Notes from site visits in Bordeaux

SIVOM des Canton du pays de Born

Small scale energy from waste

Site visit to a small scale energy from waste plant serving 16 communes, covering a population of 58131 inhabitants and approximately 42,000t of waste. The population is also served by separate collection in a system that involves bringing separated waste to collection points, not collected from the households. This system began in 1997 and consists of 13 recycling centres.

History and context: The plant opening in January 1997 with one line which processes 5.3 tonnes per hour. It comprises a rocking furnace. In 2014, the plant took a total of approximately 42,000 tonnes - 16,000t waste from the locality and 26,140t from other regions outside of the core communes. The major issue the operators have is the influx of visitors in the summer, which means that there is too much waste in the summer and this has to be stored for combustion in the winter. The storage of waste over the summer is normally of the order of 6,400 t, but a recent problem means that they have had a shut down and a large amount of refuse is being stored on a temporary basis. The site has a contract with Sivom for 4 years, but this can be extended.

Staff: The plant employs 16 staff. One plant controller per shift.

Waste input: The waste contracts are for four years but these have twice been extended. The amount of waste produced in the time since opening has decreased. The original plans were that waste would increase by 2% a year, but this has not happened due to the increase in recycling, and so the amount of waste available from the core area is much less than expected. As a result the plant operators have been able to extend the area from which they take waste.

Hours: operating hours have been 7752-7841/year. Availability is 95.7%.

Output: in 2014, the plant generated 9,316,950 kWh. However, this was not typical. In 2010, 14,289,822 kWh were generated.

Capacity for storage: 4200t. This is treated to decrease odour and manage fire risk. Waste is stored in the summer and used in the winter. They have had issues with fires due to waste storage, but have put in procedures to deal with this effectively. Waste is normally stored within a building.

Energy: The plant generates 13,800MWh electricity and 40,000MWh heat. Electricity is supplied to the grid, and heat is supplied to a recently constructed 10,000m^2 greenhouse, which utilises 1MW of heat per 1000m^2. 30% efficiency. The heat network to the greenhouse came in to operation in December 2014. The heat is stored in a water reservoir at the greenhouse (3000m^3). This water is

used in the greenhouse at 58°. The overall energy efficiency of the plant including the use of heat for the greenhouse is now 80%. The plant must work closely with the greenhouse to work out the best time to undertake maintenance, although natural gas is on standby for any plant closures. This was a joint project between Tiru, the greenhouse company, and Sivom and the municipalities in the surrounding area.

Capacity: 5.3t/hour average.

Residues: 42kg/t fly ash, 176kg/t bottom ash. Fly ash is sent to a hazardous waste landfill at €200/tonne (including the cost of travel). The bottom ash is recovered, although this is not easy. It is used for aggregate, but the condition is that it must not have metals in it, so efficient metal recovery is required. Ferrous metals: 30.3 kg/t are sent to be recycled. High levels of metals in the IBA is attributed to the high proportion of tourism waste (drinks cans). Metals are removed from the IBA at the site, rather than sent with the IBA for processing off site. Sludge is sent to a special centre.

Operator: Tiru were established in 1922. (subsidised by EDF). Tiru handle energy recovery and recycling. Tiru built the plant and now operate it. Tiru employ 1,121 staff and process 3.1 million tonnes of waste per year in France, UK and Canada. . They also operate energy recovery plants in Grimsby and Exeter in the UK and operate a 9000 tpa plant used for desalination on the Caribbean island of St Barthélemy. Other plants include Quebec (310ktpa) and Saint-Oven (France) (630ktpa).

Key Performance indicators: operation at 8000hours/year; safety is a key target. The plant has had some fires. Aim to operate between 2 and 10 t/hour, with a one hour residence time.

Operation: waste is transferred via a hopper and is pushed into the kiln. The furnace is a rotary kiln and the movement of the waste is through the rocking motion of the kiln. The furnace is lined with concrete, which has to be replaced once a year. This system uses more air than a grate furnace, so the efficiency is lower. Primary air is supplied to the flame; secondary air is used for cooling the combustion chamber. There are no CO or dioxins and NOx are lower. Flue gas treatment using lime and activated carbon. Run off from storage of the waste is treated on site.

Capital cost (1996): €16 million (excluding land cost). They estimated that this would be €40 million now. For a 10,000t plant the capital cost would be ~€10 million.

The economics of CHP work because they have a long term (15year) contract with the greenhouse to supply heat at a special price. This puts them in a privileged position re tax: with the greenhouse scheme they pay a tax of €4/t; without the tax would be €8/t. This is because the efficiency of the plant has improved. The greenhouse project cost €4-5m and was paid for by EDF as a subsidy in the form of green certificates.

If Tiru were building the facility today, they would make it smaller because there is less waste due to the introduction of recycling collections and the impacts of waste reduction. Whilst waste has decreased in terms of volume, CV of the waste has increased.

Gate fee: average of €107/t (including tax). Local landfill gate fees are €102/t plus transport, but untreated MSW cannot go to the landfill.

Rotary kiln

Bottom ash

Metals extracted from ash

Greenhouse

Europlasma CHO site

Europlasma was established in 1992 to develop civil industrial applications for plasma torch technology. It has developed treatment of hazardous wastes and treats asbestos at the CHO site, but the application can also be used on fly ash and radioactive waste. Europlasma has 110 employees. The Europlasma melting solution at Morcenx is used to treat hazardous waste such as ashes, asbestos waste and other hazardous wastes and turn it in to an inert product. Europlasma report that Japan and China are making it compulsory to treat fly ashes from EfW. Europlasma are also working in the nuclear market – solid radioactive waste treatment. Europlasma have built and designed a plasma furnace to reduce waste volume and immobilise radioactive waste.

CHO Power – Turning waste and biomass in to electricity

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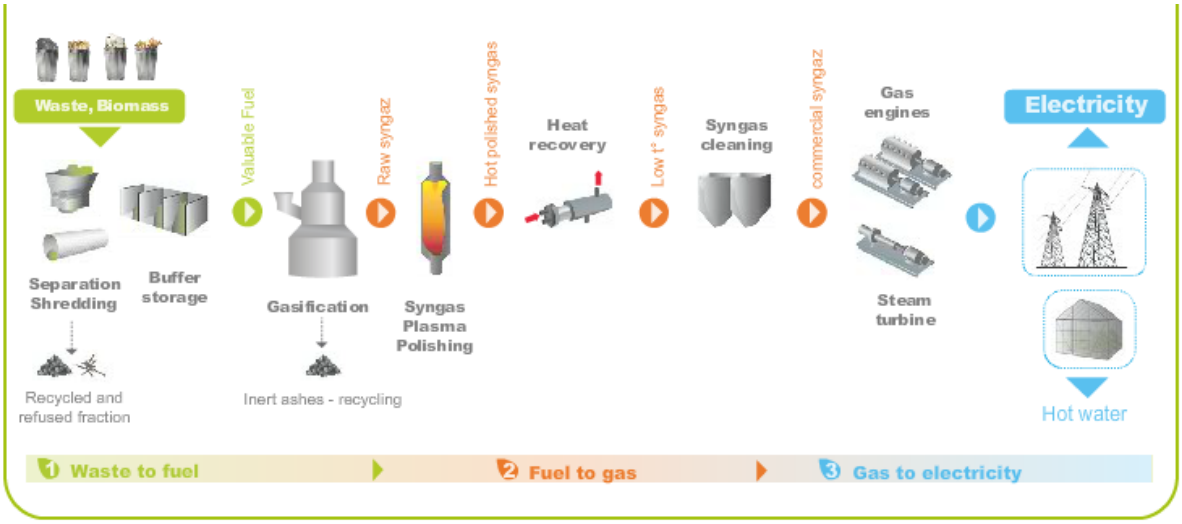
Since 2006 they have been developing plasma gasification at the Morcenx site, which is 100km south of Bordeaux. The process at Morcenx takes shredded waste and biomass, gasifies it to syngas and uses the plasma torch to polish the syngas at 1200°C. Inert materials and recyclables are removed from the input shredded waste and inert materials are removed after gasification. The gasifier produces 5-10g tars per kg and these are destroyed. The syngas is then reformed using the plasma torch at 1200°C for 300 milli-seconds. The plasma torch uses 10MW, which is maintained for approximately 1 second. Pre-treatment: injection of lime to takechlorides and sulphur compounds. Dust and soot are filtered and made into bricketts. The syngas is mainly CO and H_2 plus residual heat, which can be used for combined cycle or district heating. Heat is used to dry the biomass for the plant from 55% to 20% moisture content (using under 20% of the heat produced by the plant). The focus of the plant is on power production, not waste management.



http://www.cho-power.com/en/our-process.html

Operating conditions for CHO plant

Tonnage waste	50,000t/y of commercial and industrial waste plus 7000t/y waste wood fuel and 30,000t/y of solid recovered fuel (8t/hour). Waste is sourced from local and national waste collection companies, including Sita, Veolia, Cetraid.
Biogenic content	85% to comply with tariff requirements
CV	16GJ/t
Energy	18MWth (hot water delivered to a wood dryer which is used to dry wood chip to <20% moisture content. Heat from both the gasification process and the gas engines is used to raise steam in a turbine, generating 11MWe of power (when all gas engines are installed)(power sold to EDF)
Electricity generated by September 2014	5MW

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The plant gained preliminary acceptance in June 2014, and is still under commissioning. For the plant to receive a biomass Feed in Tariff, they must demonstrate that the renewable content of the waste is >85%.

There will be a second plant at Thouars, based on the same business model as the Morcenx plant. It is due to be constructed in 2015, but this is currently subject to a public enquiry.

Europlasma expect a typical plant to be 8t/h, 16GJ/t producing 10MW electricity over 7500hours/y.

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