GREAT DESIGNS IN STEEL

LEAN Thinking Analysis of Fastener Installation in Metal Stampings

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PROFIL, VP Business Development

The Discussion

GDIS

Value Stream Analysis of

Traditional projection weld nut installation

vs

Mechanically Attached Fasteners (MAF) in-die installation

MUNRO Analysis - Overview

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Part Information

200,000 EAU

RH & LH Bracket per vehicle

225 MPa steel

(2) M6 nuts per Bracket

Stamping Process

600-ton press

RH & LH out prog die

Projection Weld Nut Process

Projection weld nuts

Pedestal weld

Nuts auto feeding

(2) Nuts installed per welder cycle

Panel manually loaded & unloaded

In-Die Rivet Nut Process

Mechanically Attached nuts

In-die installation

Nuts auto feeding

(4) Nuts installed per press cycle

Nut feeding to 60 SPM

Right Hand

Left Hand

MUNRO Analysis – Value Stream Map

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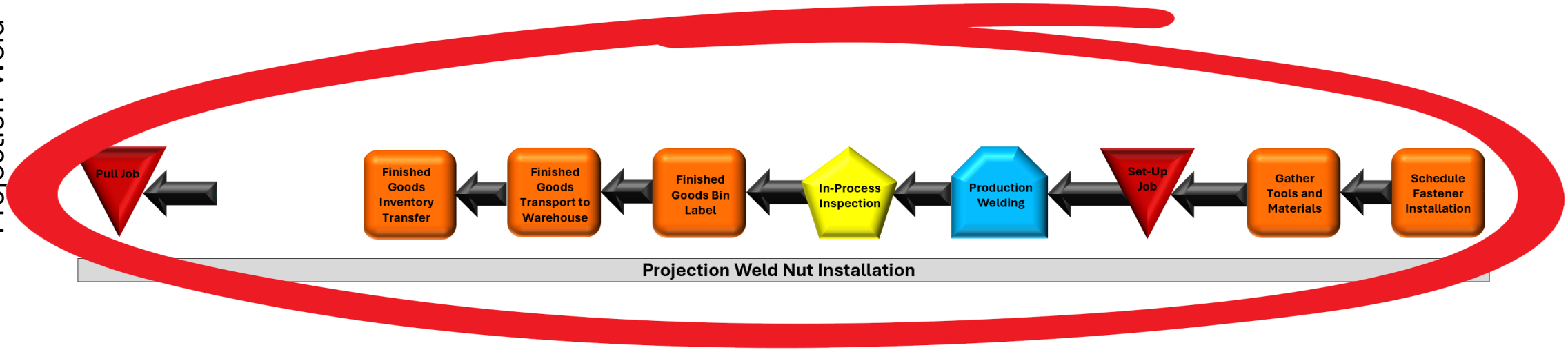
Projection Weld

In-Die

Waste



MUNRO Analysis – Side-by-Side Summary

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Cost Element		Projection Weld Nuts	In-Die Rivet Nuts	
Fasteners		4	4	
Process Steps		28	10	← *Shorter process, Think LEAN*
Total Cycle Time (sec)		24	2	← *Shorter process, Think LEAN*
Purchased Part Roll up Costs		$ 0.24	$ 0.32	
Raw Material Costs		$ 2.36	$ 2.36	
Processing Costs		$ 0.39	$ 0.05	
Total Manufacturing Cost (without Mark-Up)		**$ 3.00**	**$ 2.73**	
SG&A Applied to Manufacturing	12%	$ 0.36	$ 0.33	
Logistics Applied to Sum of all Above	3%	$ 0.10	$ 0.09	
Total Cost without Tooling Amortization		**$ 3.46**	**$ 3.15**	
Profit Mark-Up	8%	$ 0.31	$ 0.29	
Tooling and Equipment Amortization		$ 0.32	$ 0.35	
Sale Price		**$ 4.09**	**$ 3.79**	← *Less cost, Think LEAN*
Total Tooling Investment		$ 389,188	$ 421,533	
Tooling Cost / LH&RH Pair Set		$ 0.32	$ 0.35	

Piece Price Save per Pair of Brackets (4 nuts) $ 0.30

Life of Program Save $ 359,254

$.075 per installed fastener

Program Information

Vehicle Annual Volume	200,000
Years of Production	6
Efficiency	85%
Production Location	USA

Costing is per set of Brackets

MUNRO Analysis – Side-by-Side Detail

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Projection Weld Nuts

Purchased Parts

Part Name	Material	Total Quantit	Weight (kg)			Piece Cost Each	Notes	Total Cost
Weld Nut-M6 x 1.00-Flanged Hex Head		4	0.0069			$0.06		$0.24
Sub Totals		4	0.0069			$0.06		$0.24

Raw Materials

Part Name	Material	Total Quantit	Net Weight kg	Gross Weight kg	Material Cost Per kg	Piece Cost Each	Notes	Total Cost
LH Heat Pump Mtg Bracket	Med Carbon Steel 1040	1	0.4824	0.8260	$1.43	$1.18	LH & RH Out at the same time during the stamping. The material cost includes both	$1.18
RH Heat Pump Mtg Bracket	Med Carbon Steel 1040	1	0.4824	0.8260	$1.43	$1.18		$1.18
Sub Totals		2	0.9648					$2.36

Processing - 2 Weld Nuts per Panel

Process Description	Process Steps	Total Quantity	Work Cell Machine Rate Cost/Hour	Number of Operators	Labor Rate Cost/Hour (Fully Burdened)	Total Time (Sec)/Part	Notes	Processing Cost
LH & RH Bracket Stamping							Cycle Time per part includes Tooling Changeover amortizing time, stamping press cycle time	$0.00
	600 Ton Progressive Stamping	1	$46.43	0.5	$42.67	1.06	LH & RH are stamped at same time. So the time per part is reduced to half of the total cycle time.	$0.02
	600 Ton Progressive Stamping	1	$46.43	0.5	$42.67	1.06	LH & RH are stamped at same time. So the time per part is reduced to half of the total cycle time.	$0.02
LH & RH Nuts Assembly Process							Assume one pedestal welder, one panel and two nuts welded per cycle, weld fixture common for RH & LH panels	$0.00
	LH Panel Projection Welding	1	$10.75	1	$40.42	8.00		$0.13
	EMP Fixture Gage Off Line C	1	$0.00	1	$40.42	3.00		$0.04
	RH Projection Welding	1	$10.75	1	$40.42	8.00		$0.13
	EMP Fixture Gage Off Line C	1	$0.00	1	$40.42	3.00		$0.04
Sub Totals								$0.39

Tooling - 2 Weld Nuts per Panel

Part Name	Process	Total Quantit	Cost Each				Notes	Total Cost
LH & RH Heat Pump Mtg Bracket	Progressive Stamping Die	1	$313,593				LH & RH Out Progressive Stamping Die to form the LH & RH Bracket	$313,593
LH & RH Heat Pump Mtg Bracket Asm	Assembly & Quality Check							$0
	Projection Welding Nuts	1	$66,600				Proline Pedestal Welder, Dual Heads	$66,600
	EMP Fixture Check	1	$8,995				Fixture Cost	$8,995
Sub Totals								$389,188

In-Die Rivet Nuts

Purchased Parts

Part Name	Material	Total Quantit	Weight (kg)			Piece Cost Each	Notes	Total Cost
PROFIL M6 RND Rivet Nut		4	0.0069			$0.08		$0.32
Sub Totals		4	0.0069			$0.08		$0.32

+$.08

Raw Materials

Part Name	Material	Total Quantit	Net Weight kg	Gross Weight kg	Material Cost Per kg	Piece Cost Each	Notes	Total Cost
LH Heat Pump Mtg Bracket	Med Carbon Steel 1040	1	0.4824	0.8260	$1.43	$1.18	LH & RH Out at the same time during the stamping. The material cost includes both	$1.18
RH Heat Pump Mtg Bracket	Med Carbon Steel 1040	1	0.4824	0.8260	$1.43	$1.18		$1.18
Sub Totals		2	0.9648					$2.36

+$.00

Processing - 2 PROFIL MAF Nuts per Panel

Process Description	Process Steps	Total Quantity	Work Cell Machine Rate Cost/Hour	Number of Operators	Labor Rate Cost/Hour (Fully Burdened)	Total Time (Sec)/Part	Notes	Processing Cost
LH & RH Bracket Asm In-Die Mechanically Fastened Nuts Stamping							Cycle Time per part includes Tooling Changeover amortizing time, stamping press cycle time	$0.00
	600 Ton Progressive Stamping	1	$50.48	0.5	$42.67	1.06	LH & RH are stamped at same time. So the time per part is reduced to half of the total cycle time.	$0.02
	600 Ton Progressive Stamping	1	$50.48	0.5	$42.67	1.06	LH & RH are stamped at same time. So the time per part is reduced to half of the total cycle time.	$0.02
Sub Totals								$0.05

-$.34
-$.26

Tooling - 2 PROFIL MAF Nuts per Panel

Part Name	Process	Total Quantit	Cost Each				Notes	Total Cost
LH & RH Heat Pump Mtg Bracket	Progressive Stamping Die	1	$313,593				LH & RH Out Progressive Stamping Die to form the LH & RH Bracket	$313,593
LH & RH Heat Pump Mtg Bracket Asm	Progressive Stamping Die w/2 Nut In-Die Tooling							$0
	2-Nut In-Die Tooling	2	$22,720					$45,440
	4-Tracks Nut Feeder	1	$62,500					$62,500
Sub Totals								$421,533

+$32,345

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$.07 to $.15 save per installed fastener

400 structural fasteners per vehicle

$30 to $60 per vehicle

Think LEAN … Think In-Die

Soft Costs

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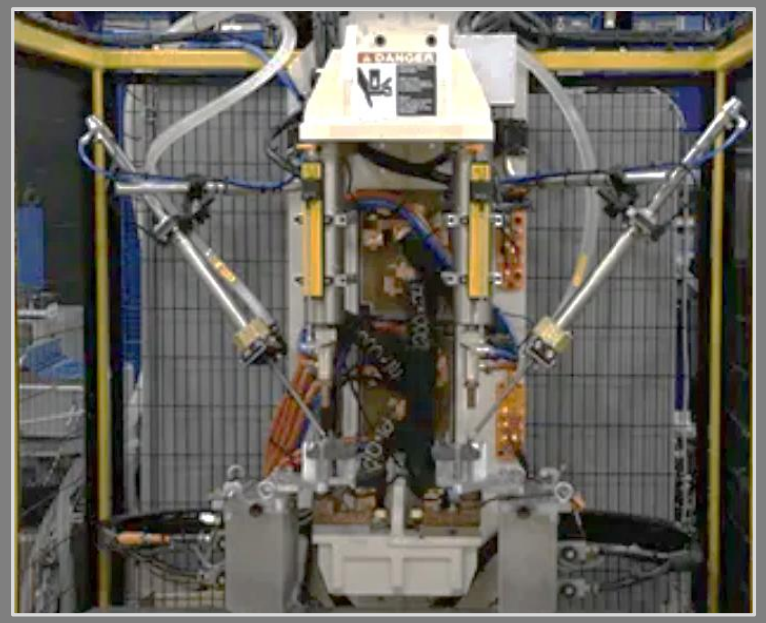
Weld



Perishables
- Shunts
- Electrodes

Consumable
- Conditioned electricity
- Chiller (cooling water)
- Compressed air

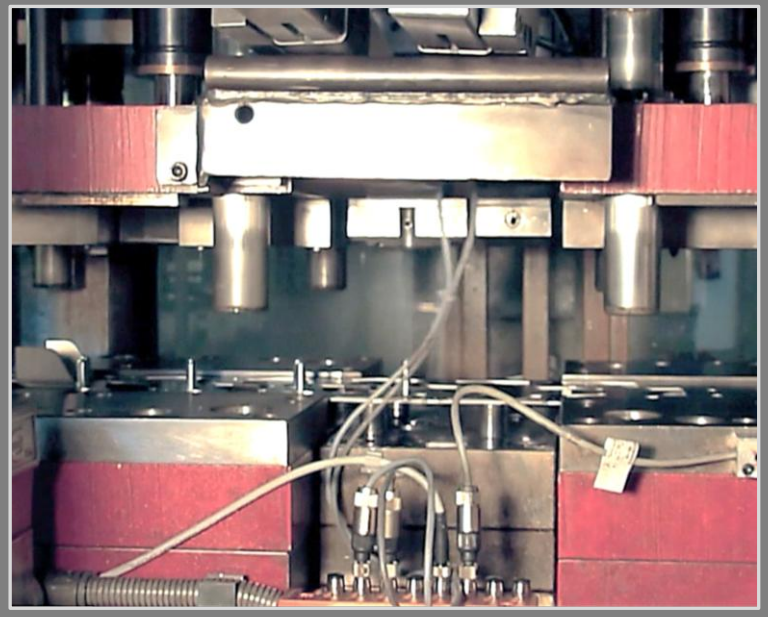
Maintenance
- Air scrubber
- Clean feeder bowls

Floor Space
- Weld cell
- WIP storage

WIP
- Cost of inventory
- Material moves in plant
- Scheduling

Racks
- WIP racks needed

MAF In-Die



Perishables
- Die button (500k hits)

Consumable
- Compressed air

Maintenance
- Inspect die buttons
- Clean feeder bowl

LEAN Principles Realized

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1

Value

Eliminate waste and costs to meet the optimal price for the customer and maximize profits

2

Value Stream

Analyzing materials and resources required identifying waste and improvements

3

Flow

Removing barriers to improve lead times

4

Pull

Working by only doing work when there is demand

5

Perfection

Continued process improvements

In-Die Methods and Technologies

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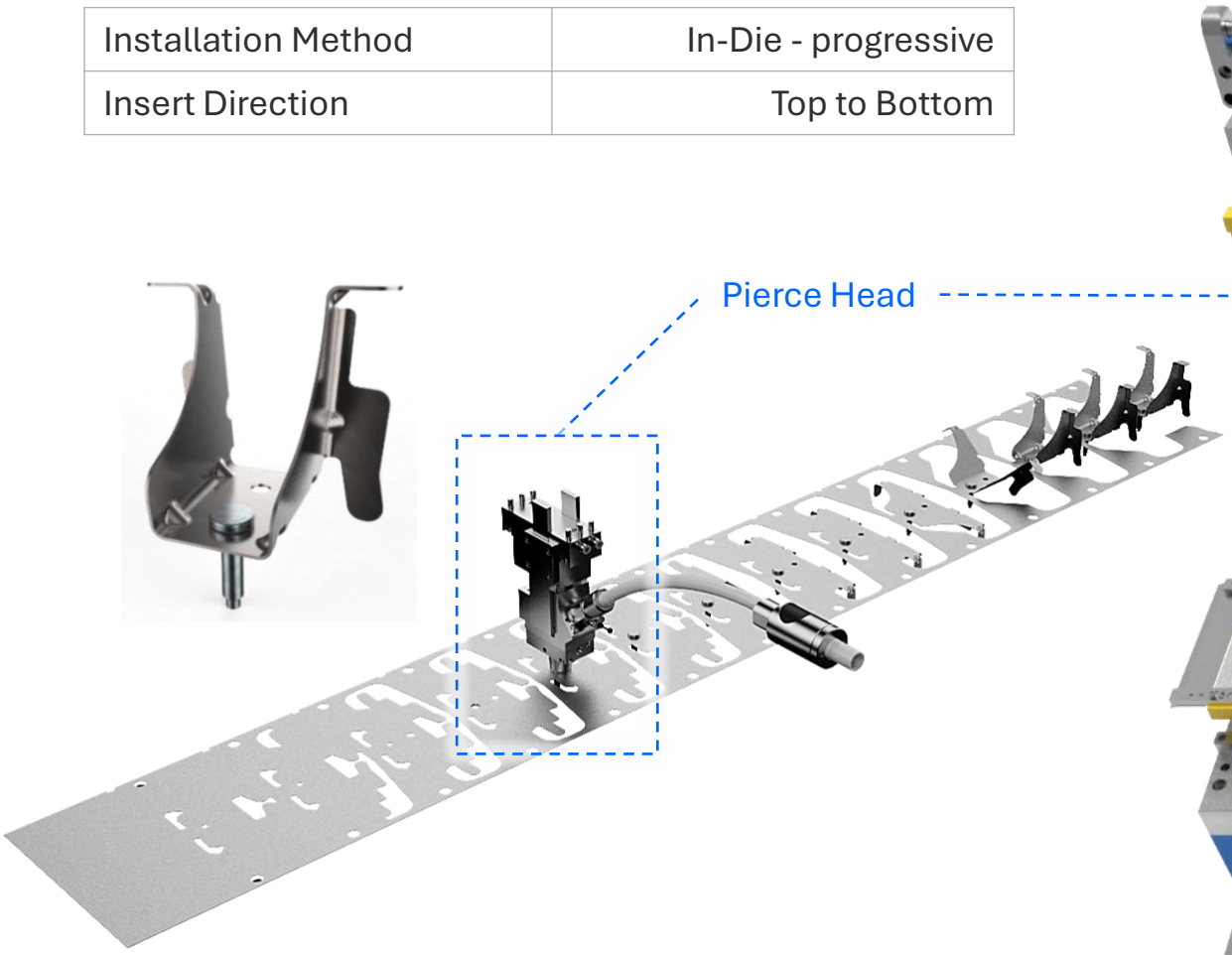
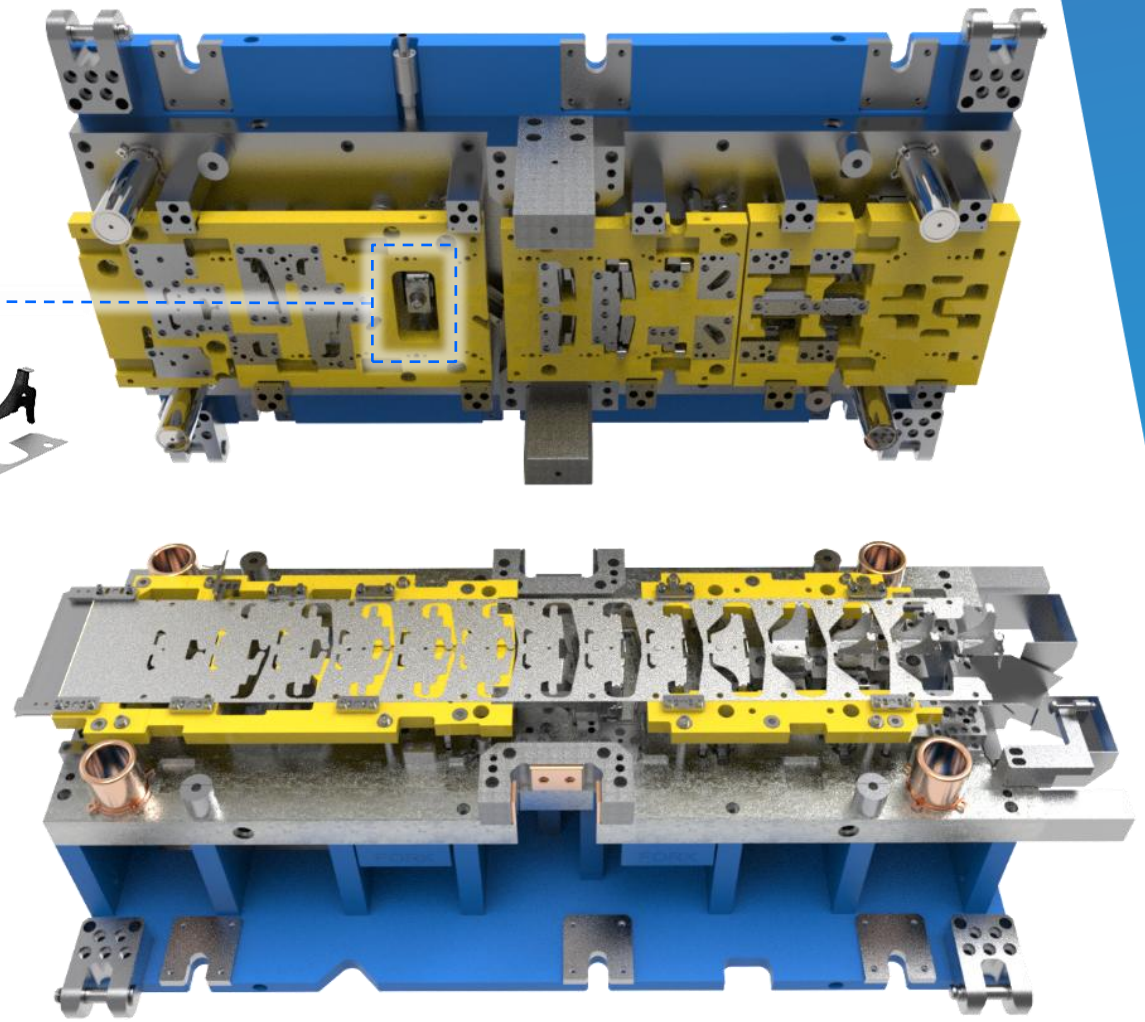
Stamping Process	Prog	Transfer	Tandem
Fasteners	Nuts	Studs	
Orientation	Top - Down	Bottom - Up	
Press Speeds	Nuts up to 60 SPM	Studs up to 40 SPM	
Feeders	Up to 20' from die / Multiple ganged	Not stamping specific	Out of press / On bolster

In-Die Methods and Technologies

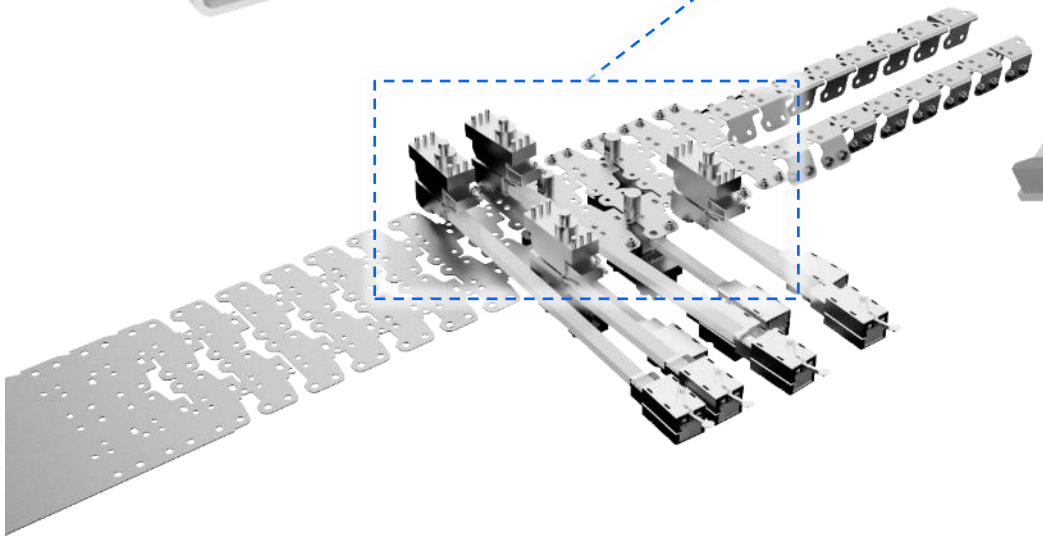
Installation Method	In-Die - progressive
Insert Direction	Top to Bottom



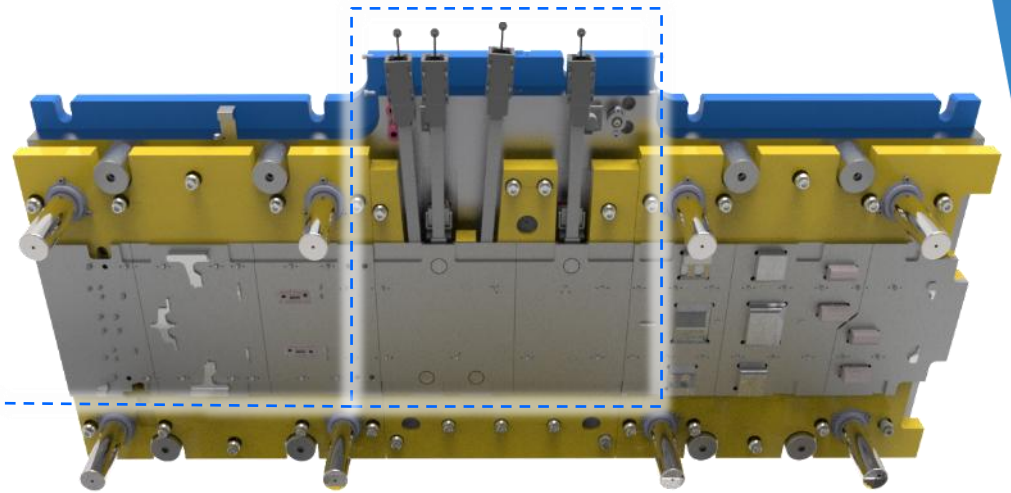


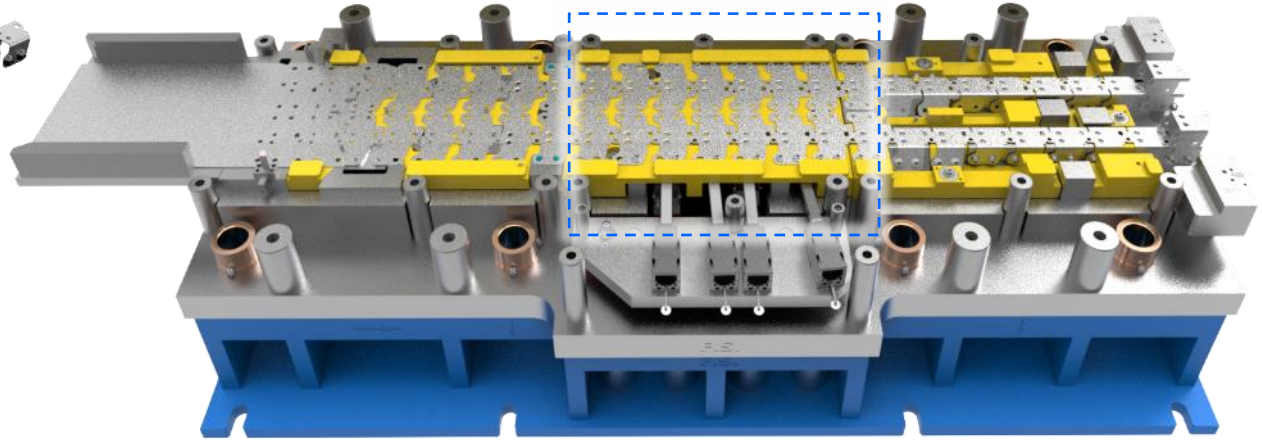
In-Die Methods and Technologies

Installation Method	In-Die - progressive
Insert Direction	Top to Bottom + Bottom to Top



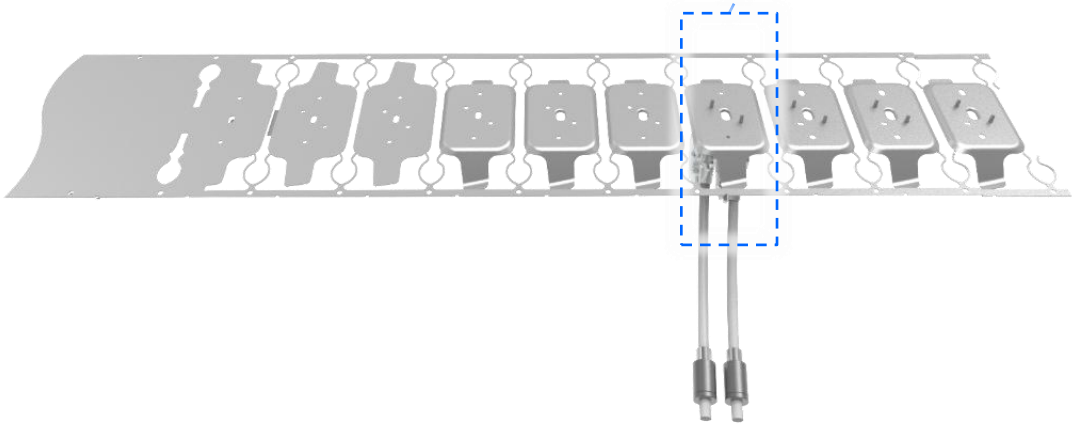
Pierce Heads

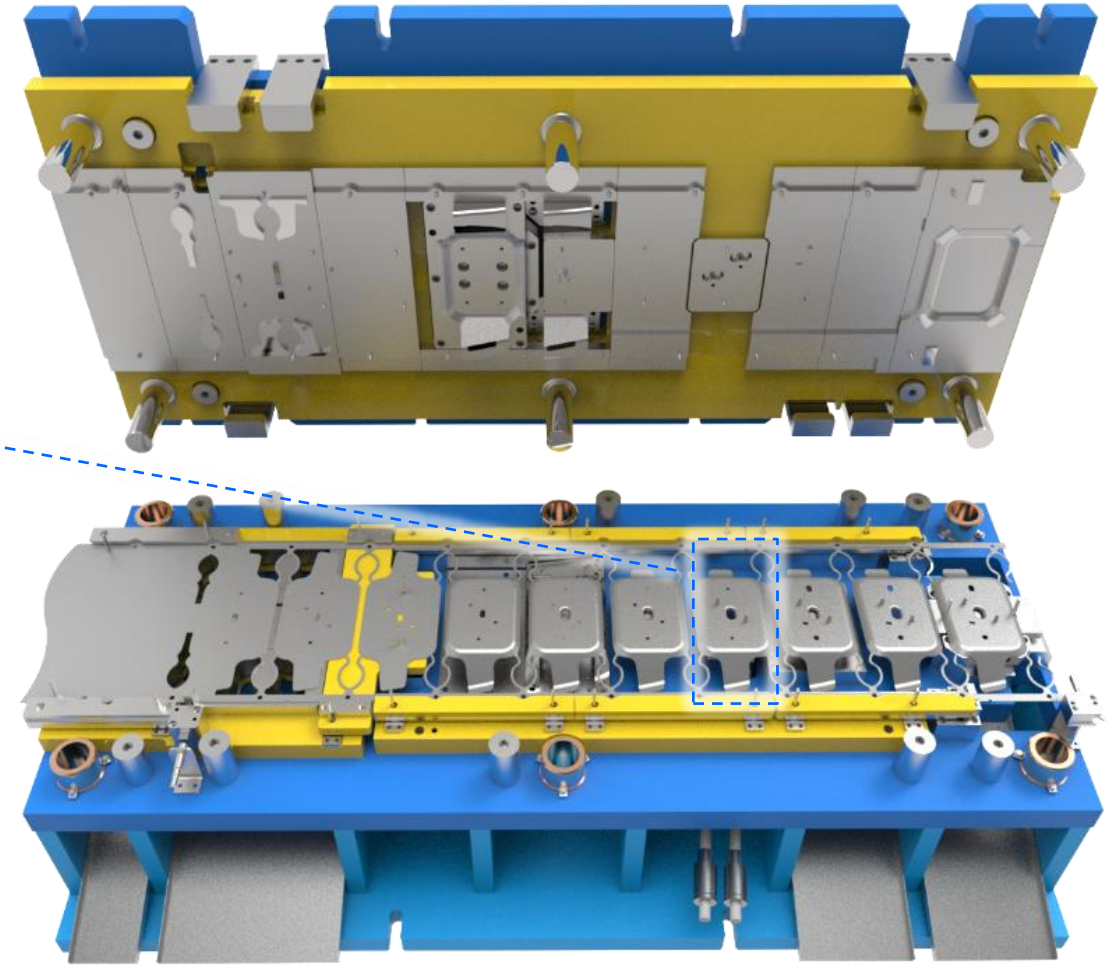




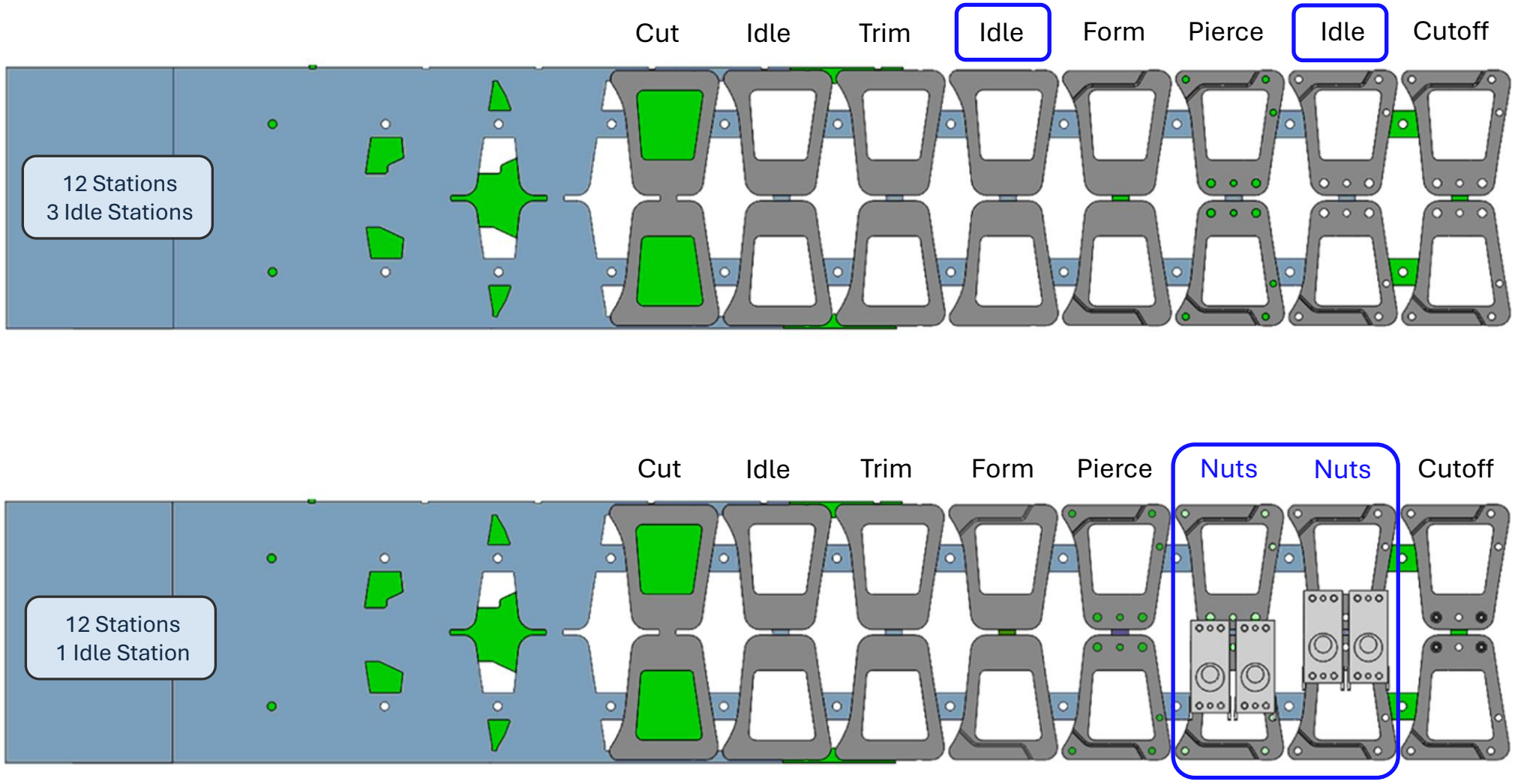
In-Die Methods and Technologies

Installation Method	In-Die - progressive
Insert Direction	Bottom to Top





In-Die Methods and Technologies



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Application Engineering

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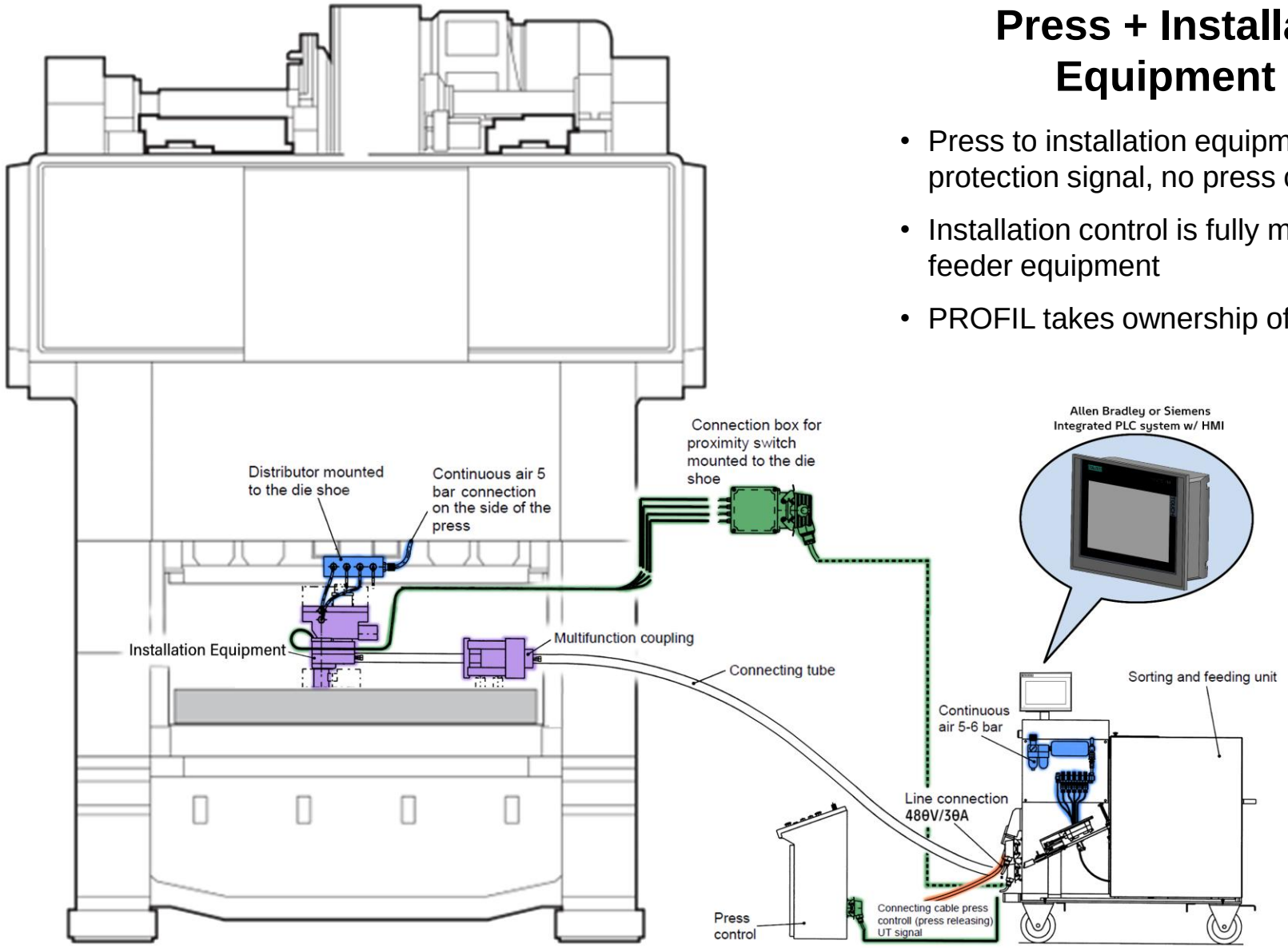
Application Engineering

In-Die Methods and Technologies

Press + Installation Tool & Equipment Interface

- Press to installation equipment interface is one die protection signal, no press controls changed
- Installation control is fully managed and error-proofed in feeder equipment
- PROFIL takes ownership of installation controls



- 480 VAC / 30A
- 75 psi compressed air
- Handshake signal from press

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There is a better way

Think LEAN … Think In-Die

Thank You for Your Attention

Danke, Gracias, Dziękuję Ci, Merci, Grazie

Děkuji, 감사합니다, ありがとう

For more information

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