BOSCH
Invented for life

Bosch Connected Industry

NEXEED –
software and services
for production and logistics

Bosch Connected Industry – Industry 4.0 software from a single source

NEXEED

Content

The expectations for Industry 4.0 are clear: manufacturing companies require lower maintenance and repair costs with higher machine availability, and increased efficiency through transparency and traceability. Employees want the best possible support in a modern, digital work environment.

Intelligent software solutions and services ensure consistent transparency and efficiency in production and logistics processes. Bosch Connected Industry pools these solutions in a comprehensive portfolio under the name Nexeed.

Nexeed has one overarching goal: to offer our customers the best possible support in connecting their value stream. To do so, we support them from the first consultation through implementation to onward connectivity.

Our solutions make day-to-day work easier for employees and optimize production and logistics processes in terms of transparency, agility, cost, quality and time.

NEXEED makes production and logistics easier

The Nexeed software solutions make sure that product, process and logistics data of all machines and systems are used for continuous optimization – from procurement (source) through production (make) to the end customer (deliver). Nexeed makes it easy to get started with the connected factory: customers receive cost-efficient starter kits and simple retrofit solutions, as well as comprehensive packages with customized services. Nexeed solutions can be used to connect individual lines, entire plants and plant networks, their intralogistics and the external goods flow.

Bosch's dual strategy
Bosch is both leading user and leading provider for Industry 4.0. In line with this strategy we validate our Nexeed solutions internally before we introduce them to the market. Customers benefit from the experience of more than 270 Bosch plants and more than 700 warehouses all over the world. This experience is integrated into the further development of our products, generating practical solutions with a clear focus on specific customer benefits.

**Who is Nexeed developed for?**
We supply our Industry 4.0 software solutions and services to our own Bosch plants around the world and to customers from different industries:

▸ **Operators of all kinds of production facilities and warehouses**, i.e. producers and distributors from the following industries: automotive, logistics, electronics, pharma and food

▸ **Machine and equipment manufacturers** who act as suppliers for the manufacturing industry

▸ **Logistics service providers, leasing and consulting companies** who use our solutions to optimize their internal fleets and customer fleets

▸ **Industry 4.0 suppliers and system integrators** who use our components to offer their customers individual systems and complete solutions

We also work with numerous partners from a wide range of areas. Our solutions can be put to greenfield use in new manufacturing and warehouse concepts and integrated into existing lines, factories and warehouses.

NEXEED –
Bosch software solutions
for the connected value stream

NEXEED

TRANSPARENCY AGILITY COST QUALITY TIME

SOURCE   MAKE   DELIVER

Nexeed Open Integration
Harmonizing Industry 4.0 applications

Users of Industry 4.0 solutions perform a wide range of tasks with specialized software applications. Nexeed Open Integration bundles all these applications in a single framework.

It makes it easier to switch between the applications and to ensure the interoperability of core functions. Users can access all required tools through a single, open interface and with just one login. Nexeed Open Integration provides quick access – to the Nexeed solutions, to other Bosch applications, and to third-party solutions.

Nexeed Connected Manufacturing
The Nexeed Connected Manufacturing solutions connect the entire production process. We have transferred the extensive domain knowledge from more than 270 Bosch plants into software solutions. Working together, manufacturing and software specialists have created a portfolio that provides solutions for the real needs of all production processes. The result is greater transparency and efficiency along the entire value stream.

Nexeed Production Performance Manager
Software for the systematic and sustainable optimization of production

Nexeed Maintenance Support System
Shorter repair times and higher machine availability through intelligent maintenance

Nexeed Manufacturing Execution
Far more than an MES –
modular and scalable as needed

Nexeed Automation
Rethinking automation: efficiency for machine manufacturers and operators

Nexeed Remote Shopfloor Access
Remote maintenance in real time –
reduced integration costs, maximum security

Nexeed Manufacturing Transparency Kit
Fast machine upgrades, increased OEE and efficiency – with no downtime

Nexeed Device Portal
Transparency and security for IIoT devices through centralized management

Nexeed Data Analytics
Discovering unexpected potential for optimized quality, cost and delivery performance

Nexeed Connected Logistics
With our Nexeed Connected Logistics solutions, we offer software services based on sensor-based real-time data from the supply chain. As leading user and leading provider for Industry 4.0, we can draw on extensive expertise in connected IoT real-time logistics. The Nexeed Connected Logistics solutions are used in Bosch plants, and are now also available for external customers. The solutions are designed to digitize processes and add value in the form of automation, asset uptime, reduced circulating stock, and material flow transparency with IoT data.

Nexeed Intralogistics Execution
Optimizing and monitoring vehicle fleets, material stock and transport routes

Nexeed Track and Trace
Seamless transparency throughout the entire supply chain

Nexeed Connected
Manufacturing
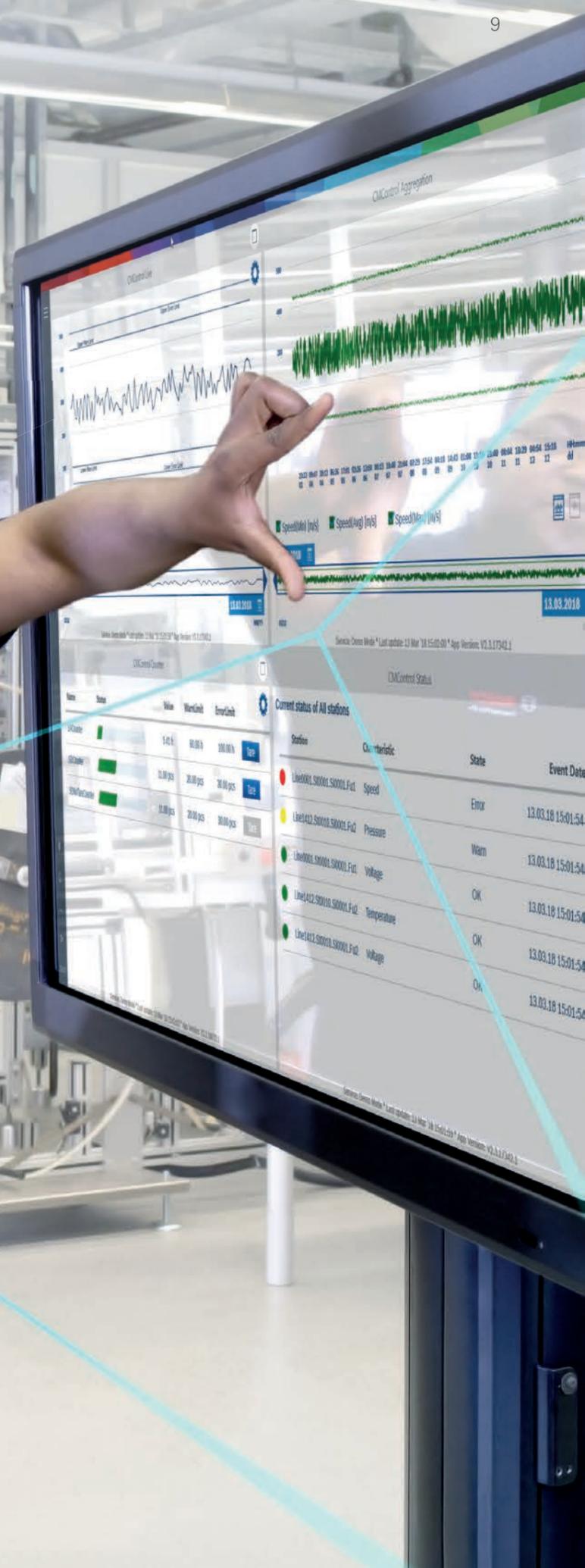
Nexeed Production Performance Manager

Systematic production optimization

The systematic, sustainable optimization of production – this is the goal of the Nexeed Production Performance Manager. The software collects and harmonizes production and machine data from many different sources across the shopfloor in real-time. The data is visualized and passed on to the employees as defined events, which means that reaction times can be shortened, errors avoided and tasks clearly assigned.

The Nexeed Production Performance Manager provides an overview of the current state of individual machines and the entire production system from anywhere in the factory.The simple rule configuration allows maintenance personnel to carry out predictive maintenance with minimum downtime. Product quality can be optimized by monitoring and documenting the process data.

The Nexeed Production Performance Manager operates as a stand-alone solution. Thanks to its open interfaces, it can also be combined with other solutions, e.g. as an MES extension. Customers benefit from the steadily growing ecosystem and the open Industry 4.0 standard Production Performance Management Protocol (PPMP), offering fast and easy machine connectivity.

The Nexeed Production Performance Manager consists of a modular, scalable system which can be adapted to each specific customer application:

▶ **Condition Monitoring**: ongoing status recording for maximum transparency

▶ **Live process data analysis**: minimizing production errors and process deviations

▶ **Predictive maintenance** through configurable rules, automatic notification and task assignment

▶ **Flexible Industry 4.0 multipurpose tool** for customized applications

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Advantages at a glance

▶ Up to 15 % higher machine availability through predictive maintenance

▶ 5-10 % higher production performance by reducing scrap

▶ Full transparency: machine and process data available live at any time

▶ Employees can contribute their expertise without the need for special IT skills

▶ Maximum flexibility and safety for future applications thanks to modern software architecture, documented interfaces and open standard (PPMP)
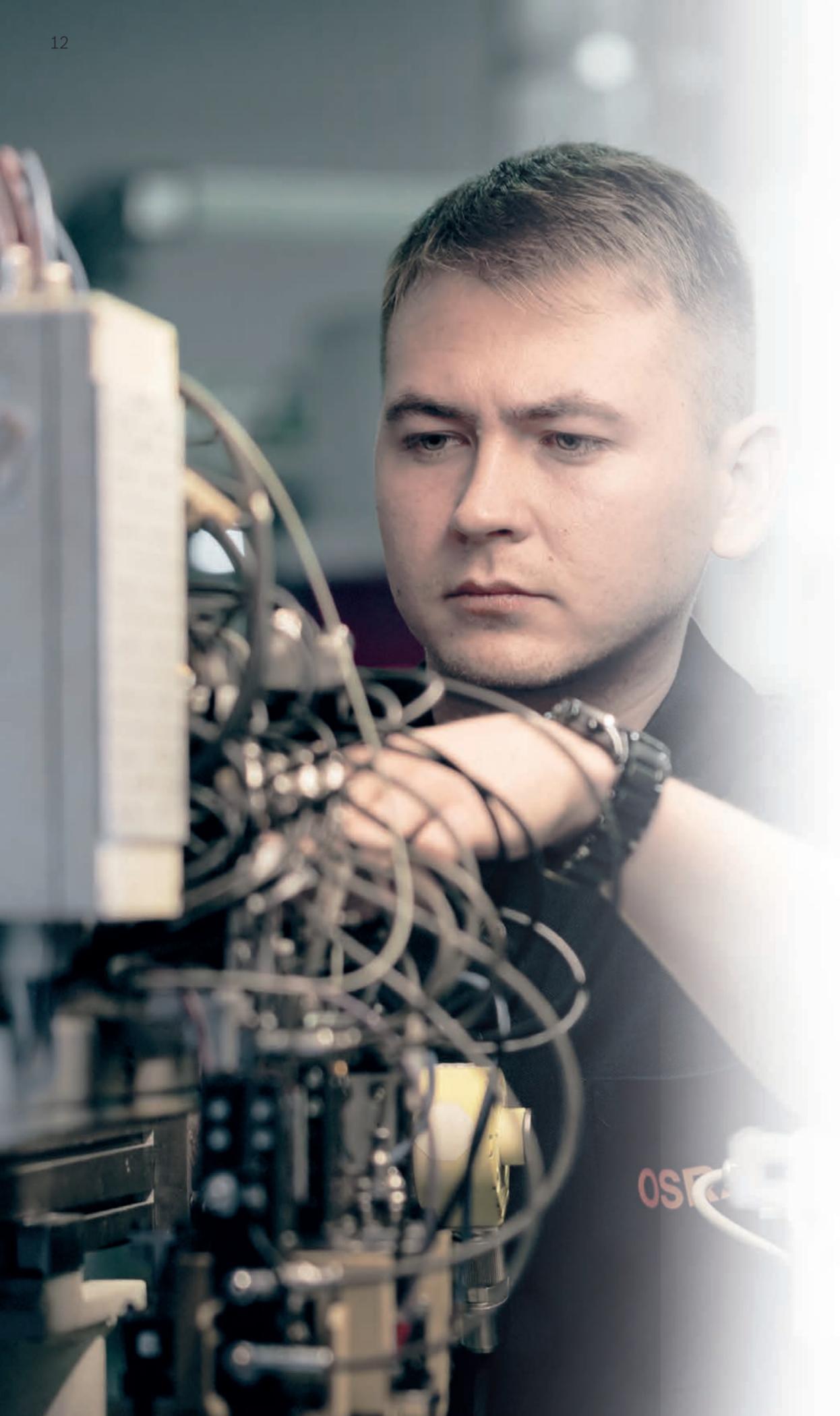
**Nexeed Production Performance Manager
Application example**

The OSRAM Ticket Manager app for employees

For the lighting company OSRAM, we have connected more than 80 machines of various vintages and production technologies. The company's xenon lamp plant in Berlin now has an "OSRAM Ticket Manager", which supports employees on the way to flexible, connected production.

The technological basis is the Nexeed Production Performance Manager, which "translates" the machine data from different formats into a single common language and converts the data into useful information. Employees can now simply consult an app to get a status report on their machinery. Tasks like maintenance work or material supply can be clearly displayed, organized, evaluated and assigned directly to the employee with the appropriate qualification.

> "Together with Bosch we developed the OSRAM Ticket Manager, an individual solution that addresses the specific needs of our employees and our workflows."
>
> **Dr. Frank Sroka,
> Head of Industry 4.0 manufacturing at OSRAM**

Nexeed Maintenance Support System

Maintenance work clearer than ever

Maintenance work often ties down resources unnecessarily. With our Nexeed Maintenance Support System (Nexeed MSS), long paths, diagnostic and coordination times are a thing of the past. The analysis and transmission of data in real time make it possible to respond quickly and process maintenance orders efficiently – even without extensive specialized knowledge.

For this purpose, the Nexeed Maintenance Support System bundles all necessary information and makes it available to machine operators and maintenance personnel on mobile devices. For example, technicians can use their smartphones to read out fault history data and access errors that have already been fixed. They can also call up digitized documents, images and videos. In no time at all, operators and technicians have all the information they need for efficient maintenance.

In addition to fault diagnosis, the Nexeed MSS also simplifies the ordering of spare parts. The maintenance technician checks the available stock directly on his mobile device. If the required part

is in stock, he reserves it and can install it promptly. He then documents the assignment and closes the ticket. The result is shorter repair times and increased machine availability.

The Nexeed Maintenance Support System is available as a stand-alone solution or as part of the extensive Nexeed Manufacturing Execution.

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Advantages at a glance

▶ Average disruption period
 reduced by 20 %

▶ Up to 5 % higher OEE

▶ Time and cost savings thanks
 to optimized maintenance processes

▶ Short response times thanks
 to the automated alarm mechanism

▶ Intuitive, easy-to-operate user interface

▶ Available as stand-alone solution
 and with optional machine connectivity

▶ Open, secure standards based on
 Nexeed Manufacturing Execution

Nexeed Manufacturing Execution

Far more than an MES

Real-time transparency is the basis for successful production optimization, planning and control. The modular, scalable Nexeed Manufacturing Execution delivers the precise information organizations need for active control, complete documentation, traceability, quality assurance, and monitoring of their entire manufacturing operations. The goal is to continuously optimize processes, to react quickly to changes, and thus to increase production efficiency.

Nexeed Automation

Automation made easy

The automation platform Nexeed Automation combines all the advantages for machine manufacturers and operators. The basis of the platform is the control-independent software system "Control plus". Its modular engineering approach enables machine manufacturers to realize their automation projects easily and cost-effectively. The software framework based on the PLC standard IEC 6-1131, the extensive object library and the visualization system are configured via the central development tool OES. This very quickly generates a testable software project which can be supplemented by process-specific sequences and functions.

Integrated engineering gives machine operators added value in the form of services and apps. The apps or assistant systems support the machine operator in handling diagnosis and error detection throughout the machine's lifecycle, while ensuring consistently high machine availability. The system can be integrated into customer-specific IT infrastructures via open IT standard interfaces such as REST or OPC-UA, and provides additional machine, operating and process data. Intelligent machines with a modern architecture make production fit for Industry 4.0.

Advantages at a glance

▶ More than 22,000 applications in Bosch facilities all over the world

▶ Reduced development costs through use of an SW framework

▶ Shorter development times and reduced project risk thanks to modular engineering

▶ Intuitive operation

▶ Apps provide high production transparency

▶ Open, standardized interfaces, e.g. for easy integration into IT systems

Nexeed Remote Shopfloor Access

Maximum security for remote maintenance

Unplanned machine downtime can quickly become a cost-intensive business. To counter this, we have developed a time and cost-saving solution for large customers: Nexeed Remote Shopfloor Access enables service technicians (either external service providers or an employee) to monitor and maintain machines and systems centrally via remote access.

Nexeed Remote Shopfloor Access focuses on the "Security by Design" approach. Sophisticated multi-stage authentication and release management ensures control over who has access to what machines at what time and for how long. Encrypted tunnels create a secure connection between the machine and the service technician's computer.

Nexeed Remote Shopfloor Access is independent of software and supplier. It can be quickly implemented and is accessible from freely selectable terminals. The solution can be integrated into the customer's existing enterprise IT systems and business processes, thus cutting the usual integration costs, especially for large machine parks.

Advantages at a glance

▶ Security by Design: personalized authentication and multi-level release management

▶ Reduced integration costs: holistic and supplier-independent

▶ Higher efficiency and quality without on-site support

▶ Connectivity of existing IT networks with machines on the shopfloor

▶ Automatic updates and security certificate generation

▶ Process reliability for remote maintenance documentation

▶ Approx. 75 % of all maintenance tasks can be carried out remotely

Nexeed Manufacturing Transparency Kit

Small retrofit solution with great effect

The causes for delays or unplanned production downtime are often difficult to identify – which is both time-consuming and nerve-wracking. The Nexeed Manufacturing Transparency Kit provides machine operators with fast information about bottlenecks, irregularities or the status of their machines and lines.

The Nexeed Manufacturing Transparency Kit is a retrofit solution that can be applied quickly and easily to existing machines and lines. It includes sensors, the Bosch Rexroth IoT Gateway and an individually adaptable user interface. The sensor is easy to install without machine downtime, and the system is easy to configure – without interfering with existing IT infrastructures.

Staff can use their mobile devices at any time to access the user interface, which is visualized on a web interface. This makes it possible to identify and eliminate sources of error more quickly and to achieve an OEE or efficiency increase. We have developed different solutions that can be combined modularly and flexibly according to customer needs. They are available "out of the box" and are independent of all other connections.

Advantages at a glance

▶ Increased OEE

▶ More transparency and control of production

▶ Faster error response times

▶ Non-invasive, easy installation without machine stops

▶ Quick implementation of plug & play sensor systems

▶ Low investment costs

Nexeed Device Portal

The digital conductor of all IIoT devices

Managing a large number of Industrial IoT devices can quickly become confusing and time-consuming. Any change to the software costs staff time and labor. Moreover, the software of IIoT devices might age and be susceptible to malware and viruses. The Nexeed Device Portal provides a remedy.

The cloud-based solution offers a central overview of all IIoT devices in the production network. It enables configuration, installation of updates and additional features, and remote access – throughout the device's lifecycle. Users get a clear overview of all connected devices and their status at any time, and can manage them centrally. Sensitive production data remains untouched.

The Nexeed Device Portal makes production ready for future challenges – given that it is often impossible to know today what functions will be required tomorrow. The portal keeps all options open for installing future updates, such as improved analysis algorithms, quickly and without complications. The software itself can be integrated into the existing IT infrastructure with minimum effort.

Advantages at a glance

▸ Clear overview of the status of all IIoT devices

▸ Safe and future-proof

▸ Full control of data; no access to production-related information

▸ Central management of updates and additional software

▸ Remote access to individual devices from anywhere in the world

▸ Time savings and support for production workers
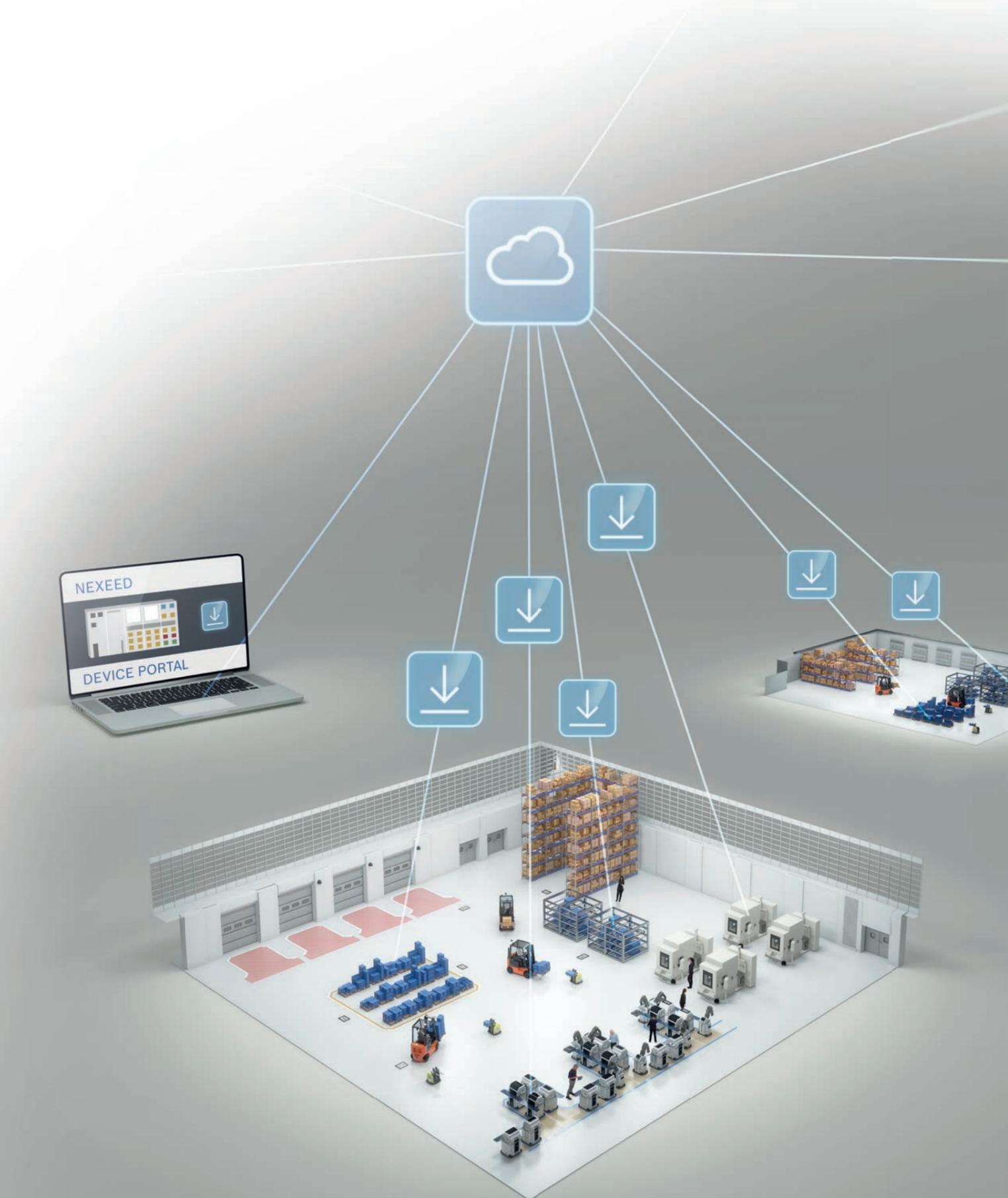
Nexeed Data Analytics

Generating added value from production data

The production process generates large and varied volumes of data – the most important raw material of Industry 4.0. With Nexeed Data Analytics, this data can be used intelligently to draw important conclusions for optimization potential. Data analytics help to visualize and analyze problems and to identify previously unknown correlations.

Customers do not have to deal with data analytics themselves – this task is entirely in the hands of the Bosch experts, who integrate predictive models into the existing IT environment so that they can be applied to real-time data for such tasks as predictive maintenance. Development divisions also benefit from Nexeed Data Analytics in improving existing products or engineering new ones.

We offer customers an individual service – from the first data analysis to comprehensive prediction models – by combining our long-term production expertise with extensive software and data know-how. Whether it be data integration and processing or machine learning and artificial intelligence – we combine the right methods for every application. This way we help customers gain new insights from their data and deliver tangible improvements in quality, cost and delivery performance.

Advantages at a glance

▶ The fast way to profitable results

▶ Amortization period: 4.5 days in a Bosch plant

▶ Recognized methods, proven applications

▶ Optimization of costs, quality and delivery performance

▶ Reduced maintenance costs

▶ Optimization of new or existing products

▶ Full service, also after handover of the results

▶ Getting started immediately with workshops and training sessions, including specific takeaways

Nexeed Connected
Logistics

Nexeed Intralogistics Execution

One-stop-shop intralogistics

Logistics in production and in the warehouse is a complex matter. Managing materials, vehicles and routes so that everything is always in the right place at the right time can quickly become confusing as volumes of goods, short-term rescheduling and disruptions occur. Nexeed Intralogistics Execution is a software solution that meets these challenges and ensures transparency and efficiency from warehouse to point of use.

Our vision comprises a digital, smart material flow throughout the entire intralogistics value stream. Interoperable modules deal with the three most prevalent issues for logistics specialists: digitizing the vehicle fleet, optimizing material storage and designing transport routes dynamically. They help the logistician in his daily work and facilitate long-term planning.

With Nexeed Intralogistics Execution, information about the entire fleet is available in real time: from material storage, to the exact position of vehicles and transport routes, through to the percentage of empty and loaded trips. This solution supports logistics specialists in the dynamic planning and execution of all in-house transport movements. The warehouse arrangements can be optimized using real-time inventory data from the intelligent supermarket.

Advantages at a glance

▶ Interoperable IoT data hub with interface integration of intralogistics subsystems

▶ Live overview of all vehicle, route, transport and stock information

▶ Calculation of the optimum transport route and vehicles in real time

▶ Complete transparency of stock levels and storage location

▶ User-friendly visualization

▶ Efficiency and quality increase across the entire material flow

▶ 30 % efficiency increase of a fleet in a Bosch plant

Nexeed Track and Trace

Seamless transparency throughout the supply chain

Our Nexeed Track and Trace solution enables the freight and load carriers to send regular information about their current location and status to the cloud. For instance, schedulers can view where the packages are at any time and whether they are expected to arrive on time. Information about temperature, vibration and humidity is also transmitted.

IoT devices such as wireless sensors and gateways make it possible to log and track information about each package or load carrier. The items and carriers themselves transmit the information: logistics specialists receive reliable, high-resolution and real-time information. Geographical coordinates are added, and the results are sent from the gateway to the cloud.

This information is made available to the user via a web-based stand-alone solution on mobile devices or is transmitted to the company IT system via standard interfaces. The ongoing flow of data helps logisticians pinpoint utilized capacity, disruptions and bottlenecks, makes it possible to analyze loss of goods and reduces planning efforts.

Advantages at a glance

▶ Continuous optimization of logistics processes

▶ Tracking based on real-time events

▶ Independent of third parties, thanks to intelligent packages

▶ Integration into existing logistics applications

▶ Plug & play implementation for suppliers, service providers etc.

▶ Optimized material and capacity planning

▶ Possibility of condition monitoring during transport

▶ Optimized utilization of load carriers