

Those Who Can, *Teach*

BY PETER A. HANSEN

Whether the collar is blue or white, the person wearing it needs to be well trained





Roy Inman

Students at Chigger Yard learn a variety of operational skills. Here, a student practices throwing a hand switch in August 2001.



Roy Inman

High in the cab of a BNSF GE DASH 9, today's trip over Cajon Pass looks pretty routine. But no run here is ever predictable, and it isn't long before we find that out first-hand. With whining dynamics holding down the momentum of the 6,000 tons behind us, we do a service application of the brakes to keep the train from exceeding track speed. If we release too much air and can't recharge while in transit, we'll have to stop and tie up the main. In a high-volume area like this, that's bound to attract some attention we don't need.

A few seconds later, getting called on the carpet is the least of our worries. We've done too many service applications without giving the compressor sufficient time to recharge. We begin to pick up speed, and there's still another 6 miles of 3% descending grade ahead of us. Yes, your heart just skipped a beat.

Fortunately, none of this is happening on the road. We're in a simulator at the BNSF Railway academy, and the simulator is doing as it was intended: Prepare engineers for the worst. "In simulations, you can set up a safety-

sensitive situation and not create a hazard," says Technical Training Manager Warren Scholl. "You can put an engineer under the gun in a way you can't do in real-life circumstances."

As a trainee in the simulator, just try nuzzling the limits, and see what Scholl and his crew have in store for you. Violating restricted speed? They'll pop another train into the scene, just around the next blind curve. Did you forget to notify your dispatcher when you went into emergency? Don't be surprised to find another train in your path, unaware of your presence. Scholl doesn't have a mean streak, he's just serious about safety. "The scenario generator can set up virtually any safety situation you can think of, and it can even re-enact accident situations," says Dave Tolle, who heads BNSF's training academy in suburban Kansas City. "When [students] see what could happen out on the road, you can see the hair stand up on the back of their necks and the sweat pop out on their foreheads."

George Bernard Shaw once opined, "He who can, does. He who cannot, teaches." Shaw never met Tolle.

A career railroader with 30 years' experience, Tolle heads a faculty of 70, all of whom had years of real-world

Until mid-2004, students used GP9 1610 at Chigger Yard, a lab for train-handling courses. Current classes typically use second-generation road-switchers from the local pool.

experience as a prerequisite to joining the staff. The curriculum is as far-reaching as BNSF's empire, encompassing labs and classrooms in the Kansas City site, mobile locomotive simulators that roam the system, and a growing array of computer-based training.

BNSF is by no means alone in its commitment to formal training. As railroading becomes more technically demanding, the industry is searching for new ways to attract and retain good talent. A few educational institutions are also getting in on the act, sometimes in cooperation with a railroad. BNSF's program, for instance, is run in conjunction with Johnson County (Kansas) Community College. The result, say students and faculty alike, is a railroader who gets smarter faster, and who's better able to grapple with today's increasingly technical crafts.

Rising traffic levels and simple demographics also are driving the increased emphasis on training. U.S. rail traffic reached record levels in 2004, smashing the old mark by nearly 5% — and the trend shows no sign of letting up. In the next 10 years, 40% of railroaders in several crafts are



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A BNSF employee instructs students in the finer points of maintaining a GE prime mover. The mechanical lab has a variety of equipment available to students.

expected to retire. You don't need to be a mathematician to see it adds up to a big need that's only getting bigger.

Across the country, railroads, community colleges, and respected universities offer a variety of programs, both craft-based and professional. More likely than not, the 21st century railroader will have a lot of technical education behind him or her.

On BNSF, engineers are required to train on the simulator, not just when they're just hired, but when they're qualifying on a new territory, too. The simulations are followed by several qualifying trips on their territory with the designated supervisor, the number of which will vary with the difficulty of the run. Cajon Pass, for example, requires 15 qualifying trips.

Eventually, every territory on the BNSF system will be available for simulations. New engineers will still travel to Kansas City for the personal attention offered in a formal classroom setting. Experienced engineers seeking re-certification are increasingly able to do it at their home terminals, because the railroad is deploying a series of "Net-Sims." These are network-based simulators linked via the corporate intranet to the academy. Twenty-seven locations systemwide have them already, and more are scheduled. Even small crew terminals benefit from traveling simulators that often spend two months in a given location.

PARTNERS IN TRAINING

The academy offers far more than engineer training, though. Courses of study also include mechanical, maintenance-of-way, signal systems, conductor/yard crew training, and more. Courses are designed to cover a wide range of skills in every discipline, with offerings for apprentices and journeymen, new hires, and experienced employees.

The plan to provide this educational option was conceived in 1986 when the community college expressed a desire to establish a vocational curriculum. When administrators learned that Burlington Northern was planning to start a training facility, the two parties agreed to join forces. The community college calls its operation the National Academy of Railroad Sciences; BNSF's is called the Technical Training Center. The real estate belongs to the college, but the faculty comes mostly from BNSF, whose personnel teach classes for both operations. Students are drawn from different demographics, with most training center students coming from BNSF, while the community college students are paying their own way in a vocational education program leading to associate degrees in railroad electronics or railroad operations.

Each organization gets something from the arrangement. The railroad benefits from the instructor certification the college provides, as well as the

location, since Kansas City is a major center of BNSF operations. The community college gets career railroaders as instructors for its degree program, people who have been out in the field and can bring their own experiences into the classroom.

Tolle himself is a prime example. He came up through the ranks, starting with Santa Fe in 1965 as a roadmaster's clerk. That position and his second job, secretary to the general manager at Topeka, Kan., exposed him to every aspect of railroad operations. He worked his way up to trainmaster on Colorado's busy Joint Line, and in 1979 became the head rules instructor for engineer training. He was one of the founders of the joint Santa Fe-Southern Pacific engineer training program in the 1980s, and later became BNSF's general director of rules and field support at the training center before assuming the top post.

All that experience is of limited use, however, without an effective way of delivering it to the students. Instructors are made more than born, and "training the trainer" is the primary component that the community college and its director, Andy Burton, bring to the partnership, instructing future trainers in presentation methods, student

Training at the Other Class Is

BNSF is hardly alone in its commitment to training. Here's a rundown of programs at the other Class I's:

"We're going to turn over 42% of our craft workforce in the next 10 years — that's a big number," says Margaret Downey, director of training development and culture at **CSX**. Her company is seeking to meet the need with an \$8 million training center in Atlanta, opening in phases between February and July this year. All crafts will be centralized there for the first time, and Downey sees several advantages: "When you're teaching a conductor, for example, you need to be able to teach them about signals. It's great to have those people right down the hall." CSX plans to hire 1,800 conductors this year.

Canadian National's technical training is done both internally and with external suppliers. In contrast to the centralized and community college-based programs of some carriers, CN has a decentralized approach, using locations throughout its system. Spokesman Jim Kvedaras says that CN's program is heavily focused on safety training as recently acquired railroads are converted to common operating rules across all of CN's properties. He also reports that CN generally hasn't faced the enormous recruitment problems experienced by other carriers. "We have kept up a steady stream of hiring and training for train and engine service employees and some mechanical forces, to keep pace with retirements and our business growth," he says.

Kansas City Southern also takes a decentralized approach, training workers at several locations systemwide. Some training is also contracted out to other facilities, including BNSF's. Conductors receive an initial four-week course in the classroom, followed by eight weeks on the job. Engineers spend five weeks in class and then train for 20 weeks on the job. Re-certifications are accomplished with computer-based training every three years. KCS mechanical department apprentices are enrolled in three-year correspondence courses with the Railway Education Bureau, and they also receive 40 hours of training annually. Maintenance-of-way and signal department training is conducted over a two-year period. New hires begin working with a mentor right away, along with their classroom training.

Norfolk Southern has an 18-acre facility in McDonough, Ga., with a total of 55,000 square feet of classroom and lab space in four buildings. Southern Railway opened the center in 1975, and NS expanded it in 1992 with the addition of several locomotive simulators. NS added a welding lab in 1995. McDonough handles all the initial training for conductors, engineers, locomotive machinists and



Norfolk Southern Railway

electricians, signal maintainers, carmen, yardmasters, and dispatchers, says Training Manager Bill Faulhaber. Some 4,000 employees in all crafts have been trained there in each of the past two years.

Union Pacific has elected to regionalize its training. Salt Lake Community College (with which UP partnered to construct a science and industry building) is a major site for training of locomotive engineers, signal maintainers, telecom technicians, and others, says spokesman John Bromley. Additional sites include West Chicago, the new Omaha headquarters, and Spring, Texas. Smaller facilities include Kansas City; Roseville Calif.; North Little Rock; North Platte, Neb.; and Tyler, Texas. Like BNSF, UP is making increased use of the virtual classroom. "We can put training material on the Web, and our employees can access it whenever they want," says Kevin Naylor, assistant vice president of human resource development. "Not only does it give the employee an instant source of training, it also allows the company to maintain an up-to-the-minute package."

Canadian Pacific was contacted for this survey, but did not respond prior to deadline.

— Peter A. Hansen

learning styles, and more. Only certified instructors may teach classes in any accredited institution. The result?

"The railroad gets the college's expertise on teaching methods and instructor certification, while the college gets the credibility of real railroaders as instructors, and the ability to confer craft certifications for the General Code of Operating Rules, haz-mat handling, and hostling," says BNSF's Tolle. "And the benefits even extend beyond the college and the railroad, since out-of-town students pump hundreds of thousands of dollars a year into the local economy."

A BROAD SCOPE

Formal training programs aren't limited to craft-based disciplines, though. One of the greatest needs in the industry today, and, therefore, one of the greatest opportunities for employment, is in engineering, particularly civil engineering.

The need arises from a squeeze in the supply of civil engineers and an expected increase in demand for their expertise. On the supply side of the equation, roughly half of the railroad industry's engineering staff will retire within the next five years. As for demand, most of the challenges faced

by the industry today relate to an engineering issue in one way or another: Service reliability, capacity, safety, and the future of intermodalism all hinge on successful engineering solutions.

Dr. Chris Barkan is another man who negates George Bernard Shaw's quote. Barkan is associate professor and director of railroad programs at the University of Illinois. He moved to the university seven years ago, after nearly 10 at the Association of American Railroads, where he directed research on projects related to railroad environmental performance, tank-car safety, hazardous-materials handling, and risk analysis.



Bill Parks, manager of conductor training, discusses installation, operation, and basic maintenance of a rear-end device ("FRED") at Chigger Yard in August 2001.

The University of Illinois and the University of Kentucky offer classes in civil engineering specific to railroads. Others, including Massachusetts Institute of Technology and Texas A&M, have well-regarded engineering research programs, and Virginia Tech has recently begun one. The Illinois program has a century-long history, and its former directors include Arthur Newell Talbot, Edward Schmidt, and William Hay, whose work was the foundation for many railroad engineering practices still in use.

Barkan believes the engineering emphasis for the 21st century lies in five areas:

- Systems analysis to improve rail service reliability, capacity, and economics, including intermodal integration
- Advanced infrastructure design, safety, durability, and maintenance
- New technologies for rail traffic control systems
- Information, communications, sensor and computer technology for smart-train infrastructure and vehicle

systems

• Motive power and train technology to improve energy efficiency, reliability, and speed.

The industry understands competition, growth — its very future — are at stake. The AAR, individual carriers, and equipment suppliers funnel nearly \$1 million in research grants to university programs annually. AAR has named the University of Illinois, Virginia Tech, and Texas A&M as affiliated labs in its Technology Scanning Program, an effort to look ahead 5 to 10 years, and identify industry problems and the technologies likely to address them. Several current projects with industry funding include those to develop:

- New, more durable rail steels to support heavier loads, high-adhesion locomotives, and greater train speeds
- A laser-based method of analyzing rail stress arising from thermal expansion and contraction. Rail stress management costs the industry \$100 million a year, and also affects service and safety
- Fatigue-resistant rail welding techniques
- Smart sensors to monitor the functioning and health of railcar and infra-

structure components and systems.

The university programs also serve as a forum for information exchange among railroads, public officials, and academicians. University of Illinois, for example, has hosted workshops on positive train control, haz-mat transportation risk analysis, and technologies for the detection of broken rails. It also hosts an annual railroad environmental conference.

DIVERGING TRACKS

As with any technical career, aspiring civil engineers are advised to concentrate on math and science studies, but also explore rail interests outside the classroom. While in high school, for example, Barkan worked at the Shore Line Trolley Museum in East Haven, Conn., where he was introduced to car work, maintenance-of-way, electric traction, and more.

Engineering graduates will go on to work for a railroad or an outside consulting engineering firm. In the wake of industry downsizing, most railroads farm out the engineering design work to a consulting firm, while their own engineering staffs manage the consultants and oversee track maintenance. A

graduate from one of these programs will thus need to decide if he or she prefers a hands-on career or a management position, because that can drive the choice between working for the consulting firm or the railroad itself.

There are advantages to each career track. Consultants might gain more in-depth knowledge in a particular field of work, while managers get first-hand exposure to a variety of engineering problems, but on a higher level. Most railroads have management internship programs in which young engineers are hired and given time in a variety of positions, exposing them to the wide range of engineering and operational issues in which railroads are involved, before settling in one particular area.

Barkan's students are pursuing both paths. Recent University of Illinois graduates have landed positions with BNSF, Canadian National, CSX, Norfolk Southern, and several consulting firms. Kevin Day is a case in point.

Three years removed from the University of Illinois, he's had four assignments with CN, and is now the company's bridge supervisor in Illinois. His education was "definitely a beneficial experience," he says, adding that networking has been one of the biggest benefits, since a key part of the program is exposure to real-world projects and industry conferences.

"Our program is very cross-functional," says CN's Tanya Lovegrove, manager of targeted recruitment. "A recruit is exposed to operations, marketing, transportation, and more, so they can really go almost anywhere."

A recruit might spend time on the road in a locomotive, or in CN's network operations center in Edmonton, Alberta. This exposure helps them see the interplay between various parts of the company, and requires a top-to-bottom commitment in the organization, since recruits are training with working railroaders who have responsibilities of their own.

But with the demands come rewards. Civil engineers are unsung heroes in railroading, striving to make the industry safer and more efficient. To the extent that hazardous materials are contained, or high-speed rail relieves congestion in the air and on the road, or the environ-



University of Illinois student Tyler Dick inspects the Union Pacific/Norfolk Southern diamond at Dwight, Ill., for damage due to high-impact loads in June 2000.



University of Illinois railroad engineering students John O'Bryan, Pooja Anand, and Kevin Day inspect AAR's Track-Loading Vehicle at the Transportation Technology Center Inc. in March 2002.

A thermite weld charge is ignited (right) in Newmark Lab at UofI while Professor Fred Lawrence and his students, Yiren Chen and Jeffrey Cyre, observe in early 2001.

ment is cleaner because shippers have chosen rail over truck, engineers will be responsible.

Having grown up in the '60s, Barkan admits that the social consciousness of the era left its mark on him. "Railroads have a role to play in the nation's future, and the chance to help students learn and become excited about participating in that is very rewarding," he says of the motivation for his choice for a dual career as both scientist and academic.

"It's not just about money or developing your career. It's about doing something useful with your life." I

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