RESOURCES RECOVERY IN THE CITY OF CHICAGO: AN HISTORICAL PERSPECTIVE

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Discussion by

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I would like to complement the authors on their paper. To my knowledge, it is the first of its kind to cover the history of Chicago’s involvement in the resource recovery and incineration field from the first plant in 1887 to the present time.

It is interesting to note that since the Chicago Fire, either the City or its citizens have practiced some kind of resource recovery. The Municipal Reduction Plant was the first successful City operated resource recovery facility. The Southwest Incinerator was erected on its site and during the building of this plant the old foundations were uncovered.

The Goose Island plant design was antiquated before construction was finished and this contributed to its short service life. Refuse was never rail-hauled to the plant. The City, at that time, used open side dump trailers in the alleys for refuse collection. These were formed into trains of three and four trailers and pulled to the plant by a tractor. The trailers were unloaded into the plant pit by dumping the trailer sideways.

There are three City solid waste disposal projects that I believe are of historical significance which the authors did not cover.

One was the building of a reduction plant in 1969 at the Goose Island site for the shredding of bulk trash collected on the North and Northwest side of the City. The 96,000 cubic yards (73,400 m³) per year of bulk materials picked up in these areas was to be processed so that the metals could be sold and wood material burned in the incinerator furnaces. The shredder design capacity was 25 tons/hr (23 tph). After many months of operation, it was apparent that the machine would not handle more than 12 to 15 tons/hr (11 to 14 tph) over any 8 hr working day. This, along with failures in other equipment, indicated that shredding of solid waste materials posed a big question as to its reliability and economic feasibility.

The second project was the recovery of a marsh area on the north end of Lake Calumet by filling it with refuse materials. There were three methods of delivery to the fill site. The Southwest and South Central sections of the City’s solid waste was loaded onto railroad cars at 40th and Ashland and at E. 26th Street and the I.C. tracks and shipped to the Calumet disposal site. The refuse from the Far South section of the City was delivered to the site by collection trucks. Near North and Northwest side refuse was taken originally to East South Water Street and the I.C. Railroad for delivery to the Calumet fill. However, this was a problem operation. To eliminate the railroad haul, a transfer station was built on the Medill property prior to the erection of the incinerator plant. Sixty-six cubic yard (50 m³) self-unloading trailers were used in conjunction with the station to transfer the waste materials. This operation was one of the first of its kind. Approximately 230 acres (931,000 m²) of
land were reclaimed by these operations and the Calumet Incinerator was erected on this site.

Another interesting project was erected at the Calumet Incinerator site. It was the Experimental Baling plant which was opened in 1969. This was the first attempt to analyze the technical and economic potential by baling refuse for landfill. Operational data from the plant and the distribution system needed for disposal indicated that the system was not economically viable.

Also not mentioned in the paper was the salvaging of ferrous metals at the Calumet, Southwest and Northwest plants.

In the following comments on the authors’ remarks covering Chicago incinerator plants, I am including some reasons why three of these plants are not in service today.

The Medill Incinerator was an experimental plant and had minimal air pollution control equipment. However, a Detrich-Jens scrubber was never installed in this plant. That equipment was installed in the No. 1 furnace at Calumet and showed varying efficiencies from 0.08 to 0.13 for particulate removal.

In 1971, plans and specifications were prepared to modernize the Medill furnaces from multiple cell to continuous flow. Electrostatic precipitators were to be installed for emission controls. If this work had been allowed to proceed, the plant would be in operation today at a cost of approximately $9.00 per ton, including amortization.

Plans were also prepared in 1971 to convert Calumet’s six multiple cell furnaces to continuous flow and to install electrostatics for emission control. The Department of Public Works, which was acting as consultant to the Department of Streets and Sanitation, did not allow the plans for upgrading to proceed. However, they prepared contracts to install wet scrubbers in five furnaces. A test scrubber was installed in one furnace prior to the other four and this failed to meet ordinance requirements. Installation of the scrubbers in the remaining four furnaces was still carried out, with the result that none of the furnaces could meet the State Emission Ordinance for particulates.

The authors made note that the waste heat boilers and air pollution control equipment were the reasons the Southwest plant was shut down. To my knowledge, waste heat boilers were not a problem at Southwest. However, improper furnace operation over the last five or six years the plant was in service did lower steam output from the boilers. Steam at this plant was never sold for less than 62½¢ per thousand pounds and this price was raised to approximately 70¢ in 1970. Plans to install electrostatic precipitators in this plant were never implemented.

The Northwest Incinerator plant, in the original design prepared by the Department of Streets and Sanitation, was to be one of the outstanding plants in the United States. Its original design concept included a 100,000 lb (45,400 kg) an hour turbo generator and a steam line to a candy company and a wholesale bakery, with an opening to supply the industrial area to the south and east of the plant. This equipment would have reduced the roof condensers by at least 50 percent. A difference of opinion between Streets and Sanitation and the Department of Public Works prevented these energy saving items from being utilized. Due to this decision, the City has lost millions of dollars in steam sales and electrical fees. However, today, the line to the candy company is practically built and a turbo generator for the plant is being considered.

In evaluating the Chicago Supplementary Fuel Plant, it might be noted that before it was built it was not economically viable. A contract with Commonwealth Edison Company for the sale of the processed refuse for 30¢ a million Btu was the reason. Were the plant to run at peak capacity, the price for power would still be more than the income from the sale of the fuel. Also, the equipment designed for use in this plant was still suspect as to its ability to function at rated capacities.

It is a shame that a city like Chicago, which had made such great strides in resource recovery and the incineration field, should find itself in the same condition it was when the incinerator building program started in 1953.

Why the City would allow three of its incinerators to be shut down instead of rehabilitating them is hard to comprehend. This becomes less understandable when you consider the energy problem faced by the United States and the need for all available plants capable of processing alternate energy materials into space heating or electrical power.

I agree with the authors’ statement in the abstract of their paper that a good political climate must exist for a successful resource recovery program because, in some instances, departmental politics are not always in the best interest of the city’s future.
Discussion by

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This paper is interesting in that it presents little known historical data about early attempts of Resource Recovery in Chicago. The authors are to be complimented for enriching the report with descriptive material about conditions in Chicago before and after the 1871 Chicago Fire.

For further enlightenment, one should read Upton Sinclairs “The Jungle” written in 1906 which was meant to expose the poor working conditions in the Stockyards but instead generated a public outcry against unsanitary conditions in the plants where meat products were prepared and sold to the Public. This book makes mention of obnoxious liquids leaving the buildings where the animals were butchered and going by way of open sewer to “Bubbly Creek” which flowed behind the Municipal Reduction Plant at Pershing Road and Iron Street. This practice stopped sometime after the City took over the Reduction Plant as today “Bubbly Creek” does not exist.

The definition of garbage has changed. This paper points out that raw garbage originally contained 60-65 percent moisture probably due to the amount of animal carcasses which were collected and required drying before burning could take place. The livestock market has all but disappeared from Chicago and with it the animal problem except for two million pounds annually of dead animal carcasses, mostly dogs and cats. Today these animal carcasses are disposed of in a separate incineration plant and the moisture content of the remainder of the garbage has dropped to about 25 to 30 percent which is low enough for mass burning to take place without auxiliary fuel.

It is difficult to find any areas of dispute with a presentation of historical facts. The authors have prepared a well documented chronology of solid waste and resource recovery management during the life of the City of Chicago. About all I can do is to embellish and supplement the information given.

It is deflating to the ego of those of us who are active in the solid waste management field to learn that many of our modern day concepts such as source separation, railhaul, barge haul, shredding and producing fertilizer from waste material were all tried many years ago.

When we look at Chicago’s beautiful lake front today, it is hard to visualize that it was, to a large extent, made possible by dumping all types of waste in the swampy shoreline areas. Would Chicago have been allowed to do this today under present EPA regulations?

The Southwest incinerator with its heat recovery and steam generation and distribution system was a concept that may have been implemented before its time. It was in operation and supplying steam from incinerated refuse in 1973 when the oil embargo hit. At that time the country’s priorities were quickly shifted to energy production from alternate fuels; something that this plant had been doing for years. Steam was supplied from this plant to a distribution system serving many industrial plants in the area. A privately owned power plant was also connected into the distribution system. By metering plant output, the City and the privately owned plants were credited with their share of the steam sales. If the steam sale cost could have been escalated to be comparable to post embargo prices, it may have been feasible to retrofit and rehabilitate the incinerators. At least it may have been possible to interest DOE in a grant to keep this resource recovery plant in existence.

In the paper the authors mention that steam will soon be sold to a candy manufacturer adjacent to the Northwest Incinerator. In view of the Southwest steam system shut down, it would be interesting to know the sale price for the steam at Northwest. Hopefully it is high enough to take into account today’s fuel prices and rate of escalation. The Southwest steam sale contract was very detrimental to the City and was, no doubt, a contributing factor to the decision to shut the plant down. The City would have been wise to include input from their own engineers and their retained consultants in negotiating a sale contract rather than leave it all up to their lawyers.

Discussion by

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First I would like to compliment the authors for a job well done. So much has been written on solid waste processing in the past 5 years that one wonders if he has not read a paper even though it has just been published. This paper by Nigro and Peacy is a new and refreshing approach.
As long as the authors are talking like Texans and have noted that Chicago has the largest this and the tallest that, they should have added that it also boasts of the world's busiest airport. When analyzing methods of solid waste disposal one must remember that the only responsibility of the City Engineer or Public Works Director is to dispose of the municipal solid waste at the lowest possible cost, in a manner that is environmentally and socially acceptable. As well portrayed in this paper, the market is fickle. Many products that are at one time or another cost effective to salvage are of no value at other times. Some products undoubtedly will never be of value again, i.e., grease, once used for soap, has been replaced by synthetics. We all know how the market for ferrous metals and paper fluctuates. Today and possibly for at least 20 years the recoverable resource that is of the most value is energy in the form of steam. That is, unless the small package atomic energy plant is perfected within the coming decade. We can and have produced steam in an acceptable manner, but at a rather high cost. This is well illustrated by the operation of the Northwest Incinerator. The Southwest Supplemental Fuel Processing facility should be the answer. The answer to a low cost method of disposing of municipal solid waste in an environmentally acceptable manner while producing energy in the form of steam - but to date it is not. Chicago needs help and it can not go it alone. It needs financial help. It has already spent approximately $25 million on the RDF plant - local money with no state or federal aid.

More research is needed - not theoretically or pie in the sky research, but down to earth trial and error experimentation. Let us look at the problems that are not mind boggling problems, but in fact appear to be so simple that one wonders why they have not been solved. The RDF has too high a percentage of grit (sand and glass). In an attempt to minimize the detrimental effects of this condition, a high percentage of combustible material is shunted aside as non-combustible. The pneumatic conveyance system does not operate properly, the material in the conveyance system is subject to freezing, and the same material is subject to cementing action in the silos. These are but some of the problems. All of them solvable, all solutions within the state of the art. Why haven't they been solved? Shortage of funds. There were many more problems, more difficult ones, that have been solved. But now the City needs financial help. Chicago is so close to a major breakthrough in solid waste disposal that will benefit every community in the United States that it would be unconscionable if the federal government did not aid in this endeavor.

Discussion by

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The authors of this paper have presented a very interesting history of one city’s pioneering endeavors to cope with its solid waste problem.

The vagaries of resource recovery and its dependence on the market place is well illustrated. In practically all cases of recovered materials mentioned, the commercial use product was eventually replaced by a cheaper commercially developed material. Today, with proper regard to the need of the market places, this may change.

The separation of ferrous metal from the incinerator residue at the Medill, Calumet and Southwest Chicago plants is not mentioned. This was carried on for quite a few years, I believe until the plants were closed.

The Northwest plant also had a shredder installed in an endeavor to handle oversized materials in the furnace. A shredder was also installed at the Goose Island plant and operated until it was converted to a transfer station.

The economics mentioned in the paper indicate that resource recovery should be regarded as a cost reduction process rather than a profit making process when considered with a city’s total disposal costs. By reducing landfill requirements, the cost of acquiring additional land is also reduced.

The production of steam for heating or process purposes within the plant, adjacent municipal facilities, or for sale to private industrial plants has proved to be the most viable resource recovery option over the operating life of the plants.

This paper again illustrates the tremendous impact of the ever increasingly stringent Environmental Protection Agency's regulations on the cost of solid waste disposal. Until the bonded indebtedness life span is taken into consideration, the taxpayer is at the mercy of possibly well intentioned periodic changes in pollution emission requirements.

If all automobiles in the possession of owners were required to meet a unilateral exhaust requirement change, or parked in the garage until modified regardless of cost, the hue and cry from the public would undoubtedly require an alternative approach.
Until the public realizes the financial and possible health hazards engendered by these quick shifts in enforcement attitudes, the real problem will remain unsolved.

AUTHORS' REPLY

We are pleased and delighted with the insightful discussions generated over our paper by our peers and associates. The quality of their discussions is self evident regardless of the direction from which they approached the subject and regardless of whether or not one agrees or disagrees with their specific comments and assertions. The point is that they, as knowledgeable and interested people, warmed to our subject and contributed valuable additional historical data as well as valued opinions.

Within the prescribed constraints for length of papers submitted, our attempt was to simply enumerate the variety of resource recovery techniques and the associated benefits that accrued to the city of Chicago over time. We could not and did not attempt to make note of every resource recovery system. We made a special effort not to bias historical facts with our opinions and/or prejudices but to simply present the facts from recorded data.

We believe it to be healthy and invigorating to the profession to have open discussion and expressions of opinions from interested parties and are indebted to Messers. Noel, Ryder, Sanneman, Soloway and Hampton for their contributions. However, in keeping with the spirit of our intentions in the subject paper, we have no comment on the several specifics of opinions expressed by the discussors.