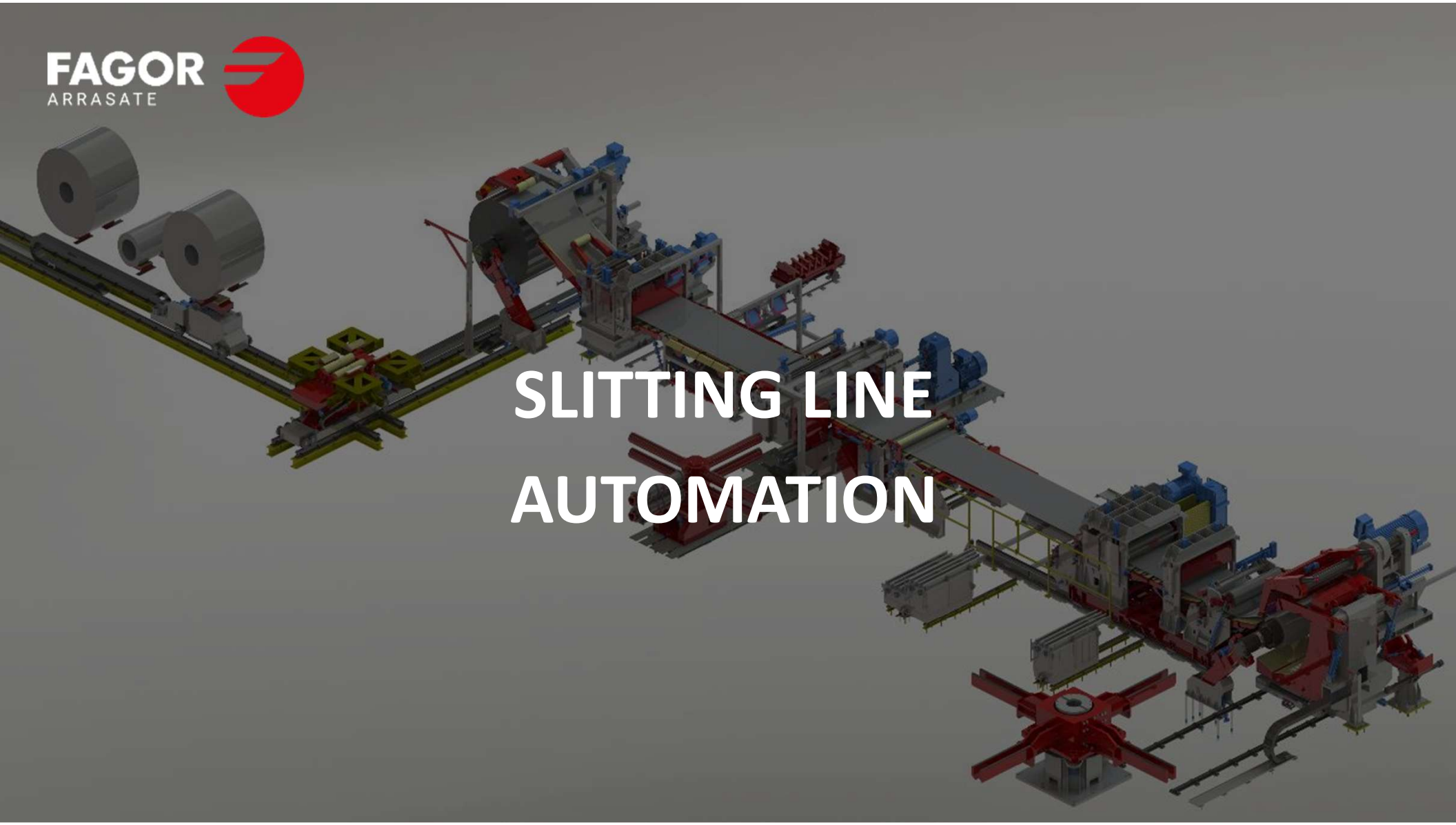
FAGOR
ARRASATE



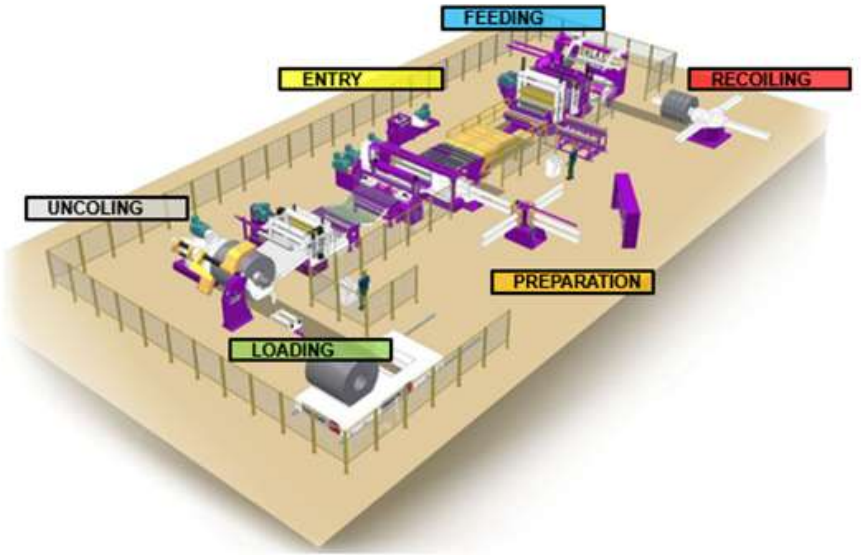
SLITTING LINE AUTOMATION

IWCC Legal Disclaimer

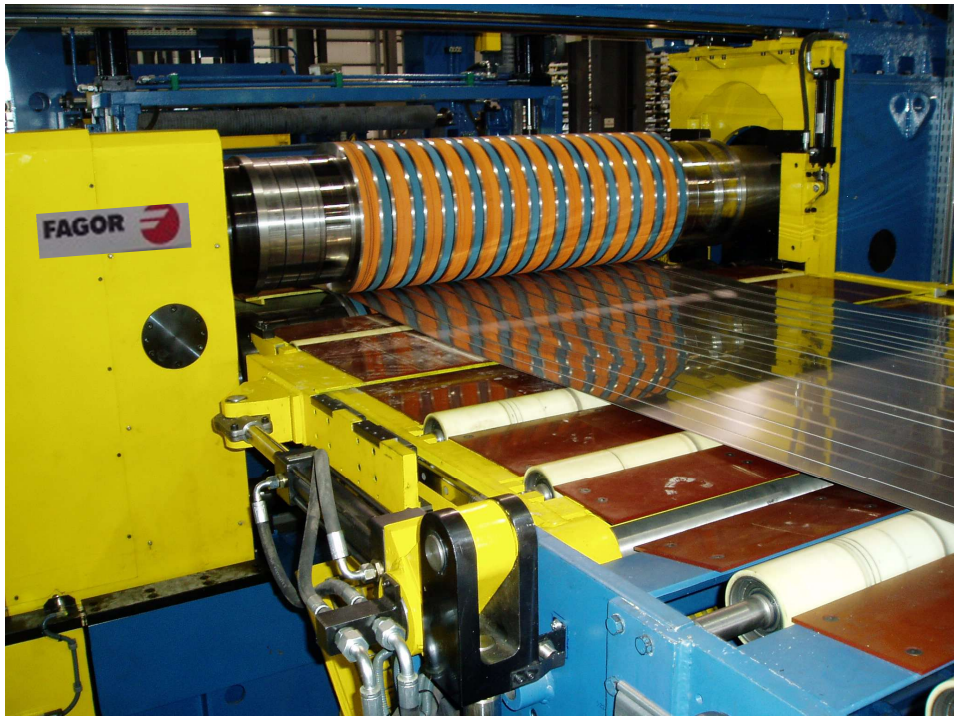
The purpose of this presentation is to guide programs benefiting the copper industry and to provide attendees with information to make independent business decisions.

WHY AUTOMATE YOUR COIL PROCESSING LINE?

- High level of automation for fast changing times and short line idle times
- Fast presetting times.
- Few operators required.
- Less cost in terms of operation cost and labor cost
- Higher production levels.
- More ergonomic – generally no stairs for operators to constantly navigate
- Consistent quality – with automation no set-up mistakes
- Less maintenance.
- Complete integration control.
- Optimized electric design to reduce power consumption.



HIGH PRODUCTIVITY
SLITTING LINE



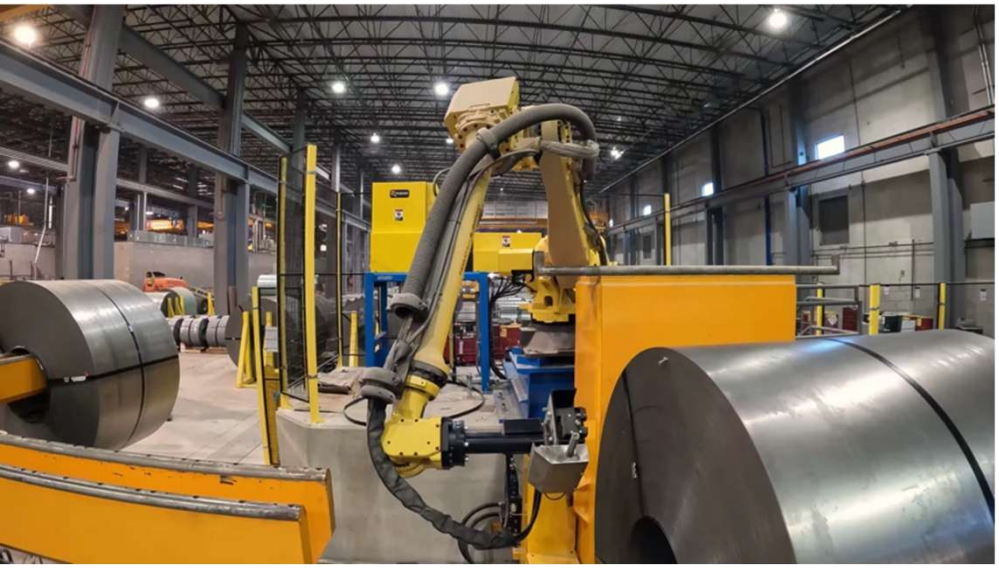
AUTOMATIZATION
BENEFITS

Drivers in design:

- Quality
- Flexibility
- Productivity
- Reliability
- Repeatability
- Simplicity
- Safety & Energy saving

In accordance to the different features and adopted technical solutions we divide the lines in two sizes:

- Light Gauge: Up to 0.250”
- Heavy Gauge, Up to 0.750”



AUTOMATIC DEBANDING
LOADING SYSTEM

Preparation of the next coil to be processed, automatically removing the strap and disposing it in a scrap container.

AUTOMATIC COIL
LOADING SYSTEM

Starting from the entry we have fully automatic coil loading.

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COIL
STORAGE

Feeding from the storage area and buffering with a turnstile or coil car. Entry can be configured to customer space limitations.

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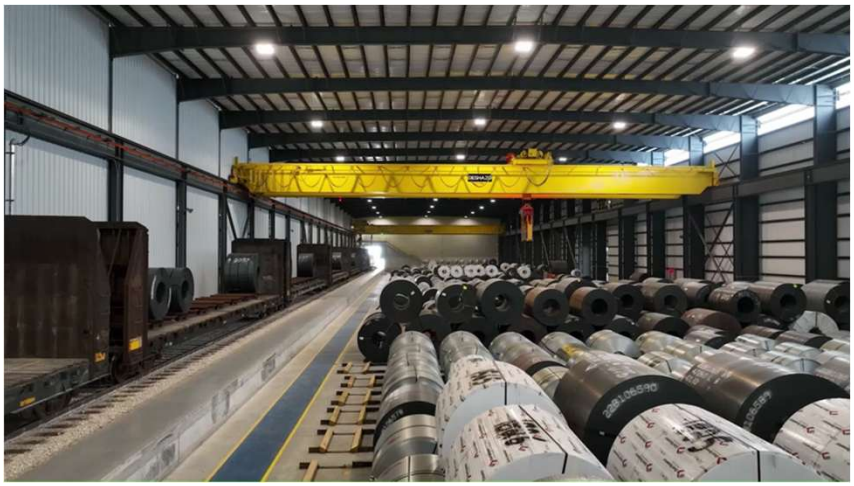
HANDS FREE
AUTOMATIC FEEDING

Transferring from the coil storage station to the mandrel with automatic centering device, positioning of the coil head and cutting of the bands.



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Transferring from the coil storage station to the mandrel with automatic centering device, positioning of the coil head and cutting of the bands.

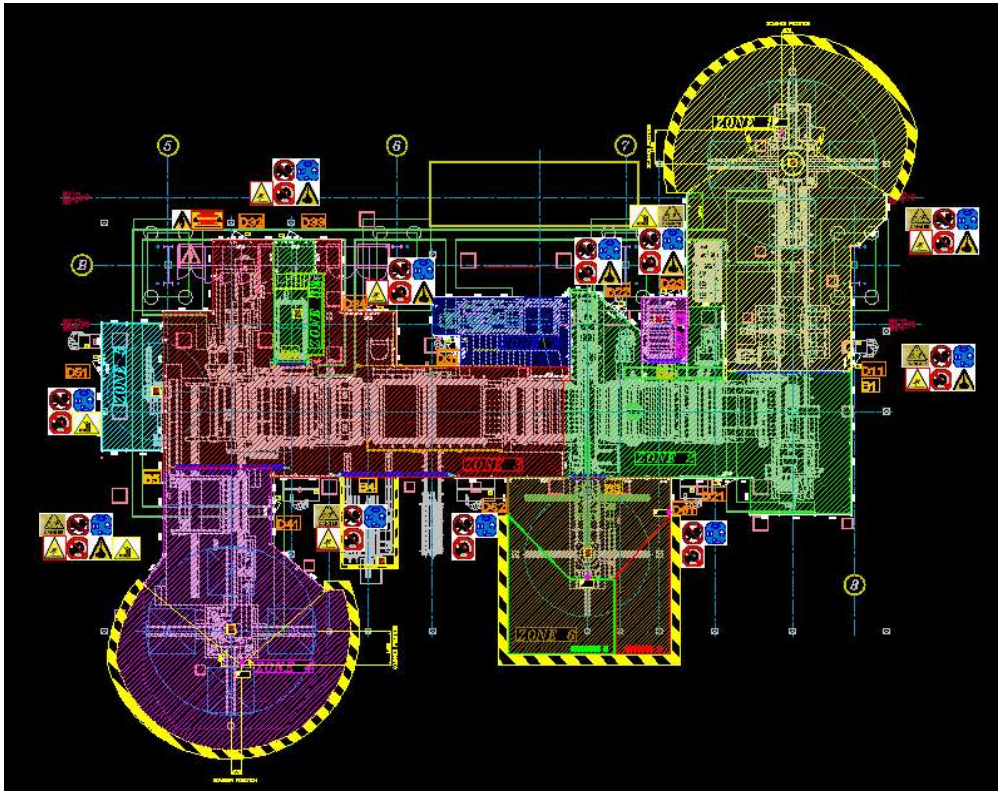
SAFETY
AREA

•To effectively automate the line, the line is divided into seven (7) basic “zones” which are integrated together. 1) Coil Stocking; 2) Entry & Cropping area; 3) slitting area; 4) tensioning/recoiling area; 5) coil exit & banding, 6) Tooling set-up, and 7) scrap handling.

•This **reduces the threading downtime:** when the exit area is recoiling the tail while a new coil is on loading cycle on the uncoiler.

•The automation level allows for the safe operation of the line. The various zones lets operational sequences from threading of the master coil thur the exit of the slit product.

•This still allows for restocking of partially run coils.



SLITTING LINES
SAFETY PLC AND ZONE DISTRIBUTION

SAFETY
FENCING

FEEDING
AREA

- **The exit pinch roll has the additional function to steady the slit strands before the loop, feed them into the loop and control the loop height.**

- **The exit pinch-roll can be integrated with a burr smashing unit.**

- For critical and/or oiled material surface special polyurethane or woven coated rolls can be used to assist the grip without damaging the material.

AUTOMATIC SLITTER
TOOLING EXCHANGE

- **Slitter head assembly is a single head with hydraulic lock up of the tooling, minimal use of rubber spacers in connection of a patented tools extraction system allowing a precise alignment of the cutting knives.**

- Shafts positioning can be by single or double eccentric.

- **Changeover of tooling assembly is fully automatic** with an hydraulic locking clamp.

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ROBOTIC SLITTER
TOOLING SET-UP

CLAMPING DEVICE

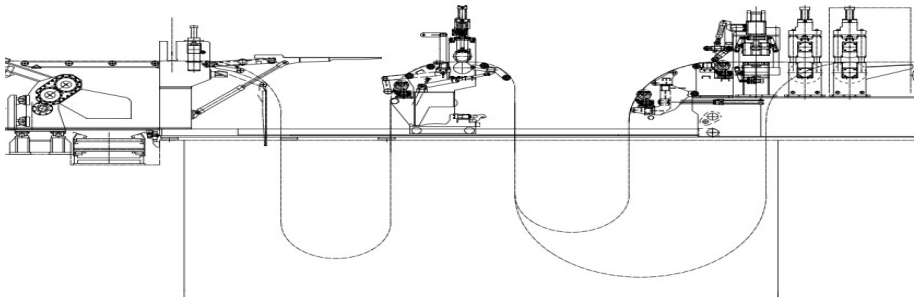
•The line threading is fully automatic. The slit strips are gripped at the exit side of the slitter and pulled across the pit. The slit strands are inserted into the recoiler gripper without operator intervention.

•It's also possible to use a **clamping device** moving through the braking carriage assembly to clamp the strips at slitter head exit and thread the heads directly into the recoiler mandrel slot.

CLAMPING
DEVICE

This solution can be used for very thin material with large number of cuts or medium and high gauge material with high tensile strength.

For very thin material and many mults can also apply a “plunge cut” that leaves the head of the incoming strip unslit in order to have very easy feeding of the strip to the recoiler mandrel.



DOUBLE
LOOP

To solve problems of high water levels in deep looping pit for thin material, typical depth is 10 - 12 m – 33 - 39 ft, it's possible to use **a double loop** with the initial part of the braking carriage detachable, capable to move independently and equipped with a driven pinch roll to allow the formation of the first loop, fix it at a preset depth and move back to allow the formation of the second loop for the remaining length of the coil. This solution allows to shorten the depth of the pit to 5 – 6 m – 16 – 20 ft keeping the threading and processing in full automatic way.

FAGOR ARRASATE

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AUTOMATIC SEPARATORS
SHAFTS

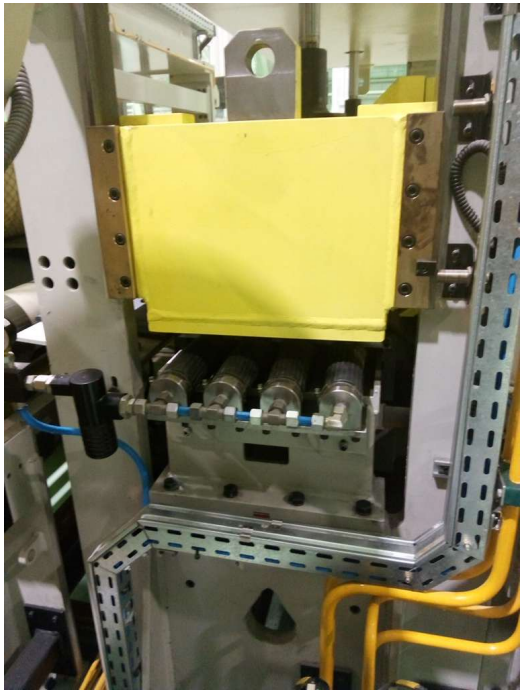
- To **increase** line **productivity** and **eliminate errors** the automatic separators shafts facilitate the line preparation.
- Preparation time of 32 separators in less than 2 minutes.

BRAKING
UNIT

Braking unit is one of the most important parts of the line. Several solutions are available depending on the material surface, thickness, number of cuts and speed.

For non critical surface material we use a felt press system with several sections of inflatable chambers to allow different pressure on the slit strips.

For critical surface material we use poly urethane coated pinch-rolls with different possible configurations: just twin combined or as per a bridle shape. For oily material, non-woven rolls can be utilized.



MOTOR SIDE

OPERATOR SIDE

BELT
BRIDLE

In addition to these solutions we have **a slidingless system** using a belt bridle consisting in a pinch-roll divided in several pulley sections capable of complying with the different speed of the slit strips applying a very homogeneous tension to each strip. This is allowed by expandable chambers placed between the core motor driven shaft and the external pulley sections allowing the sliding between them and the shaft with a minimal controlled delta speed and consequently a very low heat dissipation. This represents a much more efficient system in comparison with other very expensive and complex water cooling equipments.

TENSION
UNIT

•Another important feature effecting the **quality** of recoiling and precise alignment of each wrap of the slit coil is **to keep the recoiling angle constant**.

•**The movable carriage and deflecting roll** assembly accomplishes this function with a closed loop automated control.

•A **crop shear** to can be added after the deflecting roll minimizing the need to re-thread the entire line.

•This shear is integrated with a **bending device** to bend down the cropped tail edges in order to get easy and safe the handling and strapping of the slit coils without the risk of cutting the strap with a sharp, outer tail edge.

AUTOMATIC
SEPARATOR DISC

•**CNC positioning of separator disks and the CNC tooling setup** are two high automated functions allowing the preset of the line.

•Preparation time of 32 separators in less than 2 minutes.

•The system is completely integrated with the factory LAN. A level 2 workstation equipped with suitable interface software and data base installed between the level 1 and level 3.

•**This automation capability allows high flexibility of the line.**

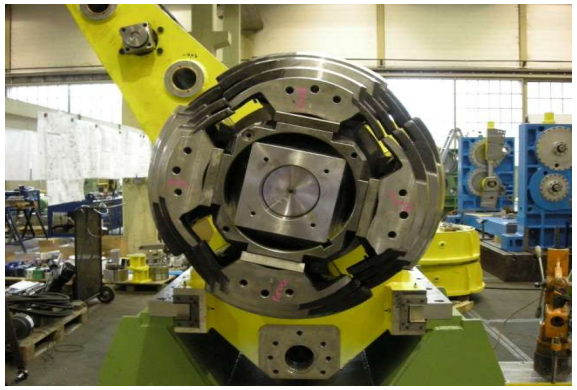
•The CNC tooling setup can be equipped with additional functions such as a **washing machine** to clean the knives and a **statistic software** to predict the wearing of the tooling.

UNCOILING
MANDRELS

For different inner coil diameters there are several solutions available.

Uncoiling mandrels:

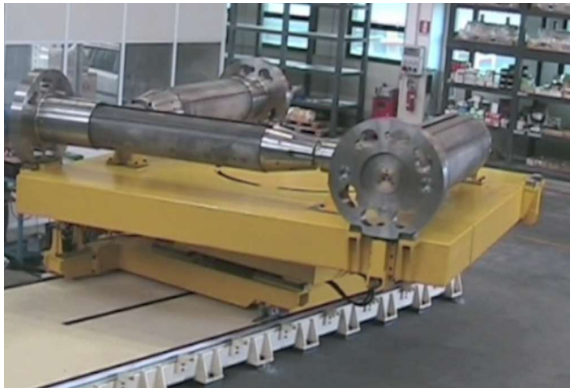
- **Low expansion** mandrel with different types of outer spacers (rubber sleeve, plastic or steel shells);
- **Double expandable** multistep mandrels;
- **High expansion mandrel** able to cover the range from 508mm to 610 mm (20in – 24,02in) or from 610mm to 760mm (24,02in – 29,9 in).



RECOILING
MANDRELS

Single fixed mandrel with spacers incorporating a clamping device to keep a short clamped edge.

Multiple interchangeable mandrels: this can be done with a special tool to be installed on the slit coil extraction carriage or with the use of a separate rotating platform capable to house up to four different diameters mandrels. Locking of the mandrel on the driven support can be bayonet or flange type with manual locking or hydraulic one with full automatic changeover sequence.



SLITTER
OUTPUT

To complete decoupling the recoiling operation from the strapping one, also for **safety reasons**, to extract the slit coils from the mandrel in a safe and reliable way by means of an **holding arm with a piano finger edge** installed on the transfer car from the mandrel to the strapping turnstile.

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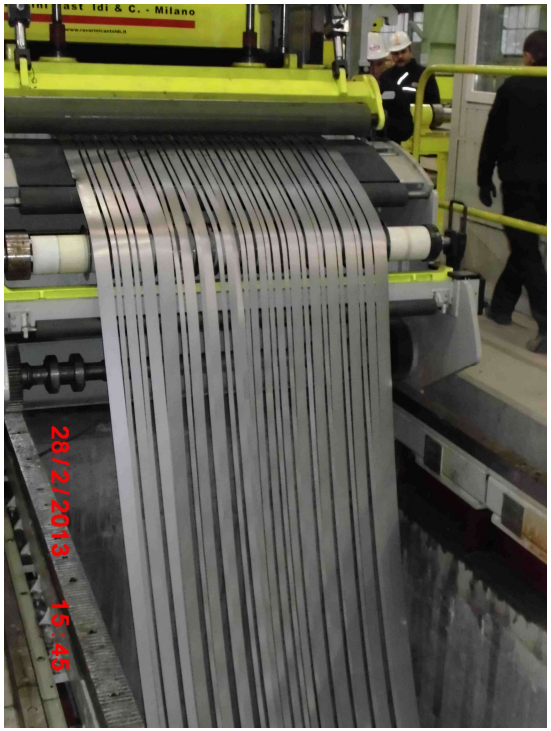
AUTOMATIC
STRAPPING

To complete decoupling the recoiling operation from the strapping one, also for **safety reasons**, to extract the slit coils from the mandrel in a safe and reliable way by means of an **holding arm with a piano finger edge** installed on the transfer car from the mandrel to the strapping turnstile.

BRUSHING
UNIT

Another feature to improve the **surface quality** of hot rolled material and increase the life time of the knives and rolls is a **brushing unit with vacuum system** to remove the scale from both the upper and bottom surfaces of the strip. This keeps the plant floor clean and enhance the environment conditions.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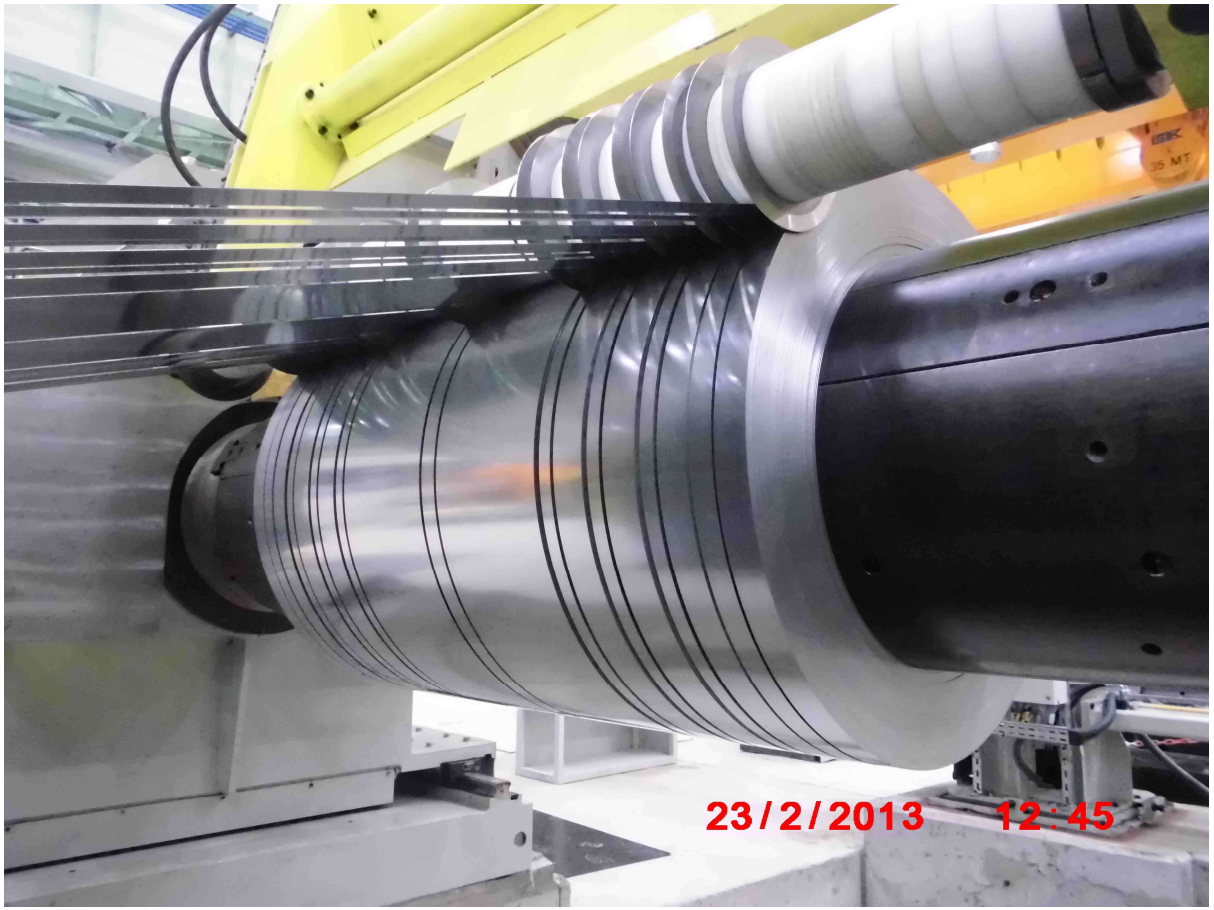
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Light-Medium Gauge Fully Automated Slitting Line
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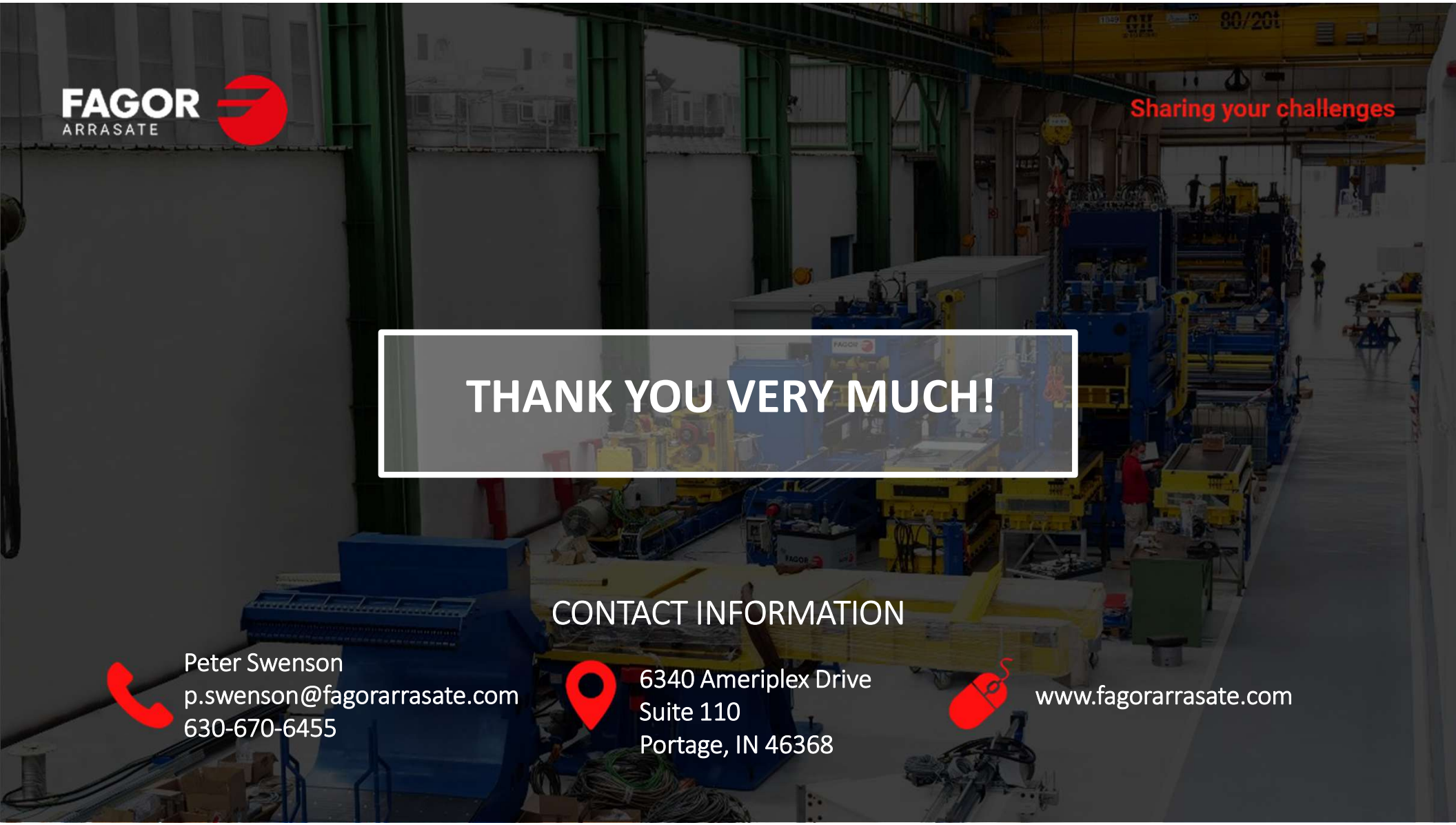

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