The Liberty Wheel project: Part 2: The maintenance of tyred wheels

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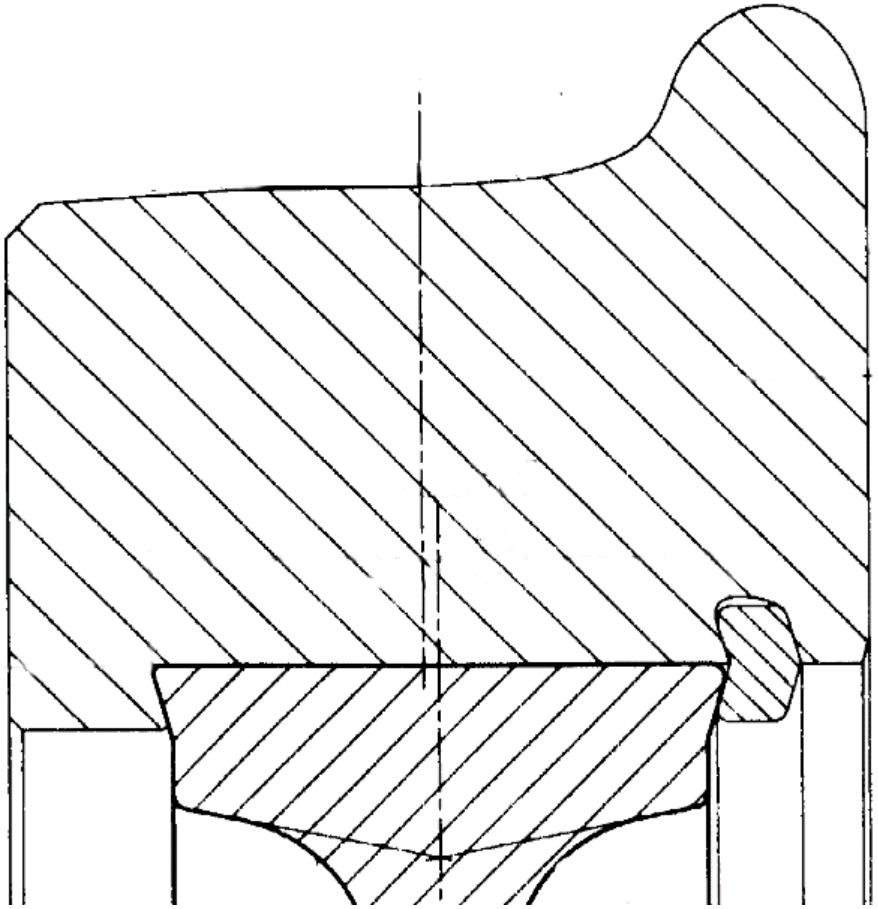
Morphology of a tyred wheel

- WHEEL LIFE: monobloc=finite, tyred=infinite
- AXLE LIFE: monobloc=finite, tyred=infinite

THE PROBLEM IS MAINTENANCE COSTS!



Arrival of a wheelset to be overhauled

1. Retaining ring and worn tyre removal

First, the retaining ring must be «turned» on a wheelset lathe to be removed

1. Retaining ring and worn tyre removal

Then, the tyre can be removed by torch cutting (damage to wheel centre *very likely)*

Or, the tyre can be removed by saw cutting + an extractor (damage to wheel centre *very likely*)

1. Retaining ring and worn tyre removal

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Tyres can be removed by «shrink removal» (no damage!)

In this case no wheel centre reprofiling is needed (just cleaning)

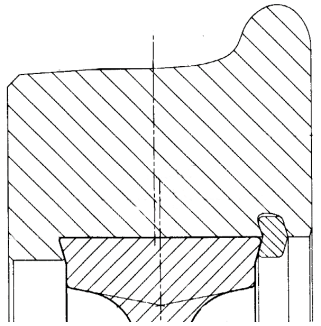
1. Retaining ring and worn tyre removal

Induction heating provides a clean, fast and reliable alternative

2. Wheel centre machining

Needed when «tyre seat» is damaged

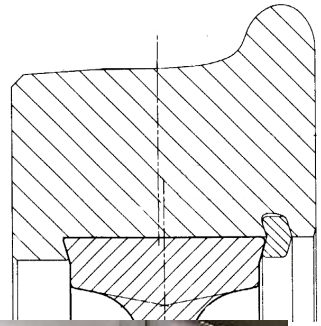
Very simple machining: cylindrical turning



3. Tyre bore machining

Needed to adjust tyre to wheel centre diameter

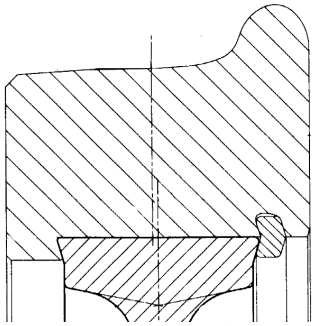
Very simple machining: cylindrical turning



4. Dimensional checks

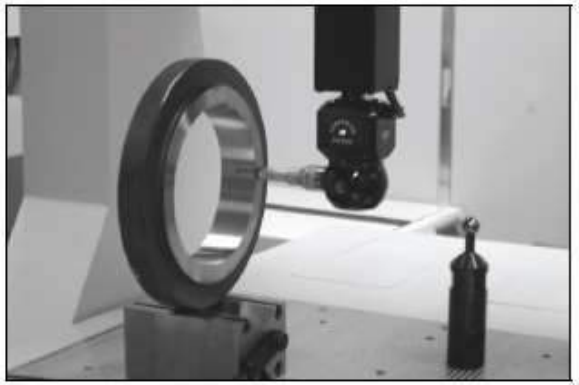
Diameter check with manual callipers + tyre profile check with profile projector

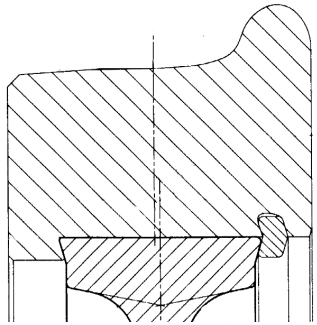
Very basic equipment

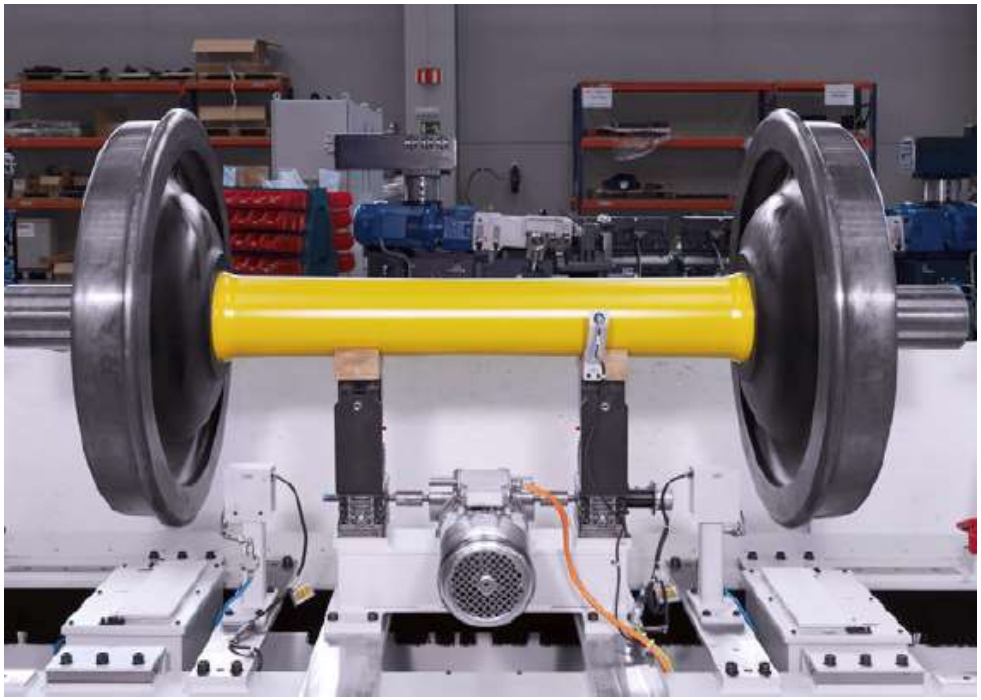


4. Dimensional checks

CMM + laser + measuring stations



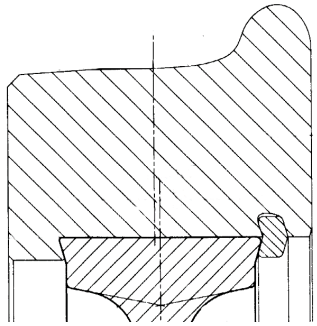




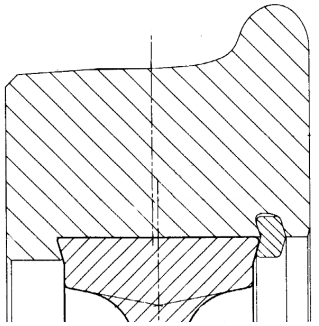
5. Tyre heating and mounting

Heating ovens (mainly for wheels)

Induction heating systems (for tyres)



5. Tyre heating and mounting

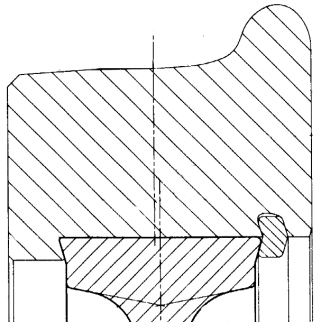


Wheelset is lowered on hot tyre (raw or finished)

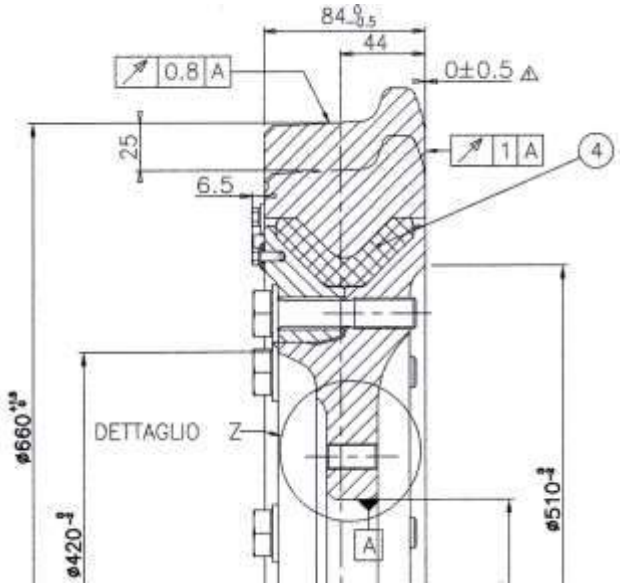
Retaining ring is cut and plastically deformed in the groove

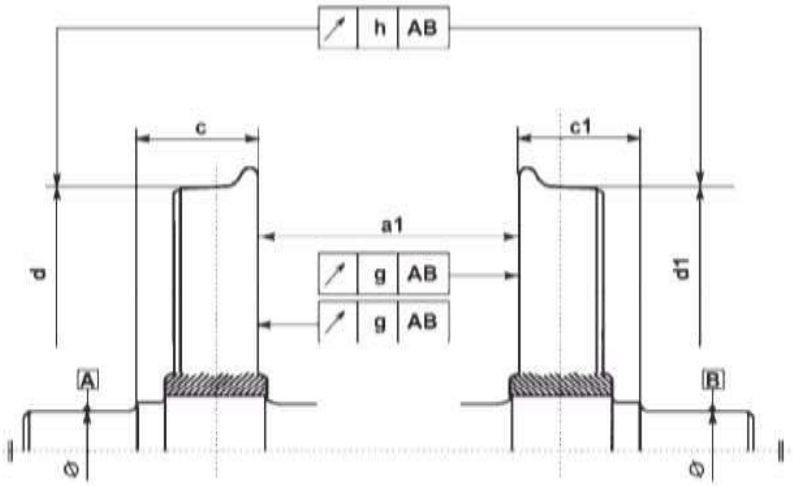
6. Final machining

Needed to get the proper tolerances!!!!



EN 13260 tolerances on assembled wheelset





Category 1: v > 200 km/h

Category 2b: 120 < v ≤ 200 km/h

Category 2a: v ≤ 120 km/h

Dimensions in mm

Description	Symbol	Category 2		Category 1
		a	b	
Distance between the internal wheel faces[a]	a_1	$+2^{b}_{0}$		$+2^{b}_{0}$
Difference in distances between the internal face of each wheel and the plane on the journal side defining the corresponding collar bearing surface	$c - c_1$ or $c_1 - c$	≤ 1		≤ 1
Difference in tread circle diameter	$d - d_1$ or $d_1 - d$	≤ 0,5	≤ 0,3	≤ 0,3
Radial run-out in tread circle	h	≤ 0,5	≤ 0,3	≤ 0,3
Axial run-out of the internal wheel face[a]	g	≤ 0,8	≤ 0,5	≤ 0,3

[a] Measurement at 60 mm beneath the top of the flange

[b] The tolerances may be changed for special designs of wheelsets

Third World workshop?

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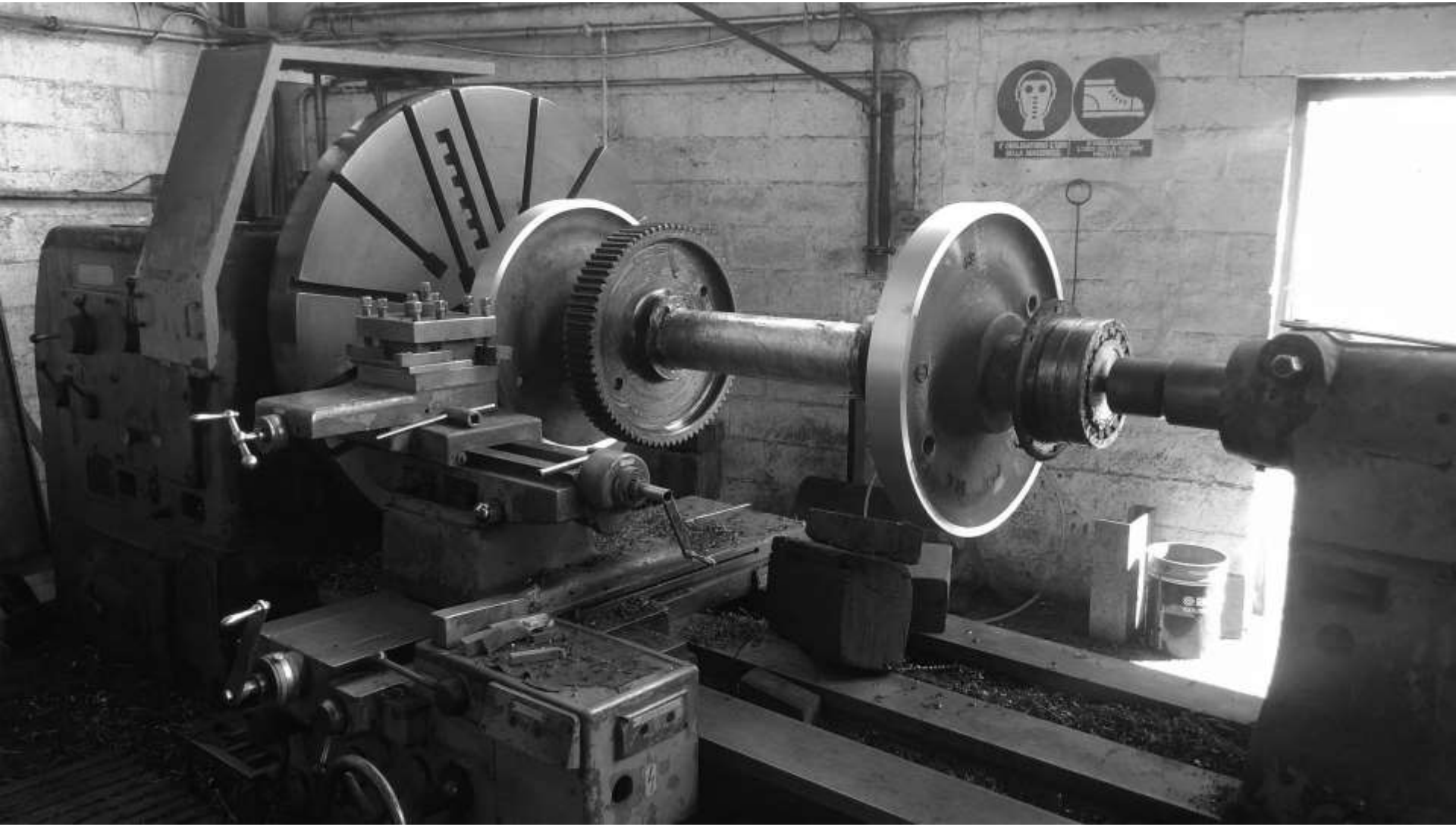

Third World workshop?

Back to engineering: how were tyred wheels designed?