

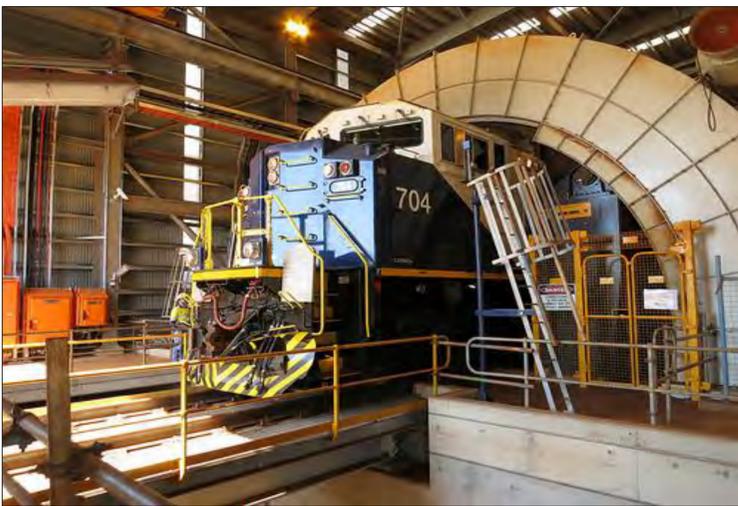
HEAVY HAUL AND MASS TRANSIT – RAILWAY RESEARCH PROGRAM

OVERVIEW

Excessive component wear after BHPB-IO commenced operations in 1969 formed the basis of a research program initiated with BHP Melbourne Research Laboratories in 1972. In 2015, the relationship continues with the Institute of Railway Technology at Monash University.

BHPB-IO annually transports over 200 million tonnes of Iron Ore from eight mine sites in the Pilbara, WA. Ore is carried by approximately thirty trains in constant circulation, each hauling approximately 30,000 tonnes per trip to Port Hedland. It operates some of the highest long-haul loads globally and is recognised as a benchmark heavy haul railway system - achieved through commitment to research and a pro-active and supportive management prepared to push the boundaries of component performance.

To achieve these results, research centered on key areas described below, has continued.



Ore Train Dumper

VEHICLE COMPONENTS

- Extensive testing and continuous monitoring has enabled many components to operate above manufacturers' specifications.
- Working relationships have been formed with many suppliers to develop improved component performance.
- Service life increases of 3x have been achieved with many major components — bogies, wheels, car bodies; reducing capital and operating costs.



Calibration of Rail Weighbridge



Ore Train

HIGH AXLE LOADS

As a result of continuous improvement:

- Axle loads have increased from 30 tonnes to the current 38.5 tonnes.
- 40 tonne axle loads are now being assessed.
- Although higher loads increase component wear, operational savings have reduced total system costs.
- Between 1990 and 1998, railway transport costs were halved.
- IRT has developed instrumented ore car technology to assist track monitoring.



Railway Track with Concrete Sleepers

TRACK COMPONENTS

- In 1972, the research program targeted increased rail life.
- In 2000, rail life is typically 5 times longer than in 1972. This has been achieved through improved understanding of wheel-rail interaction, improved maintenance practices and development of new materials.
- Significant effort has also been made on rail weld performance, track sub structures and maintenance efficacy.