In-pipe condition assessment of cast iron trunk mains – a new approach

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Overview

• Thames Water’s trunk mains
• Trunk main condition – the problem
• Overview of our trunk main innovation project
• Fast-track field trial
• Trunk main test rig at Kempton
• Trialing technologies
• Future use of in-pipe condition assessment
• Summary
Thames Water’s trunk mains

Our network
- 2,600 ML/d
- 9 million customers
- 3,600km of trunk mains
- Diameters up to 60” (1500mm)
- Laid up to 200 years ago
- Predominantly cast iron

Key influences
- Leakage
- Burst risk
  - Supply interruption
  - Flooding
- Long-term research activities
- Late 2016 trunk main bursts
  - Independent forensic review
  - Internal strategic review

Strategic management
- Modelling
  - Consequence and likelihood of failure
  - Range of input data including routine spot NDT inspections
- Intervention toolkit
  - Contingency planning
  - Leakage surveys and valve checks
  - Online monitoring systems
  - Replacement/rehabilitation
Trunk main condition – the problem

- Level of trunk main burst risk is too high and replacement rates are too low (500 year asset life implied)
- We can’t secure adequate investment without proving we understand consequence AND probability aspects of risk...
- …but probability depends on pipe condition, which is very variable, so we need a condition surveying capability...
- ...there’s little incentive for development of in-pipe devices for trunk mains because water companies aren’t investing enough in their networks...
Overview of our trunk main innovation project

- **Build a pipe test rig at Kempton Park WTW**
  - A safe proving ground for trunk main technologies

- **Rig trials of in-pipe condition assessment tools**
  - Shortlist of the best tools and stimulation of technology development
  - Standalone pumped supply
  - Deteriorated cast iron pipe samples from the network
  - Launch/receive chambers
  - 24” and 36” above ground test sections

- **Field trials of the best in-pipe condition assessment tools**
  - Validated results from real buried trunk mains

- **Supporting research and model development**
  - Decision support tools to use the new and existing condition data

Standalone pumped supply
Launch/receive chambers
Vehicle access ramp
Deteriorated cast iron pipe samples from the network
24” and 36” above ground test sections

Deteriorated cast iron pipe samples from the network
Fast-track field trial
Fast-track field trial
Fast-track field trial
Fast-track field trial

Calibration features:
- Ground strips
  - 13-50mm wide × 1-3mm deep

Validation features:
- Single/clustered drilled holes
- Dished patches
  - 18-260mm diameter × 8-16mm deep

Follow-up development of the sensors and analytics by the service provider is ongoing…. a deferred success?
Overview of our trunk main innovation project

1. Build a pipe test rig at Kempton Park WTW
   - A safe proving ground for trunk main technologies

2. Rig trials of in-pipe condition assessment tools
   - Shortlist of the best tools and stimulation of technology development
   - Standalone pumped supply
   - Deteriorated cast iron pipe samples from the network
   - Launch/receive chambers
   - 24" and 36" above ground test sections

3. Field trials of the best in-pipe condition assessment tools
   - Validated results from real buried trunk mains

4. Supporting research and model development
   - Decision support tools to use the new and existing condition data

Standalone pumped supply
Launch/receive chambers
Deteriorated cast iron pipe samples from the network
24" and 36" above ground test sections
Vehicle access ramp
Site clearance
Trunk main test rig
Deteriorated cast iron pipe samples from the network

Vehicle access ramp

Launch/receive chambers

24” and 36” above ground test sections

Draft design

Due to be completed Spring 2020
**Trialing technologies**

### Key requirements
- Benign effect on water quality
  - No damage to internal surface
  - Approved materials
- Able to assess long lengths of thick cast iron at high resolution
  - Wall thickness
  - Corrosion defects
  - Casting defects
  - Cracks

### Market research
- Our own experience, contacts and research
- Water industry sources, e.g.
- **Call for innovation**
  - ENERGY INNOVATION CENTRE

### Approach
- Publicise the industry’s collective needs (opportunities)
- Collaborative trials to evaluate and validate robustly
- Share results to maximize value for all
- Endorsed by:
Future use of in-pipe condition assessment

Investment in a targeted main without an in-pipe condition survey

- Largely unknown condition
- Isolated poor condition
- Region of poor condition
- Scattered poor condition
- All poor condition

....and with an in-pipe condition survey (£)

- All good condition
- Reduced cost for the overall project?
- Future viability of surveys if this result is typical?

- ✓
- ✓
- ✓/✗
- ✗
- ✗
Summary

What’s the problem?

- We need to be able to assess the condition of cast iron trunk mains better, in order to increase the efficiency of mains replacement activities that reduce the risk to our customers and society

And what is the ‘new approach’?

- Raising awareness in the wider market of our in-pipe condition assessment needs
- Providing a purpose-built test bed to enable detailed evaluation of in-pipe devices without risk to customers or our network
- Working collaboratively to maximise the value to us, other UK water companies, and the technology suppliers
- Making sure the research and modelling keep pace
Thank you