AN INVENTORY OF CHARACTERISTICS AND TREATMENT PROCESSES FOR FLY ASH FROM MSW-TO-ENERGY FACILITIES

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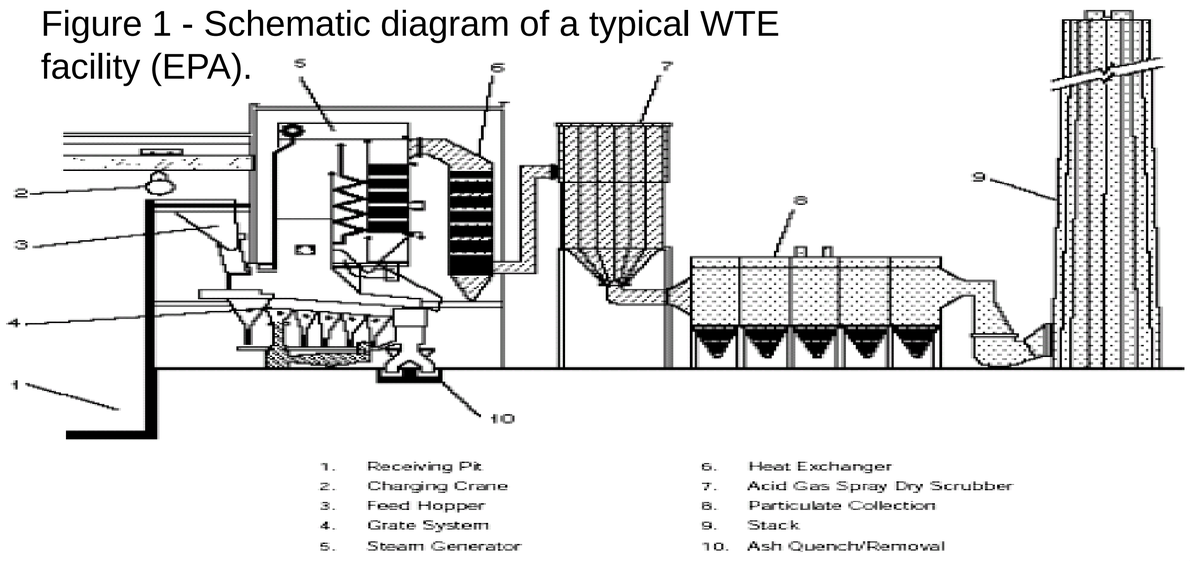
INTRODUCTION

Municipal Solid Waste Incineration (MSWI) is often the preferred option in countries with limited availability or accessibility of space for landfilling.

The current disposal management practices for MSWI residues are rarely based on sustainability criteria and long-term strategies; instead, traditional sanitary landfilling techniques have generally been applied to the MSWI residues without any significant adjustments.

The properties of MSWI residues are very different from those of uncombusted MSW, and while sanitary landfilling may be entirely appropriate for MSW, its application to MSWI residues may lead to disposal solutions which are less than optimal in terms of resource conservation and environmental safety, particularly in the long term.

Figure 1 - Schematic diagram of a typical WTE facility (EPA).



DISCUSSION

The predominate technology approaches available for WTE projects today are:

- modular incinerators,
- refuse derived fuel (RDF) systems
- mass-burning systems.

Table 1 - Typical amounts of residues produced per metric ton of waste incinerated.

Type of residue	Typical amounts produced, kg/ton of feed waste
Bottom ash	250-420
Grate siftings	5
Boiler ash	2-12
Economizer ash	Small
Fly ash	10-30

WTE residues can be divided in the following groups (Table 1):

- Bottom ash as discharged from the bottom of the furnace (mainly the grate) and fallen through the furnace grates;
- Heat recovery ash (HRA) as collected in the heat recovery system including boiler, economizer and superheater. HRA is frequently discharged into the botrtom ash stream and thus is often included in a broader definition of bottom ash;
- Fly ash carried over from the furnace and removed before sorbents are injected to clean the fuel gases;
- Air pollution control (APC) residues as collected in the APC equipment (i.e. scrubbers, electrostatic precipitators, and baghouses) including fly ash, sorbents, condensates and reaction products. The term “fly ash” usually includes APC residues;
- Combined ash as a mixture of the above categories.

The major constituents of concern in municipal waste combustion ash are heavy metals, particularly lead, cadmium, and mercury. These metals may impact human health and the environment if improperly handled, stored, transported, disposed of, or reused (for example, using stabilized ash in construction materials such as concrete blocks).

- The costs of technical processes should be comparable in most industrialised counties whereas the disposal fees will change from country to country.
- the specific costs of the technical measures are rather high, especially for thermal processes, but due to the small residue streams the expenses per ton of waste are low and similar for all disposal strategies.
- the economy will not be the decisive factor for the selection of a specific process and local conditions like access to adequate disposal sites will be more important.

Table 4 - Cost estimation of the various APC residues treatment options (ISWA, 2008).

Process	Weight change, %	Cost, €/ton of residue
Cement stabilization	+20-50	20-50
Vitrification	+30-50	100-500
Melting	-	100-500
Acid washing + thermal treatment	-20	100-200
Stabilization by FeSO4	-10	65
Stabilization by CO2	-10-20	80
Stabilization by PO4	+10-20	25

CONCLUSIONS

- Modern plants are equipped with new technologies for the minimization of their environmental impacts, especially of toxic gas emissions;
- WTE solid residues are produced, corresponding to about 20-30 percent of the feed material;
- These residues include mainly bottom ash, fly ash and air pollution control devices residues;
- Fly ash normally comprises only a small proportion of the total volume of residue ranging from 5 to 20 percent of the total ash;
- Residues should be treated by appropriate methods for the reduction of their environmental impact due to the release of hazardous compounds;
- The residue management costs of these processes are similar in most industrialised counties, whereas the disposal fees will change from country to country.