Sewer Corrosion and Odour Research (SCORe)

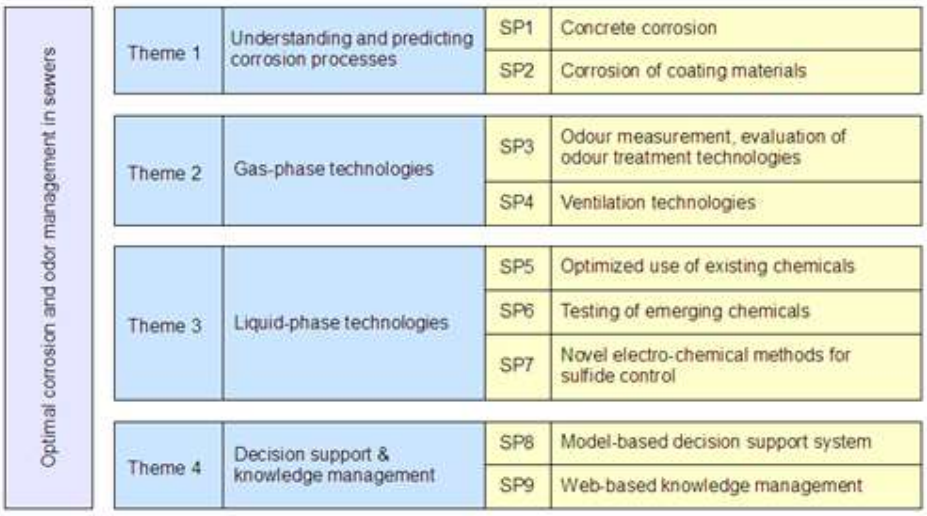
Project Dates: 2008 to 2013

Overview

The SCORe project w.as a five-year (12/2008 – 11/2013), $21M research project jointly funded by the Australian government ($4.7M) and many major water utilities in Australia. This was likely the largest ever research project worldwide focusing on sewer corrosion and odour. The project was collaboratively and successfully delivered by its five research and eleven industry partners.

Optimal management of sewer systems has been hindered by a limited understanding of several key in-sewer processes, and the lack of tools and reliable technologies to support strategic decisions and cost-effective sewer operation. The value of public assets is being significantly diminished as a result of corrosion problems, with the replacement of concrete sewer pipes costing hundreds of millions of dollars yearly in Australia. The research project attempted filling in the above gaps and provided knowledge and technology support to the Australian water industry for cost-effective and efficient corrosion and odour management in sewers, delivering highly valuable outcomes for the Australian water industry.

The SCORe project was divided into four themes consisting of nine sub-projects as shown in the figure below.



Project Outcomes

The project delivered the following outputs:

- Quantitative relationships between concrete corrosion rate and the gas phase concentrations of H2S, H2O, O2 and other influencing factors including temperature
- A model predicting corrosion rate and the remaining life of sewer pipes with various degrees of corrosion, and the potential risk of sewer failure, under given environmental conditions
- Guidelines for the use of coating materials
- A database of odorants from sewers, and their removal by various treatment technologies
- Guidelines for sewer ventilation

- Algorithms for the on-line control of chemical dosage for sulfide control
- New products for sulfide control in liquid phase
- Enhanced model for the prediction of sulfide generation and emission in sewers
- A model-based decision support tool

The use of the tools developed in the project has resulted significant savings of sewer operation and maintenance costs to a number of water utilities.

The research on the optimal management of sewer corrosion and odour was jointly delivered by its five research and eleven industry partners: The University of Queensland, The University of New South Wales, The University of Newcastle, The University of Sydney, Curtin University of Technology, Sydney Water Corporation, Barwon Water Corporation, CH2MHILL, City of Gold Coast, Hunter Water Corporation, Melbourne Water Corporation, South Australian Water Corporation, South East Water Limited, Veolia Water Australia and New Zealand, Water Research Australia Limited, and Western Australia Water Corporation.

The Australian Research Council through its Linkage Research Program granted $4.7M to the project while the water industry partners provided the balance cash of $3.5M, totalling over $8M cash.

The industry and research partners also provided $13M in kind support. This was the largest research grant of the ARC Linkage Program for research within the water industry at the time.

People

- Jurg Keller
- Zhiguo Yuan
- Phil Bond
- Keshab Sharma
- Guangming Jiang
- Ilje Pikaar
- Hui-Wen Lin

Awards:

- Australian Water Association (AWA), Queensland Research Innovation Award 2014
- Business/Higher Education Round Table Award 2014 for outstanding achievement in collaboration between business and higher education in the fields of research and development
- International Water Association (IWA) Asia Pacific Regional Project Innovation Award for Applied Research, 2014
- International Water Association (IWA) Global Project Innovation Award (Applied Research), 2014

Journal papers

- Pikaar, I., Likosova, E. M., Freguia, S., Keller, J., Rabaey, K. and Yuan, Z. (2013) Electrochemical abatement of hydrogen sulfide from waste streams", submitted to Critical Reviews in Environmental Science and Technology.
- Sharma, K., Derlon, N., Hu, S. and Yuan, Z. (2014) Modeling the pH effect on sulfidogenesis in anaerobic sewer biofilm. Water Research, 49: 175-185.
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- Sun, J., Hu, S., Sharma, K. R., Keller-Lehmann, B. and Yuan, Z. (2014) An efficient method for measuring dissolved VOSCs in wastewater using GC-SCD with static headspace technique. Water Research, accepted on Oct 28.
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- Pikaar, I., Rozendal, R. A., Keller, J., Rabaey, K and Yuan, Z. (2013) In-situ caustic generation from sewage: the impact of caustic strength and sewage composition. Water Research. 47(15) 5828 – 5835.
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- Jiang, G. and Yuan, Z. (2013) Inactivation kinetics of anaerobic wastewater biofilms by free nitrous acid. Applied Microbiology and Biotechnology, accepted.
- Jiang, G., Keating, A., Corrie, S. O'halloran, K., Nguyen, L. and Yuan, Z. (2013) Dosing free nitrous acid for sulfide control in sewers: Results of field trials in Australia. Water Research, 47(13): 4331-4339.
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- Jiang, G., Sharma, K. R. and Yuan, Z. (2013) Effects of nitrate dosing on methanogenic activity in a sulfide-producing sewer biofilm reactor. Water Research, 47(5): 1783–1792.
- Ge, H., Zhang, L., Batstone, D., Keller, J. and Yuan, Z. (2013) Impact of Iron Salt Dosage to Sewers on Downstream Anaerobic Sludge Digesters: Sulfide Control and Methane Production. Journal of Environmental Engineering. 139 (4): 594-601.
- Sudarjanto, G., Gutierrez, O., Ren, G. and Yuan, Z. (2013) Laboratory assessment of bioproducts for sulfide and methane control in sewer systems. Science of the Total Environment. 443: 429-437.
- Guo, L., Porro, J., Sharma, K. R., Amerlinck, Y., Benedetti, L., Nopens, I., Shaw, A., Van Hulle, S.W.H. and Yuan, Z. and P.A. Vanrolleghem, P.A. (2012) Towards a benchmarking tool for minimizing wastewater utility greenhouse gas footprints. Water Science and Technology, 66(11): 6683-6695.
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Source

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http://www.awmc.uq.edu.au/sewer-corrosion-and-odour-research-score