EPR Rehabilitation of Asbestos-Cement Pipeline[2]

Steven Nash [1,2]

1. FST Technology, Golden Square, Vic, Australia
2. CAF, Shepparton, VIC, Australia

ABSTRACT: Abstracts limited to 200 words maximum.

Goulburn Valley Water and Intelligent Water Networks have co-funded the world first trial of EPR for rehabilitation of an asbestos cement (AC) water main in Fair Street, Shepparton.

EPR™ is **E**ncapsulation **P**ipe **R**eline and the process in this trial is pipe reaming the AC pipeline with encapsulAC®. This captures the AC pipe fragments and surrounding soil in a safe, identifiable and coagulated mass sitting outside a new Polyethylene pipeline.

The trenchless reaming process comprises:

- old pipe as pilot hole for drilling rods
- connecting the new polyethylene pipe to the rods
- flow points out of cutting head injects fluid at it rotates and rods pulled back
- creating a congealed mass enveloping the PE pipe comprising granulated old AC pipe, surrounding soil and vibrant blue coloured fluid.

The trial project is the rehabilitation of 230m of 100mm diameter AC water main, constructed in 1968, located in a nature strip in a residential area.

This presentation will review success and lessons learnt including:

- Approval process
- Project team members
- Communication plan
- Scope of works
- Construction program
- Rehabilitation efficiency
- Comparison to other options
- Standard guidelines
- Sampling analysis results

EPR could become a future viable option for rehabilitation of AC pipes.

1. WHAT IS encapsulAC®

The Australian Water Industry must manage, repair, and replace approximately 40,000km of AC pipe within the next 40 years while satisfying environmental, OHS and financial considerations. A conservative estimate in 2012 of the costs for rehabilitation of AC pipes in Australia was $8.9 billion.

encapsulAC® is a proprietary dry-bagged powder which, when blended with water, produces a vibrant blue fluid. It has been developed in USA and was originally marketed as an addition to low-cost replacement techniques, such as pipe bursting and splitting, to coat the fractured pipe and any exposed fibres. The vibrant blue pumpable fluid would coagulate as applied and covert the AC pipe fragments and fibres with a dyed gel creating a coagulated mass.

Pipe reaming was identified as an alternative process that would enable inclusion of encapsulAC® while also improving on the pipe bursting technique to be a viable in line replacement technique.

2. EPR - ENCAPSULATION PIPE RENEWAL

EPR™ is **E**ncapsulation **P**ipe **R**enewal and the process is pipe reaming the AC pipeline with encapsulAC®. This process will capture the AC pipe fragments and surrounding soil in a safe, identifiable and coagulated mass sitting outside a new Polyethylene water pipeline comprising:

- Using the old pipe as a pilot hole for the drilling rods
- Connecting a new polyethylene (HDPE) pipe to drilling rods with propriety cutting head to ream
- Mixing encapsulAC® with water and other additives, as per soil conditions, to create a drilling fluid
- Injecting fluid out of the cutting head as it rotates and pulling back rods
- Creating a congealed mass enveloping the HDPE pipe comprising granulated old AC pipe, surrounding soil and vibrant blue coloured fluid.

The process, is shown in Figure 1 below:

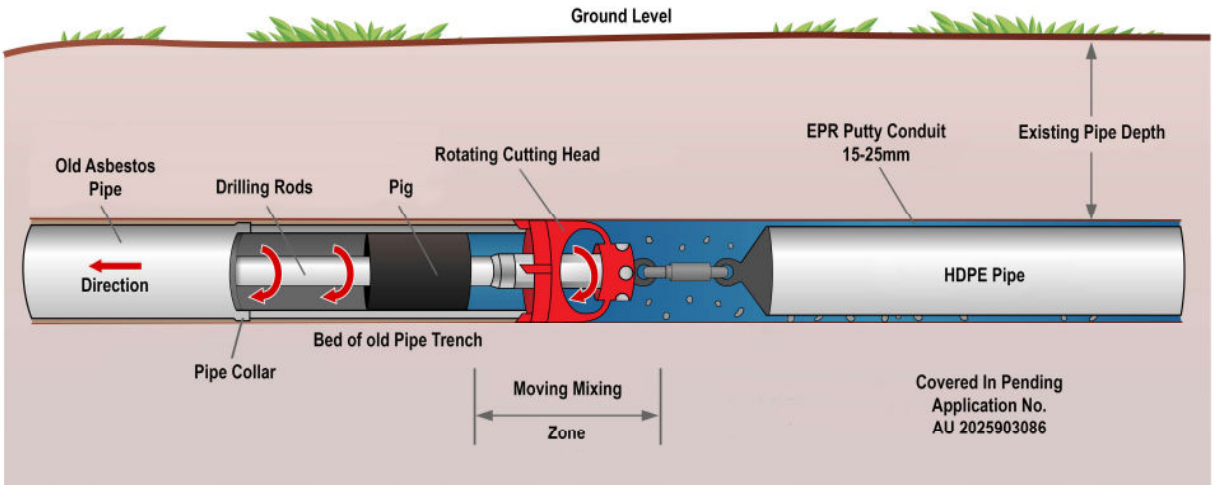

Figure 1 – EPR Process Diagram

3. FAIR STREET WATER MAIN REPLACEMENT

GVW had identified a 100mm water main in Fair Street, Shepparton, Victoria, for replacement as it was a 1968 AC water main that had 7 water main failures, with 2 in a 12-month period. The other features of this pipeline included:

- Total length of 230m crossing three streets in 2 equal stages:
  - Stage 1 – 115.3m from Vaughan Street to Ashenden Street
  - Stage 2 – 114m from Ashenden Street to Sobraon Street
- Located just behind the kerb and crosses through two stormwater pits
- Shallow cover (400-500mm) in a stiff clay soil with little to no bedding sand evident
- All services present including Telstra, sewer, NBN, overhead power, stormwater and gas

4. PROJECT TEAM

The R&D project team was expanded to include all consultants, contractors and funding agencies required to complete the project scope and regulator requirements, including:

1. R and R McClure (McClures) – Drilling contractor, pipe remaining, EPR mix, locations
2. Rankin Plumbing (Rankin) – GVW water main replacement contractor
3. Ashworth Excavations (Ashworth) – Class A asbestos removalist and all AC works
4. WSP – Hygienist for air and soil sampling, laboratory analysis and reporting
5. CAF Consulting (CAF) –Exemptions, project management and community consultation
6. GVW – Asset owner, water main shutdowns, community and project funding
7. IWN – Project funding and water industry promotion of results
8. ISC Services and Boyd Tech – Mix design and encapsulAC® material supply

5. EXEMPTION APPROVALS

The project team participated and supported the development of the exemption applications, for both EPA and WorkSafe, by providing review and input into the process. WorkSafe required exemptions signed from both GVW and Ashworth (Class A asbestos removalist). The exemption and approval process provided value to the project as it ensured that the project was supported by Regulators, which also helped the community consultation.

6. COMMUNITY AND WATER INDUSTRY CONSULTION

The community consultation program commenced in February 2025, with the key components including:

- Information letter to residents and owners including project, program and about EPR
- GVW website link for project information, FAQ's and question forum
- Ensuring all nature strips to be accessible at the end of each working day
- Advice on minimal impact of temporary services and connections for each property
- Contact phone number of the project manager
- Survey to be sent out to residents and owners post project for feedback and comment

CAF then undertook a door knock letter drop and visited and spoke to all residents and owners of properties in Fair Street. This included a block of flats where an interpreter assisted.

7. PROJECT CONSTRUCTION

The project timetable was to commence works on site post Victorian Labour Day Holiday (Tuesday 11 March 2025) and have the project completed before Good Friday (Easter) 19 April 2025, which was met. The key components of the EPR construction process included:

- GVW operations staff marked up the locations of previous water main repairs
- Rankin marked up all services on the ground with clearances.
- Rankin and McClures hydro excavated all fittings, water tapings, repairs, and services
- WSP set up air sampling units at all work sites and reported results to WorkSafe, GVW and CAF at end of each working day
- Once the water mains were isolated all fittings and tapings were removed, by cutting the AC pipe 400mm either side, and disposing to landfill, the pipeline was drained.
- Asbestos exclusions zones with appropriate PPE were set-up and adhered for AC cutting
- Once drained, the AC main was CCTV inspected by push camera to identify and locate other repair bands and repair pipe (Blue PVC)
- GPR was used along the top of pipeline route to locate fittings, repairs and other services
- Trench excavations required for entry and exit pits (2-3 metre) for each stage
- Reaming process would stop when a repair fitting was hit which had to remove by hand, requiring hydro excavation and hand cutting of cast iron fittings in AC PPE
- Blue PVC repair pipe would wrap around the drilling head and had to be removed as hit
- All pits had to be covered, sealed and fenced off when not being accessed.
- The EPR^{TM} blue coloured mix was easily identifiable and as aided clearing of pits where splash occurred. WSP would validate all sites as clear of asbestos material.
- All asbestos material was removed to the local licenced landfill as generated locally
- The length of AC pipe removed was 25m of the 230m total length, and including fittings. Other material removed to licenced landfill included soil and the stormwater pits.

8. PROJECT RESULTS

As outlined above, the project was completed according to the original project timetable, with the main issue being that the reaming drill hit a total of 31 repair bands, well above the 7 recorded by GVW. Investigations identified that the AC main had been repaired by both AC pipe and Blue PVC, indicating that the main was failing prior to 1985.

The frequency of these undetected repair fittings, as close to 300mm from the previous removed fittings, caused a lack of continuity to the reaming process, that otherwise would operate smoothly. Each repair fitting had to be excavated and then removed by hand, using cutting tools for the cast iron and stainless-steel bands.

The impact of these frequent repairs and the original construction technique was also evident in the background soil sampling test results, prior to the EPR^{TM} and outside the EPR^{TM} process influence, showing localised asbestos fibre detections. The excavations also located abandoned tools and other rubbish from previous tasks on the pipeline.

WSP set up 8 air monitoring units up each day at all working areas. These units did not record any air fibres throughout this construction, which indicates that the reaming process was effective in containing all asbestos within the EPR™ mass created on the outside of the new HDPE water main. The rod self-cleaning successfully prevented AC returning to the drill unit.

When reaming pipe continually, the reaming process was smooth, as it is only cutting the outside pipe wall to collar (20mm) and the soil in between, which is then being mixed with the encapsulAC® fluid. This is more efficient than drilling a 125mm tunnel on a new alignment. The reaming did not cause any pipeline heave and therefore no cracking of driveways, kerbs and gutters. Pits in road surfaces and driveways where backfilled and sealed.

Where pits were opened and inspected, it was noticeable that if the top of the pipe was uncovered, the pipe would 'chunck', like pipe bursting. These chunks were removed and bagged with AC waste to the licenced Cosgrove landfill.

2025 had a long dry summer, and this project was completed in above 30 degrees heat most days. There was one rain event and one lost afternoon to rain. Even with this heat, the temporary services rain effectively, and the auto flush mechanism was effective in managing water temperature and quality. This heat did not dry out the EPR™ mass in the trench but did accelerate the drying out once the material was removed, bagged and left in sunlight.

The community consultation was effective as there was only one request for compensation for water from a front tap for cleaning tools, as part of EPR cleanout, which was accepted.

The 230m of the AC water main was completed for a total cost of $420,000 (ex GST), which included all contractors and consultants. There is improve the process further, as all efforts were taken to ensure that the trial was successful and provided all information for project analysis.

The post project laboratory analysis by WSP has confirmed what field tests showed, that the process does encapsulate and seal the asbestos pipe fragments and does contain all the fibres in and around the AC pipe within the EPR™ mass. The mass appears hydrophilic and therefore retains moisture, preventing release of fibres and remaining spadable, and easier and safer to handle than AC pipe.

9. LESSONS LEARNT

The opportunities for improvement include:

- Locating repair band by an in-pipe method to enable removal prior to reaming
- Refining the mix design and optimising pit locations to prevent excessive release of fluid
- Trialling upsizing of pipe diameter to enable larger diameter replacement pipes
- Mix design requirements for different soils, such as sandy soil rather than stiff clay
- Selecting projects where there are fewer alternative options to reduce cost difference against the trial
- Removing and cleaning removed old fittings and repair bands for recycling rather than into landfill

- Developing processes to licence, train and audit contractors, consultants and water agencies for future EPR™ projects to ensure to regulators EPR™ standards are being maintained, managed, documented and improved
- Continue to sample and analyses background soil for asbestos fibres in and around old failing AC pipes

10. FUTURE TRIAL OPPORTUNITIES

The interest in the success of the Fair Street Trial from across Australia enables the investigation of options with other State regulators, contractors, water agencies and soil conditions. The aim is to develop a trial in each state and follow through with regulator exemptions (EPA, WorkSafe and Council) which will also provide alternative soil and project design. Further laboratory analysis and site investigations are also required to model and confirm long term performance of the EPR™ mix in the field.

Ultimately, the aim is to develop and refine a process and system that is acceptable to regulators across Australia, and internationally, where EPR™ is accepted as a viable option that has an exemption enabling it to be used for planned and emergency works as they arise.

11. CONCLUSION

The EPR™ trial with encapsulAC® in Fair Street Shepparton has been successfully completed and provides confirmation that EPR™ is a viable technique that could be accepted into the hierarchy of asbestos cement pipe replacement options now.

Further field sampling and laboratory analysis is required, however the evidence and results to date from the Fair Street trial results indicate that EPR™ with encapsulAC® has been effective in:

- replacing the AC pipe in line with a new PE standard diameter main which accepts standard fittings
- renewing the AC pipe so that it remains un-friable in the field long term, and therefore safer and easier to manage than an abandoned AC pipe
- reducing the volume of AC pipe material taken through communities enroute to licenced landfills than in-line replacement options
- using modern existing machinery, processes and systems, that are consistent with existing standard AC operation safety instructions, requirements and procedures.

References

1 – Asbestos Safety and Eradication Agency (ASEA) “Asbestos-Cement Water and Sewer Pipe Management Guidelines”, 2022, Section 6
2 – Covered in Pending Application No. AU 2025903086