

# Pitch Fiber: A Legacy Of Post War America

By 2010, the United Kingdom is expected to pass legislation stating that water companies will be required to take ownership of a large part of the private drainage of England and Wales. As one example, this will have the effect of doubling the sewerage assets of Wessex Water. Many of these private sewers are constructed from Pitch Fiber pipe – a solidified, Bitumen and wood pulp papier-mâché material, predominantly used for private drainage installations between 1950 and 1970.

Most of these sewers have deteriorated due to large deformations, delaminations and general material breakdown under the stresses of existing ground conditions over time. The Critical Sewers Team (CST) of Wessex Engineering and Construction Services (WECS), which concentrates on the no dig aspects of renovation and construction within Wessex Water, is tasked with completing the most cost effective renovation of this sewerage project for its client, Networks.

The CST is evaluating the following technologies for their cost effectiveness to satisfy the operational needs of their client:

- Analysis of current re-rounding, CIPP lining practices and their potential longevity
- Research and develop new, radical linings with industry partners; and
- Pipebursting and sliplining.

James Kitching, the winner of the UKSTT Young Engineer Award for 2008, was tasked with evaluating pipebursting.

## Total surround

Senior members of the CST have experienced situations where concrete beds and surrounds had caused problems during pneumatic bursting during the 1980's and likewise, static bursting today. One of the aims of Kitching's work was to establish whether a concrete surround existed outside the pipe under review using robotic technology. Wessex Water appraisal estimates always include at least one trial hole per sewer length to establish the bed and surrounding construction; however, this was becoming costly, not only for deep excavations, but in terms of socioeconomic considerations. Wessex Water is identified as one of the leading water companies for customer satisfaction and the need to reduce occupation of sites is of paramount importance. This is reflected in the new Traffic Management Act, which is even more onerous on the excavation of any type in the highway.

Kitching's research focused on the renovation of a 1,400 m of 150 mm (4,500 feet of 5.9 inches) diameter pitch fiber public sewer in a major highway known as the A361 in Trowbridge, Wiltshire. In total there were 25 lengths with depths of up to 3 m (9.9 feet). The A361 is a main trunk route connecting daily commuters to places like Bath, Chippenham and Warminster. Historically, district and county engineers responsible for the original construction, pre water company formation in 1974, were known to be very conservative, and a concrete surround could be expected given the importance of the highway.

## Lateral cutter saves time, money

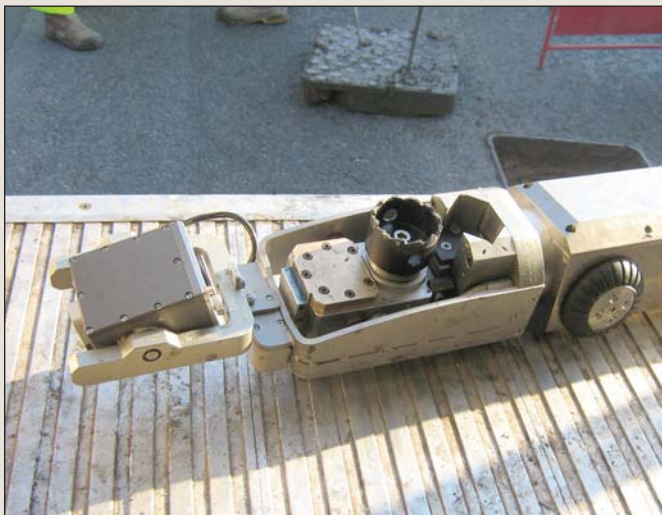
Kitching is also a section engineer involved with the CIPP 'softlining' of sewers for CST, and the bursting project coincided with the purchase of a new lateral cutter by Onsite Central Ltd. of East Challow, from Prokasro of Baden Baden in Germany.

He quickly realized that the hydraulic power of the Prokasro cutter could easily core through the wall of any pipe, passing through the surrounding bedding. Onsite Central was asked to commission a specialized toothed cutting head for core retrieval, which would not 'wax up' while coring Pitch Fiber. Prokasro worked with Onsite to develop the cutting head and trials began in the fall of 2007, with additional exploration trials in February 2008.

The original estimates to establish the presence of concrete surrounds for 25 trial holes came to £54,000 (US\$105,708) and would have taken a team about five weeks to complete. Whereas, using the core cutting system took only one weekend and cost just £7,000 (US\$13,702).

## Cutting methodology

Kitching studied the various construction codes pertaining to sewers from 1950-1971 and other published documents. He identified that any concrete bed would be 'flaunched' (the practice of concreting up to mid level of the pipe). If concrete was found at this level, a core would be taken at the 12 o'clock position. During pipebursting, a bed of concrete could be as troublesome



**Left:** The coring head of the robotic cutter used to test for concrete pipe surrounds in pitch fiber pipes.

**Right:** Preparing the robotic cutter for coring.



as a full concrete surround, and that is why any traditional open-cut excavations would not cease upon reaching the soffit of the sewer, but had to establish the bed as well.

### **Prokasro design house**

Kitching's research showed that 4- and 6-inch diameter pipes accounted for over 80 percent of the total Pitch Fiber laid in the UK and this machine fit into a 6-inch diameter pipe. There were two hydraulic lateral cutters available, and it is the smaller of the two which was utilized.

The PHC is a crawler style vehicle designed to fit 150 mm to 300 mm (6-12 inch) diameter pipes. The cutting tool is hydraulically driven by oil at operating pressures up to 160 bar, and is adjustable through 360 degrees via the electric motor. The system includes a powerful hydraulic pump which is connected to an oil cooler and 120 m (396 feet) cable-drum, allowing greater working distances with enough strength to perform repairs in the pipe. The detachable camera is equipped with a wiper to clean the front glass from cutting dust and water. The adjustable LEDs also give enough light for

working in the darker sewer environment of Pitch Fiber.

The hydraulic pressure delivered gives this unit a great cutting advantage over pneumatically or electrically powered systems, which would struggle to cut through harder materials. The cutting tool geometry, specially designed by Prokasro, shows the cutting teeth are placed at alternating angles to each other to obtain a wider cut. The idea was to try and ensure the cutter was able to loosen the extraction material around it in order to more successfully extract the material core into the cutter.

### **In practice**

During the test work, an additional camera was used to follow the cutter, and give a good visual idea of how the cutter works in situ. The cutter was used to extract at least two cores per length, for a minimum of 50 cores throughout the project.

The results of the test proved excellent. All but one length were found to have either 'as dug' or granular bedding, generally describe as 'shingle'. One length had a concrete surround and will not be considered for bursting without further investigation.

The cutter was traversed as far as possible along the sewer until large deformations caused abandonment. During this passage deformations were cut by the teeth on the coring head, and a number of deformations were actually delamination blisters which came away easily.

### **Conclusion**

In Kitching's view: "No-dig saves costs for the company and ultimately for customers, by not having to pay the carbon tax on concrete pipes for open excavation, the landfill tax for muck away and the taxes associated with quarrying bedding and GSB1."

Largo, FL, is interested in the research carried out by the CST team and Kitching, so much so, that the mayor of Largo has asked Kitching to share their findings with city engineers to help establish a mutually beneficial relationship. The city has earmarked \$100 million to address sewer deterioration, including Pitch Fiber problems.

The benefits offered by UV-Light CIPP are also being evaluated by the CST for its faster installation time and improved socio-economic losses. ■