Editorial

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The use of complex numerical modelling and physical models plays an ever increasing role in the understanding of our water assets, throughout their design, operation and maintenance. A more sustainable approach to the use of water is required to reflect the scarcity of this most basic asset, but also the increasing demands on energy efficiency, reducing OPEX costs and the wider carbon agenda. In this issue of *Water Management* the papers clearly illustrate this contribution in the design and optimisation of a selection of critical water assets.

It is good to see that the papers, whilst research-based, are considering the practical application of their outputs. A key purpose of this journal is to inform the work undertaken on a day-to-day basis by practising engineers and scientists. The first paper by Rasoulzadeh-Gharibdousti *et al.* (2011) addresses the optimal design and operation of an irrigation pumping station system using hybrid non-linear programming and a genetic algorithm (NLP-GA). The non-linear programming approach is reflective of the non-linear nature of optimisation in water engineering applications. The paper evaluates the algorithm in a practical problem (large irrigation pumping station in Iran) and successfully demonstrates the potential theoretical cost savings that could be delivered through a more efficient operating regime. It goes on to indicate how the tool could be used by designers and decision-makers.

The design and optimisation of water distribution networks, and the development of intelligent tools to inform decision-making is a key aspect of effective asset management within the water industry in the UK and overseas. The second paper by Ghajarnia *et al.* (2011) addresses the combinatorial optimisation problem of least-cost design of water distribution networks and shows that the honey-bee mating optimisation (HBMO) algorithm is particularly suited to this type of problem. This paper also demonstrates how many of the algorithms used in modern research effectively mimic natural selection, made possible by modern computing power.

Both of these papers allude to the importance of the boundary conditions used in the numerical models. Boundary conditions must be transparent, robust and clearly understood to ensure that the outputs from such models can be contextualised by the practising engineers or scientists. The second paper also highlights how constraints on model parameters, in this case the availability of discreet pipe diameters, can impact on the identification of an 'optimal' solution. Inevitably there are compromises that need to be made when considering the more practical aspects of the operation of any asset and the development of numerical modelling tools needs to consider this.

The third paper by Amiri *et al.* (2011) is the only paper in this issue to utilise physical modelling, in this case to investigate the prevention of surface vortex formation at power intakes. Again this is a practical problem that affects the efficient operation of existing assets, as well as the design of new assets, in terms of air entrainment, vibrations and ultimately energy loss. The paper explains the six different severities of vortex that can occur and how, through physical modelling, relatively simple solutions (perforated horizontal plate above the intake) can be identified to significantly reduce the formation of all six types of vortex. The paper also highlights the importance in physical modelling of appropriate dimensional analysis in designing the model and minimising scale effects.

The final paper in this edition by Nayak and Jain (2011) considers the problems faced in many large river catchments due to significant soil erosion, transport and deposition. Estimates of watershed sediment yield and the correct assessment of sediment transportation is required to solve a number of practical problems in hydrologic and hydraulic engineering. This paper demonstrates the estimation and simulation of discharge and sediment concentration for two river basins in the USA and India. Artificial intelligence, as part of data-driven modelling techniques, are discussed and utilised, being considered most applicable to hydrologic assessments and predictions. The results show that the estimates of discharge and sediment concentration provided by the neuro-fuzzy model are much better than the multiple linear regression model for both basins studied.

The papers in this issue of *Water Management* are of interest to both academia and industry. They reflect the continued move, particularly in the UK water industry, to asset management where relevant data is critical to and underpins informed decision-making.

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