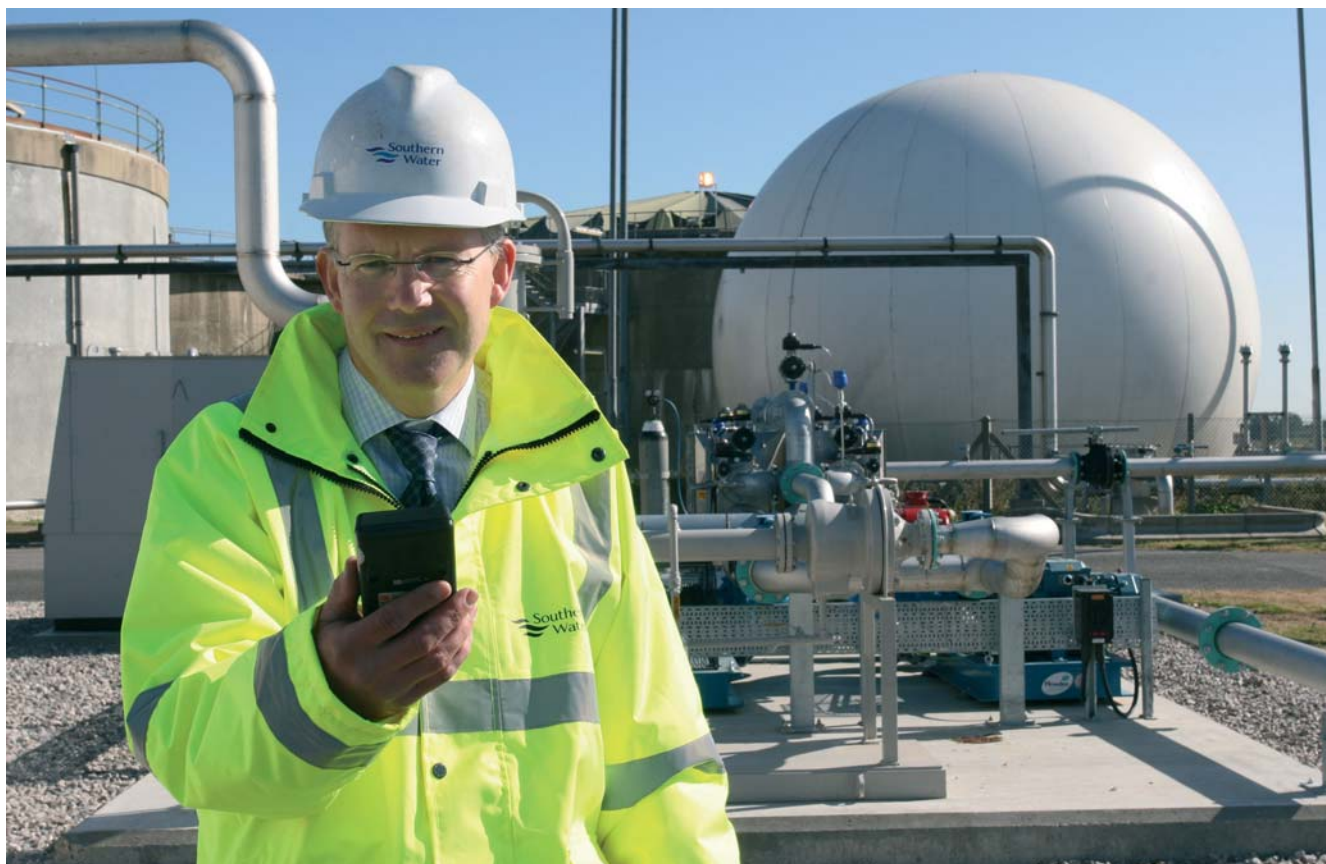


Budds Farm CHP

getting the most out of recycling waste

by M J Ross

Southern Water is continually looking for new ways to improve the sustainability of its processes. The protection of the wider environment must be at the heart of the decision process and while the company is required to upgrade wastewater treatment works to meet the Urban Wastewater Treatment Directive it recognises that these new treatment methods are energy intensive in their efforts to remove nitrogen. It is, therefore, important that there is a continuous review of energy creation treatment facilities, such as Combined Heat and Power (CHP).



Carbon Policy manager Martin Ross at Southern Water's CHP facility

photo courtesy Southern Water

Southern Water has made significant investment in biogas fuelled CHP and now has eleven operational CHP with the capacity to generate approximately 10 per cent of the company's electricity consumption. The company has set itself a target that by 2020, 20 per cent of the energy used will come from its own renewable sources.

Budds Farm Waste Water Treatment Works is the latest site to benefit from CHP. The site, which is located at Havant in Hampshire, is the largest of the company's waste water treatment works treating wastewater from Portsmouth and surrounding area.

To facilitate the delivery of these CHP schemes a framework was tendered and awarded to Finning Power Systems and Cogenco Ltd. The framework includes unit costs for the supply and installation of a range of CHP ratings. A schedule of rates is also provided to cover the variance in site specific installations relating to the distances for power, hot water and biogas service connections.

The framework includes a 10 year operation and maintenance (O&M) contract with the charges based on engine run hours. The agreement also includes guarantees on performance for electrical and heat output

and engine availability with a 'pain-gain' approach to under and over performance. Biogas quality is another variable and a significant issue for CHP performance. Variance in quality and the impact on maintenance costs is managed under the framework with a biogas quality/O&M fee matrix which increments the O&M fees as the levels of Hydrogen Sulphide and or Siloxanes in the biogas changes.

Budds Farm Waste Water Treatment Works includes sludge treatment of up to 18,000tds/annum. The sludge is thickened, digested, centrifuged and dried before being distributed to local farms for use as a fertiliser. The sludge dryer operation was originally fuelled from biogas and although this minimised the amount of natural gas consumed at the site it did not prohibit operation of CHP. The operating regime was also wasteful in that not all the biogas produced during sludge digestion was consumed by the dryer and the surplus was wasted to flare. The corrosive nature of the biogas also caused problems with the dryer burners resulting in increased maintenance and reduced dryer availability, which resulted in further biogas wastage.

A review of the economics of installing CHP fuelled from biogas and switching the existing sludge dryer to natural gas was carried out and

GENERATING REVENUE FROM BIOGAS

Finning Power Systems is the UK's leading supplier of power and Combined Heat and Power (CHP) solutions to the water and sewage treatment industry.

The company has a framework agreement with Southern Water to develop CHP solutions across a number of its sites.

At Budds Farm the site was using biogas from the digesters as fuel to run a sludge dryer. Finning suggested that this biogas should be used as fuel to power a Caterpillar G3520C generator set to produce 2MW of electrical power – enough to power the whole plant. The heat recovered from this system and the dryer warms up the digester to the optimum temperature for biogas production.

Southern Water can also sell the electricity produced from this system back to the grid at an enhanced tariff under the Renewable Obligation Certificates (ROCs) scheme. Using Biogas to produce "green" electricity therefore made sound financial sense.

DELIVERING THE SOLUTION

Using biogas to power a generator requires a lot of planning and engineering to overcome technical issues due to contaminants in the fuel. In addition, installing a CHP system on an operational site can involve a lot of disruption.

Finning proposed a modular approach, where much of the engineering and design work was completed off site way in advance of delivery and installation.

This had several benefits. First, all of the modules were subject to a strict factory based quality control regime. It also allowed Finning to use more of its in-house engineering resource to ensure that the bespoke solution met all of Southern Water's needs. But perhaps most important, it halved the amount of time spent on site installing the solution.

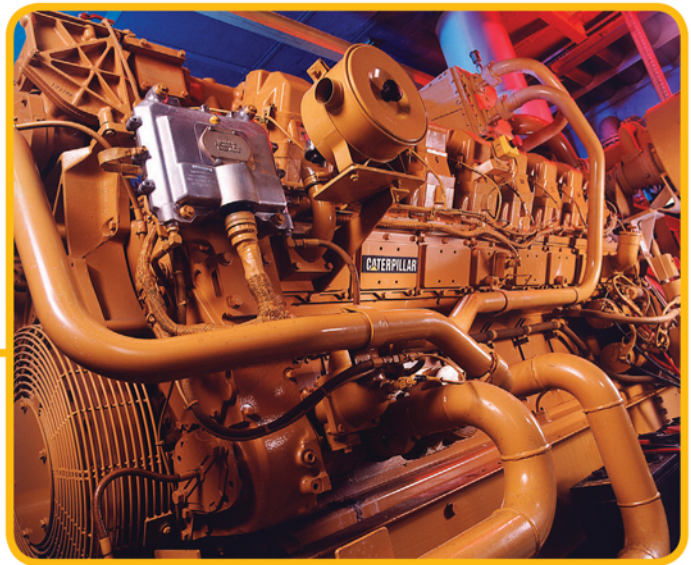
MODULAR SOLUTIONS

Biogas is not a perfect fuel source. The level of contaminants in this gas will vary from site to site. For Budds Farm the main contaminants were siloxanes and hydrogen sulphide (H₂S).

The system developed by Finning is designed to remove such contaminants thus ensuring that the generator set can use the biogas as a fuel. Finning delivered the solution in four modules.

The first module was a fully packaged generator set that included synchronising switchgear and the company's versatile LIMA control system. This connects to and monitors the site's HV switchgear.

The second module was a fully packaged heat recovery system designed to capture heat from both the jacket water and exhaust of the high efficiency G3520C.



Module three was a gas collection and compression station that filters and also removes some of the solids and vapour from the biogas.

Finally, the fourth module is a gas clean up skid that removes other contaminants such as siloxanes and H₂S. This fourth module uses new technology to remove the siloxanes. The filters use a regenerative media instead of activated carbon filters with charges lasting up to five years, eliminating the problem of waste carbon disposal.

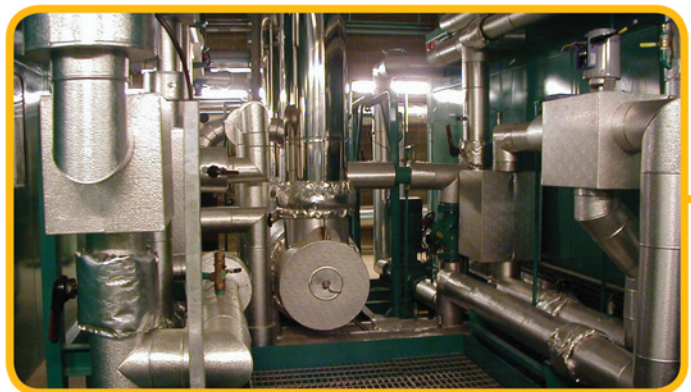
SERVICE AND SUPPORT

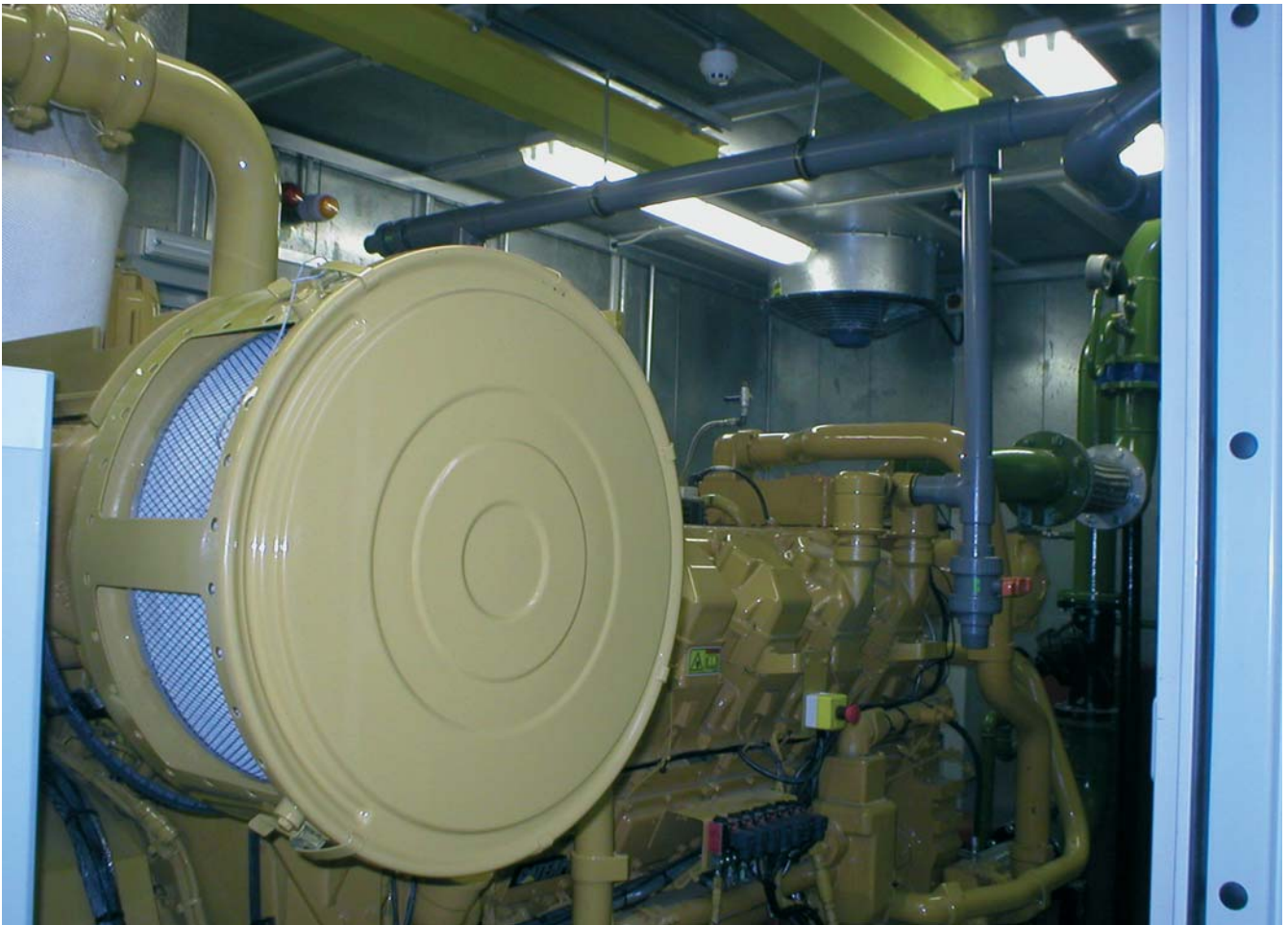
Following the installation, Finning has agreed a commercially guaranteed ten year Operation and Maintenance contract with Southern Water to optimise the generator's output and heat recovery with the fuel available.

Says Mark Barnes, General Manager for the Power and Energy division at Finning Power Systems: "For biogas fuelled solutions the details of the maintenance contract are extremely important, particularly if the site is to maintain power production."

Finning will service the engine at regular intervals and check oil samples for evidence of wear and contaminants. They will also provide 24 hour, 365 days per year remote monitoring of the generator set from their Operations Centre in Slough.

Delivering a CHP solution and using biogas as a fuel for electrical power generation can make sound financial sense and help the environment. Make sure that you do your research, however, and pick a partner that has relevant experience and a proven track record.





Containerised CHP Unit

courtesy Southern Water

the revenue from the sale of Renewable Obligation Certificates (ROCs) together with the saving on the amount of electricity imported to the site were sufficient to justify an investment of £1.9m on a 2MWeCHP system and the contract was awarded to Finning Power Systems in June 2007. The project also included Ferric Chloride dosing to reduce Hydrogen Sulphide levels in the biogas and a Pptek auto regeneration filtration system to reduce Siloxane levels.

cleaner more consistent natural gas is anticipated to reduce sludge dryer maintenance time, costs and more importantly reduce down time. With the rising cost of energy the CHP scheme is expected to achieve a payback in less than 4 years lower still once Enhanced Capital Allowances have been claimed. Southern Water will continue to invest in renewable generation such as CHP to ensure that its target of 20 per cent renewables by 2020 is achieved.

The impact on Southern Water Operations following installation of the CHP has been positive and fuelling the sludge dryer from the

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Carbon Policy manager Martin Ross at Southern Water's CHP facility

courtesy Southern Water