

Water Services Training Group

19th Annual Conference

Optimising Services Delivery in the Water Industry

Radisson Blu Hotel, Sligo, 3rd. September 2015



Comhshaol, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government

Optimising Services Delivery in the Water Industry

Novel Approaches to Solving Drinking Water Quality Issues

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Summary

- * **THM Reduction using Reservoir Aeration**
- * **Reducing Iron and Manganese levels using Source Mixing**
- * **Alternatives to Carbon for Taste and Odour Reduction**
- * **Lead Reduction by Changing Coagulants**
- * **TOC reduction using Ion Exchange**

Summary cont

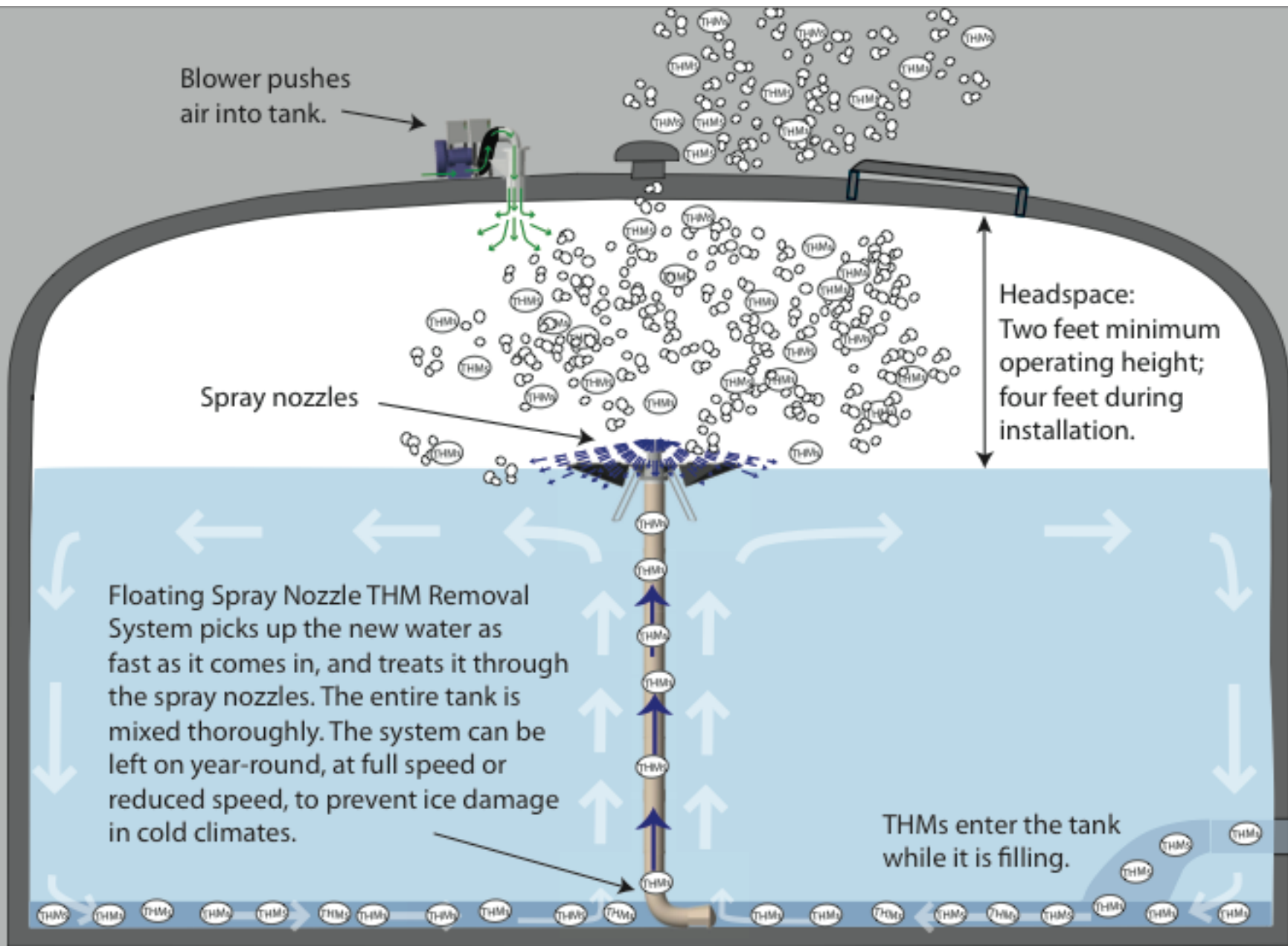
- * **Alternatives to Mains Flushing-Ice Pigging and Air/Water Jetting**
- * **Cross Contamination Survey using Smart Ball**
- * **Containing Algal blooms using permeable liners**
- * **Using Fluoride Levels as a Water Quality Guide**

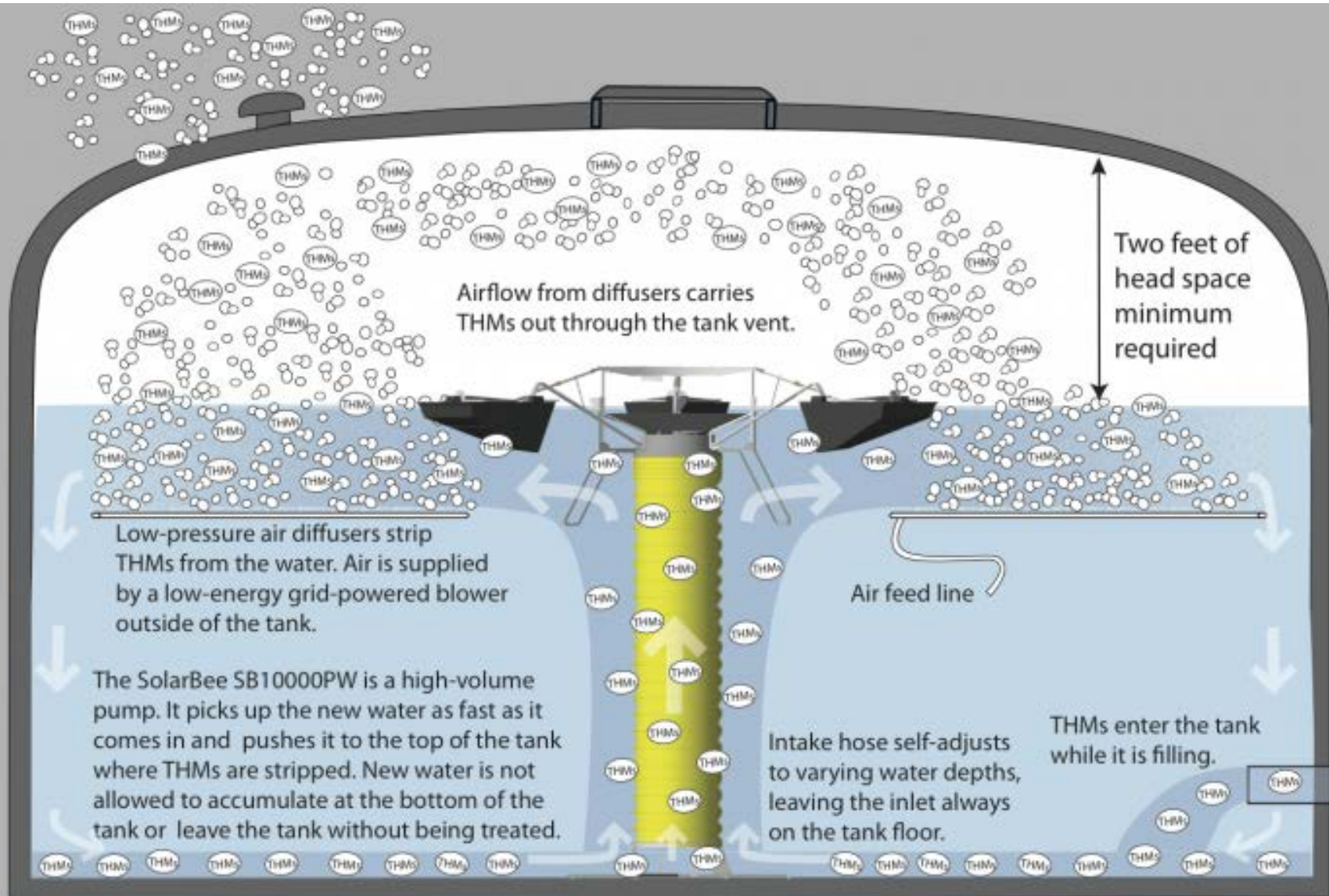
THM Reduction using Reservoir Aeration

- * **Trihalomethanes (byproducts of free chlorine and natural organic material) are volatile**
- * **Levels can be reduced significantly by exploiting this characteristic**
- * **Surface or diffused aeration and subsequent extraction of the volatized compounds can result in compliance**
- * **Pioneered in USA in 1980's. 2011 study confirmed potential**
- * **Ongoing study in Donegal - Fintown**

THM Reduction using Reservoir Aeration cont

- * **Spray aeration more efficient**
- * **Key variables are droplet size, headspace and reservoir turnover rate**
- * **The finer the droplet, the smaller the headspace required**
- * **Solarbee and Pax the 2 dominant systems but DIY used**
- * **€300 (three hundred) to €1m!**





Airflow from diffusers carries THMs out through the tank vent.

Two feet of head space minimum required

Low-pressure air diffusers strip THMs from the water. Air is supplied by a low-energy grid-powered blower outside of the tank.

The SolarBee SB10000PW is a high-volume pump. It picks up the new water as fast as it comes in and pushes it to the top of the tank where THMs are stripped. New water is not allowed to accumulate at the bottom of the tank or leave the tank without being treated.

Air feed line

Intake hose self-adjusts to varying water depths, leaving the inlet always on the tank floor.

THMs enter the tank while it is filling.

Reducing Iron and Manganese levels using Source Mixing

- * **WEARS.com**
- * **Iron and Manganese dissolve into raw water due to low oxygen levels**
- * **Algae grows due to elevated N and P levels in concentrated areas**
- * **RESMIX 1000 used in Manchester to bring a seriously contaminated reservoir back to full health in 3 weeks**
- * **Dilutes N/P and raises oxygen levels**
- * **£250,000 in total in that example**

United Utilities Heaton Park Manchester 2013



Alternatives to Carbon for Taste and Odour Reduction

- * Carbon-both PAC and GAC are very effective
- * Expensive to renew PAC which is very vulnerable to colour/coagulant carryover etc
- * PAC significantly increases coagulant demand
- * Chlorine or hydrogen peroxide *followed by* UV at Wastewater Dose levels remove over 90% of earthy/musty odours

Trojan UV is your T&O solution.



When the drinking water you're supplying has taste and odor (T&O) problems, it's not good news.

Decaying algae blooms in your source water can produce MIB, geosmin, and other T&O-causing compounds that result in earthy, musty odors and an unpleasant taste at concentrations lower than 5 parts per trillion.

Trojan UV-Oxidation:

Trojan has developed cost-effective, user-friendly UV-oxidation systems, including the TrojanUVSwift™ECT. This advanced treatment system offers a proven way to eliminate T&O-causing compounds and acts as a barrier to other chemical contaminants. These include NDMA, 1,4-dioxane, pesticides, and endocrine disruptors – all of which are becoming increasingly prevalent in our water supplies.



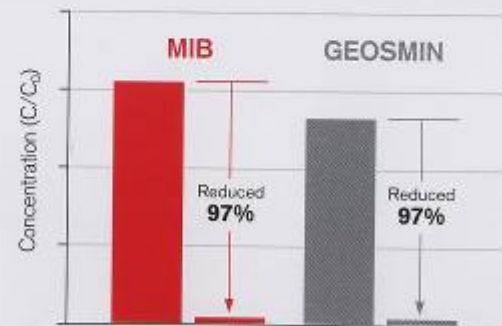
Key Benefits of Trojan UV-Oxidation for Taste & Odor Control

- Cost-effective for municipal applications
- Easy to retrofit into existing plants
- Proven treatment of T&O-causing compounds, even at high concentrations (>1,000 ppt)
- Performance guaranteed
- Designed for complete elimination of your T&O problem
- Fully-validated UV disinfection meets LT2 requirements

Simultaneous Disinfection and T&O Control

The compact, reliable TrojanUVSwift™ECT features dual treatment action. It delivers fully-validated disinfection of bacteria, viruses, *Cryptosporidium* and *Giardia* year-round. When seasonal taste and odor events occur, the system also provides simultaneous elimination of T&O-causing compounds. The environmentally-friendly process does not form bromate, disinfection by-products, or hazardous gases.

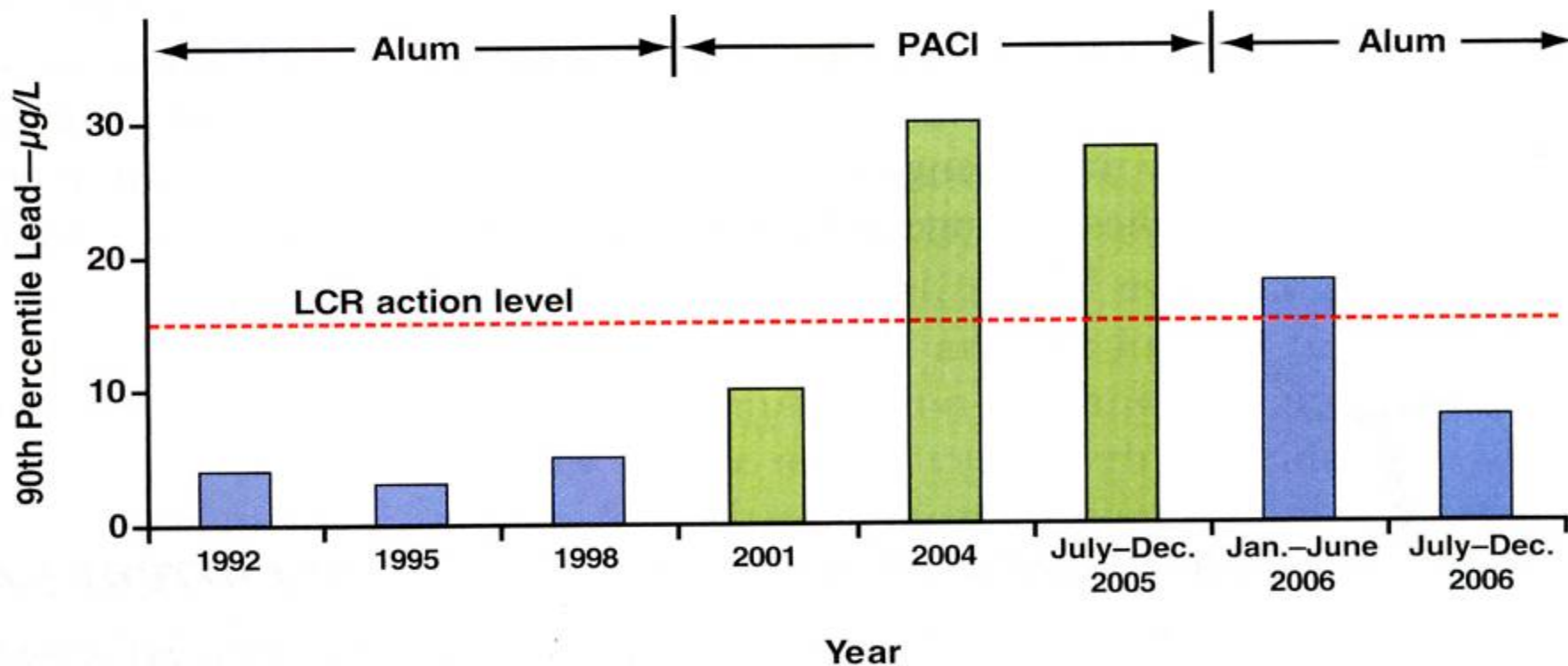
Results: Trojan UV-Oxidation Treatment of MIB & Geosmin at 4 MGD



Lead Reduction by Changing Coagulants

- * Pacl and Ferric based coagulants leach significantly more lead from services than Aluminium Sulphate
- * Removal of Lead is long term solution but secondary leaching from soldered joints, water cylinders and plumbing fixtures common
- * *Local addition* of phosphoric acid to known problem areas a short term fix

FIGURE 12 Greenville, N.C., compliance history with the LCR action level for lead



LCR—Lead and Copper Rule, PACI—polyaluminum chloride

TOC reduction using Ion Exchange

- * **MIEX-Orica (now IOXM Watercare)**
- * **Proven in NZ,USA, Australia,UK**
- * **Similar trial results Donegal Co Co – average 40% TOC removal – matches coagulants**
- * **Other ion exchange TOC removal systems not as consistently effective**
- * **10 minute contact time**
- * **2-6 m³ of brine waste per 100m³ water treated – no other sludge waste**

Alternatives to Mains Flushing-Ice Pigging and Air/Water Jetting

- * **Bristol University invented Ice Pigging process. 5% brine for slush ice**
- * **Claim that up to 400 times less water used than flushing**
- * **Very fast-minutes rather than hours**
- * **IW/Wexford trial with Aquology/Glanbury 2015**
- * **Injection through hydrant**
- * **€3.60 per metre plus Wexford pre-planning costs**

Samples were taken during the pigging process every 30 seconds. These were used to estimate the amount of sediment removed from the pipe.



Alternatives to Mains Flushing-Ice Pigging and Air/Water Jetting cont

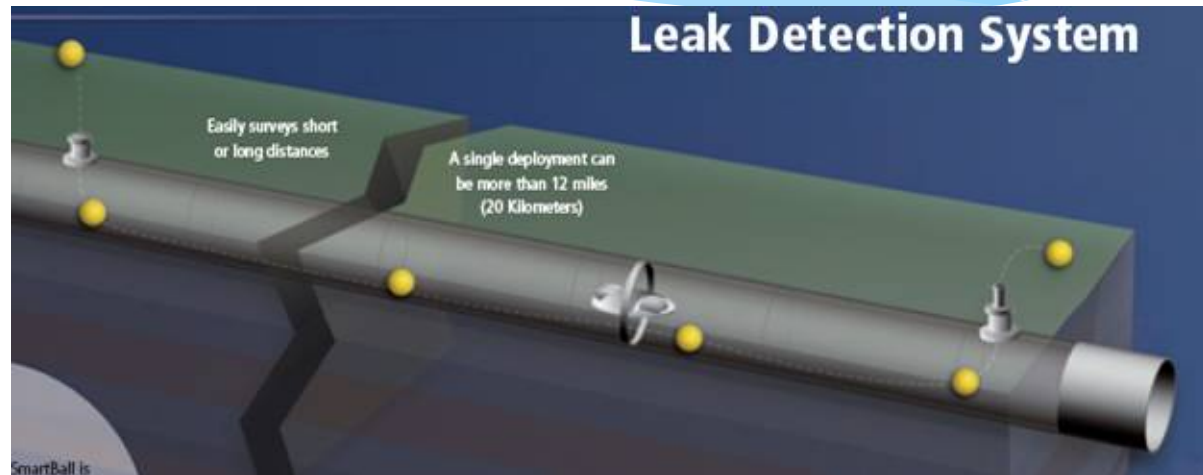
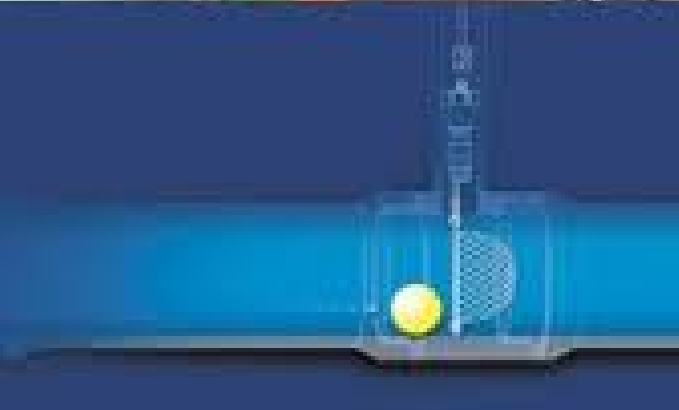
- * **Air/Water jetting carried out by M&T in Wexford**
- * **5 days-€6,000 plus VAT**
- * **Used jetting equipment similar to that used in FOG and other sewer blockage removal**
- * **Long term manganese scales removed**



Cross Contamination Survey using Smart Ball

- * Hydraulic grade line reduction can result in significant cross contamination events
- * Smart Ball is a US process
- * WRC have licence-IW examining
- * Can identify leak locations but also any ingress/cross contamination source very accurately

Smart Ball



Containing Algal blooms using permeable liners

Flow-routing baffle protects raw water from an *Aphanizomenon* sp. biomass

