Field trip to
Montenay Dutchess County RRF
Poughkeepsie, NY
by Werner Sunk and Georgia Columbus

On November 21st, 2005, Columbia University graduate students Georgia Columbus, Shang-Hsiu Lee, Adam Penque, WTERT engineer Werner Sunk and Prof. Themelis visited the Dutchess County WTE plant in Poughkeepsie, NY, operated by Montenay Dutchess LLC. We met Rick Taylor, Facility Manager, Roy Chance, Operations Manager, and Rene Harde, Plant Engineer, on site to discuss our questions. Following this meeting Roy Chance and Rene Harde guided us through the plant.

General Information

Montenay Dutchess LLC is a waste to energy (WTE) facility located in Poughkeepsie, NY, about 68 miles north of NYC, built in 1989 and has served the local community for the treatment of household municipal solid waste (MSW) since then. Also, it generates electricity that goes to the grid. Montenay Dutchess LLC is a member of ISO 14001 and a participant in the Occupational Safety and Health Administration's VPPPA program.

Figure 1: Geographical position (left), Montenay Dutchess County RRF (right).

This plant processes about 153,000 t/y (permit 160,000 t/y) of MSW, some commercial and light industrial wastes in two O’Connor rotary furnaces. In this context this facility is one of the smaller WTE-plants in the U.S. The plant receives less waste from February to May, because during that period the WTE plant in Westchester has a lower tipping fee.

The plant operates as a co-generation facility and produces about 50,000 lbs/h of steam and 9-10 MW/h of electricity, which is sold to Central Hudson Gas and Electric Co. The entire plant is operated by 5 people in 4 shifts; the overall number of staff is 40 persons, including administration.

As reported to IWSA, Dutchess County WTE has a very high Community Recycling Percentage reaching the amount of 57%. This results from the beneficial reuse of the 45,663 t/y WTE ash as daily landfill cover and the recovery of about 8,600 t/y of ferrous metals, which represents, assuming an estimated 5% of ferrous metals content in the waste, nearly 100% of the metal input in the MSW. The recovered metals are sold by the Dutchess County Resource Recovery Agency (www.dccrra.org; 845-
463-6020) and shipped about 1,100 miles to American Steel, Alabama. Non-ferrous metals are not collected.

Dutchess County RRF monitors continuously CO, CO$_2$, NO$_x$, SO$_2$, temperature and stack moisture. The installed air pollution control (APC) systems includes: duct sorbent (dry) injection (DSI) and fabric filters (FF). Currently work is done for the installation of a new spray dryer absorbent/scrubber (SDA).

Dutchess County RRF gets paid by the net-weight of MSW processed. That is, they calculate the stream they get paid by subtracting the produced ash and the recovered materials from the incoming waste stream. The tipping fee is $50 per ton.

The Process

After weighing the trucks to determine the net-weight of the incoming MSW, the waste is unloaded on the tipping floor, near the hopper (capacity 4000 tons). At this point very bulky materials, which could clog the furnace feed chute or damage the rotary furnace are collected and shipped to a landfill. The MSW is fed with a crane to the rotary furnace. The furnace is of Westinghouse O’Connor Water-Cooled Rotary Combustor-Type. It is about 40 ft. long and 10 ft. in diameter, turns at 4 to 5 rph and is inclined 6º to the horizontal. It must be noted, that when the incoming waste has higher moisture during raining periods, the kiln rotates at 2 to 3 rph, which is considered to be low.

The combustor barrel is divided in 3 zones A, B, C. In zone A the MSW is mixed and dried, zone B is the main combustion area (1,200°F) and zone C is used for completing the combustion. According to the operators, combustion already starts in the first zone. All 3 zones are supplied with preheated combustion air (about 500°F) by 3 windboxes. Additionally the preheated combustion air is subdivided in “underfire air” and “overfire air” to supply fresh air for both sides, through and above, the tumbling waste bed. Figure 2 and Figure 3 show the main principles of operation of the rotary furnace, the combustion air flow and the layout of the combustion barrel wall.

Figure 2: Combustion air zones of a rotary furnace.
The residence time of the MSW in the furnace is about 1 hour. After this time the residues (ash, metals, not already burned out MSW, over sized material) fall out of the barrel on a horizontal traveling grade to complete combustion and cool down. The traveling grate discharges ash to a quench tank.

The cooled ash is conveyed out of the quench tank by a sifting conveyor. Although most of the water drains out on conveyors, the ash still consists of 30% water. This means at least, that the Montenay Dutchess LLC WTE plant spends almost one third of their tipping fee for land filling on water – even though the Dutchess County WTE plant pays less tipping fee for the beneficial use of the ash as daily cover to the landfill.

The next step in the bottom ash handling system is the “grizzly feeder” fed by a vibratory conveyor with the ash. The grizzly feeder separates the remaining bulky chunks regardless to the material. The overflow of this separator includes materials like pieces of concrete, metal parts (e.g., beams, pots, etc.) and occasionally not burned parts from MSW (see Figure 4 below).
Figure 4: Bulky fraction separated by the grizzly feeder

The underflow of the grizzly feeder is conveyed by a belt conveyer under a magnetic separation drum to collect the smaller pieces of ferrous metals. As Figure 5 shows, the metals are covered with a thin film of wet ash.

Figure 5: Ferrous metal fraction after magnetic separation

As there is no further treatment of the metals, both the overflow of the grizzly feeder (mostly metals) and the ferrous fraction are combined in a container and trucked to the County for selling.

The last step of the ash handling system is the mixing of bottom ash and fly ash. First the fly ash is humidified with a small amount of water in a pug mill (see Figure 6 below) to cut down dusting. The fly ash is then fed on top of the bottom ash stream continuously.
Analyses show, that about 10% of carbon is still contained in the combined ash. This means at least, that the combustion was not complete and that energy was lost. In general, samples of fly and bottom ash have shown various values in carbon content; the minimum was 0%, while the maximum was 13%. Therefore, an application for a 15% carbon content permit was filed by Montenay Dutchess LLC.

The combined ash is shipped to a landfill, where it is beneficially used as daily cover.

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