Scientificclosure & containment of Old MSW dump at Dhapa; Salt Lake Kolkata using Geosynthetics products.

Project Description

Project: Construction of landfill embankmentbyusing Techgrid Geogrid TGU (PVA & PA coated)
Location: Kolkata, West Bengal.

Product: Techgrid TGU 35 (PVA and PA coating); Geonet and Drainage composite.

Manufacturer&Supplier: TechFab (India) Industries Ltd.

Project Brief

Dhapa has been historically used for waste dumping for many decades. With the gradual development of the city towards the east, the garbage dumping has moved away further eastwards and the old dumping areas nearer to the main city are now used for farming.

The current "dumping area" is spread over about 35 hectares. It consists of two unlined dumpsites, spaced~ 500m apart – one closed dump of area ~ 12.14 ha and one active dump of area ~ 23 ha.

Establishment of a new and controlled landfill dump is planned in the area. Both the closed and the active dumpsite are unlined and without any environmental protection or mediation facilities. The closed dump site bearing of area of approximately 12.14 ha is the project site.

11 storied high Dump before starting work at Dhapa Landfill, Kolkata

Project Challenges

- Defining alignment of periphery as well as datum level of dump was another challenging task due to steep slope in some of the portion which spread beyond boundary line, horizontal shifting was not possible.
- Profiling: excavation, shifting, filling, &compaction of existing waste in shape as per design were difficult to manage the pace of construction due monsoon & high moisture content inthe naturally settled waste as well as natural openings for leachate flow.
- Space constraint for movement of machinery and management of space to accommodate more waste in the same foot print area.
- Handling of & shifting of existing waste due to high moisture content and opening of natural leachate flow.
- Mass balancing of earthwork was difficult taking into account possibility of uneven primary settlement due to unanticipated compaction from heavy vehicular movement, settlement during monsoon as well as continuous settlement due to emission of gas.
- Volume of soil layer was of gigantic proportions (about 1.5 lakh Cu.m) to procure, shifting up to 35m height on steep road, and achieving the desired level of compaction on slope was the most difficult task of the project. Approximately 15000 truck load of soil transported from various location during night hours to avoid traffic congestion in city.
- Availability ofspace for construction of new scientific landfills and storage of geogrids and liners which affected the procurement schedule.

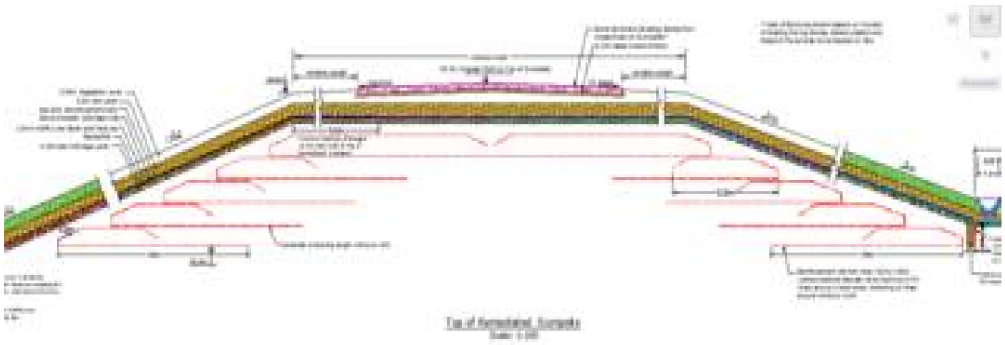
Solution proposed:

Unlike any new landfill , management of existing waste would require a detailed study of various aspects including design of slopes to accommodate more waste in the provided foot print area; stability of base and embankment slopes ; ease of construction ; health & safety of workman etc.

In this case, embankment was constructed on weak foundation; there was possibility of uneven primary settlement. So, it was necessary to construct stable soil embankment, it was proposed to use Techgrid TGU Geogrid (PVA & Pa Coated) reinforcement &Geonet

- Geogrid Wrap around system was used for raisning of embankment of the dump site from existing +25.0 m RL up to approximately +35.0 m RL in order to protect embankment from land slide and creating cell pockets to accommodate existing waste
- Steeper slope building with use of geonet
- Existing soil lying should be reshaped, slope was steep 1V:2.5H and there was no scope for horizontal shifting so it need be reinforced with Geogrid on the Slope.

Proposed cross section by consultant is shown below.



Execution on Site:

Profiling of waste:

- The flow of excavation for profiling was considered from top of the dump and preceded towards bottom of the dump, with the peripheral waste clearance being the last activity.
- Excavated waste was loaded onto dump trucks and placed in the filling area.
- Filling area was compacted by roller before laying / dumping each layer of excavated waste
- Elevation of every layer was marked near the filling area. Excavated waste was dumped in the filling area.
- Dumped waste was spread to a thickness of 500mm and was compacted by roller with a minimum of 3 passes as per the design.

(Excavation, Loading & Reshaping of waste)

(Transportation of Waste)

(Maintaining moisture content by sprinkling water)

(Slope Formation)

(Leveling of waste by Dozer)

(Compaction of Waste by Vibratory Roller)

Installation of Geogrid for raising dump site top within waste body

- Laying of Geogrid –
  - The Geogrid was laid with the longitudinal direction parallel to the direction of the principal stress (perpendicular to the top of the slopes).
  - The Geogrid was installed in intervals of maximum 0.70 m. Geogrid was anchored with wrap around in outer section with an overlap of minimum 5.0 m and with a horizontal (anchoring) length on the waste of minimum 10.0 m.
  - Re-disposal of excavated waste on laid Geogrid was in two layers with the first layer between 0.4-0.5 m and the second layer between 0.2-0.3 m.

- After disposal and compaction of waste layers the Geogrid was wrapped around the margin of the waste and the next Geogrid was overlaid.
- Installation of Geogrid was following the manufacturer's guidelines with the wrap around methodology.

(Laying of Geo-grid)

(Laying of Geo-grid)

- Jointing of Geogrid –
  - No joint in the longitude direction was accepted. Geogrid was connected by simple overlapping in perpendicular direction to the role. Overlapping was minimum 0.10 m.
- Connections to structure –
  - Geogrid was cut in shape as required and with maximum distance between the penetrating structure and the Geocomposite at 0.25 m. At the toe of the slope the Geogrid was installed on top of the erosion stone layer. The Geogrid had at minimum 0.5 m overlap in directly connection with the top of the stone layer.

Installation of Geogrid on slope within soil layer

- Laying of Geogrid –
  - The Geogrid was laid with the longitudinal direction parallel to the direction of the principal stress.
  - Rolls were placed on the formation in the position where the length of the Geogrid was required starting and with the roll as closely as possible at right angles to the line of the run.
  - Accurate alignment at the start was essential to ensure a satisfactory positioning of the laid Geogrid. The run and lying of the Geogrid was straight and all strips should remain flat and untwisted with no undulation.
  - Laid Geogrid was kept stable by using sand bags or any other suitable weight. Overlaid soil was laid on slope starting from the toe of the slope and taking any slack in the Geogrid up to the top. The Geogrid was covered with soil within two (2) weeks of installation.

- Jointing of Geogrid –
  - All joints in the longitude direction should take place in anchoring trenches with a minimum 1.0 m overlap. Geogrid was connected by simple overlapping in perpendicular direction to the slope direction. Overlapping was minimum 0.10 m.
- Connections to structure –
  - Geogrid was cut in shape as required and with maximum distance between the penetrating structure and the Geocomposite at 0.25 m. At the toe of the slope the geogrid was installed on top of the erosion stone layer.
  - The Geogrid should at minimum have a 0.5 m overlap in directly connection with the top of the stone layer.

Liner System:

- On the surface of compacted MSW, on the top as well on the side, Vertical Gas Collection Wells were provided as per guidelines.

For laying of Liner System:

- Geotextile, HDPE liner, geo composite was laid along the slope as per requirement of the project specification and general guidelines of CPCB and MORTH.

(Laying of Geo-Textile)

(Laying of Geo-Textile)

(Laying of 1.5mm Both side Textured HDPE Liner)

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(Laying of 500mm thk. Non-contaminated Soil)

(Laying of 450mm thk. Vegetative Soil)

Conclusion:

The closure and containment of old waste was achieved scientifically with the aid of Geosynthetics products to get final height of 35m; 10 m higher than old unscientifically disposal. Further the new facility would have managed waste in a more efficient way to save almost 1.5 ha of land. This is important achievement & would have been possible due to steeper construction of slope by using Geogrid and other geosynthetics material.

Landfill turned into Green slopes

Project was successfully completed by the contractor as per requirement of contract document.Over a period of few months a lush green turf was being formed on the outer face the slope. There is no way to understand that underneath the expansive gardens lie the garbage hills of the city for years.

This project made into many news channels

Stinking Dhapa dump to turn tourist destination by 2020

https://timesofindia.indiatimes.com/city/kolkata/stinking-dhapa-dump-to-turn-tourist-destination-by-2020/articleshow/59888917.cms

Eastern India's Largest Garbage Dump Goes Green

https://www.msn.com/en-in/news/good-news/eastern-indias-largest-garbage-dump-goes-green/ar-BBXVrNv?li=AAggbRN

KMC converts Dhapa, largest open garbage dump-yard into a green plateau

https://www.getbengal.com/details/kmc-converts-dhapa-largest-open-garbage-dump-yard-into-a-green-plateau

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