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Biggest technical challenge railroads ever faced

Positive train control has the industry in a knot

Somewhere in the attic of the Smithsonian Institution sits the prototype of the seminal train-control invention of the past century. It's a five-foot-long control board for the first installation of centralized traffic control. The invention of Sedgwick North Wright, an employee of General Railway Signal Co., CTC first controlled a 40-mile segment of a New York Central subsidiary in northern Ohio. That was in 1927.

CTC made possible huge jumps in capacity, efficiency, and safety. Yet it was deployed slowly. Stranger yet, railroads at first put it where they needed it least. On Missouri Pacific, for example, an early use was between Kansas City and Atchison, Kan., a secondary route. Think what CTC could have done to rationalize New York Central's overbuilt, four-track New York-Chicago route any time during the next 30 years. Well, railroads didn't have much money. They distrusted this emerging technology, too, and wanted to test its durability. Ultimately, CTC proved itself and today is widely used.

The irony of what I've just written may be dawning on you. Here the railroads are in 2011, spending billions atop billions they could put to better use, installing on roughly 73,000 route miles a technology that is still in the process of being invented. That would be positive train control, of course. PTC will prevent collisions, overspeeds, incursions into work zones of maintenance forces, and running through incorrectly lined switches. Congress mandated its use immediately after a head-on collision in 2008 that killed 25 people.

So far, PTC may be an abstraction. Even when fully in place it will remain largely invisible. But this is the biggest technical challenge railroads ever faced — the Manhattan Project of the iron horse — requiring finance, cooperation, coordination, originality, and blind faith that it will all come together and work as intended. I've been talking to the railroaders in charge of getting PTC put in place. And I've come away with a few impressions I'd like to share.

First, the sheer scope of the undertaking is mind-boggling. The closest parallel may be the Safety Appliance Act of 1893, which mandated power brakes and automatic couplers within seven years. The distinction is that by 1893 a lot of railroads already enjoyed both of those safety advances. Thousands of railroaders are (or soon will be) involved in making, installing, testing, and tuning PTC along rights-of-way, aboard locomotives, and in back offices. It's safe to say that two years ago, few imagined they'd be doing this.

Second, the conditions in which positive train control is being rolled out couldn't be worse. This year, most railroads will field test PTC. But the 200-megahertz radios needed to communicate data between wayside, locomotive, and office installations don't even exist and won't until late this year, at best. Will they work? We'll find out. A lot of the software that will control PTC is still being written or tested. So field testing involves using temporary radios on different frequencies that will later be cast aside and some software that is barely in beta stage. In other words, things are being done backwards, because everything is being driven by an arbitrary date, Dec. 31, 2015, when Congress decrees all shall be operational.

Third, this is a terrible waste of brainpower as well as money. This industry-wide project is sidetracking some of the best engineering and management minds. Just on the issue of interoperability of locomotives on different railroads, each with their slightly different variations of PTC, the industry has assembled technical teams to address architecture, applications, wayside signals, messaging, locomotives, communication steering, and data management. And unless you value a single human life at hundreds of millions of dollars, PTC won't pay for itself, or even come close. Largely, this is money (government cost estimates for PTC the next 20 years range from $6.7 billion to $22.5 billion) spent because Congress said to.

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Fourth, there is no slack whatsoever in the implementation schedule, at least for large railroads. Once radios specifically designed for PTC begin to be delivered, maybe in late 2011, they must be tested in the field. When they pass muster, each railroad can then file with the Federal Railroad Administration its PTC safety plan, totaling many thousands of pages of documentation. FRA has six months to review that plan and then issue a certification of the PTC system. That is, unless it wants changes, further setting back the timetable. All of this will take until at least the end of next year. Only then can large-scale installation begin.

Fifth, it may not work. By that, I mean the hardware and software could work in the lab or in field tests, but still bring American railroads to their knees. For example, if the constant data-transmission handoffs by more than 100,000 radios are 99.99 percent accurate, you'll still have a hundred failures a day, each bringing a train and those around it to a halt. In urban areas such as Chicago, hundreds if not thousands of wayside devices and locomotives will be simultaneously exchanging data by radio with various back-office central computers. Will the sheer volume overwhelm or confuse the PTC systems and cause lockup? Nobody knows. The biggest fear of all appears to be this: Railroads all operate their trains on each others' tracks. Will the PTC systems recognize the locomotives of other railroads and communicate with them correctly, enabling seamless operation? Each railroad will have its unique central computing system processing the incoming radio data bursts, and getting them to behave the same is daunting.

Positive train control is the most compelling event in railroading in this new decade. Everything rides on its working flawlessly within less than five years; *almost* flawlessly won't cut it. Benefits are few, the cost of failure unimaginable. ⊥

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