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

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

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

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