

Extending Wheel/Rail Life: The Australian Experience

The extension of the service lives of key railway components, such as rail and wheels, has been the focus of research efforts for a great many years. Through the advent of improved maintenance techniques, such as lubrication, profile grinding and the use of premium steels, component lives have been significantly extended. In some cases, rail life has reportedly doubled within the past 10 years (*RT&S*, March 1990, p. 16). Throughout this period, the maintenance techniques and practices developed on the Western Australian heavy-haul ore railways have been among the most prominent techniques used to achieve extensions in components' lives.

At a recent Heavy Axle Load Workshop, representatives from one of the Western Australian mining roads reported even further advances in the extension of rail and wheel life¹. By using a combination of active wheel and rail maintenance techniques, and by carefully controlling the wheel/rail contact geometry and monitoring the wheel/rail contact-band conditions, the actual interface between the wheels and the rails is carefully maintained. These maintenance techniques, which are part of a "total-system approach" to railway operations and maintenance, address both the wheel and the rail, not just individually, but on the basis of their active interaction. This wheel-profile maintenance concept, which is behind rail-profile grinding as well, is not, however, readily adaptable to the free-interchange environment of North American railroads².

This type of interaction is illustrated in Figure 1, which shows the variations in the wheel/rail contact band as a function of track location (for curvatures between tangent and three degrees).

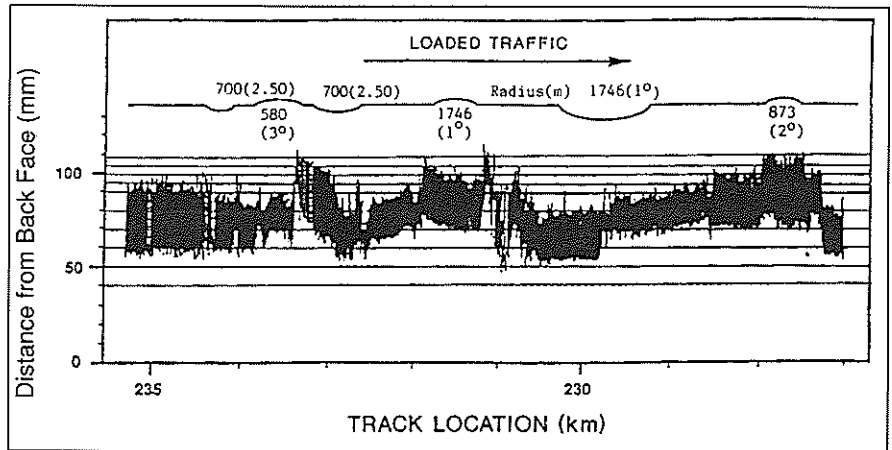


Figure 1 — Wheelrail contact band variations¹.

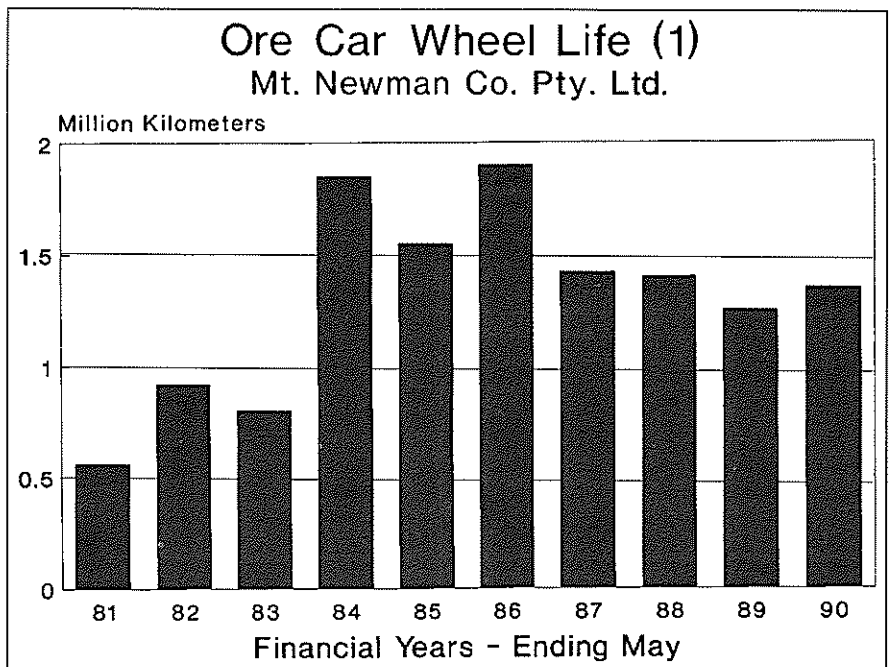


Figure 3 — Changes in wheel profile¹.

toring of the wheel/rail contact band and the corresponding rail and wheel profiles is a key part of the total system approach.

Controlling fatigue defects

Control of rail (and wheel) fatigue defects represents still another important aspect of extending their respective service lives, particularly under the high-axle-load conditions reported by the Australians. An earlier Australian paper reported a significant decrease in the development of transverse defects in both tangent and curved track as a function of several factors:

- Phasing out the original wheel profile.
- Relieving the rail's gauge corner through grinding.
- Introduction of modified narrow-flange wheels and asymmetrical rail profiles in curves.
- Replacement of the worst performing rails.
- Exhaustion of potential nucleation sites for the defects.³

This effect was also reported in the most recent Australian presentation which showed a dramatic reduction in rail defects (in both absolute numbers and in the number of defects per MGT), and the apparent relationship between this reduction in defects and the development of an aggressive rail-grinding and profile-maintenance program (Figure 2)¹.

The result of the combination of maintenance activities on one heavy-haul mining railway was a reported existing rail-head condition with an average head area loss (on 132-pound rail) of 12% at a cumulative tonnage level of 850 MGT. The corresponding forecast for rail life under the heavy-axle-load conditions was 2.4 billion gross tons¹.

Similarly, extended lives were also reported for wheels, where the life for conventional (Class C) wheels was approximately one million miles (Figure 3) and the predicted life for micro-alloyed wheels was projected to be 1.7 million miles¹.

It must be noted, however, that the operating conditions on the Western Australian mining roads are significantly different from those in North America. The Australian roads have no severe curvature and only limited grades, so it is unreasonable to expect that these numbers can be duplicated under North American conditions. But given the similarity in axle loads, car types, track components and maintenance equipment, it appears that extensions of rail and wheel lives may be possible on North American railroads as they move toward a similar, total-system approach that addresses track and equipment problems interactively, rather than independently.

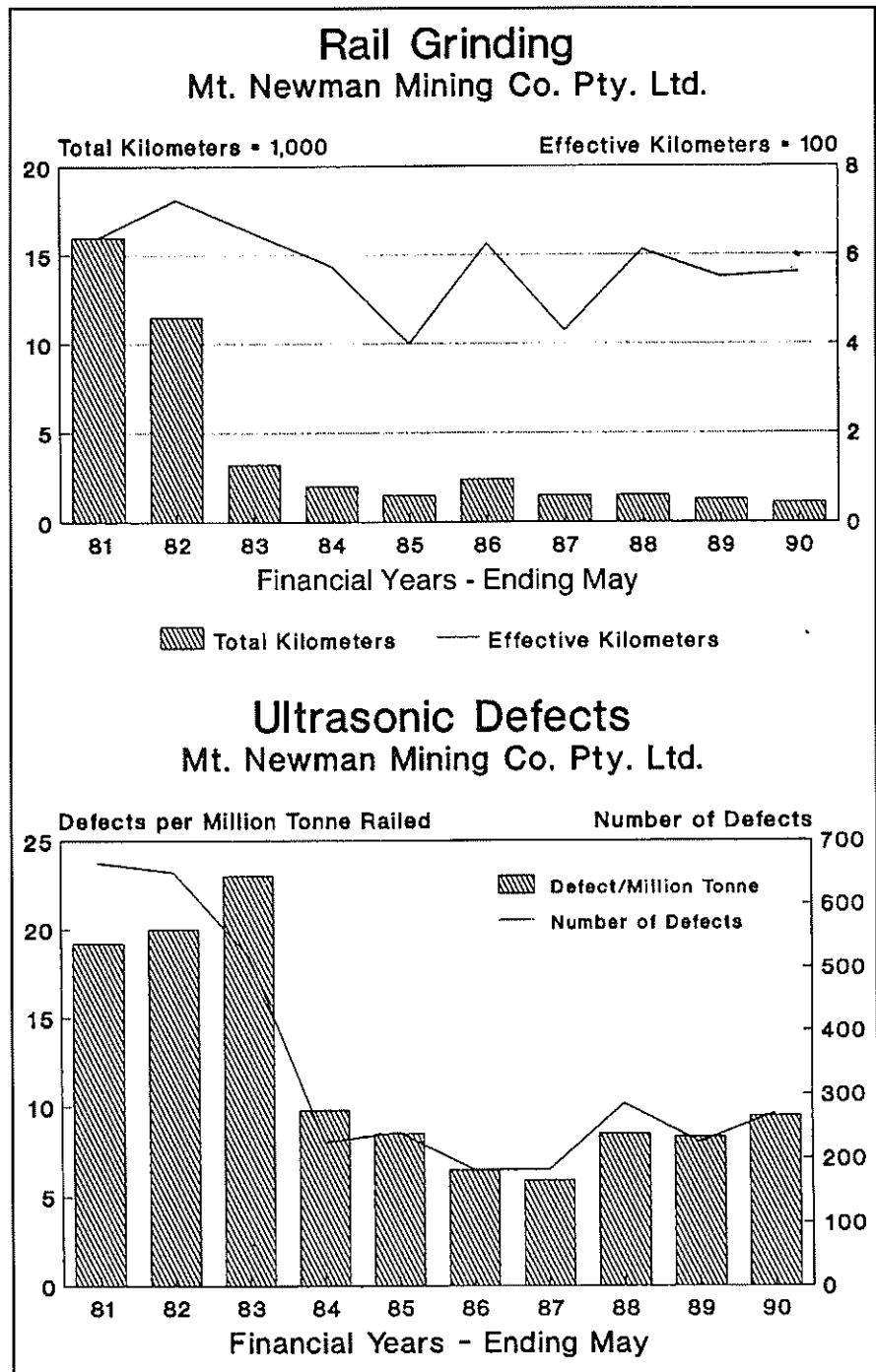


Figure 2 — Rail-grinding and rail-defect experience¹.

Given the high cost of track and equipment maintenance, extensions in component lives, and their corresponding reduction in overall maintenance costs, is of great importance to freight railroads in today's environment.

References

- (1) Mitchell, R. and Dudek, J., "Operating Experience with Heavy Axles at Mt. Newman Mining Co. PTY Limited," Workshop on Heavy Axle Loads, Pueblo Colo., October 1990.
- (2) Zarembski, A. M., "The Evolution and Application of Rail Profile Grinding," Bulletin of the American Railway Engineering Association, Bulletin 718, Volume 89, December 1988.
- (3) Marich, S. and Maas, U., "Higher Axle Loads are Feasible; Economics and Technology Agree," Third International Heavy Haul Railway Conference, Vancouver, B.C., Canada, October 1986.