CONDITION ASSESSMENT OF LARGE DIAMETER WATER MAINS

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EXECUTIVE SUMMARY

Large diameter (DN300 and above) water mains are a vital part of the Water Industry. In recent years there has been an increased awareness by water authorities of the need to determine the physical condition of these mains due to the recognition of many of these mains as being critical. A failure of the majority of these mains would severely disrupt supply to consumers, be expensive and time consuming to repair, and lower the public perception of the authority responsible for operating the pipeline. In addition, in some instances costly third party damage claims could be pursued against the authority.

The vast majority of Australia's large diameter mains consist of grey cast iron, steel, wrought steel or ductile cast iron, with some having been in use for more than 100 years. These pipelines have been constructed using a variety of jointing methods, including rubber rings, lead and welded joints. A variety of external protection systems, such as cement mortar (Gunite), coal tar enamel wrapped, fusion bonded polyethylene, loose polyethylene sleeving and thin bitumen, tar and zinc-rich paints have been used. Lining systems for internal corrosion include cement mortar (applied either centrifugally in the factory before installation or in-situ in the pipeline), coal tar epoxies and a thin bitumen or tar paint. Many of the mains are buried and exposed to a variety of soil conditions, but a significant number of them have been installed above ground - the Chichester Trunk Gravity Main supplying the city of Newcastle, Sydney Water's Warragamba pipelines and the Perth to Kalgoorlie pipeline to name but a few.

A step-wise methodology of condition assessment of large diameter mains is provided, utilizing a combination of desk-top and field techniques, such as

* Remote Field Technology (RFT) Mainscan®;
* direct physical measurement of metal and coating thicknesses;
* linear polarisation resistance (lpr) soil testing; and
* extreme value statistics.

Each technique is discussed briefly, and its applicability described as a function of pipe diameter, pipe metal type, joint type, coating and lining type, and access to the surfaces of the main (viz. whether the main is man entry size, and located above or below ground). Specialised electrical techniques, such as direct current voltage gradient (DCVG) survey can be used if the pipeline is electrically continuous (by use of welded joints or bonding cables).

The results from a condition assessment of a pipeline should provide an indication of the classification of risk of failure for each main, or for sections of a main, and allow the water authority to either provide a pro-active maintenance programme (selective replacement or refurbishment) or utilise resources and capital elsewhere.

Finally, a summary of the condition assessment of the external surface of ACTEW's 20km 35 year old DN1600 mild steel Bendora Gravity Main (BGM) are presented. For the major part of its length the pipeline traverses the Cotter River catchment which is the main source of water for Canberra and Queanbeyan, and is located in an area of severe topographical conditions, with pipeline gradients up to 40%. The overall outcomes of the condition assessment have been positive. Corrosion protection coatings on the main have been found to be in good condition, and still giving good protection. However, due to poor design and construction detailing, remedial work is required at the majority of buried scour valves to improve accessibility and provide a less corrosive environment.

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