Hot Stamping Experience and Tech Tour

November 29-30, 2022

Novi, MI

FAGOR ARRASATE

Gerald Schulz

PRODUCED BY PMA PRECISION METALFORMING ASSOCIATION | MetalForming Magazine

AGENDA

Fagor - Introduction

Press - Hardening

Aluminum - Hot - Forming

FAGOR ARRASATE

is a founding member of

MONDRAGON
HUMANITY AT WORK
Finance
Industry
Retail
Knowledge

MONDRAGON

IS A PROJECT BASED ON

COOPERATION

MEN AND WOMEN WORKING TOGETHER AND JOINING FORCES AND DEDICATION.
PEOPLE UNITED TO ACHIEVE GREAT THINGS.
TO MULTIPLY RESULTS AND ACHIEVE MORE.

A GLOBAL PROJECT

WITH DEEP CULTURAL ROOTS IN THE BASQUE COUNTRY AND
A CONSOLIDATED PRESENCE INTERNATIONALLY

MONDRAGON CORPORATION
IN FIGURES

Four business areas

FINANCE

INDUSTRY

DISTRIBUTION

KNOWLEDGE

A group of companies

We are a **highly diversified group** with implantations in the **5 continents**:

266
BUSINESSES

Main figures

SALES	JOBS	INVESTMENTS	EBITDA	R+D	MONDRAGON UNIBERTSITATEA
€11.300M	80.818	€451M	€1.021M	15 own R+D centres	4.600 students

FAGOR ARRASATE

more than 60 years' experience

FAGOR ARRASATE
IN FIGURES

FAGOR ARRASATE designs, manufactures and supplies **Presses and Stamping Systems, Metal and Composites Forming Solutions, Coil Cutting and Processing Lines** as well as complete Installations to manufacture Complex Sheet Metal Parts.

More than 60 years of experience

800 employees

6 manufacturing and assembly facilities and 5 service centers

3% investment in R&D

220 MM€ turnover in 2019

Exports 85% of its sales

First-class customers

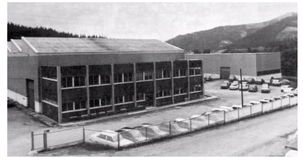
FAGOR ARRASATE
HISTORICAL MILESTONES

1957
Foundation of Fagor Arrasate

1963
Signature of different technical licenses with foreign companies (Olma, Fimi, Verson ...)

1969
First large press for the automotive sector

1971
Inauguration of the Markina factory



1980
Delivery of several lines of presses to OEM of Spain

1984
Acquisition of the company PROIN S.L., manufacturer of cutting lines PROIN

1993
Inauguration of a delegation in China

1995
Development of electronic transfer and CNC cushion

2006
First mechanical Servo Press

2008
Acquisition of RDI Met
RDI Met
Inauguration of FMMTK in Kunshan

2012
Delivery of the first line of high speed presses

2013
Fusion with ONAPRES and start with Press Hardening

2016
First servo-mechanical press for hot stamping technology

2017
60 Years
High speed press line for SEAT

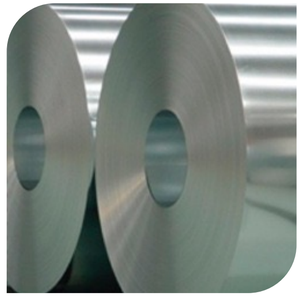
FAGOR ARRASATE
SECTORS

OEM

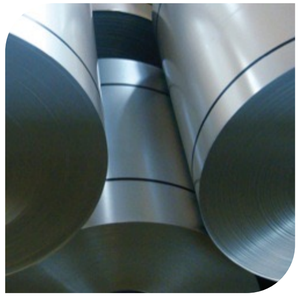
TIER

Non Metallic Parts Suppliers

Forging Industry



Mills



Service Centers

Die Makers

Home Appliances

Railway Industry

Aerospace Industry

Naval Industry

Construction

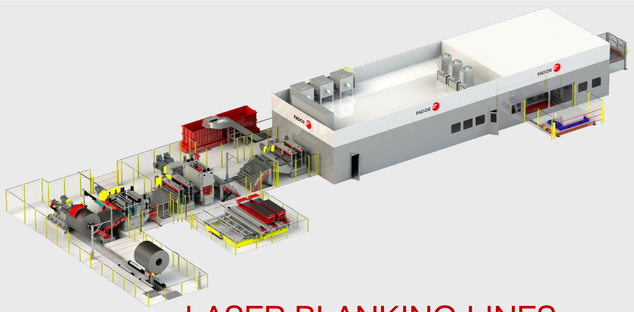
Tube mills

FAGOR ARRASATE
PORTFOLIO AUTOMOTIVE

PRESS HARDENING
ALUMINUM HOT FORMING
Full automation and synchronization

HIGH SPEED
LINES
New top level of performance

BLANKING LINE
(STEEL / ALU)
High productivity, better quality



LASER BLANKING LINES
To produce short runs with great added value, flexibility and optimization of material

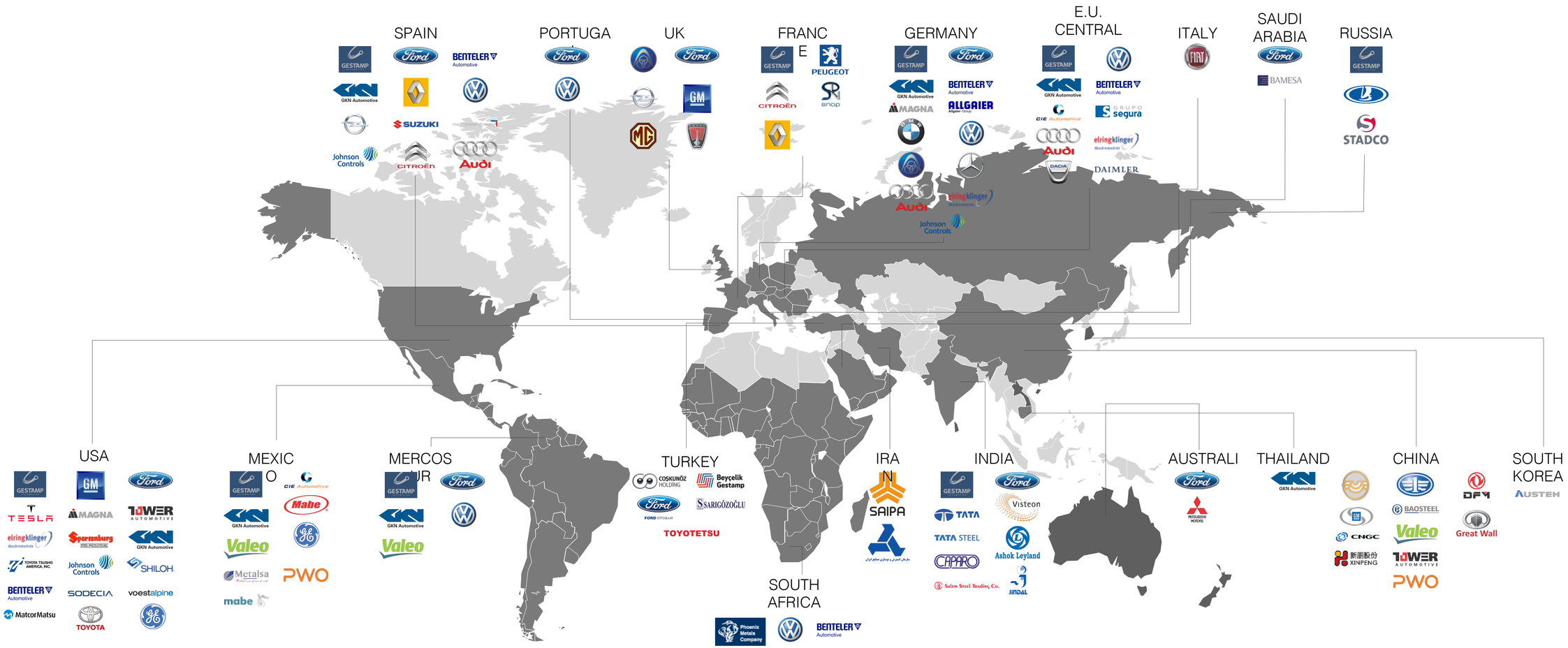
TRANSFER PRESS
Improve productivity and flexibility

COMPOSITES
40+ years of experience

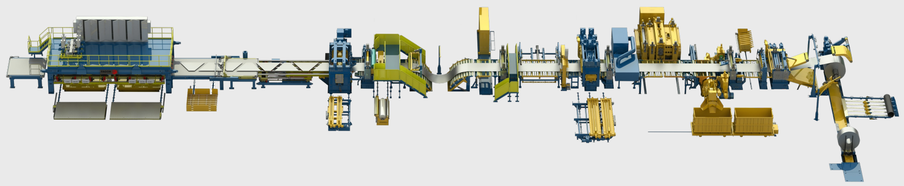
FORGING SYSTEMS
High production forging transfer presses

TRY-OUT PRESSES
Try-out and production presses

AUTOMOTIVE
FIRST-CLASS REFERENCES



FAGOR ARRASATE
PORTFOLIO METAL

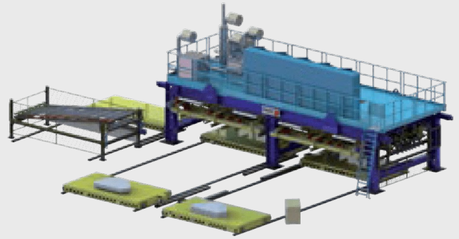


CUT-TO-LENGTH LINES

Capable of producing top-quality aluminum blanks with a high degree of efficiency and flexibility

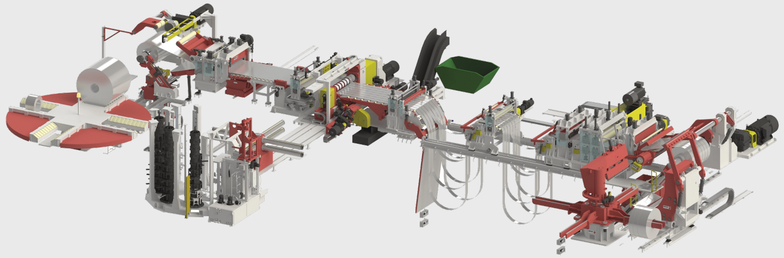
PRESS BLANKING LINES

Tight dimensional tolerances and high flatness quality



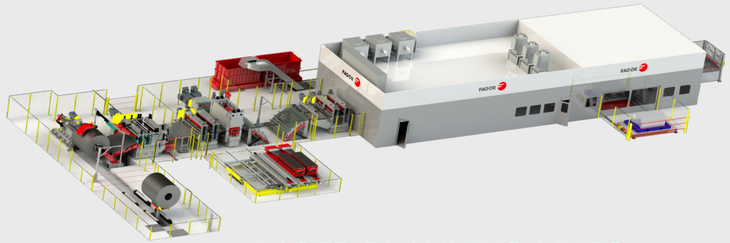
STACKERS

Efficient stacking solutions adapted to each type of customer and material: *Steel, Aluminum or Both*



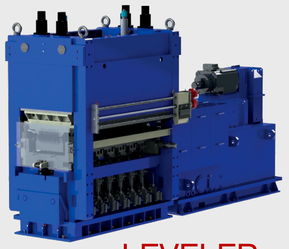
SLITTING LINES

Easy operation and reduced operational costs.
Hands-free operated lines.



LASER BLANKING LINES

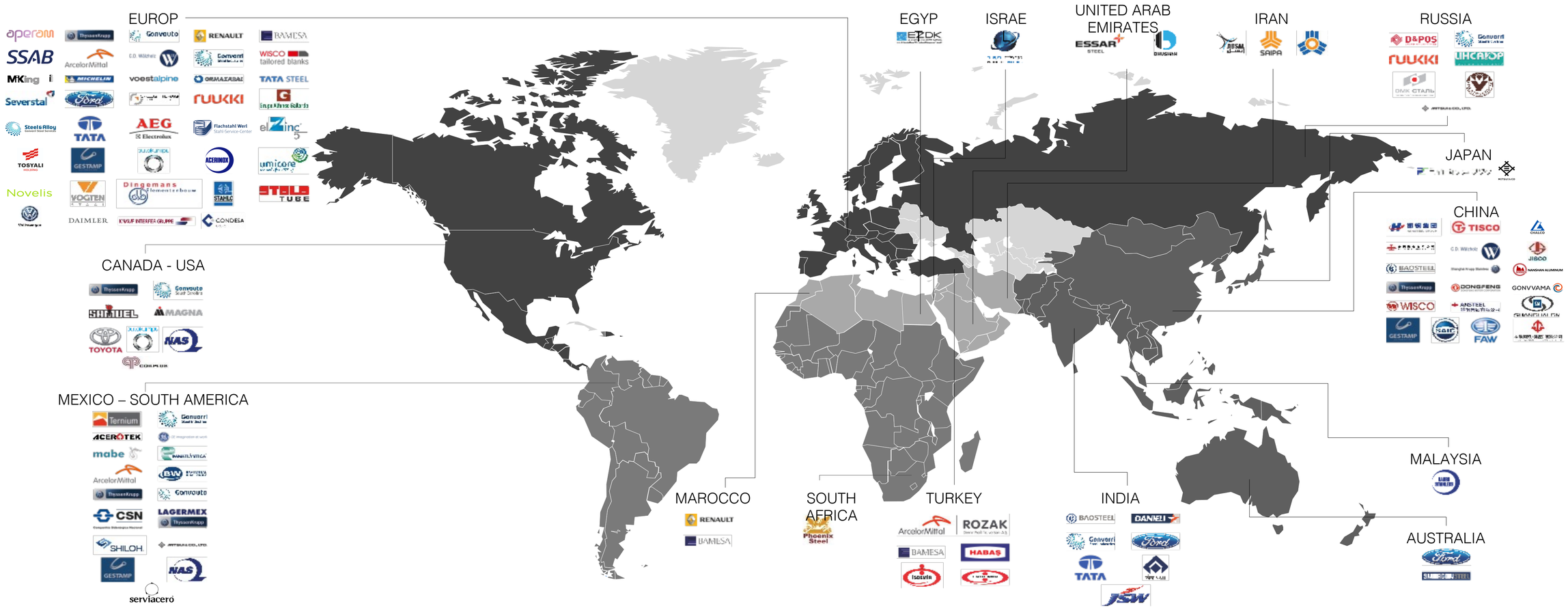
To produce short runs with great added value, flexibility and optimization of material



LEVELER

The roll leveling process adapted for the latest tendencies (HSS, Laser Flat technology)

METAL
FIRST-CLASS REFERENCES



FAGOR ARRASATE
LOCATIONS

HEADQUARTERS
Arrasate
Production – Service
Engineering

SERVICE
Arrasate
Service - Engineering

ENGINEERING
San Sebastian
Service - Engineering

TIER 1, FORGING & HOME APPLIANCES
Markina
Production - Engineering

HYDRAULIC PRESSES
Zamudio
Production - Service
Engineering

FMMTK
China
Production-Service

HILPOLTSTEIN
Germany
Service

QUERÉTARO
Mexico
Service

PORTAGE, IN
USA
Service

KOACELI
Turkey
Automotive
division facility

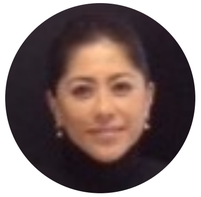
RIO CLARO
Brazil
Home appliances
facility

Operating since JANUARY 1ST, 2022

SERVICE TEAM
IN PORTAGE

Management

PHIL CONWAY
General Manager



MARLENE RUEDA
Secretary

Commercial

DANIEL ECHEVERRIA
Commercial Director

MATHEW MITCHELL
Automotive Division Commercial

ROBERT BUDZ
Automotive Division Commercial

PETER SWENSON
Metal Division Commercial

Service Managers

ANJEL LOPEZ
Service Coordinator

UNAI ARIZMENDIARRIETA
Service Technician

ANDER ASTORGA
Service Technician

JESUS RODRIGUEZ
Controls programmer

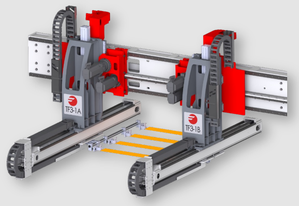
ERICK RODRIGUEZ
Controls programmer

INHOUSE COMPETENCE
FAGOR ARRASATE

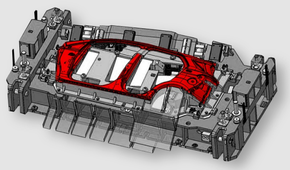
Process engineering
R&D

Line development

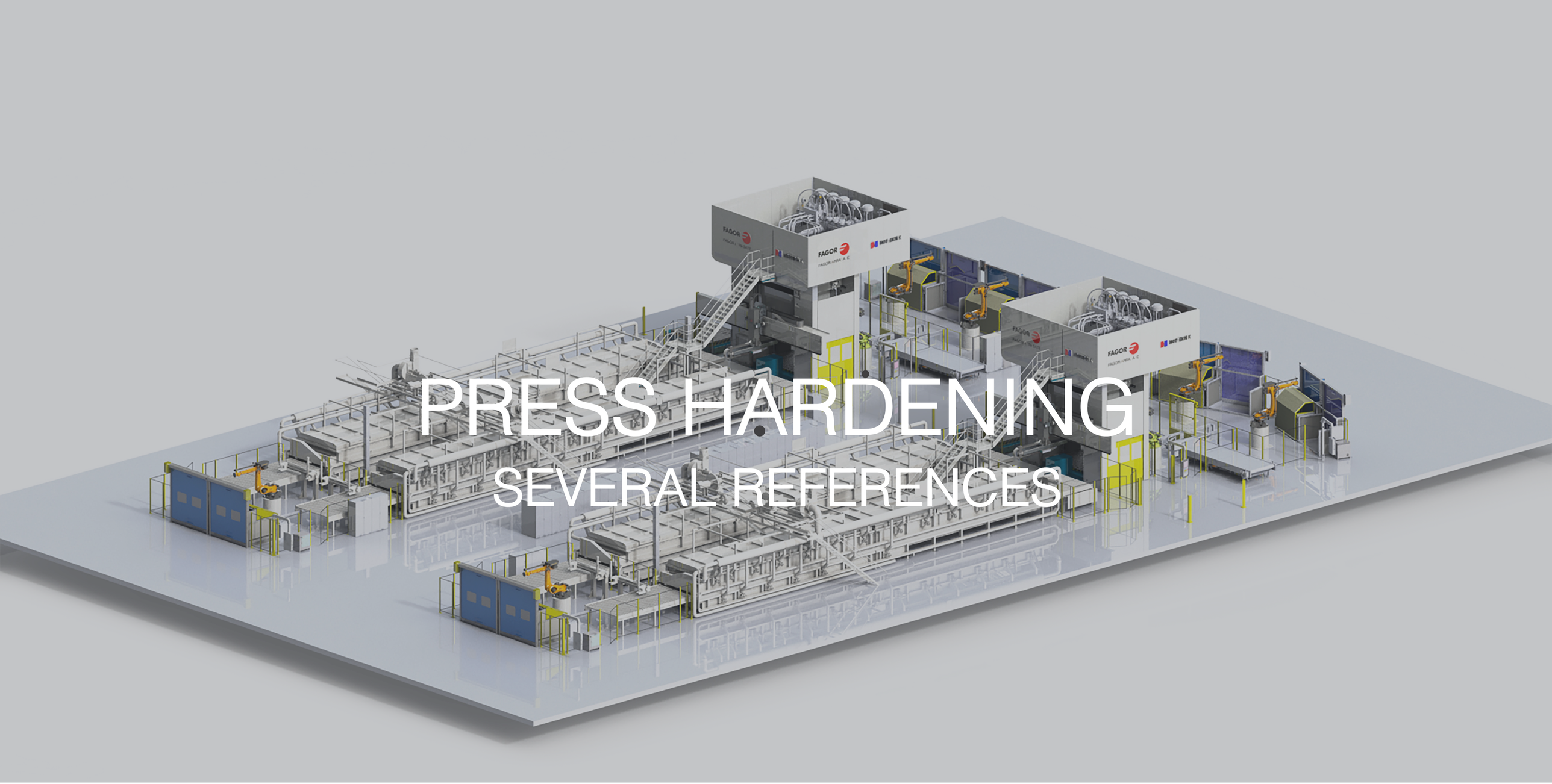
Presses
Mechanical, hydraulic
or servodriven presses



Automation
Feeding line
Transfers
Robotization



Dies and tooling



PRESS HARDENING

SEVERAL REFERENCES

PRESS HARDENING
SEVERAL REFERENCES

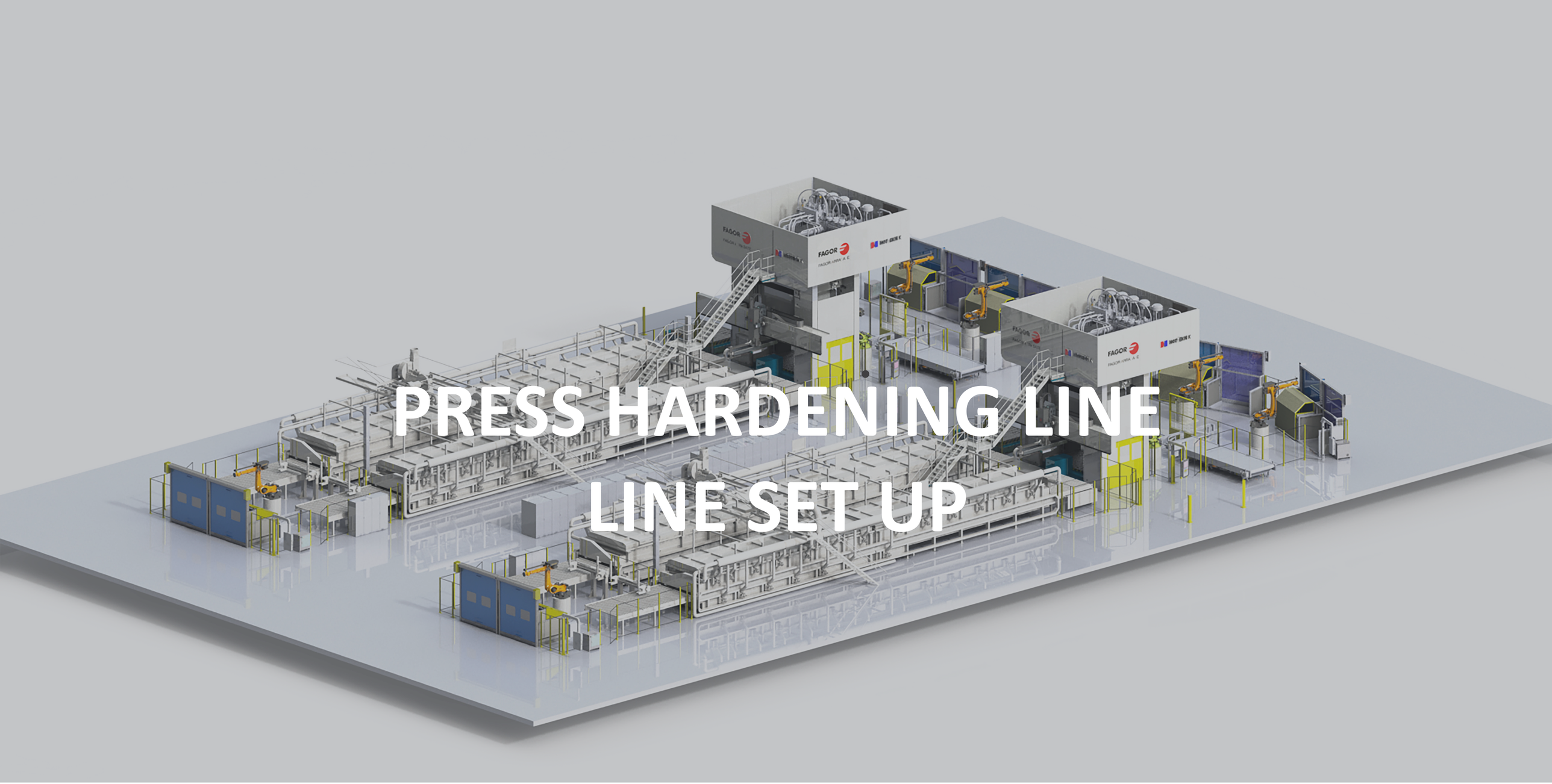
Germany
Hydraulic – 12.000 KN
3.200 x 2.500

Spain
Hydraulic – 12.000 KN
3.000 x 2.250

Germany
Hydraulic – 12.000 KN
3.200 x 2.400

Poland
Hydraulic – 16.000 KN
4.000 x 2.500

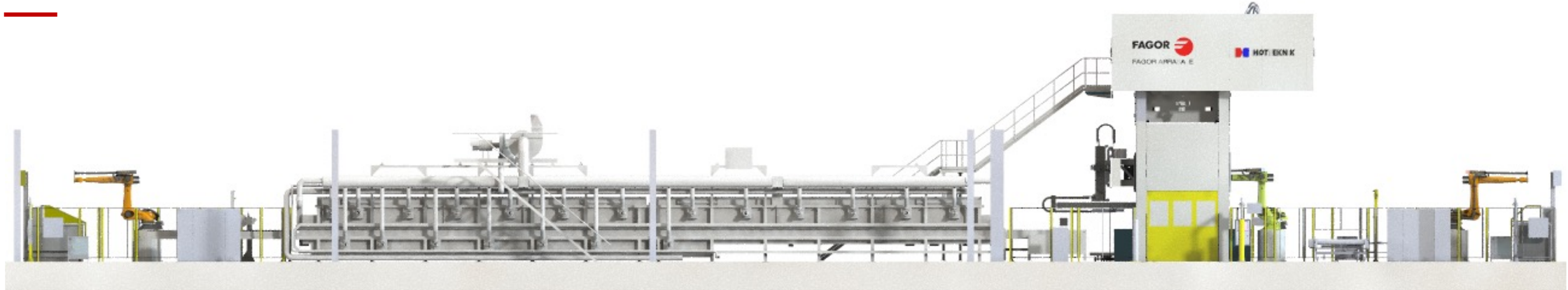
PRESS HARDENING
SERVERAL REFERENCES



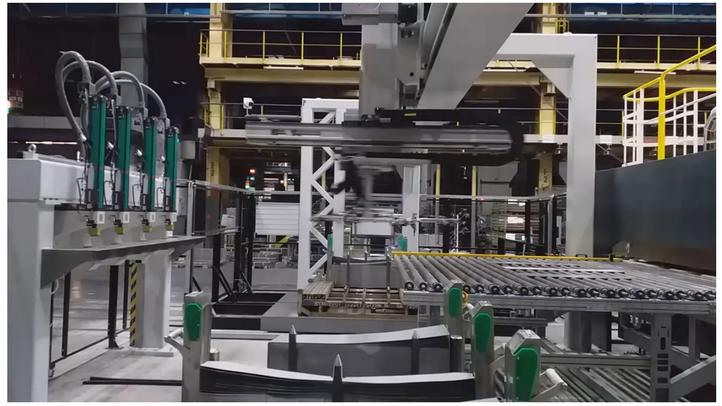
PRESS HARDENING LINE
LINE SET UP

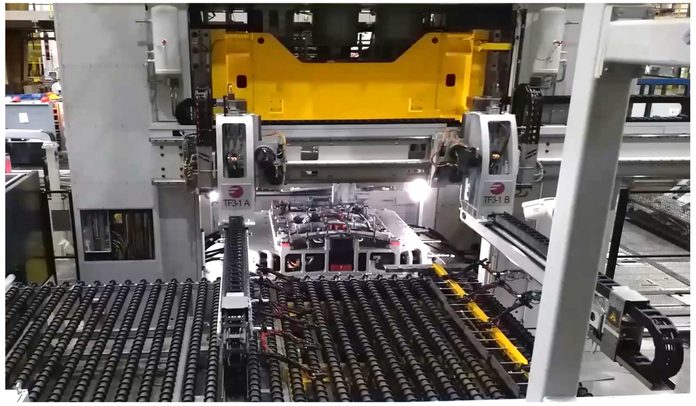
High Productivity: L type +Transfer

Lay-out



Destacker	Loading	Unloading





HOT FORMING DESTACKER & PRESS LOADING / UNLOADING

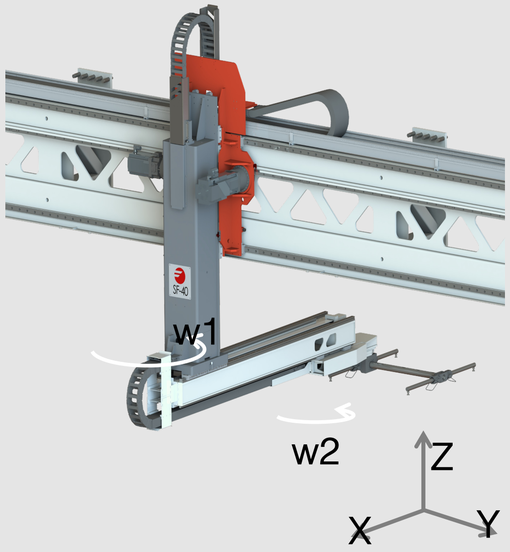
FIVE AXIS LINEAR ROBOTS

FAGOR ARRASATE

	LRH5-60	LRH5-120
Max transport weight	60 kg	120 kg
Automatic tool changer	Optional	Optional

Strokes

X	4300 mm	4500 mm
Y	Configurable	Configurable
Z	1200 mm	1200 mm
w1 (Rotation - optional)	180º	180º
w2 (Rotaion - optional)	180º	180º



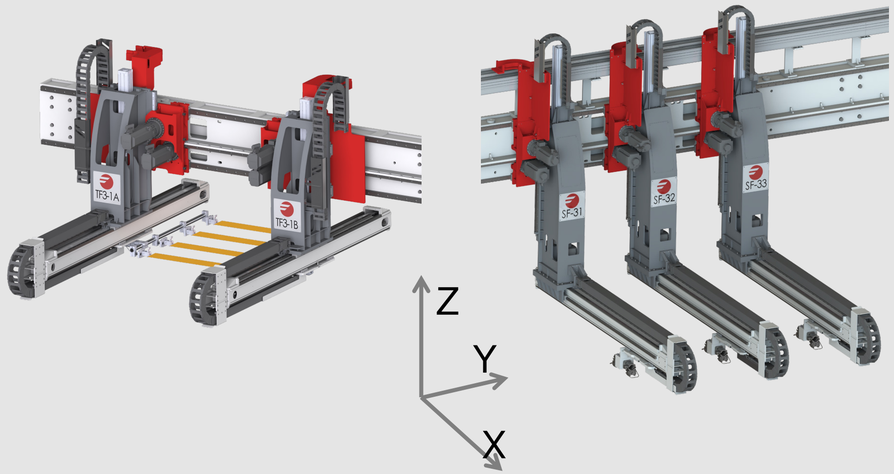
HOT FORMING PRESS LOADING & UNLOADING
THREE AXIS LINEAR ROBOTS

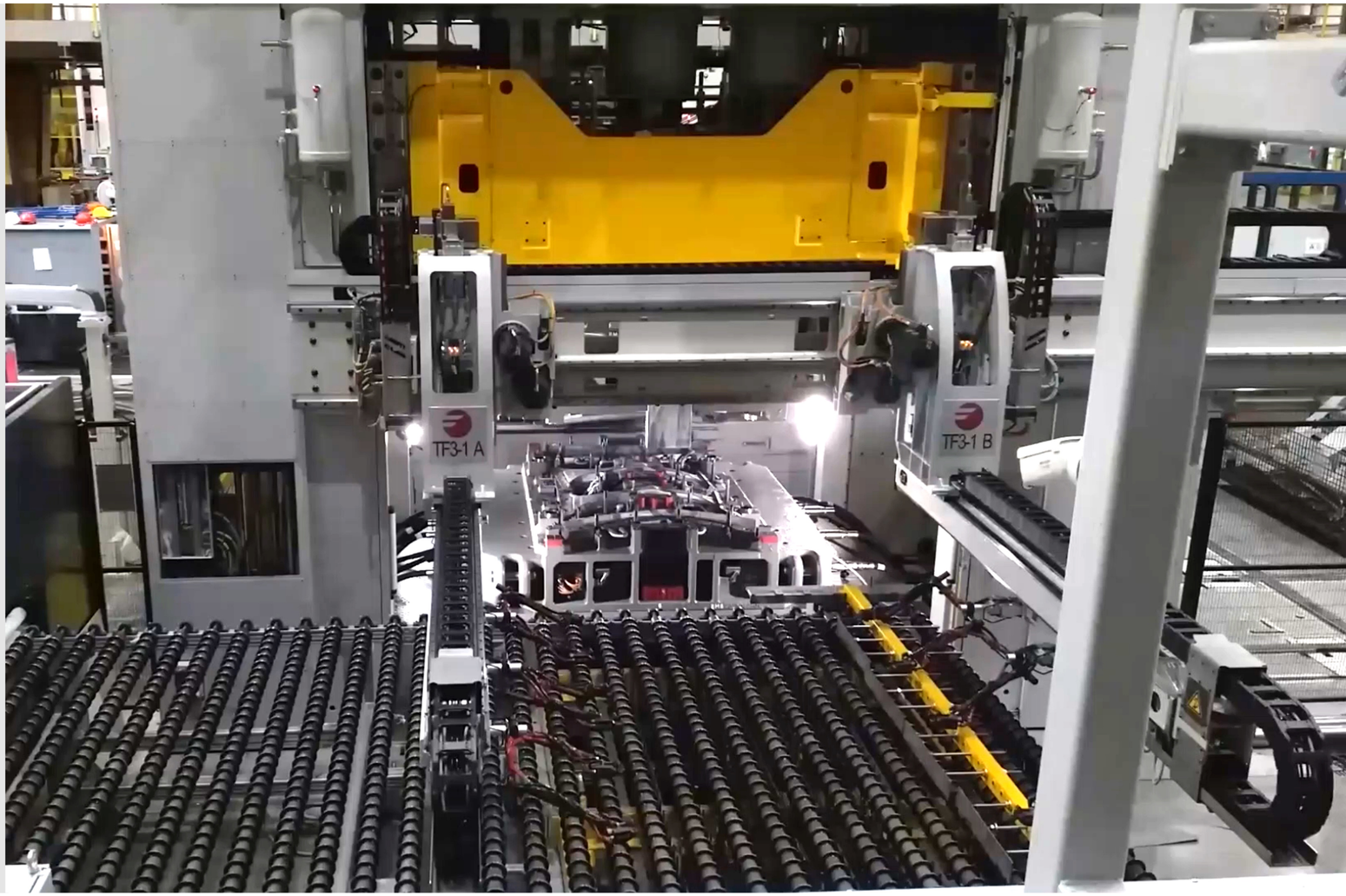
FAGOR ARRASATE

	LRB3-20	LRB3-40	LRB3-80
Max transport weight	40 Kg	80 Kg	160 Kg

Strokes

X	3200 mm	3800 mm	4200 mm
Y	Configurable	Configurable	Configurable
Z	400 mm	500 mm	600 mm





HOT FORMING PRESS LOADING/UNLOADING/END OF LINE
LINEAR ROBOTS & ROBOTS

ALUMINIUM HOT FORMING

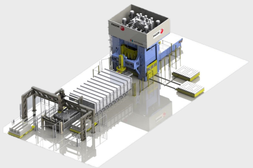
HFQ LIGHTWEIGHTING

FAGOR ARRASATE
HISTORICAL MILESTONES IN ALUMINUM

2013
Fusion with ONAPRES and start with Press Hardening

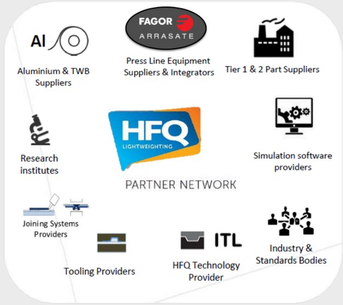
2016
First servo-mechanical press 15.000 kN for hot stamping technology

2017
Design of an fully operational ALUMINUM hot stamping line BEROALU-Project Mondragon University

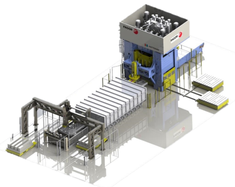


2018
First SERVOPUMP-HYDRAULIC-PRESS

2019
HFQ Partnership

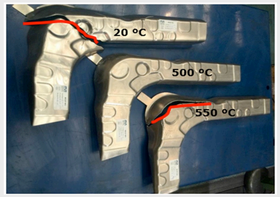


2020
Quoting Aluminum Line
SERVO-PUMP-HYDRAULIC-PRESS
up to 700.000 stroke per annum



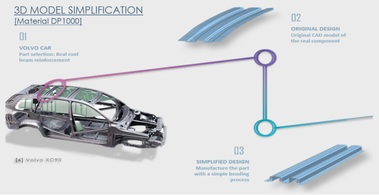
2015
Start of the art investigation on capabilities of the hot stamped Aluminum part

2016
Testing phase
real Part production
AL series 6000-7000

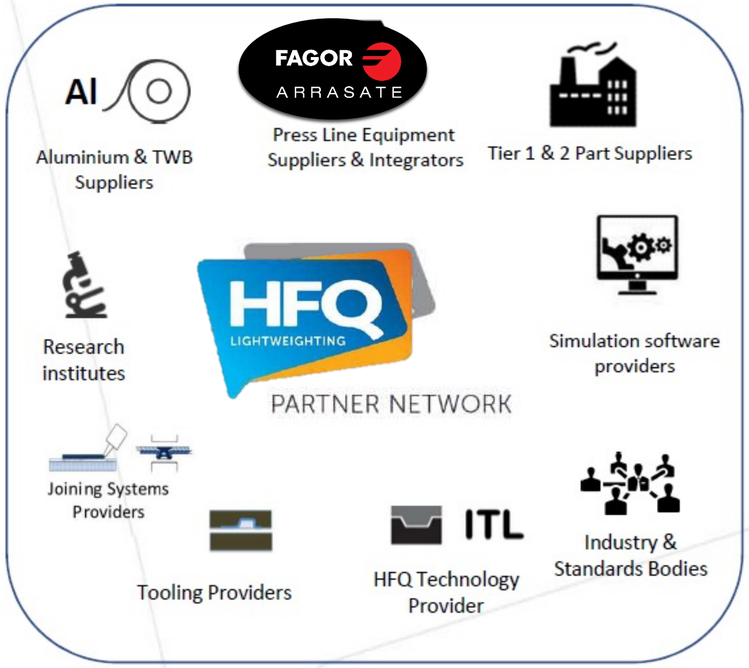


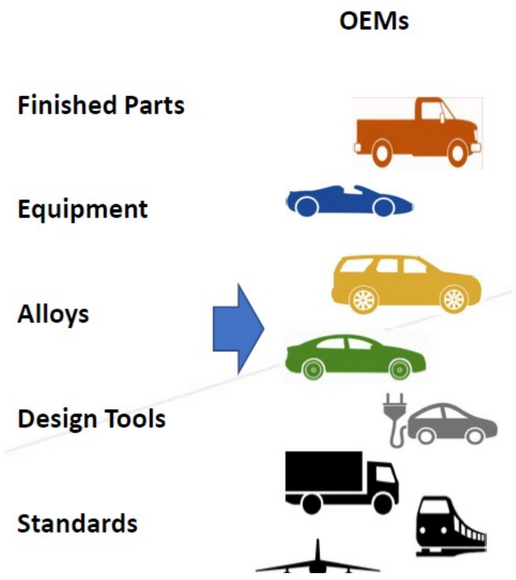
2018
PHD on AL was grated by Fagor and Mondragon University

2019
Feasibility analyses
VOLVO
Reinforcement DP
1000 – 1,42 kg
AA 6082 T6 – 0,84 kg



2021
Bumper Production in Spain





ALUMINUM
HOT FORMING

The ecosystem model can apply to HFQ.
By aligning leading actors in market to grow light weighting.

ITL developed Al Hot forming process aims to be the **automotive** standard for Al Hot formed parts.

HFQ is a new consortium of companies of all the spectrum (Al suppliers, equipment manufacturers, stamping companies, OEM …).

This consortium **develops and promotes the technology** and related standards.

Fagor Arrasate is one of the founders of this consortium to start public activities in 2019.

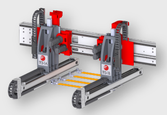
2022 an official HFQ LIGHTWEIGHTING Eco-system Partner

ALUMINUM HOTFORMING
TECHNOLOGY OVERVIEW

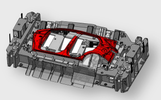
Process engineering
R&D

Line development

Presses
Mechanical, hydraulic or servodriven presses



Automation
Feeding line
Transfers/Robotization



Dies and tooling

Technology Overview

- HFQ Trademark
- HFQ Tech Transfer Process

Metallurgy & Alloy Characterisation

- Alloy HFQ Characterisation Testing
- Recycled Alloy processing
- Low cost alloys for HFQ parts
- TWB Weld Properties
- Aging Optimisation
- Post formed properties
- Corrosion assessment
- HFQ Joining assessment

Modelling & Simulation Tools

- Material Card Generation & Validation
- Advanced Material Modelling
- HFQ Forming Window per alloy
- Advanced Simulation
- Friction Models
- Microstructural Modelling
- Thermo-mechanical distortion
- Simulation Software HFQ Plug-ins

Simulation & Simultaneous Engineering

- Formed Parts Simulation
- Design & Part Consolidation
- Alloy selection & listing for HFQ
- Patch Blank Optimisation
- Laser welded blanks design
- Extra-deep parts – HFQ-D
- Part Costing & Value Pricing
- Optimising HFQ for joining

Tooling & Tribology

- Die Face Design & Construction
- Die Materials for HFQ
- TWB/Patch Blank Tool Surface
- HFQ Lubricants & application
- Tool Cooling Guidance
- HFQ Tool Maintenance
- Modular Tooling
- Thermal Compensation

Production Process Settings & Controls

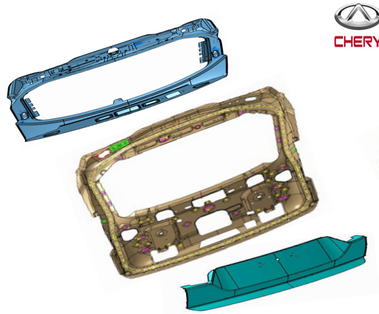
- Process Window by part/alloy
- Cleaning for HFQ lubricants
- Production Rate Maximisation
- QC & QA Process & Calibration
- Ageing Cycle Specification
- Fault Finding & Troubleshooting
- Thermal Imaging Systems
- Pre-cool stage for certain alloys

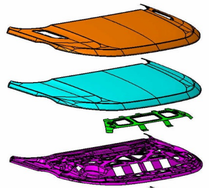
Production Equipment Specification & Sourcing

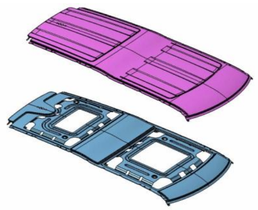
- Part Handling Automation
- Blank Heating
- Hydraulic- /Servo-Press
- Aging Oven
- Part Cleaning
- Lubrication Application
- QC Equipment
- Convert current plant to HFQ

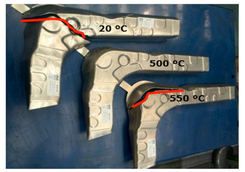
ALUMINIUM COLD-HOT FORMING DIE REFERENCES

ALUMINUM
DIE REFERENCES COLD AND HOT_FORMING

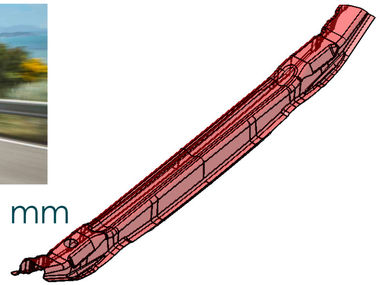








Mercedes-Benz E-Class (2017)



Section: 275x1425 mm

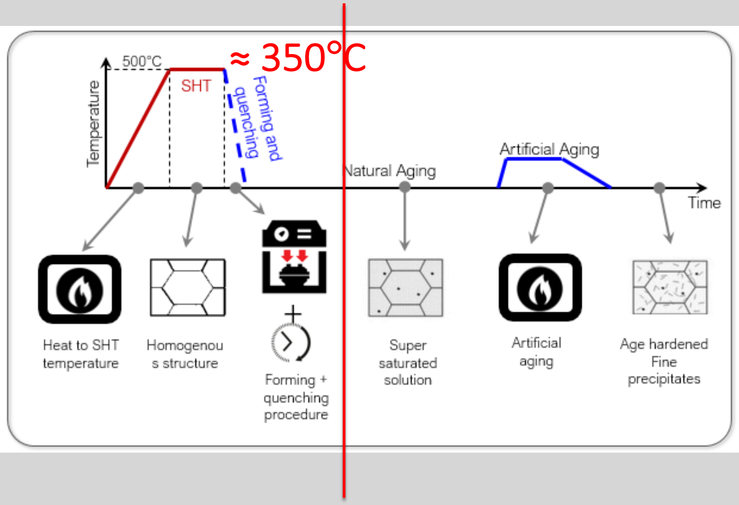
Thickness: 3mm

Materials: AA6082-T6 eta AA7075-T6

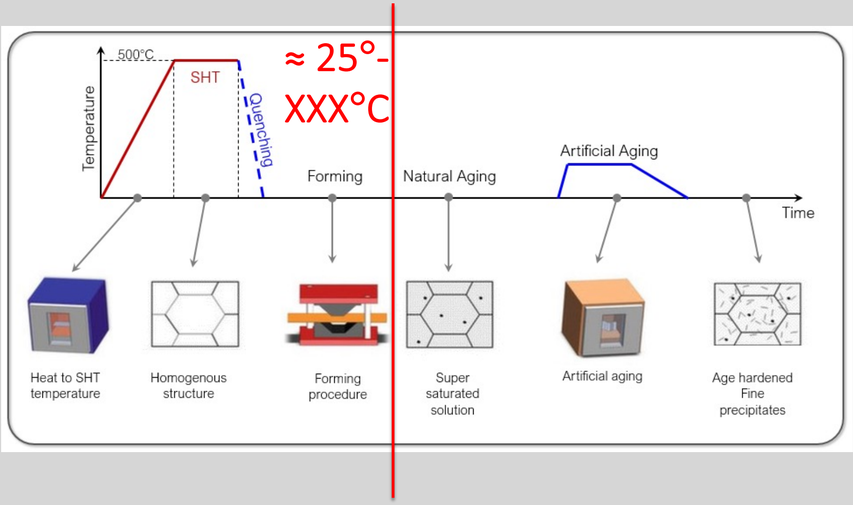
ALUMINIUM HOT FORMING PROCESS INTRODUCTION

PROCESS
INTRODUCTION

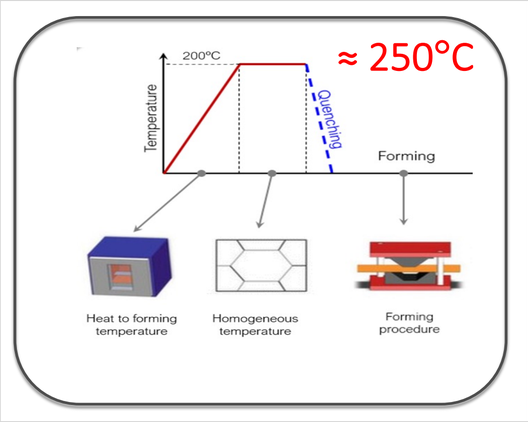
HOT STAMPING



W-TEMPER FORMING



WARM FORMING



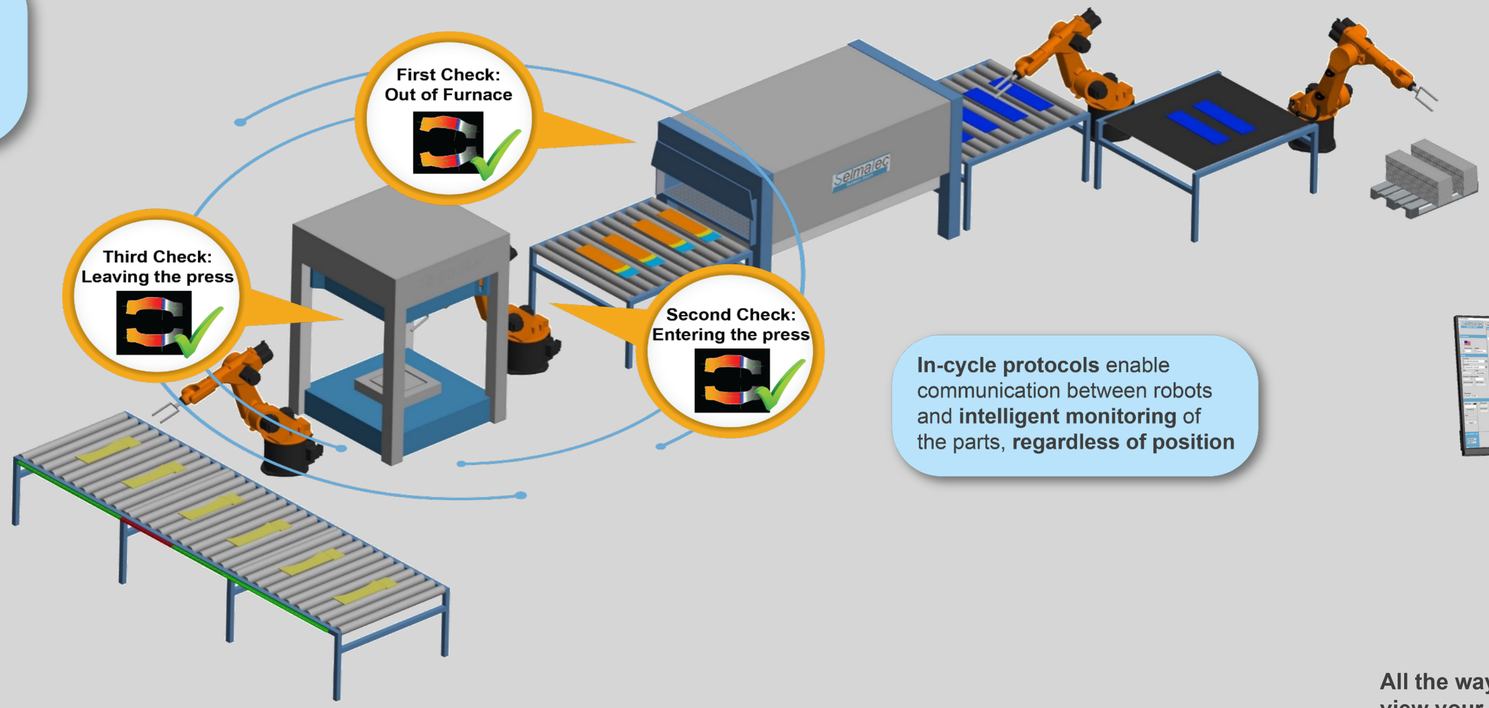
Process Monitoring Aluminum

ALUMINUM
PROCESS MONITORING

An automated system for **data acquisition and management** allows all monitoring modules to be **interconnected**

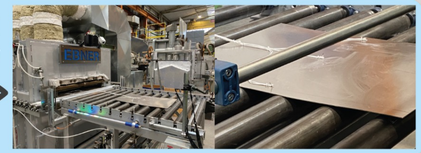
Features

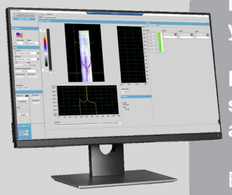
- **Monitoring of transfer zones**
- **Thermal profiling**
- **Early detection of system malfunction**
- **Scalable**



In-cycle protocols enable communication between robots and **intelligent monitoring** of the parts, **regardless of position**

Real View





Add as many modules as you want

Enjoy the optimal setup for aluminum applications

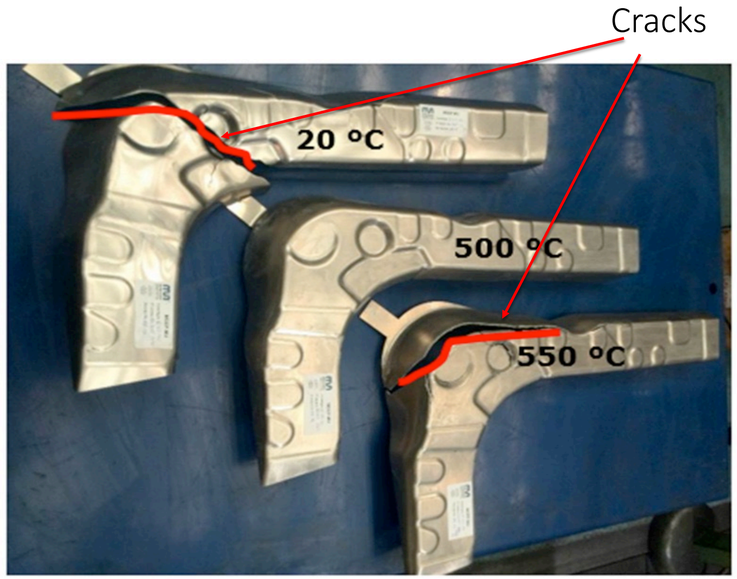
Easily visualize data with **a user-friendly dashboard**

All the ways to view your data:

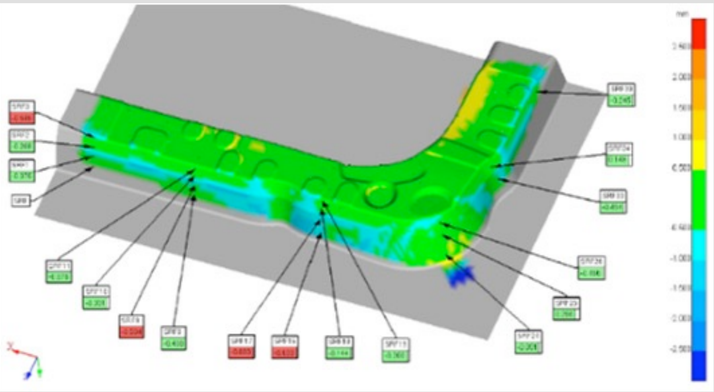
Source: Selmalec Systems GmbH

REAL PART EXPERIENCE

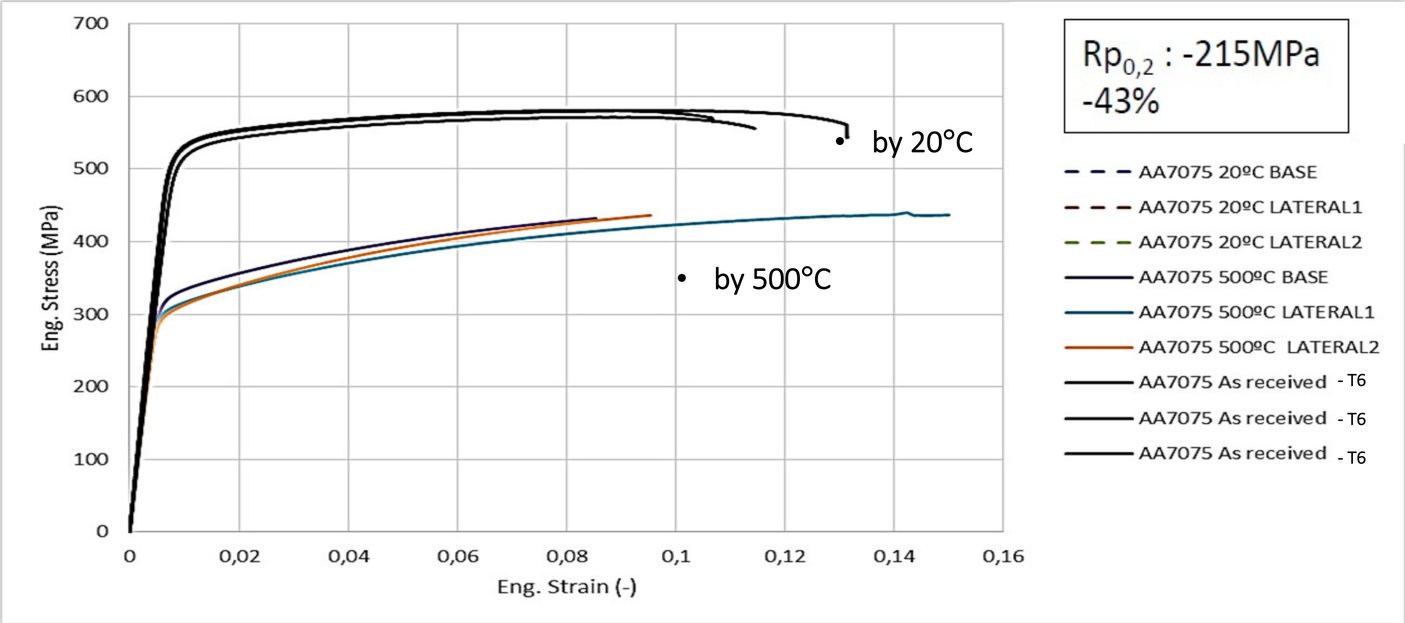
REAL PART EXPERIENCE
TEST & RESULT



- TRY OUT
  - Material AA 7075
  - Temperature 20°C / 500°C / 550°C
  - Thickness 1.5 mm



- THERMAL SIMULATION
  - AA 7075
  - 500°C
  - 1.5 mm Thikness



INDUSTRIAL TRAILS

INDUSTRIAL TRIALS

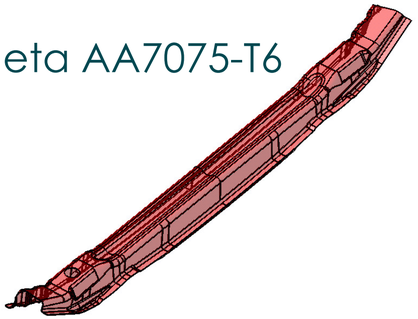
CASE STUDY

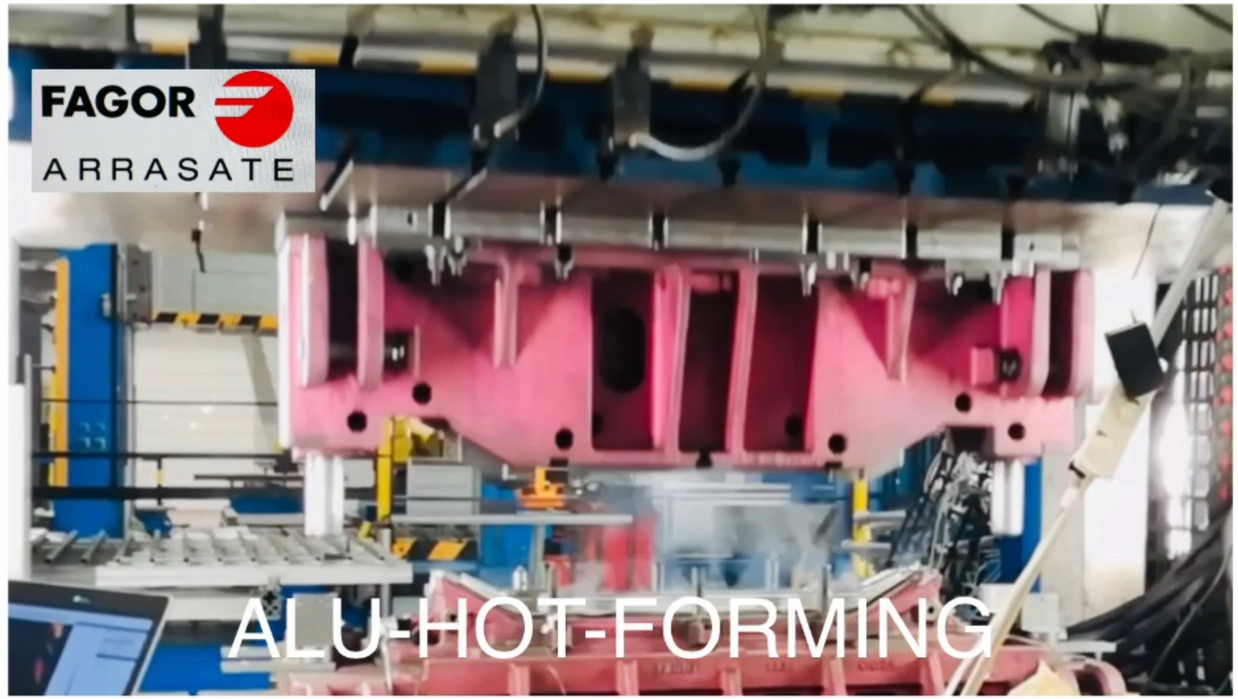
Mercedes-Benz E-Class (2017)

Section: 275x1425 mm

Thickness: 3mm

Materials: AA6082-T6 eta AA7075-T6

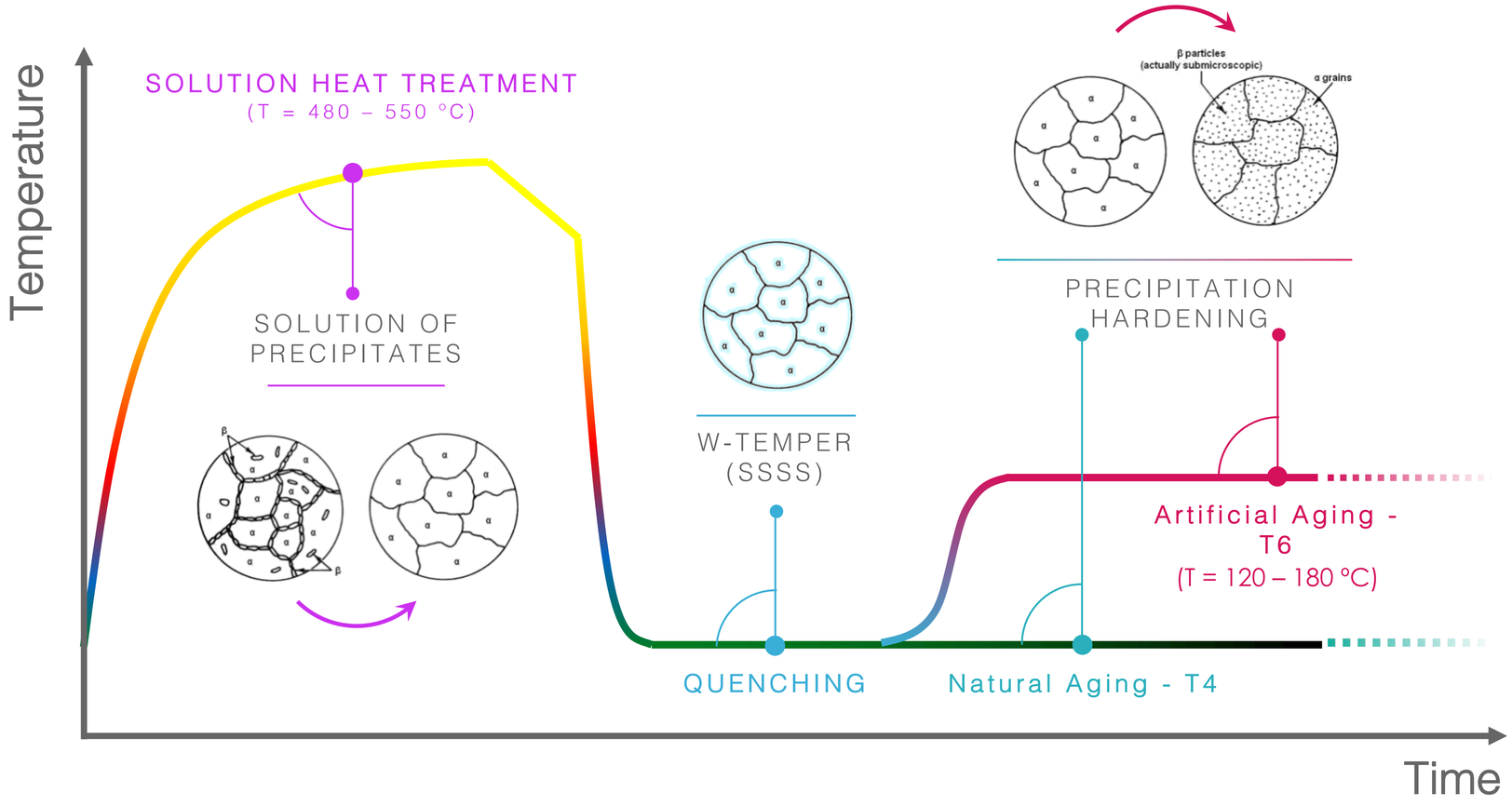




PIC•COLLAGE

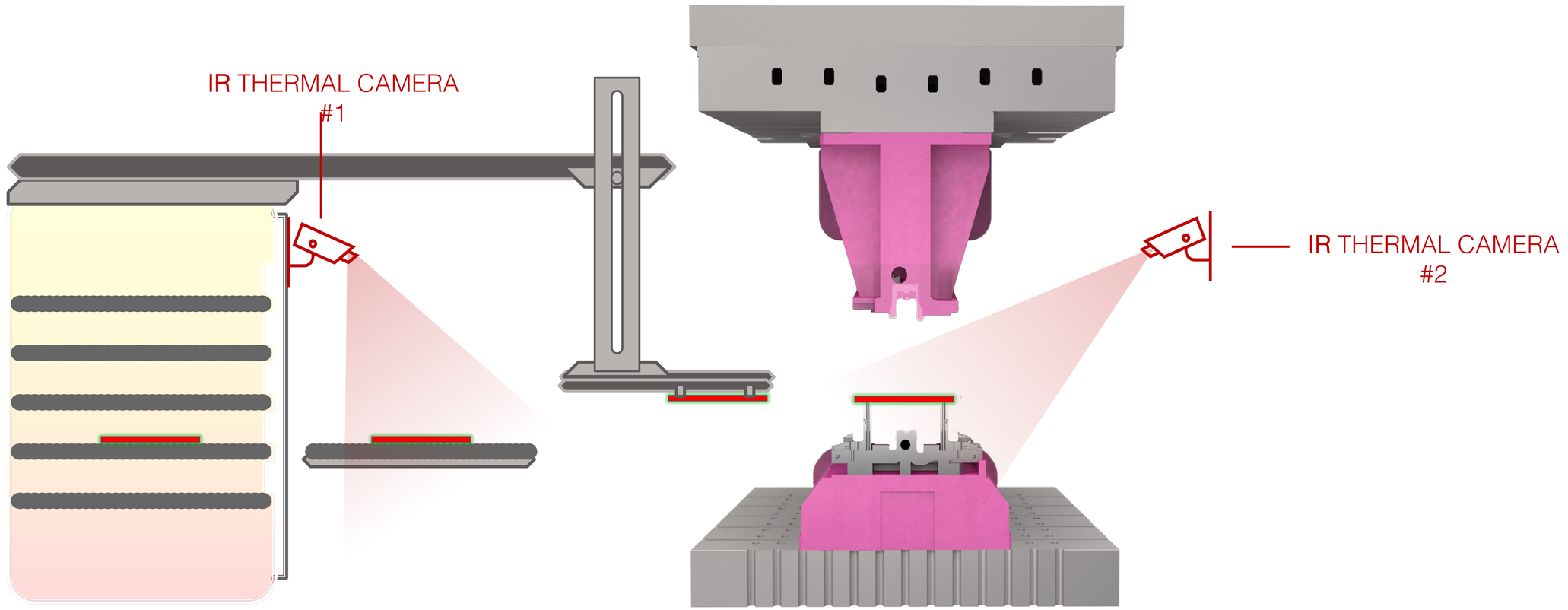
INDUSTRIAL TRIALS

THERMAL CYCLE



INDUSTRIAL TRIALS

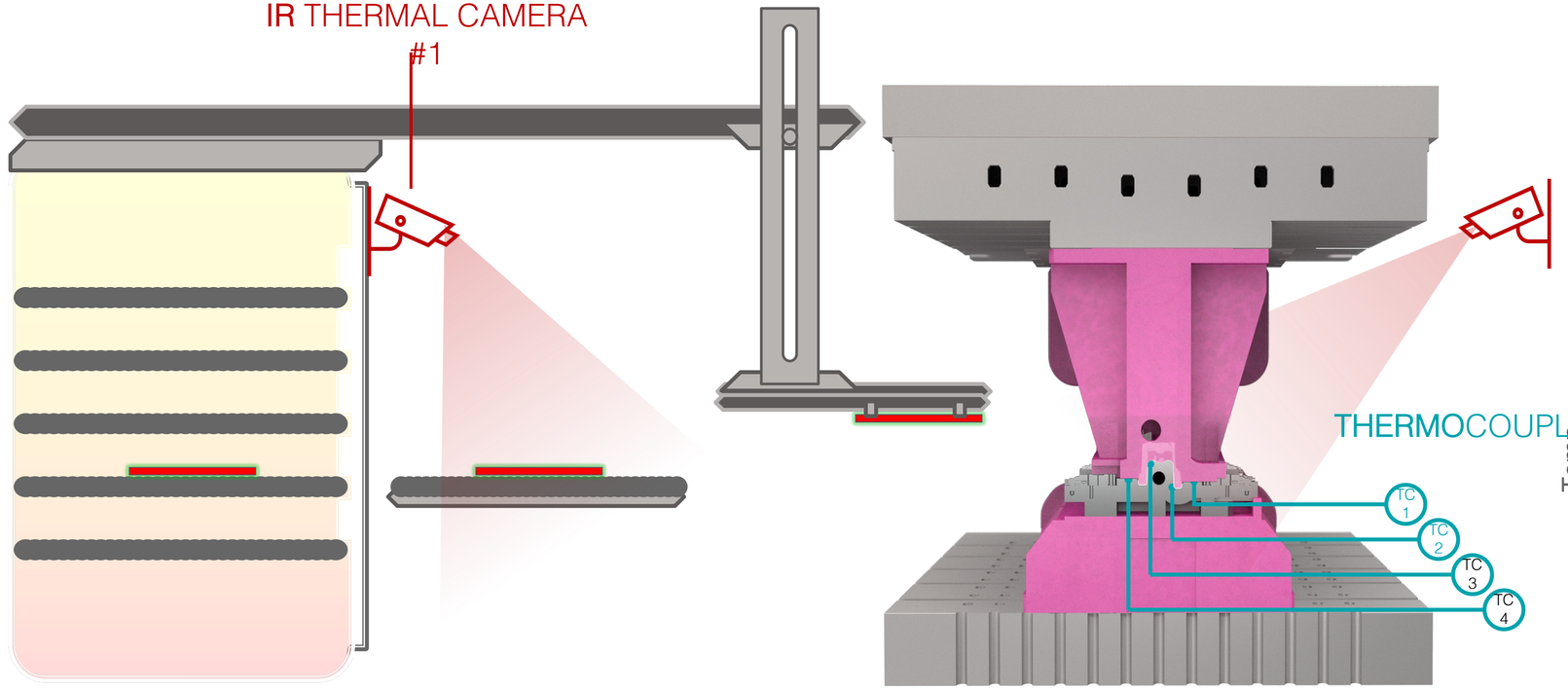
MONITORING

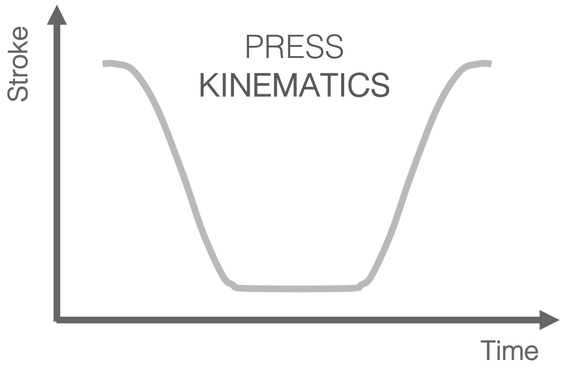


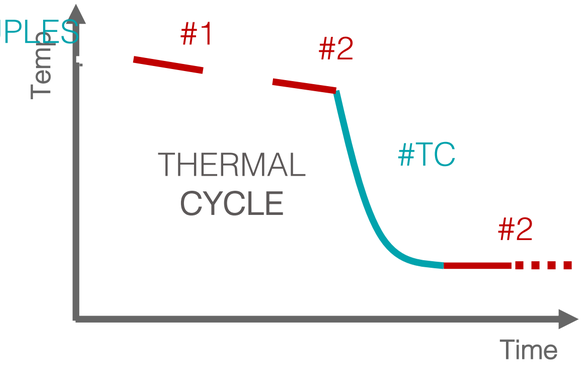
SHT	TRANSFERIZATION	FORMING + QUENCHING
MULTILEVEL **FURNACE**	FAST **FEEDER**	SERVO-MECHANICAL **PRESS**

INDUSTRIAL TRIALS

MONITORING



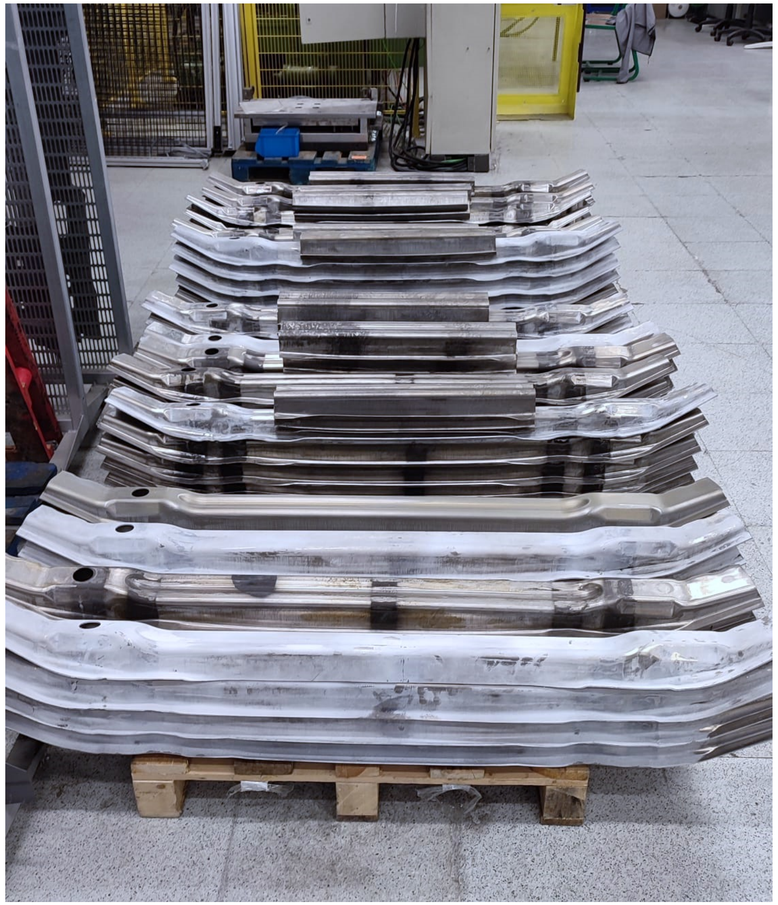




SHT	TRANSFERIZATION	FORMING + QUENCHING
MULTILEVEL **FURNACE**	FAST **FEEDER**	SERVO-MECHANICAL **PRESS**

INDUSTRIAL TRIALS

MORE THAN **150 BUMPERS** WERE **HOT FORMED**
WITH AA7075 AND AA6082 ALUMINUM ALLOYS



OUTLINE

- INTRODUCTION
- INDUSTRIAL TRIALS
  - CASE STUDY
  - THERMAL CYCLE
  - MONITORING
- METHODOLOGY
  - GEOMETRY ANALYSIS
    - 3D SCANNING
    - SPRINGBACK
    - THINNING
  - MECHANICAL PROPERTIES
    - HARDNESS
    - TENSILE TEST
    - CORROSION
    - CRASH TEST
- RESULTS
  - TRANSFER TIME
  - QUENCHING TIME
  - PRESS FORCE
  - TRIBOLOGICAL PERFORMANCE
  - HEAT TREATMENT
  - FORMING TECHNOLOGY
- CONCLUSIONS
- FUTURE WORK

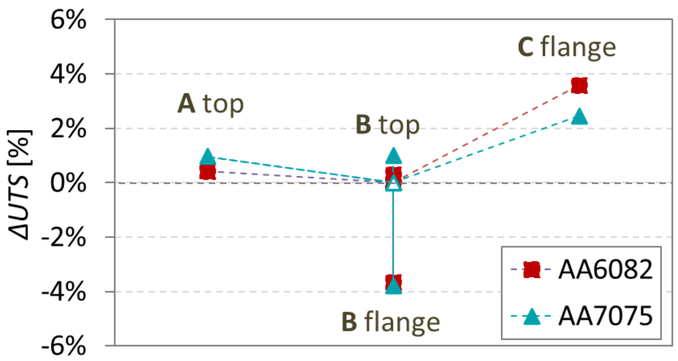
RESULTS

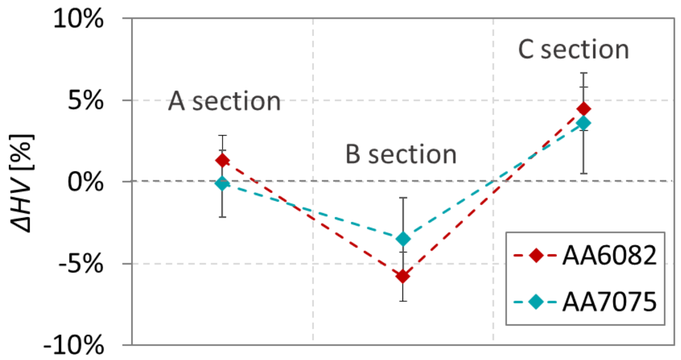
HETEROGENEITY ANALYSIS

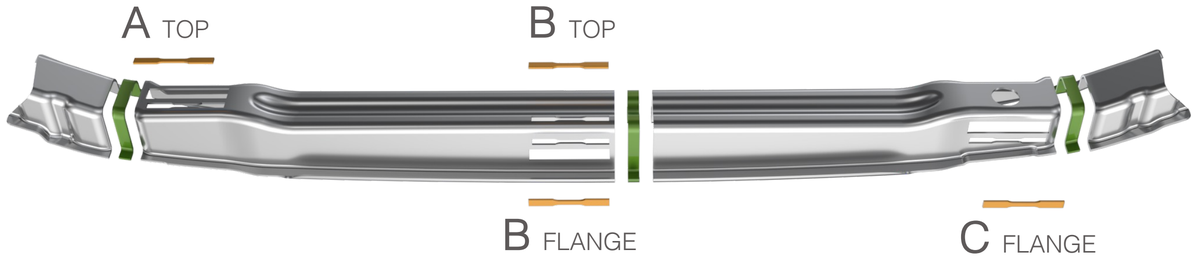
3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

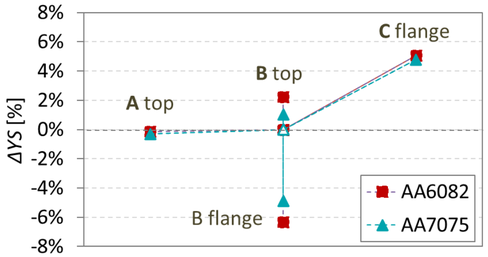
RESULTS

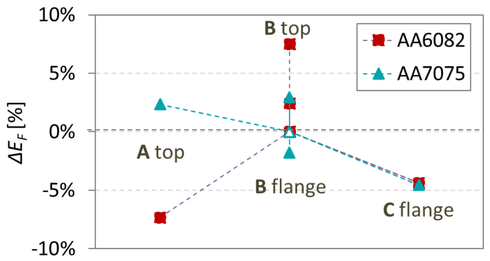
HETEROGENEITY ANALYSIS





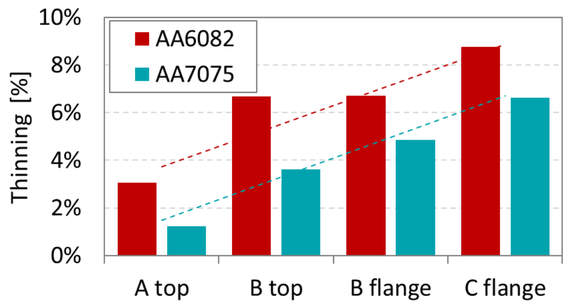






HETEROGENEITY REASONS:

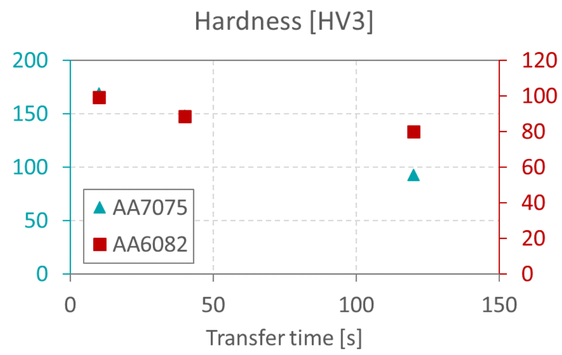
- Different quenching efficiency
- Different plastic strain (Thinning)

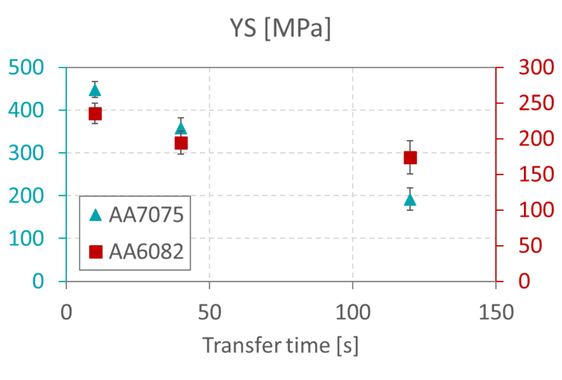


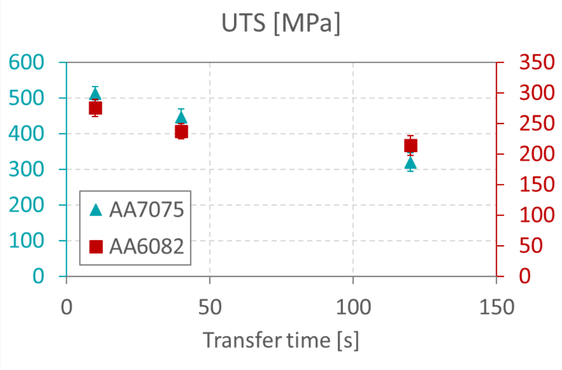
3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

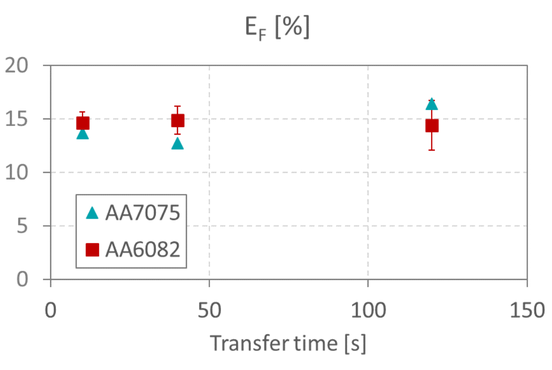
RESULTS

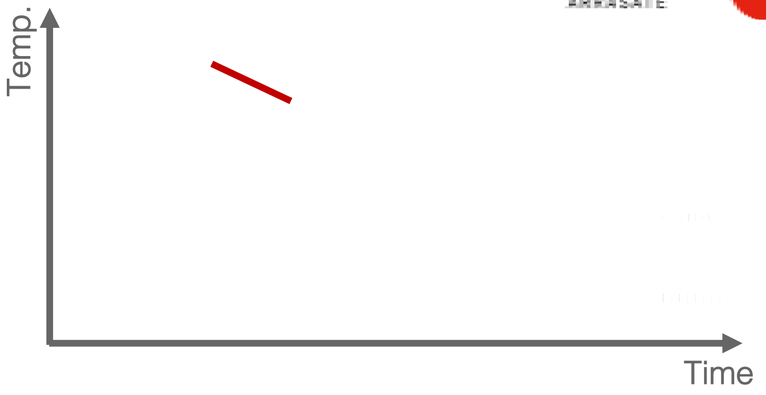
TRANSFER TIME

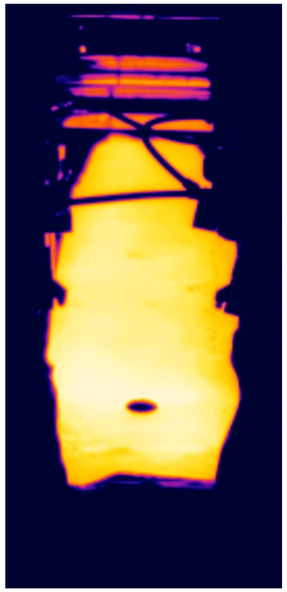


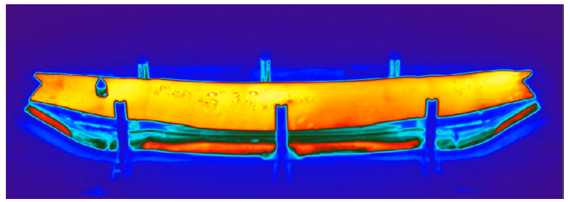












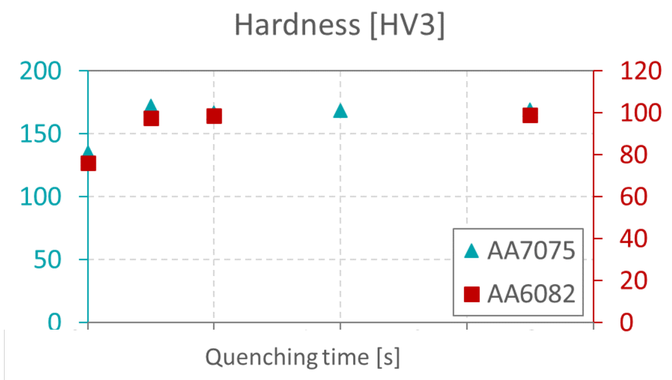
TRANSFER TIMES:

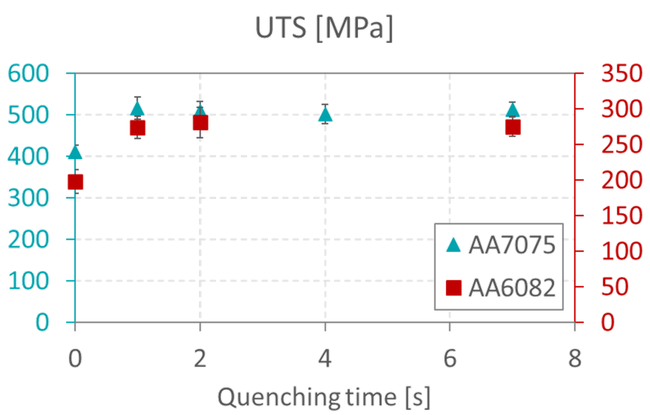
- Tested: 10s, 40s and 120s
- Shorter transfer time -> Higher properties
- Define feeder/robot specifications

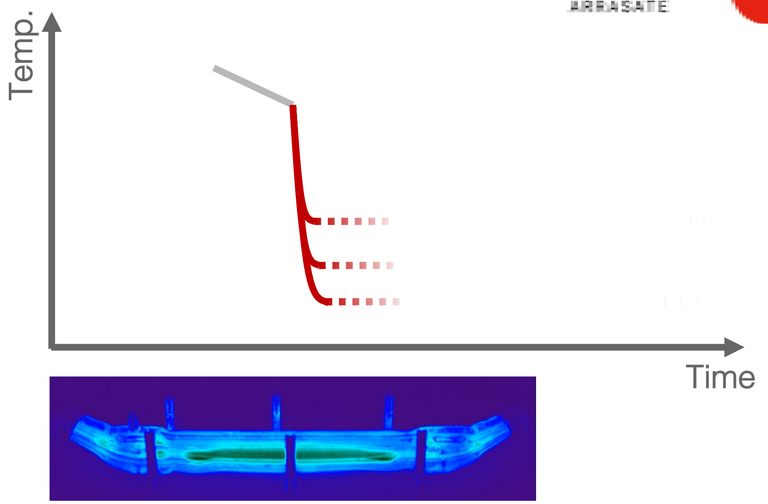
3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

RESULTS

QUENCHING TIME



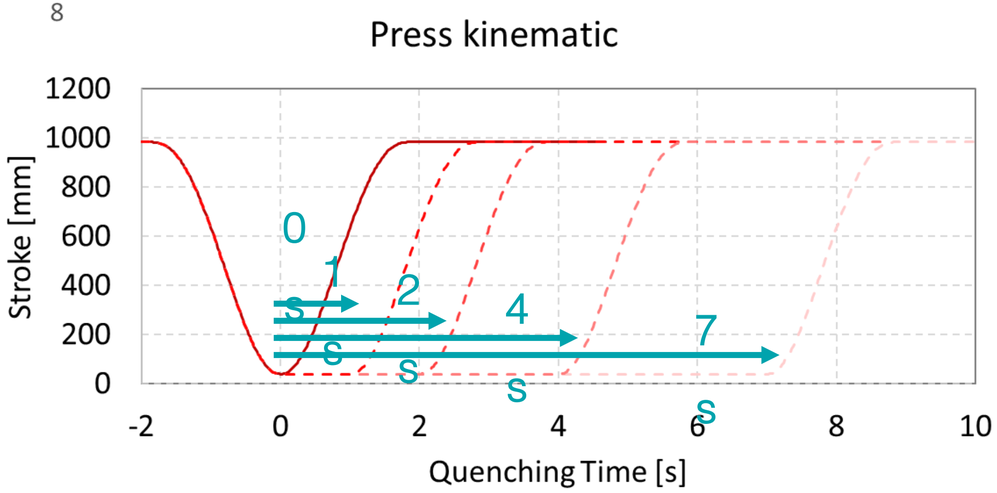




QUENCHING TIMES:

- Tested: 0s, 1s, 2s, 4s and 7s
- Longer quenching time -> Higher properties
- 1s quenching is acceptable

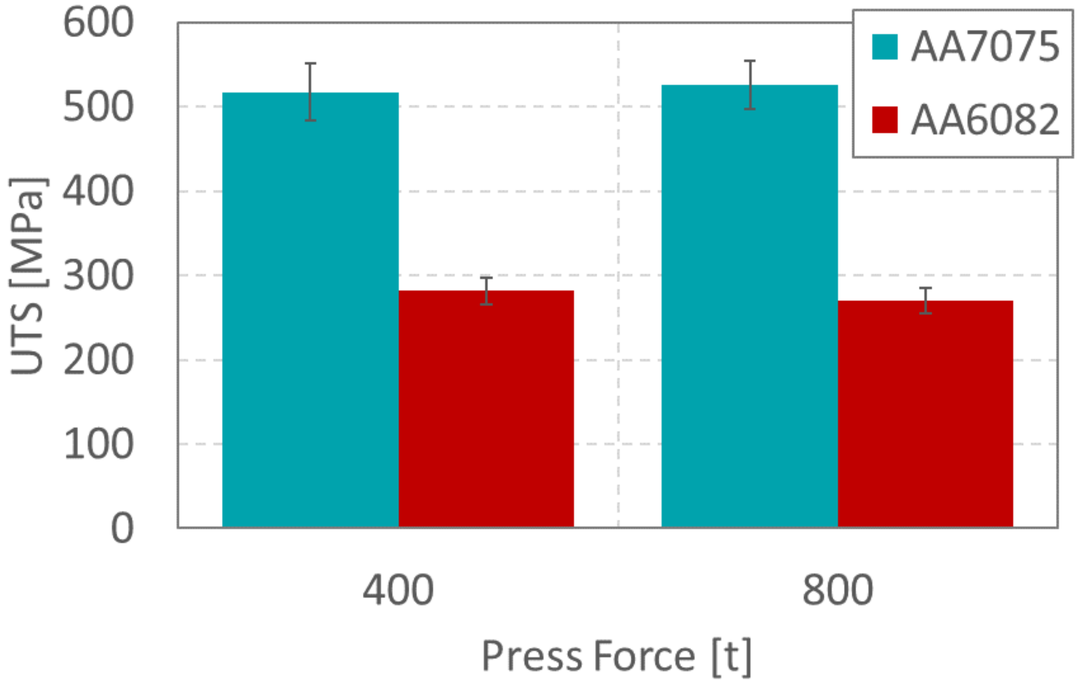
- Define press specifications

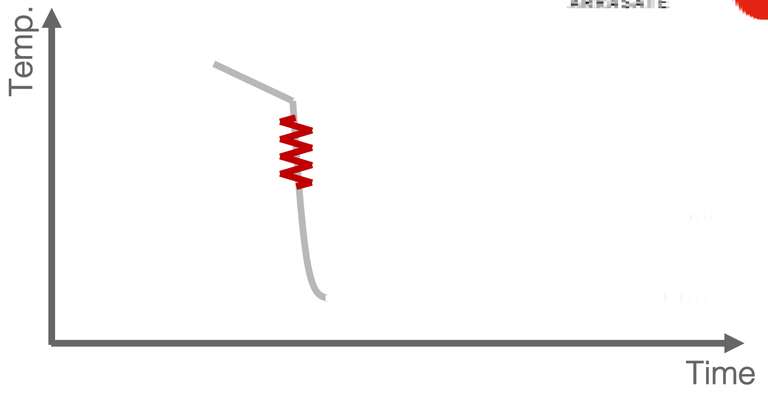


3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

RESULTS

PRESS FORCE





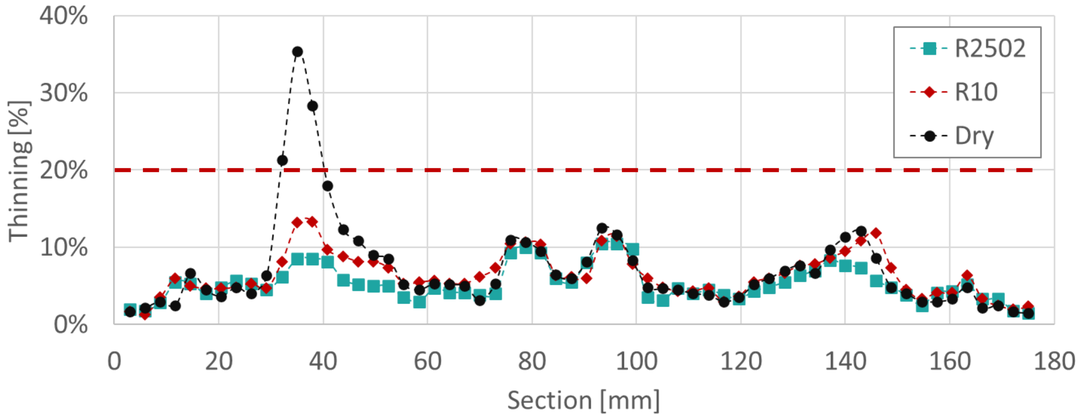
PRESS FORCE:

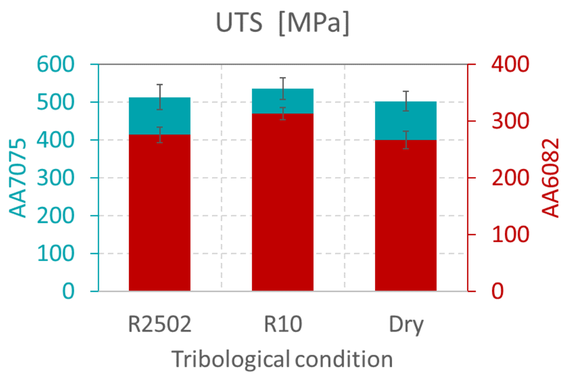
- Tested: 400t (17 MPa) and 800t (34 MPa)
- Same mechanical properties
- Define press specifications

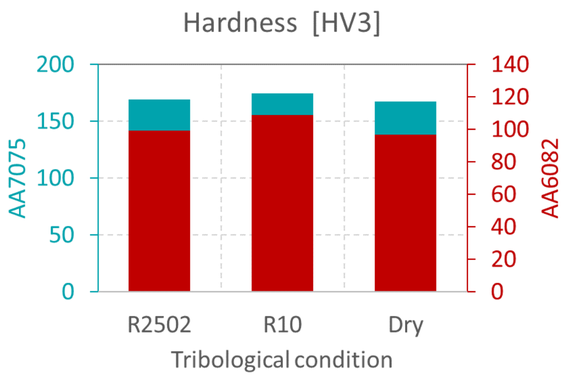
3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

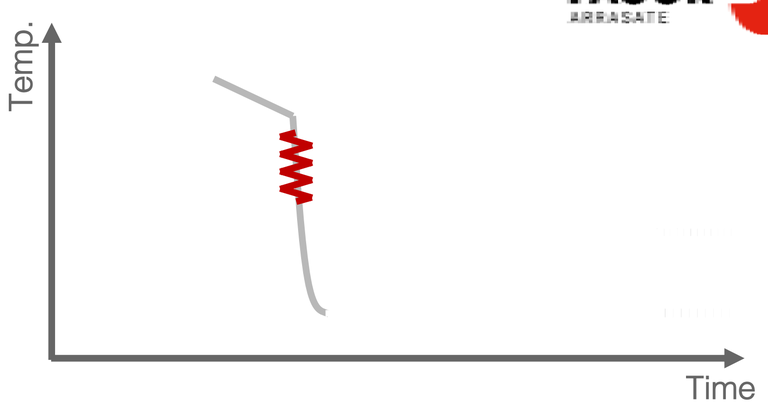
RESULTS

TRIBOLOGICAL PERFORMANCE



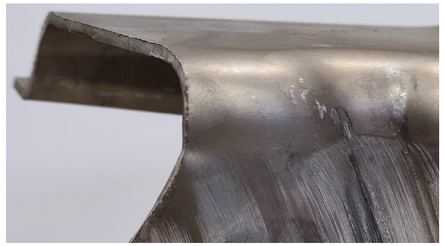




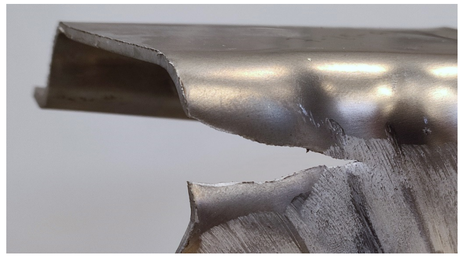


LUBRICATION:

- FUCHS lubricants:
- R2502(white) and R10(black)
- Increase formability
- Less thinning -> Slightly better properties
- Dry condition unacceptable!



LUBRICANT

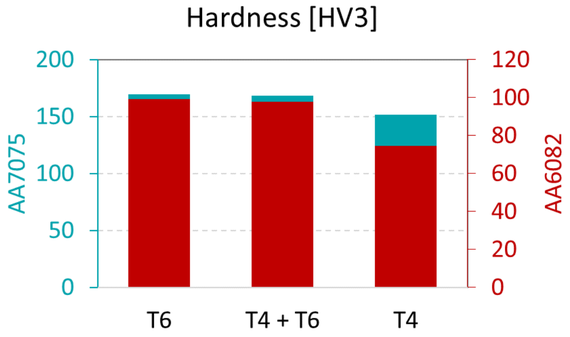


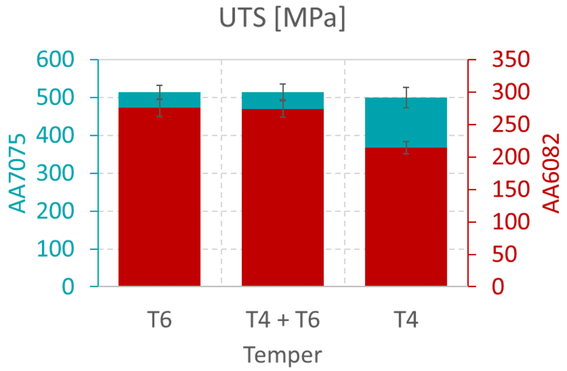
DRY

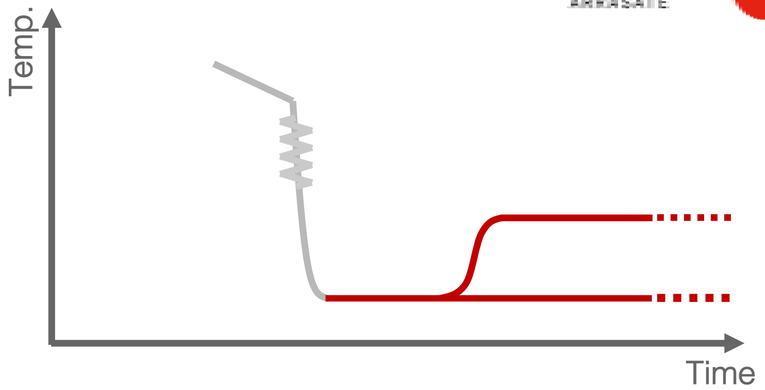
3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

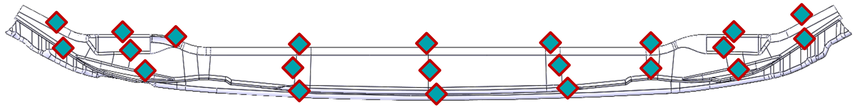
RESULTS

HEAT TREATMENT









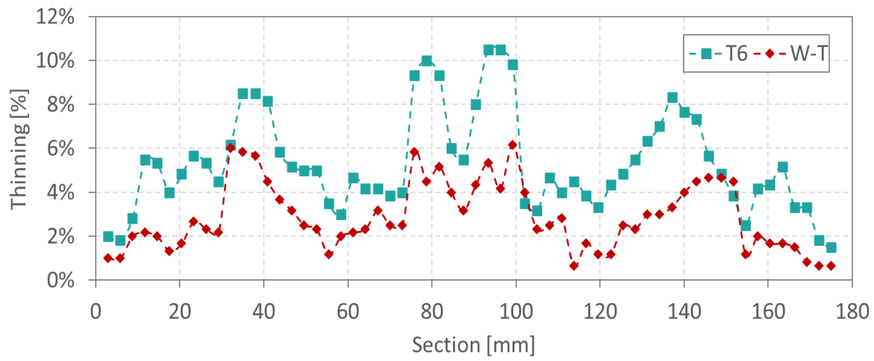
TEMPER

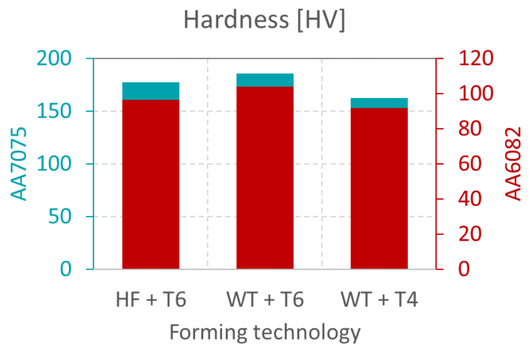
- Acceptable properties with T4(natural aging) and T6(artificial aging) tempers
- 2 week T4 before T6 -> Viability for Logistic issues
- Geometry does not change after T6

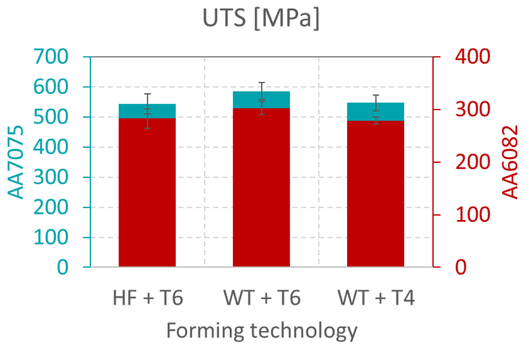
3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

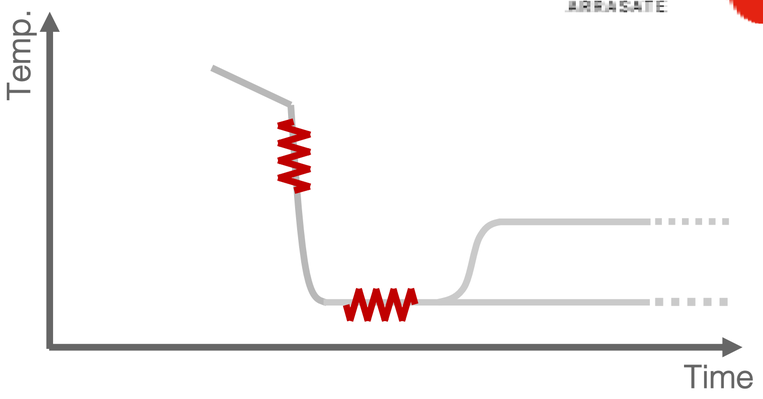
RESULTS

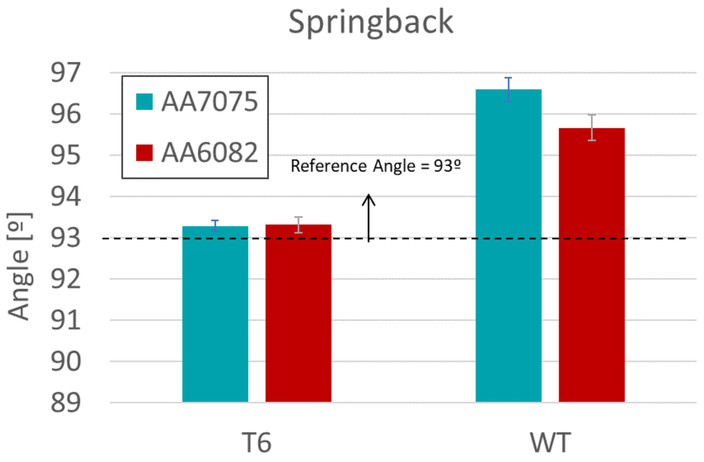
FORMING TECHNOLOGY











FORMING TECHNOLOGY

- Better properties with W-T forming:
- W-T forming better thinning
- HF better springback performance

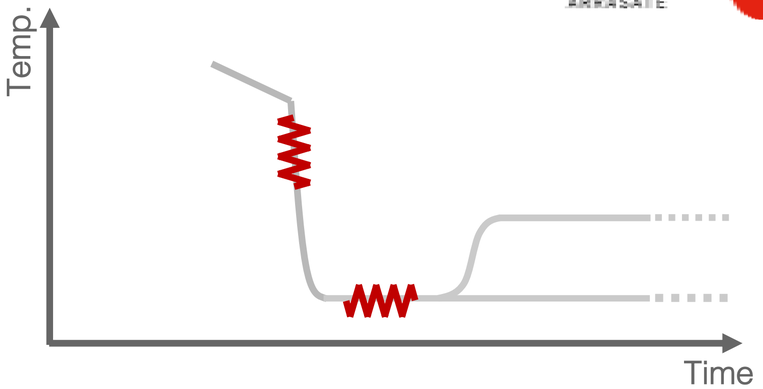
3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

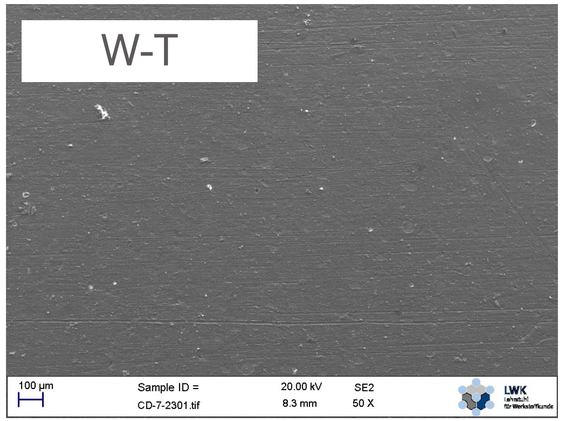
RESULTS

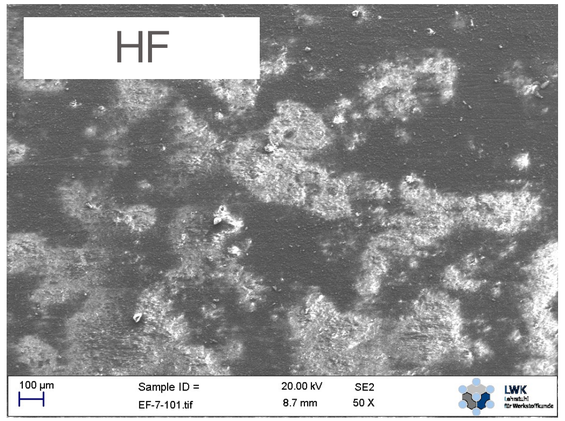
FORMING TECHNOLOGY

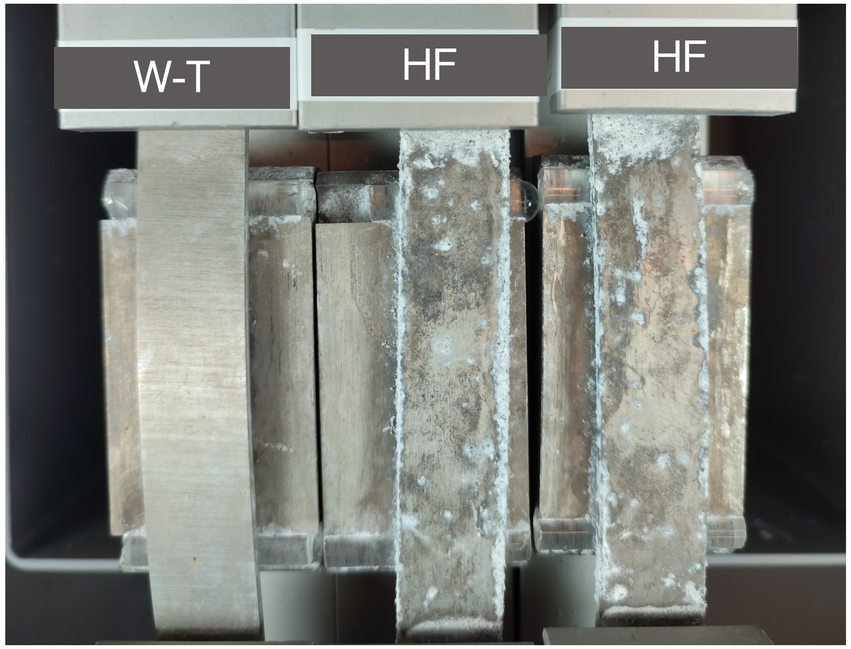
STRESS CORROSION CRACKING

- ALL BUMPERS PASS THE 2 WEEK TEST
- Different surface corrosion behaviour









3D SCAN | SPRINGBACK | THINNING | HARDNESS | TENSILE TEST | CORROSION | CRASH TEST

LINE FURNACE SOLUTION

ALUMINUM
HOT FORMING

Fagor Arrasate: In House - Manufacturing Line

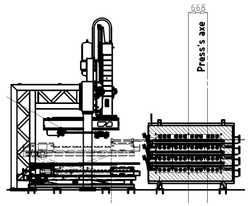
Hot Forming Technology Center

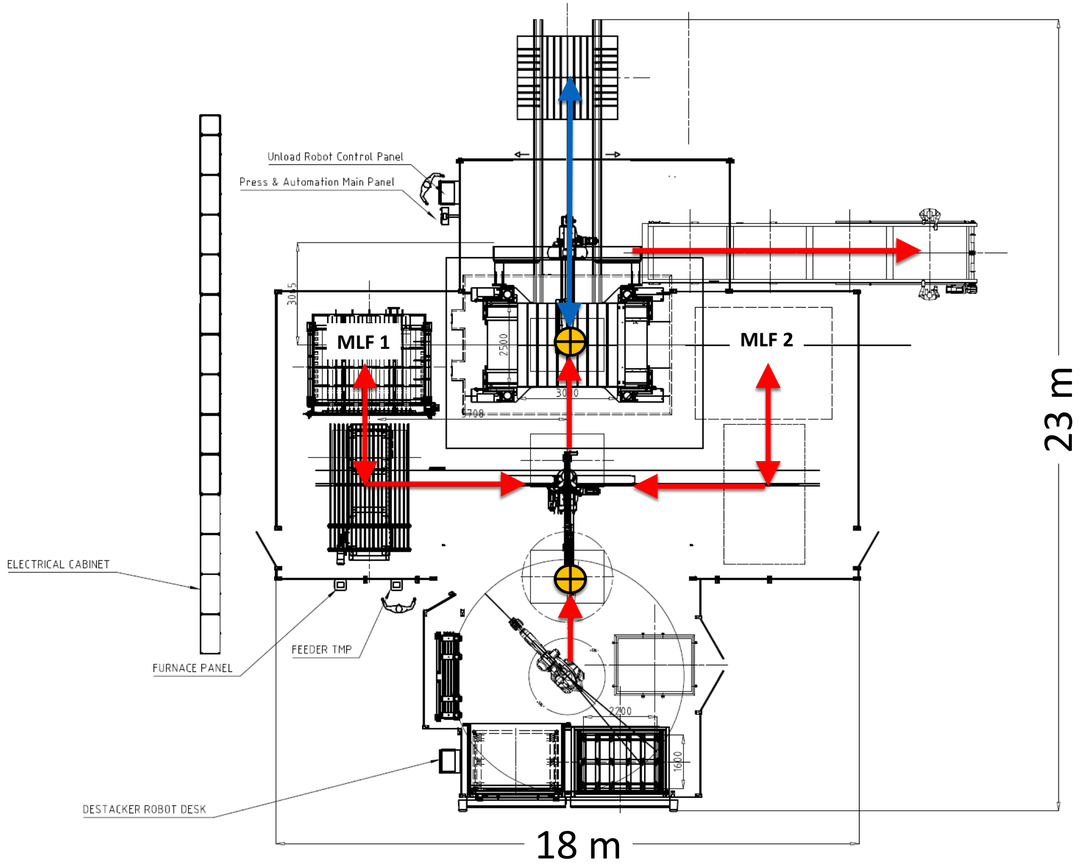
Mondragon Unibertsitatea
Faculty of Engineering

Servo Mechanical Press 15.000 KN
Table size 3.600x2.500 mm
Automatic feeding system
1 x Multi-Layer-Furnace

ALUMINUM
HOT FORMING

Fagor Arrasate: Line Lay Out Multi-Layer-Furnace



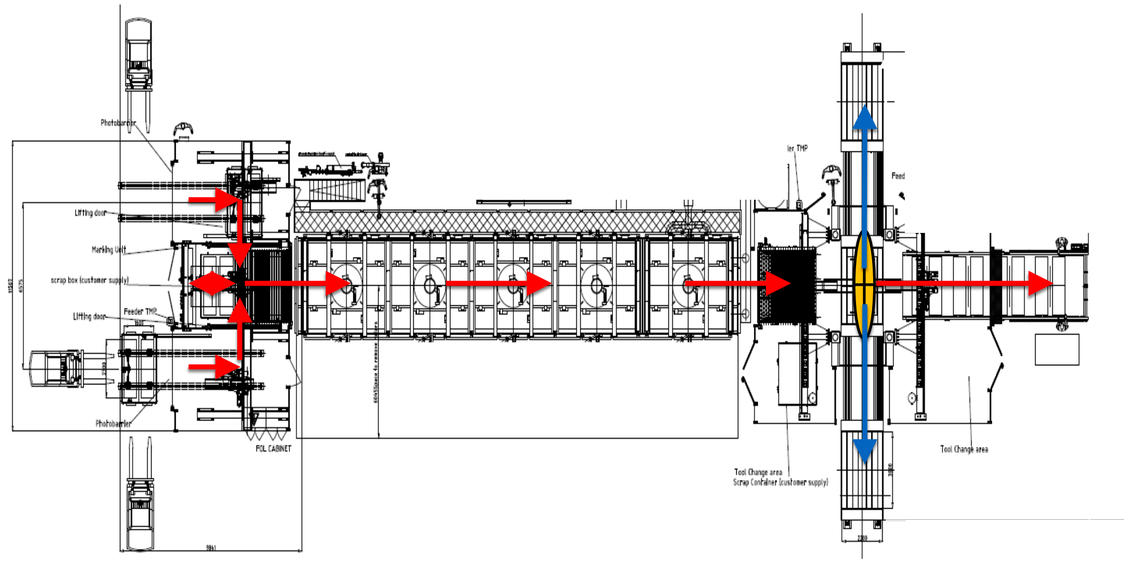


1. Production Line - Example
   - **4** x Multi Layer Furnaces (2 on top of each other) total **8-Layer** heating zone
   - 800t Servo Hydraulic Monoblock Press
   - Material 6xxx, 7xxx Al alloys
   - Temperature 550°C +/- 5°C
   - 2,0 mm thickness, 1650mm x 2150mm batch, 18,4 kg
   - cycle time = 51 Stroke / hour
   - **300,000 Stroke per Year** (5800h)

ALUMINUM
HOT FORMING

Fagor Arrasate: Line Lay Out Roller-Furnace

Example 2.



Total length appr. 55 m

2. Full Automation Production Line - Example
   - Roller Furnace appr. **30 m** heating zone
   - 800t Servo Hydraulic Monoblock Press
   - Material 6xxx, 7xxx Al alloys
   - Temperature 550°C +/- 5°C
   - 2,0 mm thickness, 1650mm x 2150mm batch, 18,14 kg
   - cycle time = 120 Stroke / hour
   - **700,000 up to 800,000 Stroke per Year** (5800h)

1.000.000 PART LINE-SOLUTION

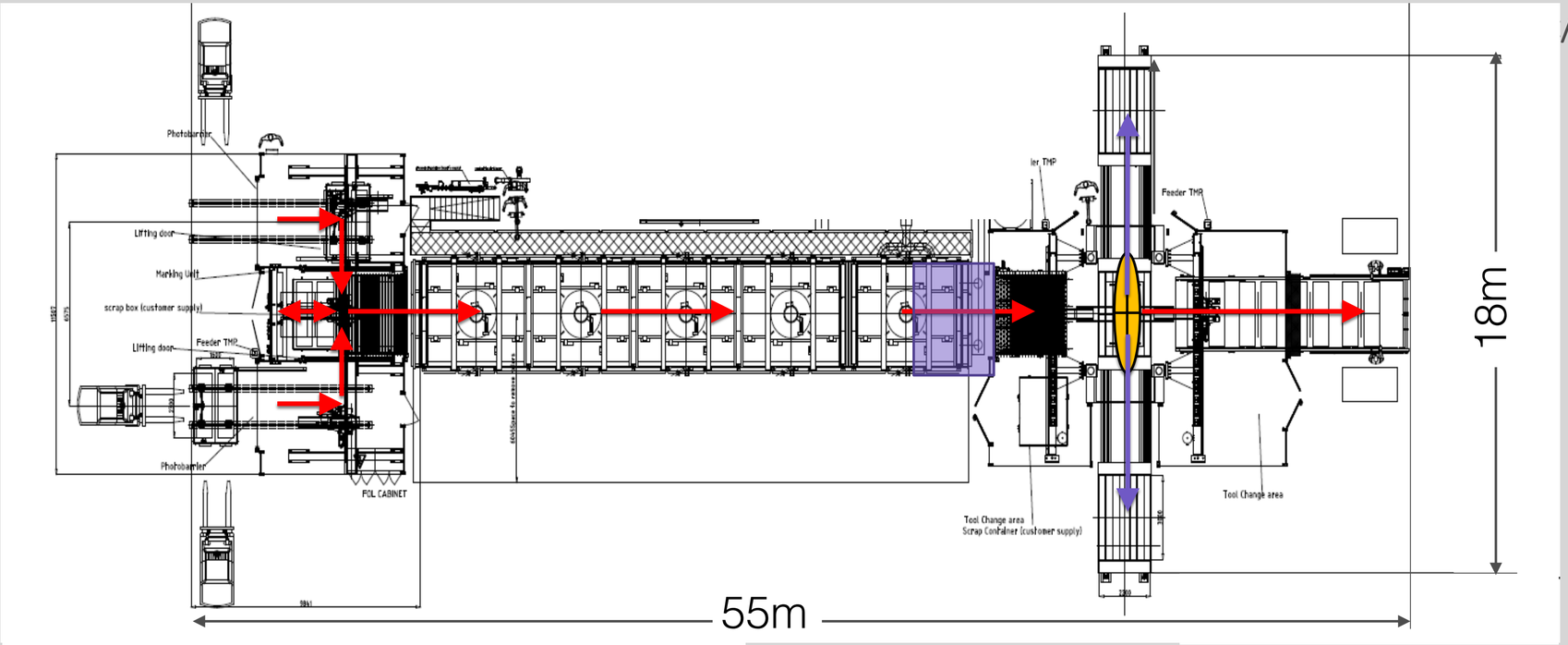
ALUMINUM Hot Forming
LINE SOLUTION: 1.000.000 Part Example

Production Line – Example 1.000.000 part/annum

Article	Illustration (EXAMPLE)	Material	Cavaties	Parts per Stroke	Material thickness [mm]	Surface [m^2]	Part weight Kg	Batch weight	Parts per year	sets/stroke per year	Cycle Time Average [5.800h/yer]
B-pillar LH/RH		Aluminum S650 (AMAG)	2	2	4	0,31	3,25	6,5	200.000	100.000	
Reinf. Roof side outer LH/RH		Aluminum AA6082 (AMAG)	2	2	3	0,48	3,94	7,88	200.000	100.000	
Reinf. Roof side outer LH/RH		Aluminum AA6082 (AMAG)	2	2	3	0,53	4,33	8,66	200.000	100.000	
Door Ring Outter LH		Aluminum S650 (AMAG)	1	1	2,5	1,6	10,73	10,73	100.000	100.000	
Door Ring Outter RH		Aluminum S650 (AMAG)	1	1	2,5	1,6	10,73	10,73	100.000	100.000	
Door Ring Inner LH		Aluminum S650 (AMAG)	1	1	2,5	1,1	6,94	6,94	100.000	100.000	
Door Ring Inner RH		Aluminum S650 (AMAG)	1	1	2,5	1,1	6,94	6,94	100.000	100.000	
									1.000.000	700.000	29,83

- 800t Servo Hydraulic Press
- 1 x Roller Furnace 30m heating zone
- 2 x Roller Furnace 14m heating zone
- Temperature 550°C +/- 5°C
- Material 6xxx, 7xxx Al alloys
  - 2,5 mm to 4mm thickness,
  - Batch-weight 6,5 to 10,73kg
  - Soaking time 2 min.
- cycle time
  - 30 sec.
  - 120 Stroke / hour
- 700,000 Stroke per Year (5.800h)
  - 1.000.000 Parts

ALUMINUM Hot Forming
LINE SOLUTION: 1.000.000 Part Example



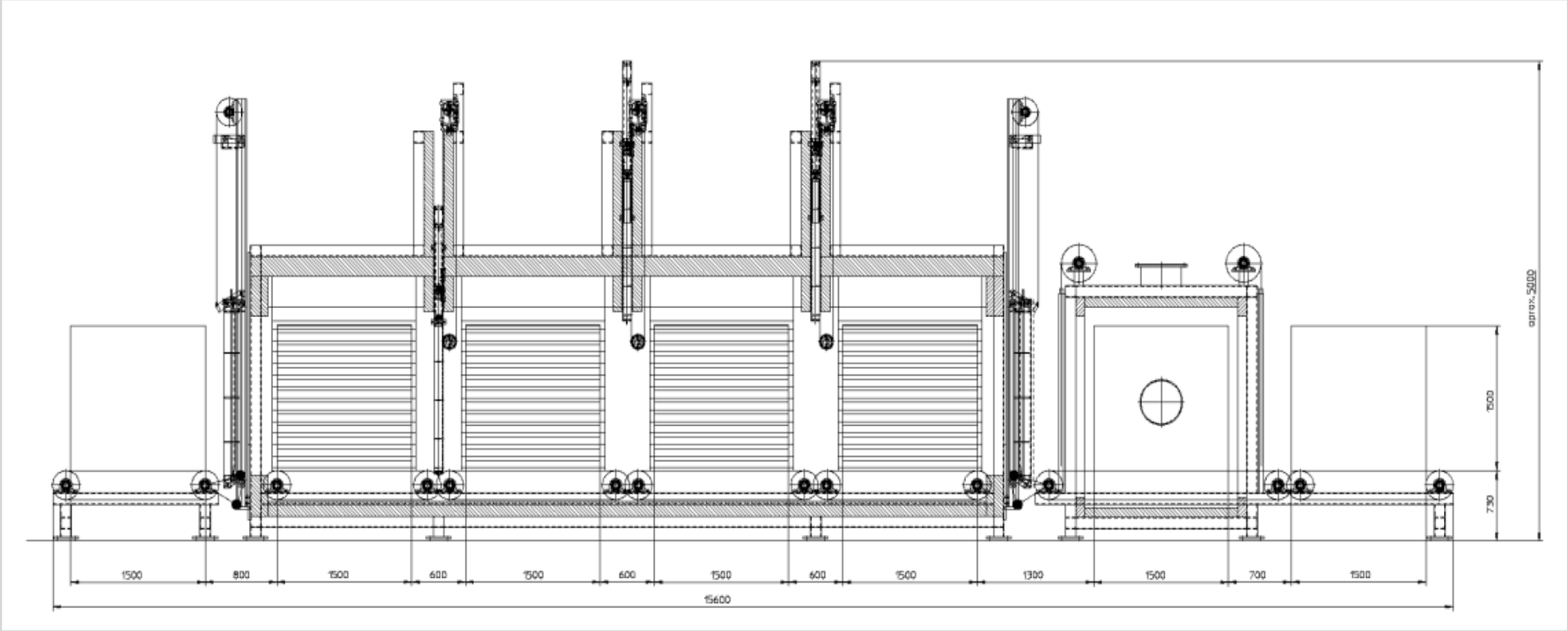
with prec-ooling: + 4m, total lenght 59m,
Dependance on Throughput furnace as well 49m

Production Line – Example 1.000.000 /annum

- 800t Servo Hydraulic Press
- 1 x Roller Furnace 30m heating zone
- Temperature 550°C +/- 5°C
- Material 6xxx, 7xxx Al alloys
  - 2,5 mm to 4mm thickness,
  - Batch-weight 6,5 to 10,73kg
  - Soaking time 2 min.
- cycle time
  - 30 sec.
  - 120 Stroke / hour
- 700,000 up to 800,000 Stroke per / Year **(5.800h)**
  - **1.000.000 Parts**

ALUMINUM Hot Forming
LINE SOLUTION: 1.000.000 Part Example

Production Line – Example 1.000.000 part / annum



Total length appr. 14 m

AGING

2 x Furnace 4 x heating zone

Rack Size

- Width 2300
- Length 1500
- Hight 1500

Temperature 250°C

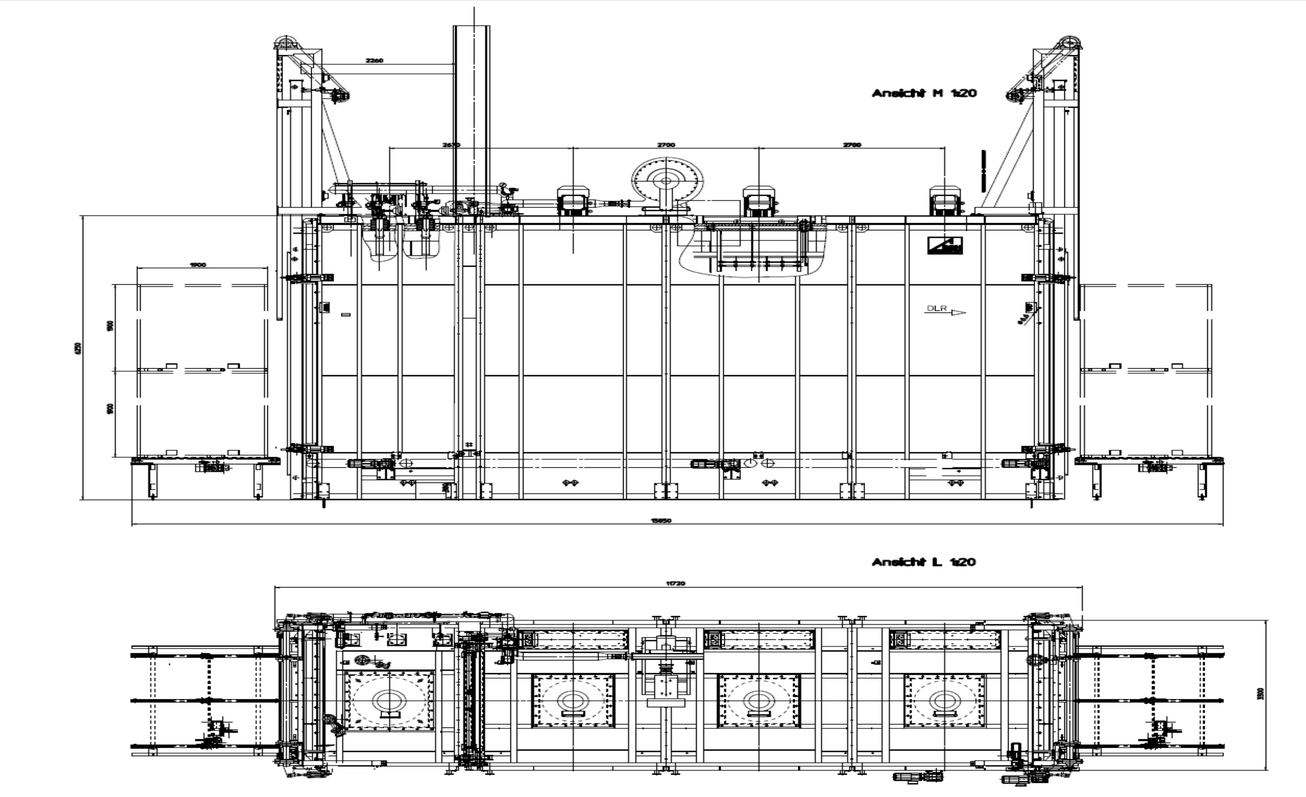
Material 6xxx, 7xxx Al alloys

- 2,5 mm to 4mm thickness,
- Batch-weight 6,5 to 10,73kg

cycle time

- Soaking incl. 1m
- Appr. 200 Parts / hour average
- Up to: 1.200.000 Parts / annum
  - (5800h / annum)

ALUMINUM Hot Forming
LINE SOLUTION: 1.000.000 Part Example



Total length appr. 20 m

Production Line – Example 1.000.000 part / annum

- AGING, through-put, double stock
- 4 x heating zone gas & electric
- Rack Size, [350 Kg, 25 pcs.]
  - Width 2,300mm
  - Length 1,900mm
  - Hight 1,900mm
- Temperature 250°C
- Material 6xxx, 7xxx Al alloys
  - 2,5 mm to 4mm thickness,
  - Batch-weight 6,5 to 10,73kg
- cycle time
  - Soaking incl. 1m
  - Appr. 200 Parts / hour average
  - Up to: 1.200.000 Parts / annum
    - (5800h / annum)

CHILLER SOLUTIONS
Aluminum

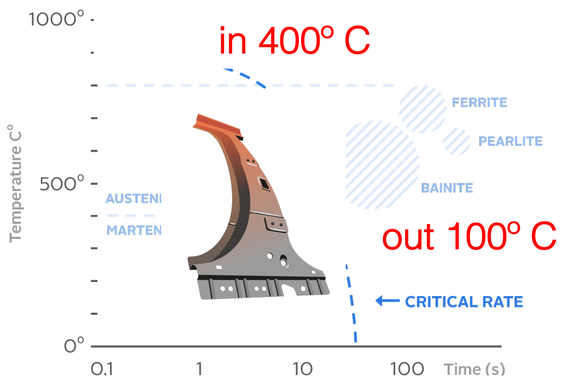
CHILLER EXAMPLE
DIE COLLING Aluminum

ONI-Sample-Cooling-System consisting of:

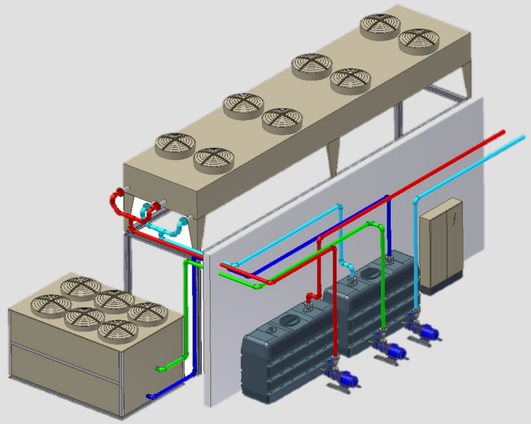
Chiller only for the DIE colling

- **Line cycle time appr. 10 sec.**
- **Batch 25kg max**
- **Through put per hour max. 2t**

- Air-cooled chiller 726kW with screw-type compressor
- Temperature of cooling water in-20°C out 25°C at 35°C up to 45°C air
- Appr. 120m^3/h = 2000L/min.



Standard Solution



Installation and piping on steel base frame

Example of a steel frame cooling

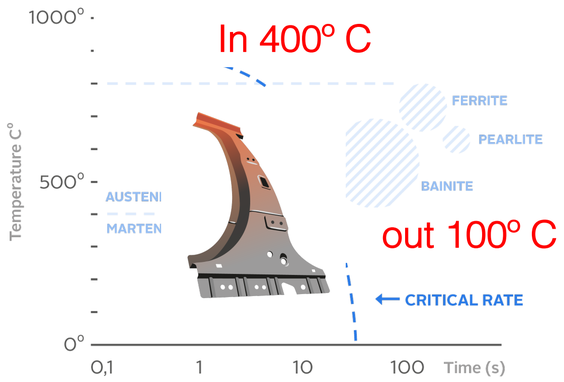
CHILLER EXAMPLE
LINE COLLING Aluminum

ONI-Sample-Cooling-System consisting of:

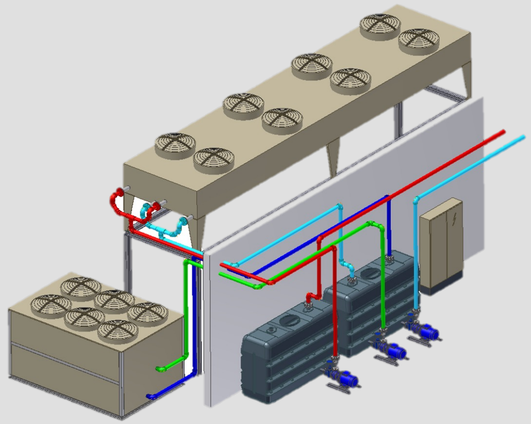
Chiller for LINE colling

- **Line cycle time appr. 10 sec.**
- **Batch 25kg max**
- **Through put per hour max. 2t**

- Air-cooled chiller 1186 kW with screw-type compressor
- Temperature of cooling water in 20°C out 25°C at 35°C up to 45°C air
- Appr. 200m^3/h = 3400L/min.



Standard Solution



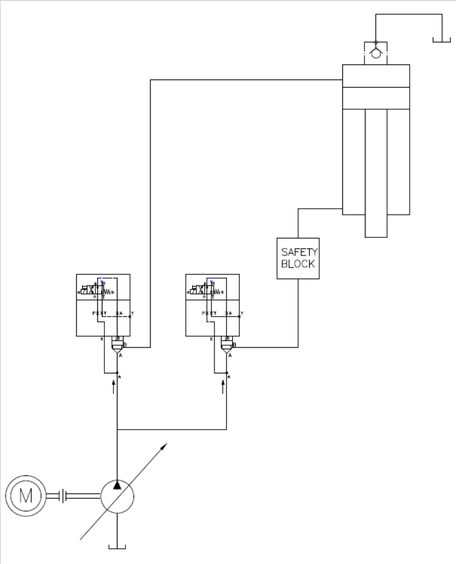
Installation and piping on steel base frame

Example of a steel frame cooling plant

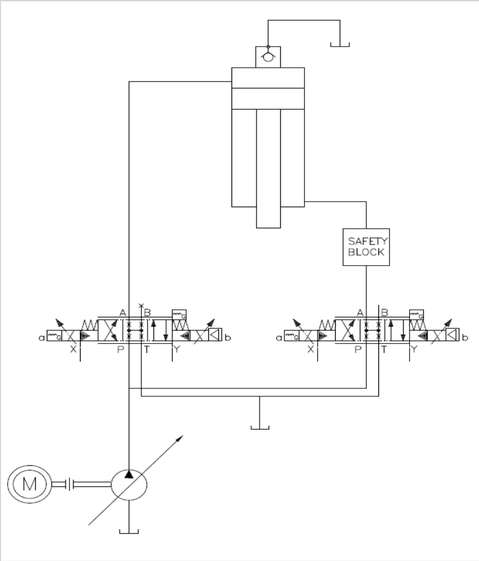
SERVO PUMP HYDRAULIC SOLUTIONS

HYDRAULIC PRESS
CONTROL

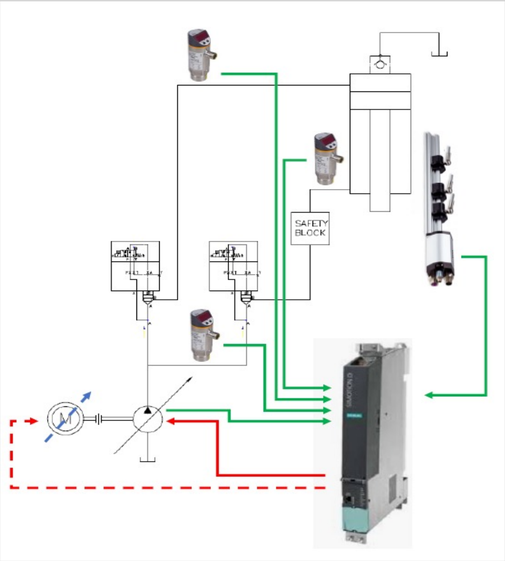
CONVENTIONAL



SERVO VALVE

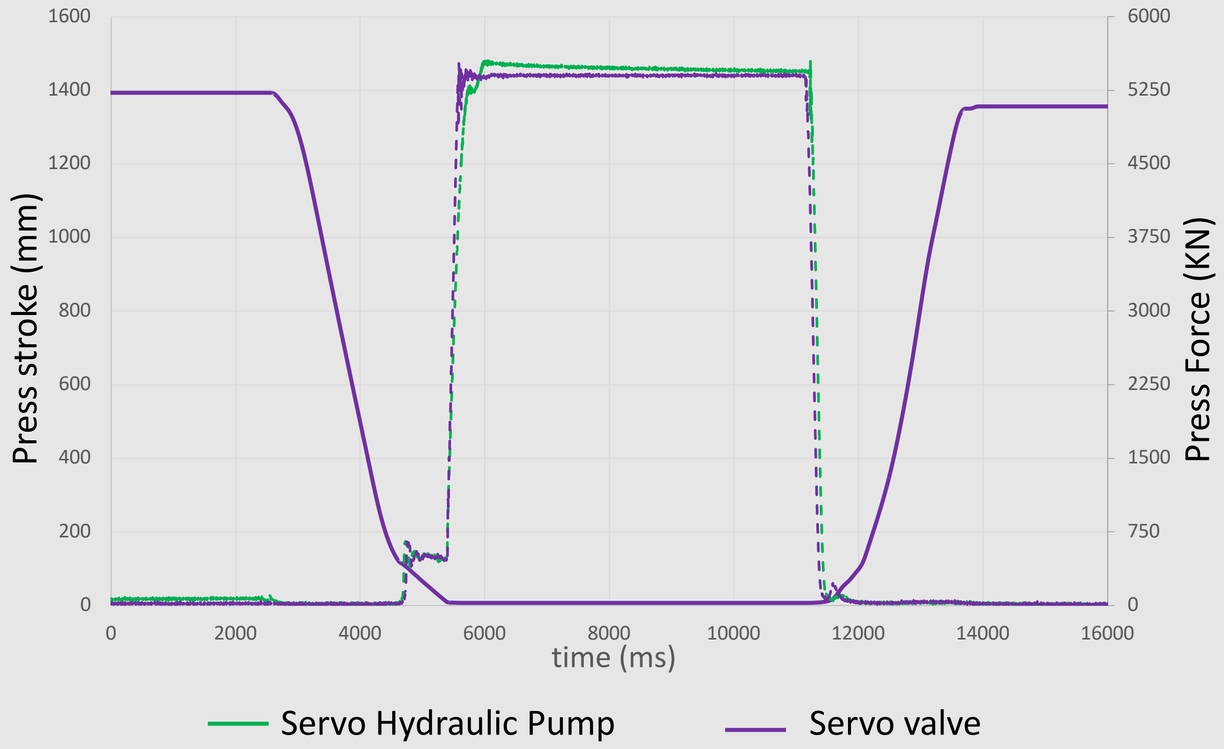


SERVO PUMP

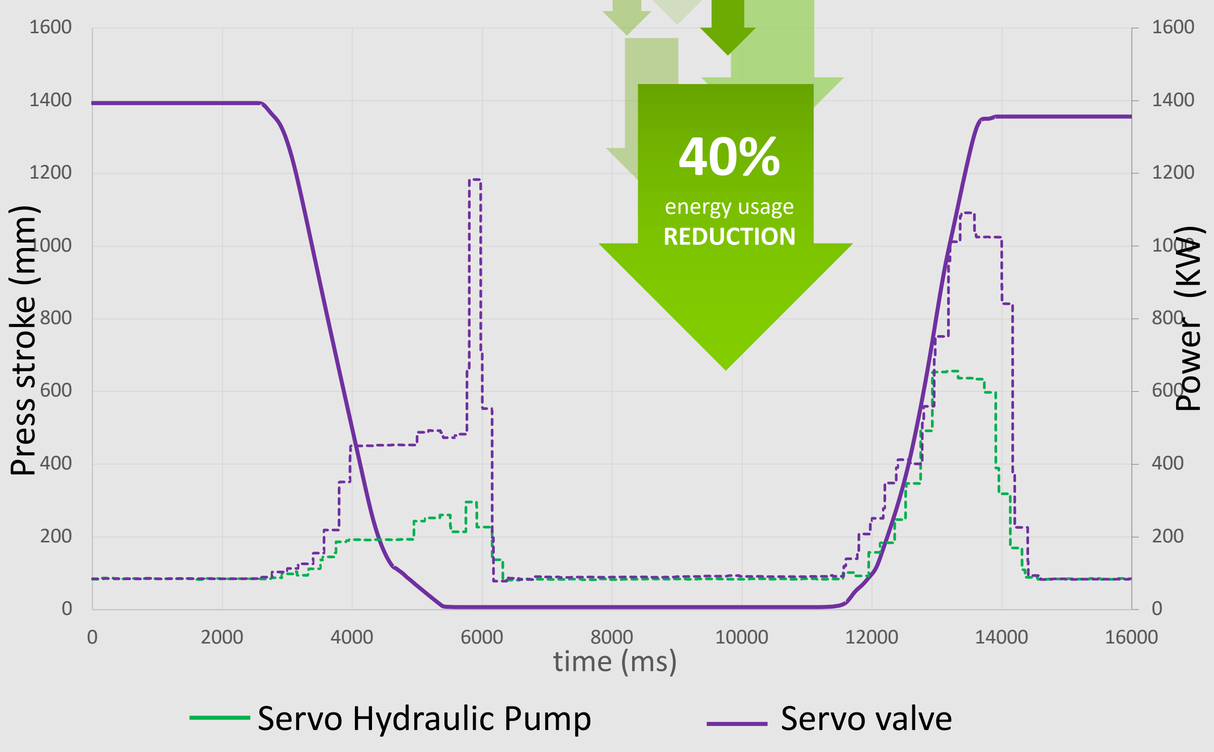


HYDRAULIC PRESS CONTROL
SERVO HYDRAULIC - SERVO VALVE

PRESS Force



ENERGY Consumtion



Servo Valve: ***3928 kJ***

Servo Hydraulic Pump: ***2552kJ (-35%)***

40%
energy usage
REDUCTION

DIRECT SERVO HYDRAULIC PUMP
ADVANTAGES

Performance

- Dynamism improved comparing to conventional systems
- Programable force during whole operation
- Full process monitoring

Consumption

- Lower electrical consumption
- Lower refrigeration water consumption
- Smaller hydraulic Tank
- Reduced noise level

Maintenance

- Less hydraulic components
- Less sensitive Hydraulic elements
- Reduced spare part cost
- Reduced non programmed stops
- Reduced maintenance stop time

HYDRAULIC PRESS CONTROL
SERVO HYDRAULIC - SERVO VALVE

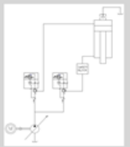
1200 to Press Press Hardening	Consumtion /stroke [KJ]	Consumtion /stroke [%]	Consumtion Saving /stroke [KJ]	Consumtion Saving /stroke [%]	Energy-Cost /stroke	Energy-Cost /year (800.000 strok's)	Energy-Cost saving /year	additional invest [€]	ROI return on add. invest [year]	7 years-view Saving/Profit
Convetional Hydraulic Press	4359	100,0%	0	0%	0,48 €	387.467 €	-	-		0 €
Servo Valve Hydraulic Press	3928	90,1%	431	9,9%	0,44 €	349.156 €	38.311 €	100.000 €	2,61	168.178 €
Servo Mechanical Press	1870	42,9%	2489	57,1%	0,21 €	166.222 €	221.244 €	800.000 €	3,62	748.711 €
Servo Pump Hydraulic Press	2356,8	54,1%	2002	45,9%	0,26 €	209.493 €	**177.973 €**	100.000 €	**0,56**	**1.145.813 €**

40% energy usage REDUCTION

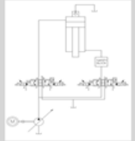
BASED ON	
Price [€] per [kWh]	**0,40 €**
Stroke per Year	**800.000**

ATTENTION: focus is based on Energy-Consumption per STROKE

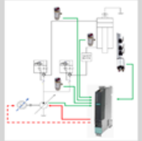
CONVENTIONAL



SERVO VALVE



SERVO PUMP



SERVO MECHANIC

RELIABLE PARTNER FOR YOU

RELIABLE PARTNER FOR YOU
FAGOR ARRASATE

1. Customer Oriented
   - Local, Professional Service and Sales
   - Turn Key Supplier with corroborate Project Management
   - Start-up and launch support, customer training work shops
   - Flexible acting during the Project phase
   - Delivery in Time

2. Global Group Advantages
   - Healthy Group Structure with 4 different Divisions
   - Global experiences with OEM's and Tier one, Tier two supplier
   - World Marked Grow, possibility with our customer
   - World Marked Share in Press Hardening since 2013
   - Customer support world wide

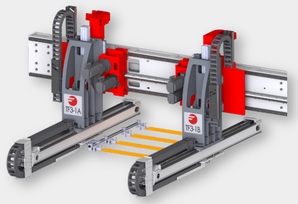
RELIABLE PARTNER FOR PRESS HARDENING PRESS
FAGOR ARRASATE

3. Fagor Inhouse Competens

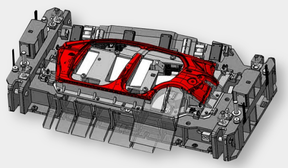
Process engineering
R&D

Line development

Presses
Mechanical, hydraulic
or servodriven presses



Automation
Feeding line
Transfers
Robotization



Dies and tooling

FAGOR ARRASATE

Thank You !
For Your Attention

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+49 151 4651 8261

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