For Presentation at the
Asia-North-American Waste Management Conference
Los Angeles, California
December 9-11, 1998

Waste Management for Developing Countries (#26)

Michael Brown, P.E., President
Thomas Vence, P.E., Corporate Vice President
Brown, Vence & Associates, Inc.
120 Montgomery Street, Suite 1000
San Francisco, CA 94104
(415) 434-0900 [phone]
(415) 956-6220 [fax]
bva-sf@brownvence.com

ABSTRACT

This presentation will show existing waste management conditions in several developing countries and describe the development of practical improvements that are sensitive to local socioeconomic, political, and institutional conditions. Although highlighted by specific examples, the information provided in this presentation has direct applicability to other developing nations.

The presentation is in two parts. The first documents existing conditions at several landfills and collection methods in several urban cities in Latin America and Asia. For example, in Calcutta, a city of over 6 million people, approximately 3,000 tons of municipal waste and over 100 tons of medical waste are generated each day. The collection system is highly labor-intensive, employing approximately 12,000 workers. Workers pushing handcarts collect waste daily, either directly from the generators or swept up from the gutters. The handcarts are delivered to one of approximately 200 three-sided concrete bunkers where human and animal scavengers remove reusable materials. The remaining waste is loaded by hand, or machine, onto trucks for delivery to the Dhappa Landfill. Infectious wastes are commingled with other wastes and bundled in the same manner.

The second part of the presentation describes the development of recommendations for system improvements that are practical given socioeconomic and cultural conditions.. For example, landfills sustain a great number of human scavengers in developing nations. Without proper consideration, the implementation of sanitary landfill practices can lead to the displacement of this population, resulting in social crisis.

This presentation (illustrated with slides) will give the attendees a view of solid waste management that is completely different from anything that most have experienced.

WASTE MANAGEMENT FOR DEVELOPING COUNTRIES (#26)

ANACON '98 Conference

Los Angeles, California

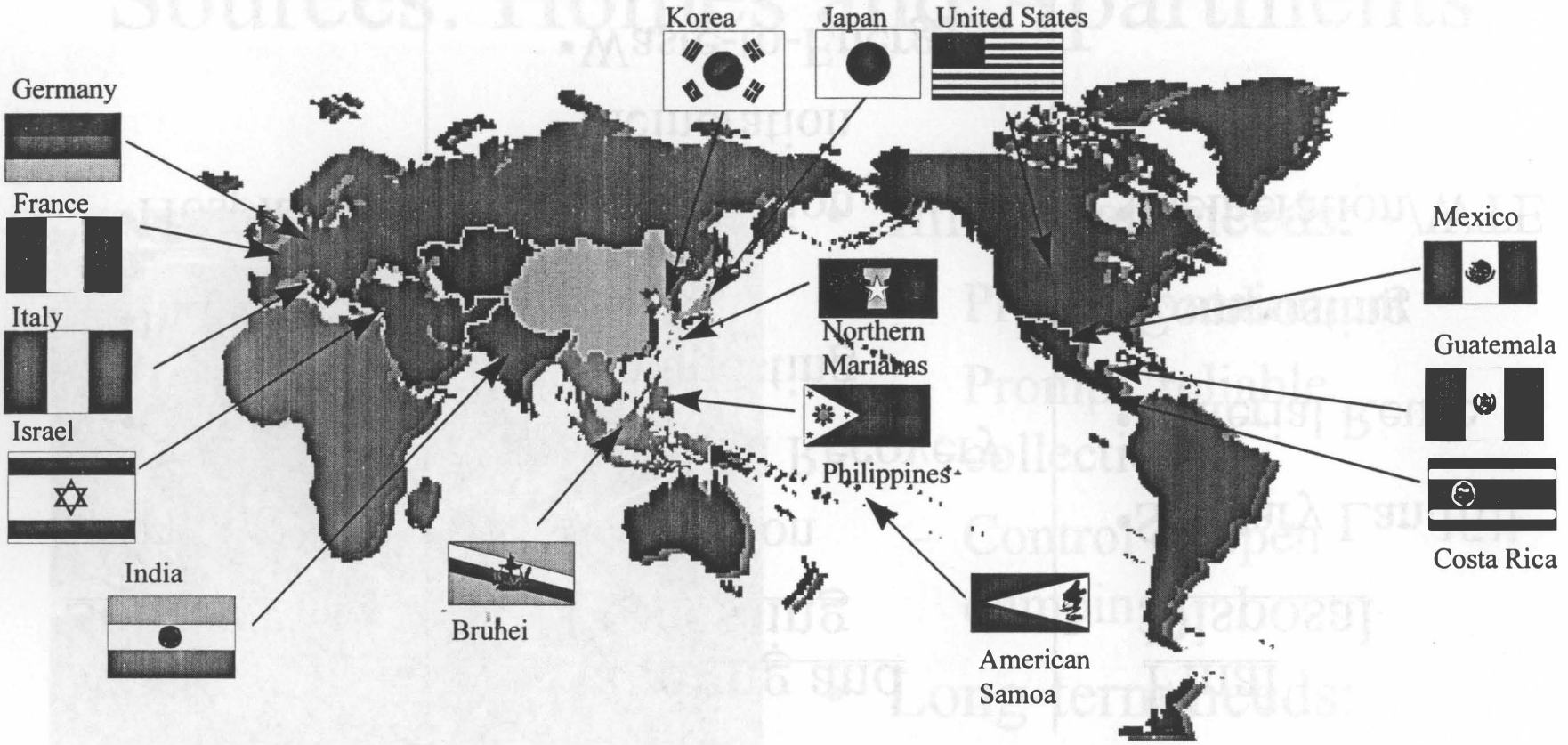
December 9, 1998

Michael D. Brown & Thomas D. Vence

Brown, Vence & Associates, Inc.

San Francisco & Roseville, California, USA

MSW & MW Experience



- Specialists in implementing integrated waste management systems
- Planning, engineering, construction, training and operational support
- Provide best technology available worldwide

Integrated Municipal & Medical Waste Management System

Waste Sources

- Homes
- Commerce
- Industry
- Hospitals

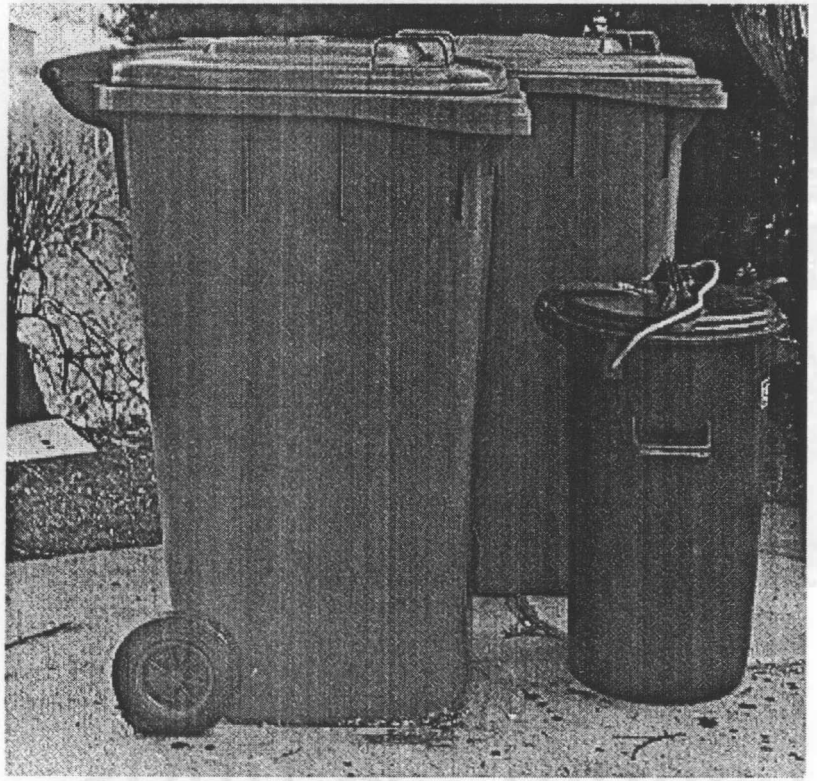
Handling and Processing

- Collection
- Material Recovery
- Composting
- Baling
- Sterilization
- Incineration
- Waste-to-Energy

Final Disposal

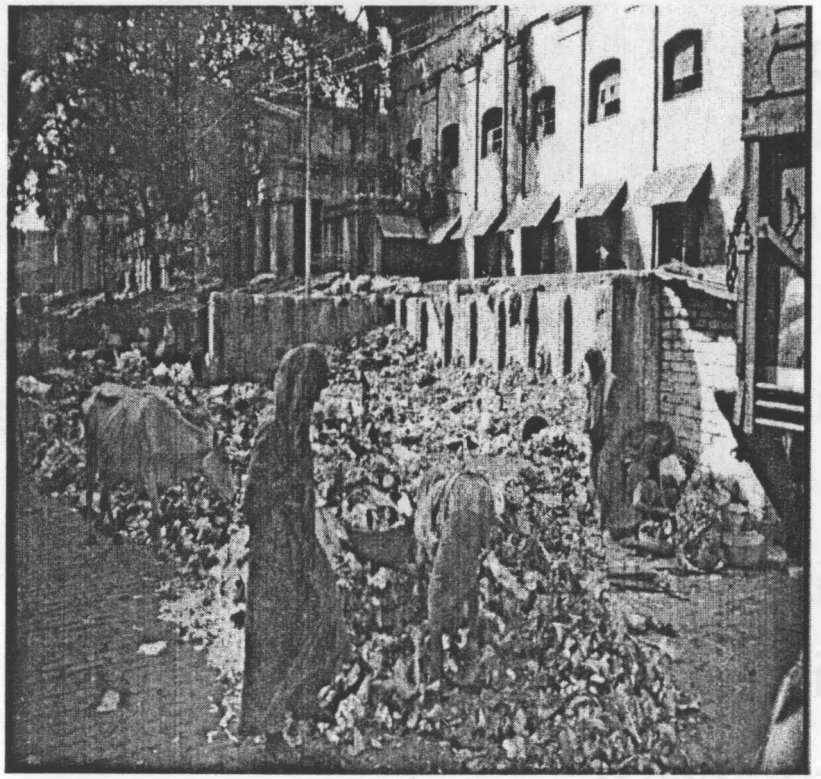
- Sanitary Landfill
- Material Reuse
- Composting
- Incineration/WTE

Sources: Homes and Apartments



- Immediate needs:
  - Proper containment
  - Prompt, reliable collection
  - Control of open dumping
- Long-term needs:
  - Worker training
  - Stable employment

Sources: Industry and Commerce



- On-site systems should contain and compact wastes
- Waste exchanges allow beneficial use
- Recycling and reduction help control production costs

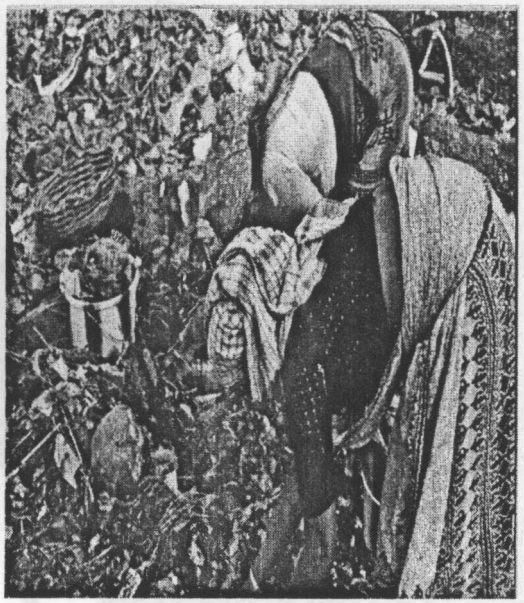
Sources: Hospital Wastes

- Significant threat to workers and the environment
- Requires proper management
- Education, inspection, enforcement

Waste Collection and Transport

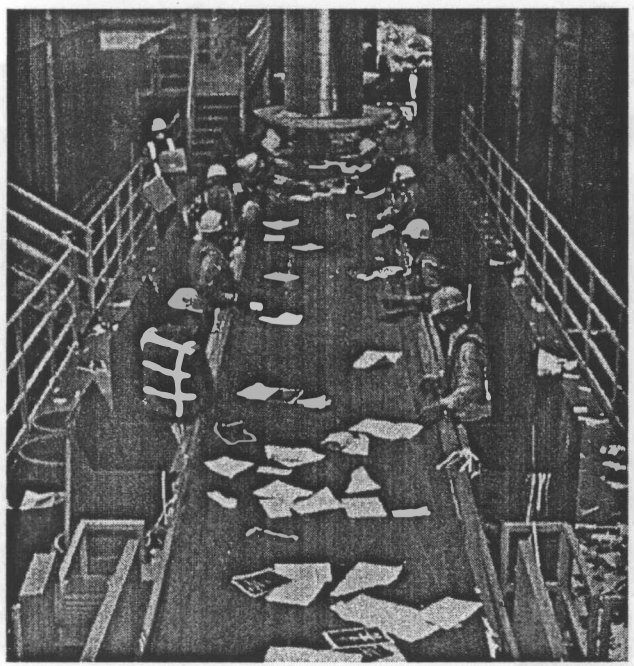
- Employ existing collectors
- Improve route efficiency
- Provide modern equipment and training
- Door to door service where practical
- Truck/rail container where appropriate
- Better service; less traffic; reduced pollution

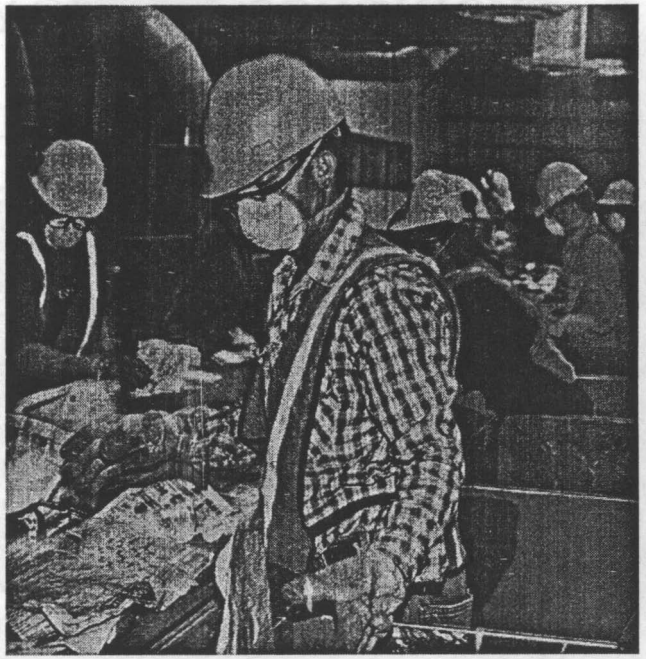
Existing Recycling Programs



- Inefficient, disorganized systems
- Unsafe working conditions
- Lack of developed markets

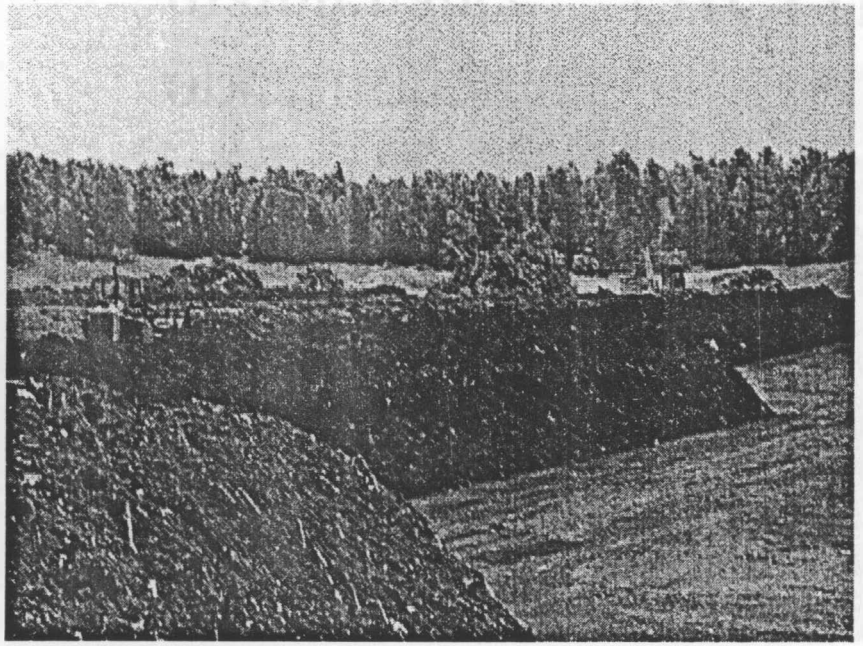
Materials Recycling Facilities





- Utilize modern technology
- Employ local labor
- Safe working conditions

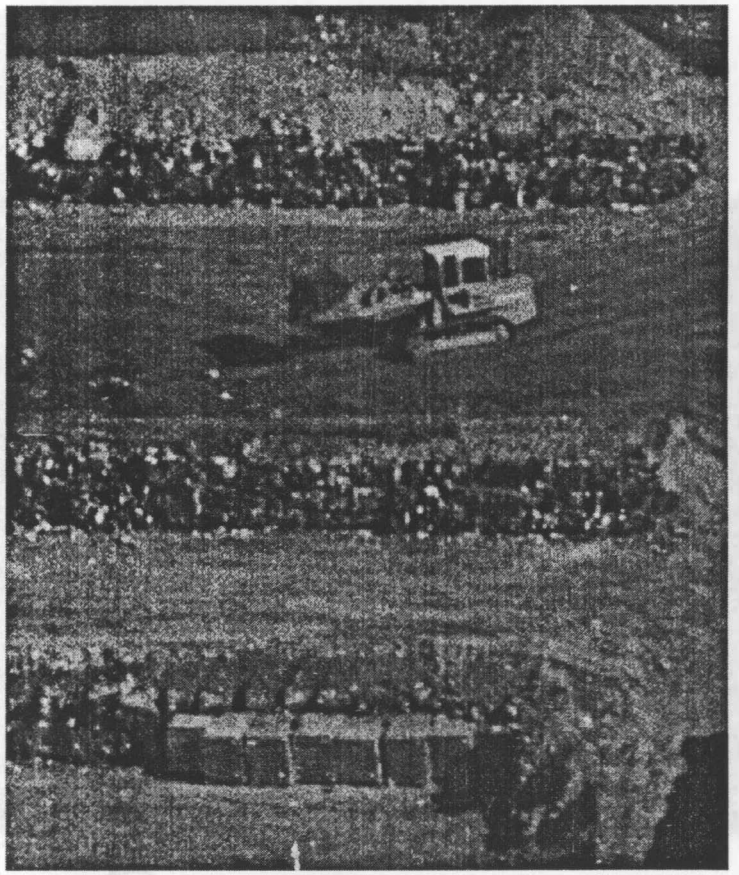
Composting



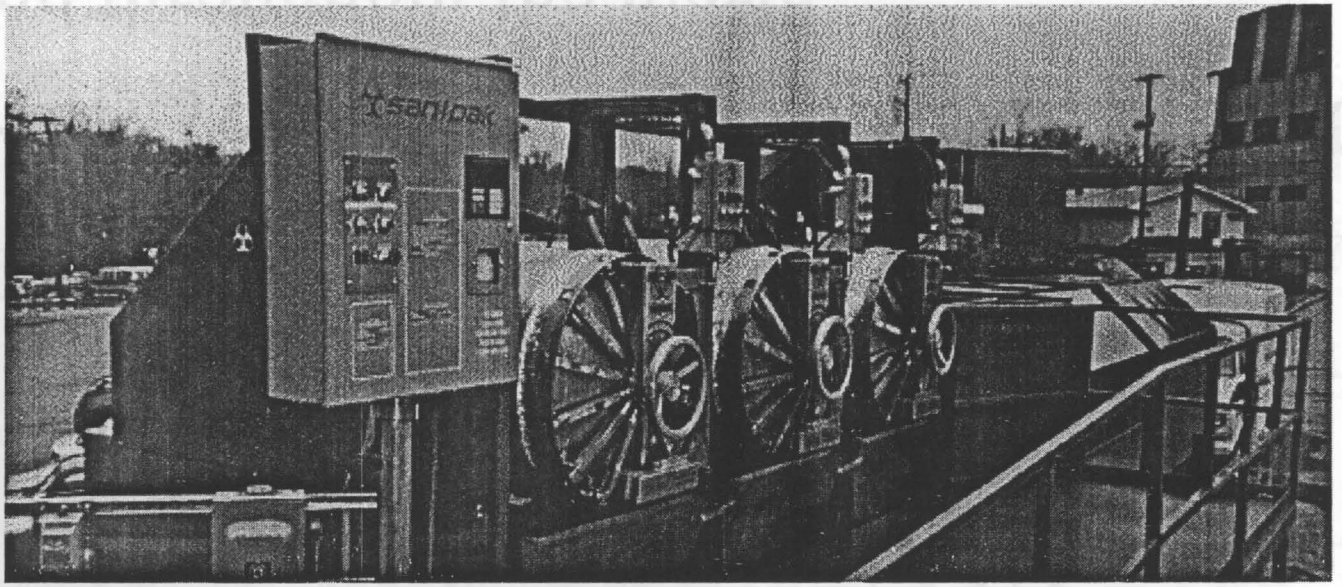
- Proper management essential for odor control
- Controlled natural process
- Useful by-product

Baling Facility

- Compresses waste into rectangular bales
- Enables wastes to be temporarily stored
- Simplifies handling and placement
- Requires skilled operation and maintenance



Medical Waste Incineration & Sterilization

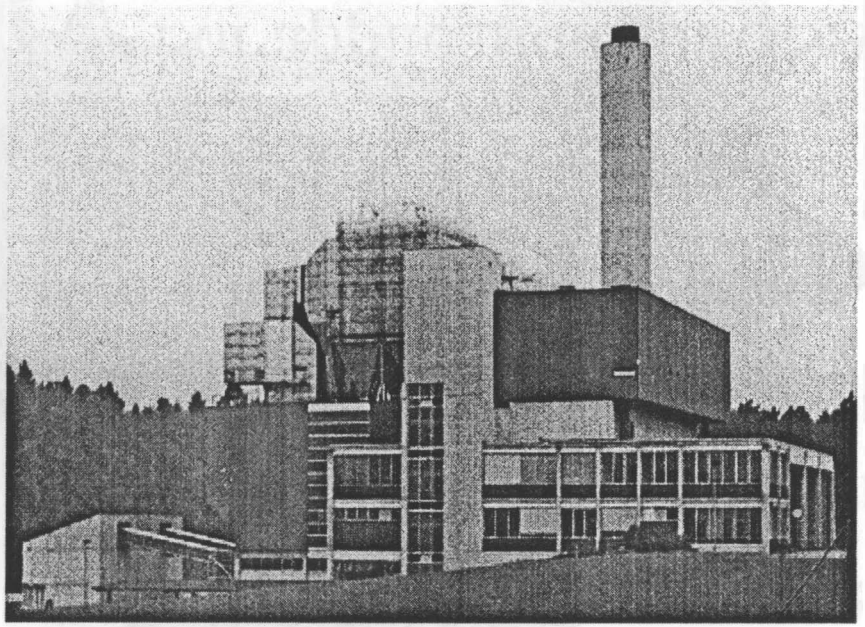


- Provides safe handling of hospital wastes
- Heat or microwave energy kills pathogens
- Wide variety of systems available

Incineration

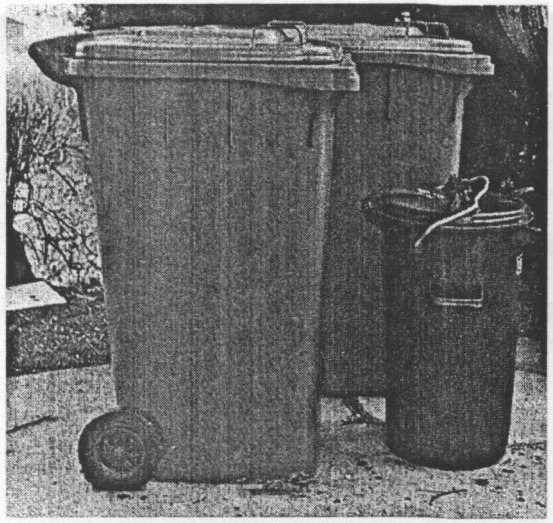
- Volume reduction typically 90%
- Metals and aggregate may be recovered from ash
- Many years operating experience in the US and throughout the world

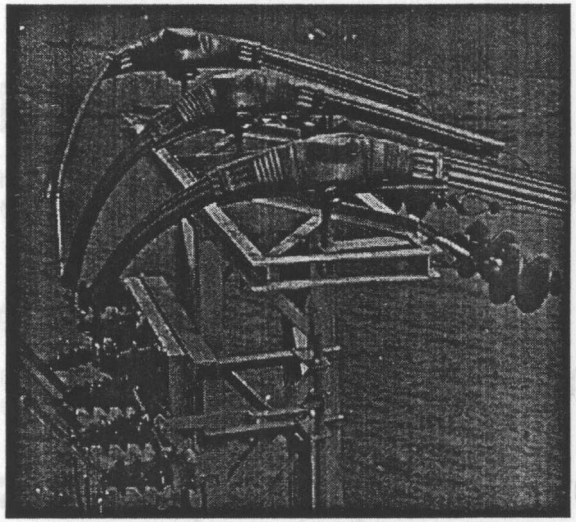
Waste to Energy Systems



- Produce electricity, steam heat, hot water
- Significantly reduce waste volume
- Stack emissions may be of concern

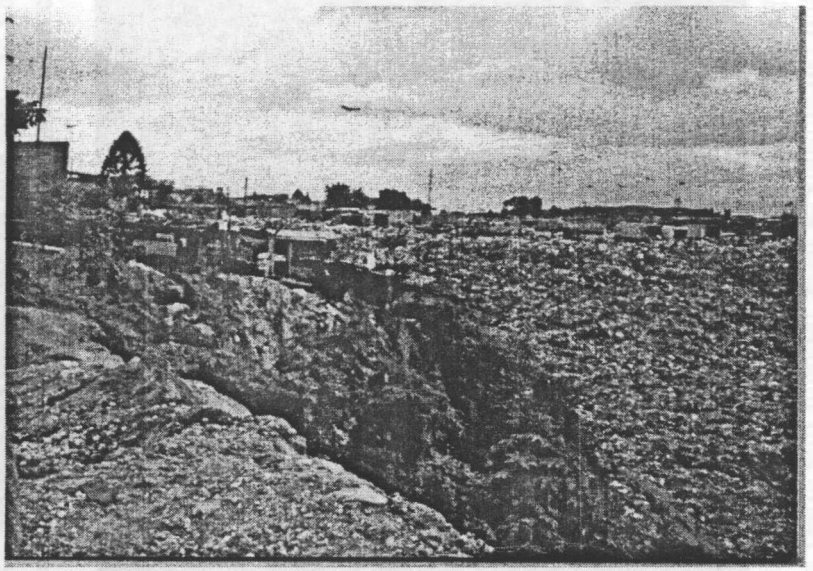
Waste to Energy System Productivity

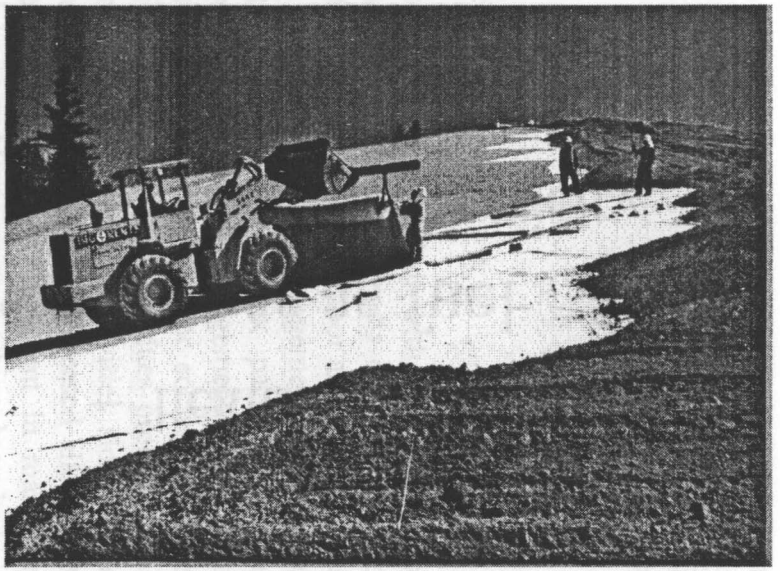




- For applications in USA:
  - 1 ton of waste produced per person per year
  - 1,000 tons/day = 25 MW electricity production

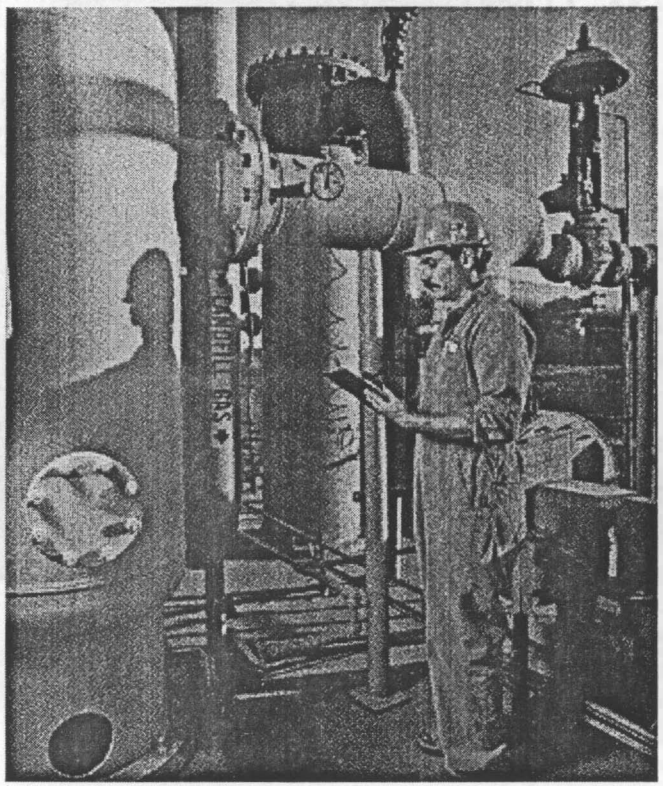
Sanitary Landfill





- Wastes compacted and covered
- Contact with water supply prevented
- Vermin and fires controlled
- Public health protected
- Landfill gas managed

Landfill Gas Control



- Prevent spread of gases
  - explosion risk
  - health hazard
- Use gas as fuel
  - generate electricity
  - produce heat
  - fuel vehicles