INTRODUCTION

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There have been many changes to railway track and its maintenance since I have been associated with the industry. I have seen it go from very good to very bad and back again. However, that is really an oversimplification when one considers all of the changes that have taken place in traffic patterns, axle loadings, maintenance practices, and commercial pressures.

In comparison with the conditions prevalent on many main lines in the late 1960s and through part of the 1970s, today's trackage is, by and large, a thing of beauty. Somewhere along the way, railroad top management learned that to stay in the railroad business you need decent track. Of course, providing decent track is not always easy, especially when it has been allowed to deteriorate as badly as some lines had.

As I mentioned, there was some very good track in the early 1950s, but today's track must be considered superior in several respects: first, it is more uniformly maintained; in the 1950s, even on the same route there were some wide variations in quality. Second, today's main-line track must withstand more traffic with higher axle loads and higher speeds; subjected to the same loadings, I doubt that the good track of the 1950s could have stood up. Apparently, we have learned a good deal in the intervening 30 years about the importance of ballast, ties, drainage, and subgrade, as well as the more obvious matters of rail metallurgy and continuous welded rail.

Those of you who were able to be with us at the first Track Maintenance Workshop four years ago at Pennsylvania State University will recall the high standards set by speakers at that meeting. However, we should also recall the challenges that they issued to the maintenance community. At that workshop, we heard of activities such as research directed at optimizing gang size for various track occupancy rates, the effects of heavy axle loads on track maintenance requirements, the use of innovative inspection devices such as the Track Train Dynamics Decorator, and the pursuit of computer-based track data bases. Some 4 years later, we find that many of the concepts discussed at the first workshop have become reality. However, for those of you who are concerned with providing quality track structure at the lowest possible cost, challenges still remain.

A month ago I had the opportunity to participate in a TRB conference, similar to this one, focusing on railroad productivity issues. At that conference it became clear that to remain competitive with heavy trucks, the railroad industry must strive to become more productive in all aspects of its activities. Although productivity is usually thought of as increasing output per man-hour of labor, and there is certainly room for continued improvement in that account in maintenance-of-way, productivity must also be thought of as putting physical resources to the best possible use. These physical resources include the rails, ties, and ballast that railway management is purchasing and the maintenance machines we have at our disposal.

The recession of 1982 severely limited the purchase of rail and new ties the railways could place in track. At that time, the Class I railroads had achieved perhaps the best track conditions that had been seen in a generation. It is doubtful that the volume of maintenance activities conducted in the late 1970s will be reached again in the near future. The large quantities of rails and ties placed in track at the end of the last decade were primarily the result of catching up from the deferred maintenance that grew out of the financial problems that many railroads were burdened with in the late 1960s and early 1970s. However, today, under deregulation, financial problems of that magnitude are not expected to occur again. On the other hand, deregulation puts considerable pressure on us to keep costs under control. The challenge currently facing the maintenance-of-way community arises from the need to maintain the current level of quality of North American track, while at the same time providing adequate return for our investors and maintaining an adequate market share for the railroad industry.

It is now accepted that quality track is a requisite for any viable railroad. Although many of us have believed this all along, work currently under way at the Association of American Railroads (AAR) and other research institutions is beginning to quantify the benefits that the railroad industry can derive from quality track structure. Many have understood that poor track degrades more quickly; in other words, track geometry degrades and component lives are shortened as track deteriorates. Studies currently under way at the AAR have shown a tendency for clusters of failed ties to develop. One explanation for this clustering phenomenon is the overloading of sound ties adjacent to failed ties. Such overloading would be expected to shorten the life of sound ties and bring about their premature failure.

Other studies currently under way indicate the relationship of track structure condition to the cost of other components of the railroad transportation system. In connection with our freight car structural fatigue program we have noted that infrequent track irregularities can impose large loads on freight car structures. In some cases, these loads have been noted to be as much as twice the static design criteria for our freight equipment. Analysis has shown that these infrequent, but high, loads shorten the fatigue life of the vehicle significantly. Studies are currently under way to identify the particular track characteristics that are responsible for developing these significant loading patterns. These studies will compare the cost of maintaining track geometry to eliminate these dynamic loads with the true costs of building cars to accommodate them, including the costs of hauling the extra dead weight around.

An additional preliminary study has shown significant differences in fuel consumption for various track conditions. At the AAR track dynamics laboratory in Chicago, it has been noted that stiffer track reduced the rolling resistance of a 263,000-lb car. Studies are currently under way to quantify the relationship between vertical stiffness and possible reduction in rolling resistance and therefore in fuel consumption. Analytical studies under way at Massachusetts Institute of Technology are an investigation of the relationship between track surface and alignment errors and train resistance. The energy dissipated in the suspension and at the wheel-rail interface resulting from surface and alignment errors appears to be responsible for a significant portion of the rolling resistance in the 40-mph range. Results from this study have shown a significant decrease in rolling resistance for a track at the limits of Federal Railroad Administration (FRA) Class 5 alignment and surface errors compared with that of a theoretical track at the limits of Class 4 standards. Although it is recognized that most railroads do not maintain track to the exact limits of FRA standards, the fact that track configured to these limits results in a significantly lower level of fuel consumption must have significance for track maintained to more realistic limits; this could provide justification for maintaining track to much higher standards than required.

The challenge to the industry is clear: in this competitive environment, we must provide a mode of transportation that is as cost-effective as possible. We have the opportunity to optimize a total transportation system because railroads are unique in controlling both equipment and roadway. Certainly, we have done a good job in the past 5 years. In 1984, total railroad operating revenues were only slightly lower than in the record year of 1981; at the same time, railway operating income was the highest of the 5 previous years. Of course, revenue ton-miles were at a 5-year high, but at the same time so were capital expenditures. Clearly, we have done a good job; clearly, we are producing a modern viable system now that partial deregulation has brought us a degree of pricing freedom and the ability to charge different prices for different levels of service.

However, this certainly is not the time to stand back and pat ourselves on the back. Our competitors are busy moving larger, heavier trucks on the nation's highway system. Much effort is being put into the Strategic Highway Research Program, making significant dollars available for highway research, all of which will be used to help make our competitors more cost-effective. We must continue to improve our efficiency. We must continue to make better use of our physical plant. We must continue to determine the best methods of maintaining a quality track structure while consuming a minimum of rail, ties, ballast, machine-hours, and man-hours.

Certainly, a way to achieve the goal of providing quality track at the lowest possible cost is through the intelligent use of planning. The theme of this workshop is cost-effective track maintenance, in other words, making maintenance dollars as effective as possible. It is a timely and well-chosen theme.

You have a unique opportunity to determine how railroads meet the challenge of a free market. If we are able to do better than our competition in service and price, we will all prosper. If we can not or do not, we will be out of work. The days of government, in the form of the Interstate Commerce Commission or FRA, perpetuating money-losing rail lines are gone. Track costs us 25 percent of every revenue dollar. If that percentage is reduced without a sacrifice in track quality, we can compete in more markets; if it goes up, we will compete in fewer markets. The equation is simple.

Many may feel uncomfortable with the idea of maintenance planning. Certainly, no planning system should replace sound on-site engineering judgment. I do not believe that any advocate of maintenance planning believes that either. However, as territories become larger and resources become more precious, we need tools to evaluate the various alternatives--indeed, the multitude of alternatives--that are currently available. We can not afford to waste resources by installing them in less than the best place at the best time in the most cost-effective way.