

Geomembrane for raw water reservoir in Kalyani steels in Hospet – Karnataka, South India

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ABSTRACT

A geomembrane is very low permeability synthetic membrane liner or barrier used with any geotechnical engineering related material so as to control fluid or gas migration in a human-made project, structure, or system control. This is a case study of using a high-quality Geomembrane for Water Reservoir in a Steel plant in Hospet Taluk of Bellary District in Karnataka, south India. A Reservoir is an open-air storage area where water is collected during rains (or rainy season) and kept in quantity so that it may be drawn off for use during necessity like summer. The role of water-storage reservoirs, therefore, is to impound water during periods of higher flows, thus preventing flood disasters, and then permit gradual release of water during periods of lower flows. Simple storage reservoirs were probably created early in human history to provide water for drinking and for irrigation.

Water in a reservoir may be lost by surface evaporation, by seepage into the surrounding soil or rocks, and by seepage through dam foundations. Seepage losses ordinarily can be reduced to a great extent by using Geomembrane.

Keywords: Geomembrane, Synthetic Membrane, Geotechnical, Water Storage Reservoirs.

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Introduction

A geomembrane is very low permeability synthetic membrane liner or barrier used with any geotechnical engineering related material so as to control fluid or gas migration in a human-made project, structure, or system control. The manufacturing of geomembranes is from raw materials, which include the polymer resin, and various additives such as antioxidants, plasticizers, fillers, carbon black etc. These raw materials (i.e., the "formulation") are then processed into sheets of various widths and thickness by extrusion process.

This is a case study of using a high-quality Geomembrane for Water Reservoir in a Steel plant in Hospet of Bellary District in Karnataka, south India. A Reservoir with an open-air storage area where water is collected during rains (or rainy season) and kept in quantity so that it may be drawn off for use during necessity like summer. The role of water-storage reservoirs, therefore, is to impound water during periods of higher flows, thus preventing flood disasters, and then permit gradual release of water during periods of lower flows. Simple storage reservoirs were probably created early in human history to provide water for drinking and for irrigation.

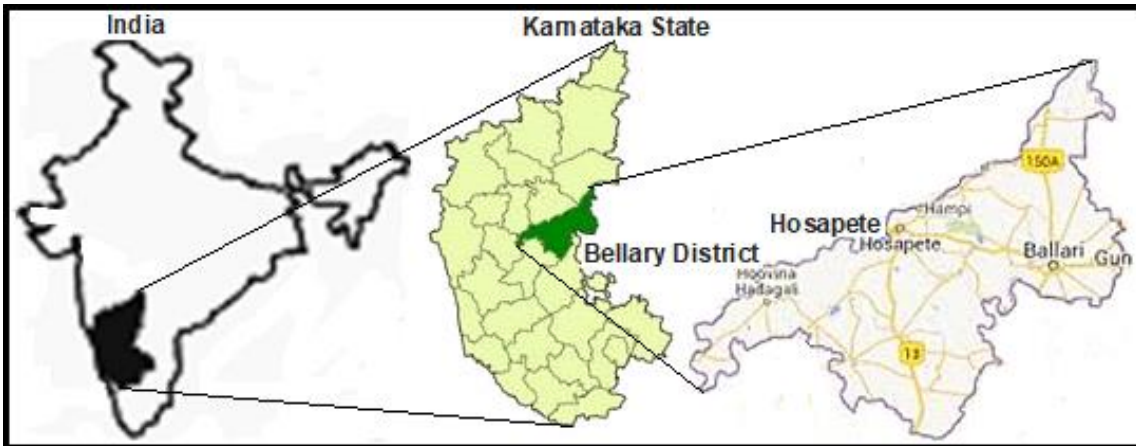
Study Area

Kalyani Steels in Hospet, (also known as Hosapete) is a city in Bellary District in central Karnataka State, India. It is located on the Tungabhadra River, 12 km from Hampi. Hampi is a World Heritage site containing the ruins of the medieval city of Vijayanagar, the former capital of the Vijayanagara Empire. It is having a total area of 70.12 km² and the population of 2.06 lakhs in 2011 Census. Weather of Hospet is 28 °C, Wind SW at 16 km/h, 75% Humidity.

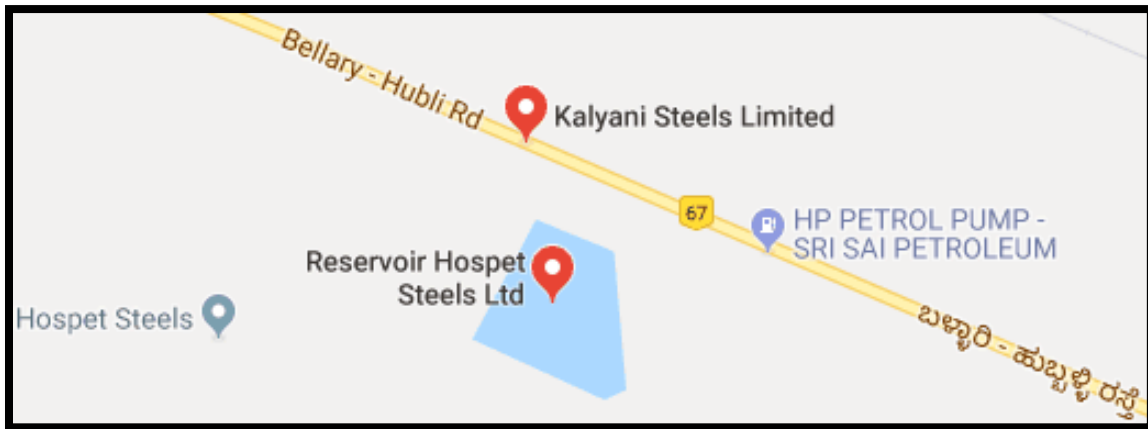
About Kalyani Steel Plant

Post reforms and liberalization in early 90's, the manufacturing sector witnessed unprecedented growth, and Kalyani Steel Limited identified tremendous potential beyond serving the in-house requirements. There was a need to grow, upgrade, diversify and economize. Thus, KSL shifted base to Hospet, Karnataka, to set up a world class integrated steel mill (iron-ore based, blast-furnace route) in 1997, with a hot metal capacity of 2,90,000 TPA. This establishment was of extreme strategic importance, with southern region being a budding automotive hub, and Karnataka being a state rich in Iron Ore, along with Mangalore port for other raw material imports. With its Head Office in West (Pune) and Plant in South, Kalyani Steels steadily gained a nationwide foothold.

Map shows India with Karnataka State-Bellary District & location of Hospet



Map of Kalyani Steels Limited and Reservoir Hospet



Satellite image of the Kalyani Steels Limited and Reservoir Hospet



Objective

- A water-storage reservoir is to impound water during periods of higher flows is to preventing flood disasters.
- Water-storage in the reservoirs is to permit gradual release of water during periods of lower flows.
- Simple storage reservoirs were probably created to provide water for drinking and for irrigation.

Methodology

Water in a reservoir may be lost by surface evaporation, by seepage into the surrounding soil or rocks, and by seepage through dam foundations. Therefore, to stop these seepage losses ordinarily can be reduced to a great extent by adapting the method of using Geomembrane.

Kalyani Steels in Hospet of Bellary District in Karnataka State, South India

Tungabhadra River flows near Hospet and there is a dam nearby Tungabhadra Dam. Tungabhadra Dam was the lifeline of once chronically drought prone districts in Karnataka – Bellary, Koppal, and Raichur districts – and also of neighboring Andhra Pradesh – Anantapur, Kadapa, and Kurnool districts. Owing to accumulation of silt over the years, the original capacity of the dam of 133 tmcft has come down to around 100 tmcft. Usually, the dam gets filled much earlier and would also overflow in August. But for the last few years, the dam has not reached its full reservoir level owing to failure of rain. Owing to low storage level, water was not released for cultivating the second crop in the last two years. The Irrigation Consultative Committee had decided to release water into canals for irrigation for short duration in September. Also, authorities have appealed to the farmers to cultivate only light irrigated crops by making judicious use of water.



Photo of Kalyani Steels in Hospet of Bellary District in Karnataka State, South India

There are many Steel Plants in this area and water is required in huge. One big steel plant here is M/s. Kalyani Steels, which has a world class integrated mill, with a hot metal capacity of 2.9 Lakh TPA. They had huge requirements for water and hence wanted to go with lining of their reservoir for 1,00,000 Sqm.

Geomembrane

A geomembrane is very low permeability synthetic membrane liner or barrier used with any geotechnical engineering related material so as to control fluid or gas migration in a human-made project, structure, or system control. The manufacturing of geomembranes is from raw materials, which include the polymer resin, and various additives such as antioxidants, plasticizers, fillers, carbon black etc.

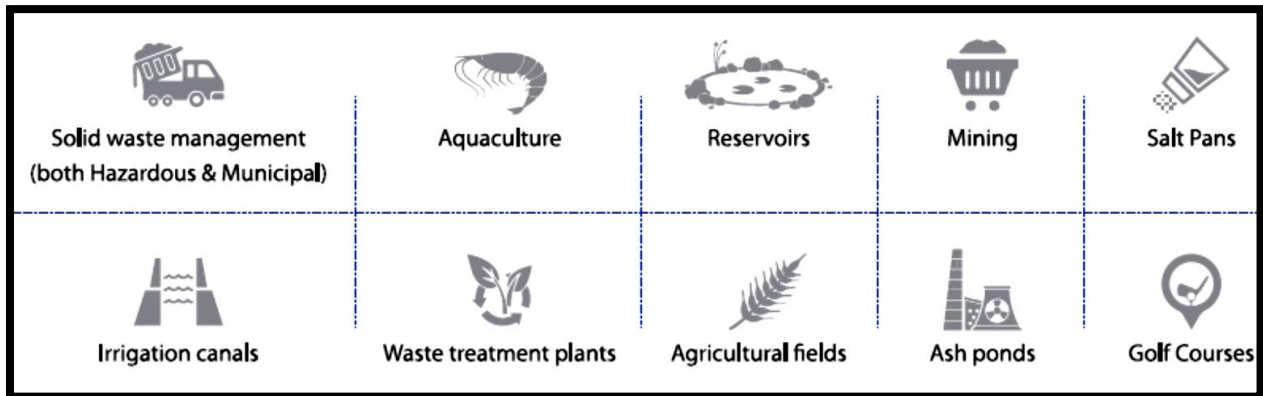
Geomembranes market is currently divided in to six types i.e., High-density polyethylene (HDPE), Linear low-density polyethylene (LLDPE), Polyvinyl chloride (PVC), Flexible polypropylene (FPP), Chlorosulfonated polyethylene (CSPE) and Ethylene propylene diene terpolymer (EPDM).

As Geomembranes was setting a high standard of quality by maintaining quality control with fully equipped Laboratory. Carefully testing at three places right from testing of Raw Materials followed by on-line testing and then on the finished products ensuring the best product and best quality, which consistently exceeds expectations.

The specifications for High-density polyethylene (HDPE) lining were 1 mm with Warranty for five years. The Work had to be completed in 6 months and the client can visited the plant by finding capability of the plant.



Uses of Geomembranes



Properties

The majority of generic geomembrane test methods that are referenced worldwide are by the American Society of Testing and Materials (ASTM) due to their long history in this activity. The Physical & Mechanical properties normally tested through Thickness, Tensile Properties on Yield strength, Break strength, Yield Elongation & Break Elongation, Tear Resistance, Puncture Resistance, Stress Crack Resistance, Carbon Black Content, Carbon Black Dispersion, Oxidative Induction Time, Oven Aging and UV Test.

The Life expectancy of geomembrane is not yet ascertained but is taken as 100 mins of Oxidative Induction Time correlates to 40 years in exposed condition. Joints are seamed by wedge welding. Ideally, seaming two geomembrane sheets should not result in tensile strength across the two sheets.

The manufactures of Geomembrane (having Smooth, Single side and Double side Thickness in Black Colour and offering different Coloured Geomembrane's on request from its Daman (India, Near Mumbai) facility and have imported machines from Bandera (Italy) with three-layer co-extruder Geomembrane adhering to GRI GM13 standards having width of 8 metres and thickness up to 3 mm which is first of its kind in India.

Geomembrane have the durability of strength, flexibility, UV and chemical resistance, extensively used in civil and agricultural fields, irrigation, water and solid waste management, fluid conveyance and containment, ash ponds, soil protection and stabilization, landfill closures, ponds and reservoirs, irrigation canals and waste treatment plants.

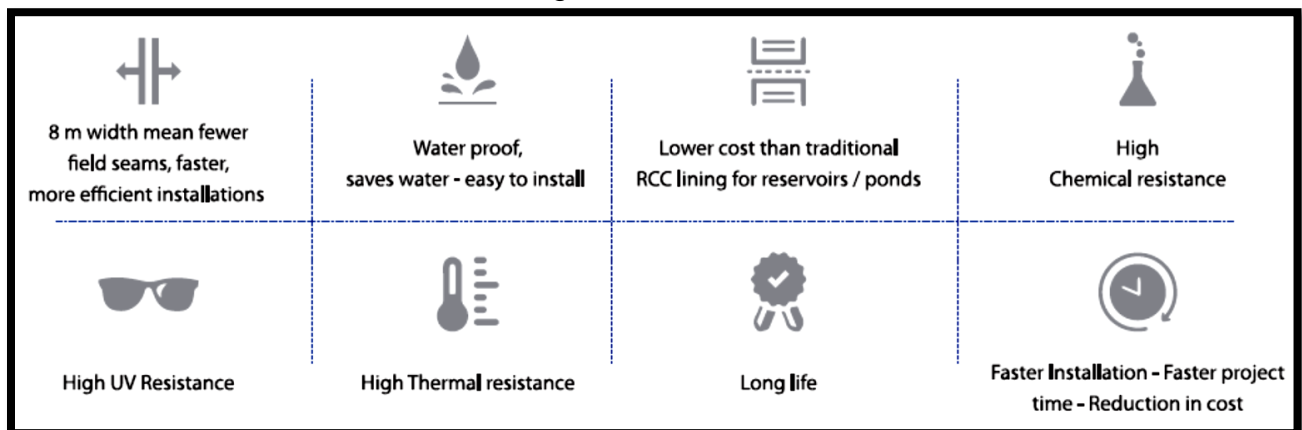
Advantages

1. 8 m width mean fewer field seams, faster, more efficient installations and less opportunity for leakage.
2. Liners are inspected at three places stringently at Procurement of RM, during manufacturing and finished product.
3. Environmental Stress and Crack resistance.
4. High Chemical resistance.
5. High UV Resistance.
6. High Thermal resistance

Testing

The total lot was tested by KALYANI STEELS, carefully, selecting arbitrarily sample from site and checking for Thickness, Density, OIT, Tensile properties, Puncture resistance, Carbon black content & Tear Resistance. The liners passed all tests comfortably and Client was satisfied.

Advantage of Geomembranes



Conclusion

Geomembrane's have long term durability of strength, flexibility, UV and chemical resistance, extensively used in civil and agricultural fields, irrigation, water and solid waste management, fluid conveyance and containment, ash ponds, soil protection and stabilization, landfill closures, ponds and reservoirs, irrigation canals and waste treatment plants. And it's long-term durability of strength, flexibility, UV and chemical resistance. Because of its irregular size 8 m width liners helped in reducing no of joints. And also, it is impounding water during periods of higher flows, thus preventing flood disasters, and then permit gradual release of water during periods of lower flows.

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Excavation in Progress in Kalani Steels in Hospet



Trench Work in Progress in Kalani Steels in Hospet



Geomembrane Installation in Progress in Kalani Steels in Hospet



Geomembrane Installation in Progress in Kalani Steels in Hospet

