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CAPITAL MARKET DAY, OCTOBER 6TH, 2015

# ACHIEVEMENTS AND POTENTIALS IN LIGHTWEIGHT AND NON- AUTOMOTIVE APPLICATIONS

Dr. Martin Habert

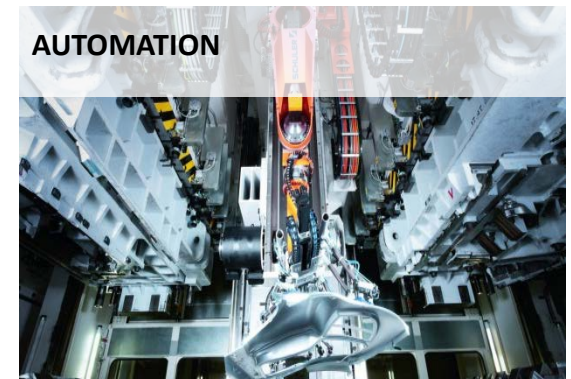
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# ACHIEVEMENTS AND POTENTIALS IN LIGHTWEIGHT AND NON-AUTOMOTIVE APPLICATIONS

- 
- Division Hydraulic
  - Non-automotive applications
  - Lightweight automotive solutions

# SCHULER GROUP STRUCTURE

## 6 DIVISIONS WITH GLOBAL RESPONSIBILITIES



# HYDRAULIC DIVISION

## Facts and figures

- **Technological and global market leader**  
in hydraulic presses and forming systems
- **History:** Schuler, Müller-Weingarten, Hydrap
- **Products:** Hydraulic presses and complete systems for cold or hot metal forming, forging and composites production
- **Applications:**  
Automotive (ca. 55 %), Railway (ca. 25 %),  
Aerospace, Heat Exchangers, General industry
- **Key Technologies:**  
Hot Stamping  
Railway wheels  
Hydroforming  
Titanium Forming  
Fineblanking

### Hydraulic division 2015

<b>Sales</b>	ca. 150 Mio. €
<b>Order Entry</b>	ca. 160 Mio. €
<b>Order Backlog</b>	ca. 170 Mio. €
<b>Employees</b>	165
<b>Markets</b>	Europe ca. 30% Asia ca. 30% Americas ca. 30% Russia ca. 10%

# TRADITIONAL APPLICATIONS

## HYDRAULIC PRESS LINE @ JAGUAR, 2001



# WHAT REALLY COUNTS HYDRAULIC PRESS LINE @ TODAY

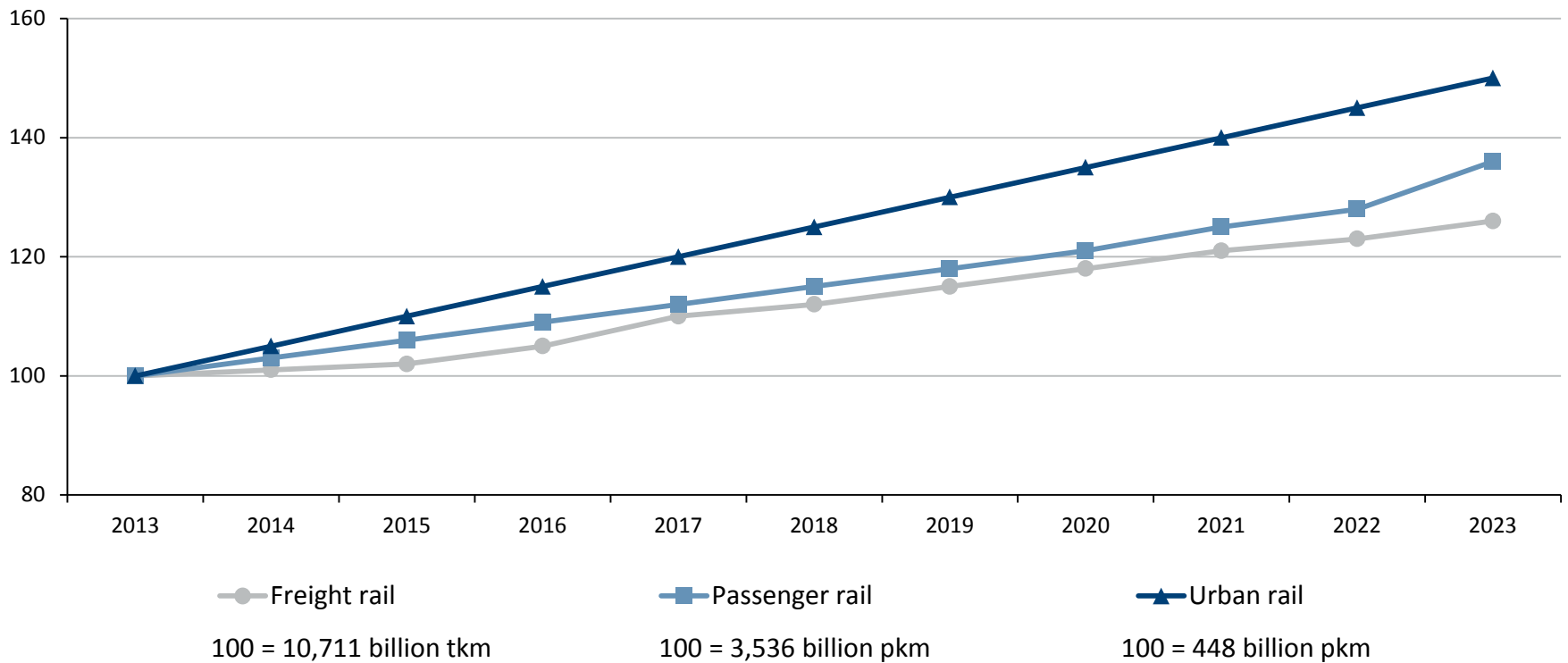


*Hydraulic presses:  
...very high press forces  
...at any position  
...as long as necessary*

# NON-AUTOMOTIVE APPLICATIONS

# GROWTH MARKET RAILWAY

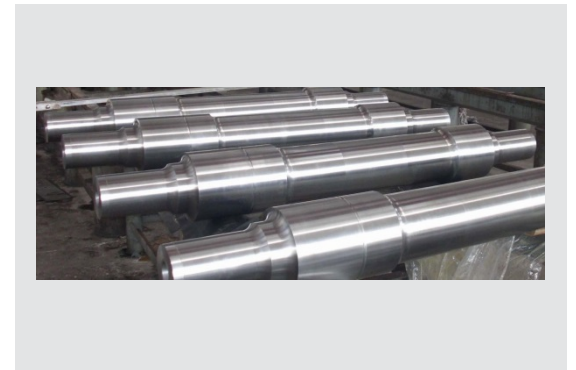
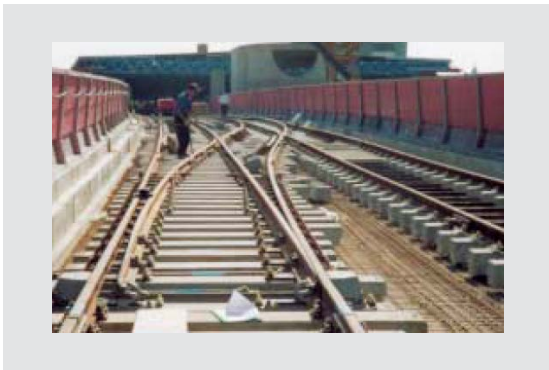
**Worldwide rail transport performance 2013-2023**  
[Index 100=2013]





# NON-AUTOMOTIVE APPLICATIONS

## RAILWAY



# SYSTEMS FOR WHEELS FORMING SEQUENCE

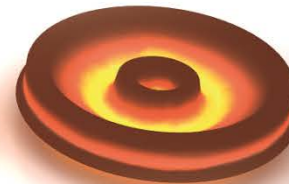
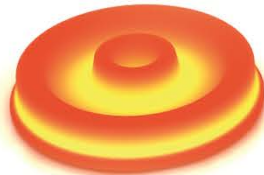


**Upsetting**

**Preforming**

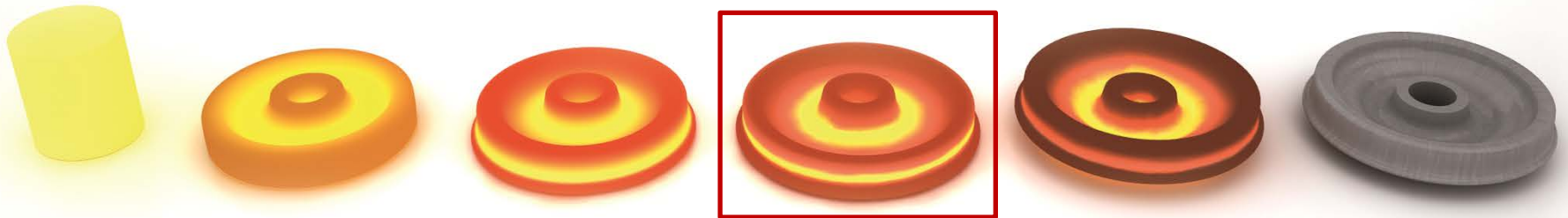


**Dishing**



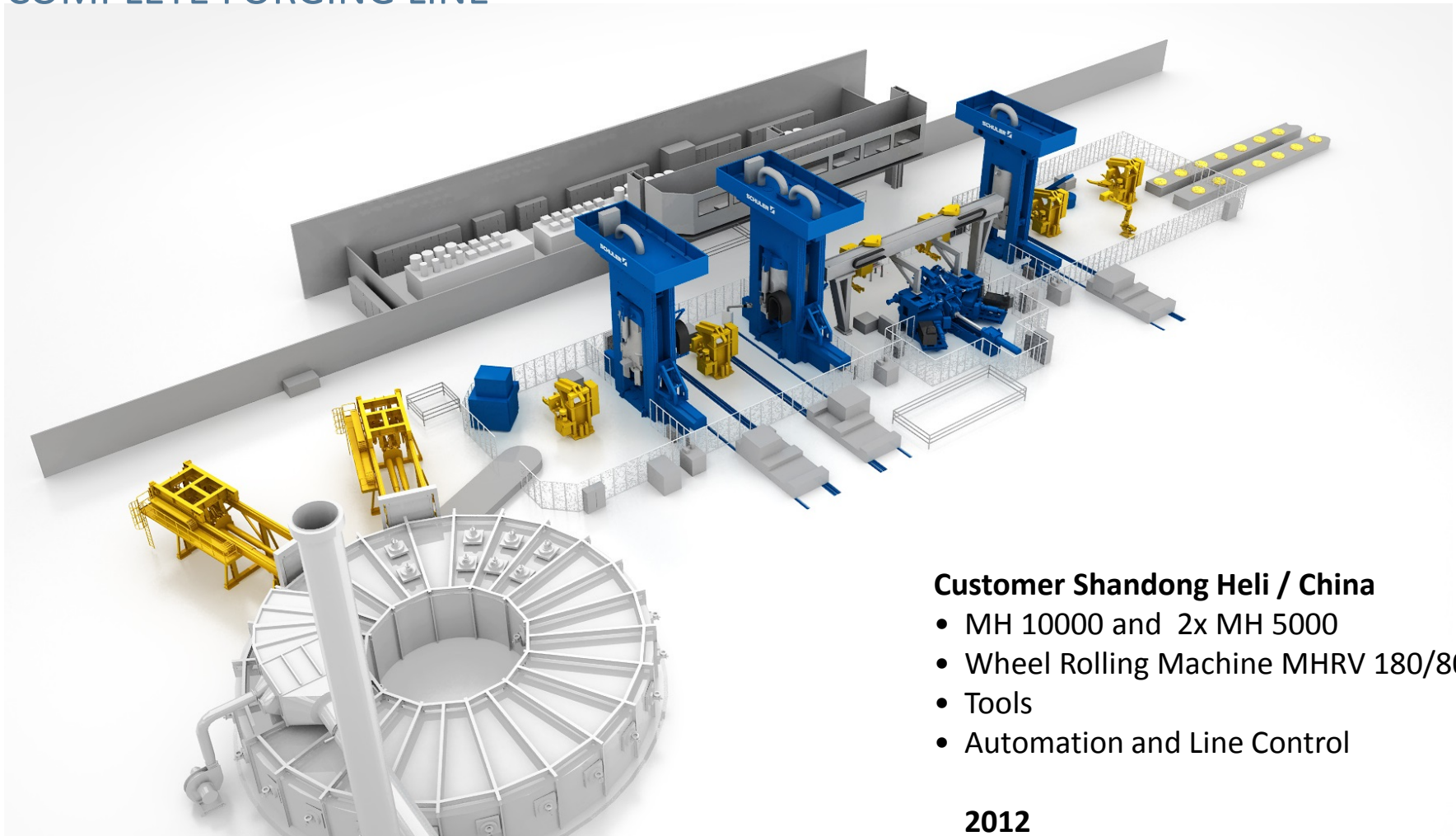
## SYSTEMS FOR WHEELS

### CLOSING THE GAP – NEW SCHULER WHEEL ROLLING MACHINE



# SYSTEMS FOR WHEELS

## COMPLETE FORGING LINE

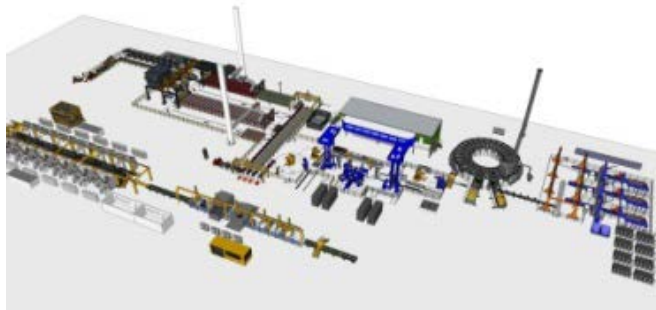


### Customer Shandong Heli / China

- MH 10000 and 2x MH 5000
- Wheel Rolling Machine MHRV 180/80
- Tools
- Automation and Line Control

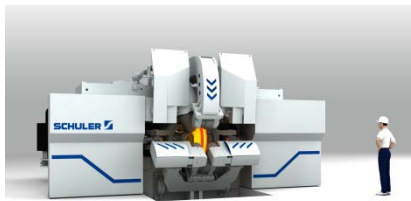
**2012**

# NEW PRODUCTS CREATE NEW BUSINESS



**4** **CUSTOMER KARDEMIR , TURKEY 2013**

- Sawing lines for billets
- Furnaces (Andritz Metals)
- Hydraulic forging presses MH 10000 & MH 5000
- Wheel roller MHRV 180/80
- Dies
- Machining equipment (FFG)
- Automation, line control, auxiliary equipment



**3** **CUSTOMER SHANDONG HELI , CHINA 2011**

- Hydraulic forging presses MH 10000 & 2 x MH 5000
- Wheel roller MHRV 180/80
- Dies & automation & auxiliary equipment



**2** **CUSTOMER MWL, BRAZIL 2009**

- Hydraulic forging press MH 3000



**1** **CUSTOMER CAF, SPAIN 2007**

- Hydraulic forging presses MH 10000 & MH 5000

1 | € 9.200.000.-

2 | € 3.200.000.-

3 | € 32.600.000.-

4 | € 92.000.000.-

5 | € 52.500.000.-

**NEW ORDER 2015  
SCHULER & ANDRITZ METALS**

- Hydraulic presses
- Wheel roller
- Dies, autom., aux. equipm  
Schuler: € 36.500.000-
- Rotary furnace and heat treatment (Andritz Metals)  
Andritz: € 16.000.000.-

Order Intake Mio. €

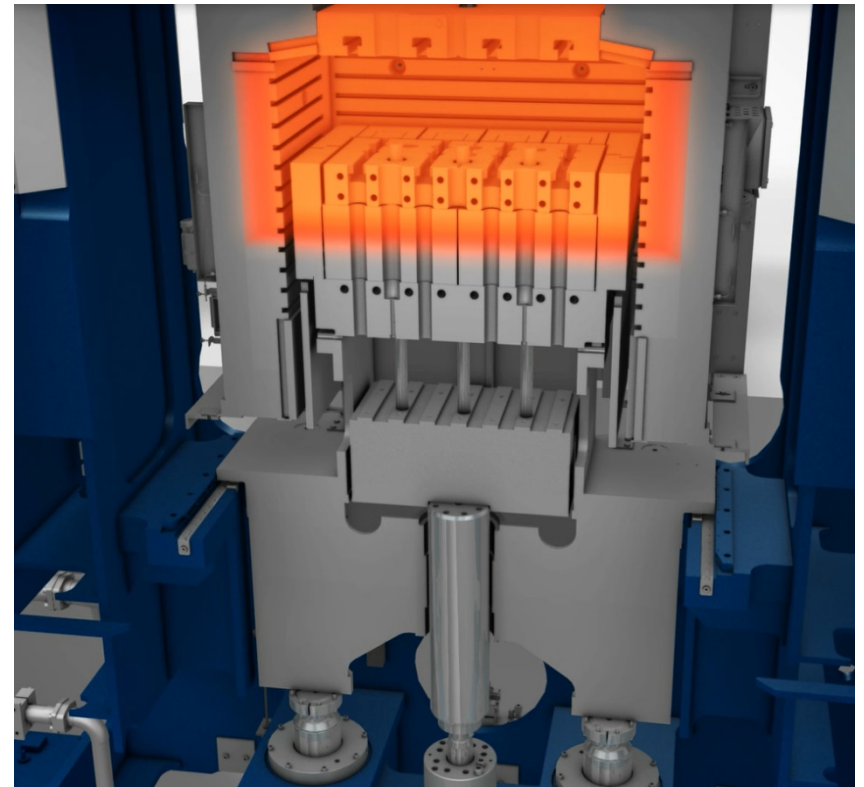
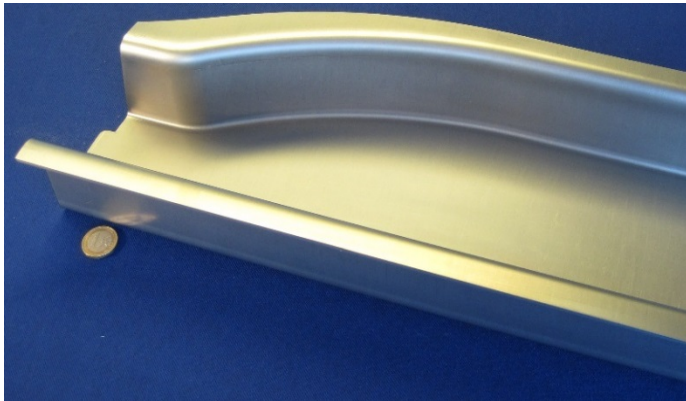
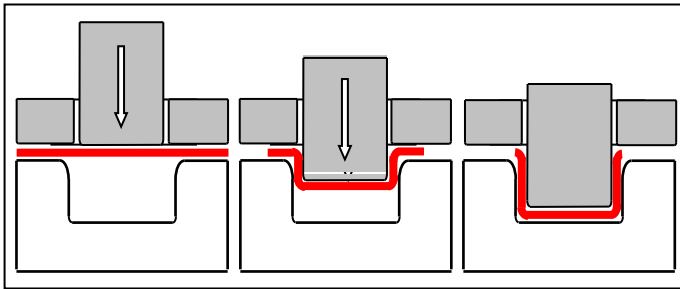


# SCHULER AEROSPACE

## TITANIUM AND SPECIAL METALS HOT FORMING



# HOT DEEP DRAWING



# LIGHTWEIGHT AUTOMOTIVE SOLUTIONS

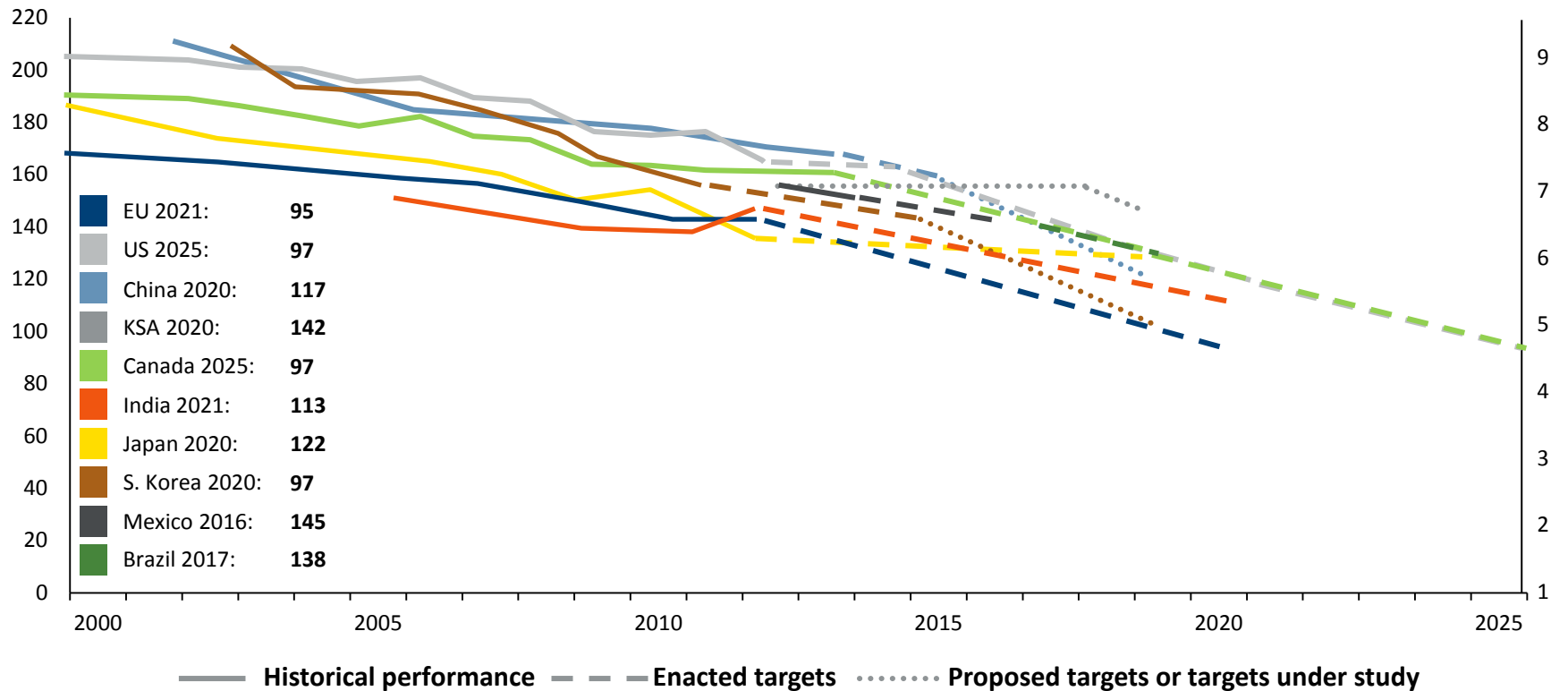


# AUTOMOTIVE LIGHTWEIGHT DESIGN MOTIVATION

## LIGHT-DUTY VEHICLE STANDARDS ON CO<sub>2</sub> EMISSIONS

Grams CO<sub>2</sub> per km, normalized to NEDC

Liters per 100 km (gasoline equivalent)



# AUTOMOTIVE LIGHT WEIGHT DESIGN MOTIVATION

## INFLUENCE OF THE WEIGHT TO FUEL CONSUMPTION AND PERFORMANCE



### Rolling resistance

$$F_R = k \times m \times g \times \cos \alpha$$

### Gradient resistance:

$$F_G = m \times g \times \sin \alpha$$

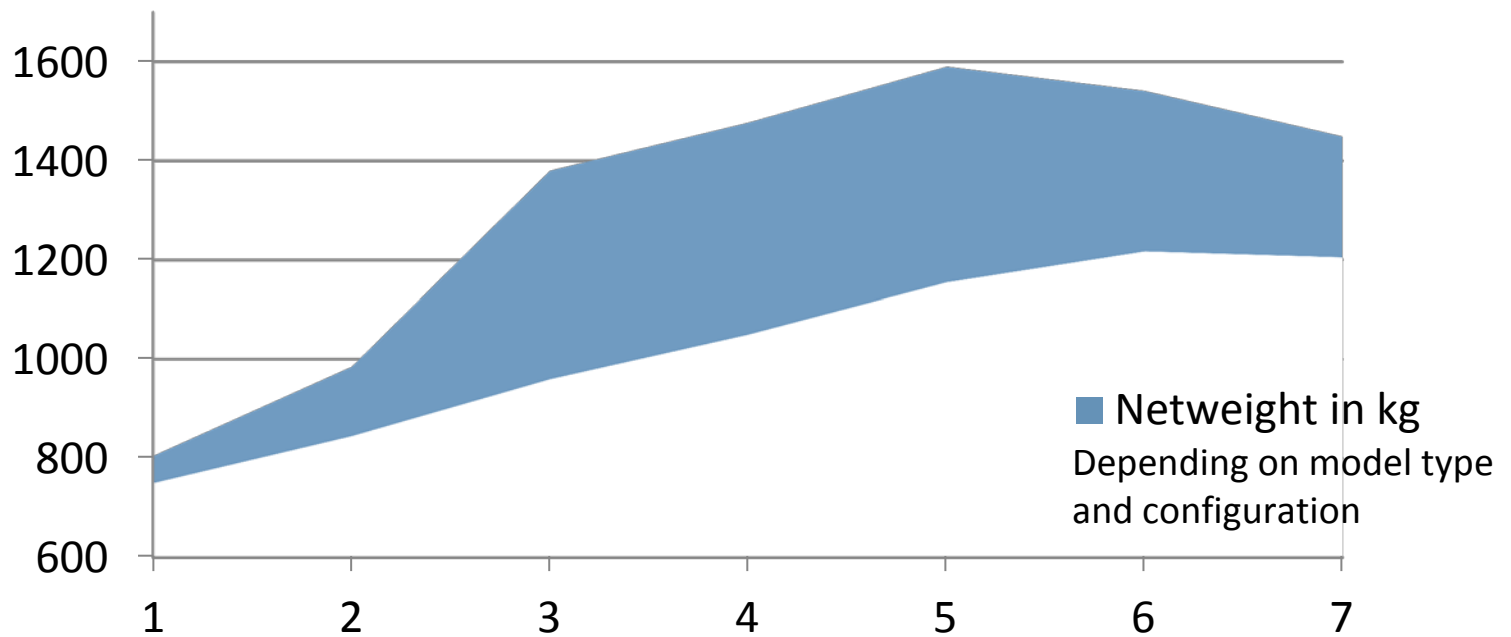
### Acceleration resistance

$$F_A = k \times m \times a$$

Source: BMWn

# AUTOMOTIVE LIGHT WEIGHT DESIGN - MOTIVATION

## NETWEIGHT OF THE GOLF (1974-2013)



# AUTOMOTIVE LIGHT WEIGHT DESIGN

## CLEVER LIGHT WEIGHT DESIGN

- The multi-material body in white combines different components of light weight metals:
  - High-strength steels
  - Cold and hotformed steels
  - Aluminium
  - Magnesium
  - Carbon fiber reinforces plastics
- Less use of soft deep drawing steels
- Material mix increases the complexity in the joining technology



### THE DESIGN CONCEPT OF THE HYBRID CONSTRUCTION:

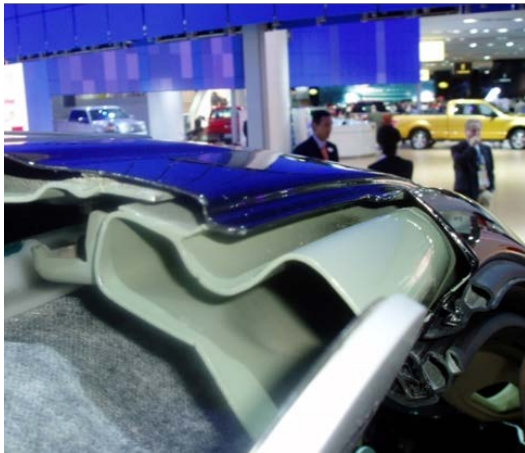
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The right material – (depending on the function) at the right place – in the smallest amount possible!

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# AUTOMOTIVE LIGHT WEIGHT DESIGN

## SCHULER FORMING TECHNOLOGY FOR LIGHT WEIGHT MATERIALS



HYDROFORMING



PRESSHARDENING



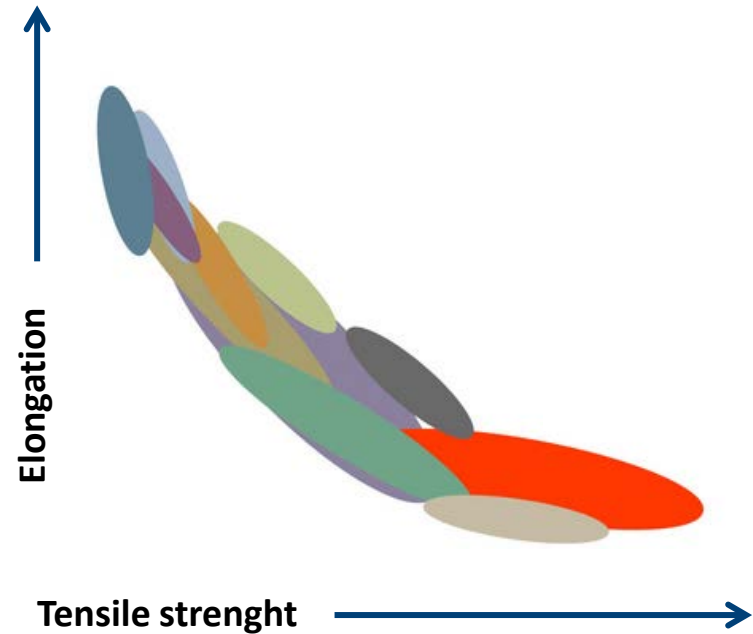
COMPOSITES

# HIGH-STRENGTH STEELS FOR AUTOMOTIVE HARDENING PROCESS IMPROVES TENSILE STRENGTH

Hardening



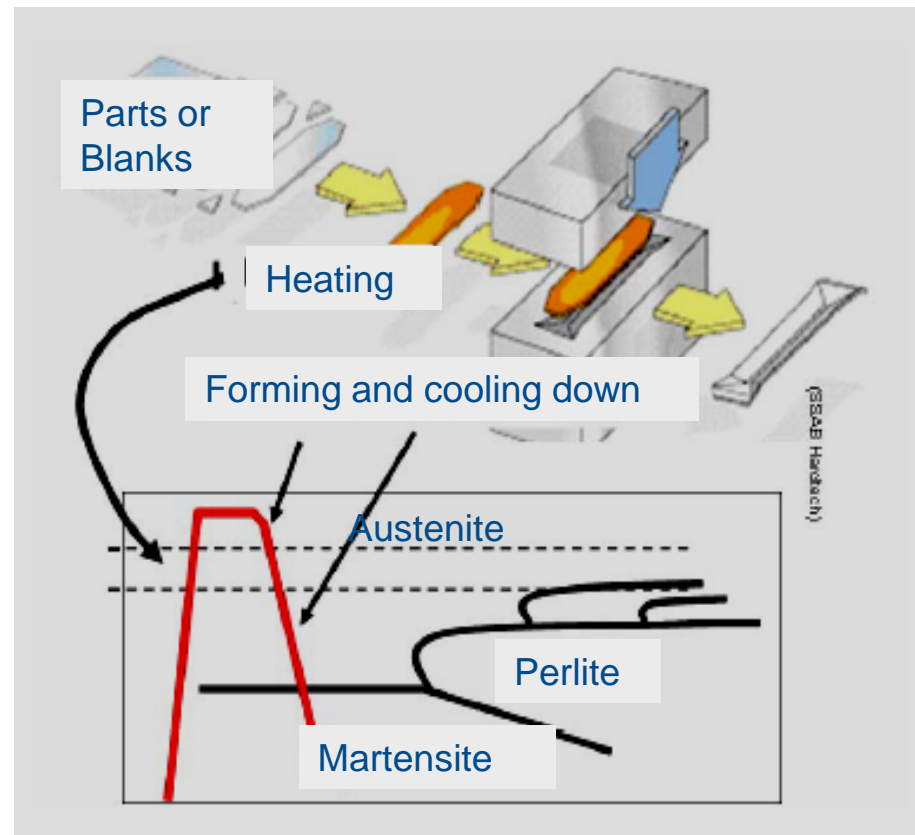
Steel qualities



# PRESS HARDENING

WHAT HAPPENS WITH THE MATERIAL? USIBOR, 1500 MPA, ELONGATION<10%, STRUCTURAL PARTS

- Blanks are heated to 950 °C in a furnace.
- The heating time of 5 minutes is important to achieve the proper material structure (austenite)
- The heated blank has to be fed into the press as fast as possible to avoid cooling of the material by air.
- The press has to close fast, form the part and keep it closed for several seconds.
- During this time the cooling circuits in the upper and lower dies are cooling the part down to approximately 200 °C.

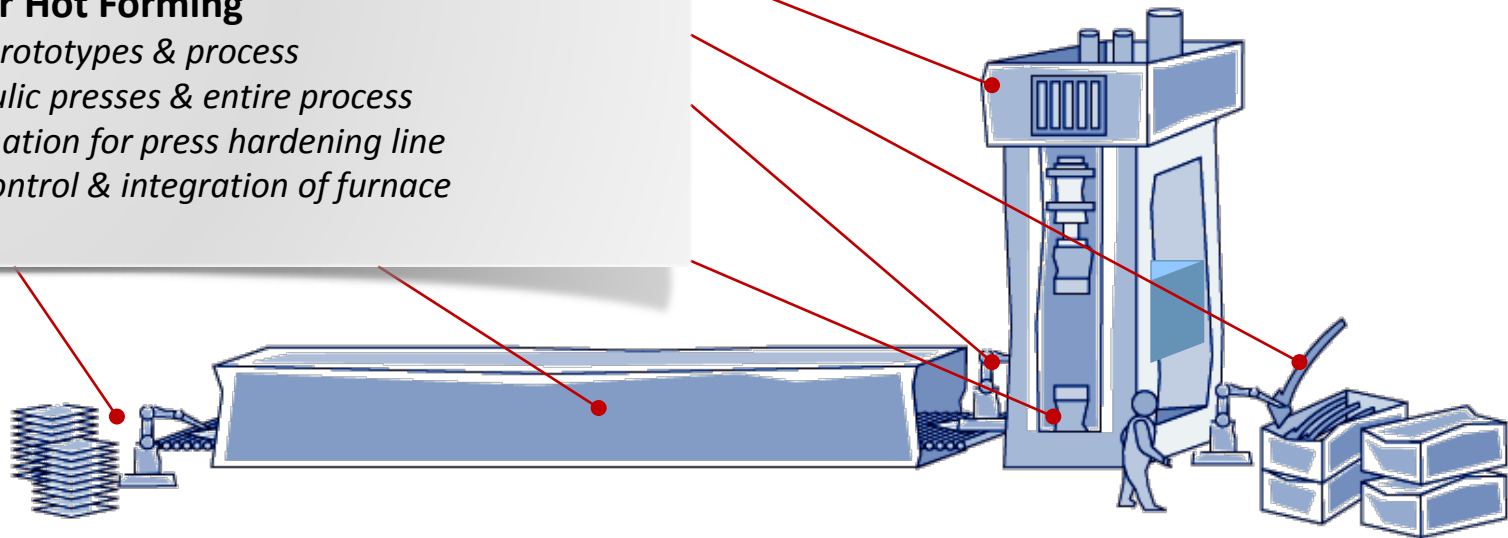


## PRESS HARDENING TURN-KEY SOLUTIONS FROM SCHULER

### Competence center press hardening

#### Schuler Hot Forming

- dies, prototypes & process
- hydraulic presses & entire process
- automation for press hardening line
- Line control & integration of furnace

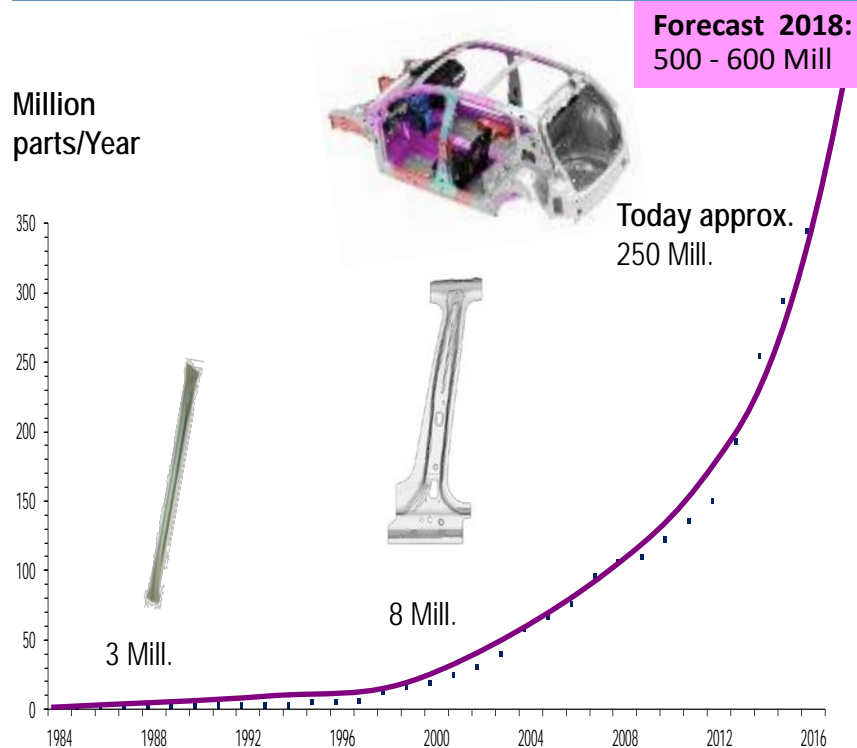




# CURRENT SITUATION AND FUTURE NEEDS

## SIGNIFICANT INVESTMENTS FOR NEW LINES

### Hot Stamping Part Production

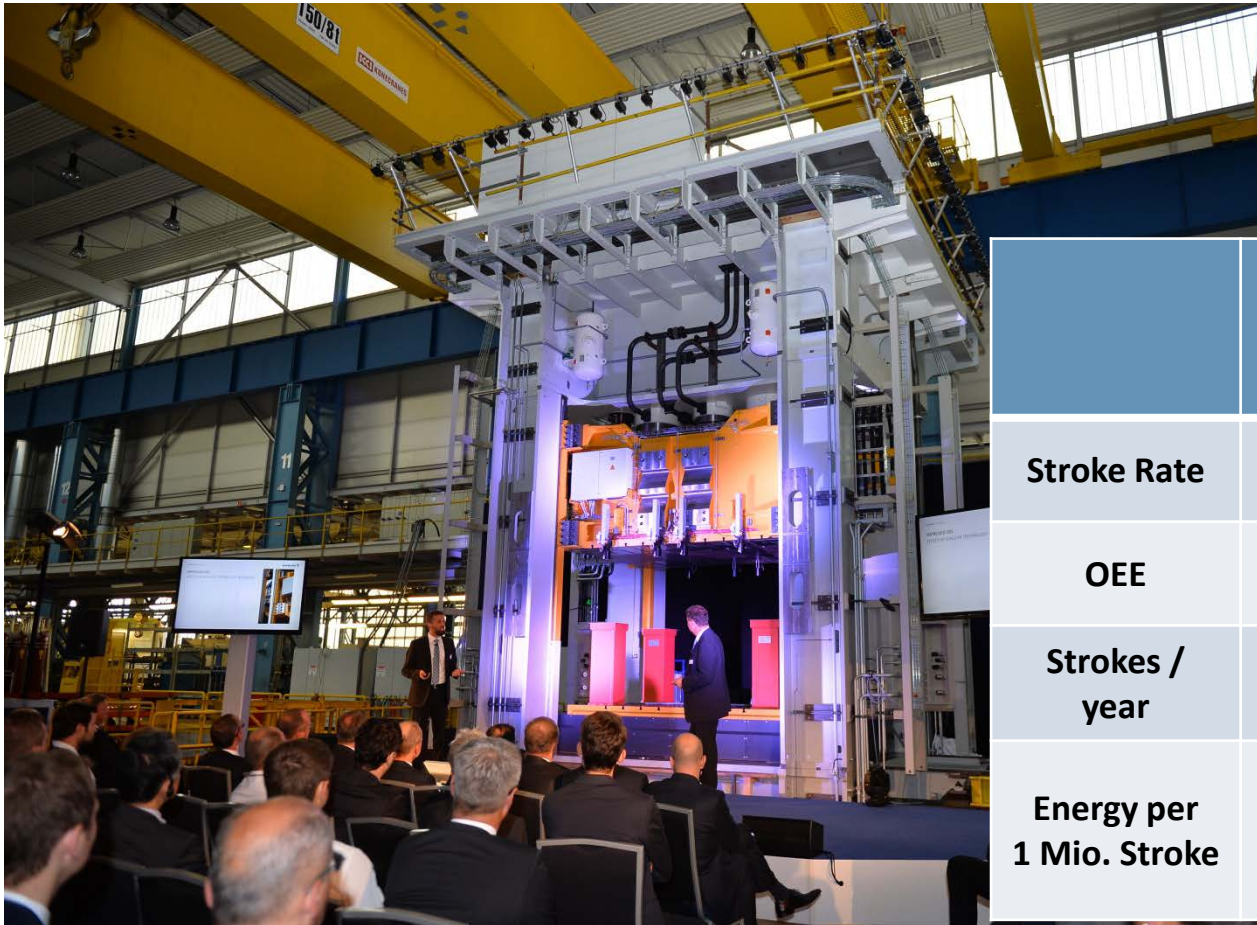


### Trend upwards

- Number of hot forming parts per vehicle will increase from an average of 10 today to more than 30 in 2018
- OEM experts say that by 2018 up to 600 Mio parts/year are needed
- End of 2014: ca. 240 lines in operation

**1/3 OF INSTALLED BASE BY SCHULER**  
**25-30 NEW LINES PER YEAR**  
**FOR THE NEXT 5-6 YEARS**

# NEW PRODUCT: HIGHEST PRODUCTIVITY AND ENERGY EFFICIENCY



	Conventional others	PCH flex with EHF 1-4
<b>Stroke Rate</b>	3.6 SPM	5.2 SPM
<b>OEE</b>	60 %	70 %
<b>Strokes / year</b>	1,000,000	1,750,000
<b>Energy per 1 Mio. Stroke</b>	1,500 MWh Press only!	900 MWh Press only!

Production time = 20 shifts/ week x 8h / shift x 50 weeks/ year = 8000 h/year

# SCHULER TECHCENTER 2015

## LOCATIONS

### Servo TechCenter

- Göppingen, D | MSD 250
- Erfurt, D | TST 1.600, TSD 1.100
- Tianjin, China | TST 1.600

### Hot Stamping TechCenter

- Göppingen, D | PCH-Linie

### Hydroforming TechCenter

- Canton, Mi USA | Hydroforming-Press

### Automation TechCenter

- Gemmingen, D | Crossbar Roboter 4.0
- Canton, Mi USA | Crossbar Roboter 4.0
- Hessdorf, D | Intratrans

### Scope of Services

- Demonstration & Training
- Technology development
- Prototype production
- Back-up line for customers



# LASER BLANKING LINE SCHULER AUTOMATION



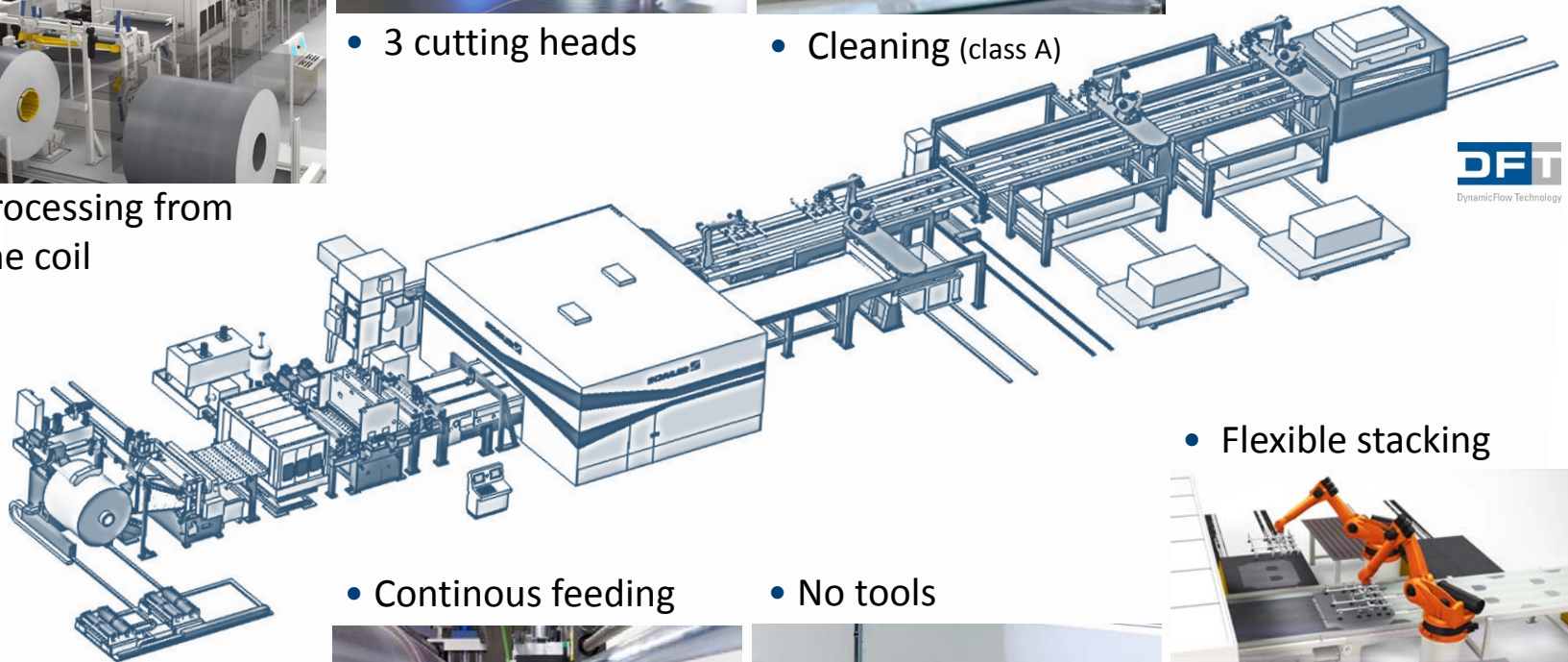
- Processing from the coil



- 3 cutting heads



- Cleaning (class A)



- Continuous feeding

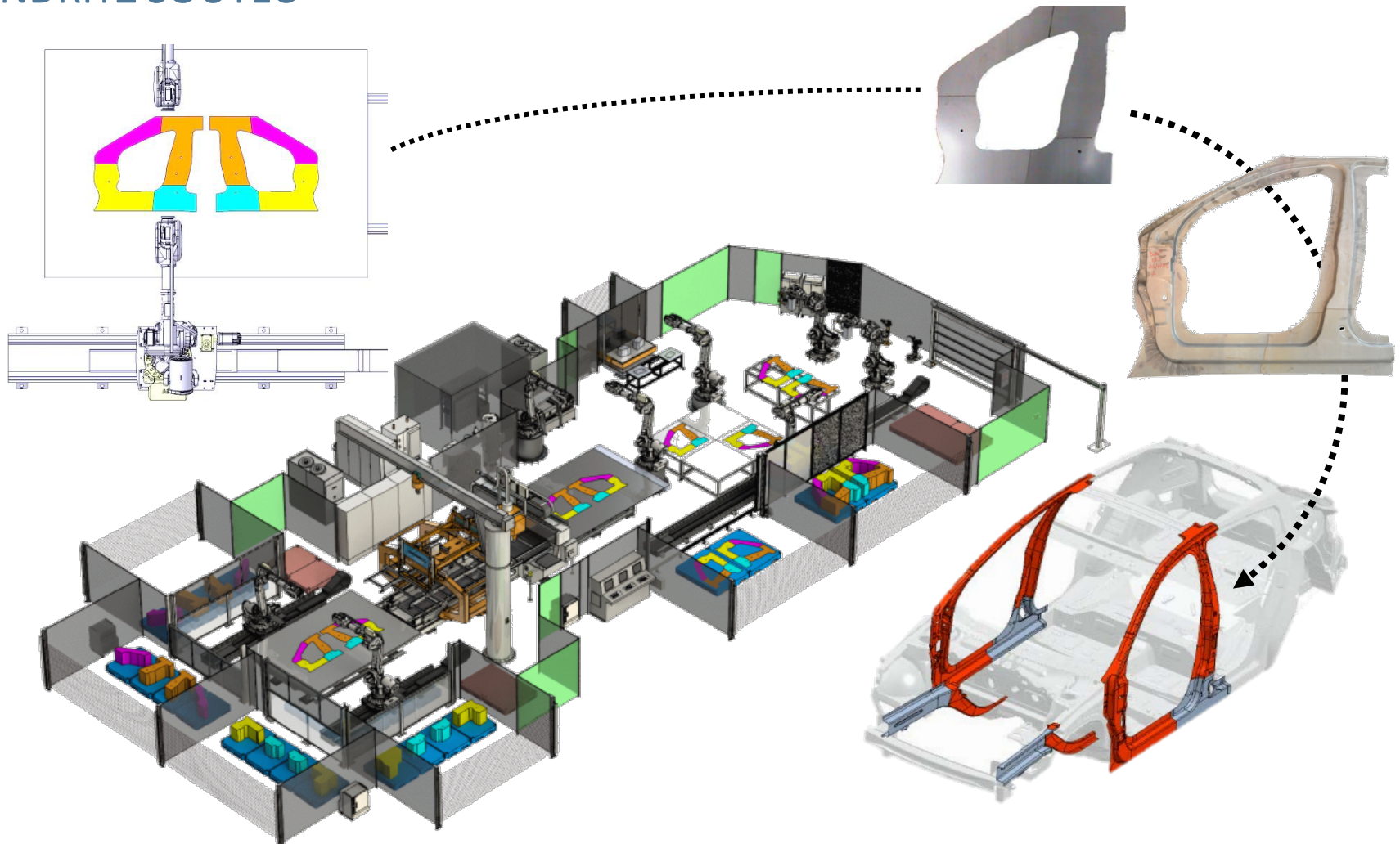
- No tools

- Flexible stacking



# SOUTRAC WELDING LINE FOR HOT STAMPED DOOR RINGS

## ANDRITZ SOUTEC



THANK YOU!