

WWEM 2016 Hailed an Enormous Success



Year-on-year growth meant WWEM 2016 was the busiest ever.

In early November, the world's water sector came together to share knowledge and experience in all matters relating to the testing and monitoring of water, and with the collection transmission and management of data. Conference delegates, speakers, workshop attendees, exhibitors and delegates all hailed WWEM 2016 to be an enormous success. Expressing his delight, WWEM Organiser Marcus Pattison said: "Visitor numbers were up 15% in 2014, so we are thrilled to have grown participation by a further 5% and I would like to thank the organisers of the conferences and workshops that took place alongside WWEM 2016 for helping to make this such a useful event for every visitor."

The WWEM events (www.WWEM.uk.com) were created to provide anyone with a professional interest in testing and monitoring of water and environmental samples with a unique opportunity to see the whole sector in one place at one time. As a result, WWEM visitors included those responsible for monitoring natural waters such as groundwater, rivers, lakes and marine water, in addition to process water in applications such as drinking water, wastewater and industrial manufacturing and processing. There was also a Gas Detection Zone for those working in confined spaces and other areas where toxic or explosive gases have the potential to accumulate. WWEM 2016 visitors came from a broad spectrum of industries and sectors including regulators, government, manufacturers and process operators, water utilities, accreditation organisations, commercial laboratories, instrument manufacturers, consultants, analytical service providers, researchers and academics.

With 8 Conferences, more than 60 Workshops and over 140 Exhibition stands, WWEM 2016 offered something for everyone.

WWEM CONFERENCE – PRIORITY POLLUTANTS

The first day of the Conference addressed a laboratory environmental analysis theme; entitled 'Priority Pollutants Legislation: Issues for Industry and Potential Solutions.'

One of the challenges facing the Water Industry over the next 10 years is meeting the requirements of the EU Priority Substances Directive which sets out Environmental Quality Standards (EQS) for a large list of potentially toxic substances in the water environment. The challenges and uncertainties faced by those tasked with implementing the Water Framework Directive's present and future requirements on harmful substances were discussed and an approach was presented for managing priority substances with the aim of reducing their presence in surface waters and improving chemical status.

The Chemical Investigations Programme (CIP) has been established by UKWIR in response to emerging legislation on surface water quality. The CIP was intended as a means of gaining a better understanding of the occurrence, behaviour and management of trace contaminants in the wastewater treatment process and in effluents. It is a monitoring programme of unprecedented scale and complexity and has been undertaken as a collaborative programme by water companies in England, Wales and Scotland and the respective national regulators. Between 2015 and 2020 a total of 600 sewage treatment works along with the receiving rivers are being sampled in order to inform where substances are in breach of the limits and how they are best controlled. The water companies have also commenced 11 collaborative trials of technologies to determine which are most suitable to remove different priority substances should the need occur. Early findings from this research and the implications for the water industry were covered.

Several of the speakers have been involved with the UKWIR project and are working extremely hard to develop a knowledge base that can inform decision making on how best to approach the regulatory requirements. It has previously been estimated that the cost for the advanced wastewater treatment infrastructure in England and Wales that would be needed to remove the proposed additions to the list of priority substances could be as much as £28 billion. This represents 25% of the total of £108 billion invested by water companies in England and Wales since privatisation in 1989 and would incur a rise in household water bills of over £100. A key aim of the UKWIR project is to find a more cost effective way of meeting the standards.

Speakers from ALcontrol, DEFRA, Atkins, United Utilities, Wessex Water and Welsh Water delivered an update on work conducted to-date and provided an insight into possible treatment solutions. ALcontrol's Chief Scientist, Prof. K. Clive Thompson and Technical Director Paul Gribble chaired the morning session which covered the background, associated legislation and arising issues. Clive Thompson explained: "Priority substances are those that must be monitored and controlled in surface waters. At the end of last year the Water Framework Directive was

updated and as a result laboratories will need to develop and demonstrate technical capability to measure the additional compounds recently added to the priority substances list with a December 2018 deadline. These substances are: dicofol, perfluorooctane sulfonic acid and its derivatives (PFOS), quinoxifen, dioxins and dioxin-like compounds, acenifin, bifenoxy, cybutryne, cypermethrin, dichlorvos, hexabromocyclododecanes (HBCDD), heptachlor/heptachlor epoxide and terbutryn. However, the very low detection limits together with the required precision and accuracy targets represent a very significant challenge to analytical laboratories." Jane Youdan from Wessex Water agreed, adding that up to 16 sample bottles are necessary for just one sample for all specified parameters.

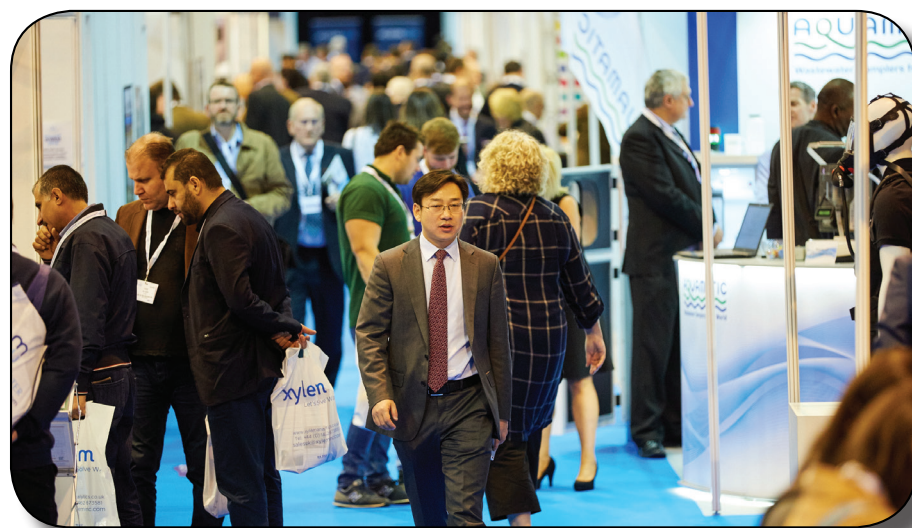
A wide range of treatment technologies are currently being addressed by the UKWIR project, ranging from advanced oxidation to reed beds. The objective is to evaluate which are the optimum treatment technologies for each of the substances.

The afternoon session was chaired by Tony Harrington, Director of Environment at Dwr Cymru, Welsh Water. Tony summarised the morning presentations and posed the questions: "Are people prepared to pay for the improvements that would be necessary? And can we change the types of waste that are thrown down the toilet?" He also expressed the view that processes for efficient Phosphate removal are showing promising potential. This session discussed practical considerations and potential solutions to some of the issues identified in the morning presentations.

A key aspect is fit for purpose sampling and analysis for the relevant substances to meet the regulatory limits of detection, precision and accuracy criteria. Without this, undertaking large amounts of analysis would be pointless. The analysis of Polyfluorinated and Perfluorinated (PFAS) compounds is a good example. These are man-made compounds of emerging concern in the environment even when present at sub-parts per billion. PFOS and PFOA are the best known of this class of chemicals. It was reported that standard analytical techniques for the analysis of PFOS and PFOA in wastewater have been around for less than 10 years. The majority of these methods use Solid Phase Extraction (SPE) followed by analysis with Liquid Chromatography - Triple Quadrupole Mass Spectrometry (LC-MSMS). It is also becoming recognised that in addition to PFOS and PFOA, there are also many more PFAS compounds that are of environmental concern. These compounds could be in excess of thousands in number and have a broad range of functional groups. This leads to analytical challenges that need to be overcome and a Total Oxidisable Precursor (TOP) assay was described, offering a means to assess 'Total' PFAS concentration in a sample, whilst maintaining information on the chain length of the PFAS compounds. Paul Gribble explained the problems associated with the measurement and treatment of PFAS and outlined an award-winning analytical technique that has been developed in conjunction with Arcadis.

Describing PFAS compounds as having 'bullet-proof' very long lifetime stability in water, Jonathan Miles from Arcadis outlined the treatment options available and referred to a case study at Guernsey airport.

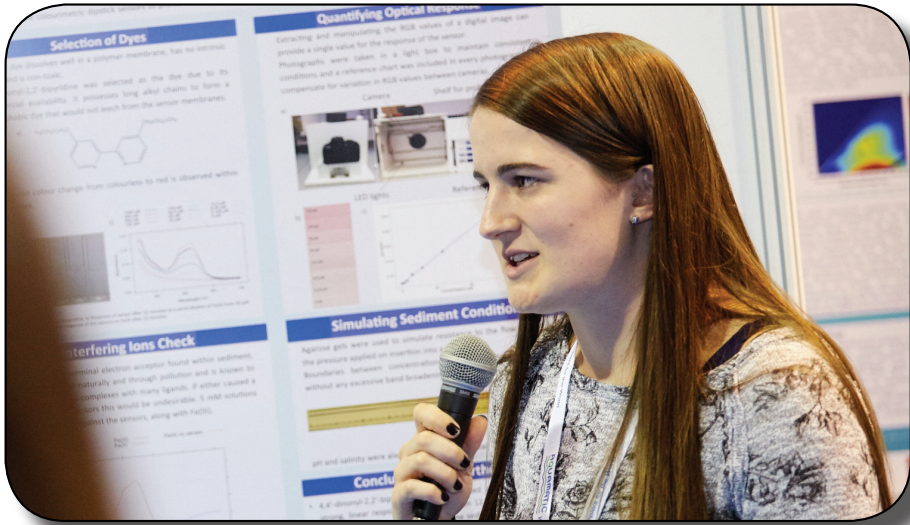
In the final presentation of the day Peter Reineck explained how recovering energy from sludge and other wastes using Flameless Pressurized Oxy-Combustion (FPO) technology, can represent an alternative to land recycling. FPO is a technology that burns fuels using industrial oxygen instead of air. As a result, the mass and volume of flue gas are reduced by ~85%, with the advantages of less heat lost in flue gas and cost of flue gas scrubbing reduced considerably versus other known combustion processes.



WWEM CONFERENCE – SENSORS AND NETWORK RESILIENCE

The Sensors for Water Interest Group (SWG) ran two taster sessions during WWEM: one on 'Resilience of sensor networks' and one on 'Sensors for challenging applications'. One of the UK Government's key tasks in the 2015 National Security Strategy is to improve the resilience of the infrastructure most critical to keeping the country running in the event of terrorist attack, natural damage or other disruptive events.

Monitoring and control systems are fundamental to the operation of the water utilities and have, in recent years, become increasingly important in the protection of water industry assets against the effects of disruptive events. Data from on-line instrumentation is becoming vital for managing risk, maximising efficiency and providing reliable and trusted information.



Winner of the SWIG Early Career Researcher Prize, Zoe Goddard.

Dr Sarah Ward provided an overview of the models which the University of Exeter has developed to address resilience in water management, and their application. In an evaluation of different sustainable urban drainage options (SUDS) using the results of water sensor data, green roofs had the best score. Sensors can be incorporated into smart rainwater harvesting systems which can be used both for stormwater attenuation (retention) and as a water supply in times of drought (release). Global Resilience Analysis (GRA) can be used to recommend where network sensors are best located.

Matt Dibbs of Meteor Communications described the use of 3G camera technology in remote monitoring for resilience against flooding. The kinds of assets which can be monitored include trash screens, storm drains / culverts, pumping stations, weir gates and flood defences. The benefits of this technology are multifold, delivering cost savings and carbon reduction. The frequency of maintenance visits is reduced, preventing unnecessary site visits except in real events. Also, response times are faster – blockages can be seen and addressed even before flooding occurs. The Environment Agency have already realised the benefits by installing a flood defence camera network.

Edward Klinger of CNI Guard (Critical National Infrastructure Guard) then presented another method for adding resilience from flooding and other extreme events to utility networks, through real-time intelligent monitoring. He suggested that the utilities could benefit from efficiency savings by sharing the same underground network of sensors, throughout a city for example. The CNI Guard 'Sensorcore' can be configured to detect, defend and protect critical national infrastructure with cost-effective, scalable solutions to eliminate or minimise disruptions and damage.

The presentations then moved to a theme of 'sensors for challenging applications.' Darren Hanson provided an overview of the evolution in the design of sensors for challenging applications from the original Aanderaa Optode dissolved oxygen probe to multiparameter sondes with built-in antifouling techniques. Darren explained that the accurate measurement of dissolved oxygen can save as much as £65k in energy savings on one sewage treatment works. He also predicted that the next steps in the design of sensors will be: extending the length of deployment without maintenance; removing moving parts; lowering costs; smaller sensors as LEDs evolve; reduced use of chemicals as microfluidics develop; use of smart networks; smart sensors which can self-diagnose, and intelligent real-time control.

Greg Kilbridge of Siemens then provided an insight into the future of big data and cloud solutions using smart technology and the Internet of Things. Siemens has developed a secure open cloud platform for industrial customers called 'MindSphere'. An alternative view of the future was provided by Brian Back of Radio Data Networks who questioned the security of data held in the 'cloud' but recommended that any sensitive data including operational data should always be held in offline computers and data for critical national infrastructure transmitted via cyber proof radio waves. Brian also shared experience of monitoring in challenging locations including meters in sewers, partial discharge monitoring (power industry), National Rail temperature monitoring and CSO and sewer monitoring. These environments can be wet, damp, have explosive gases and can be corrosive, in addition to having wildlife to contend with.

IWA CONFERENCE

The International Water Association hosted their 3rd Conference in the "New Developments in IT & Water" series, which was designed to bring 'Smart' into the Water Industry. This was highlighted when the first of the keynote speakers said: "This is what the key highly successful service industries in the world are doing to provide customer service...how about you?"

Bas Boersma of Cisco Systems set the scene for the first day with the two sessions being chaired by Elliot Gill of CH2M Hill and Jim Southworth. The sessions covered the Value of Smart Water, modelling and control in potable and wastewater, as well as data analytics, decision support systems and the Internet of Things.

The second day, which was hosted by Richard Crowder of CH2M Hill and Oliver Grievson of Water Industry Process Automation & Control (WIPAC) covered the risks that the industry faces from Cyber Security (and the ease with which it is possible to hack a SCADA System). The Shinning Stars programme was discussed along with the work that is being done with companies such as Anglian Water to educate the work force. Communication protocols were described with speakers discussing the newest of releases from the Water Industry Telemetry Standards Association (WITS) which is WITS-IOT.

In another room, simultaneous presentations were given on the management of data within the Water Industry and Sensing & Analysis in Wastewater.

The IWA Conference finished with two workshops. The first, hosted by the IWA, concentrated on the Smart Wastewater Industry, and the second by the Smart Water Networks Forum (SWAN), hosted by Jim Southworth. In the IWA session a panel of experts and the delegates discussed

how to make the Smart Wastewater Industry "Business of Usual." Normal discussions of what Smart means to the water industry ensued, but the lack of understanding of what Smart is and what it can do for the water industry was seen as a major factor in the lack of adoption along with a lack of engagement and understanding of the benefits.

CIWEM CONFERENCE

CIWEM Conference provided expert opinion on how the water and environment sector will look in 2050. Discussions included the latest innovations including Built Environment SMART Cities, Energy & Climate Change, Processed Water, Water Resources, Waste & Resources and Management & Regulation.

The old adage 'you can't manage what you don't measure,' was referred to by Oliver Grievson who chaired the WIPAC Flow Forum, which covered three key areas:

- Installation, Operation & Management of Flow Measurement Installations
- The Value of Flow Measurement
- Area Velocity Flow Measurement in Wastewater

Presentations by Simon Richardson of Siris and John Curtis of Morrison Utility Services highlighted the care that needs to be taken in not just installing but operating Entitled 'A Step to the future... Water and Environmental Management 2050' the flow measurement structures and Tony Wood of CSA Group highlighted the systems that need to be in place to manage flow measurement effectively.

In the second session of the Flow Forum Alan Hunt (ABB), Lorenzo Pompa (Anglian Water) and Danny Ronson (Siemens) presented on the uses of flow measurement. Lorenzo described the difficulties of managing wastewater networks and the benefits that flow measurement can deliver.

The last session featured presentations and an open discussion on the use of area velocity flow measurement and in particular the presentations by Laurent Soliec (Nivus), Mark Davis (Flowline) & Rob Stevens (RS Hydro) showing the reliability of the technique and what can be done to verify that it is as accurate as other flow measurement techniques.

'MONITORING FOR HYDRAULIC FRACTURING'



WWEM 2016 provided an excellent networking opportunity.

British Water and Cranfield University ran a Workshop with sub-topics on setting baseline monitoring and ongoing monitoring. This workshop was repeated on both days of WWEM and provided delegates with a clearer understanding of available techniques and identified gaps in knowledge and R&D opportunities in the area of onshore gas extraction. The Workshop was facilitated by Dr Frederic Coulon, Senior Lecturer in Environmental Technology at Cranfield University, and Tom Williams, Director at Enebio and convener of the British Water Extractive Industries Focus Group. Frederic described WWEM 2016 as "a very thought-provoking event helping visitors to keep abreast of new developments and what is happening in the sector."

LAB ANALYSIS OF ENVIRONMENTAL SAMPLES

EFASIG, a special interest group within the British Mass Spectrometry Society, held a meeting in which the first session was mainly devoted to Aspects of Comprehensive Chromatography and when coupled with Mass Spectrometry.

The Keynote speaker was Prof. Dr. Peter Quinto Tranchida from the University of Messina, who had stepped in at very short notice to replace his colleague, Prof. Luigi Mondello, who had to withdraw for serious personal reasons. Peter provided an introduction to the topic 'GCxGC/MS and LCxLC/MS for the Analysis of Environmental and Food Matrices.'

Bob Green from SepSolve introduced his company's innovative work on the recent development of a flow modulator followed by an application entitled 'Comprehensive insights into tobacco smoke using flow-modulated GCxGC-TOF MS.' Chris Hopley from LGC reviewed the application of comprehensive chromatography to reference materials, in a presentation on 'Multidimensional chromatography for the certification of environmental reference materials.' David Smith of Scientific Analysis Laboratories demonstrated why GCxGC was of particular importance when using a conventional GC detector, FID, and without the need for MS, in a talk on 'The Application of GCxGC-FID to Environmental Hydrocarbon Analysis.' The final presentation of the morning session was given by Leon Barron of Kings College, London on 'Suspect screening of emerging contaminants using liquid chromatography-high resolution mass spectrometry and in-silico methods.' The analysis involved the monitoring of appearance of target analytes in Thames River water.

Session 2 was devoted to 'Aspects of the application of chromatography mass spectrometry to water and environmental matrices including the involvement of Ion Mobility Mass Spectrometry.' Roberto Sommariva from the University of Leicester, gave an account of the application of 'Real-Time Mass Spectrometric Analysis of Hydrocarbons from Crushed Shale,' in which he mapped out the abundance and distribution of shale strata in England. John Thompson from the University of Birmingham provided a review entitled, 'Using refillable diffusion tubes for VOCs, SVOCs and oxygen-sensitive VOCs for calibration of PTR TOF MS' in relation to his involvement with Tracer Measurement Systems Ltd. Ashley Sage, the current vice-chair of the BMSS, and from SCIEX, also presented a review of 'Screening and Quantitation of Emerging Environmental Pollutants in Drinking and Waste Water using Targeted and Non-Targeted LC-MS/MS Workflow'. Eimear McCall of the Waters Corporation described the Environmental Screening of Water Samples Utilising Ion Mobility Enabled High Resolution Mass Spectrometry. The final presentation, given by Mark Barrow from the University of Warwick, described 'Analytical Methods for Profiling of Water from the Athabasca Oil Sands Region using FTICR-MS' - this gave an insight into the analytical problems facing the commercial exploration of oil sands. In the discussion session John Thompson raised the issue of misquoted parameters, LOD and LOQ in litigation, and a discussion took place on the use of conventional comprehensive chromatography alone and in conjunction with mass spectrometry. The Pump Centre's 'BIM' Awareness Day provided a detailed explanation of the implications of Building Information Modelling (BIM). Speakers from the Pump Centre and the BIM4Water Steering Group explained the background and others addressed the implications for employers, consultants and manufacturers.

INSTRUMENTATION APPRENTICE COMPETITION

After a hugely successful debut in 2014 the Instrumentation Apprentice Competition, organised by WRc and SWIG, returned at WWEM 2016. The competition recognises the importance of apprenticeships within the water sector and gives instrumentation apprentices the opportunity to extend their knowledge and demonstrate their skills by competing in a series of problem solving, practical and question based exercises. The competition was supported by Partech Instruments, Siemens, ABB, Siris Environmental, ATi and the organisers of WWEM. This year, five teams from UK water companies competed over a full day of activities including practical testing and a quick-fire quiz. The winners were announced at the WWEM Gala dinner in front of an audience of over 300 industry professionals. Congratulations go to Fred Riseborough and Dale Reece from Anglian Water who were the 2016 winners. They will receive training days with Siemens and ABB as well as the trophy. All the apprentices received a free ticket to a SWIG event of their choice, a power pack, a WRc goodie bag and a certificate.

EARLY CAREER RESEARCHER PRIZE

The SWIG Early Career Researcher Prize is intended to raise awareness of technological development and novel applications related to water measurements and thereby promote innovation in sensor research and commercial application. The competition is open to all 'early career researchers' to include undergraduate and postgraduate students either in full time education or within the first 4 years of employment within their area of expertise. This year, the SWIG Board of Directors selected the top three submissions and the competitors were invited to WWEM to present their posters. This year's winner of a cheque for £1,200 was Zoe Goddard from the University of East Anglia who presented a poster on "Optically-Profiling Diffusible Iron Concentrations in Sediment Pore Water." Kevin Martins of the University of Bath and Elena Koutsoumpeli of the University of York were runners up.

WWEM WORKSHOPS

Over 60 free walk-in, walk-out workshops operated from 8 different 'rooms' located within the Exhibition Hall. In general, the themes of the Workshops on the first day were Process Monitoring and the themes of the second day were Laboratory Analysis - this was so that the workshop content did not conflict with the Conference content. The workshops were mostly run by experts from the exhibiting organisations and provided an opportunity to learn more about the latest technologies, chemistries, methods and services that were featured in the exhibition.

WWEM 2016 EXHIBITION

With over 140 stands representing more than 250 of the world's leading providers of testing, analysis and monitoring equipment, and related services, WWEM 2016 provided a unique opportunity to see all of the latest developments at the same time, in one place. The Exhibition was bigger than ever and WWEM event manager David Hellyer says: "The feedback from exhibitors has been tremendous - with more visitors than ever before, the exhibition stands were extremely busy."

Oliver Grievson WIPAC Group Manager described the WWEM Exhibition as "an instrumentation sweet shop." He also noted that many of the exhibitors now use the WWEM events as an opportunity to launch their latest innovations or to announce their latest certification achievements. For example, Vega Controls launched a light version of their radar level monitor that received MCERTS Product certification and ABB had their newest laser level meter on show, while Pulsar had both their Microflow Flow meter and their Ultimate Controller on display, and Nivus demonstrated their newest area velocity flow measurement technology. ATi unveiled a completely new range of continuous water quality monitors for distribution networks, and Cooper Environmental provided information on a new continuous multi-metals water analyser. In addition, Envitech showed the latest version of its in-situ auto-calibrating Ammonia monitor for wastewater.

Other new products included the new Lovibond online Turbidimeter and PPM demonstrated a



WWEM's workshops proved popular.

new monitor for UVT and dissolved organics, a new low-flow final effluent turbidity monitor and a new digital technology allowing the integration of multiple sensors including pH, optical DO, Ammonium, Turbidity and MLSS.

Whilst speakers in the Priority Substances conference were highlighting developments in the treatment of phosphate in wastewater, OTT Hydrometry's stand featured the new HydroCycle PO4, the latest version of the Cycle-P remote, battery powered phosphate monitor. This technology was also the subject of a presentation in the Demonstration Area and a Workshop on diffuse pollution.

SMART technologies featured in many of the WWEM conferences and a workshop presented by OTT Hydrometry highlighted the use of intelligent Pluvio2 raingauges and telemetry in the Portsmouth Flood Alleviation Scheme.

Technolog featured the Cello 4S, a new remote telemetry outstation and Bell Flow Systems demonstrated the Aqualink telemetry systems. Ashridge Engineering's Sam Nichols said: "WWEM 2016 was a great success for us; we met a large number of both new and existing customers and received a particularly high level of interest in our Textlog range of remote data loggers and the Hydroguard trunk main monitoring system."

Yara had a significant presence at WWEM 2016, launching a range of new products to add to their Full Service Odour Control concept. Katie Oldfield said: "This was Yara's first time exhibiting at WWEM. We found the event well organised and the quality of leads excellent. It was a great way to launch our range of Nutriox Dosing and Evodor Air Treatment Systems."

Some of the new laboratory products launched at WWEM 2016 included the new Sempuris Dual Filter System from Labman, for water sample preparation. The SEAL Analytical stand was extremely busy with high levels of interest in the company's automated discrete analysers and segmented flow analysers. The company also received numerous enquiries for their new SmartBlock II digestion blocks which are available with high quality branded consumables. Photonic Measurements displayed their range of spectrophotometers, turbidity and UV-254 analysers. CTO Dr. Connor Douglas said: "Our WWEM 2016 stand was very busy - our turbidity analyser gained the most interest with its patent pending ability to measure different turbidity standards and simulate the measurement of process analysers."

Blue Scientific launched a TXRF spectrometer for ultra-trace element analysis and PerkinElmer unveiled a brand new ICP, the Avio 200, for the analysis of toxic metals to ppb levels. Parker Hannifin's stand featured their new THM analyser, Labmedics unveiled the new Smartchem 600 discrete automated nutrient analyser and Skalar were delighted with the level of interest in the BluVision™ discrete analyser which was launched at WWEM 2016.

Reagecon showcased their new Physical & Chemical Standards Compendium and Palintest's stand focused on the only EPA approved portable instrument for measuring chlorine dioxide and chlorite. ITS Europe demonstrated the eXact iDip® Smart Photometer System® which pairs directly with a smartphone/tablet, and Xylem Analytics showcased the latest WTW spectrophotometer featuring OptRF reagent free measurement.

Visitors to Aquamatic's stand were shown a number of new technical features which are available across the whole water/wastewater sampler range. Their Jeremy Smith said: "With a wide range of samplers and configuration options, the Aquamatic team is constantly looking for opportunities to work with customers to develop sampling solutions that meet their specific needs. The WWEM events provide a perfect opportunity to meet customers and show them the latest MCERTS approved sampling technologies. This year's event was busier than ever, with particularly high levels of interest in our Aquacell wastewater samplers."

Summarising the advantages of an exhibition, WWEM organiser Marcus Pattison says: "If you sit at a desk and Google, you usually only find what you searched for, and predominantly on the websites of the larger suppliers. However, visitors to WWEM exhibitions find things they weren't necessarily looking for; they get to handle the product and in some cases, even try it out. "They say 'seeing is believing' but 'seeing, handling, trying and discussing' is much more powerful. That's why every WWEM event is bigger and better than the last with year on year growth in visitor numbers."

Feedback from WWEM 2016 speakers, delegates, visitors and exhibitors has been extremely positive, with all respondents commenting on how well the event went. However, Marcus says: "We have now set the bar even higher for WWEM 2018, and preparations are already underway. We will be back in Telford on 21st and 22nd November 2018 and look forward to seeing you there!"

Marcus Pattison WWEM Organiser

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