

Renewing ovoid pipe

By Ian Bateman, Interflow

While the ovoid pipe differs from the circular pipe in many ways, the methods used for cleaning both varieties of pipe need not be different. The latest 'close-fit' liner from Interflow, Interline CIPP liner, will conform to the shape of the host pipe, making it suitable for installation in ovoids or in circular pipes with bends and changes in direction.

The majority of sewer pipes are circular in cross section. However, many decades ago it was quite common to install ovoid – egg shaped – pipes. Compared to a circular pipe, the principle benefit of ovoid pipe is the hydraulic properties that keep the flow velocity in the invert high as the volume inside the pipe reduces. This enables the ovoid pipes to collect less silt and debris and perform more self-cleaning.

The major difficulties associated with ovoid pipes are that they require different tools and equipment for maintenance, and a particular method is needed to rehabilitate the pipes.

There are many systems and contractors capable of lining circular pipes, however the number of techniques and skilled contractors available for ovoid pipes are relatively few. There are various important differences and challenges associated with relining ovoid pipes. These include:

Variability of shape

There are standard shapes for ovoids, which can be seen in Figure 1. However many of the ovoids in existence today were constructed by hand many decades ago. This means there is usually some degree of dimensional variation from pipe to pipe and along the pipe. As a result, a lining system is needed that can accommodate this variation.

Structural strength

The structural characteristics of an ovoid pipe are quite different to a circular pipe. The net effect of this is that typically an ovoid liner will need to be significantly stiffer than a circular liner with the equivalent cross-sectional area. For this reason, a resilient lining system needs to be manufactured.

Tooling and equipment is designed for circular pipes

Contractors have standard sets of equipment that are designed to work in circular pipes. The standard equipment design



Installing the Interline CIPP lining from an existing access chamber.

typically makes use of the fact that the pipe is symmetrical about the centre line. In an ovoid pipe some of this equipment will not function properly and needs to be adapted or replaced with equipment purpose-made for an ovoid geometry.

Interflow's product of choice for ovoid relining is Interline CIPP (cured-in-place pipe). Interline CIPP is the latest addition to Interflow's range of pipe liner products and is ideally suited for renewal of ovoid pipes from 150 – 1,200 mm.

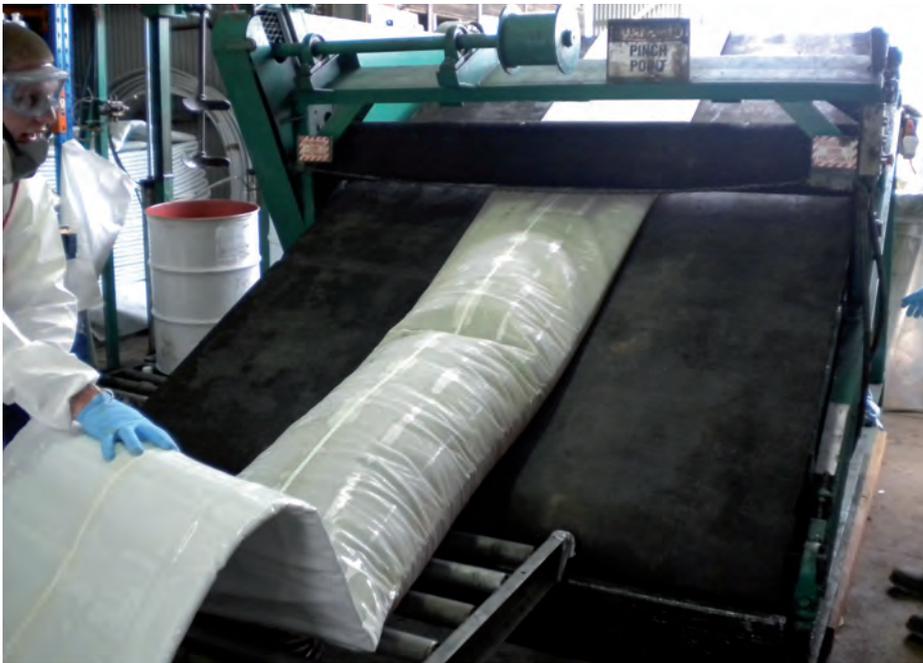
The Interline CIPP system is a resin-saturated felt liner that is installed by inverting it inside the host pipe under a head of water and then curing it using hot water. Because the lining is in a soft state when it is installed, the Interline CIPP liner will conform to the shape of the host pipe

making it suitable for installation into ovoids or in circular pipes with bends and changes in direction.

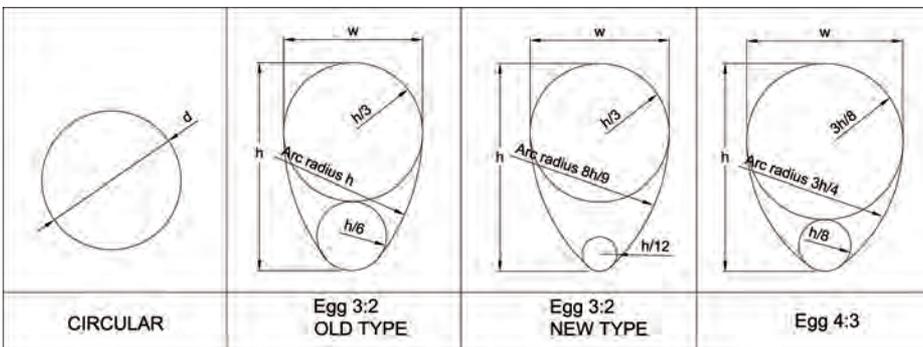
Interline CIPP provides a 'close-fit' liner. The strength of the liner is provided by the resin and is a function of the liner wall thickness. The wall thickness can be selected to suit design or structural requirements.

When cured, the Interline CIPP has sufficient strength to resist pipe loadings and provides a smooth, chemically resistant internal surface which restores or often improves the hydraulic capacity of the original pipe. The end result is a renewed asset with an expected surface life of at least 50 years.

The steps in the rehabilitation of an ovoid pipe generally involve the following:



Crews had to overcome tight traffic constraints whilst working from an access chamber.



Standard ovoid shapes.

The major difficulties associated with ovoid pipes are that they require different tools and equipment for maintenance and a particular method is needed to rehabilitate the pipes.

1. The first step of the rehabilitation process is to identify what shape (type) of ovoid the existing pipe is, in accordance with Figure 1.
2. Once the type of ovoid is known, the next step is to inspect and measure the existing pipe. This is a critical step because the felt liner is made specific to each pipe. If the felt liner is made too big for the pipe the excess material can produce wrinkles and folds in the liner, while if the liner is too small it may stretch and thin out, or will be unable to conform to the shape of the host pipe. Figure 1 references the dimensions typically required to specify an ovoid pipe.
3. Having determined the shape and size of the ovoid pipe, the design thickness of the liner can be calculated by using the appropriate design standard and taking into account the loads on the liner.
4. Once the shape, size, and thickness of liner is known, the felt liner can be procured.
5. The felt liner is then impregnated with resin in a controlled environment after which it is stored chilled until it is ready for use.
6. The pipeline is then cleaned and prepared for the lining. A CCTV survey is conducted to confirm that the pipeline is ready for lining. The liner is delivered

7. At the end of the cure, the water is cooled and the ends are trimmed and sealed to the existing access chambers' surfaces.
8. Lateral junctions are reinstated by robotic cutting with a purpose-made ovoid cutter.
9. A final CCTV survey is performed to confirm that the lining has been successfully installed.

To date Interflow has secured contracts to rehabilitate a total of approximately 1.5 km of deteriorated ovoid sewers that require rehabilitation, of which 550 m have already been completed using Interline CIPP.

Technology in action

During a recent ovoid sewer rehabilitation contract for United Water in Adelaide, Interflow crews had to overcome tight traffic constraints whilst working from an access chamber located on Adelaide's South Road, a busy dual-carriage way. Due to the high volume of cars that use the road during the weekday, work was only permitted at night or on weekends when traffic was lightest.

As part of the project's risk mitigation strategy Interflow relocated its resin impregnation equipment from Sydney to Adelaide for this project. The impregnation plant and equipment was established at Interflow's Adelaide depot, which was in close proximity to the site location. This allowed the liner to be impregnated off site and inside factory-controlled conditions during week days.

To minimise disruption to the community and road users Interflow created a comprehensive Traffic Management Plan, which focused on carrying out the relining work during a 48-hour working window on the one weekend. Interflow crews mobilised and established the site on the Friday evening at the end of the traffic peak. The plan was to install the Interline CIPP liner in two separate installations and over two separate night shifts;

To deal with the challenges of working in the ovoid geometry Interflow used camera and robotic cutting equipment specifically made for traversing in ovoid pipes.



Before and after CCTV shot of a 698 mm x 478 mm ovoid pipe lined with Interline CIPP.

the first liner was 178 m long and the second was 198 m long.

To deal with the challenges of working in the ovoid geometry, Interflow used camera and robotic cutting equipment specifically made for traversing in ovoid pipes. This equipment made it possible to perform a CCTV survey of the pipe and to cut and reinstate lateral junctions at productivity rates comparable to those used in circular pipes.

In total, Interflow successfully installed 376 m of Interline CIPP in ovoid pipe measuring 525 mm (height) x 350 mm

(width), reinstated 21 laterals and conducted a final CCTV survey of the pipeline within the 48 hour working window. The work was completed within the timing constraints and without incident, and the site was disestablished prior to the start of the traffic peak on Monday morning. As a result the ovoid pipe was effectively renewed with only minimal disruption to the community and no impact on regular week day road users.

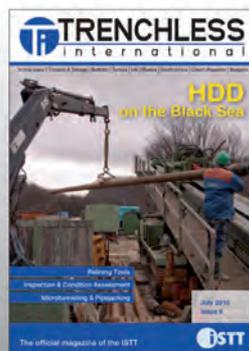
United Waters Manager of Water and Wastewater Systems Projects, Naz Dastoor, said "Interflow's ability to install spiral

wound liners in deteriorated sewers is well known to United Water. We are pleased to find that your experience in the operations of our network, including flow, traffic and community management can be applied with equal success to cured-in-place liners in ovoid sewers."

This project was another example of how Interflow was able to provide a solution that met the needs of the client. With the addition of Interline CIPP to the existing product range, Interflow continues its commitment to offering its clients solutions of the highest value. 

For more information about Interline CIPP and Interflow visit www.interflow.com.au

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