Session 1 Q&A

GMI Biogas Subcommittee Training Series: Best Practices for Landfill and Organic Waste Management

1. **CEO BWMC:** Can we get the data of total waste dumped on dumpsites which had slope failure? (Slide 15 of Session 1 presentation)

   Response: I believe it was holding approximately 13 million metric tonnes of waste when the Ghazipur Dumpsite collapsed in 2017. Daily in-coming waste is about 3000 metric tonnes, with half of that volume going to the incinerator next to the dumpsite and its ash residues back to the dumpsite.

2. **Syed Osama Faheem Rizvee:** Is there any way we can minimize the effect of leachate on ground water while closing a dumpsite?

   Response: The effective way to minimize leachate generation is to install an impervious final cap system over the entire dumpsite surface. The lateral movement of leachate from the waste mass can be controlled somewhat using a slurry cutoff wall installed around the footprint of the dumpsite, along with a series of leachate pump stations that can be installed on the dumpsite side of the wall to extract leachate for treatment and disposal. This impervious slurry wall needs to be designed by an experienced professional and installed by an experienced contractor to ensure its performance. For the vertical movement of leachate where there is no liner system at the bottom to stop it from going down, there is nothing one can do to stop it from going downward by gravity, unless the dumpsite is sitting on a very thick low permeable clay deposit or stratum.

3. **Rizwan Jabbar:** Dumpsite to controlled landfill conversion - how is this done as engineered landfill require liner system? How can we provide lines in already dumpsite?

   Response: You can't install a liner system below an existing dumpsite. However, if there is additional parcel of land adjacent to the dumpsite, you can install a liner and leachate collection system on the new sanitary landfill footprint as well as on the sideslope of the dumpsite (piggy-back expansion) to control leachate as well as later to extract methane gas.

4. **Sbahat Shaukay:** My concern is about groundwater quality under dumpsite, especially during rain

   Response: If the dumpsite is in operation, the concern of groundwater quality under the dumpsite is always there and there is nothing you can do to improve it unless the exposed waste is covered with daily cover soil to reduce infiltration of rainwater or inactive area to cover with a temporary rain tarp cover, or to finally close the site by installing a proper final cap system and remediating any lateral movement of leachate by a system of cutoff slurry trench and leachate pumping station. An experienced landfill design/consulting firm should be engaged to recommend a site-specific solution.

5. **CEO BWMC:** What should be the preferred method of dumping waste on sanitary landfills? In baled form tightly stripped or in open and loose form? Please advise.

Response: There are few baled-waste operations left in the US, even if we had quite a few in the past. Baled waste operations are not preferred and less common in the US because baling operations are troublesome and difficult to operate and maintain. Baled waste will decay at a lower rate because liquids tend to travel between the bales and does not penetrate the bales and contact the waste. The result is very slow decomposition which will result in a longer period in which methane will be produced and mitigation is required.

However, loose waste in landfills still needs to be compacted. As a sanitary landfill operation, waste should not be exposed or placed in loose form. It should always be covered with a daily cover and the waste compacted with at least 3 to 5 passes using a landfill waste compactor. This practice increases the waste's density and hence the life span of a landfill. A higher density benefits methane gas generation and collection efficiency.

CEO BWMC: How can you separate methane and carbon dioxide and at what stage?

Response: Methane and carbon dioxide only need to be separated when converting LFG to Compressed Natural Gas (CNG) or Liquid Natural Gas (LNG). There are a few different processes that can accomplish this, such as membrane separation or adsorption through liquid solvents. It would be done after collecting the LFG and prior to distribution of the methane-rich product gas. Please consult the project development handbook.

Methane and carbon dioxide do not need to be separated when utilizing the LFG in an internal combustion engine, turbine or direct use project. They also do not need to be separated if the LFG is being flared.

6. **Rizwan Jabbar:** Location of condensate sump in landfill?

   Response: The condensate sumps are located at low points along the header collection pipe or where there are long segments of piping that could develop low points.

   Leachate sumps are located at low points in the bottom liner system.

7. **Rizwan Jabbar:** What are the cost implications of Direct Landfill gas uses and renewable energy?

   Response: If there is a nearby energy user, direct use projects, which utilize the landfill gas as a medium-BTU fuel source, are usually the least expensive and require limited large infrastructure, such as the moisture removal vessel, blower/compressor units, transmission pipeline, and a back-up flare unit. In addition to moisture removal, some pretreatment of the gas may be necessary but can usually be accomplished with activated carbon filtration.

   Renewable energy projects that produce electricity require electrical generation equipment, such as an internal combustion engine or a gas turbine, and also require additional infrastructure to connect to the power grid, which is referred to as the “interconnect”.

8. **Dr .M. Mahboob Alam:** How to deal with LF sites which are already closed but not properly?

   Response: The steps to close a dumpsite include evaluation of the slopes and waste placement, engineering a capping system, implementation of the engineered cap including gas collection, and developing a monitoring and maintenance program.

9. **Sidra Rao:** Is it operationally feasible to integrate wastewater treatment plant sludge into landfill operations for methane production, and what modifications would be required?

Response: Yes, sludge can be integrated into landfilled waste but the proportion needs to be controlled to prevent oversaturating the waste and creating stability issues. Landfills permitted to integrate sludge typically follow a 6:1 ratio (waste-to-sludge). The sludge material should also be monitored closely to keep loads with free-flowing liquids out.

10. **Aamir:** From an economic point of view, is LFG utilization as energy financially sustainable model or environmental friendly?

    Response: LFG utilization to energy can be financially sustainable based on the preliminary and detailed feasibility assessment findings. Reducing emissions contributing to global climate change and improving air quality are some of the environmental benefits of LFG utilization.

11. **Rizwan Jabbar:** Can we get the permeability value of cover material or range of permeability so that use of in situ material can be maximized?

    Response: Typically, no permeability requirements exists for daily cover material. Coarse material is usually preferred for use as daily cover to enhance leachate drainage to the collection system of a sanitary landfill. Low permeability soils may create a barrier and result in lateral flow leading to outbreaks on the sides.

12. **Aamir:** Can baled waste (1 ton baled at transfer station) be the best practice for high efficiency of LFG?

    Response: Baled waste usually has a lower rate of methane production because it is difficult for water and microbial colonies to infiltrate the bale to enable decomposition of the waste.

13. **Syed Osama Faheem Rizvee:** Is there any possibility of leachate going into gas collection system?? as gas collection system and leachate is also in between the waste.

    Response: The gas collection lines are designed with low points to drain condensate, as the extracted gas along the collection system cools into a condensate sump. Leachate buildup through the perforations of vertical wells is removed with pumps to facilitate gas flow.

14. **Rizwan Jabbar:** Please provide the revenue generation from LFG system to compare the economic viability of project.

    Response: Revenue generation vary from landfill to landfill and will largely depend on historical waste practices in determining the potential volume of gas generation. LFG generation from sanitary landfills with liners, leachate collection system, active cover system is more productive than in open dumpsites. Revenue generation can only be determined after assessments of the technical, financial, and economic feasibility have been performed.

15. **Mohammad Tahir Khan:** Can we assume that leachate will be purified through percolation if there is no membrane beneath it?

    Response: We cannot assume that leachate that penetrates into the natural subsurface soil underlying an open dumpsite will be purified through percolation, a process which is often referred to as “natural attenuation”. It is typically more likely that the leachate will contaminate the groundwater. However, an engineered final cap system that includes a low-permeability layer (such as a geomembrane) and encourages stormwater run-off through stormwater diversion features will reduce the amount of leachate that will continue to be produced within the dumpsite. This will also reduce the potential for leachate to contaminate groundwater.

16. **Mohammad Tahir Khan:** Is there a specific composition of waste required for recovering or generating methane? Our waste primarily consists of organic material, various types of plastic, and other waste types.

    Response: Methane is a component of landfill gas, which is produced during the anaerobic digestion of biologically-degradable waste (often referred to as "putrescible" waste), which are primarily organic wastes, such as food waste, vegetative waste, garden waste, paper, and wood. Limiting these organic wastes from disposal in a landfill will reduce landfill gas production and decrease the potential for fugitive (uncollected) emissions.

17. **Aamir:** Best practices of landfill management and LFG collection system in South Asia?

    Response: Best practices as discussed in this training is to limit the disposal of organic matter in landfills to reduce emissions. Where organic matter is disposed, the best practice is to collect the LFG as soon as possible. Some landfills will install horizontal collectors to collect LFG while the cell is active. Other landfills will install vertical wells when the final grade is reached and the final cover is installed.

18. **Dr. M. Mahboob Alam:** Is spraying collected leachate on top of the waste a good option for reducing its toxicity?

    Response: Spraying leachate on top of waste, which can also be termed "leachate recirculation", accelerates waste decomposition and gas production. However, the practice, if uncontrolled, can lead to unstable landfill conditions. If properly planned, recirculating leachate could be an option for reducing its toxicity.

19. **Waleed Qureshi:** Can I get a recording of this presentation?

    Response: The recording of this training, as well as the PowerPoint slides, transcript, written answers to questions during the Q&A session, will be posted on the GMI website.

20. **Imran Zaman:** Will this presentation be shared via email?

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