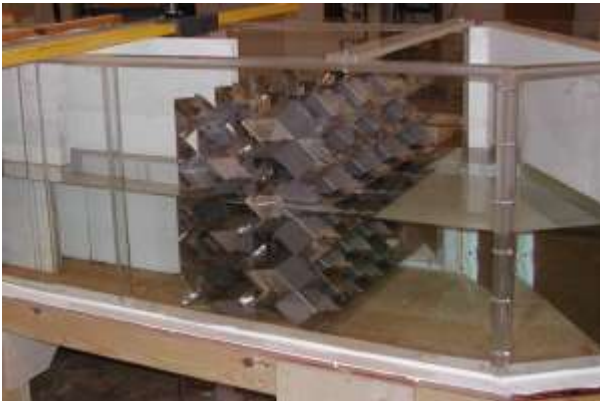




The Water and Wastewater Mixing Programme (WWM) focuses on mixing and dosing in potable water processes.

BHR Group's WWM collaborative research program has made a significant contribution to quantifying, evaluating and optimising mixing and dosing processes within the sphere of potable water treatment.



Water treatment requires liquid streams of different compositions to be combined at several stages during the overall process, examples include:

- Recycle stream blending
- pH adjustment of raw water
- Blending of coagulant and raw water
- Blending of polyelectrolyte and coagulated water
- pH adjustment of settled water
- pH adjustment of filtered water
- Chlorination of filtered water

The equipment and methods used in these processes include dosing lances, spargers, weirs, baffles, proprietary static mixers and flow-through stirred tanks.

There is a tendency for each item of equipment involved in a system to be considered in isolation, without consideration of the interaction, between one item and another, nor of the overall system objectives and performance.

Indeed, poor mixing and dosing can have a number of detrimental effects on the overall

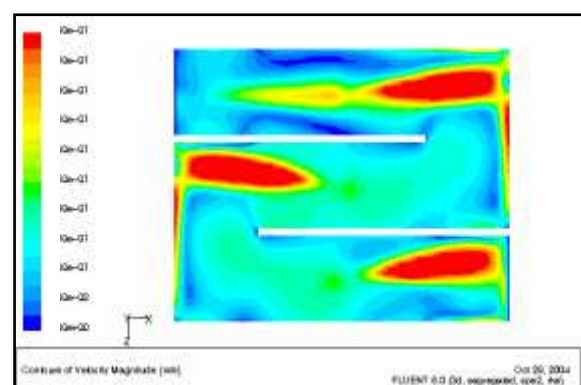
effectiveness and efficiency of a treatment process and can lead to overdosing, poor process control, non-uniform process streams, increased operating costs and higher power consumption.

WWM has provided its members with a number of research reports, design guides, site surveys and now software tools to assist them in the optimisation of their dosing and mixing processes.

Examples of the deliverables include:

- Pipe & channel mixing and dosing design guide.
- Mixing and dosing best practice seminars.
- Chemical dose optimisation toolkit.
- Independent mixing equipment evaluation and testing.

Advantages of accurately evaluating, quantifying and optimising mixing and dosing installations include reduced chemical consumption and energy usage resulting in operational cost and Carbon savings, increased process efficiency resulting in higher throughputs and potentially smaller installations.





There are a number of good examples of the WWM deliverables being used to solve real world problems, through BHR Group's work auditing mixing processes for water companies.

One particular example is an audit carried out on a water company site where they had concerns over the mixing of Phosphoric acid into treated water.

The acid is dosed through a sparger upstream of a manifold feeding four pumps.

Samples taken from downstream of the pumps on the common delivery main indicated lower readings than the known dose, implying that the acid was not fully mixed into the water.



BHR Group was asked to conduct a mixing audit to assess the current installation and provide recommendations for improvements.

On visiting the site it was apparent that it was extremely unlikely the Phosphoric acid was being fully mixed into the water before the flow split to the pumps.

Research conducted in WWM ("WWM Research Report for Liquid Blending") has shown that chemicals dosed into empty pipes are very

unlikely to mix within a length equal to 15 pipe diameters and more typically lengths of empty pipe greater than 50 pipe diameters are required.

This was borne out by the results of the subsequent sampling regime.

Using another WWM deliverable: "Design Guide for Liquid Blending in Pipes and Channels" a number of potential solutions were identified, including:

- Modified sparger design
- Dilution of the acid with carrier water
- Relocation of dose or sample point
- Installation of static mixer in pipe

The only solution certain to solve the problem was to move the dose point to more than 260 m upstream of it's current position.

BHR Group is focused towards providing commercially viable and practical solutions and it was recognised that moving the dose point may not be possible due to time, process or financial limitations.

Hence, through the use of the WWM design guide, two other more practical solutions were offered to the customer:

- Installation of a more effective multipoint sparger
- Dilution of the Phosphoric acid with carrier water to reduce its density.



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