Program: Intermodal Mystery: How Science Saved the Double-Stacked Train
Speaker: Jim Dillon, MD, Club member
Introduced By: John Prentice
Attendance: 113
Guests: Ted Danielson, Phil DeVaney, Mike Donnelly, Gay Doster, P. T. Hodgin, P. Jacob, Drew Johnson, Matt Morris, Eric Peterson
Scribe: Mark Michael
Editor: Carl Warner

Scientech's own Jim Dillon revealed a lifelong interest in trains and railroading and then gave an excellent presentation titled "Intermodal Mystery: How Science Saved the Double Stacked Train". The primary source material was in a recent article in Trains magazine written by David Ibata. Jim's information was supplemented by his guest, Eric Peterson, a former railroad civil engineer.

Container shipping was being done in the early 20th century in Great Britain to facilitate freight movement over railroads of different gauges. In the 1950's, a North Carolina trucking company owner named Malcom McLean began developing the concept of shipping entire trucks on ships but later evolved this into the container shipping concept currently used. U.S. and Canadian railroads adopted container shipping. In 1980, 3.1 million containers were shipped by ship, rail, and truck. This number had grown to 13.7 million units in 2015.

The containers are available in various sizes, now up to 53 feet long. They have common dimensions between their locking points so that containers of different sizes can be stacked. In the late 1980's, very large deep-well cars able to carry 125 thousand pounds of cargo in stacked containers were introduced. These were 3 car assemblies in which the center car shared a truck (wheel assembly) with each of the other two cars to save weight. Unfortunately between 1988 and 1992, 22 derailments involving these large double stack cars occurred.

To solve this problem, railroad engineers searched for causes. Car connectors (couplings) were not found to be at fault. Track kinking caused by heating of long segments of welded rails, or rail separations due to cold temperatures were also not identified as a primary culprit in these derailments.

Further engineering sleuthing showed a combination of factors were causing the derailments. Unlubricated "low" (inside) rails on curves were being subjected to 30% increased lateral forces and when not properly secured were rolling over. Additionally, VIP pads on truck side bearings were allowing the trucks to warp, increasing their rolling resistance and causing track spreading. Mixing lighter and much heavier cars on the same train led to "string-lining" in which the lighter cars were pulled off the tracks on corners.

Solutions to these problems have included lubricating low rails in curves, removing the VIP pads to decrease truck warp, and changing the car mix on trains and adding "pusher" engines to prevent string-lining. Also, grinding rails and maintaining wheels to facilitate proper wheel/ rail contact and decrease rolling resistance were suggested. Finally, properly securing the low rail in curves to prevent rollover was considered important.

Challenges remain. At the present time, a differential to allow adjacent train wheels to rotate at different speeds in turns is not practical. West port docks in the U.S. have been slow to develop infrastructure for handling large containers. Consequently, Canadian ports are welcoming increased trans-Pacific shipping. Finally, returning containers to their original shipper full of some type of cargo rather than empty is not always easily done.

Jim Dillon imparting wisdom to an audience member after meeting.