

Training the next generation

Training the replacements for today's aging m/w work force, as well as keeping up with advances in the field, is a continuing challenge.

by Tom Judge, editor

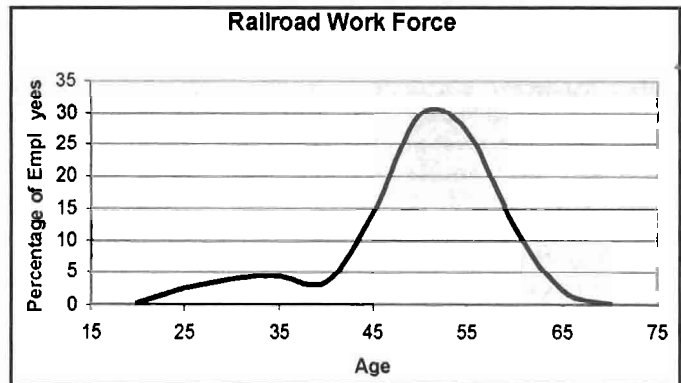
For a long time, railroads have had the luxury of an abundance of trained personnel. In the 1970s and 1980s, many railroads dramatically reduced their staffs, while others went out of business altogether. But that abundance of trained railroaders is long gone, with more on the way to retirement.

"Due to downsizing of the railroad workforce that has lasted several decades, only a few young engineers have had the opportunity of gaining experience in the railroad industry," Pasi Lautala of Michigan Technological University said in a paper presented at the 2004 AREMA Technical conference in Nashville, Tenn. "This has led to a shift towards a higher average age within the railroad work force. Large portions of employees are rapidly approaching their retirement age and this is causing an abrupt generation change in the industry.

"Simultaneously, the railroad industry is facing an increase in the volume of shipments," he said. "Due to these two developments, railroads have to prepare themselves for the generation change and start to develop new leaders, who will eventually take over the leadership positions in the industry. Educating and training a whole new generation of employees is an enormous task and it is difficult to accomplish in a short time period.

"Universities play an important part in higher education today," Lautala noted. "Currently, railroad education, even in its most basic form, is almost non-existent at the university level and, in general, students do not recognize railroads as a potential career option. One of the greatest challenges for the industry will be to change this attitude and start attracting new students to railroad careers. It is the responsibility of both the academic institutions and the railroad industry to get ready for the task of educating the next generation of railroad professionals."

Michigan Technological University has started to incorporate railroad education in its civil engineering



The railroad work force is aging.

curriculum and one of the first steps has been the development of an international Summer program in railroad engineering.

Aging railroad work force

"Railroads have become a highly technological industry, where all positions require proper education and training," Lautala said. "In order to meet the training requirements, the railroad industry has to be able to develop a thorough, but flexible, training system that is continuously reviewed and developed as the industry and technology changes. The major burden of this system, especially on the operational side, will fall on railroads themselves, but universities should be encouraged to assist the rail industry in this mission."

Lautala continued: "Railroad engineering was a common course and theme in virtually all civil engineering curriculum in the early 20th Century, but today most rail-related education has disappeared from universities and specialized railroad courses are rare. There are only a few universities where it is possible to take one or more rail-related courses. Many universities don't even include rail transportation as a part of their introductory course in transportation, so it is

not uncommon for a civil engineering student to graduate without any understanding of railroads.

"However, there have been some positive developments lately," he noted. "For example, the University of Illinois, Urbana-Champaign has introduced several new railroad courses that have become very popular with their students and the University of Wisconsin-Madison offers several short courses as part of its continuing education program. In addition, several new textbooks, such as AREMA's *Practical Guide to Railroad Engineering* and *Fundamentals of Railway Track Engineering* by Dr. Arnold Kerr, have been published recently to provide new and updated written material.

"In addition to the basic education of undergraduate students, universities can play an important role in rail research," he noted. "Although the magnitude of railroad research is limited, a few universities have been successful in securing funding for rail-related research and they have been able to provide financial support for graduate students working on rail projects. However, the number of graduate students concentrating on railroads is very small and there are only a handful of doctorate students in the whole United States.

"One of the greatest challenges in railroad education is to attract new students to the field," Lautala pointed out. "Today, competitive salaries are not enough to attract new employees. Recent studies point out that the upcoming generation, the so-called Net Generation, emphasize the overall happiness and balance of life over the monetary values and are more oriented toward family and social activities. Attracting significant numbers of these individuals to railroad careers will require changes in the current industry culture.

"Based on the author's observations, most university students don't currently consider railroads as a potential career option, due to previously mentioned aspects, lack of railroad knowledge and lack of available jobs," Lautala noted. "The fact that very few university faculty members have a rail background or are actively involved in the industry makes it difficult to spread out the railroad information and attract university students to railroad careers.

Michigan Technical University in Houghton has 6,600 students, of which about 2,700 are engineering students. Over the past three years, Lautala and Bill Sproule, a professor of civil and

environmental engineering at Michigan Tech, have been working to introduce railroad engineering back into the curriculum through a Summer program that includes a study abroad component in Finland. While in Finland, students are able to practice their basic Finnish skills studied as part of the program with local people and participate in several scheduled activities that provide an introduction to the local culture and traditions.

Twenty-nine students have participated in the program during 2004 and 2005 and plans for 2006 are in progress. The majority of the participants were from the Department of Civil and Environmental Engineering of Michigan Tech, but the group has included several students from other departments and one student from the University of Kentucky.

There were several reasons for developing an international Summer program instead of just developing a railroad course to be taught on campus in Houghton. As mentioned earlier, the program goal was not only to increase the students' technical capabilities, but also to increase their awareness of different cultures.

"From a railroad point of view, teaching the course both in the United States and Finland provided several advantages," Lautala said. "Students got an opportunity to visit, see and hear about the quite-extensive differences in American and European rail transportation systems and cultures. Another goal was to develop a versatile railroad course that would approach the railroad education from a practical point of view. Therefore, field visits in Chicago and Finland were organized to show how the material presented in the lectures was applied in the industry."

Topics, instructional methods

Since the purpose of the course was to be an introduction to railroads, a wide range of topics was covered. Topic selection was based on the results of a survey that was filled out by each participating student more than two months prior to the program. The order of the topics was built around the field visits, so that operations discussed during the visits were presented and discussed in advance in the classroom.

The course utilized several instructional methods. The base method was interactive lectures that incorporated both short and extensive discussions to

facilitate active and continuous participation from students. Interactive lessons were combined with guest lectures given by industry professionals, simulations, several short workshops and almost daily homework assignments. In addition, students prepared for and participated in a debate about the necessity of rail transportation.

The course included several field visits. In Chicago, students visited a CSXI intermodal yard, the Belt Railway of Chicago hump classification yard, Patrick Engineering and Metra's Centralized Control Facility and locomotive shop.

In Finland, the students visited a hump classification yard, checked out a track rehabilitation project and rode an automatic track measurement vehicle.

Based on student feedback, the Summer in Finland program has proved to be a great success.

"This program is an excellent starting point for railroad education at Michigan Tech," Lautala said. "The ultimate goal would be to offer several rail-related courses and have a successful rail research program with several projects and funded graduate students.

"After several students made inquiries for job opportunities with railroads, we have worked on developing contacts and facilitating internships with Class 1 railroads," he said. "This past Summer, seven out of 13 students started their internships immediately after returning from Finland. One of the 2004 students actually returned to Finland this past Summer to work with VR Track, Ltd. Several students have also taken full-time positions with Class 1 railroads, but we are realizing that there needs to be more guidance for students considering that alternative. Working for Class 1 railroads is not for everyone and we want to be careful of encouraging students to take positions that won't meet their expectations. Internships provide a risk-free investment for the railroad and the student to get to know each other without a long-term commitment. We are currently working on expanding the pool of companies that provide internships to include consultants, contractors and manufacturers. We have also decided to continue to allow students from other universities to apply for the program."

Where to now?

"Education and training of new employees will be one of the greatest future challenges and both railroads

and universities play an important role in the search for the solutions," Lautala and Sproule said. "The continuous trend of railroads for outsourcing most of the technical work to engineering consultants will increase the number of professionals who work on railroad projects, while not being employed directly by railroad companies. Most young engineers in engineering consulting companies are university graduates, which further increases the importance of universities as an active participant in the railroad education.

"In order to develop railroad education at universities, the key challenges are to attract enough students, obtain adequate material and equipment for meaningful courses and possess necessary skills and understanding of topics. Attracting students will become easier, as the potential to work in the industry increases. If the estimate of 80,000 new employees is correct, student interest should not become a major concern. Young graduates hired by the industry are probably the best marketers to help attract new students, as long as they are satisfied with their experience."

Availability of railroad material is improving. The Internet has increased



Michigan Tech students visit BRC hump classification yard in Chicago.

access to material and a new generation of written textbooks is being published.

"From a program developer's point of view, there seems to be need for an affordable textbook that would incorporate a wide range of railroading basics and include problems and assignments," Lautala said. "AREMA's Committee 24 is currently working on several projects that are geared to providing basic information and materials to the universities and other organizations that provide railroad education.

"The greatest challenge at universities may lie in the faculty," Lautala stated. "Few professors have rail background or even basic level of understanding in rail transportation. Rail experts are rare in the academic world and the low number of graduate and

doctorate students working on rail-related research is not improving the situation. Until the industry starts to communicate the need for increased education and the commitment for more widespread research activities, it will be tough to justify the need for rail experts in academia. Without rail experts at universities and rail-related research at universities, funding of graduate students interested in the topic becomes difficult. One solution to the lack of knowledge is to bring industry experts to teach the courses as guest lecturers. One example is the Student Speaker program under development by AREMA Committee 24, where universities can invite AREMA-affiliated industry professionals to give the rail-related lecture. This approach works in introductory level, but is difficult to adapt for semester-long railroad courses or research projects. However, this program provides an excellent example of one of the main points regarding the future of railroad education.

"The railroad industry and universities have to work together and develop a system where each of them takes the responsibility for the portion of education that fits their capabilities the best." □

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