



Potable Water Line Rehabilitation with Compact Pipe

Through Fields and Meadows Without Trenches

Frequently recurring damage and the maintenance of high supply reliability were the convincing arguments for the rehabilitation of a drinking water line in Tönisvorst. The Compact Pipe Method was employed – with compelling results.

The line intended for rehabilitation was a 1935 m long transmission pipeline made of PVC, OD 280 x 13.4. This line is mainly in use for the emergency supply to one of the districts of Tönisvorst. The line was built in the early 1970ies. Lately, an accumulation of damage cases was recorded, involving heavy water losses and an impairment of the supply reliability. “Two years ago, three repair cases within a single year convinced us that the frequent repair of single damage spots in this line simply could not be the

right maintenance strategy”, Dieter Gredig told us. He is the managing engineer of the Stadtwerke (public services) Tönisvorst GmbH, who have been operating the drinking water supply network in Tönisvorst for the past 8 years.

Aspects of Damage – Ridge Crack Formation

The damage found when investigating was a crack formation of the ridge. This weak point,

The Compact Pipe is pulled into the damaged line.



Up to 410 m of Compact Pipe OD 250 was wound onto a drum.



Actually the classical marginal conditions for an excavator and open construction: the path of the line mainly runs along access roads or through agricultural land.

Most Economical Variant: The Compact Pipe

New installation or rehabilitation of the existing lines – these were the alternatives considered in the attempt to solve the problem. The path of the line mainly runs along access roads or through agricultural land.

The classical pre-conditions for an excavator and new installation by means of open trenches, to all appearances. But a closer look revealed the obvious complications of the situation. “The registration of servitude, loss of use and decrease in profits, caused by the utilisation of agricultural land during all construction phases, would incur sky-high incalculable costs and payment of compensation to the property owners,” we are told by Dieter Gredig. The position of the line in a countryside protection area did nothing to ease the matter. Therefore, trenchless renewal methods like pipe bursting or pipe pulling were also taken into account. Below the line, the Compact Pipe variant from Wavin, on offer by the Stehmeier & Bischoff branch in Cologne, appeared to be the most economical method for the given marginal conditions.

These marginal conditions were ideal for the Compact Pipe method. Pulling lengths between 200 and 410 metres were feasible. The only limiting factor for the length of the single sections was the maximal pipe length to be wound on a reel. There was another reason to opt for the trenchless method: since it was a transmission pipeline, lateral integration was not called for.

As Good as New

The utilised pipe, size OD 250, is made of PE 100 with a wall thickness of 14.7 mm, it is designed to resist an operation pressure up to 10 bar. “With a pipe like that”, Heinrich Bollmer explains, “you can manage angles up to 45 de- ❖❖❖

causally determined by the production technique at that time, was a problem that all manufacturers of PVC pipes had to face in the early 1970ies, Heinrich Bollmer from the application technology department of the pipe producer Wavin explains to us.

Expressed in simplified terms, the pipe was longitudinally cut open during production and then joined together again under the influence of heat and pressure. The seams of the PVC pipes, generated in production, present an increased hazard. If such a pipe is subject to pressure, particularly impact pressure, it tends to splitting open completely. This failure was recognised very quickly and rectified immediately, Heinrich Bollmer emphasises. Still there are a few places left where this damage aspect is unearthed, as the line in Tönisvorst shows.



Typical damage aspects of PVC pipes manufactured in the early 1970ies: crack formation at the ridge.



Compact Pipe with the pulling head welded on.



Preparing the heat-up phase.



Getting the steam up: the installed pipe is being heated up.

grees if you drive a drawn bend with a radius of five times the OD." The pipe has its own static, it is regarded as a new system in the old system. "For us, the Compact Pipe is like a new pipe installed according to conventional methods. An important point for the determination of the payout time and therefore crucial for the business people's calculation", Dieter Gre-dig adds.

When the Compact Pipe is made, a round pipe is produced, cooled down and formed like a C at a precisely defined temperature. For production-technical reasons, this processing temperature is an industrial secret. This specific temperature is responsible for the so-called "memory effect". It makes sure that the pipe, reduced in its cross-section by the deformation process, "remembers" its original shape after having been pulled in and heated up with hot steam. After this step, the pipe is rounded again and nestles snugly up against the inner wall of the old pipe in a close fit without needing additional inner pressure.

Compact Pipe is available for the rehabilitation or trenchless renewal of lines with diameters up to OD 500. The rehabilitation of pres-

sure pipes up to 10 bar is possible with Compact Pipe, which has its own static and does not depend on the old line. As long as the old pipe is up to the static operational demands, the method is also suitable for considerably higher pressures. "Recently, we have rehabilitated crude oil pipelines with operation pressures up to 34 bar for Gaz de France in Lingen, using the Compact Pipe method", Heinrich Bollmer tells us.

A Glance at Stress

The specific properties of PE do demand a certain amount of know-how from the company installing the Compact Pipe. During production of the PE pipe, it is pulled out of the extruder and, conditional of manufacturing, traction forces additionally affect the pipe during the forming process. This causes axial tension in the Compact Pipe which wants to be relieved during the heating operation on site. Shortening of the pipe to the point of three percent can be the result. This is prevented with so-called fixed points made of PE, which are welded on to the pipe ends. They brace the new pipe in

the old, thus avoiding a shortening of the new pipe. "The axial tensions are relieved by 80 percent in the next three months, remaining tension can still be found after 10 further years", Heinrich Bollmer explains and stresses the particular importance of this phenomenon for the renewal of sewers with laterals. "If this is not regarded, there is a certain risk of the integrated laterals tearing off subsequently. The fixed points rule out this hazard and the laterals can be safely connected to the AKE system."

Good Aspects

However, the company Stehmeyer & Bischoff is quite familiar with the specific features of the rehabilitation method Compact Pipe. Since 1993, the long-established enterprise with its headquarters in Bremen has been applying the method as license holder, with good results. "And we see real good future aspects for Compact Pipe", says Norbert Korbach, since early 2008 manager of the Cologne branch of Stehmeyer & Bischoff, the company which carried out the project in Tönisvorst. Korbach, with more than 20 years of professional experience



The intermediate pit, involuntarily established to repair a defect of the pulling-in tooling, was the ideal window for watching the reforming process of the Compact Pipe.



Unimpressive, but particularly important: the welded-on fixed point prevents the pipe from getting shorter when it is heated up.

in sewer maintenance, sees a great application diversity for Compact Pipe with its specific properties and assets in industrial and municipal sectors. “Compact Pipe is absolutely on a par with hose lining in many cases. The customer receives a new pipe, made of DIN-based material at the factory. We found out that we have good chances with side offers. As long as the marginal conditions are ok, we don’t have to hide our price, either.” “The technical arguments, particularly for our projects involving the chemical industry, are convincing, any-

way”, Wolf-Michael Sturm, responsible engineer and right hand of Norbert Korbach at the Cologne branch of Stehmeyer & Bischoff, adds to our conversation.

This statement is confirmed by the Stadtwerke Tönisvorst GmbH. For Dieter Gredig, the short working times are a good argument in favour of Compact Pipe. After only 7 weeks, the rehabilitation of the entire 1935 m long line with a contract volume of 250,000 Euro was completed. It included the conventional excavation works, carried out by the company Horle-

mann from Uedem. This was so much the better because additional unplanned measures to lower the groundwater became necessary within the region of the working pits. The unexpectedly high groundwater level would have caused immense problems for new installation with an open trench method”, says Dieter Gredig and sees this as a confirmation for choosing the Compact Pipe method as suitable rehabilitation measure.

A. zu Eulenburg



Satisfied expressions on the jobsite: Wolf-Michael Sturm, Dieter Gredig, Norbert Korbach and Heinrich Bollmer (from the left).