

Coil-fed punching and laser

Modern technologies - Effective production

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Dallan group established in northern Italy in **1978** for the production of coil fed lines:

- **Roll forming** machines (1978)
- Coil fed **punching** machines (1989)
- Coil fed **laser cutting** systems (2014)

Agenda



- **Origins of coil fed punching and laser lines**
- Typical setup and products for coil fed lines
- Three Advantages for coil fed punching and laser cutting
- Calculation of part cost
- Ideal conditions to use coil fed lines
- Coil fed lines in detail

Origins of coil fed punching



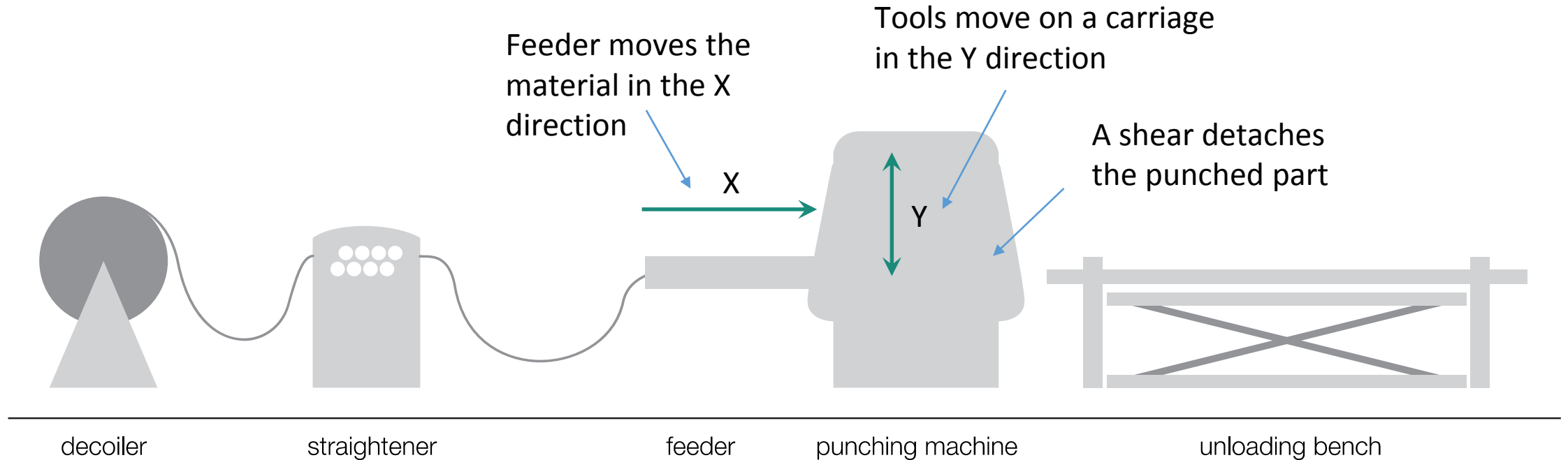
- Rollforming and Press stamping are suitable for mass production
- In the '80s new Market Requirements for higher flexibility arise:
 - Smaller batches – **Just in Time** production
 - Products complete with holes in variable positions
- This leads to the development of flexible coil fed punching machines match flexibility and productivity
 - Use of **standard thick turret tools** instead of hard tools
 - Initially connected to roll forming machines
- Coil punching machines become an **independent product line** (90s)

Agenda

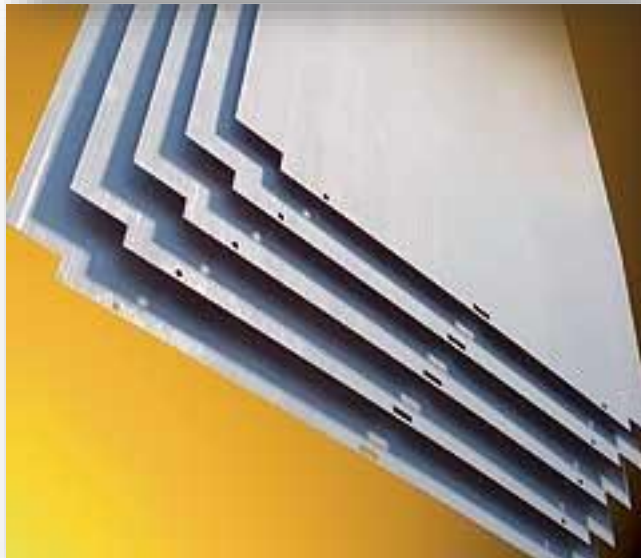


- Origins of coil fed punching and laser lines
- **Typical setup and products for coil fed lines**
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Typical setup for a coil fed punch line



Typical products for coil punching applications



Typical products for coil punching applications



Agenda



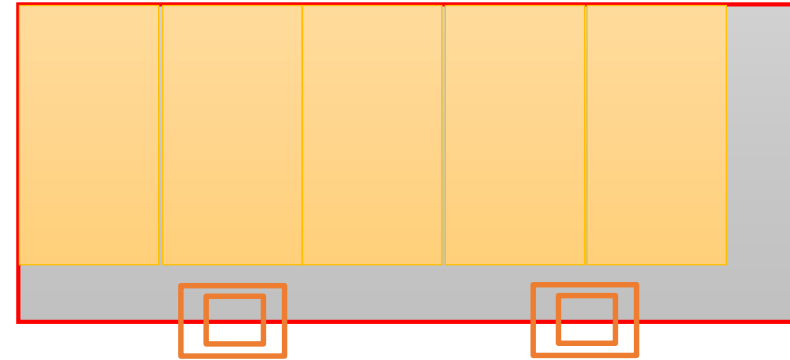
- Origins of coil fed punching and laser lines
- Typical setup and products for coil fed lines

• **Three Advantages for coil fed punching and laser cutting**

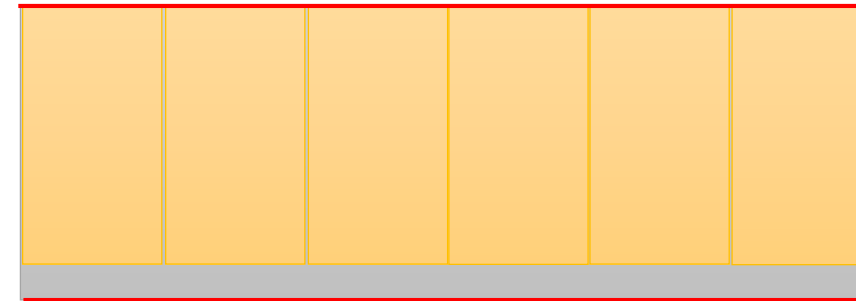
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Advantage 1: material optimization

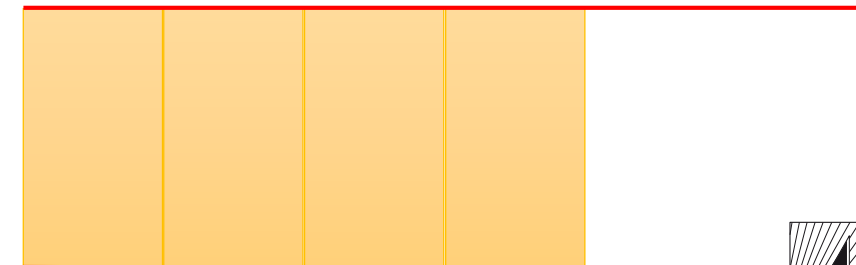
Optimization of rectangular products on **standard size sheet**



Optimization on **standard size coil**



Optimization on **slit to size coil**



Advantage 2: higher speed and productivity



- **ZERO** Time for sheet loading and product unloading:
10 to 25 seconds SAVED per each loaded sheet
- **ZERO** time required for tool changes
- No need to nibble the perimeter of the part



Advantage 2: higher speed and productivity



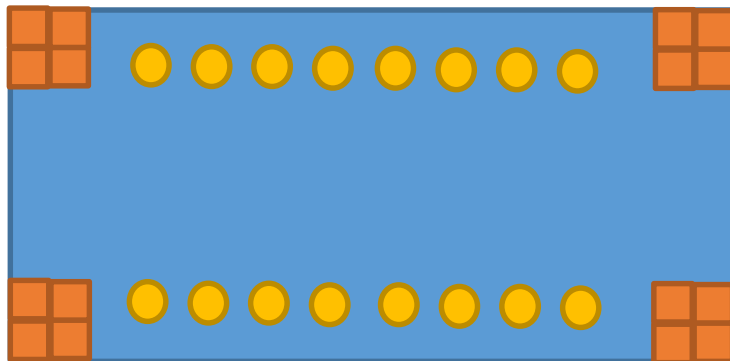
→ How to calculate cycle time

[Time per operation]x[No. Of operations]
+ [Time per unit of length] x [length]

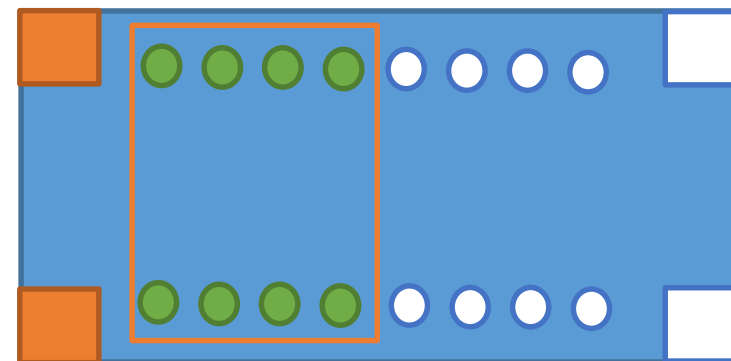
=> The choice of tools influences the cycle time

=> Cluster tools improve productivity

Single hit = 33 operations
25 seconds per piece



Cluster tools = 7 operations
7 seconds per piece



Advantage 2: higher speed and productivity



→ How to calculate the opportunity to build a cluster tool

- C = Cost of tool(s) (ex: 10,000\$)
- T = Punching time saved by the tool(s) per part in seconds (ex: 18s)
- H = Hourly cost of the machine (ex: 100\$)
- N = number of parts that will payback the tool

$$N = 3,600 \frac{C}{T \times H} = 3,600 \times 10,000 / 18 / 100 = 20,000 \text{ pcs}$$

Advantage 3: Automatic production & stacking

- The coil fed punching and laser systems produce automatically
- One operator can follow up to 4 coil fed systems simultaneously
- Stacking is simple and does not require to sort parts out of the skeleton

=> Less labour cost required by the line

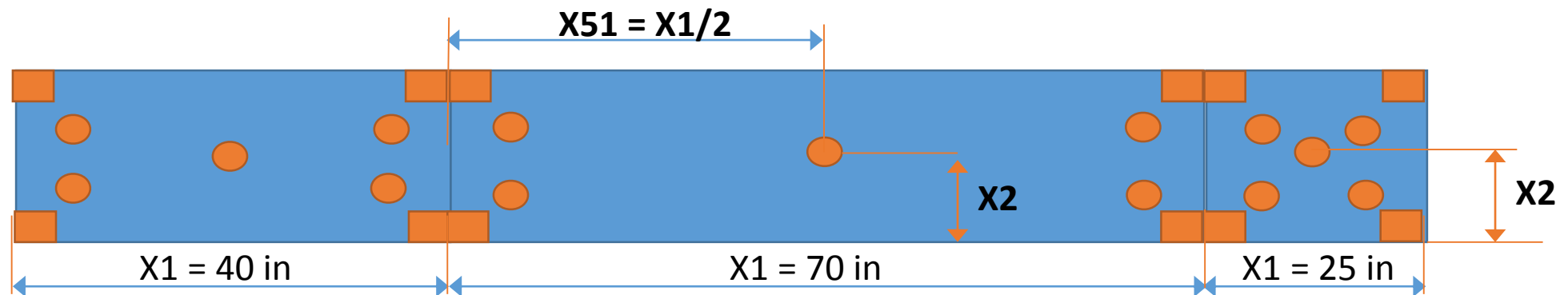


Other advantages

→ Parametric programming

1) Parametric products can be programmed via excel tables

- Same coil & tools = production without interruptions nor waste of material
- Ex: Doors, HVAC dampers, filter frames, lockers, shelving, lighting fixtures



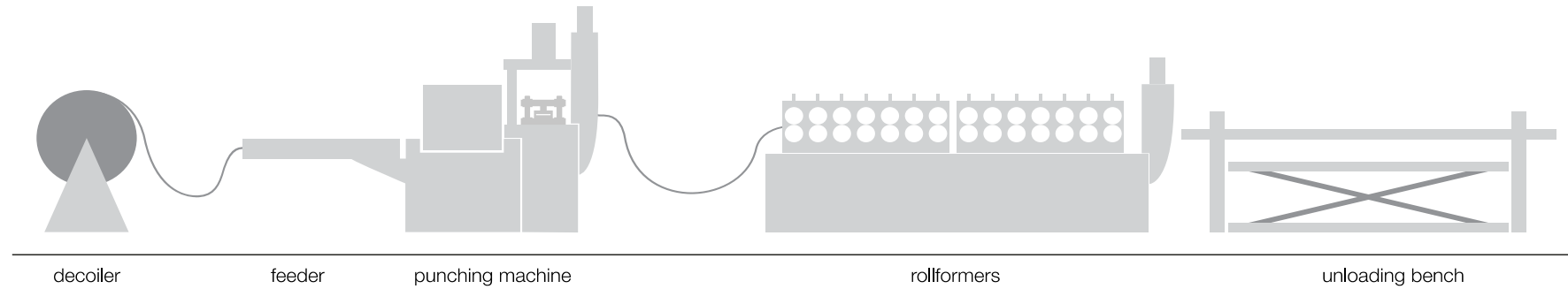
FAMILY NAME/ MASTER PROGRAM	QUANTITY	X1	X2
«PANEL A»	10	40	5
«PANEL A»	2	70	5
«PANEL A»	200	25	7

Other advantages

→ Connection to rollforming lines



3) Possibility to connect easily to rollforming machines and plants



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Calculation of part cost



Part cost can be quickly calculated by adding:

- + **Raw Material cost (incl. Waste)** (Advantage 1)
- + **Cycle time x machine hourly cost** (Advantage 2)
- + **Cycle time x Labor cost connected to the machine** (Adv. 2+3)
- + **Hidden costs: material handling and added processes** (Advantage 3)

Calculation of part cost



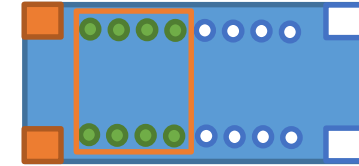
→ Synergies coil fed punching & coil fed laser

- + **Material optimization** (A1)
(less material is required to produce each part: with rectangular products with width = coil material utilization is close to 100%)
- + **Faster production** (A2)
(shorter cycle times mean the machine is engaged for fewer hours)
- + **Automatic and leaner production** (A3)
(continuous process from coil means less labour cost engaged per line)
- = **Minimum cost per part**

=> Maximum profit per part

Calculation of part cost

→ Case study 1



C-SH

S-SH

C-CT

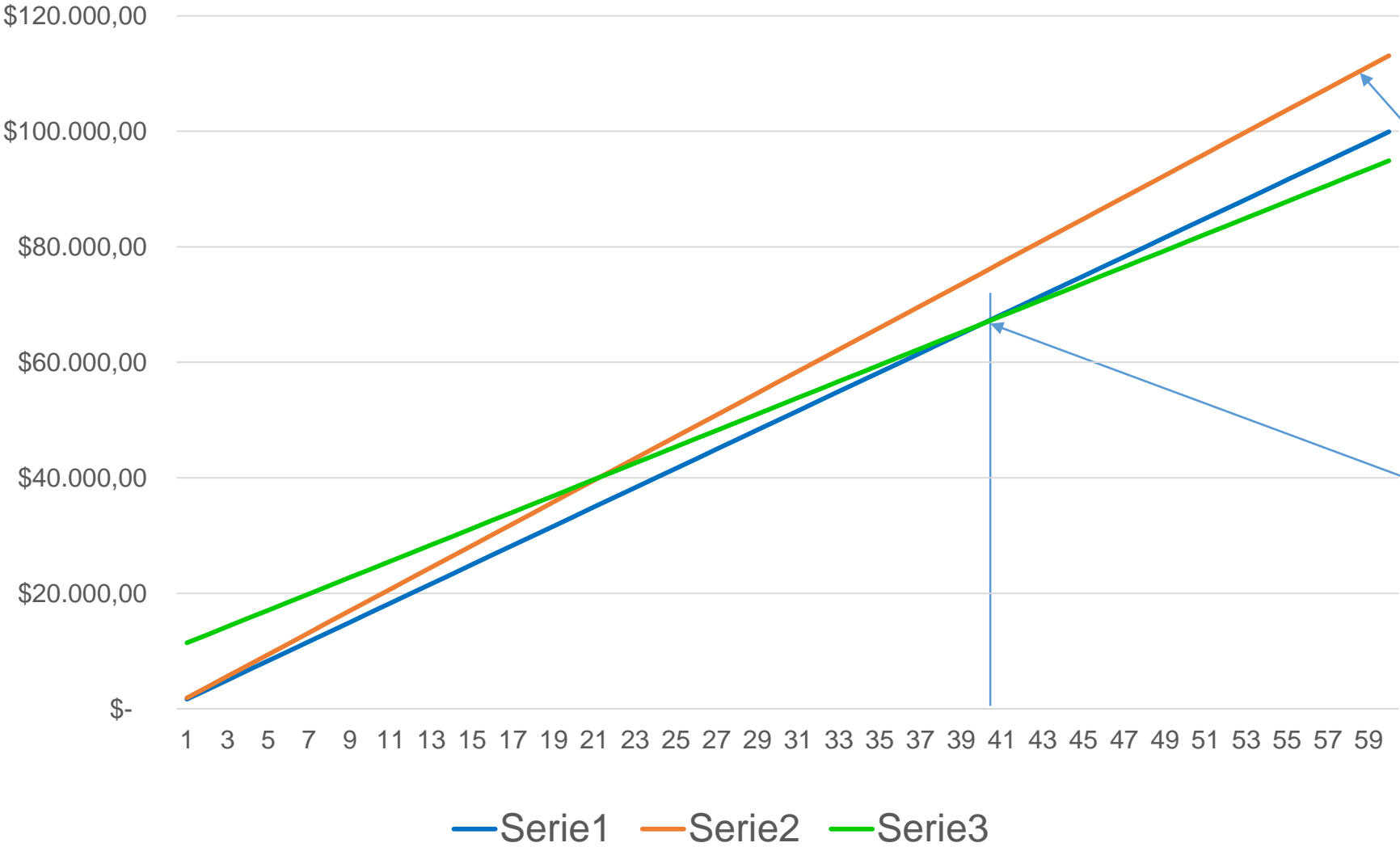
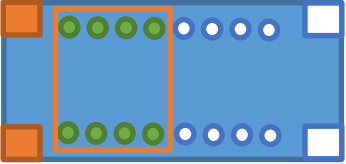
Cost of the raw material per piece	Coil fed single hit	Sheet fed single hit	Coil fed cluster tools
width in mm	300	310	300
thickness in mm	1,5	1,5	1,5
length in mm	1000	1130	1000
specific weight	7,8	7,8	7,8
weight per piece in kg	3,51	4,10	3,51
cost of the raw material per kg	\$ 0,75	\$ 0,75	\$ 0,75
Cost of the raw material per piece	\$ 2,63	\$ 3,07	\$ 2,63
Cost for new tooling			
Cost for tooling specific for this production	\$ -	\$ -	\$ 10.000,00
Estimation of part production cost			
Hourly cost of the machine incl. Labor	\$ 100,00	\$ 100,00	\$ 100,00
Cycle time in seconds	25	27	7
Cost of the processing	\$ 0,69	\$ 0,74	\$ 0,19
Cost of the raw material per piece	\$ 2,63	\$ 3,07	\$ 2,63
Total cost material + processing	\$ 3,33	\$ 3,81	\$ 2,83
Estimation of total production cost			
Total number of pieces	5000	5000	5000
Cost of the tooling	\$ -	\$ -	\$ 10.000,00
Total cost of the production	\$ 16.634,72	\$ 19.050,02	\$ 24.134,72

The cost of the raw material represents from 75% to 95% of the production cost



Calculation of part cost

→ Production cost varying with N



Because of the higher cost of the raw material, the production cost of sheet punching remains higher than coil fed punching with single hit

The cluster tools make the production faster: they start to be convenient over 20000 produced parts

With 30,000 parts, the coil fed with cluster generates 20,000 \$ savings in 2 weeks

Agenda



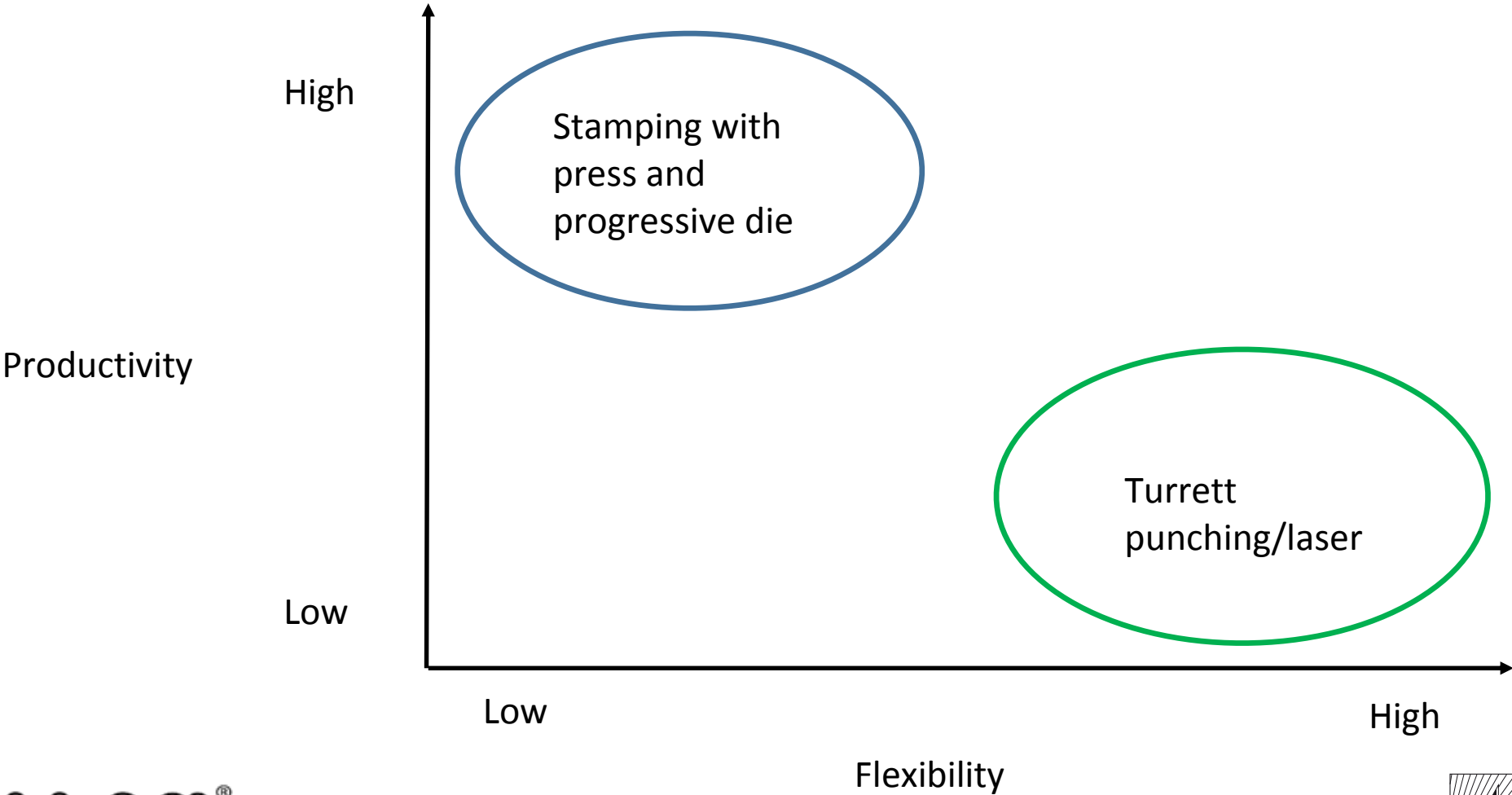
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Ideal conditions to maximise advantages

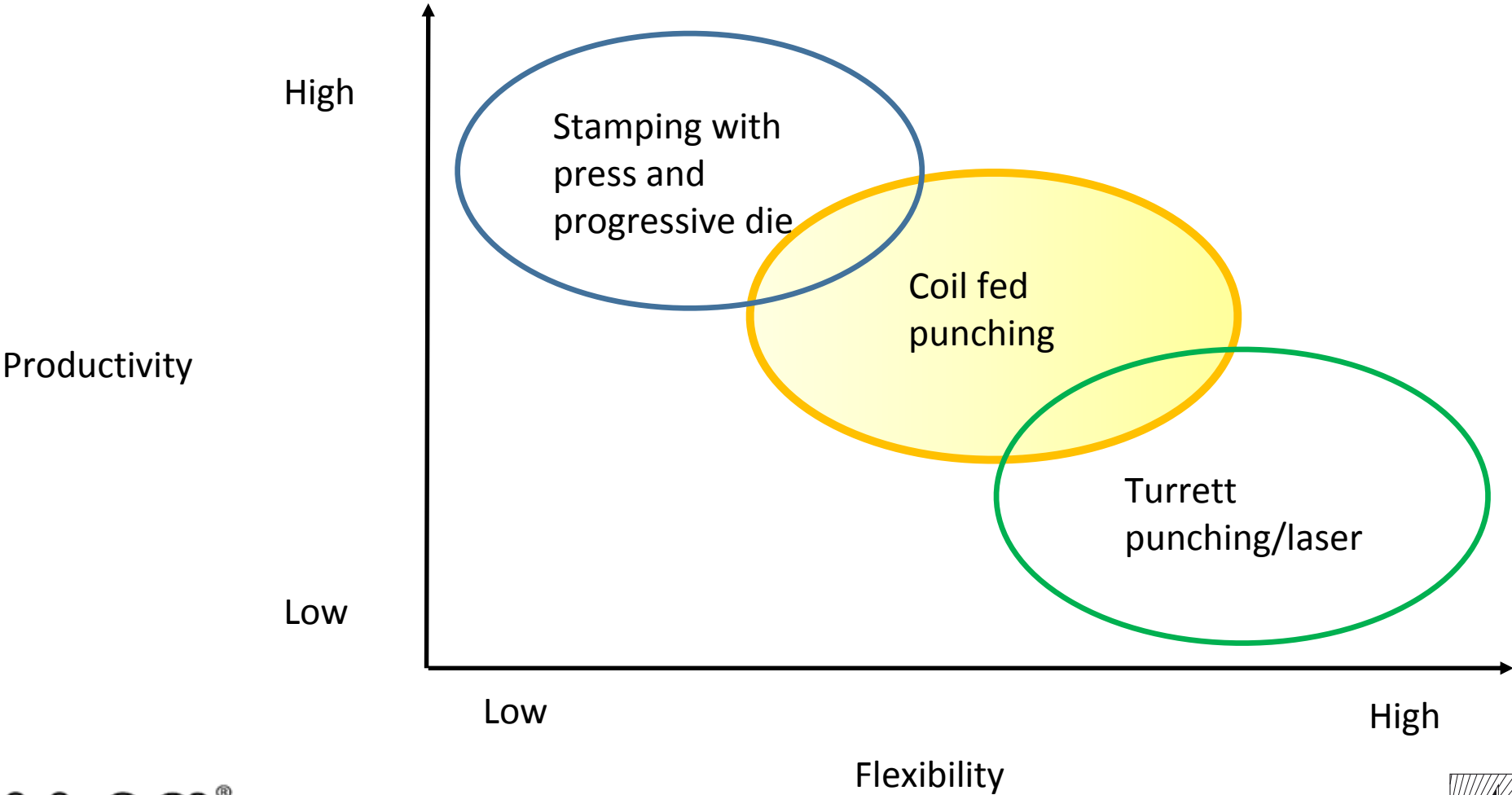


1. The **ideal batch size** lets complete the process of one or more coils
2. Material optimization up to 100% is possible for **regular parts** (rectangular)
3. The **Typical range** of coil up to 0,2 inch thickness and up to 60 inch wide

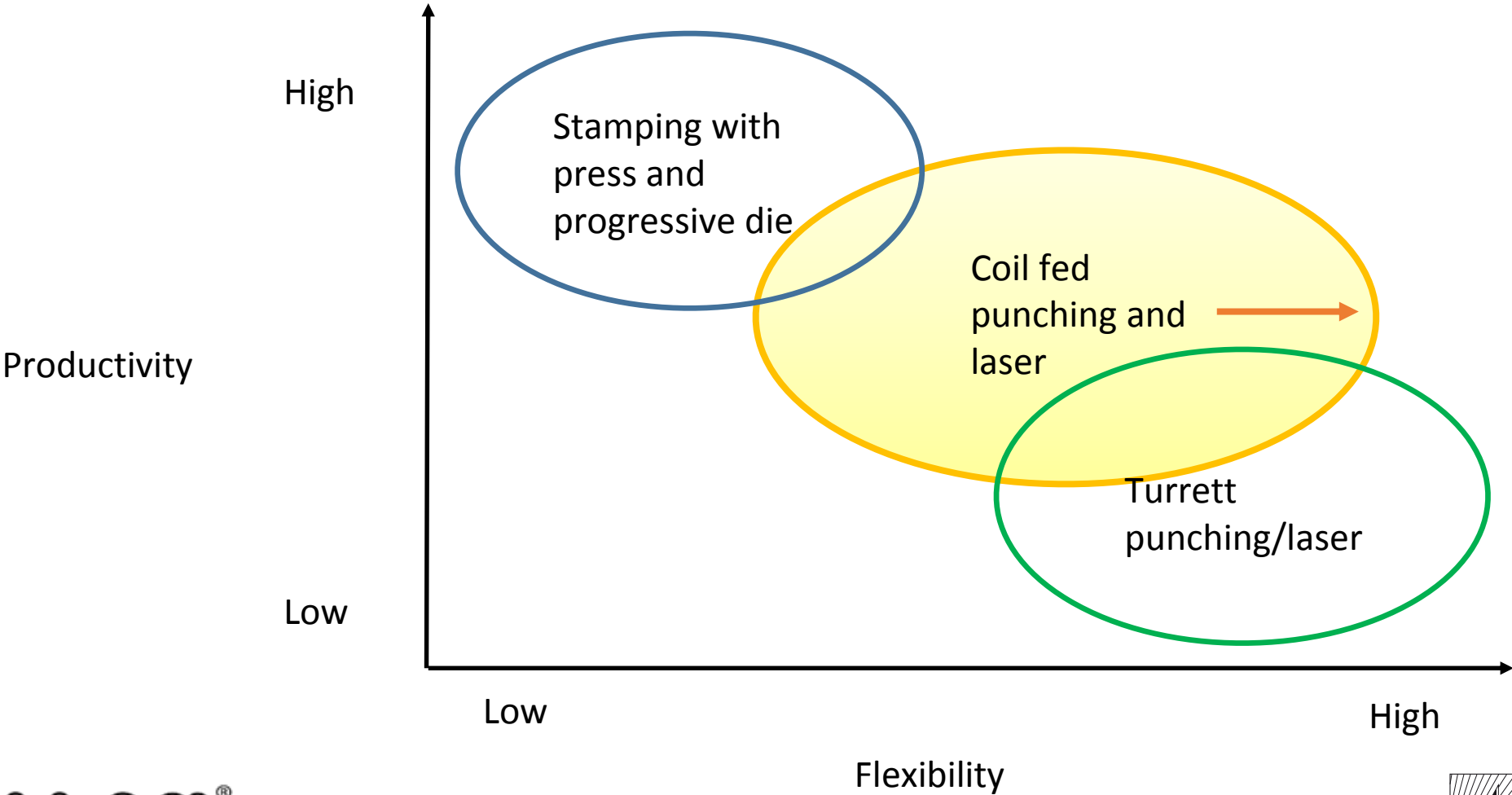
Productivity and Flexibility diagram



Productivity and Flexibility diagram



Productivity and Flexibility diagram



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• **Coil fed lines in detail**

1. **Hydraulic coil fed punching**
2. **Servolectric coil fed punching**
3. **Coil fed laser cutting**
4. **Coil fed punch/laser combo lines: case study**

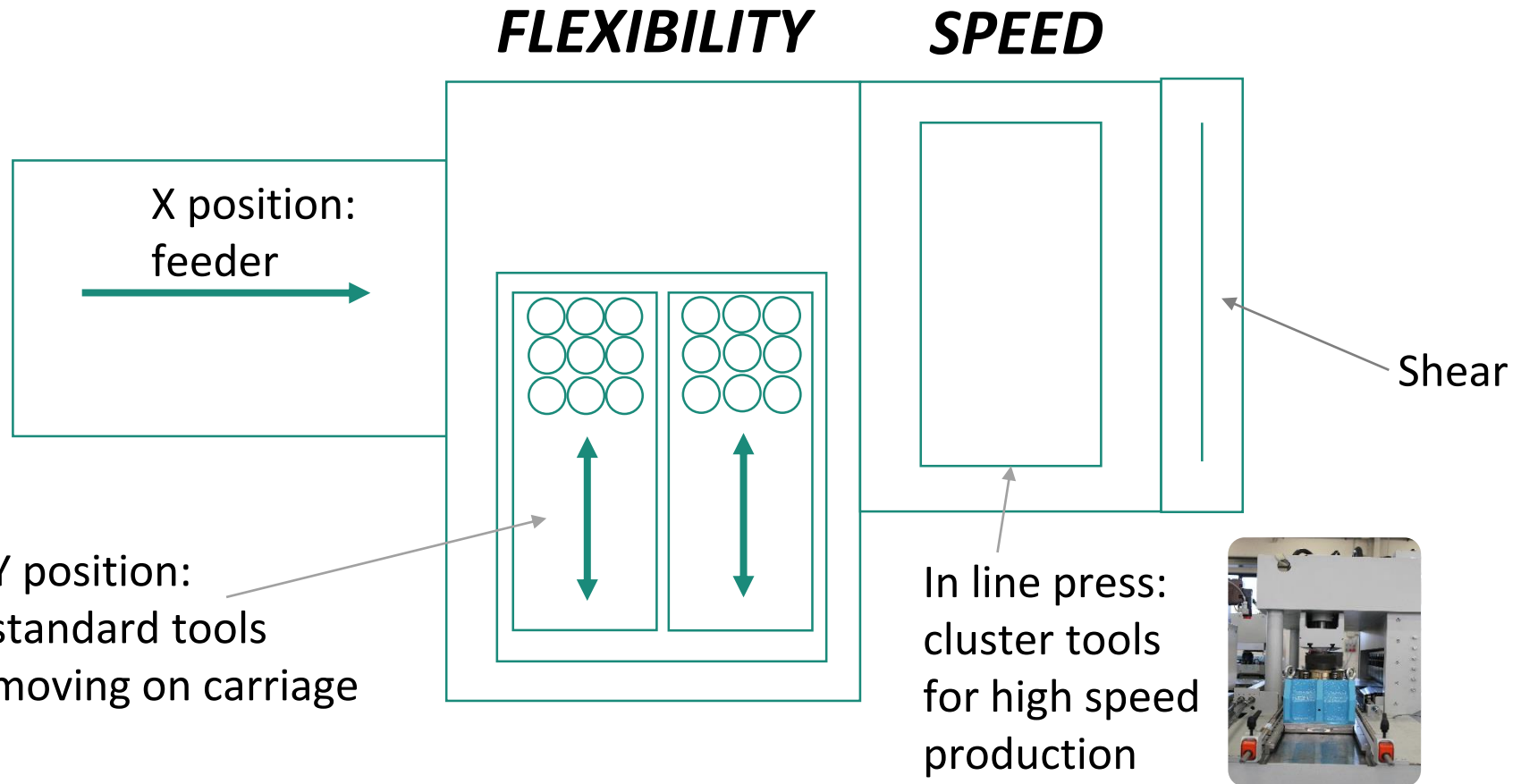
1. Coil fed punching: hydraulic



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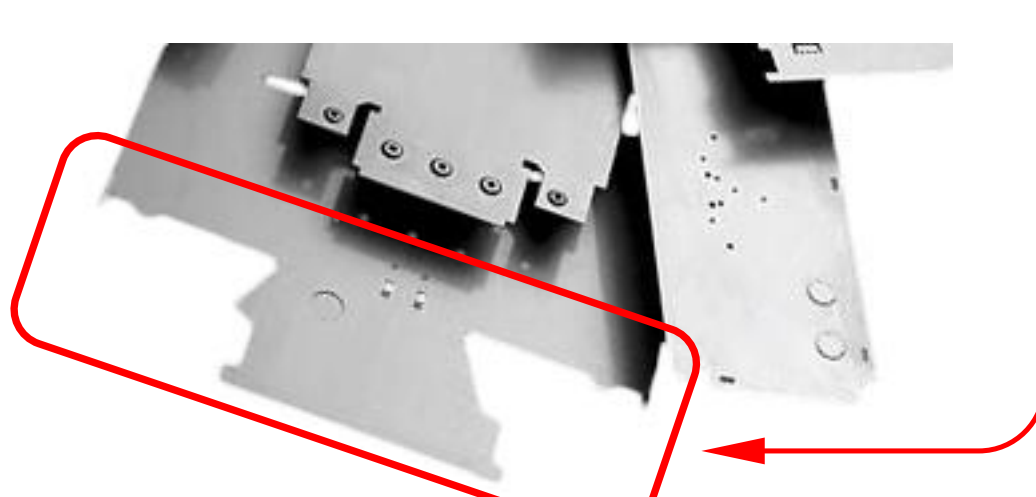
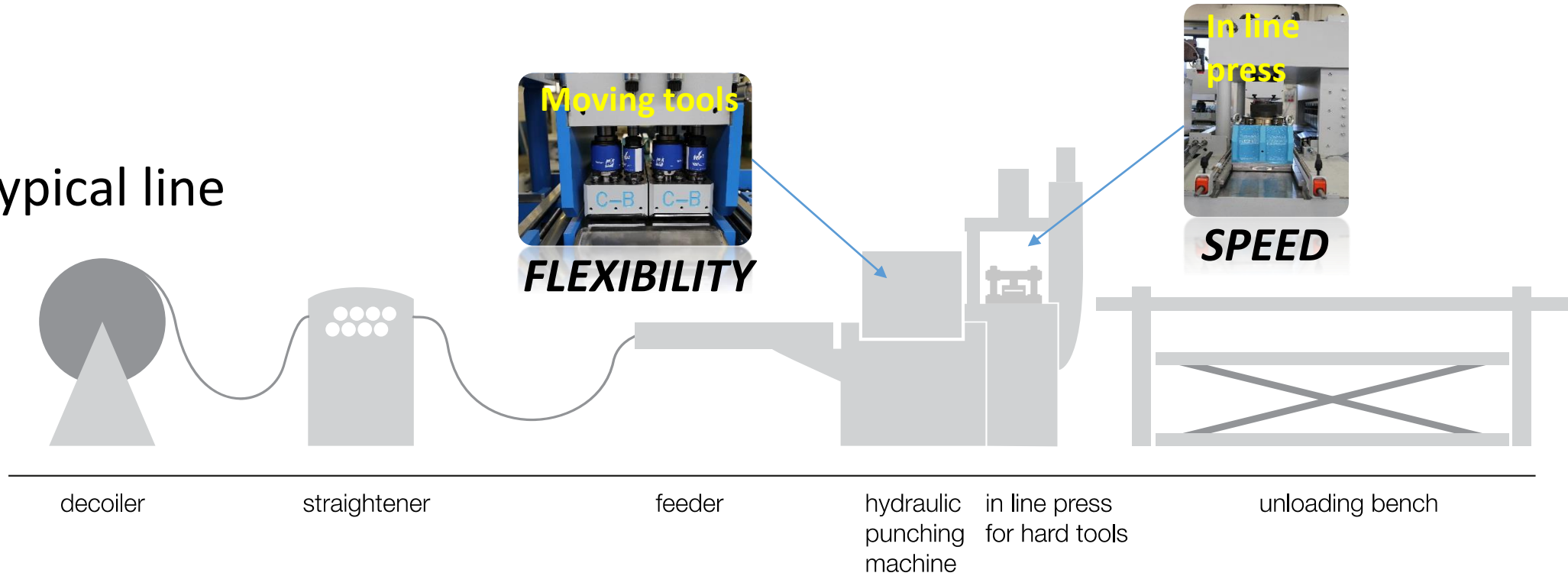
- Strip and tools movements



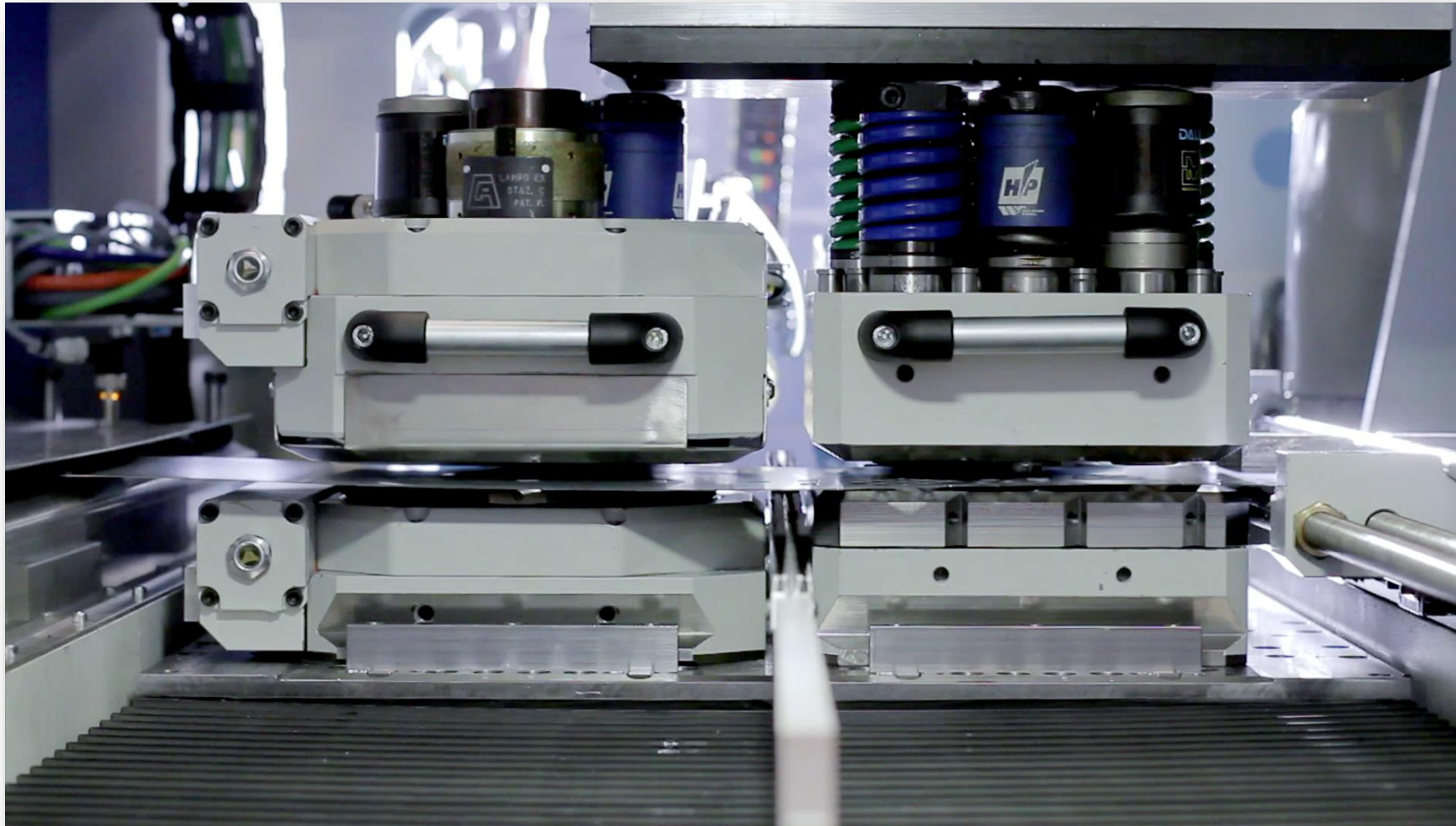
1. Coil fed punching: hydraulic



- Typical line



2. Coil fed punching: servo electric



Dallan® coil punching division

2. Coil fed punching: servo electric



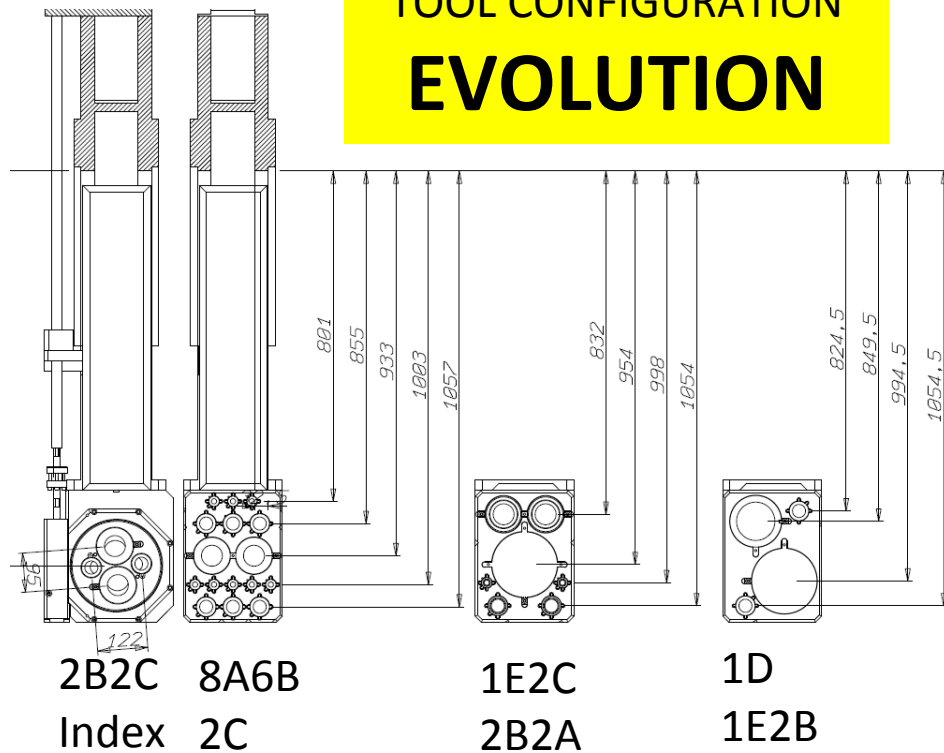
- **Energy saving:** eliminating the hydraulic circuits reduces the energy consumption
- For example:
 - HYDRAULIC 40 inch wide machine consumption: 27KW
 - SERVO ELECTRIC 40 inch wide machine consumption: 11kW
- **Green:** It is a much cleaner technology: no hydraulic oil has to be changed
- **Flexible:** Equipped with rotary tools (Index) and with interchangeable tool arches

2. Coil fed punching: servo electric



- **One hammer for all the tools**, means that the tool arches can be changed in the machine, to adapt to different tool configurations

TOOL CONFIGURATION EVOLUTION



DALCOS
COIL PUNCHING MACHINES

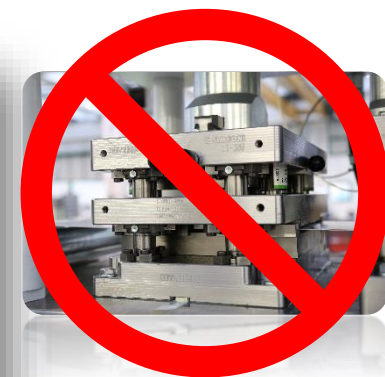
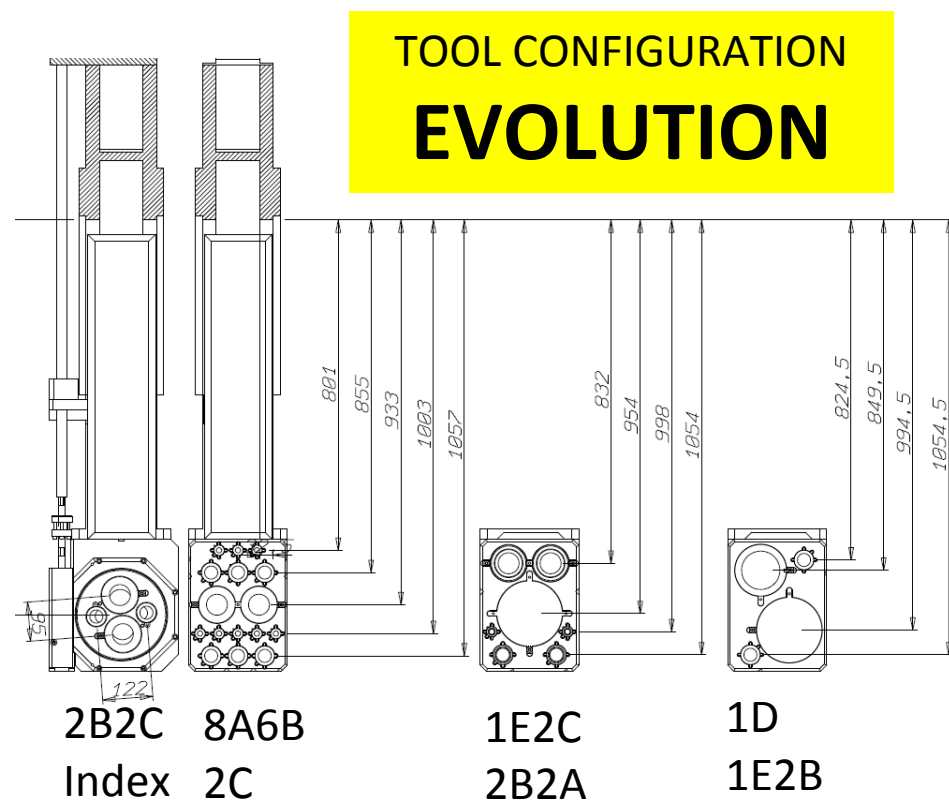
Dallan® coil punching division

2. Coil fed punching: servo electric



→ Tool arches

- One hammer for all the tools, means that the tool arches can be changed in the machine, to adapt to different tool configurations



Standard tools
= unexpensive
tooling



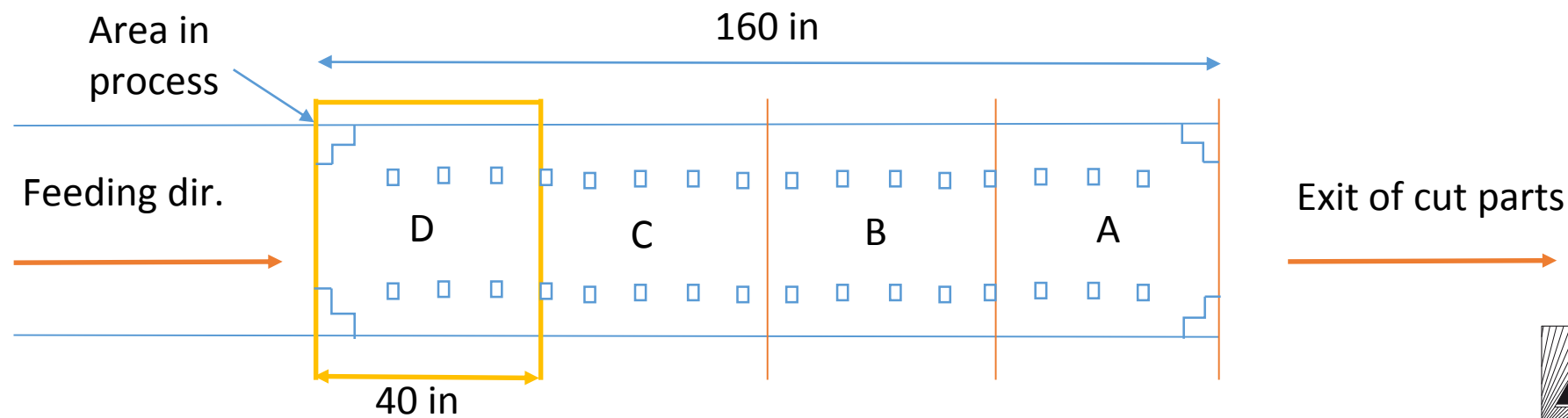
DALCOS
COIL PUNCHING MACHINES

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3. Coil fed laser

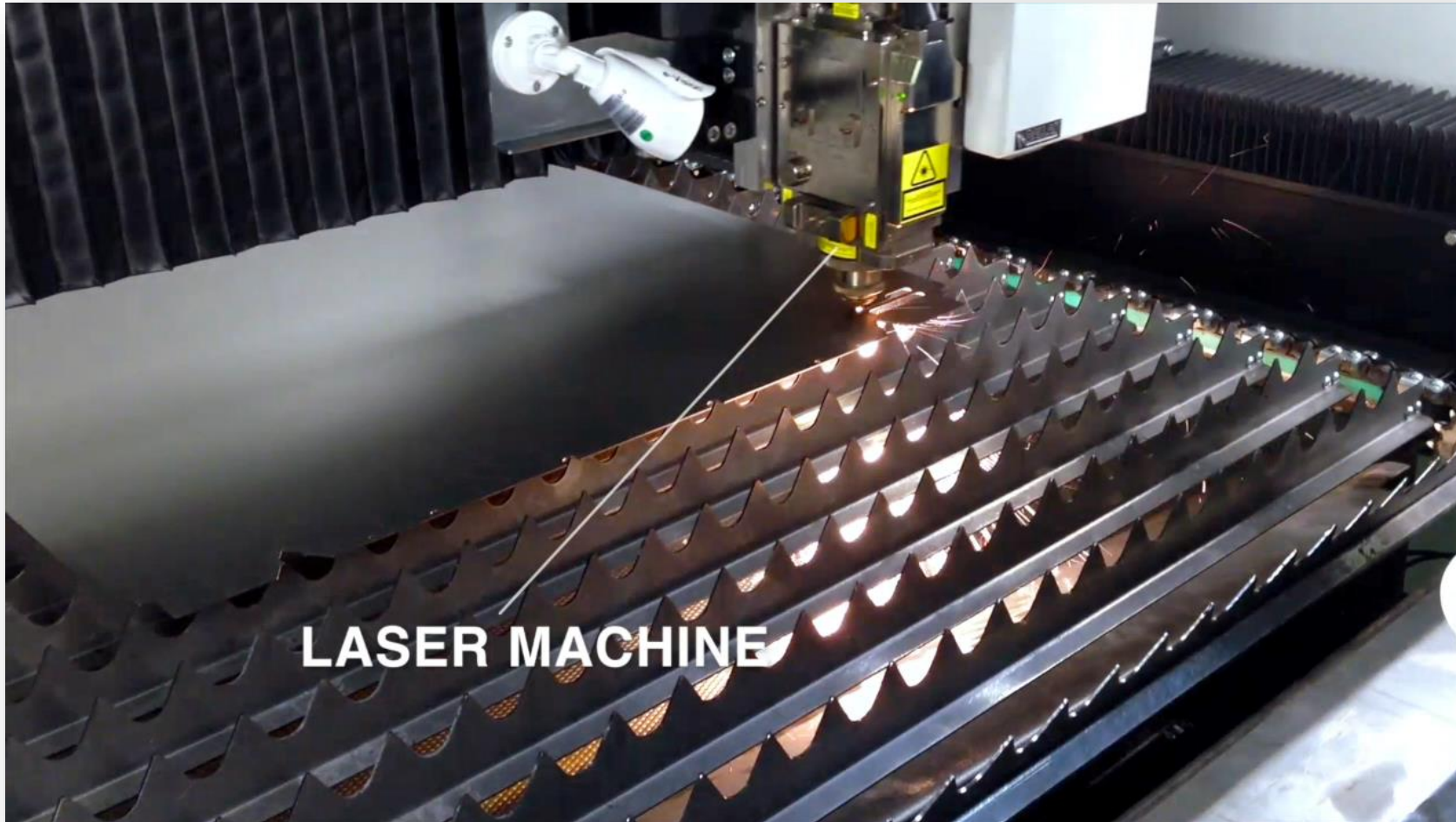


- Fiber laser efficiency and ease of use has enhanced the possibilities in coil fed applications
- Increased flexibility – almost any part that is feasible in sheet processing machines, can be easily driven to coil fed processes
- Coil is fed into the machine by a roller feeder



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3. Coil fed laser

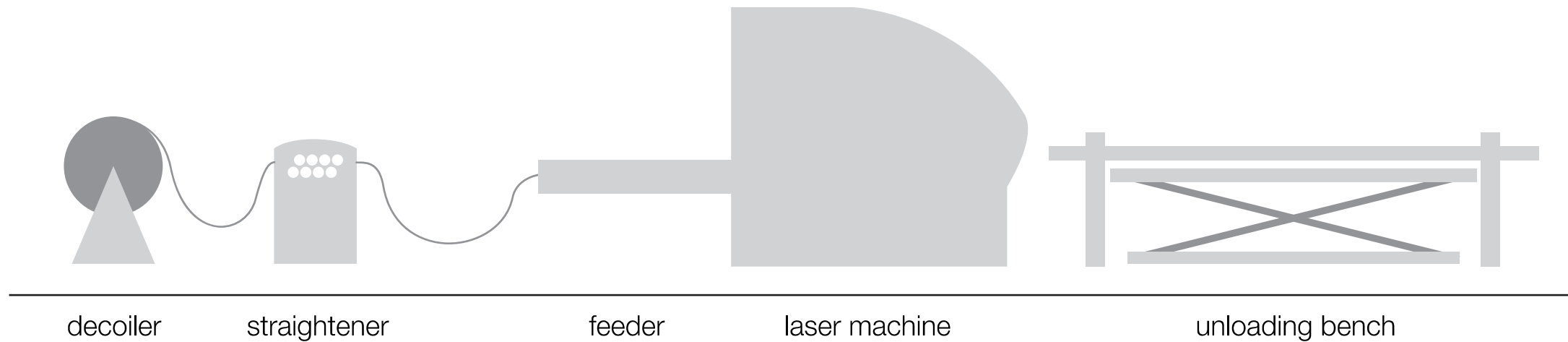


Dallan® coil punching division

3. Coil fed laser



- Typical line

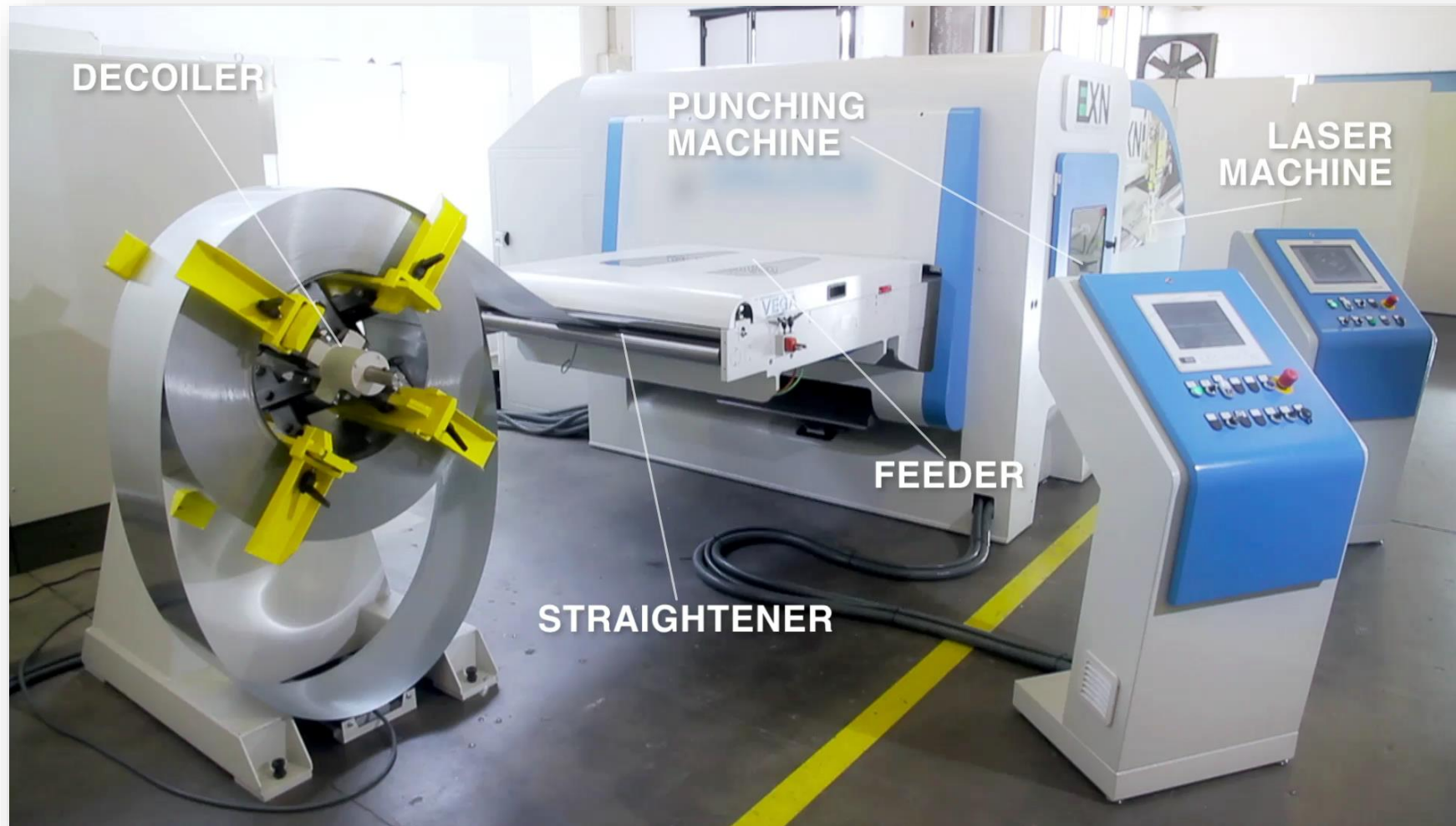


4. Coil fed punch laser combo



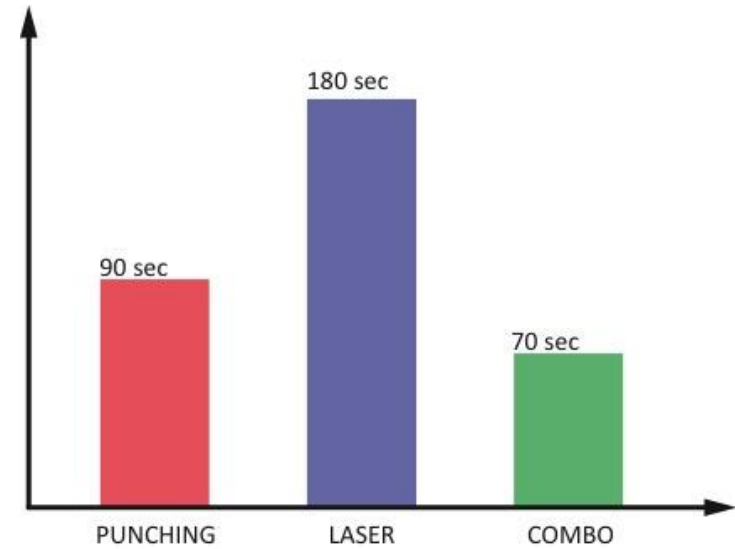
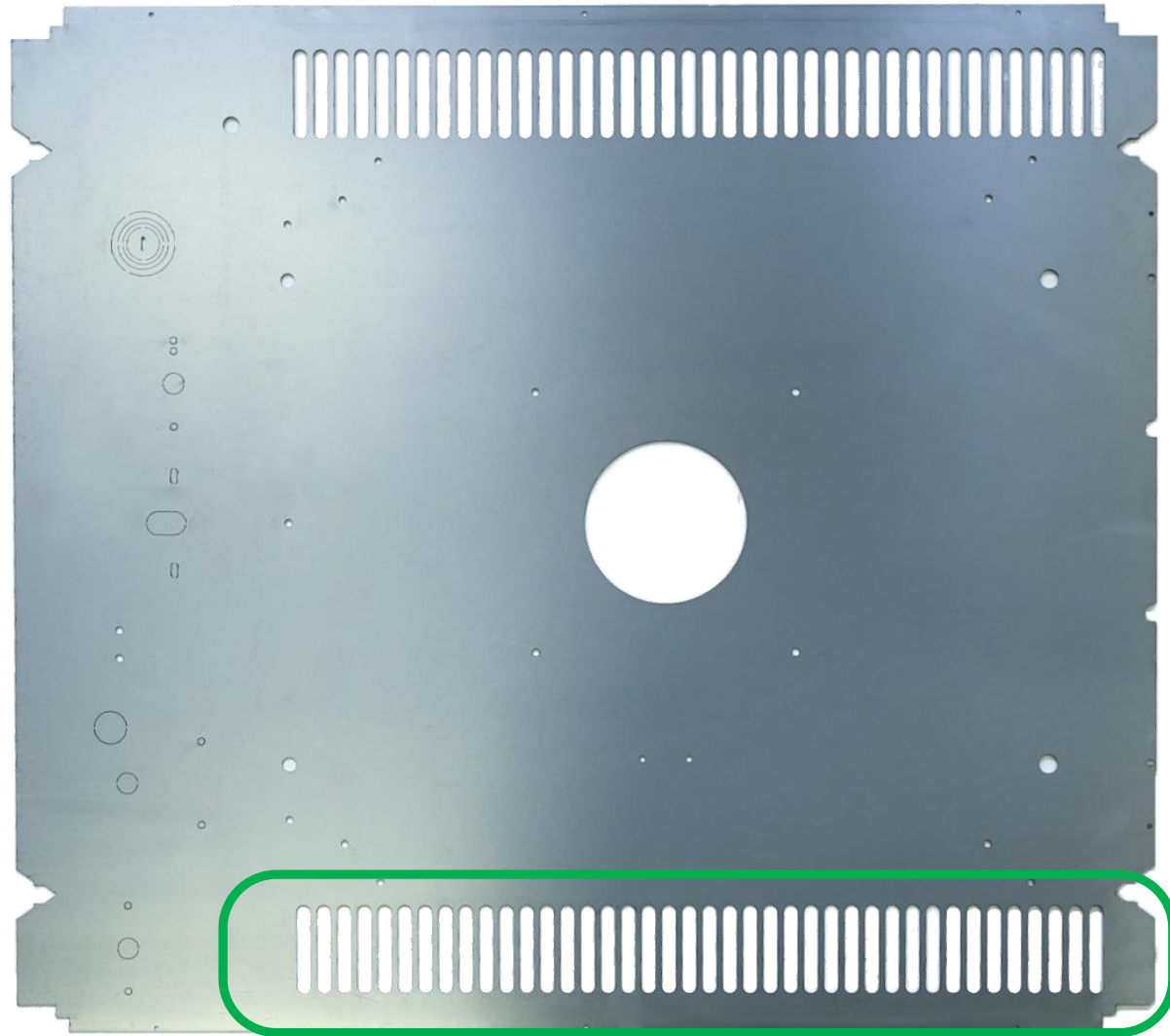
- **Laser advantages:**
 - flexibility
 - speed for complex shapes such as notchings
- **Punching advantages:**
 - speed for parts with multiple holes
 - cost-effective process (no gases required)
 - Possibility of embossings
- **Coil fed punch laser combo combines both advantages**

4. Coil fed punch laser combo



4. Coil fed punch laser combo

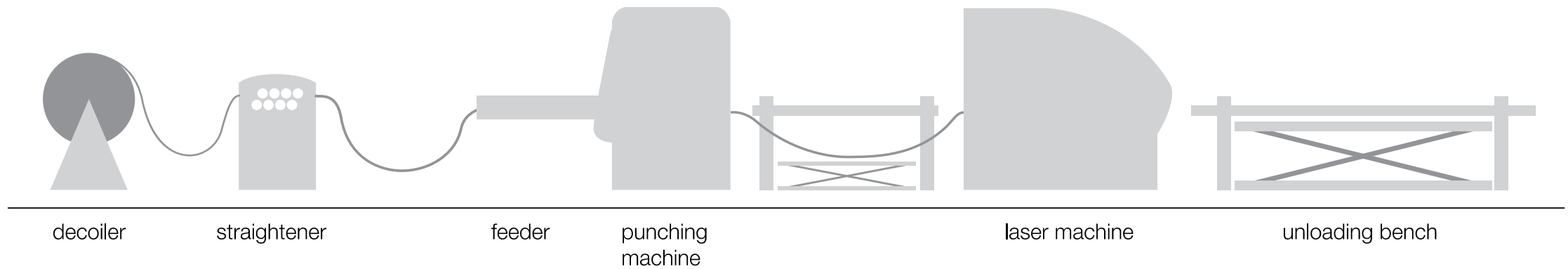
→ Case study



4. Coil fed punch laser combo

→ High performance layout

The loop between the coil fed punching and laser allow simultaneous production with the two machines



Conclusions



- Main advantages of coil fed process compared to sheet process - with the right conditions
 - **Maximum profit per part** for the metal manufacturer
 - **Faster production**
- A large part of sheet metal products in the industry **meets the base conditions:**
 - Regular shape
 - Batch size between 100 and 500.000 parts
- The use of coil fed lines was first chosen by **Pioneers** that have profited from these advantages against the competition
- With the modern coil fed technologies available on the market, it is easy to find the best solution for the manufacturers' specific needs

THANK YOU!

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