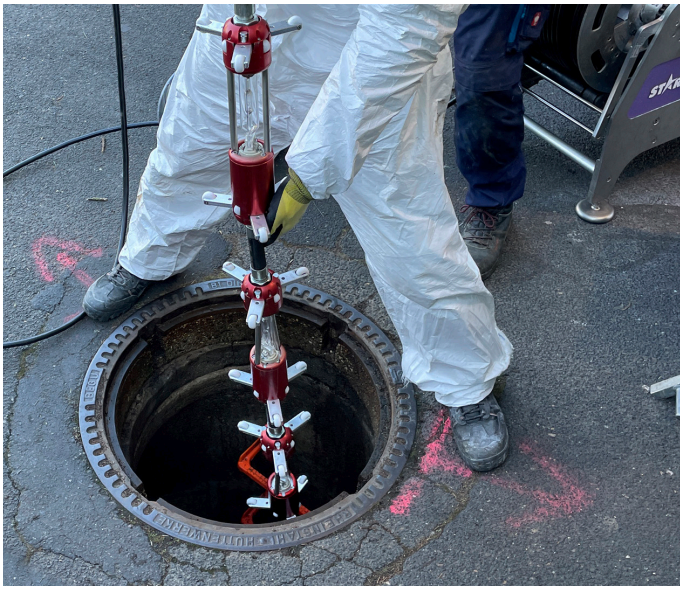
SEWAGE AND THE ADVANTAGE OF USING INFRARED SENSORS

Water and wastewater services are vital functions in a society. To ensure that the sector provides good-quality services, the water and wastewater networks must be continuously rehabilitated and upgraded. Throughout the world, there is a considerable need for investment in upgrading sewer systems – due to three main factors:

- ageing infrastructure
- climate change and
- urban population growth

The need for investments is expected to grow significantly in the years ahead. Trenchless rehabilitation (no-dig) of sewer pipelines is a cost-efficient and environmentally friendly method for upgrading existing pipelines with sufficient capacity.



Trends

Despite sizeable annual investments, there is still a considerable sewer rehabilitation backlog due to ageing infrastructure. Investments in the EU are expected to increase to EUR 289 billion (OECD 2020) by 2030. In Sweden, calculations show that investments of EUR 46 billion are needed until 2040 to maintain the functionality of the infrastructure, further develop water and wastewater services and meet future demands (The Swedish Water Association 2020).

Maintenance and rehabilation

Severe constraints are applied to sewerage, which may result in premature deterioration. These include root intrusion, joint displacement, cracks, and hole formations that lead to a significant volume of leakage with an overall risk for the environment and public health. For example, it is estimated that 500 million m3 of contaminated water per year can leak into soil and ground-water in Germany.[1] The rehabilitation and replacement of damaged sewers is very costly. Annual rehabilitation costs for Los Angeles County are about €400 million,[1] and in Germany, these costs are estimated to be €100 million.

I.S.T. Innovative Sewer Technologies GmbH

Headquartered in Bochum, the heart of the Ruhr area, I.S.T. is a key leading provider of complete solutions for pipe and sewer rehabilitation. This rapidly growing global company was founded in the spring of 1998 by its managing director Jörg Vogt. They manufacture and distribute a wide range of successful sewer rehabilitation products. The I.S.T. design team has a high focus on innovative, in-house developments at the very highest level using the most sophisticated techniques and components.

"At IST we are always looking for state of the art technology and at efficiency. Efficiency simply implies that we will offer numerous configuration options offering adaptability to almost all tasks. For circular and egg-shaped profiles, for larger nominal widths and more powerful light sources, IST will provide the right solution an existing infrastructure demands", said managing director of I.S.T. GmbH.

Temperature in pipe repair

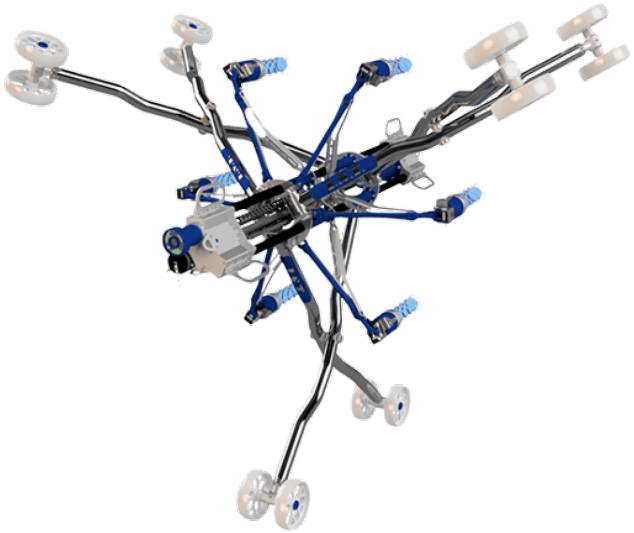
I.S.T. will bring in their Double Six Core light source which is

- easy to use in confined installation conditions
- low weight and
- easy and fast to insert into the liner.

Working with the right temperature is of the essence. The UV liner is impregnated with a resin that is curable with UV light. It will be positioned in such a way that the

patch of the sewage pipe that needs repair is pressurized so it expands against the inner wall of the pipe. UV light sources are entered into the liner and they illuminate the inner wall of the hose creating a chemical reaction which hardens the resin. The newly formed layer of hardened resin now forms a novel inner layer of piping that is impenetrable for fluids.

But, there needs to be an eye for a lot detail: UV curing of the resin should be not too long, not too short. The duration of the exposure can be monitored and controlled by measuring the temperature of the resin during the curing. The temperature of the resin is indicative for the extend of the curing: so if the operator carefully monitors the temperature of the resin, he knows at what speed he can cure the liner.



Bottom line: the exact right timing of the exposure to UV light of the resin is crucial:

- too long, material damage of the installation tools may occur
- too short the curing process has not been completed and parts of the laminate can still be liquid.

In both cases there is a risk a leak might occur.

Challenge

In the field of trenchless sewer rehabilitation, the pipe liner method with UV must be safe, fast, and the most cost-effective rehabilitation option. As I.S.T. is always looking for the most innovative solution they wanted

- a small IR sensor as it could not take up a lot of space in their pipe
- definitively very accurate
- and robust, stand up against harsh external influences.

AND.....as I.S.T. works in smaller sewage pipes and sometimes in larges pipes, it is particularly important that all three requirements are combined in one sensor. They were simply looking for the best solution to their problem, so that their high-quality solutions were equipped to their highest requirements. They needed an accurate, small IR sensor that is capable of showing them the exothermic reaction of the resin used (between 60°C and 90°C). Without this temperature information, it is not possible for the I.S.T. fieldworker to see whether the desired exothermic reaction is starting and the resin is curing or not. In the worst case, if the resin in the liner is not fully cured, the liner must be completely removed and a new liner installed. This means higher costs, loss of time and double work.

Solution

Exergen's IR thermocouple IR-T-C-K-240F simply has it ALL. It combines all the requirements I.S.T. wanted for their Power LIGHT Double Six Core solution. They tested this sensor to the max and:

- it measures extremely accurately and
- impresses with a robust
- and compact design.

Due to the compact design they are even in a position to install this sensor at three positions within the chain and thus measure different areas (360° measurement at different points) which proves to be a fantastic add on to their accuracy level.

Why Exergen IRt/c Sensors?
Exergen's proprietary technology includes the smallest available IR sensor – the Micro IRt/c. The sensor does not need a power supply because it is self-powered. It consists of only passive components and therefore does not drift, making the sensor very stable, durable and accurate. Another advantage is that the sensor does not need periodic recalibration, as all powered sensors do. This means that I.S.T. has no maintenance on the sensor when their light sources are in the pipes. Combine this with the fact that the IRt/c is able to withstand high ambient temperatures AND is not sensitive for UV light, and you see why I.S.T. choose for the Exergen IRt/c sensor.

Exergen's non-contact IRt/c sensors are extremely accurate. The IRt/c sensor makes it possible to measure the exact temperature during the curing process, with a resolution of approx. of 0.0001°C and a repeatability error of 0.01°C. This ensures I.S.T. exactly knowing at what temperature to stop.

More information about I.S.T.
It provides more power for liners of dimensions DN 1000 to DN 1600. The chain consists of two identically constructed, self-sufficient cores. Each core has six radially arranged UV lamps with 1,200 watts each. The installation of wheelsets of different lengths allows the adaptation to different pipe diameters. To make sure that the chain passes quickly through the packer into the liner, it should be as small as possible. To achieve this, the wheel set and emitters can be retracted. Once the chain is in the liner, the wheels are extended and lift the cores upwards. At the same time, the emitters extend in the direction of the pipe wall in order to irradiate the laminate with the highest possible light intensity. A display on the panel provides information about the current extension position. In the event of motor overload, the movements are stopped.

References
[1] https://lifé.vn/en/Sewerage-2066602644