LEANDER ZIELENBACH
EXECUTIVE VICE PRESIDENT
SALES
DANIELI GERMANY

INNOVATIVE SOLUTIONS FOR **BRAKE FORCE CONTROL** in SLITTING

From Danieli First Class Solutions in Aluminium and Copper Slitting Lines

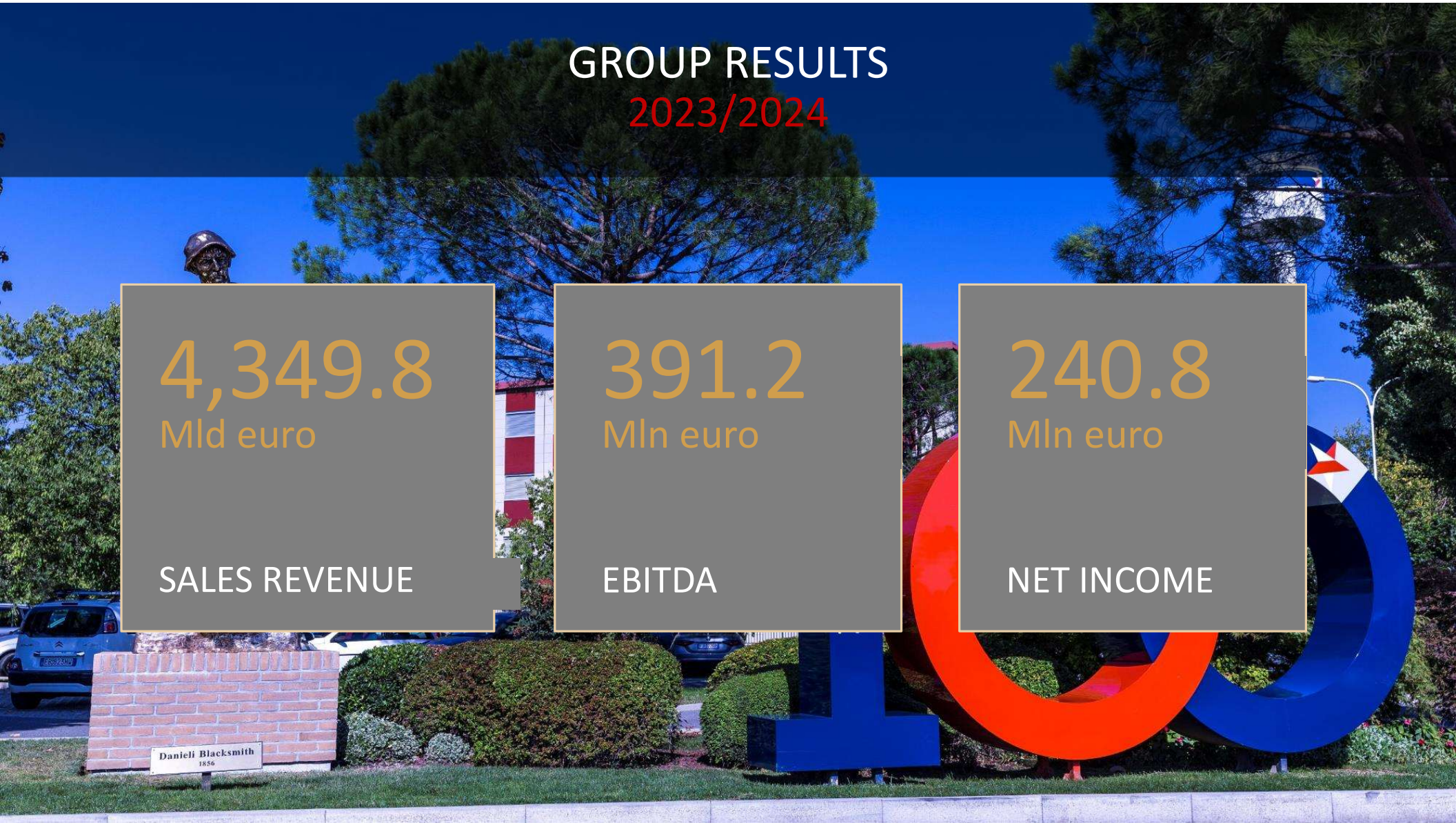
IWCC TECHNICAL SEMINAR
March, 2025
Dallas, TX, USA

DANIELI / SINCE 1914
PASSION TO INNOVATE
AND PERFORM
IN THE METALS INDUSTRY

DANIELI TEAM MORE THAN A CENTURY OF PARTNERSHIP EXPERIENCE


DANIELI
ranks among
the three major plantmakers
supplying the steel and nonferrous
metal industries worldwide
Danieli Blacksmith
1856
1914 2014
DANIELI CENTURY

GROUP RESULTS
2023/2024



4,349.8
Mld euro
SALES REVENUE

391.2
Mln euro
EBITDA

240.8
Mln euro
NET INCOME

DANIELI WORLDWIDE

Danieli Plantmaking
Worldwide presence

DANIELI THE TEAM

DANIELI WORLDWIDE

DANIELI

1 / Danieli Headquarters, Italy

2 / Danieli China

3 / Danieli Thailand

4 / Danieli India

5 / Danieli Austria

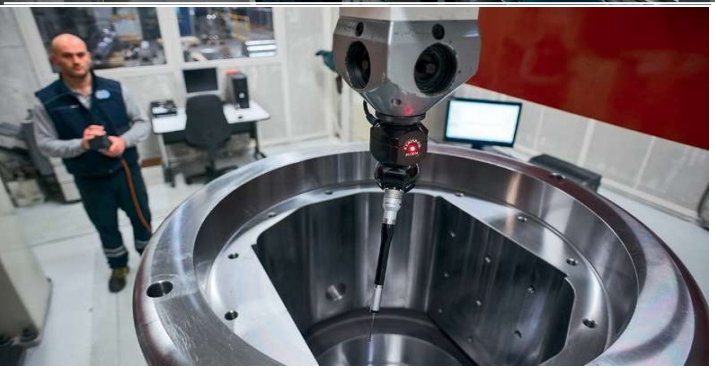
6 / Danieli Germany

Danieli workshops worldwide
Italy

Italy

Danieli Headquarters
Buttrio

Sales, design, engineering, manufacturing, assembly, project management, R&D, after-sales service.

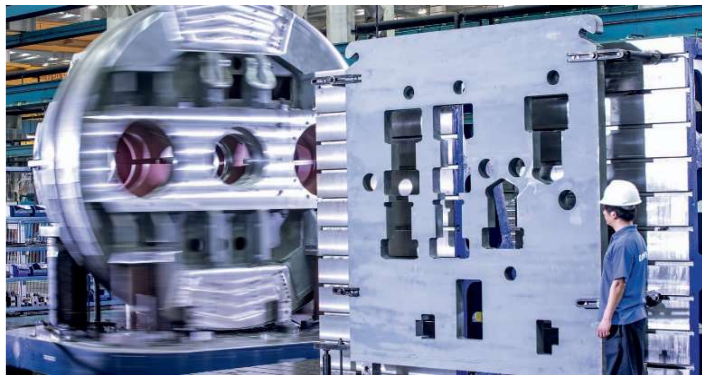


Danieli workshops worldwide
China

China

Danieli China
Changshu, Shanghai

Sales, design, manufacturing, assembly, project management, after-sales service.



Danieli workshops worldwide
Thailand

Thailand

Danieli Thailand
Rayong, Bangkok

Sales, design, engineering, manufacturing, assembly, project management, after-sales service.

Danieli workshops worldwide
India

India

Danieli India
Sri City, Andhra Pradesh

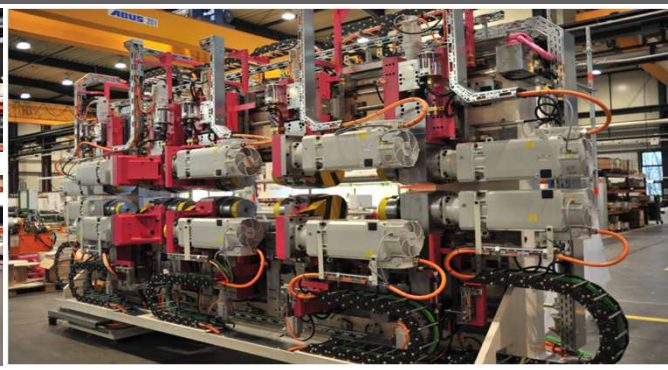
Sales, engineering, procurement, manufacturing, assembly, project management, after-sales service.

Danieli workshops worldwide
Germany

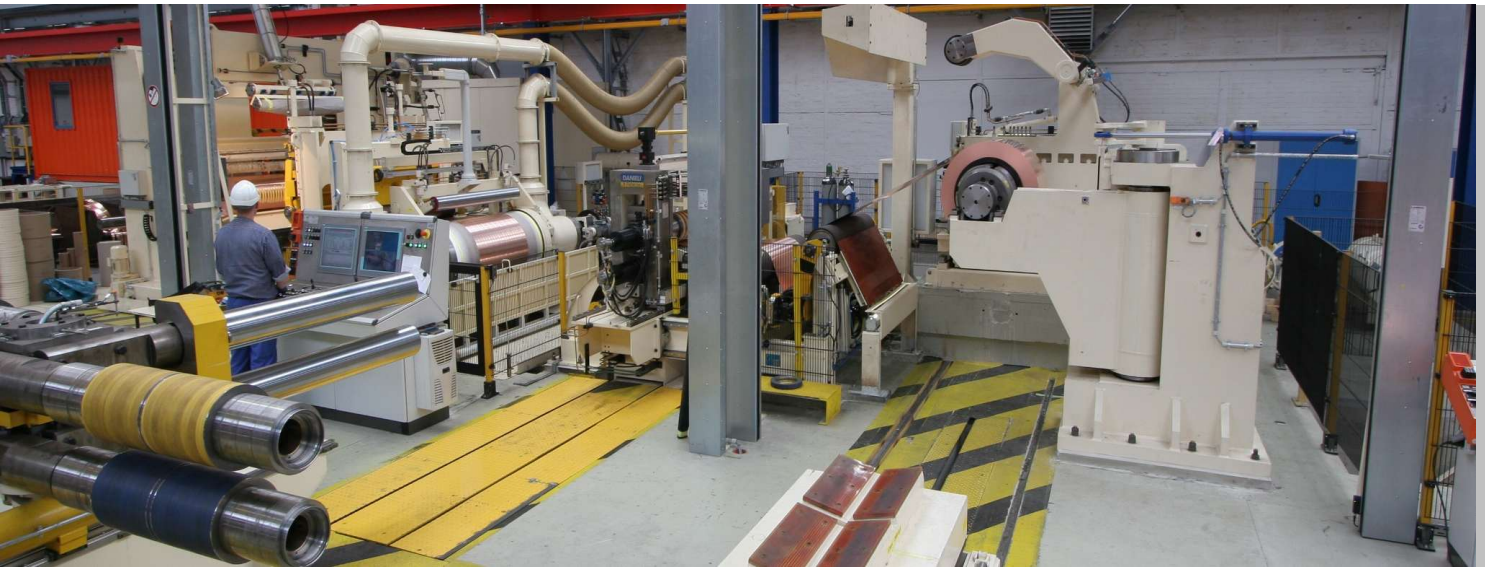
Germany

Danieli Germany
Meinerzhagen,
Nordrhein-Westfalen

Sales, engineering, manufacturing, project management, after-sales service



DANIELI FRÖHLING



Since 1947

Specialty Mills and
Strip Finishing Lines

Germany

480 STRIP FINISHING LINES

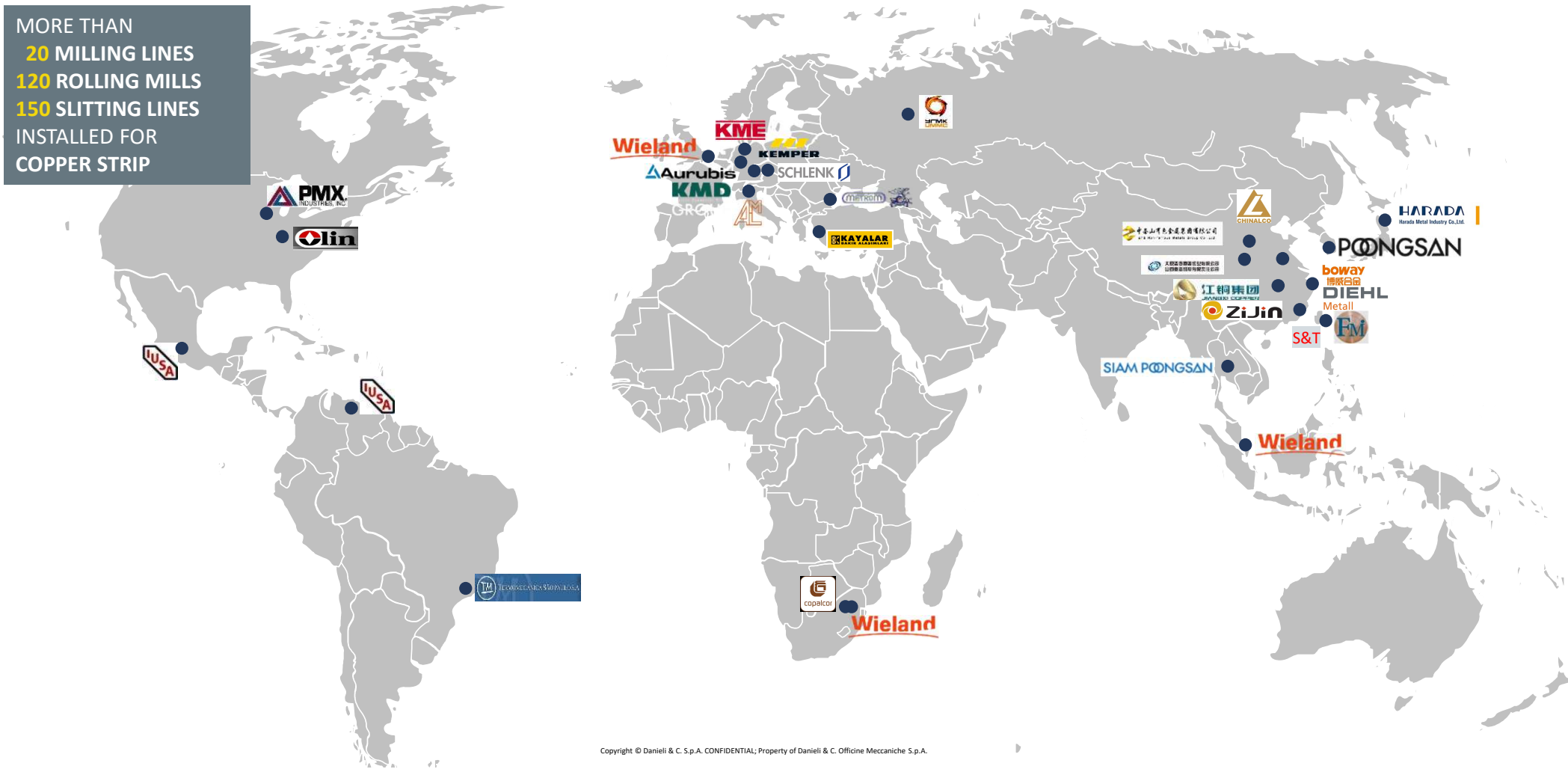
- MULTIPLE STRIP PIT SLITTING LINES
- HIGH-SPEED TRIMMING AND SLITTING LINES
- HEAVY GAUGE TIGHT MODE SLITTING LINE
- CUT-TO-LENGTH LINES
- TECHNOLOGICAL PACKAGES

DANIELI
THE TEAM

OUR COPPER CUSTOMERS AND REFERENCES

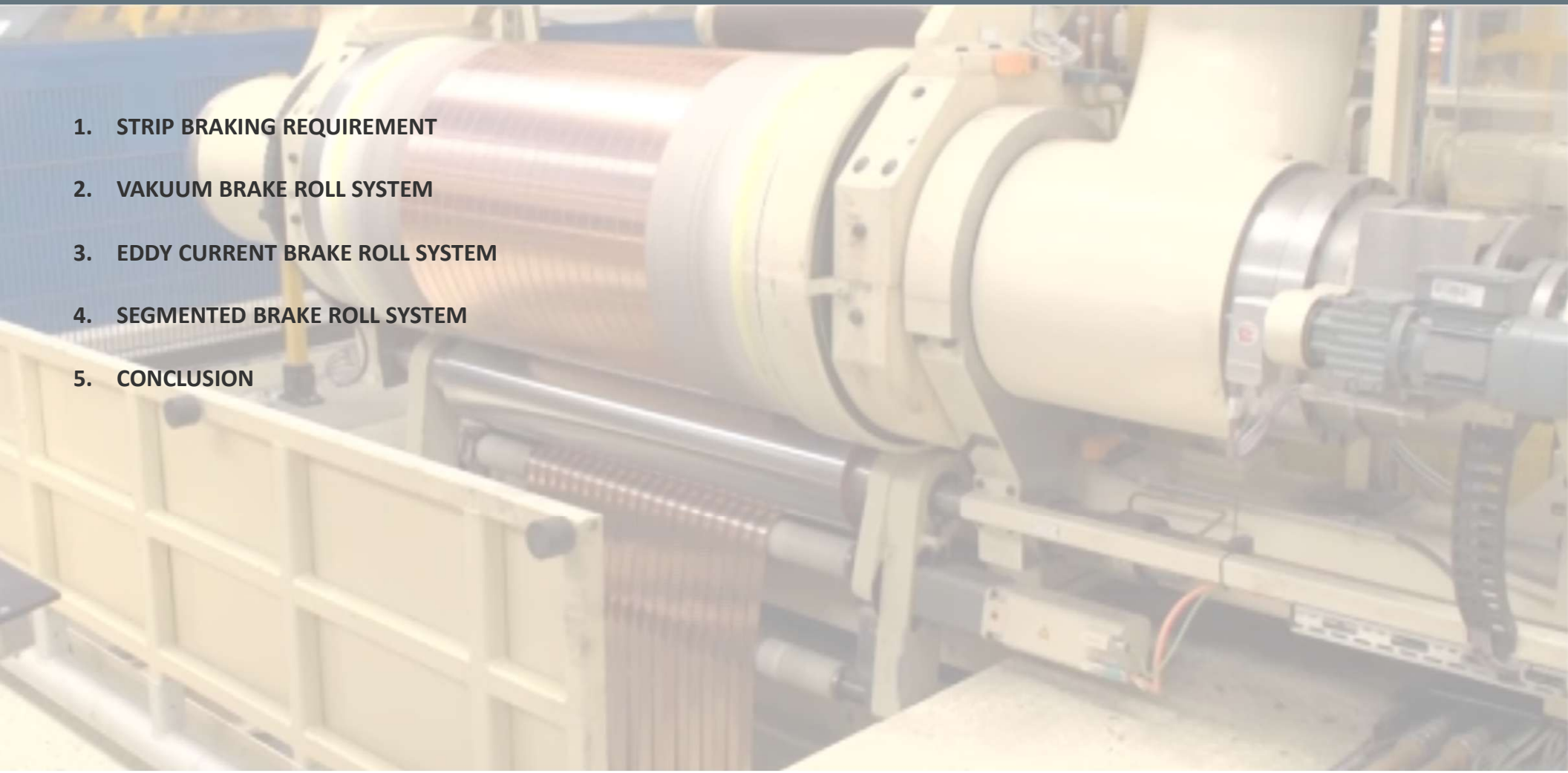
DANIELI

MORE THAN
20 MILLING LINES
120 ROLLING MILLS
150 SLITTING LINES
INSTALLED FOR
COPPER STRIP



DANIELI SOLUTIONS FOR COPPER SLITTING

INDEX

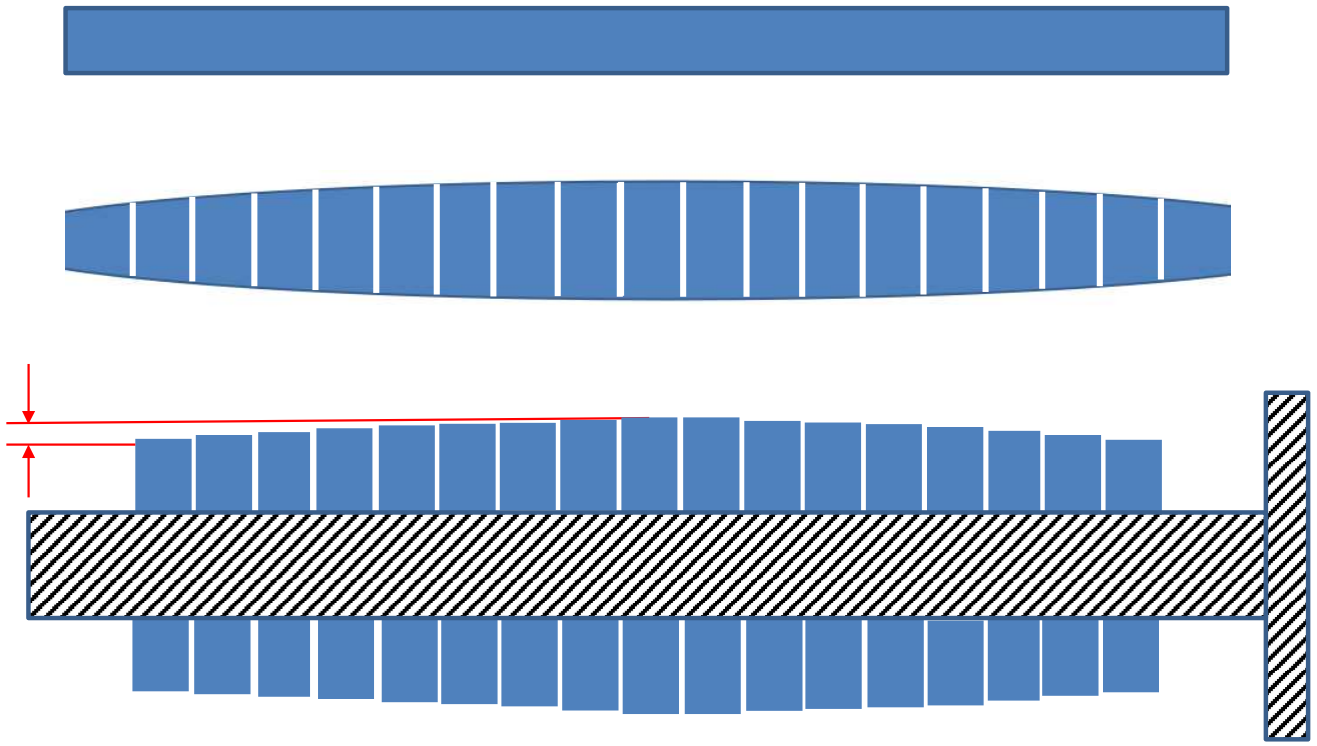


STRIP BRAKING REQUIREMENT

RE-TENSIONING OF MULTIPLE STRIPS

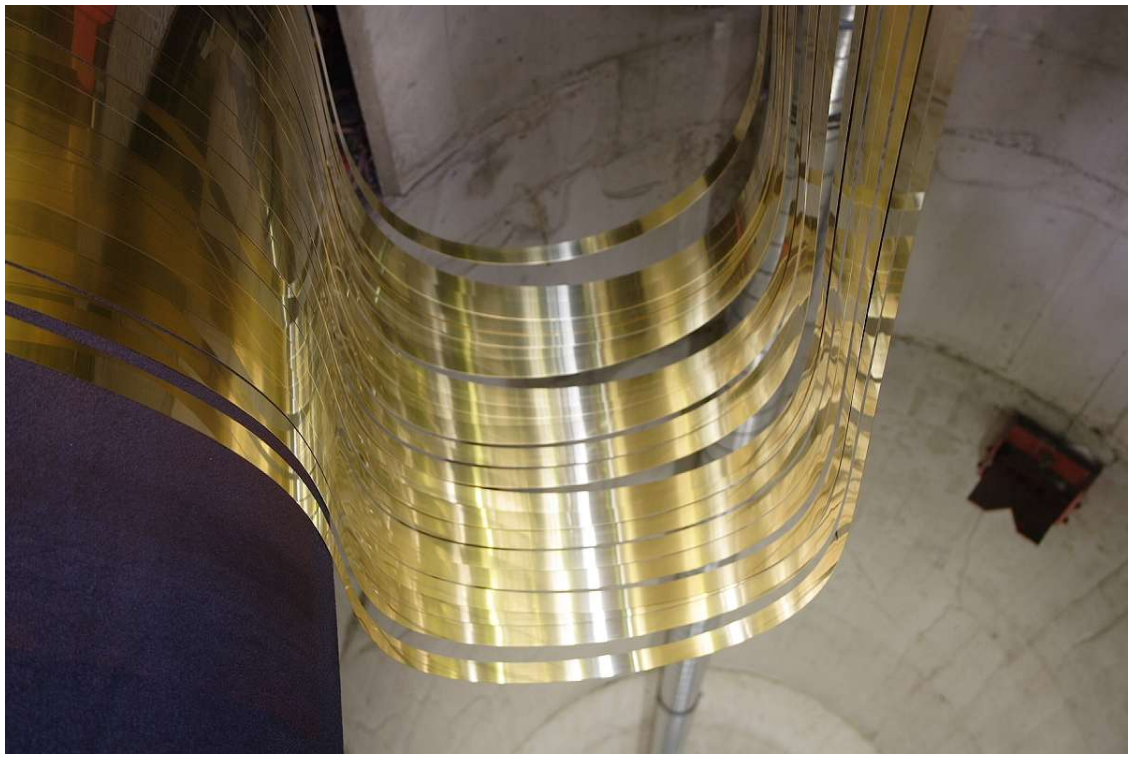
SLITTING OF MULTIPLE STRIPS

- Cross section tolerances
- Levelling quality



LOOPING PIT

Requirement of a tension free looping pit

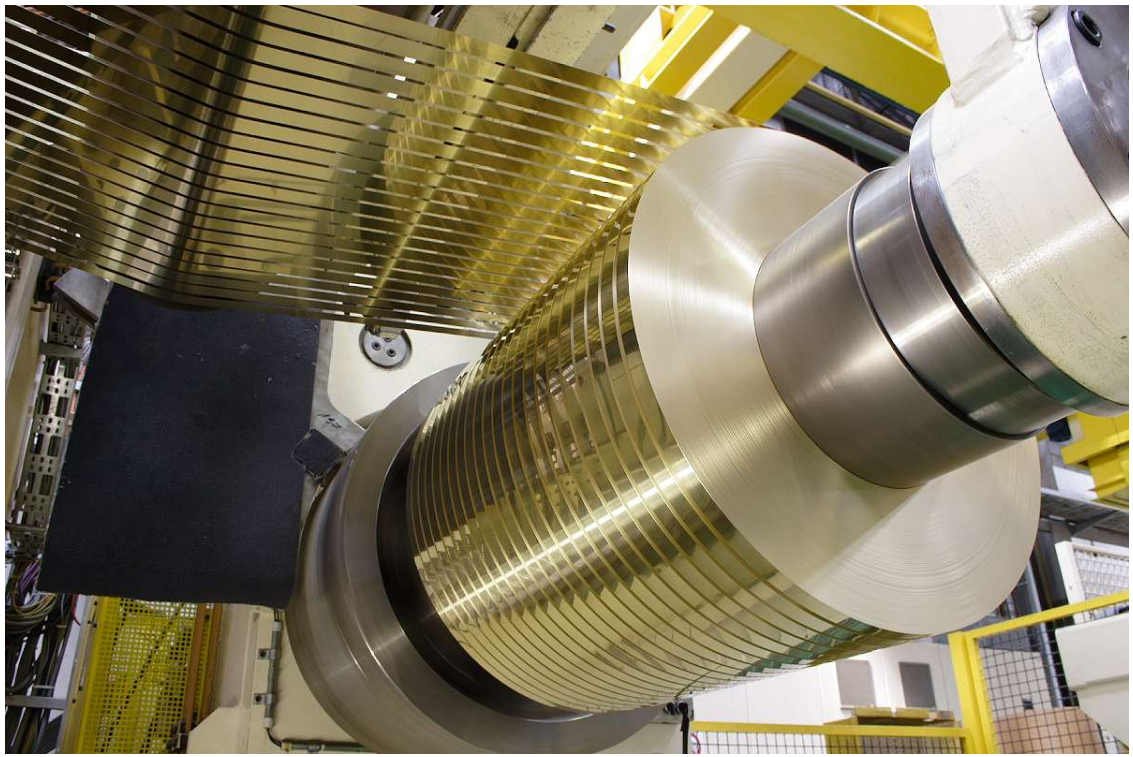


RE-TENSIONING OF MULTIPLE STRIPS

REWINDING OF MULTIPLE STRIPS

Re-Tensioning REQUIREMENTS:

- ✓ UNIFORM SPECIFIC TENSION
- ✓ SURFACE QULITY
- ✓ LINE SPEED CAPACITY
- ✓ TEMPERATURE
- ✓ ENERGY CONSUMPTION



RE-TENSIONING OF MULTIPLE STRIPS

STRIP PRESS

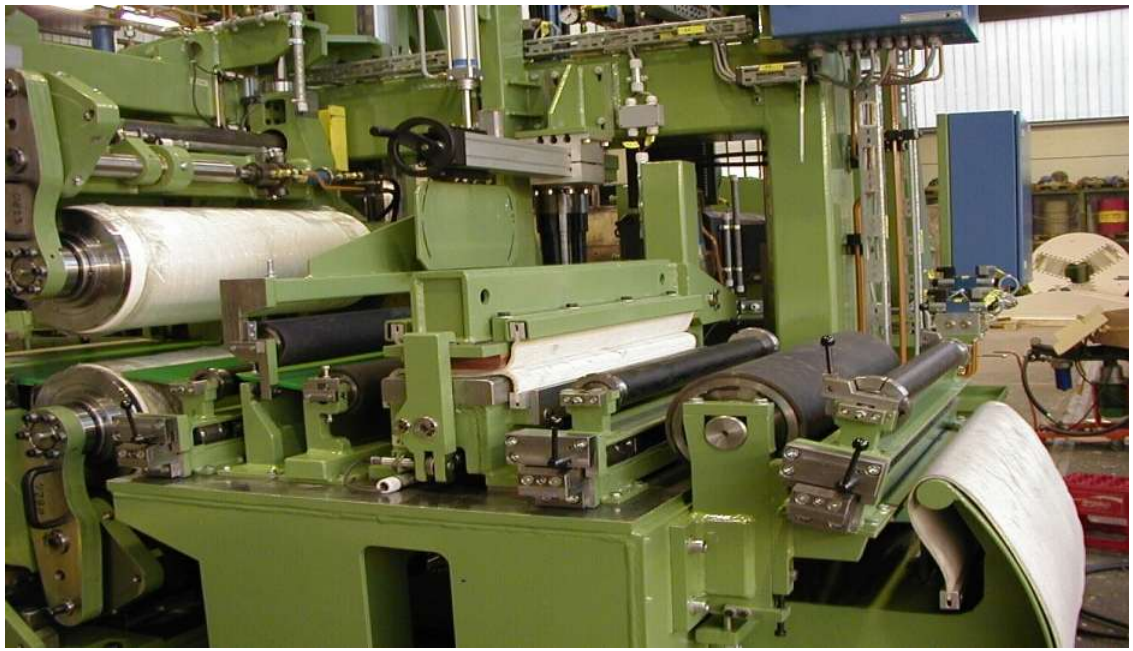
Full relative movement between press and strips

→ not applicable for material with sensitive surfaces (e.g. tin-plated copper)

Speed and Strip Tension Limitation

→ Reduced Flexibility

Felt has to be exchanged after each coil



RE-TENSIONING OF MULTIPLE STRIPS

STANDARD BRAKE ROLLS

Micro Slippage between Rolls and Strips

→ Tension Variation due to Change of Friction Coefficient

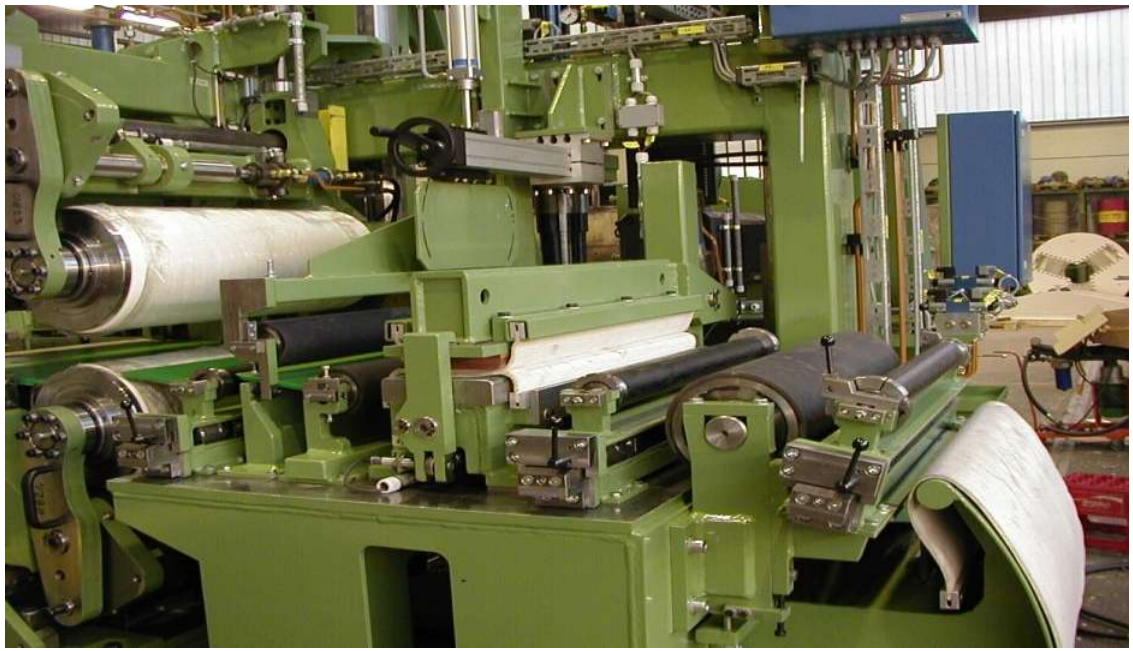
→ Impact on the Surface Quality

Reduction of Relative Movement

→ Suitable for Higher Speed compared to the strip press solution

Requires a Pre-Tension

→ Typically combined with an upstream Strip Press



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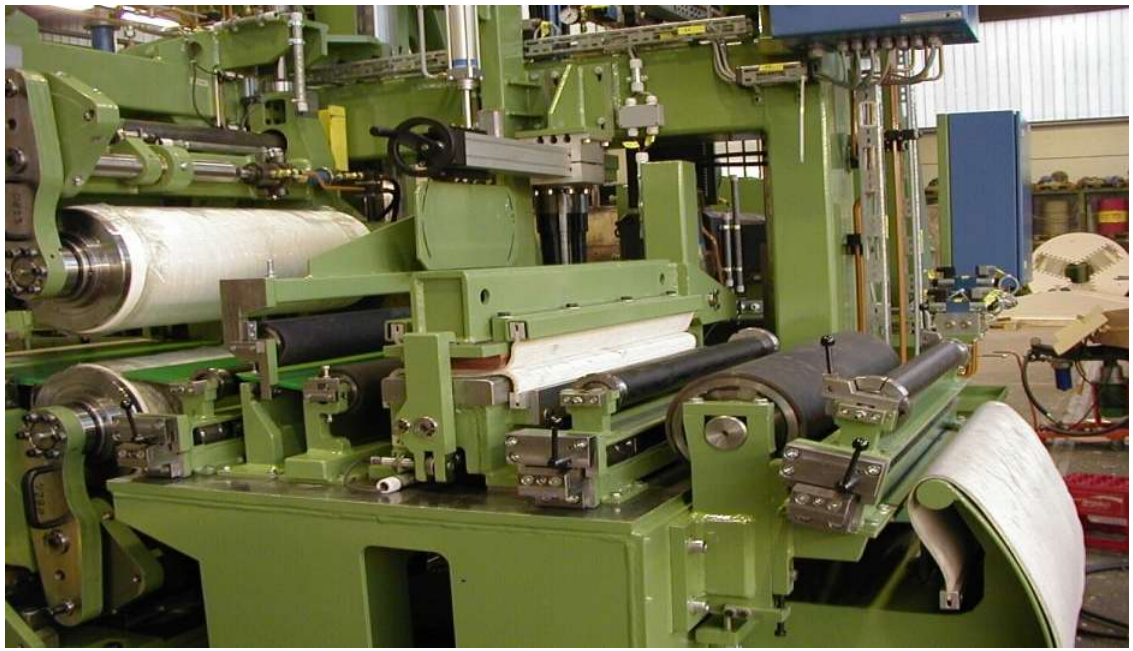
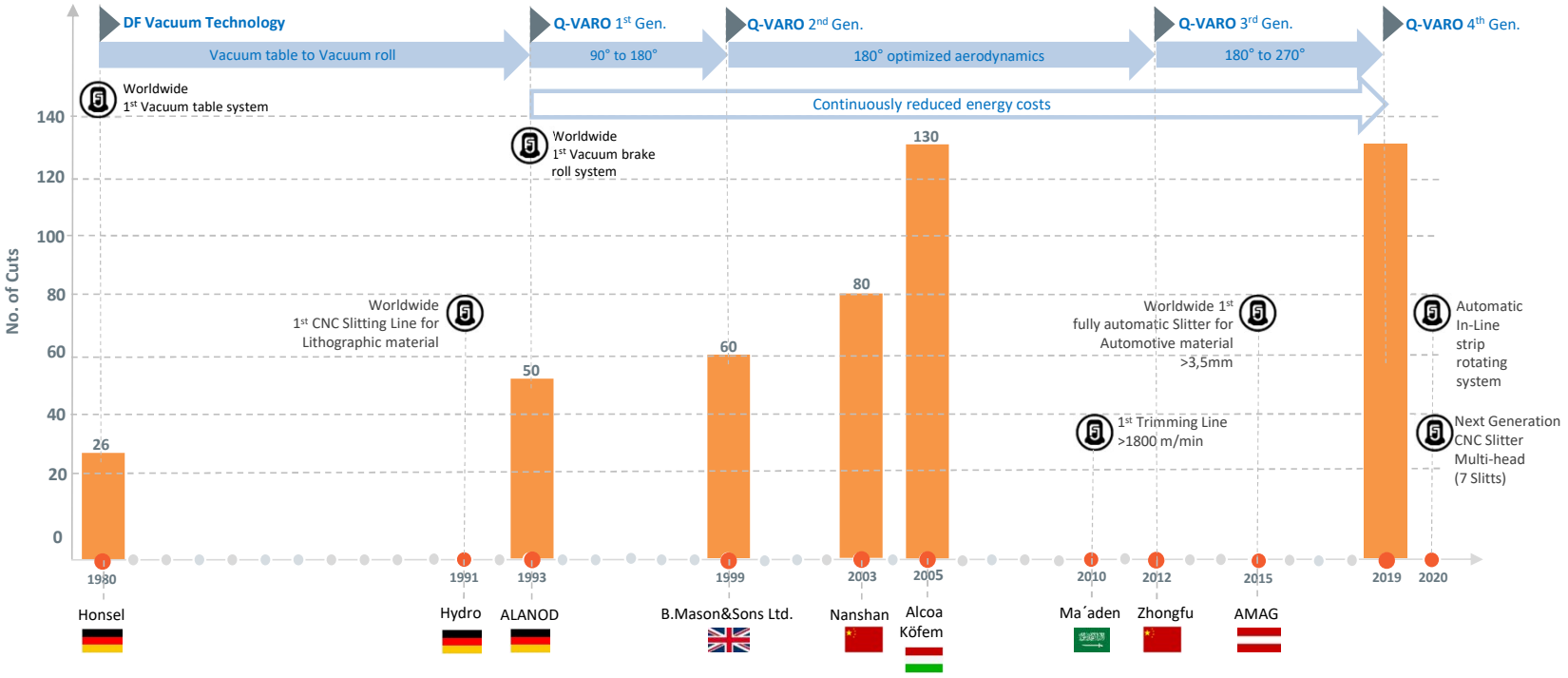


VACUUM BRAKE ROLL SYSTEM

EVOLUTION OF MULTIPLE SLITTING LINES

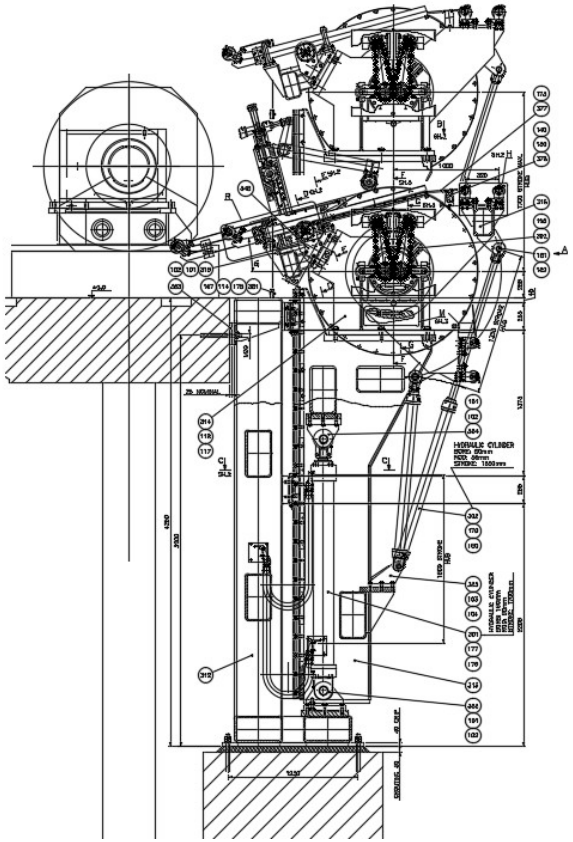


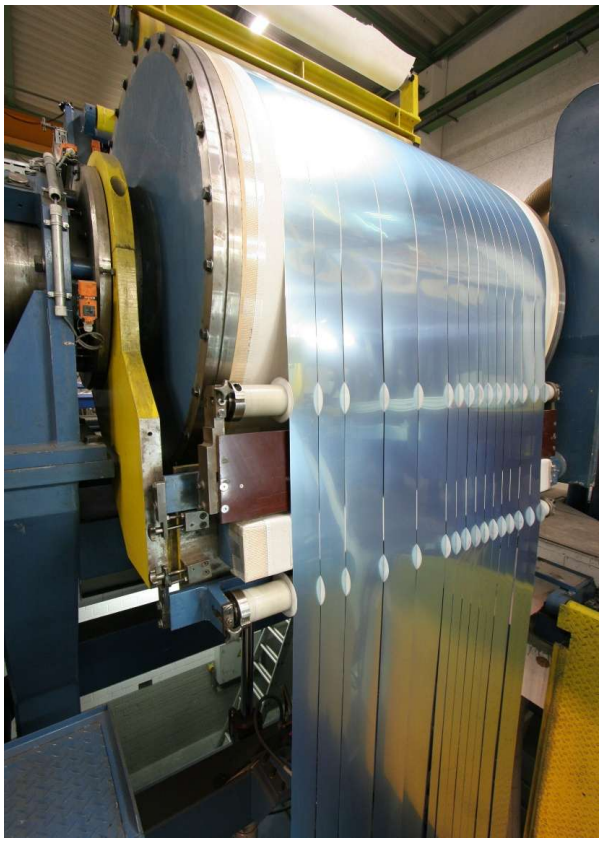
DEVELOPMENT OF THE VACUUM TECHNOLOGY

90° VACUUM ROLL

Improvement to Strip Press / Brake Roll Combination

- → Contact free Re-tensioning to the top material surface
- → Minimum Relative Movement to the bottom material surface
- → Uniform Tension to each individual strip
- → No speed limitation due to this brake system

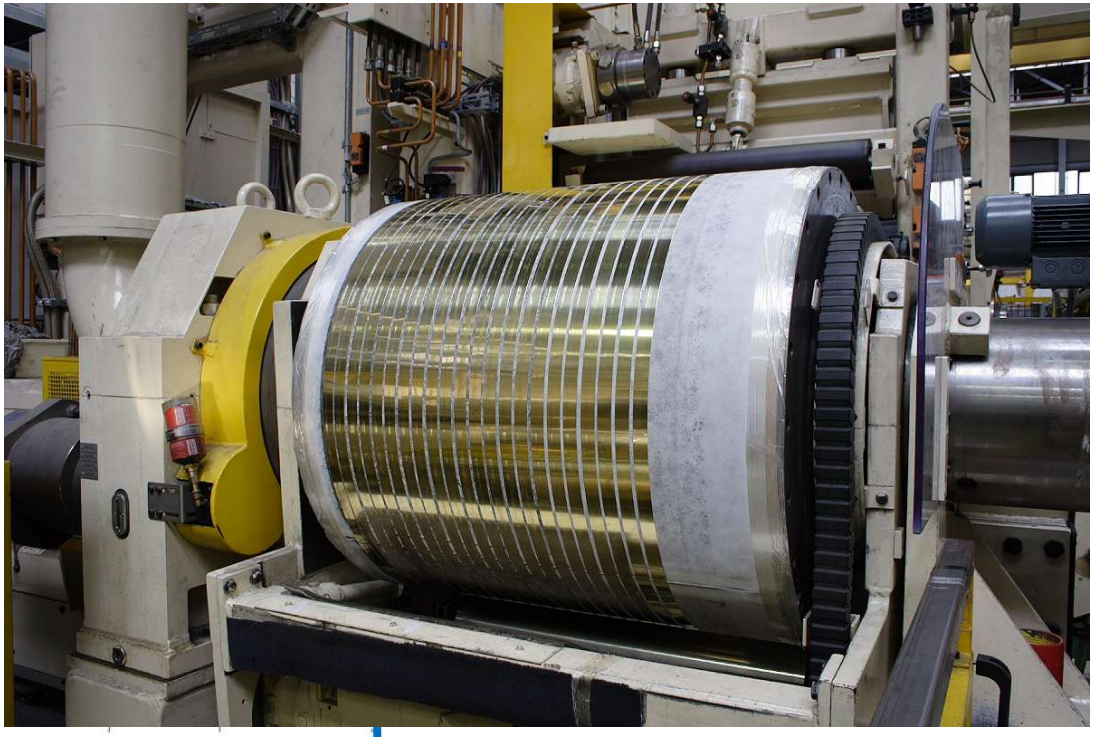




180° VACUUM ROLL

Improvement to 90° Vacuum Brake Roll

- → Stabilizing the Guiding of the Separated Strips
- → Optimizing the Air Dynamic within the Piping and inside the Vacuum Roll
- → Reduction of Equipment cost
- → Reduction of Energy Consumption



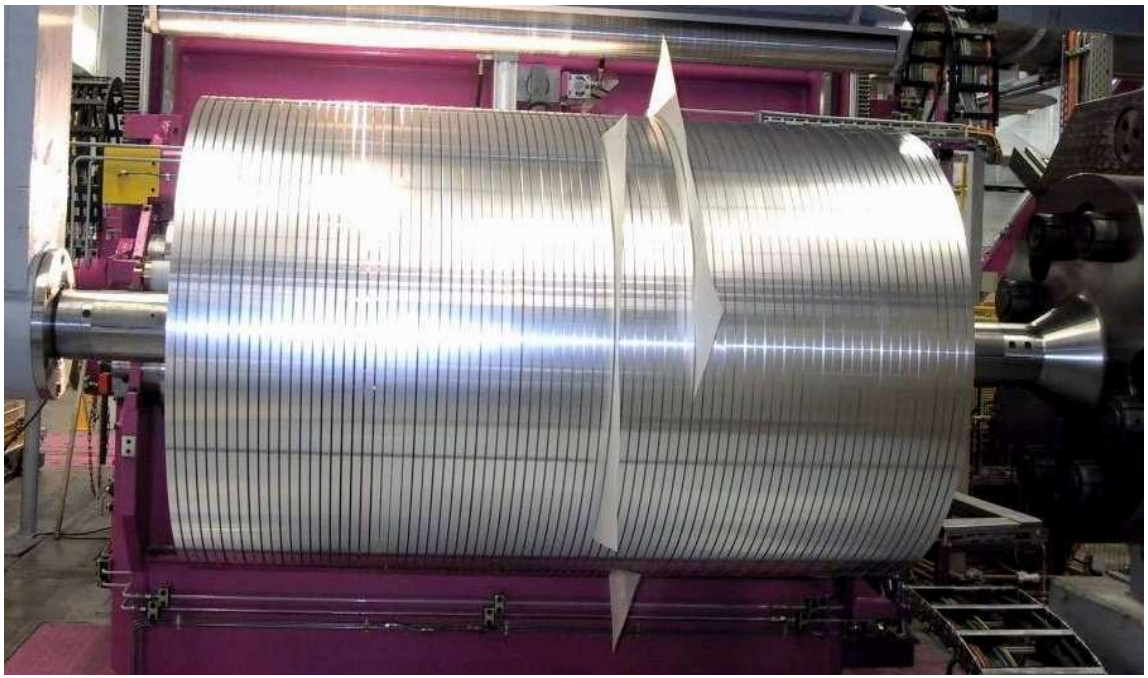
MORE THAN 35 SLITTING LINES EQUIPPED WITH A 180° VACUUM BRAKE ROLL

180° VACUUM ROLL

Improvement to 90° Vacuum Brake Roll

→ Perfect Rewound Multiple Strips

→ Stable Mults ready to be safe handled by Vacuum Stackers et.



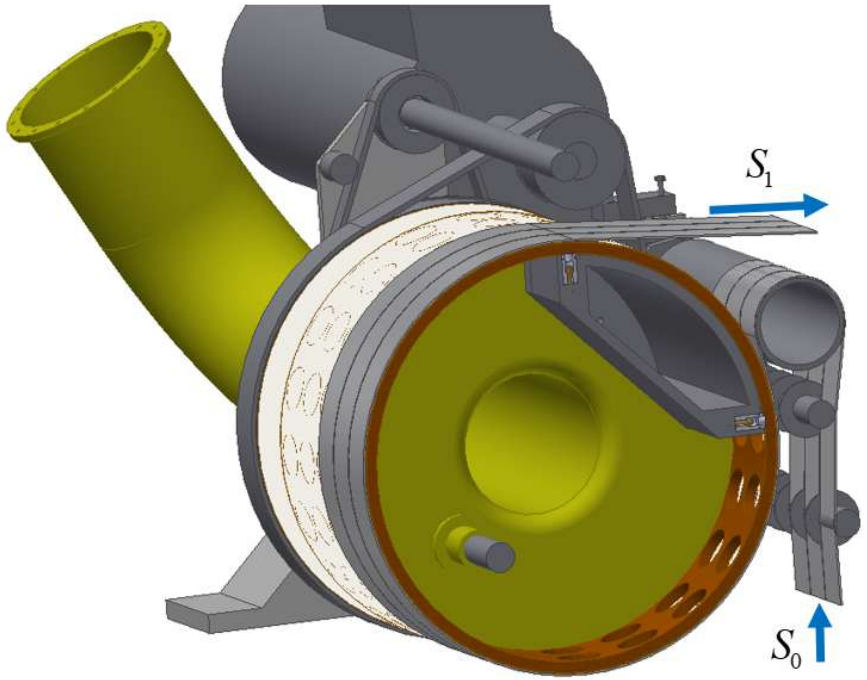
130 FINISHED STRIPS FROM ONE INCMOING COIL @ Arconic Köfém

DEVELOPMENT OF THE VACUUM TECHNOLOGY

270° VACUUM ROLL

4th GENERATION OF DFF VACUUM BRAKE ROLLS

- → Reduction of Operating Cost
- → Reduction of Vacuum Pressure
- → 50% Less Energy Consumption
- → Development of Sealing Design
- → Decrease of Surface Pressure



DEVELOPMENT OF THE VACUUM TECHNOLOGY

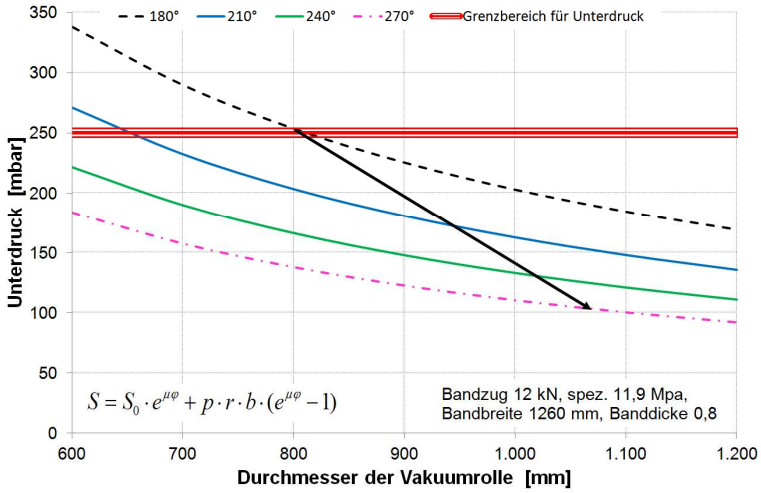
Target of enhancement project:

> Further improvement of reliability of operation
> Optimization of maintenance
> Reduction of operating costs
> Reduction of energy consumption
> Overall cost reduction

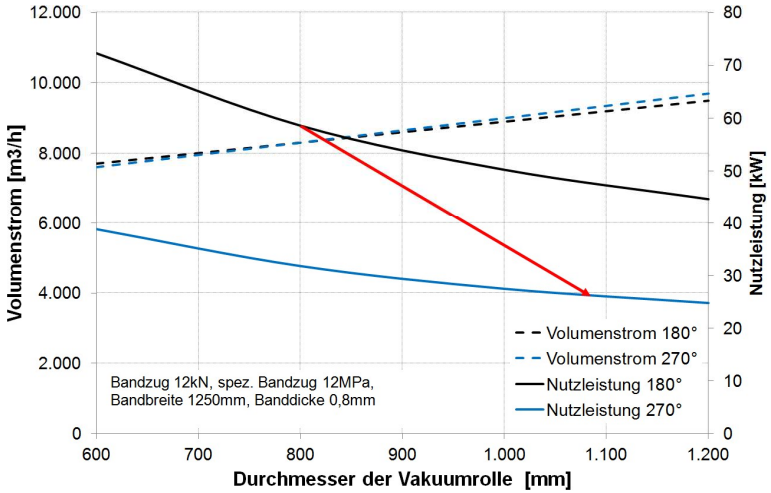
Results of enhancement project:

> Increase of wrapping angle from 180°to 270°
> Increase of roll diameter from 800 mm to 1140 mm
> Reduction of vacuum pressure, leading to reduced energy consumption of about 50%
> Improved sealing design and accessibility

Pressure related to Roll Diameter and Wrapping Angle



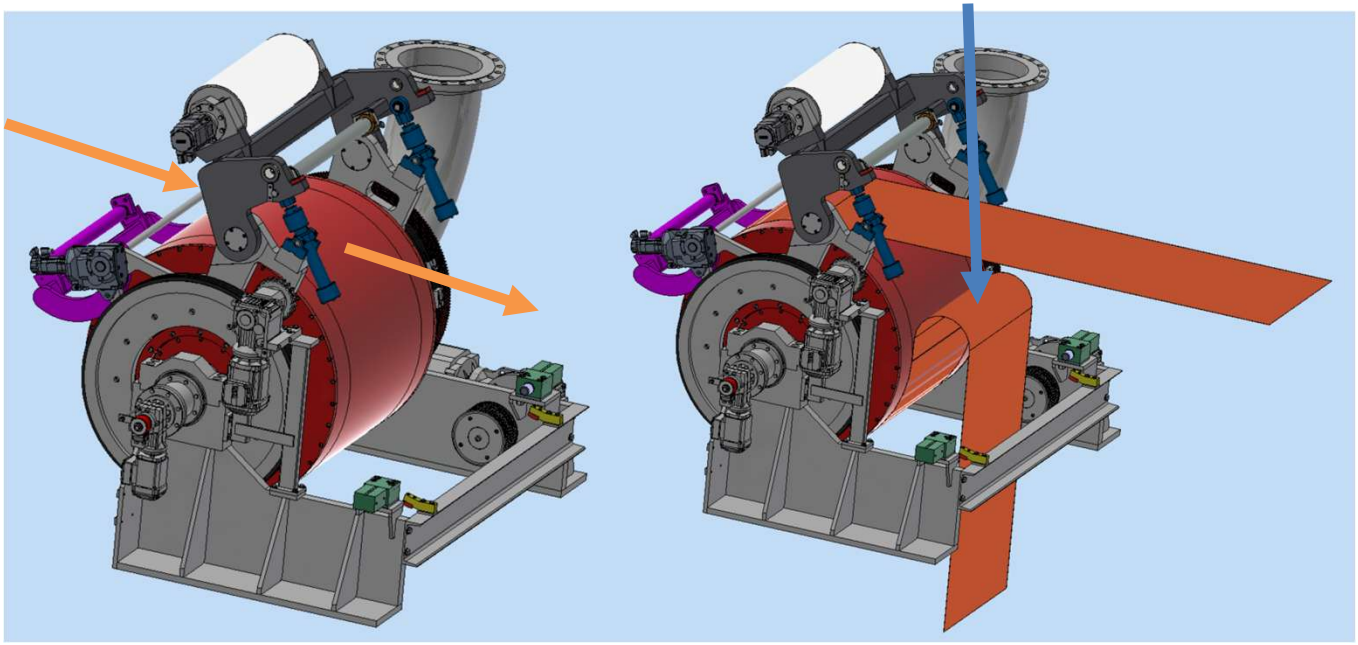
Air Flow and Power Requirement related to Roll Diameter and Wrapping Angle



DFF 4TH GERATION VACUUM BRAKE ROLL

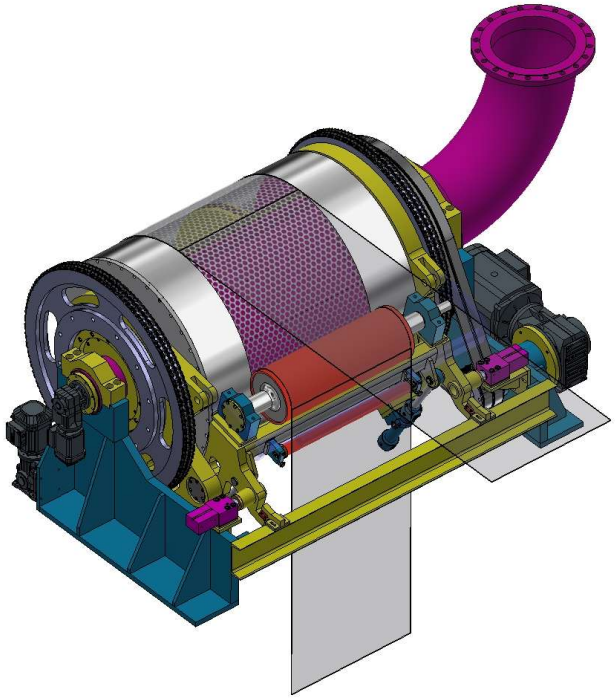
THREADING-IN POSITION

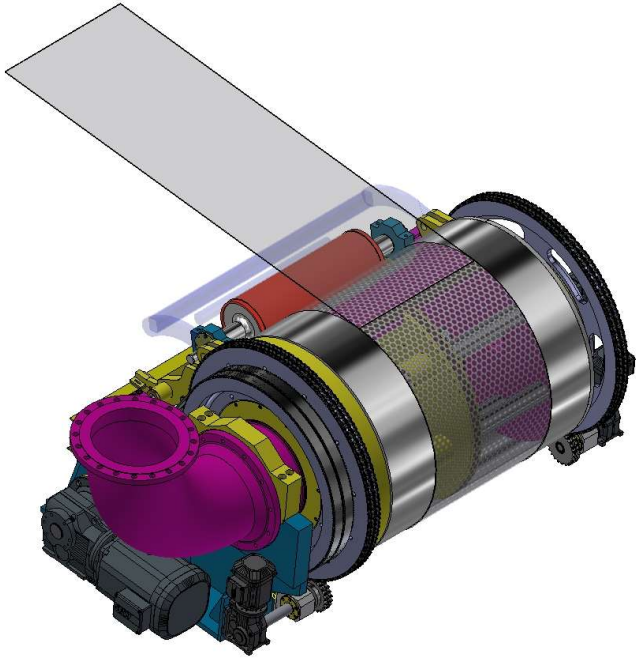
PROCESS POSITION



DANIELI GERMANY PATENT

DFF 4TH GERATION VACUUM BRAKE ROLL





DANIELI GERMANY PATENT

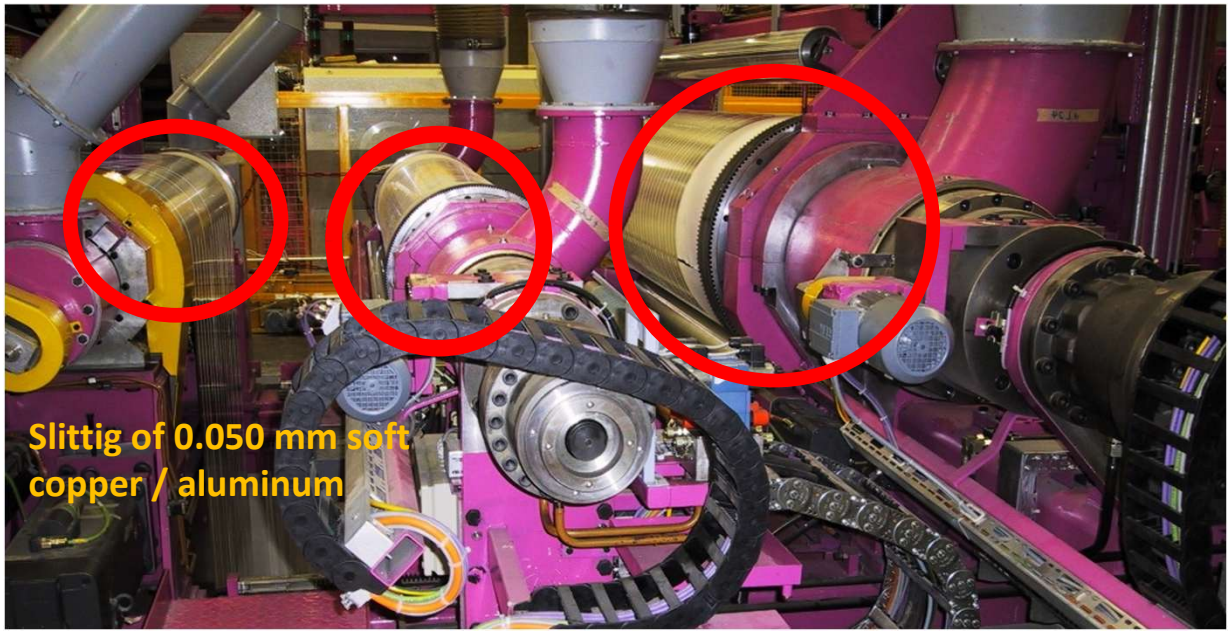
DEVELOPMENT OF THE VACUUM TECHNOLOGY

VACUUM ROLL APPLICATION

SLITTER EXIT GUIDE UNIT (TENSION FREEE SLITTING)

DOUBLE LOOP BUILDER

STRIP BRAKING



VACUUM ROLL I TENSION FREE SLITTING

VACUUM ROLL II DOUBLE LOOP BUILDING

VACUUM ROLL III SURFACE PROTECTED BRAKING

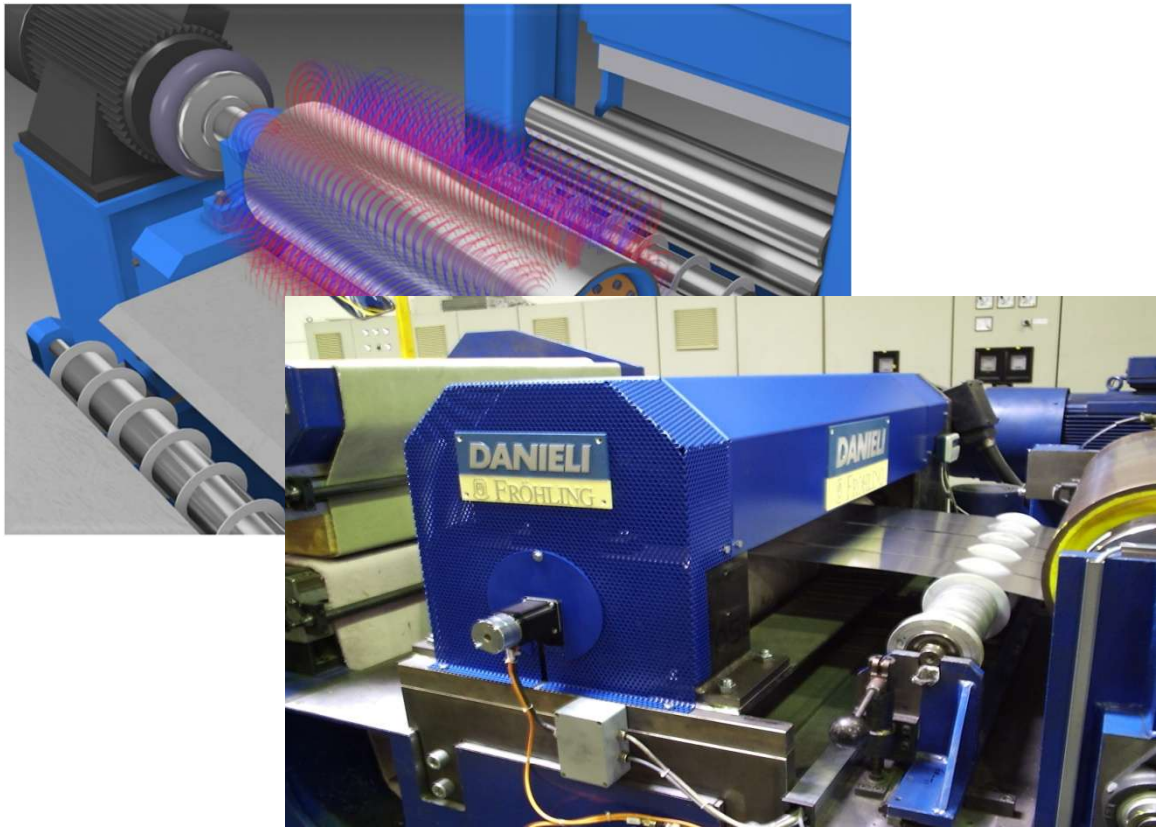
EDDY CURRENT BRAKE ROLL SYSTEM

CONTACT FREE RE-TENSIOING

EDDY CURRENT BRAKE ROLL SYSTEM

CONTACT FREE RE-TENSIONING

- → Use of Eddy Current Effects
- → Applicable for non-ferro-magnetic material (0.20 … 6.00 mm)
- → Contact Free Re-Tensioning perfect for Coated Materials
- → Only Applicable for uniform cross sections / slit width



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SEGMENTED BRAKE ROLL

LATEST STRIP BRAKING EVOLUTION

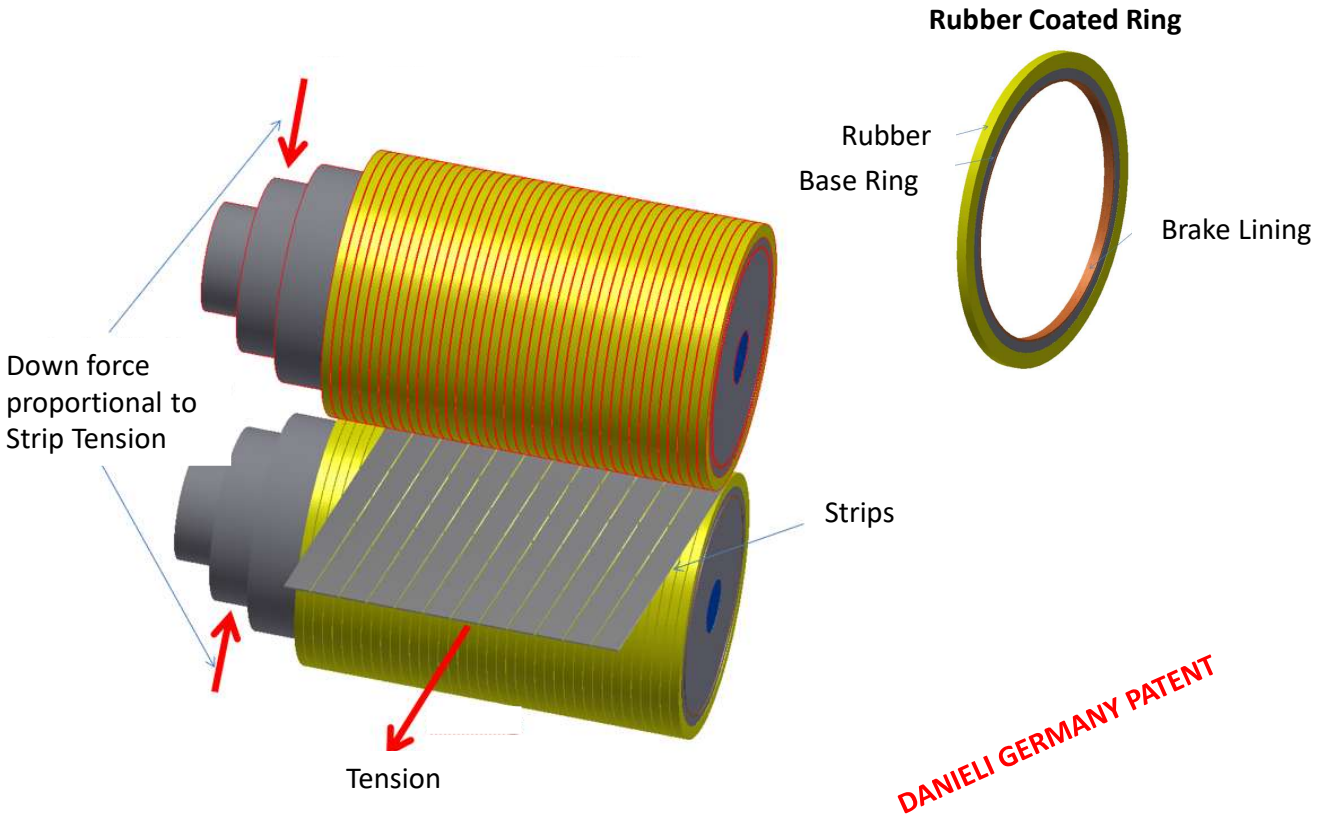
SEGMENTED BRAKE ROLL SYSTEM

No Relative Movement between Strip

→ Strips are guided between the Segmented Rings

→ The Rolls are Proportional to the Brake Force pressed together

→ Rubber Coated Segmented Rings are Rotating with the Strips



LATEST STRIP BRAKING EVOLUTION

SEGMENTED BRAKE ROLL SYSTEM

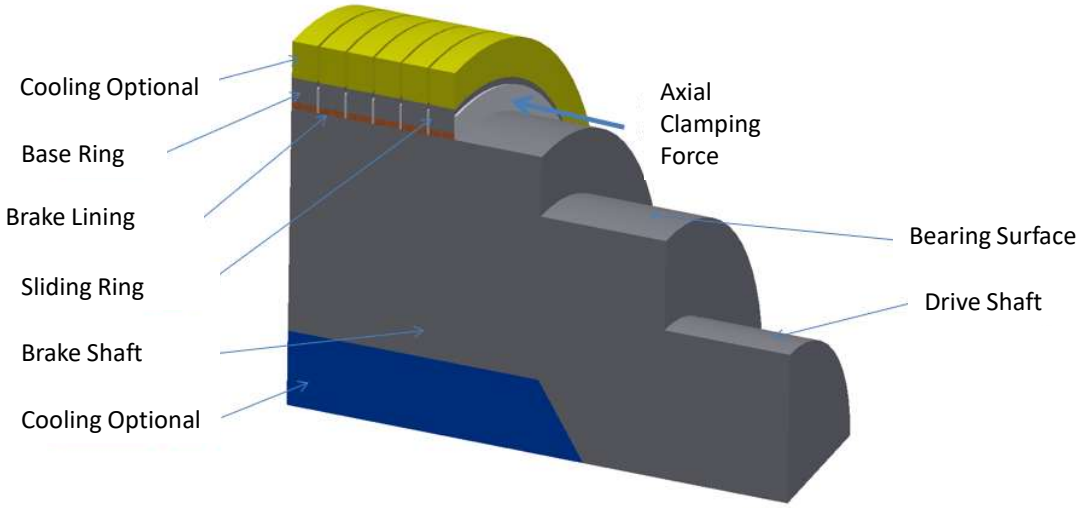
No Relative Movement between Strip

→ Solution for Sensitive Surfaces

→ Applicable for High Speed

→ Re-generation of Strip Brake Energy (5% under speed)

→ Minimum Heat Generation

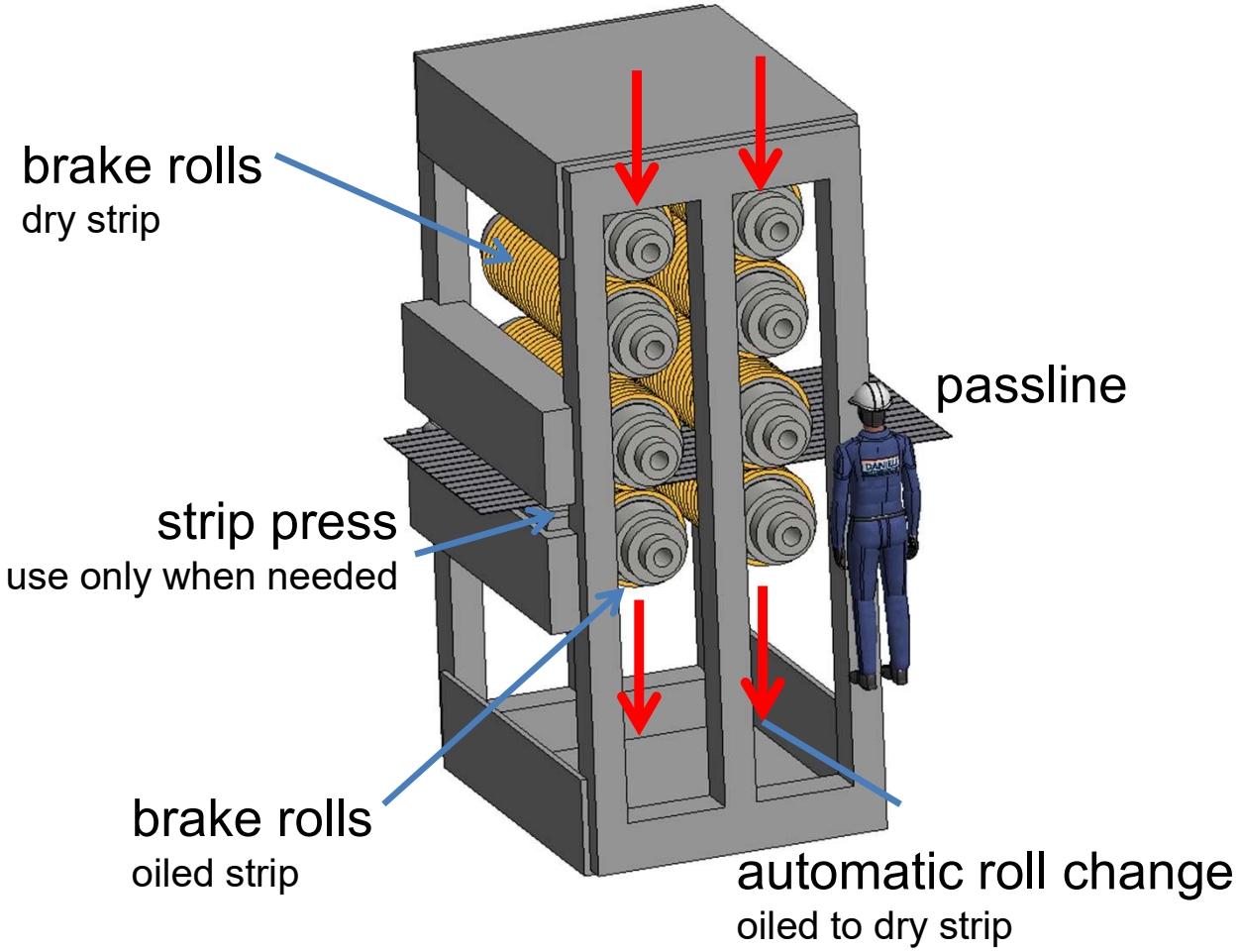


DANIELI GERMANY PATENT

SEGMENTED BRAKE ROLL SYSTEM

Reference Project for Coated Steel

- → Strip Thickness max. 6 mm
- → Strip Width 1.600 mm
- → Brake force 115 kN
- → Minimum Heat Generation

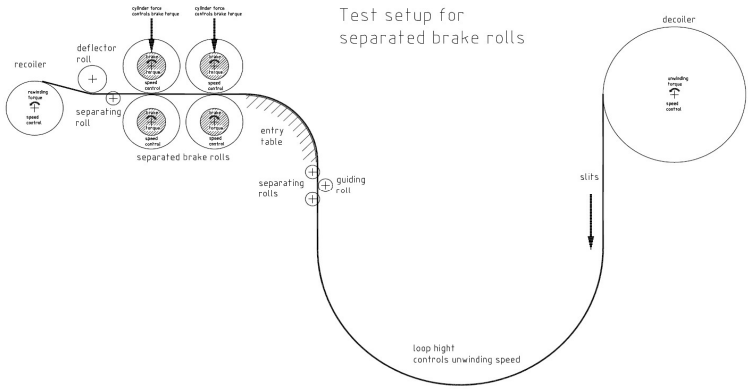


SEGMENTED BRAKE ROLL SYSTEM

Prototype

→ Testing of Coils

Danieli
Research and development



CONCLUSION

ENGINEERING = OPTIMIZATION

Brake System	Surface Quality	Operational Cost	Winding Quality	Limitation
Strip Press	☹	😐	😐	Strip Tension Control
Standard Brake Rolls	☺	😐	😐	Difficult for material with small / changing friction coeffizient
Vacuum Roll 180°	☺	☹	☺	Limited max. strip thickness (1.2 mm)
Vacuum Roll 270°	☺	😐	☺	Limited max. strip thickness (1.2 mm)
Eddy Current	☺	☺	☺	No different strip width / cross sections are allowed
Segmented Brake Rolls	☺	☹	☺	Difficult for material with small / changing friction coeffizient
Belt Bridle	☺	☹	☺	Tension Speed Chart < 300 m/min

1. **MOTIVATION**
2. **VAKUUM BRAKE ROLL SYSTEM**
3. **EDDY CURRENT BRAKE ROLL SYSTEM**
4. **SEGMENTED BRAKE ROLL SYSTEM**
5. **CONCLUSION**
6. **OULOOK**

OUTLOOK

AUTOMATIC THREADING

AUTOMATIC STRIP TWISTING DURING THREAD

Sort the Cutting Burr to the Top by Twisting every 2nd Slit

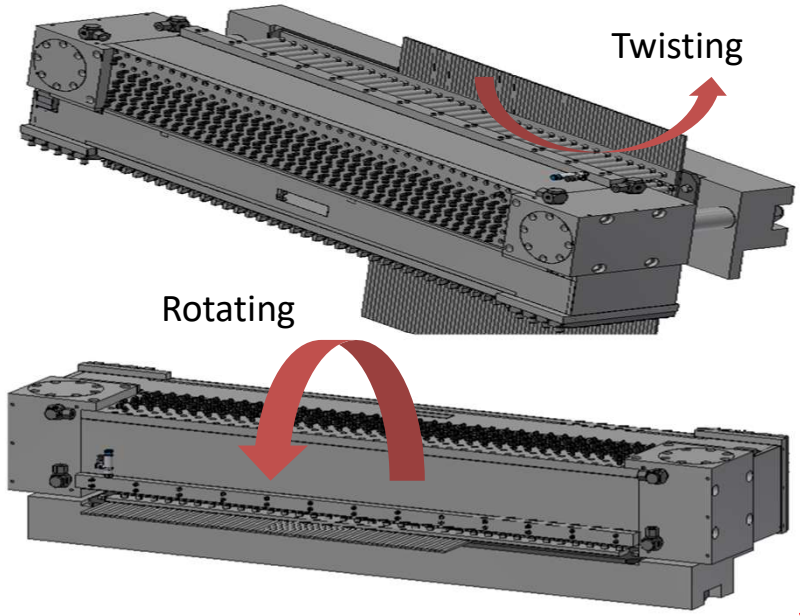
→ Fully Automatic Slit Twisting and Threading

1st Step:
→ Twisting every 2nd Slit and bring the burr to the Top

2nd Step:
→ 90° Rotation and Thread Heads up to the Mandrel

→ Improved Coiling Result

→ Increase Safety and Line Availability

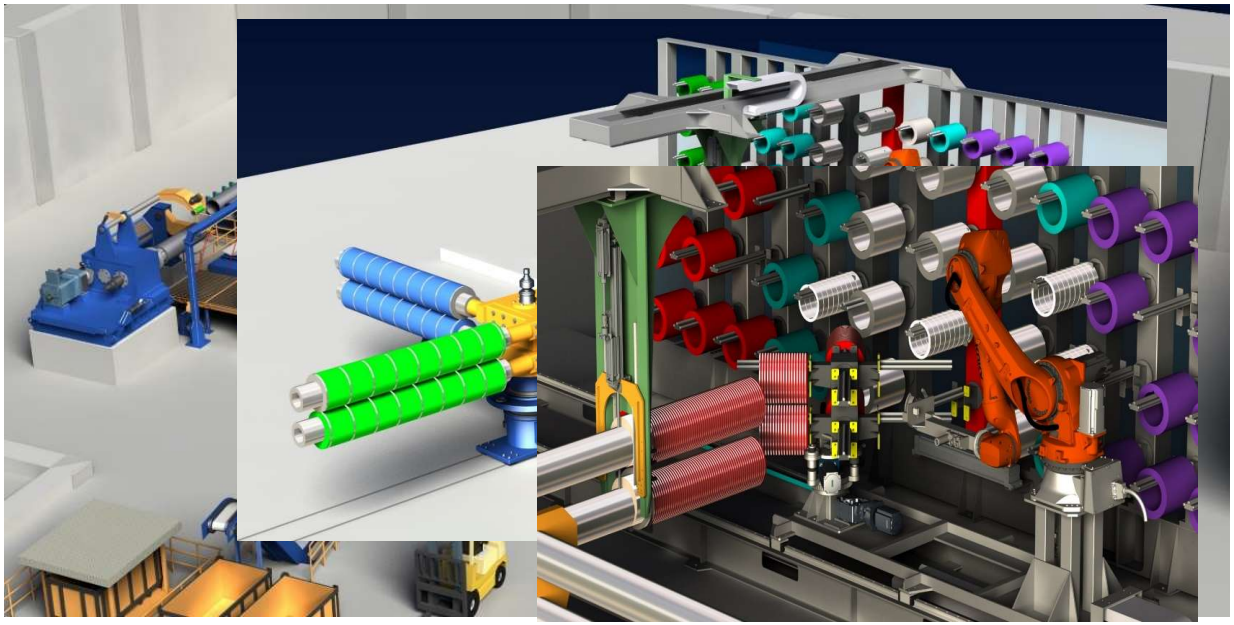


DANIELI GERMANY PATENT

TOOLING ROBOT

Robot Processed Tool Setup

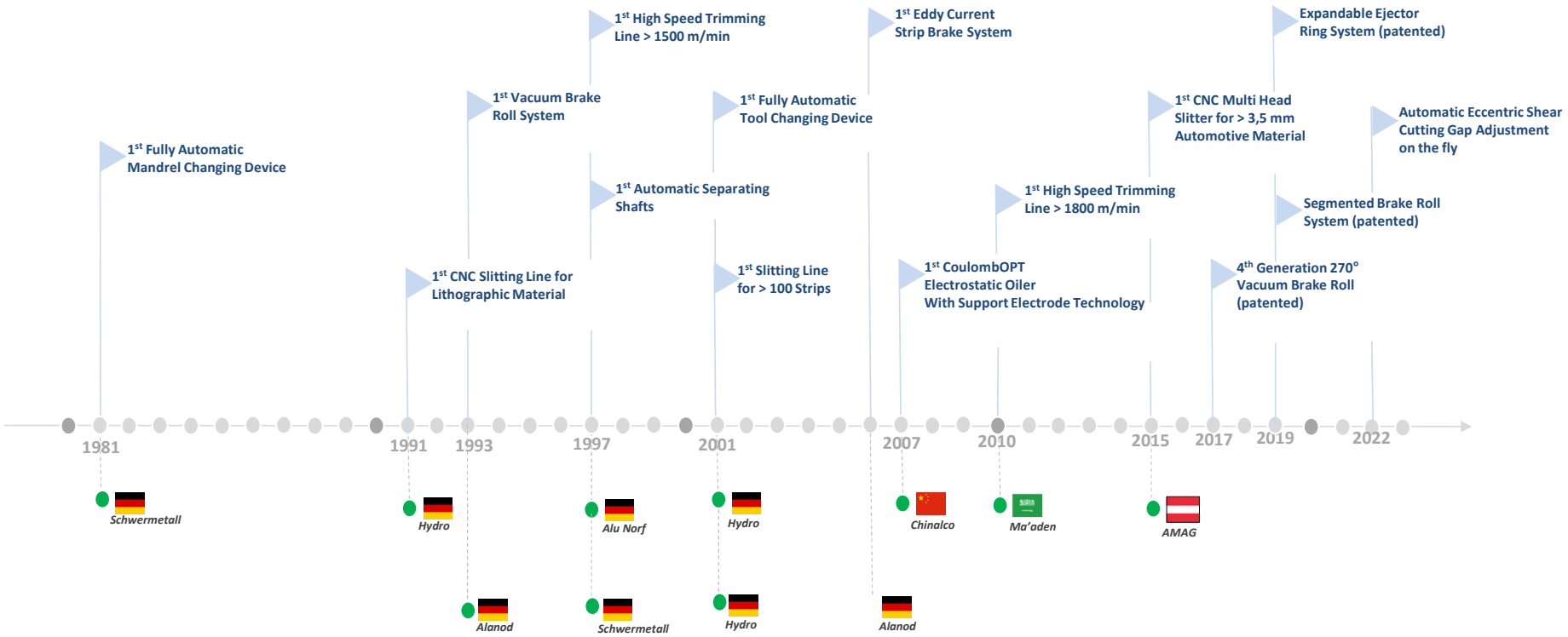
- → Compact tool management system – integration in existing slitting line area
- → Tool handling and program preparation via catalouge robot system – low maintenance cost due to standard components
- → Pneumatic mechanical hybrid gripper design – Handling of Tools down to 0,50 mm thickness
- → Fully Automatic Slit Twisting and Threading



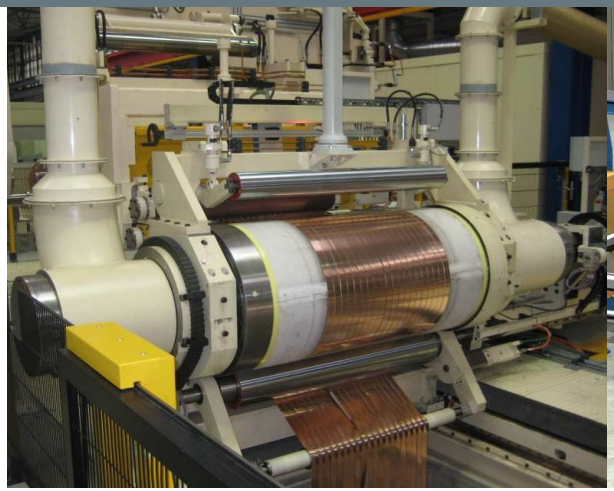
DANIELI TELEROBOT

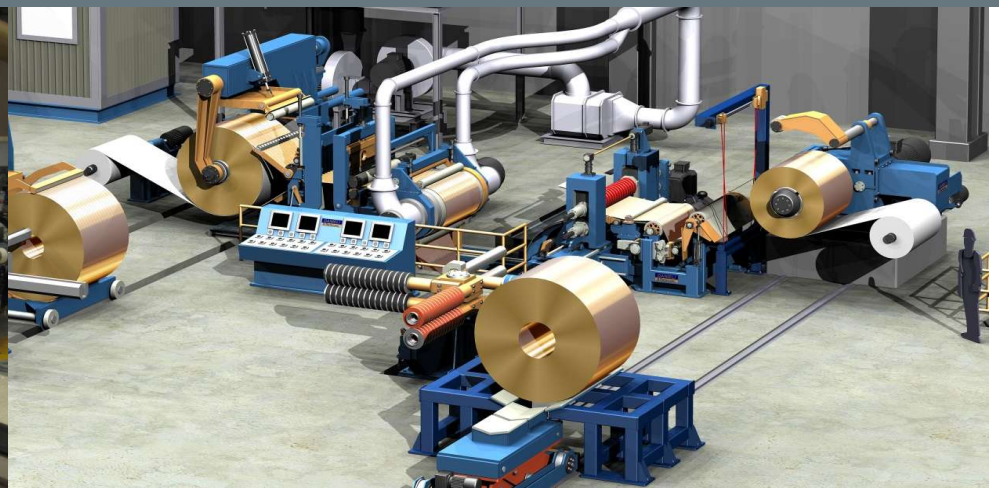
EVOLUTION OF SLITTING LINE TECHNOLOGY

DANIELI



WIELAND - GERMANY





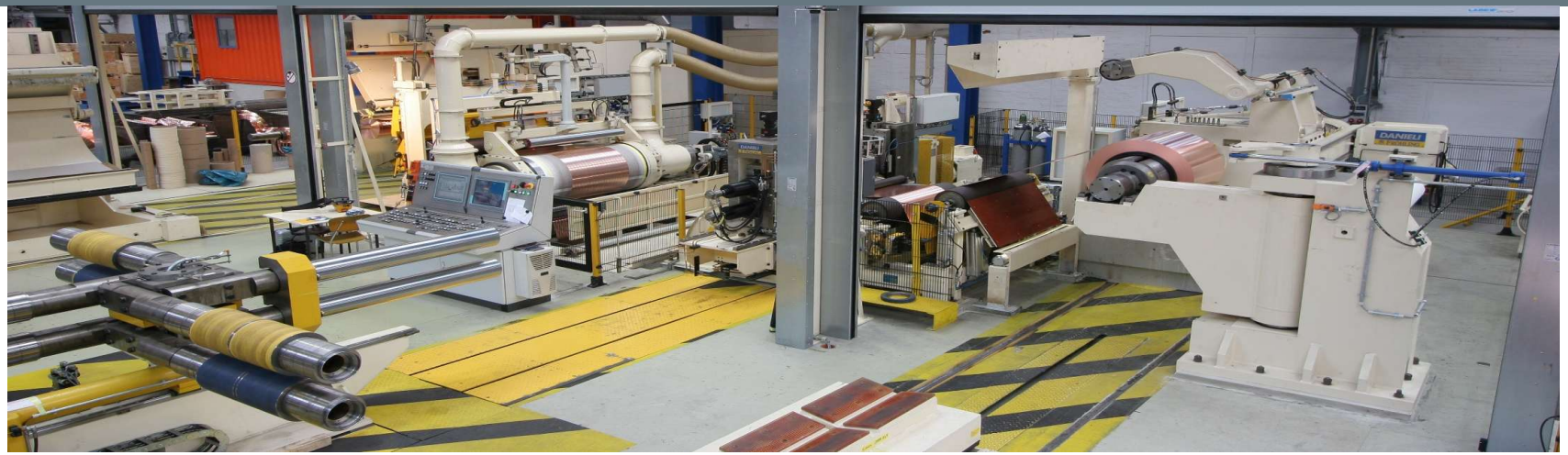
Equipment Data:

Slitter Type:	300/200 x 670 mm (26”)
Number of slit strips :	max. 25
Line Speed Max.:	400 m/min (1312 ft/min)
Customer:	Wieland Werke AG / Germany
Year:	startup 2020

Material Data:

Material:	Copper & Copper Alloys
Min. Thickness:	0,80 mm (0,03”)
Min. Thickness:	0,08 mm (0,003”)
Strip Width Max.:	650 mm (25,5”)
Strip Width Min.:	10 mm (0,4”)
Coil Weight Max.:	10.000 kg (22046 lbs)

KME MANSFELD – GERMANY



Equipment Data:

Slitter Type:	290/190 x 1250 mm (50”)
Number of slit strips :	40
Line Speed Max.:	500 m/min (1640 ft/min)
Customer:	MKM / Germany
Year:	2010

Material Data:

Material:	Copper and Copper Alloys
Min. Thickness:	0,05 mm (0.002”)
Min. Thickness:	0.80 mm (0.031”)
Strip Width Max.:	1250 mm (50”)
Strip Width Min.:	20 mm (0.787”)
Coil Weight Max.:	22000 kg (48502 lbs)

TONGLING – CHINA

Equipment Data:

Slitter Type:	225/150 x 650 mm (25,5“)
Number of slit strips :	max. 30
Line Speed Max.:	400 m/min (1312 ft/min)
Customer:	Tong Ling Jinvi
Year:	Startup 2004

Material Data:

Material:	Cooper & Alloys
Min. Thickness:	1,0 mm (0,039”)
Min. Thickness:	0,05 mm (0,002”)
Strip Width Max.:	640 mm (25”)
Strip Width Min.:	20 mm (0,79”)
Coil Weight Max.:	10.000 kg (22046 lbs)

LEANDER ZIELENBACH
EXECUTIVE VICE PRESIDENT
SALES
DANIELI GERMANY

INNOVATIVE SOLUTIONS FOR **BRAKE FORCE CONTROL** in SLITTING

From Danieli First Class Solutions in Aluminium and Copper Slitting Lines

IWCC TECHNICAL SEMINAR
March, 2025
Dallas, TX, USA

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