

# **New York Municipal Solid Waste**

## **EXECUTIVE SUMMARY**

**Senior Capstone Design Project  
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## EXECUTIVE SUMMARY

New York City is currently generating nearly 46,000 tons per year of municipal solid waste (MSW). With the closing of the Fresh Kills Landfill in 2001 and the population growth of nearly 9% per year, the MSW crisis continues to escalate as the city pays as much as \$75 per ton to dispose of waste in neighboring states.

The objective of this project is to provide a solution to the waste problem facing New York City. A more cost effective disposal method is accomplished through the development of a mathematical model that assists in the strategic planning of the New York waste management system. The model is to be used as an engineering tool that incorporates cost minimization of the waste management process from an economic perspective. This includes consideration of all possible investments, waste management disposals and technologies, locations, and amounts of waste processed.

The current mathematical model evaluates pyrolysis as the waste management disposal method. This method was chosen over the alternative disposal methods of landfilling and incineration. Several end products were considered by the mathematical model including hydrogen, ammonia, and synthetic fuel. The model is capable of finding the optimal process and end product selection as well as providing the best processing route between transfer stations, plant locations, and consumer locations. The model also considers important factors and variables including capital investments, operating costs, revenue, waste amounts, and expansion.

The mathematical model currently selected hydrogen as the optimal product to be produced from pyrolysis. Of the thirteen possible plant locations, four were selected to startup in year 2010. These plants are located at Hempstead (NY), Babylon (NY), Huntington (NY), and Charles Point (NY). For a 20 year lifetime, the Total Capital Investment for all plants and expansions is \$2.1 billion with an annual plan operating cost of \$510 million. Revenue generated from the recovered scrap, waste disposal fee, and hydrogen production is predicted to be \$825 million annually. The total amount of waste processed per year is 3.8 million tons. This proposal provides NYC with a disposal fee of \$45/ton.

Presently, the model is set up to optimize the net present value in order to generate the largest profit. However, it is not a foregone conclusion that the solution to the MSW problem is in the form of a private enterprise. If risk is too high or there exists no investors into a privately owned company, then the model possesses the capability to reverse course and determine the most cost efficient method to dispose of all the excess waste in the city. There exists the possibility of managing some combination where a fraction or all of the profitable aspects of the proposal is privately owned and the remainder is run by the city of New York. For these reasons the potential market for this type of private enterprise in New York as well as possible forms of municipal investment and ownership must be further analyzed.