



fives

DIGITAL TRANSFORMATION IN STEEL

TWO ITALIAN SUCCESS STORIES

Future Steel Forum
Bologna - June 3-4, 2026

Maxime Monnoyer
Sales Manager, Steel Digital Factory, Fives



MEETING CHALLENGES OF THE STEEL INDUSTRY

Competitiveness

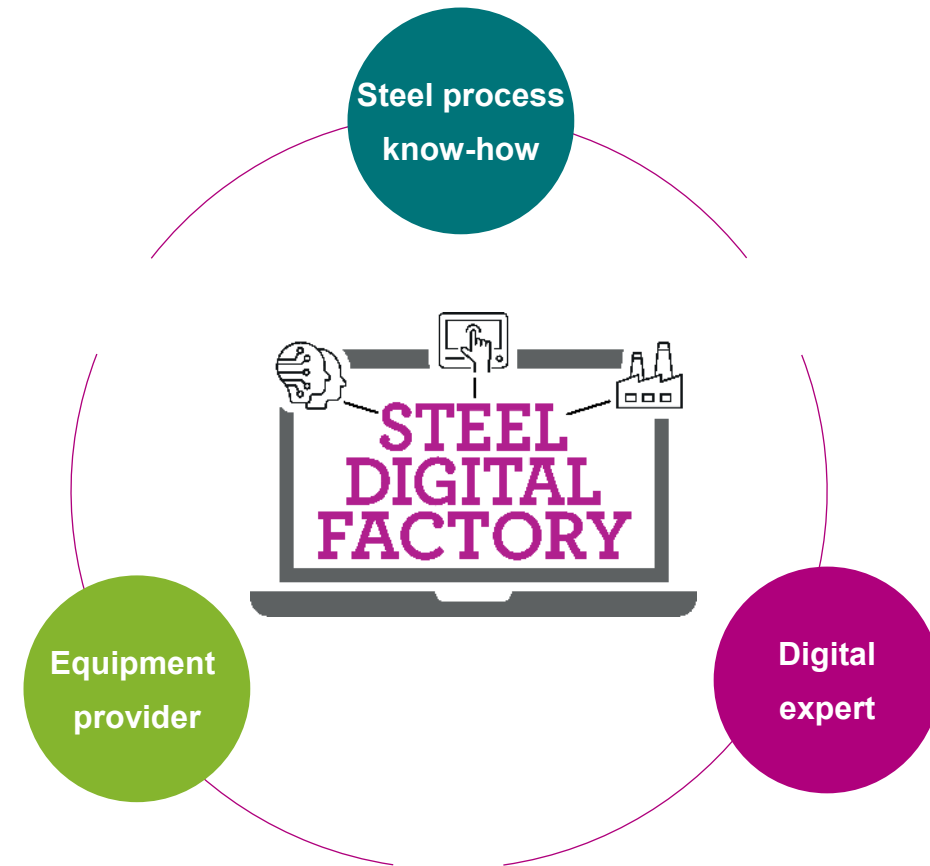
- Productivity increase
- Cost reduction
- Quality / yield improvement
- Product mix complexity

Environmental footprint

- Lower energy consumption
- Minimized emissions
- Raw material savings
- Waste limitation

Digital solutions play a **key role** in addressing these challenges. They are able to link:

- Steel process & metallurgical expertise
- Advanced technologies
- Powerful modeling & data analytics software



EYERON®: INTELLIGENT, REAL-TIME QUALITY MANAGEMENT



Eyeron® traces process steps, quality events & process parameters and automatically qualify products



DATA COLLECTION & DISPLAY



AUTOMATIC PRODUCT GRADING



DEFECT ANALYSIS



PRODUCT & PROCESS OPTIMIZATION



REALLOCATION & REPAIR

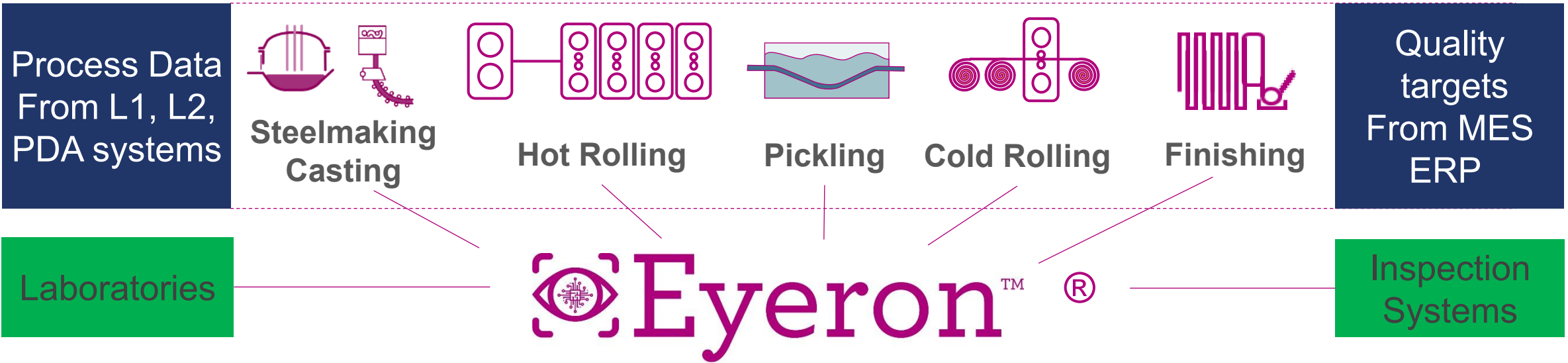


PROCESS & EQUIPMENT ANALYSIS

BENEFITS

- Scrap reduction & better-quality yield
- Claim reduction
- Efficient quality analysis
- Optimized operator time
- Improved product lead time

EYERON®: MODULAR AND EVOLUTIVE PRODUCT-ORIENTED CONCEPT

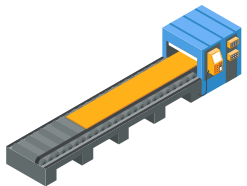


ETL program for data injection

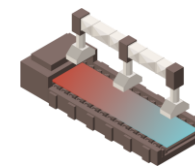
Steelmakers Quality Rules

Physical models

AI models



Flat & long products
Carbon, stainless, & electrical steels

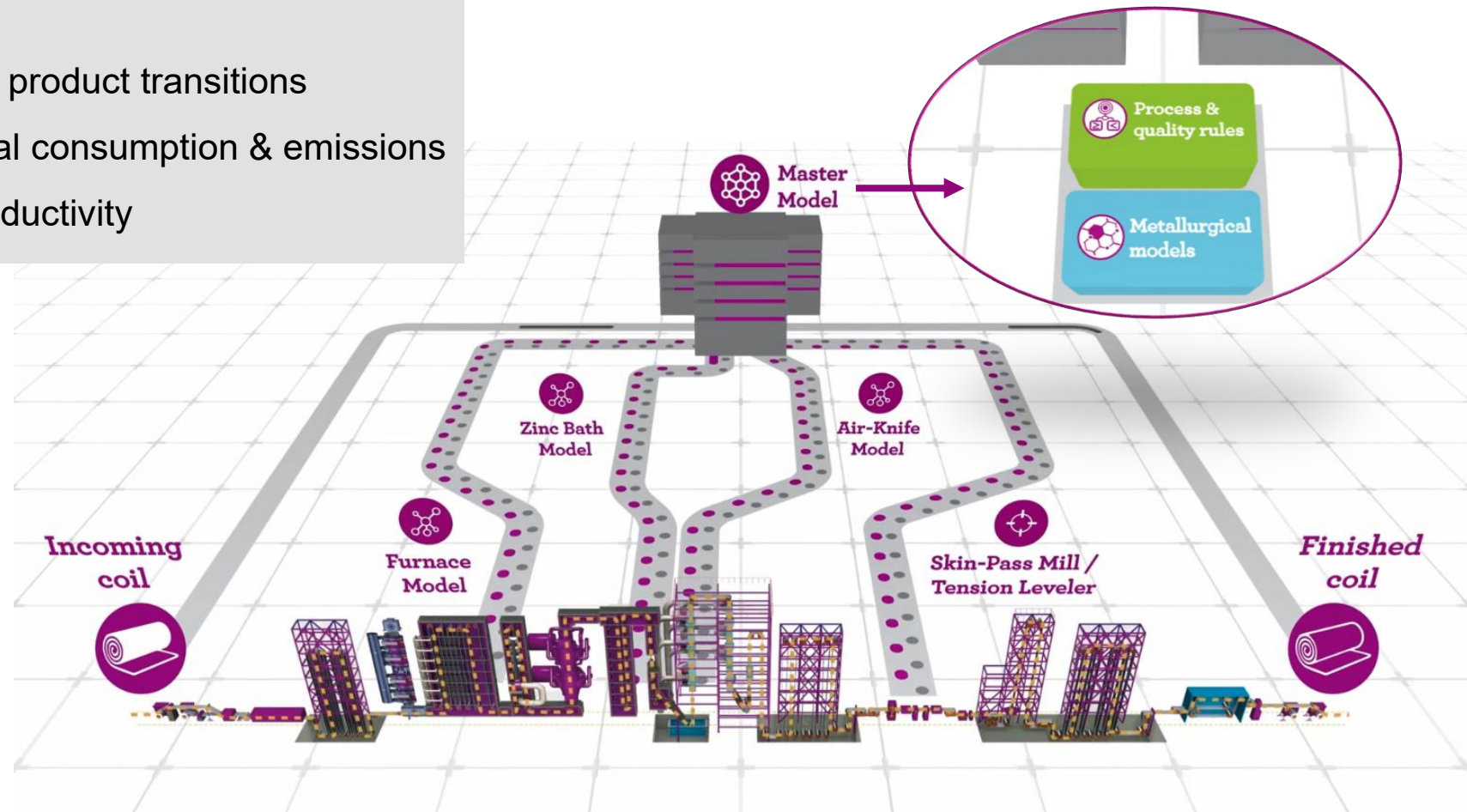


Steel making
Hot plant
Cold plant
Annealing (BA, CAL, CGL, APL, ACL, DCL...)

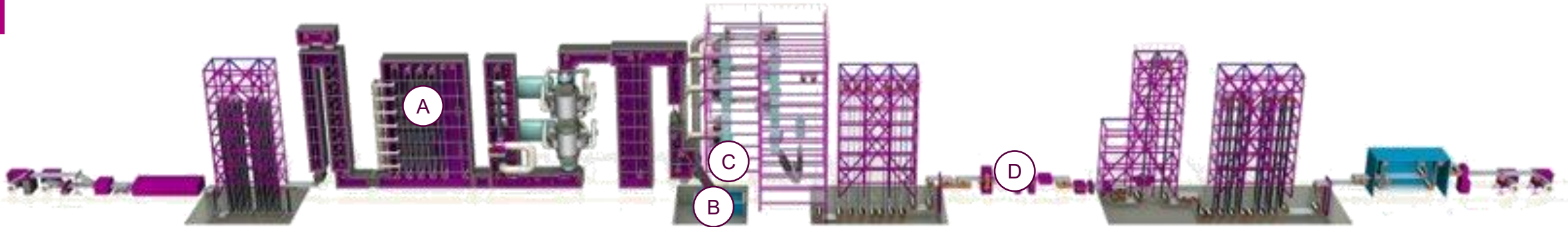
SMARTLINE™: MODULAR PROCESSING LINES CONTROL

BENEFITS

- Automatic control and coupling of key processes & line speed
- Dynamically optimizes product transitions
- Decreases raw material consumption & emissions
- Improves quality & productivity



SMARTLINE™: DEDICATED MODELS SUPPORTING EACH KEY PROCESS



A

VIRTUO™-L FURNACE MODEL

- Drives furnace at optimal conditions through predictive, dynamic & real time control
- Optimize product transition management
- Can adjust line speed automatically



- ✓ Precise annealing cycle control
- ✓ Accurate coil homogeneity and conformity achievement
- ✓ Optimal transitions management

B

ZINC BATH MODEL

- Predicts bath level and chemistry variations according to production
- Provides right ingot feeding instructions to anticipate & optimize level & chemistry evolution



- ✓ Enhanced surface quality
- ✓ Ingot supply chain improvement
- ✓ Operator work optimization

C

AIR KNIFE MODEL

- Pre-sets optimal wiping parameters at transitions (Physical model + AI)
- Optimizes coating thickness based on closed loop control
- Linked with Virtuo™-L for optimized speed automatic control



- ✓ Limited over coating & Zinc savings
- ✓ Steady coating weight
- ✓ Enhanced surface quality

D

TM/TL (Skin Pass)

- Provides elongation target



- ✓ Mechanical properties optimization

MARCEGAGLIA RAVENNA EYERON® IMPLEMENTATION ON COLD PLANT



- **Biggest steel metallurgy plant in Marcegaglia Group producing >3Mtpy of carbon steel**
- Advanced equipment for carbon steel coils finishing, including:
 - Chemical pickling
 - Cold rolling
 - Annealing
 - Skin-passing
 - Galvanizing and pre-painting
 - Service center for slitting and cut-to-length
 - 885 workers
- **Present:** purchasing hot rolled coils from the international market.
- **Future:** new steel production site in Fos-sur-Mer (France), Marcegaglia will be able to transform its own hot rolled coil production

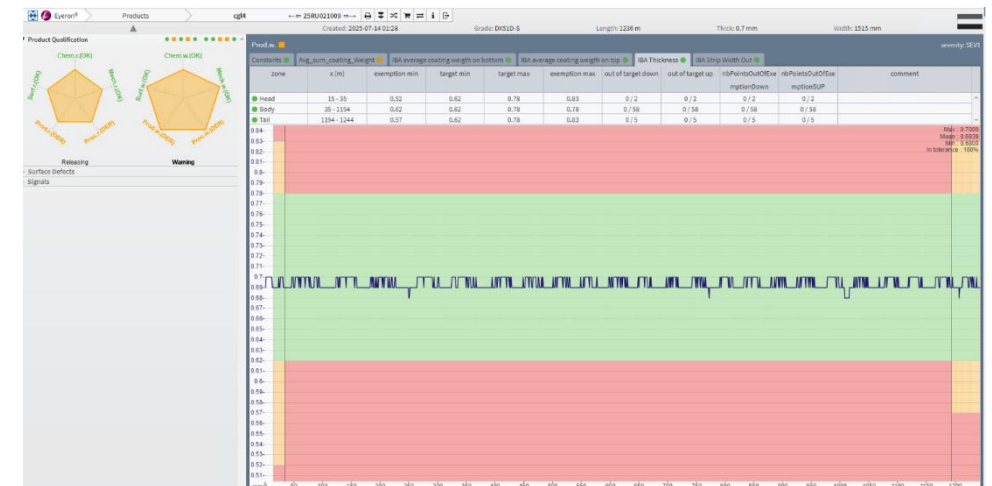
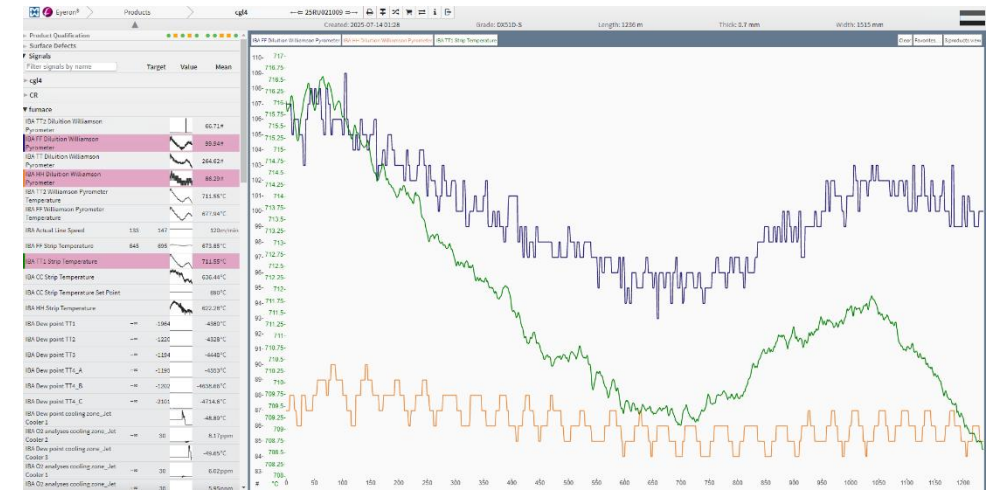
MARCEGAGLIA RAVENNA EYERON® IMPLEMENTATION ON COLD PLANT



MAIN ACHIEVEMENTS

- Installation of Eyeron® & data injection from plant databases (PDA & Level 3) and surface inspection systems
- Basic functionalities deployment
- Expert quality rules integration based on process, product (chemistry, dimensions, mechanical properties) and surface quality parameters

Year	Month	Day	Process	Cut hour	Name	Grade	Thickness	Width	master model status	Quality in	Chem. OK (Y/N)	FC comp. (Y/N)	Prod. OK (Y/N)	Grading	Detailed Grading
2025	Jan	1													
	Feb	2	cg14	0050	2SRU021001	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
	Mar	3	cg14	0011	2SRU021002	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
	Apr	4	cg14	0022	2SRU021003	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
	May	5	cg14	0033	2SRU021004	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
	Jun	6	cg14	0044	2SRU021005	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
	Jul	7	cg14	0055	2SRU021006	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
		8	cg14	0106	2SRU021007	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
		9	cg14	0118	2SRU021008	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
		10	cg14	0128	2SRU021009	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
		11	cg14	0140	2SRU021010	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
		12	cg14	0151	2SRU021011	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
		13	cg14	0205	2SRU021012	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●
		14	cg14	0216	2SRU021013	DX51D-S	0.7	1515	PROD-L3MP	PH-2	Y	N	Y	AA	●●●●●●●●
		15	cg14	0228	2SRU021014	DX51D-S	0.7	1515	PROD-L3	PH-2	Y	N	Y	AA	●●●●●●●●



MARCEGAGLIA RAVENNA EYERON® IMPLEMENTATION ON COLD PLANT



MAIN ACHIEVEMENTS

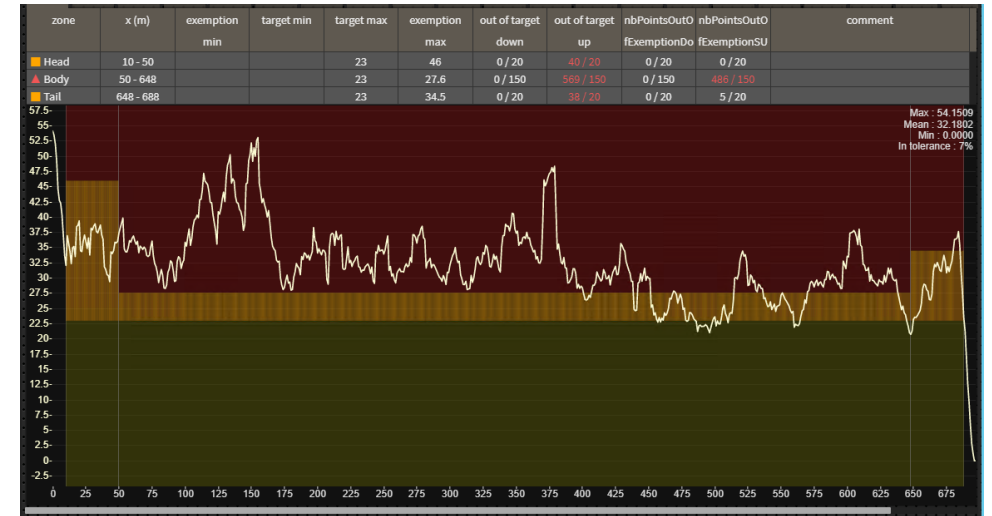
- **Development of specific functions** tailored to Marcegaglia's needs, in particular:
 - ✓ Marcegaglia Surface Quality Index (MSQI)
 - ✓ Real time process alarms

Alarm message of 25RU019907

DIFETTI INDIVIDUATI: VELOCITA' INFERIORE AL TARGET
 AZIONI CORRETTIVE SUGGERITE: La velocità applicata è inferiore rispetto al ciclo di questo prodotto, tornare alla velocità prevista dal ciclo. Per i prodotti strutturali, microlegati e DualPhase riportarsi tassativamente alla velocità prevista dalle pratiche operative.

DIFETTI INDIVIDUATI: GRUMI
 AZIONI CORRETTIVE SUGGERITE: il coil presenta grumi, avvicinare il più possibile le lame d'aria adeguando opportunamente la pressione. Disattivare la modalità semiautomatica nel modello delle lame, se attiva.

DIFETTI INDIVIDUATI: COLATURE
 AZIONI CORRETTIVE SUGGERITE: il coil presenta delle colature, avvicinare il più possibile le lame d'aria per ridurre il ripples adeguando opportunamente la pressione in modo da ottenere il rivestimento richiesto. Disattivare la modalità semiautomatica nel modello delle lame, se attiva.



#	code	incl.	N	width	length	x	z	dy	side	Armato	all'angolo	Chor at
1812	PHen1	1	18	83	1027	371.8	381.7	bottom		Argento NC	Arg NC	17
1813	PHen1	1	41	83	1042	148.9	142.7	bottom		Bordo Normale	BordoNorm	10
1817	PHen1	1	41	83	1042	415.3	106.3	top		Bordo/Line	BordoLine	218
1818	PHen1	1	33	78	1077	159.8	478.3	top		Bordo/UC		1
1819	PHen1	1	48	71	1077	119.3	471.6	top		Carota		1
1820	PHen1	1	51	71	1064	180.3	174.4	top		Bozza		2
1821	PHen1	1	40	51	1174	877.0	186.3	top		Collare/Chok		1
1822	PHen1	1	44	51	1174	877.0	186.3	bottom		Off Space	Onok	8
1823	PHen1	1	82	216	1216	1336.0	100.3	bottom		Risultato/Line	Lineum	268
1824	PHen1	1	32	166	1068	1097.0	390.3	top		Griffa		100
1825	PHen1	1	37	226	1106	890.0	211.3	bottom		Griffa		470
1826	PHen1	1	37	226	1106	1004.0	207.3	bottom		Griffa		16
1827	PHen1	1	23	51	1023	723.0	41.2	top		Griffa		1
1828	PHen1	1	33	53	1023	823.0	165.3	top		Grumi	Grumi	18
1829	PHen1	1	33	53	1023	783.0	165.3	bottom		Passivazione	Spag/Co	22 615
1830	PHen1	1	48	51	1023	783.0	165.3	bottom		Passivazione	Spag/Co	615
1831	PHen1	1	31	162	1207	860.0	48.3	bottom		Saldatura	SAL	5
1832	PHen1	1	36	174	1218	797.0	281.3	bottom		Saldatura	SAL	5
1833	PHen1	1	24	71	1218	1428.4	100.3	bottom		Scaglia	Scaglia	3
1834	PHen1	1	67	161	1218	508.3	183.3	top		Sfogliatura	SfogLit	1
1835	PHen1	1	53	71	1248.0	1002.0	175.4	top		Spacco	Spacco	15
1836	PHen1	1	57	71	1278.0	1158.0	161.4	bottom				15
1837	PHen1	1	42	163	1278.0	1013.0	167.4	bottom				15

MARCEGAGLIA RAVENNA EYERON® IMPLEMENTATION ON COLD PLANT

FRUITFUL COLLABORATION RESULTING IN MEASURABLE BENEFITS



Improved process efficiency: 29% reduction in suspended coils after 12 months (CGL4)

Enhanced quality control reliability across all product characteristics

Improved process monitoring & reliability through continuous key parameters evaluation

Proactive alerts for early deviation detection & non-conformities prevention

Corrective guidance

Reduced internal non-conformities and disputes



NEXT STEPS

Roll-out achievement on full cold plant by end 2026 including advanced failure analysis using **Machine Learning**

MARCEGAGLIA RAVENNA SMARTLINE™ IMPLEMENTATION ON 4 CGLS



Hot rolled coil diversity

- 20% DP
 - 20% HSLA
 - 45% mild steel
 - 5% packaging
 - 6% structural steel
- > 40% automotive steel
- > 20 suppliers for upstream HRC

MAIN CHALLENGE

Improve consistency of delivered product quality

Strong collaboration between Fives and Marcegaglia from 2018 to 2022 allowed developing tailored solution:

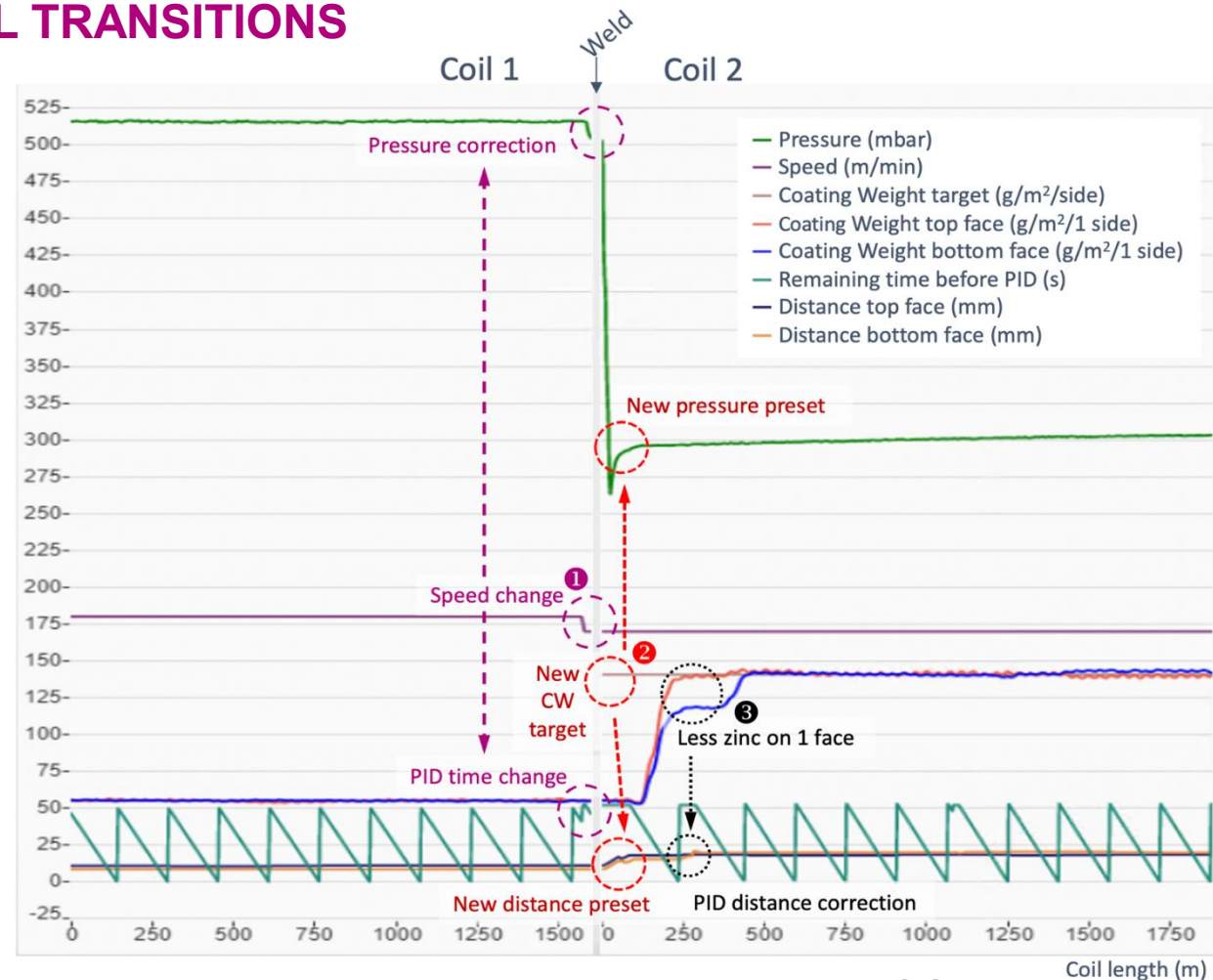
- **Furnace level 2:** better transitory management and energy saving
- **Metallurgical Models:** increased productivity and reduction of Mechanical Properties deviations
- **Zinc bath model:** reduced zinc bath chemical and level variations
- **Air-Knife Model:** increased zinc savings due to over coating limitation

MARCEGAGLIA RAVENNA SMARTLINE™ IMPLEMENTATION ON 4 CGLS

FOCUS: SMARTCOAT™ AIR KNIFE MODEL TRANSITIONS

3 main phases

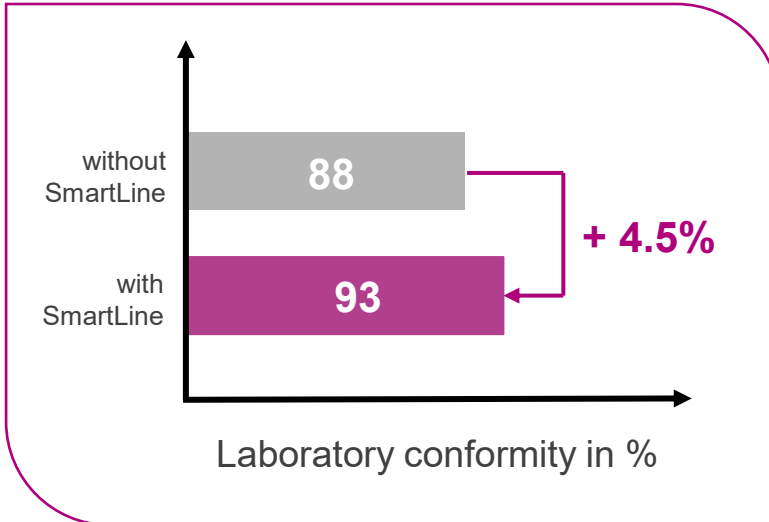
- 1 Automatic adjustment after speed change (predictive model)
- 2 Computation of settings for new coils / new coating target (predictive model)
- 3 PID control loop



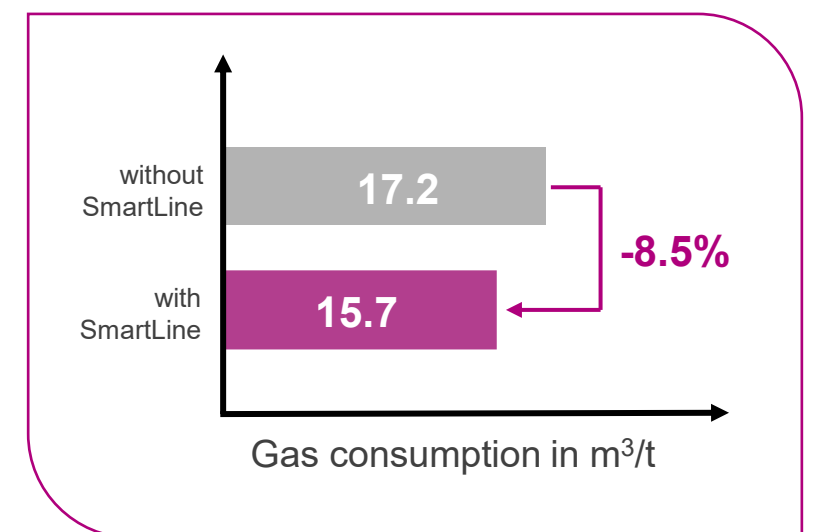
Example on Marcegaglia Ravenna's CGL2

MARCEGAGLIA RAVENNA SMARTLINE™ IMPLEMENTATION ON 4 CGLS

Quality & productivity improvement together with **gas consumption reduction** for cold rolled coils (CGL#4)

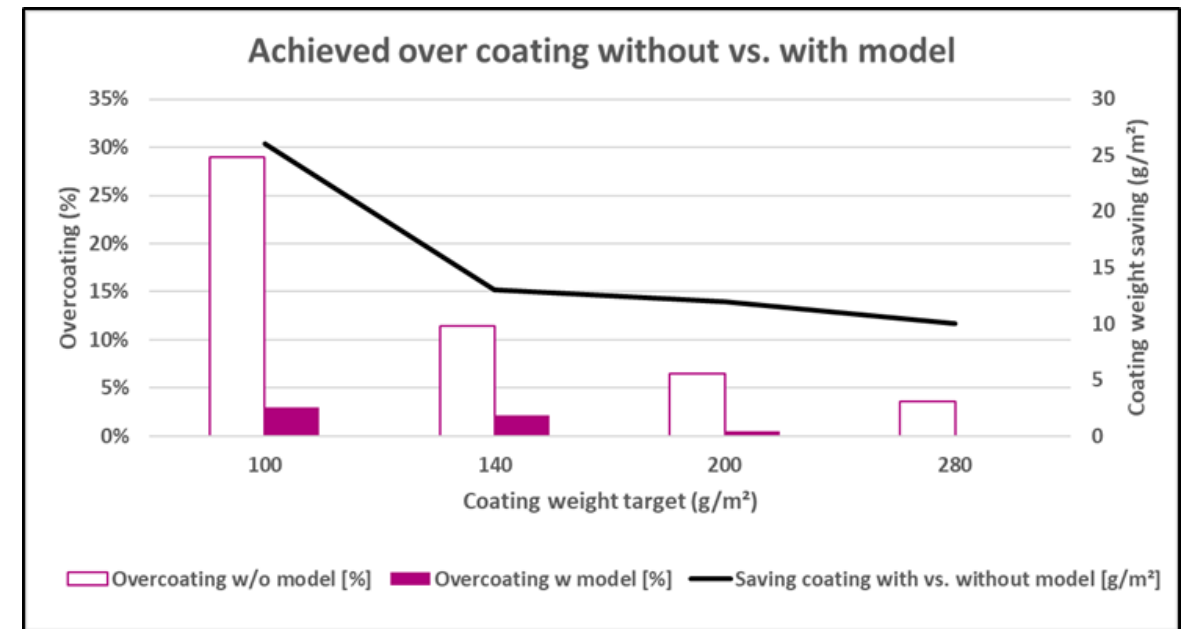
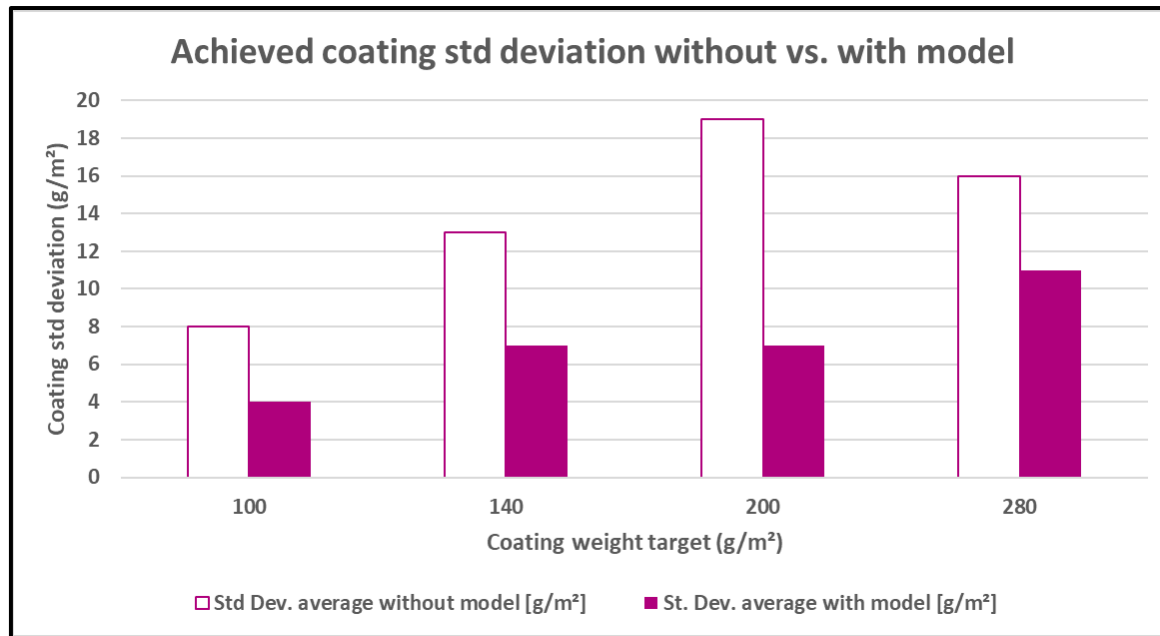


Steel grades	Average speed increase
Al-K	4.36%
HSLA	6.95%
DP	7.06%
IF	7.98%
TOTAL	5.96%



MARCEGAGLIA RAVENNA SMARTLINE™ IMPLEMENTATION ON 4 CGLS

Coating improvement achievement: standard deviation and overcoating reduction leading to significant **Zinc consumption reduction**



➔ **>25% reduction of coating variability**

➔ **Improvement done thanks to close loop management and transitory management**

ARVEDI AS TERNI EYERON® IMPLEMENTATION ON INTEGRATED PLANT

Arvedi AST produces flat rolled stainless steel products.

On the market and user side, currently ~250 different customers,

- ❖ 11 different quality levels
- ❖ 96 final uses
- ❖ 50 different steel brands
- ❖ 36 surface finishes
- ❖ 3 standard width formats, customizable
- ❖ Thickness range from 0.4 mm to 6.0 mm

The complexity of production process is due to the number of production steps required to arrive at the finished roll starting from the scrap and the number of plants available to make it.



EAF Integrated plant - 1 Mtpy Capacity

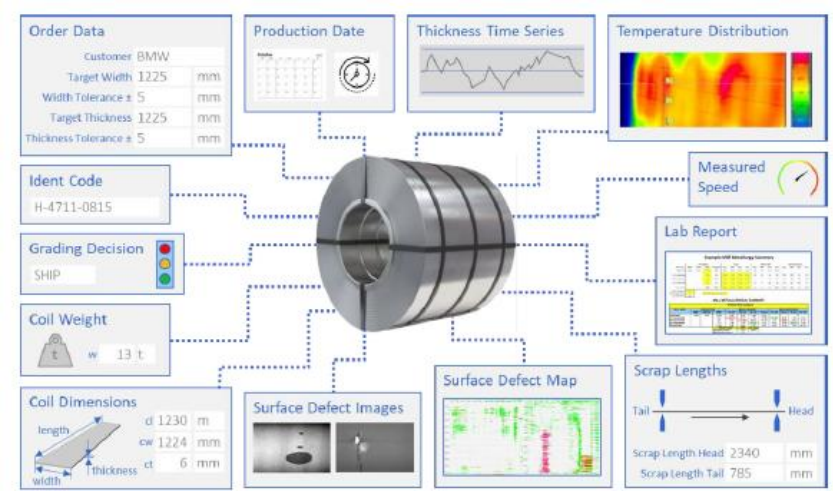
CHALLENGE

Significant difficulty to control and manage all the possible combinations in traditional way



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ARVEDI AS TERNI EYERON® IMPLEMENTATION ON INTEGRATED PLANT



End of Sept 2020, implementation of Eyeron® software in the frame of Coil Intelligent Processing project, aiming at:

- Controlling product quality in real time
- Proposing coil reassignment based on end-customer quality target
- Predicting occurrence of surface defects according to specific process conditions on upstream lines



Plant

EAF Integrated plant - 1 Mtpy Capacity



Processes & Lines in scope

Argon Oxygen Decarburizing & Ladle Furnace: AOD2 – LF / AOD – LF ASEA

Steelmaking and Continuous Casting: 2 CC

Slab Grinding - Hot Rolling Mill

Cooling control batch Furnaces

HAPL: 3 lines, Z Mills: 6 lines, CAPL: 2 lines, BAL: 2 lines



Laboratories

Chemical composition lab

Mechanical testing lab



Impact

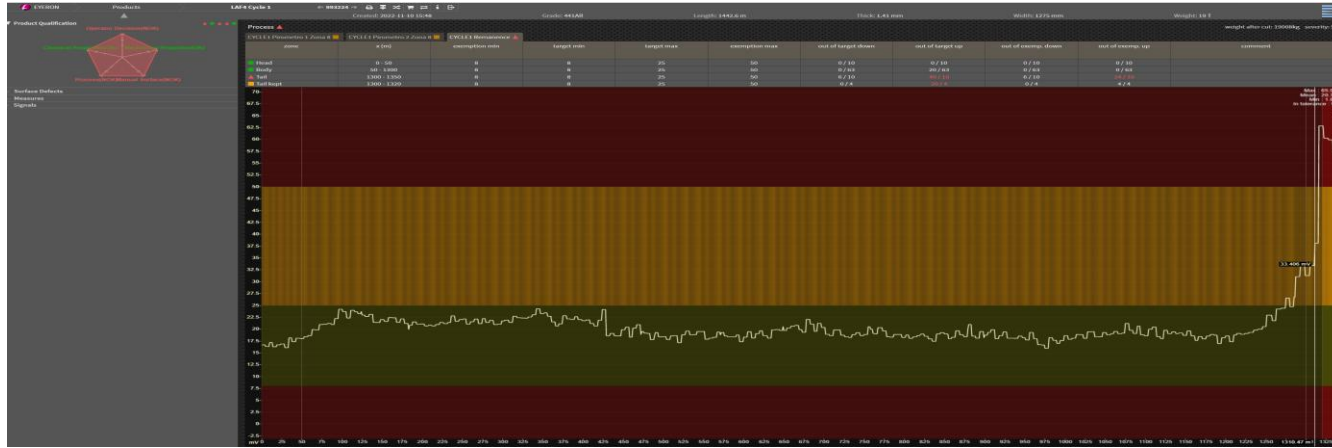
>20%

Reduction of downgraded and scrap coils

>95%

Automatic qualification of produced coils

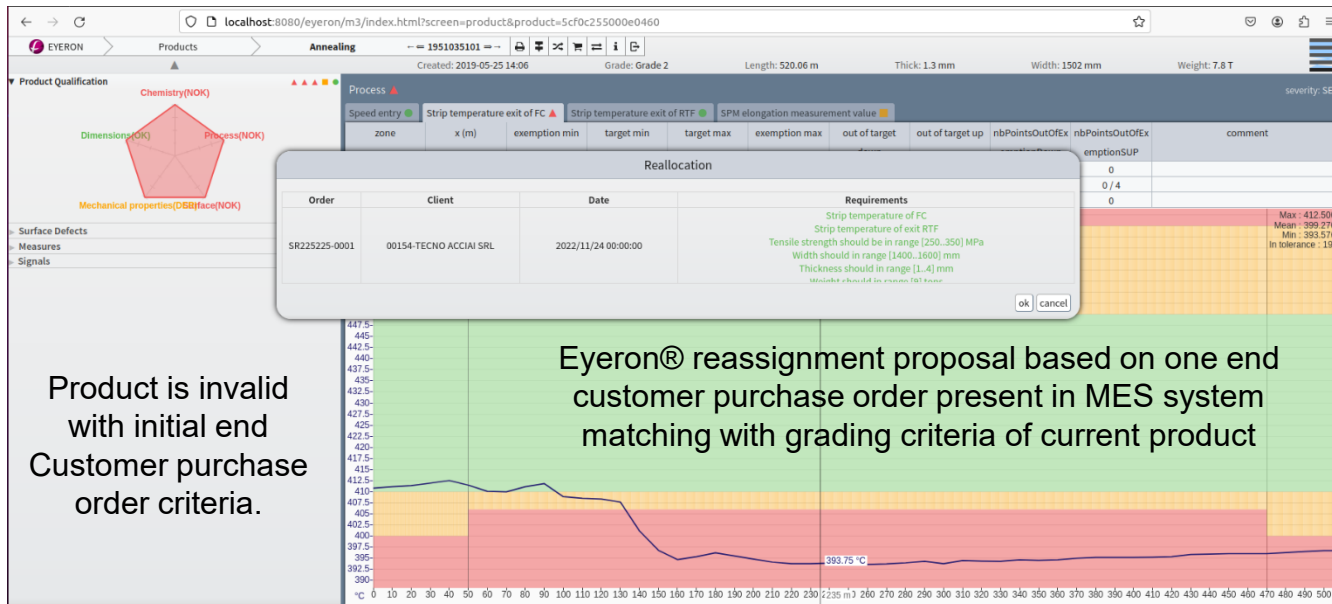
ARVEDI AS TERNI EYERON® IMPLEMENTATION ON INTEGRATED PLANT



NEW FUNCTIONS

Product repair support – Automatic product cut computing

The exact length of scrap is computed and proposed to operators by Eyeron®

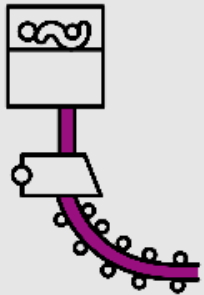


Product reallocation

When a coil has a bad qualification, it is possible to reallocate this coil to another customer order

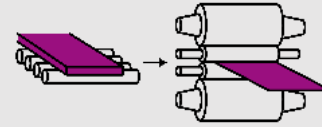
Benefits: No scrap, reuse existing coil. A compatible order is proposed to quality manager (link with MES & ERP)

CONTINUOUS CASTING



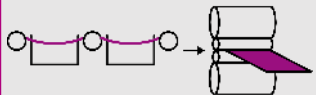
- **Inspected products:** decrease to zero for stabilized ferritic family
- **>50% annual scrap reduction:** >\$225k/y for stabilized ferritic family
- **Automatic detection** & interception of defective slabs
- **Reduction of product management time**

HOT ROLLING



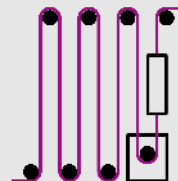
- **30% reduction of coil checks:** 1/10 → 1/15
- **Improved management of roll change** in FM
- **Automatic detection** & interception of defective coils

Z-MILLS



- **Effect of corrective actions** taken on Z-mills following shape defect detection on HRM
- **Reduced downtime:** by ~30%

CAPL



- One line: **50% scrap reduction** due to transitory
- **Savings:** > 500k\$/y

ARVEDI AS TERNI VIRTUO™-L IMPLEMENTATION ON CAPL

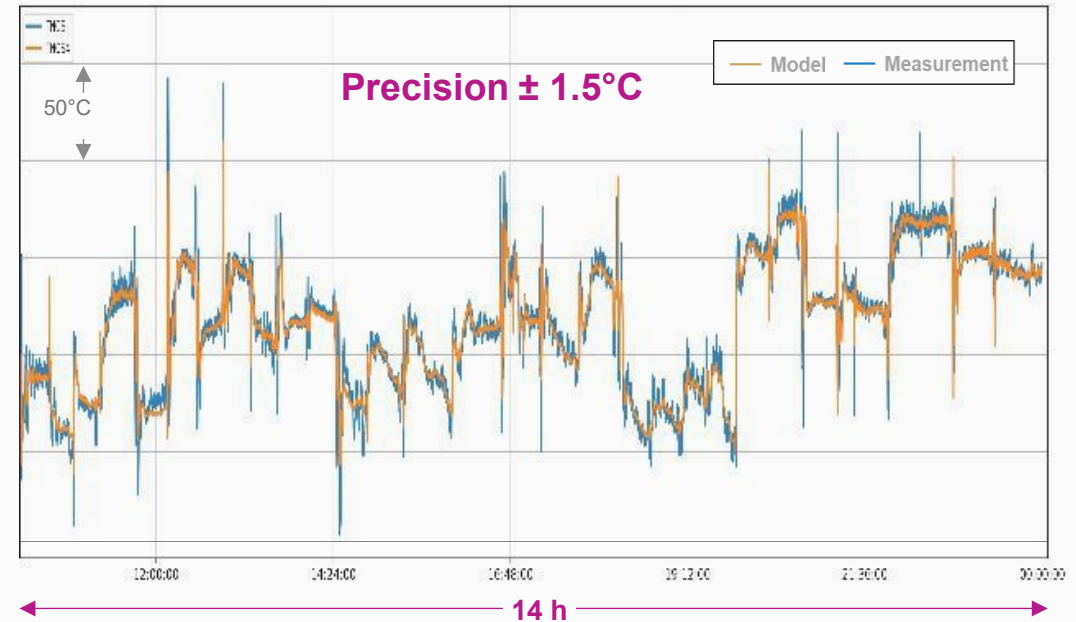


New project: upgrade of cold annealing and pickling line by installing Virtuo™-L furnace level 2 software, for automatic control of:

- Direct flame heating section, based on **dynamic & predictive thermal modeling**
- Gas and water jet cooling section based on **Artificial Intelligence**
- Process line speed

An automatic scheduling model will also be implemented for transitions optimization

High precision of modeled temperature compared to measured



EXPECTED BENEFITS

- Mechanical properties improvement through precise transition management
- Decrease of product rejections
- Decrease fuel consumption through improved temperature control stability

THANK YOU !



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Industry can do it

Maxime MONNOYER
Sales Manager - Steel Digital Factory at Fives

www.fivesgroup.com