



SOLMAX APAC eNEWS

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[Feature: Geosynthetics Liner System in Mining Application](#)

Mining industry is a major contributor to the economy of many countries around the world including some developed countries. Although relatively minor in comparison to material such as cement, aggregates, diesel, electricity, geosynthetics material has seen an increasing utilization over the past decades in the life cycle of a mine which includes exploration, construction, operation and finally closure. (Fourie et al., 2010)

In this edition, we will put our focus on geosynthetics material for base lining system:

- **Geomembrane** is typically used to (i) contain liquid, whether in heap leaching pad, tailing facilities or water dam. (ii) They are also used to prevent infiltration (i.e., stormwater) from seeping into the underlying material, (iii) mine closure and capping.
- **Geosynthetic Clay Liner (GCL)** has been used extensively to substitute compacted clay liner (CCL) for its obvious advantage in constructability and quality control while having comparable/superior performance.

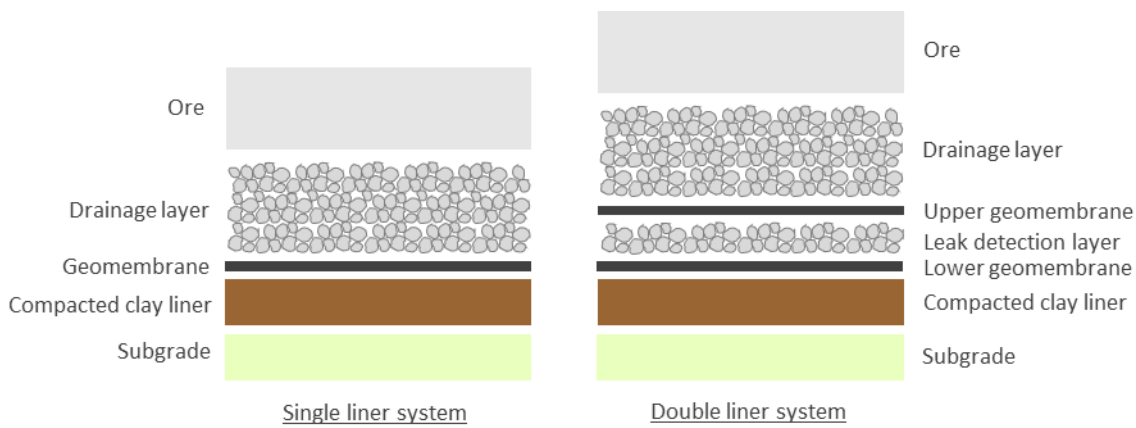
Link: <https://www.solmax.com/en/industries/mining>

Typical Liner Design

It is very common nowadays to have a composite liner system in mining application for either solution pond, tailing storage facility or other usage. The composite liner normally consists of a compacted clay liner or an equivalent geosynthetic clay liner overlain by a geomembrane layer.

The liner system used in heap leach pad can be a single composite liner or a double liner system sandwiching a leak detection layer constructed on top of the prepared subgrade foundation. Lupo & Morrison (2005) reported that the thickness and types of geomembrane depends on the loading conditions, underliner and overliner characteristics, slope stability requirements for the mine facilities. The typical combinations used are as listed below:

1. Single liner system – 2.0mm or 2.5mm LLDPE / HDPE geomembrane depending on the mechanical or friction properties.
2. Double liner system
 - a. Upper and lower 2.5mm LLDPE / HDPE geomembrane for greater than 120m of ore and/or 10m of solution.
 - b. Upper 2.5mm and lower 2.0mm LLDPE / HDPE geomembrane for greater than 100m of ore.
 - c. Upper 2.0mm and lower 1.5mm LLDPE / HDPE geomembrane for greater than 60m of ore.



Areas of Usage



Mining Ponds:

Solution ponds in a heap leaching process demand the most durable containment lining systems available. Pond liners are exposed to the harsh elements and must be able to both protect the environment and contain the solution, ensuring minimal loss of precious metal into the ground.

Evaporation ponds are required to recover salt from brine by taking advantage of nature's drying processes. Geomembrane liners provide excellent chemical resistance to high concentrations of salts for extended periods, provide very low permeability, and offer a high UV resistance.

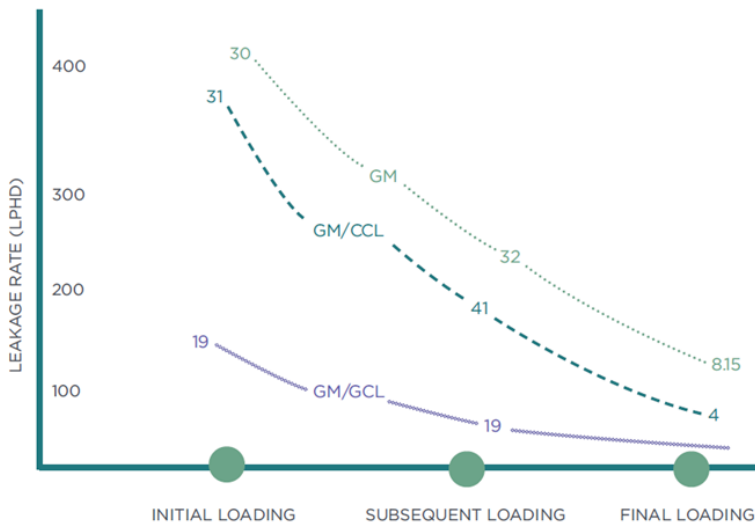
Tailing storage facilities:

When storing mine tailings in ponds or impoundments, failure is simply not an option. Tailings are often the most significant environmental liability for a mining project and can be as large as 1 million times greater than the mineral extracted. The containment of tailings is therefore of the utmost importance; hence the use of geosynthetic lining system is a cost-effective containment solution. The geomembrane liner serves as a barrier system and prevents the release of mining refuse into the environment.

Mine closure and capping:

The contaminating lifespan of mines may extend for long periods beyond mine closure. High-performance geomembrane liners with GCL are required in mine closure for effective waterproofing and containment of potential contaminants and as part of the land reclamation process.

Advantage of Composite Lining



*Bonapart, Daniel and Koerner, 2002. "Assessment and Recommendations for Improving the Performance of Waste Containment Systems," US EPA.

Composite liners comprising of a geomembrane and a GCL inheriting the advantages of both materials while complementing each other.

The liner (CCL or GCL) system prevents liquid migration into the subgrade soils and impede leakage through hole or defect in the geomembrane by limiting the movement area and flow rate.

Taking into consideration the extra benefits given by GCL over a CCL, the factory-controlled quality of a GCL, lesser vulnerability towards desiccation and without the need to worry about the degree of compaction makes GM/GCL composite an ideal composite lining system for

various containment application including mining application.

Geomembrane

High Performance HD

High-Performance HD Liner Series is the choice for premium performance. It comprises the best mechanical and enhanced endurance properties of any HDPE geomembrane liner available on the market.

Leak Location

Leak Location Finish is essential where you can't afford a leak. It is the most cost-efficient and reliable leak detection method in the industry, improving damage detection in both exposed and covered applications, even after installation.

High Temperature

High-Temperature Liner Series is designed to provide superior endurance where liner integrity and long service life are required in extreme temperature environments.

White Reflective

Solmax's White Reflective Prime Finish reflects the light and keeps the liner cooler, resulting in fewer wrinkles, less chance of damage during backfill and improved damage detection.*



*Also comes in Tan and Green colors.

Link: <https://www.solmax.com/en/products-and-services/pe-geomembranes>

Geosynthetic Clay Liner

Bentoliner®

Bentoliner® creates an impermeable barrier. Its dimensional stability and increased internal shear strength offers a high sealing effect and outstanding mechanical properties for different applications.

Polymer Enhanced BentoLiner®

Polymer Enhanced BentoLiner combines the performance of sodium bentonite with a specially formulated polymer, encapsulated between two geotextiles, to create a reinforced geosynthetic clay liner with superior hydraulic barrier properties.



Link: <https://www.solmax.com/en/products-and-services/gcl-bentoliner>



GundSeal

GundSeal provides the best leak protection in the industry. It combines the low permeability of a HDPE or LLDPE geomembrane with the self-sealing characteristics of bentonite clay, perfect for many environmental applications.

Polymer Enhanced GundSeal

Polymer Enhanced GundSeal uses combination of bentonite and specially formulated polymer to improve the barrier performance when dealing with aggressive leachate such as bauxite tailing, coal ash & brine. Together with geomembrane, it forms a highly effective barrier.

Link: <https://www.solmax.com/en/products-and-services/gcl-gundseal>

Case Study – Minera Dolores, Mexico



Minera Dolores, located approximately 250km west of Chihuahua state is the most advanced of all the mines owned by Minefinders in Mexico. The site produces both gold and silver.

Mining is carried out at Dolores through conventional open-pit techniques. The run-of-mine is stacked in heap leach pads lined with Solmax 2.0mm Textured LLDPE in order to firstly protect the environment from possible harm due to contact with leaching liquors as well as to increase mineral recovery and productivity. The pregnant solution is then pumped to the Merrill-Crowe plant to produce gold – silver doré.

Approximately 400,000m² surface area is covered with Solmax 2.0mm Textured LLDPE. It is estimated that Minera Dolores has approximately 107.64 million tonnes reserves and estimated mine life of around 15.5 years.

For any further enquiries on Solmax's products and applications, please email tsapacnews@solmax.com.

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