Emerging ideas in water emergency management | Speaker abstracts

Laura Moss
Deputy Chief Inspector,
Drinking Water Inspectorate

Risk and preparedness for water emergencies – A regulatory viewpoint

The regulatory regime in England and Wales is well established when it comes to drinking water quality. A risk based approach is well embedded and delivering excellent outcomes for public health. Our expectations are that this approach will protect public health under a wide range of scenarios including emergencies. DWI expects water companies to plan and invest to take sufficient measures to protect against any adverse impact on consumers whatever the cause. To achieve this a collaborative approach is required within the industry and with a range of other stakeholders. Recently with the Inspectorate taking on the role as competent authority for the water sector on behalf of Defra, we have expanded our scope, but the principles remain true. I will briefly update on progress with implementation and enforcement of the NIS regulations to date. To deliver real improvements we look forward to and welcome innovation in this area in line with the changing expectation for increased resilience.

Mike Bishop
Director of Operational
Services, Dŵr Cymru
(Welsh Water)

Water Industry – UK Critical Incident Management (EU Exit)

In the autumn of 2018, the water industry in the UK came together to develop a joint contingency plan in readiness for 'Brexit'. Nearly all of the primary water and waste water treatment chemicals used to provide safe drinking water or to protect the environment are imported from Europe. For the first time ever, all of the water companies and authorities across England, Northern Ireland, Scotland and Wales established a single plan to mitigate the risk of a potential 'no deal' exit from the European Union. Water UK the industry trade association played a key role in coordinating the plan. Underpinning the plan was the establishment of an incident management structure which enacted daily reporting of chemical stock levels across the UK in the run up to the initial 29 March 2019 deadline. In support of this the senior industry team established very close and effective working relationships with the chemical suppliers and manufacturers. The normal 'just in time' delivery supply chain was enhanced to provide six weeks of contingency supply of vital chemicals in the event of a 'no deal' scenario. The senior incident management team undertook extensive liaison and dialogue with UK and the devolved administrations. It also developed an effective framework for inter-company support through 'Mutual Aid' arrangements and in addition carried out two large scale emergency simulation exercises in readiness for a 'no deal' settlement. This presentation will focus on the process and methodology employed by the industry to face an unprecedented risk to the whole of the sector.

Dr. Eyal Brill
Owner, Decision Makers Ltd., Israel

Novel event detection methodologies: Use of machine learning to identify water quality events

Recent developments in sensor technology combined with decreasing communications costs and developing capabilities across the 'Internet of Things' have created new opportunities for upgrading water quality monitoring capabilities in water supply systems. Whereas not long ago it was only possible to measure water quality where electricity and communication infrastructure existed, developments in the last 3-5 years have enabled water quality measurements to be obtained automatically - anywhere and anytime. However, high availability of water quality data has also created a challenge. How to avoid false alarms and how to filter knowledge out of the huge amounts of data. Publication of ISO/TS 24522: 2019 Event detection process: Guidelines for water and wastewater utilities has introduced the prospect of using statistical and machine learning capabilities in the detection and classification processes for water quality events. However, this may be easy to say but can be challenging to implement. The presentation will give a short theoretical overview how machine learning can be used for water quality event detection and how machine learning algorithms can be trained to classify events based on prior human knowledge. Using examples from real-world projects - and incorporating knowledge from use of the 'IBM Watson' artificial intelligence system - the principles of how such a technology may be implemented will be demonstrated. The last part of the presentation will be allocated to the introduction of a new concept called “Spatial Limits”. These limits are alarming limits which result from the process of a machine learning relationship between data from neighbouring monitoring stations

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Robert Wurm
Director, S::CAN, Austria

Towards drinking water quality monitoring directly at the end-point of use: Evaluating an in-pipe monitoring

In tomorrow’s smart cities, not only the resource efficient movement of goods and people will be of highest importance. Amongst the most important areas will also be the monitoring of energy use and water quality. In a smart city every resident will have real-time access to parameters like indoor air quality, fastest commute route including locations of shared electrical vehicles. It is s::can’s strong belief that the quality of each and every tap water supply will be amongst the most important parameters. One important safety parameter where UV/VIS spectroscopy is accepted by the EPA as a surrogate method where complex analysis systems are not practicable is Total Organic Carbon. The measurement of the UV absorbance at 254nm (UV_{254}) as an easy way to monitor drinking water for organic contaminants is widely used nowadays. Our ambitious goal of monitoring the drinking water quality directly at the point of consumption is not yet reachable. However, a few years back the development of an LED based UV/VIS spectrometer was the first step towards this goal. Bringing this spectrometer online as an in-pipe measurement system and combining in it with traditional water quality sensors was the next logical step to get closer to our envisioned tap water measurement system. The goal of this study was to test the aforementioned in-pipe sensor system for robustness and reliability. One system was installed in Bruges, Belgium in the water distribution network of the company Farys for field testing.

Steve Kippin
Ambipar Response Ltd

Wide area sampling and decontamination

For many years there has been the threat that a terrorist group could target the water infrastructure. This threat has been partially addressed by the 24/7 availability of specialist laboratory services which should be able to identify the biological or chemical agent that has been used. At present the response to an obvious attack, with or without casualties, is for the police to arrange to take initial samples in a forensic fashion followed by analysis - and this is where it ends. If a lethal agent has been used, how prepared are water companies for the next phase?The next phase will involve entry into a contaminated zone by trained staff in appropriate PPE who are competent in forensic sampling and decontamination techniques and, moreover, have undertaken these activities on a regular basis. Do you have such staff and equipment ready to deploy at a moment's notice? It is not only terrorist activity that can lead to the need for these activities, the amount of toxic materials in transit around the country all day and every day probably pose a more likely contamination risk! The basis of planning must be to identify the agent; determine how far it has spread; decontaminate; and provide re-assurance that the infrastructure is safe and can to put back into operation as quickly as possible. It took two weeks to establish that a restaurant in Salisbury had been contaminated, during which time it remained open for trade!

Phillip Hohenblum
Environment Agency Austria, coordinator of ERNCIP's TG Water

Progress of the Thematic Group Water within the European Reference Network for Critical Infrastructure

The European Reference Network for Critical Infrastructure Protection ERNCIP is a JRC facilitated network of security experts addressing pre-standardisation issues at EU level towards fostering the development of innovative and competitive security solutions. ERNCIP's Thematic Group "Chemical and Biological Risks to Drinking Water" addresses technical and strategical issues to make drinking water utilities more resilient towards malicious acts regardless their size. TG Water elaborated practical guidelines on the requirements of a continuous online water-quality monitoring system in drinking water supply systems and compiled analytical best practices for rapid identification of potential security issues. An overall guidance on requirements for production of a water security plan shall help utilities to analyse gaps and design a tailor-made security plan and implement a Water Security Plan. Three phases guide utilities from detecting and confirming potential events to managing the event and how to recover and return to normal supply. The guideline on the requirements of continuous online monitoring describe sensors, placements and optimization thereof, event detection systems, simulations and event management systems. An appraisal of analytical best practices summarized innovative analytical methodologies to address and confirm potential alerts as quickly as possible and links online event detection techniques with confirmatory practices.

Geoff Miller
Director, Enterprise Risk and Resilience Ltd.

Understanding organisational 'risk appetite' and 'risk attitude'

The past decade has seen an increasing professional and regulatory focus on the expression of organisational risk appetite - broadly characterised as 'the acceptable level of risk to take in a given situation'. However, ambiguity and imprecision of terminology, including the sibling concept of 'risk attitude', continue to hinder wider understanding and adoption of these and related concepts. Recognising and distinguishing between these valuable concepts - not just in 'enterprise risk management' but, crucially, during incident management - increases the likelihood of achieving, or maintaining compliance with, strategic objectives. The presentation will illustrate and define the components of the Risk Appetite / Risk Attitude (RARA) Model (Hillson / Murray-Webster). The model's use will be illustrated via risk assessment of, and major incident response to, a hypothetical water industry event. The presentation will distinguish between factors internal to individuals or groups and those existing external to individuals that are more easily observed and measured. It will explore the limited number of such factors amenable to choice and their influence in establishing risk thresholds designed to avoid breaching an organisation's risk capacity.

Alan L Warren
Technical Director, Mott MacDonald | Chair, The British Dam Society

Reservoir Incident Management - Present and Future

The major reservoir safety incident in August 2019 at Toddbrook Reservoir in Derbyshire highlighted many of the unique challenges in managing emergency situations at dam structures. The current provisions for UK reservoir safety management will be provided including the regulatory provisions for reservoir safety inspection and emergency management. The presentation will provide an overview of selected UK and international reservoir safety incidents and the associated emergency response. Using the Whaley Bridge incident as a case study, the presentation will describe and discuss the incident management from a dam engineer's perspective including:

- Incident identification and initial response actions
- Mobilisation of support services
- Working within the Bronze Control (on-site) team
- Resources for evacuation planning
- Logistics for site support
- Dealing with third parties
- Health and safety on site
- Incident 'sign-off' and de-escalation

As well as providing a historical perspective on the significance of the Toddbrook incident, the presentation will highlight areas of potential changes or improvements that could be made to reduce the incidence of reservoir flood risk emergencies and to improve the resources available in managing such incidents in the future.

Dr. Robert Hodgson
Independent
Geotechnical Engineer

The challenges of restoring urban water supplies during and after complex emergencies

Conflicts and related complex emergencies typically disrupt communication, power, water and wastewater infrastructure. The overarching importance of water to human life and dignity makes restoration of public water supplies a key objective for humanitarian agencies supporting populations caught up in such emergencies. Drawing on a lifetime of civil engineering disaster response assignments with many relief agencies in a range of humanitarian contexts, the author offers personal observations on the prerequisites for effective and rapid restoration of urban water systems. The responder must identify when key local players are torn between divided loyalties and be flexible to work around the unavailability of important materials due to truncated supply chains. Restoration of sophisticated urban infrastructure may require specialist skills to, inter alia, analyse networks and trace leakage. The 'Urban Competency Framework', established and promoted by the humanitarian agency RedR UK and Lloyd's of London, provides links between relief workers on the front line and the specialist back-up that they increasingly need.

Dr. Martin Padley
Director of Water and
Scientific Services,
United Utilities

Can 'system thinking' improve incident and risk management?

Systems thinking is an operational approach that manages the operation of the source to tap system by understanding its performance as a whole, end-to-end system. Importantly, it enables the water utility to understand the linkages and interactions between the individual and grouped component parts within the system and the impact those parts can have on one another. Systems thinking is integral to United Utilities long-term strategy and is key to the effective future risk management, improving the resilience of service to our customers, early identification of issues and effective response to potential disruptive issues. Fundamental to the effective operation of this model is high quality situational awareness – ensuring that live granular data is marshalled within the central control facility and available to the centre and field teams, so that issues are identified quickly and action planned and taken. United Utilities has invested heavily in a suite of telemetry and data systems, including a new telemetry system, system wide coverage of flow and pressure sensors, live asset data and an effective GIS based visualisation system that enables live and historic integration of water quality results, events, customer contacts and the location of staff. This approach has delivered both improved performance and a reduction in disruptive incidents to customers.