Dutchess County is located in New York State on the east side of the Hudson River about halfway between New York City and Albany, with a population of about 250,000. County residents are a mix of exurbanites, who commute to jobs in Westchester County or New York City; high techs, who work at one of the county’s two large IBM complexes, and farmers and gentleman farmers who live in the eastern half of the county.

Garbage collection methods vary. The two cities, Poughkeepsie and Beacon, and three of the smaller communities, have municipal collection systems, but in most of the county, residents either contract directly with a private carter, or take their garbage to a town operated transfer station. A significant number practice backyard self-disposal.

The county got involved in solid wastes in the 1970’s when it took over operation of a landfill. About the same time, it entered into discussions with Union Carbide to construct a plant that would convert solid waste into a fuel oil type product by means of a process called PUROX, a form of pyrolysis. These discussions collapsed when Union Carbide, who had never built a commercial sized purox plant, refused to provide adequate guarantees that the process would work.

About this time, Westchester County, just south of Dutchess County, was building a waste-to-energy plant at Peekskill based on the Von Roll mass burn technology, and Dutchess County decided to follow in its footsteps. In 1981, HDR was hired as consultant and project managers, for the procurement financing and permitting process. In 1983, the Dutchess County Resource Recovery Agency was formed as an independent public benefit corporation to assume all responsibilities for Solid Waste Management (SWM) in the County. In response to a request (RFP) issued by the Agency, six proposals were received, and a proposal from Pennsylvania Engineering Corp. (PEC) for a plant based on the O’Connor Rotary Combustor system was selected and a design-build-operate service agreement was negotiated. Permits were received in 1983, financing was completed on Dec. 20, 1984 and construction started on January 2, 1985.

The original PEC proposals provided for two combustion lines with a total annual capacity of 120,000 tons MSW and an electrostatic precipitator (ESP) based air pollution control (APC) system, with a guarantee to produce particulate emissions not to exceed 0.030 gr/dscf. The only other significant permit condition was that, in order to comply with federal prevention of significant deterioration (PSD) rules, the plant would not emit more than 210 tons of sulfur dioxide per year.

During the design process, PEC came to the Agency with two propositions, both on a no extra cost basis- PEC would supply basic combustion systems capable of processing 140,000 tons municipal solid waste (MSW) per year and would provide a dry lime and sorbent injection and fabric filter APC system instead of the ESP system originally proposed. The reasons given for the size change were that PEC was building two other O’Connor plants at about the same time of the 140,000 tpy size and that it was cheaper for them to build...
three facilities all of the same size. The reason for the APC system change was to reduce corrosion in the flue ducts and the stacks. There was no requirement for acid gas reduction and no guarantee for maximum SO2 levels. PEC did agree to a voluntary reduction in particulate levels from 0.030 gr/dscf to 0.015 gr/dscf. The Agency accepted the PEC proposals and Dutchess became the first waste-to-energy (WTE) plant in the east to be equipped with fabric filters. A few years later, fabric filters became the industry standard.

The Clean Air Act of 1977 (1977 CAA) required EPA to develop new source performance standards and guidelines for emissions from existing plants for various industrial categories including municipal waste combustion (MWC) units, and it took EPA until 1989 to propose the first set of such rules, with final rules promulgated February 11, 1991. These were immediately attacked by environmental groups as not being in compliance with the Clean Air Act Amendments of 1990 (1990 CAAA), particularly Section 129 which mandates limits on pollutants beyond those in the 1977 Act.

Under the 1990 CAAA, emission limits were to be based on the principle of maximum achievable control technology (MACT), which was defined as:

"Emission standards for existing units shall not be less stringent than the average achieved by the best performing 12% of units in the category"

Congress also required EPA to develop separate MACT limits for two categories of MWC units, large units with capacities of more than 250 tons per day (tpd), and small units with capacities of less than 250 tpd. In retrospect, it turned out to be an unfortunate choice for a dividing line, since there were many MWC units with capacities of just about 250 tpd. Furthermore, the definition of capacity was, and still is, far from clear. It also turned out that determining the actual emissions from existing MWC units was not an easy matter either, since emission data from different plants were not always reported on a comparable basis. EPA solved this problem by using permit limits rather than actual emission data as the basis for determining MACT.

In the summer of 1994, EPA withdrew the 1991 rules and proposed new rules, which took into account Section 129 of the 1990 CAAA, and required the regulation of additional pollutants. These rules were promulgated in final form in August 1995. The rules created two categories of MWC units, those at plants with more than 250 tpd capacity and those at plants with less than 250 tpd capacity.

Following promulgation of these rules, the Davis County (Utah) Solid Waste Management District file a petition with the U.S. Court of Appeals for the District of Columbia for a review of the rules. The petition claimed, among other claims, that the rules violated the Congressional mandate by using plant capacity rather than unit capacity as the basis for the initial categorization. On December 6, 1996, the Court ruled that EPA had indeed erred, and that unit size rather than plant size had to be the basis for the initial categories, and therefore the entire 1995 rules were vacated or declared invalid. While Dutchess did not actively participate in the Davis litigation, we were very much aware that its outcome could have a significant impact on our plant.

After some extensive negotiations between EPA and the litigants, the 1995 rules were remanded rather than vacated, with the result that the rules were allowed to stand for units of more than 250 tpd capacity, but were invalidated only for units of less than 250 tpd capacity at plants with more than 250 tpd capacity. These plants thereafter became known as the "Davis Class" units. Dutchess County found itself in the Davis Class category, with essentially no guidance to tell it what emission limits it had to meet.
Simultaneously with this rule making process, there was another regulatory process proceeding under Title V of the Clean Air Act. This dealt with the creation of a nationally uniform air permit program for emissions from industrial sources. MWC plants were in the “first call” list of sources and had to submit applications for Title V permits by June 1997. Dutchess County submitted its application as required, not knowing what emission limits we had to meet. This seemed to be no obstacle to the issuance of a permit. When our Title V permit was issued in August 1999, it contained many references to federally enforceable rules, but emission limits for only one pollutant, sulfur dioxide (SO\textsubscript{2}). This was a holdover from our original 1983 application for a permit to construct an incinerator under the PSD provision of the 1977 CAA. For all other pollutants, the permit contains no limits.

When EPA finally proposed new rules for small MWC in August 1999, it created three subcategories of “small MWC units”. Class A units were units of more than 40 tpd but less than 250 tpd capacity that used non-refractory technology, by which EPA meant integral waterwall boilers. Class B units were units of the same size, but using refractory technology, that is, boilers separate from the actual combustion unit. Class C units were small units of less than 40 tpd capacity.

Dutchess County fell into the Class A category, which was subject to essentially the same emission limits as large plants under the 1995 rule. Davis, incidentally, fell into Class B, subject to much less stringent limits. We had won the battle, but lost the war.

The 1999 proposed rules would have required Dutchess to replace its dry lime and sorbent injection (DLSI) APC system with a spray dryer and absorber (SDA). We estimated that the cost of such a retrofit would be about $8 million, and that the benefits would be minimal. We were already complying with eight of ten emission requirements under the 1999 rule. The only two we had any major problems with were the requirements for sulfur dioxide (SO\textsubscript{2}) and hydrogen chloride (HCl). While our DLSI system was removing much of the SO\textsubscript{2} and HCl, we could not consistently meet either the 31 ppmv requirements or the 75% removal of SO\textsubscript{2} and 95% removal of HCl. (We actually met the HCl requirements during our last stack test)

Dutchess County representatives met with EPA officials and presented them with our concerns. The substance of our comments was that the categories proposed by EPA made no sense, that if EPA felt that Class B units were entitled to special consideration because of their technology, we had economic problems that also deserved consideration because of the technology at our plant. We were joined in our appeal by the Islip Resource Recovery Agency, another New York facility using the same technology as Dutchess. We then filed formal comments as required by the rule making process.

The Davis class of MWC units constituted an interesting mix of technologies. In the Class A subcategory, there were three plants using the rotary combustor (O’Connor/Westinghouse) waterwall technology, three plants using fluidized bed technology with RDF/wood chip mix fuels and one plant using conventional grate and waterwall technology. In the Class B category were two plants using conventional grate (actually Katy-Seegers) technology, but no radiant waterwall boiler section, and three plants using basically modular (Vicon) combustors followed by waste heat boilers. Our argument was that there was as much difference within each of these categories as between the categories, and that to give relief just to one type of plant based on technology made no sense.

One important aspect of our case for relief was that Dutchess and Islip had already
installed advanced (at the time at least) APC systems were removing substantial portions of the pollutants of concern to EPA. Replacing the DLSI systems with SDA therefore yielded far lesser benefits than retrofits of plants that only had ESP systems without any acid gas removal capacity. Actually, EPA had established a precedent for such relief when it allowed large plants with ESPs to retain the ESP systems rather than replacing them with fabric filters, noting that the cost of such replacement far exceeded the benefits derived from such replacement.

On November 3, 2000, Carol Browner, then EPA Administrator, signed the final rule for emission guidelines from small MWC units. It took another month before the rule was published in the Federal Register on December 6, 2000. The final rule contained one major surprise. EPA had eliminated the distinction between Class A and Class B units and combined both in a new subcategory Class 1. It now defined all Class 1 units as units at a "location" where the aggregate capacity was more than 250 tpd. Thus, whereas the Court of Appeals had ruled that EPA had to use unit capacity rather than plant capacity as the basis for categorization, EPA neatly circumvented this rule by replacing "plant" with "location". The emission limits for units at locations with more than 250 tpd aggregate capacity were identical to the emission limits for large units, except that there was no relief for MWC organics (dioxins) for plants with ESP based APC systems. The preamble to the rule states that this action reestablishes the 1995 guidelines, which it does with a vengeance.

The effect on the former Class A units was simply that their plea for relief on the basis of economic hardship was turned down by EPA. This creates an interesting problem of interpretation of the law mandating the use of MACT technology. The law says that MACT shall not be less stringent than the emissions achieved by the best 12% of units in the category, known as the MACT floor. It is generally agreed that economics is not a consideration if emission limits are set at the MACT floor. However, the law also states that, if EPA chooses to set emission limits below the MACT floor, it must consider the cost of achieving such limits. It is our claim that the crucial emission limits of the 1999 guidelines have been set below MACT floors, and that EPA was therefore required to take cost into account.

The effect on the former Class B units was much more devastating particularly since several of them had already started retrofits to comply with the less stringent standards they were required to meet under the 1995 rule. However, that is another case study. At this point, there have been several actions filed with the U.S. Court of Appeals for review or recall of the new rules.

Dutchess County has two basic options. One would be to comply with the rule as it now stands. That would require replacing the present DLSI system with a SDA system. Based on our latest stack testing, we do not believe that we need to install carbon injection for mercury or dioxin control or SNCR for NOx control, since we were well within the guidelines for those pollutants. However, we still will be faced with construction costs of the order of $8 million. The cost per ton of waste processed, taking into account the cost of financing, loss of capacity during construction, and increased operating costs, is estimated to be about $20 per ton, which is in line with EPA estimates. The only problem is that EPA assumes that these costs can be passed through to the users as tip fee increases. We now have a small subsidy from the County called a net service fee that currently amounts to about $750,000 per year in order to remain competitive. If we cannot increase our tip fee, we would have to pass the entire cost of the retrofit through to the County, increasing the net service fee by about $3 million. There would be no measurable improvements in local air quality.
The second option, which we hope EPA and our state regulatory agency will approve, is to upgrade our DLSI/FF APC system to achieve the maximum removals of SO₂ and HCl. We have in the past conducted test runs with higher lime feed rate than are necessary to meet our current permit limits. These tests have shown that it is possible to achieve 50% removal of SO₂ on a fairly consistent basis. Under the new rules, the final compliance date for small units is December 6, 2005. We would propose to use the next two years to conduct pilot plant studies of various types of modifications to our DLSI system to achieve higher SO₂ removals. Modifications under consideration include operating the fabric filters at longer cleaning cycles and higher pressure differentials, trying other reagent than hydrated lime, humidification of the flue gases to increase reactivity, proportioning the lime feed rate to the inlet SO₂ level (we have inlet SO₂ CEM capacity), and flyash recirculation. A rough estimate of the costs of such modifications is about $1.5 million with a per ton cost of about $3.00. We are currently conducting baseline tests to give us data on which to base the design of potential modifications of our DLSI system.

A third option, which is not really an option, would be to shut down the plant and use the tip floor as a transfer station for shipping out our waste to other disposal sites. It is unlikely that this will result in any net savings for the County, since the County would then be obligated to pay off the outstanding debt of the Agency, currently amounting to about $35 million. We might also have to repay the State of New York a portion of the $13.5 million grant that was obtained to assist in financing the project.

We are currently pursing a two-pronged approach. On the one hand, we are taking part in litigation seeking to have EPA either recall or modify the December 2000 rule. On the other hand, we are in contact with our state regulators, who are required to submit their state implementation plan (SIP), or in the case of New York, a modification of its SIP to include small MWC units, by December 6, 2001. We hope to be able to get them to concur with us that the second option, upgrading our present DLSI system, is, as the law requires, as protective of the environment as the guidelines, and to approve a compliance plan based on that option. The final approval then rests with the EPA.

This has been an interesting example of what I would assume, were unintended consequences of establishing national regulations on one specific member of the regulated community. Dutchess was one of the leaders in providing emission control from MWC plants. We were the first MWC plant in the eastern U.S. to install fabric filters as part of its emission control system. Even now, our system produces particulate emissions (PM) that are one tenth of the standards now being proposed in the new guidelines. With low particulate emissions come low emissions of MWC metals and organics. Only with respect to acid gas removals does our system fail to comply with the new rules, and even with respect to these pollutants, we will probably wind up very close to the new requirements.

Unfortunately, the new rules as currently written not allow much flexibility. It would be a shame if Dutchess County were forced by regulatory inflexibility to make what for a small community are huge expenditures, and which would yield only minimal environmental benefits.
Figure 1: Simplified process flow diagram for a rotary combustor.

**DRY LIME INJECTION/FABRIC FILTER AIR POLLUTION CONTROL SYSTEM**

Figure 2: Dry lime injection process.
Figure 3: Westinghouse O’Connor Combustor

Figure 4: Westinghouse O’Connor Combustor
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
1996 EMISSIONS INVENTORY

FACILITY: DUTCHESS COUNTY RESOURCE RECOVERY FACILITY

<table>
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<th>CONTAMINANT</th>
<th>UNITS</th>
<th>SUBPART CLASS A BBBB LIMITS</th>
<th>ACTUAL EMISSION</th>
<th>Test Date</th>
<th>Comments</th>
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<td>104</td>
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KEY:
Technology: MB = Mass Burn
            ROT = Rotary
Emission Control: DLSI - Duct Lime - Sorbent Injection
                     FF = Fabric Filter
                     CEM = Continuous Emission Monitoring

Note:
All concentration levels are corrected to 7% Oxygen on a dry basis
Actual emissions are average of two units
CEM are 24-hr averages during emissions test; corrected to 7% Oxygen dry;
RATA conducted and passed prior to emissions test.
COST ANALYSIS OF DUTCHESS COUNTY RETROFIT OPTIONS

ASSUMPTIONS

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<td>Annual Throughput</td>
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<tr>
<td>Emissions, tons per year</td>
<td>SO2</td>
<td>HCl</td>
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<td>Uncontrolled</td>
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<td>500</td>
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<td>Present ECS (DLSI/FF)</td>
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<td>100 (80%)</td>
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<td>Upgraded ECS</td>
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<td>MACT (SDA/FF)</td>
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<td>25 (95%)</td>
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INCREMENTAL REMOVALS

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<td>62.5</td>
<td>25</td>
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RETROFIT COSTS

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<td>Capital</td>
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<td>Upgrade</td>
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<td>Debt Service (6%)</td>
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<tr>
<td>O &amp; M</td>
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<td>125,000</td>
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<td>MACT</td>
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<td>Debt Service (6%)</td>
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<td>$1,170,000</td>
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UNIT COSTS (per ton MSW processed)

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COST PER TON OF ACID GASES REMOVED

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EPA COST CRITERIA

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"prohibitively expensive and unreasonable"