

## Increasing the Quantity and Quality of Metals Recovered at Waste-to-Energy Facilities

Werner Sunk and Nickolas J. Themelis  
Department of Earth & Environmental Engineering,  
Henry Krumb School of Mines,  
Columbia University, New York, NY 10027

### Abstract

The Integrated Waste Services Association (IWSA) compiles annual data of metal recovery by U.S. waste-to-energy (WTE) facilities. The 2004 IWSA survey showed that the U.S. WTEs processed 28.8 million short tons of municipal solid wastes (MSW) and recovered a total of approximately 706,000 tons of ferrous metal scrap, i.e. 2.45% of the MSW stream. The 2001 U.S.E.P.A. report on the characterization of the U.S. wastes reported that MSW contained 7.9% metals. However, some of this metal is collected separately at the household level and a small amount is non-ferrous metal. If it is assumed that the waste stream that is "disposed" in WTE facilities contains on the average 5% of ferrous metals, the ferrous input to all U.S. WTEs is estimated at approximately 1.44 million tons. On this basis, close to 0.7 million tons of metal are not recovered in WTEs. On the same basis, the ferrous metal lost in MSW that is landfilled (247 million tons in the U.S.) is estimated to be about 12 million tons per year. The non-recovered metal at WTEs entails both environmental and economic penalties. Therefore, an industry-university collaborative study is addressed to examining a) current metal recovery before and after combustion; b) potential for increasing metal value by physical processing of the metals recovered, either at WTEs or at a regional facility to be supplied by several WTEs; c) sampling and characterization procedures used in the WTE industry; and d) potential for physical and chemical characterization of different grades of WTE metal scrap. This paper focuses on the first two subjects - the current state of WTE metal recovery and the potential for increasing metal recovery. This work in progress is published in the NAWTEC 14 Proceedings with the objective of stimulating discussion and obtaining useful input from industry and academia concerned with the conservation of non-renewable resources.

### 1. Introduction

An analysis of metal recovery data published in the IWSA Directories of 2002 showed that the recovery of scrap metal at various WTE facilities in the U.S. ranged from 100% to very little. It is realized that the metal concentration in MSW varies from place to place and even from time to time. However, the low recoveries reported by many WTEs is a good indication that hundreds of thousands of tons of metals are lost annually to landfills. The problem is compounded by the fact that only few WTEs have the necessary equipment (shredders and eddy current separators) for separating non-ferrous from ferrous metals; as a result, the mixed scrap has a much lower market value.

Following this preliminary analysis and the fact that the rapidly growing market of China has increased the value of scrap metal, a collaborative effort between Columbia University and the WTE industry was started in 2005. The initial sponsors of this study are the

Waste-to-Energy Research and Technology Council (WERT) and North American Metals Corp. (NAMCO), headquartered in Jacksonville, Florida. The objective of this study is to carry out an in-depth analysis of the approaches used for metals recovery in various WTE plants in the U.S. and abroad and use this information to devise ways for increasing the amount and value of metals collected before and after combustion by WTE facilities. This may be accomplished by:

- a) increasing the quantity of WTE metals recovered through different means of managing the metals collected from the WTE ash, either at the WTE site or at a regional facility that processes metals from a number of WTEs, and
- b) increasing the value of the metals collected by better characterization of the physical and chemical make-up of WTE metal scrap, as has been done for the metal residues of other industries.