WORLD HEALTH ORGANIZATION
REGIONAL OFFICE
FOR THE EASTERN MEDITERRANEAN

ORGANISATION MONDIALE DE LA SANTÉ
BUREAU RÉGIONAL
POUR LA MÉDITERRANÉE ORIENTALE

SHORT COURSE ON SOLID WASTES
COLLECTION AND DISPOSAL
Damascus, 20-30 May 1968

EMRO 134
Lecture No. 13

Design and operation of Incinerators

I. General Objectives

A. Complete Combustion

1. Reduce volume of residue
2. Minimize air pollution
3. Minimum of putrescibles remaining in residue

B. Central Location

1. Reduce haul distance
2. Near center of refuse development area

C. Economical Operation

1. Possible salvage
2. Possible heat recovery

D. Minimum Nuisance

1. Dust
2. Noise
3. Traffic

II. Design - General

A. Location

1. Access
2. Foundations
3. Public acceptance
4. Meteorological considerations
5. Availability of services and utilities
6. Cost of land
7. Disposal facilities for residue

B. Capacity

1. Design period
2. Population growth prediction
3. Per capita refuse production
4. Industrial and other sources of refuse
5. Hours of operation
6. Provision for expansion

C. Type of Furnace

1. Batch feed
2. Continuous feed
3. Water wall

D. Auxiliary Components

1. Scales
2. Storage pit
3. Crane
4. Air pollution control

III. Design - Details

A. Unloading Area

B. Storage Pit

1. Capacity - 100-150% day's capacity

2. Dust control

C. Charging Equipment

1. Overhead cranes

a. Monorail

b. Bridge crane

2. Charging hoppers or chutes

3. End-loaded furnace

D. Types of Furnaces

1. Batch feed

a. Grates

(1) Fixed

(2) Movable

b. Advantages

(1) Small capacity

(2) Cheaper first cost

c. Disadvantages

(1) High maintenance costs

(2) Poor air and temperature controls

(3) Variable combustion results

2. Continuous feed

a. Advantages

(1) Large capacity

(2) Thermal and air control

(3) Variable rate of burning

(4) Less stress on refractories

b. Disadvantages

(1) High cost

(2) Need for skilled operation

E. Design of Combustion Chamber (Defined as where the refuse burns)

1. Temperature

Best at 1700-1800°F (U.S.practice)

Above 1400°F destroy practically all aldehydes and mercaptons which cause odors

Below 1400°F get fixed carbon particles and increase fly ash

Stay below 2000°F to protect refractories

Flame temperatures may be 2200°-2400°F or higher

2. Grate area

Burning rate 50-70 lb/hr/sq. ft. of grate area

Heat release - recommend 12,500 Btu/cu. ft/ hr. (12,000-15,000)

Volume approx. 25 cu. ft/ton/day rated capacity

3. Air supply

a. Under fire - keep to a minimum - cool grates

b. Over fire

(1) Side wall - for combustion

(2) Through roof - for turbulence

c. Air requirements

(1) Stociometric - 5.2 lbs. air/lb. of dry combustible (based on cellulose)

(2) Excess - 60% minimum up to 150% or more - for cooling gases in furnace

F. Residue Handling

1. Amount 5-25% by weight; 3-15% by volume

2. Characteristics

a. Abrasive

b. Corrosive

c. Putrescible if it contains unburned organics

3. Discharge hoppers

a. Capacity - for intermittent discharge

b. Quenching - prevent grate damage

4. Final disposal

a. Landfill

b. Salvage

G. Structural Design

1. Structural steel framework

2. Reinforced concrete

3. Brick and tile

H. Refractories

1. Suspended type

2. Preventative maintenance

3. Classes of brick

- I. Chimney
- J. Air Pollution Control
  - 1. Wet collectors
  - 2. Dry collectors

IV Costs

- A. Building and Equipment
- B. Replacement and Alterations
- C. Maintenance
- D. Amortization
- E. Personnel
- F. Utilities and Supplies

V. European Design Trends