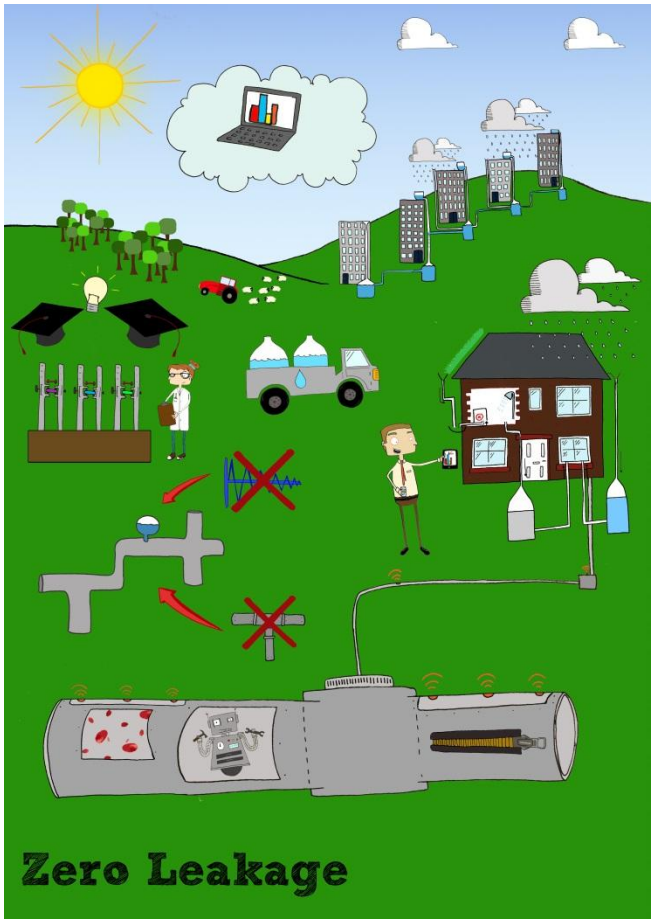
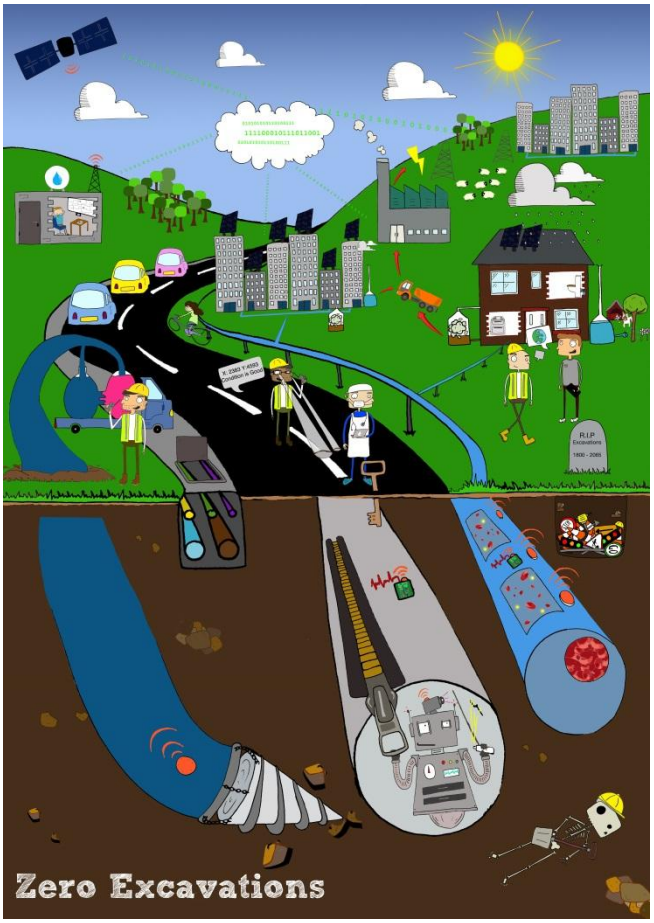
Zero Excavations
Zero Leakage

Industry Action Plan





This action plan sets out the first steps to change

The water industry is facing a difficult challenge. **Customers** demand ever lower leakage – but at the same time they don't want the **inconvenience** of more traffic disruptions.

In 2005 UKWIR estimated the **social cost** of excavations to be at least £5.5 billion per year and yet we are still **losing** almost a quarter of all of our water through leaks.

If the industry is to achieve these potentially conflicting goals it will need to seek more **innovative solutions** with a real focus on **cost effectiveness**.

Summary of needs

Condition Assessment

Develop proven and cost effective techniques to provide an accurate assessment of condition without interruption to supply and demonstrate that the structure of any pipe is sound.

Smart Meters and Smart Sensors

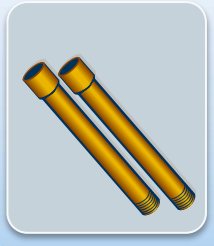
Encourage a greater penetration of meters and sensors, in particular at an individual household and sub-DMA levels. Focus also on use of models and software to reliably interpret data, predict possible impacts and effect appropriate responses to mitigate those impacts ahead of customer contacts.

Asset Location

Agreed standards for data collection to ensure quality of information is fit-for-purpose with a knowledge of inherent uncertainty.

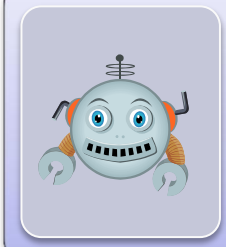
Supply Pipe Adoption

Ensure adoption occurs without undue cost burden to customers and efficient management of supply pipes post-adoption.



Small Leaks in Small Pipes

Understand the failure mechanism of plastic networks and develop economically viable methods of detection of leaks and repair of pipes.



Robotic Inspection, Keyhole Techniques and Advanced Materials

Improve plastic pipe jointing workmanship through improved training, sharing best practice, trialling results and agreeing an approval system for new products.

Using this Action Plan

Click on the link below to take you direct to actions of relevance by THEME

Click on the theme logo throughout the document to bring you back to this page

Supply pipe adoption

Cost-effective supply pipe management strategies
Boundaries and timetable for supply pipe adoption

Asset location

Co-operation of stakeholders in recording exposed assets
Technical standards for inter-operability

Condition assessment

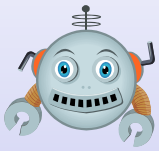
Method to assess risk across network for investment planning decisions

Smart meters and sensors

National trials of smart revenue meters
Develop model capability
Metering solutions and easy installation techniques
Develop reliable high performance sensors for new parameters
Agreed protocols for inter-operable communications

Small leaks in small pipes

Identify benefit and issues with network renewal
Improved methods for acoustic leak detection



Robotic inspection, keyhole techniques advanced materials

New technique for joining plastic pipes
Adoption of keyhole techniques for suitable repair work
Use robotic technology for non-excavation proactive inspection

Using this Action Plan

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Technology development

Method to assess risk across network for investment planning decisions
Metering solutions and easy installation techniques
New technique for joining plastic pipes
Improved methods for acoustic leak detection
Develop reliable high performance sensors for new parameters

Data and data management

Method to assess risk across network for investment planning decisions
Develop model capability
Boundaries and timetable for supply pipe adoption

Investment planning

Method to assess risk across network for investment planning decisions
National trials of smart revenue meters
Boundaries and timetable for supply pipe adoption
Cost-effective supply pipe management strategies
Use robotic technology for non-excavation proactive inspection
Identify benefit and issues with network renewal

Regulation or legal position

Agreed protocols for inter-operable communications
Cost-effective supply pipe management strategies

Customer relationship

National trials of smart network meters
Boundaries and timetable for supply pipe adoption
Adoption of keyhole techniques for suitable repair work
Use robotic technology for non-excavation proactive inspection
Identify benefit and issues with network renewal

Operational management

Co-operation of stakeholders in recording exposed assets
Technical standards for asset location
Cost-effective supply pipe management strategies
Adoption of keyhole techniques for suitable repair work
Use robotic technology for non-excavation proactive inspection
Agreed protocols for inter-operable communications

Method to assess risk across network for investment planning decisions

Industry Goal

The availability to assess that a pipeline (including joints) is structurally sound, or not, using proven and cost-effective techniques and the ability to use the same techniques for collection of other network data e.g. leak detection and location, internal condition, turbidity.

- For critical mains, proven and cost-effective techniques which provide an accurate assessment of real condition without interruption or disruption to supply.
- For non-critical mains, proven and cost-effective techniques which provide comprehensive information (leak, condition assessment, turbidity) for the validation of predictive models without interruption or disruption to supply.

Industry outcome to be achieved

A method to assess corporate risk across the network leading to a risk profile on which to base decisions on repair and renewal programmes.

- The ability to identify where a pipeline is structurally sound and does not need replacement.
- The ability to target mains renewal and replacement based on understanding of overall pipeline condition (i.e. is a leak/ burst a one-off event or symptomatic of deteriorating pipeline?) rather than short-length condition surveys.
- A method to model leak development based on pipe material, ground conditions, water quality, linings etc.

Action to be completed to deliver outcome

- Increased use of acoustic, magnetics and ultrasonic devices to accurately determine pipe condition.
- Define the ageing process of a pipeline (all materials, all sizes) under different ground conditions.
- Relate the work carried out by Cassa et al (Urban Water Journal, 2010) on leak growth to pipelines in ground loading conditions.
- Review previous work carried out in Canada on pipe failure mechanisms.
- Recognise precisely where leaks occur on a pipeline through improved data capture at every intervention.
- Design and build a predictive ageing model based on knowledge of ageing processes, water & ground conditions.
- Validate example model using in-situ condition measurements (and possibly the UKWIR National Mains Failures Database).
- Improve data for the UKWIR National Mains Failures Database (UKWIR) through better awareness during on-site data collection and auditing to check validity.

Relative importance / prioritisation

This area is a high priority for two reasons:

1) Continuing high level of leakage from plastic pipes joints.

2) The need for cost-effective techniques for condition assessment over long lengths.

Who needs to be involved

The need for action is driven by the water industry need for cost-effective techniques and hence the work should be led and funded by the water companies.

Other interested parties: Defra/ EA/ DWI (loss of water), OFWAT (cost of water), supply chain (pipes and fittings, technology providers), Universities (on-going programmes e.g. Assessing the Underworld / Stream Industrial Doctorates).

Catalysts to success

Population growth and need to supply additional water

Threat of missing leakage targets.

Need to deal with background leakage – drives the need for plastic pipe condition techniques.

Increasing problems with failing asbestos-cement pipes.

Returning to OFWAT with requests for expenditure on repeat repairs.

Competition in the water market and the need for lower losses between source and tap.

The service incentive mechanism (SIM) provides focus and promotes the need to plan works better to minimise customer disruption.

Multi-utility gantries – requirement for condition to be assessed.

Barriers to progress

No legislative drivers – asset management planning (AMP) cycle drives decisions.

Product purchasing driven by cost – the increasing range of fittings and protection results in less .chance of understanding ageing of products.

Surveying by traditional methods leads to customer disruption (SIM impact) and discolouration.

High costs of enabling works or excavation for surveying.

Costs of inspection don’t stack up in business case for leak reduction.

Localised conditions lead to failures which survey elsewhere on the same asset won’t show.

Too much data collected which won’t be used.

Cost of developing new inspection techniques requires strong business case for investment.

Need for non-intrusive inspection and repairs: less coupons/ cut outs for absolute measurements.

National trials of smart revenue meters

Industry Goal

The effective use of smart meters and network sensors to manage the network proactively identifying and resolving problems without the customer being aware.

Industry outcome to be achieved

A high penetration of smart household and non-household revenue meters is needed to improve reliability of data on water consumption at a sufficiently high frequency to facilitate near real-time water balances and predictive models.

Action to be completed to deliver outcome

Nationally co-ordinated trials are required to gather evidence. Need to understand the resolution at which data becomes "noise" and becomes too detailed to make sense of.

Relative importance / prioritisation

General agreement that large scale trials were required though the question remains of whether we need this data at a household level or would small zones (sub-DMA) be sufficient.

Who needs to be involved

Regulator / government input or leadership required to co-ordinate at high level and support investment in large trial.

Catalysts to success

Smart energy metering will raise customer expectations and may help with social acceptability.
Water scarcity pressures will cause household revenue metering to increase.
Pressure for better water management under the WFD.

Barriers to progress

Regulator needs persuading of the cost benefit case. Not all benefits are fully understood or quantifiable, especially the wider societal benefits of new services that could be developed and offered. Changing priorities - commitment from companies to get funding for wide scale programme. Lack of support from Government.
Lack of common standards on data and interoperability of systems.
Legacy "dumb" meters stock.
Customer resistance due to concerns over privacy. Customers do not trust water companies and other utilities, i.e. would be difficult to persuade them of a benign purpose.
Lack of low cost solutions for 'difficult to meter' supplies. Practical problems with wide scale deployment – e.g. knowing who owns lamp-posts for repeaters, getting permission to install repeaters and concentrators.

Develop model capability

Industry Goal

The effective use of smart meters and network sensors to manage networks and be able to identify problems before the customers call in.

Industry outcome to be achieved

Better network models are required to interpret the data. These need to be faster, take a more holistic view, i.e. encompass water quality, customer service etc. be able to operate predictively and handle data from a large number of different meters and other sensors. Systems should be clever enough to avoid excessive alarms and prioritise actions.

Action to be completed to deliver outcome

Development of, and investment in, better modelling capability. Needs to be supported by better asset information. Ability to take in data from social networking.

Relative importance / prioritisation

Seen as a high priority, though "chicken and egg" – any point investing in better models if data not available to put in so meters and sensors need to come first, but difficult to justify high levels of investment in them if data cannot be used effectively.

Who needs to be involved

Supply chain – specifically those companies developing network management tools
Water companies to invest in development of requirements.

Catalysts to success

Memory costs have fallen, processing speeds have increased and continue to do so. Organisations like the stock exchange have very sophisticated tools for interpreting and acting on large amounts of data.
Expansion of social networks.
Work on process alarms identification and prioritisation.

Barriers to progress

Large investments required – difficult to do piecemeal – in software and systems upon which to run them and the need to put data into them.
Location and status of many assets unknown and not monitored (e.g. valve status)
Accuracy and resolution of current data

Metering solutions and easy installation techniques

Industry Goal

The effective use of smart meters and network sensors to manage networks and be able to identify problems before the customers call in.

Industry outcome to be achieved

A greater number of meters at sub-DMA level is required to improve the spatial resolution of flow data.

Action to be completed to deliver outcome

Low cost and reliable metering solutions – self powered for 10 years fit and forget. Easy installation techniques – preferably without need for chamber.

Relative importance / prioritisation

There appears to be significant support across the industry for this action.

Who needs to be involved

Water industry - to specify the need in order to stimulate the market and facilitate development
Supply chain – meter suppliers

Catalysts to success

Developments in battery technology, low power electronics and sensing.
Memory and data processing costs falling.
Increasing access points (e.g. full-bore hydrants).

Barriers to progress

Reliability of current buried sensors perceived as poor.
Lack of systems to make full and effective use of data.

Develop reliable high performance sensors for new parameters

Industry Goal

The effective use of smart meters and network sensors to allow networks to be operated proactively identifying and resolving problems before the customers aware.

Industry outcome to be achieved

Additional sensors, in addition to flow and pressure sensors, incorporated within the network to give a wider view and feed into more holistic network models. Additional sensors could include valve position, water quality, network condition, acoustic and ground temperature sensors. Though some such sensors are emerging, further development is required to extend performance and reliability. The target should be for 10 year “fit and forget”.

Action to be completed to deliver outcome

The need and specifications for such sensors need to be defined to stimulate development. Water companies need to work with suppliers to demonstrate that there is a need, and hence a market.

Relative importance / prioritisation

Considered to be a hot topic – some more so than others. Priorities were valve position and flow / no flow for unmetered fire mains.

Who needs to be involved

Water companies need to drive this by clearly defining the need and demonstrating commitment. Based on this the supply chain can then respond. Innovation will most likely come from the supply chain. Should include academic researchers and make use of government initiatives and support via for example the TSB.

Catalysts to success

Developments in battery technology, low power electronics and communications networks driven by demand in other sectors, notably mobile telecommunications.
Developments in microfluidics e.g. MEMS (micro electrical, mechanical sensors).
Energy scavenging technology could help with power requirements
Flow / no flow sensors available for process applications – could these be adapted?
Oil and gas are thought to have on-line condition assessment monitoring – could this be adapted?

Barriers to progress

Current limitations on reliability and battery life – but lots of development in this area, so also considered a catalyst.
Commitment from industry as to need to persuade suppliers to develop.
Synchronising data.
Cost of installation.

Agreed protocols for inter-operable communications


Industry Goal

The effective use of smart meters and network sensors to allow networks to be operated proactively identifying and resolving problems before the customers aware.

Industry outcome to be achieved

Communications that can effectively and reliably handle data from high numbers of meters and other sensors in near real time. Reliable communications from underground assets and ensuring data compatibility (interoperability of systems).

Action to be completed to deliver outcome

Develop and agree protocols to facilitate inter-operability
Reliable communications from below ground
Understand how data from disparate autonomous sensors can be synchronised

Relative importance / prioritisation

Crucial if more meters and sensors are to be deployed

Who needs to be involved

Standards bodies at European and international levels – water industry needs to actively engage
The water industry needs to be an active participant, providing effective support and representatives to the standards forming bodies to ensure that its needs are adequately addressed. A firm steer needs to come from a high level in the industry that interoperable devices are required and will be used. This needs to be reinforced through procurement decisions that look at the whole life costs of systems holistically, rather than as discrete parts. The supply chain is critical to success.

Catalysts to success

Developments in battery technology, low power electronics and communications networks driven by demand in other sectors, notably mobile telecommunications.
Cloud based systems.
4G rollout.
New thinking, in particular considering opportunities that arise by utilising synergies with services from outside the industry. For example, the use of bin lorries that regularly visit all households to collect meter readings as they go which might avoid the need for a dedicated fixed network.

Barriers to progress

Water industry puts assets underground.
Communications is a rapidly developing field – when to go, fear of something better around the corner.

Co-operation of stakeholders in recording excavated assets

Industry Goal

Continuous improvement in the accuracy of records of existing underground assets for all utility companies.

Records of many existing assets are inaccurate, incomplete or non-existent. Surveying of all existing assets has been shown to be uneconomic and is therefore unrealistic. A process is required for opportunistic capture and sharing of information about located assets and unidentified buried objects (UBOs). This would apply to water companies or their contractors when exposing their assets or for providing information to other utilities companies on infrastructure located during the surveys and excavations they undertake.

Industry outcome to be achieved

Economically justifiable asset data captured and shared from every survey and excavation.

The information captured during survey and excavation should be captured, audited and exchanged to an agreed standard. This standard would cover spatial accuracy, (x,y,z), asset type and data quality metadata.

Action to be completed to deliver outcome

Develop clear business case

The business case should define the economics of data capture and consider the benefits in terms of time saved locating and working on assets, and avoiding accidental damage to infrastructure assets. Consideration should be given to reducing disruption to customers and citizens.

Agree data to be captured

Once the economics have been fully agreed cross-utility working parties should agree a standard for data capture.

Develop a Code of Practice

The agreed data to be captured should be detailed and good practice described in a Code of Practice which is either voluntary or enforced through legislative requirements. The code of practice would include;

- What data should be collected.
- Spatial accuracy of the data collected (x,y,z).
- Absolute versus relative positioning issues.
- Data quality metadata.
- How data is reported / stored / accessed.

Implement contractual arrangements

Design contracts between asset owners and contractors to ensure good quality data is returned.

Relative importance / prioritisation

High importance - opportunities are being missed every day (around 4 million excavations per year in the UK).

Who needs to be involved

Utility Owners and their contractors

All stakeholders involved in street works but mainly those carrying out excavations on behalf of (inter alia): Water and Sewerage companies, Gas distribution network operators, Electricity network operators, Telecoms operators and Local Authorities.

Government

Utility assets are mainly located in public land. As a minimum the government needs to provide leadership about what is socially acceptable in terms of inconvenience to industry and the citizen. The most appropriate government body would be the Department for Transport (DfT).

Catalysts to success

The cost benefit ratio of actively capturing and sharing accurate utility information is becoming more favourable.

Technology

The increased viability of on-line mobile computing, GNSS location technology and image capture technology is reducing the time spent and cost of accurately and unambiguously capturing location and communicating this information.

Growing awareness of the issue

Utilities strive to be efficient asset stewards. Reducing costs to locate assets and avoid damage to utility assets are clear benefits. Our public spaces are increasingly congested and the societal cost of transport disruption is increasing.

Barriers to progress

Hidden Costs

The true cost to utilities of the time taken to locate assets is often hidden in unit rates paid to contractors. The societal cost of the time saved in locating assets and avoiding damage is indirect.

Corporate IT system Changes

Changes would be required to corporate IT systems including job management systems, mobile work / GIS , together with associated business processes.

Contract changes

Changes to framework contracts between utility asset owners and their contractors will be required.

Change in operative practices

Changing the culture of operators from long-established working practices and capturing ‘hearts and minds ‘so that the change will be embraced rather than resisted will be a challenge.

Political Will

This approach is not new. The requirement is in the new Roads and Street Works Act (NRSWA) but was never enacted. The requirement was addressed in Traffic Management Act (TMA) Records Code of Practice but has not been implemented. DfT is expected to revoke the existing (less onerous) Records regulations. Gaining political traction will only happen if the business case shows a clear win-win for utilities and the citizen.

Technical standards for asset tagging



Industry Goal

Agreed open technical standards for actively locating assets to ensure interoperability . Active tagging allows buried assets to be rapidly located thus reducing cost of survey and excavation. Active tags can be part of the pipes themselves or in small devices that can be co-located with the pipe. A technical standard that defines how locating devices interact with the tags allows different technologies to be tried without being locked to a single vendor.

Industry outcome to be achieved

Wider adoption of smart asset tagging. All new laid assets would utilise technology to facilitate active location . Tagging of existing critical assets would be defined by the economics and risk appetite of the asset owner. Excavated existing assets would be opportunistically tagged.

Action to be completed to deliver outcome

- Review of current situation: deployments, vendors, costs, performance, accuracy, reliability etc.
- Undertake cost benefit assessment and develop the business case.
- Develop technical standards for interoperability.
- Develop products using the technical standard.

Relative importance / prioritisation

Medium: The requirement is to ensure new laid assets can be readily located . Accurate records or relying on proprietary vendor formats would do this. However in the longer term it is expected that asset tagging is the most cost-effective solution.

Who needs to be involved

Utility Owners and their contractors

All utility owners and contractors installing new assets and carrying out excavations on their behalf. Water and Sewerage companies, Gas network operators, Telecoms operators, and Local Authorities.

Vendors

Pipe manufacturers and companies developing tagging solutions.

Catalysts to success

- Improving technology
- Possible adoption of supply pipes

Barriers to progress

- Longevity of tags not proven
- Ownership of technology devices required to locate assets

Links to other actions

Co-operation of stakeholders in recording existing assets

Boundaries and timetable for supply pipe adoption

Industry Goal

Minimise risk from supply pipe adoption, for both customers and water companies.

Industry outcome to be achieved

Definition of the boundaries and timetable for supply adoption that will not place an excessive cost burden on customers (directly) or water companies.

Action to be completed to deliver outcome

1. Develop business case for adoption for each supply pipe configuration (i.e. single connection to semi-detached house, single connection to a rural property, flats, common supply to terraced houses etc.). This should include classification of configurations, quantification of prevalence of the configuration and costs of managing if adopted, and identification of the issues concerning adoption.
2. Consider the direct cost to customers for each configuration if adoption does not go ahead.
3. Identify total cost to the water industry of adoption of these configurations. Is there a point at which will be too much of a burden on companies (and ultimately consumers through their bills)?
4. Develop a timetable for supply pipe adoption which allows business plans to include investment for managing supply pipes if they are adopted.
5. Water industry to use outcome to engage with regulators and legislators to ensure a smoother adoption process.

Relative importance / prioritisation

This is a hot topic. The industry needs to have a complete picture of the costs (burden) of supply pipe adoption so that a realistic legislative proposal can be implemented. Some work on costs and benefits was undertaken by UKWIR, but this considered a simple adoption scenario.

Who needs to be involved

Water companies. Data gathering, analysis and economic evaluation should be completed collaboratively. Engagement and consultation with UK Government / economic regulators needs to come from water industry groups such as Water UK. This work should be led by Water UK but delivered through collaborative research such as UKWIR or WRc's Portfolio programme.

Catalysts to success

Defra have recently consulted on supply pipe adoption and the results are due later this year. The consultation document clearly set out that Defra's preferred route is for supply pipe adoption.

Barriers to progress

There is a lack of information and data on the prevalence of some supply pipe configurations. Very little data has historically been collected on supply pipes. Might be able to infer details from house stock information, an approach that was taken for modelling work for private sewer transfer. Insurance company data may also be useful.

Cost-effective supply pipe management strategies

Industry Goal

Minimise risk from supply pipe adoption, for both customers and water companies.

Industry outcome to be achieved

Cost-effective supply pipe management strategies developed from point of adoption and quantification of potential efficiencies that could be gained from adoption of alternative practices.

Action to be completed to deliver outcome

1. Identify suitable strategies that will address leakage, asset deterioration and water quality (issues that may be improved by adoption). This could include replacement and alternative repair strategies, re-siting of meters on property walls, compared with current practice.
2. Quantify (or qualify) benefits of each strategy in terms of leakage, water quality, customer disruption (access issues), re-instatement costs etc. This should include the 'negative' benefits such as loss of work for small contractors that will not be on framework agreements with water companies, but have lots of experience dealing with supply pipes. This should also include
   a. research on customer viewpoints.
   b. investigation of regional differences/risks e.g. cold weather impacts on wall mounted meter boxes.
3. Recommend appropriate management strategies.

Relative importance / prioritisation

This is a 'hot' topic as companies are already thinking about how to manage supply pipes.

Who needs to be involved

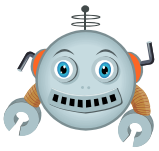
Water companies, economic regulators, technology suppliers. The work could be funded through collaborative research programmes such as UKWIR or WRc's Portfolio programme and technology verification trials.

Catalysts to success

Current industry momentum to address customer leakage (Ofwat, UKWIR), lead (DWI) and customer metering.

Barriers to progress

Loss of visibility of customer leakage.
Right of access issues (do not have the same rights under legislation as gas because of lack of health and safety concerns).
Lack of inertia to change current operational policies and practice.



New technique for joining plastic pipes

Industry Goal

To install fit for purpose plastic pipes with joints that can be made reliably, robustly and cost effectively in-situ so that they do not represent a leakage and failure risk.

Industry outcome to be achieved

The outcome is an industry which gets it right first time when installing new pipelines. To achieve this the supply chain must deliver a new technique for joining plastic pipes which can be conducted in-situ without the risk of a poor joint and future failure and the need for excavation.

Specific requirements (to be fit for purpose) for this technique:

- Allow minimum joints over the pipe length.
- Be possible within the trench environment i.e. not require a clean lab environment.
- Be within the skill level of operatives doing the job.
- Make the pipe more detectable through use of additional technology such as RFID tags or metal which can be more easily detected than plastic.

The outcome is linked to new technology but also has a regulatory (leakage) and an operations (fewer excavations) driver.

Action to be completed to deliver outcome

A comprehensive review of the current plastic pipe jointing approaches assessing the financial impact of poor joints on the water industry. Answer the question: How much does poor joints cost the UK water sector a year. This action is needed before the industry will fund either improved technology, better installation, greater inspection of newly fitted pipes and also to get regulatory acceptance.

A second action identified at the workshop was to strengthen the link between suppliers of plastic pipes, joints, fittings etc and the water companies. This may be through making better use of the existing BPF plastic pipes liaison group.

It was thoughts that there was great benefit in involving innovators from outside the usual pipe technology sector to bring new ideas to this long standing challenge.

Relative importance / prioritisation

This is a hot topic and a big issue for the industry. It is not going to be easily resolved as there are many barriers, so requires immediate action to start the process.

Who needs to be involved

Water companies need to lead and put this on the agenda. The lead will not come from elsewhere.

Need to involve:

- The water companies as owners of the assets and held responsible for leakage.
- Innovators – companies, people etc capable to coming up with new ideas.
- Supply chain – supplier of existing technologies, clear message of the issues and needs.
- Main contractors – installing pipelines, working with these problems on a daily basis. These are the people who will deliver change given the right technology and funded to do the job.
- Trade bodies – such as the BPF.

Funding for a review of the current situation and assessing the cost to the UK water companies should come from the water companies. The development of new technologies and installation approaches could be funded, based on the value, from investors looking for new technology opportunities or via government support such as from the TSB.

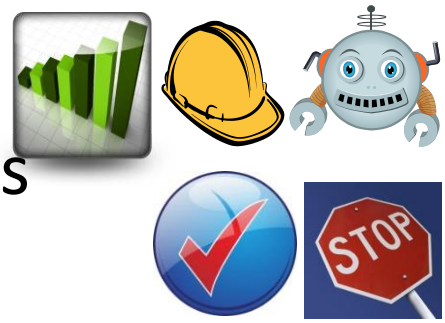
Catalysts to success

Leakage is a big issues with a high regulatory profile and also a customer perception. Added to this increasing costs associated with excavations mean this there is a driver for change.

One of the big challenge is despite there being a very apparent problem there is no clear catalyst to make change happen.

Barriers to progress

- Cost – This is the single biggest barrier. Unit costs per joint have been pushed down. Water companies have reduced costs, there is a perception that this results cutting corners as a result of pressure on contractors.
- The incentives for contractors to use new innovative techniques are no there. The risk versus the reward is too high. Contractors are expected to use BAT but there is not route for new technologies.
- Established and unchallenged working practices – joints in water pipes often made in the trench, where it is much more difficult to do produce a good joint due to the dirty environment. Gas pipeline are commonly jointed above ground prior to putting in the trench.
- Skills, training and qualifications and money – all currently limit the best possible job.
- Water industry slow to change – Suppliers can't see payback for investment in new ideas.



Adoption of keyhole techniques for suitable repair work

Industry Goal

Use of keyhole techniques for repair to reduce the size of excavations.

Industry outcome to be achieved

Adoption of keyhole techniques such as core and vac for suitable repair work. This will result in smaller, quicker excavations with reduced disruption and lower street works cost and long term damage to the road surface.

Action to be completed to deliver outcome

- Water companies to share best practice, trial results and experience. Requires improved communication channels.
- As an industry establish the suitability of existing techniques, costs and benefit.
- Address the need for a shared pain gain approach to adopting new technologies. (Water companies and Tier 1's working together).
- Address staff, training, acceptance of new techniques.
- Define a route to approve products and new techniques which is widely accepted by the industry and build confidence and accelerates update.
- Research on new techniques – reduced footprint of techniques.

Relative importance / prioritisation

Immediate action - Current experience and suitability of existing technologies to the water industry.
It may be that current techniques used for gas are not suitable at present due to, for example limitations of the water industry to accurately locate failures, but this needed to be assessed to allow efforts to then be focused on the improvements needed.

Who needs to be involved

Water companies must lead this and work with Tier 1 contractors.
Suppliers of existing suitable technology need to be involved.

This should be funded by the water companies and through the contractors via incentives.

Catalysts to success

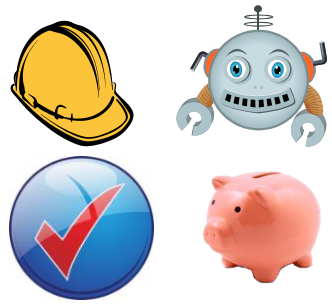
Excavations are big issues with big customer impact and poor perception. This combined with the cost of failed reinstatements results in a big driver.

The main catalyst is that there are technologies available, which based on current understanding, are not being fully utilised. Such techniques offer the potential for increased efficiency of operations by contractors. Each team can do more jobs per day. Less time at each site = less space and time.

Barriers to progress

- Technical issue – the cut and vac techniques is less suited to muddy excavations which are more common in water, less so in gas. Are these techniques suitable?
- Cost – upfront investment in the technology (high capital cost). Water company or contractor to invest? If the contractor is to invest they need a known programme of work which they can spread the capital expenditure over. There is a need to share the pain gain if these new techniques are to be used. Share the costs and risk but then the benefit.
- New technique, new skills. Fear of how to use and maintain new technologies – This is personnel, training issue.
- The need for accurate location data. The location of gas joints is accurately known, water not so. A small excavation needs accurate location of the asset, leak, joint etc.

Use robotic technology for non-excavation proactive inspection



Industry Goal

Internal robotic inspection of live pipes to reduce need for excavations to repair failed pipeline.

Industry outcome to be achieved

The outcome is the use of existing robotic technologies / techniques to allow non-excavation, proactive inspection and in the future repair.

Action to be completed to deliver outcome

- Establishing suitability and costs of existing technology – Issues such as: access, potential asset information gathered, costs etc.
- Establish the specific water company requirements (data) and value – think beyond current approaches and use of this sort of technology.
- Coordination. Share experience, testing and evaluation between water companies
- Establish approach to allow the contractor to share the risk.

Relative importance / prioritisation

There is interest in this area but not red hot.

Who needs to be involved

- Water companies.
- Supplier of current technology – many overseas.
- Tier 1's –users the technology.
- Exova – seminars, key people attend.
- Independent bodies – to test, establish suitability , costs of existing technology, issues such as access, potential asset information gathered, costs etc.

This needs coordination to happen.

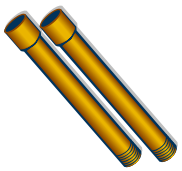
Catalysts to success

Cost of failure – especially on trunk mains, hence inspection costs can be justified.
Asset condition to inform replacement strategies.
Increasing costs of street works (permit / lane rental).
Improves efficiency – more jobs per team per day.

Barriers to progress

- Cost – Robotic inspection is a high cost activity. Currently only asset condition assessed using robotic methods - big value increase if capability developed to repair is possible.
- Access points – getting robotics in and out of the water main is currently difficult and costly.
- Need to drain down the main.
- Managing the quantity of data – make full use of the data.
- Water quality – concerns over impacts. Discolouration.
- Standard – WRAS approval for clean water.
- Convincing the contractors this information is valuable.
- Risk associated with introducing a new techniques.

Identify benefit and issues with network renewal


Industry Goal

Ensure new laid networks last as long as the pipe material remains viable through identification of the precise nature of the joint reliability problem as monitoring and control are not working.

Industry outcome to be achieved

A full understanding of the reported problem of the leakage in new networks being little different after wholesale replacement of the network. This will then allow new practices/technology to be adopted to ensure full value is obtained from mains replacement.

Action to be completed to deliver outcome

Identification of the precise nature of the failures that are occurring:
Is the problem leakage or legitimate, unmonitored consumption?
Where in the new network are the leaks occurring and in what timeframe do they occur?
Identify if failures be linked to a specific factor (e.g. way of working, weather or ground conditions) building on previous work.

Relative importance / prioritisation

This is a key area and vital for future integrity of the network. Money invested in upgrading the network should be spent on procedures/technology that are fully understood and optimised.

Who needs to be involved

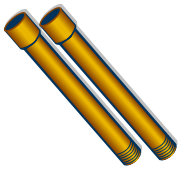
Water companies and their consultants should design the monitoring process used to assess the nature of the problem. Fitting/pipe manufactures will need to be involved in analysis of any pipe/fitting failures found. Once the true problem has been identified then the appropriate part of the supply chain will need to be involved with funding development of solutions.

Catalysts to success

Understanding the cost benefits of improved installations will only come through understanding the nature of the problem and the cost to put it right.
The desire to improve the processes/technology should be stressed, a policy of openness from manufactures and contractors will be needed to get reliable outcomes.

Barriers to progress

Detection of leaks in new plastic networks is difficult. Additional monitoring may need to be installed during the pipe laying process (this should not involve the introduction of additional/non-standard fittings).
Success will depend on looking at several new networks – may need several water companies and pipe laying contractors to be involved.
It may be possible to study existing (recently laid) networks if suitable monitoring and leak locating techniques can be used.
It may be necessary to split an network into smaller zones to help identify the location of leakage.
Comparisons with gas network may be unreliable due to different fluids and operating conditions.



Improved methods for acoustic leak detection

Industry Goal

Development of improved technology/methods of use for acoustic leak detection. While there are continual minor improvements to acoustic techniques the changes in pipe materials (to plastics) and reduction in operating pressure have seriously detrimental effects on their performance. The introduction of new fittings, improved training and careful design of networks could improve the effectiveness of the techniques. There are several strands to reaching this goal.

Industry outcome to be achieved

Noise loggers

Noise loggers appear to offer a cost effective solution to identification and localisation of leakage. Their performance is restricted due to the unit cost of the devices. A series of studies utilising a large number of the sensors would identify the potential for more widespread use. A positive result would allow manufacturers to explore large volume design/manufacturing with a potential for significant cost reduction.

Ground microphone vs Listening sticks

Generally passive listening sticks used for the final confirmation of a leak position but also used to sweep an area containing a suspected leak. Operators are generally reluctant to use ground microphones – possibly due to unfamiliarity with the technique – training is often given by older in-house staff who favour “traditional” methods. Effective training could help realise the potential benefits of ground microphones

Fittings to enable leak detection techniques

In-pipe hydrophone techniques (Sahara, JD7) offer the potential to pin-point the location of leaks in any material but they are expensive to implement due to the need for specialist launch points. Hydrophone sensors when used with correlators appear to offer improved performance. Tools such as Ferret would be more cost effective if the fittings to allow their use were installed at the same time as new boundary boxes. Installation of suitable points at appropriate locations throughout the network would allow/improve the use of each of the techniques listed. This may be a solution for critical parts of the network.

Action to be completed to deliver outcome

Noise Loggers

An initial investigation to establish the potential for cost reduction through large volume manufacture.

Work with water companies, noise logger manufacturer and network modelling experts to carry out study(s) to establish the benefits of use of more noise loggers and the requirements for changes that may be needed in modelling and analysis software.

Ground microphone vs Listening stick

Small scale study working with technology supplier and expert operators to compare the performance of the listening stick and ground microphone.

Identify the relative merits of each and where additional benefits can be realised by use of the ground microphone. Identify limitations to use and potential for improvement.

Develop an industry approved training programme.

Fittings to enable leak detection

Identify the specification for new access points and the potential additional benefits/drawbacks (more accurate location, improved sensitivity, increased cost, new leakage points)

Implement introduction in pilot areas

Carry out monitoring of actual benefits over a specified period of use.

Relative importance / prioritisation

These topics are likely to only be of interest to companies that are committed to further reductions in leakage and are currently at the limits of existing techniques.

Who needs to be involved

Noise Loggers

Equipment maufacturers, network modelling specialists, water company leakage engineers.

Ground microphone vs Listening sticks

Equipment manufacturers, experienced leakage technicians, training organisations

Fittings to enable leak detection

Equipment manufacturers, network designers

Barriers to progress

Cost will be the major barrier – proving there is an economic benefit to implementation of any of these actions will be hard.

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