construction site. After the pipes are demoulded, a Perfect Pipe connector with two external KLP seals is mounted in each pipe, also by means of an automated process.

Perfect Pipe concrete-plastic composite pipes are manufactured with different external contours depending on regional and project-specific requirements. In addition to the traditional round bell sleeve pipe, prebed pipes with or without a moulded bell have proved very successful from the start of this development. Of course, round pipes are required for use in microtunnelling. The aspect of maximum value creation in the concrete plant is particularly worth a mention in the field of pipe jacking. As it is vital to avoid delays in installation caused by additional manipulations in the starting pit and in the site depot where there are restricted storage and working areas, Perfect Pipe composite pipes with preinstalled connectors are absolutely ideal for this application area. The pipes are delivered from the pipe plant ready for installation and lifted into the starting pit. They form a complete pipeline after completion of each single jacking cycle. In this case, subsequent welding of the lining is also not necessary. The production process developed by the system manufacturer Schlüsselbauer Technology includes protected process steps and technologies. For the concrete pipe manufacturers who are already using the Perfect Pipe process, both the commissioning of a plastics processing facility and the manufacture of concrete pipes using easy- or self-compacting concrete (SCC) represent innovations. In general, the associated outlay is not inconsiderable and must always be understood as a strategic development step in a manufacturer's product range and production policy. However, the new developments make it possible for such innovative manufacturers of pre-cast concrete parts to supply corrosion-protected pipes even for applications where traditional concrete pipes would no longer be used anyway.

The construction sites highlighted in this report are located in Germany, France and Switzerland, as well as in Singapore. The pipes used in the projects clearly show the wide range of pipe contours that has already been described. Yet no matter whether a round or a prebed concrete pipe is required, or whether a bell is or is not necessary, two key elements of Perfect Pipe remain the same: firstly the connector, which provides a flexible and yet watertight pipe connection. And secondly the HDPE liner material, for which only an extremely thin wall thickness is required, thanks to its high resistance to chemical attack coupled with its high abrasion resistance. ■

FURTHER INFORMATION

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