



Methane to Markets

Landfill Operations to Improve Installation of Cap and Gas Collection

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Presentation Overview

- Proper landfill operational practices are key to successfully completing a landfill's final cap and installation of a gas control and collection system (GCCS)
- Several operational practices can make an important difference, including:
 - Waste type management
 - Waste compaction
 - Daily cover
 - Stormwater management
 - Leachate control

Waste Type Management

- Strategic placement of different types of waste improves:
 - Working face management
 - Daily cover and final cap application & construction
 - Safety
 - Installation of GCCS



“Easy” Waste

- Fairly homogeneous
- Easier to handle
- Poses little threat to equipment
- Consists of regular household garbage
- Arrives in collection trucks
- Ideal placement on the outside and closer to the surface of the cell



“Difficult” Waste

- Bulky
- Difficult to grade
- Normally does not compact well



- Typically delivered in open top trucks and small trucks
- Best to place on lower grades

Waste Compaction

- Most important aspect of operating a landfill – need to conserve airspace
- Flatter slopes are better for compaction (build from the top down)



Waste Compaction

- Four factors that affect compaction
 - Weight of Equipment
 - Design of equipment
 - Speed of equipment
 - Lift thickness

Waste Compaction

Weight of Equipment



- Heavier is better
 - More ground pressure is ideal
 - If compaction equipment has wheels:
 - Design of the teeth,
 - Diameter of the wheel, and
 - Wheel width
- ...All have an impact on compaction

Waste Compaction

Design of Equipment



- Center of weight transferred to rear of machine – extra stability
- Decreases surface area of the tracks

- Track-type equipment have low ground pressure
- Best for pushing waste uphill



Waste Compaction Speed of Equipment

- Faster the equipment passes, the greater the compaction
- Faster speed does not mean unsafe and sloppy!
- Requires skilled and knowledgeable equipment operators



Waste Compaction

Lift Thickness



- Refers to placement of waste layers on the working face
- Thicker is not always better
- Thin lifts of trash compact easier
- 30 cm to 60 cm thick is ideal

Daily Cover

- Material placed over waste at the end of each day
- Soil is typically the most common type of daily cover material applied; however, others exist, including:
 - Green waste
 - Tire chips
 - Wood chips
 - Chemical foams
 - Construction/demolition debris
 - Incinerator ash

Daily Cover Purpose

- To comply with Regulation
- Provides rodent/pest and odor control
- Controls litter
- Reduces the risk of fire
- Provides barrier for stormwater run-off/reduces infiltration
- Improves LFG generation by creating anaerobic conditions
- Controls waste scavenging
 - Reduces access
 - Encourages safety



Daily Cover Application

- Material used depends on cost and availability
- Spread in 15 cm lifts to achieve even, thin layers
- Material typically stripped off each morning to maximize airspace
- Handling material is expensive – store close to working face, minimize movement



Stormwater Management

- Stormwater = water that originates from precipitation events
- Becomes leachate if it make contact with the waste and infiltrate into the landfill
- Operational difficulty due wet and muddy conditions
- Can cause erosion at the working face
- Increases cost of landfill operations
 - Cost of stormwater management is less than cost of leachate treatment

Stormwater Management

Preventing Run-on

- Run-on control prevents surface water from running on to the working face
- Use of earth berms can divert stormwater away from working face
- Reduces leachate = large cost savings
- Promotes easier operation of equipment – keeps water away from operations

Stormwater Management

Controlling Run-Off

- Run-off control refers to systems that keep stormwater away from the waste
- Landfill operations should include:
 - Maintaining proper slopes
 - Minimizing sheet flow off the landfill
 - Maintaining stormwater controls – remove silt from stormwater controls and ponds
 - Compacting daily cover
 - Preventing ponding
 - Repairing erosion damage

Stormwater Management Control Measures

- Ditches
- Berms
- Slopes/grading
- Culverts
- Seeding
- Erosion control
- Energy dissipation
- Sediment basins
- Detention basins



Stormwater Management Control Measures



Leachate

- Leachate is a liquid containing dissolved and finely suspended particles that drains or “leaches” from a landfill
- Liquid in waste and stormwater infiltration become leachate
- Contaminants dependent on:
 - Solid waste composition
 - Physical, chemical, and biological activity within the landfill
- Leachate is typically a strong, soluble organic waste, with high concentration of inorganic constituents

Leachate Generation Factors

- Geographical area
- Storm frequency
- Season of year
- Cover over waste
- Operational methods
 - Stormwater run-on and run-off
 - Rain tarps
- Waste composition
 - Moisture and organic content

Leachate Surface Discharges



Leachate Prevention

- Manage stormwater -- stormwater that runs onto the working face becomes leachate
- Once in contact with waste – best to prevent stormwater run-off (contaminated stormwater)
- Improve stormwater run-off controls of areas around working face
- Reduce infiltration
 - Avoid creating flat surfaces that encourage water to “pond” and seep
 - Maintain vegetative cover

Leachate Collection

- Perimeter Trench - can be used to drain leachate and carry it to treatment system
- Subsurface Perimeter Gravity Drain - can be built around and under the landfill
- Vertical Well Pumps – effective but expensive



Final Cap Purpose

- Provides protection for human health and environment
- To meet regulatory requirements
- Provides barrier for stormwater runoff
- Provides protection against fire
- Reduces stormwater infiltration
- Improves landfill gas generation – creates anaerobic environment
- Improves ability to collect landfill gas – limits atmospheric loss
- Reduces odors
- Provides vector control

Final Cap



Final Cap Components

- **Constructed Soil Cover**
 - Clay or low permeable soil (60 cm)
 - Vegetative layer – soil to support vegetation (15 to 30 cm)
- **Geomembrane**
 - Can be used to further reduce infiltration
 - If used should be above clay cap
 - Should be in direct contact with clay
- **Stormwater Controls**
 - Remove stormwater before it becomes leachate
 - Prevent erosion
 - Top of landfill should be graded to encourage run-off

Gas Control & Collection System Purpose

- Improve air quality
- Reduce odors
- Develop local energy source
- Reduce greenhouse gas emissions

Gas Control & Collection System Components

- Network of interconnecting piping (lateral & header)
- LFG collection points
 - Vertical extraction wells
 - Horizontal collectors/trenches
 - Gas monitoring wells
 - Connection to existing vents, wells, etc.
- LFG blower/compressor
- Condensate removal
- Combustion device (flare, engine, etc.)

Gas Control & Collection System Components



Gas Control & Collection System Components



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