



**Perspektiven mit Stahl | *Perspectives with Steel***

**Plant Capability and Flexibility of Rolling Mills - Response to Customer Demands**

**New Materials and Coatings for Lightweight Construction of the Body in White  
Challenges for Flat Steel Production**

Dr. Franz M. Androsch \*, Dr. Thomas Hebesberger, Dr. Andreas Pichler

\* Head of R&D and Innovation voestalpine



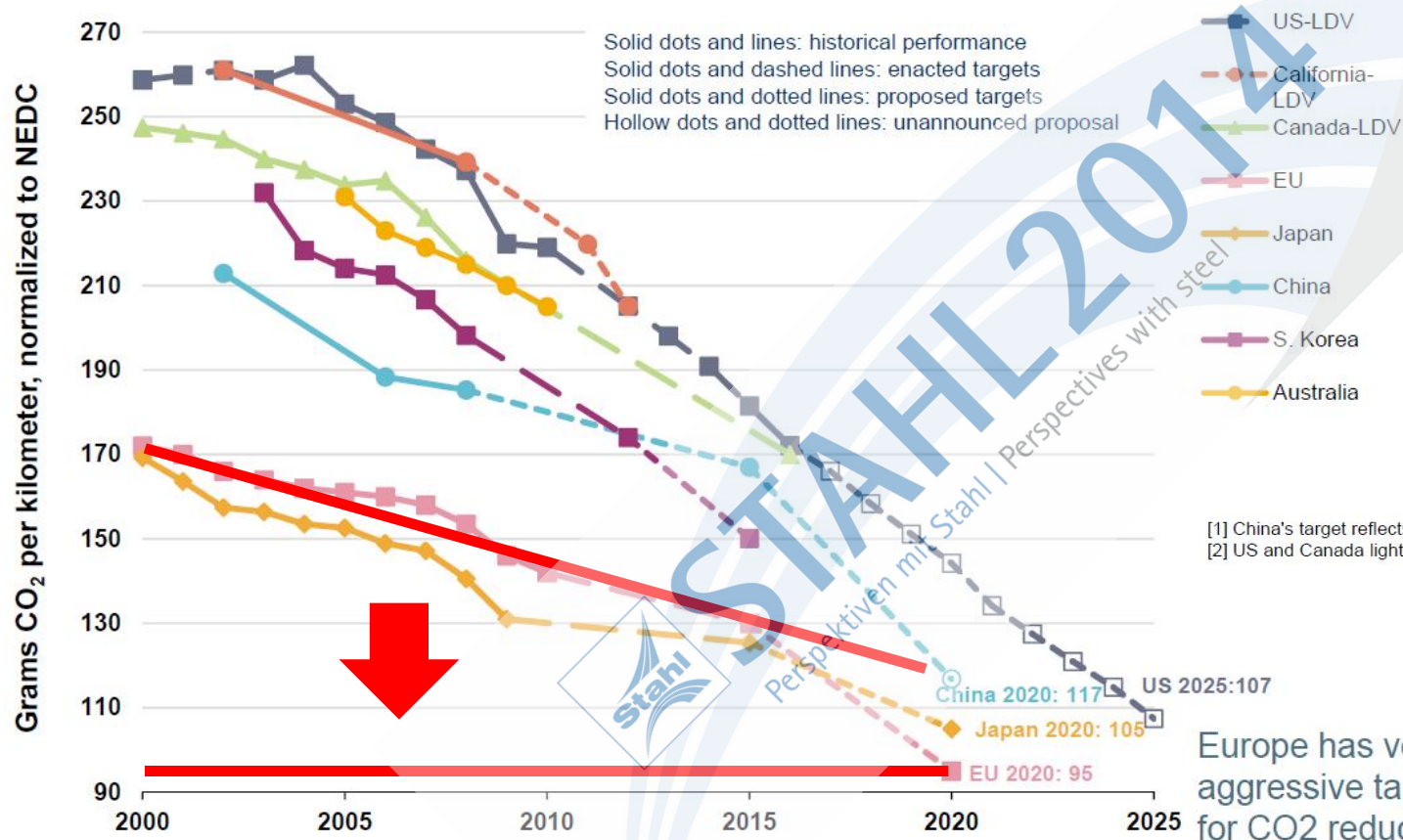
# Main Drivers of the Automotive Industry for Innovation in Flat Steel Production



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# CO<sub>2</sub> Regulations

Global fleet CO<sub>2</sub> emissions performance and current or proposed standards adjusted for the European test cycle



Source: DUCKER WORLDWIDE

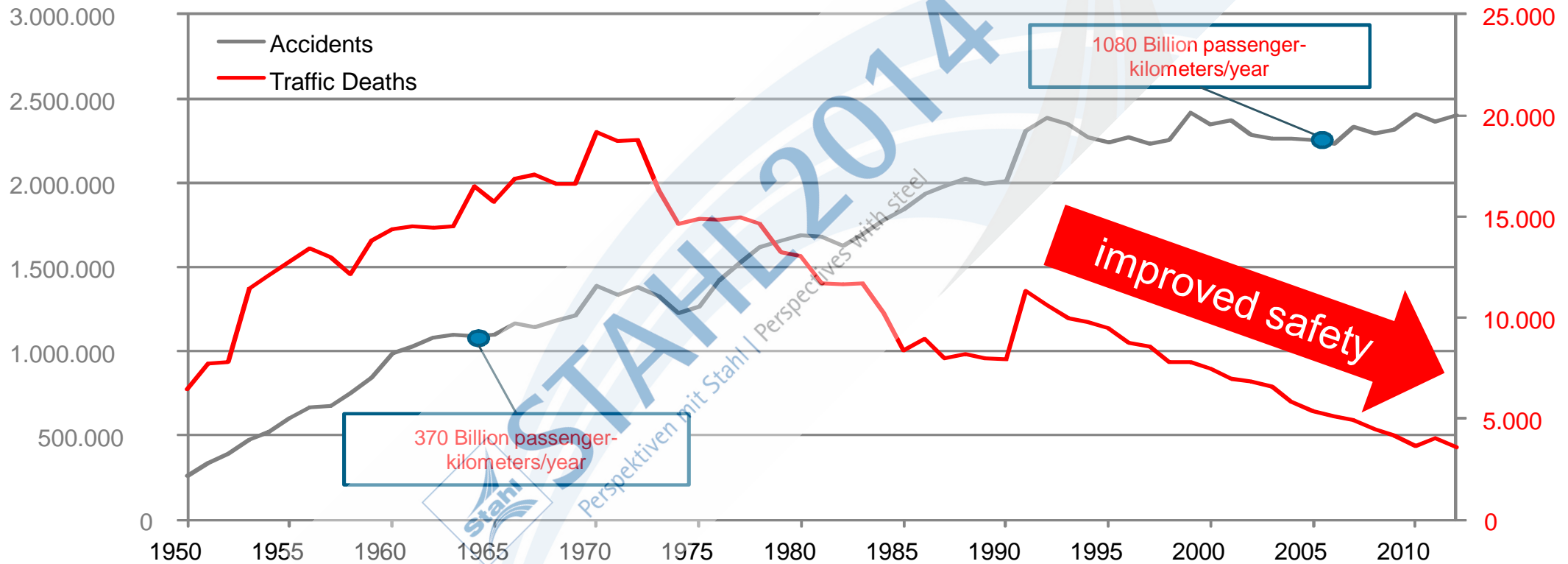
[1] China's target reflects gasoline fleet scenario. If including other fuel types, the target will be lower.  
 [2] US and Canada light-duty vehicles include light-commercial vehicles.

Europe has very aggressive targets for CO<sub>2</sub> reduction



# Crash Safety

## Historic Evolution of the Traffic Deaths in Germany (Time Period 1950 – 2012)





# Solutions from the Steel Industry



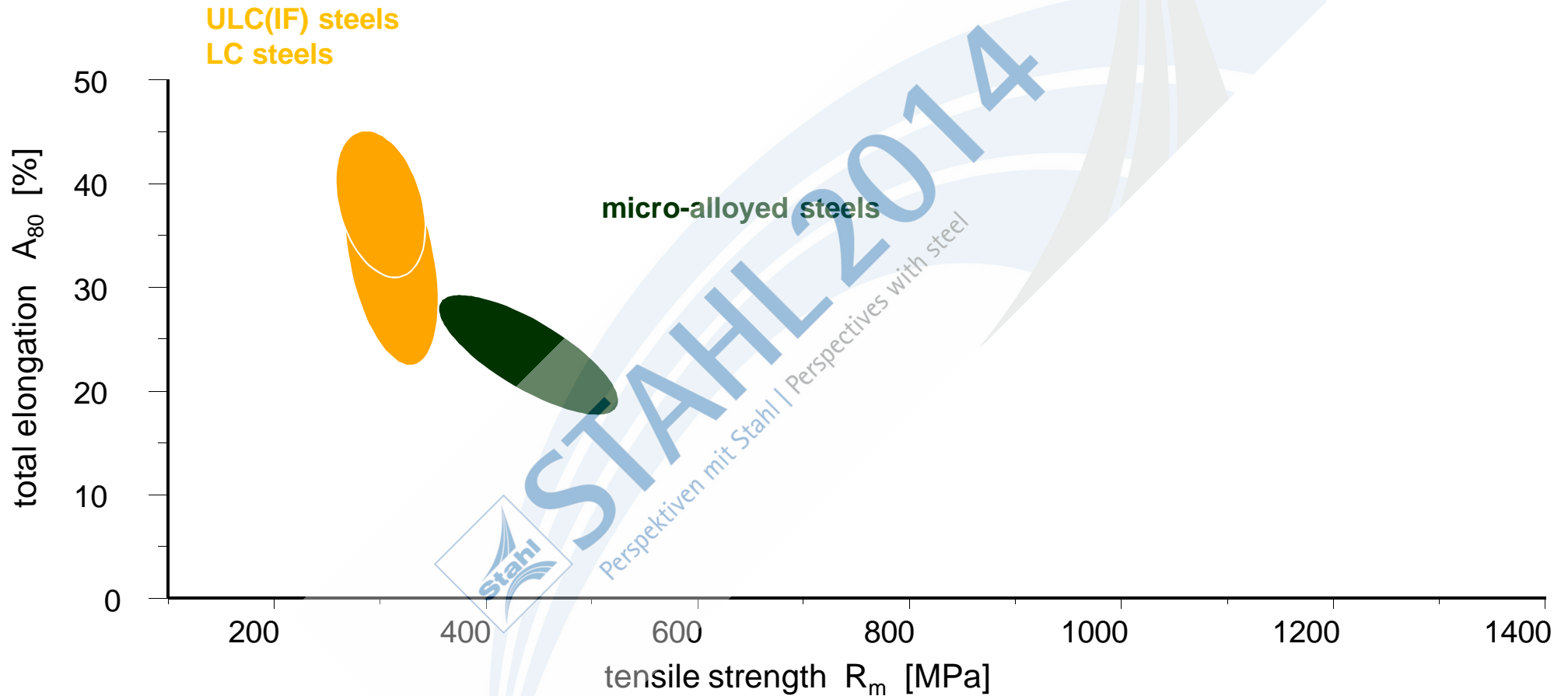
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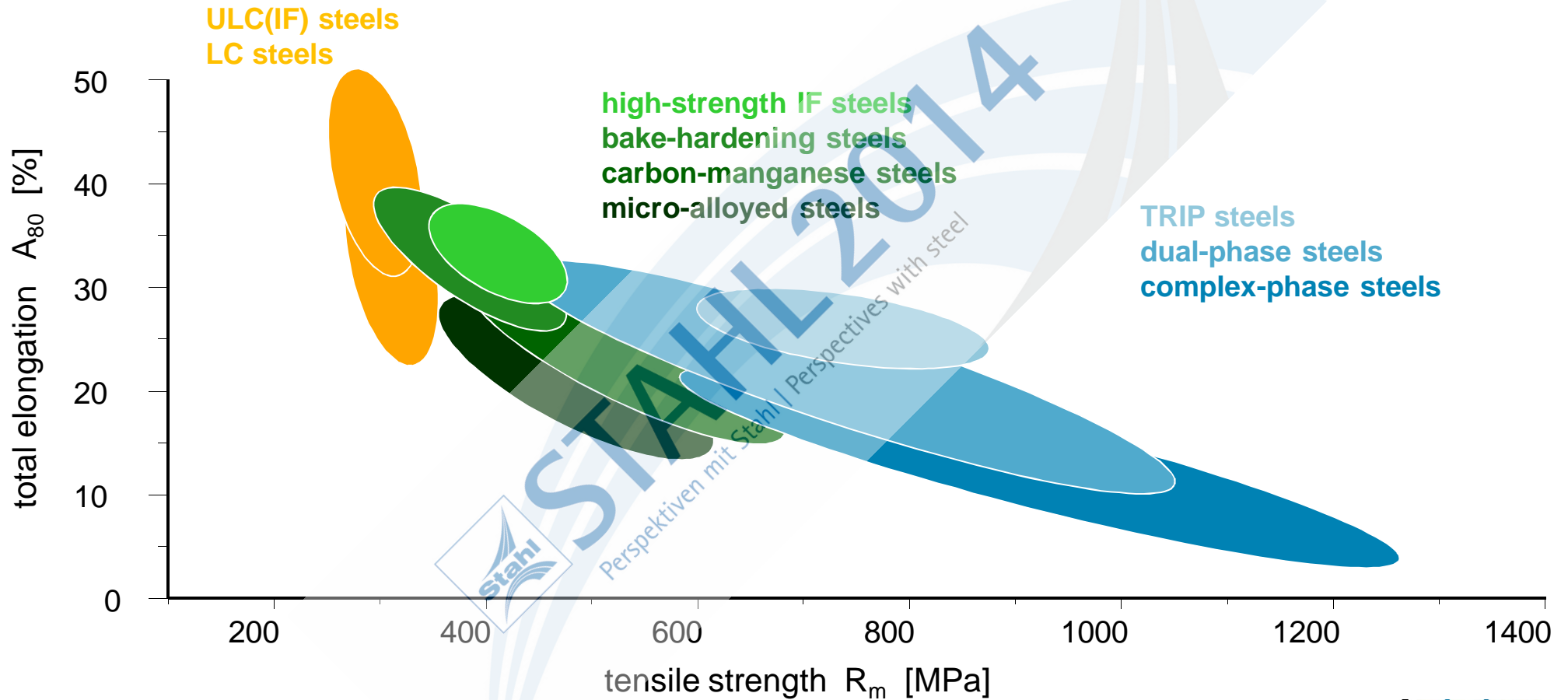
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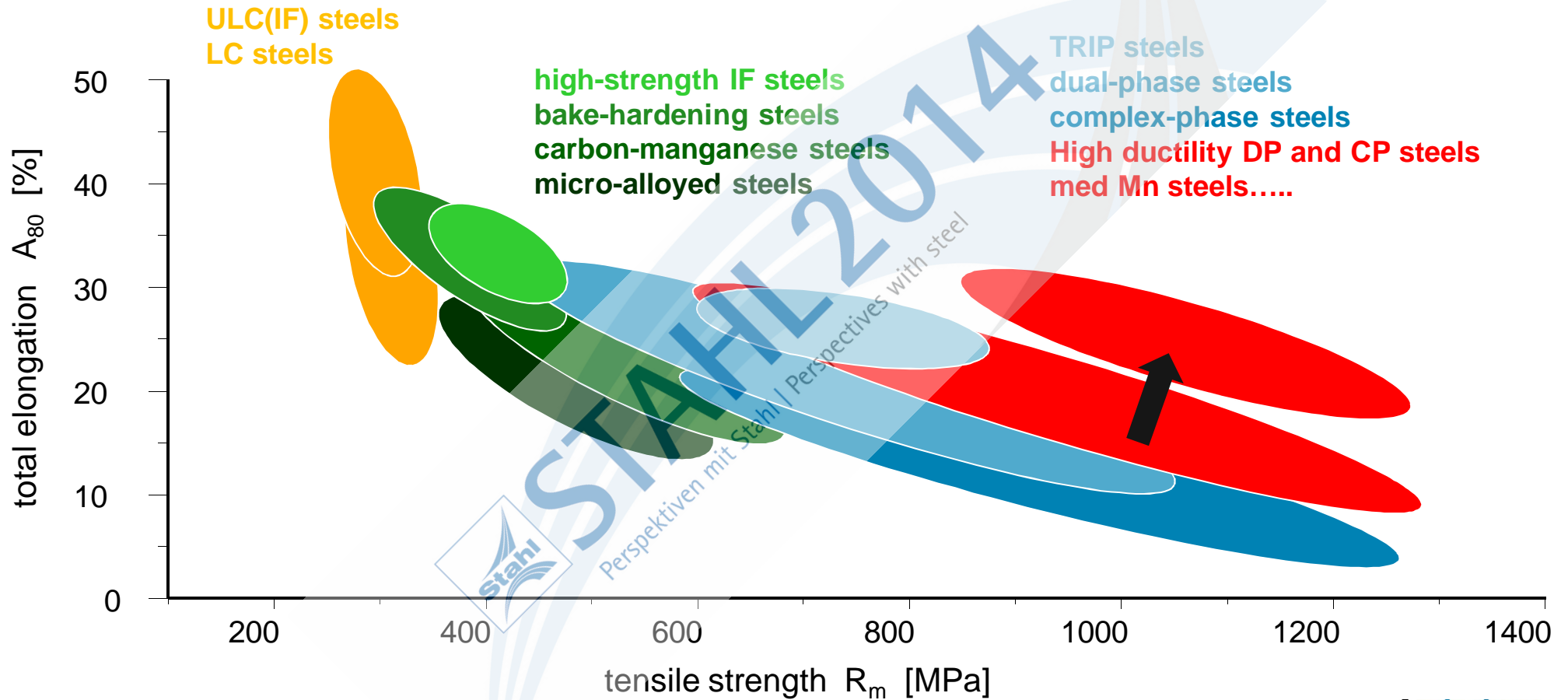
# The Simple World for Cold Rolled Flat Steel until 1990



# The Situation for Cold Rolled Grades Today

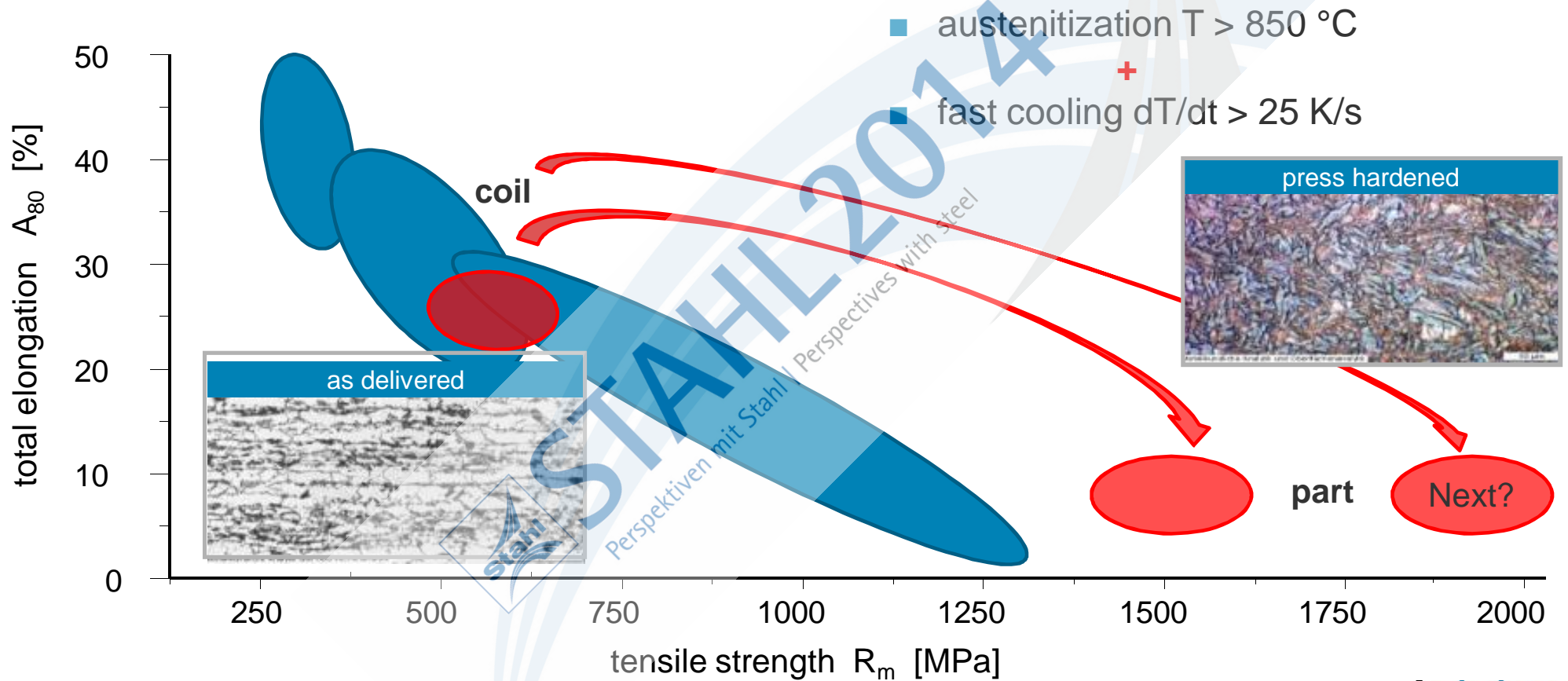


# The Situation for Cold Rolled Grades Tomorrow





# Add to This: Press Hardened Steels



# Combine with Metallic Coatings

(products of voestalpine)

galvanized **GI/Z**

**1973 –**

7-25 µm zinc  
(ca. 0,15% Al)

galvannealed **GA/ZF**

**1990 –**

5-10 µm zinc  
(ca. 10% Fe)

zinc/aluminum/  
magnesium **ZM**

**2013 -**

5 - 10 µm

zinc-nickel **ZNE**

**1986 – 2001**

2-6 µm zinc

electro-  
galvanized **EG/ZE**

**1990 –**

2,5-10 µm zinc

hot dip galvanizing  
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electrolytic galvanizing

Next ?



# What do all these developments mean for production?



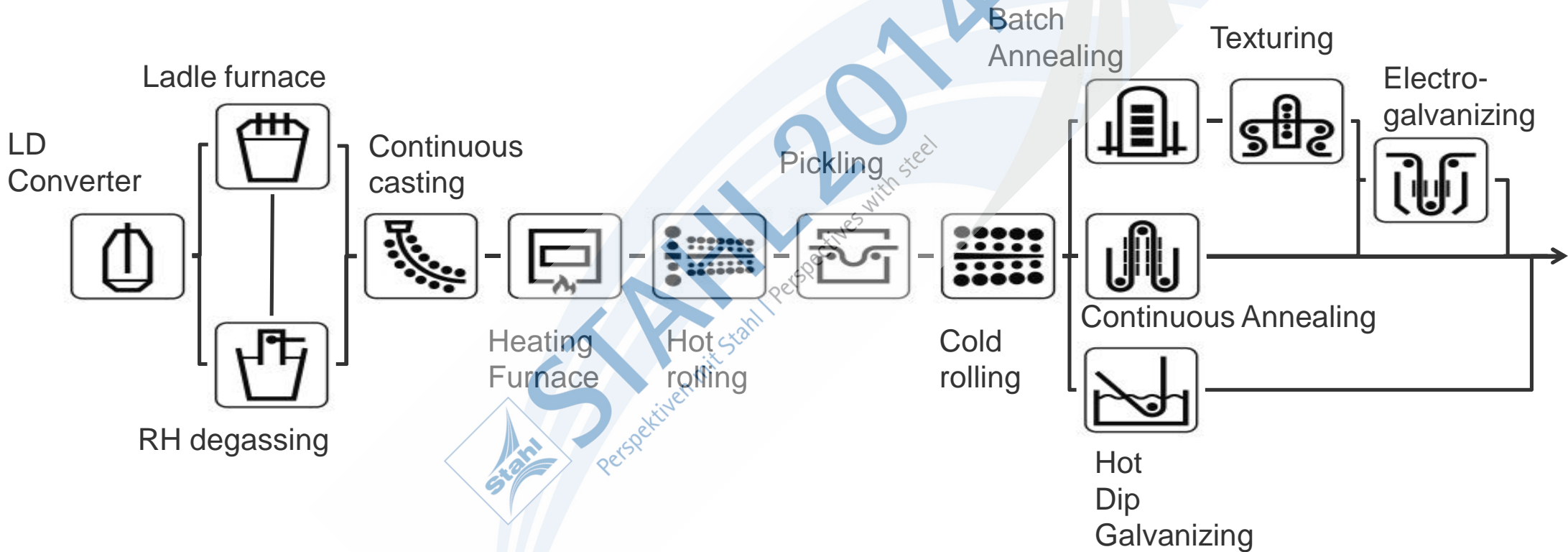
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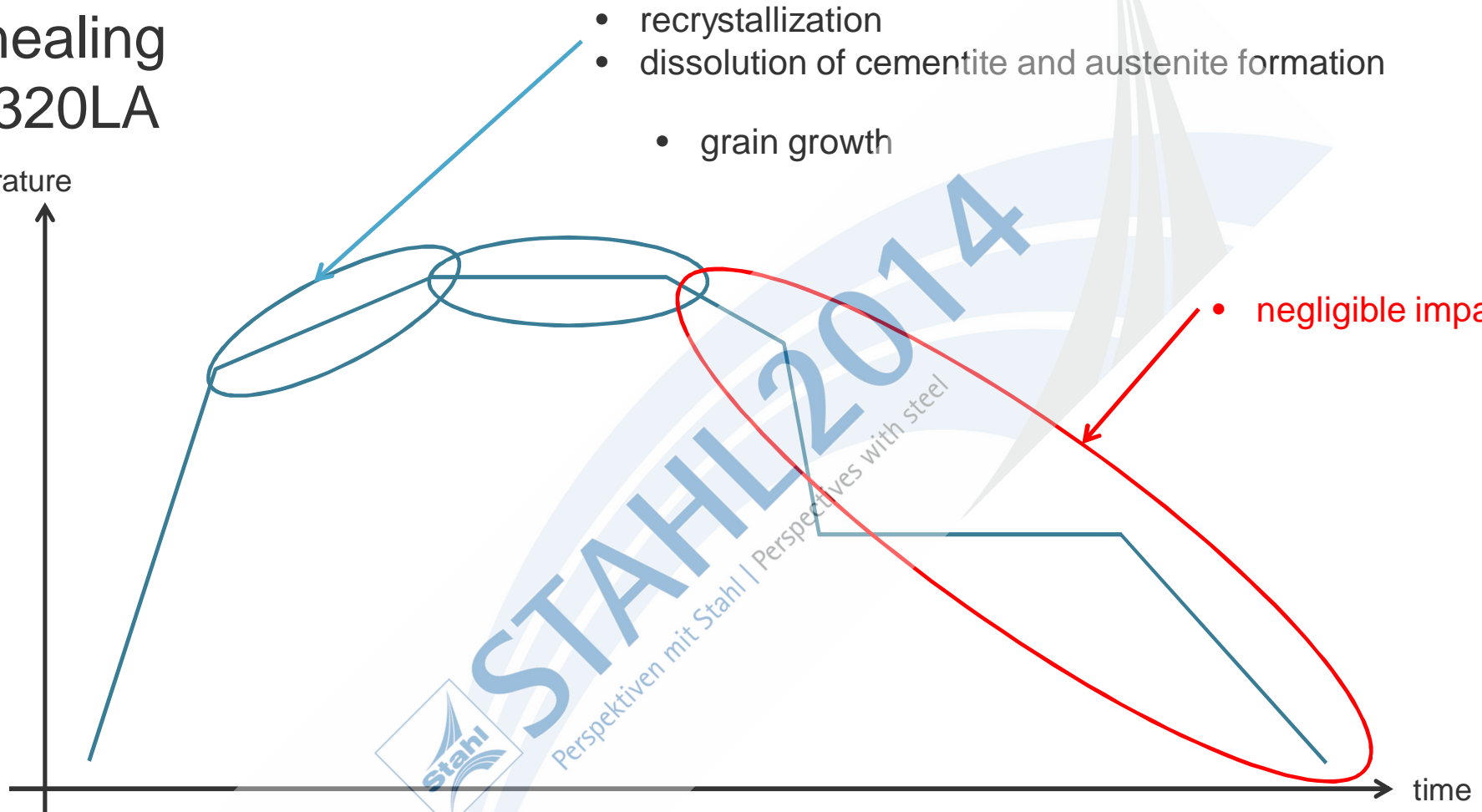
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# Typical Processing of Thin Sheet Grades (automotive relevant)



# Annealing CR320LA

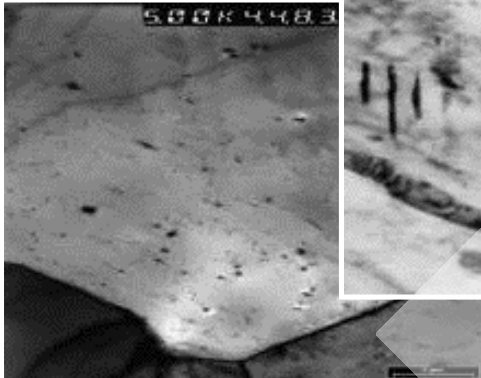
temperature



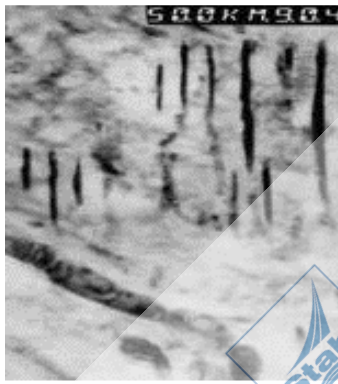
# High-tech enables

From low ...

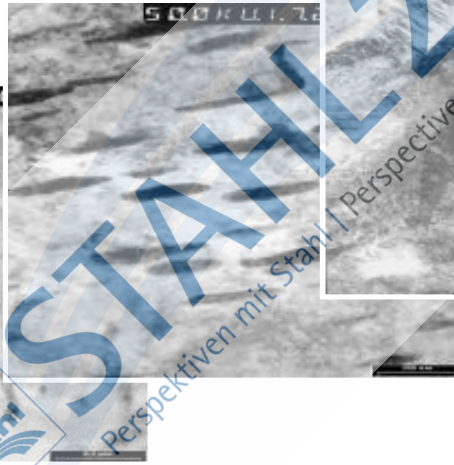
Ferrit



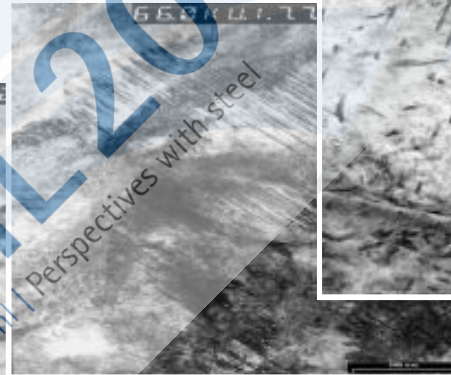
Perlit



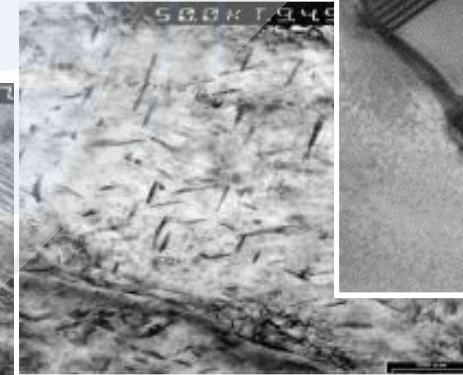
Bainit



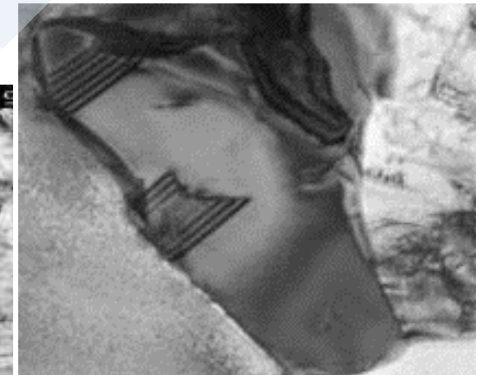
Martensit



tempered  
Martensit



Austenit

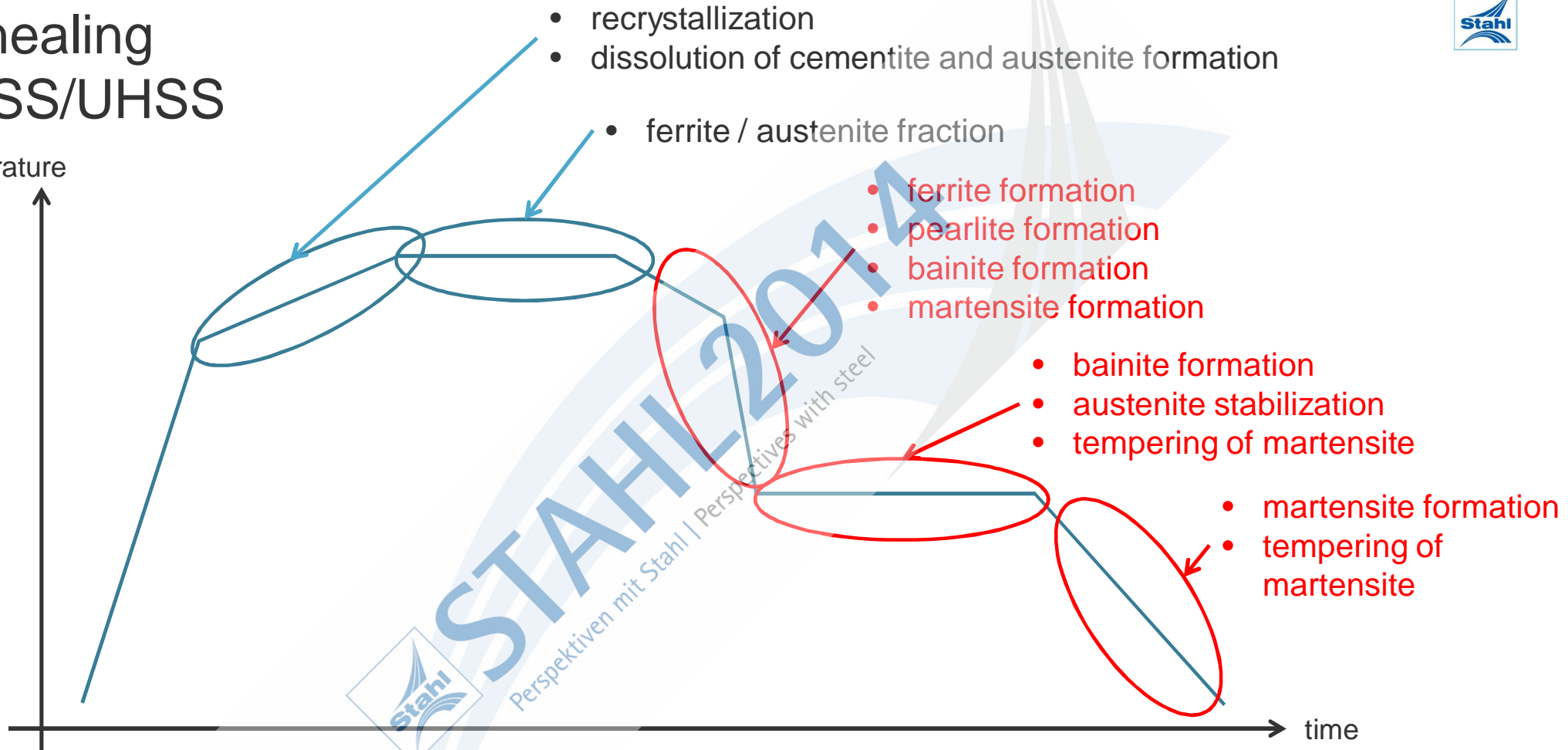


... to highest strength

# Annealing AHSS/UHSS



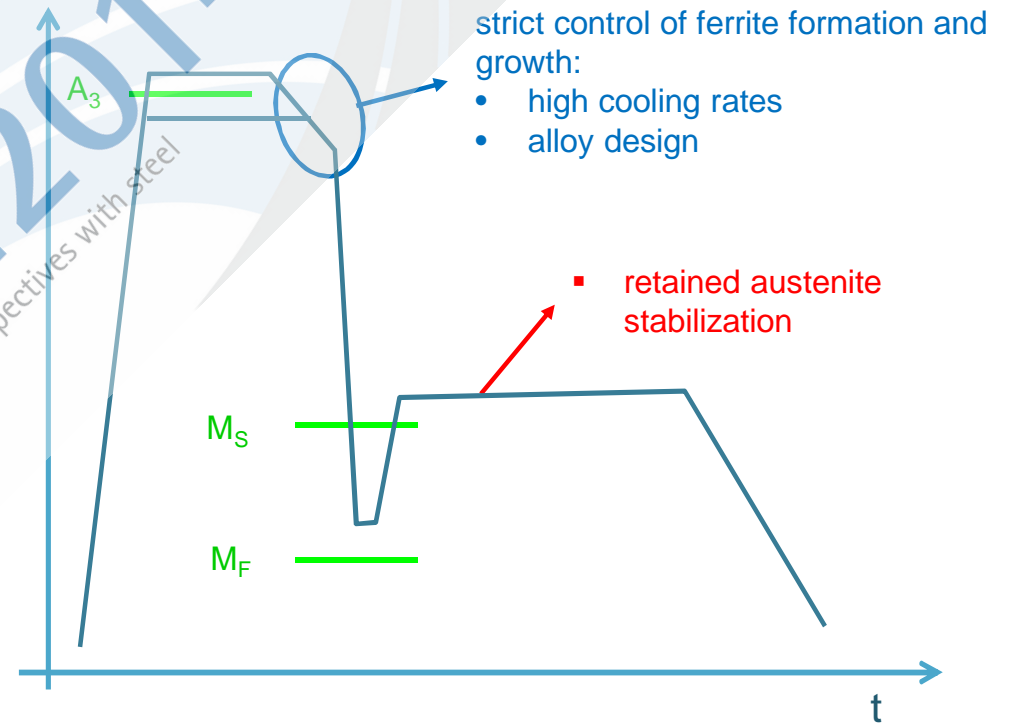
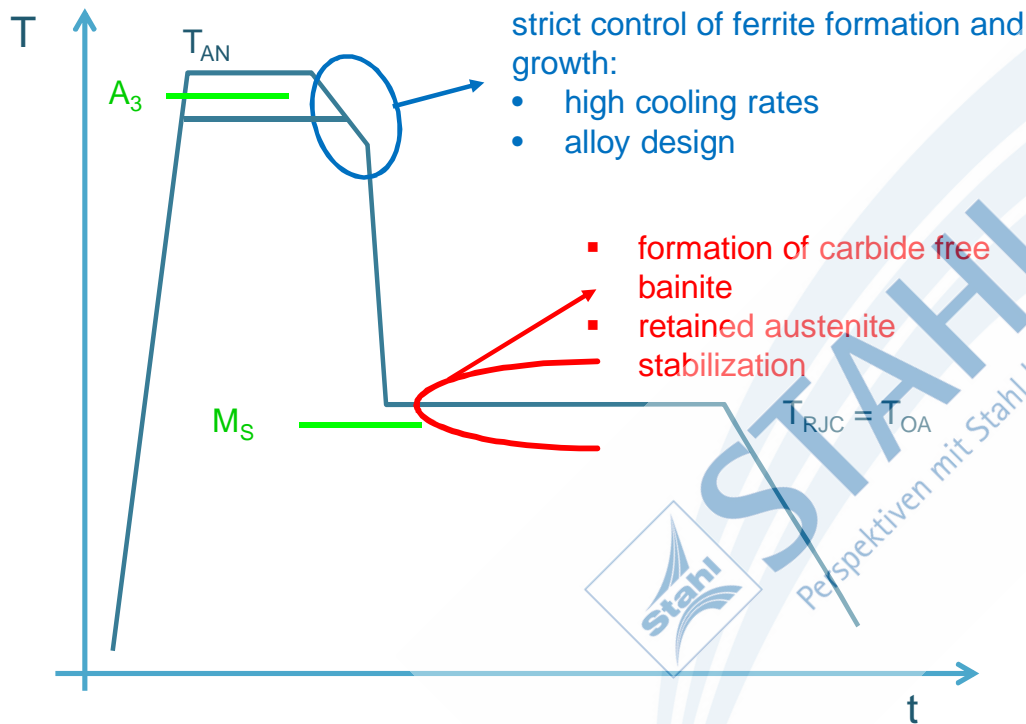
temperature





# Processing of Retained Austenite Types

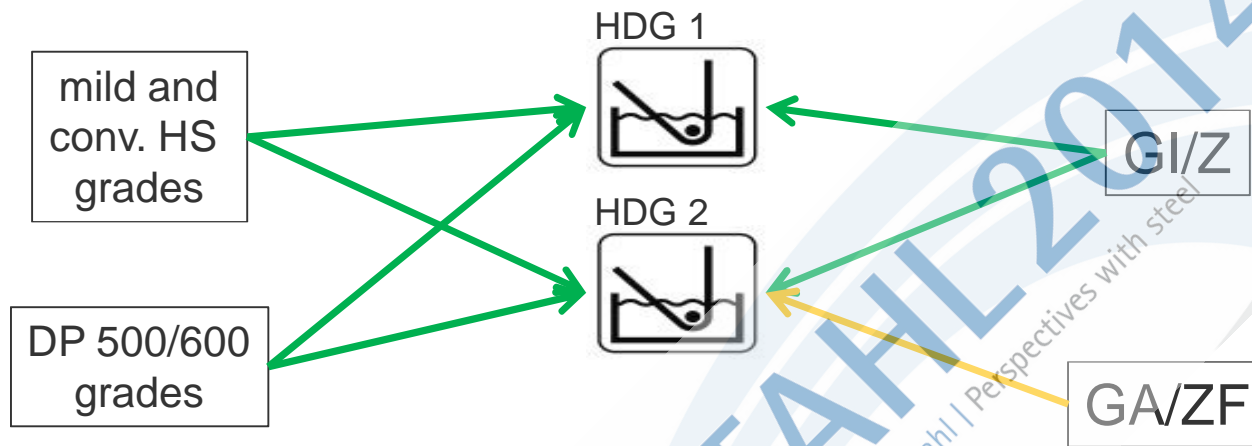
## TBF (TRIP with Bainitic Ferrite) versus QP (Quench and Partitioning)





# HDG Lines at voestalpine until ~2000

## Grades / Coating / Processing Lines

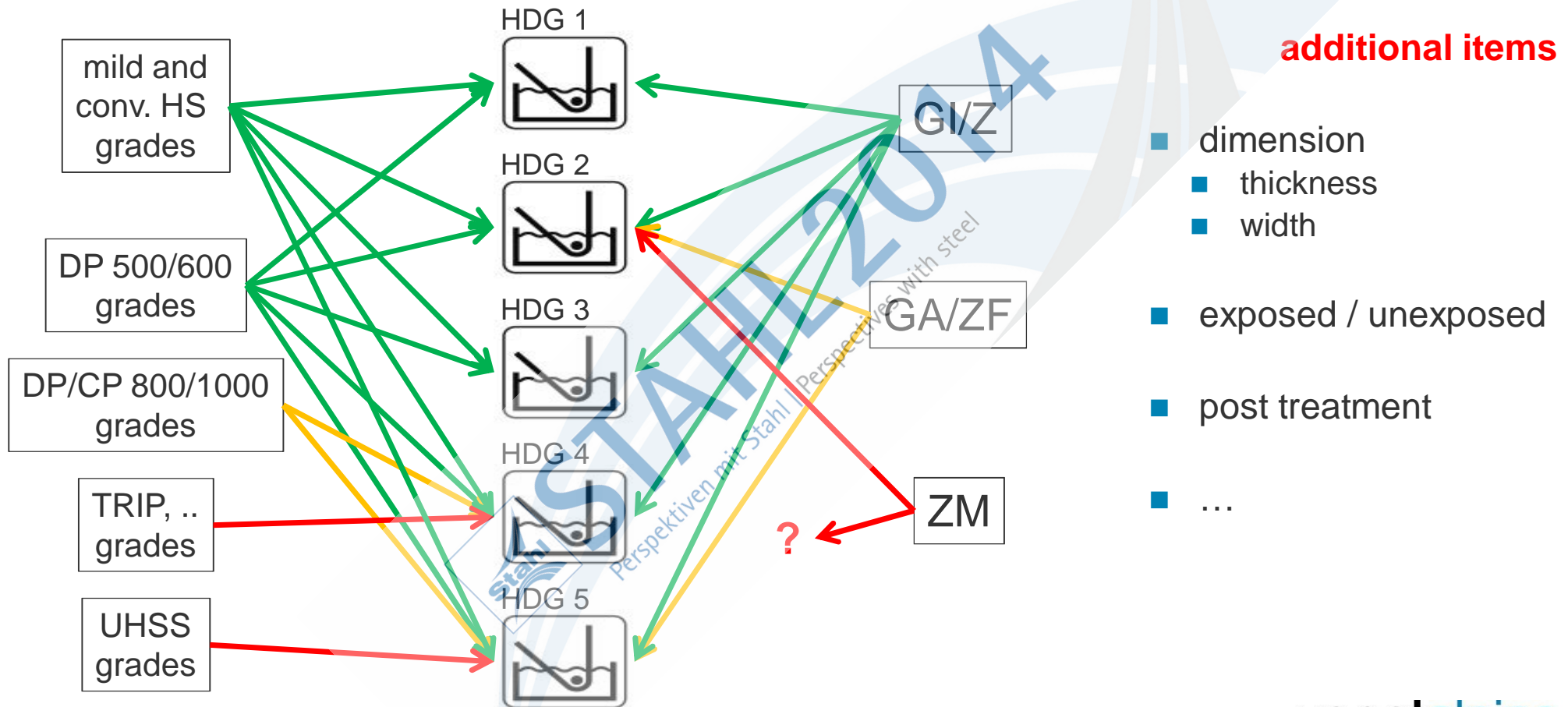


### additional items

- dimension
- thickness
- width
  
- exposed / unexposed
  
- post treatment
  
- ...

# HDG Lines at voestalpine 2014

## Grades / Coating / Processing Lines





# How to Handle these Challenges?



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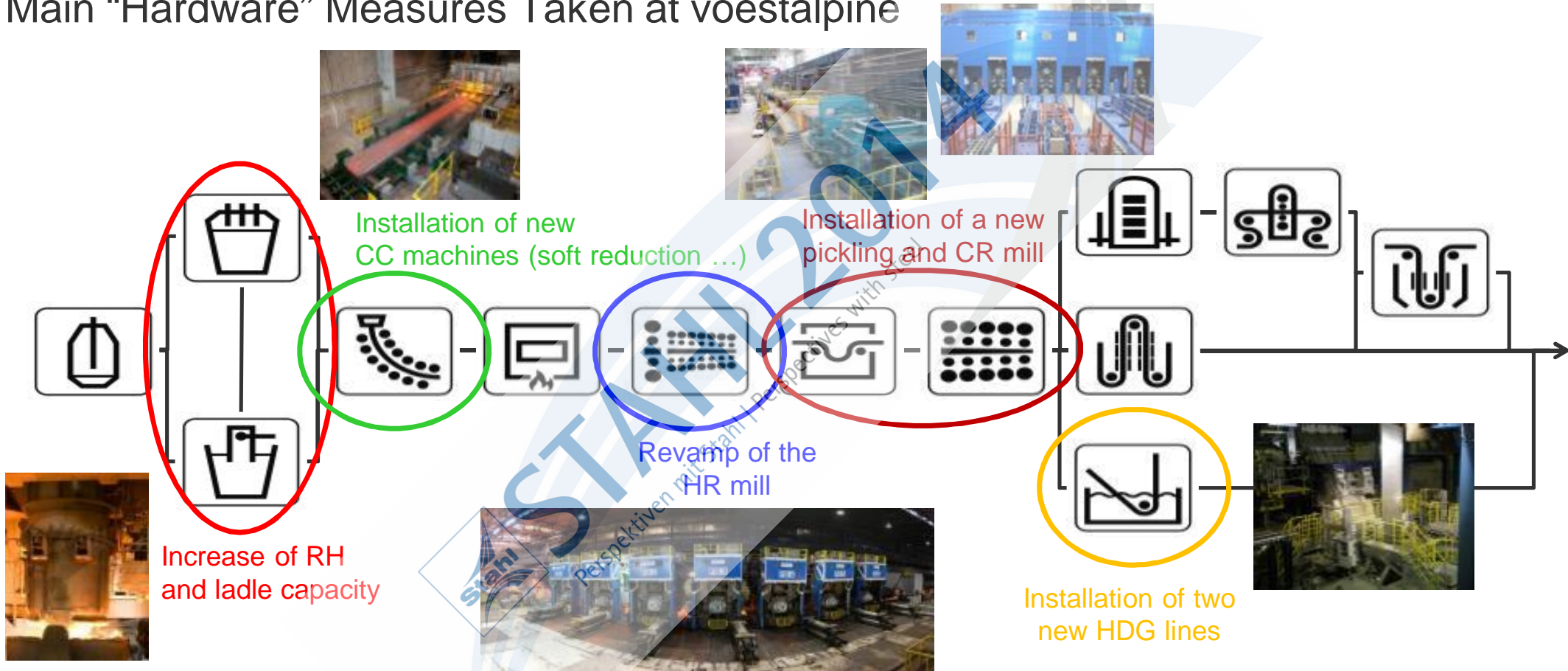
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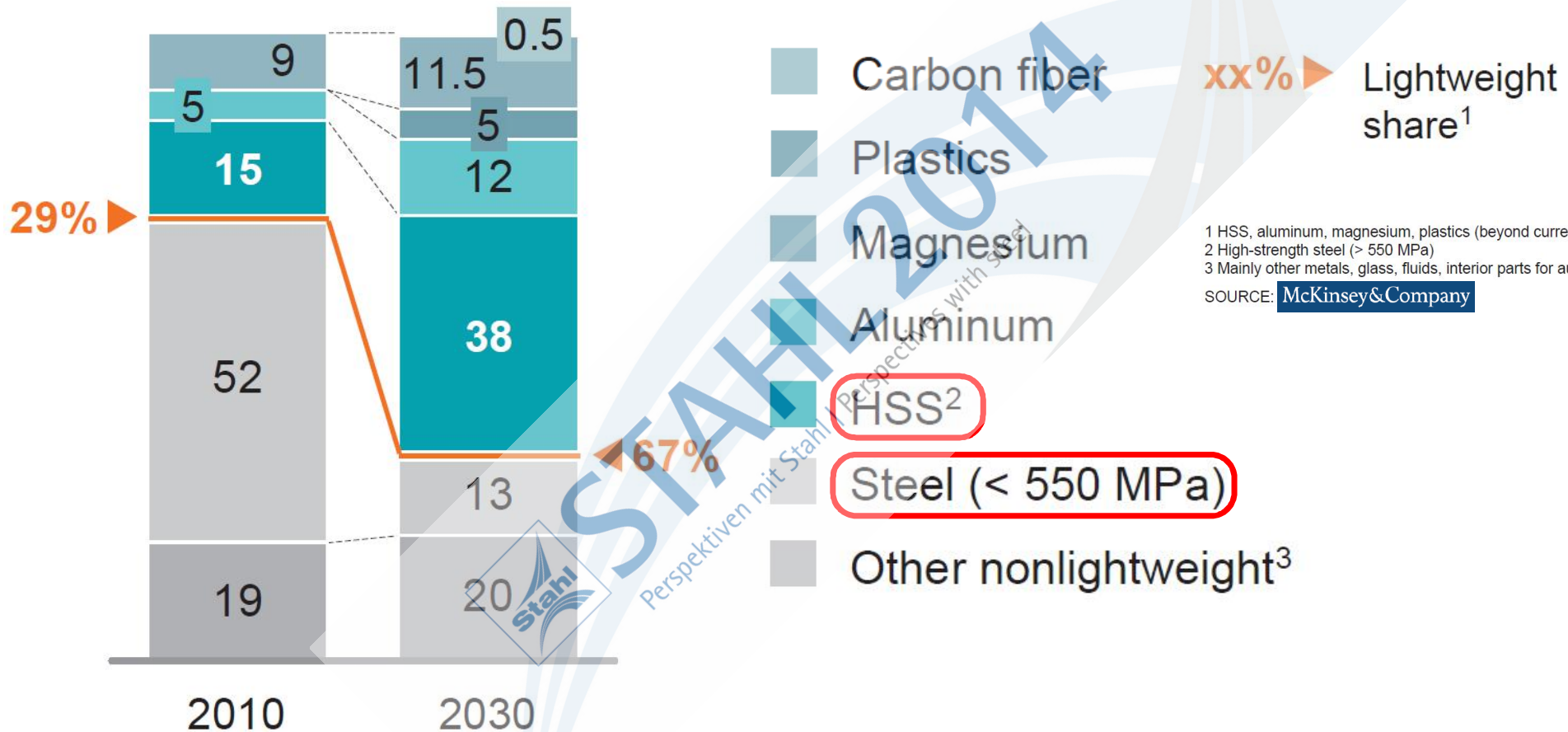
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# Investment in New Lines or Revamping is Necessary

## Main "Hardware" Measures Taken at voestalpine



# Forecast: Material Split for the Automotive Industry



1 HSS, aluminum, magnesium, plastics (beyond current use), glass/carbon fiber  
 2 High-strength steel (> 550 MPa)  
 3 Mainly other metals, glass, fluids, interior parts for automotive, etc.  
 SOURCE: McKinsey&Company



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**THANK YOU FOR YOUR ATTENTION**

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