BTO *Executive Summary*

Degradation of asbestos-cement pipes shown perfectly with CT scans

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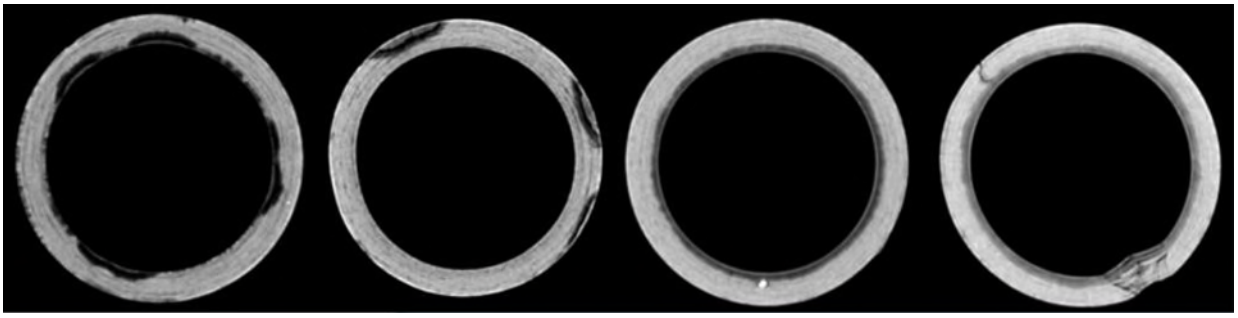
Computed tomography (CT) can provide a very precise picture of the degradation of asbestos-cement (AC) pipes. Comparisons with the established georadar and thymolphthalein techniques show that CT closely matches thymolphthalein, while georadar systematically underestimates the deterioration of AC pipes. CT will be valuable as a reference for the validation of other techniques, and can be used for condition assessment whenever additional assurance and detail are desired.



A single CT scan produces hundreds of cross-sections of a pipe; this renders deterioration clearly visible as darker patches.

Interest: prioritising AC pipe replacement

Roughly 25% of the drinking water transport and distribution network is still made of asbestos-cement (AC). Drinking water utilities aim to replace AC pipes over the next decades. In order to replace the worst pipes first, the utilities need good methods to determine the condition of AC. A new method, computed tomography (CT), offers possibilities.

Approach: CT images converted into numbers; comparison with thymolphthalein and georadar

With simple image processing steps, the CT scans of removed AC pipes are converted into numbers that can be used for further analysis. A study is then done to determine whether the degradation of the scanned pipes can be statistically described. Lastly, the technique is compared with two established condition tests: thymolphthalein and georadar.

Results: CT provides a complete picture, georadar underestimates degradation

The CT images provide an unprecedentedly complete and detailed picture of the degradation of removed AC pipes. It is perfectly feasible to automatically convert the images into numbers, in order to summarise the condition of the pipe and to compare the CT results with those of other techniques. This comparison showed that georadar systematically underestimates degradation and that CT data closely match thymolphthalein results.

Implementation: CT is valuable for validation and can offer additional assurance

CT is valuable primarily as a reference for the validation of other techniques. Its occasional use for condition assessment is conceivable for projects that demand additional assurance. Because georadar systematically underestimates degradation, it would make sense to investigate this technique more closely *before* drinking water utilities proceed with its widespread application.

Report

This research is described in the report *Röntgentomografie als meetmethode voor toestandsbepaling van asbestcementleidingen* (BTO-2019.010).