

# HOFMANN ENGINEERING

## RAIL ENGINEERING SOLUTIONS

Traction Gearing  
Bogie  
Manufacture &  
Upgrade  
Wheels & Axles  
Components  
Inspection &  
Failure Analysis

*Since 1969 Hofmann Engineering has provided specialist engineering services to Australia's industry leaders.*

*Quality Assurance certification by Lloyds complements our total quality culture.*

*Our commitment to continuous quality-improvement touches every aspect of our products, services and customer support.*

### HOFMANN ENGINEERING PTY LTD

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Bassendean  
Bendigo  
Cheltenham



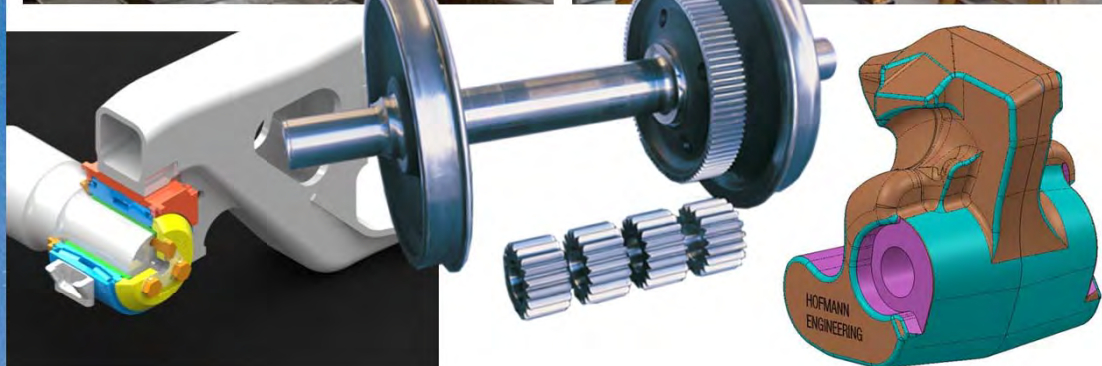
Cheltenham



Hofmann Engineering is providing engineered rail solutions with a history of over 40 years and is a single source provider for all types of machined components. Hofmann Engineering has extensive experience in precision machining and offer efficient production services backed by an ISO 9001 and AS 9100 certified quality management system. Traction gearing is manufactured for locomotives, DMUs and EMUs.

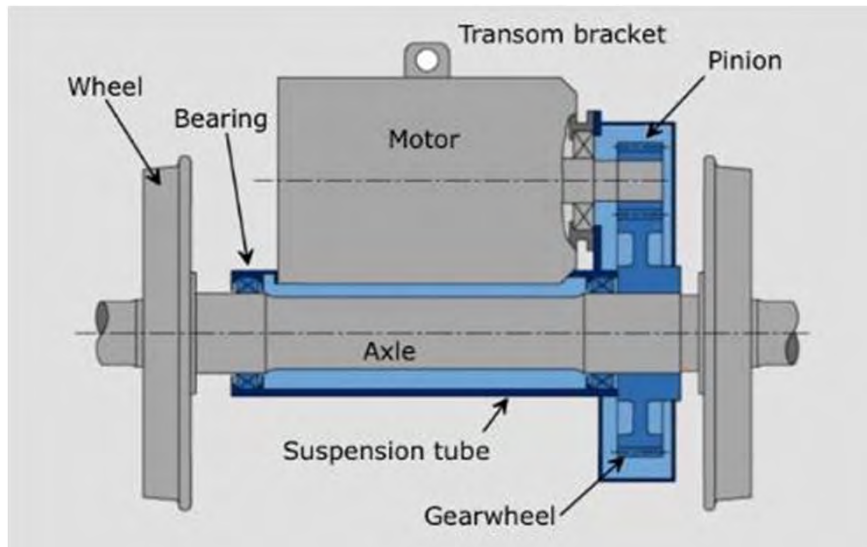


**Rail Engineering Solutions Made in Australia at your Doorstep in WA, VIC & NSW.**

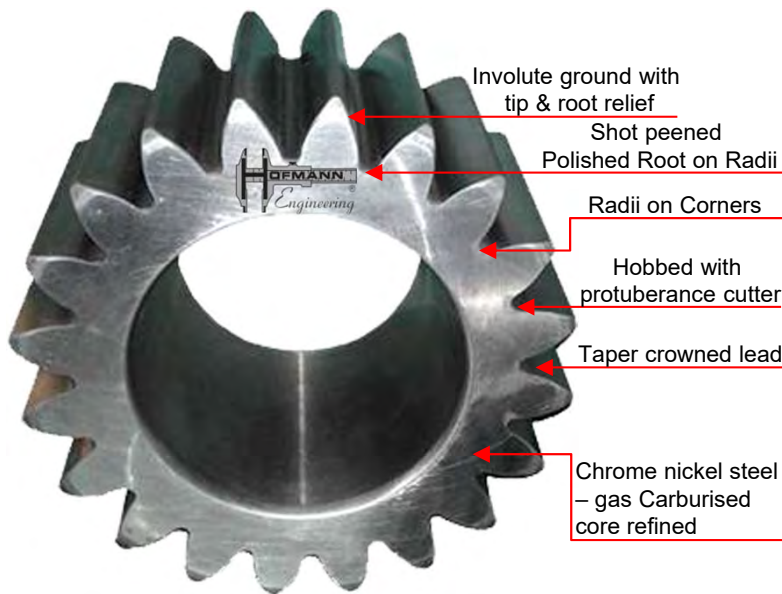




# TRACTION GEARING

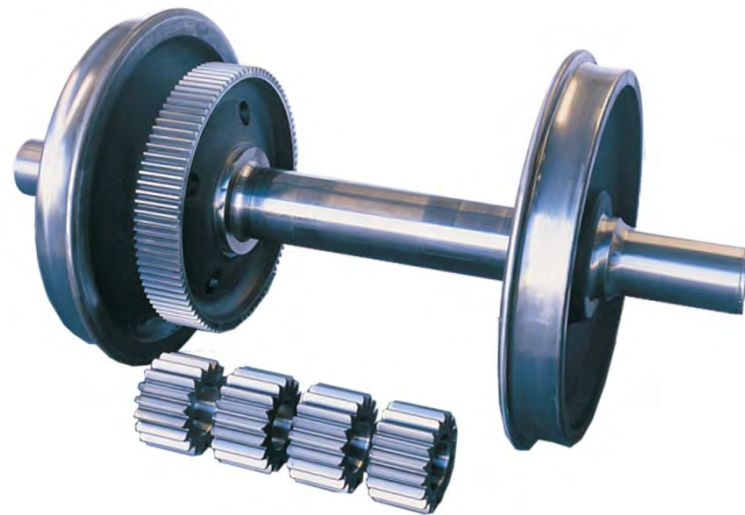


Traction Motor Layout Example (Voith)



## PINIONS

Case carburised and accurately ground including taper crowning. A shot peened full root radius on our pinions provides a substantial strength increase.



## SPIRAL BEVEL GEARS

- Case carburised to 58 – 62 HRc and precision hard cut to DIN Class 3.
- Capacity to manufacture spiral bevel gearing up to Ø2m.

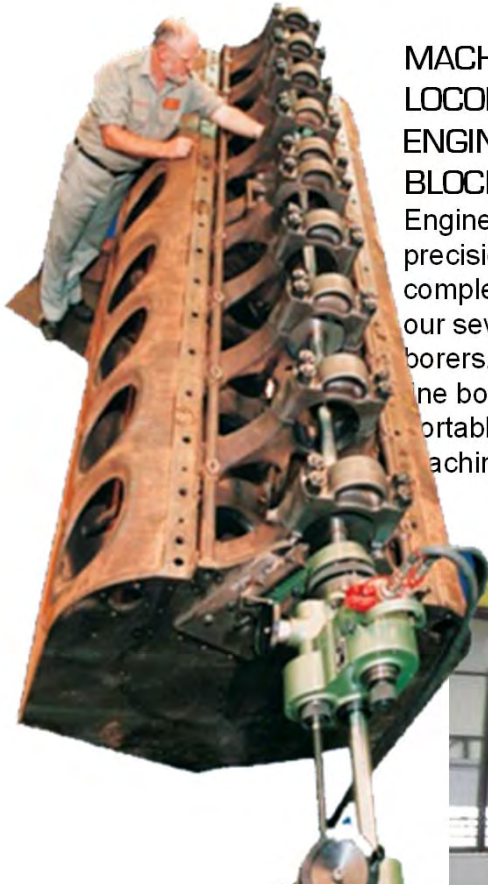


## BULL GEARS

- Case carburised & shot peened and ground and / or skived.
- Tooth by tooth full contour induction hardened and ground.
- Profile regrinding of old worn bull gears.

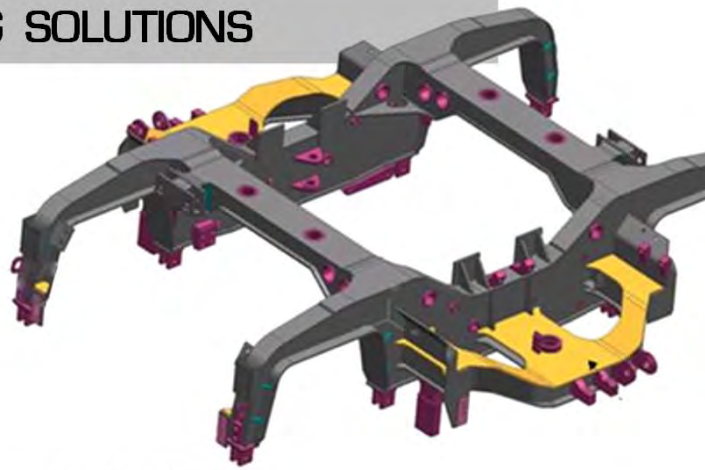


# RAIL ENGINEERING SOLUTIONS



## MACHINING LOCOMOTIVE ENGINE BLOCKS

Engine blocks are precision machined complete on one of our seven floor borers. In-Situ line boring with our portable line boring machine is also offered.



## BOGIE FABRICATION

Bogie frames can be completely fabricated using both certified welders & robotic welding in accordance with the stringent requirements of EN15085 (European Railway Welding Standard).. Full stress relieving is also available.

## BOGIE MACHINING

The bogie frames are then precision machined on one of our seven floor borers or five gantry CNC machining centres. Dimensional compliance is proven during machining with in house state-of-the-art CMM and Laser Tracker equipment.

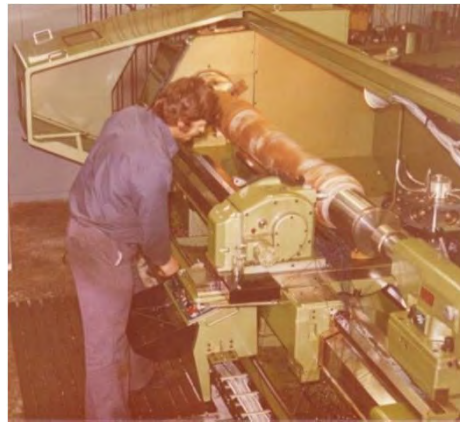


# MANUFACTURE & ASSEMBLY OF WHEELS & AXLES



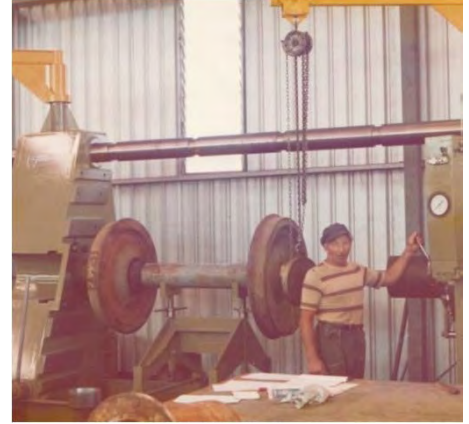
## MACHINING WHEELS

Forged wheels finished machined on one of our 6 CNC vertical borers including multi pallet changer.



## MACHINING AXLES

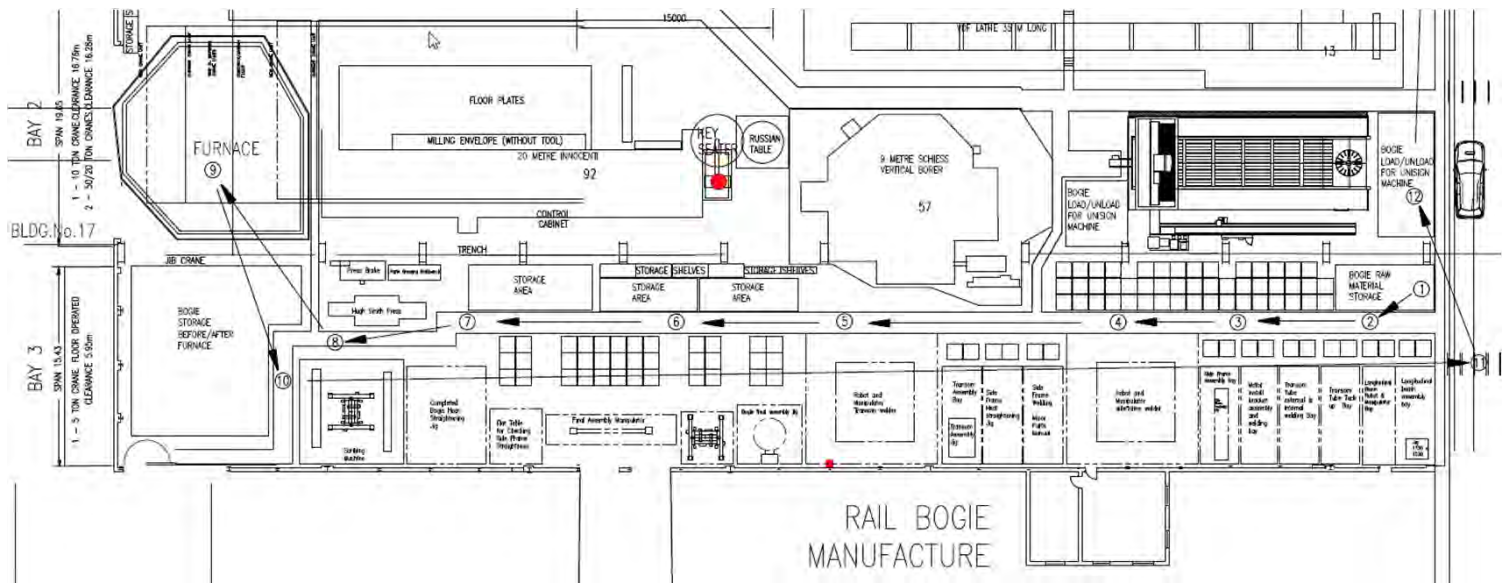
Axles manufactured to AAR Standards. Sourcing of forged material, NDT tested and finished machined.



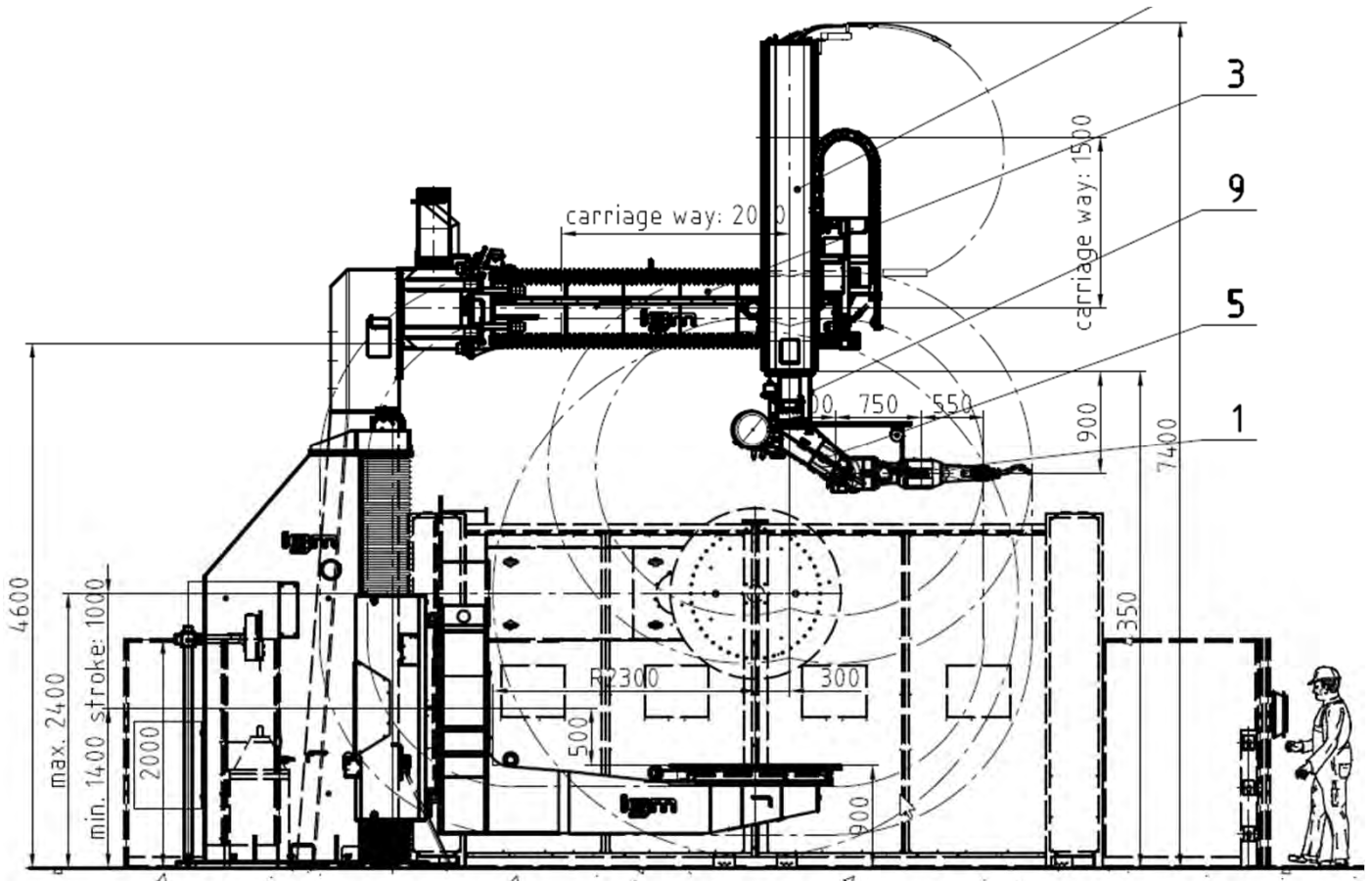
## PRESSING WHEELS ON AXLES

Controlled pressing of wheels onto axles using calibrated press with incorporated chart recorder for traceability.

# STATE OF THE ART ROBOTIC BOGIE PRODUCTION

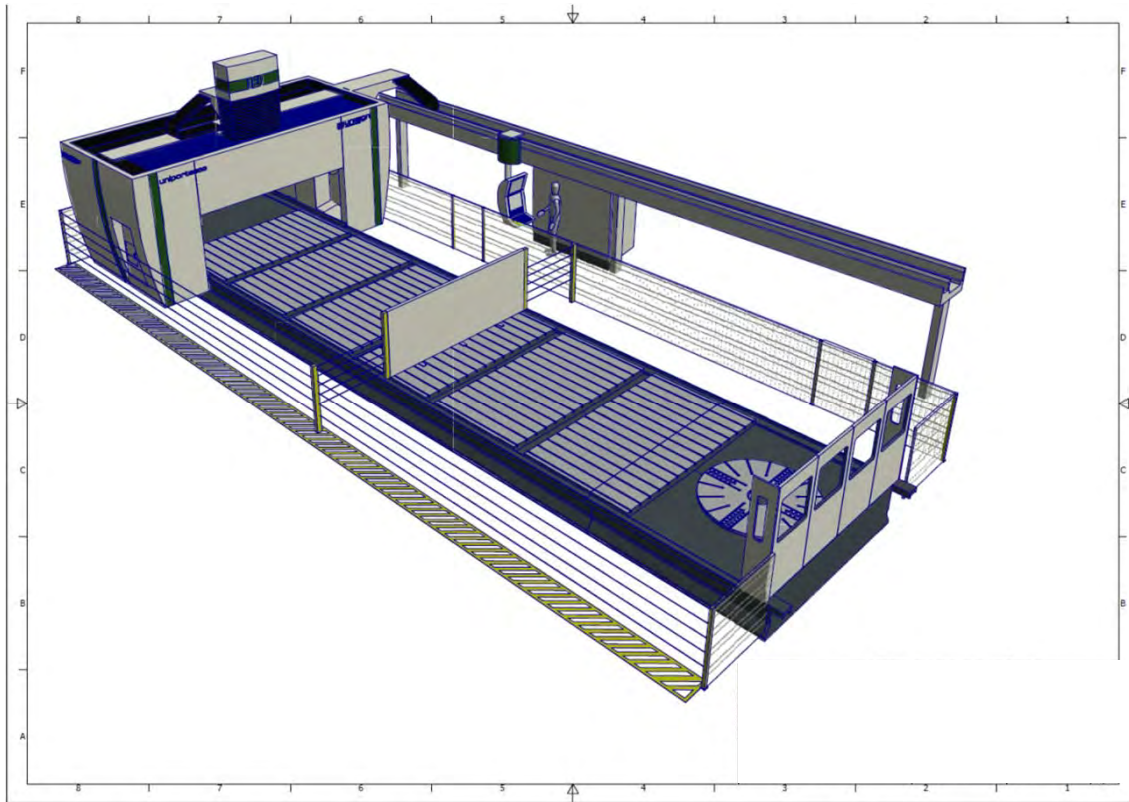


New Bendigo Workshop Layout for Robotic Bogie Manufacturing





## STATE OF THE ART ROBOTIC BOGIE PRODUCTION



New Bendigo Workshop Layout for Robotic Bogie Manufacturing  
IGM Machine example below



# RAIL BEARING UPGRADE: EXAMPLE

## PROBLEM:

- K-Class Bogie with up to 36 tons axle load:  
bearing life is approximately 2 years

## SOLUTION

- Upgrade to Short G-Class Bearings (max. 40 tons axle load); bearing life at least 8 years

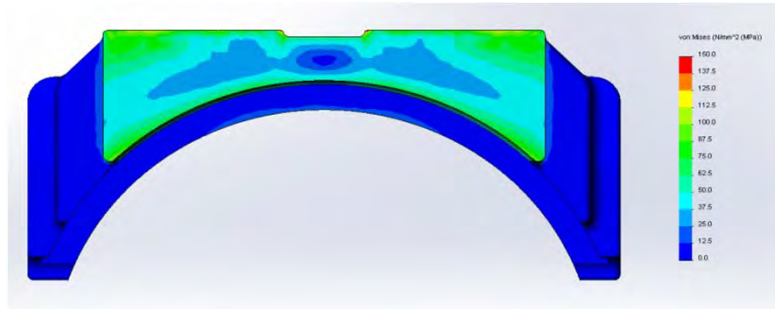
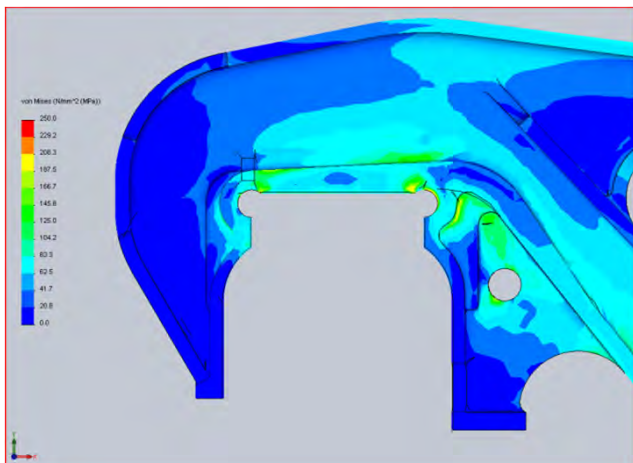


## Method:

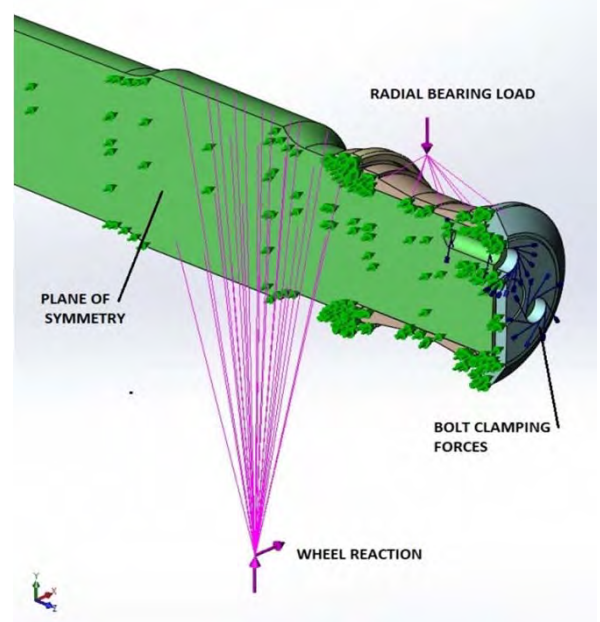
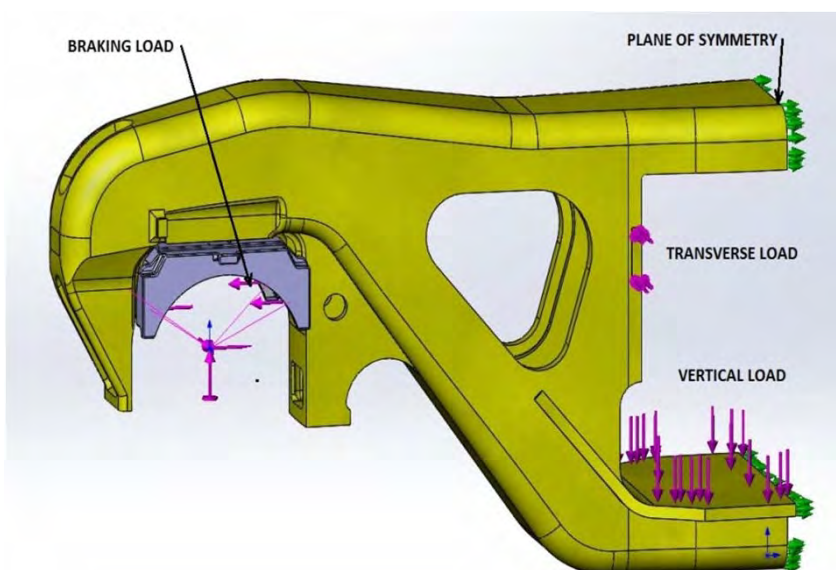
Sleeving the axle & Machining approximately 7mm off the side frame

## Benefits:

Increase Bearing life by up to 400% & Increase Bearing load capacity by 17%.

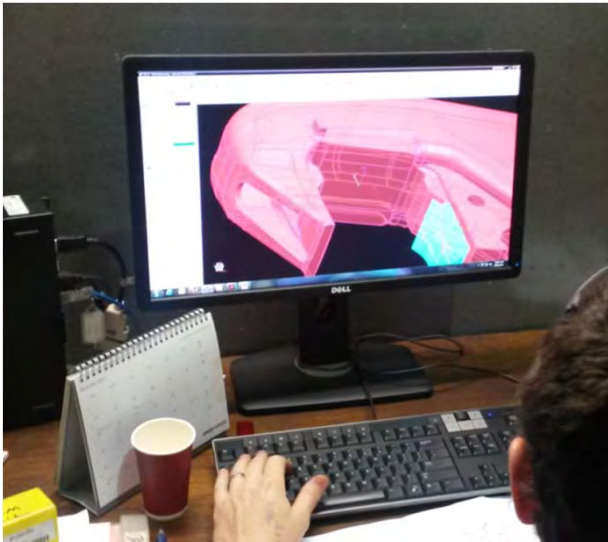


Design backed up by FEA: no stress raisers introduced

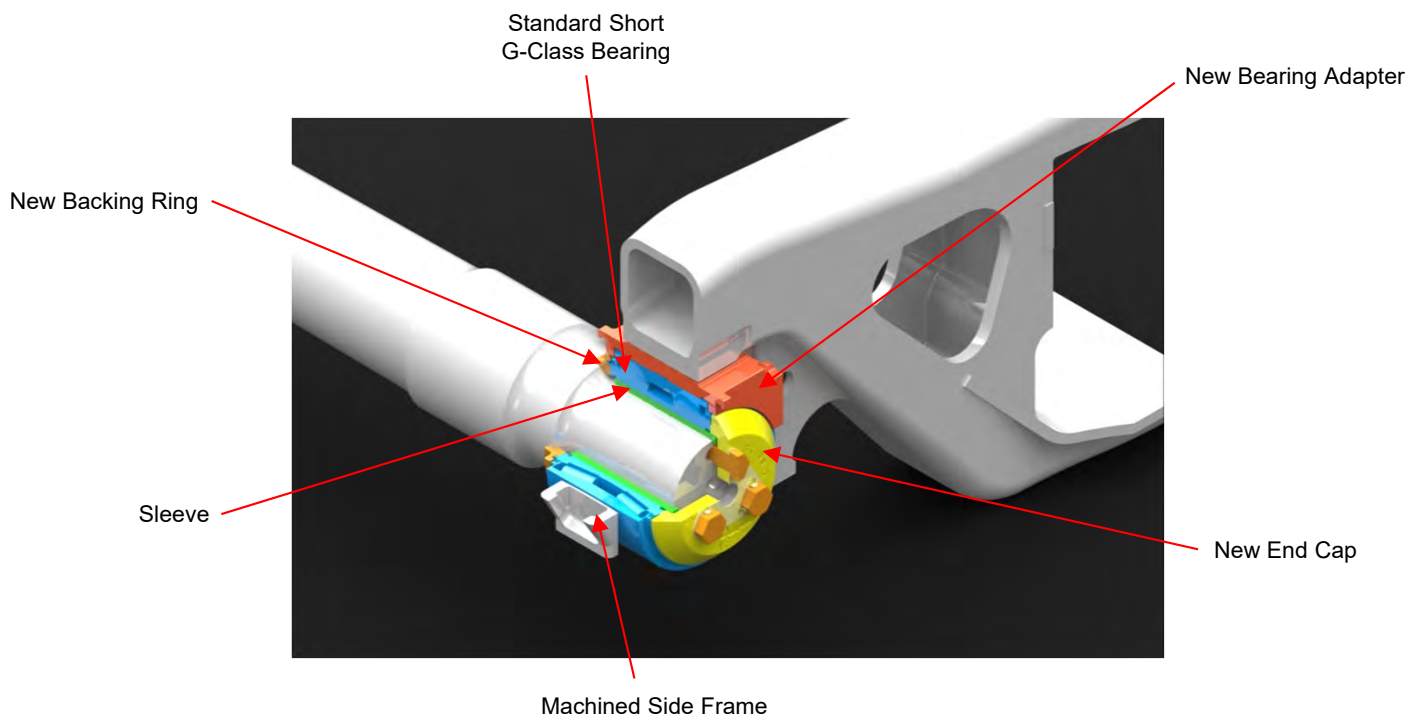




## RAIL BEARING UPGRADE: EXAMPLE



Machining approximately 7mm off the side frame on CNC Machine Centre



Manufacturing cast adapters and case carburized sleeves



## RAIL BEARING UPGRADE: EXAMPLE



Upgraded bogies after final assembly



Strain gauge application and on-board stress monitoring during trial





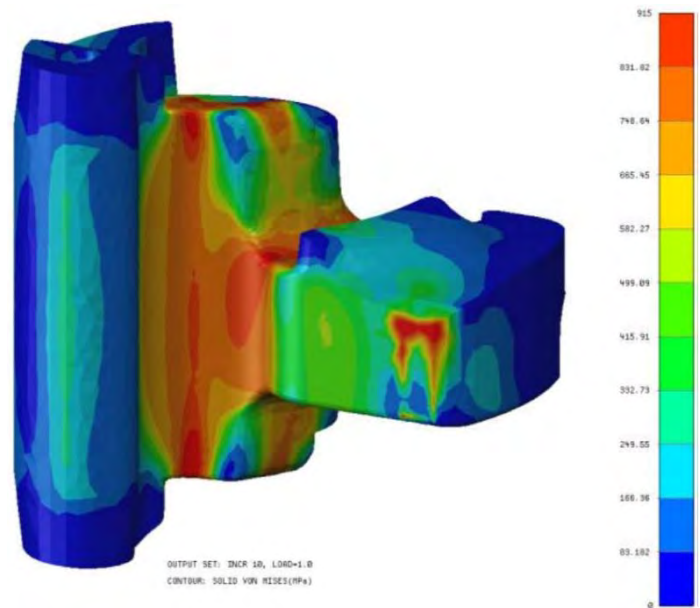
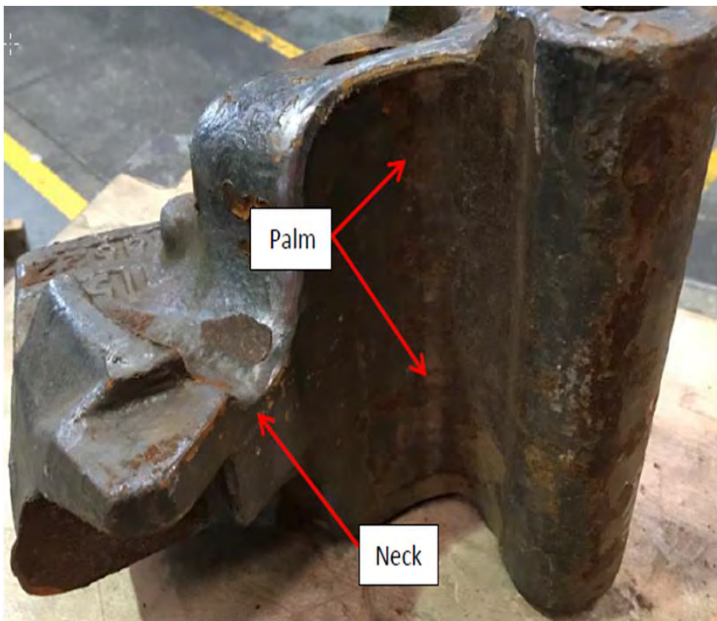
# COUPLER LIFE EXTENSION, EXAMPLE: F-TYPE KNUCKLE

## PROBLEM:

- Train Separation due to premature failure of F-Type Cast Knuckle

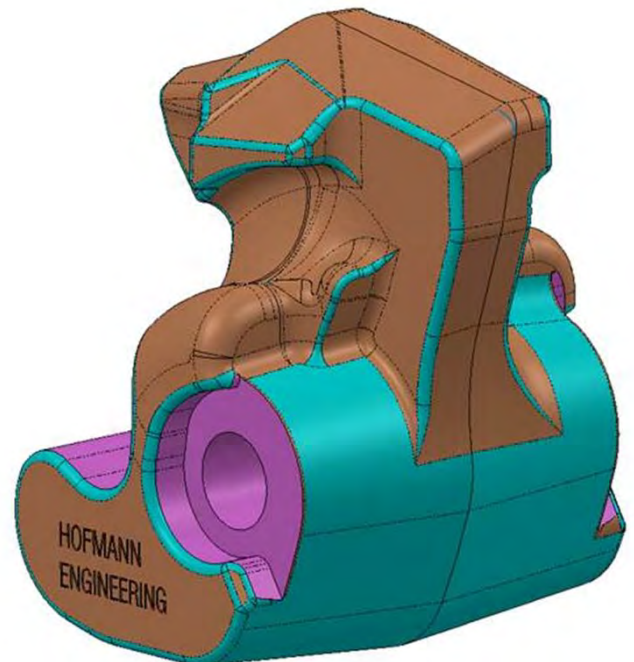
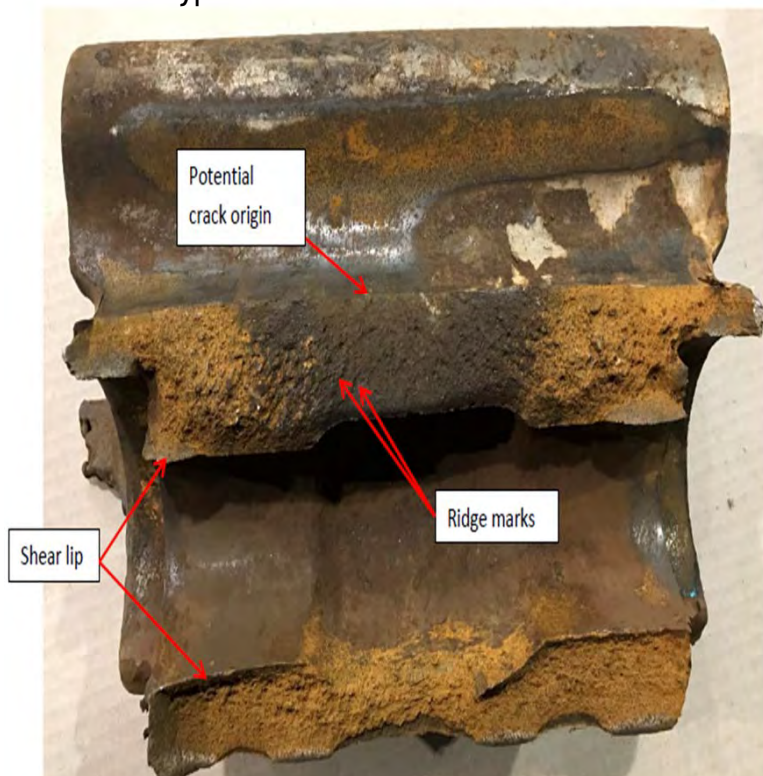
## SOLUTION

- Product improved Forged F-Type Knuckle
- Applying Forged-Gear Technology which has performance track record of >30 years



Typical areas of knuckle failure

Finite Element Analysis (FEA) for stress evaluation



AAR8624 fracture surface (as received condition) : Typical knuckle failure in palm (through pinhole)

Developing Forging Knuckle Design and Die Tooling



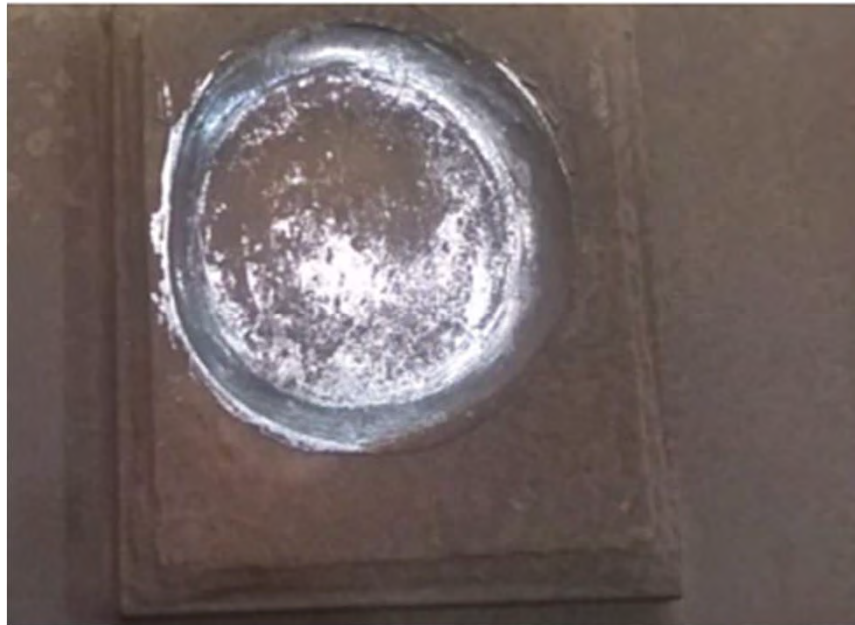
# COUPLER LIFE EXTENSION, EXAMPLE: RETAINER PIN & PLATE

## PROBLEM:

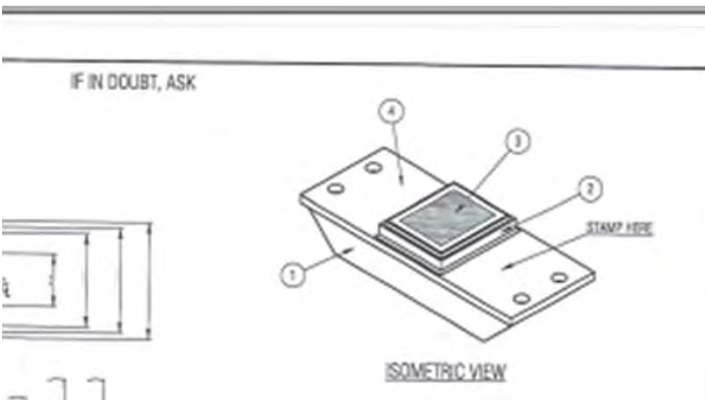
- Train separation due to failure of Retainer Pin & Plate

## SOLUTION

- Product improved Plate and Pin

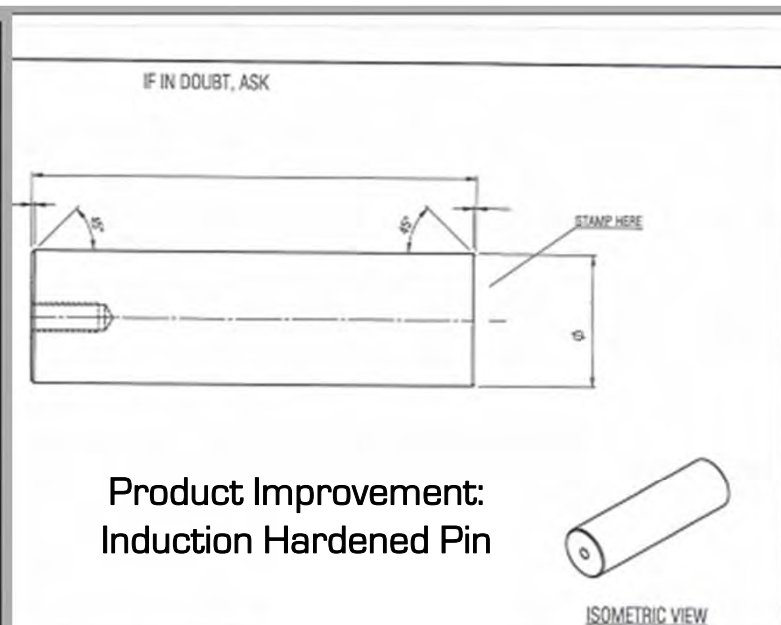


Typical areas of Retainer Plate wear: leads to sheering of Retainer Pins



Product Improvement:  
Case Carburized Retainer Plate

ITEM	MATERIAL	DESCRIPTION	QTY	ITEM NO
1	STEEL	RETAINER PLATE	1	
2	STEEL	RETAINER PIN	1	
3	STEEL	RETAINER PIN	1	
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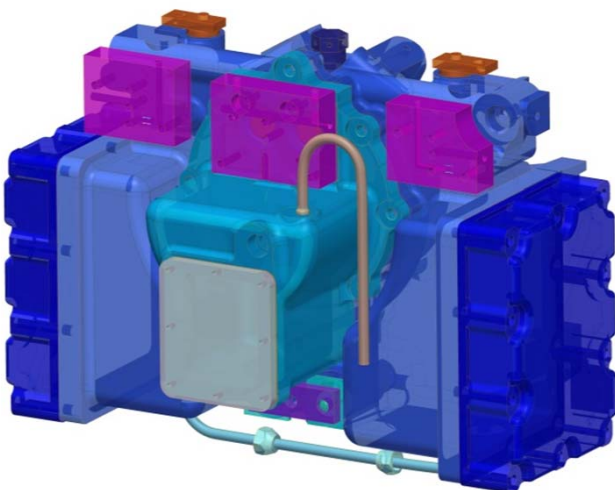
Product Improvement:  
Induction Hardened Pin

ITEM	MATERIAL	DESCRIPTION	QTY	ITEM NO
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2	STEEL	RETAINER PIN	1	
3	STEEL	RETAINER PIN	1	
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# COMENG POWERHEAD OVERHAUL

Location of Powerhead English Electric GEC 02PM05A2  
(Melbourne Light Rail Train)



Hofmann Engineering have engineered and developed an overhaul process that provides further performance over the original manufacturers



CYLINDER COVER



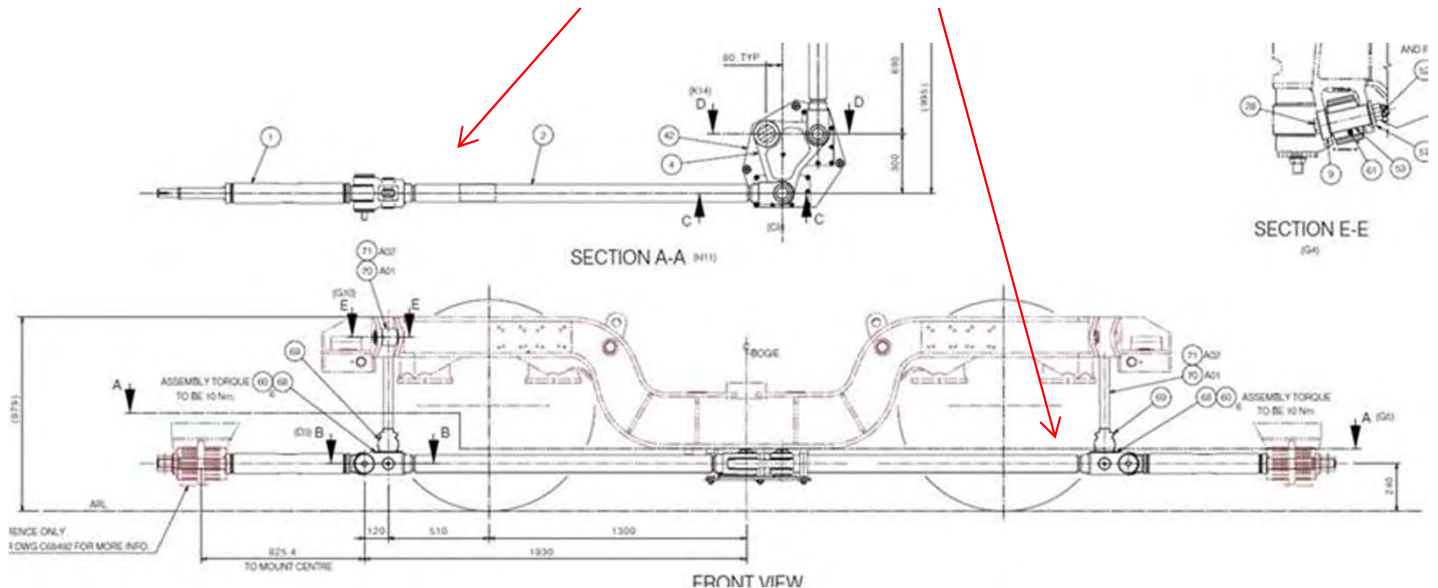
VALVE SEGMENT BLOCK



# RAIL COMPONENTS



Traction Rods for Queensland Rail Electric Loco QREL 3700



Bogie Centre Pins



Axle Box CNC Macining



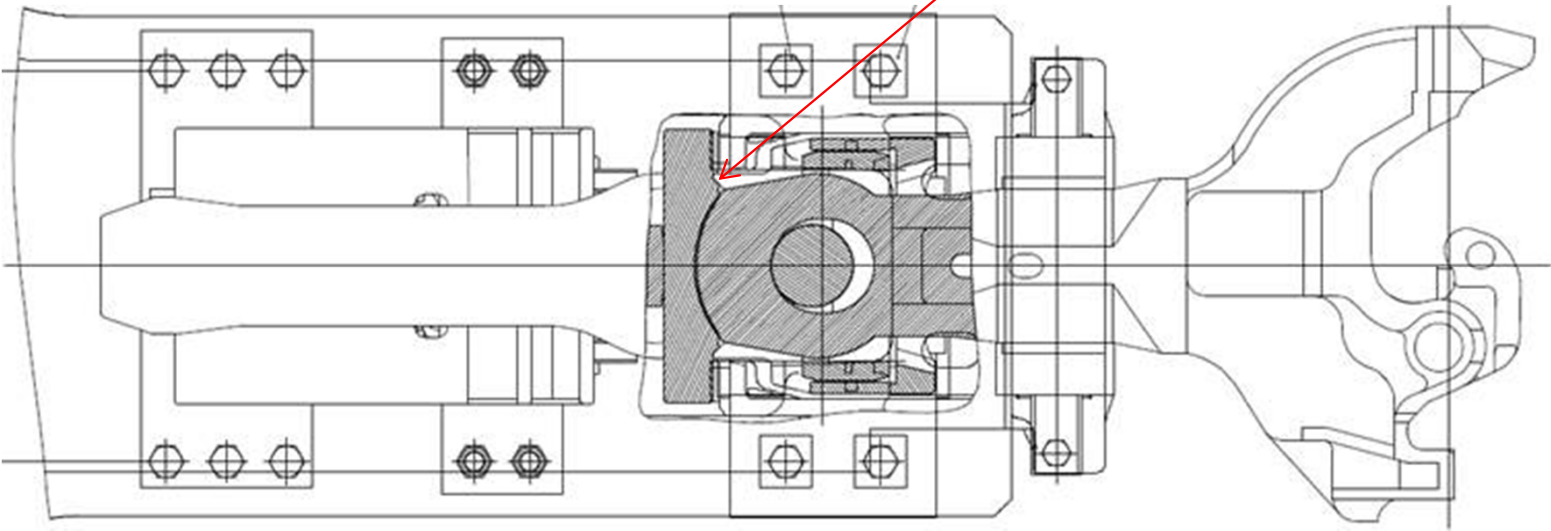
# RAIL COMPONENTS



Signal Box Casting



Coupler Follower Blocks



Customised Bearing Adapters:  
Interface between Short G-Bearings /HH Side Frames



# FAILURE ANALYSIS & CMM INSPECTION

## METALLURGY

Complete metallurgical lab for:

- Quality control of heat treatment processes.
- Metallurgical failure analysis.

Our specialty is failure analysis of gearing to AGMA and DIN standards.



World class metallurgical specimen preparation for high quality microscopy (using a Leco inverted 500)



Microscopy and Image analysis to support production, product improvement or failure analysis (using Leica Stereo Binoculars)



## CMM COMPONENT MEASUREMENT

Temperature controlled calibration and inspection facilities. Leitz fixed Coordinate Measuring Machine (up to 2µm accuracy). Photo showing axle bearing components being inspected after machining.



## PORTABLE CMM MEASUREMENT

Portable Co-ordinate Measuring Machines (PCMM) & laser trackers used to measure manufactured components both in the workshop and onsite.