Ash Management and Metals Recovery in Broward County, FL
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Introduction
Broward County (the County), which is located on the southeast coast of Florida, is currently faced with an ash management and metals recovery decision. The County has two mass burn resource recovery plants and they process a combined total of approximately 1.65 million tons of MSW. The ash residue from these two facilities is currently landfilled. At one facility, the South Broward Waste-to-Energy Facility (the South County Facility), ferrous was being recovered at the ash monofill using mobile equipment, as the plant was not equipped with metals recovery equipment. But as market prices dropped, so did the ferrous metals recovery. This has adversely affected the useful life of the ash monofill, owned by the County. The County is looking for a cost-effective alternative for an on-line metals (ferrous and non-ferrous) recovery system.

In processing municipal solid waste at waste-to-energy facilities, the primary byproduct (by weight) is ash residue, which typically represents about 30 percent by weight and 10 percent by volume of the incoming materials. The ash residue contains unburned material, of which a significant percent is metal. The most common type of metal is ferrous metal which is magnetic and easily recovered using magnetic material handling equipment. In addition, some facilities have been recovering non-ferrous metals which although limited in quantity, are of significantly greater value on a unit basis in the secondary materials markets.

Recent projections indicate that the ash monofill will reach capacity around December 2010. The Solid Waste Disposal Services Agreement (SWDSA) between the County and operator is projected to terminate in August 2011. The increasing market value of recovered materials combined with the declining landfill capacity prompted the County to consider implementing a metals recovery system.

Approximately 35 to 40 percent by weight of the metal recovered is ash that is stripped away from the metal during processing, and returned to the ash monofill for disposal (this is called “return ash”). This manual approach to recovering metals at the point of disposal is highly inefficient, as it requires double handling of the material and results in a high return ash component. A third party firm, NAMCO currently operates for about 10 to 12 hours per day, 5 days per week.

The most common approach to recovering metal at a waste-to-energy facility is the use of screening equipment for removal of large material, and magnetic recovery of ferrous metals, as the ash is discharged from the combustion unit into the waiting transfer trailer. The recovered metal is discharged into a concrete bunker for loading when sufficient amounts are collected.

Ash Handling Alternatives
A number of alternatives were considered for handling ash residue from the South County Facility, including:
- Maintaining the Status Quo
• Construct a facility modification to process the ash.
• Constructing a separate County-owned facility to process the ash.
• Ash Reuse (meaning a process to convert ash to a usable product for beneficial use)
• Expanding the current approach to maximize metals recovery

Our analysis considered the technology, the logistics (including the contractual environment), and cost factors. With each alternative, the cost estimates use assumptions. However, cost estimates can only be validated by the market when services are sought.

1. **Status Quo.** This includes:
   - Continuing the disposal of unprocessed ash residue until capacity is reached at the monofill.
   - NAMCO will continue to recover metals as it does now, as long as Wheelabrator allows.
   - The County or Wheelabrator will arrange for haul and disposal of ash residue until termination of the SWDSA.
   - The lowest cost option in this interim period is considered to be the County-owned contingency landfill, but this would be determined when and if necessary.

Advantages of this approach is that no action is required. Disadvantages is that valuable landfill space consumed.

2. **Constructing a facility to process the ash.** Three levels of processing are considered: bulky materials recovery only, ferrous recovery, and non-ferrous recovery.

   a. **Recover bulky materials, only and dispose.** This approach involves installation of screening equipment to recover large unburned material, most of which is metal. Typically, materials larger than 8-10 inches are removed. This step is required as a precursor to any subsequent ash processing.

      Advantages of this approach include:
      • Removal of large volume material would be expected to reduce the volume consumed in the monofill.
      • Some minimal revenue would be generated.
      • The amount of return ash would be reduced compared to alternatives 1, and 5.
      • Lower capital cost than most other alternatives.

      Disadvantages:
      • Significant amount of unrecovered metal and lost revenue.
      • Implementation time and effort.
b. Recover bulky and ferrous materials. This approach involves installation of screening equipment as described under 2a, above. Then, a magnetic conveyor or drum magnet separates the ferrous and discharges it into a bunker or transfer trailer.

Advantages of this approach include:

- Significantly more material would be removed compared to the other options considered. It is estimated over 20,000 tons per year would be removed.
- Removal of large volume material and ferrous metal would be expected to further reduce the volume consumed in the monofill, beyond alternative 2a, above.
- Significant revenue would be generated.
- The amount of return ash would be reduced.

The disadvantage is implementation time and effort.

c. Recover bulky, ferrous (Fe) materials, and non-ferrous (non-Fe) metals. This approach is the same as Alternative 2b, above, with the addition of equipment to remove aluminum, and other high value non-ferrous metals.

The advantages of this approach was a fairly significant revenue would be generated, per ton of metal recovered, which contributes significantly to the capital cost recovery based on revenue projections.

Disadvantage was revenue projections are not really possible to predict with certainty.

Constructing a separate County-owned facility to process the ash. This would be essentially the same as Alternatives 2a, 2b, and 2c, except that the County would have to provide the site and construct the facility. Under this approach, Wheelabrator would be requested to transport the unprocessed ash residue to a County-owned facility for processing. This option was not considered in detail because:
- The capital cost would likely be greater than Alternatives 2a, b, and c.
• The County would have to provide for the system operation either directly or by contract.
• Additional handling and transportation cost would add significantly to the cost.
• Wheelabrator would have to either haul and dispose of the ash residue at the monofill after processing or allow a 3rd party under contract to the County to access the monofill and dispose of the material.

3. Ash Reuse. This refers to a process to convert ash to a usable product for beneficial use.

There have been many attempts to create a commercial process to convert ash to a product for beneficial reuse in the U.S. To date, all projects have been temporary demonstration projects to determine the viability of commercial processing. None have resulted in ongoing commercial operations. This is not to say such a demonstration project is impossible. The time required to obtain a permit and implement a process would not assist in maximizing landfill volume before the end the SWDSA. Therefore, no further review of this alternatives was conducted.

It should also be noted that the legal counsel has opined that Wheelabrator owns the ash, and therefore must be a party to any such discussions or project.

4. Expanding the current approach to maximize metals recovery: This alternative contemplates increasing the level of effort currently exercised by NAMCO under their contract with Wheelabrator. As previously indicated, the County is not a party to this relationship, and can only request, or otherwise incentivize Wheelabrator to cooperate.

Advantages of this approach are no capital investment required, and additional metals may be recovered

Disadvantages of this approach include:
• There is no guaranteed performance, relating either to availability, material recovery efficiency, or term.
• As the landfill increases in height the working area becomes more limited, which inhibits the ability for NAMCO to coordinate operations with Wheelabrator.
• The County is not a party to this arrangement.

5. Request Wheelabrator to recover metal at the monofill. This approach involves requesting Wheelabrator to purchase mobile recovery equipment, and resume metal recovery at the monofill site. This would likely require a contract amendment to establish minimum operating and maintenance requirements.

Advantages of this approach include:
• The County has oversight of Wheelabrator and can assure performance to an extent.
• Capital investment would be lower than many of the other alternatives.

Disadvantages include limited metals recovery, implementation time and effort.
Estimated LF Economic Alternative Closure Ranking (NPV)

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Estimated LF Closure</th>
<th>Economic Ranking (NPV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Status Quo with transportation and disposal of excess ash at alternative facility</td>
<td>End 2010</td>
</tr>
<tr>
<td>2A</td>
<td>Implement Bulky Waste only with no expansion of Landfill</td>
<td>2011</td>
</tr>
<tr>
<td>2B</td>
<td>Implement Ferrous and Bulky Metals Recovery with no expansion of Landfill</td>
<td>1st Qtr 2012</td>
</tr>
<tr>
<td>2C</td>
<td>Scenario: CASE 2C – Implement Metals Latter 2012</td>
<td>2012</td>
</tr>
<tr>
<td>3</td>
<td>Separate County-constructed system</td>
<td>Not Evaluated</td>
</tr>
<tr>
<td>4</td>
<td>Ash Reuse</td>
<td>Not Evaluated</td>
</tr>
<tr>
<td>5</td>
<td>Expand Current Approach</td>
<td>End 2010</td>
</tr>
<tr>
<td>6</td>
<td>Wheelabrator recover metals</td>
<td>End 2010</td>
</tr>
</tbody>
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* Note: Since the County is not party to the current agreement for recovery, no revenue is generated for Alternatives 1, and 5. Therefore, the net present value and economic ranking is the same for these alternatives.

**Conclusions**

Based on our evaluation of alternatives, the results fall into three general categories:

a. Impractical due to implementation issues
b. Capital investment required, but greater impact on landfill life and improved economics
c. No capital required, but limited to minimal impact on landfill life.

Figure 2 below reflects the projected remaining monofill capacity over the next several years for several alternatives.

Ultimately, the RRB and its constituents should consider the results in conjunction with its planning horizon. If planning is limited to the period up through the SWDSA term, then the lower capital cost options may be more attractive. These are Alternatives 1, 5, and 6. If planning is to consider a longer time frame, the results favor Alternative 2C.
Figure 2: Projected Remaining Landfill

- Status Quo with transportation and disposal of excess ash at alternative facility
- 2A Implement Bulky Waste only with no expansion of Landfill (1)
- 2B Implement Ferrous and Bulky Metals Recovery with no expansion of Landfill
- 2C Scenario: CASE 2C - Implement Metals Recovery with no expansion of Landfill
- Expand Current Approach

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