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FEDERAL TRANSIT ADMINISTRATION

REPORT SUMMARY

U.S. Department of Transportation
Federal Transit Administration

Technical and Safety Evaluation of the Southern California Regional Rail Authority Positive Train Control Deployment Project: Challenges and Lessons Learned

Background

The Rail Safety Improvement Act of 2008 mandates most US railroads to implement Positive Train Control (PTC). PTC technologies use automation to eliminate human errors that would otherwise cause train-to-train collisions, over-speed derailments, and safety risks directly observable by central dispatching offices. The Southern California Regional Rail Authority (SCRRA or Metrolink) took early initiative to implement PTC on all line segments where passenger operations are conducted and to establish itself as a rail safety leader.

Objective

A partnership between Rail Safety Consulting (RSC), part of TUV Rheinland North America, and the University of Southern California (USC) studied SCRRA's PTC implementation process to evaluate current PTC technology and document deployment challenges and lessons learned.

Findings and Conclusions

PTC technology can improve rail operational safety and capacity as long as it enables high reliability principles and reinforces existing rail safety practices.

SCRRA has undergone substantial challenges to integrate PTC into its operations. This report investigates the multilevel challenges—technological, human, organizational, and systematic—that SCRRA faced implementing the new technology as well as many of the lessons the railroad industry can learn from these challenges and examines interactions among the numerous Systems of Systems for their impact on successful PTC implementation.

Integration and field testing PTC system components and obtaining the necessary radio spectrum were a particular challenge to SCRRA. Both challenges are identified as issues plaguing PTC implementation throughout the rail industry. To implement its PTC system successfully, Metrolink needed to replace and overlay different parts of its existing operational systems. Locomotives required new hardware and software to communicate with the dispatching software via a back office server. Computer-aided dispatch (CAD) software and hardware were replaced because the legacy system could not be upgraded to accommodate PTC operability. SCRRA constructed a new hardened

operations facility for day-to-day operations because the existing one was insufficient. The entire rail network map needed calibration to ensure accuracy for PTC operations. SCRRA bought simulators to train locomotive engineers on PTC. Finally, acquiring the necessary 220 MHz radio spectrum bandwidth required considerable time, including more than five years of litigation, during which time the PTC–220, a Class 1 company, leased the spectrum to SCRRA.

During the switchover to the new system, SCRRA reported 90% of successful overall runs operating PTC from June 2015 to February 2017. It also established new safety checks and procedures using PTC-generated data, train operator input, and data analysts as part of its new troubleshooting procedures, with included potential hazard identification.

To achieve fundamental elements of rail (system) safety, the industry must realize that technology and human workers cannot integrate successfully unless there exists a deep respect for the complexity of systems of systems, including how legacy practices must evolve to ensure positive change. To achieve better system of systems performance, the industry must establish good feedback loops that provide information and enable wise decision-making that provides stability and growth while avoiding inadvertent resistance to change and inevitable system collapse.

Benefits

Technology alone cannot ensure safety, but a properly-implemented PTC system can develop and promote high reliability practices that enable safe operations throughout an organization. The SCRRA has shown glimpses of this in how its working culture has evolved collaboratively among locomotive engineers and computer engineers to troubleshoot problems with its PTC system. As long as the industry can maintain proper non-conflicting directives that do not threaten sustainable behavior by overriding all other priorities, the industry as a whole will tend towards a self–organizing, resilient equilibrium that autonomously achieves good performance.

Project Information

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