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## **MAXIMISING THE LIFESPAN OF YOUR BELOW GROUND PIPE SYSTEMS TO HELP THE CIRCULAR ECONOMY**

Long-life products which can be maintained and adapted during their lifetime to keep them in use as long as possible support the Circular Economy principle of eliminating waste. When it comes to below ground civils projects, there are a number of ways to maximise the lifespan of the systems to minimise the need for new products.

### **Product lifetime**

If a product or system has a long life – whether below or above the ground – it invariably improves its value within the circular economy. Predicted lifetimes of below ground plastic pipe systems are now well over 100 years – as proven through extensive research undertaken by TEPPFA, the European plastic pipes and fittings group.<sup>1</sup> This research has shown that for polyethylene (PE) pressure pipes for example, reliable working lifetimes have been found to be in excess of 200 years.

All products have modes of failure and in the case of PE plastic pipes, excluding non-time dependent ductile rupture failures due to excessive pressure, the main types of failure are stress cracks and oxidation. However, continuing work in developing newer variations of these materials is helping to reduce the occurrence of both of these factors. The TEPPFA research also showed that PE gas pipes last even longer than PE water pipes, as chlorine in water initiates an oxidation degradation mechanism. Despite this slow oxidation, the research has shown that these late life failure modes (wear) are likely to start at about 235 years from original installation<sup>2</sup> – over two centuries is a significantly long timespan.

Other research from TEPPFA shows that plastic pipelines require fewer repairs during their lifetime<sup>3</sup> and are subject to fewer defects or leakage developing, such as through fissures, displaced joints, deformation or infiltration.

### **Good installation**

As always, good installation is a key factor in maximising the lifespan of below ground plastic pipes. If best practice techniques are followed, including the correct types of pipe and fittings, clean and effective joints and correct trench depths and materials, the pipe can be installed and remain undisturbed below ground for many decades – even centuries. Organisations like the BPF Pipes Group provide technical specifications and guidance documents to assist in promoting best practice techniques across the industry to ensure that below ground plastic pipes can perform as specified, for exceptionally long periods.

### **Lifetime of the pipe network**

The lifetime performance and longevity of the entire pipe network is a major factor in contributing towards a circular economy, as is being able to adapt the system to future demands. Pipe network requirements and loads do vary during their lifetimes so for example if additional service pipes are required, these can be fitted to PE pressure pipes via branch saddles drilled into the live pipe, minimising invasion to the existing system.

Being able to make under pressure connections to an existing network prolongs its useful life, with fewer new products or joints needed and less water used for integrity testing than having to empty and refill an entire main. With PE water pipes, the risk of contaminating the water is significantly reduced, as this method minimises disruption to users and reduces the amount of above ground equipment and traffic control needed. By not having to reinstall whole sections of pipeline, the integrity of the original system is maintained and product waste minimised. Maintenance to such networks is minimal, as these pipes are corrosion-resistant with smooth internal bores, no tuberculation (deposits) on the inner pipe walls to restrict pipe bore, no leaching or discolouration and therefore no routine cleaning required.

There are therefore many ways in which plastic piping systems contribute to optimising a product's use during site installation. Going beyond this, it is clear that in the construction industry plastic pipes can significantly contribute to the drive towards a circular economy.

More information about how to maximise the lifespan of products and systems within the circular economy is on the BPF Pipes Group website at: <https://www.bfppipesgroup.com>

<sup>1</sup> TEPPFA Study: '100 Years Lifetime of Polyethylene Pipe Systems Buried in the Ground for Water and Natural Gas Supply'

<sup>2</sup> 'Lifetime Prediction of a Blue PE100 Water Pipe' by Hoang EM, Lowe D, Polymer Degradation and Stability, Issue 8 (2008), pp 1496-1503.

<sup>3</sup> TEPPFA Study: 'European Study of the Performance of Various Pipe Systems, Respectively Pipe Materials for Municipal Sewage Systems under Special Consideration of the Ecological Range of Effects during the Service Life' (2005, from pipes in Germany, Netherlands and Sweden, pp 38-73).