K K Enviro Tech Pvt Ltd
formally known as KK Enterprises
Environment and geotechnical solutions company

Case Study

Erosion Control and Seepage Control of embankment of closed red Mud Pond

Site details

Area: 9000 sqm.
Slope Angle: 40 to 45 degrees.
Height of red mud pond embankment: 17 to 18 m
Rainfall: 150 cm annually.

When Aluminium is extracted from Bauxite, a waste known as Red Mud is generated. This Mud is highly alkaline and contains Oxides of Iron, Titanium and Calcium. It may also contain traces of heavy metals and sometimes radioactive materials.

The red mud pond was built many years ago near a river, without any bottom lining system and subsequently closed, when full, by covering with a thick layer of cinder and soil. Some afforestation work was also carried out to make the dump area green.

Fibertex F-25 NW Geotextile for Trench drains

Problem:-

During monsoon, there was erosion of the top surface of the embankment. Soil was entering the river from the embankment. There was also a problem of seepage of caustic materials along with infiltrated rain water and this too entered the river water.

Requirement:-

The embankment area was to be protected against erosion and seepage controlled.

Solution:
The ideal solution was to cap the whole area with a geosynthetic lining system so that rain water ingress could be stopped.
However, due to financial constraints a simpler solution was offered.
The idea was to limit the ingress of water by removing all surface water before it infiltrated deep into the fill. This way the water would be devoid of any chemicals from the red mud.
The Erosion was proposed to be controlled by growing vegetation.

Materials Used:
Fibertex F-25 Nonwoven Geotextile as Filter
Intermas Via Drain – a Prefabricated Drain
Perforated Pipes
Coir Geocell as soil holder.on steep slope

Stones, Top Soil and Seeds.

Method of installation

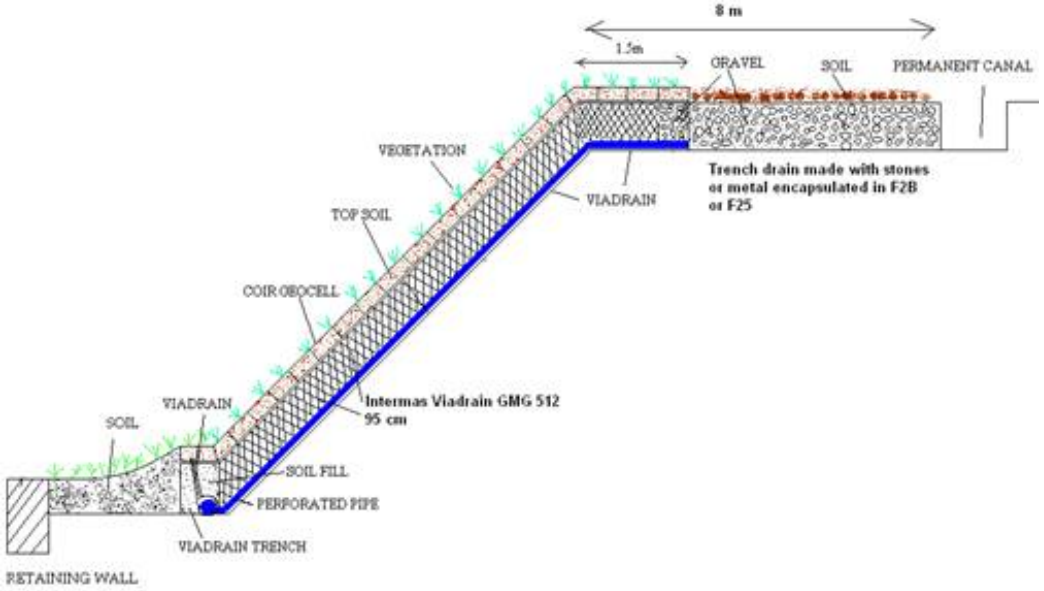
1. The slope was cut and filled and compacted to make the slope uniform.
2. Trenches 1m depth and 0.5m wide were excavated on the top flat surface. The excavated earth from trenches was used to fill the non-uniform slope or in backfilling the trench after installing the viadrain. One viadrain trench at the bottom of the slope was also excavated. The trench horizontal to the embankment should be excavated in a slope of 1 in 50.
3. Trenches were cut on slopes and completed with laying of Viadrain and perforated pipes. The soil from these trenches was used as backfill.
4. A trench drain was made parallel to the embankment 1.5 m away from the edge. The trench was 1 m deep and 0.5 m wide. Fibertex F-25 was laid filled with stone metal.
5. In the bottom trench Viadrain was placed and the trench was filled with excavated soil.
6. coir geocell was placed over the whole sloped area. The geocell layer was extended 1.5 m over the shoulder of the slope.
7. geocell was half filled with top soil and seeds.

Watering of slope was not required as rainy season began soon after installation

Installation of Viadrain in slope trench

Installation of Coir Geocells and soil

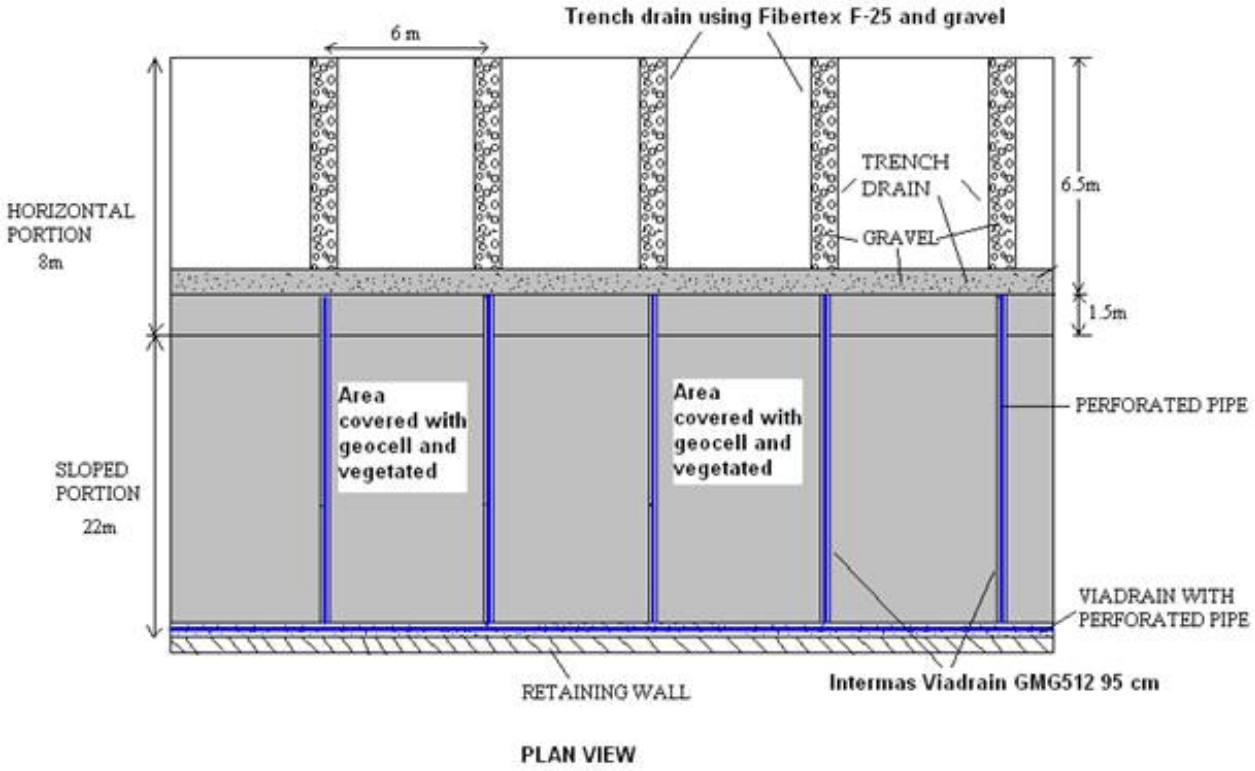
Barren slope after drainage works



EROSION CONTROL DESIGN: CROSS SECTION OF THE SLOPE EXCLUDING RETAINING WALL

Vegetation growing after 40days

Vegetation growing after 100 days



PLAN VIEW

Results:

After the first monsoon it has been found that the area has become totally green with no visible signs of erosion.

There has been no seepage from the embankment. The water is clear and contains pollutants within specified limits.

Further monitoring is going on

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