

Semi-Structural Resin Pipe Linings successful trials by South East Water

Insitu lining of water mains has been implemented for over thirty years. The original purpose of carrying out this work was to: * Improve water quality by placing a barrier between the host pipe and the conveyed liquid; * Improve hydraulic performance by the removal of internal tuberculation; * improve the working life of the main by stopping further corrosion. The drawback with both cement mortar linings and epoxy coatings was the length of time which the main had to be taken out of commission to allow for the coatings to cure. During the latter part of the 1990s new materials were introduced onto the market (polyurea) that were similar to epoxy materials but had a much faster curing time (typically 2 minutes) which allowed for same day return to service for the treated pipe.



Semi structural resin pipe lining - photo shows spray head & lined pipe

courtesy: South East Water & Pipeway

Whilst insitu lining of water mains was considered cost effective, the process added little to the structural integrity of the water main. Therefore, it was limited to mains which were considered to be structurally sound. To combat these problems new developments in this field of technology introduced the application of semi structural linings that claimed to add to the structural integrity of the water main.

The latest materials have the potential to add considerable value to an ageing infrastructure, but it is important that initially controlled trials take place to realise the full potential of the product.

Trials

South East Water, with contractor *Pipeway* have recently completed successful field trials using the DWI approved semi structural resin Copon Hycote 169HB in Bidborough, Tunbridge Wells, Kent.

A 4 inch diameter cast iron main in poor structural condition was made available by South East Water. The operating pressure on the pipe had been reduced to overcome frequent burst problems. Lining thicknesses of up to 3mm of the 169HB product were applied and after completion of the works, the main was returned to its optimum operating pressure.

The new material which can be applied at a thickness of up to 6mm, not only dealt with the problem normally associated with ageing cast iron mains, but also added structural properties to the old pipe.

The 169HB product offers the following advantages over other lining techniques:-

- * same day return to service, reducing or eliminating the need for temporary supplies;



Bidborough spray rig on site

courtesy: South East Water & Pipeway



design & manufacture of internal pipe lining equipment

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creating solutions -

- * improvement in the carrying capacity of the main by removal of internal corrosion prior to lining;
- * improvement of the structural integrity of the host pipe;
- * long lining lengths achievable.

Accreditation

The first stage was to gain approval to use the product. South East Water supplied *Pipeway* with a live site on which to operate and test this system. WRc were chosen to carry out the accreditation, having been appointed by the DWI to undertake this task.

The approval process was broken into two parts, a rig assessment and a contractor assessment. The first part (rig approval) was carried out at the contractor premises. For the second part (contractor assessment) a pipeline was chosen that had a poor burst history and was, therefore, not considered suitable for non-structural spray lining.

The main was 4" diameter cast iron and was some 470 metres in total length. The pressure had been reduced in this section in an attempt to alleviate the burst problem and contained a number of service connections (ferrules).

Development

Developments with the semi structural lining system can, broadly, be split into three categories:

- * machinery developments;
- * process developments;
- * assessment procedures.

Machinery development – Spray Head

A new spray head for this material is necessary due to the material being more of a viscous/sticky nature that tends to build up in the cone. This build up is progressive and reaches a point where the cone which spins at some 25,000 rpm, makes contact with the body of the spray head which in turn leads to catastrophic failure. A prototype spray head has been developed which overcomes the problem associated with the above.

Machinery developments – flow rate umbilical

Due to the increased material viscosity and temperature restraints placed by the material supplier, only a flow rate of some 1.5 litres per minute can be achieved. This means that semi structural linings at this time are a little slow to apply. For example, applying a 3mm coating to a 4" diameter pipe requires a material quantity of approximately one litre per metre. This means that the rate of travel through the water main is only some 1.5 metres per minute, which is a little slow and tends to limit the process to pipes of a similar diameter and shorter lining lengths.

Pipeway are currently working on a new design of umbilical which should double up the flow rate.

It is important to note that these are the areas that have been identified to date, but further areas for improvement will be identified during further trials of the product.

Assessment procedures

It is important for both South East Water and *Pipeway* to put into place formal post lining test procedures to allow a proper working window for the product to be defined. The procedures should be



Pipelined with 3mm of semi structural material

such that the improvement is measurable in the main, ideally without destroying it or making it so complicated that it becomes uneconomic to work. The general consensus at this time is that a form of air pressure test should be used both after cleaning and after lining, but it is accepted that due to household connections etc this may not always be possible. Records will also be important with regard to the above so that the improvements in efficiency gained with this product can be seen.

Results

The results from field trials have shown to have a positive effect on the structural integrity of what was considered to be a main near to the end of its useful life. In addition to this, the new material offers a substantial saving when considering the structural rehabilitation of pipelines and water quality issues in the future.

To date, trials have been undertaken with this product but to aid the development of the 169 HB product and to understand the potential for the product, further trials are being planned on pipes in different conditions, diameters and of different materials. At this current stage of development the works carried out are to specifically defined schemes with an evaluation period between each to allow for assessment and application refinement to take place.

South East Water and *Pipeway* are now undertaking further trials on designated strategic mains to assess the capabilities of the new product and to allow for controlled development to take place with the product in a joint development. ■

Note: *The above article was written and prepared by South East Water Ltd and Pipeway.*

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