Editorial

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I invite you to read the eclectic December 2016 issue of *Water Management*, where topics as different as culvert hydraulics, dam break and innovative methods for wastewater treatment are presented. Three of the four papers relied mainly on experimental techniques to advance knowledge (Sorourian *et al.* (2016), Kim and Oh (2016) and Zhang *et al.* (2016)) whereas the work by Zhang and Lin (2016) concerned the development of a numerical scheme that was validated against analytical and numerical solutions, as well as published site and experimental data.

The first paper describes an experimental study to improve understanding of the impact of debris accumulation on the scour generated at culvert outlets. Sorourian *et al.* (2016) note that, despite blockages being very common at culvert inlets during flood events, this has been a neglected area of research. Their work focuses on defining the flow structure at the exit from culverts (namely defining the turbulence intensity in the flow) and characterising the geometry of the scour hole downstream of a box culvert under partial blockage and free flow conditions. Confirming intuitive thinking, the tests carried out with steady flow conditions showed that blockage can considerably increase scour extent and depth (by 20–60%). Sorourian *et al.* propose an equation for the estimation of maximum scour depth at box culvert outlets that takes into account the amount of blockage at the entrance.

Zhang and Lin (2016) describe a study carried out to develop an improved numerical scheme for simulation of dam break flows. Based on the shallow water equations, the finite difference method also included artificial diffusivity, dependent on the local gradient and curvature of the water profile, to eliminate non-physical oscillations. For the validation of the method in a complex topography, the authors used the real test case of the 1959 Malpasset Dam disaster with good results. With climate change enhancing the overall risk of dam break, the authors conclude that the method developed is timely as well as robust. The model is expected to be further improved in the future by inclusion of turbulence modelling and sediment transport simulation to capture the often extreme topographical changes following dam break.

The last two papers deal with promising new wastewater treatment methods to reduce contaminant levels in the treated flow, thus reducing the residual pollutant charges into the environment.

Kim and Oh (2016) address an issue commonly faced at wastewater treatment plants (WWTP); the high concentrations of

contaminants in the incoming wet-weather flows during the early stages of a rainfall event. These highly concentrated and intermittent flows of contaminants can originate from combined sewer overflows, from diversion works or from exceedance of permit limits. Wet-weather flow samples collected from a WWTP in Seoul, South Korea, were used to assess the efficacy of a coagulation-sedimentation process with polyaluminium chloride (PAC) as a coagulant. Kim and Oh found that the laboratory results and analysis could lead to the recommendation of optimal operational conditions for pH (5), turbidity (400 NTU) and PAC dose (48 mg/l). Under these optimal conditions, the treatment method allowed removal of phosphorous, chemical oxygen demand and *Escherichia coli* in the order of 80%; whereas for a neutral pH of 7, the optimal turbidity and PAC dose led to removal rates of 81.0% for phosphorous, 76.7% for chemical oxygen demand and 64.5% for *E. coli*.

Zhang *et al.* (2016) report on an experimental study of the gasification of petrochemical sludge. Petrochemical sludge is found at wastewater plants as a result of the increasing consumption of petroleum and of fabricated related products, and is associated with a negative environmental impact. Using a high-pressure reactor, the research looked at the effect of operational parameters (temperature, residence time, pressure and concentration) on gasification efficiency in supercritical water (i.e. water above its critical point: 22.1 MPa, 374.5°C). It was found that treating the petrochemical sludge with supercritical water gasification (SCWG) at the conditions tested (530–650°C, 26–42 MPa and residence times of 200–360 s) the main gas products were hydrogen, methane, carbon monoxide and carbon dioxide. Whereas pressure change has no significant effect, higher temperatures and longer residence time enhanced gasification efficiency and lower temperatures contributed to hydrogen production. Zhang *et al.* conclude that using SCWG for hydrogen generation is a technique that shows significant promise.

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