

Going greener with Palmerston North City Council's biogas to energy project



BY ANN PISTACCHI

Sustainability is important to Palmerston North residents. The issue was a key theme that came through in the public consultation on the city's 10-year plan and it is a cornerstone to the Palmerston North City Council's vision to "make the city a better place to live."

The Palmerston North City Council (PNCC) website says that "this means getting a good balance between social, economic, environmental and leisure activities for current and future residents." As a means to achieving this goal the council launched its "Going Greener" campaign.

"Going Greener" is an over-arching strategy and marketing brand linked to specific long-term sustainability goals and targets. The strategy includes projects focused on composting food waste, increasing recycling volumes of paper, cardboard and metals, promoting public transport use and, perhaps most significantly, developing sources of renewable electricity for the city.

PNCC currently has a target to generate 100 per cent of the city's

electricity needs (2.5 MW) by 2012. The council plans to generate this electricity by harvesting the energy potential in landfill and biogas as well as increasing capacity of their existing (mini) hydro and possibly wind generators. The long-term goal is for biogas to replace landfill gas as it is depleted in the next 15 to 20 years.

PNCC services engineer for water and waste, Phil Burt, says that when his team first set out to increase renewable energy generation: "we thought we would be able to just put in a second generator and run it off of landfill gas and biogas from the existing digesters, but when we went out to the marketplace with this idea we quickly came to the realisation that we didn't have enough landfill or biogas to do this."

Mr Burt says it was "serendipitous" that while PNCC engineers were investigating different biogas engines they happened to go to Hamilton where council staff had been working successfully with a consultant named Dr Jürgen Thiele, a research and development specialist at Waste Solutions (a division of CPG (NZ) Ltd) on

their own waste management issues. They gave PNCC staff Thiele's details and Mr Burt says "things snowballed from there."

Soon after the Hamilton visit, Waste Solutions-CPG (WS-CPG) was engaged by PNCC to undertake a programme of investigation, design and construction management services to improve the PNCC digester performance. The goal was to meet the unique requirement to achieve a 400 per cent improvement of the daily biogas production capacity in the existing sludge digesters by 2012.

The fact that this plan used existing city assets proved to be both a benefit and a challenge to the project. The two existing municipal sludge digesters at PNCC's Totara Road plant were installed in the 1960s to treat municipal sludge (primary sludge biosolids). By 2008, tests conducted by Waste Solutions-CPG showed that the mixing efficiency in both PNCC Totara Road digesters was low. Thiele says "the tests showed that PNCC was not achieving more than about 50 per cent of the potential digester biogas production capacity – mainly due to inefficient contact between the sludge bacteria and the



primary sludge biosolids. This means there was significant potential to improve the daily biogas production by improved digester mixing.”

Thiele therefore suggested a series of practical, economical steps for designing and implementing digester upgrades.

Mr Burt says with Thiele’s help “we’ve progressed to the point where we’ve purchased the engine (which is now onsite and being commissioned) and we’re about one-third of the way through the upgrade to our biogas digesters,” with the remaining equipment purchased and awaiting delivery.

The costs to upgrade the two digesters to four times the daily biogas production including a new waste reception are in the order of one million. The total cost for this project is approximately \$3 million including the generator.

“This is a big investment,” Mr Burt says, “but we’ve done some very careful financial modelling and we believe the engine and upgrades will pay for themselves within eight years from energy sales. Not only that, but the plant will make us money in the future.”

Thiele claims the fast repayment and potential for future earnings comes from three main sources: sales of produced green electricity, a lessened need to buy pipelined natural gas to operate the generator (which will eventually run on 100 per cent biogas) and PNCC’s plan to collect a “gate fee” for receiving new waste materials into its upgraded sludge digester facility. One of the greatest benefits of the improved PNCC Totara Road digester facility is that it can digest a wider range of additional industrial waste including piggery manure, whey waste, grease trap waste, and selected food industry flotation foams. Digesting this waste produces an increase in biogas – which means PNCC ultimately avoids natural gas purchase costs and gets the income stream from collecting the waste in the first place.

By viewing organic waste as a resource, PNCC is not only helping to divert organic material from water and landfill disposal (Mr Burt claims the upgrades will reduce sludge that goes to landfill by 60 per cent), it is finding a way to generate greener revenue streams well into the future. WS-CPG is now exploring the application of this technology at other sites in New Zealand.



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Finding an effective dewatering solution

When Jurgen Thiele and his team needed a new dewatering solution at the upgraded Palmerston North Totara Road plant, they turned to Andritz Pty Ltd.

Nick Cvet at Andritz knows that demands on dewatering solutions vary widely, so he worked closely with Thiele to supply the 'optimum solution' for Totara Road.

"The function of the thickener in the [Palmerston North] project is to thicken the anaerobic sludge in order to increase the active biomass concentration in the digester," Cvet says.

"Thiele required a machine that would thicken the waste product from 3 or 4 per cent to about 8 per cent. After we presented him with a few options, he chose the rotary drum thickener."

Cvet says the drum thickener is extremely effective and easy to use. Prior to the feed being sent into the thickener, a polymer is mixed into the waste stream via a venturi mixer. This polymer increases the efficiency of the thickener and improves the solids capture rate. As



the feed enters the thickener, it is slowly turned over, which can increase the effectiveness of the solid/liquid separation (compared to gravity thickeners). The filtrate passes through a polyester belt while the solids are rolled towards the solids discharge hopper.

An added advantage to the Andritz drum thickener is that it has a smaller footprint than gravity thickeners, so less floor space is required. The machine is

also easy to maintain, with quick and simple parts replacement, and is completely enclosed ensuring a safe working environment.

The effectiveness of the drum thickener directly results in considerable cost savings when it comes to transporting sludge after treatment.

"When you're paying by the ton to transport waste," Cvet says, "hauling water is wasted money."

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