The power of three

Milton Keynes’ waste recovery park, when completed later this year, will be the first to combine the three processes of mechanical treatment, anaerobic digestion and advanced thermal treatment. Geraldine Faulkner reports on the EFW facility’s progress and practical ambitions.

I t would not be too far-fetched to say that in the energy from waste (E FW) world, all eyes are currently on Milton Keynes’ waste recovery park (MKWRP), construction of which began in spring 2014 and is on course to be fully operational by the end of the year.

So why is MK’s facility attracting so much attention? It is the first time that a waste recovery project comprises the three technologies of mechanical treatment (MT), an anaerobic digester (AD) and advanced thermal treatment (ATT).

Peter Waller, project manager with Amey, says: “The unique aspect of MKWRP is that we are bringing three processes together that each have a proven track record, but have not been previously operated together on a single site.”

The mechanical treatment (providing STAPLER) will sort the waste, ensuring any recyclable items can be extracted, and is expected to take out at least 9% of the incoming waste for recycling. Then there is the fully enclosed Jones Celtic Bioenergy AD, which will extract recyclable items can be extracted, and is expected to take out at least 9% of the incoming waste for recycling. Then there is the fully enclosed Jones Celtic Bioenergy AD, which will extract recyclable items can be extracted, and is expected to take out at least 9% of the incoming waste for recycling.

The advanced thermal treatment plant (supplied by Energos) will convert the remaining waste material into a gas that is then combusted to generate steam to create electricity in a turbine.

According to Amey, the contractor that is working in partnership with MK Council to design, build and operate MKWRP, the combination of all three technologies is expected to cut the amount of rubbish the authority sends to landfill by around 8%.

The facility is also anticipated to create enough renewable electricity to power the equivalent of 1,100 homes.

Waste pyramid

Waller emphasises that the council’s choice to go for a WRPs is “to make the most of the waste pyramid thus ensuring the carbon footprint for the whole process has been optimised by recovering recyclates and generating renewable energy.”

David Proctor, waste contracts manager with Milton Keynes Council, has been involved during the whole procurement process for MKWRP. In 2010, Project Reduce, a joint PFI procurement project with Northamptonshire County Council, was abandoned.

“It was down to the last three bidders when the government withdrew the PFI credits,” recalls Proctor. “We stepped back and decided that we still wanted to take a long-term asset-based approach.”

In 2011, the council restarted the procurement process for a contractor to design, build and operate the waste recovery park and, in June 2013, awarded the contract to Amey/Cespa, as Amey was then known.

MK Council has a non-mains burn incineration policy, which came about due to a ‘lively’ full council meeting attended by up to 1,500 residents against proposals to build a large merchant incineration facility in the borough.

As a result “we set to market asking for a solution which included mechanical pre-treatment, a meaningful biological step with energy benefit and an advanced thermal treatment process”, continues Proctor. Designed to factor in growth, the WRPs is expected to take in 132,000 tonnes of residual waste (the council’s residual waste is expected to rise to 85,000 tonnes by 2040) with 92,000 tonnes anticipated to go through the gasification process.

Proctor again: “We have left an initial operating contract of 15 years after which time we will have to extend or re-tender. We are taking a medium-term approach compared with a public private partnership (PPP) type deal, which normally entails a 25-30 year contract.”

Another element of the project that differentiates it from other waste recovery facilities is the decision to go for a dry AD process. Jones Celtic Bioenergy is providing the dry fermentation section of the facility that will process 30,000 tonnes per year of organic fines material generated by the mechanical treatment plant at the site.

Keeping the balance right

The balance of material will be processed by the on-site gasification plant. The AD facility includes a reception bunker and will be charged into. From here the fines are transferred by loading shovels into nine dry fermentation chambers. Post digestion, the gasification is conducted at the ‘erated static piles’, where it is composted to dry the material. The output is then screened prior to pasteurisation in a proprietary tunnel composting system, with the final compost product being stored in a building before being transferred of-site for “beneficial use”.

“Burnsley, Doncaster and Rotherham have the same AD process,” continues Proctor. “AD is not typically used for mixed municipal waste but, in the case of MKWRP, it is treating the organics fraction of the residual municipal solid waste. In terms of the output, it could in theory meet PAS 100 requirements, but as it comes from an unregulated dirty source it cannot be certified as such and you can’t use it as ‘slurry’ it cannot be reclaimed as a landfill cover or for site remediation.”

Is there an opportunity to replicate the same model in the ‘North West’? “We are carrying out a similar project with Ise of Wight Council at the moment,” states Amey’s Waller.

The three technologies

Mechanical treatment will use a series of physical separation techniques: waste reception, trommels; shredding; ballistic; separation; near infrared separation; air knives; magnetic separation and use of manual pickers.

Air from the dust filter units from the MT waste reception and tipping halls will be extracted by two carbon filter units to control odour. Negative pressure will be maintained within the MT hall to limit the release of fugitive emissions including odour.

The gasification plant will consist of two lines of advanced thermal treatment (ATT) which will thermally treat waste to produce syngas through gasification process the screened prior to pasteurisation in a proprietary tunnel composting system, with the final compost product being stored in a building before being transferred of-site for “beneficial use”.

The gasification plant will consist of two lines of advanced thermal treatment (ATT) which will thermally treat waste to produce syngas through gasification, which will be combusted to generate high-temperature steam.

ENERGY FROM WASTE

The diagram shows the full process in the gasification treatment (MT), an anaerobic digester (AD) and advanced thermal treatment (ATT).

Left: Energos’ advanced thermal treatment plant
Middle: The main stack along with the carbon silo and bag filter which removes gasses and dioxins.
Right: The nine dry fermentation chambers

that in turn will drive a turbine to produce electricity.

Refuse-derived fuel (RDF) will be conveyed into the fuel bunker from the MT. Material from the bunker will be mixed before loading as fuel to achieve a consistent quality.

Any remaining solids (bottom ash) will be discharged into a bottom ash-quench bath.

The syngas produced in the gasification process flows into the oxidation chamber. Following oxidation of the syngas, flue gas at approximately 300°C is used to raise steam in a water tube boiler.

The steam turbine and condenser system will produce electricity from the steam generated in the heat recovery steam generation system.

There is one common water tube boiler for the two ATT lines. Approximately 7MW of electricity is expected to be generated by the steam turbine. The electricity will be consumed at the facility and also exported to the national grid. Bottom ash from the gasifiers will be removed from the facility for treatment, recovery or disposal.

Anaerobic digestion will be used to process the extracted organic fraction of the municipal solid waste from the MT plant. The biogas from the anaerobic digesters will be burned in two gas engines to generate approximately 7MW of electricity, which will be exported to the national grid.

Overall the installation will recover 6.2MW of electricity from the waste processed and is expected to require approximately 3.6MW of electricity to operate site wide activities, with the remaining 2.6MW being available for export to the national grid.