

Enhancing Mining Applications with Geosynthetics

A-Alano

MINING SOLUTIONS

Tailings storage facility in operation at a Northern Nevada mine



A tailings facility at a Northern Nevada mine

The Plastics Experts.

Our highly interconnected and tech-driven world relies on mined ores. More than ever before, it has become essential to run efficient mines and associated processes to purify raw ore. To help enhance mining applications, AGRU has drawn on its experience as the Plastics Experts to develop geosynthetic solutions that can impact a mine's bottom line in five key areas: separation, reinforcement, filtration, drainage, and barrier.

The AGRU success story has been unfolding for seven decades. Founded in 1948 by Alois Gruber, who set the company on the course for plastic manufacturing, AGRU has become one of the world's most important single-source suppliers for piping systems, semi-finished products, concrete protective liners and lining systems made from engineered plastics. AGRU uses only the finest grade thermoplastic polymers as raw materials. When it comes to application-technical consulting, AGRU is your best partner in the field.



Quality

The AGRU quality assurance system is compliant with multiple international standards and AGRU's procedures help ensure that products meet or exceed these international standards, on an ongoing basis. The start-to-finish attention to quality ensures that the products meet and beat the strictest technical specifications, providing safe operation even in challenging conditions.



Overview

Mining operations utilize a variety of constructions such as evaporation ponds, heap leaching, tailing storage facilities, and process ponds. An effective mining solution can positively impact each of these segments of the operation in order to protect the project's long-term investments and minimize ecological impact. AGRU manufactures a range of products and has used these products to create solutions for most mining applications.

AGRU mining solutions help designers incorporate layers that handle separation, reinforcement, filtration, drainage, and low permeability. At the heart of these solutions are AGRU geosynthetic liners. These liners are precision manufactured with the highest quality polyethylene and demonstrate industry-leading consistency for reliable performance. The products that support AGRU mining solutions include AGRU Smooth Liner, MicroSpike, MicroDrain, AGRUTEX, Drain Liner, AGRU GeoClay, and the Integrated Drainage System.

Smooth Liner is a geosynthetic liner that is typically used in mining applications as a low-permeability barrier. MicroSpike is a geomembrane that is manufactured using the flat die-cast extrusion process to create asperities for reliable friction angle values for containment and slope stability. MicroDrain is used in mining applications as a way to combine a low-permeability barrier and slope stability with a drainage media through extruded surface studs and asperities. AGRUTEX is a nonwoven geotextile that is used to help protect the integrity of installed liners, providing filtration and protection.

Finally, AGRU Integrated Drainage System (IDS) offers a way to combine multiple products into a coherent solution. IDS offers increased shear strength performance, reliable long-term drainage, and reduced material cost and installation time. By combining multiple products into a single layer, AGRU can help projects install 15% faster when compared with traditional systems.

Read on to learn more about the mining applications that can benefit from AGRU mining solutions.





Heap Leaching

Many elements can also be extracted using the heap leaching method, one of the most cost-effective forms of mining with low capital startup and operating costs when compared with other forms of leach processing.

For heap leaching on a flat pad, on-off pads, or valley pads, a single composite liner is sufficient. The composite liner system comprises multiple layers including the existing foundation (subgrade), a low permeable layer underneath the geomembrane such as compacted clay or GCL (Geosynthetic Clay Liner (GCL)), the geomembrane, a protection layer (e.g., geotextile such as AGRUTEX), and the mineral drainage layer (including solution collection/air injection piping).

In this application, the geomembrane liner serves as a barrier for separation and serves an essential role as it must resist chemical attack, point loads from typically high heap loading conditions, site-specific topography, site-specific climate conditions, and site-specific construction conditions. GCL is a cost-effective alternative for a composite liner system if on-site sources of clay are insufficient. GCL comprises a bentonite (water absorbing mineral) layer sandwiched between two nonwoven geotextile layers. A 10 mm thick GCL will typically perform equal to or better than a 30 cm CCL. GCL provides additional filtration and barrier capabilities.

The protection layer is made with a nonwoven geotextile and helps distribute loads and provide reinforcement for the underlying geomembrane. The protection layer also assists with filtration and drainage, by preventing small particles and gravel from reaching the geomembrane. See Products section for more information.

Mine Closures

To minimize the environmental impact of mining operations, a closure solution is necessary once operations have ended. Generally, these closure solutions incorporate multiple layers of geosynthetics to provide padding, protection, low permeability, drainage, and stability. However, it is possible to combine these layers into a single product to greatly improve installation time and reliability. AGRU produces such a solution, the Integrated Drainage System (IDS), which is a Subtitle D-compliant closure and containment system that incorporates an advanced drainage structure within the geomembrane component.

Most of the padding, protection, and filtration of IDS is handled by AGRUTEX, a nonwoven geotextile that serves to extend the service life of geosynthetics. By combining multiple layers—each with its unique benefits—into one product, AGRU provides a powerful closure and containment solution that also delivers significant cost savings. Another option is ClosureTurf, a Watershed Geo patented product that serves as a final cover system incorporating an AGRU structured geomembrane, engineered synthetic turf layer, and specified infill material into a compact solution that is better equipped to resist environmental forces while also delivering a faster, cleaner installation. See Products section for more information



Brine Evaporation Ponds

Elements like lithium exist in high concentration as a layer of sediment below the surface of dried out salt lakes. To process the precious element, it must first be separated through evaporation. Brine evaporation ponds are constructed near the source to reduce transportation costs and are relatively shallow to improve evaporation rates.

Geosynthetic liners, specifically geomembranes, play a key role in the construction of brine evaporation ponds, serving as a barrier to prevent loss of the precious slurry. The barrier also separates the brine from the surrounding soil, protecting the surrounding environment. To serve as an effective solution, geomembranes should be highly durable, lightweight, and flexible to facilitate transportation and installation. HDPE liners by AGRU fulfill these requirements and more. See Products section for more information.

Tailings Storage Facilities

Another essential component of a modern mining operation is the tailing storage facility. These larger facilities, also known as tailing dams, are lined reservoirs that are used to store leftover ore, called slurry, from mining operations. Creating a reliable low permeability layer with a polyethylene geomembrane is necessary to protect the surrounding environment. Tailing storage facilities can be single or double lined, with double-lined ponds offering numerous benefits including the ability to add a leak detection for improved quality control. Liners like MicroDrain and Drain Liner are designed to support double-lined ponds. See Products section for more information.

Storm Water and Process Ponds

Mining operations often utilize support reservoirs like storm water and process ponds such as barren solution and pregnant solution ponds. These ponds usually incorporate a double-lined system using liners like MicroDrain or Drain Liner to help ensure containment. See Products section for more information.



A channel utilizing HydroTurf® solution by Watershed Geo, which also comprises AGRU's Super Gripnet liner

Products

AGRU Smooth Liner[®] | Low-Permeability Barrier

AGRU Smooth Liner is manufactured using the flat die-cast extrusion method, which allows the company to produce among the most consistent smooth and textured geomembranes on the market. Smooth Liner is available in high-density polyethylene (HDPE) and linear low-density polyethylene (LLDPE). All AGRU Smooth Liner material is rolled on 23' wide plastic cores to ensure ease of installation while also eliminating the problem of collapsed cores.

HDPE Smooth Liner Summary

- Available in thicknesses ranging from 30 mils to 100 mils
- Available in black, white, and green.

LLDPE Smooth Liner Summary

- Available in thicknesses ranging from 40 mils to 100 mils
- Available in black, white, and green.



AGRU MicroSpike® | Containment and Slope Stability

MicroSpike is a geomembrane manufactured using AGRU's patented flat die-cast extrusion process to produce highly consistent asperities for reliable friction angle values at less than 5% variation.

MicroSpike Summary

- Consistent texture and friction angle values
- Available in thickness between 30 mm and 100 mm
- Manufactured with HDPE or LLDPE
- Four customizable colors: black/white, green, or natural
- Available as a single- or double-sided liner.



AGRU MicroDrain[®] | Integrated Drainage

MicroDrain is a combined barrier liner and drainage media that features upward-facing drainage studs and bottom-facing spiked asperities integrated into the liner using AGRU's patented flat-die cast extrusion process.

MicroDrain Summary

- Consistent studs and asperities for reliable drainage and shear strength performance
- Manufactured with HDPE or LLDPE
- Upward-facing studs available with heights of 130 mils (3.3 mm), for drainage
- Bottom-facing spikes available with heights of up to 18 mil for slope stability.





AGRUTEX[®] | Filtration and Protection

AGRUTEX is a nonwoven geotextile product line specifically designed for environmental, civil, and mining applications. When installed, AGRUTEX provides filtration, separation, and/or protection for other geosynthetics.

AGRUTEX Summary

- Extends the service life of projects and may eliminate the need to import soils for the working or reworking of the subbase.
- Enables the use of more effective aggregates for drainage applications.
- Highly customizable to fit a variety of applications or project requirements.
- A critical component to AGRU's Integrated Drainage System (IDS), an advanced engineered geosynthetic solution for closure and containment applications.



AGRU Integrated Drainage System (IDS) | Closure and Containment Solution

AGRU IDS offers increased shear strength performance, reliable long-term drainage performance, a reduction in required geosynthetic material, and reduced installation time and cost.

IDS Summary

- Incorporates drainage and environmental containment performance into a single layer.
- Reduced need for separate drainage material layers, representing substantial cost savings and avoids material delay associated with geocomposites.
- High factor of safety for steep-slope stability.
- Installs 15% faster when compared with traditional closure systems.



AGRU GEOCLAY® | Efficient Absorption

AGRU GeoClay is a reinforced needle-punched geosynthetic clay liner that offers superior absorption at a fraction of the installation effort of traditional compacted clay.

GeoClay Summary

- Highly efficient, with a single truckload of GeoClay able to cover over 90% of an acre.
- Made with sodium bentonite, offering high absorption and self-healing/self-sealing capabilities.
- Compatible with most commonly used mining solutions and containment leachates.



ClosureTurf[®] | Final Cover System

ClosureTurf, a Watershed Geo patented product, is a final cover system comprising AGRU's Super Gripnet or MicroSpike geomembrane overlain by an engineered synthetic turf and specified infill material.

ClosureTurf Summary

- A proven "hybrid" composite closure system that outperforms earlier closure methodologies
- Offers a predictable level of performance when subjected to severe weather conditions that occur in a post-closure timeframe.
- Reduced carbon footprint and installation time.
- For applications for extreme hydraulic performance, Watershed Geo's HydroTurf® is also available.











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