DESIGN AND DEVELOPMENT FOR GREEN CARS

HOTTEKNIK

AITOR ORMAETXEA
a.ormaetxea@fagorarraste.com
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MONDRAGON GIZATASUNA LANEAN Finantzak Industria Banaketa Ezagutza

BATZ

FAGOR

Run by MONDRAGON for supplying PHS to Global Market

HOTTEKNIK

Presses

- Press lines and Equipment
- Hydraulic presses

Tools

- Hot Forming dies
- Pre Serial manufacturing

MONDRAGON GIZATASUNA LANEAN Finantzak Industria Banaketa Ezagutza

FAGOR

FAGOR ARRASATE, Koop. E.

BATZ

- *Created in 1957*
- *World Leader in the **design and manufacturing** of forming and processing Machine tools, specially in the domain of Coil Cutting Lines, **Steel processing** and **Stamping Presses**.*

- *Sales 2013: 280 M€*
- *Staff: 810*
- *Exports: 95%*
- *Sales in 70 countries*

WAVE FLEXIBLE CONTINUOUS LINE

FlexCell

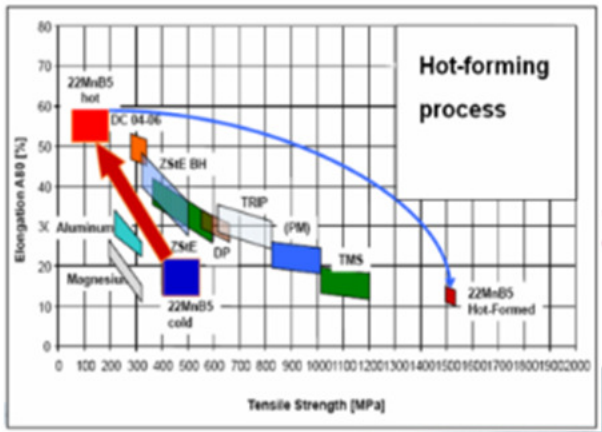
SPT ServoPressTechnology

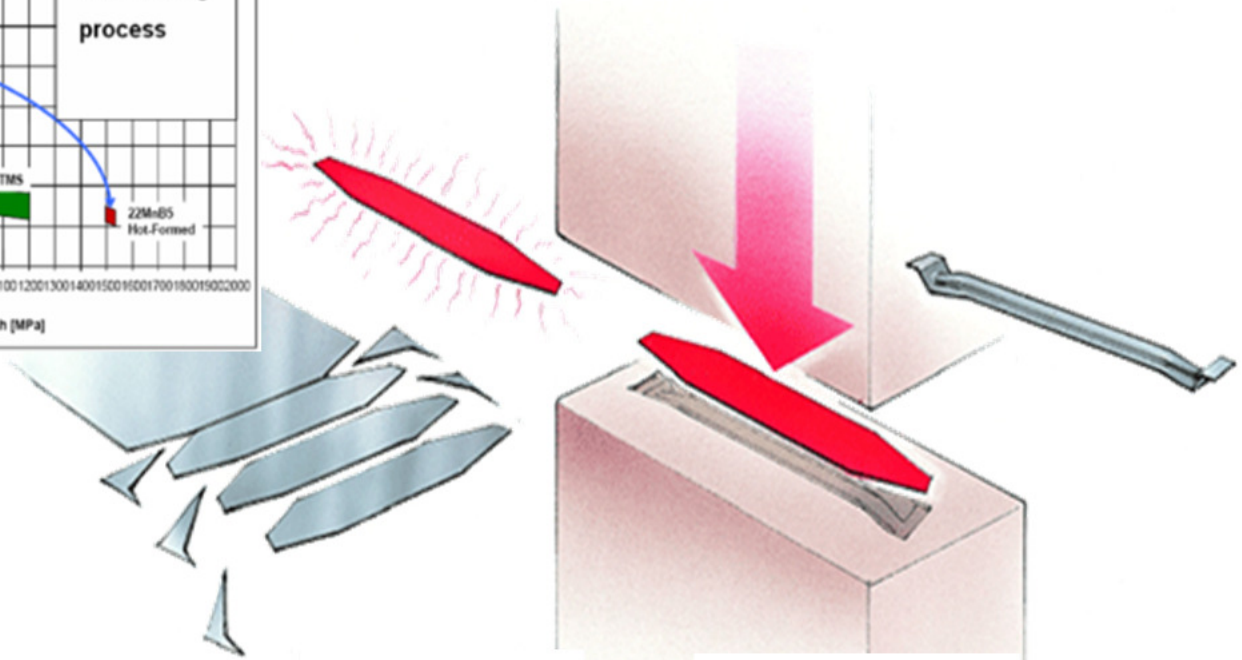
- *Established in 2008设立于2008年*
- *Kunshan, Jiangsu Province江苏昆山*
- *Mechanical presses and cut to length lines机械压力机和剪切线*
- *Local technical service本土化技术服务*

FAGOR
Fagor Metalforming machine Tool

- *Staff员工: 180*
- *面积20.500 m²*
- *ISO 9001*

Introduction



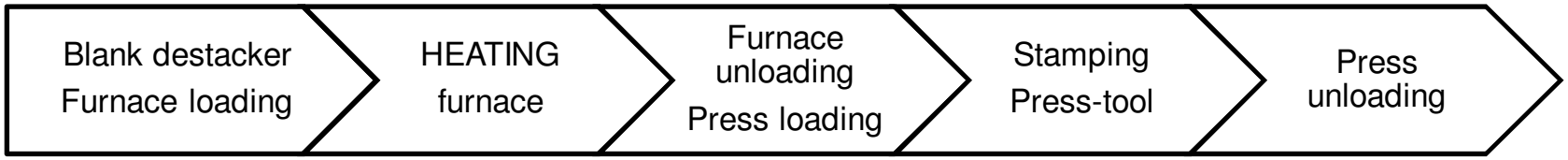


AUSTENITIZATION AT 900°C DURING 5 MINUTES

MARTENSITIC CRITICAL COOLING SPEED = 27°C/s

PUNCHING OF BLANK → HEATING → FORMING QUENCHING → SHOT BLASTING (NON COATED MATERIAL)

Process:



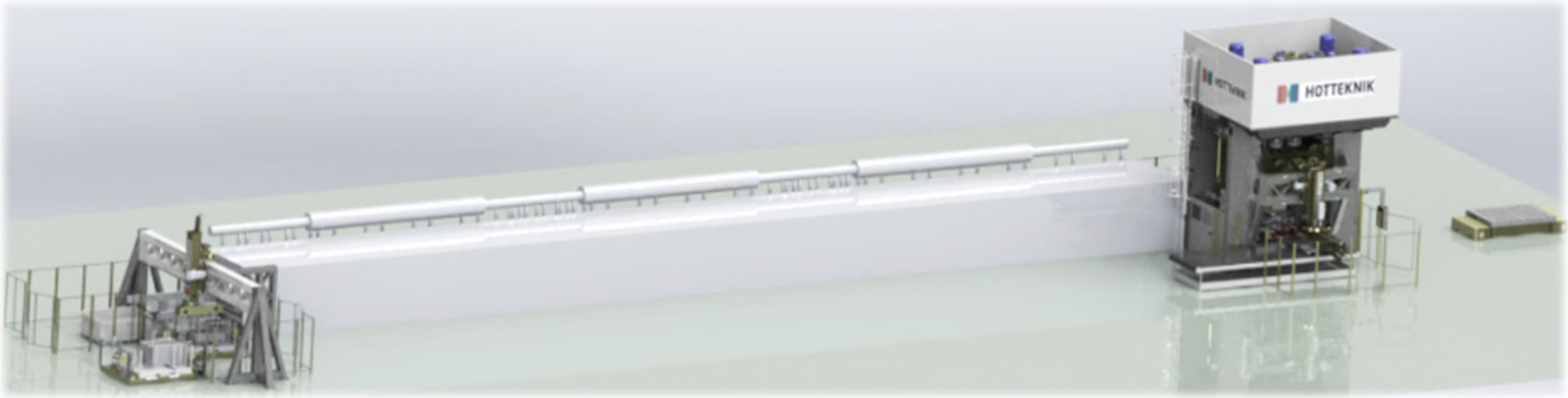
Robot Feeder	Roller hearth furnace Chamber furnace	Robot Feeder Transfer	Hydraulic Mechanical	Robot Feeder Transfer

MAIN CATEGORIES:

- Furnace type
- Automation type
- Press type

Roller Hearth Furnace-→ High Production Line

- 2-4 parts per stroke
- Cycle time 10-15 seconds



DESTACKER | ROLLER EARTH FURNACE | LOADING | PRESS TOOL | UNLOADING

DESTACKER

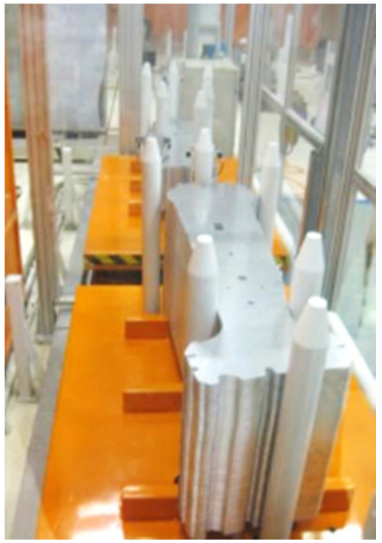
Function-components

Blanks stack loading
- loading cars
- pallet loading

Blanks marking

Double blanks detection

Blank transfer: ROBOT-FEEDER
- Part rotating
- Part turning



HOTTEKNIK

DESTACKER: ROBOT

- Configurations
  - One robot: 2 loading tables
  - Two robots: 4 loading tables
  - ATC area
- Advantage
  - High positioning flexibility
  - Easy tool change
  - Robot: 100% standard element
- Disadvantages
  - Total Speed (max approx.. 16seg)
  - Higher speed possible->duplicate elements, robot, feeder, loading tables

HOTTEKNIK

DESTACKER:FEEDER

- Configurations
  - 3 axis feeder
  - 4 axis feeder (put rotation)
  - ATC area
- Advantage
  - Very high speed
  - Low space required
- Disadvantages
  - Less flexibility
  - Dedicated installation

HOTTEKNIK

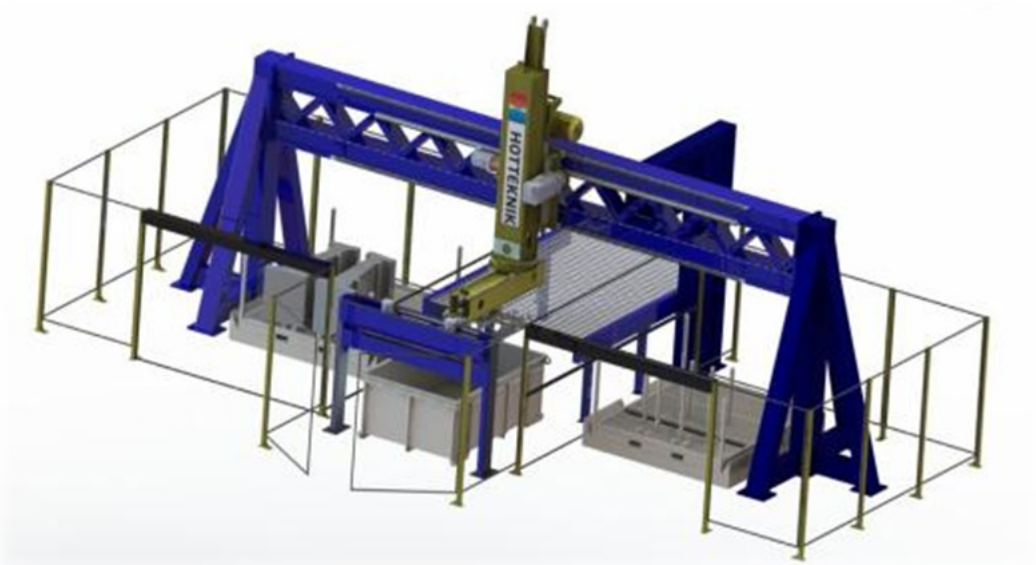
DESTACKER:FEEDER

Typical parameters

Payload capacity:	120 Kg
Y axis motion Module	
Stroke y	9.000 mm
Max. speed Vy	5 m/s
Max. Acc. ay	13 m/s ^{2}
Z axis motion Module	
Stroke z	650 mm
Max. speed Vz	1.25 m/s
Max. Acc. az	10 m/s^2
C1 main rotary axis	Optional axis I 360 º
max.speed	136º/s
accele.	2.267 rad/s^2
X axis motion Module	
Stroke x	4.500 mm
Max. speed Vx	7 m/s
Max. Acc. ax	12,5 m/s^2

FA-LR4-120

Feeder Type
10 s/cycle
Marking station included
FAGOR TESTED DESIGN



ROLLER HEARTH FURNACE

Roller Hearth ROLER

FURNACE 30-40 METERS LONG

ENERGY CONSUMPTION:

- Electric
- Gas
- Hybrid

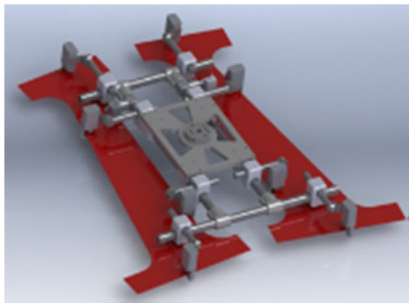
BLANK LOADING:

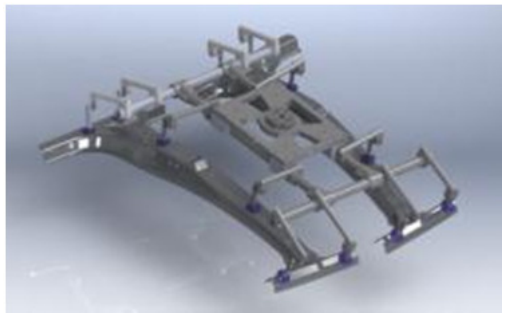
- Lengthwise
- Crosswise

Furnace length as Bottleneck calculation

ROBOT

- Configurations
  - Single robot: Direct
  - Single robot: 90º
  - Twin robot
- Advantage
  - High positioning flexibility
  - Easy tool change
  - Robot: 100% standard element
- Disadvantages
  - Slowest speed-acc.
  - Arm interference-

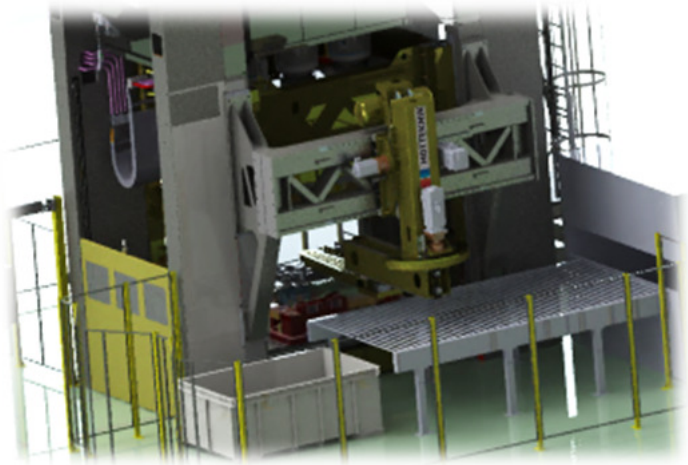




HOTTEKNIK

FEEDER

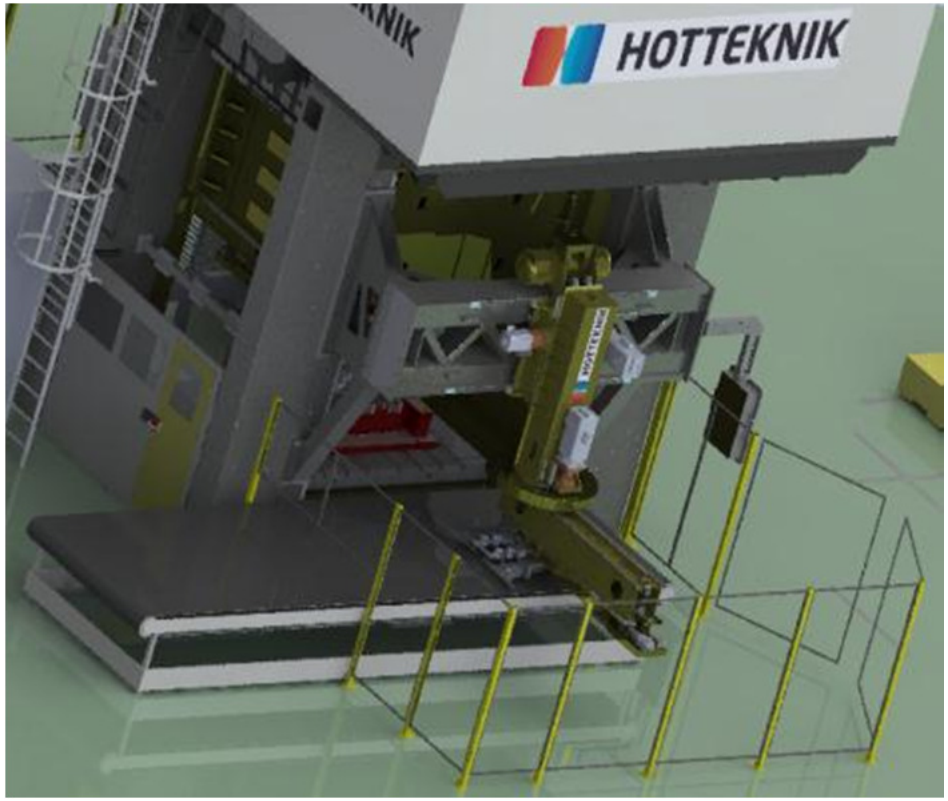
- Configurations
  - 2-axis
  - 3-axis
- Advantage
  - High speed
  - Semi automatic tool change
- Disadvantages
  - Less flexibility
  - Dedicated installation



Typical parameters

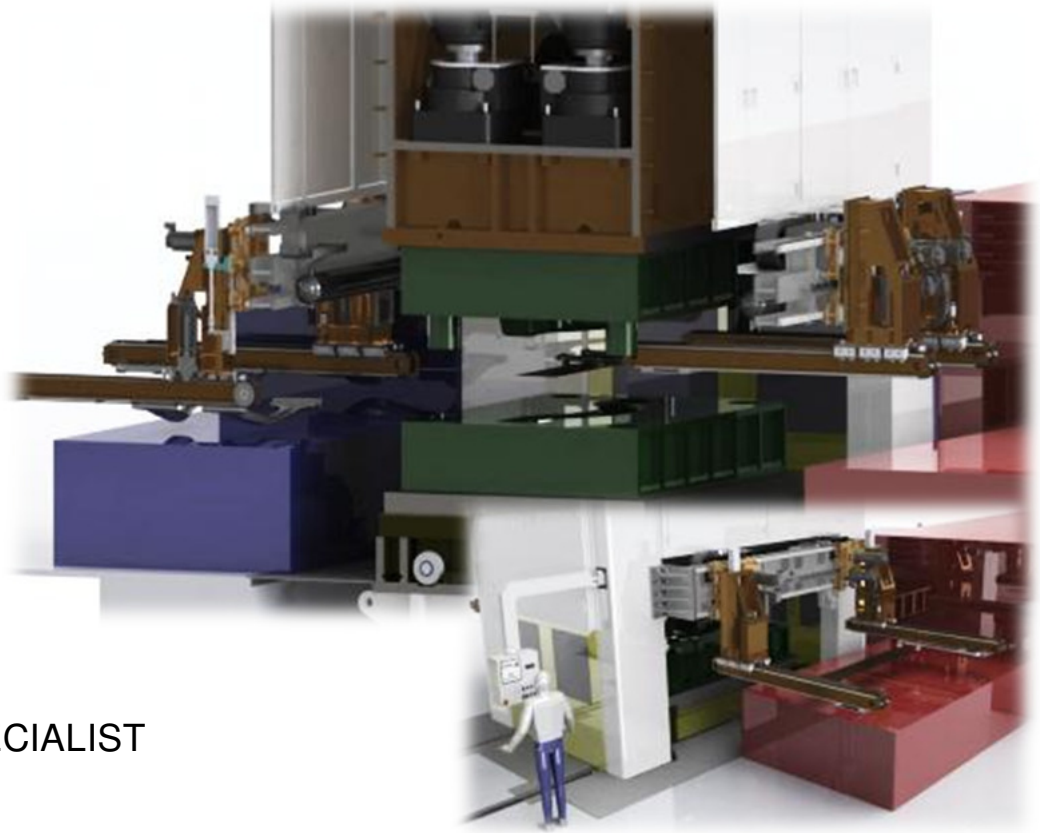
Payload capacity:	120 Kg
Y axis motion Module	Optional axis
Stroke y	Optional
Max. speed Vy	5 m/s
Max. Acc. ay	13 m/s ^{2}
Z axis motion Module	
Stroke z	650 mm
Max. speed Vz	1.25 m/s
Max. Acc. az	10 m/s^2
X axis motion Module	
Stroke x	4.500 mm
Max. speed Vx	7 m/s
Max. Acc. ax	12,5 m/s^2
C2 orientating axis	Optional axis -I ± 90º
max.speed	90º/s
accele.	2.617 rad/s^2

LR 4-120x2



TF 3/80x4

- Configurations
  - Classical transfer rail
  - Independent telescopic rails
- Advantage
  - High speed
  - Semi automatic tool change
  - Press automation Syinchro.
- Disadvantages
  - Less flexibility
  - Manual tool Change
  - Gripper complexity



FAGOR WORLDWIDE TRANSFER SPECIALIST

HOTTEKNIK

HYDRAULIC PRESS

- High speed presses
  - Pumps Vs Accumulators
- High control
  - Servo controlled
- Energy efficiency
  - Servo motors
- Others
  - Die refrigeration integrates
  - Compact upright design
  - Hidden slide clamps

Tonnage:	10000-12000 KN
Clamping area:	2200 x 3000mm
Shut height:	2300mm
Stroke length:	1000mm

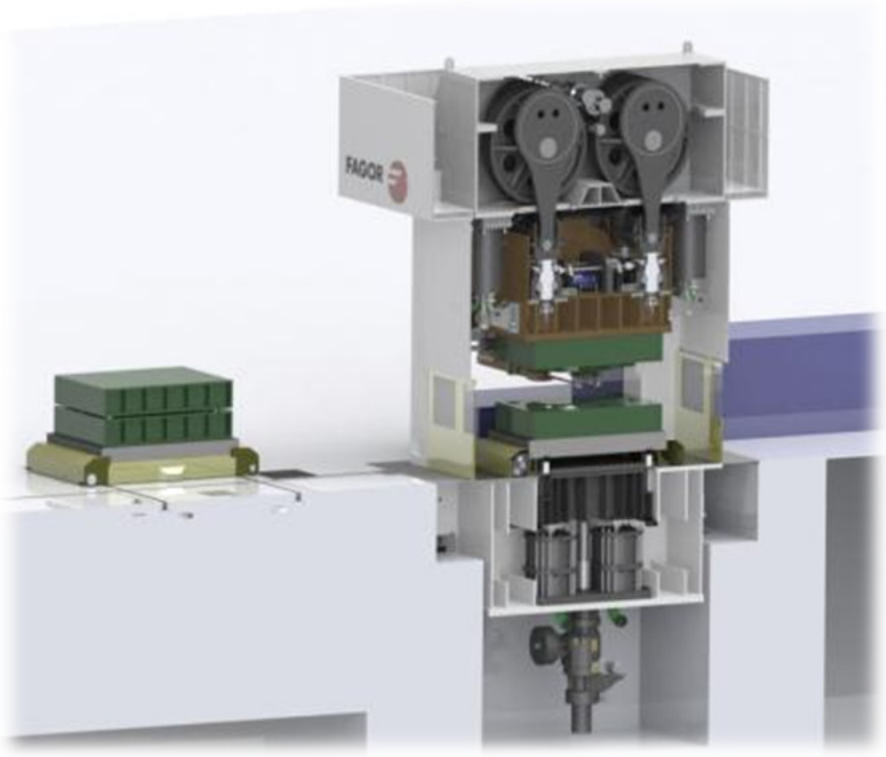
Typical parameters

Slide Speed:
Closing of press: >900 mm/s
Opening of press: >700 mm/s

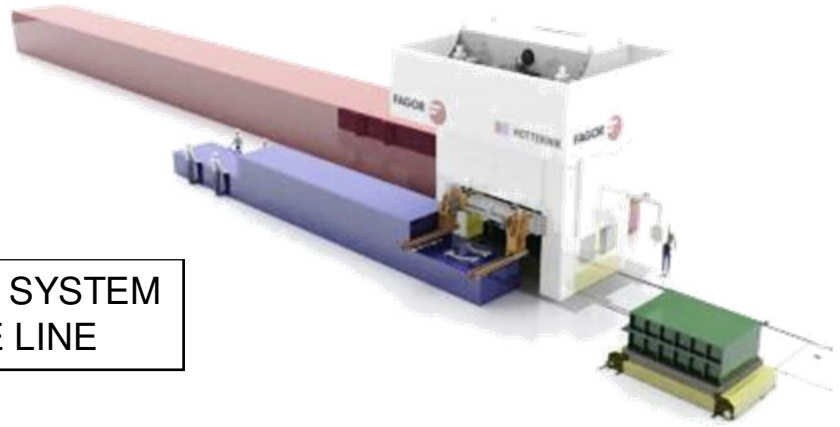
TSED4-1200-3000-2200

Servo + Force control + Bushing

Connection points	4
Total force at 10* mm before B.D.C.	12.000 kN.
Stroke	700 mm
Slide adjustment	300 mm
Shutheight (s.d.a.u.)	1100 mm
Slide area	3000x2200
Bolster area	3000x2200
Top of bolster above floor (approx.)	600 mm
Bolster and Slide max. deflection	0,125 mm/m
Maximum Die weight	35.000 Kg.



FAGOR DEVELOPMENT 2013



FULL INTEGRATED SERVOPRES SYSTEM
HIGH PRODUCTION VOLUME LINE

CYCLE TIME REDUCED

- Press Speed increased
- Press position control->safety gap reduced
- Advanced automation system

ENERGY EFICIENCY.

- Hydraulic press up to 30% of installed power energy lost
- Servo-Mechanical with kinematic buffer less than 6% energy lost

LINE RELIABILITY

- Tested Servo technology: Press + Transfer

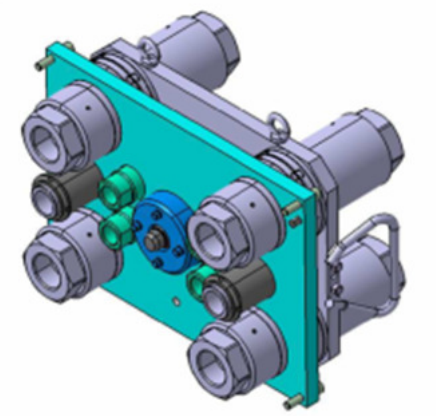
DIE COOLING WATER

- Water connection
  - Full automatic
  - Connecting plates
  - Quick connector
  - Manual keys
- Measuring parameters
  - Flow
  - Pressure
  - Temperature in-out

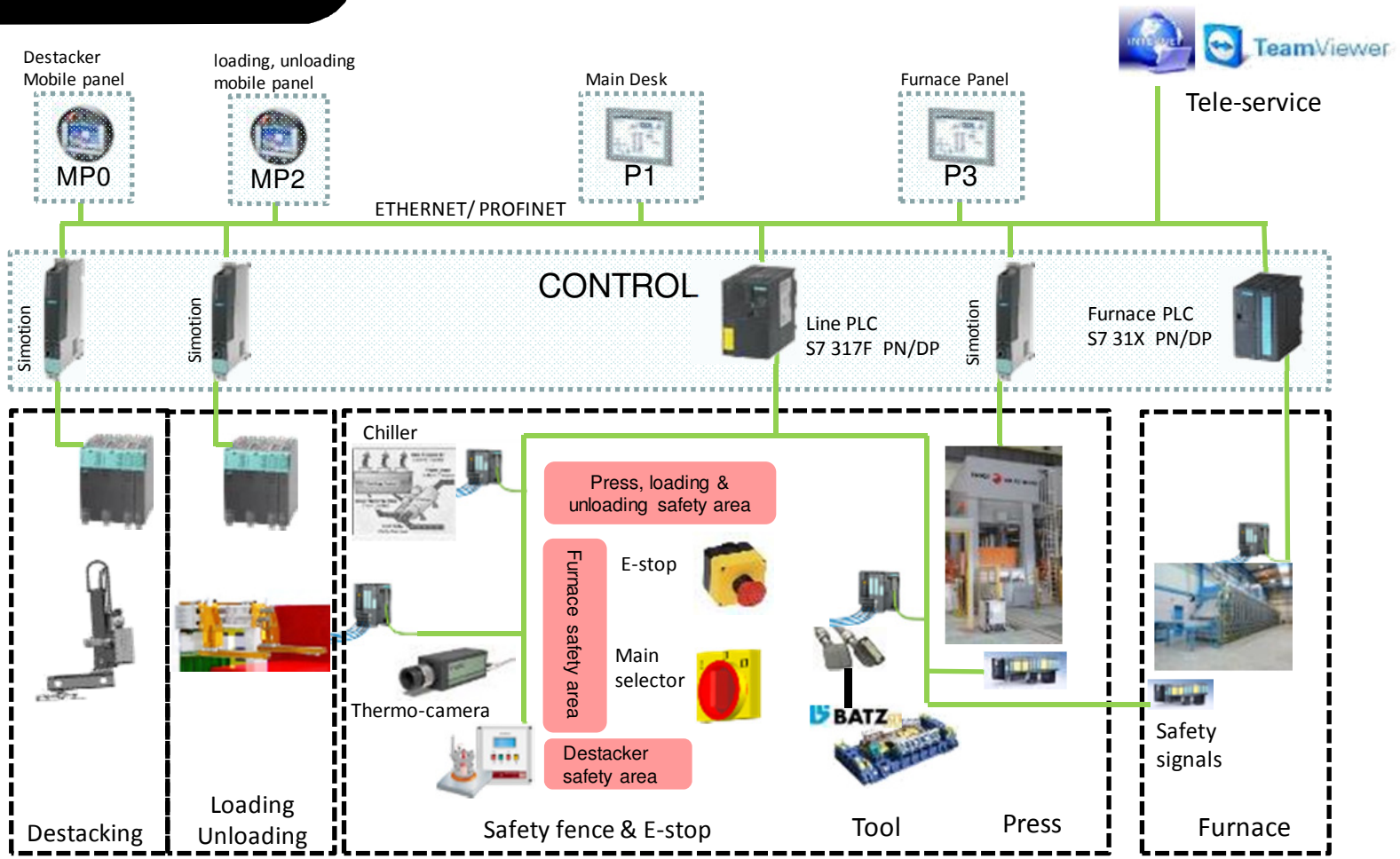
Part Processing as Bottleneck calculation

DIE HYDRAULIC FUNCTIONS

- Part ejectors
- Die internal functions
- Blank holding-cushion

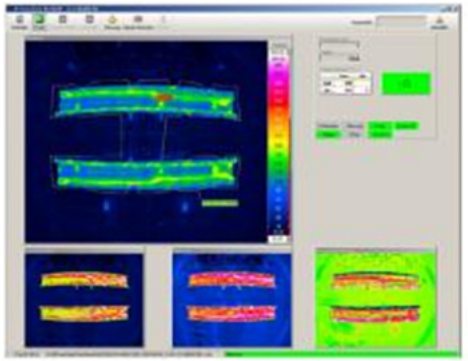


LINE CONTROL

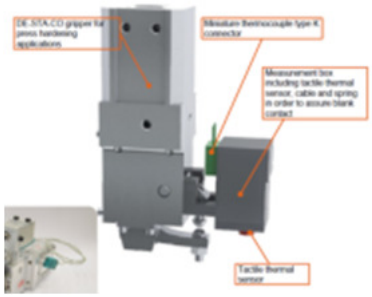


FAGOR SincroPlus	Total Integration	SIMOTION control	S7-F	Remote control	Process monitoring	PART TRACKING

- Measurement System
  - Pyrometer
  - Thermal camera
  - Linear scan
  - Gripper Sensor

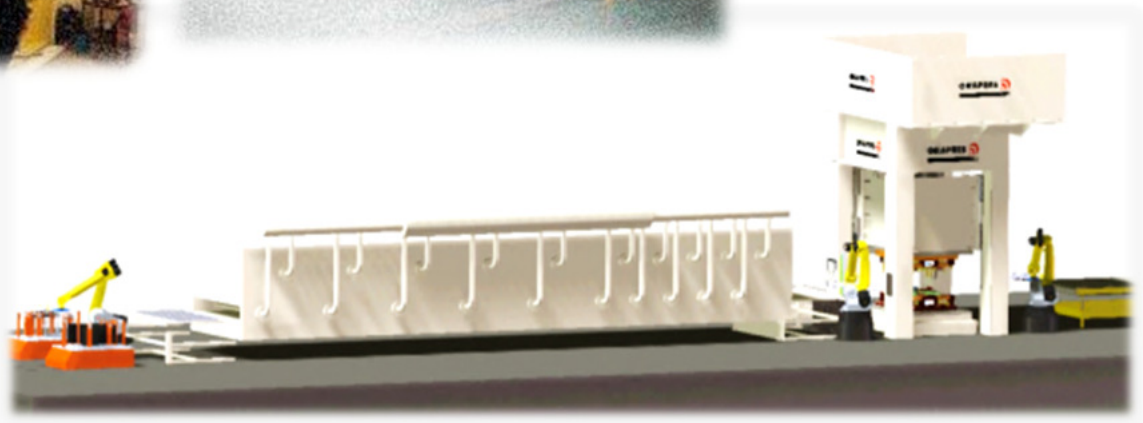


- Measuring Areas:
  - Furnace
  - Furnace exit-centering station
  - Die (before-after stamping)
  - Part transportation



Robot Lines (RRR)

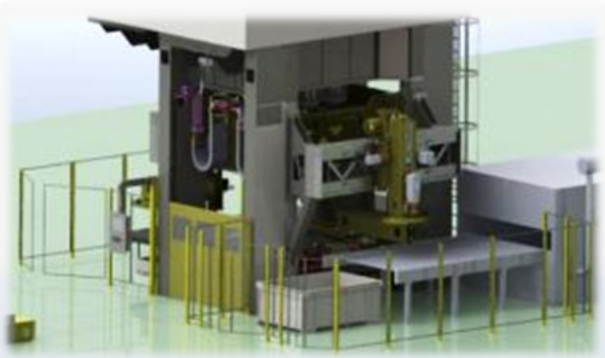
- High Speed Hydraulic Presses
- Press loading-unloading
  - Robot
- Destacker
  - Robot
- Medium speed

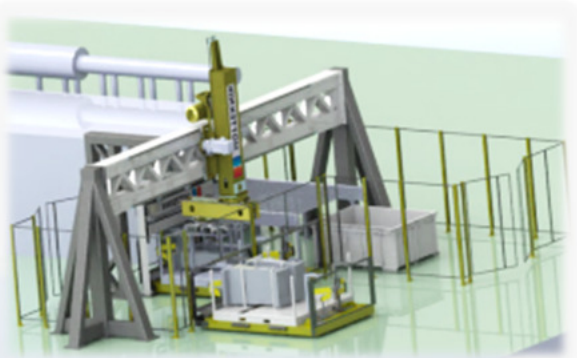


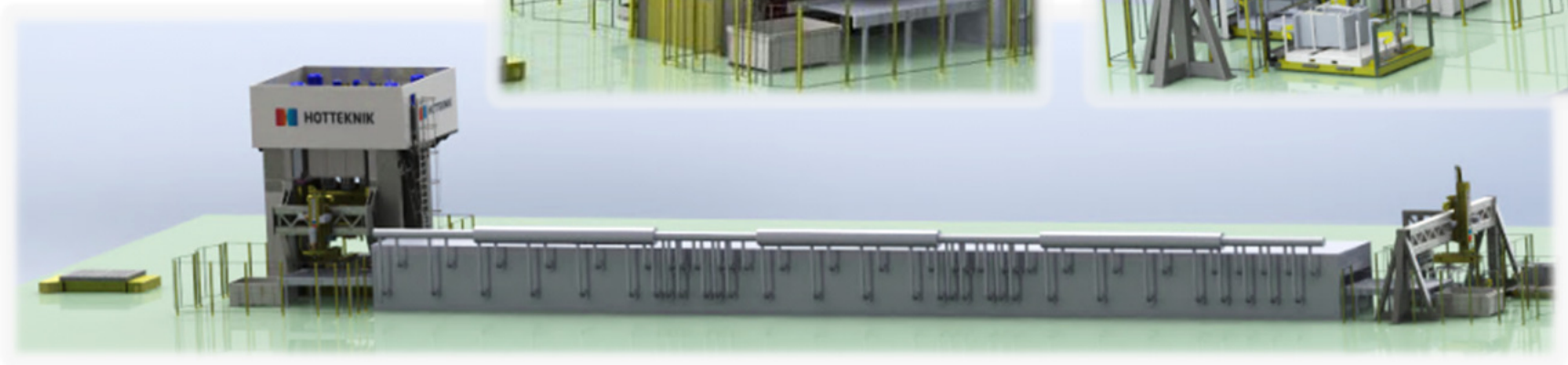
FEEDER LINE (FFF)

- Servo Hydraulic Presses
- Press loading-unloading
  - Feeders
- Destacker
  - Feeders

- Medium/high speed
- Suitable for high production



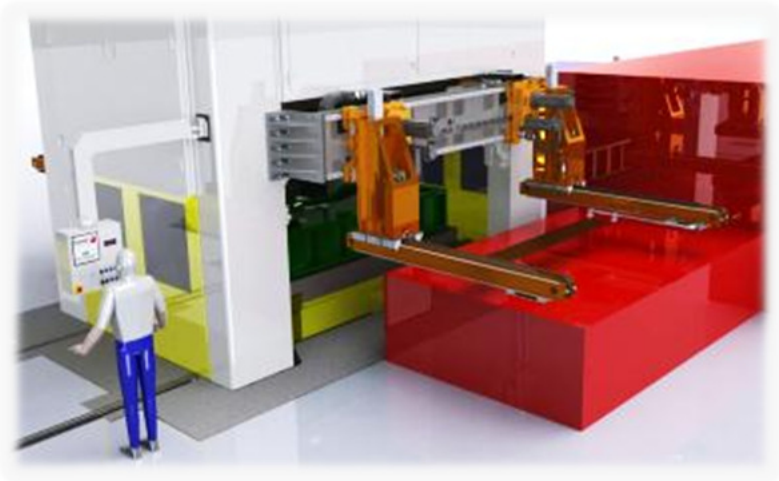


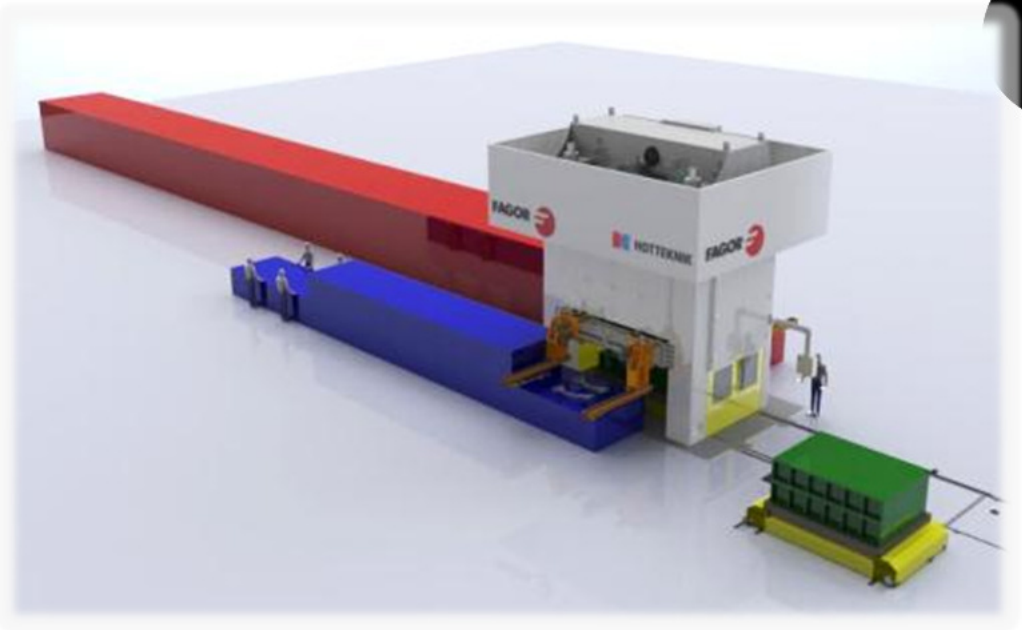


TRANSFER LINE (FTT)

- ServoHydraulic - Servomechanical Press
- Dedicated Automation
  - Transfer-Feeders
- Destacker
  - Robot/Feeders

- High speed
- Suitable for high production





HOTTEKNIK

Cycle time: Heating time /(Nº chamber x Nº furnaces)

300/8/2=18,7s

300/6/3=16,7 s

SINGLE CHAMBER

- General purpose Presses
- General purpose Automation
  - Mainly Robots

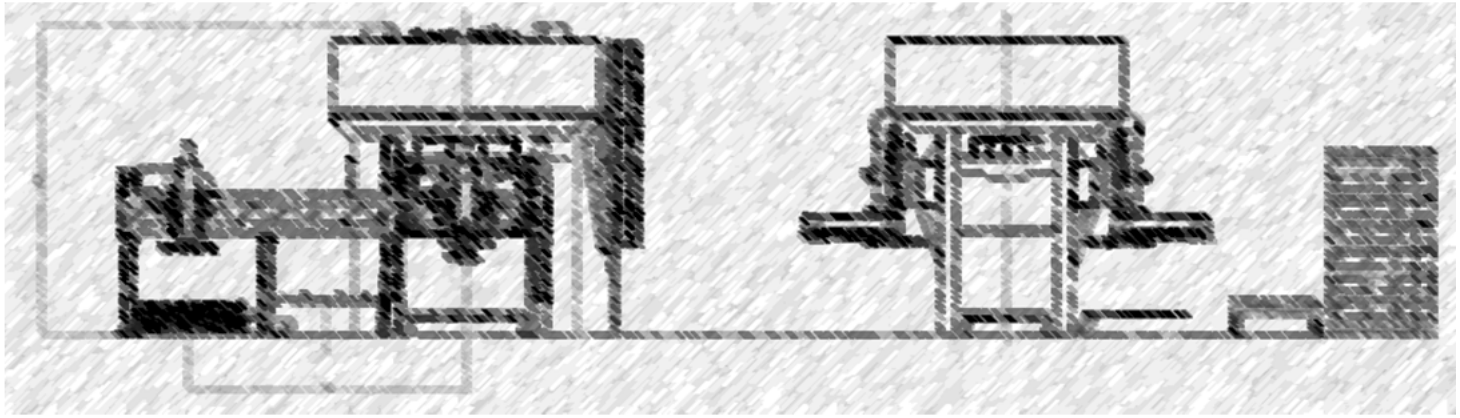
SINGLE FURNACE-MULTIPLE CHAMBER

- Low/medium speed
- No suitable for high production cars
- Suitable for small batch
- Suitable for die tryout

MULTIPLE CHAMBERS - MULTIPLE FURNACES

- Configurations
  - One door per chamber
  - Independent in-out door
- Advantage
  - Space required
  - Modularity

- Disadvantages
  - Limited cycle time
  - Part cooling in transport
  - Quality stability
    - Multiple furnaces
    - Multiple transport



KEY MILESTONES

1998 | 2000 | 2008 | 2011 | 2012 | 2013 1st proj in USA

FULL INTEGRATION
KEY OF SUCCESFULL

FAGOR

AUTOMATION
HYDRAULIC PRESSES
MECHANICAL PRESSES

HOTTEKNIK

Line Engineering
Automation Design
Project Management

BATZ

TOOLING

Aitor Ormaetxea
Managing Director
Mob.: +34 605775823
a.ormaetxea@fagorarrasate.com