

KOCKS Technological Packages

Glyn Ellis & Michael Kruse

IRD Association Inc.,  
2017 Spring Convention Riverside CA, USA

- **SCS – Size Control System** – self-optimizing system to improve tolerances
- **SID – Stand Identification** – to support tracking of equipment performance and preventive maintenance
- **4D EAGLE Profile** – a new answer to profile measurement
- **LTR – Low Temperature Rolling** – from simulation based on mill operating parameters to improve material microstructure
- **KMS – KOCKS Microstructure Simulator** – developing, optimizing and reducing costs in rolling mills due to process modeling with modern simulation software

# SCS – Size Control System

We make your product **gold**

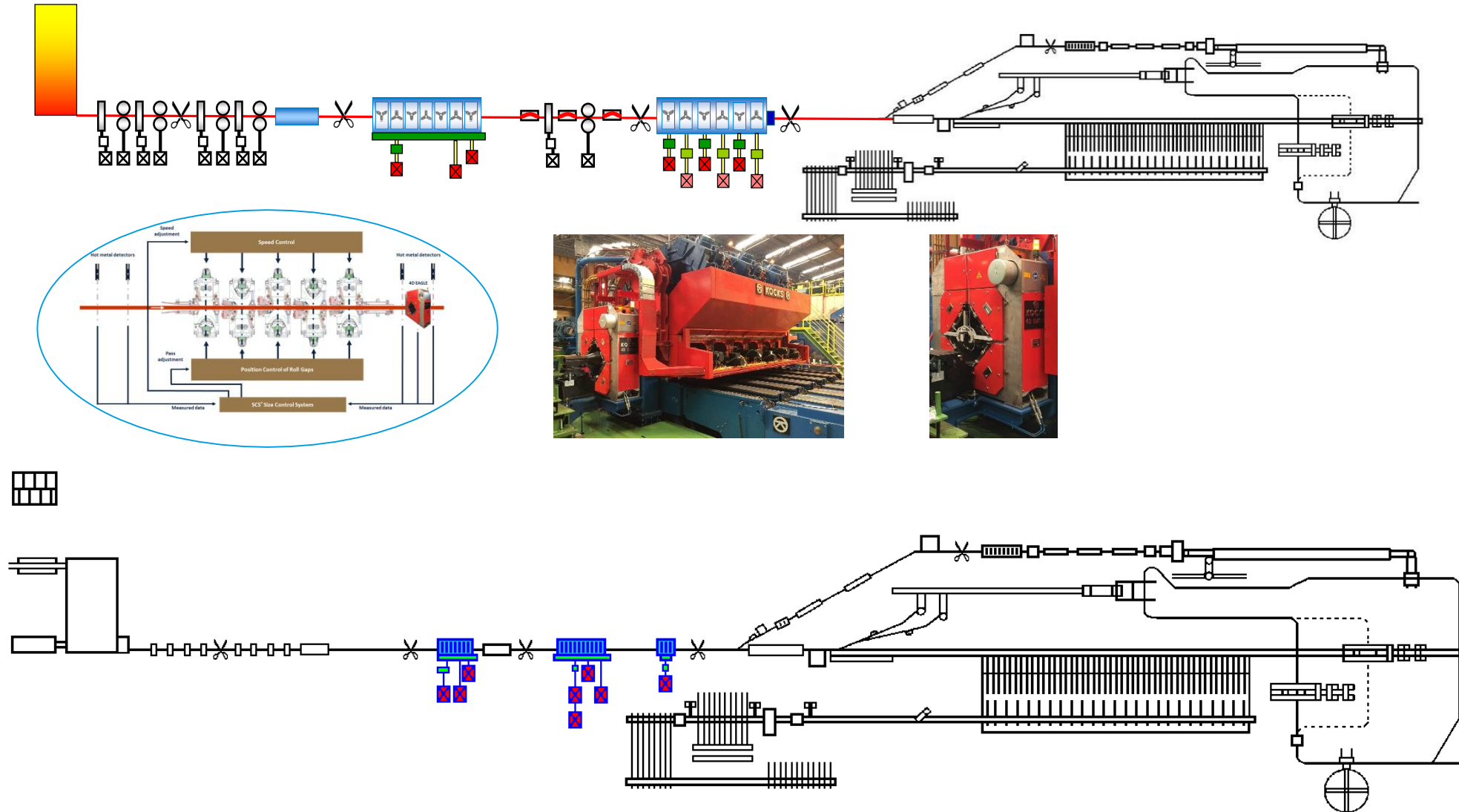


- Different material grades
- Varying Spread
- Temperature changes
- Pass wear
- Small lot sizes
- ...



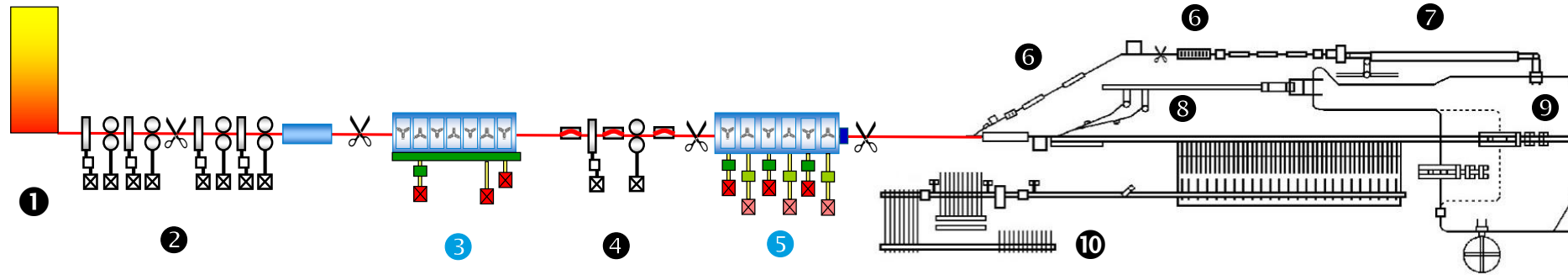
# SCS RSB 370<sup>++</sup>/6 SéAH Changwon Special Steel

We make your product gold



# SCS RSB 370<sup>++</sup>/6 SéAH Changwon Special Steel

We make your product gold



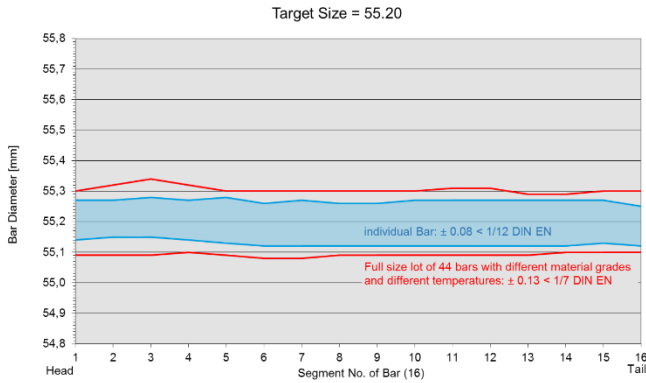
- ❶ Reheat Furnace
- ❷ 8-stand 2-high Roughing Mill (HV)
- ❸ 7-stand 500 mm 3-roll Pre-finishing Block
- ❹ 2 Continuous Stands (HV)
- ❺ 6-stand 370 mm<sup>++</sup> 3-roll RSB<sup>®</sup> with SCS<sup>®</sup>, AUL & 4D Eagle
- ❻ 2-stand Pre-finishing Block & 8-stand Wire Rod Finishing Block
- ❼ Wire Rod Outlet
- ❽ Bar in Coil Outlet
- ❾ Coil Handling
- ❿ Rake-type Cooling Bed and Bar Handling Equipment

## Technical data:

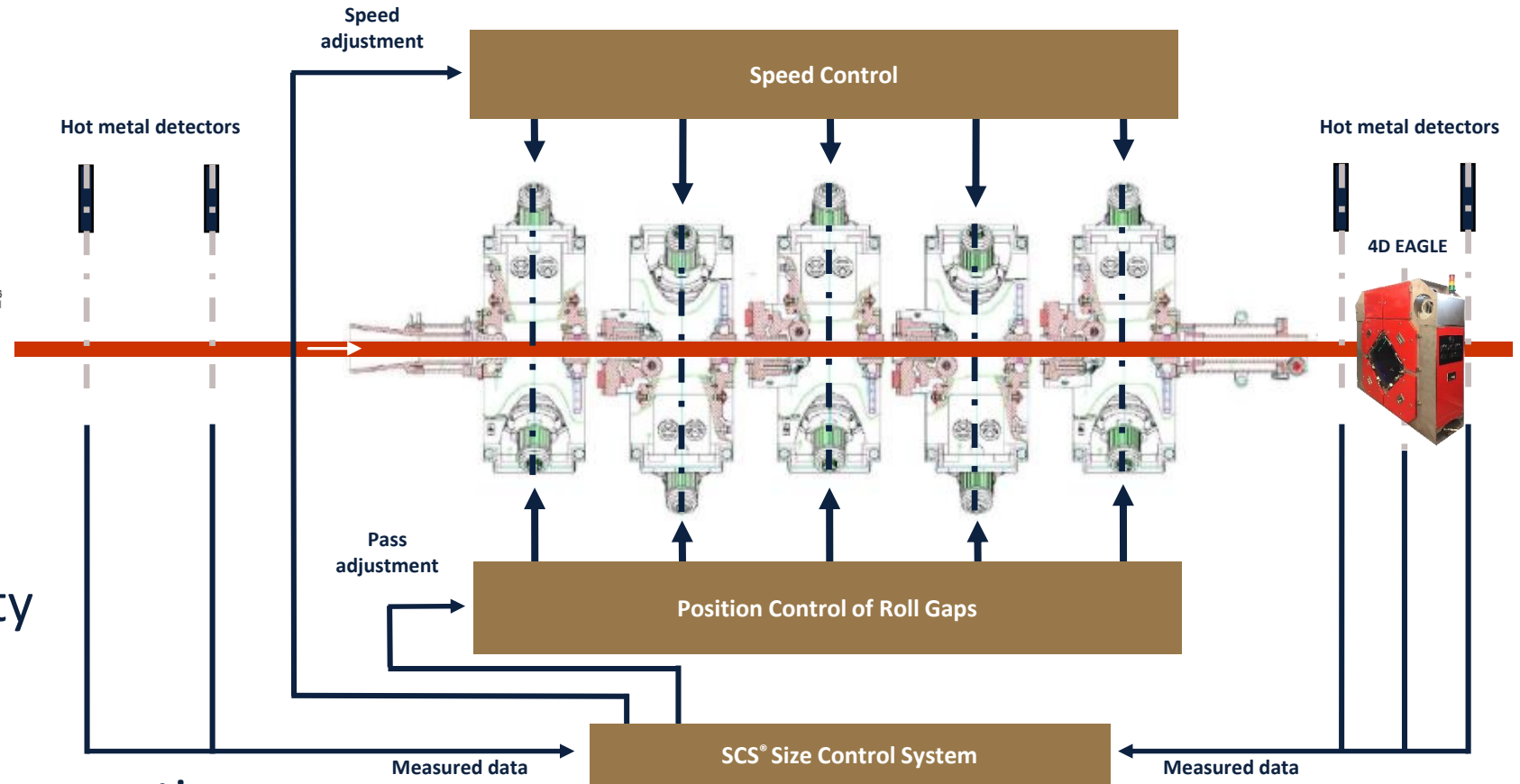
Furnace capacity	100 t/h
Production	330,000 t/a
Billet size	145, 150, 160 and 170 mm ■
Finished sizes	Wire 5.5 - 16.0 mm Ø
	BIC 16.0 - 34.0 mm Ø
	Bar 16.0 - 100.0 mm Ø
Material grades	Low and Medium Carbon Steels, Spring Steel, Stainless Steels, Tool Steels, Valve Steels, Super Alloys

# SCS structure

We make your product gold

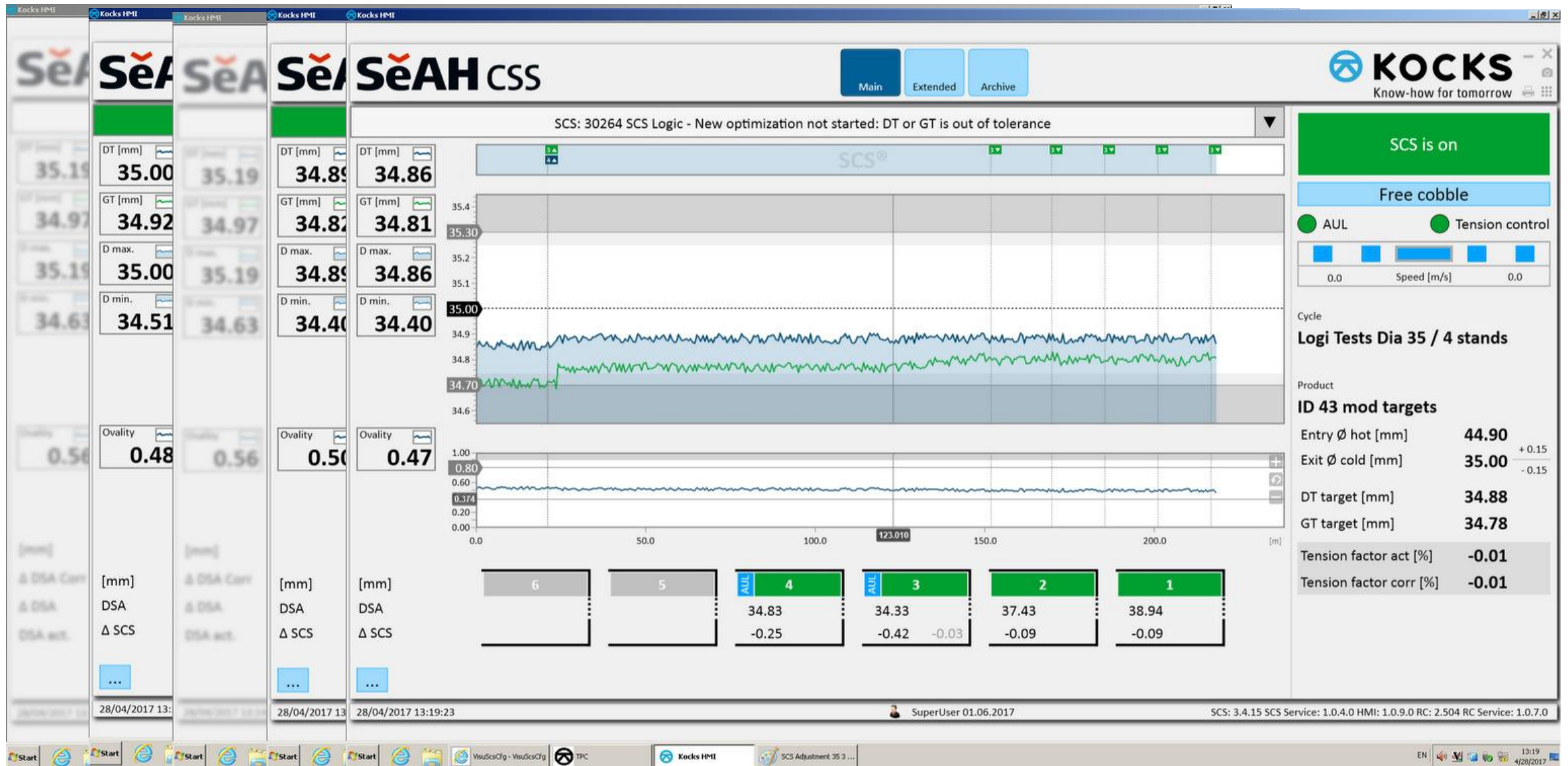


- Gap adjustment
- Tension factor
- Optimization ovality
- Pre-control
  - temperature compensation
  - entry section compensation

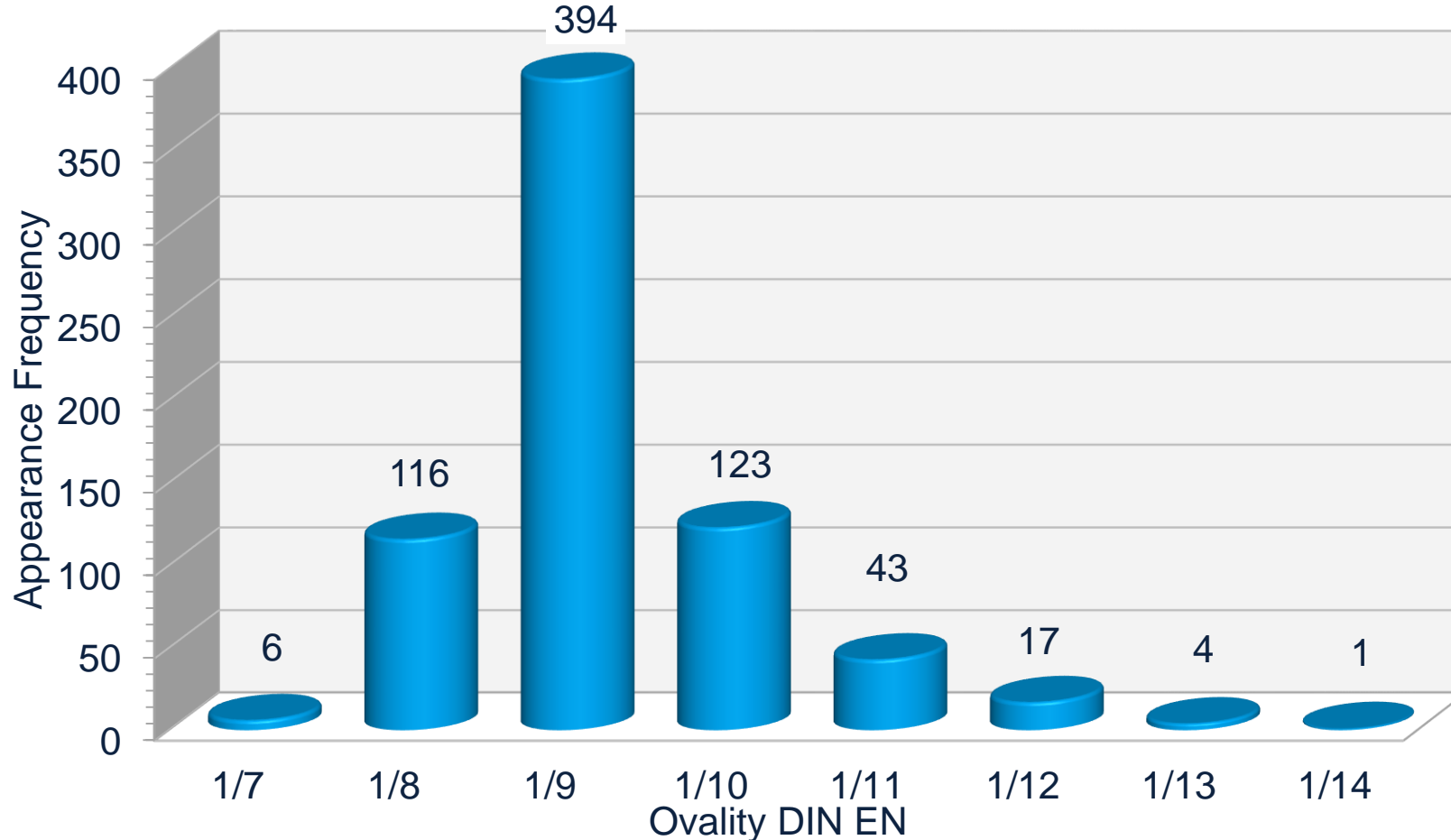


# SCS functionality

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Viewing rate (approx. 3 month) for size 55.20mm dia.  
different material grades and different rolling temperatures







- **Continuous** quality optimization by immediate closed-loop compensation of profile deviations during bar rolling
- **Significant** improvement of product tolerance and ovality
- **Simplified** handling of the RSB® by automated support for the operator
- **Reproducible** rolling results independent from operator skills
- **Increase** of productivity by fast and optimal adjustments
- **Compensation** of roll wear
- **Shorter** ramp-up curve at start-up
- **Storage** of process knowhow

# 4D EAGLE Profile ...and RSB 370++/6 at SéAH CSS, South Korea

We make your product gold



## 4D Eagle unique features...

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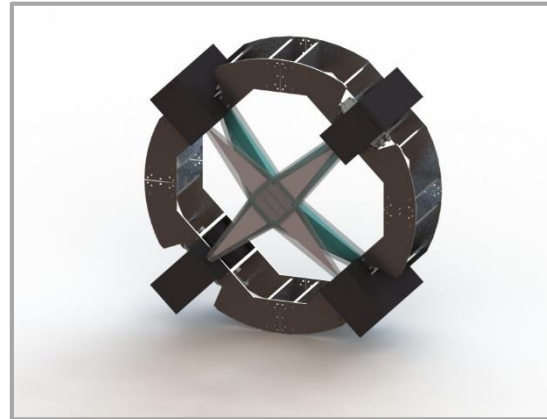
- Compact industrial design with **measuring cell protection**



## 4D Eagle unique features...

We make your product **gold**

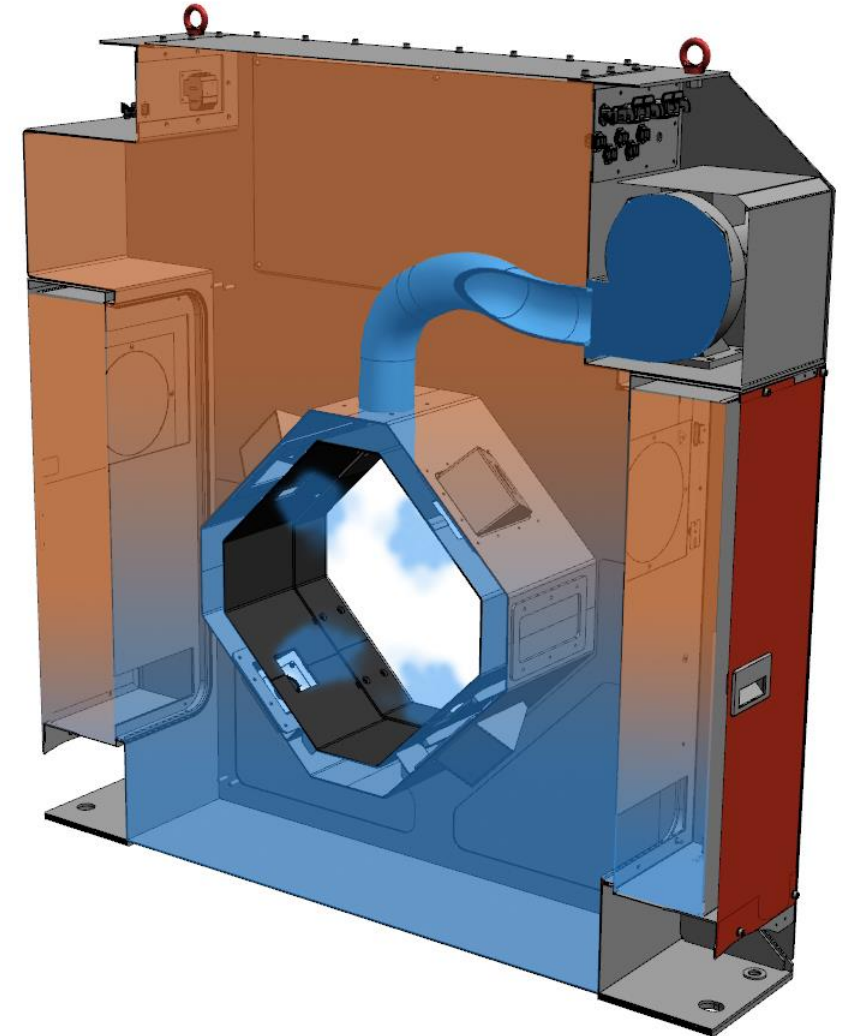
- Compact industrial design with **measuring cell protection**
- Use of **innovative materials** to avoid thermal expansions



## 4D Eagle **unique features...**

We make your product **gold**

- Compact industrial design with **measuring cell protection**
- Use of **innovative materials** to avoid thermal expansions
- **Sophisticated cooling concept** with closed loop water circulation (no process water consumption) – two separate cycles



## 4D Eagle **unique features...**

We make your product **gold**

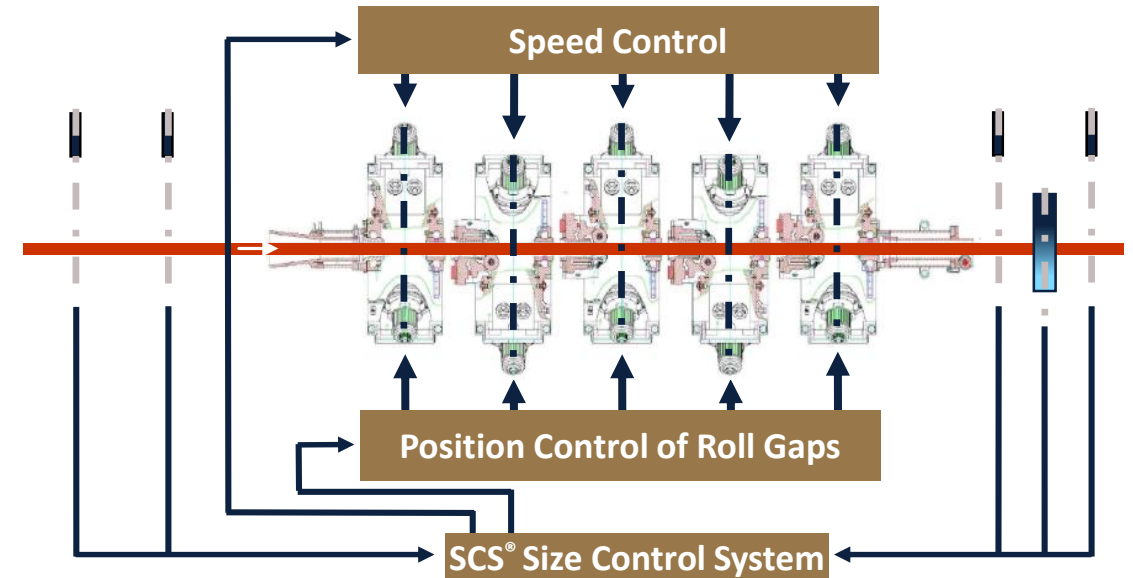
- Compact industrial design with **measuring cell protection**
- Use of **innovative materials** to avoid thermal expansions
- **Sophisticated cooling concept** with closed loop water circulation (no process water consumption)
- Exact guiding



# 4D Eagle ... and system highlights

We make your product gold

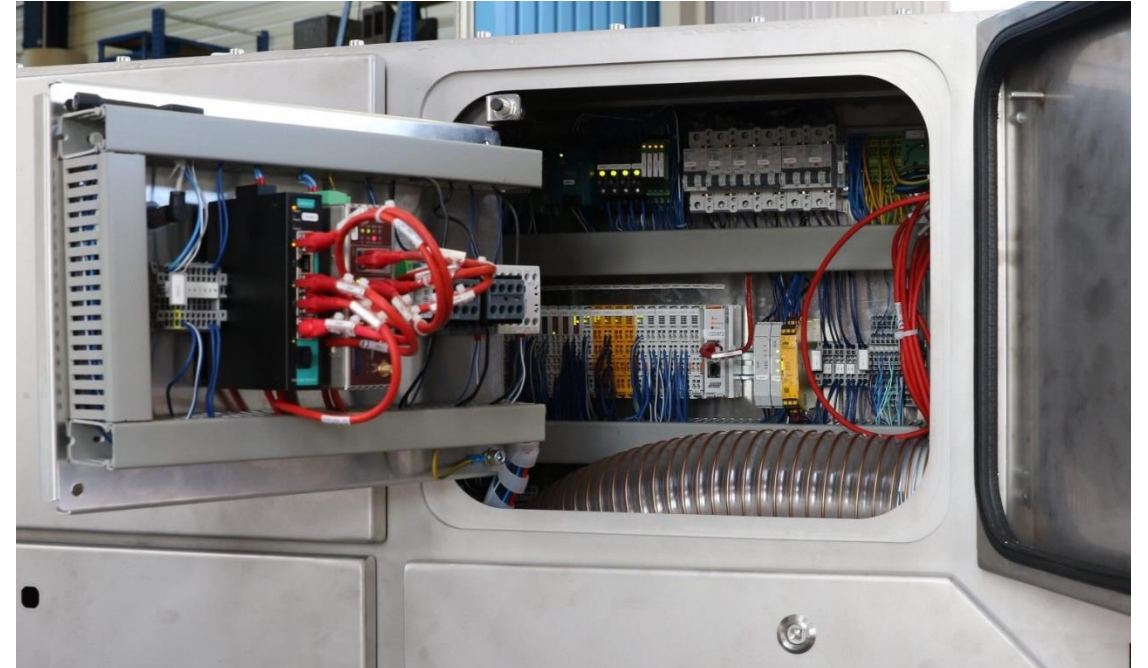
- **SCS<sup>®</sup>-Ready:** System is prepared for closed loop size control with Kocks SCS<sup>®</sup>



## 4D Eagle ... and system highlights

We make your product **gold**

- **SCS<sup>®</sup>-Ready**: System is prepared for closed loop size control with Kocks SCS<sup>®</sup>
- **Minimized** connections
- No need of an **external server cabinet**

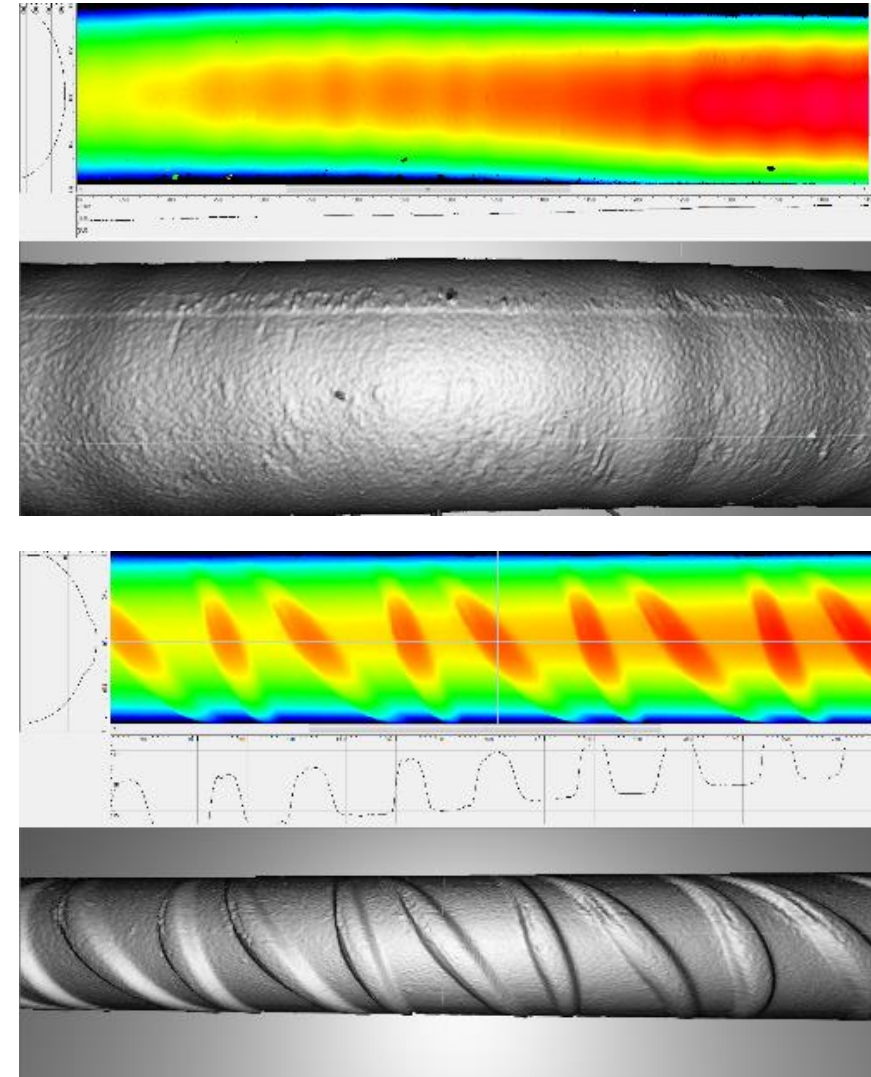




# 4D Eagle ... and system highlights

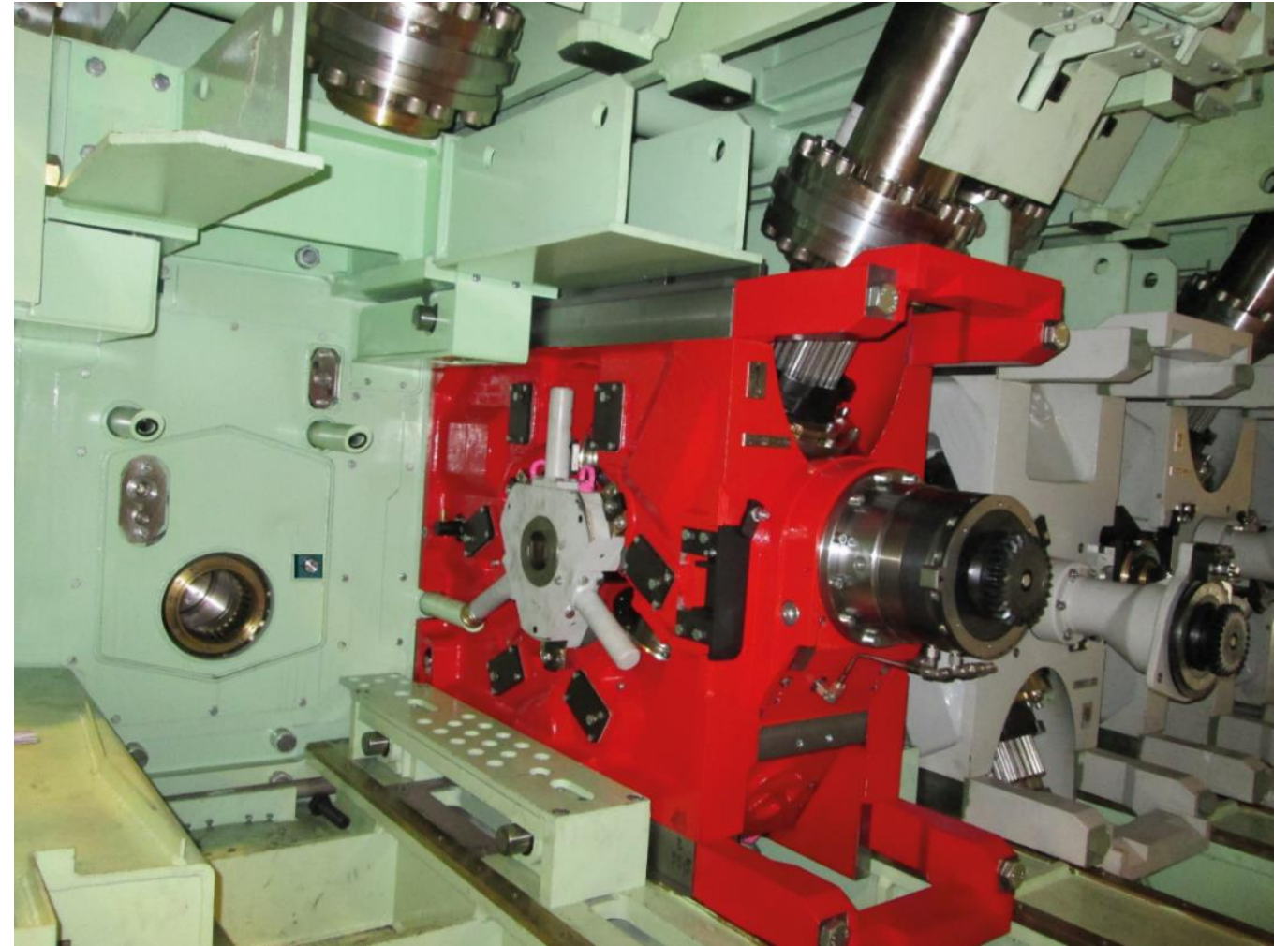
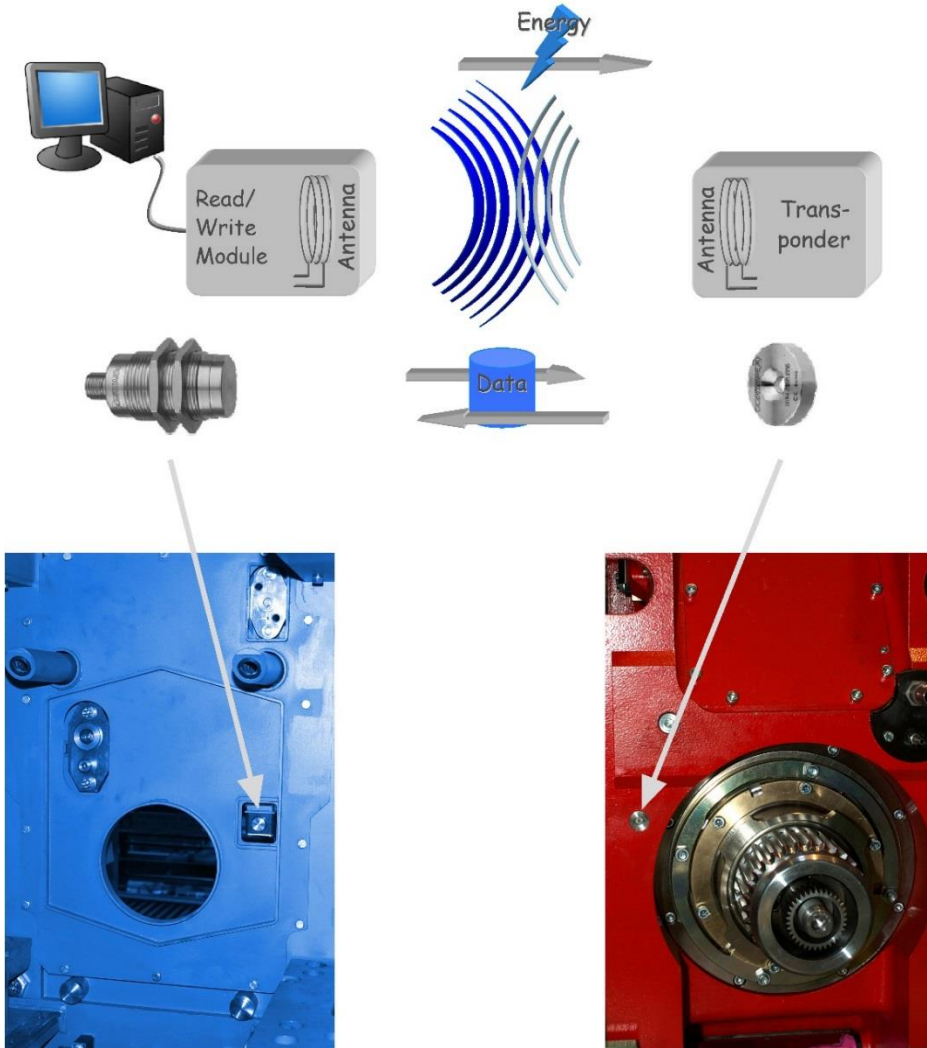
We make your product **gold**

- **SCS<sup>®</sup>-Ready**: System is prepared for closed loop size control with Kocks SCS<sup>®</sup>
- **Minimized** connections
- No need of an **external server cabinet**
- Extensions like **rolling defect inspection** available
- High measuring rate > **1.800 high precision profiles per second**



# SID – Stand IDentification

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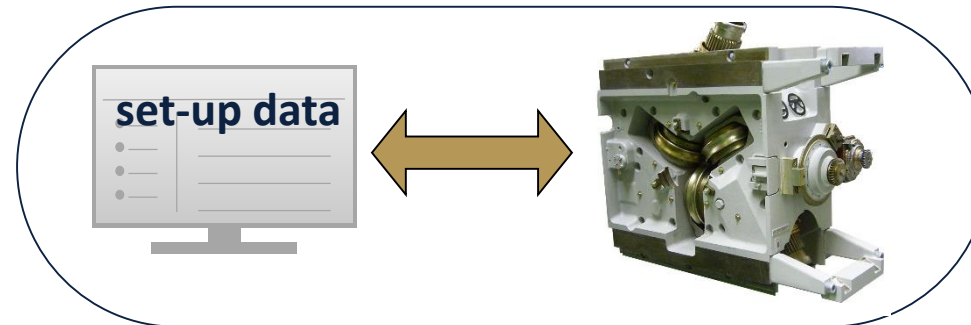


# SID overview

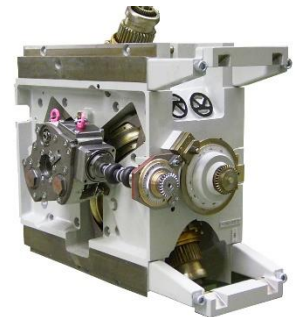
We make your product **gold**



production  
planning



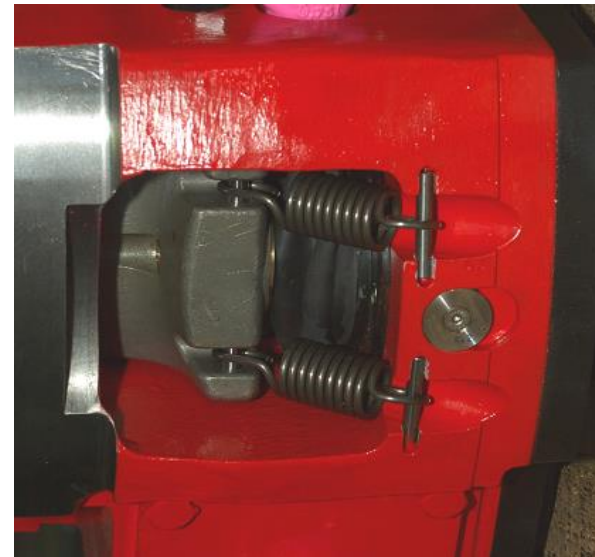
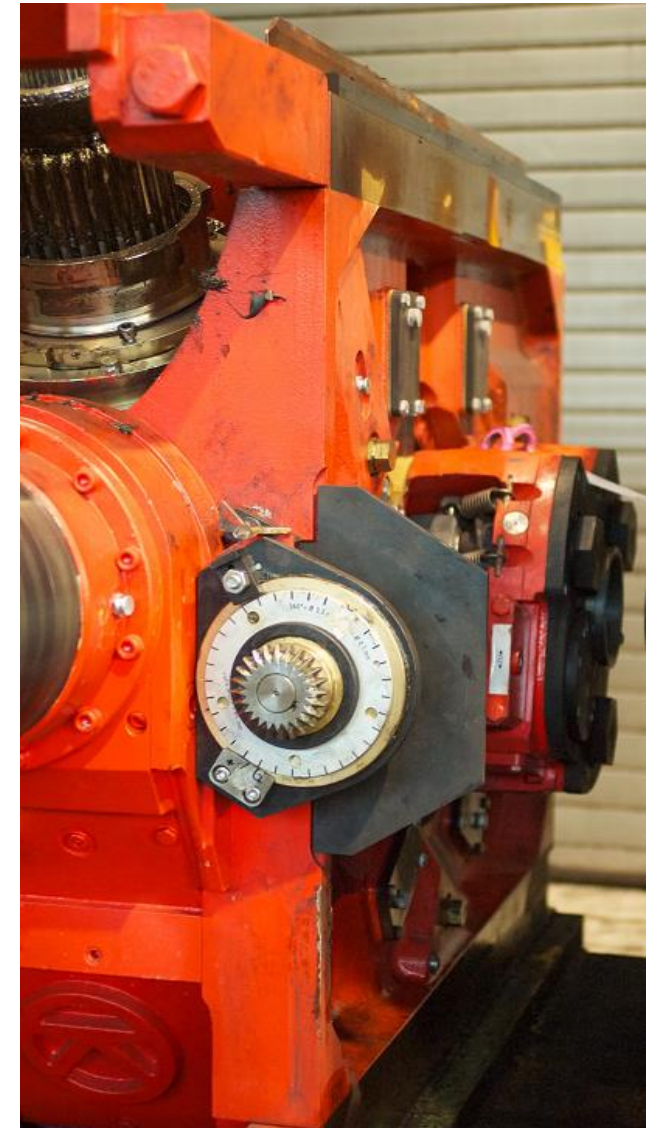
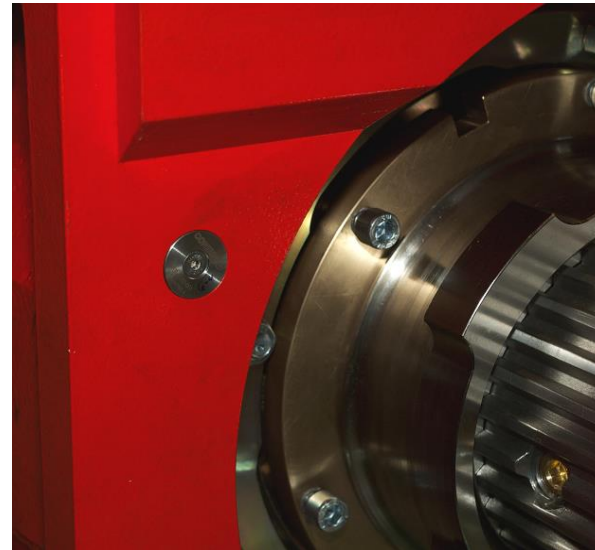
Stand/guide  
connection




# SID data transfer via RFID



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**Georgsmarienhütte**  
GmbH · seit 1856 · Edelstahl


Gerüste

Führungen

Setups

Archiv

Instandh.



**KOCKS**  
Know-how for tomorrow

**Fälligkeiten**

**Durchführung**

**Historie**

**Maßnahmen**

**Intervalle**

Gerüst

G04 ...

Scannen

Intervalle

Außer Plan - Gerüste

Nach Gerüstreinigung

Walzenwechsel nach Stecker

halbjährlich konv. Gerüste ●

alle 2 Jahre Flanschgerüste

Jährlich Flanschgerüste

Walzenwechsel Flanschgerüste

Intervallkriterium	Grenze	Aktuell
Zeit gesamt [h] <span style="color: red;">●</span>	4380	4941
Zeit drehend [h]	0	442
Zeit walzend [h]	0	364
Tonnage [t]	0	104832

Intervall bearbeiten

Maßnahmen für Intervall durchführen

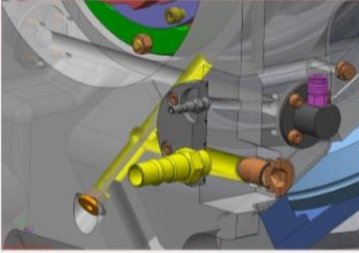
Erledigt	Maßnahmen
<input type="checkbox"/>	Sieb für Dichtluft prüfen <span style="float: right;">🔍</span>
<input type="checkbox"/>	Moment Lamellenbremse prüf
<input type="checkbox"/>	Außerplanmäßige Maßnahme

Das Sieb filtert die Dichtluft beim Eintritt in das Gerüstgehäuse.  
 Filter kann durch Verschmutzung verstopfen.  
 - Sieb ausbauen und visuell begutachten.  
 - Bei Verschmutzung reinigen oder ersetzen.


Bemerkungen

Fotos Weitere

1 / 1



<



>

Intervall abschließen ...

Übernehmen

Verwerfen

12.01.2017 11:54:09
Hauptbenutzer



## Higher degree of automation

- Avoiding of operator error
- Higher degree of process safety
- Higher degree of mill availability



## Condition and availability of stands/guides are always available

- Higher fielding flexibility
- Simplified recourse



## Stand/guide-specific data recording

- Enables comprehensive analysis



## Roll management

- Management of each single roll
- Capture of diameter and pass when re-dressing
- Attribute roll to stand during assembly
- Record roll specific data for analysis regarding wear, resource planning and failure
- History

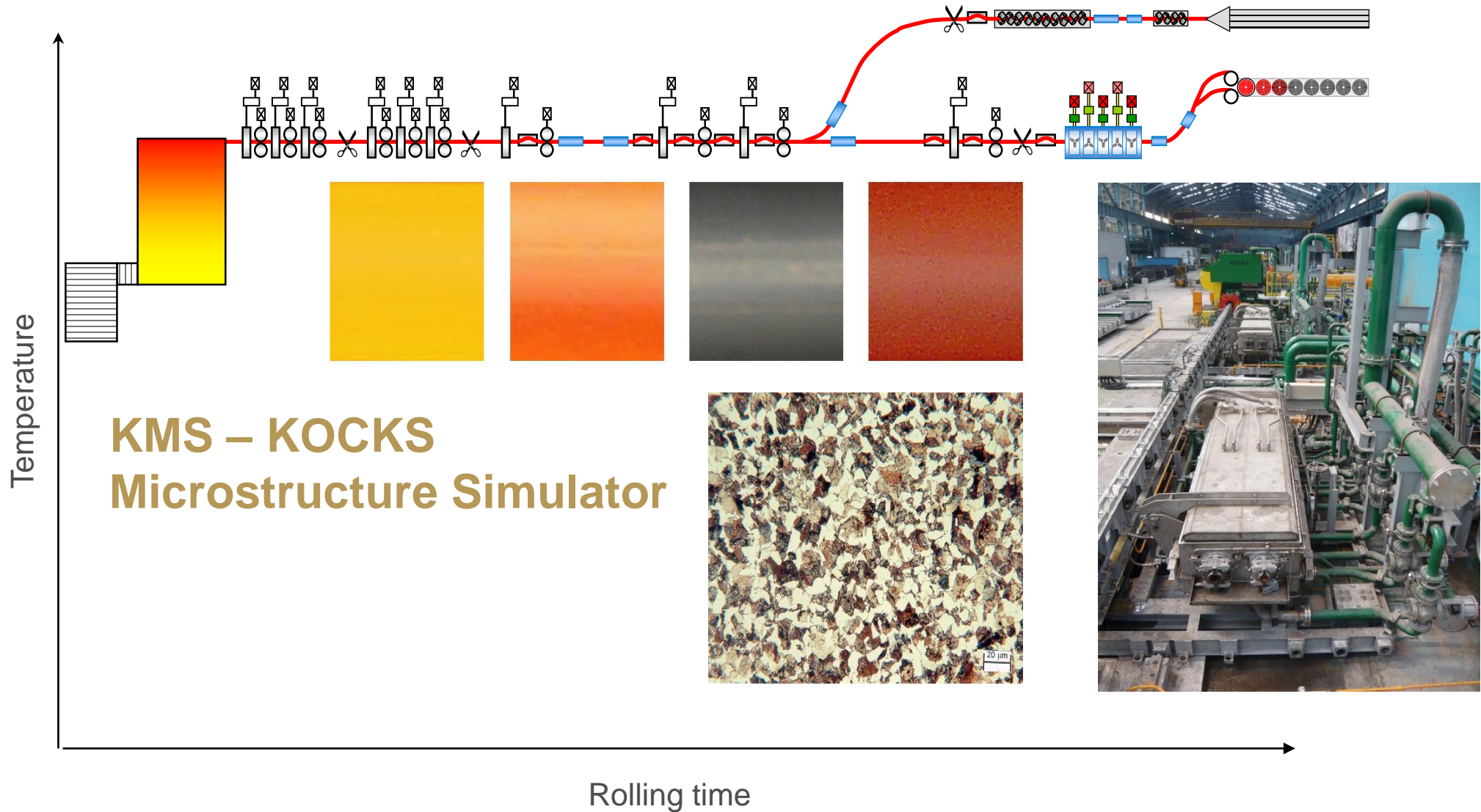
## Additional functionalities

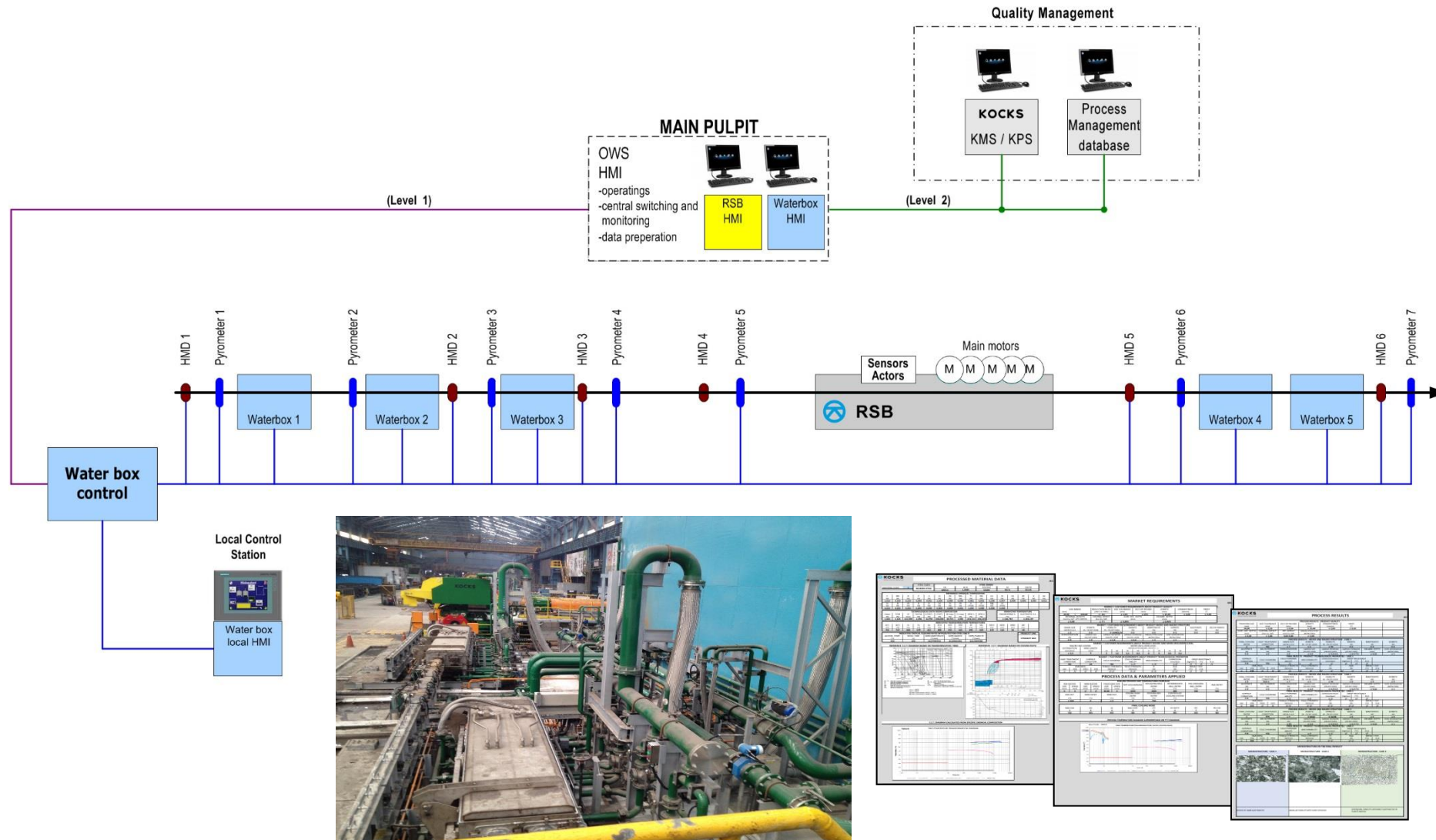
- Export function for use un repair shop
- Interfaces to superior systems, e.g. ERP
- Recording tolerances with interface to **4D Eagle** profile gauge

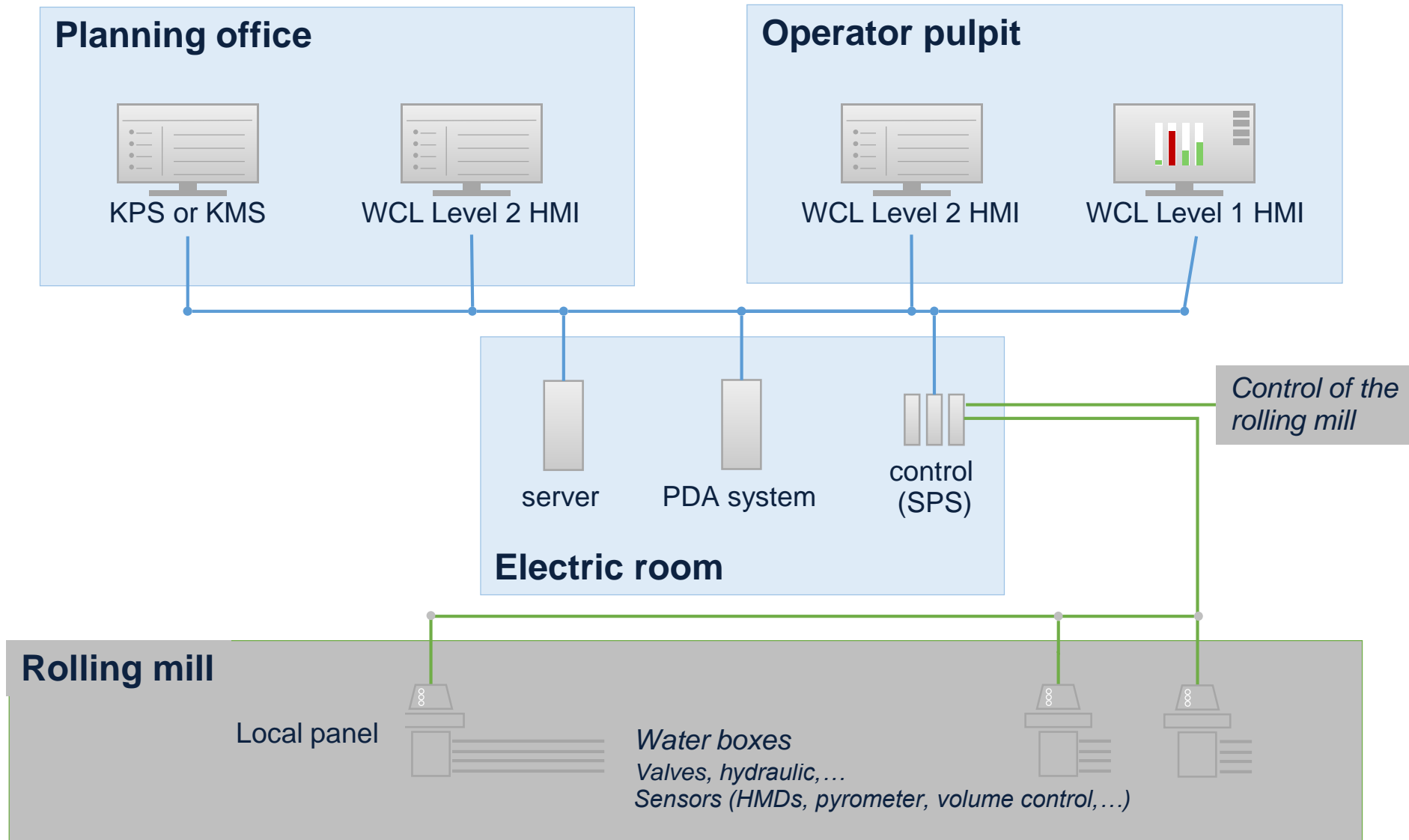


# LTR – Low Temperature Rolling

We make your product **gold**



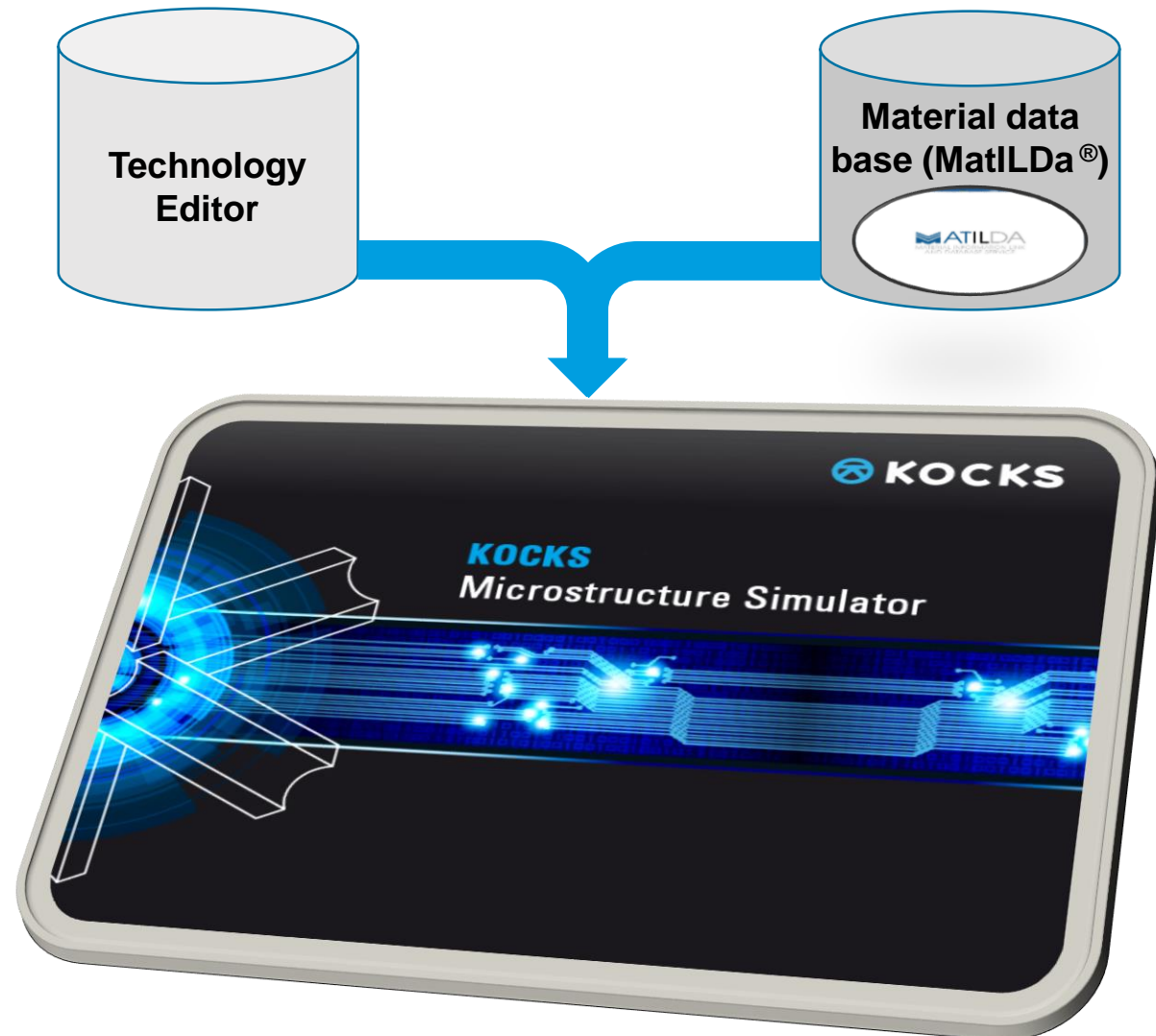




# KMS – KOCKS Microstructure Simulator

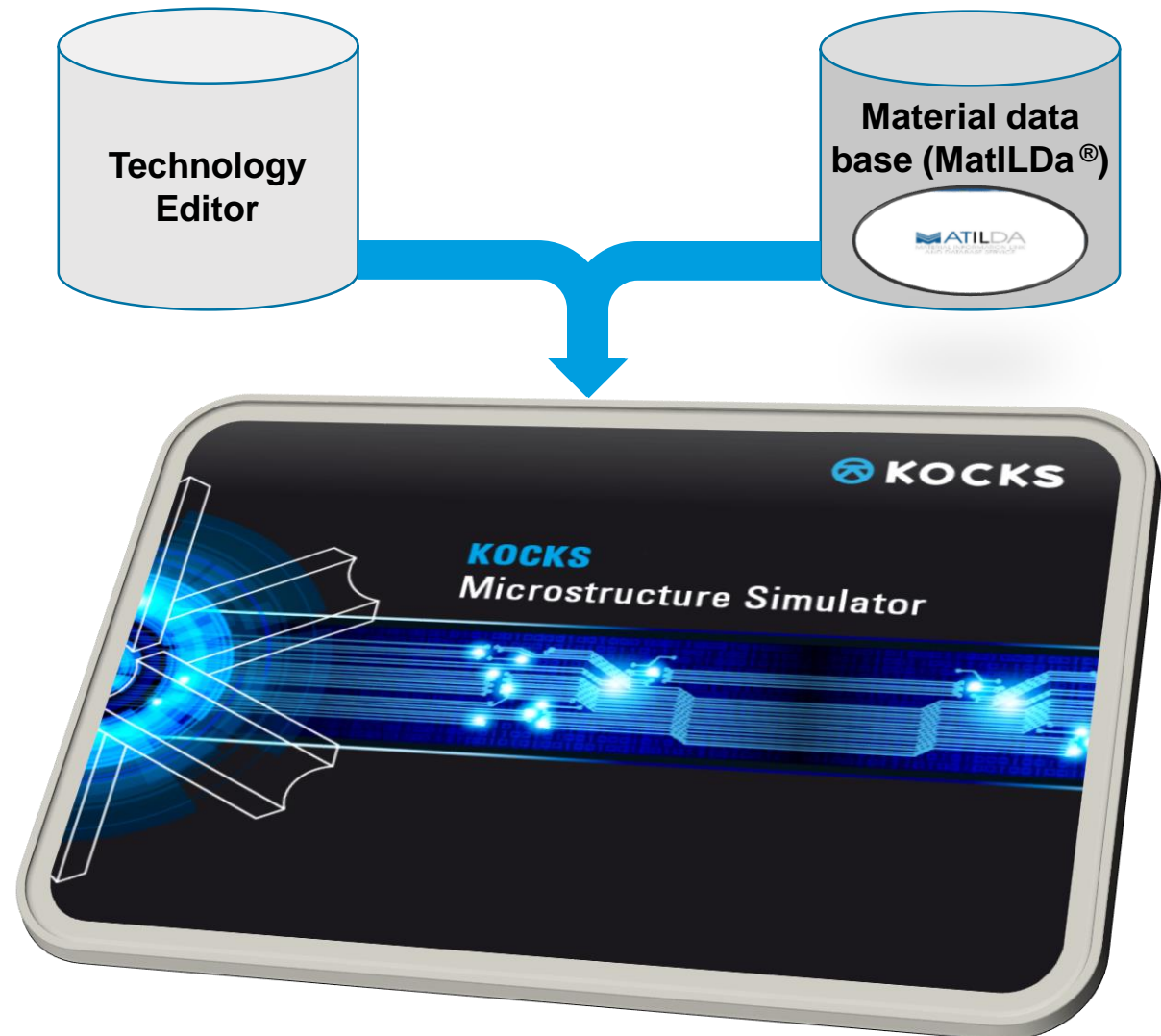
We make your product **gold**

- Simulation for wire rod, bar and tube mills
- Semi-empirical model for the calculation of microstructure and mechanical properties
- Integration of the 3-roll technology



# MatILDa Material Information Link and Database Service We make your product gold

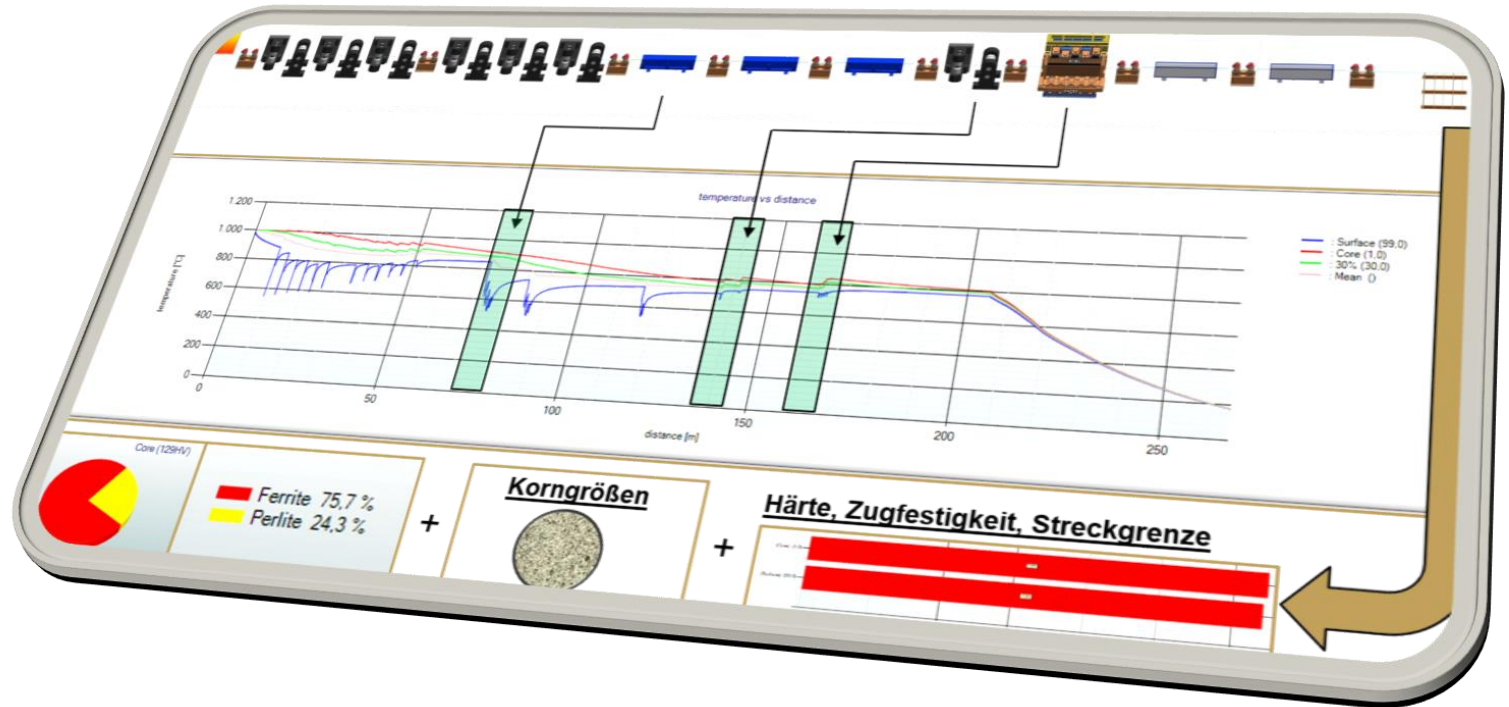
- Extensive material archive with customer specific and flexible build-up
- Comprehensive visualization functionalities
- Possibility for individual extension
- Open interface for data exchange

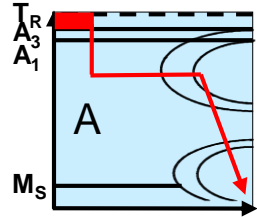
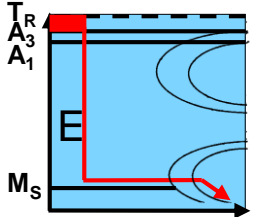
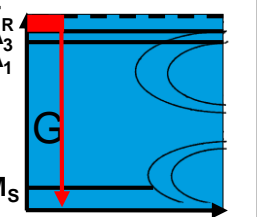
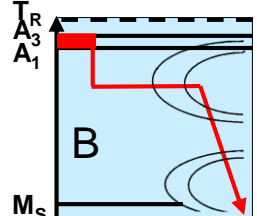
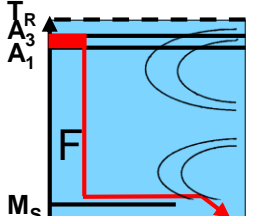
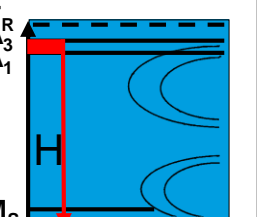
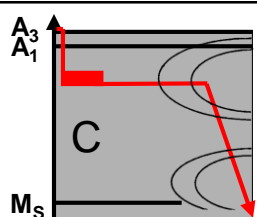
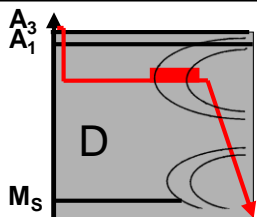


# KMS – KOCKS Microstructure Simulator

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- Temperature Process Calculation
- Grain Size Calculations
- Calculation of phase transformation
- Calculation of mechanical properties



Forming		Transformation into pearlite area	Transformation into bainite area	Transformation into martensite area
Normalising Rolling	Before phase transformation In stable area	$T_F > T_R$ 		
		$T_F < T_R$ 		
Thermo-mechanical Rolling	Before phase transformation In meta-stable area			
				

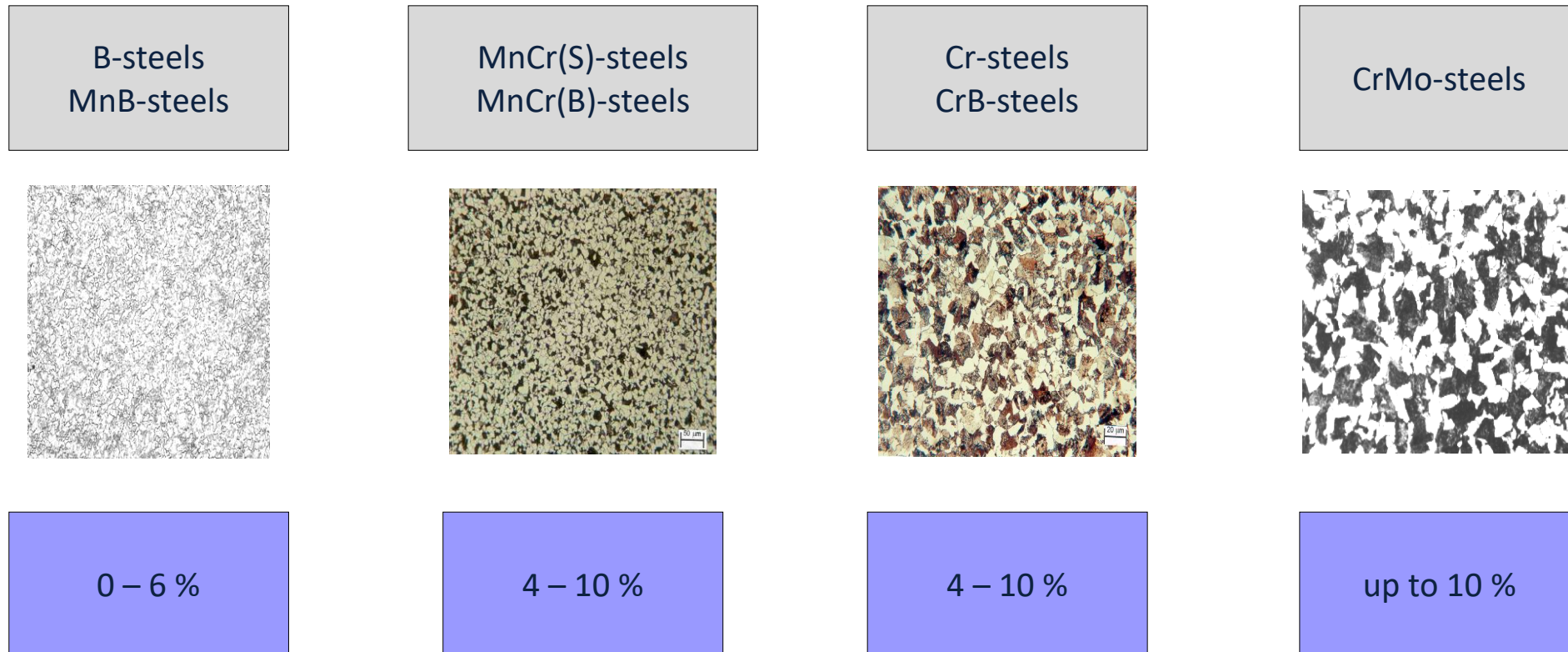
**A/B** = Temperature controlled rolling (normalizing rolling) into ferrite/pearlite phase

**C/D** = Thermo-mechanical rolling into ferrite/pearlite phase

**E/F** = Temperature controlled rolling (normalizing rolling) into bainite phase

**G/H** = Quenching and tempering process (QT) and direct hardening process. Controlled rolling into martensite phase

## Possible tensile strength reduction for different cold heading steel grades produced by thermo-mechanical processing

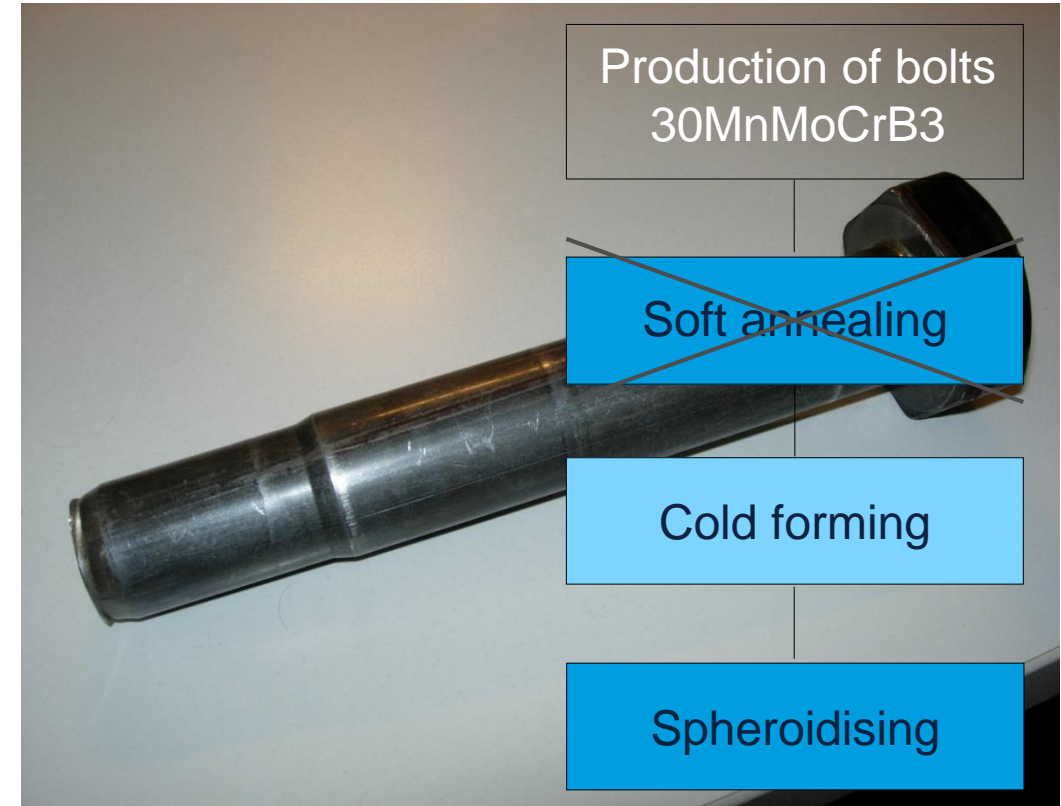





# KMS today's process application


We make your product gold

Temp. [°C]	Y. S. [MPa]	U. T. S. [MPa]	EI. [%]	R.o.F. [%]
AR + annealing	—	600	—	60
850	502	817	14.5	37
800	473	763	18.9	51
750	405	741	20.3	57





Products
Prod. Queue
L1 Mods
Events



Know-how for tomorrow

1001 - hot-diameter 17,25mm CSC
← NEXT
1001 - hot-diameter 22,33mm CSC
←
SCM435 - hot-diameter 36,5mm CSC
←
SUP10 - hot-diameter 22,33mm CSC
←
20NiCrMo2 - hot-diameter 17,25mm CSC

**Products**

new edit copy delete

Q Search...

- 1001 - hot-diameter 17,25mm - LTR-800
- 1001 - hot-diameter 17,26mm - NR
- 1001 - hot-diameter 18,27mm - LTR-800
- 1001 - hot-diameter 18,27mm - NR
- 1001 - hot-diameter 19,28mm - LTR-800
- 1001 - hot-diameter 19,28mm - NR
- 1001 - hot-diameter 19,79mm - LTR-800
- 1001 - hot-diameter 19,79mm - NR

Product Name: 1001 - hot-diameter 17,25mm - LTR-800

Variant Name: CSC

Cold Diameter (after RSB)[mm]: 17.00 Finish Speed [m/s]: 13.85

Cooling Line 1 Cooling Line 2

	WB1	WB2	WB3
<b>General</b>			
Master:	WB1 -		
	CN1: <input type="button" value="Off"/>	CN1: <input type="button" value="Off"/>	CN1: <input type="button" value="Off"/>
	CN2: <input type="button" value="Off"/>	CN2: <input type="button" value="On"/>	CN2: <input type="button" value="Off"/>
	CN3: <input type="button" value="On"/>	CN3: <input type="button" value="On"/>	CN3: <input type="button" value="Off"/>
	CN4: <input type="button" value="On"/>	CN4: <input type="button" value="On"/>	CN4: <input type="button" value="Off"/>
<b>Feed-Forward</b>			
Active:	<input type="button" value="On"/>		
Pyrometer No.:	1 -		
Entry Temperature [C°]:	919		
	CN5: <input type="button" value="On"/>		
	CN6: <input type="button" value="On"/>		
<b>Feed-Backward</b>			
Active:	<input type="button" value="On"/>		
Pyrometer No.:	4 -	Flow [m³/h]: 119.0	Flow [m³/h]: 90.0
Exit Temperature [C°]:	802		Flow [m³/h]: 0.0

05/11/2015 - 13:31:28    Current Language: en-GB    Current User: Operator    Version: 0.18.0.2

OPC
DB
MoM
SRV

[Mtr] Warning 014 - MTR Simulation

Know-how for tomorrow

Product: <b>Copy of 100Cr6-25mm-800C at 20/1/2015 14:24:48</b> Variant: <b>Copy of max</b>	Next Setup Pending	<b>Water Cooling Line 1</b> Manual Mode Feed-Forward Feed-Backward ON/OFF Cycle Water Cooling Permit	<b>Water Cooling Line 2</b> Automatic Mode Feed-Forward Feed-Backward ON/OFF Cycle Water Cooling Permit	<b>Global</b> Rolling Mode Maintenance Mode Local Permitted   Roll Stop Emergency Stop Ready To Roll
Finish Diameter (cold) [mm]: <input type="text" value="+25,000"/> Finish Speed Set [m/s]: <input type="text" value="5,99"/> Finish Speed Act [m/s]: <input type="text" value="0,00"/>	Uncooled Head WCL1 [mm]: <input type="text" value="0"/> Uncooled Head WCL2 [mm]: <input type="text" value="0"/> <input type="button" value="Send Modification"/>	Finish Diameter (cold) [mm]: <input type="text" value="+0,000"/> Finish Speed Set [m/s]: <input type="text" value="0,00"/>	Uncooled Head WCL1 [mm]: <input type="text" value="0"/> Uncooled Head WCL2 [mm]: <input type="text" value="0"/>	

### Water Box 1

MTR Event Basic Control On

SET Pos. **Strand 1 Position** Set Pos. mm **+22,4**

Act Pos. **Strand 1 Position** Act Pos. mm **+22,4**

**Locked**

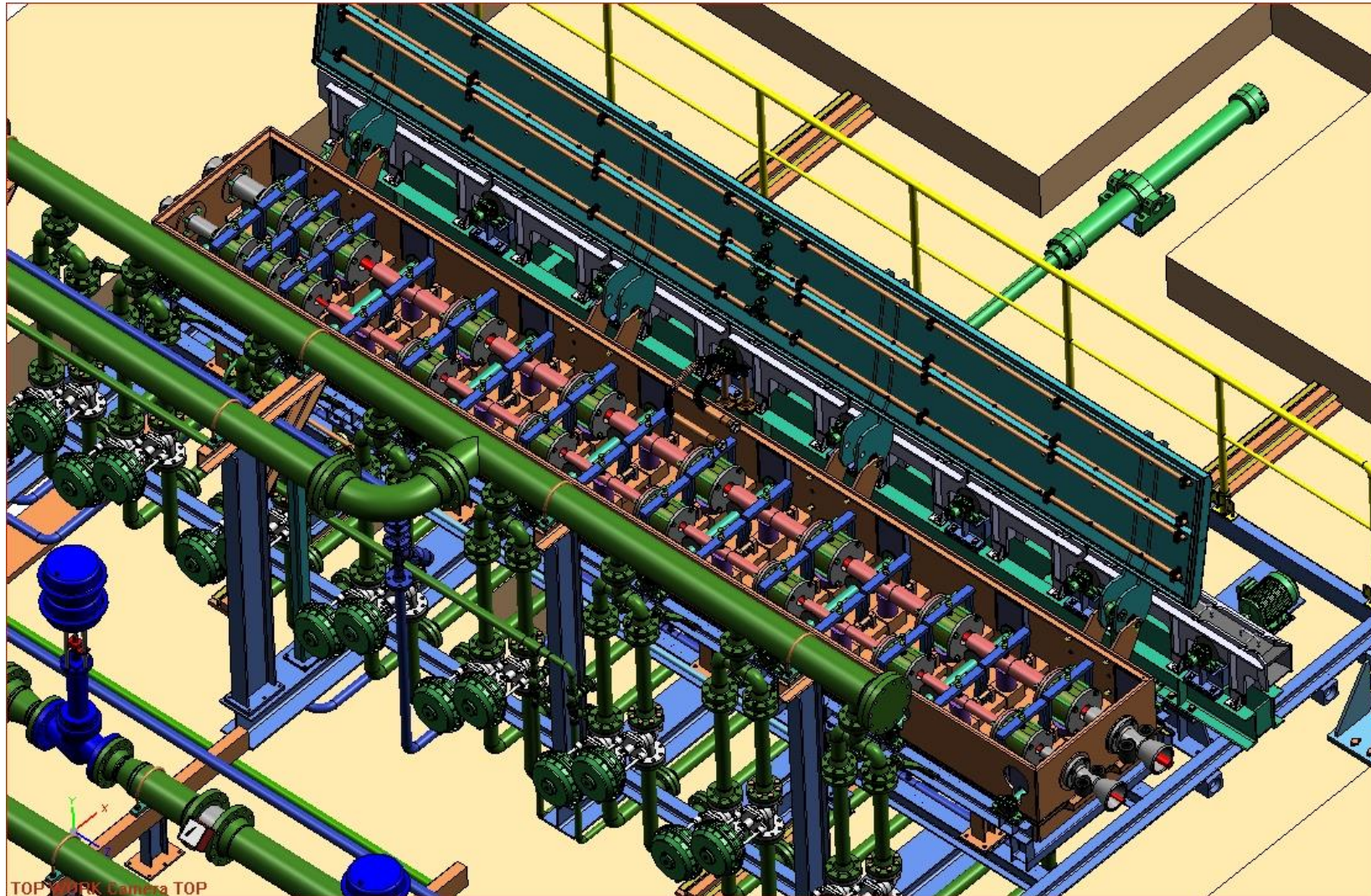
**Cover Closed**

Menu
Overview
Water Box 1
Shifting Unit

09/03/2015 08:40:01 Configuration loading complete
Level 2
Profinet
Profibus
Master HMI
V1.0.0.0

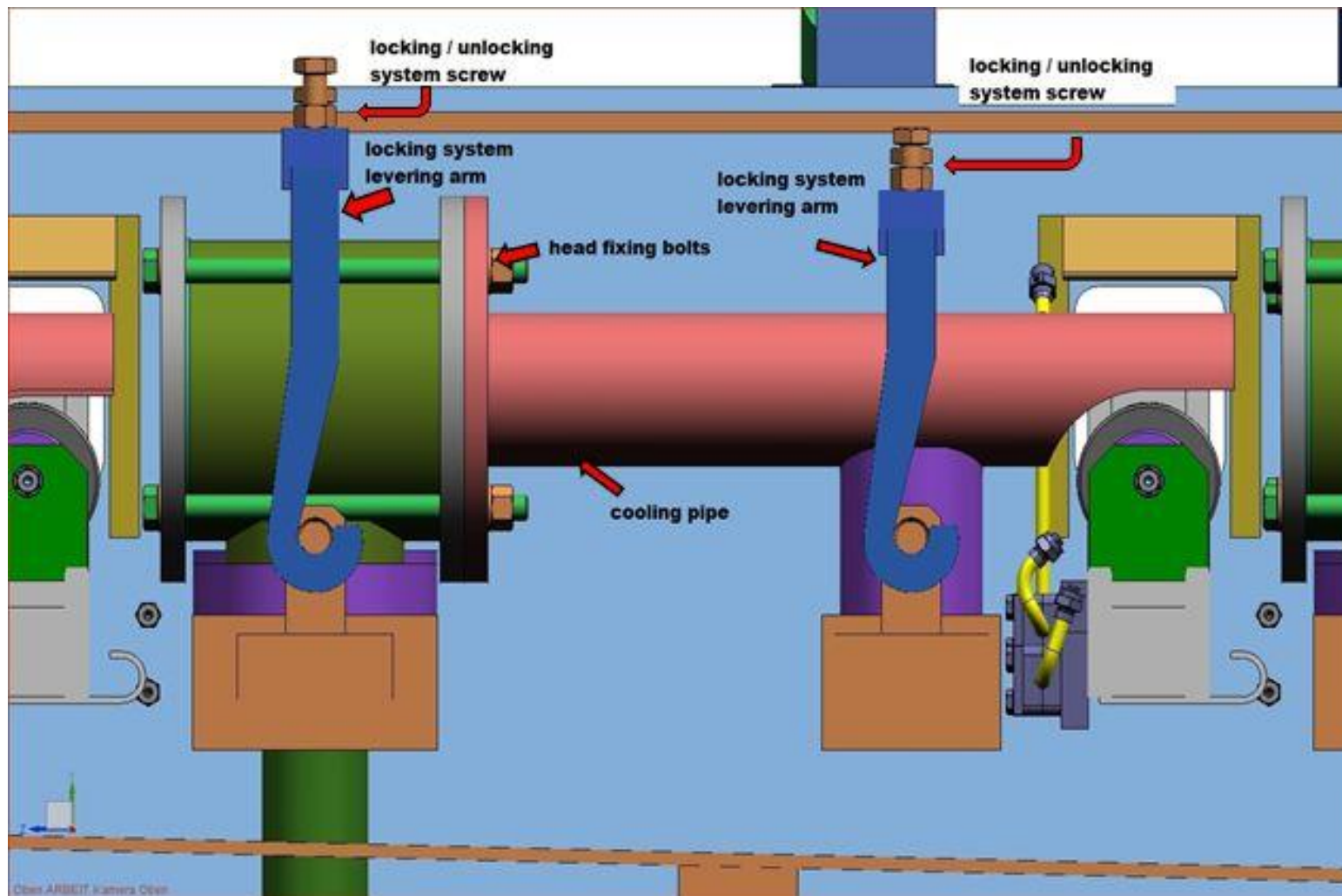
# LTR design

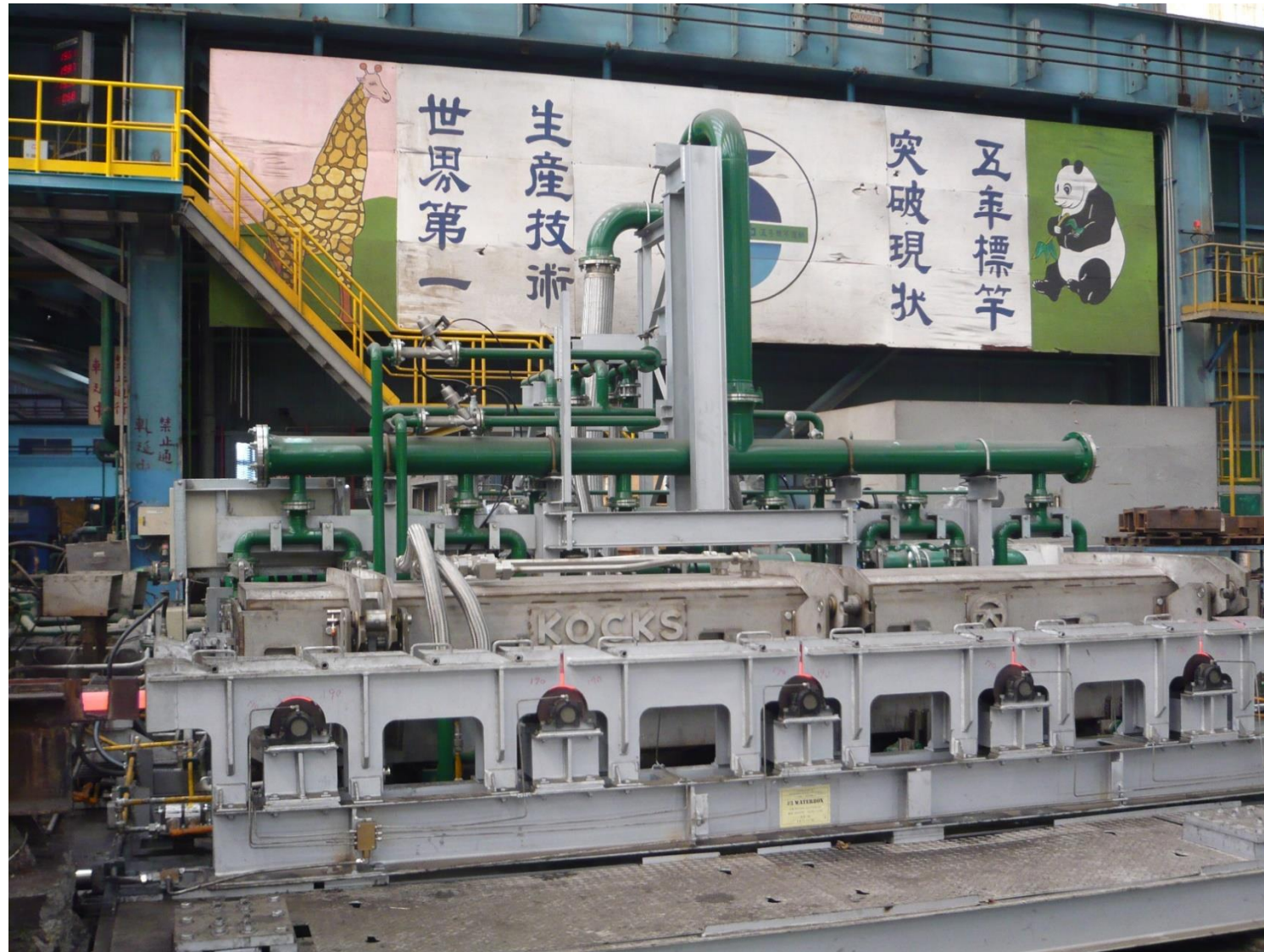
We make your product gold



# LTR design

We make your product gold











**We deliver what we promise**



**We make your product gold**