

WASTE WATER TREATMENT

Cold weather nitrification

Water Framework Directive requirements will lead to an increase in the number of sites with tighter effluent discharge standards. This will increase the risk of ammonia compliance failure during periods of cold weather when low water temperatures reduce nitrification.

An UKWIR project *The Implications of Cold Weather on Nitrification Treatment Processes* has been undertaken by WRc to develop evidence that can inform discussions with environmental regulators on the future setting of consent conditions for cold weather effluent discharges.

Currently, the Urban Waste Water Treatment Directive allows relaxations for seasonal weather conditions when water temperatures are less than 12°C during operation of a wastewater treatment works biological reactor.

The EU Freshwater Fish Directive states that in cases of low water temperature and of reduced nitrification or where the competent authority can prove that there are no harmful consequences for the balanced development of the fish population, Member States may relax ammonia limits.

The first stage of the project, managed by **Gordon Wheale** with Thames Water's **Howard Brett** as Client Manager, was to look at treatment processes commonly used in European countries with cold climates.

European experience

WRc's **Tony Dee** described how it was found that in Scandinavian countries, when water temperatures of less than 12°C are experienced during the operation of the biological reactor of the wastewater treatment plant, total nitrogen concentrations were subject to a seasonal relaxation (e.g. from 10 mg/l N to 20 mg/l N).

Germany and Austria apply a 'limited time of operation' as a substitute for low wastewater temperatures, which takes into account regional climatic conditions during winter and allows seasonal relaxation of ammonia standards. It was noted that cold weather measures, such as covers or wind breaks to protect the effluent temperatures, were costly.

It was clear that UK minimum effluent temperature for ammonia limits (>5°C) are not in line with other EU member states. Additionally ammonia limits are not dealt with differently during seasonal or unusual weather conditions.

To establish a broad picture of what happens in the UK, data were obtained from seventy nine works. In addition high quality performance data was obtained for biological treatment processes at three works during recent periods of cold weather.

The project was fortunate to coincide with the very cold winter of 2009/10.

It was found that a substantial proportion of UK wastewater treatment works are affected by low effluent temperatures. Biological filtration processes are more susceptible to production of effluent with low temperatures than activated sludge treatment. During cold weather, nitrification is more resilient in activated sludge treatment than biological filtration.

Erratic patterns

Future works operations will be subject to climate change and **Mark Kowalski** described how scenarios indicate a probability of more erratic winter weather patterns, which will include low temperature periods.

Mike steps down

Mike Farrimond is stepping down at the end of March after eleven years as Director of UKWIR. He took over from John West leaving his former post of Head of Technology Services at Severn Trent Water.

His tenure has seen a move from 'catch-up' to more 'pro-active' research, exemplified by the recent *21st Century Distribution and Sewerage for the 21st Century* projects. Recent years have seen the development of UKWIR's roadmaps and the suite of *Barriers to Innovation* projects. Mike was instrumental in devising a selection system to carefully prioritise proposed research projects to meet UKWIR members' needs.

He has greatly extended collaborative research, working with UK research councils and with international organisations, such as WERF and WaterRF in the USA and through the Global Water Research Coalition.

The UKWIR programme now has closer links with Europe including managing the *Mapping the Underworld* and *VISTA* projects involving a number of water, gas and telecoms utilities and research bodies.

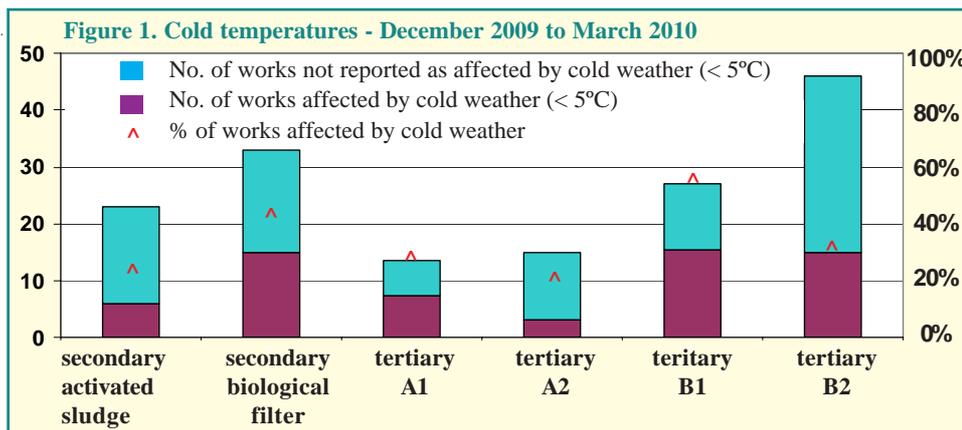
UKWIR Chairman, Paul Butler, said 'under Mike's leadership UKWIR has grown to become one of the world's leading research management organisations in the water sector'.

In terms of snow events, the modelling indicated that the projected reduction in the intensity of snowfall is not statistically significant. Whilst such snowfalls as those modelled in this study may become less frequent, when they do occur, they may be just as severe as at present.

Nitrification was assumed to return to normal as soon as the temperature rose above 8°C. Tony Dee described how this was tested. The modelling predicts that the recovery in nitrification from a low-temperature process upset takes about seven days for both biological filters and activated sludge plants.

This is at odds with current UK regulatory requirements which do not make an allowance for any process recovery time once the wastewater temperature has risen above 5°C following an exceptional cold weather event.

The project has developed evidence, based on sound science, that can now inform the environmental regulators on the future setting of consent conditions for cold weather effluent discharges and on dispensations permitted under the regulations.



Communicating with customers

There are now many more ways for water companies to communicate with customers and visa-versa. To examine customer expectations, UKWIR has carried out *Billing & Operational Services Research - Preferred Customer Communication Channels*.

At an UKWIR workshop to disseminate the findings of the project, managed by **Richard Kirby**, the Client Manager, **Richard Stanbrook**, said that *'we need to understand customer expectations and continue to develop our service offering to meet their needs'*.

Joe East from the contractors, Accent Marketing, described how they undertook seventeen 'tele-depths' with a mix of organisations that included water companies, consumer bodies, energy companies and other non-utility companies.

They also carried out a telephone survey with 1,000 consumers and with 200 small and medium size companies.

The investigation examined the role of letters, phones, bills, leaflets & inserts, visits/door drops, broadcasts, emails, websites, SMS and ASR.

Social media (eg Twitter & Facebook) were included but their use has been limited, primarily for marketing purposes.

Letters are still very much the preferred option for billing purposes but less favoured for operational events, as customers are still keen on talking to a 'real' person on the phone.

People are very familiar with using the internet with the majority of consumers (73%) and businesses (86%) using the internet at least once a day.

Although water company websites are rarely mentioned as the preferred route for communicating with water companies, consumers and businesses are comfortable in carrying out business on the internet.

There is considerable interest in the newer technologies. Companies are increasingly looking at communicating with their customers via SMS.

Figure 2 shows that, although most consumers have reservations, a quarter now say they would be happy to receive texts about their billing and operational services.

There is some interest in developing 'iPhone apps' with a number of companies already carrying out trials.

Good news

There was good news for the water industry in that 82 per cent of customers were satisfied with their contact, a better rating than comparable organisations such as telephone and energy suppliers. Such ratings are similar across broad event types.

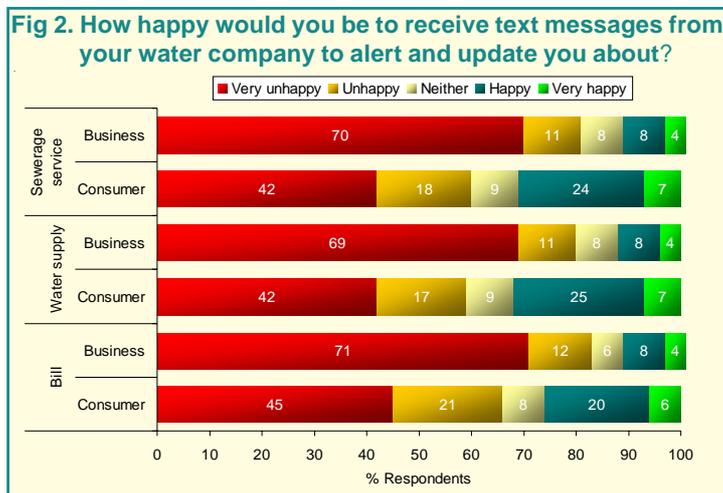
There are communication challenges for the future. Water efficiency communications will require effective messaging while applying the appropriate mix of media.

On regulation, there is a view that Ofwat needs to adapt to new communication channels to monitor company performance as opposed to relying on traditional channels.

The impact of universal metering will require all kinds of information and different distribution points such as mobile vans, surgeries, village halls etc. Smart metering will necessitate conveying the latest water tariffs to customers.

The transfer of the responsibility of private sewers presents a significant communications challenge in the short term. It is a complicated subject to convey, so key messages must come across in a very customer friendly way.

In summing up Richard Stanbrook said that *'the industry now had better information to make sound strategic choices on appropriate communications, encompassing both operational and bill-related interactions'*.



Simplifying the business plan process

The *Capital Maintenance Planning Framework*, developed through an UKWIR project in 2005, proved successful in helping water companies make the case for investment in the five-yearly water company business plans.

Now, as the process for the next periodic review is about to begin, UKWIR is looking to improve the process through a project *Capital Maintenance Planning: A Common Framework - Stage C Review*.

Prior to a workshop in November, questionnaires had been sent out to UKWIR members to solicit views on what each company sees as the main issues.

At the workshop, Client Manager, Anglian Water's **Chris Royce**, said that *'knowledge had moved on since 2005'*. He added that this project had been voted in UKWIR's top five to start next year but, given the high priority, had been brought forward.

The first phase of the project was to obtain a consensus on the issues, gaining knowledge

and understanding from the recently completed periodic review.

Paul Chadwick, from the contractor, Mott McDonald, shared the responses with delegates, who then worked in four groups to prioritise the issues.

Workshop facilitator, **John Lavan**, explained this was structured to provide gain ideas under four main headings identified from the questionnaires:

- poor data and/or lack of data history to support modelling
- demonstrating the balance of risk your asset portfolio - showing that it is broadly stable
- cost benefit analysis
- defining and articulating the current risk position.

He asked delegates to concentrate on asset types that are more difficult when applying the *Common Framework*, citing those especially with *'long-life, low probability and high consequence'*.

To help stimulate ideas, independent consultant, **John Hargreaves** set out a wider landscape. This included the recent *National Infrastructure Plan* in which the coalition government wishes to make better use of existing assets as well as improve the efficiency of the maintenance and replacement of such assets. He also suggested *'early cut-off date'* for new evidence and research to prevent protracted negotiations during PR14.

Radically reduce

Ofwat's **Mark Worsfold** set out the regulator's perspective to improve the periodic review process. He looked to radically reduce the 9,000 pages of business plans that the regulator had to read at PR09 while still maintaining investor confidence.

Following further group sessions to discuss stage C of the Framework, Chris Royce asked delegates to incorporate and try out the outcomes from the workshop. They should report back well in time for a workshop for the second phase of the project in spring 2011.

Pushing for innovation

A number of external reviews between 2006 and 2009, including the Cave Review, CST's *Improving Innovation in the Water Industry: 21st Century Challenges and Opportunities* report and UKWIR's *Barriers to Innovation* project, concluded that the UK's water industry should 'innovate more to meet the challenges that the sector now faces'.

In response, UKWIR has carried out *Research and Innovation in the UK Water Sector*, managed by **Richard Kirby** with Severn Trent Water's **Frank Grimshaw** as Client Manager.

The project, undertaken by John Hargreaves and Janet Wright of **Indepen Consulting Ltd**, comprised two modules, the first on 'incentive mechanisms and funding for innovation' and the second on 'research collaboration'.

The project involved interviews from within the water sector and with external bodies including government agencies, other regulators, academia, investors and members of the supply chain. It also examined a number of case studies on innovation.

Janet Wright told a dissemination workshop that the project concluded 'there was too little innovation' and 'innovation is a driver for economic benefit to consumers and society'.

There are many issues relating to innovation beginning with difficulty in defining it. The project quotes Peter Drucker 'innovation is the specific instrument of entrepreneurship ... the act that endows resources with a new capacity to create wealth'.

This project took a broad view of innovation, including its use in technologies, products and services, business processes and ways of working.

Risks and rewards

The water sector in the UK is seen as risk averse, insular and slow to innovate, a situation that is reflected worldwide. However, innovation can be engendered by serious risks such as a threat of water shortages as experienced in Australia, California and Israel.

The current package of regulatory incentives does not encourage water companies to look to the longer term even though asset lives are long and there are the challenges of addressing impacts of climate change and population growth. Innovation for the longer term is perceived as 'high risk'.

The time scale of reward for successful innovation can be long and hence it is difficult for both companies and the regulator to assess costs and benefits of innovation initiatives. In addition, regulation does not provide protection for costs of unsuccessful innovation.

Low take-up

The paradox is that there is plenty of potential funding available. It is, though, not always easy to track down as cited in UKWIR's recent report *UK Water Innovation – Which Way Forward in Europe*. One of the project's suggestions is that

UKWIR should explore the current low take-up of existing funds.

But what about the incentives for innovation? For incentives to be effective it was agreed that there must be clarity about the objectives of the water sector. This should be accompanied by a new regulatory framework and a supportive water company culture.

Janet Wright said there was hope that some of the changes already in the pipeline may remove barriers, in particular Ofwat were planning to look at the evidence regarding the perceived imbalance between incentives for capital and operating solutions. The publication of water companies' *Strategic Direction Statements* was also seen as a step forward.

However, it was suggested that a broader overhaul of the regulatory framework is required with a 'lighter touch', giving higher level outputs as well as strategic incentives.

An impressive array of expertise amongst the delegates from water companies, regulators, academia and the supply chain was put to good use in group sessions.

These explored questions on a number of issues including:

- where innovation can add value
- what has to change before we can have a more innovative sector
- what are the three top priorities to encourage collaboration.

The government has expressed its support for innovation as a key to the country's future wealth creation, so look out for the Government's white paper later this year to see how effective it will be as a catalyst for innovation.

Cost and benefits of competition and vertical separation

The 2009 *Cave Review of Water Markets* concluded that 'after an initial threshold of five megalitres, the Government should allow all non-household customers (1.5 million in England and 110,000 in Wales) to choose their water and wastewater retailer. The retail divisions of water companies should be made legally independent from their network business'.

The coalition government has since expressed its commitment to implementing the findings of the review.

In order to understand the impact of the proposed competition reform and help policy makers, UKWIR appointed Oxera to carry out *Competition in the Water Sector: A Review of the Costs and Benefits Knowledge Base*.

The project is being managed by **Ted Thairs** with Severn Trent Water's **Frank Grimshaw** as Client Manager.

At an UKWIR Workshop, delegates from water companies, regulators and academia heard from **Leandro Arias** and **Alan**

Horncastle how Oxera had examined recent publicly available papers on water competition. They had then obtained additional knowledge through interviews with key water companies and key other interests. They have also examined examples from Scottish Water and other sectors where separation has taken place.

The fundamental finding was that a number of areas of cost benefit analysis, carried out by Cave and then Ofwat, warrant more in-depth analysis. Policy reform decisions should only be made once these areas of the analysis have been examined more fully.

There are assumptions that require more analysis. For instance, Ofwat has assumed that the current comparative framework has no further efficiency gains to deliver.

They had also assumed that the introduction of competition would be 100% effective and that competition in the retail market would generate 'spillover' benefits for other parts of the supply chain.

Costs and benefits

Leandro then went on to describe a detailed review of the costs and benefits of separation of retail and network companies.

Oxera had identified three key benefits of separation:

- *avoiding discriminatory behaviour* where these benefits are obtained by stopping incumbents from undertaking price and non-price discrimination against entrants
- *cost information transparency* where benefits are obtained by improving the understanding of the costs of running the various parts of the value chain
- *cultural focus* where benefits are obtained by allowing the 'culture' of separated companies to evolve and focus more closely on relevant parts of the business.

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Customer benefit from flooding schemes

In his introduction to the dissemination of the UKWIR project *Risk-Based Approach to Sewer Flooding*, UKWIR Client Manager, Southern Water's **Barry Luck** said that the project would not only 'help customers with their flooding problems but had also produced some excellent ideas on how we can move forward'.

The present sewer flooding reporting register (known as DG5) is now twenty years old but does not discern between external and severe internal flooding events. The question the project examined was whether this results in the correct schemes being selected to best benefit the customer.

Peter Jordan then outlined Ofwat's sustainable drainage project and how this UKWIR project helps Ofwat's aim in moving towards high-level reporting and risk-based regulation.

Steve Hobbs, from the Customer Council for Water, presented the customer perspective. He highlighted the fact that the current DG5 reporting system does not measure the severity of the consequence of flooding.

Improved assessment

Kathryn Hickey and **Graydon Jeal** from the contractor, Atkins, described how the project recommends a risk-based approach that combines an improved and consistent assessment of actual incidents with an assessment of potential risk.

The balance is to obtain more detailed information on the location, extent and impact of an incident but keep it relatively simple by placing it in a 'low', 'medium' or 'high' category, as illustrated for internal flooding in table 1, below.

The project also recommends an 'investment framework' where the regulatory contract for large scale investments should be defined in terms of named schemes. Consideration should then be given to regulating other investment in terms of 'total expected monetary benefits' or 'risk score impact'.

The presentations prompted a lively discussion with positive views expressed about the outcomes of the project.

In summing up Barry Luck said the project, managed for UKWIR by **Brian Wilkinson**, provided a risk-based approach that 'should incentivise UKWIR members to deliver schemes that benefit customers'.

Table 1. Consequence categories

Factor	Low	Medium	High
Location	Attached or integral garage/unused cellar	Under-floor/utility cellar/conservatory	Inside living accommodation (kitchen, lounge etc)
Extent	Minor spill	Moderate spill	Major spill
Impact	Minor/no permanent damage. Easy to clean up and no/minor loss of amenity	Material damage. Loss of amenity for a short period (<1 day)	Significant damage & loss of amenity. Use restricted for a long period (>1 day). Customer may need to be rehoused

Statements contained in the UKWIR Newsletter do not necessarily represent the views of UKWIR or the Water Industry

This edition features a listing of UKWIR publications issued since the last newsletter.

CLIMATE CHANGE

10/CL/11/3 Energy Efficiency in the Water Industry: A Compendium of Best Practices £100 and Case Studies - Global Report (1 84057 571 9)

CUSTOMERS

10/CU/01/5 Billing and Operational Services - Preferred Customer Communication Channels (1 84057 578 6) £210

10/CU/02/7 Reduced Flow Devices - Impact and Use in the Household Sector (1 84057 572 7) £250

10/CU/02/8 Smart Metering in the Water Sector Phase 1: Implications of Energy Smart Metering and Future Research Priorities (1 84057 576 X) £55

REGULATION

10/RG/07/18 Review of Cost-Benefit Analysis and Benefit Valuation (1 84057 574 3) £425

10/RG/07/19 Investigation of Organic Chemicals in Sludge (1 84057 577 8) £150

11/RG/10/8 Research and Innovation in the Water Industry (1 84057 581 6) £250

WASTEWATER TREATMENT

10/WW/02/2 Chemical Source Apportionment under the WFD - Model Scoping Document (1 84057 575 1) £300

WATER MAINS AND SEWERS

10/WM/08/43 Leakage from PE Pipe Systems (1 84057 579 4) £500

UKWIR research reports are available for non-members to purchase via www.ukwir.org

COMPETITION

Costs and benefits (continued from page 3)

There are, though, significant costs in separation and Oxera identified:

- *production reconfiguration costs*. These are the costs of losing past (and future) efficiencies that have been (and could be) achieved by production models determined by the companies.

Information from the water companies suggests that they operate different production models. As a result, it might be costly to separate companies in a standard way

- *loss of economies of scope* are the costs of losing the benefit of producing outputs jointly in one company. A number of academic studies suggest that these costs could be significant.

- *transaction costs* are the costs of using the market to externalise transactions that previously took place internally.

Given their relevance, which is also suggested by the energy case study, Oxera recommends that the assumption underlying the calculations of these costs be revisited

- *coordination costs* that are the costs of coordinating transactions when the markets cannot be used.

Both Defra's **David Jones** and Ofwat's **Tim Keyworth** outlined the market reforms and finance related work that will feed into the *Water White Paper*, due in June. They both appreciated the timing of the project and the evidence it provides.

UKWIR PEOPLE

John Haley is Water Quality Compliance Manager for Yorkshire Water and is UKWIR's Client Manager for Drinking Water Quality and Toxicology.

Current projects include *Alternatives to Phosphate for Plumbosolvency Control*, *Treatment for New and Emerging Pesticides*, *Planning for Potential changes in Land Management Practices and 100% Compliance - is it Achievable?*

John joined Yorkshire Water in 2000 following various roles in water operations, water quality, laboratories, R&D and consultancy. His responsibilities include

liaison with DWI, public health and regulation and long-term planning to secure water quality in future investment plans.



John Haley talks to David Holt at a recent UKWIR workshop on compliance

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