



## Podcast Introduction

Our guest today is: Denys Parra who is the General Manager of Anddes in Peru and also an Associate Professor of the National University of Engineering in Lima. Denys thanks for squeezing this Podcast into your busy schedule and joining us from Lima, Peru. We received a number of questions after your webinar titled “Geosynthetics in Mining” presented on Nov. 12, 2020 about geosynthetic reinforcement that we would like to ask you.

### Questions Asked During Live Webinar:

1. Are PVC Geomembranes recommended for mining applications? If so, what applications? Heap leach pads?  
**A:** Currently PVC geomembrane is used in some specific cases, for example for interlift liner application in copper heap leaching in Chile, where an easy and quick installation is needed. PVC Geomembranes are also used extensively in lithium mining and other evaporation pond applications for mining.
2. Also, for heap leach pads, would there be a situation where you would prefer using a double composite liner?  
**A:** Yes, in the case where a pad-in-pond concept is used, this means, the leach solution is stored in the same leach pad by creating and impoundment area with a dam. The whole impounded area up to the top of the dam needs to be lined with double geomembrane with a leak detection in the middle of the two geomembranes, i.e., the same concept of a PLS pond.
3. What design methodology or bibliography do you recommend for heap leach pads design using geosynthetics?  
**A:** designing with geosynthetics of Robert Koerner is the base reference, however there are a lot of technical paper dealing with these topics, most of them in Heap Leach Solution conference series from 2013, 2014, 2015 and 2016.
4. What challenges with geomembrane and geotextile installation at high altitudes, winds, and low temperatures?  
**A:** High altitude: reduction of the staff and equipment performance for installation. Winds: quick installation of temporary anchor for avoiding accidents. Low temperatures: welding during the warmer part of the day or by using a flamethrower to create a small environment with adequate temperature.

5. What are the concerns of downslope bentonite migration on steep slopes? Are GCLs being placed on rocky surfaces? If so, what are your recommendation for protecting the GCL against damage? For example, do you use multiple layers of GCL?

A: it is a concern and for that reason a needled-punched GCL is used to avoid that risk.

A: GCL can be placed in rocky surfaces with protection with electrowelded mesh, heavy geotextile, geocomposite, mortar, soil-cement.

6. What kind of geomembrane do you recommend for exposed applications? HDPE when exposed for an extended period of time would not perform well.

A: HDPE or LLDPE, currently the LLDPE is manufactured with additives which increase the UV resistance.

7. To place the soil liner on a 1.5:1 slope, how do you compact the soil before placing the GCL?

A: Usually the subgrade compaction before placing the GCL is not needed, even in the case of a not so much competent soil. Steeper the slope the vertical the load (ore).

### Podcast Questions/Comments Submitted via Follow-up Survey

1. This question is regarding the shear strength to use for a needle punched GCL in a heap leach liner design at a mine in a high seismic hazard area. Would there be strength loss in the GCL beyond the residual strength due to high strains from a seismic event where some of the GCL reinforcement is loss. In other words, the overlying geotextile deforms further then the underlying geotextile resulting in pulling out the stitching that provides the shear strength for the GCL.

A: Yes, this is right, however GCL is placed in specific areas of the leach pad, and mainly in those where the reduced GCL shear strength by itself or by strength loss cannot affect the global stability, then an effort should be taken for placing soil liner in the “stability zone” to ensure proper stability conditions. If GCL is going to be placed in the whole area of the leach pad (rare cases) the design needs to consider that strength loss.

2. When opting usage for a textured LLDPE geomembrane is there a common asperity height, stud, or spike used in the design, or does it come down to a specific shear performance requirement.

A: The GM13 and GM17 has increase the asperity height to 0.40 mm (from 0.25 mm), most of the time this is enough to increase the interface shear strength but in some specific cases 0.5 mm has been required based on large scale direct shear tests. Regarding the spikes, please, see the answer to question 6.

3. Do you use anchor trenches on any perimeter berms? [Jen](#)

A: Yes, this is typical design and construction, however, Thiel et al. (2014) recommended to place a geotextile to avoid the rupture of the geomembrane because of a waste dragdown effect in landfills but in heap leach pads the same effect may happen.

4. Please discuss the life expectancy of a liner system in an acid mining system. What are the main causes of failure after installation?

A: Liner system is not affected by the acid leaching in copper heap leaching, the problem here in the temperature up to 50° that can reduce the geomembrane properties, then temperature needs to be monitored, however, not problems have been reported because of this issue.

5. I understand that protection on sharp rock slopes is: 1) chain link fence, 2) soil cement, or 3) guniting. Please confirm this or if there are other methods of line protection against sharp rock slopes.

A: In our experience we used also electrowelded mesh, heavy geotextile and geocomposite.

That is all the time that we have today, so Denys thanks for your excellent webinar and this podcast.

If you have any questions or would like additional information, please email me or Jen at:

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