RESOURCE RECOVERY NOT WASTEWATER TREATMENT

22ND JANUARY 2009 • THE GEOLOGICAL SOCIETY, LONDON

INTRODUCTION

The basic principles of wastewater treatment have remained unchanged for at least one hundred years. Our sewerage network uses water as a vehicle for transporting solids in soluble or particulate form, from their site of production to a wastewater treatment facility. At the treatment works the process is reversed and the solids removed from the flow stream. Physical separation is used to remove particulate material, whereas biological treatment is used to convert soluble organic compounds and phosphorus into particulate biomass which can then be separated by physical settlement. The treated effluent is suitable for discharge to watercourse and the solids receive further treatment before final use or disposal. This system has served us well in protecting health and the aquatic environment, but in today's carbon conscious, water hungry and, energy and resource scarce world, is it now found wanting and should each stage of the process have a serious rethink if it is to serve another hundred years?

In principle wastewater contains many valuable resources, namely: water, energy, nitrogen and phosphorus. If the value of the resources in a wastewater were included in the process selection and financial appraisal, then in it is highly likely that more sustainable alternatives would be selected. Organic carbon, quantified using the well know BOD test, can be biodegraded anaerobically in the absence of oxygen when the carbon is reduced to methane. The energy from combustion has a theoretical yield of 160 W/m^3. A modern mesophilic anaerobic digestion process fitted with some form of sludge pre-treatment (such as thermal hydrolysis, enzymic hydrolysis or sonication) can yield around 1 MW for every tonne of solids destroyed through a combined heat and power route. In addition there are ways of speeding up the MAD process and increasing methane yields, for instance by blending the sludge with other, high carbon wastes such as food industry waste. This opens up a range of possibilities for sweating existing Water Company assets by accepting biodegradable waste from a range of sources and recovering energy embedded in these wastes.

In areas of water scarcity, the water recovered from wastewater has significant value. Already, in Australia, it has been financially viable to construct a pipeline and reservoirs to transfer reclaimed water, plus its dissolved nutrients, to irrigate (fertigate) vines. Without the water that land would not be farmable because of the long-term drought; using reclaimed water for irrigation obviates the need for biological nutrient removal (which is required for disposal to the ocean) and conserves the fertiliser resource. Nitrogen and phosphorus both occur in raw wastewater, albeit at relatively low concentrations of about 45 mg N/l and 12 mg P/l. Due to the large volumes of wastewater processed daily, the N and P load is high and has the potential to supply us with 45% of our fertiliser needs as phosphorus and 38% as nitrogen. Recovery of nutrients at such low concentrations is a challenge, but again anaerobic digestion can provide a solution and digested liquor can contain 500 mg P/l and in excess of 1,000 mg N/l. Struvite is a metal ammonium phosphate salt that is insoluble, but bound N and P can be released to plants by a biologically mediated slow release mechanism. Controlled struvite precipitation can recover 90% of the P and 20% of the N from sludge liquors.

The last revolution in sewage treatment occurred in England in 1914 and it is a fitting challenge to the UK water industry to drive another revolution before the centenary of this takes place in six years time.

VENUE

The Geological Society
Burlington House, Piccadilly, London, W1J 0BC

The venue is situated between Green Park and Piccadilly Circus tube stations, full directions will be forwarded when you register.

www.geolsoc.org.uk

@qua enviro
TECHNOLOGY TRANSFER

RESOURCE RECOVERY - NOT WASTEWATER TREATMENT

PROGRAMME

09.00 – 09.45 Registration

09.45 – 09.50 Chair's Introduction and Welcome

09.50 – 10.20 The value of water

Speaker to be confirmed

10.20 – 10.50 Optimal (sewage) treatment to meet the resource needs

Steve Bottom, Principal Consultant, GHD

- range of potential water qualities and by-product resource available
- pilot plant testing of the options
- end user studies into viability of resource use
- economics of total re-use

10.50 – 11.15 Questions and Discussion

11.15 – 11.40 Coffee Break

11.40 – 12.10 Stripping N and P for Recycling

Tim Evans, Tim Evans Environment

- Stripping P for use as mineral fertiliser reduces load on wastewater treatment and 'improves' the N:P balance in the biosolids.
- The world's P is running out, we are nearing 'peak P', we must stop squandering P.
- Struvite in the wrong place is a problem; stripping turns it into an opportunity.
- Why pour energy into blowing off nitrogen when 90% of ammonia in dewatering liquor can be recovered as valuable mineral fertiliser?

12.10 – 12.40 Sludge as a source for biomolecules like biopolymers

Olof Norrlow, Head of Recycling Competence Centre, Kemira

- New sources for polymers
- Sludge as raw material
- Why sludge is problematic
- Purification of biomolecules
- The use of cells as chemical factories

12.40 – 13.00 Questions and Discussion

13.00 – 14.00 Lunch

14.00 – 14.30 The sewage works of the future - energy drain or energy gain?

Dr Bruce Jefferson, Cranfield University

- Increasing consents result in bolt on technology and higher energy processes. Yet sewage contains components which can be converted into energy and valuable resources.
- A range of potential new flow sheets will be discussed to describe how technology can be used to deliver energy generation at sewage works.
- Limitations and barriers will be discussed in order to describe the necessary changes that need to occur

14.30 – 15.00 Sewage – energy liability or asset?

John Tattersall, Regional Director of Process Technology, Black & Veatch

- Typical sewage contains 1 KWhr/m^3 of energy in the oxygen demand contained but we typically use 0.3 KWhr/m^3 of energy in treating it. Is this really the best we can do?
- Steps to date Digestion typically bring energy bill down by 0.15 KWhr/m^3
- Technologies to get into positive territory eg UASB's
- Next step? Anaerobic Membrane Bio reactors

15.00 – 15.15 Discussion Session

15.15 – 15.35 Coffee Break

15.35 – 16.05 Increasing phosphorus recovery potential from digested sewage sludge as MAP-Struvite

Kenan Guney, ISWA

- Effect of metal ions on struvite production
- Maximising MAP production and quality
- MAP recovery by chemical precipitation and separation
- Compliance with fertiliser regulations

16.05 – 16.35 Use of advanced anaerobic digestion of sewage sludge to increase renewable energy and reduce carbon footprint

Bill Barber, United Utilities

- Standard digestion of sewage sludge in the UK generates a carbon footprint in spite of biogas generation.
- Pre-treatment processes exist which can further increase renewable energy generation and reduce carbon footprint, potentially making the system carbon negative.
- The carbon footprint of sewage sludge digestion and a few of the technologies available to reduce it.

16.35 – 16.50 Discussion Session

16.50 Chair's closing remarks

BOOKING FORM

Delegate Details

I would like to register to attend the '**Resource Recovery – Not Wastewater Treatment'** conference on the **22nd January 2009**

Title _____

Name _____

Organisation _____

Address for Correspondence _____

_____

_____

Postcode _____

Tel _____

Fax _____

Email _____

Fees £295 (+VAT) per delegate = **£346.63**

Method of Payment

CHEQUE: I enclose a cheque for

£ _____

Payable to AE Technology Transfer
(A VAT Receipt will be sent automatically).

INVOICE: Please invoice for the sum of

£ _____

Purchase Order _____

Contact Name _____

Contact Number _____

Invoice Address _____

_____

_____

CREDIT/DEBIT CARD:

Card Type _____

Card Number _____

Name on card _____

Expiry date _____

Issue number (for Switch) _____

Security number (last 3 digits on reverse of card) _____

Registered address (if different to delegate address above)

_____

_____

Terms and Conditions

A charge of £40 (+VAT) will be levied for cancellations made up to 20 days prior to the event. Cancellations after this period will be liable for payment of the full fee. Payments should be received 30 days of receipt of invoice.

Signature _____

Date _____

Enquiries and booking forms directed to:

AE Technology Transfer, Unit 8, Appleton Court, Calder Park, Wakefield WF2 7AR

Tel: 01924 257 891 Fax: 01924 257 455

Email: clarehunter@aquaenviro.co.uk