Holland

TrackSTAR®

Holland's Loaded-Gauge Geometry Vehicle

RMSS White Paper Series

The NS 02 (850-series TrackSTAR® vehicle) will be used systemwide to identify broken spikes.

Norfolk Southern is an old hand at collecting and analyzing track geometry data. Like most Class 1s it operates railbound track geometry cars year ‘round across the system. And as a primarily cut-spike-on-timber-tie railroad, it pays particular attention to identifying the effects of gauge-spreading forces, which can lead to broken spikes in curves on high-tonnage lines. To help do so, NS recently acquired NS 02, a hi-rail geometry truck equipped with a loaded-gauge, split-axle system that applies a consistent lateral load to the track to find dynamic gauge widening and broken spikes.

Designed and built by Holland LP, the NS 02 allows NS to efficiently augment testing done by its two railbound track geometry cars, NS 33 and NS 36, which consist of Pullman-Standard coach cars mated to converted locomotive slugs that are weighted and instrumented to collect “loaded” track geometry and rail profile data. Each consist is pulled by a locomotive, and requires a three-person crew — an engineer, conductor and geometry car operator.

The Argus® System

The NS 02, which is equivalent to the Holland TrackSTAR®600 and 850-series hi-rail geometry car, requires one operator. It is equipped with Holland's patented Argus® system, which measures and calculates geometry parameters and generates exceptions in real time. The Argus® rail profile measurement system, which includes a laser and two cameras in each of the four modules (one each for the gauge and field sides of each rail), captures the rail shape and measures wear, cant, rail-head slope and other rail-related parameters. The Argus® system's dual camera configuration reduces the need for sun shields and provides redundancy. If one camera should fail the other camera will continue to collect data with the same level of effectiveness without interruption until repairs are made.

One operator is able to set up and operate the Argus® track geometry system and mini load axle on the NS 02.

But the primary reason that NS added the NS 02 to its geometry car fleet is the mini load axle incorporated into the system. The NS 02's load axle (a scaled down version of the Gauge Restraint Measurement Systems (GRMS) used on the big 400-series TrackSTAR® units) applies a consistent 2,500-pound lateral load to the track — a force, NS has found, that is sufficient to find broken spikes that are difficult to identify by visual inspection.

The load axle on the NS 02 generates a consistent 2,500-pound lateral load, a sufficient load for identifying broken spikes.

Using data from the NS 33 and NS 36 geometry cars, NS has been able to identify spots with broken spikes by looking for evidence of gauge widening on the geometry graphs – especially indications of recent and sudden gauge widening. Geometry car inspections are augmented by quarterly or monthly walking inspections.

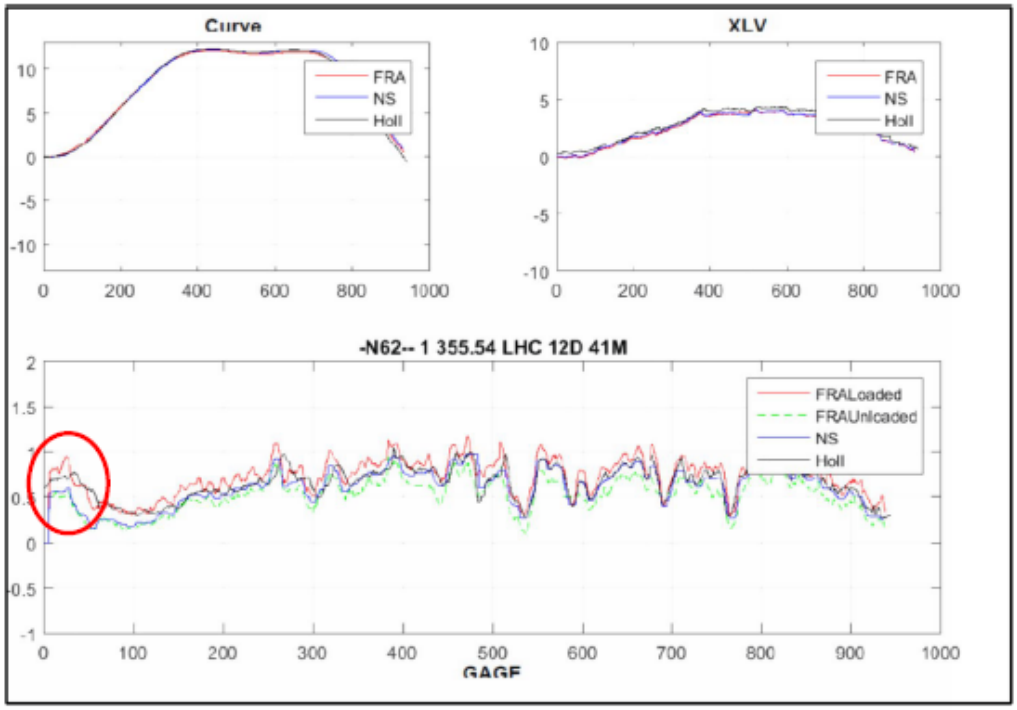
“Spikes typically break an inch and a half below the tie, and can be very difficult to find” said Brad Kerchof, Norfolk Southern’s Director of Research and Tests. “The top part of the spike does not rise up or pop out. Even from a close distance, a broken spike is typically indistinguishable from a good spike. A broken spike can be pinched between the tie plate and the tie, such that it may not move even when kicked by a boot.” Inspectors use a broken-spike-inspection tool — a long handle with a claw — to strike or pull on the head of the spike. “A good inspector can hear or feel the difference between a broken spike and good one.”

While this method works, it is, in effect, a spike-by-spike inspection of the high sides of suspect curves. It’s a tedious task for track supervisors who are already stretched to their limits, Kerchof said. Having a hi-rail geometry truck with gauge-spreading capabilities allows NS to do the job more effectively.

Before acquiring the NS 02 geometry truck, NS did due diligence on the effectiveness of the mini load axle. NS overlaid data from the Holland truck (NS 02) and NS 33 to see how the data from a hi-rail vehicle with a 2,500-pound axle load compared to the data from a railbound geometry car. As gauge widening — especially when gauge increases suddenly — is an indication of spike failure, NS paid particular attention to gauge measurements in curves.

“We found that the gauge measurements by the Holland truck were identical to those from our big car in curves,” Kerchof said. “As soon as I saw that I was sold. I’ve been waiting for 10 years for a truck like this.”

And since the load axle on the Holland-built NS 02 applies a constant lateral load on tangent as well as curved track, the NS 02 can also identify gauge widening on tangent track. “We see up to three-eights of an inch of gauge-widening on tangent track with old ties,” Kerchof said.



Gauge measurement data from NS 02 (shown in black) and NS 33 (shown in blue) are almost indistinguishable on curves. Measurements from the GRMS-equipped FRA car (which applies a 10,000-pound lateral load) (shown in red) is slightly wider. On tangent track, gauge is wider under the NS 02 than under NS 33 (red circle).

NS put the 02 truck into service for winter testing near Altoona, PA, where it quickly identified broken spikes in curves. It currently uses the NS 02 on lines and in situations where testing with the big cars (33 and 36) would be inefficient. NS’s Delaware subdivision, for example, is east of the Northeast Corridor and requires two days of travel for one day of testing with a railbound car. “We can save three days of the geometry car’s schedule by testing with the 02,” Kerchof said.

Other niches that NS plans to fill with NS 02 include:

-- intermediate tests on routes that are known to have broken spikes. Certain line segments, based on tonnage, curvature or construction, are prone to broken spikes.

-- lines that dead end. Instead of having to make a reverse move after testing, the 02 can get off track and travel by highway to the next location.

-- short crew districts. Using the NS 02 eliminates having to call a train crew for a line that only requires a few hours of testing.

-- portions of track that are missed or skipped by the railbound geometry cars. If a section of main track or siding was missed because it was occupied, or the dispatcher wouldn't provide time to test it, NS can use the 02 hi-rail unit to test it instead of bringing back a geometry car.

-- locations where snow can interfere with the optical rail-measurement systems on the railbound cars. By virtue of its load axle, NS 02 can test in optical or contact mode, providing accurate gauge measurements in all conditions.

Track geometry and rail-wear data are entered into the same databases that are used by the railbound cars. Thus, data from the NS 02 assists with both local maintenance needs and system-wide planning.

NS plans to use the 02 for 40 weeks per year, with two assigned operators working alternate weeks. About 75% of the NS 02's available testing time will be utilized for scheduled testing, covering areas formerly tested by railbound cars and the light-weight geometry truck, and for intermediate cycles of broken-spike testing. If track time is good, the local supervisors may add yard leads, and other segments in which gauge strength and spike condition is important to the schedule.

"The Holland car's gauge-widening capabilities are too important not to utilize," Kerchof said. "The truck has proven to be extremely popular. The divisions are asking for more testing than we have time available."

800-series TrackSTAR® vehicle

Holland's portfolio of track testing vehicles are designed to satisfy the track geometry and rail profile measurement requirements of Class 1, Regional, Short Line, and Transit properties in North America.

Email sales@hollandco.com and let us help you learn more about how Holland helps you make the most of your testing and data requirements.

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