THE BURNING ISSUES OF MUNICIPAL SOLID WASTE DISPOSAL – WHAT WORKS AND WHAT DOESN'T

By: Jack D. Lauber, PEDEE; Chief of Technology Assessment (retired), New York State Department of Environmental Conservation; invited presentation at the Toronto City Council Municipal Solid Waste Conference: Advances in Processes and Programs, May 12, 2005.

I would like to thank John Nicholson, Chairman of this Conference, of EBC Canada for inviting me to participate in this interesting international forum and debate about waste to energy vs. other forms of municipal solid waste disposal and recycling.

I am a Chemical/Environmental, Professional Engineer with over forty years experience, and a Diplomate in the American Academy of Environmental Engineers. I was formally Chief of Technology Assessment with the New York State Department of Environmental Conservation. I am now an environmental consultant and do not work for the waste to energy industry. I have also consulted on other waste recycling technologies, such as ethanol from waste, thermal waste gasification, and the production of activated carbon from MSW and other wastes.

Concerning thermal waste disposal, I have a "déjà vu" feeling that I have been there before. I previously debated Pat Costner of Greenpeace at an air toxics conference in Montreal, April 2, 1992[1] where I presented information that Greenpeace had exaggerated industrial incinerator emissions.[10] I discussed environmental perceptions and reality. Some environmentalists, who believe that all waste combustion is unsafe, say, "The devil burns and the Lord recycles." Perhaps these negative references to waste burning come from the Bible and the original definition of Hell, which comes from Kings 23:10 and the Hebrew word Gehenna, the Valley of Hinnom south of ancient Jerusalem. This was the site of a foul, smoking, open burning garbage dump. However, the Bible also speaks of purification by fire. Incinerators destroy wastes, modern waste to energy facilities; generate useful energy by using MSW as a renewable fuel.[11]

We have had several problems with poor incineration and toxic emissions, in previous years. I was involved in enforcing against improper waste burning in New York State, and was the first to arrest a gross air polluter in 1969. We closed several inadequate, poorly controlled municipal and industrial waste incinerators. Our efforts to preserve our environment are noted in Nelson Rockefeller's book, "Our Environment Can Be Saved," which appeared on the first Earth Day in 1970. I'm glad to be part of that story and am noted in Mr. Rockefeller's book.[2]

In our environmental profession, we often use acronyms. My favorite is BACT – Best Available Control Technology. Others refer to it as Better Avoidance of Controversial Topics. Then there are those who believe in BANANA –Build Absolutely Nothing Anywhere Near Anyone. I was always interested in Best Available Control Technologies, especially applying the best controls to municipal solid waste incineration and resource recovery systems, and

[1] "The Safe Disposal of Waste By Thermal Incineration" Air and Waste Management Association Air Toxics Conference, Montreal, Canada April 2, 1992

[10] Facts Or Myths: The Burning Issue of Incineration, J.J.Santoleri, J.D.Lauber, L.Theodore, AWMA 86 Annual Meeting Denver CO June 13, 1993

[11] Waste-To-Energy Research and Technology Council, http://www.columbia.edu/cu/wtert

[2] Rockefeller, Nelson, "Our Environment Can Be Saved," Doubleday 1970

technology transfer from other industries. In 1980, we discovered the problem of dioxin emissions from the municipal solid waste incinerator in Hempstead, NY. We also built the Albany, NY ANSWERS plant in the early 1980's that was based on the design of the Hamilton, Ontario resource recovery facility; which burned RDF, refuse derived fuel. I knew that this system had inadequate air pollution controls, only using an electrostatic precipitator, but unfortunately others didn't heed my advice. In the early 80's, I collaborated with Dr. Aaron Teller, who developed a unique dry scrubbing air cleaning system based on the use of such controls in the aluminum industry. We wrote a paper in 1983 dealing with the control of dioxin emissions from incineration using dry scrubbing air cleaning technology, which Dr. Teller had also introduced in Japan.[3] I also further studied BACT for resource recovery facilities worldwide.[4] and testified in Hartford, Connecticut in 1984 to promote such controls for the new Mid-Connecticut Resource Recovery Facility. I also evaluated the many polluting apartment incinerators in New York City, and presented a paper to the New York Academy of Sciences in 1986, which ultimately led to shutting down these multiple sources of air pollution.[5]

I was on the same side as Dr. Paul Connett and other environmentalists who were interested in shutting down these polluting incinerators, or in properly controlling them. I remember Paul complimenting me in a 1987 upstate NY newspaper article. We had a common goal in those days. However, there are those who say that we have to fully reduce, reuse, and recycle all of our solid wastes, so there will be no residual waste materials for disposal. I believe that this is idealistic, and unrealistic, as has been proven in the last quarter of a century. Waste recycling and waste reduction are admirable goals, but they are not fully practical or economical to handle the vast majority of our solid waste. At best, we can practically now recycle about a third of our municipal wastes.

In the last decade there's been tremendous progress on behalf of the US EPA, the European Union, Environment Canada, etc. in developing state of the art air pollution control emission standards and guidance to properly control trace toxic contaminants. We now see actual particulate emission standards that are extremely low, some at non-detectable levels, values that we dreamed of years ago. Negligible, safe, trace quantities of dioxin, mercury, etc have been achieved in modern waste to energy facility emissions. We've also seen the development of secondary controls for oxides of nitrogen, to control our ozone and acid rain emission problems, which also have a supplemental effect in controlling dioxins. Improved activated carbon injection systems in dry scrubbers now provide redundant controls for mercury and dioxin emissions. We've come a long way since I advocated dry scrubber air pollution controls over two decades ago. Efficient waste to energy systems, providing wide margins of safety and control of trace air contaminants, are now a proven reality. We now have a belt and suspenders air pollution control approach, using staged controls in series. Health risks from properly controlled MACT WTE emissions are in the order of one in a million, compared to the risk of automotive accidents, about one in ten thousand.

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[3] Teller, A. J., Lauber, J. D., "Control of Dioxin Emissions from Incineration" Air and Waste Management Association, June 19, 1983, Atlanta, Georgia

[4] "An Assessment of the Need for BACT for Resource Recovery Facilities," 10/12/84 New York State DEC position paper

[5] "Toxic Emissions from Small Incinerators," New York Academy of Sciences 11/19/86

Previous estimates of dioxin emissions from waste combustion facilities indicate that its total contribution is far less than 1% of known dioxin loadings.[8] Recent evidence suggests that there are some levels of dioxin too small to pose any risk of cancer at all, and fortunately the current body burdens of people in North America are this small or smaller.[9]

Others may say, now that contaminants have been removed from the air stream that they wind up in the ash. The USEPA has set stringent requirements, the TCLP test - Toxic Characteristic Leachate Procedure, to simulate the worst conditions in nature, acid leaching of metals from ash. However, if ash is mixed with the lime from the dry scrubber air cleaning system, with sufficient moisture, it sets up and forms a pozzolonic cement-like material that immobilizes heavy metals. This is how the Romans made early cements. It is analogous to the green wine bottle, where hexavalent chromium is responsible for the green color of the glass, but is locked into the matrix of the glass, making the bottle safe from metals leaching into the wine. Over a decade ago we witnessed the successful use of MSW incinerator ash, made into bricks and put into Long Island Sound by the researchers at the State University of New York at Stony Brook. Tests on this artificial reef showed no significant leaching of heavy metals into the environment over considerable periods of time. Many tests on the stabilized ash from waste to energy facilities in the United Sates show that ash is being safely managed without polluting the environment.

There are over 600 successful waste energy facilities around the world, and about 100 in the United States.[11] Facilities such as SeaMass in Massachusetts, the Montgomery County Waste to Energy Facility in Maryland, Commerce CA, and Amsterdam AEB in the Netherlands are but a few. Over two decades ago I testified, with Dr. Teller, in Palm Beach County Florida on the use of effective dry scrubbing air cleaning technology to properly control air contaminants from waste to energy plants. I've been told that the MSW tipping fee hasn't increased in six years in Palm Beach County Florida and that the revenues from electrical generation sale to the Florida Utility pays for the municipal solid waste recycling and waste to energy programs. This has reduced consumer electrical rates and minimized the use of natural gas in that community.

I also recently spoke with my former mentor, Dr.Aaron Teller in Florida, who told me that his firm had built 380 successful WTE dry scrubbing facilities in Japan, that met the most stringent air pollution control emission standards, most achieving non-detectable dioxin emission concentrations. He also mentioned that after he commissioned his dry scrubbing air cleaning system at Commerce CA in 1988, that air samples were bottled for analyses by California environmental agency staff. They showed no detectable dioxins, and the stack gas sample was cleaner than the typical ambient air in Los Angeles. [6]

Let us take a look at the problems of landfills. We know that organic waste deposited in landfills generates methane, which is about 25 times more potent as a green house gas as carbon dioxide, CO2. There are many trace, toxic volatile emissions, such as chlorinated hydrocarbons,

[8] Dioxins in Perspective, a Tel Tech Overview by Jack D. Lauber May 29,2000 http://www.teltech.com
[9] Personal communication from Dr. Laura Green, Lecturer, Mass. Institute of Technology, Biological Engineering Division April 6, 2005

[6] Personal communication with Dr. A.J. Teller, Palm Beach Fl 4/16/05

like vinyl chloride and tetrachloroethylene being emitted from landfills, some from illicit hazardous waste disposal. Europe discourages the landfilling of organic wastes to minimize greenhouse gas emissions. US landfills emit almost 2 million tons of methane per year and many thousands of tons of sulfides, mercaptans, chlorinated hydrocarbons, and other volatile toxic organic compounds into the air.[7] Contrast these massive, volatile toxic gaseous landfill emissions, to emission reductions, and progress that has been made in the waste to energy industry, based upon the USEPA MACT – Maximum Available Control Technology regulations. There has been a reduction in mercury emissions from WTE Plants from 80 tons per year in 1989 to less than one ton per year today. After MACT implementation, dioxin emissions from all WTE Plants were reduced by 99% from 10,000 grams in 1987 to 12 grams TEQ currently.[7] Backyard barrel burning of MSW generates 580 grams of dioxins.[7]

In addition to the problems of toxic air emissions from landfills, landfills will ultimately leak since polyethylene liners will degrade and leak toxic leachate into our ground and ground waters.

The transport of MSW to distant landfills, such as from Toronto to Detroit, Michigan or from New York City to Ohio, Pennsylvania, and Virginia results in excessive diesel toxic emissions and much wasted fuel. Diesel trucks transporting MSW from New York City to Pennsylvania and Virginia emit five times more particulate matter per ton of MSW than if combusted in waste to energy facilities.[7]

Those that advocate full waste recycling and zero waste are being unrealistic. I know that some plastics, newspapers, glass bottles, and metal cans can be effective recycled; however, there are many other wastes that can't be feasibly recycled, especially complex plastics and co-polymers. Mixed plastic waste recycling processes have been tried, but posed other environmental problems, like fugitive solvent emissions. So should we ban plastics? Are we going to stop using CD's and DVD's, plastic plumbing, computers, home siding, or safe vinyl electrical insulation? A Biocycle/EEC 2002 survey[7] noted that, generally speaking, we are only recycling 19.4% MSW in the United States and that 65.6% of MSW is landfilled. In 1999, Japan cleanly combusted 74.3% of her municipal wastes and only landfilled 20.3% MSW.[7] Japan is an advanced society and has tried many recycling schemes over the last decades. They have largely gone to advanced waste to energy technologies, and have implemented some of the best air cleaning systems, that are clean and safe, and pose negligible environmental risk to the public.

We can conclude that we have met the enemy and it is us. We have learned an incomplete combustion creates toxic emissions, and that state-of-the-art, high combustion efficiency MACT controls, i.e., fabric filtration, dry alkaline gas scrubbing, SNCR, and activated carbon adsorption, can result in clean, safe MSW waste to energy systems with negligible emissions, comparable to those from a few motor vehicles.

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[7] Columbia University WTERT Report, Dr. N. Themelis, 4/13/05

Landfills pollute, have leaked toxics into the air, ground, and water and contribute to global warming. We must conserve our energy resources and not ignore energy recovery from renewable waste fuels, by burying MSW in landfills, and creating toxic time bombs for future generations. We must also conserve our fossil fuels and lessen our reliance on tyrannical Mid East regimes that often sponsor terrorism. We must replace fossil fuels with as much renewable fuels as possible. The more than 100 WTE plants in the U.S. generate nearly 2800 megawatts of electricity, and save approximately 1.4 billion gallons of fuel oil.[11] How many millions of gallons of fuel oil are wasted transporting our MSW to distant, polluting landfills?

Waste to Energy, WTE, technology is a robust, proven, clean and safe technology designed for minimal environmental risk, which has been proven in practice over several decades. The old bad actors, the polluting waste incinerators are gone. BACT and MACT emission standards ensure safe, reliable operation of these facilities. How can citizens trust and be reassured that waste to energy facilities will be safely operated and properly maintained? It is important to have citizen involvement, and citizen expert environmental monitors, independent technical experts, to ensure that waste to energy systems are safe and reliable; in addition to state and local environmental regulatory staff. This has been done in several places in the US and Europe, where citizen experts regularly check the performance of waste to energy facilities.

We should also encourage other emerging MSW waste to energy technologies like biogas and thermal waste gasification systems. However they have not been yet proven on a large scale. We must utilize technologies that work effectively, and have been proven to be safe, and environmentally protective.

A philosopher once said that wisdom is not knowing what lies ahead, but rather what comes next. I believe in the Jeffersonian philosophy, that truth has nothing to fear from conflict unless deprived of her natural weapons of free argument and debate. Hopefully, this debate on waste to energy and other technologies for properly disposing of our municipal solid waste will help us to solve these problems and improve our environment.

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