

Wheel Maintenance

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What is Wheel Maintenance?

- Restore the profile of the tread by removing material
- FIRST - measure the profile



Presentation Preview

- Wheel Profile(s)
- Why True Wheels
- Truing Processes
- Wheel Measurement
- Truing Equipment Options
- Vehicle Application Notes



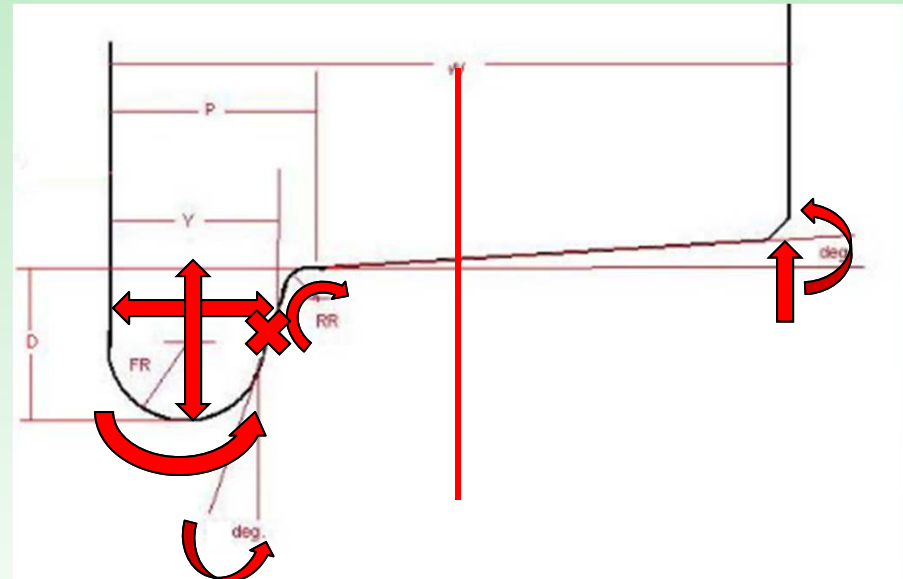
Wheel Profile

- Many different profiles in use
- Captive fleet operators determine profile
- Wheel Profile is part of a **System** that includes but not limited to;
 - Rail geometry and condition
 - Vehicle type and suspension
- Profiles have common features with uncommon dimensions



Wheel Profile

- Flange Width
- Flange Height
- Flange Shape
- Flange Angle
- Flange Tread Transition - throat
- Tread Taper
- Tape Line
- Gaging Point
- Tread Rim Face Transition – field side relief

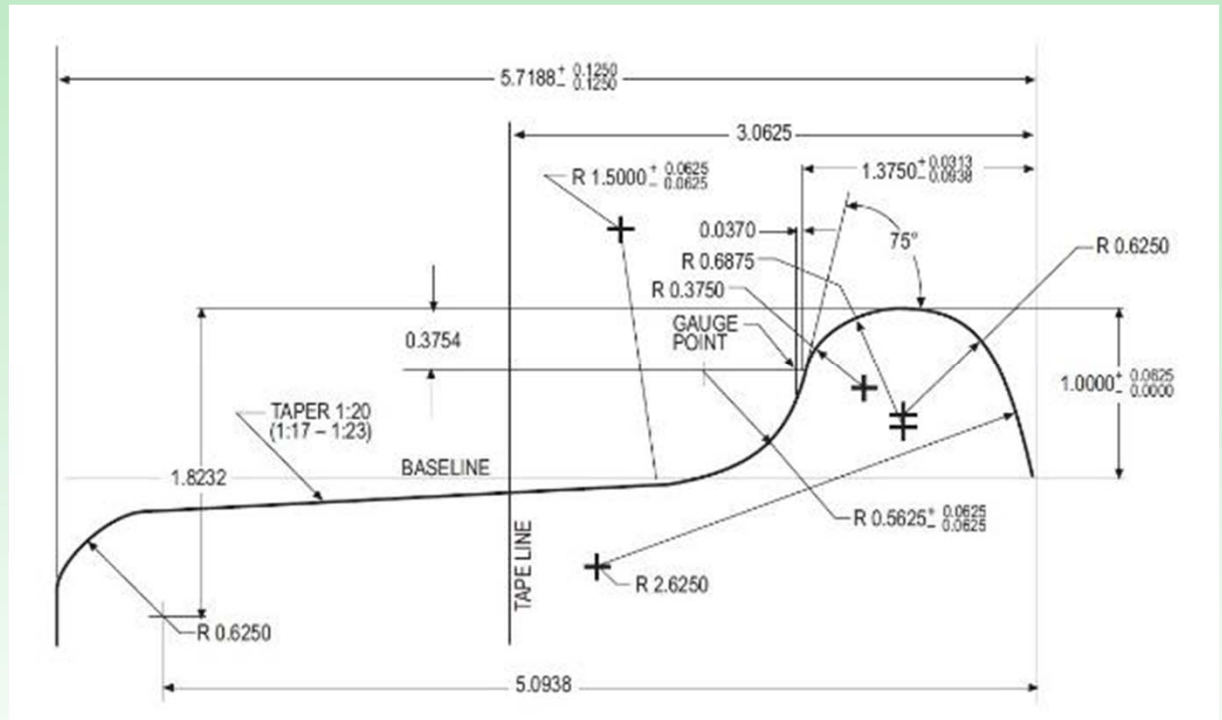


Wheel Profile - AAR

- AAR Profile – Interchange mandated
- Current AAR 1B adopted in 1989 for new wheels and wheel profiling
- Two versions – Wide Flange and Narrow Flange



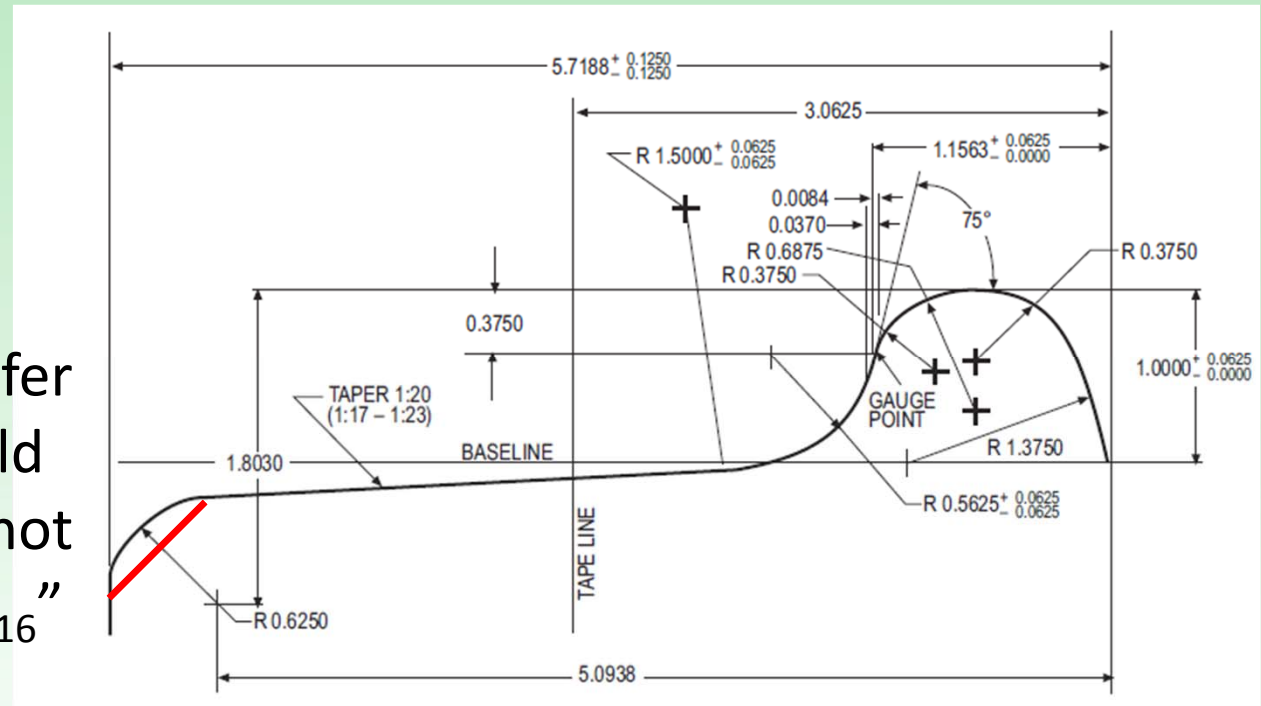
Wheel Profile - AAR



- AAR 1B Wide Flange Profile
- New Wheel Profile

Wheel Profile - AAR

Alternate chamfer
allowed on field
side transition not
greater than $\frac{7}{16}$ "



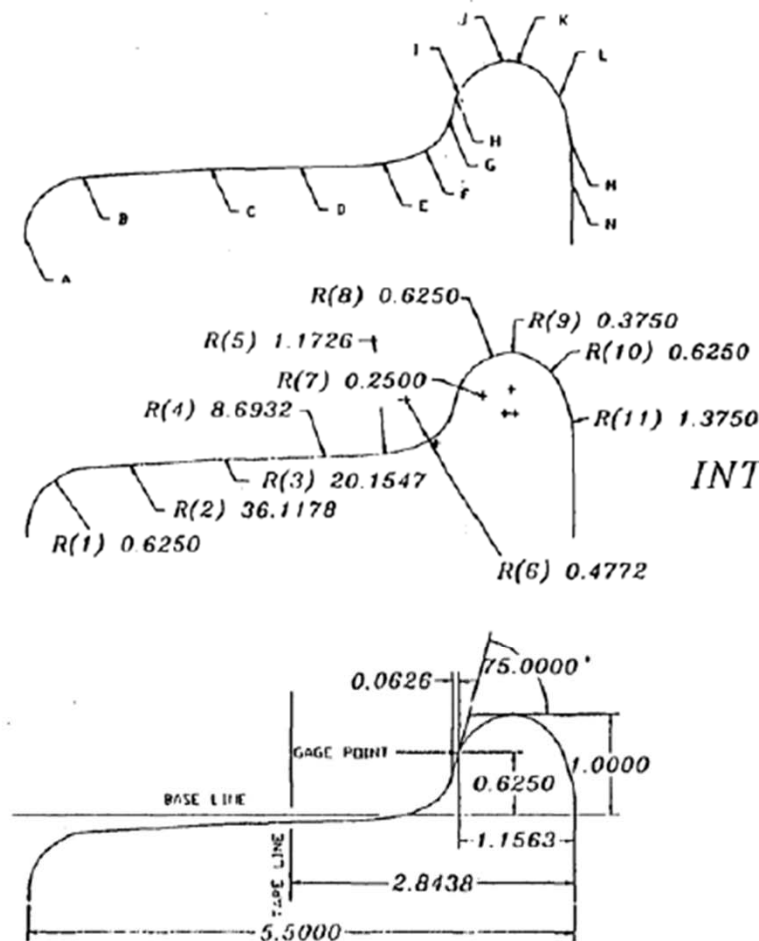
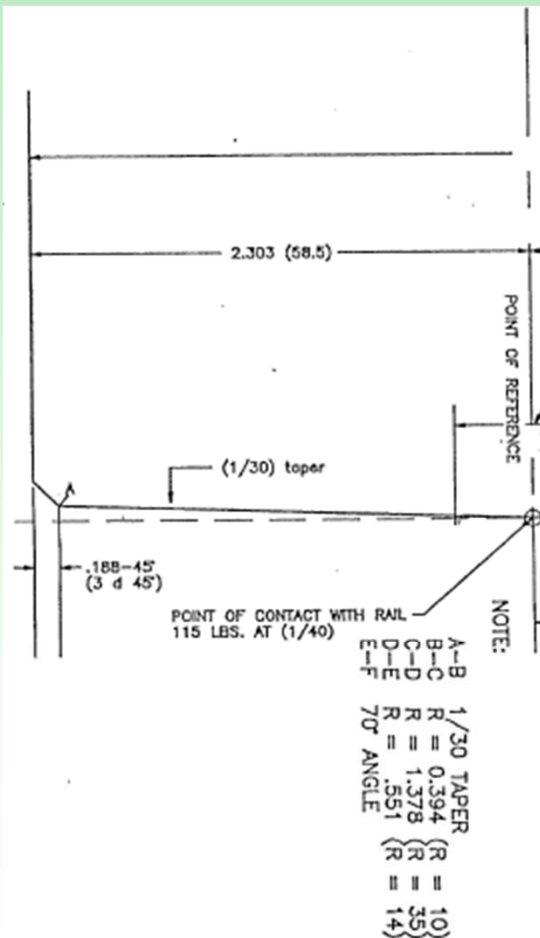
- AAR 1B Narrow Flange Profile
- Re-profiled Wheel

Wheel Profile

- Captive System Profiles can vary greatly as a result of System variables and experiences



Wheel Profile – Commuter Line

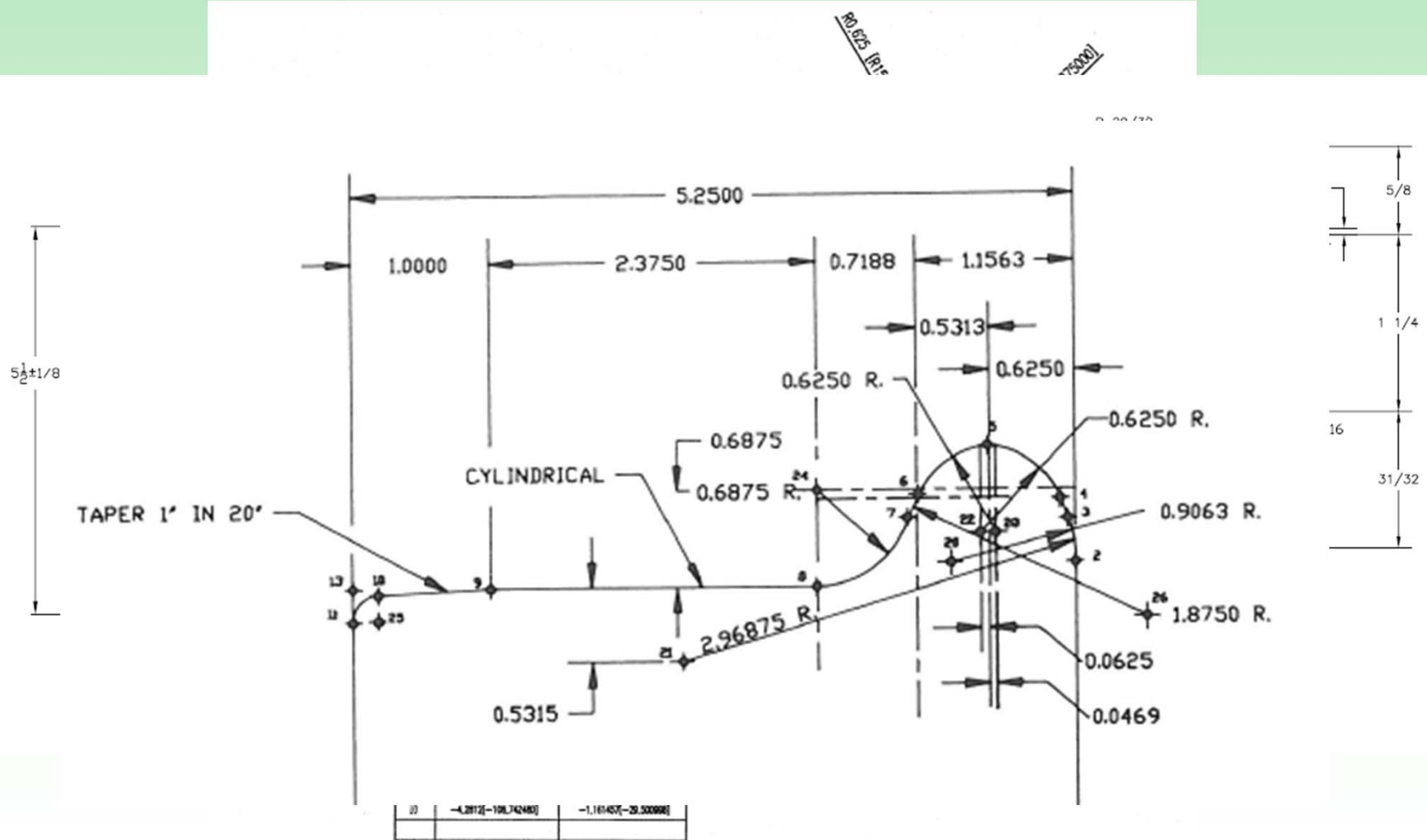


INTERSECTION POINTS

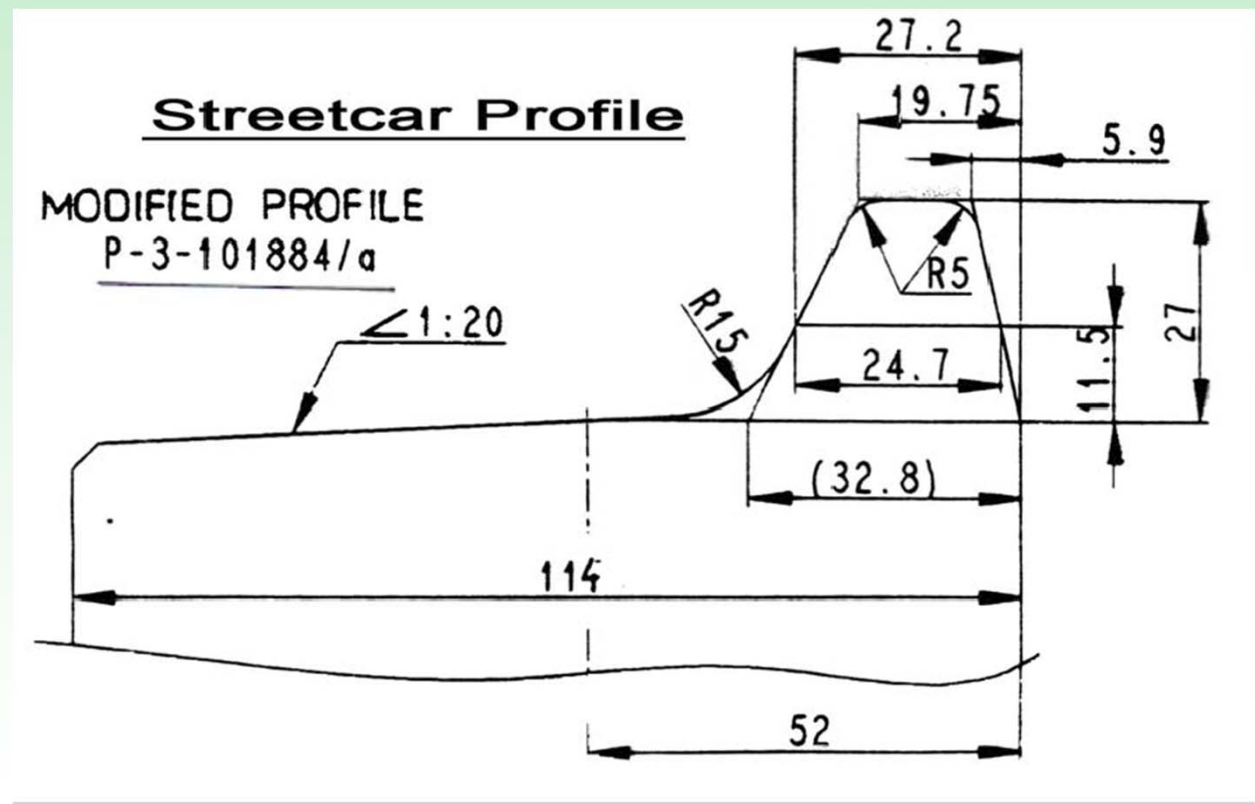
POINT	X	Y
A	-4.3438	-1.4255
B	-3.7692	-0.8025
C	-2.4666	-0.7207
D	-1.5664	-0.7005
E	-0.7322	-0.6604
F	-0.3030	-0.5333
G	-0.0626	-0.2336
H	0.0000	0.0000
I	0.0231	0.0569
J	0.4744	0.3707
K	0.6243	0.3633
L	1.0381	0.0158
M	1.1563	-0.4430
N	1.1563	-0.6250



Wheel Profile – Transit System



Wheel Profile – Streetcar



Why True Wheels

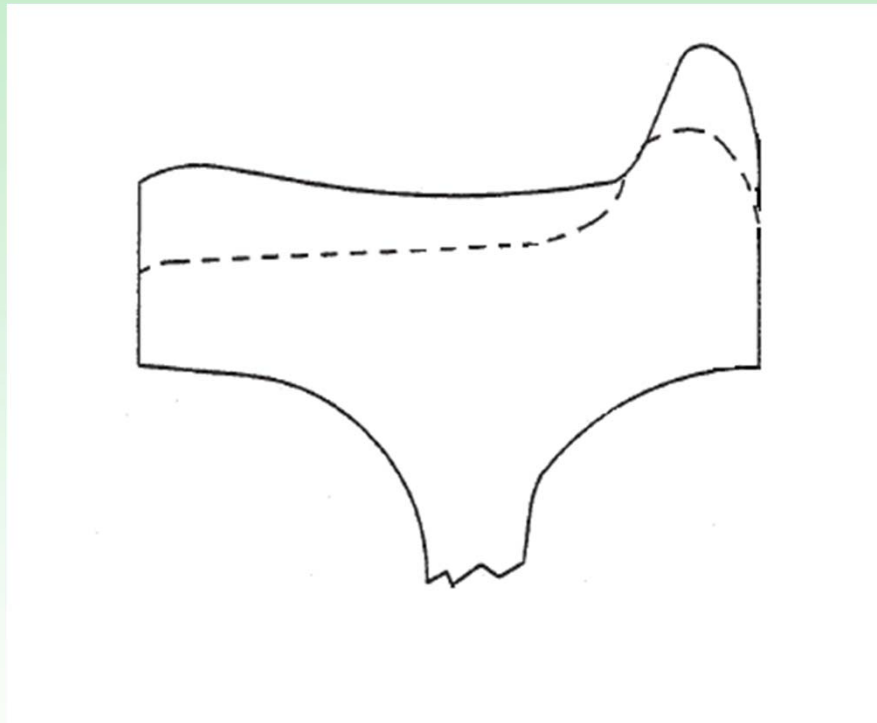
- Economics
 - Cost of replacement wheels
 - Cost of labor to produce and swap wheel sets from rail vehicle



Why True Wheels

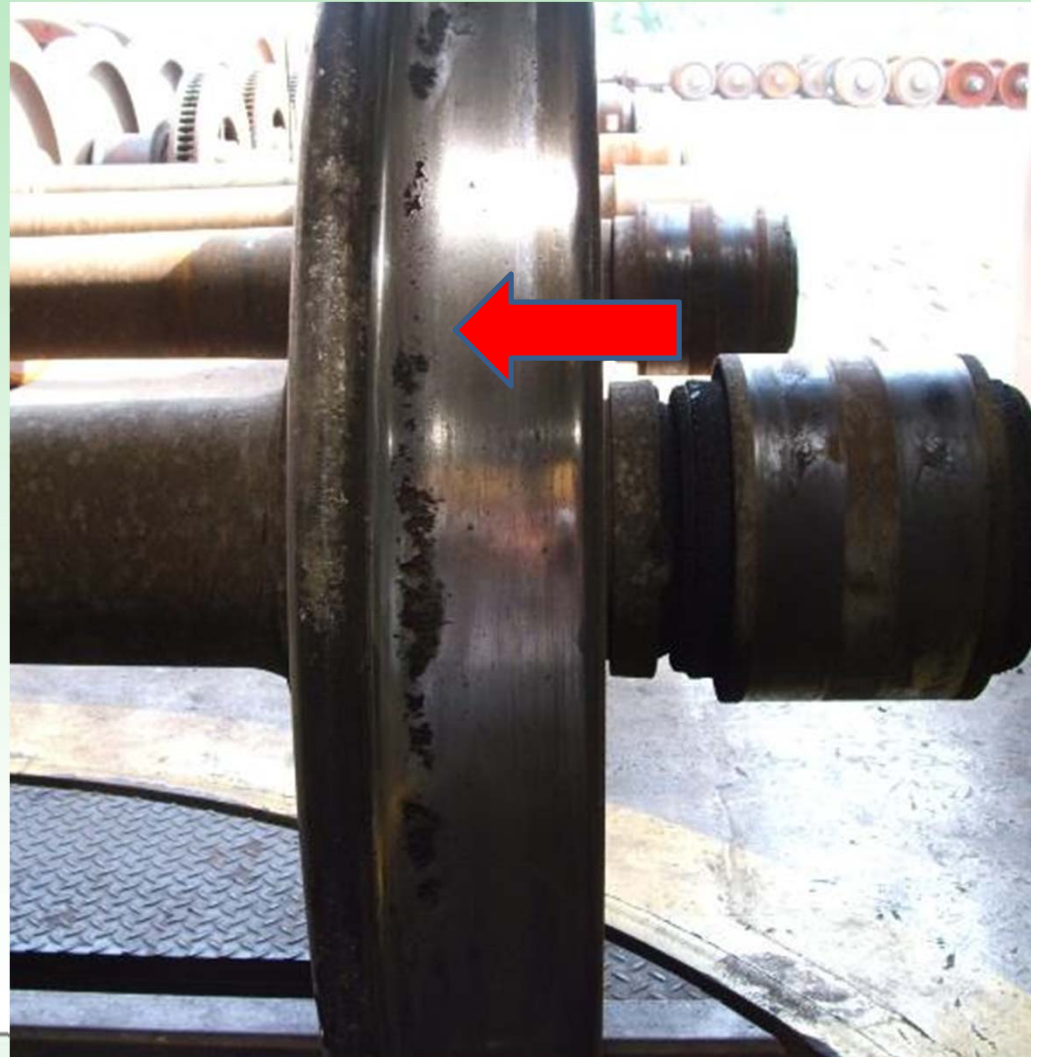


- Wear



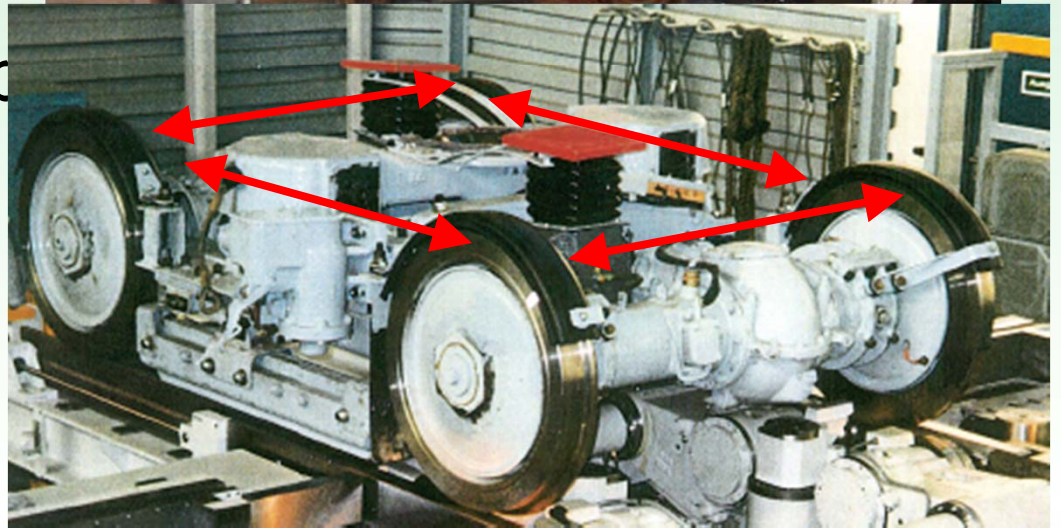
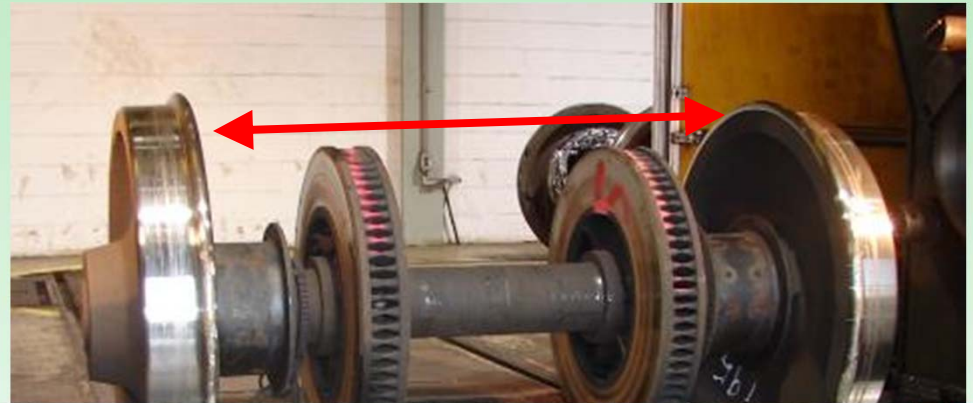
Why True Wheels

- Wear
- Defects
 - High / thin flange
 - Flat spots
 - Shelling / Built up
 - Cracks
 - Out of round



Why True Wheels

- Wear
- Defects
 - High / thin flange
 - Flat spots
 - Shelling / Built up
 - Cracks
 - Out of round
- Parity



Truing Processes

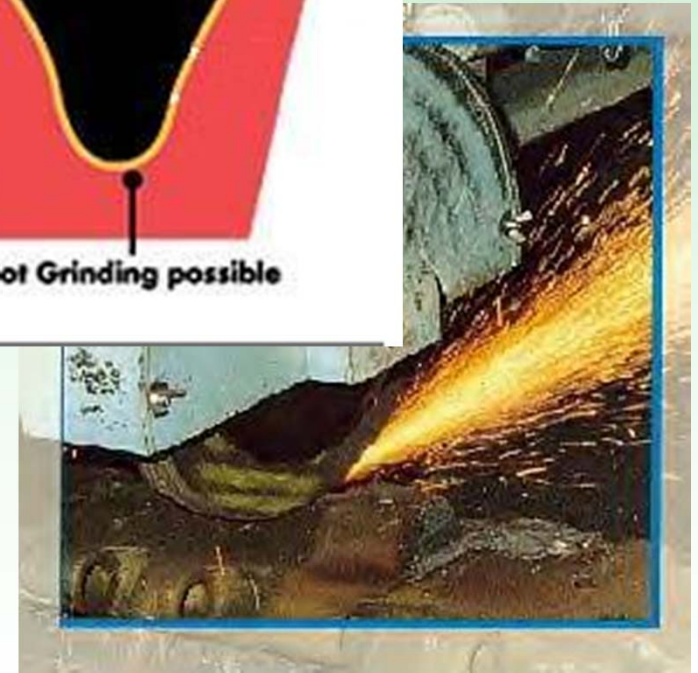
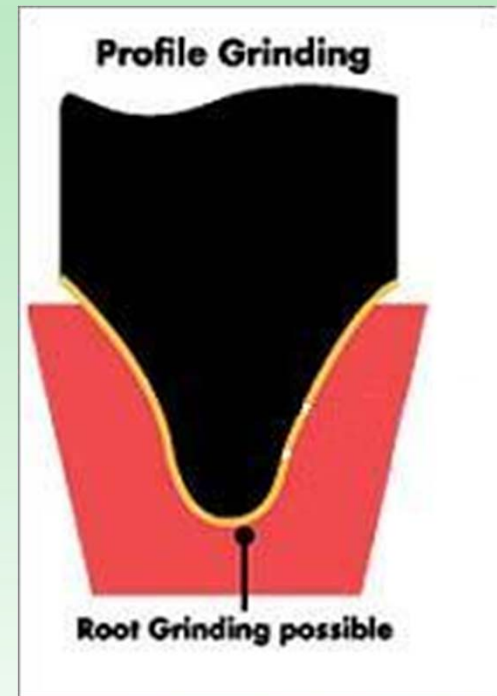
- Grinding
- Milling
- Turning



Truing Processes

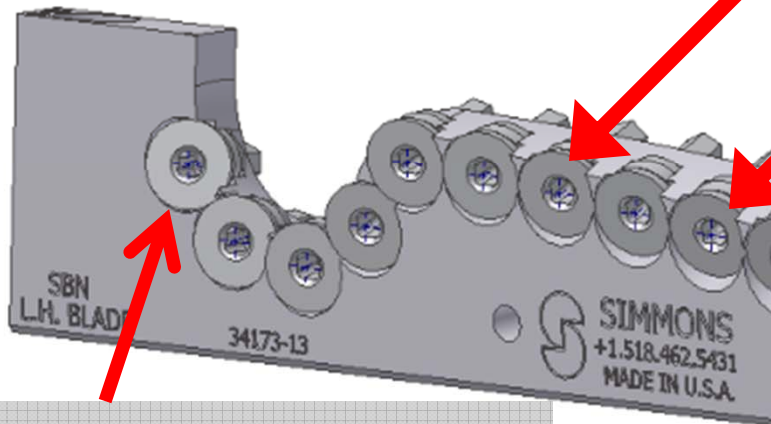
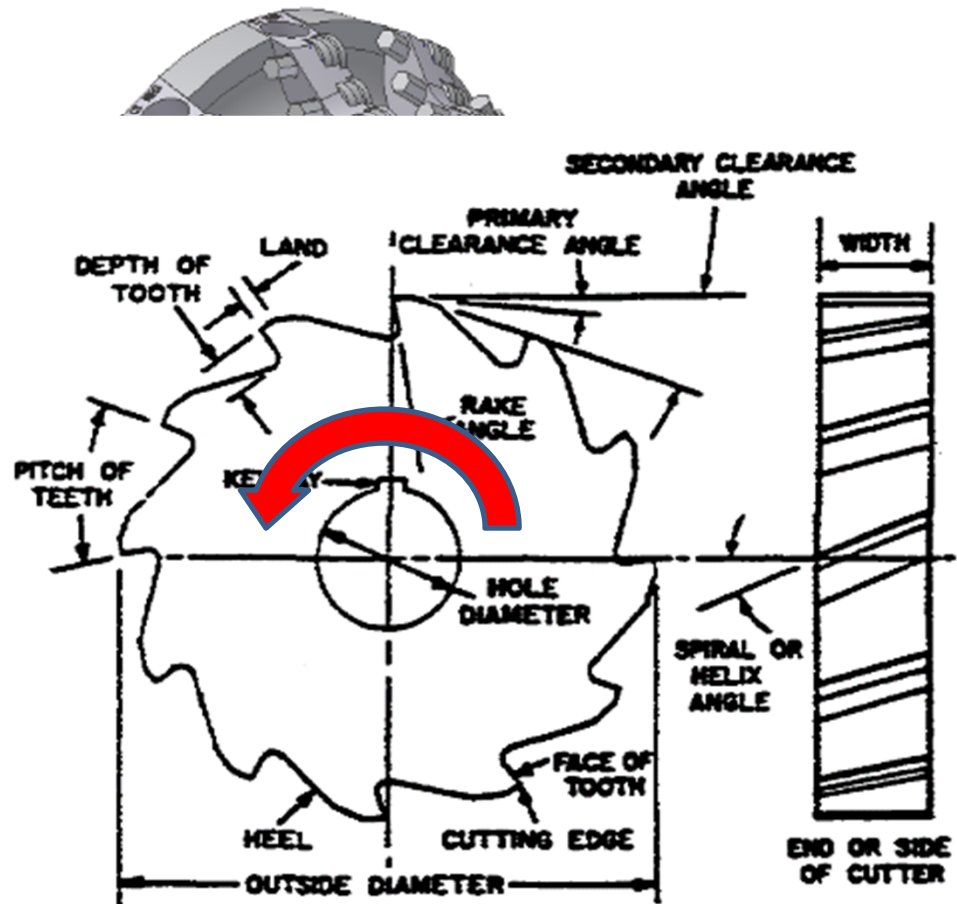
– Grinding

Process not used in NA for wheel profiling due to very low material removal rate resulting in low productivity



Truing Processes

- Grinding
- Milling



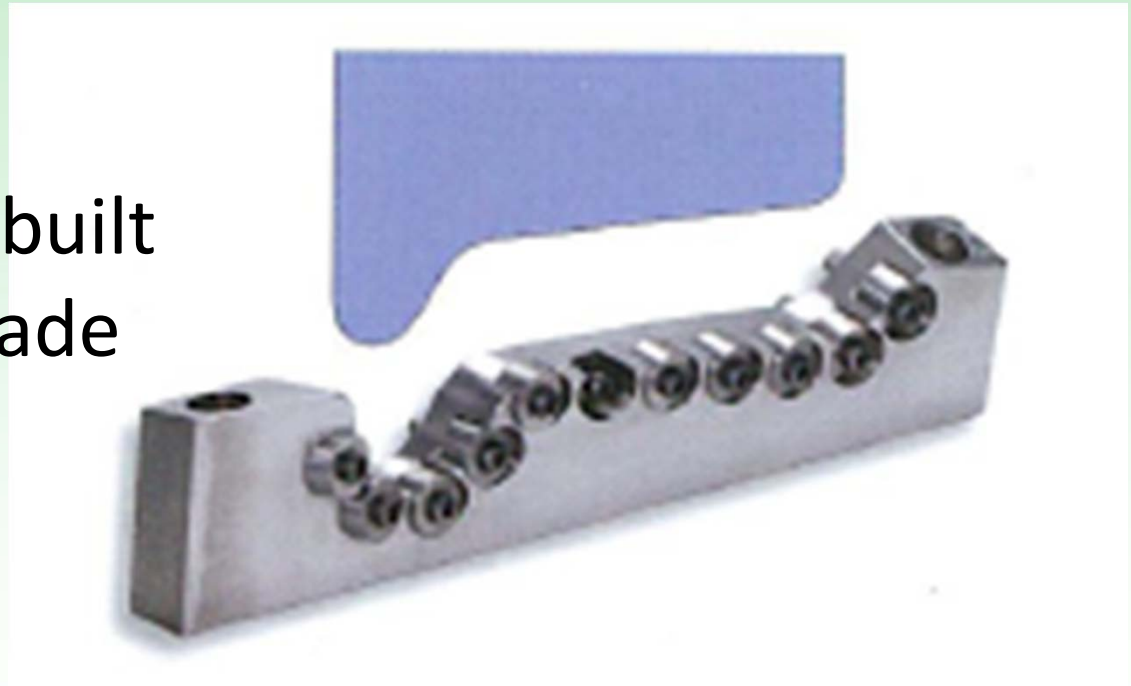
Carbide Inserts



Truing Processes

- Grinding
- Milling

Wheel profile built
into cutter blade



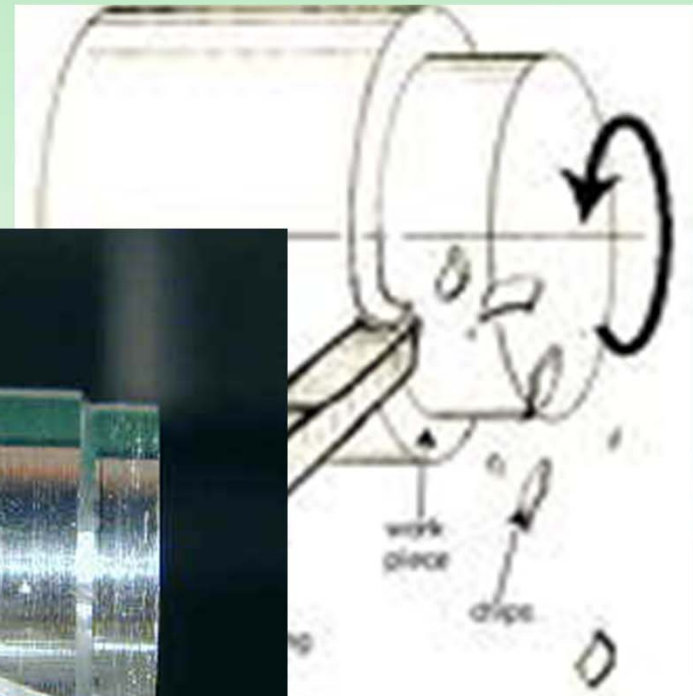
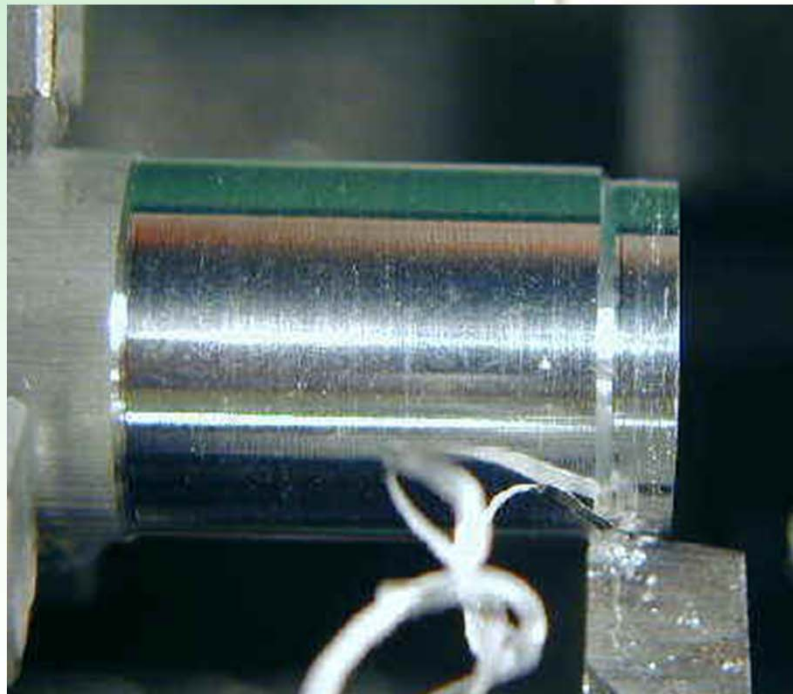
Truing Processes

- Grinding
- Milling



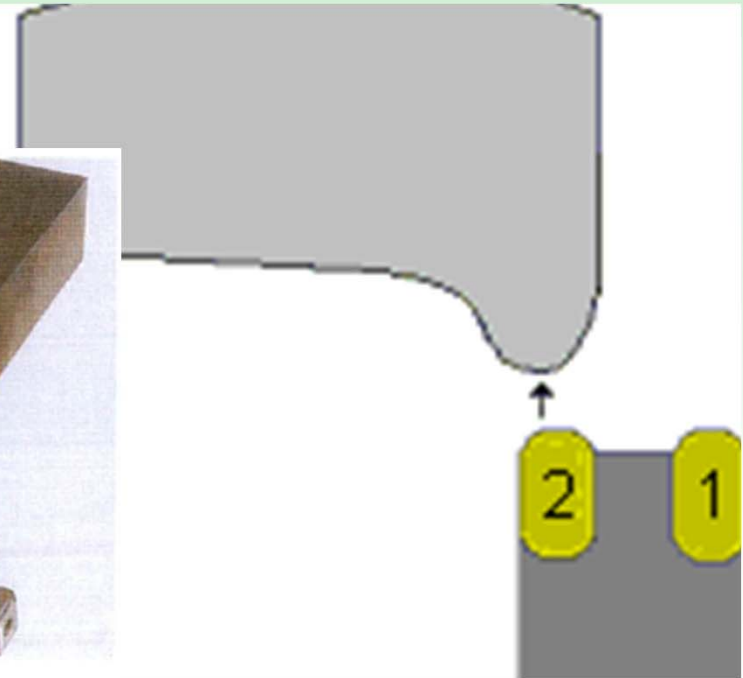
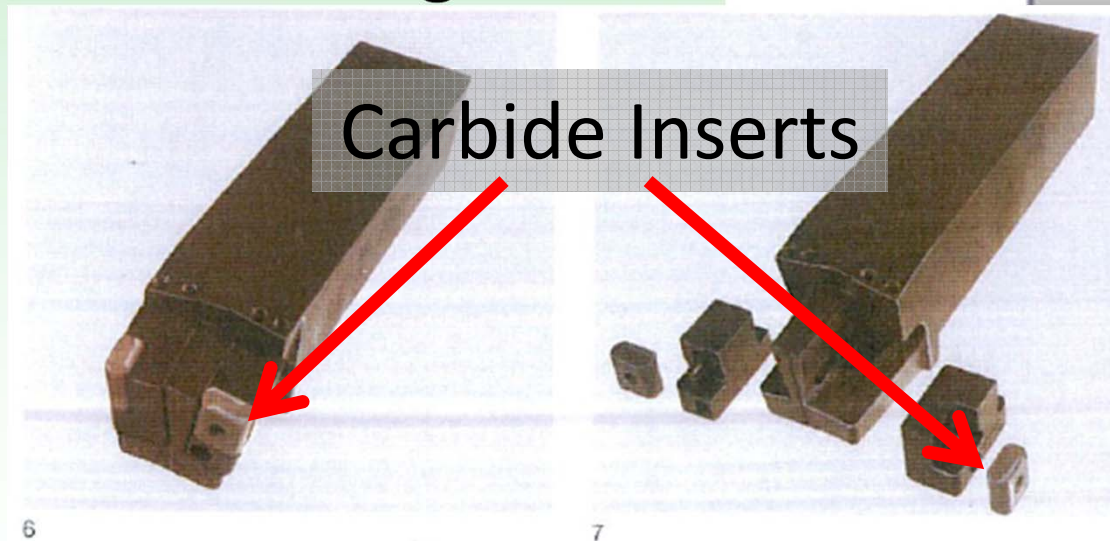
Truing Processes

- Grinding
- Milling
- Turning



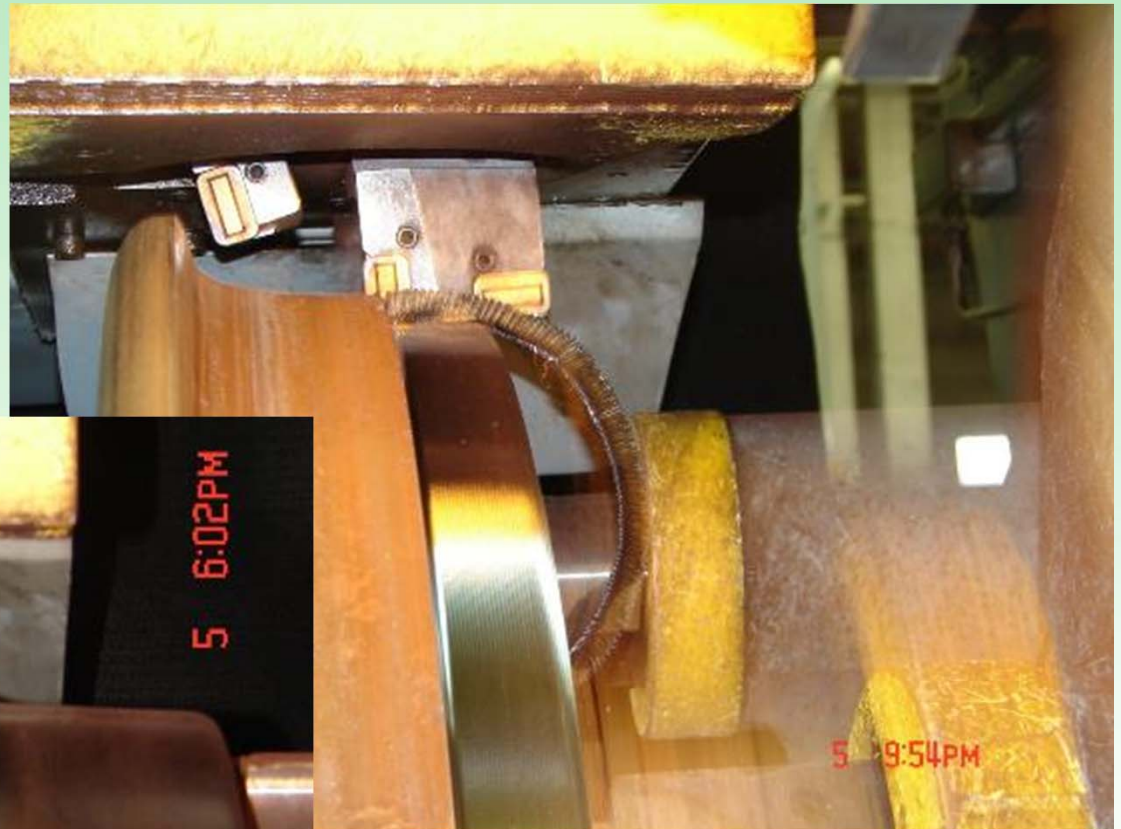
Truing Processes

- Grinding
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- Turning



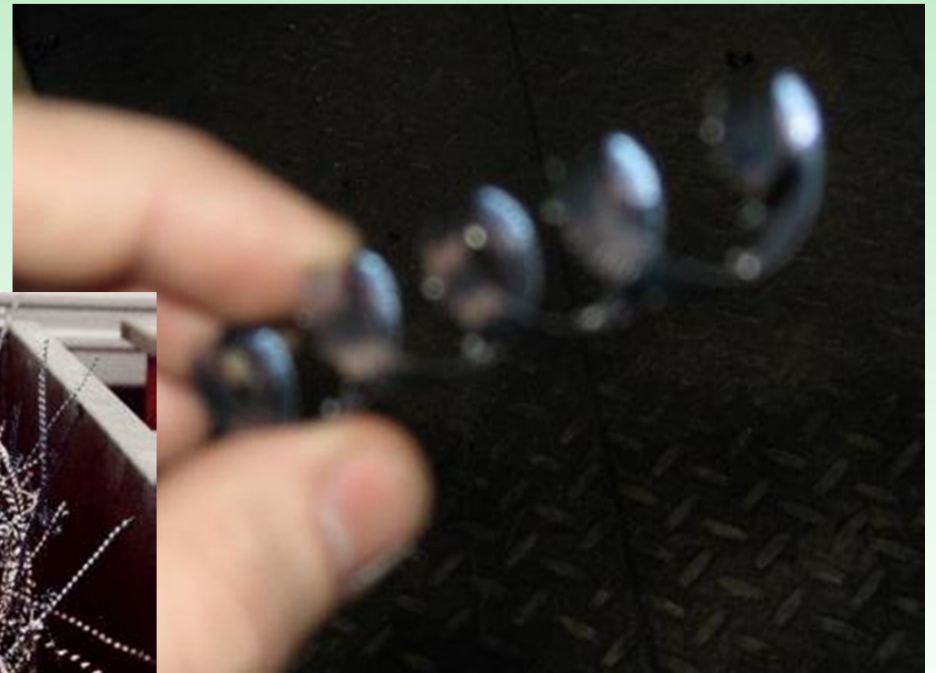
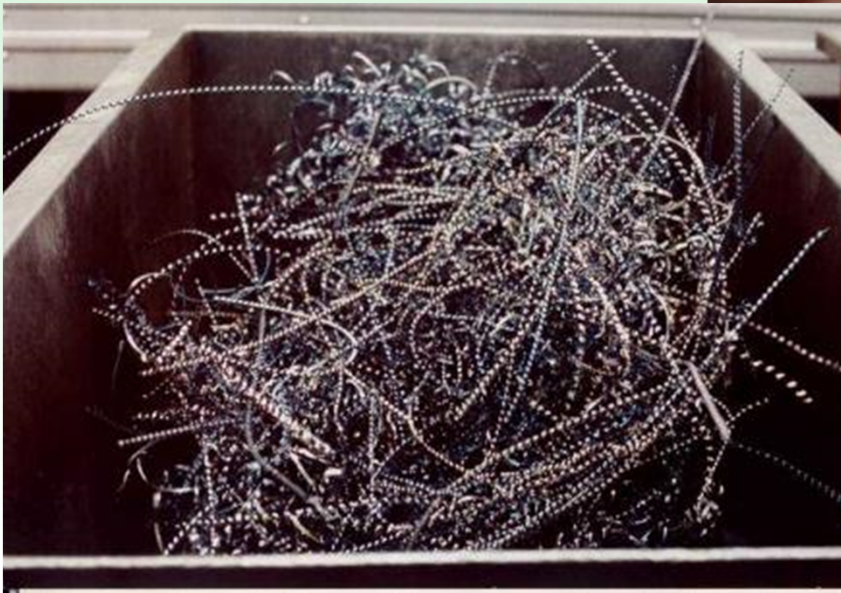
Truing Processes

- Grinding
- Milling
- Turning



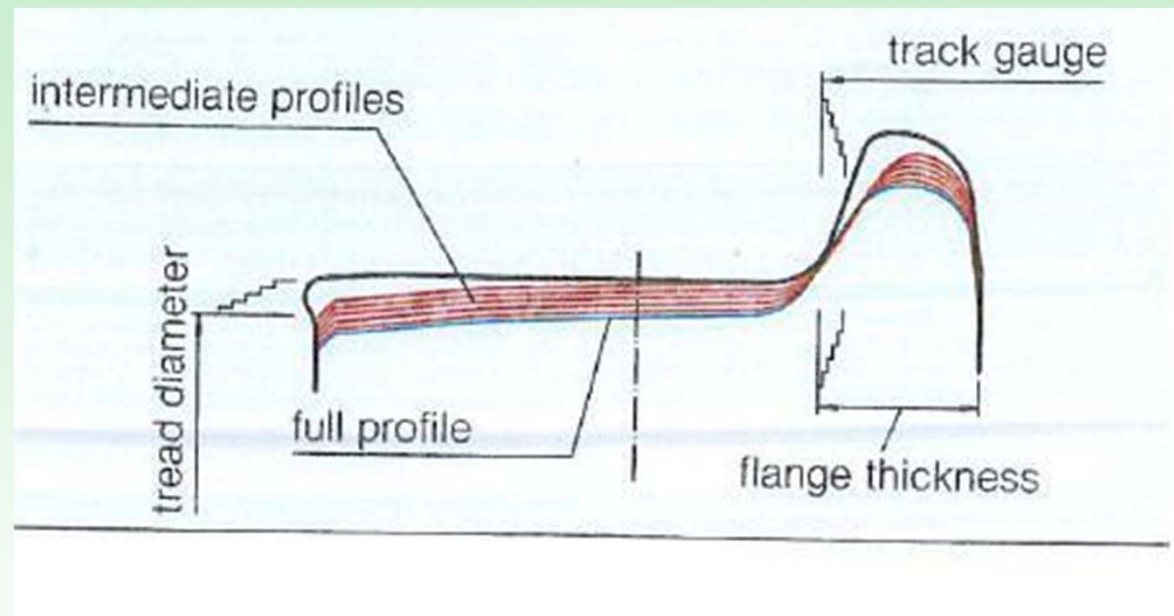
Truing Processes

- Grinding
- Milling
- Turning



Truing Processes

- Grinding
- Milling
- Turning



Major Advantage of Turning Process

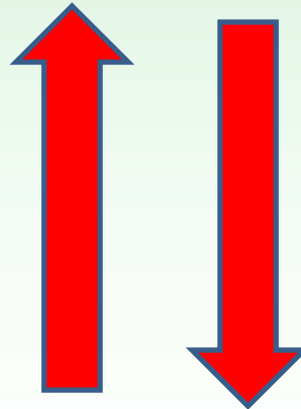


Truing Processes

– Surface Finish

- Grinding – 16 micro inch
- Milling – 150 to 200 micro inch
- Turning – 60 to 150 micro inch

Improved
Surface Finish



Productivity
Reduced



Wheel Measurement

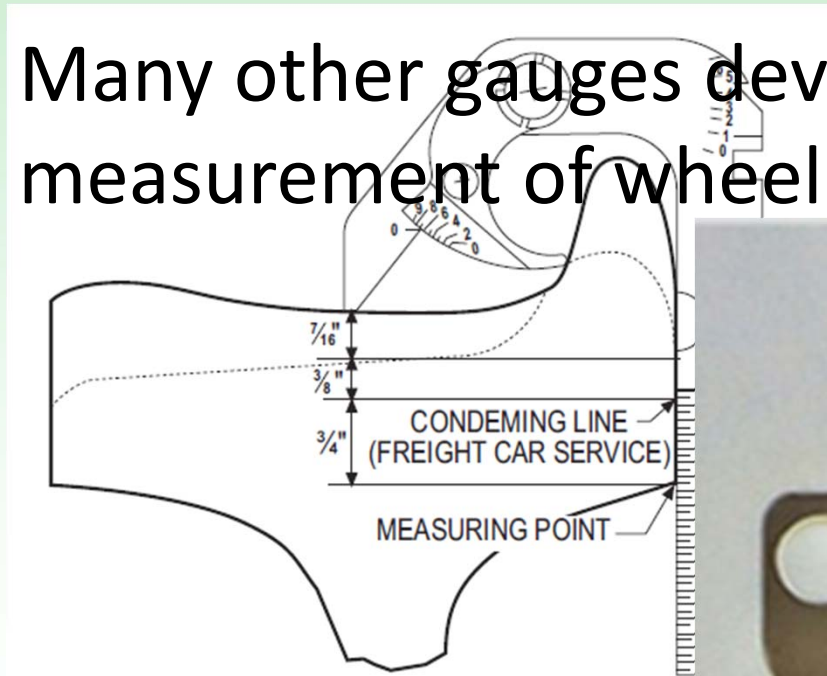
- Past practice involved manual measurements on periodic basis generally process driven
- Manual measurements are prone to human induced errors
 - Incorrect placement of measuring instrument
 - Incorrect reading of measuring instrument
 - Incorrect measuring instrument
 - Errors recording measurements or from transfer of recorded measurements

- Unsafe process



Wheel Measurement - Wear

- Using a wheel gauge to determine depth of material to remove
- Many other gauges developed for measurement of wheel wear

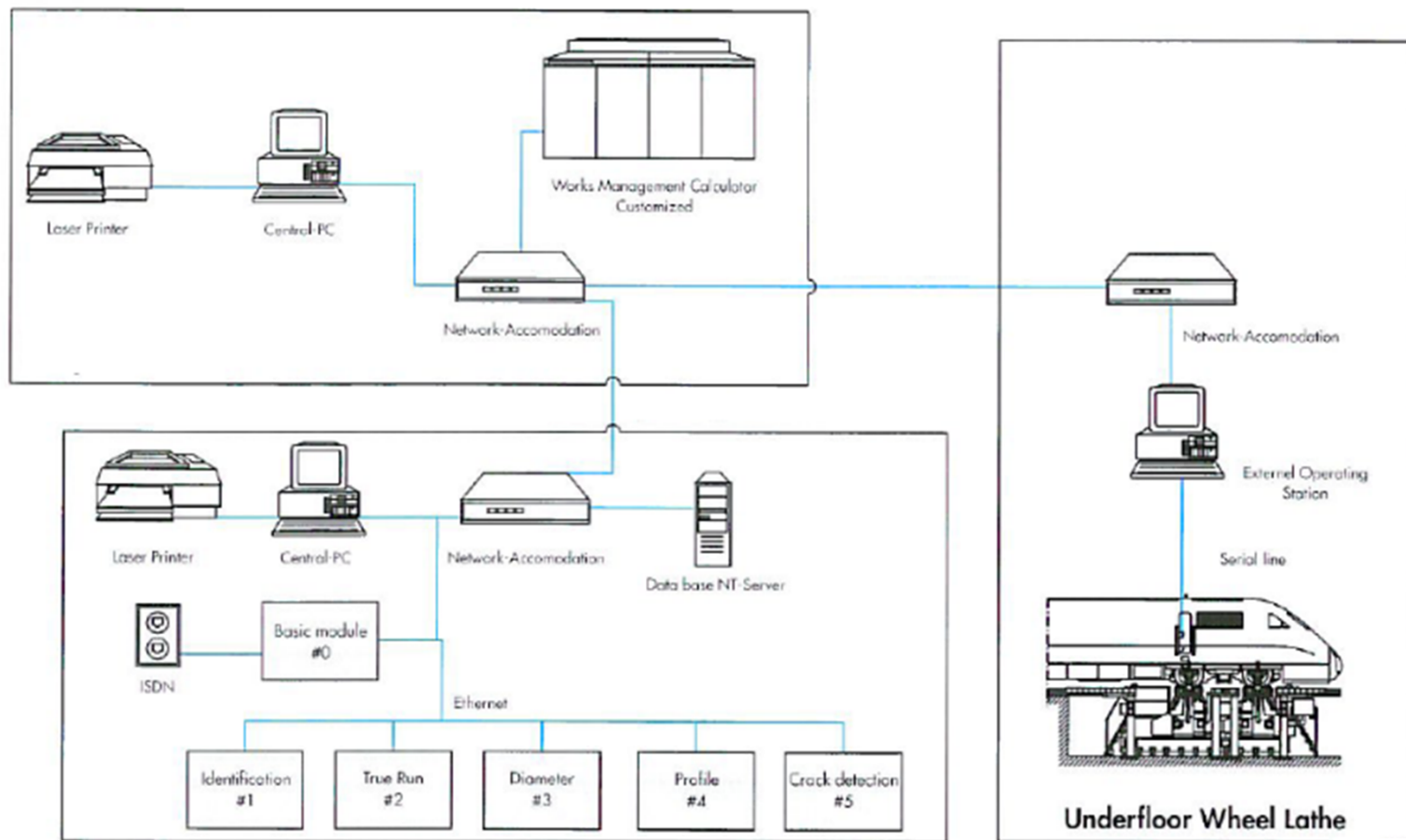
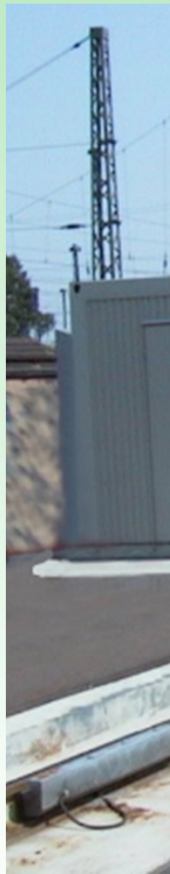


Development of Automated Wheel Measurement

- Safety – remote
- Economical - collection
- Accuracy - More human capabilities consistent with
- Explosion of systems and capabilities



In-Rail Wheel Inspection Systems



In-Rail Wheel Inspection Systems

- Wide range of capabilities
 - Profile
 - Diameter
 - Rim thickness
 - Roundness - defects
 - Cracks
- Other than wheels
 - Brake components
 - Bearings



In-Rail Wheel Inspection Systems

- Some noteworthy points for selecting a system
 - Numerous systems available
 - Purchaser must determine **System** requirements – what will the data be used for?
 - Accuracy drives vehicle velocity
 - Vehicle velocity drives installation location

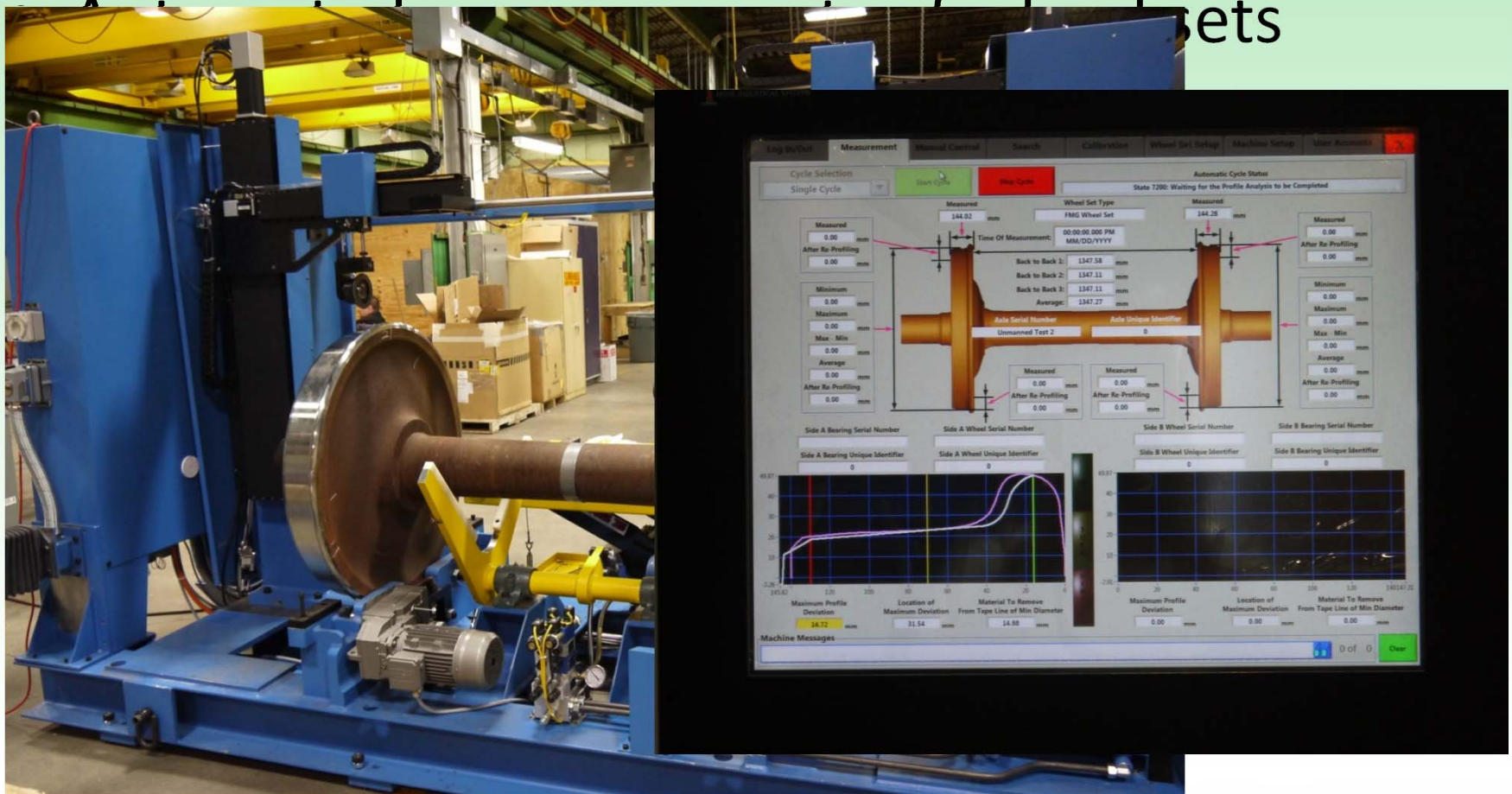


Individual Wheel Set Inspection

- Processing Individual Wheel Sets offers the same challenges and opportunities as in-situ wheel sets
 - Safety – remove operator
 - Economical - Highly efficient method of data collection
 - Accuracy - Measuring capability exceeds human capability and measurements are consistent which drives quality



Individual Wheel Set Inspection



Portable Wheel Inspection

- Portable equipment available for wheel profile measurement



Automated Wheel Measurement Data

- Greatest potential benefit is for using the collected data to analyze the **System**
- Data Mining
- Finding trends and changes in the **System**



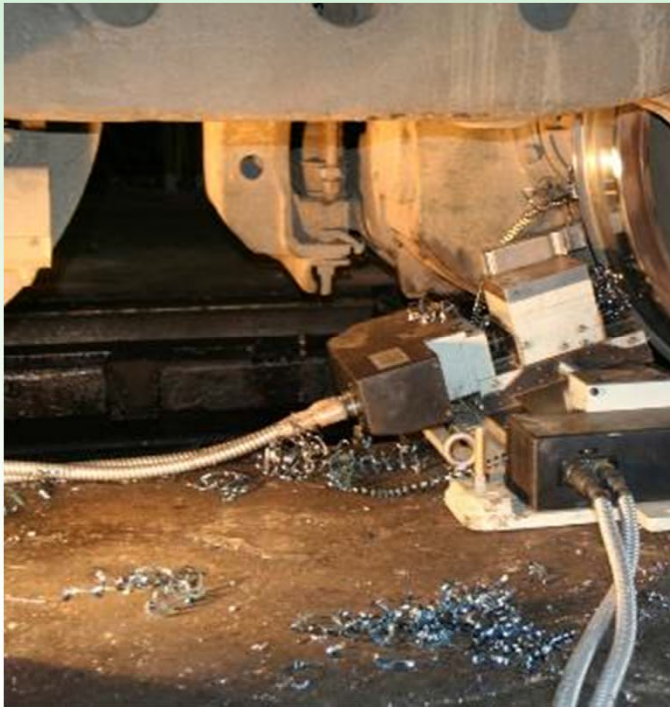
Wheel Truing Equipment Options

- Portable
- Above floor
- Under floor



Wheel Truing Equipment Options

- Portable
 - Individual wheel unit



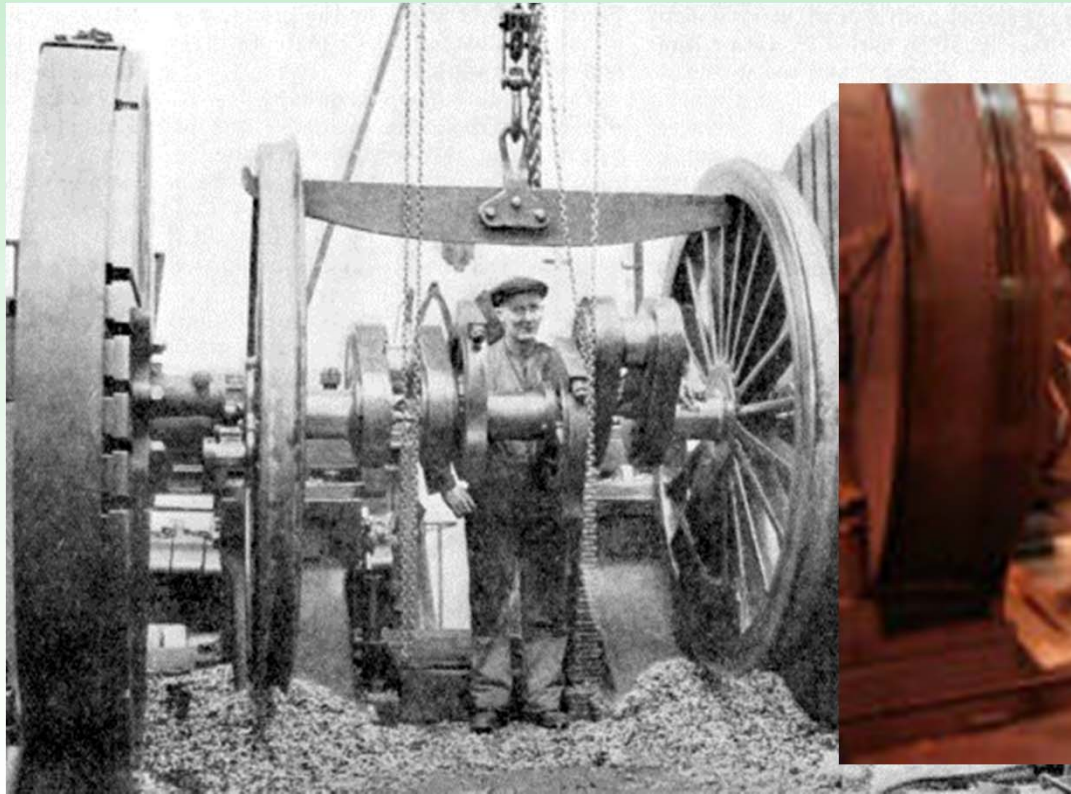
Wheel Truing Equipment Options

- Portable
 - Mobiturn®



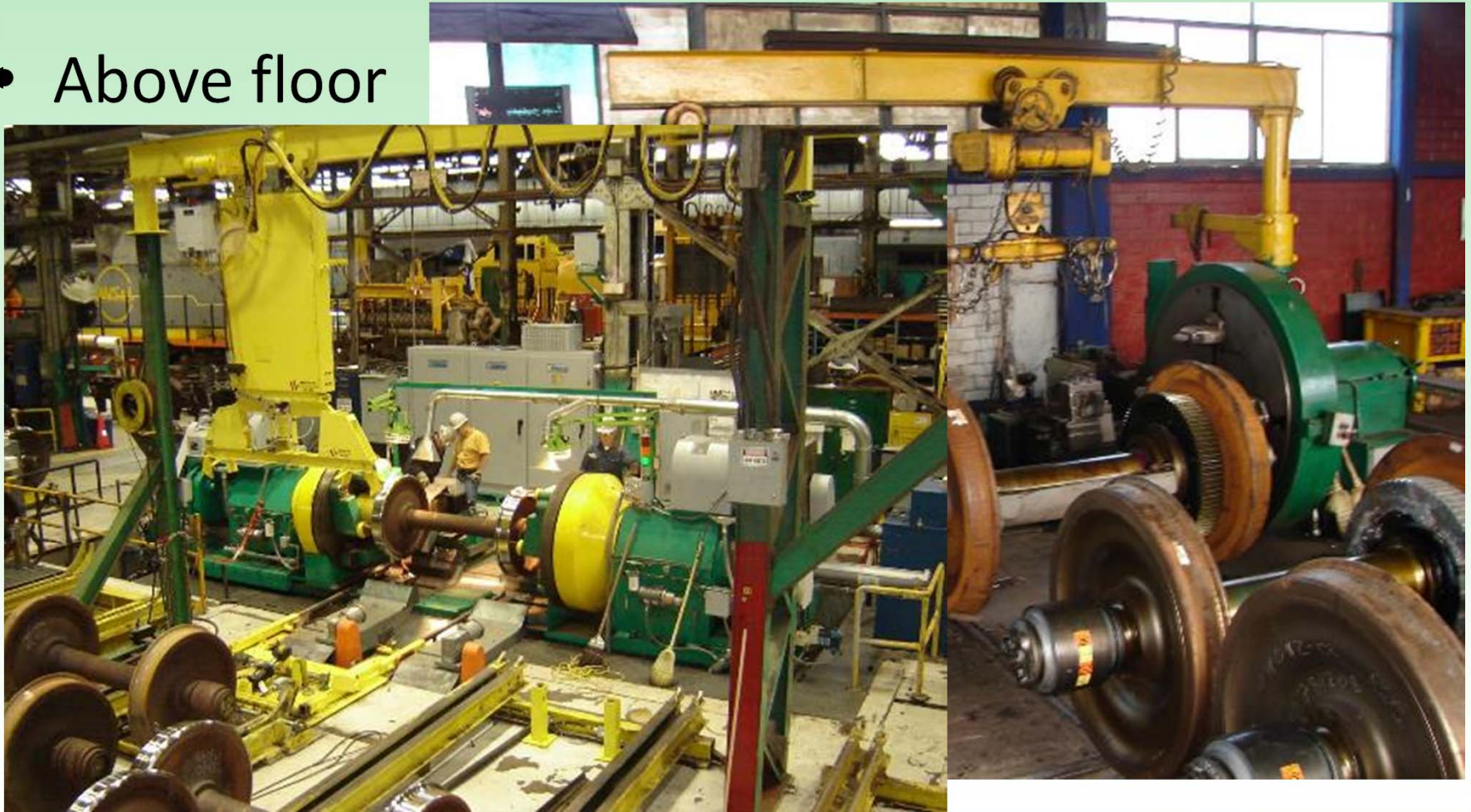
Wheel Truing Equipment Options

- Above floor



Wheel Truing Equipment Options

- Above floor



Wheel Truing Equipment Options

- Above floor – Portal style



Wheel Truing Equipment Options

- Under floor in-situ
 - Milling – Wheel Truing Machine
 - Turning – Underfloor Wheel Lathe

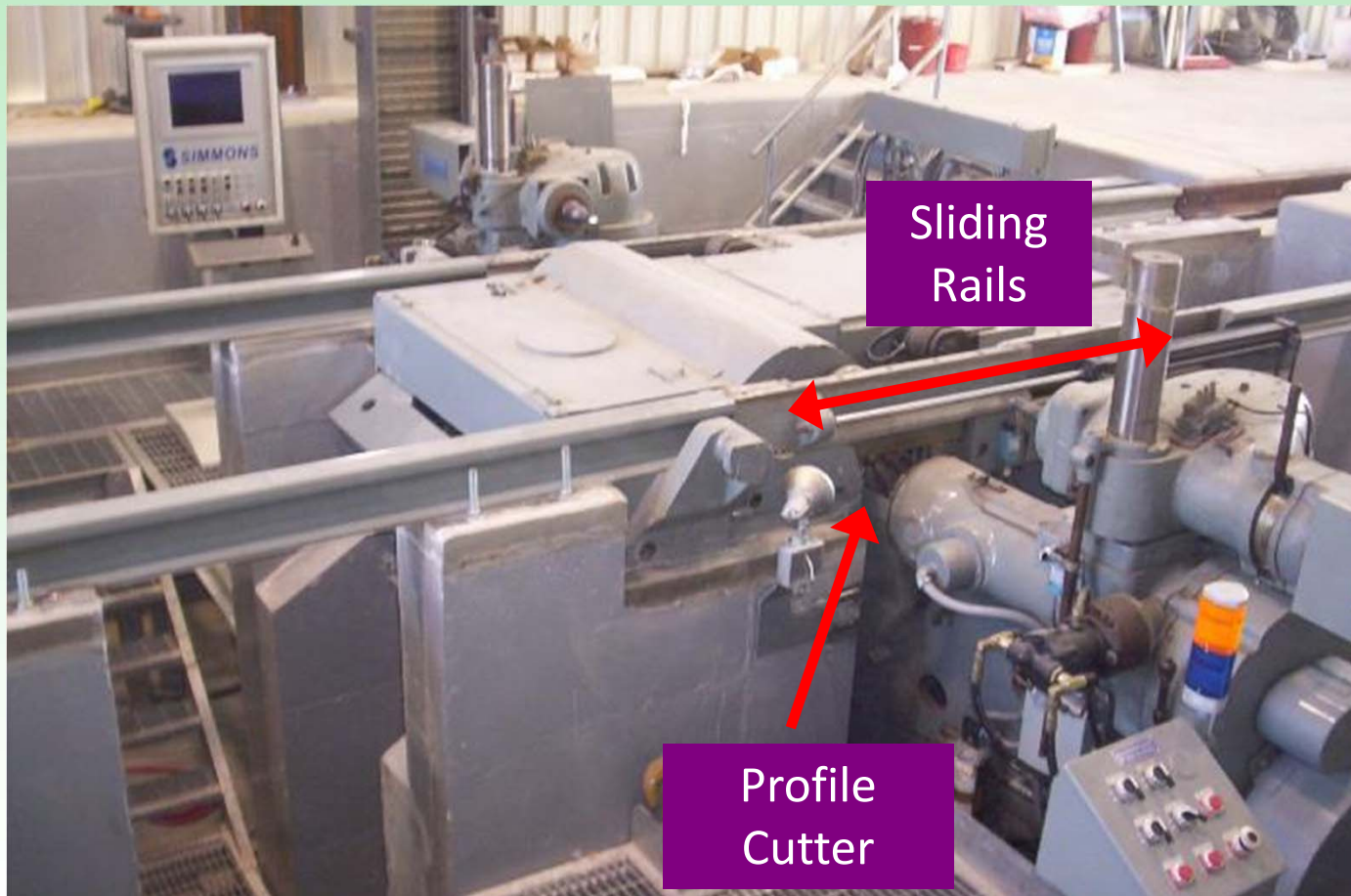


Wheel Truing Equipment Options

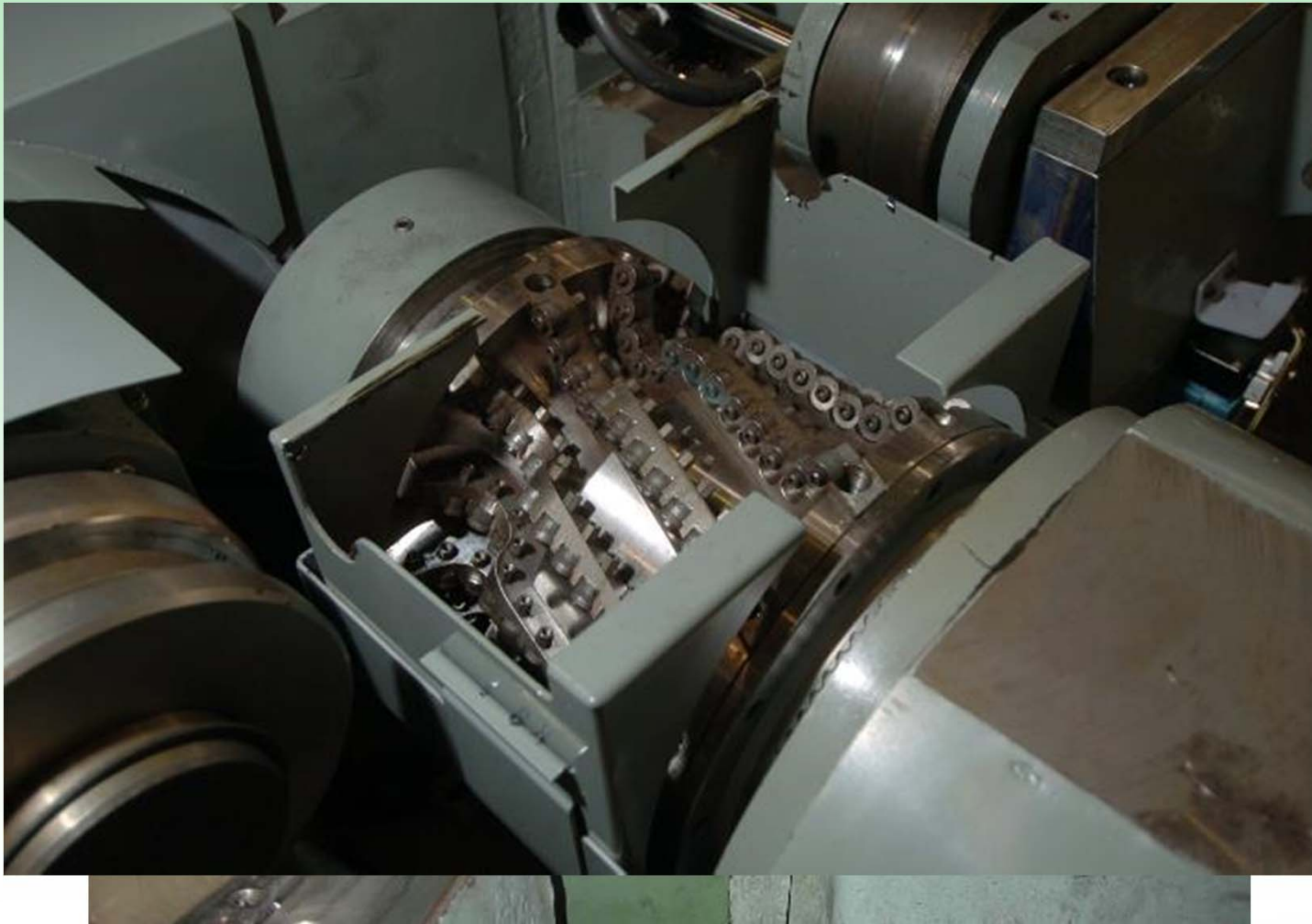
- Under floor
 - Milling – Wheel Truing Machine



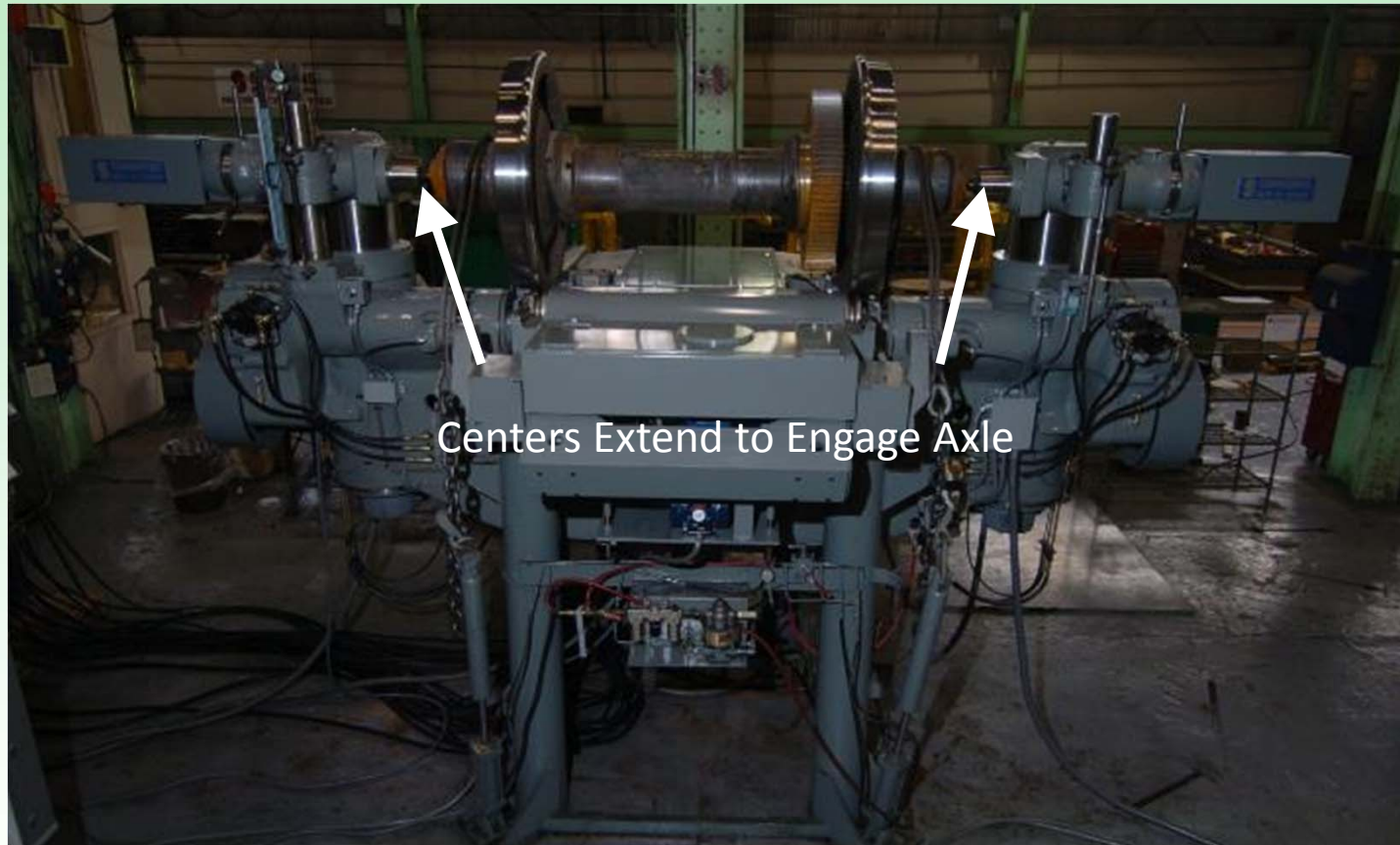
Wheel Truing Equipment Options



Wheel Truing Equipment Options



Wheel Truing Equipment Options



Wheel Truing Machine in Test Stand at Manufacturing Facility



Wheel T

Options



Wheel T

Facility



Wheel Truing Equipment Options

- Under floor
 - Lathe – Underfloor Wheel Lathe



Wheel Truing Equipment Options



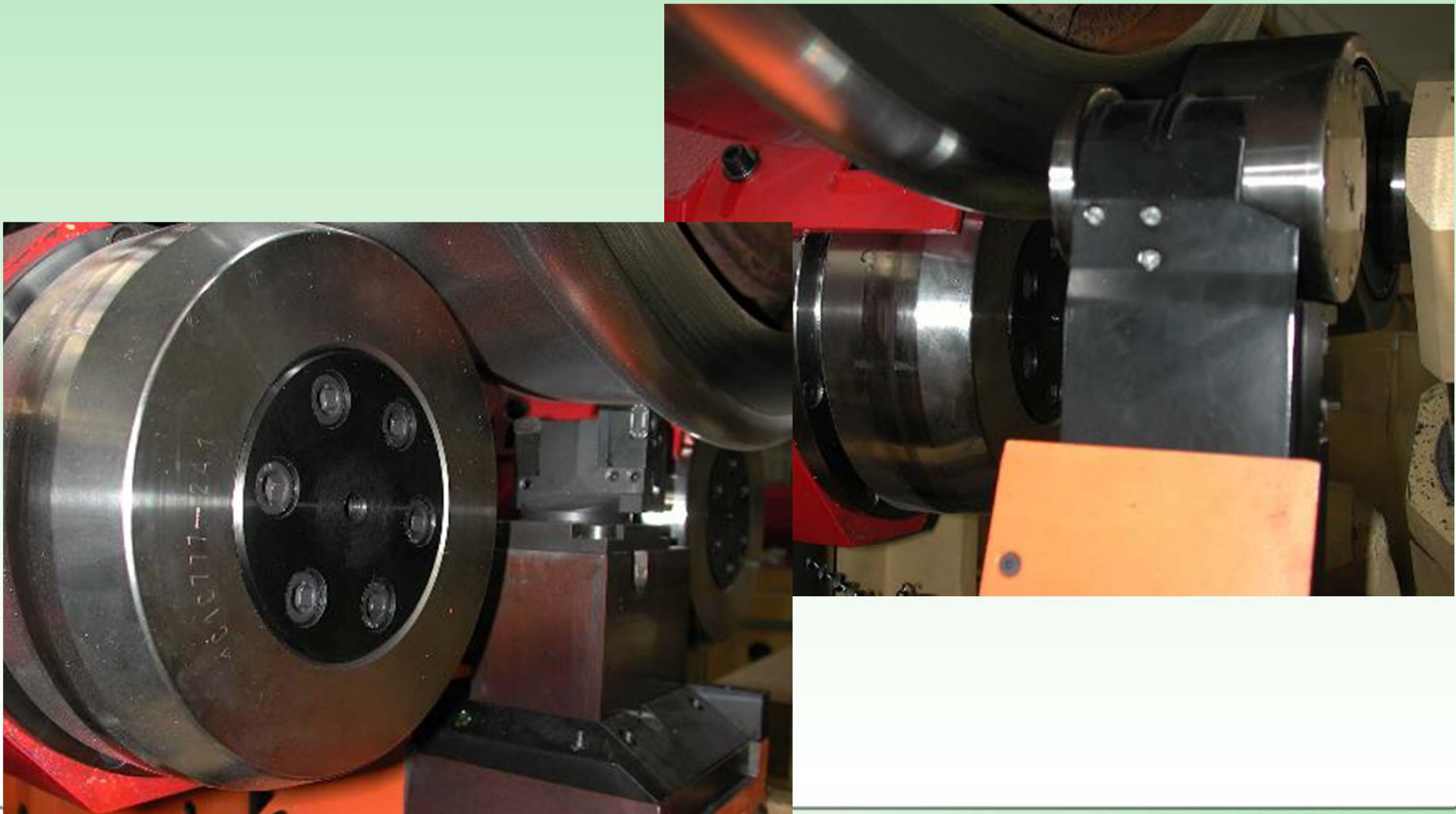
Wheel Truing Equipment Options



Wheel Truing Equipment Options



Wheel Truing Equipment Options



Wheel Truing Equipment Options



Dual Axle
Tandem
Machine



Some Vehicle Application Notes

- Wheel Truing Machine requires access to the axle centers of the wheel set
- Underfloor Wheel Lathe can be “centerless” requiring no access to axle centers
- Low floor vehicles have obstructions to axle centers and independent wheels



Wheel Maintenance Review

- Wheel Profile(s)
- Why True Wheels
- Truing Processes
- Wheel Measurement
- Truing Equipment Options
- Vehicle Application Notes



Questions

