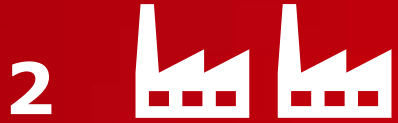


Danfoss Trata Digitalizacija delovnih procesov in kibernetska varnost v povezavi s kakovostjo

Klemen Kindlhofer, 10. 12. 2024



29 years of Engineering Tomorrow



2

Factories: Ljubljana, Kamnik

164



million EUR net sales in 2023

561



avg. number of employees in 2023

119,520

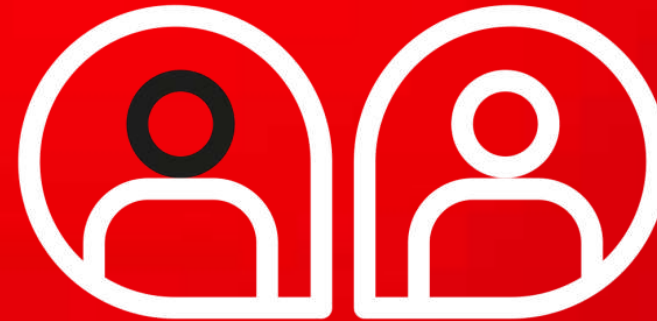


EUR value added per employee in 2023

Danfoss Trata is built on 4 pillars

Great place to work, ESG, Innovation, Smart factory.
Digital transformation is embedded in the pores of all four pillars.

GREAT PLACE
TO WORK



ESG

digital transformation

INNOVATION



SMART
FACTORY

Portfolio (Part of)

Leanheat SW



**Electronic Controllers
ECL Comfort**



**Motorized
Control Valves**



**Differential Pressure
and Flow Controllers**



**Temperature
Controllers**



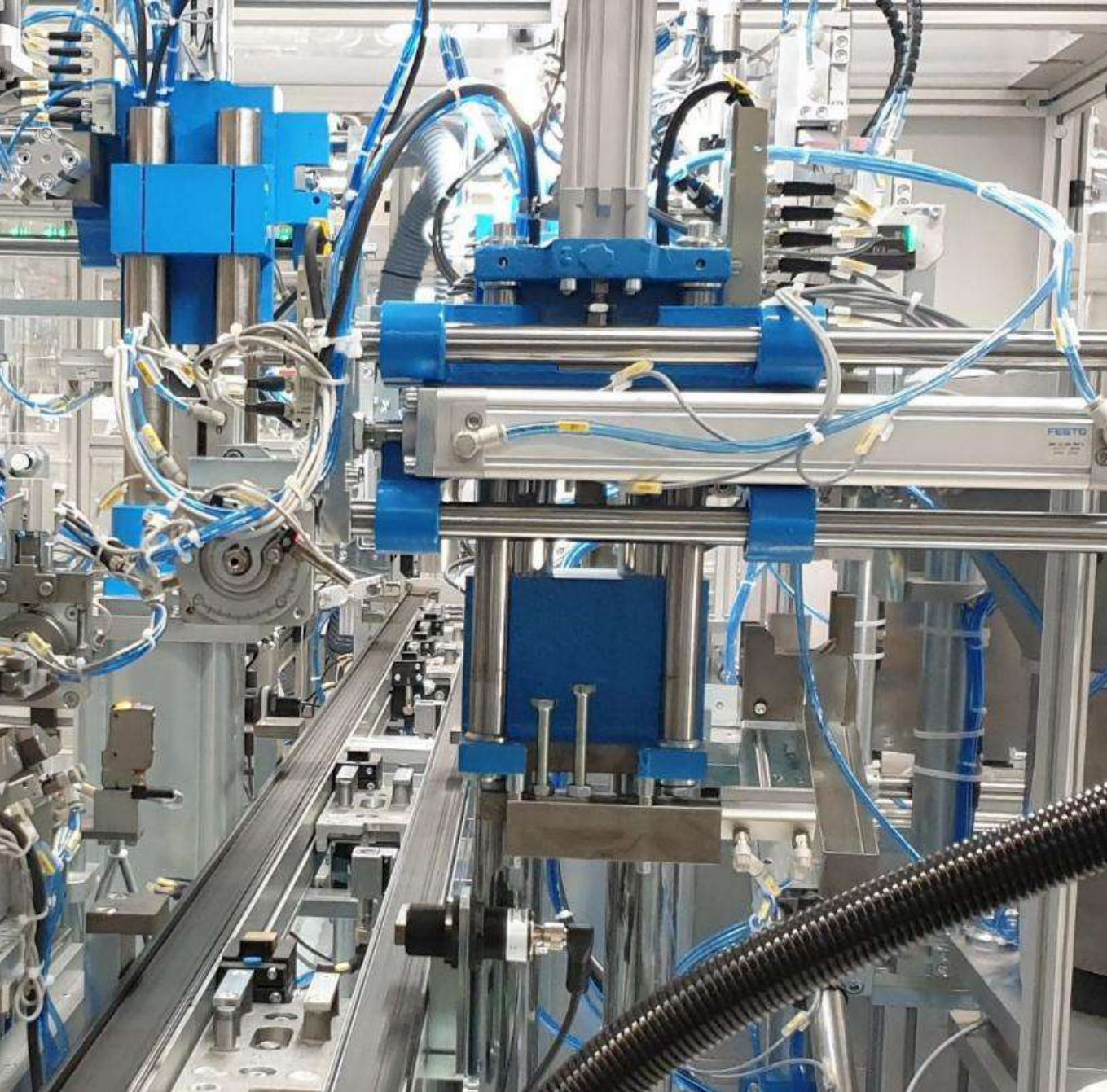
Line Components



Substations



**Heat & flow
Meters**



Cilj prezentacije je predstaviti:

- Danfoss Trato in delovne procese
- Proizvodno IT strukturo
- Vplive digitalizacije na izboljšanje kakovosti v splošnem in s praktičnimi primeri

Facts about Danfoss **Trata Manufacturing**

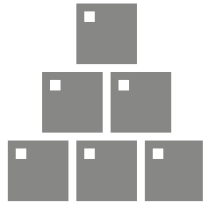
High complexity & flexibility – all produced in 3 days!



7.000

Number of
Materials
3000
Products
4000 Raw
Materials

HI



125

Average
Production
Order Size

LOW



270

Average
number of
Production
Orders per Day

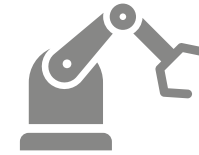
HI



≈ 200

Number of
Operators in
Production

HI



65

Assembly
Cells

17

CNC
Machines

27

Robots

HI



3

Days
Production
Order Takt
Time

LOW

Digitalization: Horizontal & Vertical System Integration (E2E)

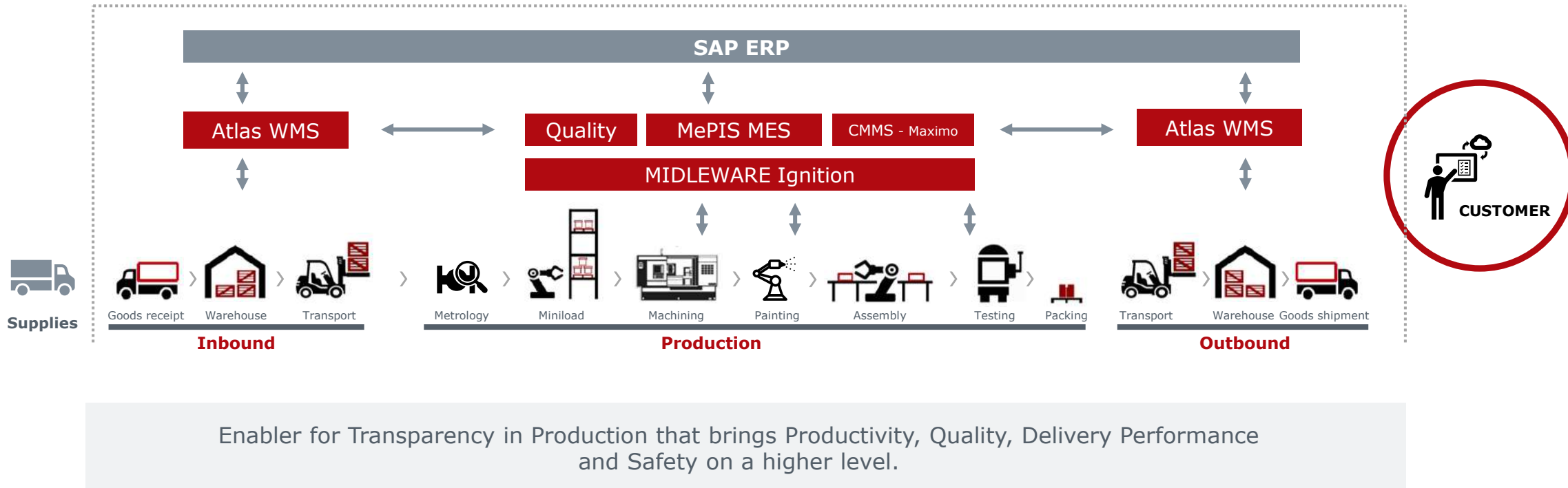
4

3

M

1&2

ISA 95



Design: DPS

IBM
MAXIMO

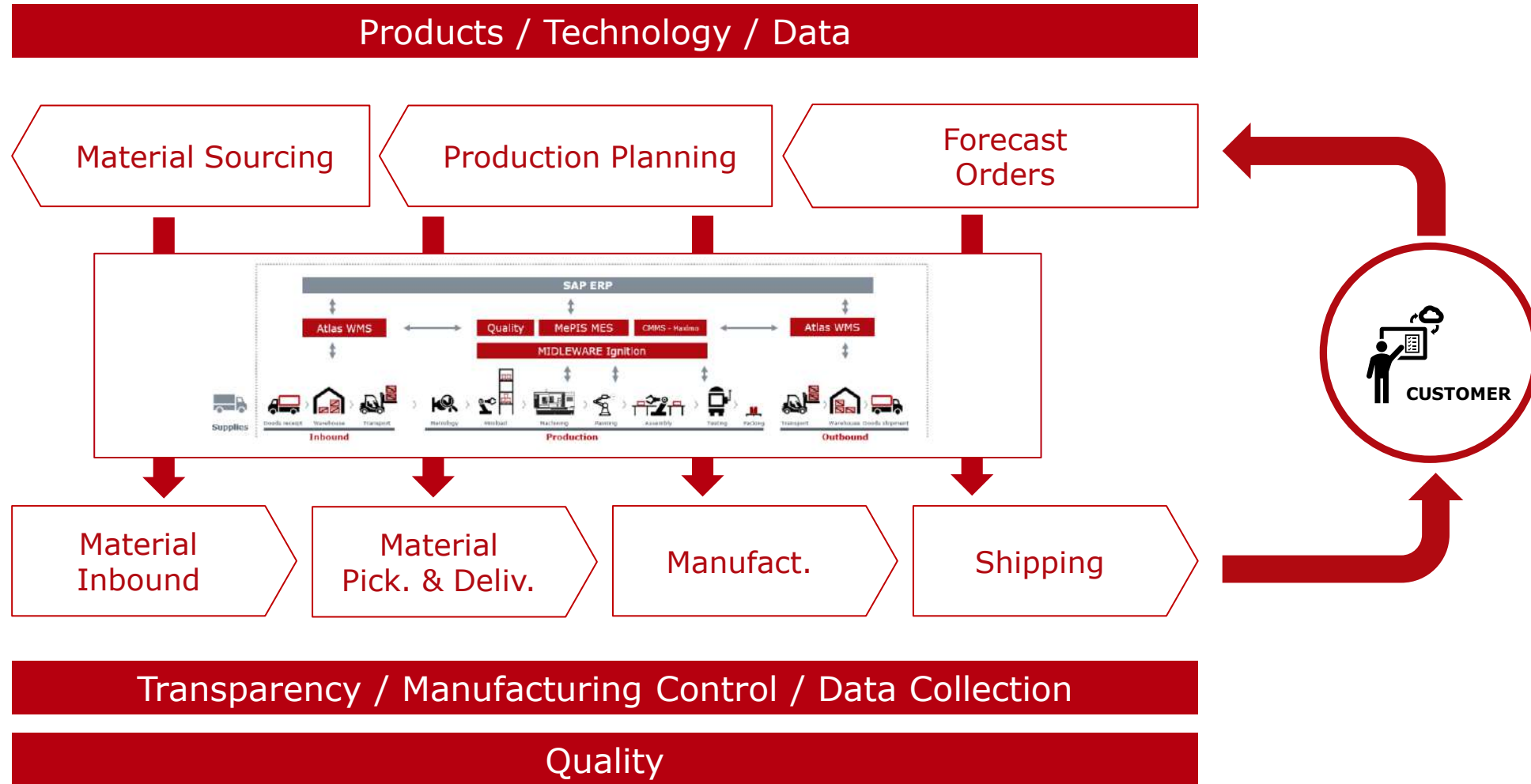
SAP S/4 HANA

MePIS MES

WMS atlas
LOGISTICS IT SOLUTIONS

Ignition
To industrial automation

Digitalization: Horizontal & Vertical System Integration (E2E)



Production Planning



Paperless transfer of data in Manufacturing

SAP and Production are connected.

Data from production order are distributed from SAP to the MES system and through MES to the systems on the level 1 and 2.

Available to:

- all departments in charge
- operators
- managers

Material Picking & Delivery to Manufacturing



Digitalization enables the new way of Manufacturing

1. **Warehouse** Automation Integration
2. **AMR** Integration
3. Visibility when the Material is prepared for PO
4. Transparency on where the material is located

[illegible]

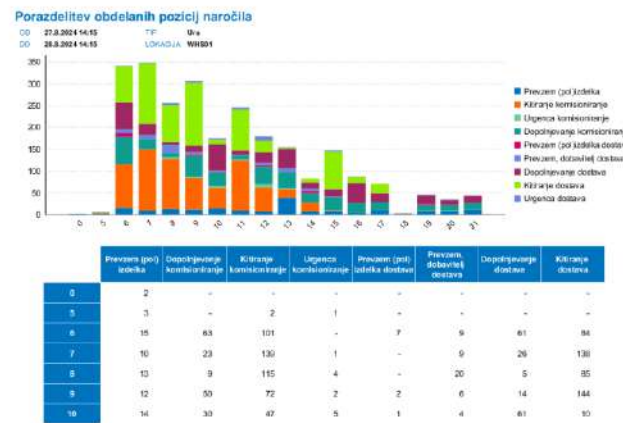
- Integrated WMS system
- Use of Scanners for activities and confirmations
- Inbound data in the system (packing qty, box type,...)
- Picking Lists created when PO is released
- Fast Line to deliver urgent materials triggered by Manufacturing through MES
- Paperless Annual Stoc Taking

Mobilni vmesnik

NABIRANJE

SU/Vsebnik/Lokacija

Referenca 000000000189566820
Opis Embalaža kart. 191x191x91
Prod. nal. 22548610
SU **3512368**
Vsebnik **100000000016126816**
C-J-02-01
Kol. **60 KOS**
Ostala kol. **0 KOS**
Kol.rasp. **507 KOS**
Nasvet
Miza



Manufacturing & Manufacturing Control



Manufacturing & Manufacturing Control

Production - Operator
MISWeb 3 - Production - Operator Operator main

Production - Leader Production - Operator Support SPC Analytics Master data System Master Data Sign Out Help

Operator main

Line: PO-MW112 Date from: 12/16/2023 6:00 AM Date to: 6/23/2024 6:00 AM Workorder

No data

Operator main

Production

Consumption

Logistic

Downtime / Deviation

Workorder operation

Status	WO code	Oper.	Split	Article code	Article name	MM	Qty. plan	Qty. prod.
45-Proizvodnja	21230265	0001	1	082H8057	AME 110 NL 24V/24s/130N	PCE	480	330
45-Proizvodnja	21223634	0010	1	082G3093	AMV 150 230V/24s/230N/1- pack	PCE	360	
45-Proizvodnja	21256921	0001	1	082H8060	AME 110 NLX 24V 24s/mm 5,5mm 130N	PCE	240	
45-Proizvodnja	21247231	0001	1	082H8057	AME 110 NL 24V/24s/130N	PCE	600	
45-Proizvodnja	21237649	0010	1	082H8043	AMV140 H 230VAC	PCE	1	
45-Proizvodnja	21237646	0001	1	082H8060	AME 110 NLX 24V 24s/mm 5,5mm 130N	PCE	240	

Operator's view:

- Production order status visible for the operator
- Manual or automated status reporting

		Q		Q	Q	Q		Q	Q	Q
	40-Nastavitev	21256334	0020	1	88631263	NOH Ohsje prekatno D 45 250 07043	PCE	53		
	45-Proizvodnja	21236685	0010	1	003Z0773	AB-QM DN65 PN16 3N	PCE	32	8	
	45-Proizvodnja	21195308	0010	1	003Z1212	AB-QM DN15 z m.priključki	PCE	120	24	
	45-Proizvodnja	21225748	0001	1	082H3041	AME 25 SU-24V 15s/mm-450 N	PCE	16	7	
	70-Končan	21213859	0020	1	003G5516	AFQM 2 PN25 80/80 /0,2 flange flow/ret	PCE	2	2	
	70-Končan	20718234	0030	1	84607910	Termostat 5,0M vezn. cevi. T6E brez zasč	PCE	20	20	
	70-Končan	21197569	0015	1	003L7643	ASV-I DN 25 INTERNAL THREAD	PCE	114	114	
	70-Končan	21219073	0010	1	06583058	VFM 2 PN25 25/10 prirobnici	PCE	3	3	
	50-Prekinjen	21177385	0020	1	88820440	PRI Ohsje ventila prir. DN40 GGG	PCE	200		
	70-Končan	21160631	0010	1	003Z1022	MTCV modul C verzija	PCE	108	108	
	70-Končan	21245563	0010	1	88837960	Drocnik AVPB-T - podsestav	PCE	10	10	
	70-Končan	21245424	0012	1	89128010	Termostat TPC - sestav	PCE	280	280	
	70-Končan	21236287	0010	1	06582405	Ventil VFG 2 DN40 PN25 Kvs 20	PCE	2	2	

Supervisor's Overview on Production Orders:

- Visible in MES
- Linked and registered in ERP

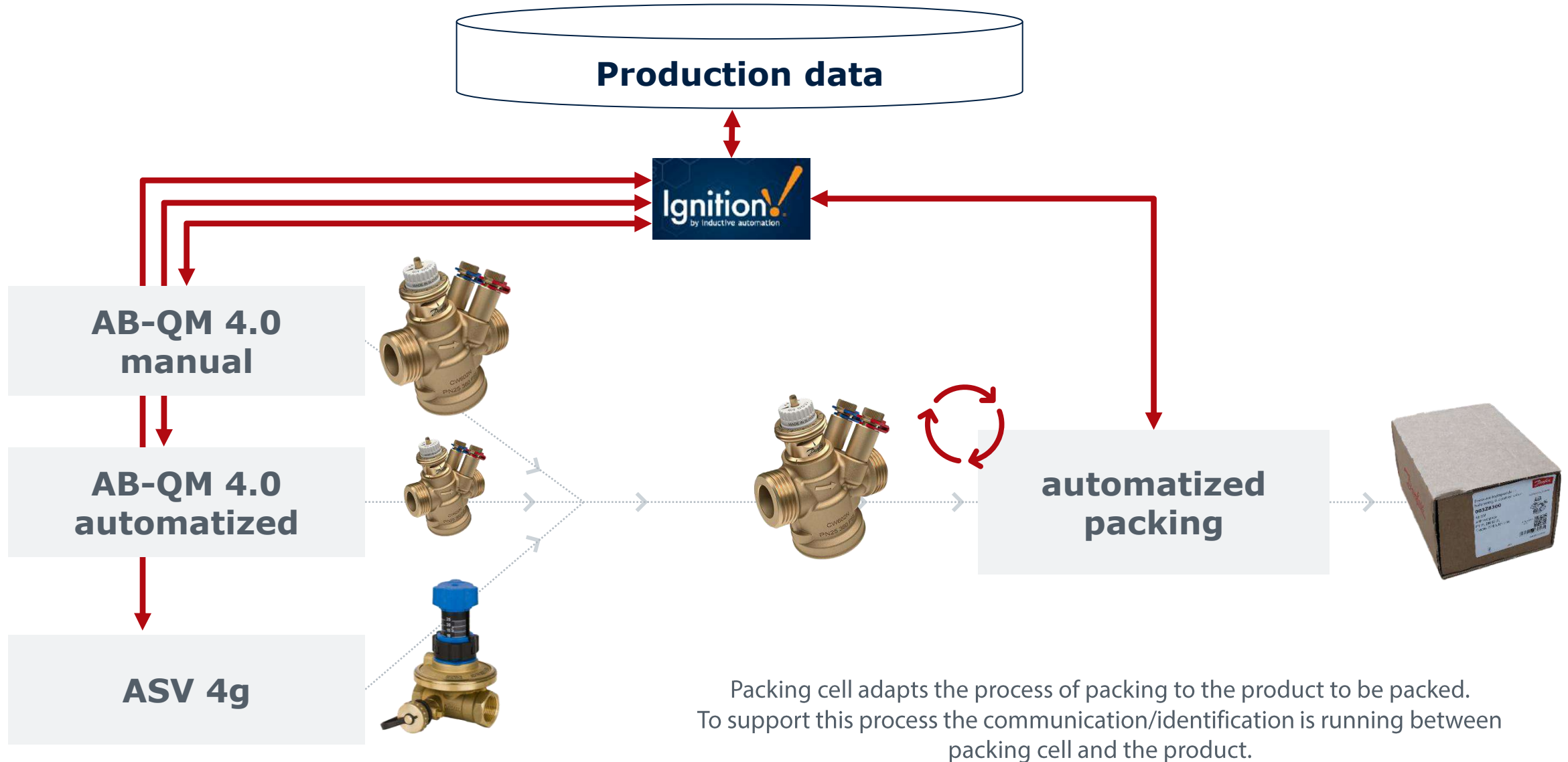
Danfoss Trata Manufacturing



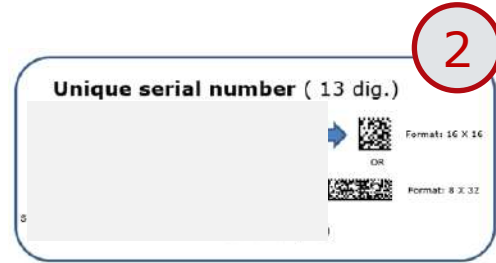
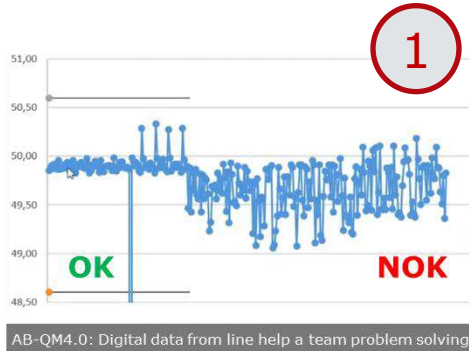
Digitalization enables the new way of Manufacturing

Process Integration

Automatization & Digitalization: Conect Cells into Systems



Danfoss Trata Manufacturing



Digitalization enables the new way of Manufacturing

1. Process Control parameters traced allowing only good products to continue the process.
2. Serial numbers enable us to track back the process parameters if needed - traceability
3. Information available to the operators
On-line Events are registered and could be traced

Digitalization in Manufacturing:

4. Improves our quality of life
5. Transforms our environment into a transparent and organized space
6. Reducing stress and fostering well-being.

Danfoss Trata Manufacturing Recipe Management Q case

Previous



Solution

Set the process parameters under control and build a common database of Manufacturing parameters.

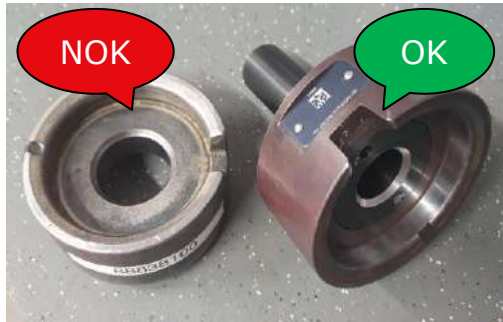
- Avoid mistakes, **improve Quality**
- **reduce** maintenance **time** of the engineers
- **increase robustness** of the system

Before the implementation recipe data was decentralized (each production line had its own location (excel file, USB key, PLC, etc.)

Tools process verification

Was state

RISK: Using wrong tool for product assembly



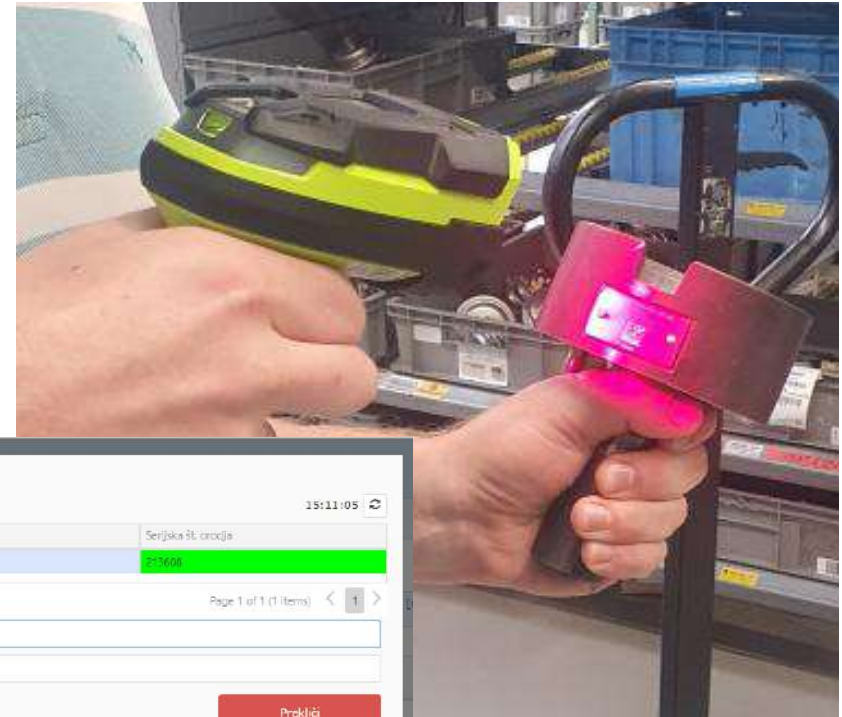
PREVENTION: Visual control of the operator



Kontrola točke:
KONTROLA: 10.1: preveriti, če so nameščena orodja za robljenje skladna z kodo spodnjega dela
- glej SI Stiskalnica 100t
KONTROLA: 10.2: V stiskalnici mora biti nameščen vložek z vratom (Oznaka 88843590)

Solution

- Tool scanning before PO start
- Automatic tool verification in Mepis



Serijska št. orodja Scan orodij 15:11:05

Naziv orodja	Serijska št. orodja
IKET pripomoček za orientacijo drage	88843590

5 10 20 50 Page 1 of 1 (1 items) < 1 >

Serijska št. orodja

PIN šifra

Potrdi Prekliči

Label Printing

Was state

Not secure | labelinterface.danfoss.net/DataInput.aspx?ProfileID=a59a9c68-4123

Home | Productstaging | Kal | Renedforce | 1BRP Program Team | Google Overcast | Data Stewardship ...

Danfoss Intranet Label Printing Interface

Home | Stermap | About

Danfoss REDAN Production Labels - Enter label data

Code no.

Prod. Order No.

OrderSize

Sales Order No.

Customer Mat. No.

VDFYFLES ALTD VED VOLF PRODUKTION, SEAR NA EN 1 PROD GRADEN

Material Serial No.

[Print Label](#) [Clear](#) [Add to queue](#) [Show job queue](#)

Solution

[illegible]

Solution - Description:

- Labels are printed from MES
- Label data automatically synced from SAP
- All data automatically loaded for released production orders
- Possibility to print from central printing are or online printing
- Possibility to trigger printing from equipment
- Printing controls based on PO qty, status, additional rules
- Traceability

Benefits:

VC reduction:

Automation Ratio:

Investment: 60.000 EUR complete MES

Project Team: Miha Ferjan, Boris Rustja, Mathilde

Alstedmark, Steffen Torp

Time of Implementation: 1 year (Complete MES)

Trata Packing unit in Shipping Department

Was state



Plant: Trata, Ljubljana

Status: Finished

Solution - Description:

fully automatized process of wrapping and labeling pallets of finished products

The operator will load the pallet on the conveyor belt and then the device will automatically transport the pallet to wrapping machine and labeling.

Labels printed on-line.

After that the conveyor belt will transport pallet outside the production where the pallet will wait for loading on a truck.

Ergonomy and safety upgrade, Further fully automatized Shipping possible.

Solution



Benefits:

VC reduction: How Much in % and 57.223EUR annually

Automation Ratio: 33% in shipping dpt. 1960 hours saved annual (from 3 to 2 FTE)

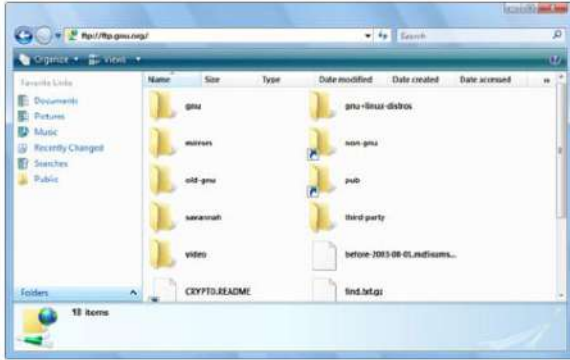
Investment: 167.300EUR

Project Team: Jure Bezjak, Martin Štular (Marko Šimnovec)

Time of Implementation: one year

Tuchom HD Station: Custommer On-Line Documentation

Was state



Solution



Plant: Tuchom

Status: In progress

Solution - Description:

- ETO Documentation portal on WEB
- Accessable by product end users
- Security on customer level
- No need to print physical documentation
- Access by scan of QR code on the product
- Documentation always available to end user

Benefits:

VC reduction:

Automation Ratio:

Investment:

Project Team: Boris Rustja, Michal Rozkowski, Lukasz Morawski

Time of Implementation: 6 months

Multi pack serial number

Solution



Was state

Each product has a unique serial number. Once packaged, the serial number is not visible on the packaging. We do not know which multi-pack it is in. Finding a specific product takes a lot of time as all boxes need to be opened.

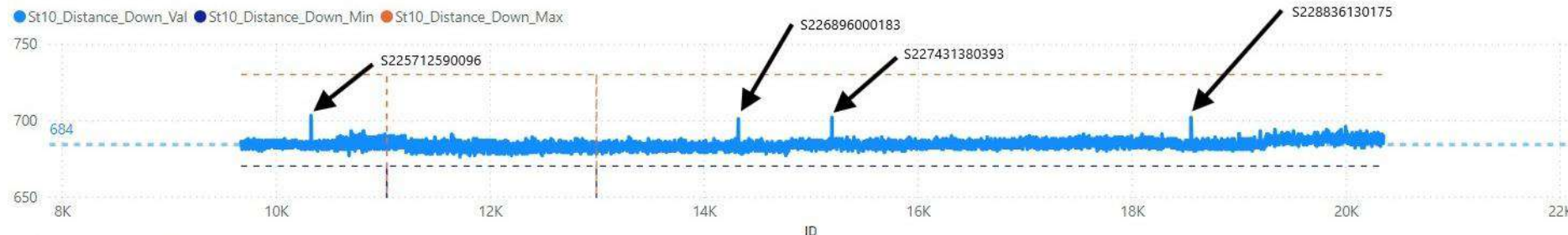
Solution - Description:

Each product has a unique serial number, which is printed on the label of individual packaging. Each multi-pack has its own serial number, allowing for traceability. We store in the database which products each multi-pack contains

Benefits:

Enabling quick search of a product with a specific serial number.
In case of a recall from the CDC, the recall can be executed for specific serial numbers.

St10_Distance_Down



Danfoss Trata Manufacturing Control

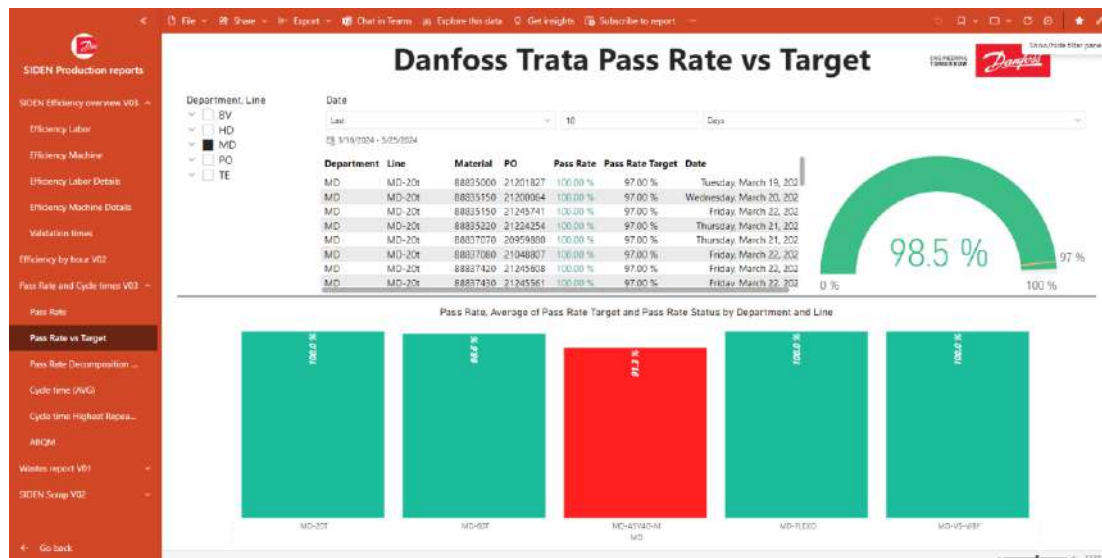


Production control:

- Real time follow up of production
- Reports tailor made for different users
- Efficiency
- Waste recording
- Analytics in PBI
- Operators have On-line access to follow performance

On the basis of the data collected:

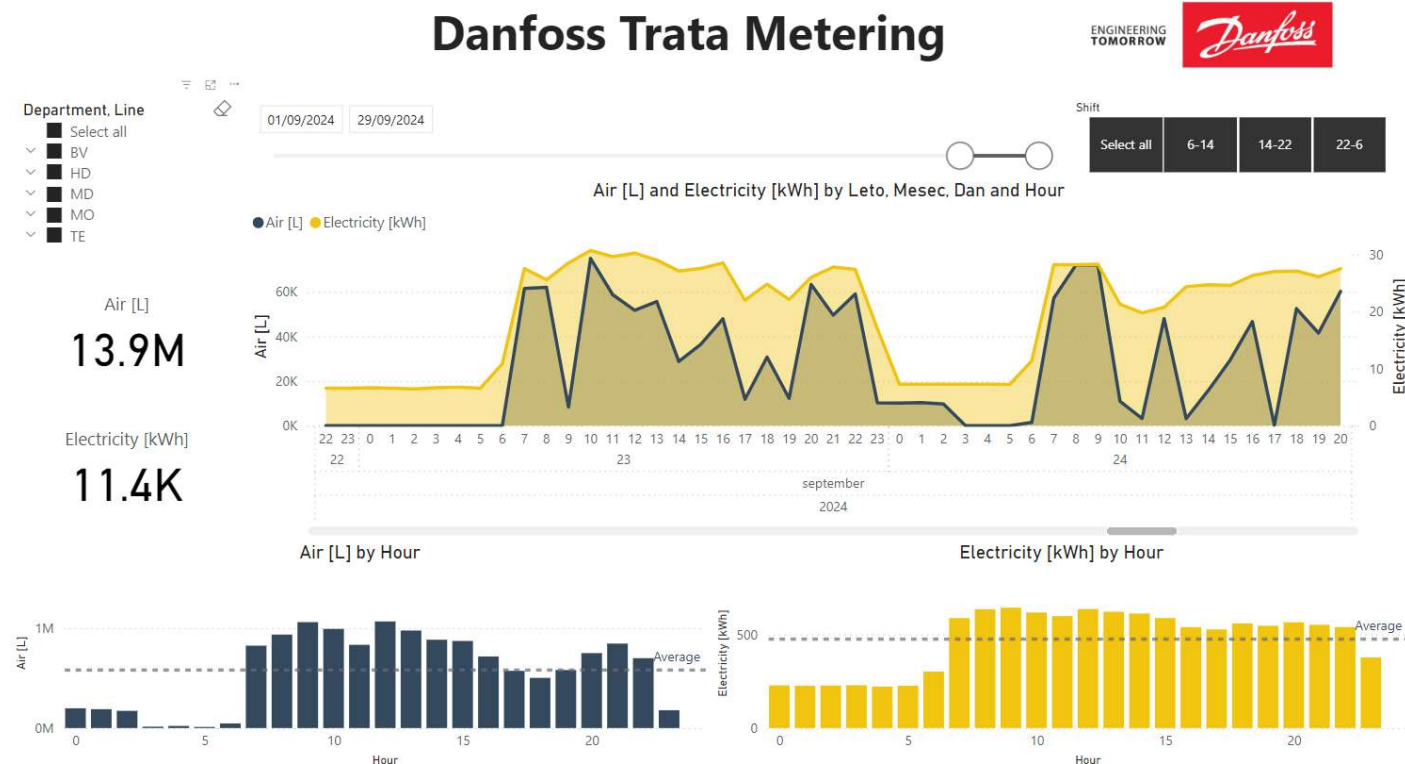
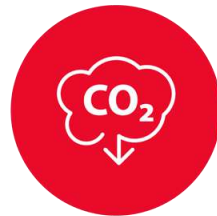
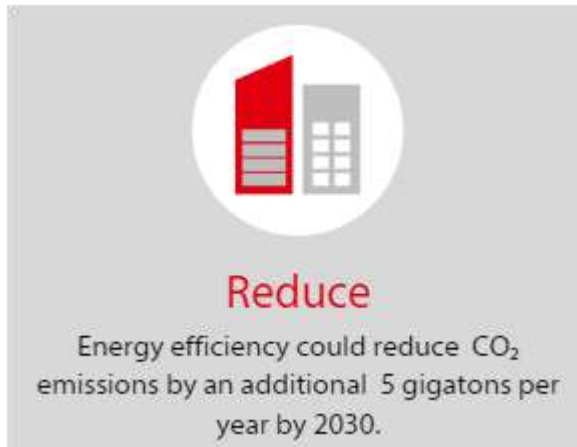
- Analysis of the current state are made
- **Improvement activities** are planned



Danfoss Trata Manufacturing Energy Monitoring

Energy consumption control:

- Near real-time energy consumption monitoring
- Efficiency control
- Analyze and detect energy spikes -> wastes optimization
- Reduce CO2 emissions per part produced
- Strive for greener production

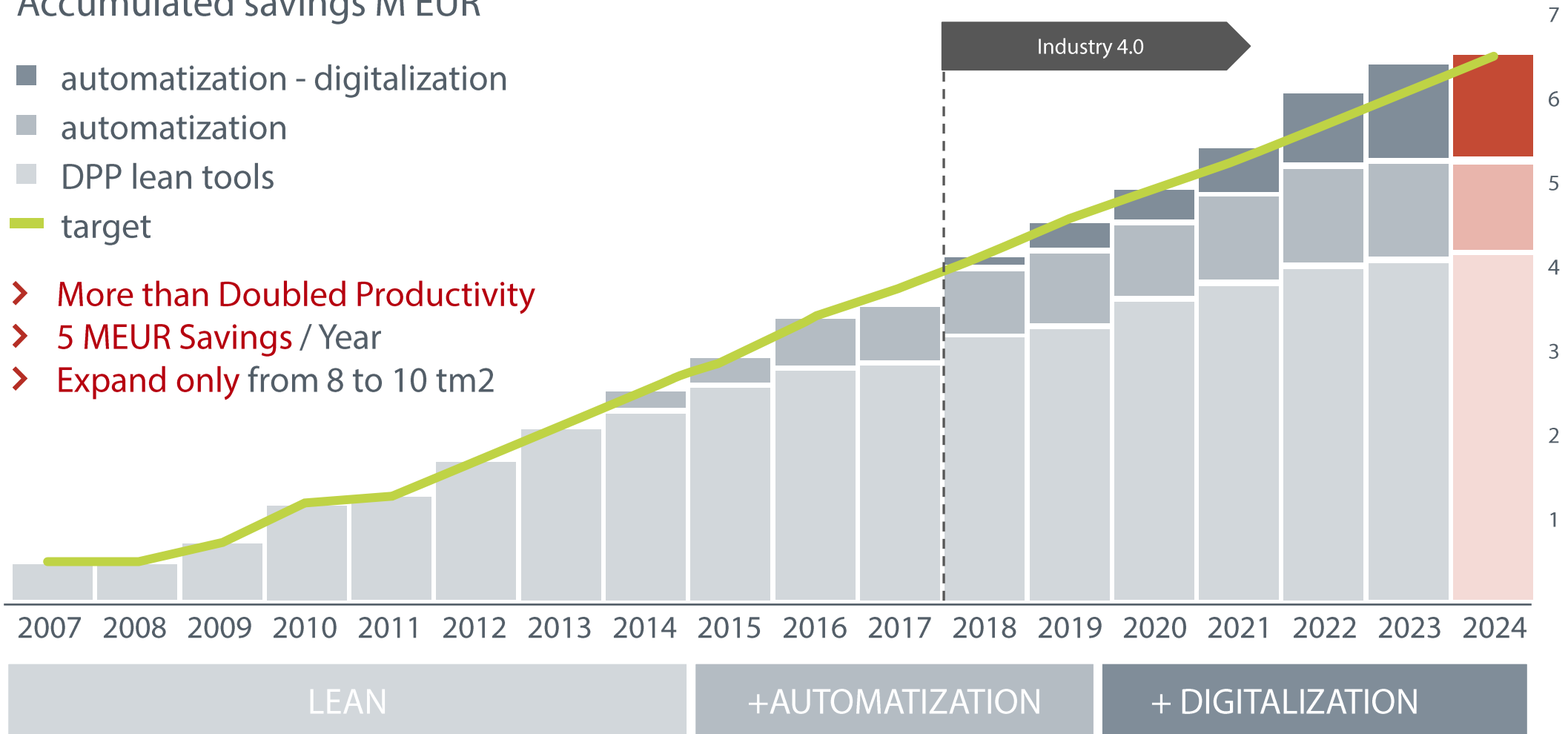


Automatization & Digitalization bring results - SIDEN

Accumulated savings M EUR

- automatization - digitalization
- automatization
- DPP lean tools
- target

- More than Doubled Productivity
- 5 MEUR Savings / Year
- Expand only from 8 to 10 tm²



Quality Performance – Production

Sum of QTY

Received claims (2022-2024 YTD)
per years

Increased efficiency

Less outdated or duplicated data.

Faster
responsiveness

Reduced costs of non-
compliance and risk mitigation.

Automation of
repetitive tasks

Savings in the development and
integration of advanced technologies.

Improved data
accuracy and integrity

Less production
stops and delays.

Document version
traceability

Data centralization and
transparency

Easier implementation
of AI and ML

Release of human
resources

Easier transfer of
organizational knowledge

Fewer errors due to
incorrect versions.

Less outdated and duplicated data

Reduced training costs.

Improved data protection
and archiving

Less incomplete data, less
repeated measurements.

Faster data collection.

Easier regulatory oversight

Fewer mismatched
requirements, inconsistent data.

Less data
fragmentation.



ENGINEERING
TOMORROW