

SPIKEFAST®

DESIGN CONCEPT

The existing screw or spike hole plugging products on the market consist of wooden plugs and a rigid foam product. These products attempt to repair the sleeper holes using properties similar to wood (i.e. similar compressive strength).

Rather than mimic this approach, a new strategy was sought. A new design concept, that ultimately led to the development of Spikefast, involved filling the spike hole with a material having similar properties to the metal spike (i.e., compressive strength much higher than wood). In other words, rather than employ a wood repair, conceptually use a bigger spike.

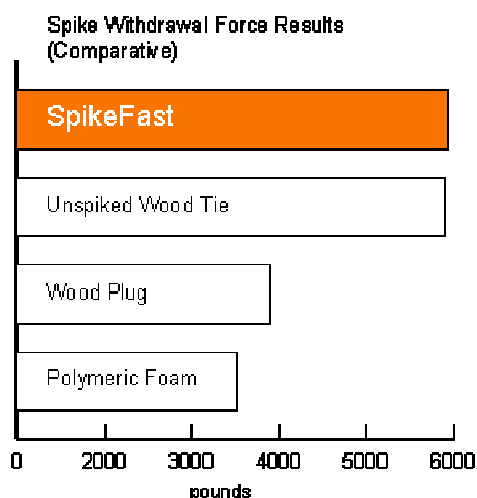
The design objectives are:

1. Typical spike insertion force must be less than or equal to 11,000 lbs. The basis for the maximum insertion force is the force required to spike virgin white oak.
2. Typical spike withdrawal force must be greater than 6,000 lbs, which is significantly greater than wood plugs.
3. Performance must be maintained during all weather conditions including temperature extremes and rain.

REACTION WITH WATER

Spikefast does not react with water. Unlike the foam filler alternatives, it retains its easy application and superior performance characteristics during all weather conditions including temperature extremes and rain.

SPIKE INSERTION AND WITHDRAWAL FORCE

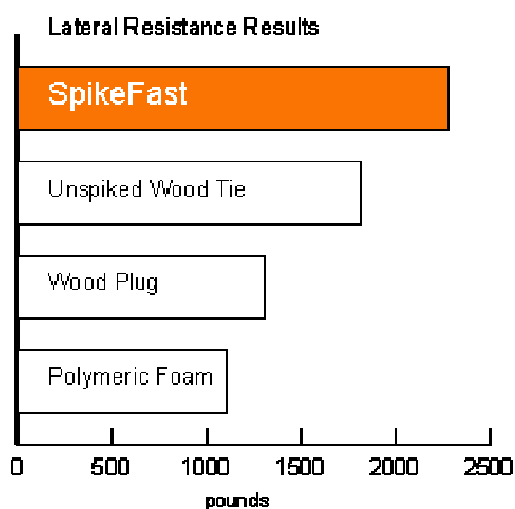


Results indicate that Spikefast's spike withdrawal force is equivalent to that of unspiked hardwood sleepers and nearly twice that of wood plugs and foam—meaning you keep gauge longer.

In a separate study, spike holes filled with the SpikeFast required an average of 1000 lbs. additional force to drive the cut spike into the material.

To measure the withdrawal force the cut spikes were pressed in and pulled out using a large tensile/ compression machine.

LATERAL RESISTANCE TESTING



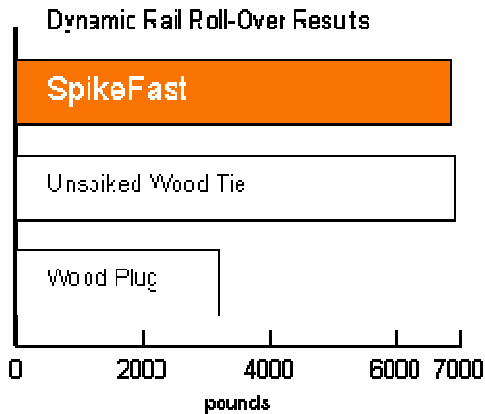
The AAR commissioned a comprehensive evaluation of all commercially available sleeper plugging materials, including wood plugs, polymeric foams, and Spikefast.

The data indicates that Spikefast's lateral resistance was 20% higher than that of previously un-spiked hardwood sleepers.

The lateral test results were obtained by measuring the force needed to laterally deflect a cut spike head 0.2 inches, which simulates rail gauge loss (i.e., widening between the rails).

Due to using actual 20 year-old sleepers with wallowed out spike holes, a wide range of sleeper integrity, and correspondingly a wide range of analytical results were obtained. Therefore, all tests were conducted 20 to ~50 times, and the results averaged.

DYNAMIC RAIL ROLL-OVER TESTING



The results of a dynamic rail roll-over study by a class 1 railroad indicate that SpikeFast's resistance to rail roll over outperforms wood plugs 2 to 1 and is comparable to virgin oak.

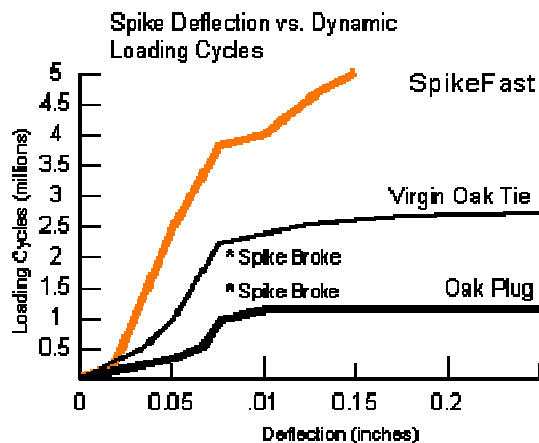
Three million 32,000 lb. loading cycles at 3 Hertz was applied vertically against a rail head (two feet long piece of rail) to simulate wear typically encountered in the field.

Simulated spike holes (3/4" with grain X 1" against grain X 5" deep) were pre-drilled into a virgin sleeper and filled with candidate plugging materials. The rail head was anchored to a virgin sleeper with a single rail plate using four cut spikes.

After the loading cycles were completed, the lateral force needed to roll the rail over was measured. Each measurement was performed once.

SPIKEFAST DEFLECTION TESTING- PRELIMINARY

Preliminary test results indicate that SpikeFast significantly outperforms virgin oak and wood plugs. SpikeFast will continue to be tested until a deflection of 1/2" is obtained.



The test used standard cut spikes and standard virgin oak sleepers with simulated spike holes (3/4" with grain X 1" against grain X 5" deep). A single spike was inserted into a spike hole filled with various plugging materials. A 2000 lb. lateral force was cycled against the spike head. The number of loading cycles to laterally deflect the spike 0.5 inches was then used to compare the performance of candidate spike hole filler materials.

The spike broke with the tests using an oak plug and a virgin oak sleeper, at the point indicated on the graph. It is speculated that the spikes broke due to loosening of the hole.

RETURN ON INVESTMENT

Rail maintenance and refurbishment performed with SpikeFast lasts longer than with the alternatives.

A simple ROI model, based on dynamic laboratory test results, indicates that sleeper refurbishment using Spikefast requires maintenance crews to revisit the same track for re-gauging operations less often, allowing their resources to be reallocated for greater efficiency.

Further, the ROI is much higher than this simple model indicates because tighter gauge means not only less overall wear to the sleepers, but also to the rail head and spike collars.

SPIKEFAST APPLICATION SYSTEMS

SPIKEFAST HANDHELD CANISTERS



The SpikeFast canister system was designed to meet the demand for a simple and portable application system.

The hand held applicator is ideal for remote locations or critical areas where holding gage is essential and high production equipment is not available.

One canister will fill approximately 15 spike holes, making it the easy solution for small bridges, switches or crossings.

As with all Spikefast systems, no harsh solvents or foaming agents are required.

Both applicators are equipped with a shoulder strap for increased safety. The Cordless applicator comes with one rechargeable 12v battery and a battery charger. Additional batteries may be purchased separately, if desired.



SPIKEFAST INTERMEDIATE SYSTEMS



Currently several major railroads are developing portable cart and high-rail based application systems for jobs to apply Spikefast. A typical cart, like the one pictured above, is designed to carry a single 55 gallon Spikefast filled resin drum and a single 30 gallon SpikeFast isocyanate drum.



An alternate chassis design concept, targeted at gangs that are willing to fill holes with the plate in place, is to place the metering components into the back of a high-rail truck.

Several key advantages exist, compared to the chassis and cart designs: A high rail truck can:

1. Travel either on or off the track.
2. Be placed off or onto the track without the use of a large crane.

Spikefast's newest innovation in sleeper plugging is a single meter portable application system. This portable system is the ideal size for small maintenance crew. The work in medium-sized maintenance projects becomes much more efficient when using this new application system.

This system is the perfect middle ground between the larger application systems and the handheld applicators. Because this new system uses twelve-gallon reservoirs, maintenance crews will be able to take advantage of purchasing in bulk chemical. When compared to handheld applications, this new system can be utilized at a higher rate of production.