Feature: Material Optimization with Solmax's Cost Reduction Program (CRP)

A lining system for containment of chemicals with adverse effect to the environment, such as heap leach pad, tailing storage facility, etc. serves as an important line of defence against the environmental threats. The system contains and prevents chemicals from seeping into the ground, polluting the surrounding and groundwater. Selecting the optimal geomembrane liner that is compatible with field materials and conditions is critical to achieve a cost effective and safe design.

To support the client on material optimization, Solmax has setup the Cost Reduction Program (CRP), where we will look at the original specifications for the project, and then refine the lining system to give a cost-effective solution with the critical understanding of performance that is required. Commonly, we see questions asked on the liner system as below:

- How long will the geomembrane perform when exposed to a given chemical and conditions?
- What liner thickness is needed to resist mechanical puncture whilst providing chemical resistance?
- What surface texturing is needed for maximum interface friction in a specific site condition?

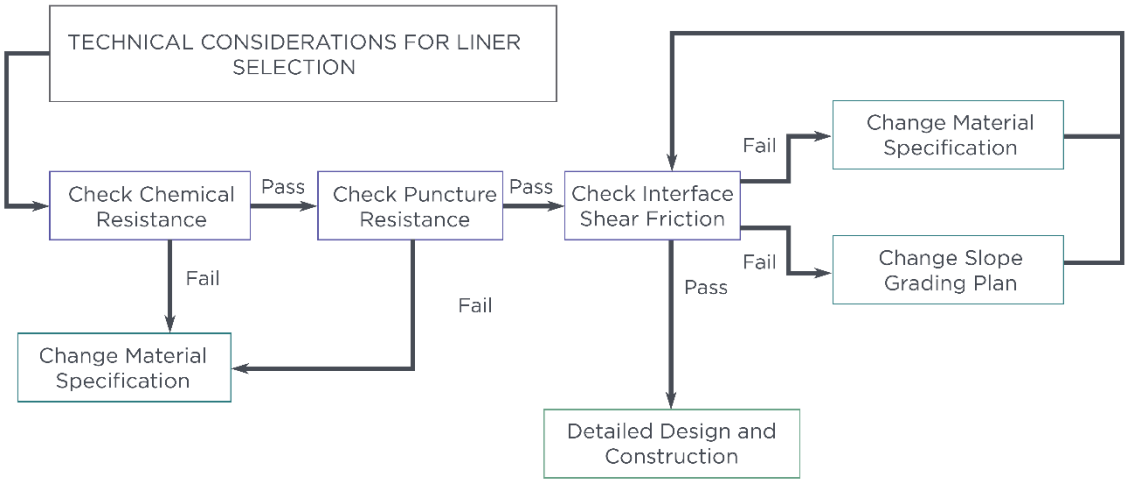

Figure 1: Geomembrane liner design logic (Adapted from Lupo, 2008; Fourie et al., 2010)

Chemical resistance, puncture resistance and interface shear resistance are key performance indicators for geomembrane liners in mining applications. The significance of these parameters to projects with geomembranes has been reported considerably in the literature (e.g. Renken et al., 2005; Lupo, 2008 and Fourie et al., 2010).

At Solmax, we are strongly committed to providing value-added services to our clients and we are taking this commitment several steps further by offering the specialized performance testing programs for chemical resistance, puncture resistance and other relevant tests to our clients. These tests will be completed in house using our state-of-the-art laboratory testing equipment. If you have any projects that are of significant size and having uncertainties in determining the geomembrane liner, please send us an email.

Link: https://www.solmax.com/uploads/tech-paper-document-en-files/solmax-cost-reduction-program.pdf

The Benefits

With the CRP, we evaluated the key performance based on site specific criteria. This could paint a clearer picture of the material's field performance and expected design life which is difficult to evaluate from index test values provided in a product technical data sheet. Below are some differences of performance and index testing.

PERFORMANCE TESTING	INDEX TESTING
Involves the use of site specific materials and expected conditions to simulate field response	Performed in accordance with industry specifications and standards to characterize geomembranes in terms of their physical, mechanical and durability properties
Provides a reliable representation of the design life and performance of geomembrane liners to be used in an application	The compatibility of geomembrane liners with site specific loading conditions, chemicals and interface contact materials are not captured effectively in index tests
Are effective for comparing the performance of various potential alternatives for an application	Effective for material characterization
Completed on a case-by-case/site-by-site basis	Routinely completed and results are typically presented in the technical data sheets provided by the manufacturer

Table 1: Performance Tests vs. Index Tests

The responsibility of conducting performance testing to determine the appropriate materials for an application is usually placed on the client or the end user. At Solmax, we believe that an early involvement is key to ascertain the suitability of the material. A collaborative project delivery would reduce unnecessary changes during later development stages, avoid overestimation that results in overdesigning the material and ultimately achieve a cost effective and substantial time/monetary savings.

Case Study – Karma Gold Mine, Burkina Faso

The Karma property consists of five closely spaced and well-defined gold deposits that are located in Burkina Faso, West Africa. The deposits are mined using conventional open pit mining methods and equipment and ore recovery is by heap leaching.

The initial liner design of the project consists of a 1.5mm HDPE geomembrane placed on top of a 600mm layer of compacted in-situ ferricrete. To maximize benefits while keeping the costs low, Solmax's CRP was used to re-evaluate the lining system.

High pressure hydrostatic tests following ASTM D 5514 were carried out on 1.5mm and 1.0mm HDPE geomembrane. A maximum 1,000 kPa pressure was applied on the geomembrane with soil samples supplied from site for 100 hours duration.

Upon completion of the tests, the plastic deformation of the test specimens were evaluated after 24 hours recovery. The results show that both HDPE geomembranes showed no signs of plastic deformation thus 1.0mm HDPE geomembrane were finally chosen over 1.5mm thickness from the intial proposal.

The case study described here showcases the successful application of the Solmax's CRP to a heap leach gold mining project in West Africa. Solmax's containment solutions that were supplied for the project consisted of:

- Solmax HDPE Series, Single Textured, Black
- Solmax HDPE Series, Smooth, White Reflective

These products were supplied in 2014 to cover over 742,000m^2. By taking advantage of the Solmax CRP, approximately 33 % reduction in project costs was achieved and product performance was not compromised.