

**A**s well as pipes sold for new pipelines, the market for renovating water and sewage systems using No-Dig methods plus industrial media transfer pipelines is growing rapidly.

An increasing number of modern coatings for renovation and protection are available as well as special sleeves mounted on existing pipelines. The effectiveness of repairs of this kind often depends on the technical condition of the pipeline being repaired. In the case of pipelines threatened with loss of carrying capacity and those featuring considerable corrosion, such solutions may turn out to be half measures with no guarantee that the investor will say goodbye to the problem in the longterm.

Long-standing experience shows that more expensive techniques are more cost-efficient than the less costly techniques, as they ensure longer life and better final effect. <sup>1)</sup>

As a rule, destructive factors or factors reducing the trouble-free pipeline operation period include the specific properties of the transported medium, such as high abrasive wear (in the case of hydraulic transport) or corrosives (in the case of aggressive liquid industrial wastes).

Liquid wastes originating from manufacturing processes in the pulp industry contain some of the most difficult agents. Precisely this problem was experienced by Zakłady Celulozowe Intercell in Ostrołęka.

#### **MASSIVE CORROSION**

The pipeline used for transporting process liquid wastes from Zakłady Celulozowe to the biological treatment plant runs under the streets of the town of Ostrołęka. This pipeline has been in use since 1965. A 10 mm steel pipeline of nominal diameter 700 mm was used for transporting liquid wastes. Due to their aggressive nature, massive corrosion was detected after only a few years of operation. Part of the pipeline was repaired by constructing a reinforced concrete covering. This work required excavation along the entire length of the section undergoing repair. In spite of the covering, further corrosion of the pipeline occurred. Several failures and local leaks into the ground were experienced.

**KWH Pipe has always been known on the Polish market for its high-quality products performing well in conditions where most other pipes fail. Besides standard applications of products for public service corporations or dewatering systems in road construction, many other special industrial applications are emerging.**

# Fault-free operations



After receiving expert opinions in 1996, the investor decided to repair the most endangered section of the collecting pipe by relining it with long PE pipes. KWH Pipe offered complete delivery of the material together with execution as a turnkey project.

Taking temporary increases in the waste temperature of the transported liquid into account (in summer it can reach a maximum of 45°C under a forcing pressure at up to 0.35 Mpa), PN6 DN 630x37.3 mm PE63 pipe was selected. Eight installation cuts (starting and receiving) of approx. 15–18 m average length were used for inserting the pipes. The length of the inserted pipe sections varied from approx. 160 m to approx. 370 m. The work was completed inside 4 months.

The removal of the reinforced concrete covering inside the excavations (B-30 concrete–20 cm thick) turned out to be the most time consuming task. The high degree of fouling and corrosion inside the pipeline was surprising. Concrete intrusions originating from the repair covering reduced the internal diameter of the pipe. Such intrusions (which are not a typical problem in repaired pressure pipelines) required vigorous mechanical cleaning. Pipeline sizing by pulling a PE pipe pilot section immediately behind the head to assess the degree of scratching on the pulled-in pipe is very important in such cases. The whole operation of pulling in the individual sections lasted less than twelve hours.

Existing pipeline bends were dealt with by bending the pipes and dispensing with segment bends. It was necessary to install a 28° segment bend in one case only. During the repair work, liquid wastes were transported by means of a 500 mm diameter emergency pipeline running next to the main collecting pipe. All work was completed in approx. 4 months. The 8 pipeline sections were tested separately and then a final test was performed on the entire repaired pipeline.

According to the investor, renovation with PE pipes turned out to be less expensive than pro-



**Massive corrosion was detected in the older steel pipes after only a few years of operation.**

viding the repaired section of the pipeline with a reinforced concrete covering.

At that time (1996) PE pipe relining was an innovative solution in Poland – it was a lesson in new technologies for all of us.

#### **THERMOPLASTIC PRESSURE PIPES**

In 2003, the investor decided to repair another 3,285-metre-long section of pipeline. This time, the tender was won by a Polish contractor who was a direct competitor of KWH Pipe. The renovation method chosen was identical with that used in the first stage. The situation was simpler, with no reinforced concrete covering in this section of steel pipeline. Moreover, inserts and flange connections of pulled-in pipes were given up. After pulling in, long pipe sections were connected in excavations using electrofusion fittings. Nevertheless, KWH Pipe still supplied the PE80 PN6.3 DN 630x30 mm pipes, the PE fittings and the butt welding machine.

A decision made by Urząd Dozoru Technicznego (the Polish Office of Technical Inspection) and delivered to the investor, granting KWH Pipe permission to manufacture thermoplastic pressure pipes for transporting dangerous materials with toxic and caustic properties, turned out to provide additional confirmation of the high quality of the pipes.

However, fault-free operation of the repaired pipeline section using PE pipes supplied by KWH Pipe turned out to be the investor's own most important experience of the entire project. ●

#### **THE SCOPE OF THE WORK INCLUDED**

- Excavation work
- Inspection of the inside of the pipeline
- Pulling the steel rope in and installing a power winch
- Cleaning the inside
- Welding PE pipes and fittings
- Pulling the head in, together with a pilot PE pipe test section
- Installation of inserts – flanged connecting members, fixtures
- Making resistance blocks
- Pressure test (compressed air)

1) See A.Kuliczkowski: "Problemy bezwypokopowej odnowy przewodów kanalizacyjnych"; Politechnika Świętokrzyska, Kielce 1998 and A. Kuliczkowski: "Questions of The Rehabilitation of Sewer Pipes Using The No-Dig Method", published by the Kielce Institute of Technology, Poland, 1998