Improving the performance of plastic joints in water distribution systems

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stream
The Industrial Doctorate Centre for the Water Sector

1. Introduction

- Leakage reduction is important for all UK Water Companies.
- Failed joints cause leakage!
- UKWIR (2011) – between 3 and 4 failures per year per 100 km in polyethylene pipe
- Common polyethylene welding methods: buttfusion and ELECTROFUSION (EF) jointing.
- From literature survey:
  - premature failures of EF fittings are predominantly due to poor workmanship.
  - the main issues with poor workmanship can be categorised as misalignments, poor scraping and CONTAMINATION.

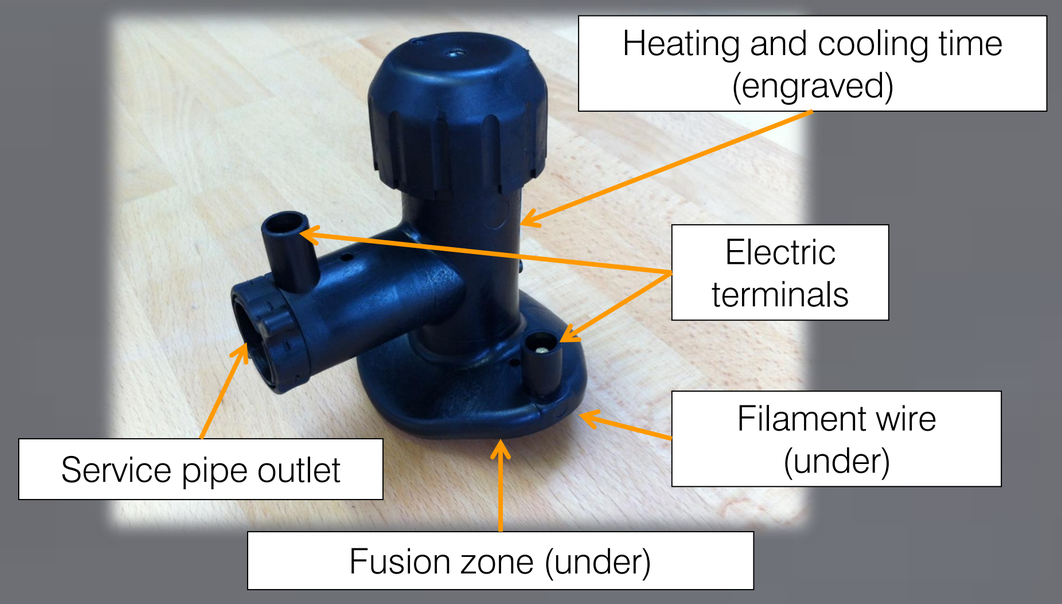

Figure 1. Electrofusion Tapping Tee.

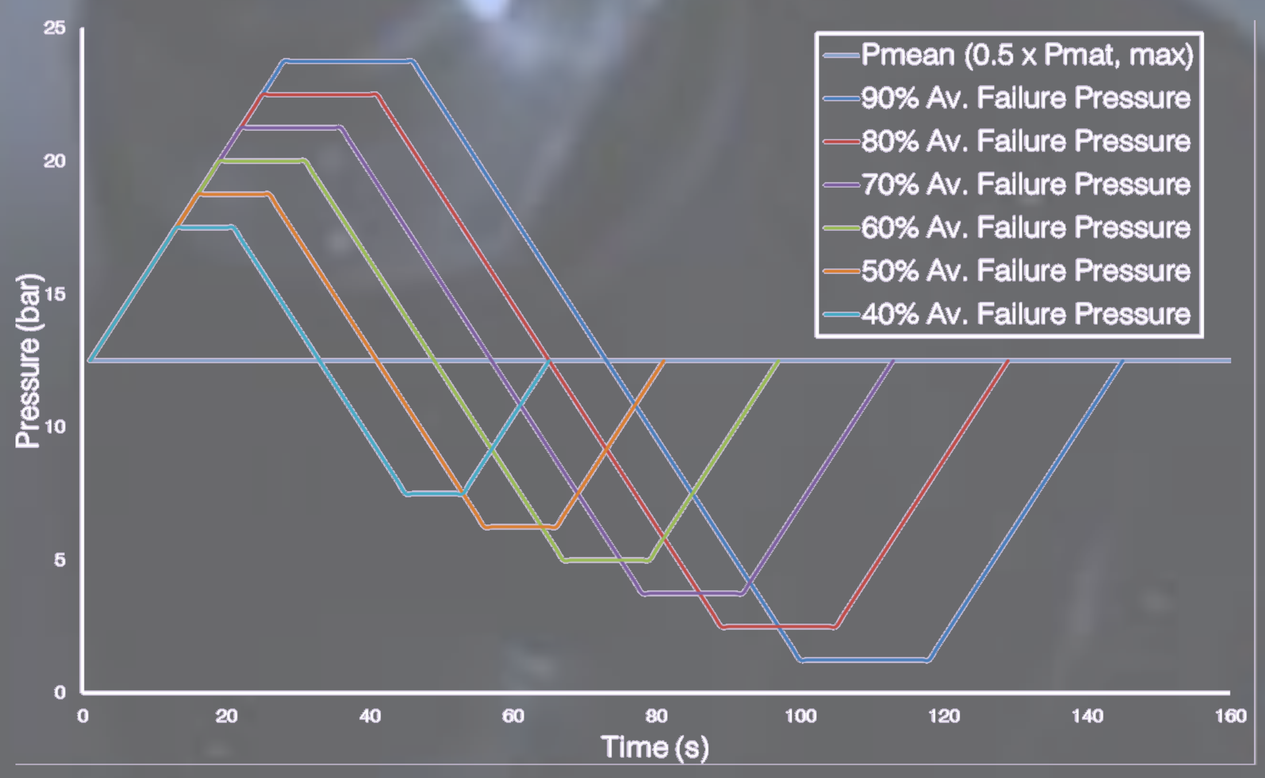

Figure 2. Loading Patterns for fatigue tests.

2. The Research

- An experimental hydraulic piston rig was designed and built to destructively test EF TAPPING TEES *(Figure 1)*
- The experimental rig is capable of performing both short and long term, static and dynamic pressure tests.
- Water Industry Standard: WIS 4-32-08's 'method of assessing the tolerance of EF welds to CONTAMINATION: short term burst test' was used to benchmark the fatigue test and the experimental rig.
- Specimens created to the above specification were dynamically tested to destruction (fatigue test) using the experimental rig.
- Trapezoidal loading patterns were followed *(Figure 2)* for the fatigue tests
- Results from testing programme *(Figure 3)* suggest that the spread increases as the pressure range decreases.

3. Project outcomes (to date)

- Failures associated with fatigue are possible if CONTAMINATION is present in the jointing interface
- It is essential that best practice is followed on site as EF jointing is not an easy or 'forgiving' process

4. Future work

- Understand the failure mechanisms behind joints failed by dynamic loading
- Correlate pressures used in the testing programme with those experienced in water distribution networks. Prove through a second round of testing.
- Establish links between short term test and long term performance

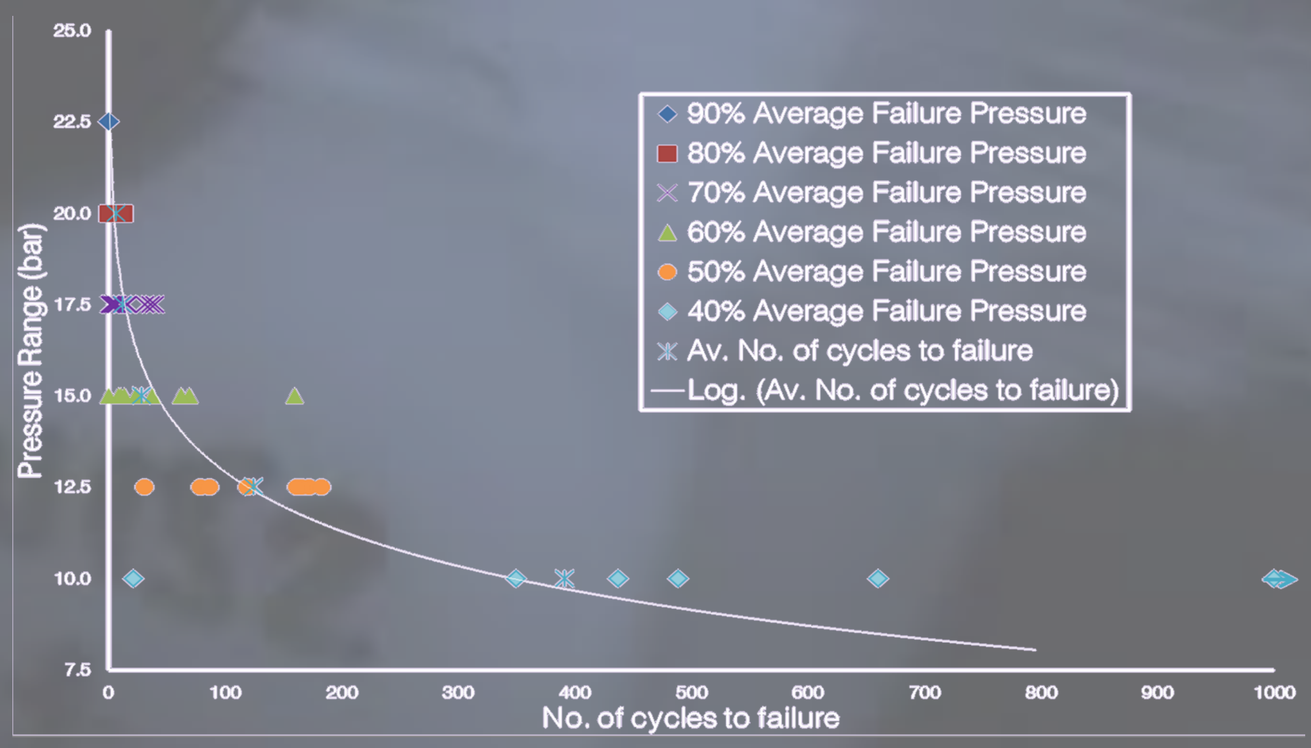

Figure 3. Pressure (in bar) Vs. No. of cycles to failure curve.

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