How digital innovation creates added value for your business!

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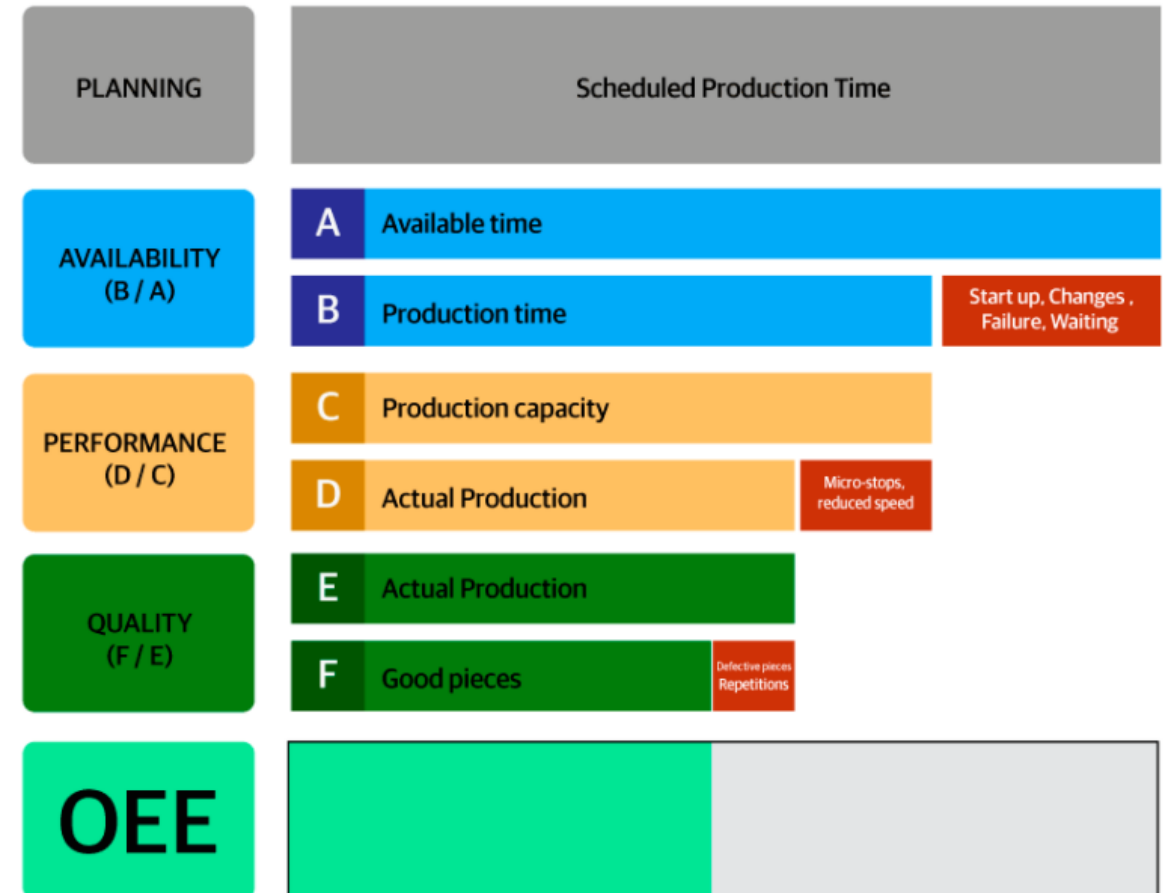
Mai 2021

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WEBINAR

The big 6 losses

Where we lose?

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Availability	Performance	Quality
Planned Downtime	Minor Stops	Production Rejects
Breakdowns	Speed Loss	Rejects on Start up

PLANNING	Scheduled Production Time		
AVAILABILITY (B / A)	A Available time		
	B Production time		Start up, Changes, Failure, Waiting
PERFORMANCE (D / C)	C Production capacity		
	D Actual Production		Micro-stops, reduced speed
QUALITY (F / E)	E Actual Production		
	F Good pieces		Defective pieces Repetitions
OEE			

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In a 480 minute shift :-
On a machine rated at 100 products output per minute
Maximum output = 480 mins x 100 units = 48000 units

Shift info:
Output (Good Production)	= 32000 units	
Speed	= 98 units per minute	
Planned downtime	= 82 mins	
Bottleneck loss due to B/down	= 30 mins	
Rejects (in process)	= 1255 in 8 hr shift	

Output (OEE) = 32000 / 48000 = <u>66.7%</u>
480mins x 66.67% = 320 mins, therefore Total Loss = 160 mins

Six Loss Calculations:
<u>Speed loss</u>
Max theoretical units possible at actual speed = 98 x 480 = 47040
= (32000/47040) – (32000/48000) =
68.03% - 66.67% = 1.36%

480 x 1.36%	= 6.53 mins / 480	= (1.36%)
<u>Planned downtime</u>	= 82 mins / 480	= (17.08%)
<u>Breakdown</u>	= 30 mins / 480	= (6.25%)
<u>Rejects</u> = 1255 / 98 (actual running speed)	= 12.81 mins / 480	= (2.67%)
<u>Minor stops</u> = 480-320-6.53-82-30-12.81	= 28.66 mins / 480	= (5.97%)
	Total loss = 160 mins	**= (33.33%)**

OEE Calculations (Time in mins):
Production time = 480   Time less availability loss = 368   Time less performance loss = 333

Availability Loss		Performance Loss		Quality Loss	
Planned downtime	=82	Speed loss	=6.53	Rejects on start up	=0
Breakdowns	=30	Minor stops (<5mins)	=28.66	Rejects in process	=12.81
Total	*=112*	*Total*	*=35.19*	*Total*	*=12.81*
Availability (368/480) = 77%		Performance (333/368) = 90%		Quality (320/333)	= 96%

OEE = 0.77x0.9x0.96 = <u>66.7%</u>

The road to digitalization
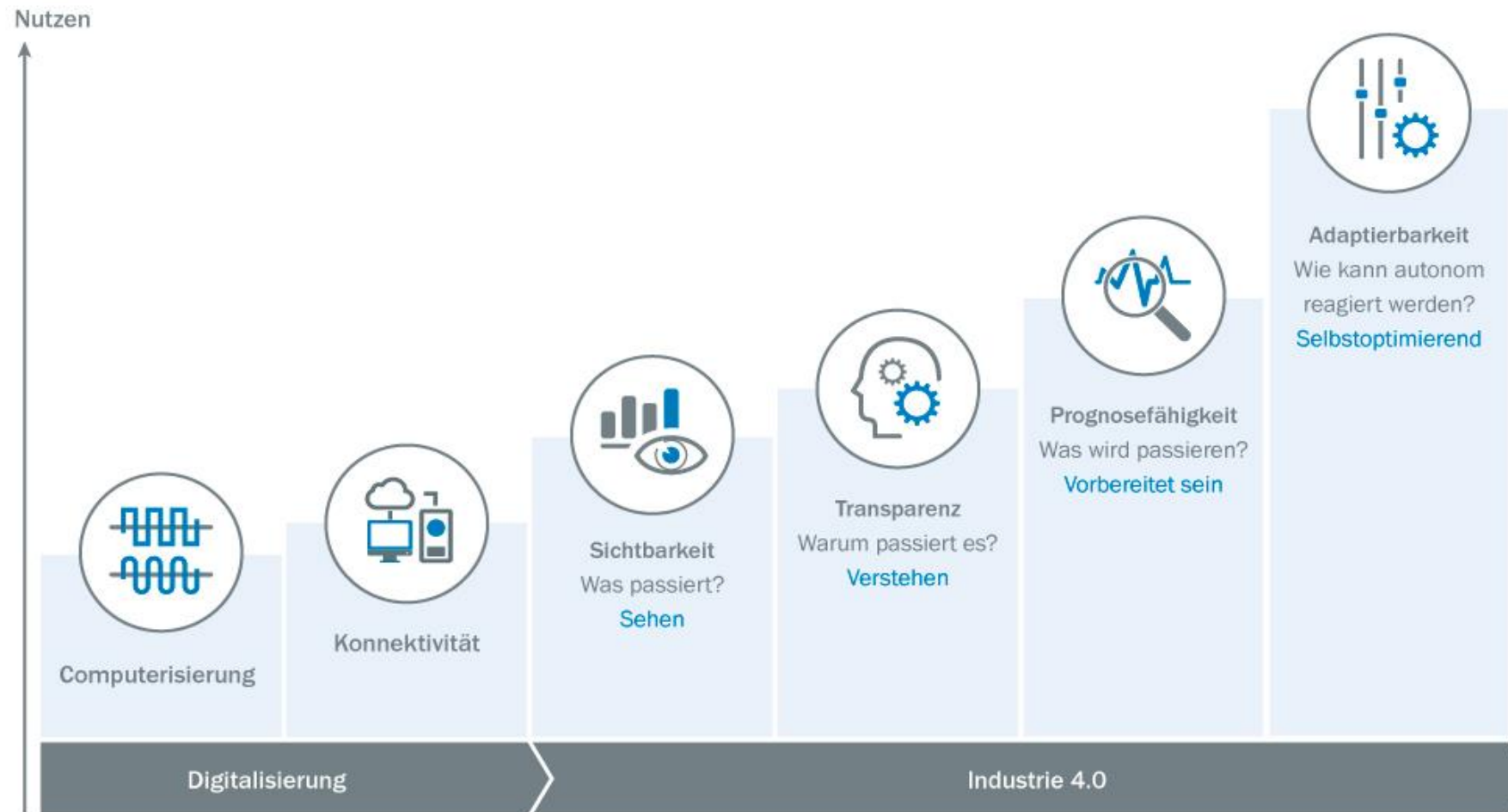
Maturity Index

The road to digitalization

Where to enter?

Roadmaps	Digitalization		Industrie 4.0			
	Computerization	Connectivity	Visibility	Transparency	Predictive capacity	Adaptability
Plannning & scheduling		Capacity planning in SAP	Integrated detailed production planning tool		Adaptive production planning	
Manufacturing & assembly		Digital data acquisition on shop floor	Digital order management	Feasibility study for smart glasses et al.		
Logistics & warehousing	Milk-run improvement	Optimization of storage location	E-Kanban system	Automated material ordering	AGVs	
Engineering & maintenance		Mobile devices	Further condition monitoring	Knowledge management (MTN&Q)	Predictive maintenance	
Quality		Integration of measurement	Integrated quality data analysis tool			
Overall		Collaboration plattform	Establish incentive system	Data analytics team		

Maturity levels on transformation path

Average score all plants and processes

Overall Equipment Effectiveness

What are the topics and where can we enter?

Status Quo

Where is the industry today?

Computerization	Connectivity	Visibility	Transparency	Predictive capacity	Adaptability
16 %	80 %	4 %	0 %	0 %	0 %

n=70

Just under half (49%) of companies using the Maturity Index are still at the "computerisation" stage in the structural area of "resources". This means that they have yet to achieve widespread "connectivity" of their machines and equipment. The picture is similar in the structural area of "information systems". 45% of companies have still not achieved extensive horizontal and vertical integration of their in-house systems.

Figure 4: Companies by average overall maturity stage; n=70 (source: Industrie 4.0 Maturity Center)
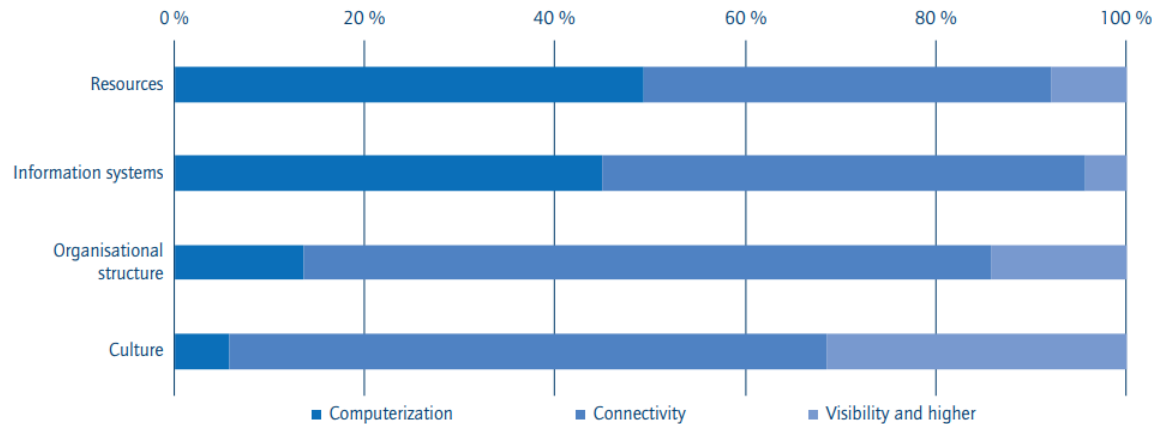
Figure 6: Distribution of companies' maturity stages for the four structural areas; n = 70 (source: Industrie 4.0 Maturity Center)

Legend: ■ Computerization ■ Connectivity ■ Visibility and higher
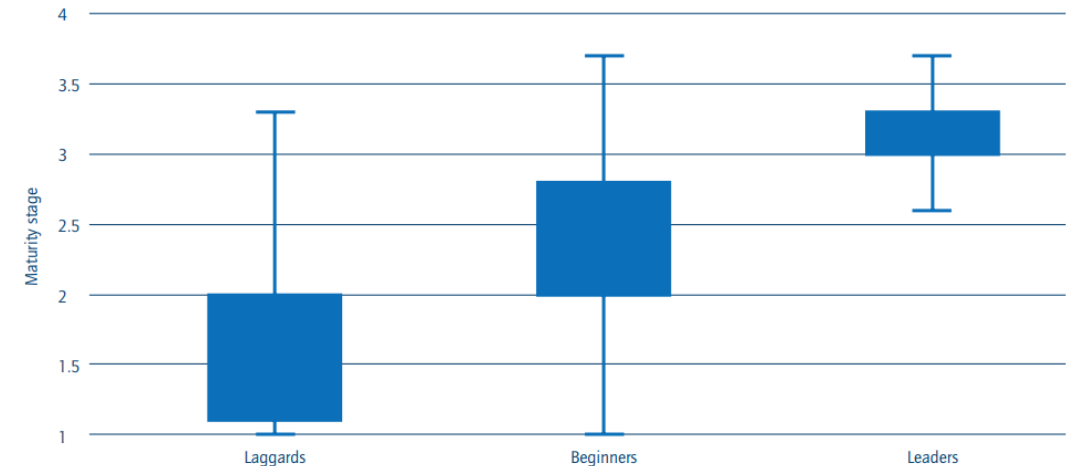
Figure 5: Distribution of overall maturity stages for the different company categories; n = 70 (source: Industrie 4.0 Maturity Center)

Plugged in ≠ connected

To properly realize digitalization, it isn't enough anymore to just plug field devices into a controller terminal. Instead they have to be connected, so that a bidirectional communication can happen.

Standard with many larger sensors, e.g. Laser scanners, Barcode readers, …

EtherNet/IP

PROFINET
INDUSTRIAL ETHERNET

EtherCAT.

Not really wide-spread with smaller sensors, which often make up the majority in plants. Often there is simply not enough space for fieldbus integration

The first step

Production Line Monitoring

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Solution: Powered by SICK Analytics, the "Production Line Monitoring (PLM)" Rapid deployment was implemented.

› PLM Analytics
  - **Real Time** and **Historical** Data Overview
  - Minute, Hourly, Daily, Weekly data insight
  - Scalable to 50 production lines
  - **Multiple Platforms:**
    i. (PC, Mobile, Tablet)

› SIG200 Edge Gateway (IO/IO-Link Master)
  - User Intuitive Interface
  - Logic Editor
  - REST API to Analytics

› WLG16P
  - Accurate, reliable, repeatable photoelectric sensor
  - Easy to maintain
  - Small footprint (Flexible deployment)

SIG-200 IO-Link Master
Sensor Integration Gateway

WLG16P IO-SENSORS

PLM – Powered by SICK Analytics
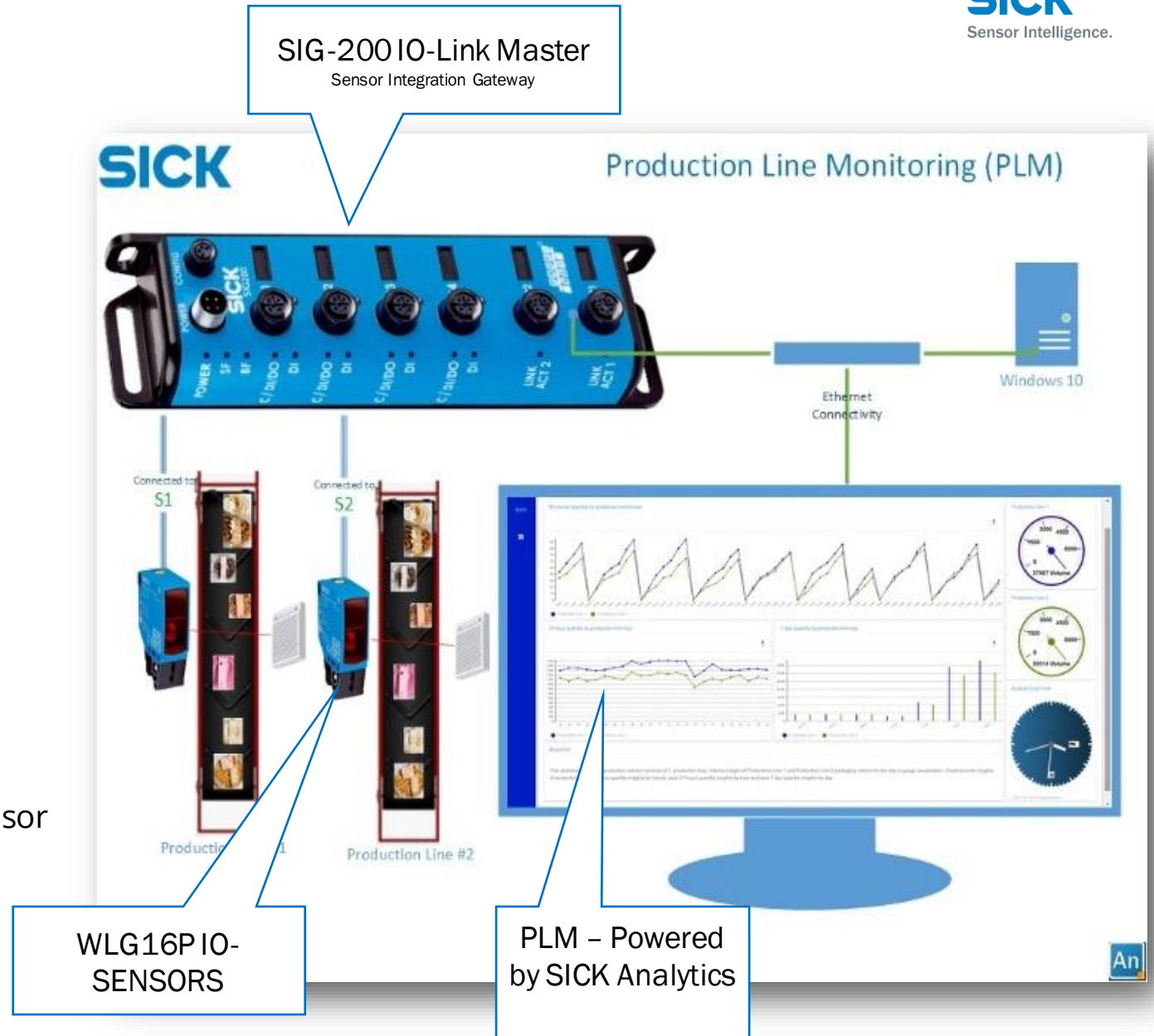
Use case
F&B PRODUCTION LINE MONITORING

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Outcomes:

› Quantified data driven business decisions

› Leaner operations (Avoid over and under producing, less process deviations, balance production lines)

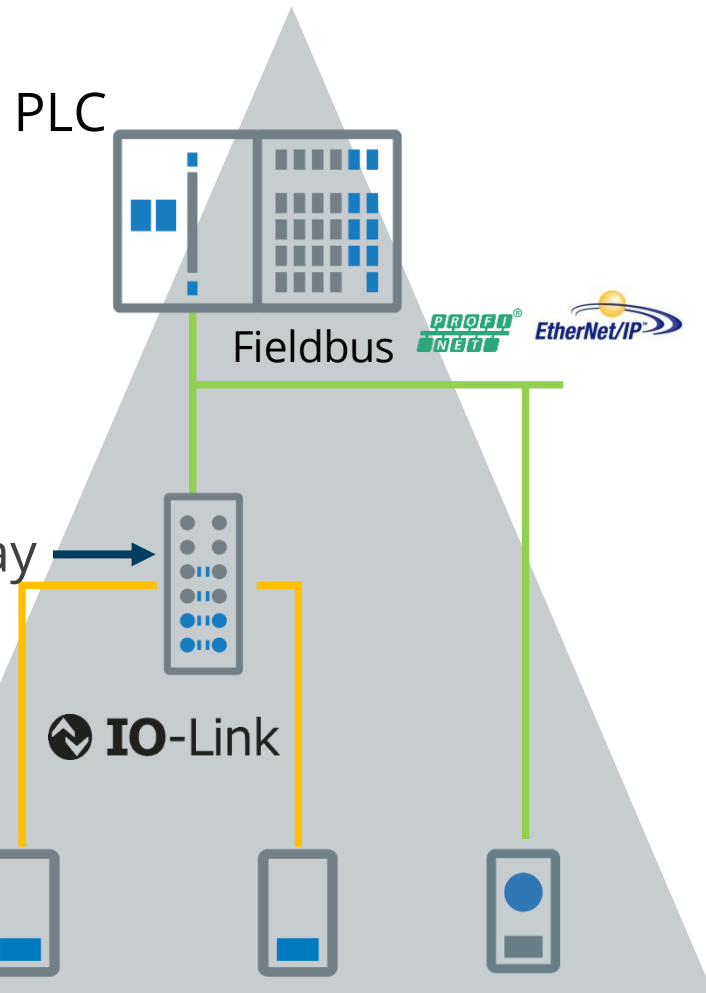› Improved Supply Chain Management

› Improved order ful-fillment

VOC (Customer Feedback Loop)

› Historic data download for analysis

› KPI Count by individual product

› Analytics API to MES

› Improved Mobile and Tablet View

Hour/Min Line 2 Line 1

Daily/Hour Weekly/Daily Time/Date

Prod. Volume in Line 1

616,631

Prod. Volume in Line 2

497,397

2 month Total

1,114,028

Daily Average

10,277

Daily Average

8,290

INDUSTRY 4.0 READY
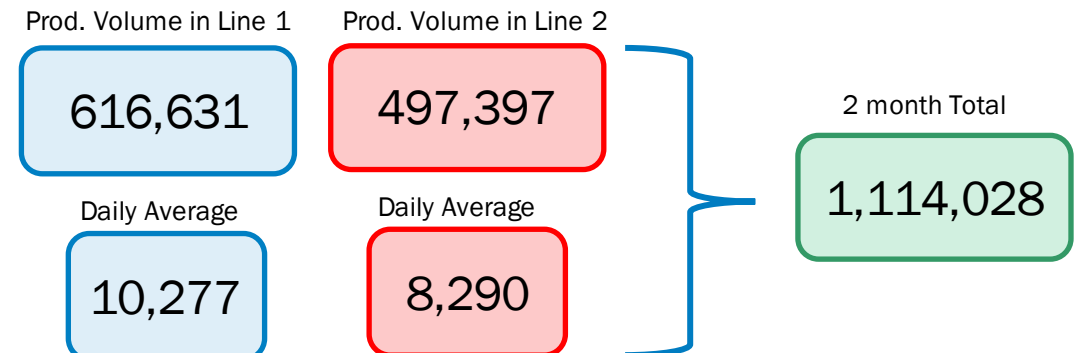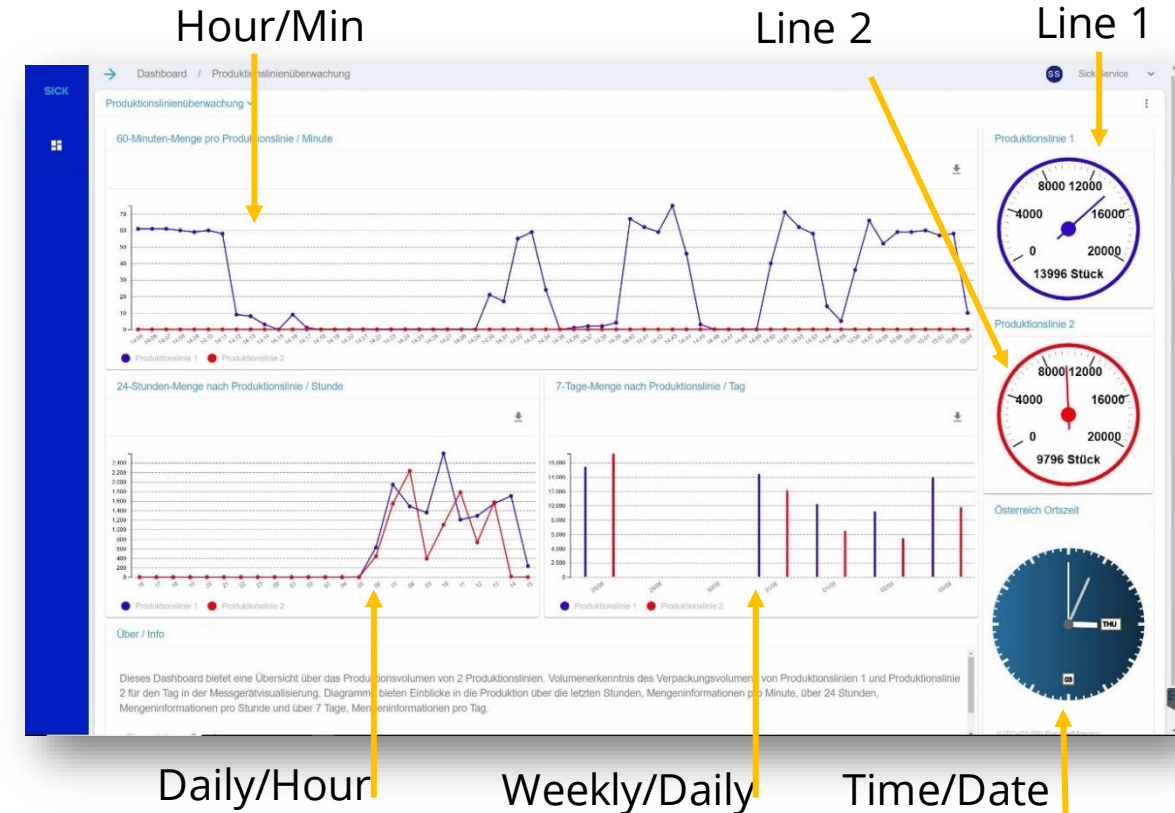
IO-Link

The perfect tool to achieve that goal

PLC

Fieldbus

Gateway

IO-Link

PIN	signal	remarks
1	L+	24 volt
2	OUT	sensor dependent
3	L-	ground
4	C/Q	communication/ switching signal
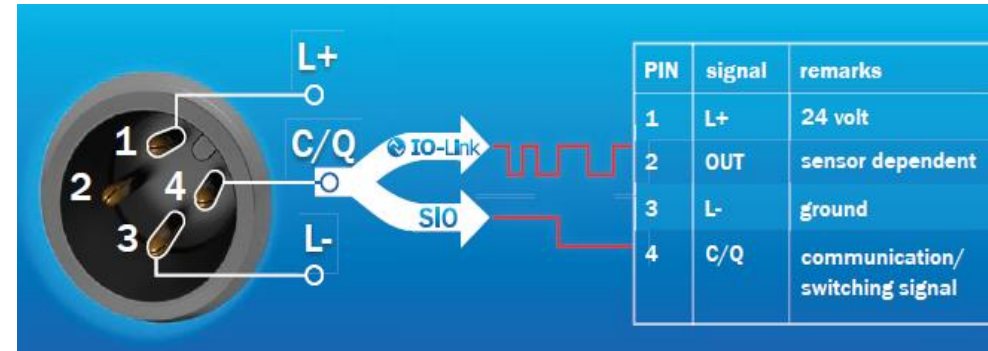
A smooth migration is possible, IO-Link Sensors …

… ca operate in classic "switching IO-mode"

… are not more expensive

… do not mean more integration effort if base-functionality is used

… do need an IO-Link master, but just as a switching sensor needs an IO-module

… reduce cabling effort (screening, decentral topology)

… deliver much more information to the controller than a switching sensor could ever do. This together with bidirectional exchange of information is the foundation of digitalization

Beyond the PLC

REST API & Cloud solutions

MES

ERP

company level

production level

field distribution level

field devices

http REST

http REST
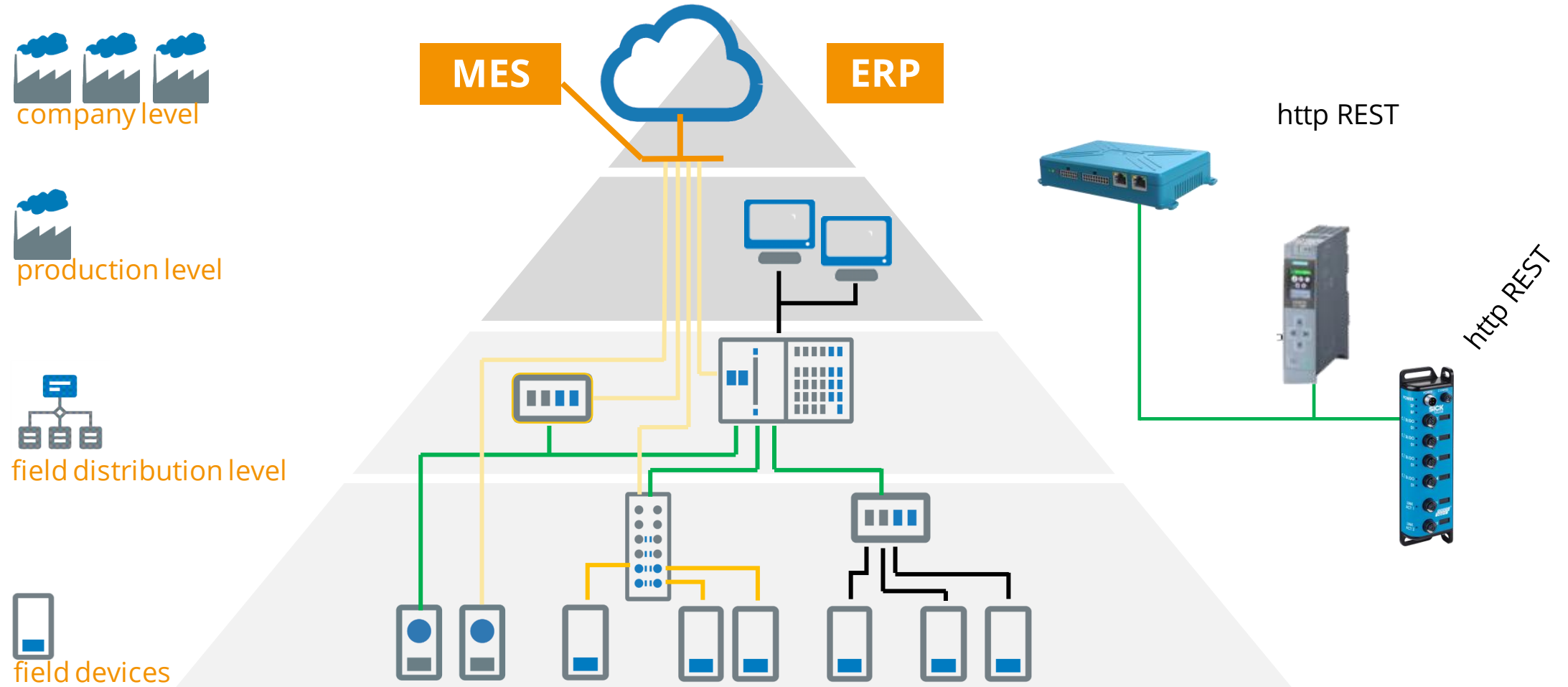
Read and write process- as well as service data

Visualization of sensor data, and configuration of sensor parameters

Process data is cyclically transmitted to the IO-Link master and forwarded to the PLC. Service data is transmitted to/from the sensor only upon request and does not interfere with process data. Both can be accessed in multiple ways:

› In the PLC program, e.g. using function blocks

› Using the SIG200 or Field Echo via web browser

› From each device in the same network as the PLC, using REST API

› Our TDC-E can be used to create simple dashboards using node-red
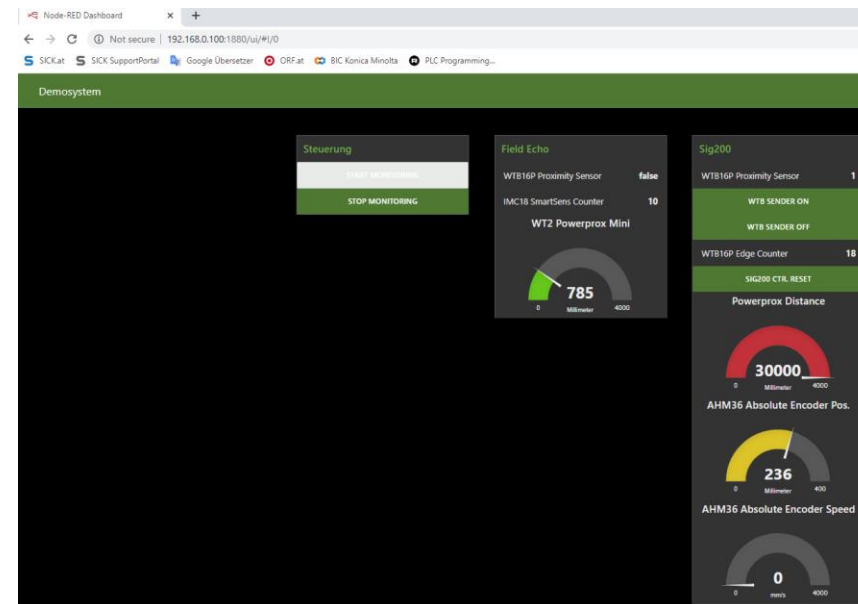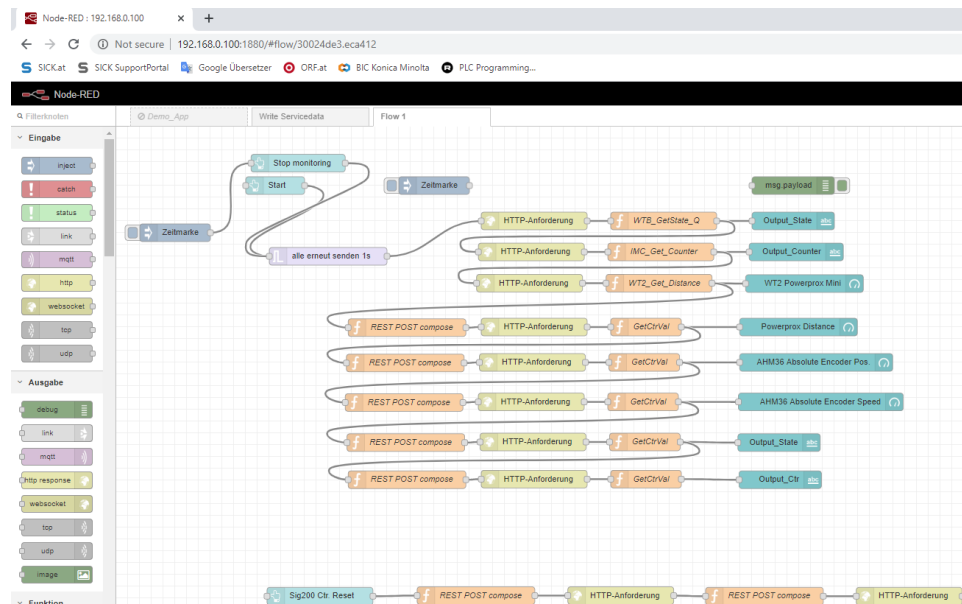
Start your journey!
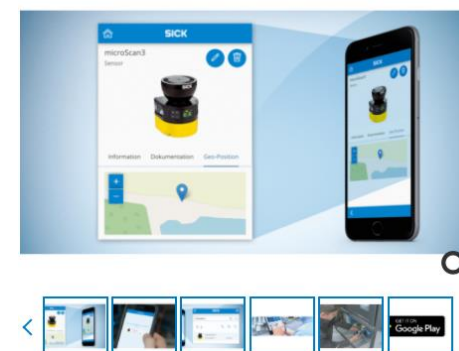## Starter KIT + "Addons"

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Digital Services for Integration
SICK Installed Base Manager

Detection of the installed base - quick, easy and clear

Your Benefits

- Easy detection of the installed base, even by several employees at the same time
- The clear representation in the app supplies you with information about where the devices and sensors are used
- Generation of a hierarchy which digitally represents your installed base
- The digital representation of your installed base can be used as the starting point for analyses with the goal of increasing efficiency
- The digital representation of your installed base is accessible for authorized employees and is easy to manage

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Digital Services for Integration
SICK AssetHub

Manage your digital twins

Software for Integration
FieldEcho®

Software tool for IO-Link data accessibility and transparency

Digital Services for Integration
Function Block Factory

Software-based service for generating PLC function blocks

Your Benefits

- Time saved and errors avoided during programming through the use of a tried-and-tested code
- Turnkey function block library for simple application in your PLC program
- Assign names or numbers according to your internal conventions
- Supplied data structures speed up development – no declaration of variables
- Convenient access to individual components of the process data thanks to process data parser functions
- Easy, transparent and bidirectional access to parameters of IO-Link devices
- No more searching for indexes, data formats or PD composition in manuals
- Available 24/7

Thank you!

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