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Composite Mats Offer Better Protection

By Jeffery L. Juergens

LAFAYETTE, LA—Unlocking the vast resources in the Utica and Marcellus shales in the northeastern United States has resulted in increased drilling activity as operators develop the rich oil and gas reserves located there. These formations offer new opportunities for meeting the nation's growing energy demand, but their proximity to major population centers presents many new challenges.

The public press has focused on the potential for hydraulic fracturing to contaminate groundwater. Rigorous regulations have been issued to prevent and control spills in order to protect native soils and watersheds from any potentially harmful byproducts of the drilling and fracturing processes. This has caused pad construction costs to rise with the additional expenses required to meet more stringent environmental standards.

New requirements to prevent surface contamination resulting from spills have forced operators to focus on spill containment, which is a major factor in meeting the standards. The most common technique for containing spills is to lay a protective plastic liner over the pad site during drilling and completion operations. However, liners alone have proven to be ineffective because of frequent tearing. Liner breaches that break containment can occur from both below and above the liners.

Failure below the liners is caused primarily by traffic passing over the liner, creating holes in it by rubbing against stone beneath the liner. As a result, additional stone sub-bases were introduced. As shown in Figure 1, layers of fine felt, and then increasingly thicker layers, were put down to create a barrier between the sub-base and the liner.

Failure above the liner occurred because of numerous factors, such as vehicle and heavy equipment traffic, oil field tools, equipment and fracturing iron.

In response to these challenges, operators began to alter pad construction to improve liner durability. Unfortunately, these alterations had little to no effect. Each successive technique adds cost, but often provides only minor improvements.

These "improvements" escalated liner costs to between \$75,000 and \$125,000. With separate liners for drilling and completion, liner costs exceed \$150,000-\$250,000 per pad. This does not include the \$20,000-\$30,000 in average repair costs to keep unprotected liners whole.

It was time for a new solution to protect liners, and operators began using a variety of matting products placed on top of their liners. Unfortunately, many of these products, which are designed to prevent liners from tearing, actually compound the problem.

For example, a number of wood matting options created liner breaches because of the sheer weight and cumbersome

nature of handling these types of mat products. Other mat products simply did not provide adequate connecting systems to transfer loads between mats that eliminated pinch points that could breach the liners beneath.

Breached liner systems often resulted in delays and/or environmental citations. A number of operators responded by choosing even thicker liners, multiple layers of liners, or other, more costly liner materials. Of course, these choices continued to escalate pad construction costs, but without significantly impacting the ultimate objective: protecting the liners so they could do their job of containing spills.

Composite Mat Systems

In response to the challenges faced by Northeastern operators, high-quality matting systems have become an integral part of protecting liners and providing safer, more environmentally friendly locations. A significant—and often overlooked—consideration is the number of hidden costs associated with making lower quality pad construction choices.

Total pad construction costs consist of a number of key elements that include sub-base construction, liner/barrier materials, trucking expense, labor, remediation, and waste disposal. In many cases, a site has to be partially remediated, and liners always have to be disposed of—all resulting in additional costs. Other examples of hidden costs include the delays and downtime associated with liner repairs, less safe working conditions, and potentially negative public perception.

It was not until two of the larger operators introduced high-quality, liner-friendly composite mat systems to protect their liners that the problem of liner tearing was essentially eliminated in their operations. Now, other operators have begun to take notice. The benefits of liner-friendly composite matting systems have been found to outweigh those of conventional wood matting systems, especially in the environmentally sensitive areas of the Northeast.

Cost-Saving Features

Composite mats are made of lighter-than-wood materials. This means transporting the system requires nearly two-thirds less trucking expense than the old,

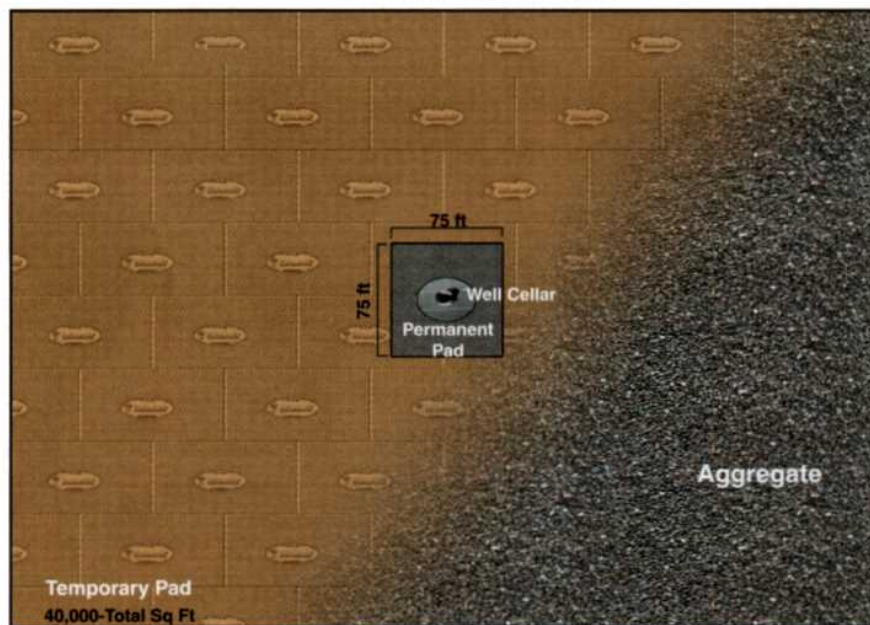
FIGURE 1

Traditional Multilayer Liner Protection System



FIGURE 2

Advanced Composite Mat System



wood matting products. For example, the reduction in trucking costs from choosing the correct matting system for a 50,000-square-foot containment area is an estimated \$27,000.

Reduced trucking not only lowers costs, but also contributes to less traffic around the well site, which enables quicker mobilization and transferring of pads. It also encourages safer work environments. According to a study by the National Institute for Occupational Safety and Health, motor vehicle accidents account for 29 percent of fatalities in oil and gas extraction—the leading single cause of death in the industry.

Composite mat systems provide superior liner protection because of their interlocking designs. This feature allows for a smooth load transfer from mat to mat, thereby preventing shifting and gapping.

The shifting commonly seen with wood mat systems not only can lead to liner damage, but also can endanger workers. With composite mats, however, the entire pad is interlocked and acts as a single, continuous protective barrier that does not allow sharp objects to come in contact with the liner.

This functionality eliminates the time, money, and resources that otherwise would go toward repairs—and the requisite delays for repair—that result from shifting and gapping. Therefore, composite mats have a twofold advantage in cost and efficiency, as well as in personnel safety

by reducing potential for tripping caused by shifts and gaps in wood mats.

Composite mat systems also can reduce stone and stone remediation expenses, which are two additional, major cost reductions for operators. One example is an advanced-composite mat system designed for use in the soft soils of the U.S. Gulf Coast. These advanced-composite mats are composed of a proprietary formulation that includes specialty resins and high-end polymer additives for enhanced durability and dimensional stability.

Testing has demonstrated composite mats tolerate extreme deflection while maintaining high load-bearing capacity in pure bending (each span is four feet). Pure compressive load capacity is approximately 600 psi, although compressive loads in excess of 1,000 psi have been observed in laboratory tests.

Because the system was developed with shifting surfaces in mind, it allows an operator to significantly reduce the stone necessary to support the rig and wellhead access. A number of advanced-composite mat test sites have had success reducing stone on the pad by as many as 200 loads.

In many leases, the landowner requires the operator to remove about 75 percent of this stone. In those situations, the savings are compounded by reducing or completely eliminating remediation.

Using less stone can save the operator as much as \$50,000 a pad, not including the additional savings should post-job removal be required. Figure 2 illustrates the use of composite mats to protect the liner and reduce the costs associated with constructing well sites.

Already, operators are seeing the potential for big construction cost savings and efficiencies at a number of sites in the Northeast where advanced-composite mats have been deployed, particularly in costs related to gravel, and associated trucking and remediation. Additionally, the mats enhance spill containment, virtually eliminating any nonproductive time associated with repairing liners.

Environment And Safety

The materials that comprise composite mats allow for a more thorough and environmentally sensitive cleaning process. The extensive cleaning required when working with wood-styled products can result in unintended consequences and further risk for operators.

Unlike composite mats, wooden mats soak up contaminants, making cleaning more difficult and lawful disposal more complicated. The ability to efficiently and systematically clean composite mat systems mitigates any concerns about contaminants potentially being carried from one site to another, and reduces the risk of materials falling off on the highway during transit.

What is more, advanced-composite mats are produced as single, self-contained units, thereby entirely eliminating the risk of harboring contaminants internally.

Another area that can unearth a vast amount of hidden costs for operators is the effect of negative public perception. Incidents that reach the awareness of the public, whether environmental- or safety-related, can reflect negatively on the company and impact not only current operations, but future activities as well.

Local governments can tie up future jobs easily through permitting, especially if the public has read negative reports and voices objections to drilling at a specific site. Simply put, better quality systems enable operators to take preventive measures to mitigate issues that potentially could have a “snowball” effect.

With stricter regulations being enforced throughout the industry, system repairs must be addressed quickly to prevent additional consequences. Dysfunctional liners are not only more costly to operators,

but potentially could be the source of slips, trips and falls.

Personnel safety always has been a concern for the industry. However, as modern technology enables rigs to operate with fewer and fewer personnel on site, each individual worker's participation has become more crucial to the timely completion of a job. A single accident can have dramatic ramifications for a drilling operation on a deadline.

Ensuring a secure, stable working surface helps reduce these risks. Some composite matting systems feature a molded treaded working surface, which delivers higher friction. This provides improved worker traction, contributing to greater overall worker safety.

The ability of a composite mat to overlap and lock is another particular safety feature that wood mats cannot offer. This overlapping feature of composite mats eliminates spacing between mats.

Spacing poses a particular threat with wood products, which tend to move independently and can settle into both high and low points. Any spacing in a matting

system can pose the risk of twisting an ankle or tripping workers. It also is one of the main causes of liner breach, as mentioned previously.

Worker safety is a top priority for all operators, and using advanced-composite mats provides a smooth, continuous surface to operate on, which helps safeguard workers. An added benefit is the goodwill that composite mats engender among landowners, who appreciate how the mats protect the ground and cut down on truck traffic.

Ultimately, composite mats allow operators to approach their jobs more cost effectively and with greater environmental sensitivity, while prioritizing worker safety. This more pragmatic approach offers further peace of mind and more favorable public perception to companies drilling in the Northeast.

Given the competitive nature of the oil and gas industry, operators are constantly looking for any advantage that allows for more efficient, cost-conscious projects while alleviating potential environmental concerns. Composite mats represent just such an advantage. □



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