

A black and white photograph of a workshop. In the background, a person is working at a large industrial machine, possibly a lathe or mill. The foreground is filled with various tools, workbenches, and machinery. The lighting is bright, coming from a window or skylight at the top. The overall scene depicts a busy industrial environment.

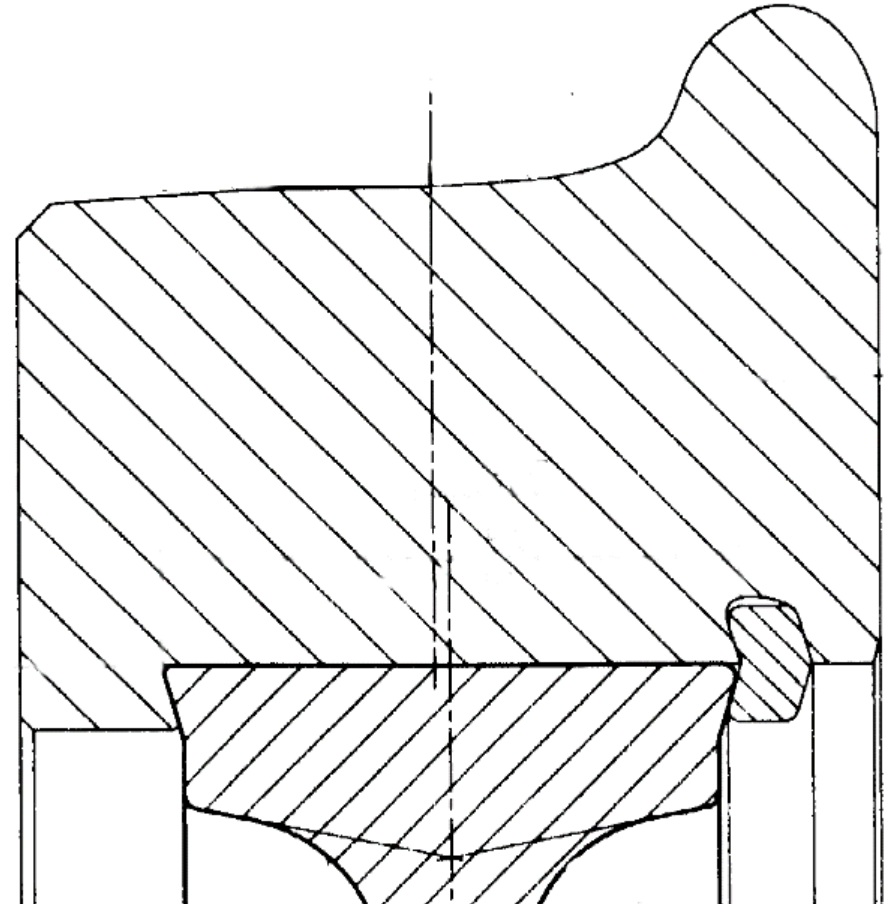
***The Liberty Wheel project:
Part 2: The maintenance of
tyred wheels***

Andrea Bracciali – Gianluca Megna

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



1. Retaining ring and worn tyre removal

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

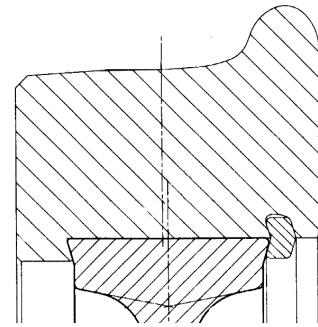
Induction heating provides a clean, fast and reliable alternative



2. Wheel centre machining

Needed when «tyre seat» is damaged

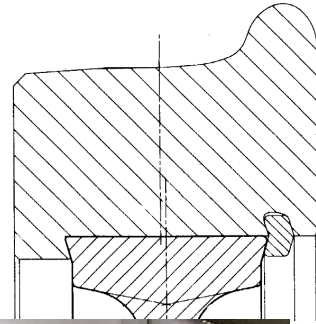
Very simple machining: cylindrical turning



3. Tyre bore machining

Needed to adjust tyre to wheel centre diameter

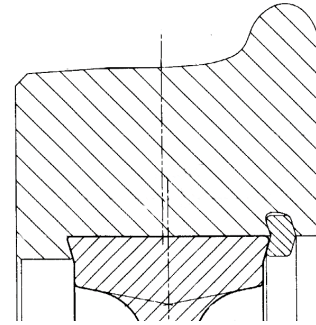
Very simple machining: cylindrical turning



4. Dimensional checks

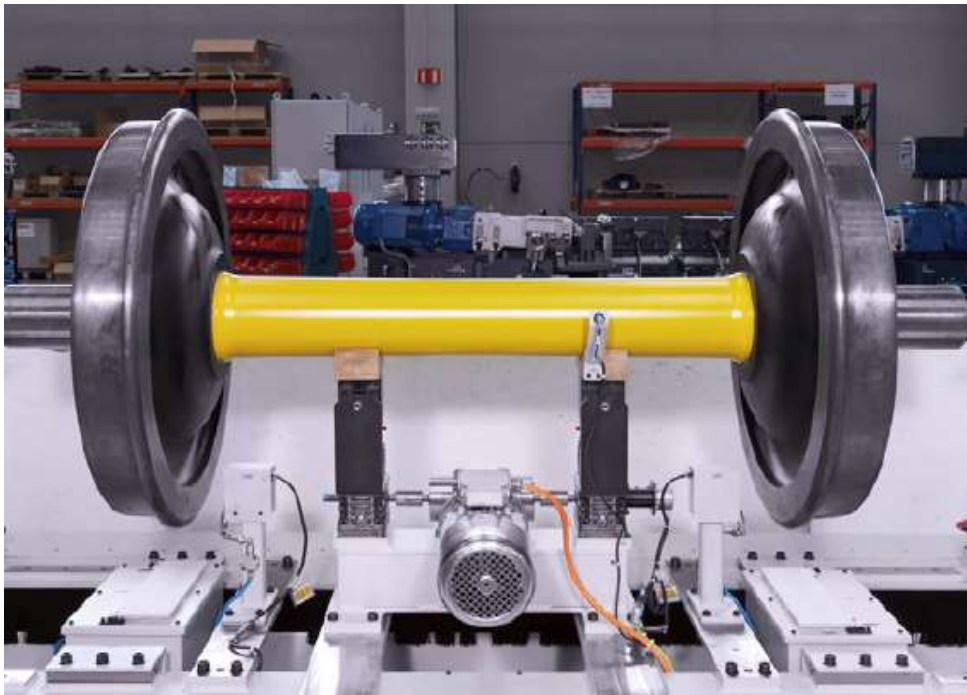
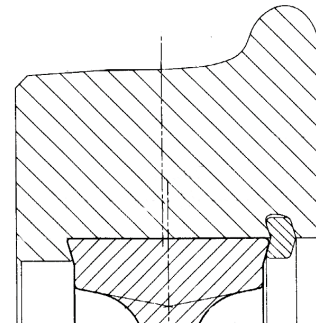
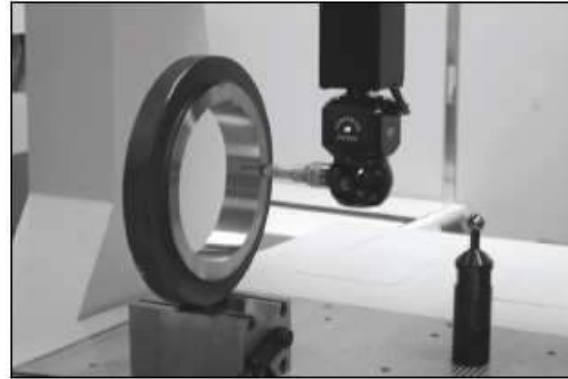
Diameter check with manual callipers
+ tyre profile check with profile
projector

Very basic equipment



4. Dimensional checks

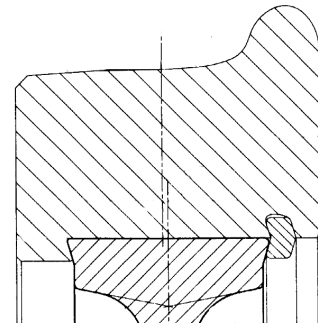
CMM + laser + measuring stations



5. Tyre heating and mounting

Heating ovens (mainly for wheels)

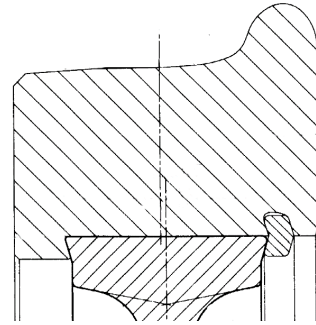
Induction heating systems (for tyres)



5. Tyre heating and mounting

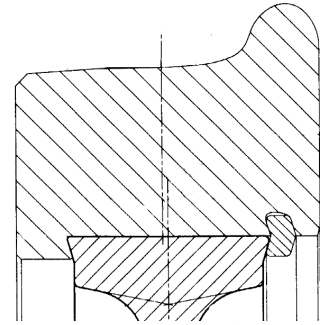
Wheelset is lowered on hot tyre (raw or finished)

Retaining ring is cut and plastically deformed in the groove

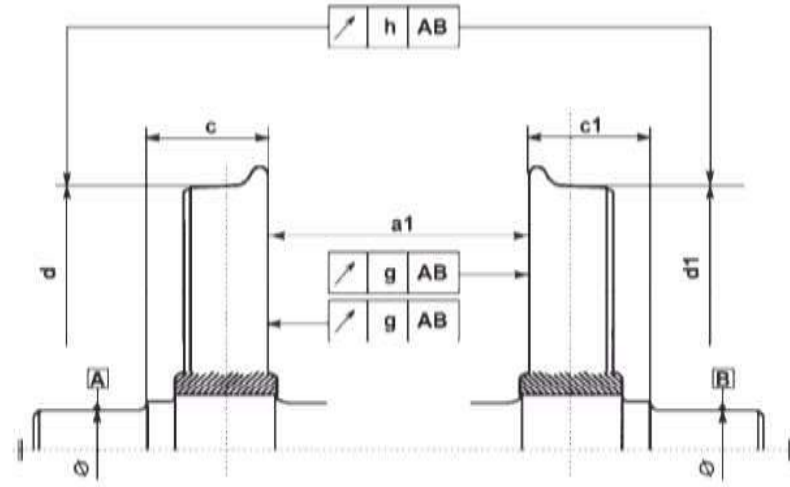
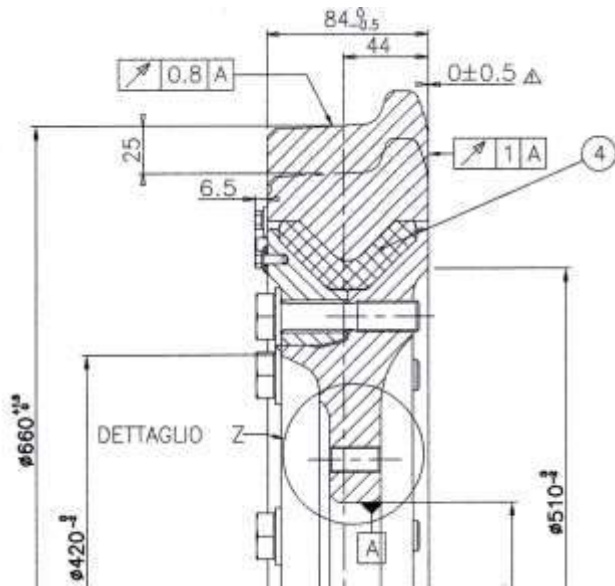


6. Final machining

Needed to get the proper tolerances!!!!



EN 13260 tolerances on assembled wheelset



Category 1: $v > 200$ km/h
 Category 2b: $120 < v \leq 200$ km/h
 Category 2a: $v \leq 120$ km/h

Dimensions in mm

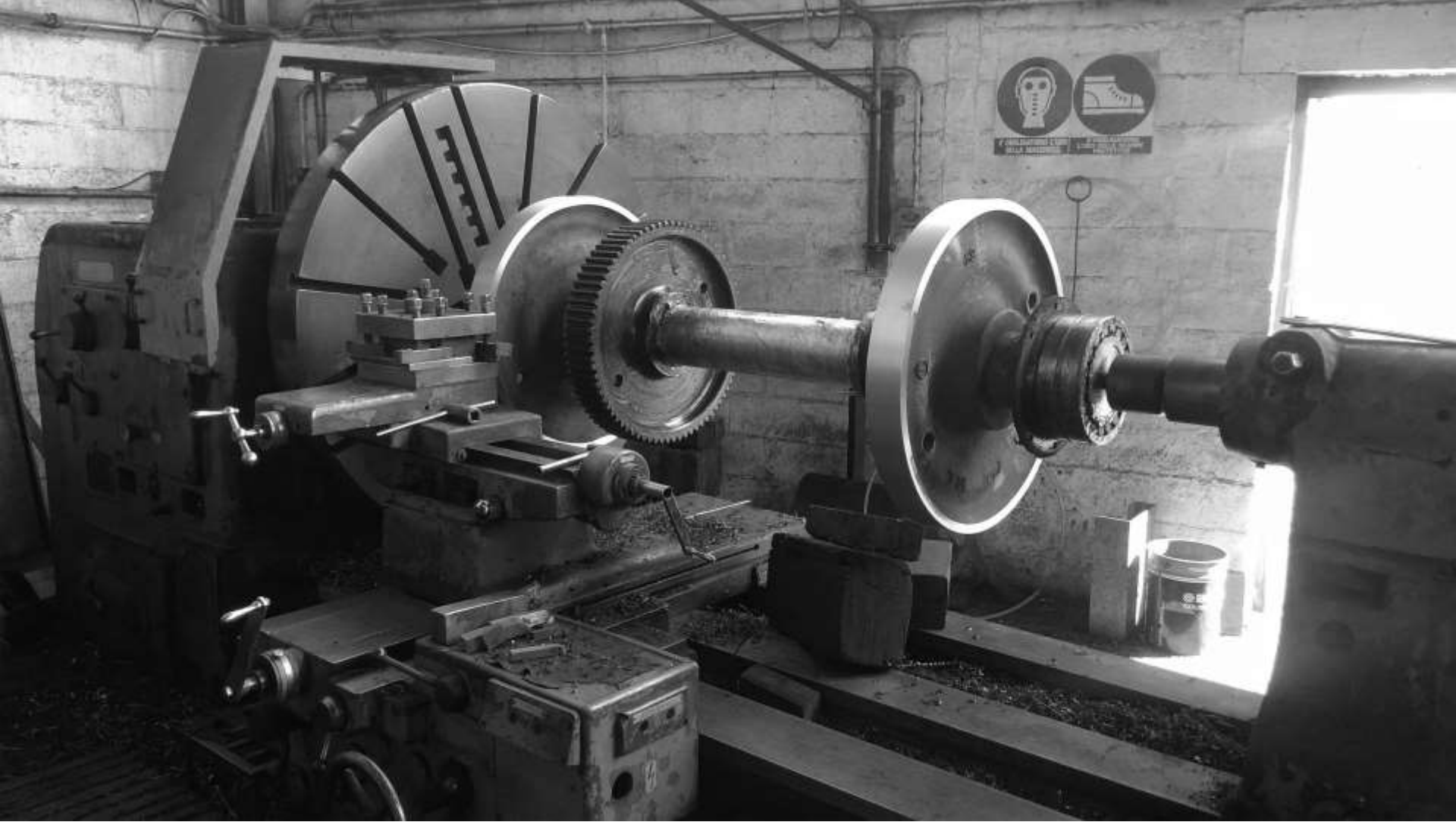
Description	Symbol	Category 2		Category 1
		a	b	
Distance between the internal wheel faces ^a	a_1	$+2^b$ 0		$+2^b$ 0
Difference in distances between the internal face of each wheel and the plane on the journal side defining the corresponding collar bearing surface	$c - c_1$ or $c_1 - c$	≤ 1		≤ 1
Difference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

^a Measurement at 60 mm beneath the top of the flange
^b The tolerances may be changed for special designs of wheelsets

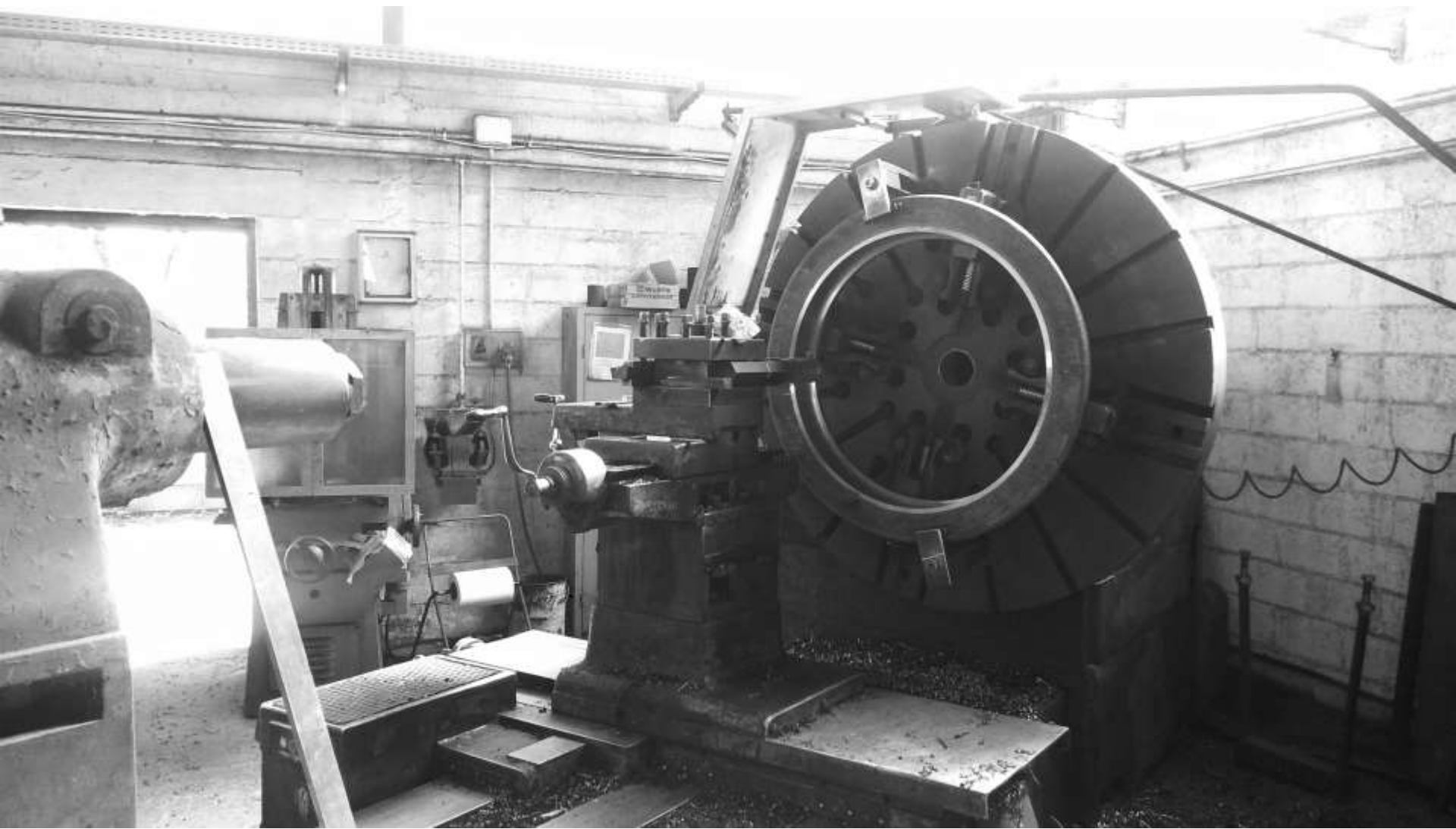
Third World workshop?



Third World workshop?



Third World workshop?



Back to engineering: how were tired wheels designed?

Karl Sachs

Elektrische Triebfahrzeuge

Zweite Auflage

Band 1

Springer-Verlag Wien New York

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COLLECTION · HISTOIRE ET TECHNIQUE ·



HISTOIRE DE LA TRACTION ELECTRIQUE

Tome 2

De 1940 à nos jours

laviedurail