← Above ground secondary containment systems for frack tanks are used to protect against spills during hydraulic fracturing (also called "hydrofracking" or just "fracking").

OPPORTUNITIES AND CHALLENGES

Geosynthetics are an important part of the growing oil and gas industry.

By Glen Knopp for the FGI Consortium

Oil and natural gas production (O & G) is a fast-growing segment of both the U.S. economy and the geosynthetic materials markets. Horizontal drilling and hydraulic fracturing of shale deposits have opened up large new oil and gas exploration plays in regions of the U.S. previously considered uneconomical to develop.

This recent and rapid growth in the O & G market has presented both opportunities and challenges for the geosynthetics industry. The scope and range of geosynthetic material specifications varies depending on region, climate, environmental and safety regulations, ability to recycle materials, and producers' ongoing search for new cost-effective solutions.

Geomembranes and ongoing research and development (R & D) initiatives have played a major role in the development of these natural resources in at least four applications: *pad liners*, above-ground and in-ground *secondary containment*, *impoundments* and *floating covers*.

Pad liners

Pad liners provide a safe anti-slip surface for workers and protect the well site environment from equipment failures, leaks and spills. Varying by region, a variety of geotextile underlayment and geomembranes are installed on the ground surface for the well drilling, completion and production phases.

Typically pad liners consist of a 24- to 40-mil geomembrane, however R & D has led to the evolution of new geomembrane products that can reduce the need for geotextile underlayment and improve surfaces for worker safety.

In addition, factory fabricated one-piece pad liners could reduce field installation time and costs. The geomembrane is attached to a variety of berm materials, such as foam-filled berms manufactured with a fabricated sleeve of woven, coated polyethylene (PE). Rainwater and runoff can be vacuumed or directed away from the drill site to collection ponds, avoiding the risk of environmental contamination.

Secondary containment

Above-ground and in-ground secondary containment is used to protect against spills during hydraulic fracturing ("hydrofracking" or just "fracking") operations for frack tanks, chemical and mud tanks, fuel tanks and equipment.

Containment areas are constructed with earthen berms or multiple above-ground materials ranging from straw bales to engineered plastic containment walls. Plastic secondary containment walls are a new and rapidly growing market for secondary containment. Typically geotextile and then a 24- to 30-mil geomembrane are installed over the containment walls and bottom when used as containment for frack tanks.

Impoundments

In-ground impoundments are for freshwater ponds and frack flowback. The typical pond uses heavy equipment to excavate and form the pond to accommodate the geomembrane. The materials used in typical in-ground ponds range from reinforced geomembranes to 6-mil black film depending on local regulations, specific applications, and preferences of the drilling company.

The pond may be single or double lined with a geomembrane, with geonet leak detection between the geomembranes and possibly a geotextile under the geomembrane liner to protect it from puncture. One drawback of in-ground ponds is that heavy equipment is usually required to restore the site to its original condition.

Because of the advantages of above-ground ponds, some states, such as North Dakota and Pennsylvania, are moving to require only above-ground impoundment. Ohio and New York are in the process of developing similar pond requirements. One of the advantages of above-ground containment ponds is that there is no need to perform remediation of an excavated pond area, as noted with in-ground impoundments.

These systems are composed of steel or low-density polyethylene (LDPE) panels that form large rectangular or circular impoundments and can contain as much as 5 million gallons of fresh or frack flowback water. Assembly of the walls is followed by the installation of, in many cases, one or more factory fabricated geomembrane liners and, sometimes, a geotextile pad installed under the geomembrane liner to protect it from puncture.

Depending on the walls deployed, various techniques are used for attaching the geomembrane to the impoundment walls. Installation time can vary, from less than

one day to a week, depending on the size of the project and the installation design. For example, a 4- to 8-foot-high LDPE wall impoundment can be completed and put into service in one day. Steel impoundment walls may be up to 12 feet tall and can take a bit longer to install.

Floating covers

Floating covers are another geosynthetic application that is gaining acceptance, especially for water storage and safety. The covers are made by sandwiching a sheet of foam board between two sheets of 24- to 40-mil LLDPE or woven and coated PE geomembrane. These covers can reduce water evaporation in summer and help limit water freezing in winter months, which can inhibit drilling.

The cost of replacing 12 inches of water evaporation per month in arid areas can be significant, especially if the water is hauled by truck to the impoundment area. In addition, drilling operations are extended later into the winter by adding floating covers and heaters to the water containment area. Floating covers can also replace bird netting in some areas.

New geosynthetic uses are making well-drilling and fracking more environmentally safe and efficient. In addition, some companies are recycling the geosynthetic material and processing it into resin pellets. But more research is needed in this sustainable activity to ensure there is no cross-contamination of polyethylene and polypropylene materials.