BHR Group

EXPERTS IN FLUID ENGINEERING

Introduction to WWM Phase 8

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Objectives

➢ Introduce WWM Phase 8

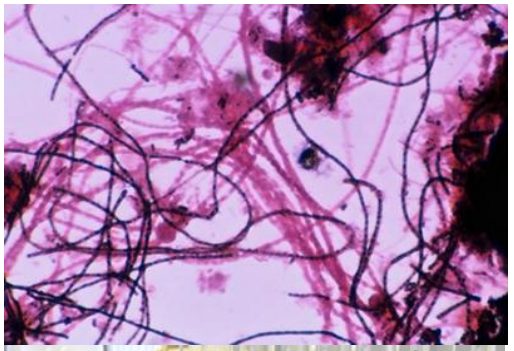
- Aim
- Focus of WWM 8
- Proposed work packages
- Future plans

Aim

- **Raise the Profile and Increase Membership of WWM**
- Increased sales / marketing activity
  - UK, Asia and Middle East
- Increased member participation
- Expanded range of work packages
  - Partnership with Aqua Enviro
  - Consultation with existing and potential members

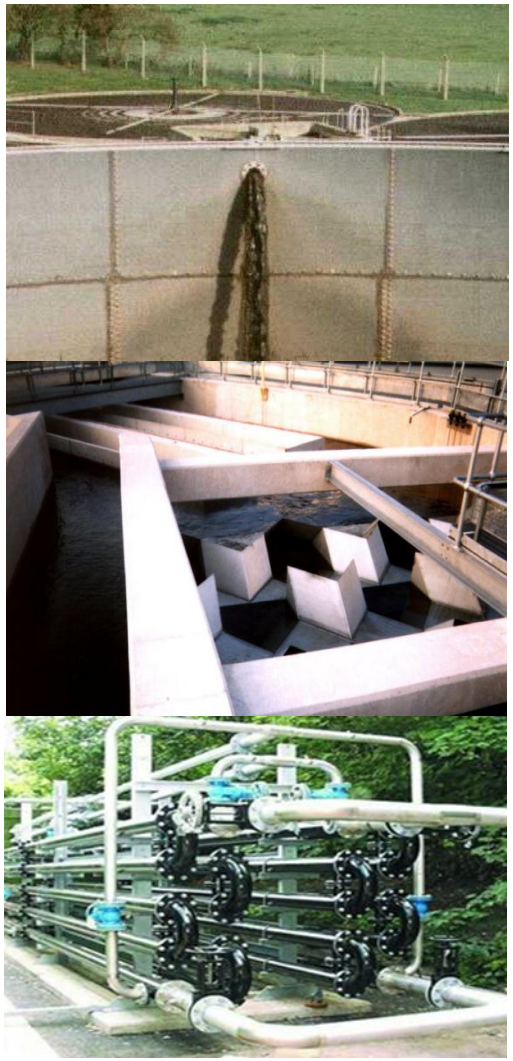
Aqua Enviro Synergies

- Pilot trials of chem, biol and physical processes
- Microscopy & specialist analytical services
- Anaerobic digestion trials.



Focus

- Improving energy efficiency
- Enhancing process efficiency
- Optimising chemical usage
- Reducing carbon footprint



Workpackages

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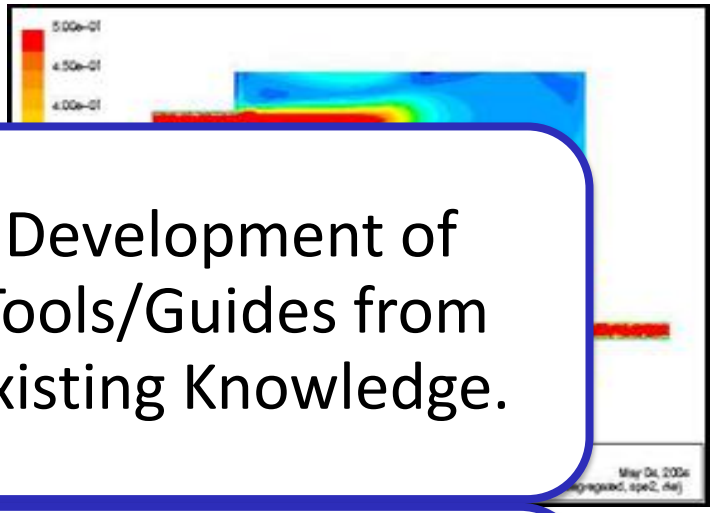
Extension of Existing Work.



Development of Tools/Guides from Existing Knowledge.

New Areas of Research.

Equipment Testing and Evaluation

Proposed Work Packages

- Pipe Fouling
- Sludge and Sludge Pumping
- Floc Strength Research
- Coagulant Dose Optimisation Toolkit
- Sludge Dewatering
- Anaerobic Digestion Technology
- Sludge Tank and Anaerobic Digester Design
- Primary Sedimentation Tank Optimisation
- WWM Website

Pipe Fouling

- Pipe fouling is a known issue within the waste water treatment process
- In particular the formation of Struvite and Vivianite
- Also fats, oils and greases or “FOG”.
- Blocking deposits within process pipelines and can lead to major asset failure.

Pipe Fouling

- Identify process “hots-spots” where fouling is likely to be excessive.
- Obtain real data regarding asset failure rate that has been linked to pipe fouling (data to include pipe material, asset age, waste stream type, throughput etc)
- Assess the effect of changes in sludge chemistry on Struvite / Vivianite solubility
- Assess viability of a laboratory and plant methods of estimating pipe fouling (ultrasonic device, process tomography)

Sludge and Sludge Pumping

- Impending deregulation of sludge treatment may allow Water companies to take and treat sludge from external sources.
- The implications are that longer sludge pumping mains will be required during AMP 5 to process the sludge efficiently at centralised sludge treatment centres.
- Improved knowledge of sludge rheology and system losses would lead to:
  - Reduced risk of system failure
  - Improved energy efficiency through better pump specification

Sludge and Sludge Pumping

- Measure rheological properties of new sludge types and mixtures.
- Evaluate the effect of fibre and fat content on sludge rheology.
- Analyse sludge cake rheology wrt dilution and fat/fibre content

Sludge and Sludge Pumping

Further Development of SRDB

- Additional data (poly-thickened/food/sludge cakes)
- Improved interface
- Integration with SLOT
- Further development of correlations (re-hydated sludges)

Further Development of SLOT

- Pump start-up
- De-rating of pumps
- Inclusion of pump performance curves
- Additional fittings losses and sequence effects

Flocc Strength Research

- Floc strength is an important operational parameter that is key to the performance of separation processes.

- Difficult measure to quantify and apply to practical situations

Floc Strength Research

- Conduct testing using test different water types, coagulants and flash mixing conditions
- Conduct and assessment of floc strength results in terms of floc size.
- Identify potential savings in chemical dosing through optimised flash mixing or flocculation.
- Development of a mobile test rig that can be used on-site.

Coagulant Dose Optimisation Toolkit

- Floc strength is a very important operational parameter that is key to the performance of separation processes.

- Floc growth/breakage results from lab jar-tests cannot be scaled to plant.

Coagulant Dose Optimisation Toolkit

- Develop, design and build a ‘proof of concept’ prototype ‘tool-kit’, comprising hardware and software, for optimum chemical dose determination on a site by site basis.
- Plan and conduct laboratory and site trials with the prototype ‘tool-kit’ to test operability functionality and accuracy.
- Demonstrate potential for realising cost savings.

Sludge Dewatering

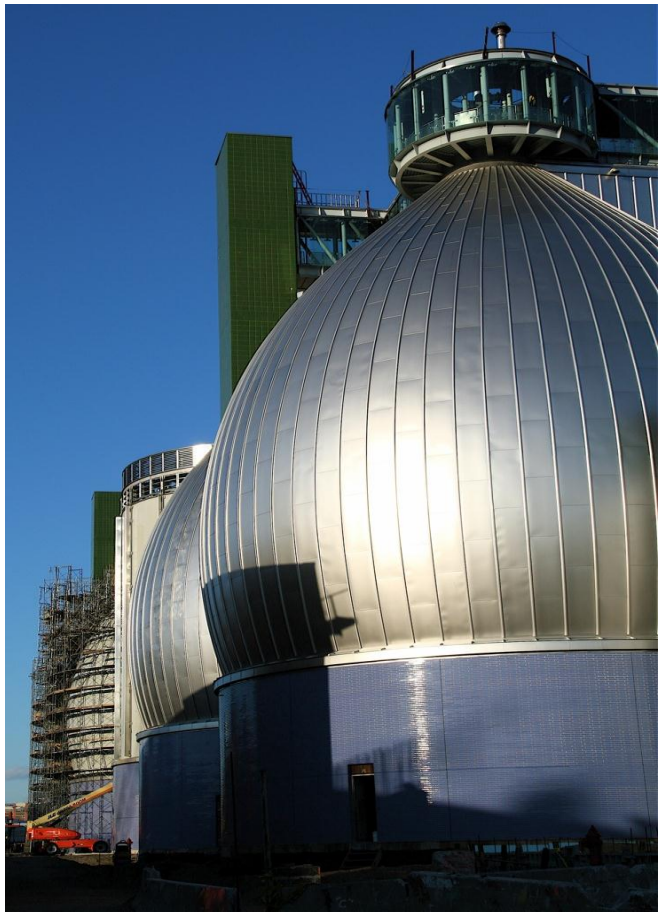
- Improvements in sludge dewatering performance can provide significant potential benefits.
  - Reduced volumes of dewatered sludge for transport and disposal and hence reduced costs
  - Reduced energy consumption and hence costs for incineration or other sludge treatment processes
  - Reduced chemical consumption
  - Increased sludge throughput

Sludge Dewatering

- Determine the capillary suction time of the sludges and fat/fibre content
- Perform capillary suction time tests to determine correlations between flocculant type/dose and dewaterability.
- Update SRDB with new data on de-waterability as expressed by capillary suction time test results
- Report on effect of flocculant type and dose on sludge dewaterability for different sludge categories

Anaerobic Digestion Technology

- The OFT has now issued recommendations designed to encourage increased competition and greater efficiency in the treatment of organic waste.
- Addition of wastes with a higher C:N can result in a greatly increased biogas yield.

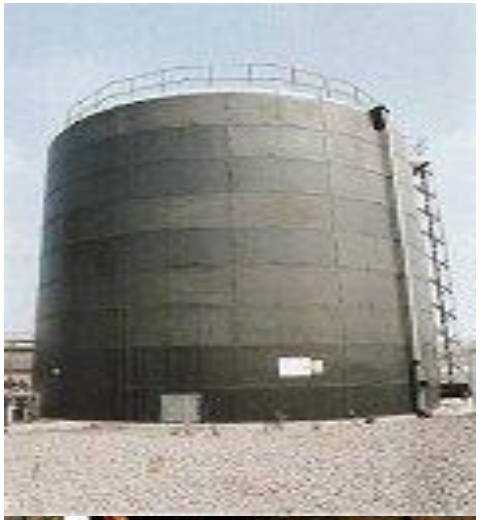


Anaerobic Digestion Technology

- Survey of potential new waste streams, investigating properties such as rheology, density and nutrient content.
- Laboratory scale co-digestion experiments on streams identified from the survey.
- Evaluation of the effect of co-digestion on sludge rheological properties, de-waterability and mixing.
- Evaluation of the potential for existing process plant to adapt to take advantage of the co-digestion potential

Sludge Tank and Anaerobic Digester Design

- The desire for sludge treated to an enhanced standard has led to increasing numbers of hydrolysis plants upstream of digesters.
- AD can only realise its full potential with improved mixing system design to ensure rapid blending of thick, gassing feeds.



Sludge Tank and Anaerobic Digester Design

- Develop design guidelines for retro-fitting of existing digesters to handle hydrolysed or co-digestion sludge feed.
- Develop physically validated CFD models of digester or sludge tank unconfined gas mixing systems.
- Further development of the Digester Mixing Design Guide.

Primary Sedimentation Tank Optimisation

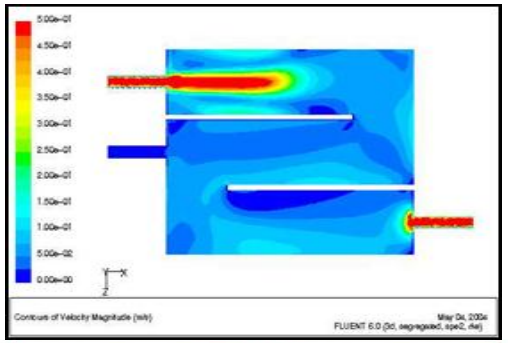
- Primary sedimentation tank (PST) performance is key to overall WWTW operation
  - Poor solids removal leads to excessive loading on downstream process units (activated sludge and tertiary treatment)
  - Improved solids removal leads to higher organics in digester sludge feed and increased gas production.
- Enlargement or construction of new PSTs is very expensive and requires sufficient available land area.

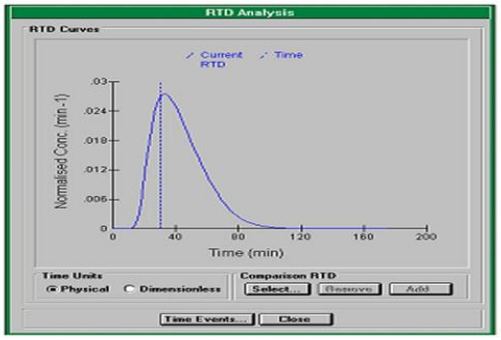
Primary Sedimentation Tank Optimisation

- Review recent literature on sedimentation tank performance modelling.
- Develop CFD modelling of PST hydraulics and SS removal to demonstrate impact of retro-fitting design.
- Select WWTW and make RTD and SS removal measurements for validation of models.
- Produce Primary Sedimentation Tank Design Guide

WWM Website

- Based on tried and tested model
- Enabling WWM members to:
  - Download deliverables and reports
  - Have remote access to software tools
- Allow improved version control
- Faster dissemination of deliverables





Moving Towards Phase 8…..

- Conclude Individual Meetings
- Complete Work Packages
- Issue WWM 8 Proposal
- Voting
- WWM8

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Thank you

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Water, Environment & Power (WEP)

Fluid Systems

Academy

Process

BHR Group is a trading name of VirtualPiE Limited