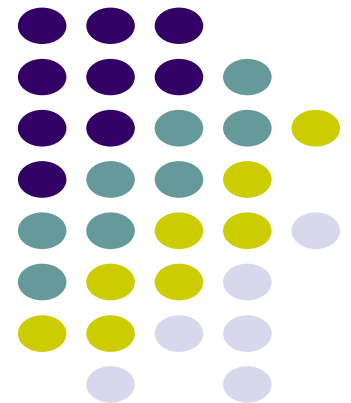


The Effectiveness of Mains Renewal in Reducing Leakage and Burst Frequency

Jo Parker

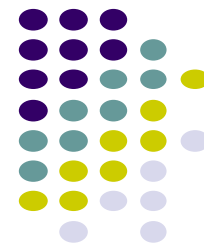




- Mains renewal is expensive
- A high burst rate/leakage level is needed to justify the work economically
- However, eventually repairs will themselves cause more failures

Dave Pearson, 'Do you know how many of your colleagues will come to your funeral?'
Water Loss 2007.





Targeted Mains Renewal

- What level of replacement is needed?
- Best method?
 - Traditional
 - Trenchless
- Mains or services too?
- Best materials?

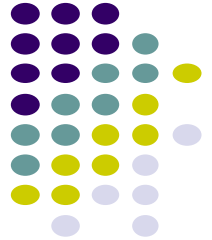
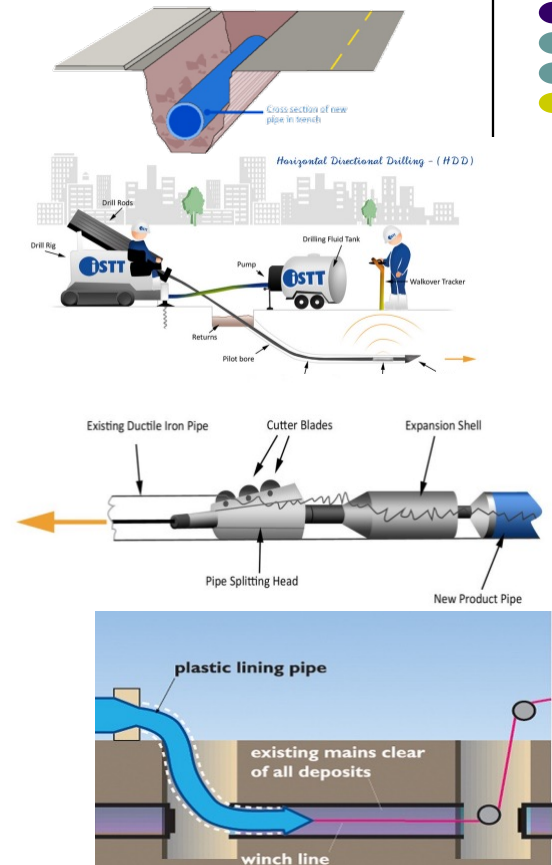


Photo author's own

Replacement methods

- Open cut
- Horizontal Direction Drilling
- Pipe Bursting
- Relining
 - Downsizing
 - Thin walled
 - Cured in place
- For further info
 - National Societies for Trenchless Technology e.g. UKSTT
 - International Society for Trenchless Technology (ISTTT)

Thanks to ISTTT for images



Maintaining supplies



Thanks to UU and Thames Water for the images



**BUT WHAT IS THE IMPACT OF
MAINS RENOVATION ON
LEAKAGE?**

Several UK Research projects



- WRC

- Effect of Infrastructure Renewal on Network Performance 2007
- Mains Intervention Improving Benefits Valuation, WRC, 2010

- UKWIR

- Linking distribution mains rehabilitation to performance 2009
- Assessing the impact of a burst-driven mains renewal programme on leakage control effort 2018
- Understanding how the deterioration of cast iron pipes evolves into leakage 2025
- A Review of the success of mains renewal methods 2025

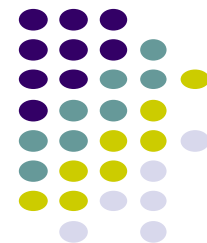
For further information on any of the UKWIR projects visit the web site www.ukwir.org

Linking distribution mains rehabilitation to performance 2009



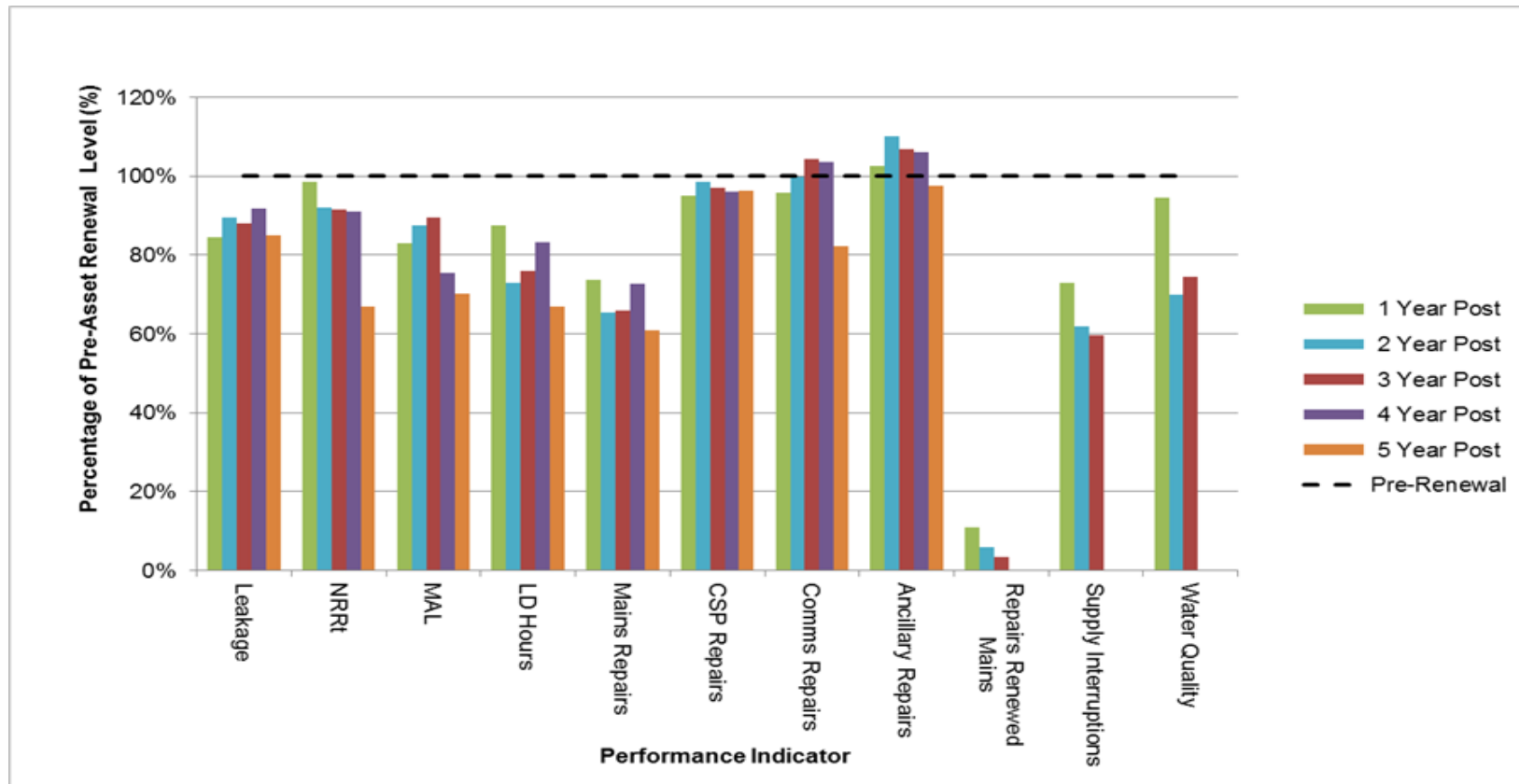
- Nightline and repair numbers decreased after renovation
- Leakage reduction was not significant (or even negative) if
 - the starting nightline leakage was below a certain threshold (<15 (10) litres per property per day)
 - percentage of mains replaced in a DMA was less than 60% (20%)
- No evidence of increases in nightline for 2-3 years after renovation
- Spend time to verify that leakage is on mains
- Customer side leakage may increase
- Scrape and reline can increase leakage

Assessing the impact of a burst-driven mains renewal programme on leakage control effort 2018



- Project ran over 4 years looking at 479 schemes
- Looked at more isolated renewals rather than covering whole DMAs
- Minimal improvements in NRR and leakage in year 1, improvements years 2-5
- 8-15% reduction to leakage over 1st 5 years post-completion
- Reductions weighted towards large burst-driven renewal programmes > 20% of the DMA.
- Reduction in mains repairs lead to sustained reductions in customer calls
- Excel tool was developed to predict KPI changes to appraise potential schemes
- KPI changes can be extrapolated over an extended period of time to arrive at whole-life costs and payback periods.
- Data requirements were consolidated for current and future development requirements in the form of a data protocol.

Improvements since Pre-Mains Renewal per KPI



A Review of the success of mains renewal methods 2025

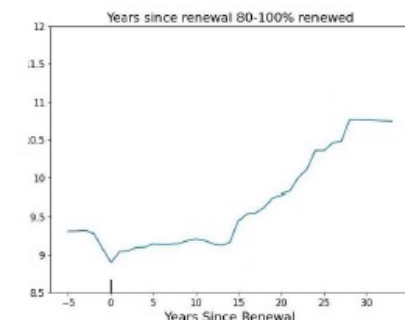
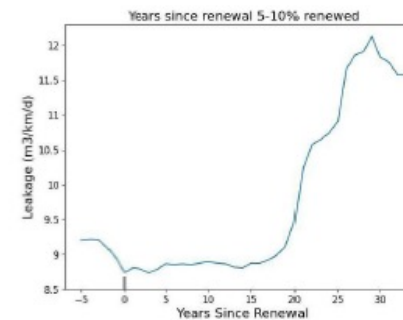
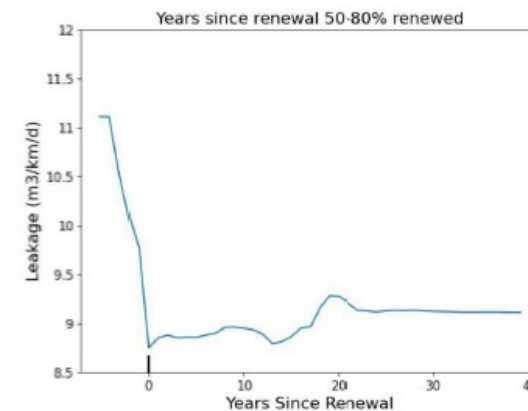
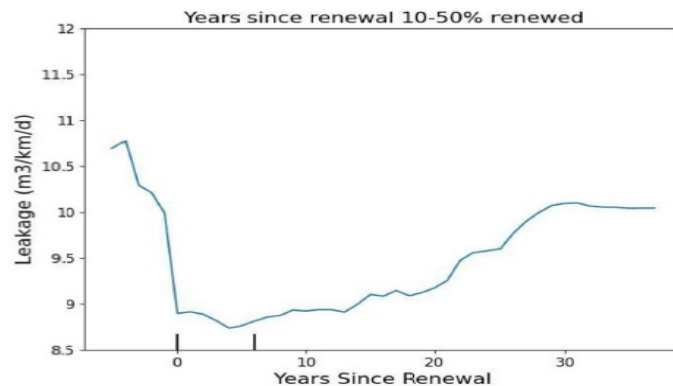


- Takes samples of mains renewed for different reasons – quality, bursts, leakage
- Focuses on projects 1990s to 2010 esp. S19 (quality)
- Assesses performance before and after renovation until now (up to 30 years data)
- Takes changes in pressure into account
- Other problems of modelling e.g. leakage depends on ALC effort and NRR is a model itself
- Model predicts performance if left unrenovated
- Compares with actual performance
- Identifies performance of different renewal methods

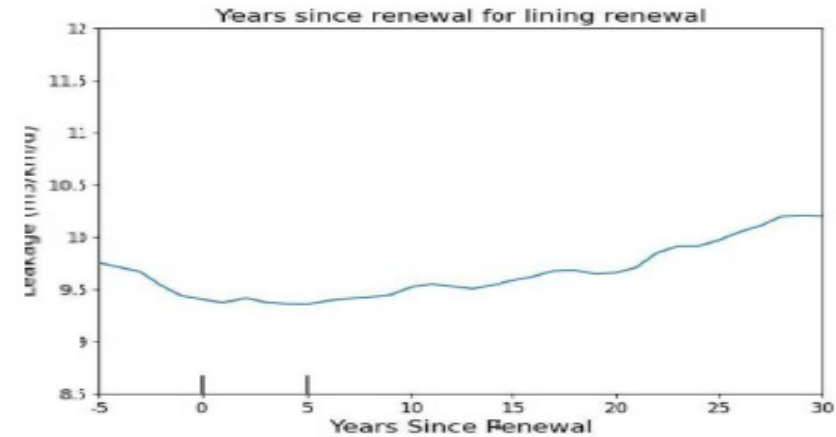
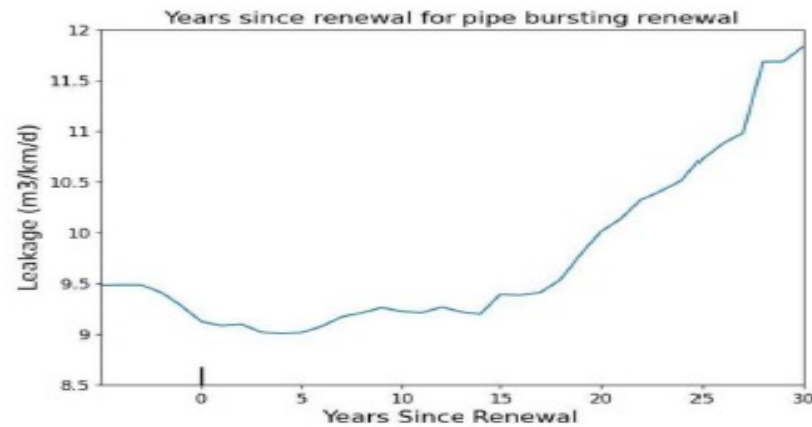
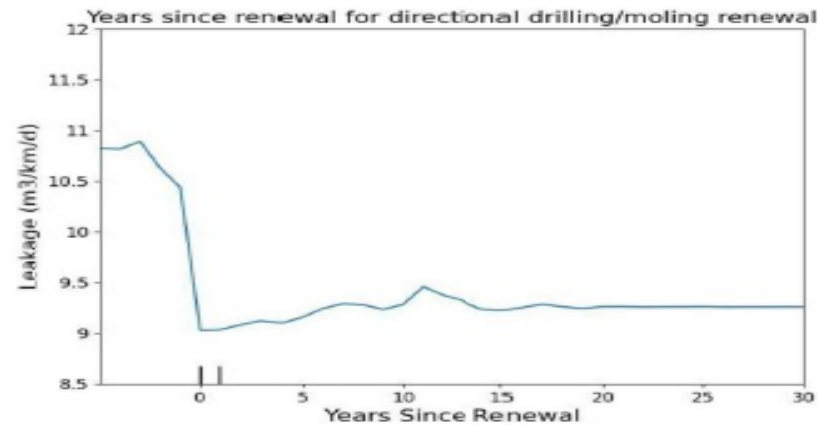
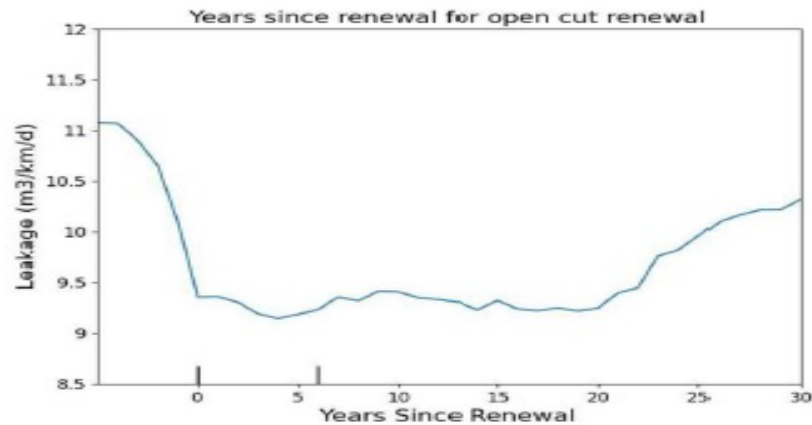


Affect of percentage of DMA renewed

- 10-50% of DMA renewed was taken as the preferred level – covered majority of cases
- In the case of other proportions the sample was rather small and the results may not be valid
- Possible affects could be
 - Better targeting of mains where smaller proportions of DMA replaced
 - Existing mains deterioration overtaking benefits after a number of years



Results for different types of renewal



These results are
for 10-50% of
DMA renewed

Conclusions



- Mains renewal is expensive but does form part of a network asset and leakage management programme
- Trenchless replacement may be more cost effective, but leakage reductions may not last with some methods
- Expected leakage benefits will not be achieved
 - at lower levels of leakage
 - when only small percentages of the DMA are replaced
 - if communication pipes are not replaced
- Models are available which can estimate future savings
- Collect robust data for every renovation project including service info
- More understanding needed about performance of connections & communication pipes

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Thank you

Any questions?

Jo Parker

