

KWATYE (WATER) PRIZE PROJECT BRIEF

WASTE RECOVERY – NOT JUST SLUDGE STABILISATION

The project will investigate anaerobic digester plant operating practices in Europe, specifically to look at digestion optimisation to improve biogas generation and recovery for energy reuse.

European countries have a long history on optimising sludge digestion. With the recent concern about climate change, these efforts are increasingly focussed on maximising energy recovery to lower carbon emissions. This is now an important area for focus in Australia and many of the European learnings can be transferred to Australia.

Processes such as gas capture from released sludge, optimisation of the calorific value of the biogas, cell lysis technologies, co-digestion of other waste products and digester stability operating parameters will all be investigated.

The applicability of these processes to the new micro-turbine energy recovery technology will also be investigated.

The outcomes of the investigation should have wide applicability to Australian treatment plants and operational staff.

KWATYE (WATER) PRIZE PROJECT DESCRIPTION

Rodney Curtis

Western Water

Melton Recycled Water Plant

July 2011

WASTE RECOVERY – NOT JUST SLUDGE STABILISATION

Introduction

The Melton Recycled Water Treatment (RWP) plant services the major growth areas surrounding Melton in Melbourne's growing Western Suburbs. Over the next 30 years, some 1 million people are expected to move into the wider region. In recent years sections of the plant have been under continuous upgrade to meet these growth needs.

The Plant comprises several components including an activated sludge treatment system, polishing lagoons, irrigation storages and a Class A Recycled Water Treatment system for the region's third pipe reticulation network. An anaerobic digester is also operated to treat sludge generated from the process. (See attached)



The anaerobic digester at the plant is approximately 30 years old and nearing its design capacity. This digester has, in the past, provided a robust and reliable sludge treatment process. There is sufficient biogas produced to heat the digester to optimum temperature, however in the past excess gas was flared. During summer the biogas was sometimes flared continuously because thermal losses were lower in the digester.

Our team identified this flared gas as a waste of an energy resource. As a consequence in 2010, Western Water installed a micro turbine co-generation plant. This was the first such first installation in Australia, operating on sewage biogas (Ref AWA Paper).

The micro turbine has the capacity to reduce the total power drawn from the main electricity grid by up to 70 %, and significantly lower the carbon footprint of the Plant. The waste heat from the micro turbine is also recovered and used to heat both the digester and the “Clean In Place” tank at the Class A Recycled Water Treatment System.

Maximising Biogas Production and Improvements

With sludge stabilisation processes achieved and after now successfully operating the co-generation plant for several months, the operating objectives have shifted from sludge stabilisation to maximising biogas production for energy.

Currently all biogas is recovered to produce electrical and thermal energy through the micro turbine. Small percentage gains in bio-gas production are important and pursued, as this improves the efficiency of the overall co-generation plant, therefore improving Western Water’s CO₂ reduction targets.

Since the co-generation plant was commissioned I have carried out a significant amount of research on anaerobic digestion including discussions and sharing data with Dr. Klaus Nickel from Ultrawaves at the Northern Institute of Technology in Germany and Dr Maazusa Othman Environmental Engineering, School of Civil, Environmental and Chemical Engineering RMIT University

Some of the areas for digestion enhancement that I have identified and would like to further explore are:

- Capturing gas from digested sludge as the sludge is released from the digester.
- Running different internal gas pressures in the digester to scrub CO₂ from biogas and thereby improve the calorific value of the biogas.
- Installing a floating cover on sludge holder (storage tank for digested sludge) to capture biogas that is being released to the atmosphere.
- Co-digestion of other select waste products such as algae or food waste which are generated in the region.

Two other areas that I’ve identified and have been able to instigate and implement improvements are:

- *Optimising pre-thickening processes by building a poly batch plant in-house.*
This optimises the sludge thickening process by blending primary and waste activated sludge in one rotary drum thickener. This has the advantage of increasing solids detention time in the digester, thereby producing more bio-gas. It also assists in increasing the capacity of the digester.
- *Pre treatment of feed sludge to digester by cell lysis destruction*
I conducted a two month full scale ultra sonic cell lysis destruction trial with assistance from Royce Water Technologies which gave me a fantastic insight into pre- treatment applications for feed sludges entering digesters. Some of the key outcomes from this trial were:
 - 10% increase in bio-gas production

- Improvements in the dewater ability of digested sludge
- Improvements in settleability of digested sludge allowing the supernatant to be removed more readily.

One of the key outcomes from the trial from an operational perspective was the stable process environment that was created in the digester. The normal peaks and troughs that occur with anaerobic digestion were reduced significantly. This benefit is difficult to quantify in dollar terms, however the peace of mind that it provides the operator is invaluable.

As you may have gathered I have a great enthusiasm for anaerobic digestion. I enjoy my work immensely and find it incredibly rewarding. Treating and recycling waste water into recoverable products is helping to protect the community and environment, while reducing Western Water's CO₂ emissions. This will continue to be increasingly important as the region grows.

European Study Tour

If successful with the Kwatye Prize I intend to visit overseas treatment plants to further investigate anaerobic techniques. European countries such as Germany have pioneered ultra sonic cell lysis disintegration processes and have many full scale applications.

It would benefit me directly to meet and talk with Operators that have been using this treatment process, and also to see what other small percentage increases in bio-gas production that could be easily adapted to plants in Australia.

I have Western Water's full support with my endeavours. On my return, I anticipate being able to implement some of the ideas as outlined in this proposal with greater conviction, including any other efficiency gains identified from the plants that I have visited.

I am also keen to presenting my findings to other Operators within the industry to assist them in their endeavours to achieve greater digestion efficiencies, and assisting the Water Industry to achieve lower CO₂ emissions.

I would also like to thank WIOA and Thermo Fisher Scientific for the opportunity to submit this application and I look forward to hearing from you in the future.

Rod Curtis
Team Leader – Melton Recycled Water Plant

Rod Curtis
Western Water
Personal Profile
July 2011

Work Experience

- Position: Team Leader Melton Recycled Water Plant (RWP).
Western Water.
Nov 2005 to present
- Duties: Team Leader Duties, supervising all operational staff at Melton RWP and management of the Melton RWP.
- Position: SCADA Coordinator.
Western Water.
18/6/2004 to Nov 2005.
- Duties: Coordination of SCADA projects.
- Position: Plant Operator Sunbury RWP Team
Western Water.
24/4/97 to 18/6/2004.
- Duties: Wastewater Plant operations and maintenance.
- Position: Electrical Contractor.
Calco Electrical.
18/5/94 to 14/4/97.
- Duties: New domestic, commercial and industrial installations.
Repairs and fault finding.
- Position: Distribution Substation Electrician
Public Transport Corporation
28/5/90 to 1/5/94
- Duties: Installation, maintenance and modification of switchboards, lighting and power circuitry. High voltage operations and issuing high voltage work permits. High voltage cable jointing and termination.
- Position: Electric Train Maintainer
Public Transport Corporation
28/1/90 to 27/5/90
- Duties: Preventive and reactive maintenance of electric trains, installation of new equipment on electric trains and fault finding as per driver requirements.
- Position: Electrical Fitter
Public Transport Corporation
28/1/89 to 27/1/90
- Duties: Repairs to electrical motors, generators, switchgear and high speed D.C circuit breakers. Repairs to power tool and armature winding.

Position: Electrical Fitter Apprentice
Public Transport Corporation
28/1/86 to 27/1/89

Duties: Training in various workshops
Electrical testing
Electrical plant workshop
Locomotive overhaul workshop
Electrical train substation
Apprentice Training Center

Major Achievements

- Completing Certificate II in Water Industry Operations
- Completing Certificate III in Water Industry Operations
- 2006 AWA Operator of the Year
- Diploma of Business Management 2010
- Involved in project team delivering major capital projects for Western Water

Activities and Interests

- My interests outside work include spending time with my family and enjoying the outdoors camping, especially fishing.
- Renovating house