

# BOSCH CONNECTED INDUSTRY

## NEXEED INDUSTRIAL APPLICATION SYSTEM V2.0



# Bosch Group – Focus Manufacturing

# Where do we come from?



**ROB. BOSCH**  
Werkstätte für Feinmechanik & Elektrotechnik  
**STUTT GART**



Who we  
are today?



**Manufacture #LikeABosch**  
with the Nexeed Industrial  
Application System



# Bosch Group

## Key figures 2019<sup>1</sup>

Bosch Group

€ 77.9 billion euros  
sales revenue



402,800  
associates



### Mobility Solutions

- ▶ One of the world's leading providers of mobility solutions



### Industrial Technology

- ▶ Leading in drive and control technology and process technology



### Energy and Building Technology

- ▶ One of the leading manufacturers of security and communication technology
- ▶ Leading manufacturer of energy-efficient heating products and hot-water solutions



### Consumer Goods

- ▶ Leading supplier of power tools and accessories
- ▶ Leading supplier of household appliances



1) As of 12.19; Preliminary, rounded figures based on internal accounting



# Bosch Connected Industry

# Bosch Connected Industry

## Business unit for IIoT software and services



5 locations



2018

Establishment of the  
business unit to pool  
most of the Industry 4.0  
activities within Bosch



500

Associates

# Bosch Connected Industry

## Mission and Value Proposition



### [Manufacture #LikeABosch]

We guide our customers in the digital transformation process to reach a Bosch-like manufacturing and logistics maturity level –  
**domain competence**

### [scalable]

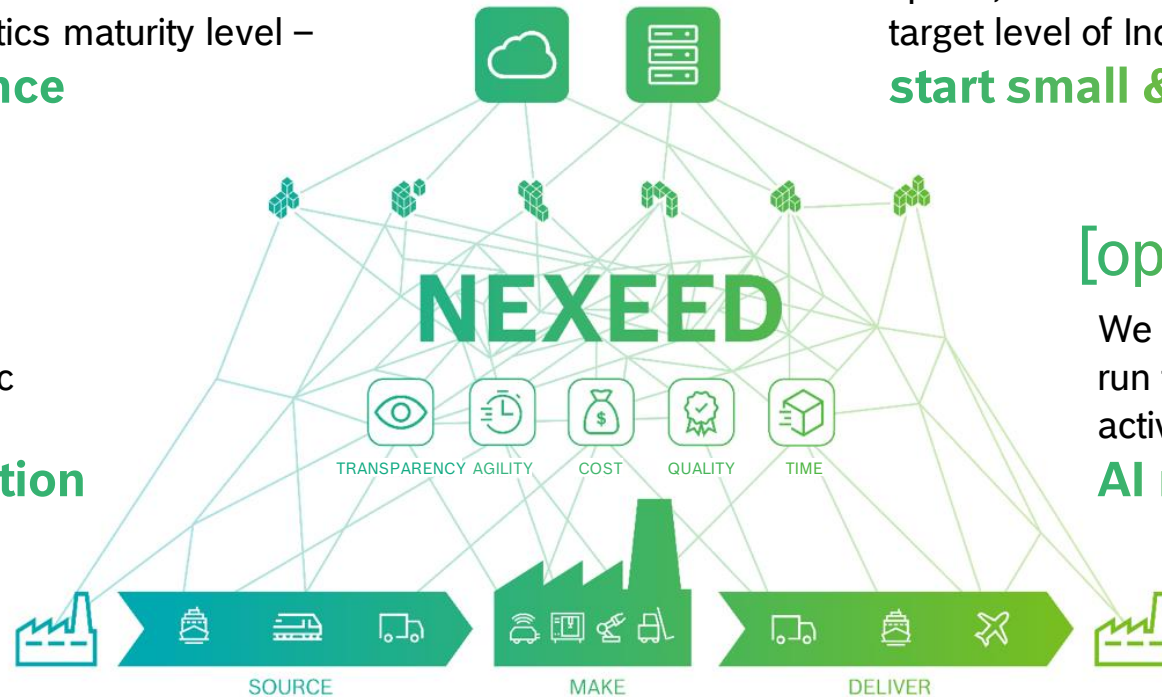
We give our customers full control on speed, content and costs to reach their target level of Industry 4.0 solutions –  
**start small & smart**

### [interoperable]

We offer our customers holistic Industry 4.0 solutions –  
**full digital transformation**

### [open]

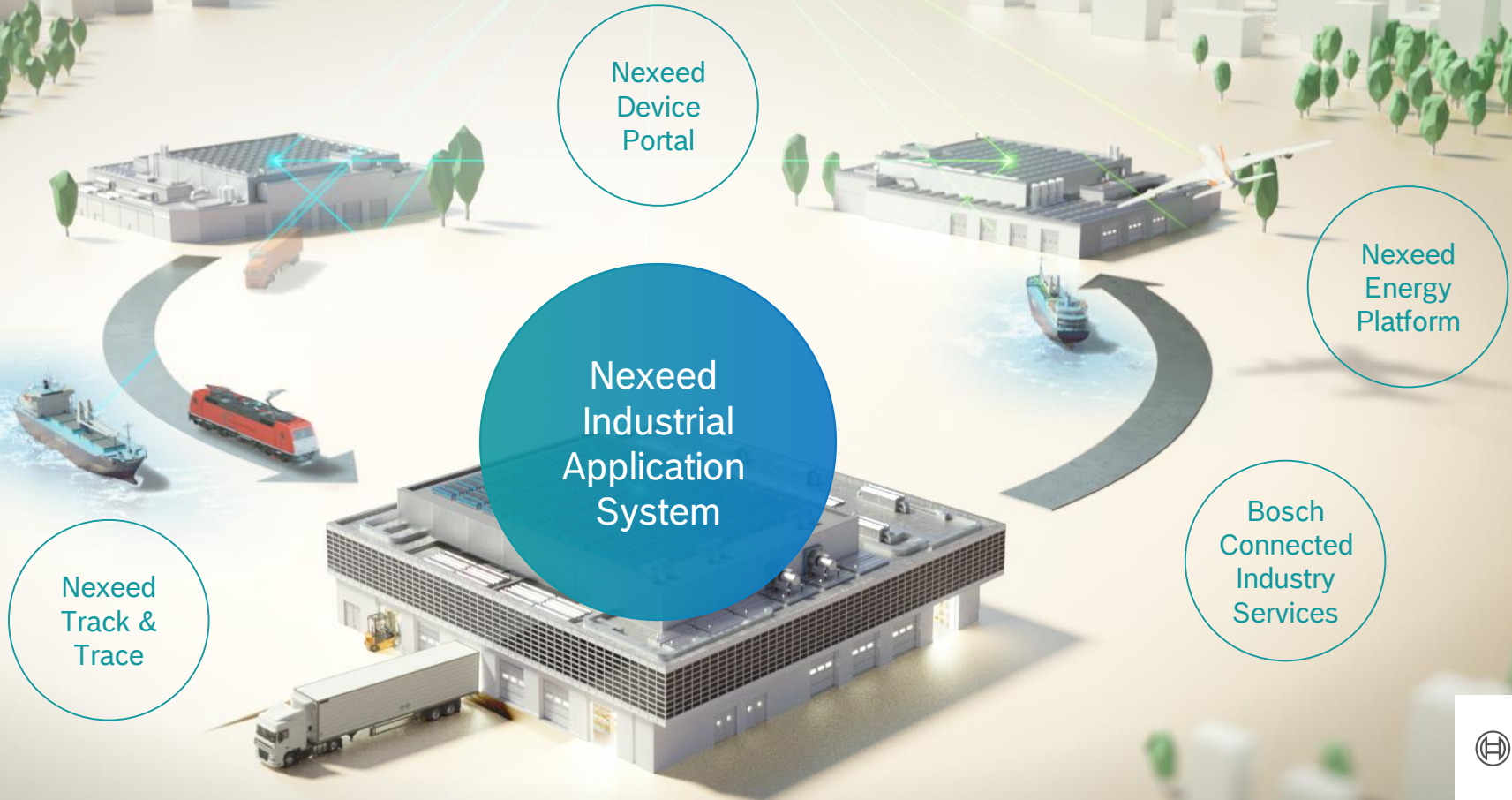
We give our customers the ability to run their own data-driven innovation activities faster with Nexeed –  
**AI ready**





# Bosch Connected Industry

## Portfolio: NEXEED – Digitalization of the entire value chain



# Bosch Connected Industry

## Portfolio: NEXEED – Digitalization of the entire value chain

Nexeed  
Industrial  
Application  
System  
Packages

Execution

Nexeed  
Automation

Product &  
Quality

Machine &  
Equipment

Shopfloor  
Management

Intralogistics

Operating  
Basis

Shopfloor  
Connectivity



# Challenges in Manufacturing & Logistics



An aerial photograph of a large industrial facility, likely a Bosch plant, situated in a lush green valley. The facility consists of several large, interconnected industrial buildings with grey roofs. To the left, a river flows through the landscape. The background features rolling green hills and distant mountains under a blue sky with wispy clouds. Overlaid on the image are numerous glowing blue digital lines and rectangular highlights, suggesting a data visualization or a smart factory concept. A semi-transparent green banner is positioned in the upper left corner, containing white text.

# Plant Management

## Actionable insights and faster decision making



# Maintenance Improving machine availability





# Quality Reducing scrap rate







# Intralogistics Optimizing material flows



The solution for these  
challenges



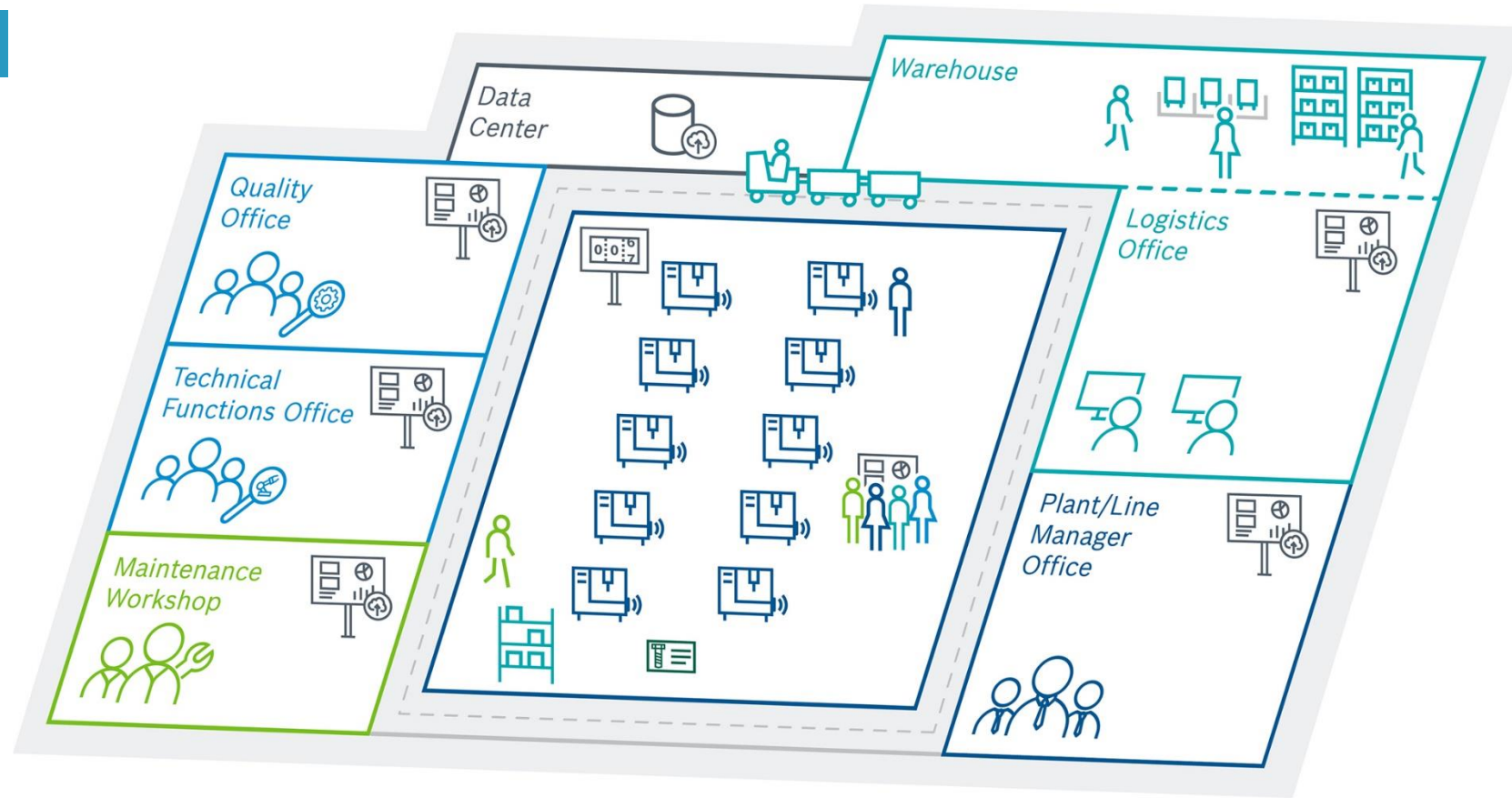
# Nexeed Industrial Application System

## The Solution

Each department gets...

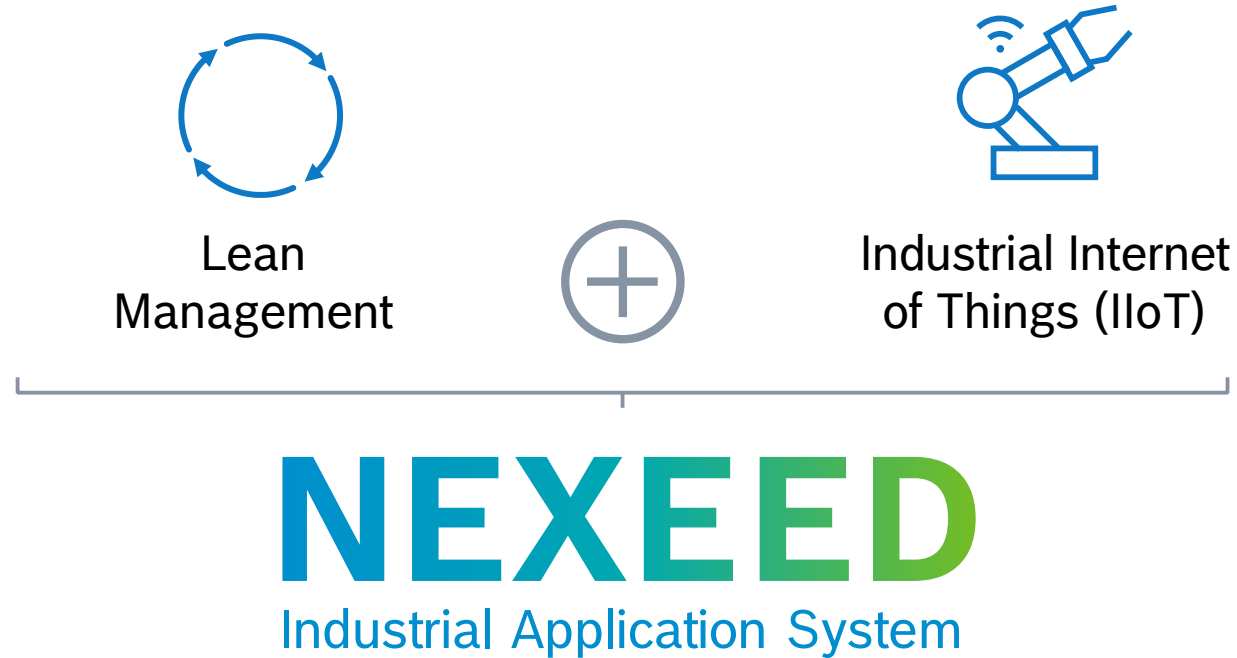
the right information,  
at the right time,  
in the right quality,

to perform better.



# Nexeed Industrial Application System

how can we make this possible?



With the Bosch Production System  
as conceptual basis



# Bosch Production System (BPS) meets Nexeed Industrial Application System

# Bosch Production System

## Vision, principles and methods of BPS are the conceptual basis of Nexeed Industrial Application System

### Vision/ideal state



100% added value

100% delivery performance

Zero defects

One-piece flow

### BPS-Principles

Pull principle

We produce and supply only what the customer wants.

Process orientation

We develop and optimize our processes holistically.

Fault prevention

We avoid errors by means of preventive measures in order to deliver flawless products to the customer.

Flexibility

We adapt our products and services quickly and effectively to current customer requirements.

Standardization

We standardize our processes and implement best-in-class solutions.

Transparency

We design self-explanatory and straightforward procedures; deviations from the target situation are immediately apparent.

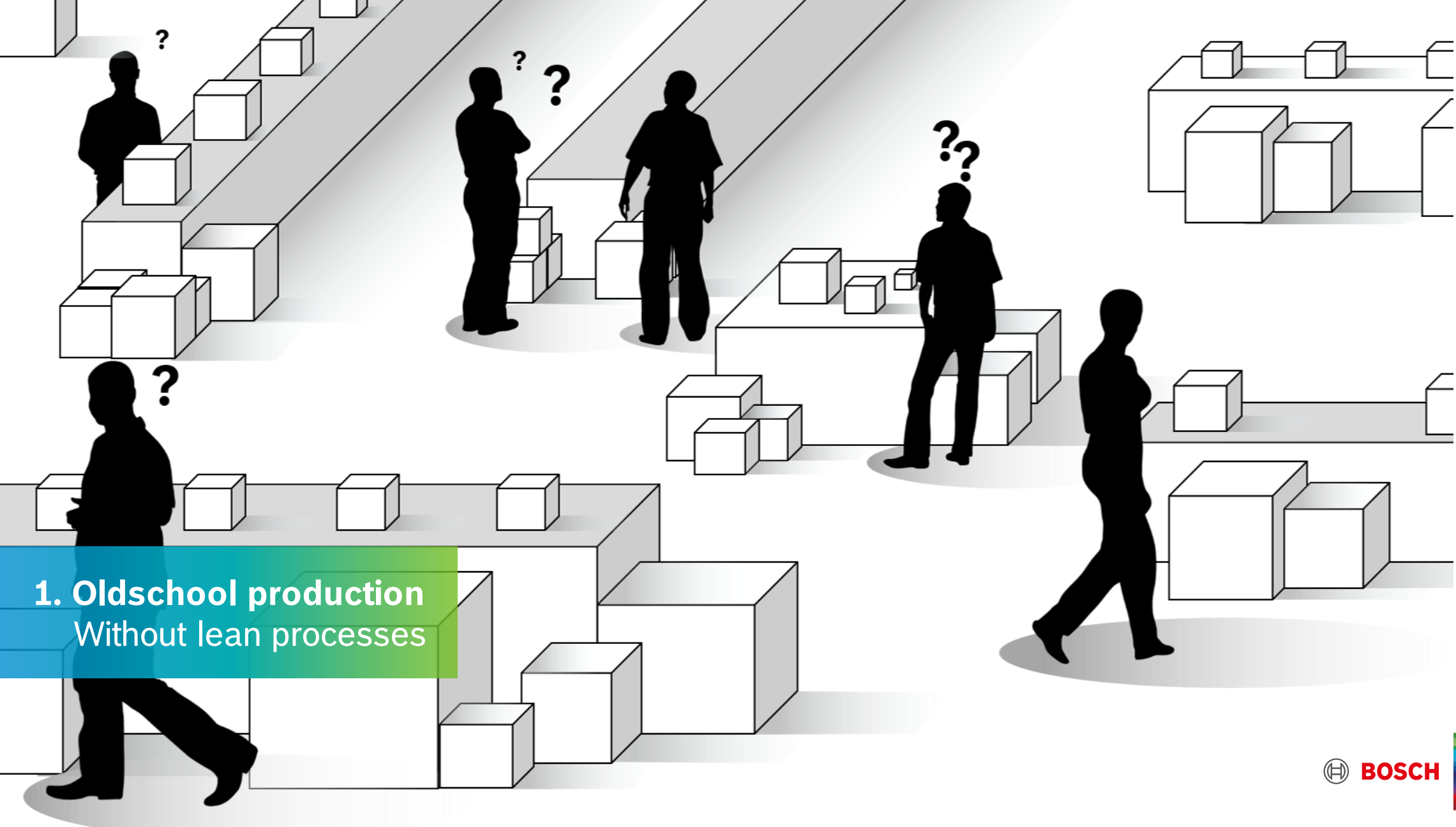
Continuous improvement

We are developing continually and in a targeted way.

Personal responsibility

We know our tasks, competencies and responsibilities and carry them out actively and independently.





## 1. Oldschool production

Without lean processes

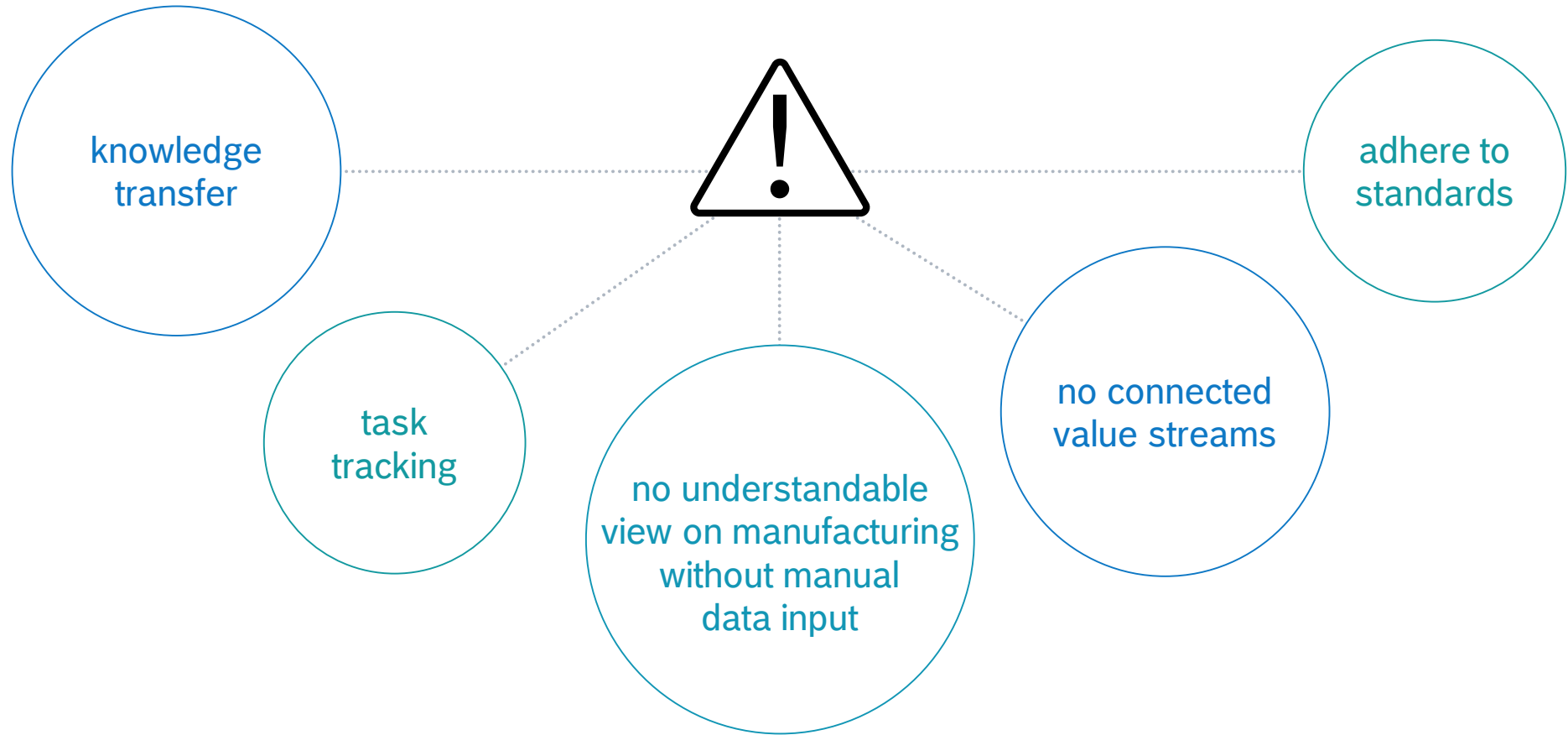
## 2. Lean processes

Result in a lot of paper work



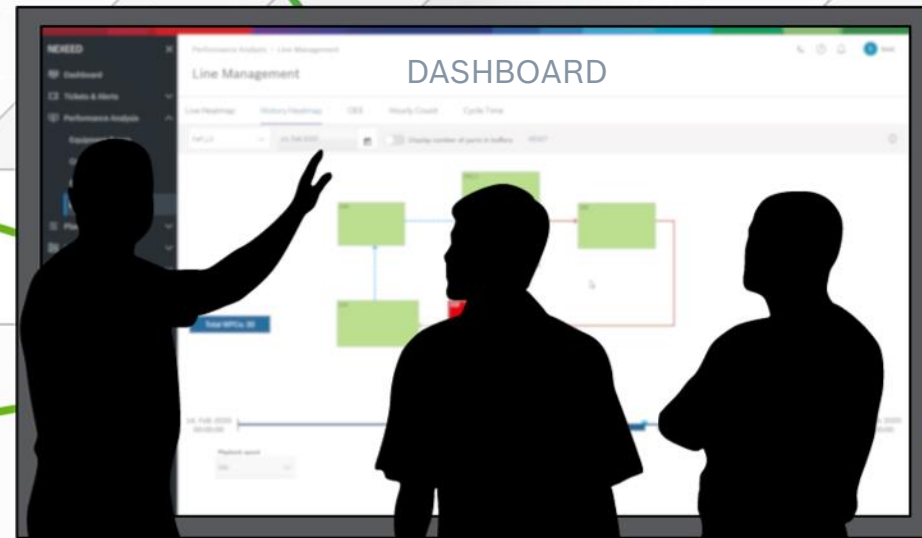
# Bosch Production System

## Difficulties in the ordinary morning meeting



### 3. Digital factory

Real-time insights, fast reaction with the  
Nexeed Industrial Application System



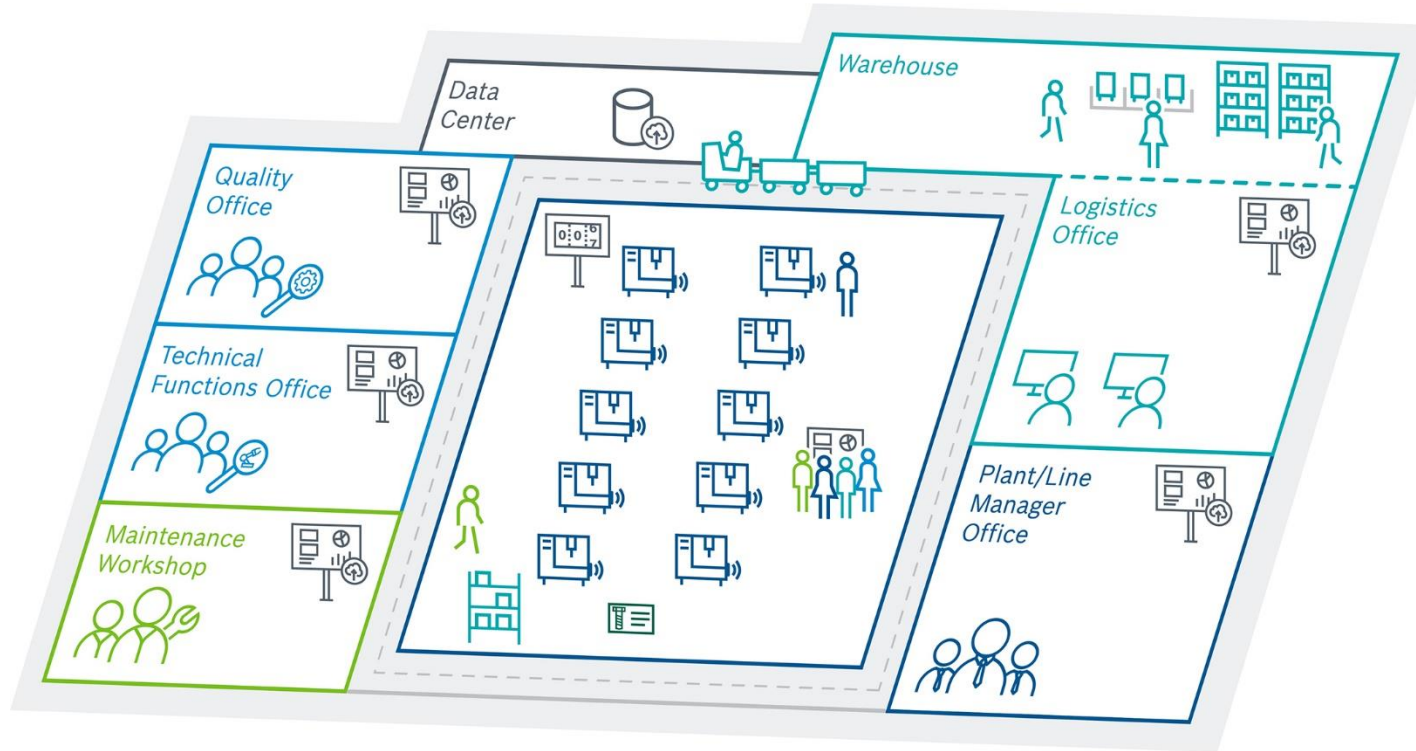




# Nexeed Industrial Application System Overview

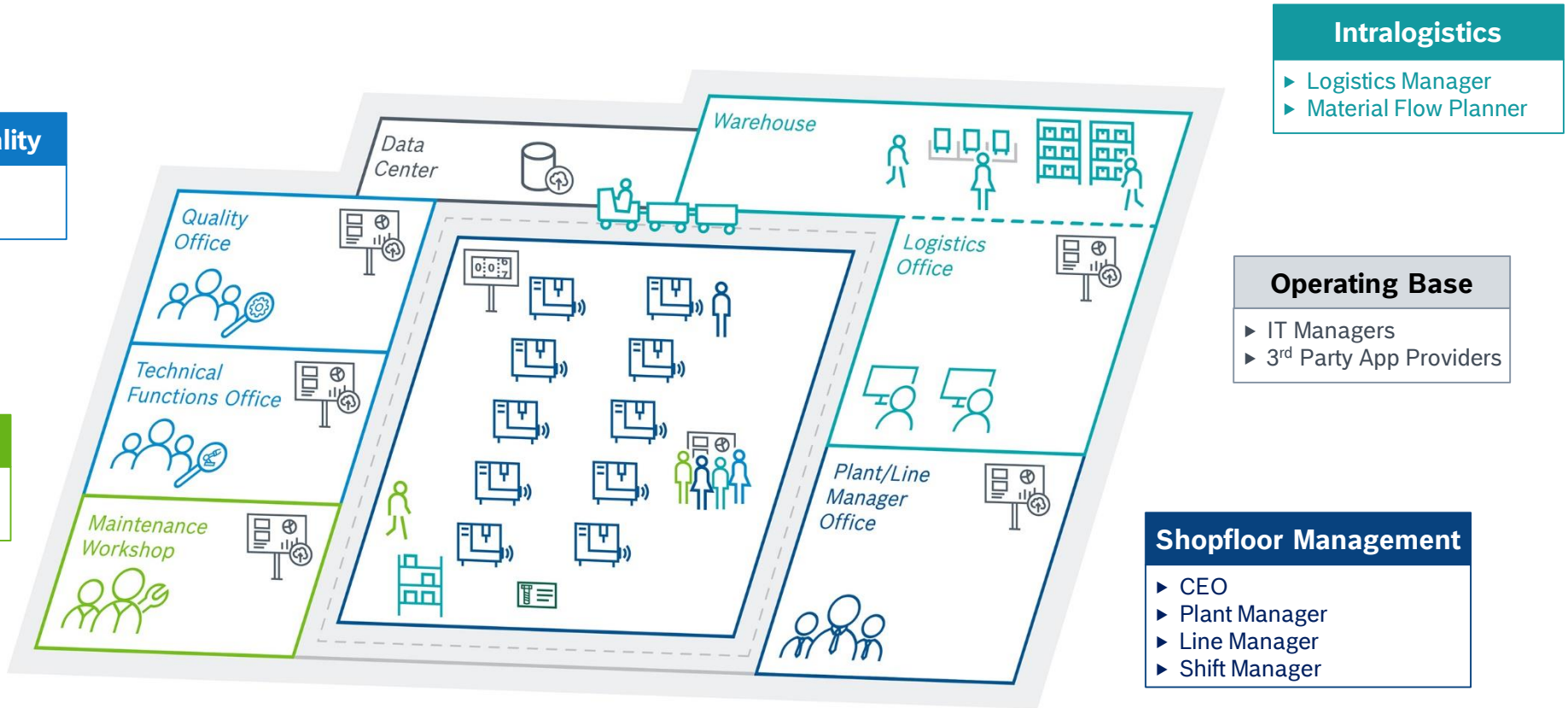
# Nexeed Industrial Application System

## The Digital Factory



# Nexeed Industrial Application System

## Users Groups in the Digital Factory & our Packages



# Nexeed Industrial Application System

## Users Groups in the Digital Factory & our Packages

### Product & Quality

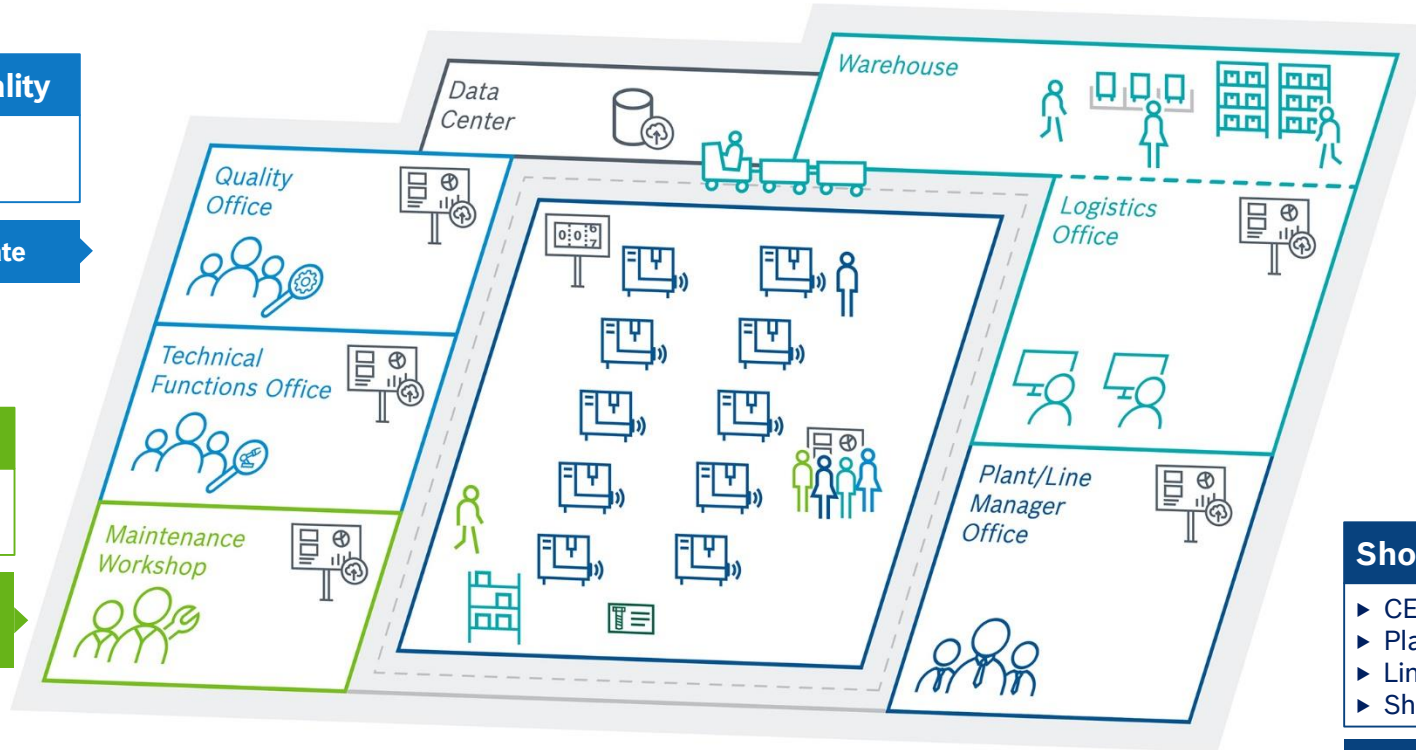
- ▶ Quality Manager
- ▶ Process Expert

Reducing scrap rate

### Machine & Equipment

- ▶ Maintenance Manager
- ▶ Machine Operator

Improve machine availability



### Intralogistics

- ▶ Logistics Manager
- ▶ Material Flow Planner

Optimizing material flows

### Operating Base

- ▶ IT Managers
- ▶ 3<sup>rd</sup> Party App Providers

Scalable, sustainable & open architecture

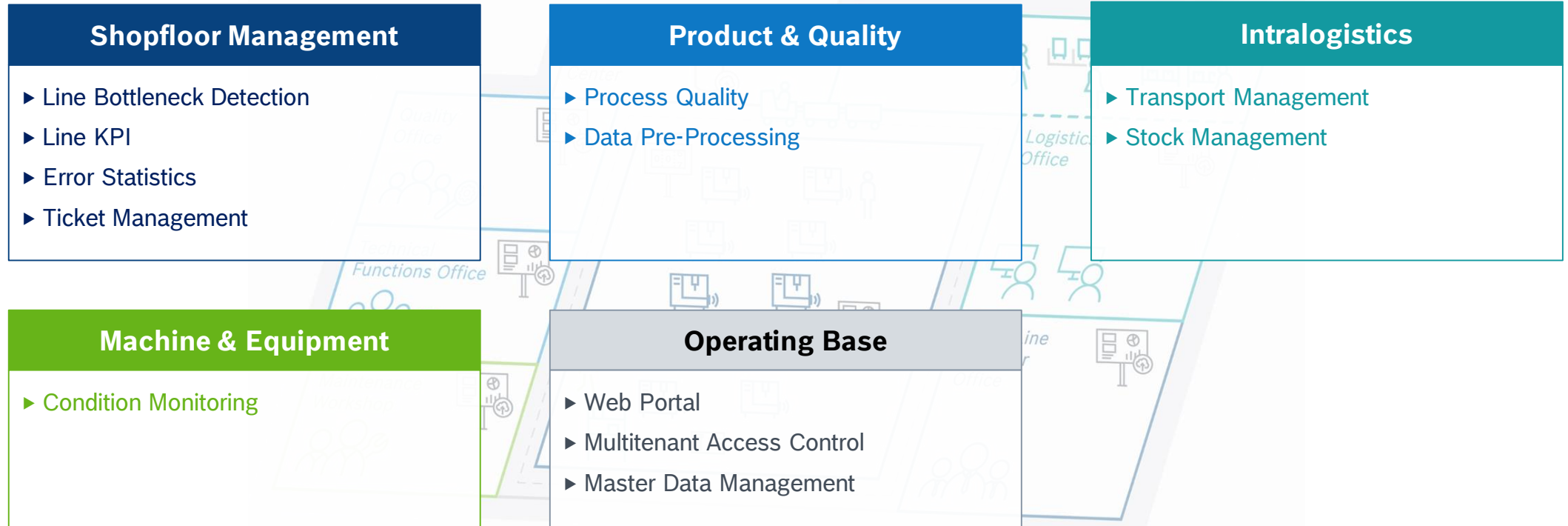
### Shopfloor Management

- ▶ CEO
- ▶ Plant Manager
- ▶ Line Manager
- ▶ Shift Manager

Actionable insights & faster decision making

# Nexeed Industrial Application System

## Application Overview – Version 2.0

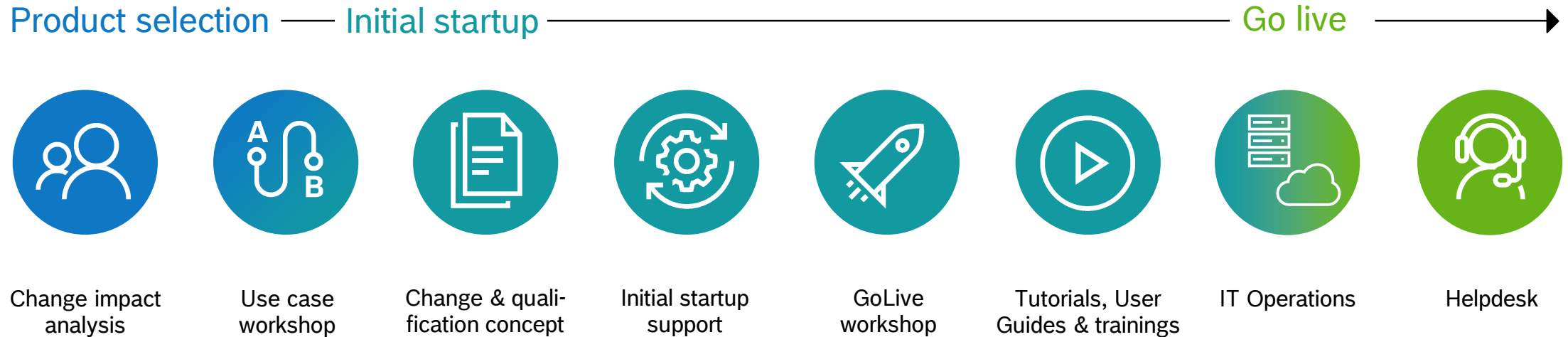




# Nexeed Industrial Application System – Training & Services

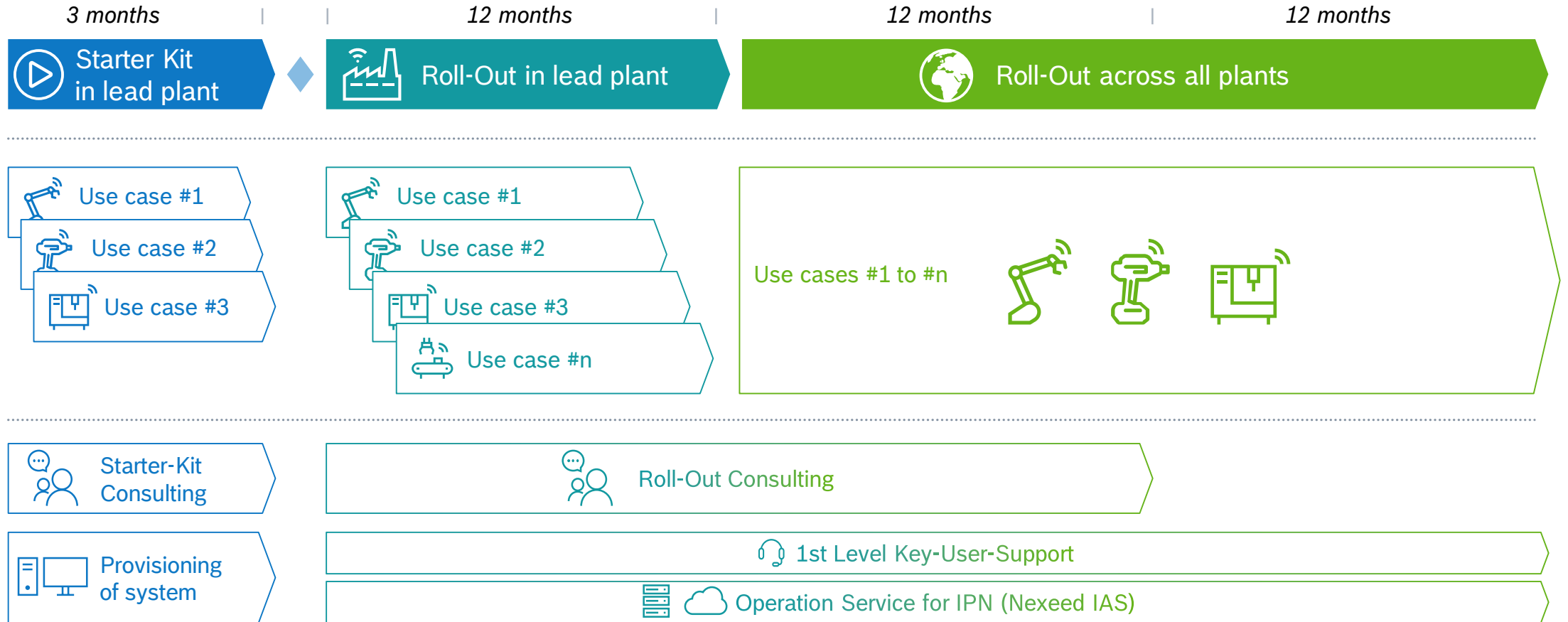
## Implement your project successfully with the right services

No matter which project phase you are in – our experts will be happy to support you with the right offer.



# Nexeed Industrial Application System

## Enterprise Roll-Out Use Case Approach



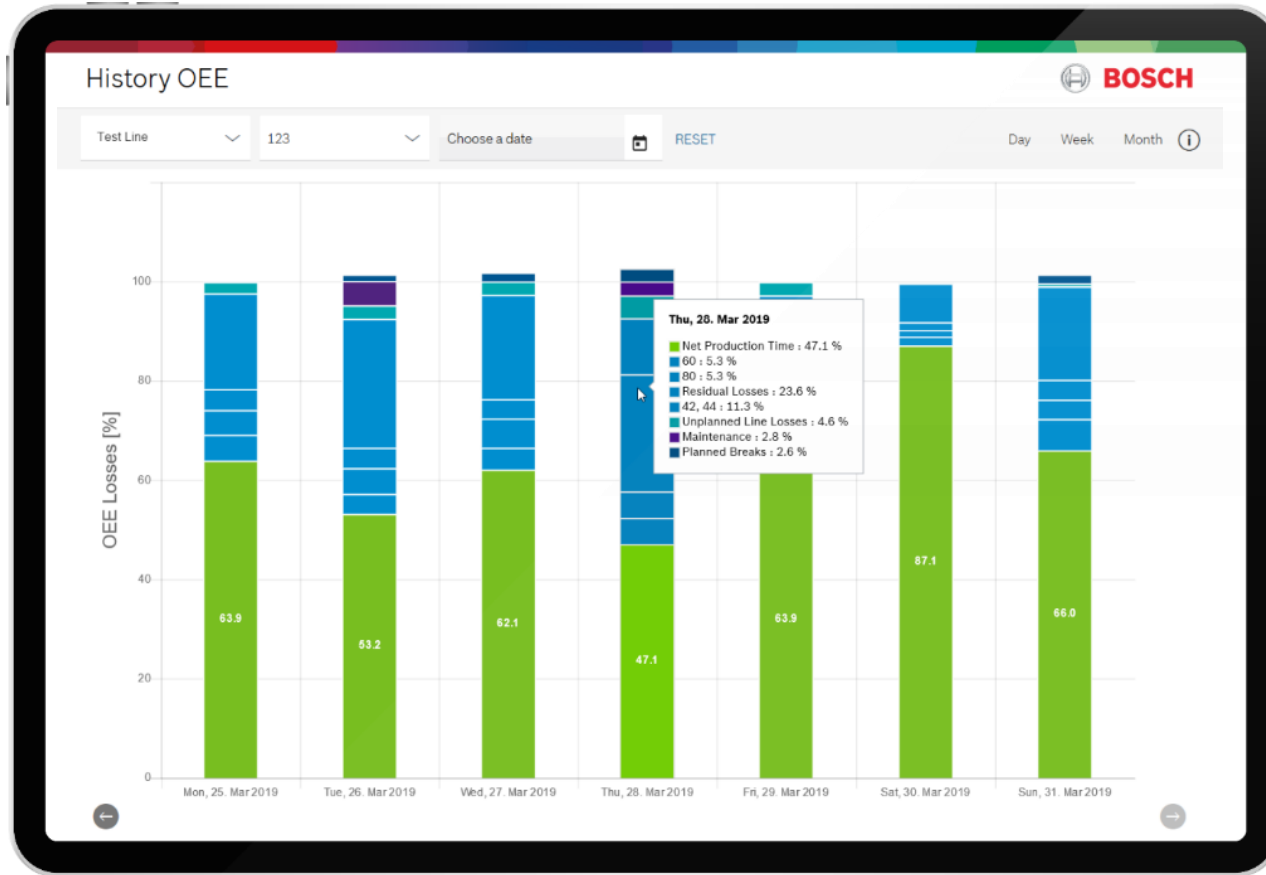
A photograph of two men in a modern industrial environment. The man on the left, with dark curly hair, wears a dark blue polo shirt with a small Bosch logo on the chest and blue jeans. He is looking down at a tablet held by the man on the right. The man on the right, with short brown hair, wears a white long-sleeved button-down shirt and dark blue trousers. He is holding a tablet with both hands and looking at it. The background shows a factory floor with glass-enclosed machinery and industrial lighting.

# Shopfloor Management

Transparent production for efficiency-  
enhancing decisions

# Nexeed IAS: Line KPI

## Capturing the most important KPIs of production machines



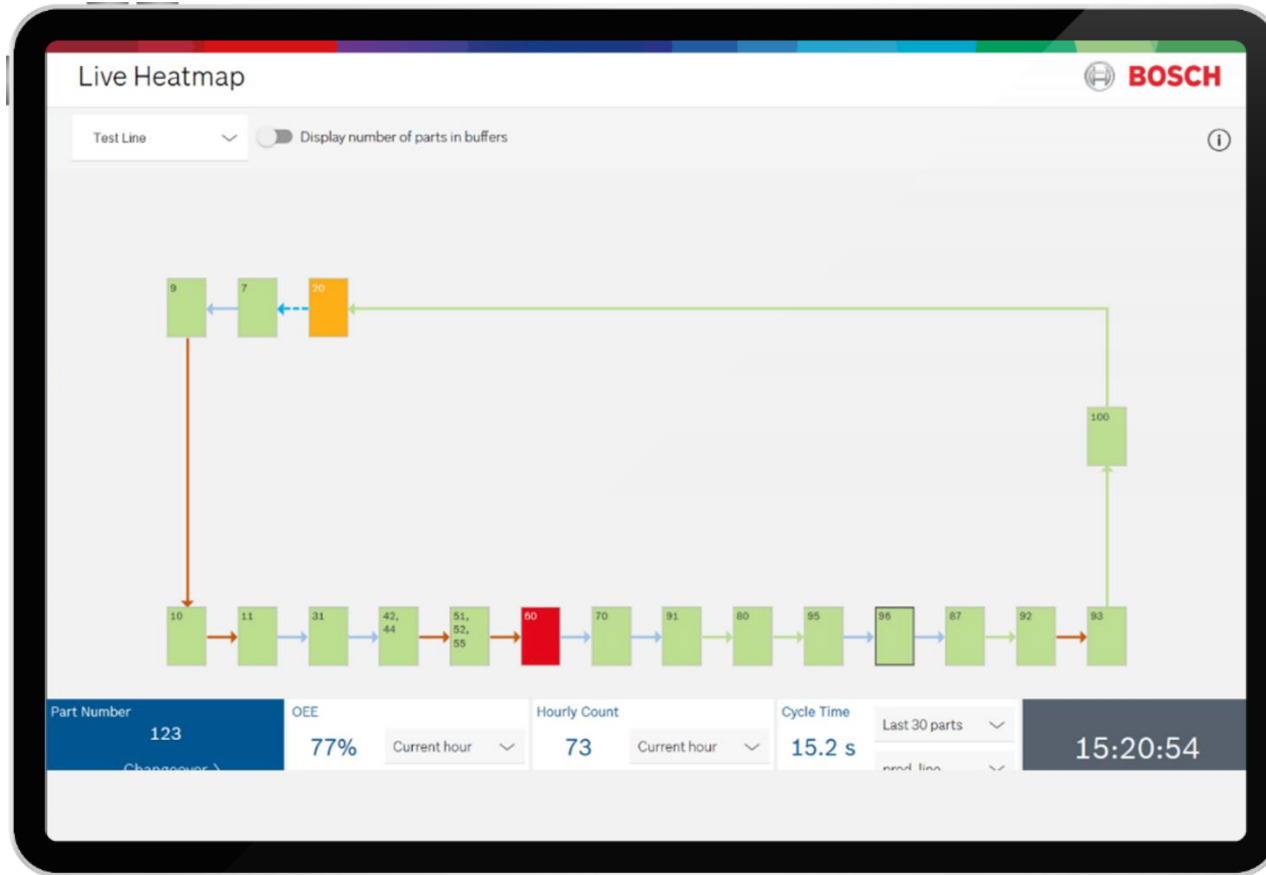
### Feature highlights

- ▶ The Line OEE view shows the Overall Equipment Effectiveness (OEE) of a complete production line
- ▶ Productivity per hour shows important production figures, such as planned /actual parts produced, rejects and rework
- ▶ The cycle time diagram shows the target cycle time for the line and the station



# Nexeed IAS: Line Bottleneck Detection

## Quick identification of bottlenecks on production lines

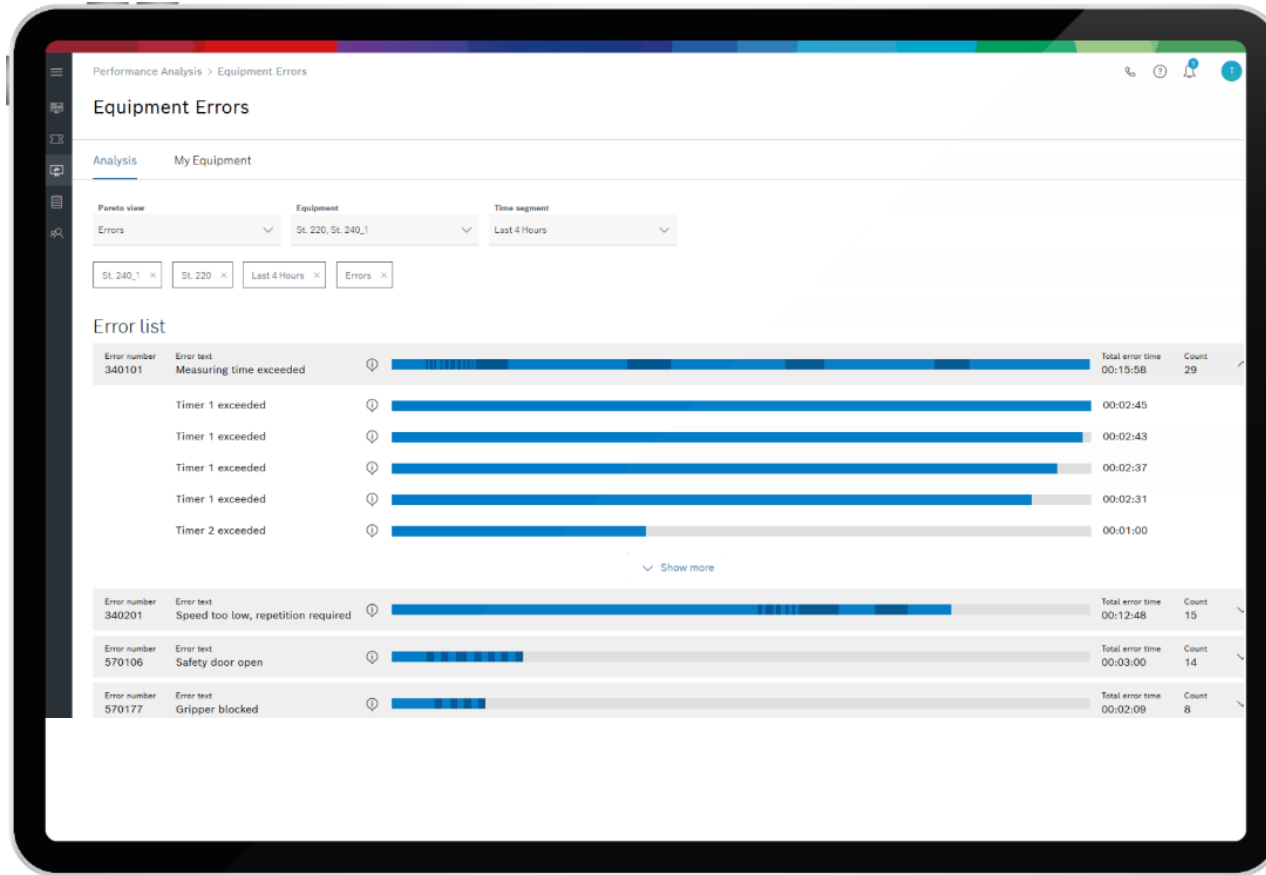


### Feature highlights

- ▶ Visualization of the line and bottlenecks by a heatmap
- ▶ Identification of the machine that triggers an OEE loss through an algorithm
- ▶ Representation of historical data for the production line

# Nexeed IAS: Error Statistics

## Localization and elimination of error sources

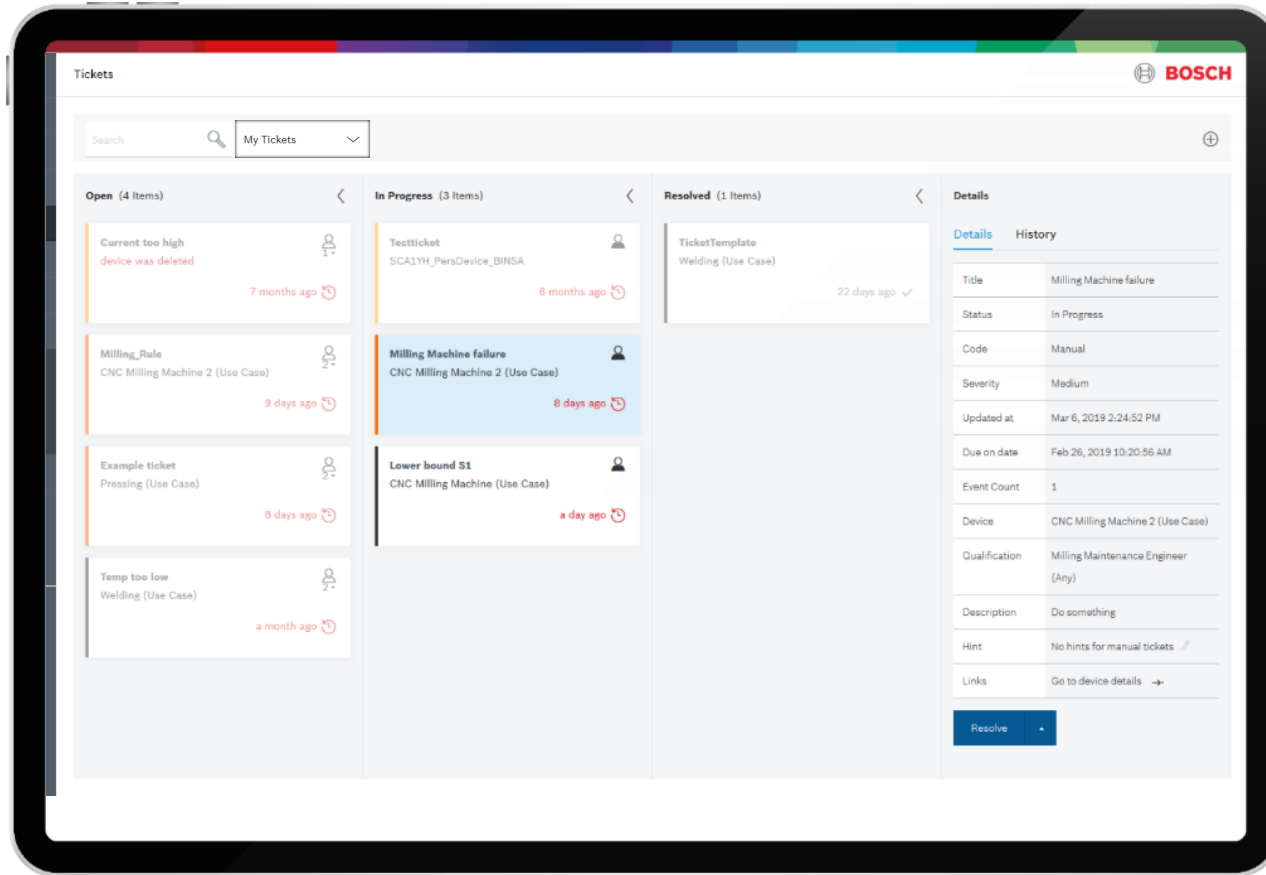


### Feature highlights

- Evaluation of machine errors
- Filters according to time window and machine/line
- Aggregation by error number or machine/line
- Display according to duration or frequency

# Nexeed IAS: Ticket Management

## Fast, qualified remedying of machine faults



### Feature highlights

- ▶ Ticket Mapping Management
- ▶ Qualification Management & Assignment
- ▶ Display and edit ticket details
- ▶ Display, accept, receive, return, close or delegate tickets
- ▶ Status information about the devices



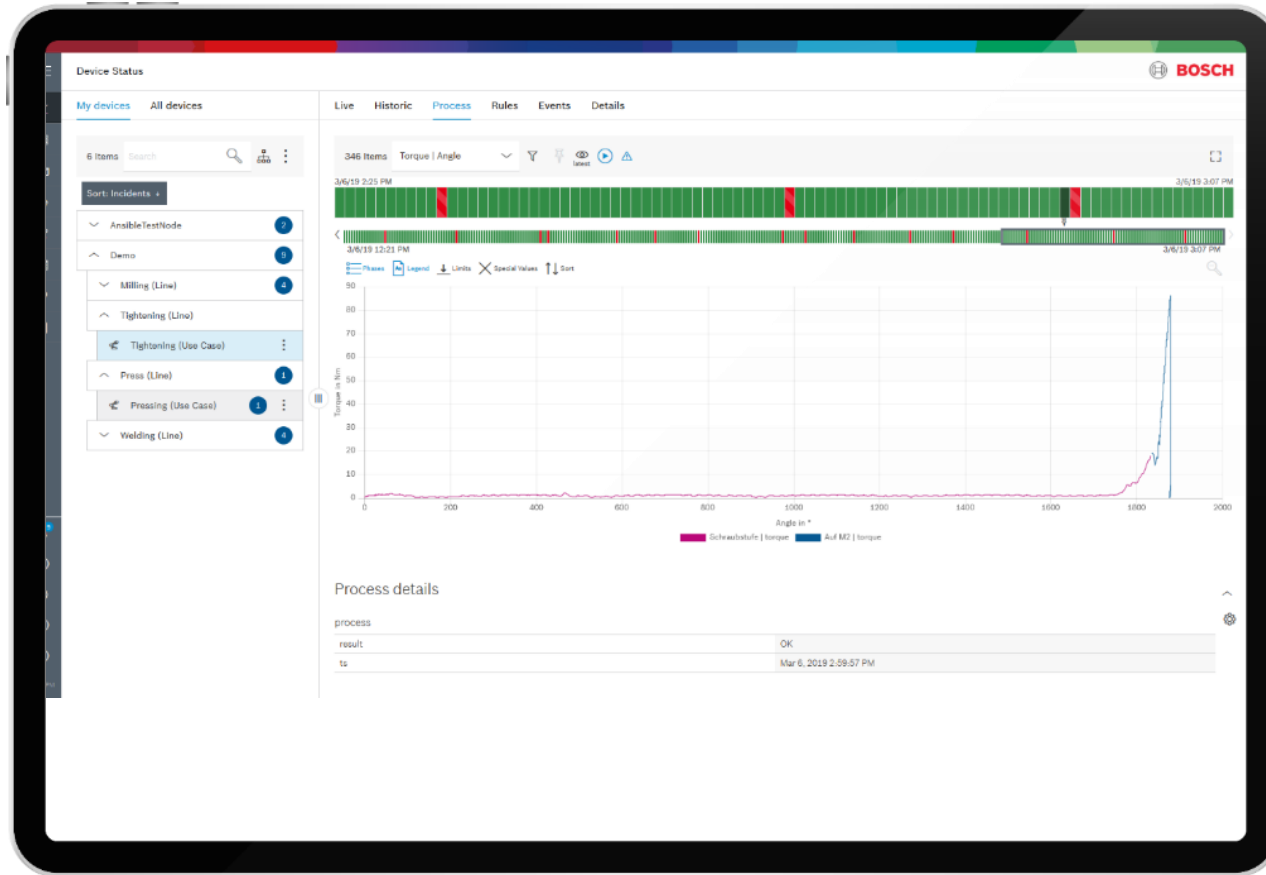
# Product & Quality

Optimize processes and product quality



# Nexeed IAS: Process Quality

## Higher process transparency & quality in ongoing production

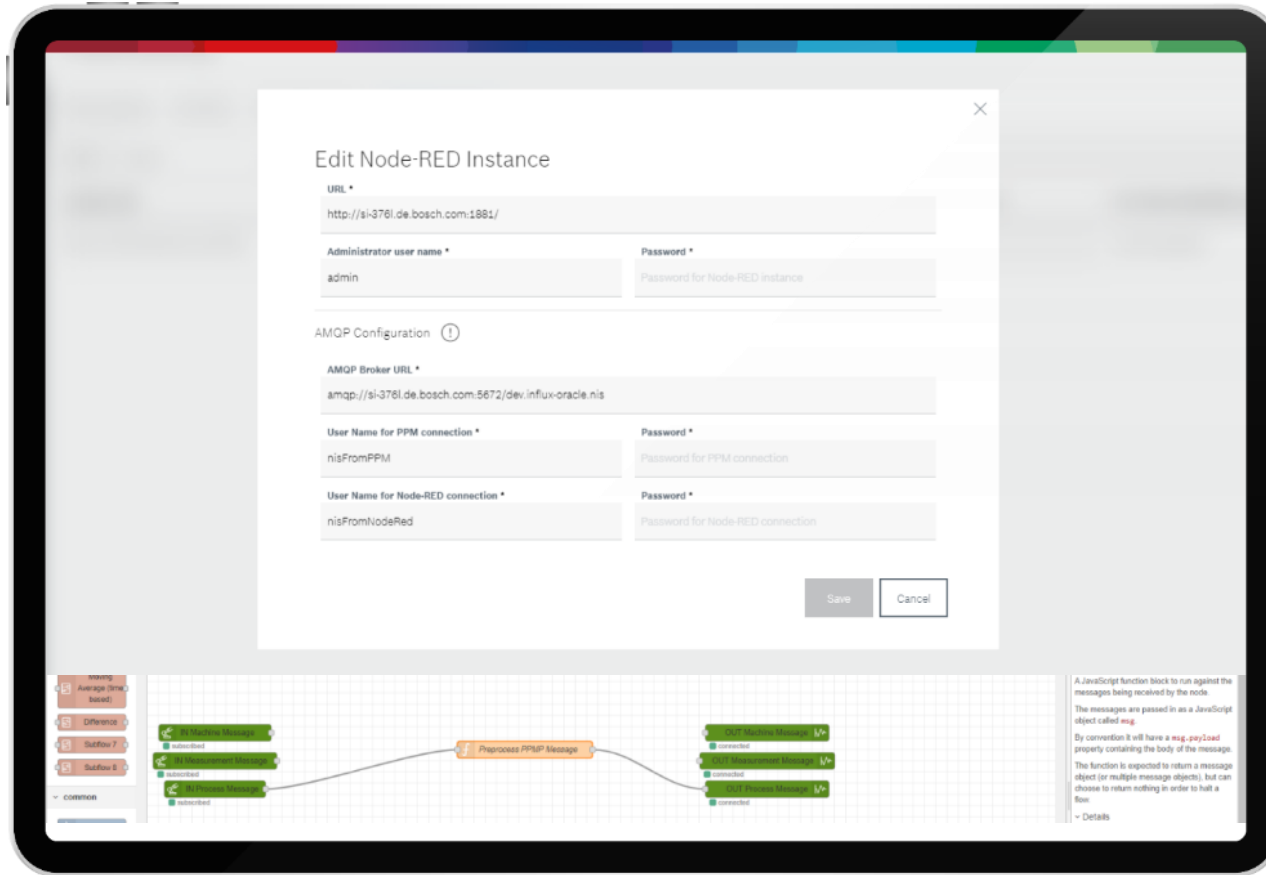


### Feature highlights

- ▶ Live and historical view of process curves, freely adjustable
- ▶ Visual comparison of data for several processes of a machine, as well as of different machines (including cross-factory)
- ▶ Filter setting for the process selection
- ▶ Display of metadata
- ▶ Successive machine processes can be combined in one view

# Nexeed IAS: Data Pre-Processing

## Pre-processing machine data quickly and easily



### Feature highlights

- Configuration of a Node-RED interface via the user interface
- Creation of pre-processings via the user interface
- Automated generation of pre-processing flows in Node-RED
- Conformity check of the Production Performance Management Protocol (PPMP) before and after pre-processing in Node-RED
- Provision of pre-processed messages in the Nexeed Industrial Application System



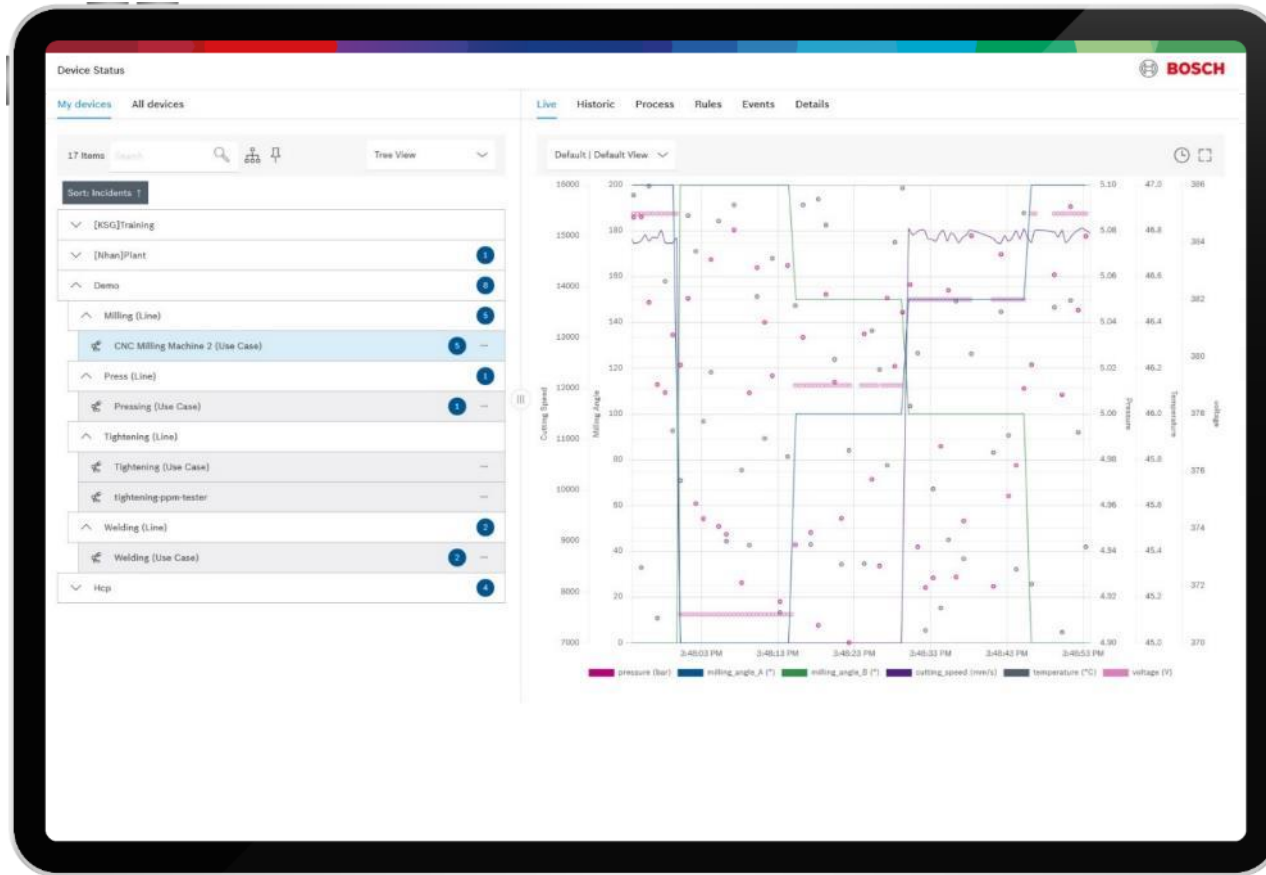


# Machine & Equipment

Reduce machine downtimes

# Nexeed IAS: Condition Monitoring

## Permanent status recording for maximum transparency



### Feature highlights

- ▶ Quickly and easily configure condition monitoring of machines and systems
- ▶ Freely configurable visual representation of measurements (both live and historical) and machine messages
- ▶ Export function for historical measured values in freely selectable aggregation levels
- ▶ Display of metadata
- ▶ Pre-installed set of rules which is continuously developed

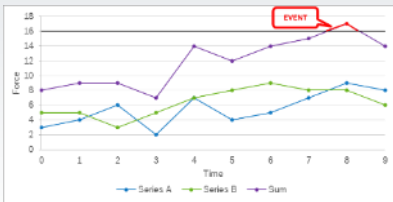
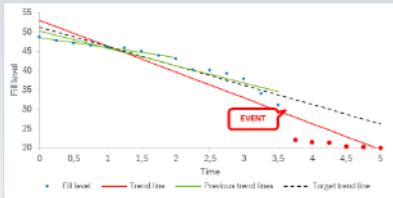
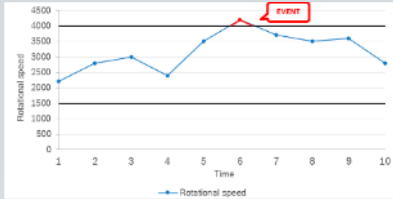
# Nexeed IAS: Condition Monitoring

## Rules overview



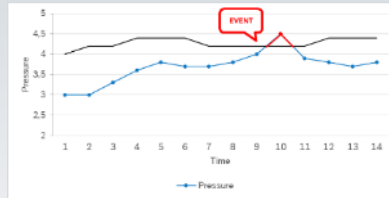
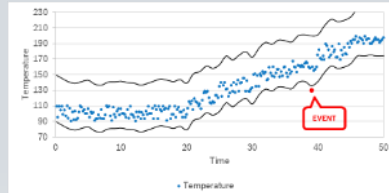
### Static

- Upper/lower limits
- Trend recognition; Sum of two measurements
- Static target with tolerance; Range



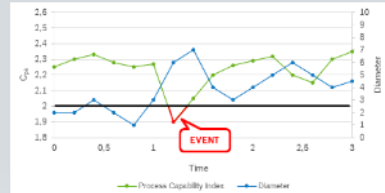
### Dynamic

- Dynamic limits
- Reference series as limit
- Jump detection



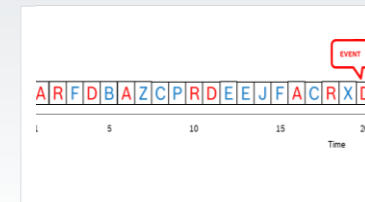
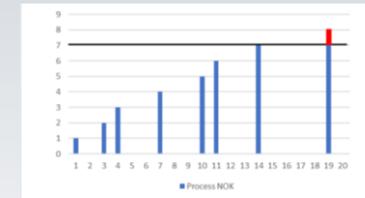
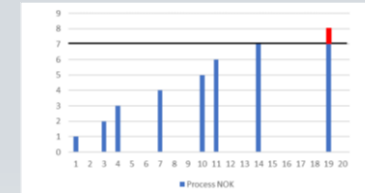
### Statistic

- Process capability index
- Normal distribution
- Nelson rules



### Counts

- Hit of events
- Hit of process results
- Event sequence detection



### Individual

Rules that can be developed for your individual use case. We offer a guided approach to find the solution you need!

- Workshop & customized rule development (separate quotation)



This can be your solution!



Waren-  
eingang



# Intralogistics

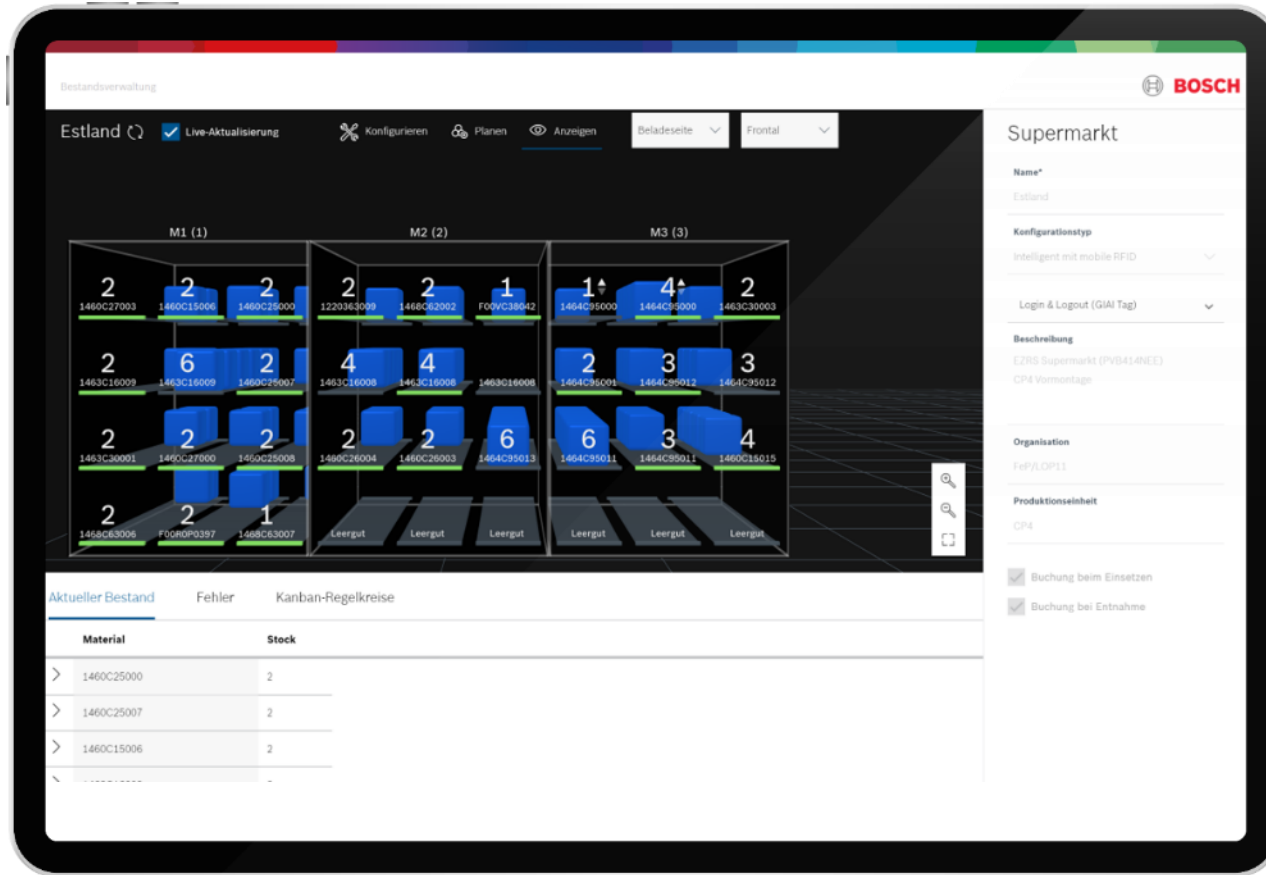
Optimize internal flow of goods





# Nexeed IAS: Stock Management

## Digitalization of the internal material flow & localization in real time



### Feature highlights

- Configuration of Supermarket (Modules, Levels, Lanes, Unit Load Types, Capacities, Storage strategies)
- Creation of Unit Load Types, Materials and Kanban Control Cycles
- List of existing Scanning Device in the Plant
- Management of Unit Load Types
- Visualisation of current stock of a selected Supermarket incl. Errors



# Nexeed IAS: Transport Management

## Dynamic route planner for logistics goods traffic

Transport Orders

Overview of the Transport Orders

0/54062 Filter

Live-Update Show / Hide Columns

State → Open Is Valid → Yes Reset filters

Source System	TO-ID	Creator	Creation Time	Deadline Time	Source Hall	Source Station	Destination Hall	Destination Station	Materials
P87011	7014088250/0001	CT_0110	06/02/2020 7:24:07 PM	06/02/2020 9:24:07 PM	604	LG040(KLT)-Zug	310	Österreich-M2(EST)	1464C1
P87011	7014088249/0001	CT_0110	06/02/2020 7:15:22 PM	06/02/2020 9:15:22 PM	604	LG040(KLT)-Zug	310	Österreich-M2(EST)	1463C1
P87011	7014088164/0001	CT_0110	06/02/2020 7:15:10 PM	06/02/2020 9:15:10 PM	604	LG040(Picking)	602	Japan(KLT)	192846
		Auto-TO	06/02/2020 7:14:44 PM	06/02/2020 9:14:44 PM	310	Österreich/Mod6	602	Russland	ZME4_L
P87011	7014088248/0001	CT_0110	06/02/2020 7:14:44 PM	06/02/2020 8:14:44 PM	602	Russland	310	Österreich	092840
		Auto-TO	06/02/2020 7:14:36 PM	06/02/2020 9:14:36 PM	310	Österreich/Mod6	602	Russland	ZME4_L
P87011	7014088237/0001	CT_0110	06/02/2020 7:14:36 PM	06/02/2020 8:14:36 PM	602	Russland	310	Österreich	092840
		Auto-TO	06/02/2020 7:14:29 PM	06/02/2020 9:14:29 PM	310	Österreich/Mod6	604	LG040(BoRo-LG)	NoWe_L
P87011	7014088214/0001	CT_0110	06/02/2020 7:14:29 PM	06/02/2020 8:14:29 PM	604	LG040(NoWe)	310	Österreich	1466CC
		Auto-TO	06/02/2020 7:14:21 PM	06/02/2020 9:14:21 PM	310	Österreich/Mod6	604	LG040(BoRo-LG)	NoWe_L
P87011	7014088193/0001	CT_0110	06/02/2020 7:14:21 PM	06/02/2020 8:14:21 PM	604	LG040(NoWe)	310	Österreich	1466CC
		Auto-TO	06/02/2020 7:14:10 PM	06/02/2020 9:14:10 PM	310	Österreich/Mod6	310	Brasilien	Gehäus
P87011	7014088105/0001	CT_0110	06/02/2020 7:14:09 PM	06/02/2020 9:14:09 PM	310	Brasilien	310	Österreich	1465CC
		Auto-TO	06/02/2020 7:14:07 PM	06/02/2020 9:14:07 PM	310	Österreich/Mod6	310	Brasilien	Gehäus
P87011	7014088256/0001	CT_0110	06/02/2020 7:14:07 PM	06/02/2020 8:14:07 PM	310	Brasilien	310	Österreich	1465CC

Items per page 15

### Feature highlights

- ▶ Easy creation of vehicle types in the system incl. parameterization (e.g. speed, load, dimensions)
- ▶ Quick definition of the stations to be approached
- ▶ Overview of all intralogistics transport orders from different systems (e.g. ERP, MES, manual input)
- ▶ Visualization of work assignments for employees at the vehicles
- ▶ Reporting of the statistical utilization of vehicle routes



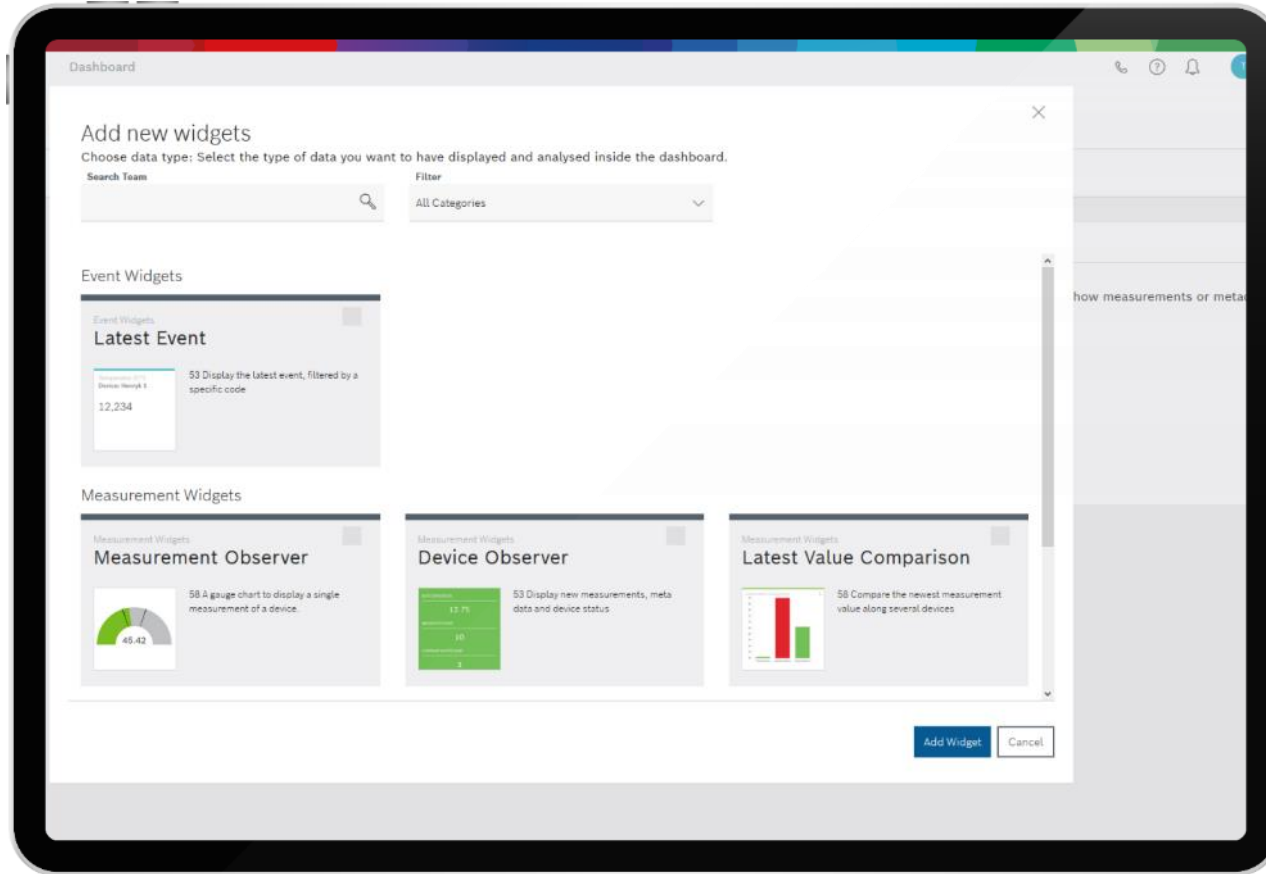
# Operating Base

Easy IT administration of the Nexeed  
Industrial Application System



# Nexeed IAS: Web Portal

## The central access point for all Nexeed Applications



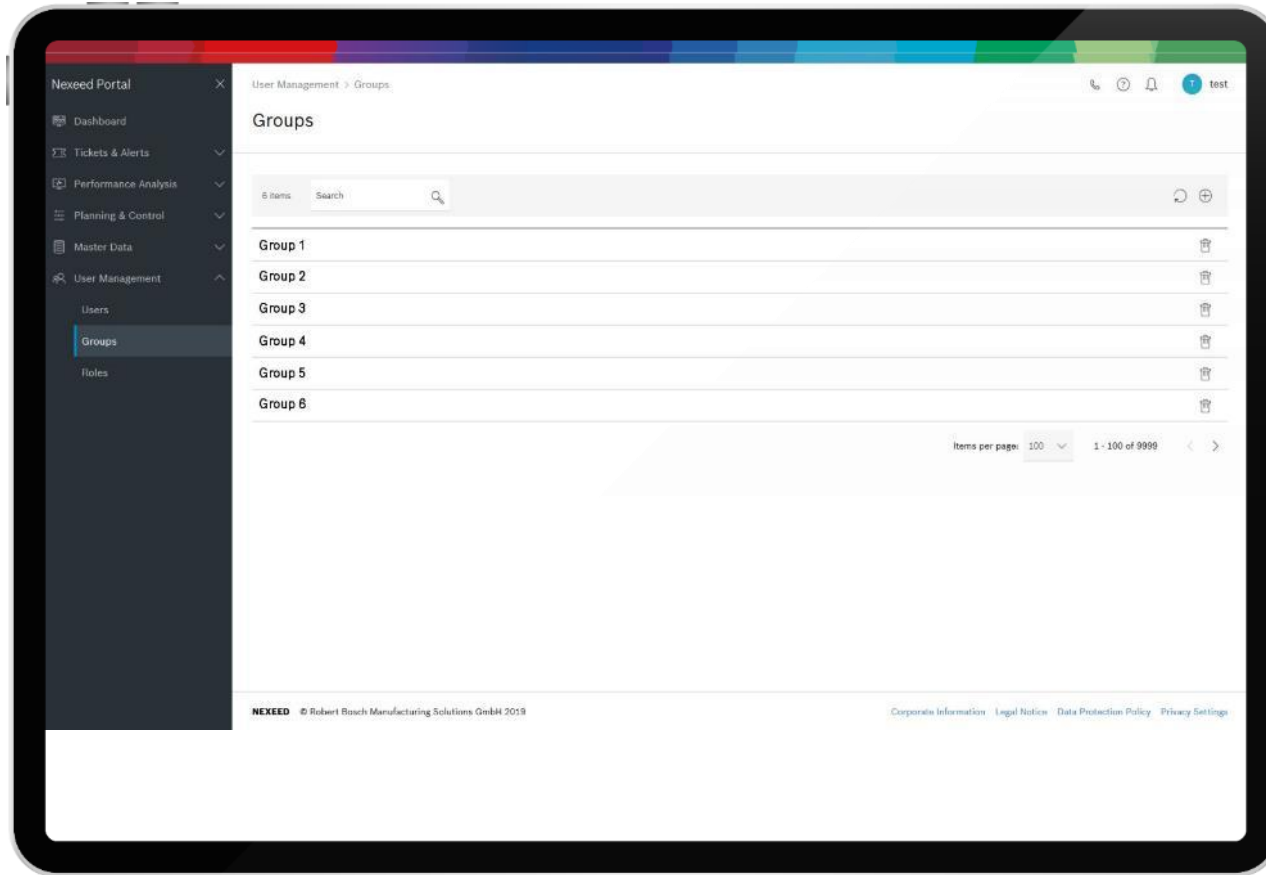
### Feature highlights

- ▶ Navigation bar with all the basic functionalities, as well as the booked applications
- ▶ Personalization options, e.g., the language and time zone
- ▶ User- and password-protected access
- ▶ Customizable dashboards
- ▶ Displaying the widgets from the respective applications on all terminals



# Nexeed IAS: Multitenant Access Control

## Managing and maintaining access rights conveniently

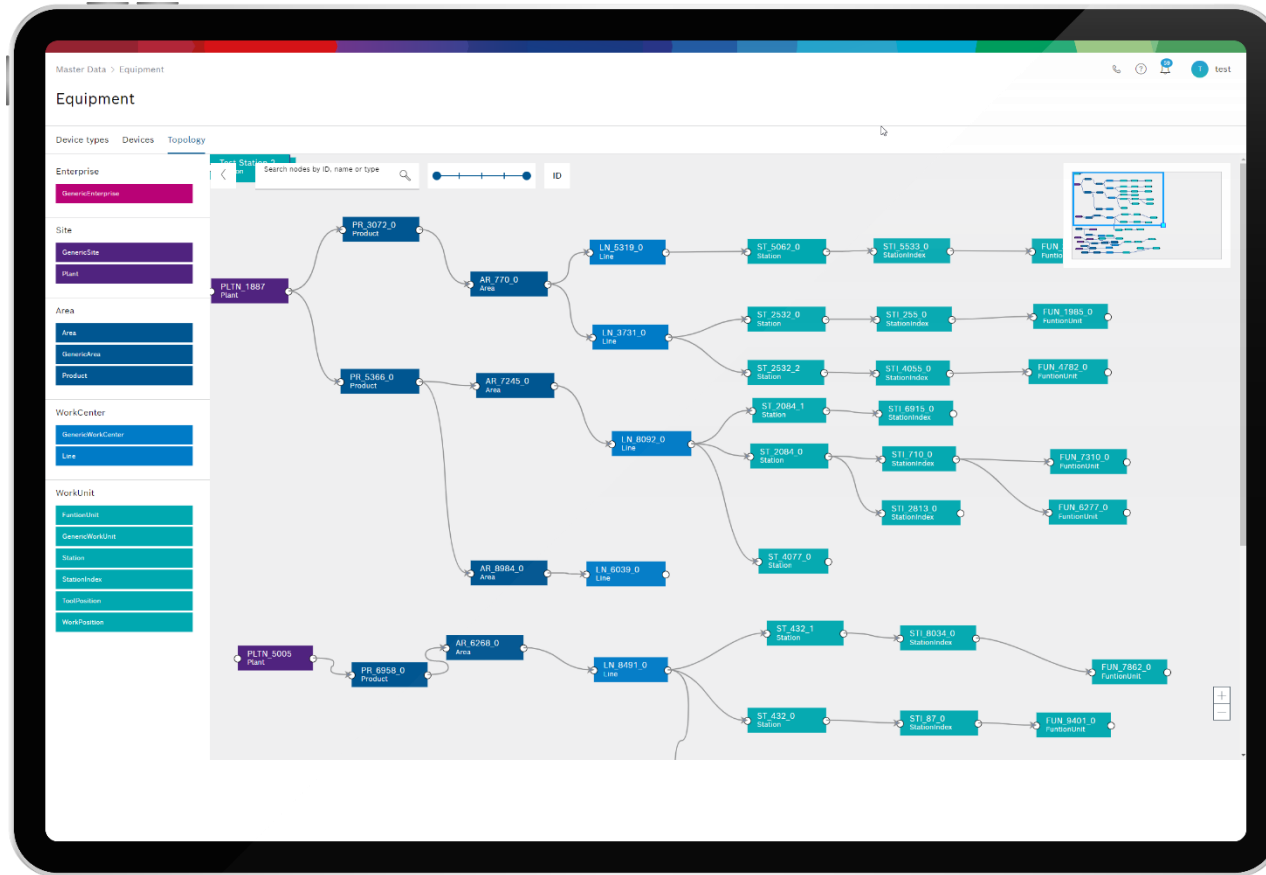


### Feature highlights

- ▶ Managing resources – generating, editing, deleting, and assigning
- ▶ Managing users – creating, editing, deleting and assigning
- ▶ Managing roles, tenants and groups – editing, deleting and assigning
- ▶ Releasing external access groups for specific resources

# Nexeed IAS: Master Data Management

## Central, cross-application master data creation & management



### Feature highlights

- ▶ Quick creation of new devices and device types
- ▶ Adding or also removing measurement points, error definitions, and instances
- ▶ Easy merging of multiple devices into individual topologies



# Use Cases

# Nexeed IAS – Use Case – Shopfloor Management

## Detection of optimization potential



### User Story

**Who?**

As a production manager,

**What?**

I want to monitor KPIs of machines

**Why?**

in order know how the stations are performing in real time.



### Approach



- ▶ Relevant process data is monitored for each machine of the line
- ▶ Identification of the station that causes the biggest OEE performance losses
- ▶ Hourly count of production figures (planned/actual produced parts, scrap/repair)
- ▶ Showing target & average cycle time of the line and stations
- ▶ Breakdown the line losses to specific machines or other reasons

### Customer benefits



- ▶ Identifies the cause of OEE losses
- ▶ Station and line losses can be differentiated

**Fast identification  
of optimization  
potential**



# Nexeed IAS – Use Case – Product & Quality Monitoring of the tightening process



## User Story

Who?

As a process and quality engineer,

What?

I want to visualize torque over angle and tightening errors from anywhere (without standing next to the machine),

Why?

in order to increase process transparency, speed up and facilitate troubleshooting and to reduce the number of returns.



## Approach



- ▶ Final torque values of all nutrunners are visualized centrally in Nexeed IAS (torque over angle)
- ▶ Message if connection is faulty
- ▶ Integrate Active Cockpit on Shopfloor with Nexeed Industrial Application System

## Customer benefit



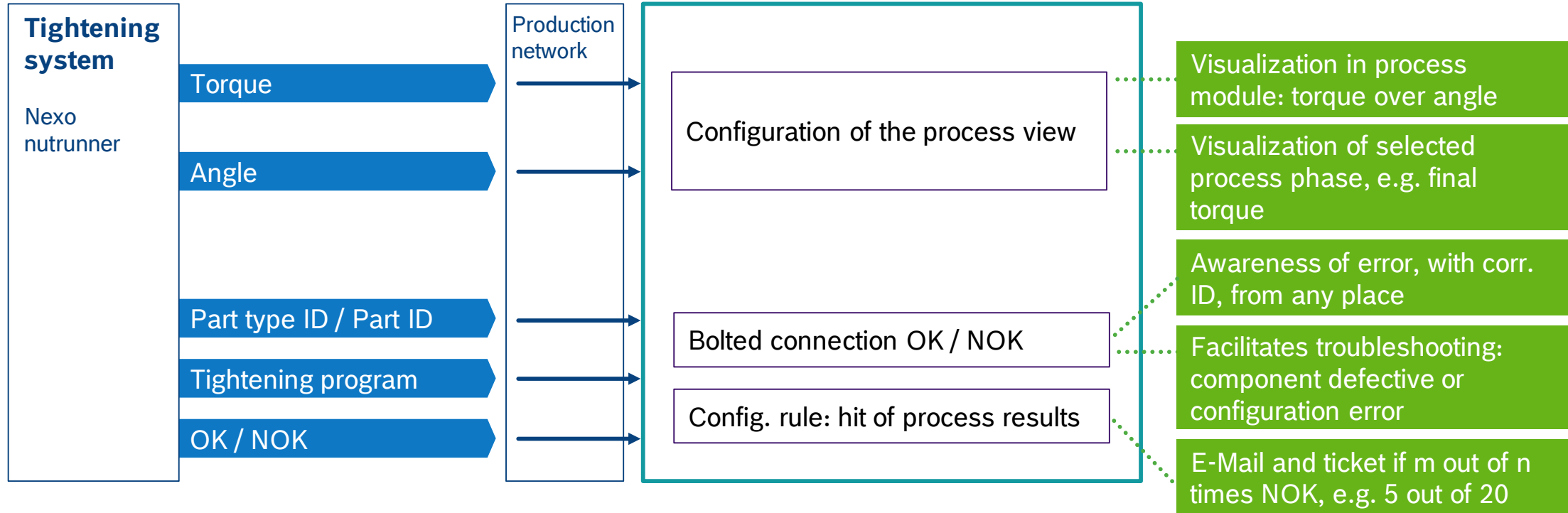
- ▶ Centralized visualization always accessible from anywhere
- ▶ Increased process transparency
- ▶ Easier error identification
- ▶ Reduction of returns

**+ 18.000 €  
annually**

Fewer customer complaints  
3 complaints at €500/month to 0

# Nexeed IAS – Use Case – Data Flow Mapping

## Monitoring of the tightening process



Shop floor

Nexeed Industrial Application System

Actionable insights

# Nexeed IAS – Use Case – Machine & Equipment

## Monitoring lubricants & filters for hydraulic valve production



### User Story

**Who?**

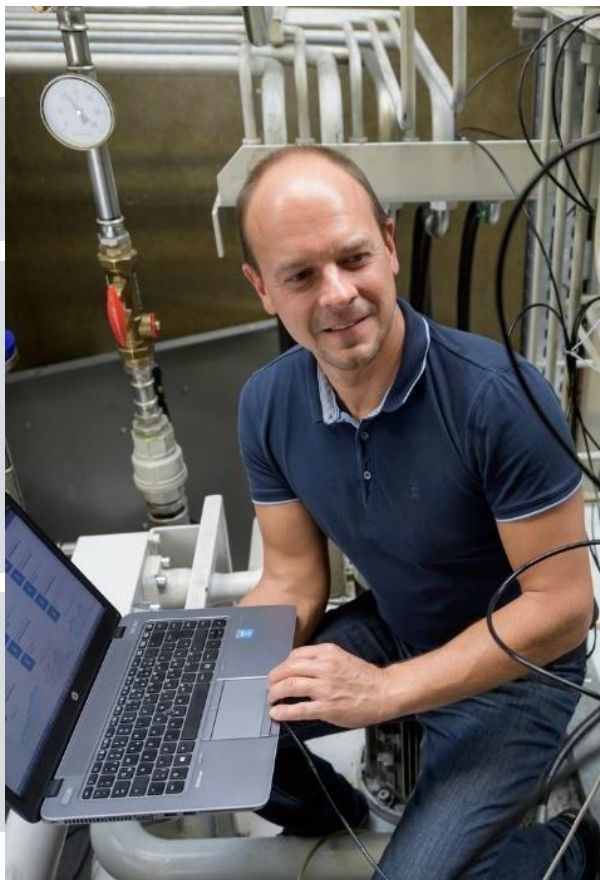
As a maintenance technician,

**What?**

I want to visualize lubricant and filter data,

**Why?**

in order to reduce maintenance costs as well as improve quality (oil cleanliness) and OEE.



### Approach



- ▶ Take the existing 30 test facility without an IT connection and retrofit it with about 20 IoT Gateways using IO-Link, Bluetooth, and USB
- ▶ Send data on lubricants and filters to Nexeed IAS for visualization

### Customer benefit

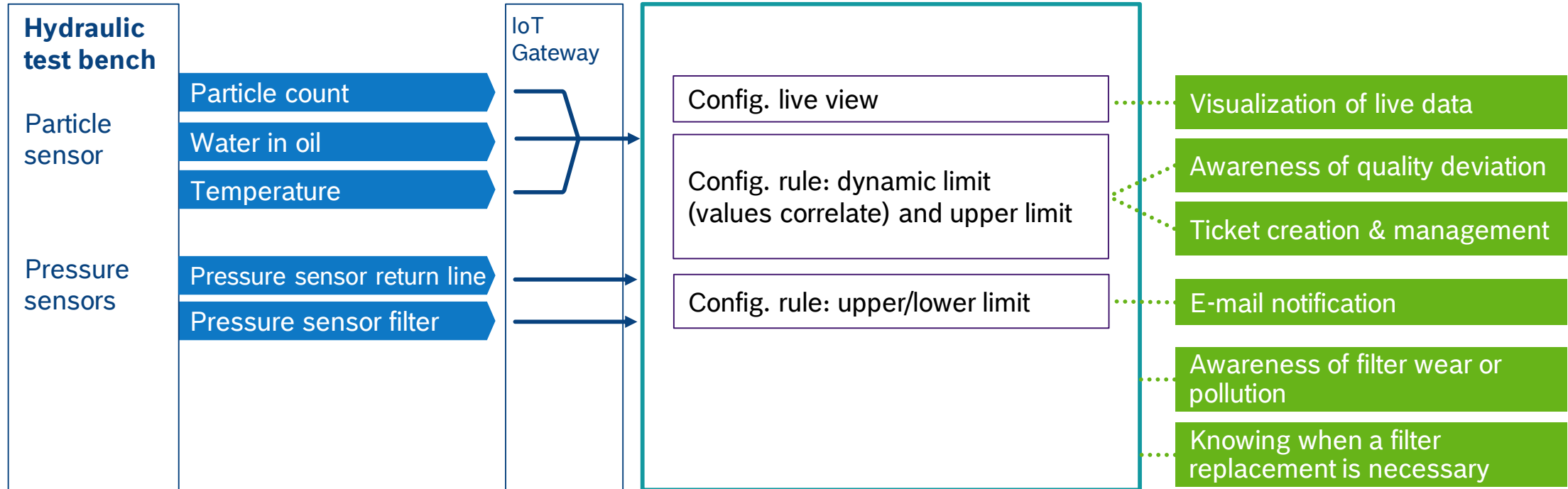


- ▶ 25% reduction in maintenance costs
- ▶ 20% less complexity in manual testing of oil cleanliness
- ▶ 5% increase in OEE

**ROI < 1.5  
years**

# Nexeed IAS – Use Case – Data Flow Mapping

## Monitoring lubricants & filters for hydraulic valve production



Shop floor

Nexeed Industrial Application System

Actionable insights



# Nexeed IAS – Use Case – Intralogistics

## Digitizing material flow and materials localization in real time



### User Story

Who?

As a logistics engineer,

What?

- ▶ Want to achieve a delivery process including an efficient real-time booking and also avoid stock deviations

Why?

- ▶ Employees need long carry out time-consuming manual bookings
- ▶ Less transparency in the warehouse due to manual operations



### Approach



- ▶ Digitization of the internal material flow
- ▶ Automatic material bookings and follow-up orders supports employees in their daily work
- ▶ Using the available lanes and containers efficiently allows the supermarket to be kept relatively small

### Customer benefit



- ▶ Increasing transparency of stock and location
- ▶ Improving error prevention
- ▶ Reduction of booking efforts

**+ ROI <1,5  
years**



# Summary

# NEXEED

## Industrial Application System



Manufacturing  
excellence inside



Value proven  
use cases



On premises  
and cloud



Quick implemen-  
tation & ROI

**All perspectives on digital production under one umbrella.**

# Bosch Connected Industry

## Selected references and figures



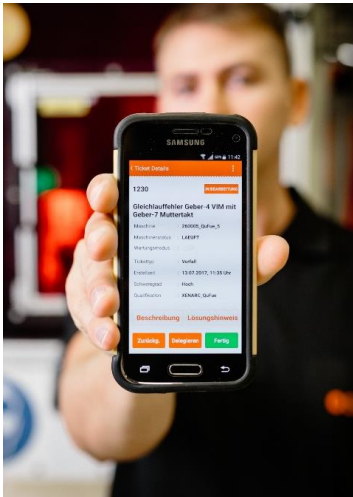
BMW Group  
Landshut  
plant

Maximum  
process  
transparency  
in automotive  
component  
production



Intern. Bosch  
Plant Network

Intralogistics  
solutions for the  
synchronization of  
real and digital  
material flow



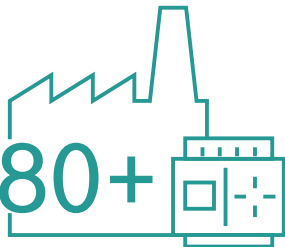
OSRAM

An Industry 4.0  
app for agile task  
management

100+

international customers



plants\*: 180+  1,200+  
machines at largest plant

\*~125 Bosch plants are using Nexeed Software components



60+

expert  
use cases  
implemented



# BENEFITS



## Transparency

in manufacturing



## Productivity

Up to **5-10 %** higher



## Maintenance cost

Up to **25 %** lower



## Machine availability

Up to **15 %** higher

# CONTACT US!

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