## Australia's First Biogas MicroTurbine at Melton Recycled Water Treatment Plant

In an Australian first, Western Water (VIC) partnered with Aquatec Maxcon to design, supply and install a Micro-turbine cogeneration plant at the Melton Recycled Water Treatment Plant to operate on anaerobically produced bio-gas. The single turbine provides more than 200kW of electrical power, along with 276kW of heat to enable the plant's digesters work at optimum efficiency and minimise electricity charges. A pre-treatment system ensures that the Cogeneration plant is protected from silica deposition from Siloxanes in the digester gas.

In a world that is facing a resource crisis, the emergence of the carbon industry, re-cycling, bio-fuels and renewable energy provides a pathway for sustainability. Although most treatment plants (i.e. reclamation plants) have a high power usage, alternative clean energy can be substituted from methane production or derived from natural gas.

Anaerobic digester systems have been used for decades at municipal wastewater facilities, and more recently have been used to process industrial and domestic wastes. These systems are designed to optimise the growth of the methane-forming (methanogenic) bacteria that generate CH4. Typically, using organic wastes as the major input, the systems produce biogas that contains 55% to 70% CH4 and 30% to 45% CO2. The Melton Recycled Water Treatment Plant utilises mesophilic anaerobic digestion operating at an elevated temperature of 35 to 38 degC. An external energy source is required to maintain this elevated temperature.

The cogeneration system provides enough power and heat at the Melton Recycled Water Plant to make the plant's digesters work at optimum efficiency. This simple, elegant system likely will serve as a model for similar projects at wastewater treatment plants.

The efficiency of thermal generation to supply hot water to heat the plant's digesters will result in the production of even more biogas that can be converted to energy generation.

The cogeneration system will produce 1.7 million kW-hours (kWh) yearly to supply the plant's electrical power needs, using as fuel up to 100 Nm3/hr cubic meters of biogas from the plant

that would have been burned as waste. Second, an external heat exchanger installed with the micro-turbine will deliver another 2.3 million kWh of thermal energy to warm the digesters. Together, the combined heat and power produced will cut carbon dioxide emissions at the plant by 1800 tonnes per year.

When Siloxanes are present in the fuel to a cogeneration system, tiny particles of silica can be formed in the combustion section. The silica particles can build up and accumulate in the combustion devices like nozzle vanes of a turbine wheel, or valves on a gas engine and then exit through the exhaust and heat exchanger if installed. The siloxane capacity of absorption onto activated carbon is also influenced by the relative humidity of the gas crossing the carbon. Chilling of biogas prior to treatment with activated carbon benefits the life of activated carbon in two ways. First, the chiller can be expected to remove some of the siloxanes. Second, the adsorption loading of the carbon is influenced by the relative humidity and temperature of a gas.

Today technology exists that can produce a waste gas with less than 4 ppm NOX and 40 ppm CO that is cleaner than the urban air environment.

We engineer and deliver custom designed plant and processes, we reduce trade waste discharges to the environment from wastewater plants, similarly clean energy derived from methane generation can reduce the carbon footprint of the treatment plant.