Improving Forensic and Analytical Capabilities with the FARO Laser Scanner

"Laser scanners aren't just for large engineering firms with big budgets, but also for small companies who want to provide their clients with state-of-the-art services and technology that in many cases exceed those of larger competitors," says James Loumiet, President of James R. Loumiet & Associates.

FARO®

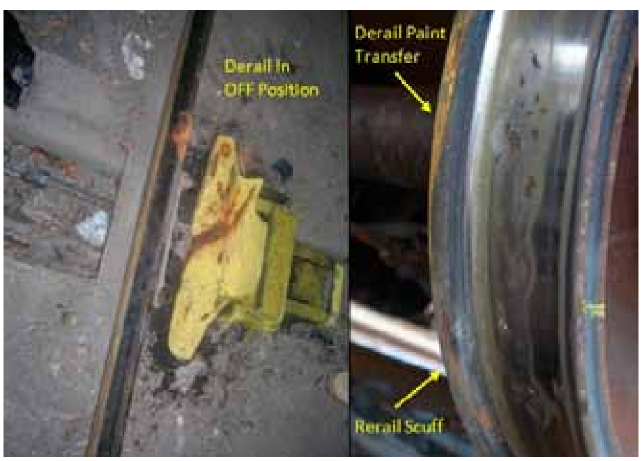
As one of the first accident reconstruction firms in the U.S. to own and implement a laser scanner for reconstructing railroad accidents, James R. Loumiet & Associates (JRLA, www.jrla.net) provides consulting and expert witness services to the legal, insurance and transportation industries. Located in Independence, Missouri, JRLA specializes in train and traffic accident reconstruction, highway safety analysis, vehicle event data recorder analysis, 3D laser scanning, and computer simulation of trains and collisions.

In a recent train accident case, JRLA was retained by Massachusetts Bay Commuter Rail (MBCR), a commuter railroad in Boston, to determine how a 130-ton loaded freight car parked on an industry track got loose and rolled past a derail and onto a main line track where it collided with an MBCR commuter train, injuring a number of passengers. A derail is a device placed on a rail and designed to redirect railcar wheels off the rail in the event a car gets loose.

In this case, a derail was placed on the industry track between the parked freight car and the main line track. However, when investigators examined the derail after the accident, it was in the OFF position (i.e. off the rail). Yet when the wheels of the freight car were inspected, paint from the derail was found on the two lead wheels of the car, suggesting that the derail was on the rail when the car rolled past it. No derail paint was present on the rear two wheels of the freight car.

JRLA was tasked with analyzing why the device had failed to derail the car if it was initially on the rail, and how the derail got to the OFF position after the accident.

Problem



The main component of a derail is called the *shoe*, which is a 24-inch long metal casting that rests on top of the rail. The shoe is shaped to redirect railcar wheels off the rail to prevent runaway railcars from reaching unauthorized track.

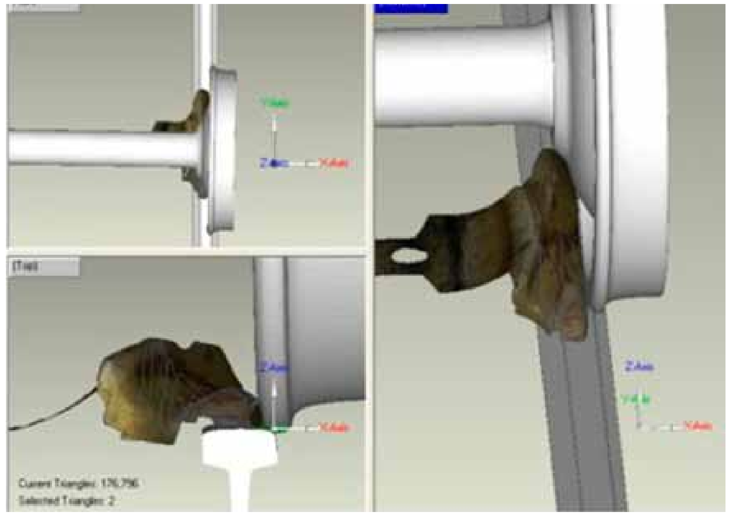
In order to understand why the car failed to derail, JRLA determined that it was important to analyze the interaction between the derail shoe and the railcar wheels. However, the unique, complex and amorphous shapes of the derail shoe and railcar wheels made capturing and analyzing the full geometric detail of the shoe and wheels using traditional methods such as tape measures and mechanical profilometers very difficult.

Solution

To achieve the level of accuracy needed for this investigation, JRLA determined that the best solution was to capture and analyze 3D models of the derail shoe and railcar wheels. Enlisting the help of Direct Dimensions, Inc. to assist with the scanning, JRLA was able to collect 3D models of the derail device, a section of the rail, and the freight car wheels using a FARO Laser Scanner. The 3D models allowed them to bring the scanned objects into a 3D environment to analyze the interaction between the wheels, derail shoe and rail.

Analyzing the evidence in the 3D environment, JRLA was able to determine that the derail shoe had initially been placed on the rail, but not fully across the top of the rail, leaving about one inch of the top of the rail exposed.

When the freight car got loose and rolled over the derail, the lead wheel mounted the shoe, and was deflected onto the top of the rail. However, instead of the wheel derailing, it re-railed itself past the derail shoe and continued rolling. As a result of the wheel-derail interaction, paint from the derail was transferred onto the first wheel.



The second wheel did the same thing, except when it re-railed, it was adjacent to the derail shoe and pushed the entire shoe off the rail, preventing the two rear wheels from ever touching it, explaining the lack of derail paint on the rear wheels. By working with the laser scanned models, JRLA was able to explain the evidence and determine how the car got past the derail.

Return on Investment

Accident reconstruction creates a challenge in accurately documenting evidence in train and automobile collisions in a safe and useful manner. James Loumiet, President of James R. Loumiet & Associates said, "The decision to purchase a FARO Laser Scanner and FARO Scene software were based on their ability to provide our firm with forensic and analytical capabilities that were otherwise unavailable in competitive products."

Adding the FARO Laser Scanner and Scene software to their toolkit has allowed JRLA to improve the quality of their analytical and demonstrative services, while reducing the amount of time for measurement collection in some cases by more than 75%. For example, on a busy roadway with a lot of tire marks, it might take up to 4 hours to make rudimentary measurements and drawings. With the FARO Laser Scanner, these same measurements and a full 3D model can be generated in about a half-hour to an hour.

Overall, the greatest value in using the technology provided by these additional tools has been the ability to provide state-of-the-art forensic services to their clients that few can match.

As innovators in the railroad accident reconstruction industry, the company has come a long way in terms of integrating laser scanning into their processes and workflows. However, this could only be achieved with the help of FARO's support along the way; according to Mr. Loumiet, "FARO's service, support, and willingness to work with our company to help us integrate laser scanning into our forensic analysis services was another reason we went with FARO as opposed to another manufacturer. The support has been outstanding."