Sales presentation, as of 06.2026

Bosch Manufacturing Solutions | BMG

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BMG | **who we are**

Bosch Manufacturing Solutions | BMG – Global industrialization partner & turnkey special machinery provider for

Intelligent Production Equipment & Automation

- > 30 years of experience in systems engineering – from process station to turnkey
- > 5.000 assembly & testing systems
  > 10.000 small & services projects
- Automation level adjustable, semi- to fully automated solutions
- Digital planning & process to digital engineering & i4.0 applications

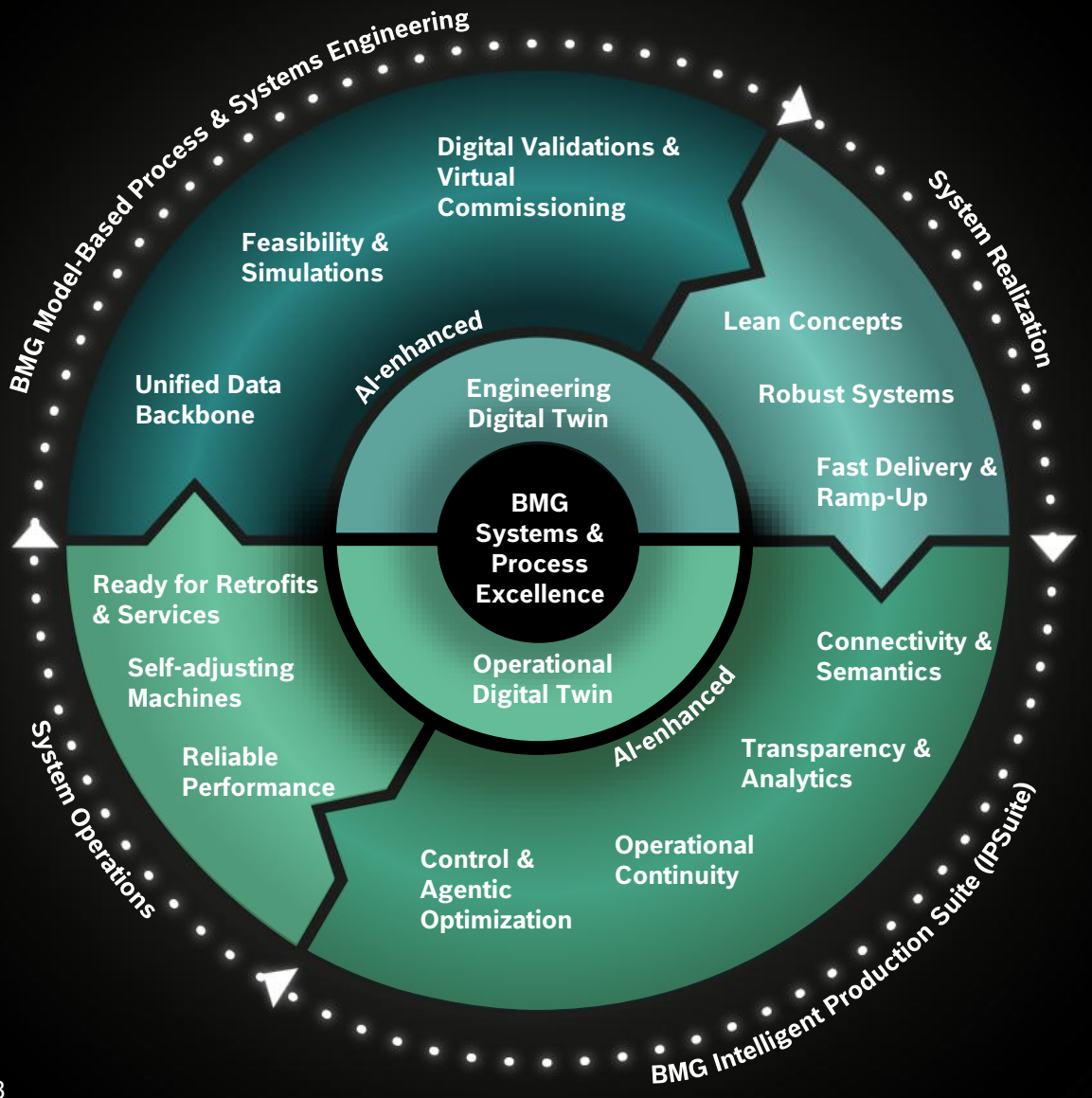
>17
Locations

Full-liner portfolio

Several industries & product areas

1.800
Employees

~520
TNS m€



BMG | Intelligent Production Systems & Services

Lean. Reliable. Adaptive.

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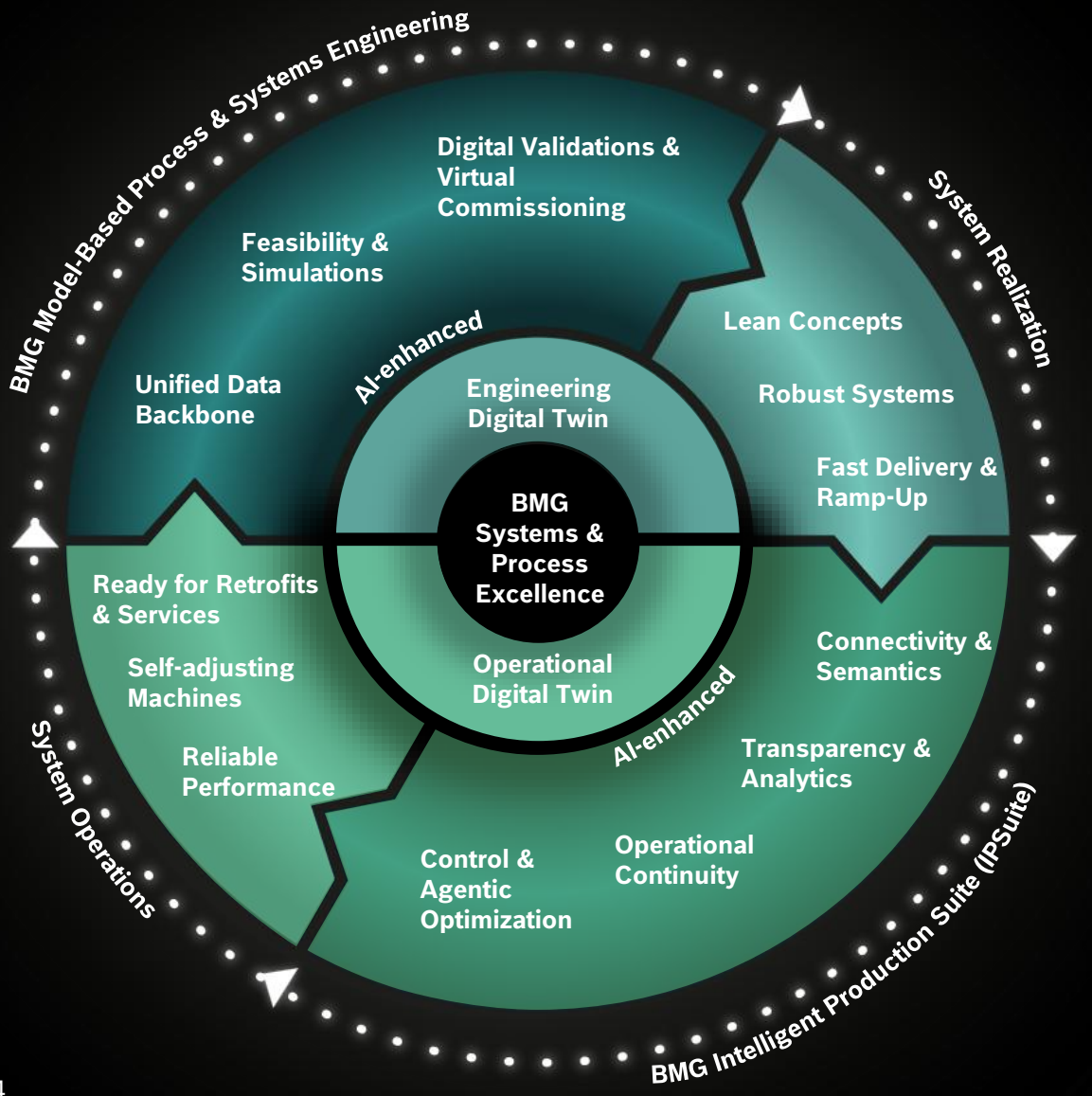

Software Defined Systems & Services, enabling SDM:

- Flexibility through modularization
- Reliability for demanding products
- Efficiency in MAE Invest & TCO view throughout the whole lifecycle

Enabled by

- Digital, intelligent Engineering and Operations Solutions & Services
- A trustful industrialization partner with overall systems and strong process know-how

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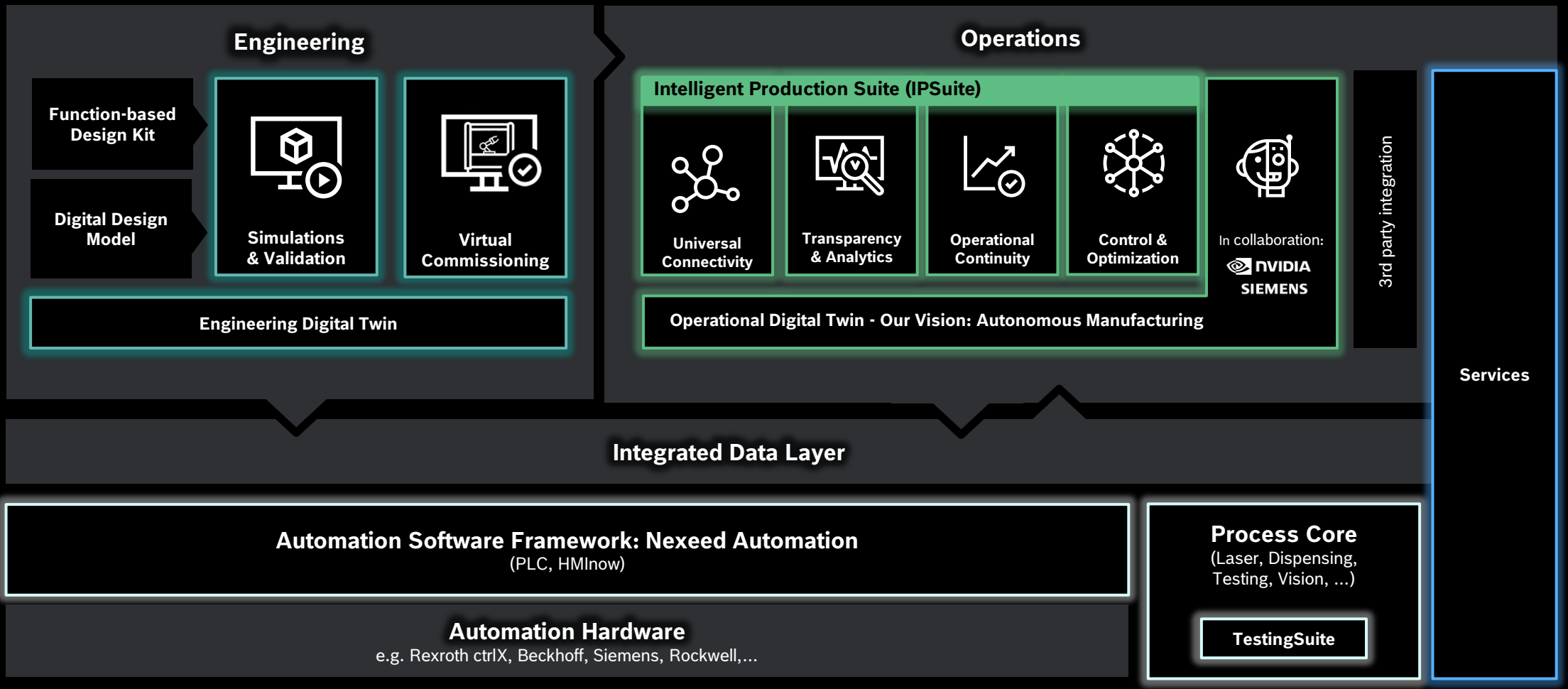
BMG | Intelligent Production Systems & Services

Digital Offer – From Engineering to intelligent & autonomous Operation



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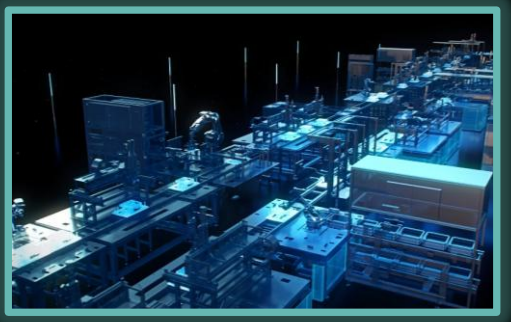
Digital Engineering



Engineering Consulting & Digital Engineering

Advanced Manufacturing Processes & Technologies

Digital & Intelligent Solutions (IPSuite)

Services along the entire product lifecycle

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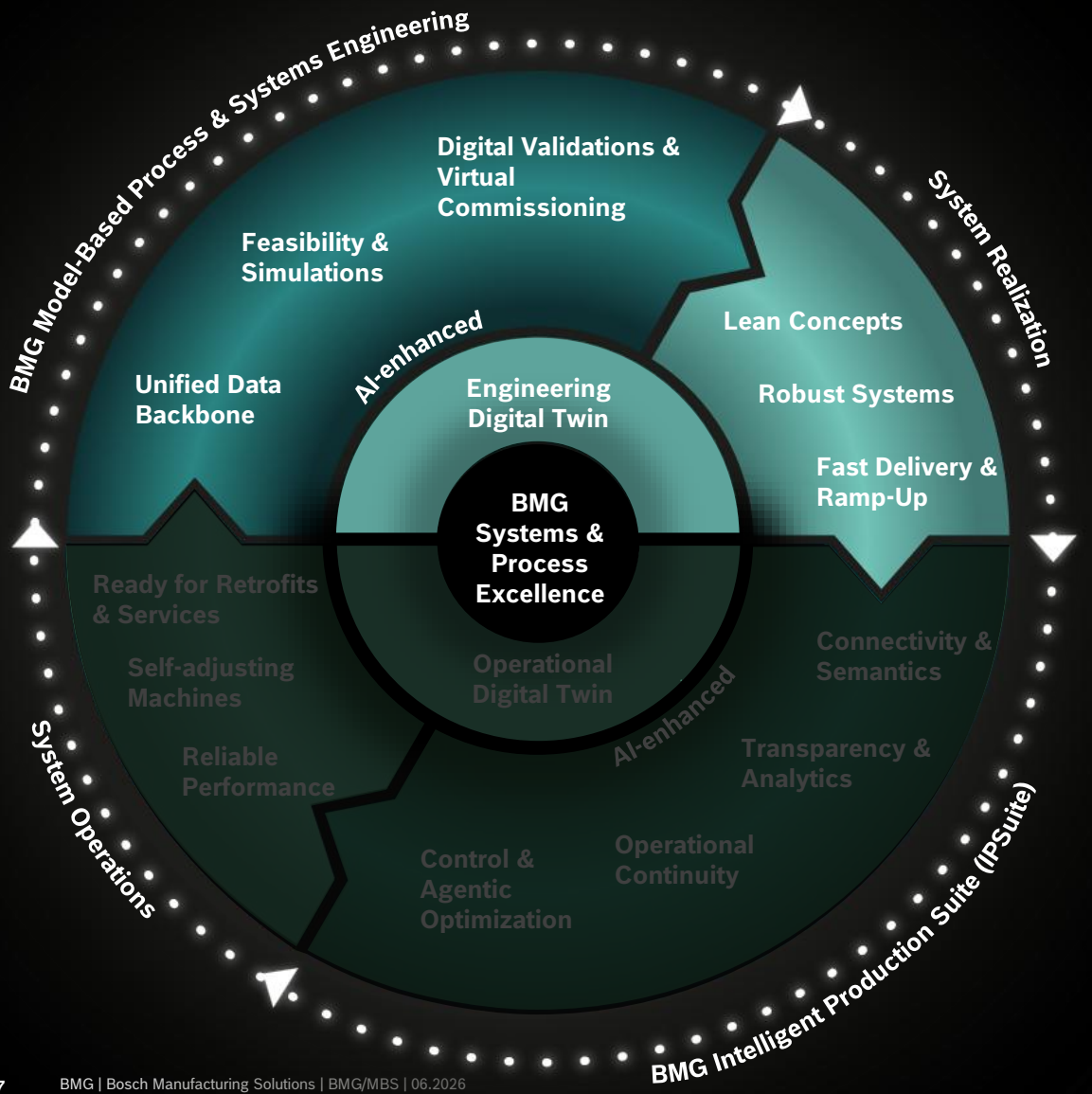

BMG | Intelligent Production Systems & Services

Digital Engineering

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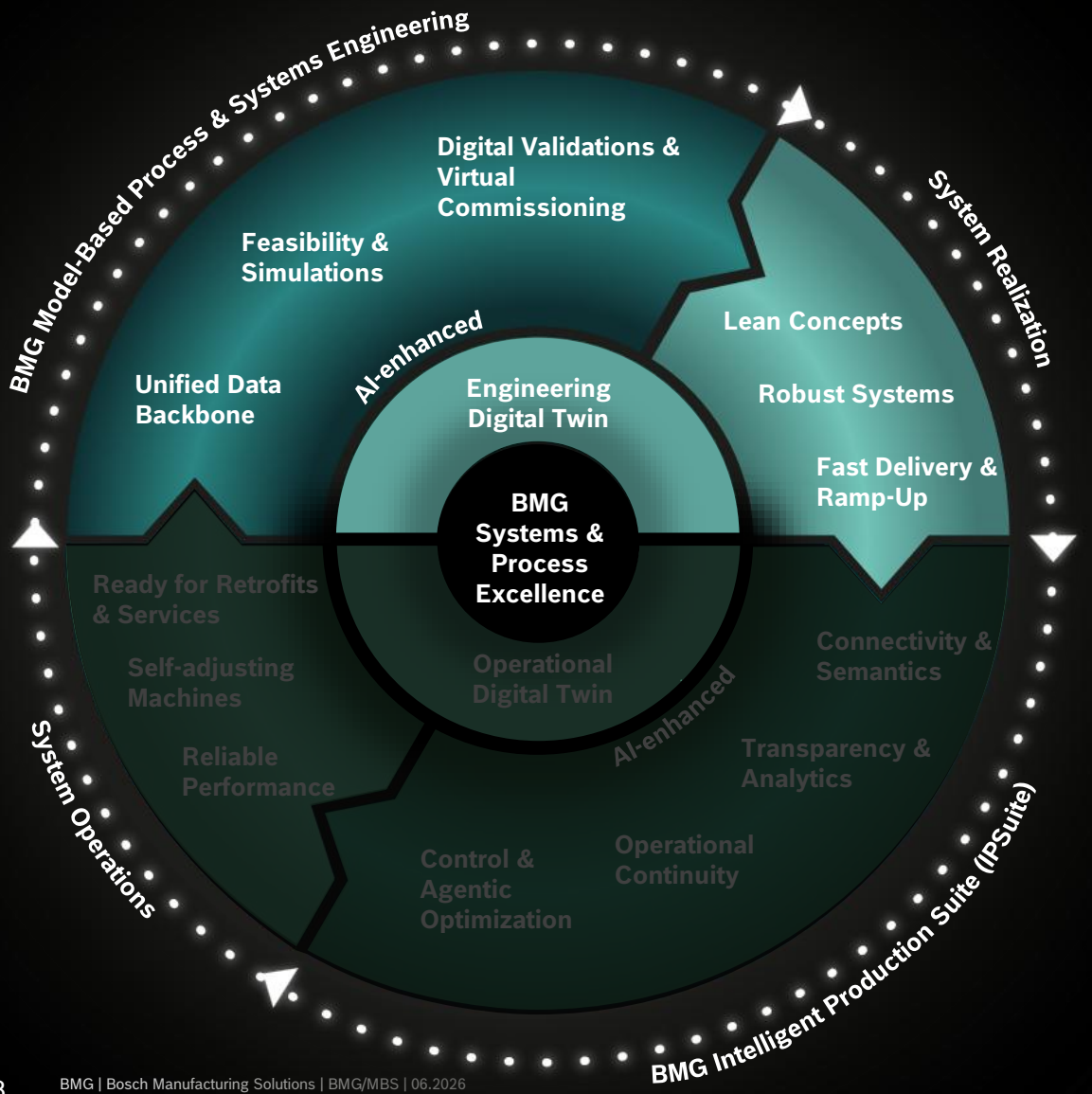

Digital Engineering

- **SE work** for sustainable product design leading to simpler and more cost-effective manufacturing concepts
- **Simulations** before realization and evaluation of feasibility and technical requirements

E2E connection and AI enabled digital approach – from concept to operation

Unified data backbone linking mechanics, electrics, and software – base for **Digital Twins**

Digital Twins for simulations, validation, virtual commissioning, and rapid adaptations to design or process changes

AI-driven tools and seamless field-data integration for intelligent, self-optimizing, and predictive operation

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PLM & Data Integration

- Siemens Teamcenter as PLM (Product Lifecycle Management) system
- Data integration across the entire machinery lifecycle
- Single source of truth (SSOT) for engineering data
- Version management across all lifecycle stages
- Accessible for engineering, operations and services

Benefits

- Reduced errors, rework, and delays through SSOT approach
- Faster engineering via highly integrated systems
- Versioned engineering data master

Model-based Systems Engineering (MBSE)

Connected digital models on systems, machine and process level

- Embodiment of BMG's system and process know-how
- Specific models include material flow, kinematics, communications and process physics
- Foundation for AI solutions in engineering (e.g., automated PLC programming) and operations (e.g., self-adjusting machinery)
- Integration of all engineering domains to speed up engineering work and quickly deal with changing requirements

Benefits

- Up to 20% efficiency gain in engineering
- Reduced development time & higher system maturity
- Professional change management even in late engineering phases

Digital Twins

Comprehensive digital twins in engineering and operations based on BMG's domain know-how in production systems and operations

Engineering Digital Twin

- Connected set of digital models
- Coverage include material flow, 3D geometry, kinematics, communications and process physics
- Virtual validations and stress tests before the equipment is built

Operational Digital Twin

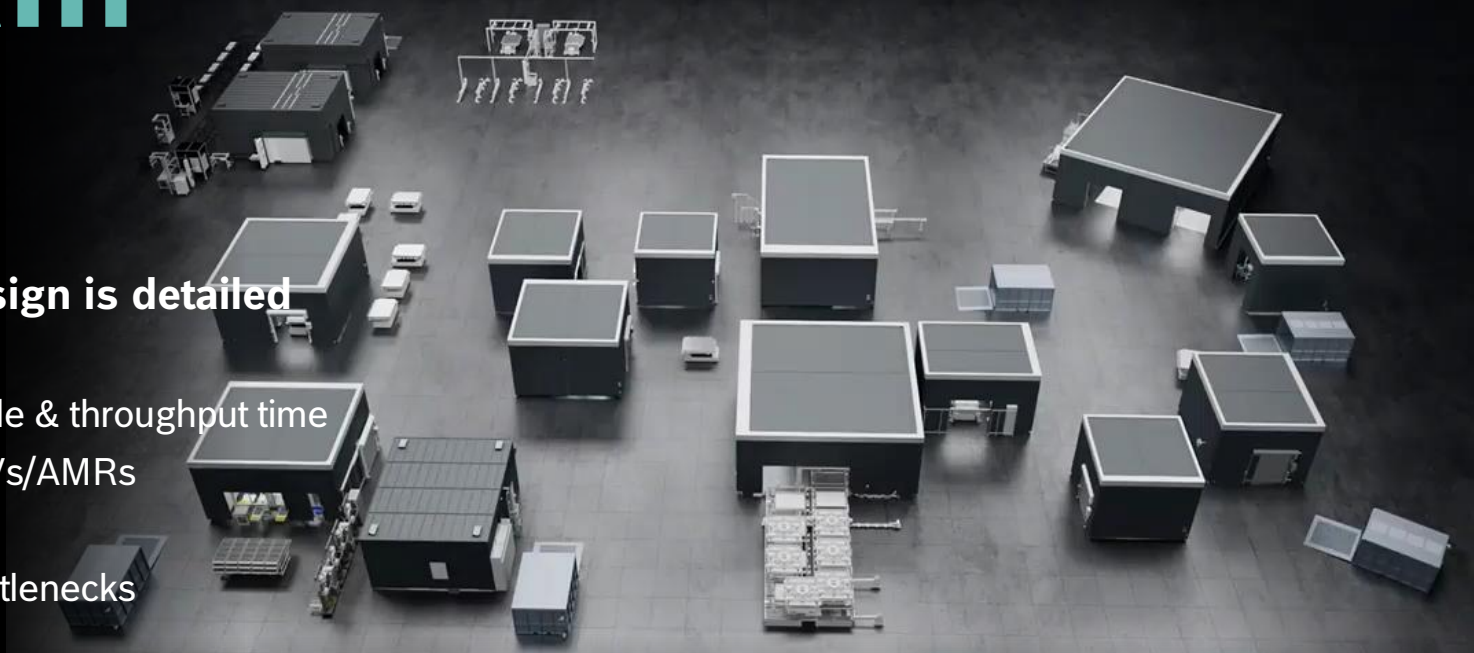
In collaboration with NVIDIA, SIEMENS

- Semantic data of BMG equipment in operation
- Descriptive, predictive and prescriptive analytics
- Self-adjusting machinery – vision: autonomous
- Key tool set: BMG Intelligent Production Suite (IPSuite)

Benefits

- Lean and robust concepts
- Fast ramp up
- Reliable and increasingly autonomous operations

Value Stream Simulation



Validated line concepts before the design is detailed

- Long-term modeling of line logic
- Optimization of line performance, e.g. cycle & throughput time
- Minimization of work piece carriers & AGVs/AMRs
- Check of inter-machine dependencies
- Removal of concept weaknesses, e.g. bottlenecks

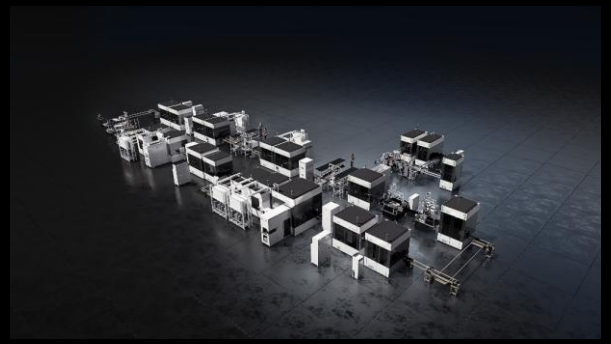
Benefits

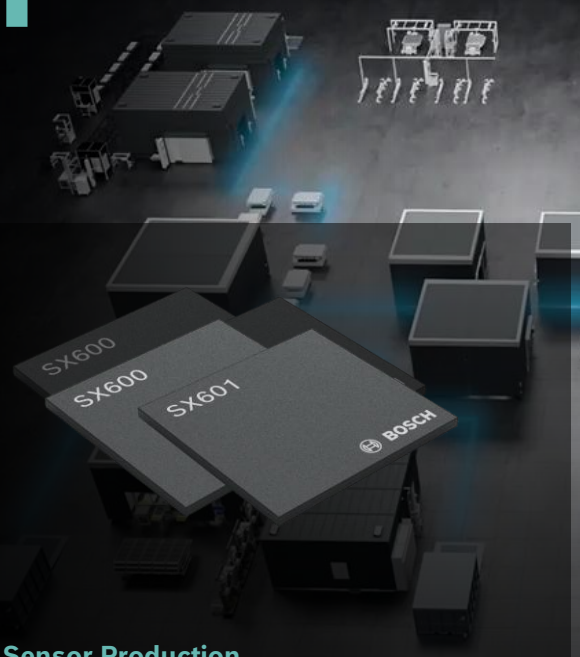
- Lean layouts
- Reduced investments
- Robust intralogistics
- Fast ramp-up

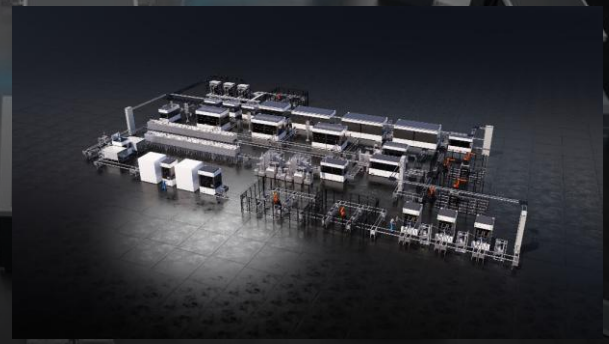
Up to **25%** fewer WPCs while maintaining full output

Up to **10%** faster time to market

Value Stream Simulation







Inverter Production

- Minimal footprint → Minimizing buffers to only the necessary
- Dispensing: Inter-station processing time challenges solved with Material Flow Simulation
- Optimized number of WPCs & WPC control concept

Radar Sensor Production

- Identified process bottlenecks in glue curing → new glue recommended
- Cycle time reduction and meeting inter-station processing time requirements
- Optimized number of WPCs & WPC control concept
- Result: stable operation and higher process reliability

Battery Module Production

- Simulation-optimized buffer dimensioning to the customer-specific minimum
- Reduced space requirements and investment costs while maintaining throughput
- Optimized number of WPCs & WPC control concept
- Ensured robust ramp-up with no unplanned stoppages

AI in PLC software engineering

Generating complex and bulky PLC Code

- Based on structured input already available
- Adheres to coding standards
- PLC-independent
- Integrates with existing engineering environment

Benefits

- Dramatic reduction of repetitive and error-prone tasks
- Higher software quality and standardization

Up to **50%** shorter software development time

Up to **25%** cost reduction in engineering

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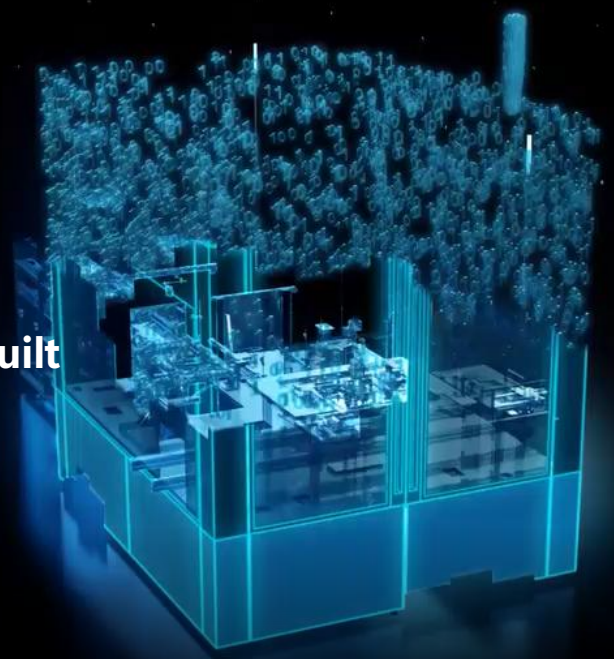
Virtual Commissioning



Validated machine behavior before the equipment is built

- Real PLC code
- Kinematics: All automatic movements
- Robotic functions
- Special modes like change-over sequences
- Data handling and communications to plant OS, e.g. MES

Benefits

- Commissioning time shorted by up to 2 months
- Up to 30% reduction in failure costs
- Well-behaved handling of exceptional situations
- Ready for efficient life-cycle optimizations

Up to **2 months** shorter commissioning time

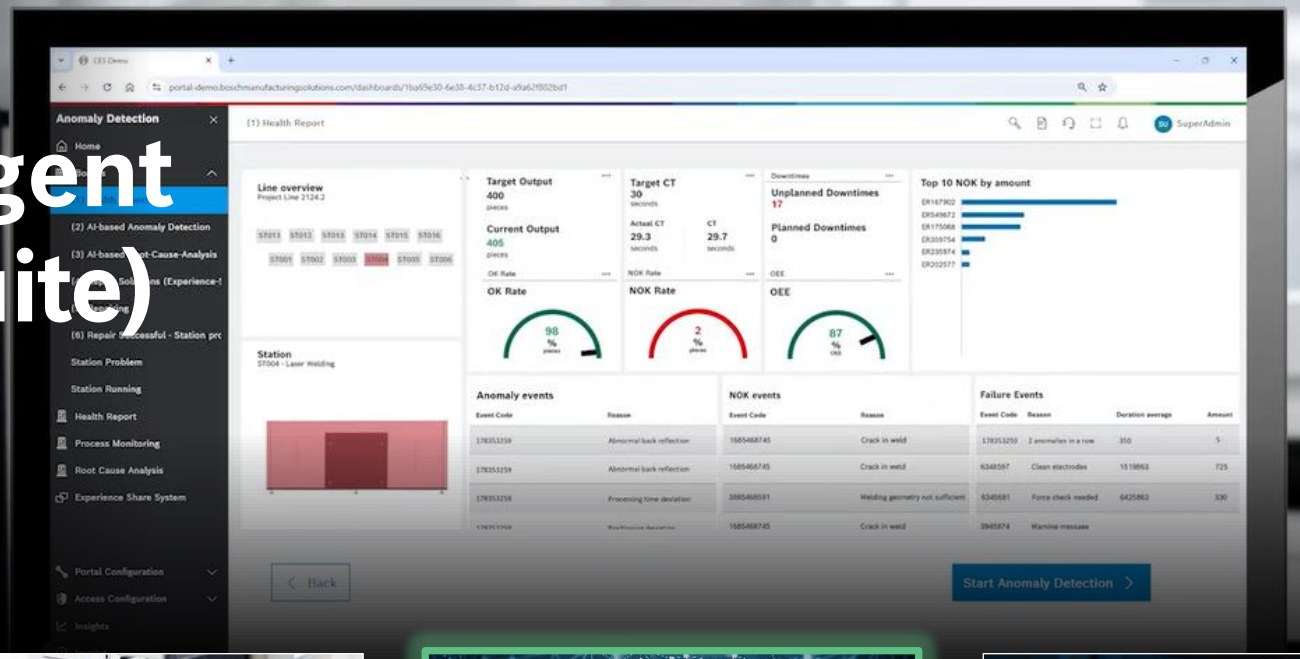
Project lead time reduced by **4-8 weeks** in average

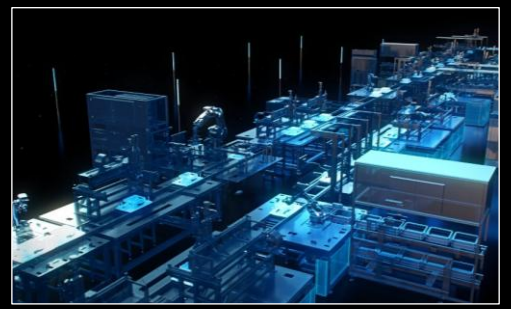
Up to **30%** reduction in risk & failure costs

Up to **70%** reduction of downtime

Up to **100.000€** savings proven in pilot stations

Digital & Intelligent Solutions (IPSuite)





Engineering Consulting & Digital Engineering

Advanced Manufacturing Processes & Technologies

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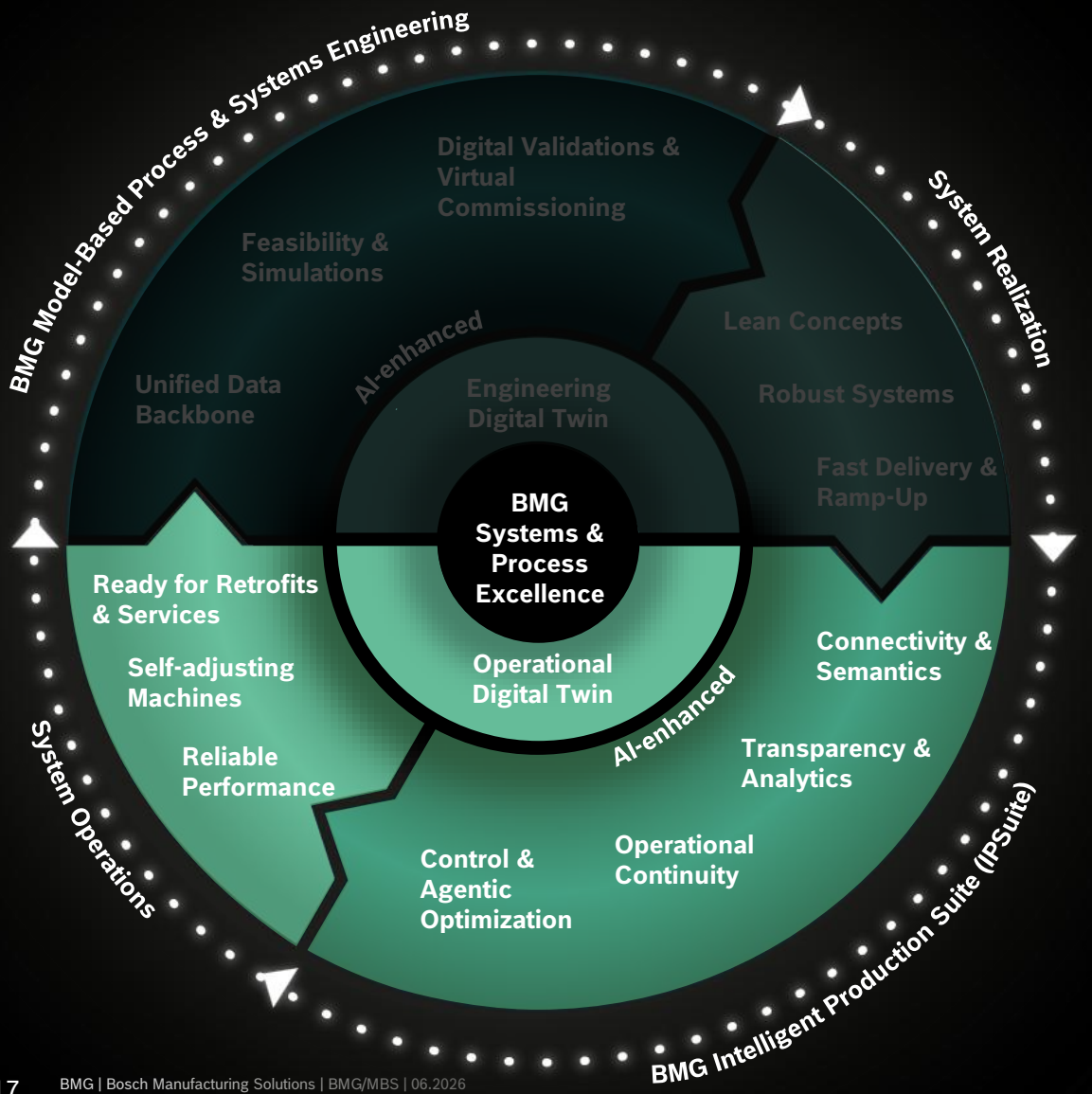

BMG | Intelligent Production Systems & Services

Intelligent Production Suite

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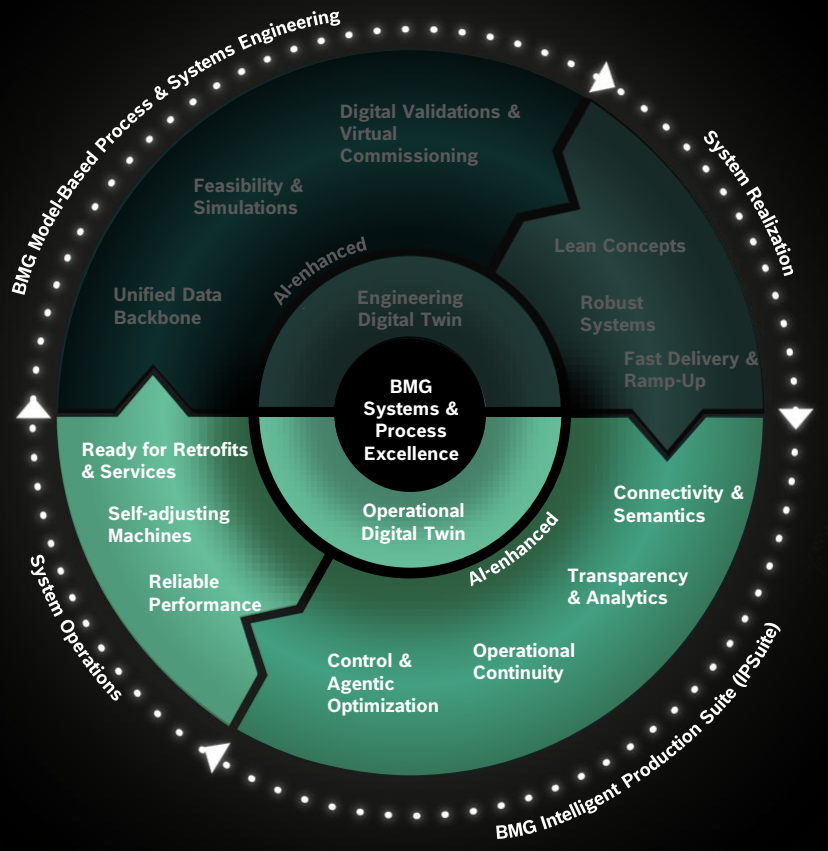
BMG | **our portfolio**
Intelligent Production Suite (IPSuite)



Transparency & Analytics

Operational Insights
- Awareness & highlighting (Andon)
- Asset health
- Cycle time & dynamic bottlenecks

Process Analytics
- Process metrics
- Production parameters

Sustainability
- Energy consumption

Operational Continuity

Preventive Maintenance
- Closed-loop ticketing

Predictive Maintenance
- Predictive analytics

Corrective Maintenance
- Anomaly detection
- Event-related video footage
- Virtual root cause localization

Control & Optimization

Autonomous Processes
- Process model generation
- Process parameter optimization
- Custom algorithm execution
- Statistical process control

Autonomous Line & Value Stream
- Line and shopfloor control

Foundation

Universal connectivity
Structured experience sharing

IPSuite | Transparency & Analytics

Operational Insights

- Transparency on production status, performance and deviations
- Systematic execution of actions with verified problem-solving
- Replicable and scalable production knowledge – independent of individual experts
- References: > 21 Bosch production plants (Bosch Mobility & Bosch Rexroth)

Benefits

- Availability improvement
- Easy to implement – no specialist knowledge required
- Fast ramp-up

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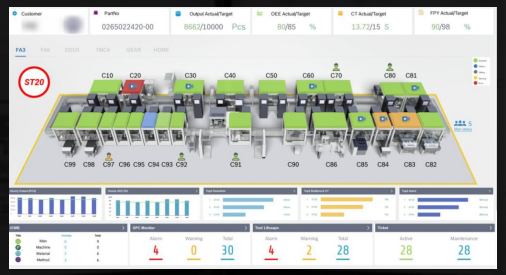
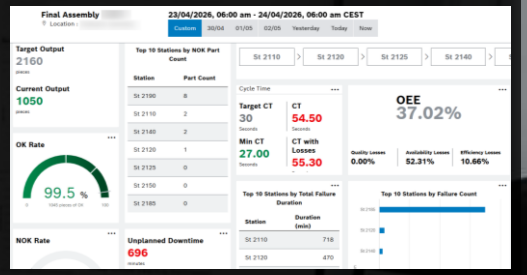
Available Modules

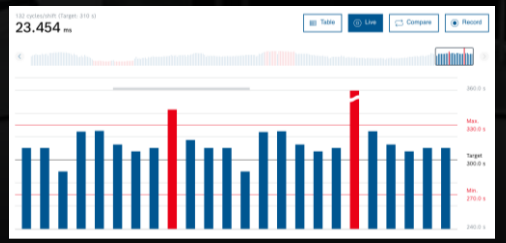
Awareness & highlighting (Andon)



Asset health



Cycle time & dynamic bottlenecks



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Awareness & highlighting (Andon)

How does the solution work?

- Customized and live visualization
- Middleware between machine and data platform

What are the technical specifications?

- Support for 2D and 3D visualization
- Drag-and-drop visualization

What are the customer benefits?

- Easy data collection to support setup of plant data platform
- Immediate reduction of machine downtimes as well as long-term competence build up

Which software components are involved?

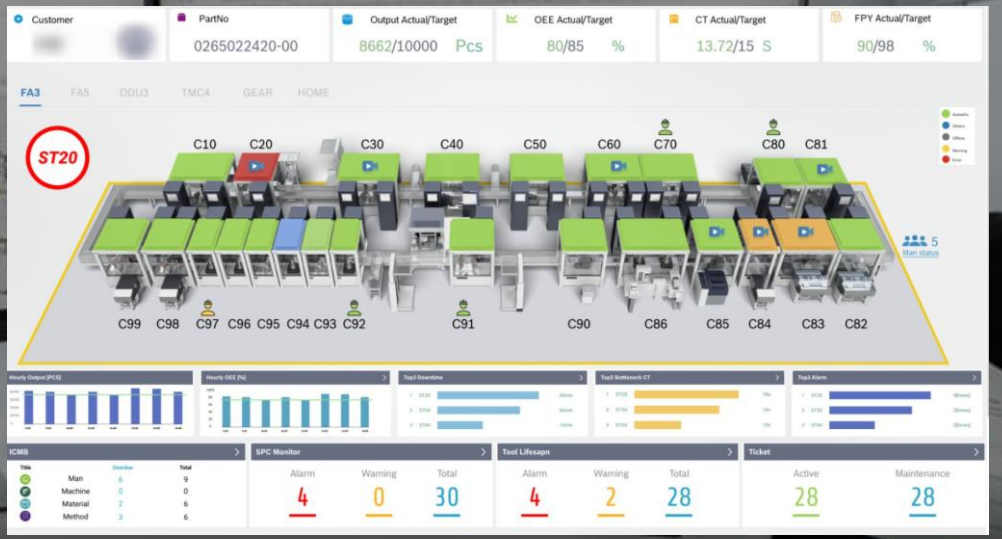
- BMG-developed solution
- Data Marketplace interface

Which modules is the solution connected to?

- Data Marketplace
- Universal Machine Connector (UMC)
- Closed-Loop Ticketing
- IPSuite Portal

What is the business model?

- Software as a Product (SaaP)



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Asset Health

How does the solution work?

- Comprehensive view of machine status
- Configuration of notifications and alarms as well as creation of pre-defined graphs and reports

What are the technical specifications?

- Web-based dashboards accessible via standard browsers
- Mobile app
- Widget-based dashboard layout for flexible KPI representation

What are the customer benefits?

- Easy configurable notifications and alerts
- Implementation of predictive maintenance and response to malfunctions
- All relevant data at a glance

Which software components are involved?

- End-to-end application is built by BMG software team

Which modules is the solution connected to?

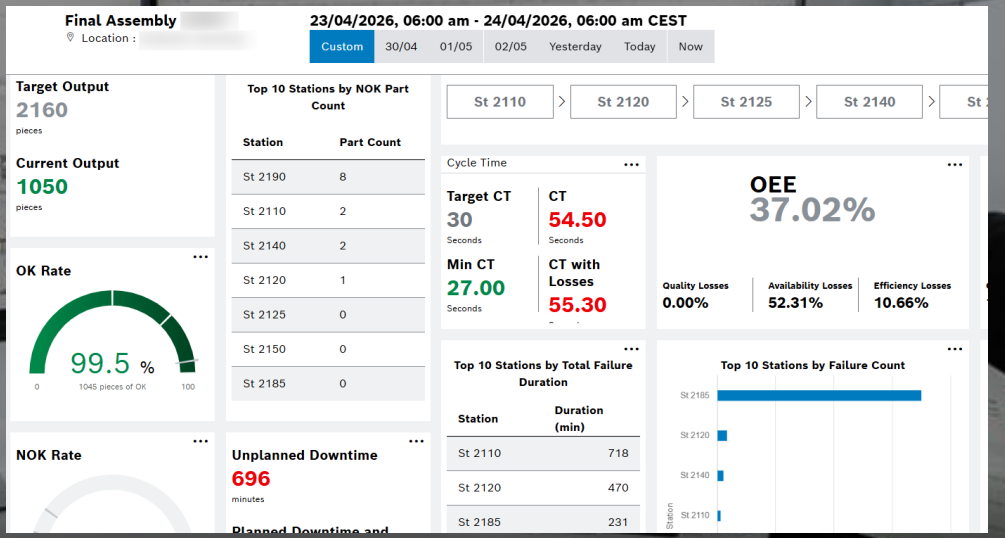
- Universal Machine Connector (UMC)

Does it use AI?

- AI assistant currently in development

What is the business model?

- Software as a Product (SaaP)



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Cycle time & dynamic bottlenecks

How does the solution work?

- Recording of a machine's cycle time information
- Fast identification of cycle time losses
- Quick identification of root causes of cycle time deviations

What are the technical specifications?

- Cycle Time Assist can be installed per machine or connect multiple machines for analysis at the edge level

What are the customer benefits?

- Fast setup, especially in Control Plus-based machines
- Detailed listing of all times contributing to the cycle time

Which software components are involved?

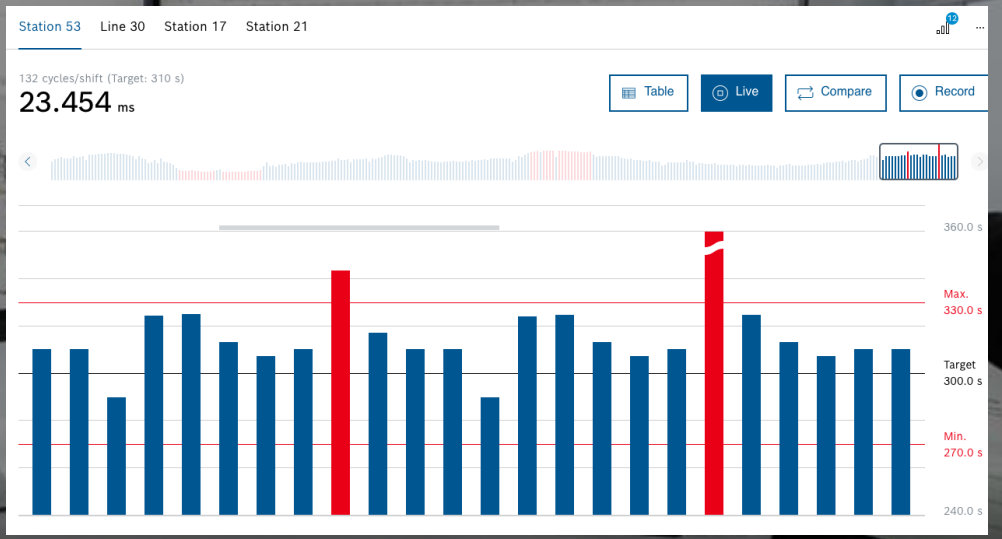
- Cycle time recordings are exported and can be further processed by other tools
- Proven integrations with platforms such as Kafka and Splunk

Which modules is the solution connected to?

- Nexeed Automation Control Plus
- Event-based Video Monitoring (DashCam)

What is the business model?

- Software as a Product (SaaP)



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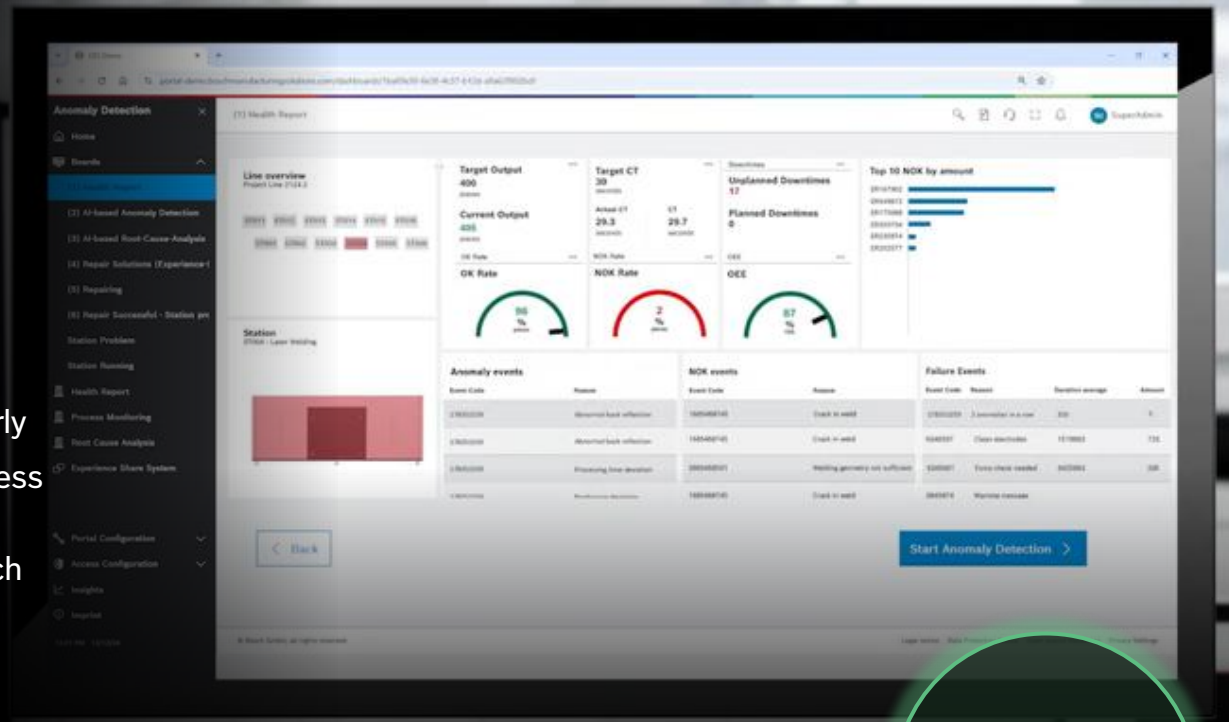
Process Analytics

- Stable, high-quality production
- Parameter mismatches and process deviations are detected early
- Combination of correct parameter settings with continuous process transparency
- References: > 20 Bosch production plants (Bosch Mobility, Bosch Rexroth, Bosch Cross-Domain Computing Solutions)



85% time savings

during failure analysis*

*Customer feedback, hotplate station

Benefits

- Reduced commissioning time
- Avoiding additional material cost by preventing e.g. tool damage
- Prevent deviations, reduce quality risks
- Reproducible performance across the entire production lifecycle
- Faster ramp-up

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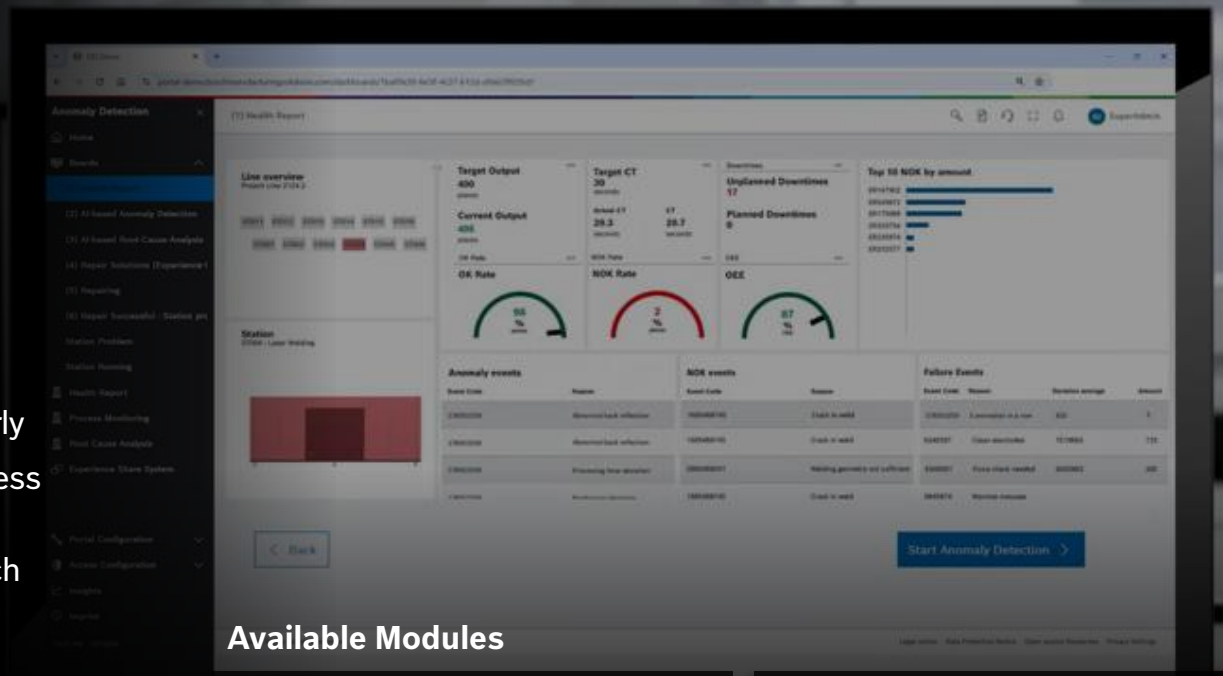
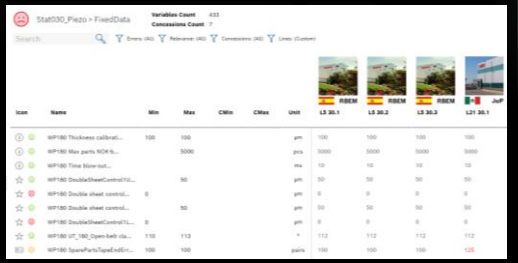


Available Modules

Process metrics

Production parameters



BOSCH

Process metrics

How does the solution work?

- Visualization of process parameters
- Basis for deciding when and with which technical measures to intervene in production processes
- Numerous interfaces which can easily be expanded into a process control system

What are the technical specifications?

- User can view Process Monitoring using any browser connected to the server

What are the customer benefits?

- Reduced commissioning time
- Avoiding additional material cost by preventing e.g. tool damage
- 85% of time effort saved during failure analysis

Which software components are involved?

- Dashboards (Grafana), data acquisition services, backend services and UMC integration
- Mainly Bosch software with open-source components (Grafana, Node-RED, etc.)
- Via UMC connection with PLCs, OPC-UA, MQTT (e.g. Solace)

How does it connect to other systems?

- Universal Machine Connector (UMC)

Does it use AI?

- Planned – Process Monitoring Assistant with AI to create dashboards

How is it delivered?

- Software as a Product (SaaP)

Production parameters

How does the solution work?

- Provides a global overview of all connected stations, machines and lines producing the same part types
- Compares parameters and displays failure alerts in case of discrepancies

What are the technical specifications?

- Quick overview of process parameters worldwide

What are the customer benefits?

- High quality assurance
- Product-recall reduction by 95% due to incorrect parametrization

Which software components are included?

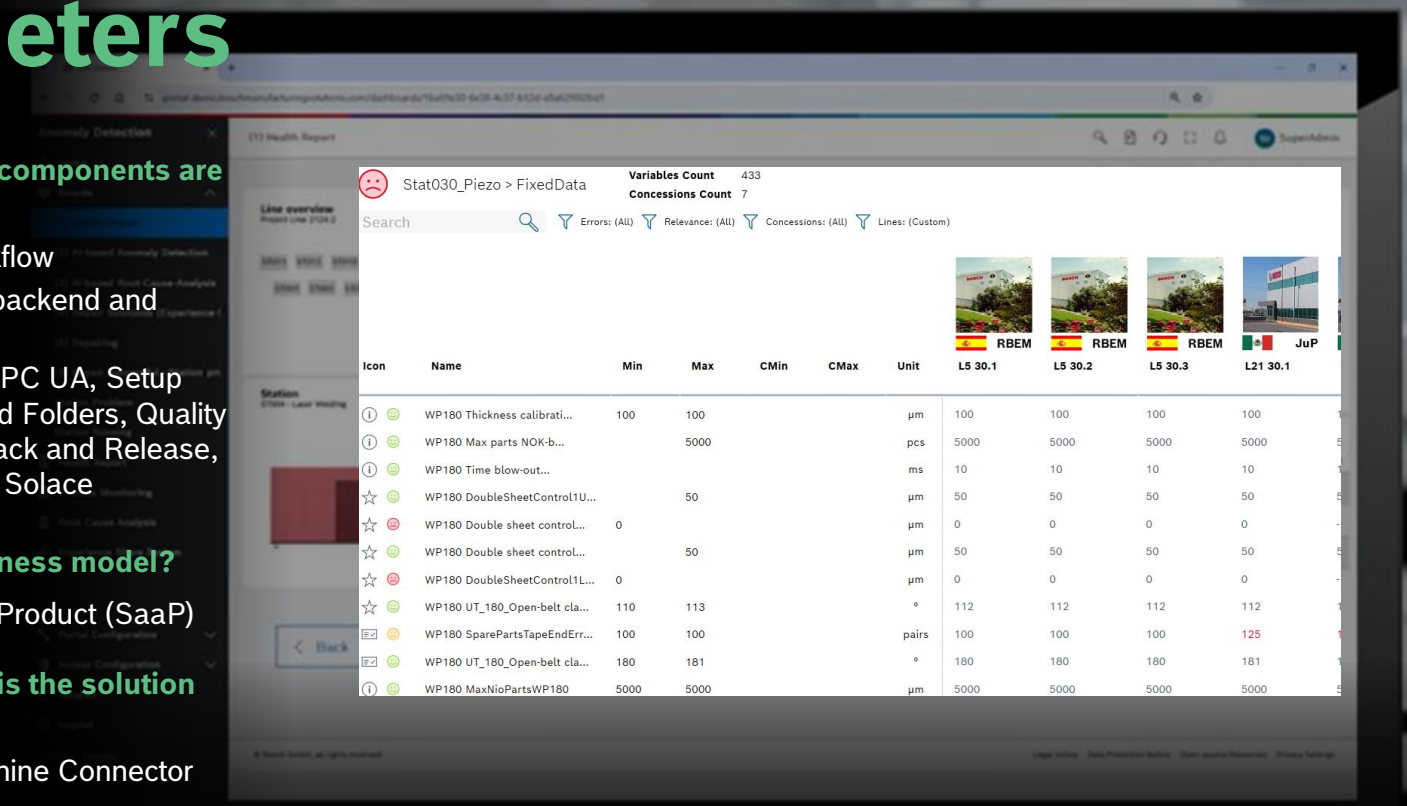
- BMG tool Taskflow
- Visualization, backend and database
- Interfaces to OPC UA, Setup Control, Shared Folders, Quality Databases, Track and Release, FTP, DDL and Solace

What is the business model?

- Software as a Product (SaaP)

Which modules is the solution connected to?

- Universal Machine Connector (UMC)



IPSuite | Transparency & Analytics

Sustainability

- Transparency on energy usage in production for analysis and decision-making
- Collecting energy-related data directly from each machine’s PLC
- References: 2 Bosch production plants (Bosch Mobility Electronics)

Benefits

- Less energy costs by finding and reducing energy waste through visibility
- Improved process stability by spotting unusual energy signatures that can correlate with machine issues
- Sustainable production and CO_2 reduction

Energy consumption

Available Module

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Energy consumption

How does the solution work?

- Collects energy data from machines via OPC-UA
- Processes and stores time-series data
- Analytics to detect inefficiencies and optimize consumption

What are the technical specifications?

- Connectivity: OPC-UA
- Scalable: machine → line → plant
- Monitoring + historical analysis

What are the customer benefits?

- Native integration with production (not standalone)
- Correlation: energy ↔ process ↔ machine
- High-granularity data
- Enables cost reduction & sustainability

Which software components are involved?

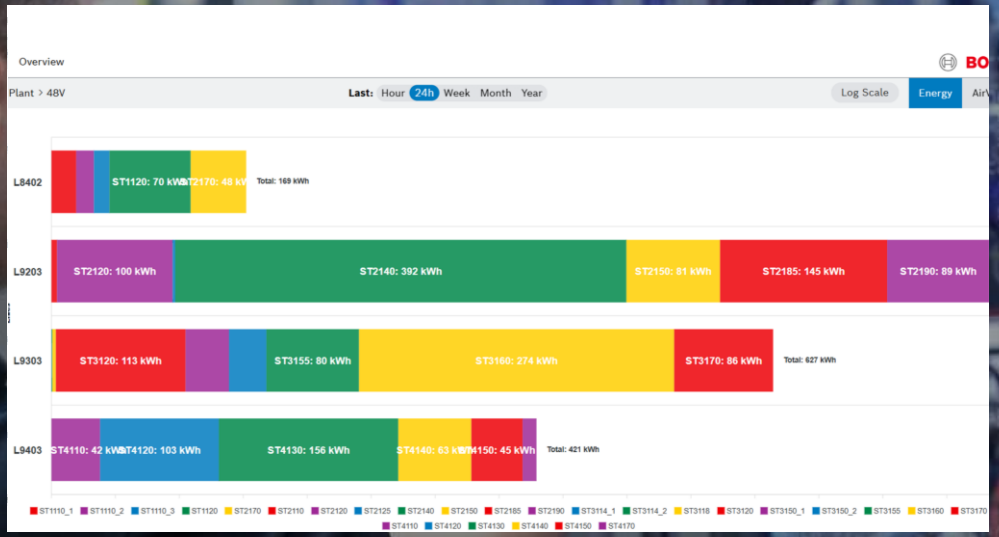
- Data collection, visualization and analysis tools
- Energy meters, OPC-UA, MQTT, databases, facility management systems

Which modules is the solution connected to?

- Health Report
- Universal Machine Connector (UMC) for Data acquisition
- Process Monitoring

What is the business model?

- Software as a Product (SaaP)



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IPSuite | Operational Continuity

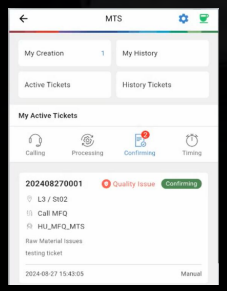
Preventive Maintenance

- End-to-end transparency of maintenance activities
- Standardized and scalable service processes
- Historical tickets and insights enable continuous improvement and better decision-making
- All stakeholders work on the same information
- References: 6 Bosch production plants (Bosch Mobility & Bosch Powertrain Solutions)
- Customer Feedback: Significant reduction of reaction time

Benefits

- Faster issue resolution
- Reduced downtime
- Foundation for digital lifecycle services
- Increased OEE due to sustainable problem-solving
- ~100.000€ savings / year & line

Closed-loop ticketing



Available Module

BOSCH

Closed-loop ticketing

AI in use

How does the solution work?

- Event-triggered alerting and information sharing to configurable target groups

What are the technical specifications?

- Freely configurable with respect to information channels, routing and user groups
- Event context and reaction history provided
- Available within IPSuite Portal and Mobile App for iOS & Android

What are the customer benefits?

- Reduced downtimes
- Knowledge-based repair

Which software components are involved?

- BMG-developed
- Interfaces to Eventbox, SPC, DLR and Data Marketplace

Does the solution use AI?

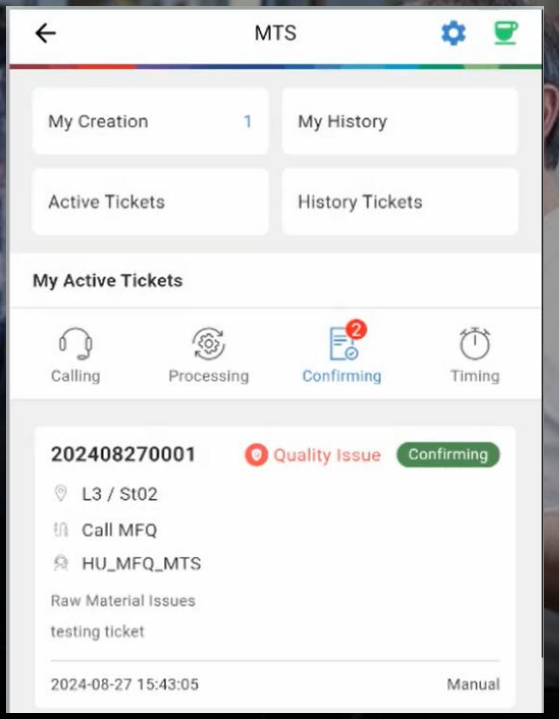
- Yes – LLM (Chat GPT4o), Agent Platform (Dify), RAG

Which modules is the solution connected to?

- Experience Share System
- Anomaly Detection

What is the business model?

- Software as a Product (SaaP)



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IPSuite | Operational Continuity

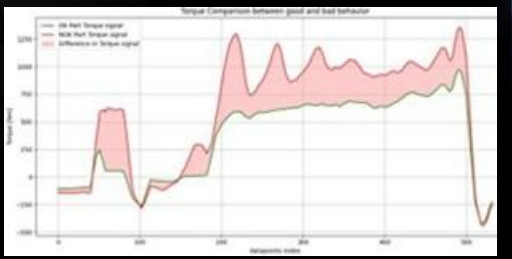
Predictive Maintenance

- Transformation of machine data into prediction
- Enabling manufacturers to prevent failures and optimize maintenance across the entire lifecycle

Benefits

- Reduced downtime
- Less maintenance and operating costs

Predictive analytics



Available Module

Predictive analytics

AI in use

How does the solution work?

- Learns machine degradation behavior and predicts the Health Index (HI) of the machine
- By extrapolating HI and combining domain expertise from process experts, the remaining useful life is predicted

What are the technical specifications?

- Data can be cyclic data, continuous event data or process data
- Customer data must be available in SL3 or SL4

What are the customer benefits?

- Fast, easy to deploy and scalable to monitor several machines at once
- Can be deployed on-premise or in the cloud
- Minimal training effort for the ML model, as it can be generalized for many use cases

Which software components are involved?

- Dashboards and Catalogs (Databricks/Power BI) are provided as user interface
- Alerting can be triggered via Azure Power Automate or IP Suite Notification Service

Does the solution use AI?

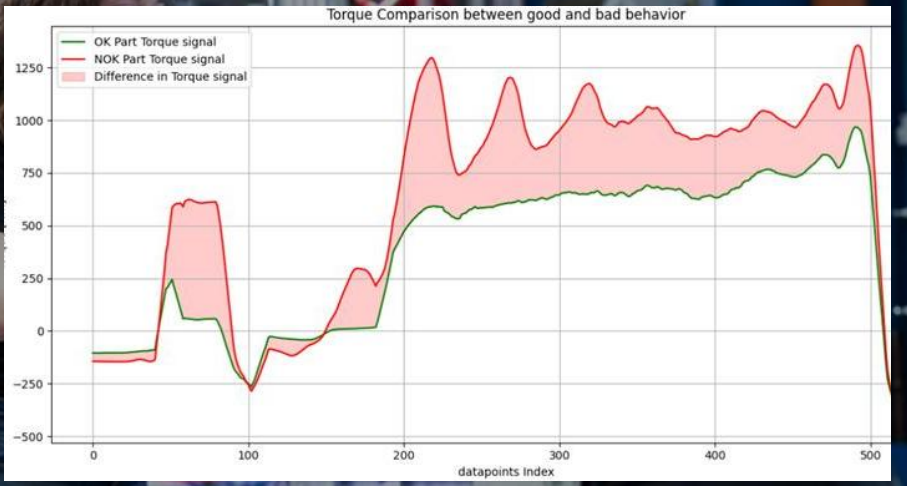
- Yes – Auto-encoders and neural networks are used as unsupervised machine learning frameworks

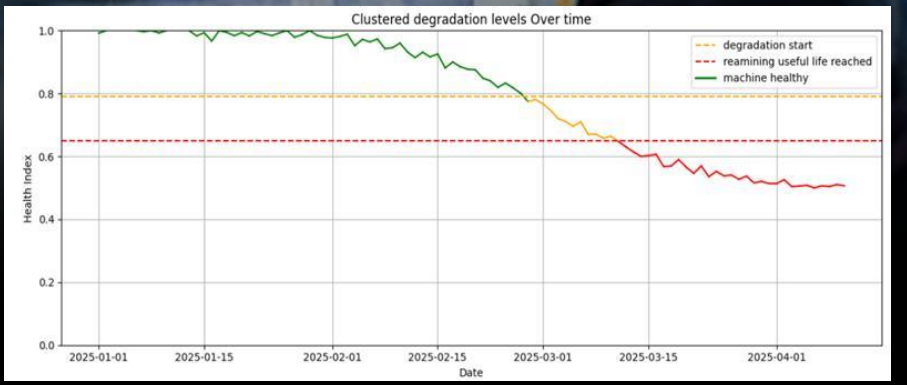
Which modules is the solution connected to?

- Universal Machine Connector (UMC)
- IP Suite Notification Service

What is the business model?

- Software as a Product (SaaP)





BOSCH

Corrective Maintenance

- Faster troubleshooting and root-cause identification
- Early detection of abnormal behavior
- Immediate visual insight into critical events
- Increased process transparency and robustness
- References: 54 Bosch production plants (Bosch Mobility & Bosch Rexroth)

Benefits

- Reduced downtime, scrap and service effort
- Sustainable improvement instead of firefighting

Over

300

- cameras installed
- virtual root cause localization instances installed

BOSCH

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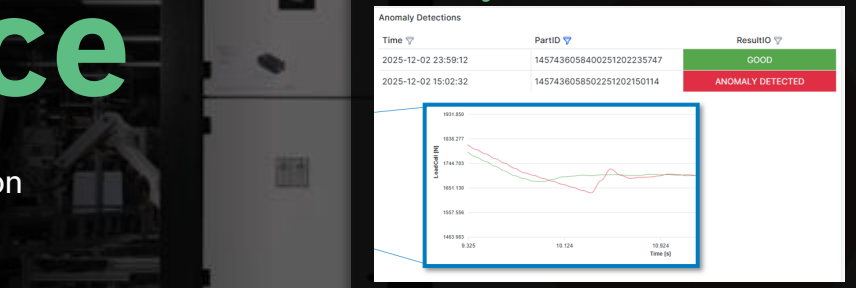
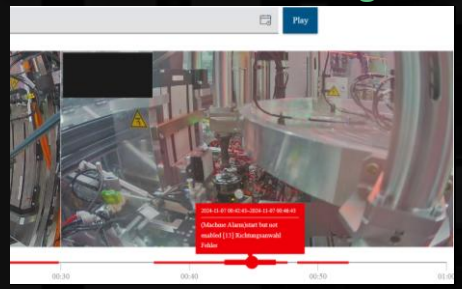
Available Modules

Anomaly Detection



Event-related video footage



Virtual root cause localization

Anomaly detection

AI in use

How does the solution work?

- Enhances manufacturing quality control by identifying deviations in data
- Enables early detection of anomalies, prevents defects, and reduces costs associated with rework or failures

What are the technical specifications?

- Flexible architecture that supports integration into various manufacturing processes

What are the customer benefits?

- Increased Quality Assurance
- Engineers can quickly identify root causes and resolve issues

Which software components are involved?

- Typically deployed together with Process Monitoring, incl. ML pipelines for industrial data analysis
- Connected to Process Monitoring data (curves, results) and databases

Does the solution use AI?

- Yes – Autoencoder-based models (unsupervised machine learning

Which modules is the solution connected to?

- Process Monitoring

What is the business model?

- Software as a Product (SaaP)

BOSCH

Event-related video footage

AI in use

How does the solution work?

- Automatically records and links video footage to machine events
- Makes production incidents instantly visible and easy to analyze

What are the technical specifications?

- Up to 4 cameras per machine
- Process and failure analysis based on data and machine status

What are the customer benefits?

- Faster error analysis by automatic and quick selection based on failure events
- Reduction of ramp-up time for new machines and processes

Which software components are involved?

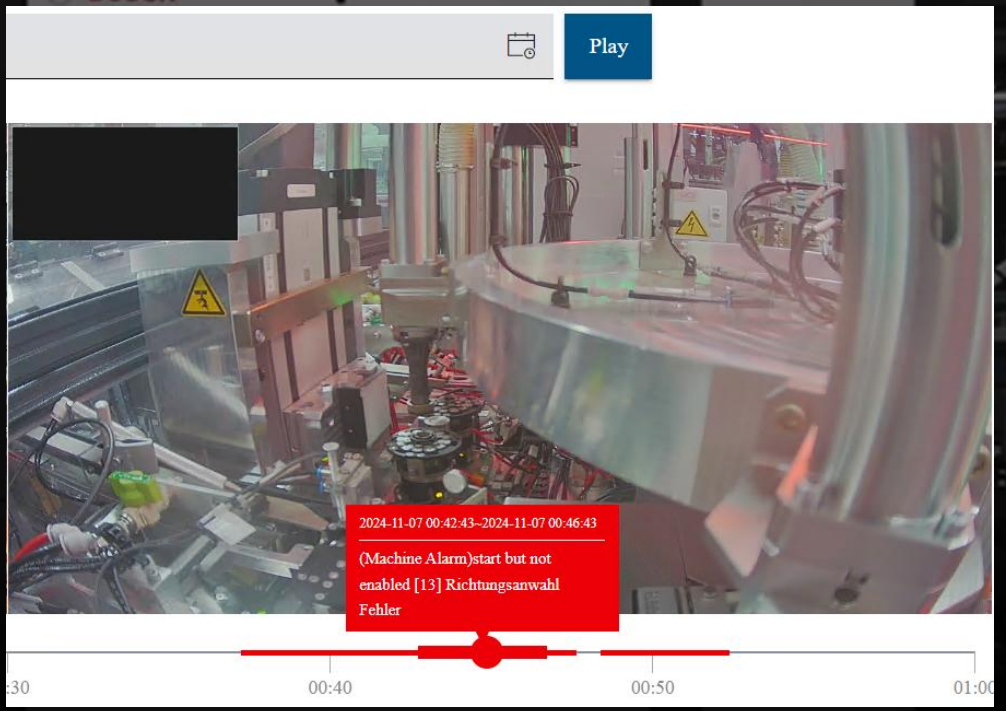
- BMG-developed
- SDK of UNV & HIKVision
- Interface to Eventbox

Does the solution use AI?

- Yes – Yolo26

What is the business model?

- Software as a Product (SaaP)



Virtual root cause localization

AI in use

How does the solution work?

- Displays machine events, such as errors, in a 3D model of the machine
- Highlights faulty machine components
- Enables users to find the correct location for troubleshooting

What are the technical specifications?

- Freely configurable error information
- Free assignment to parts of the 3D model
- Available as a standalone solution for installation in a Windows or ctrlX OS environment

What are the customer benefits?

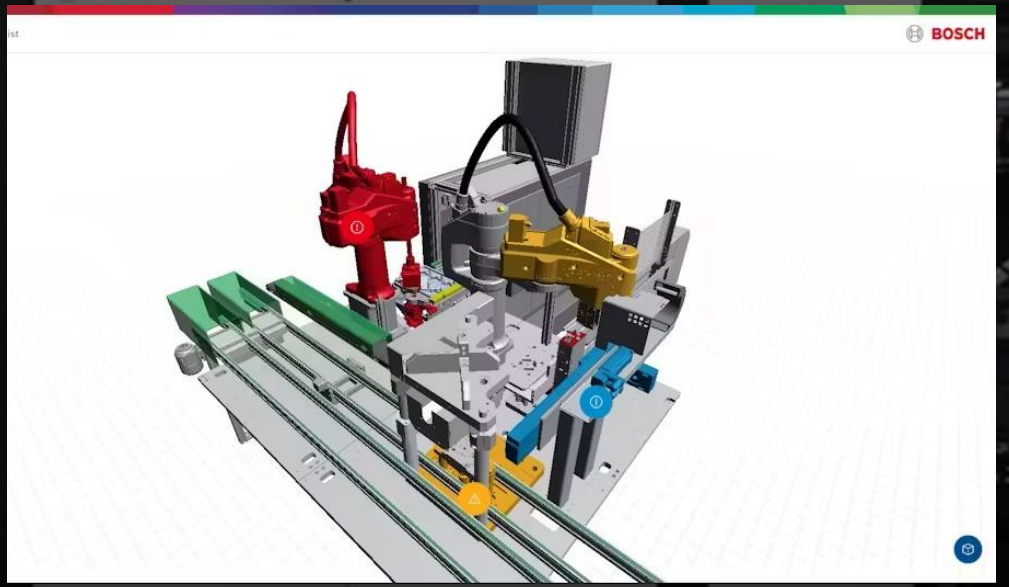
- Very fast application
- Import of the machine's 3D model (e.g., from a mechanical tool) and linking of error numbers and 3D components
- 4 hours setup time for a typical project

Which software components are involved?

- Connection via OPC UA to any data sources/machines

What is the business model?

- Software as a Product (SaaP)



Autonomous Processes

- From monitoring and control to prediction and optimization
- Enhances preventive quality management
- Higher process stability and robustness
- Early detection instead of late reaction

Benefits

- Optimized parameters for maximum performance
- OEE improvements
- Sustainable availability
- Acceleration of process development
- Speed-up of ramp up phase

Over

300

- cameras installed
- virtual root cause localization instances installed

BOSCH

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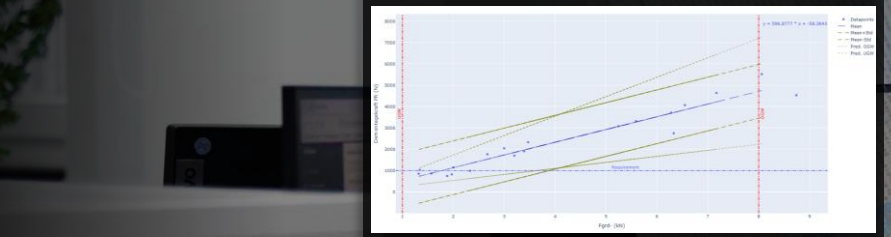
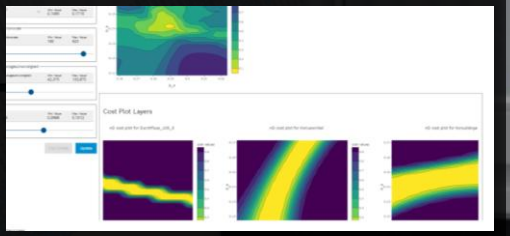
Available Modules

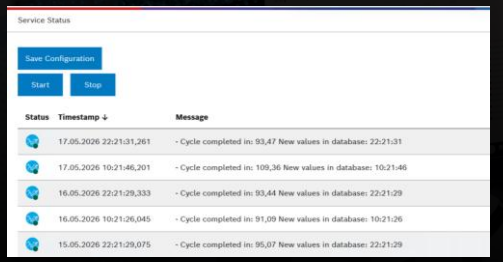
Process model generation



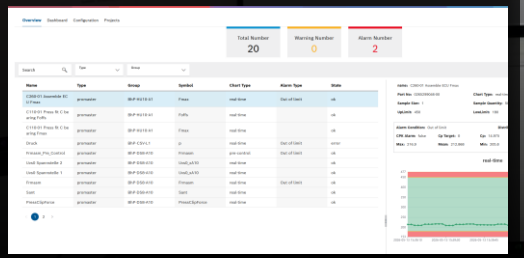
Process parameter optimization



Custom algorithm execution



Statistical process control



Process model generation

AI in use

How does the solution work?

- Fully integrated toolchain for product development and process optimization
- Standardized development workflow
- Semantically rich data model and analytics pipelines

What are the technical specifications?

- All required software components are provided by BMG as a service

What are the customer benefits?

- Time efficiency in product or process development by > 30%
- Usage of analytics pipelines without deeper data analytics knowledge

Which software components are involved?

- Interfaces to various data sources and 3rd party tools (Kistler, Instron, Precitec, Promes, Rexroth, qs-STAT, etc.)

Does the solution use AI?

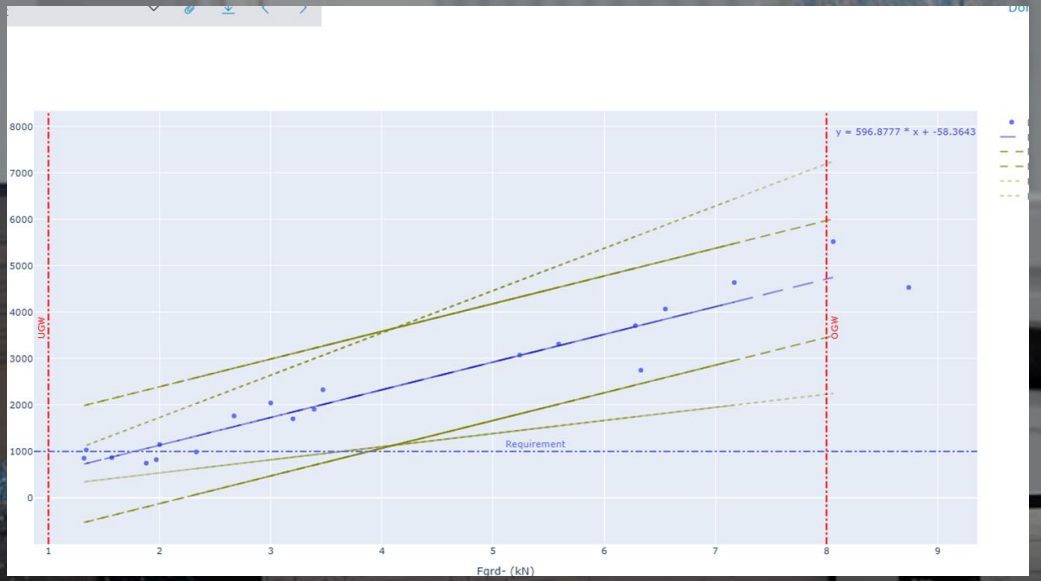
- Yes – machine learning algorithms, e.g. relevance analysis based on neural networks
- GenAI integration is coming soon

Which modules is the solution connected to?

- Digital Quality Inspection (DQI)

What is the business model?

- Software as a Product (SaaP)



BOSCH

Process parameter optimization

AI in use

How does the solution work?

- AI and data supported optimization & development of manufacturing processes
- Assistance in multidimensional space (many different parameters & quality criteria) by visualization of models and optimal areas for production

What are the technical specifications?

- Web applications with user guidance
- Machine interface via different communication protocol (e.g. OPC – UA)
- Flexible interface to integrate customer algorithms (e.g. Python) for control loops
- Bayesian Optimization (ML) & Gaussian Process Models (ML)

What are the customer benefits?

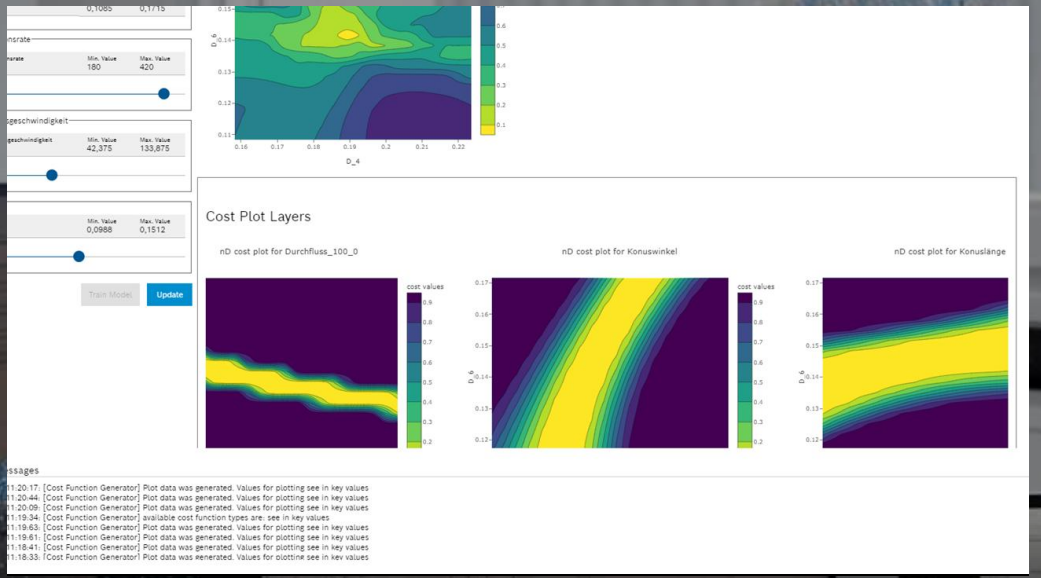
- Scrap reduction by keeping machine (e.g. against drifts) in optimum parameter settings (proven use case: 250k€ savings per line per year)
- Data visualization through generation of process models to analyze the process
- Support for process experts in multidimensional space (>3D)

Does the solution use AI?

- Yes – Bayesian Optimization (ML) & Gaussian Process Models (ML)

What is the business model?

- Software as a Product (SaaP)



Custom algorithm execution

How does the solution work?

- Freely programmable data processing platform
- For applications in surveillance, analysis and adaptive control of assembly & production processes

What are the technical specifications?

- Adaptive parameter control to ensure process stability and scrap reduction
- Surveils tolerance violations of process variables and creates events (e.g. which can be sent out as tickets to operators via Maintenance Ticket System (MTS))
- Detects long-term drifts of process variables

Which modules is the solution connected to?

- Universal Machine Connector (UMC)

What are the customer benefits?

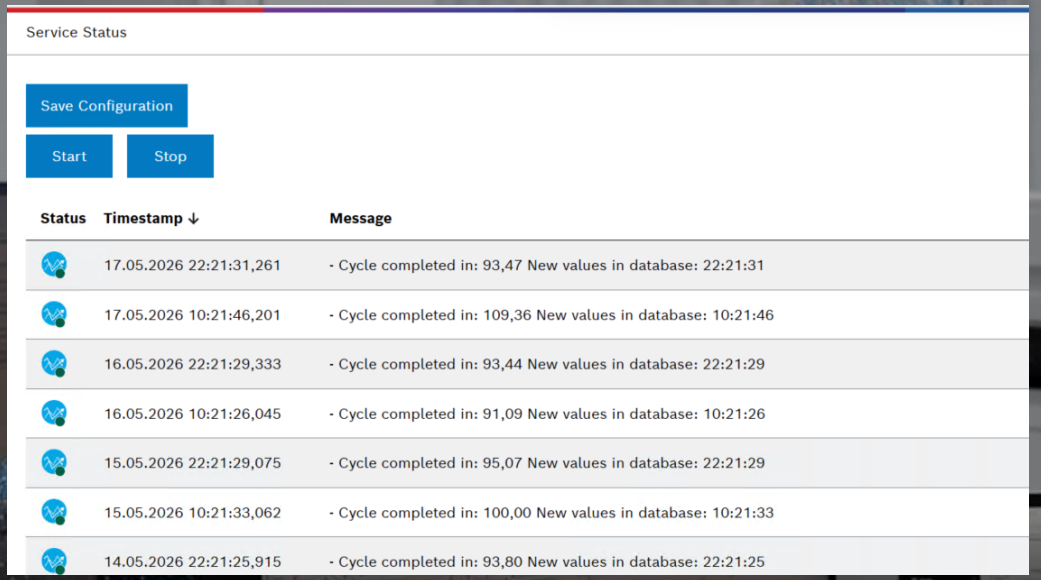
- Creation of flexible algorithms in Matlab or Python – doable by user
- Built-in bi-directional connectivity enables usage on different levels
- Option available for application & monitoring of AI models

Which software components are involved?

- BMG-developed
- Integration of Python, Matlab and C# scripts
- Interfaces to machines (via OPC-UA)
- Interfaces to Message Broker
- Interfaces to databases

What is the business model?

- Software as a Product (SaaP)



Statistical process control

How does the solution work?

- Live monitoring and analysis of machine and process data
- Automated rule evaluation, notifications, and ticket creation via Maintenance Ticket System

What are the technical specifications?

- Historical data analysis up to 1.5 years
- Configurable rules, notifications, and role-based access management

Which software components are involved?

- BMG-developed
- Interfaces to MTS and Data Marketplace

What are the customer benefits?

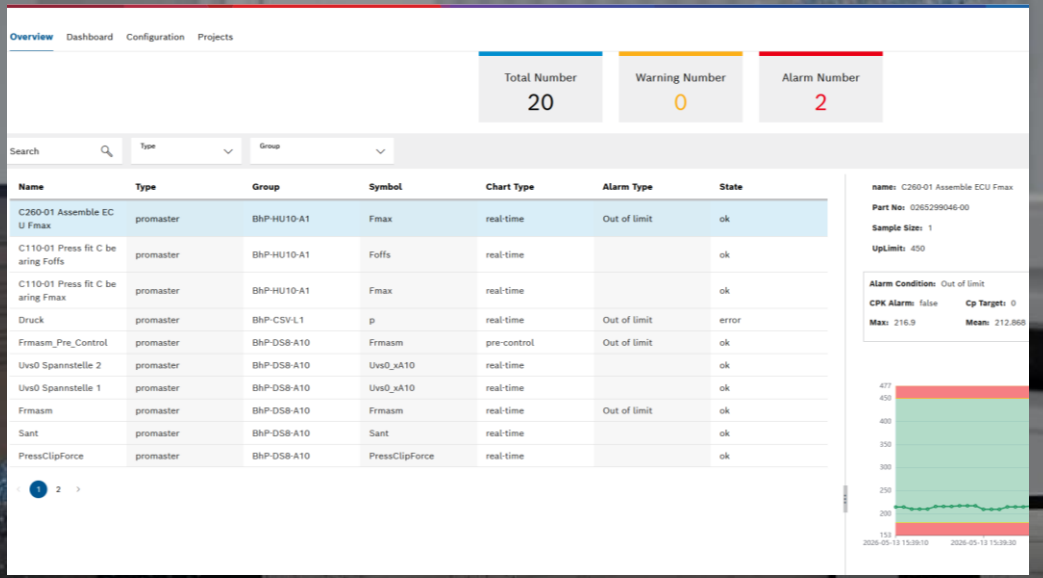
- End-to-end solution combining monitoring, alerts, and Maintenance Ticket System workflows
- Highly configurable and easily extendable via Node-RED
- Fast implementation and seamless Bosch ecosystem integration

Which modules is the solution connected to?

- Closed-Loop Ticketing
- Data Marketplace

What is the business model?

- Software as a Product (SaaP)



BOSCH

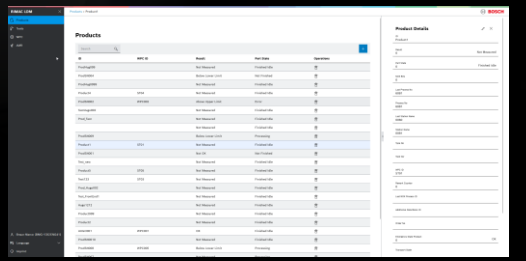
Autonomous Line & Value Stream

- Scalable solution to orchestrate, monitor and optimize complex production lines
- End-to-end production visibility
- Robust and flexible system architecture
- Transparency throughout the entire value chain
- Independent of machine supplier and product

Benefits

- Reduced downtime and disturbances
- Reduced bottlenecks and inefficiencies
- Reduced commissioning time
- Comprehensive material and component traceability within your value-stream
- Connected without compromising security

Line and shopfloor control



Available Module

BOSCH

Line and shopfloor control

AI in use

How does the solution work?

- Central line control with assignment of production orders
- Material and transport logic
- Live data acquisition

What are the technical specifications?

- Data can be cyclic data, continuous event data or process data
- Customer data must be available in SL3 or SL4

What are the customer benefits?

- Fast, easy to deploy and scalable to monitor several machines at once
- Can be deployed on-premise or in the cloud
- Minimal training effort for the ML model, as it can be generalized for many use cases

Which software components are involved?

- Dashboards and Catalogs (Databricks/Power BI) are provided as user interface
- Alerting can be triggered via Azure Power Automate or IP Suite Notification Service

Does the solution use AI?

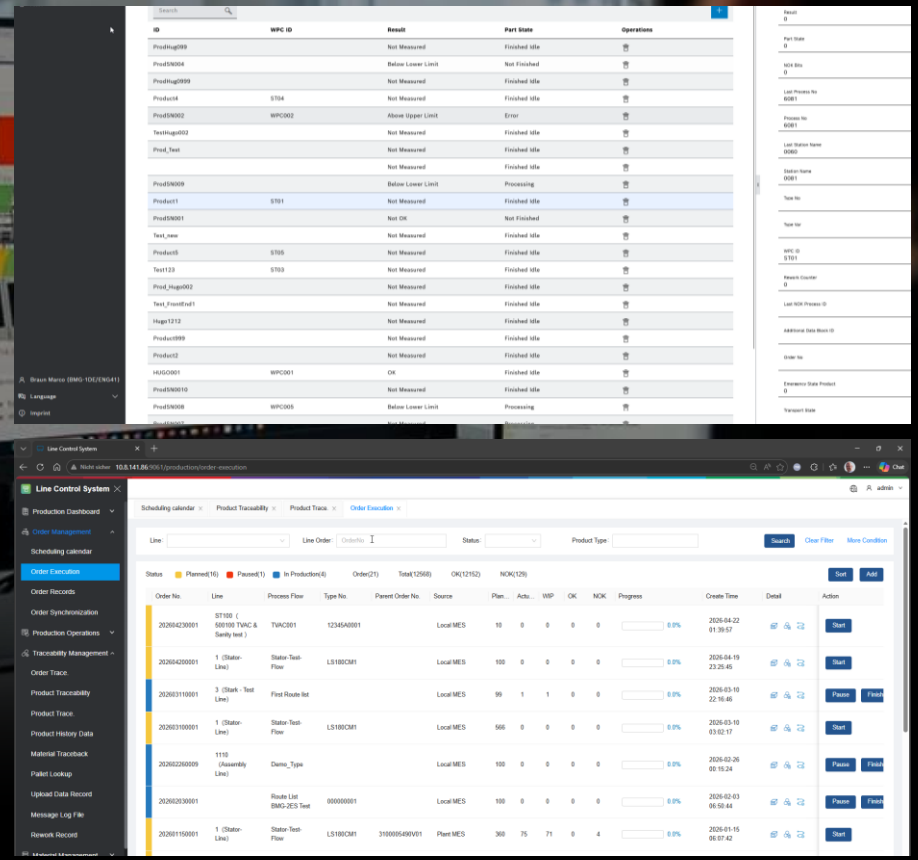
- Yes – Auto-encoders and neural networks are used as unsupervised machine learning frameworks

Which modules is the solution connected to?

- Universal Machine Connector (UMC)
- IP Suite Notification Service

What is the business model?

- Software as a Product (SaaP)



BOSCH

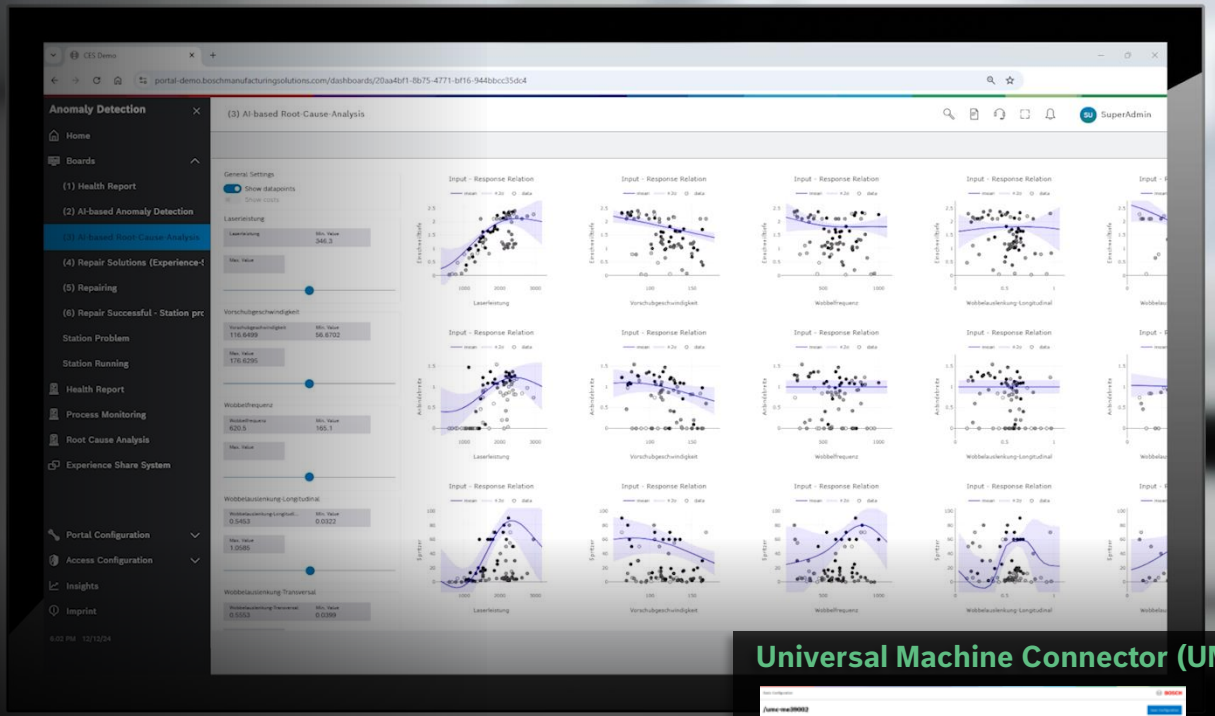
IPSuite | Foundation

Universal Connectivity

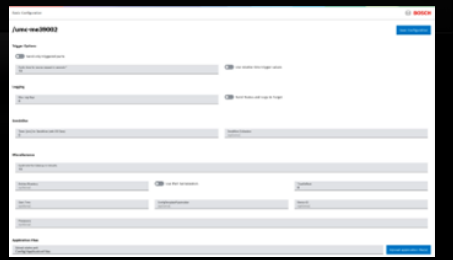
- Connection of a broad variety of industrial controls, shopfloor devices, IT systems and other data sources
- Service reads out variable values by means of various protocols and passes them to high-level IT systems
- Low configuration effort
- Foundation for several IPSuite modules
- References: > 21 Bosch production plants (Bosch Mobility, Bosch Powertrain Solutions & Bosch Rexroth)
- Over 850 UMC instances have already been installed

Benefits

- Increased transparency and data availability
- Data can be transferred bidirectional
- Connection of heterogeneous equipment



Universal Machine Connector (UMC)



Available Module

BOSCH

Universal Machine Connector (UMC)

How does the solution work?

- Connects machines independent of manufacturer, age or control type
- Transforms machine data into a consistent and structured format

What are the technical specifications?

- Bidirectional data transfer
- Multiple parallel connections via additional licenses

What are the customer benefits?

- Faster machine integration
- Enables a standardized interface layer across the shopfloor
- Continuous acquisition of machine and process data

Which software components are involved?

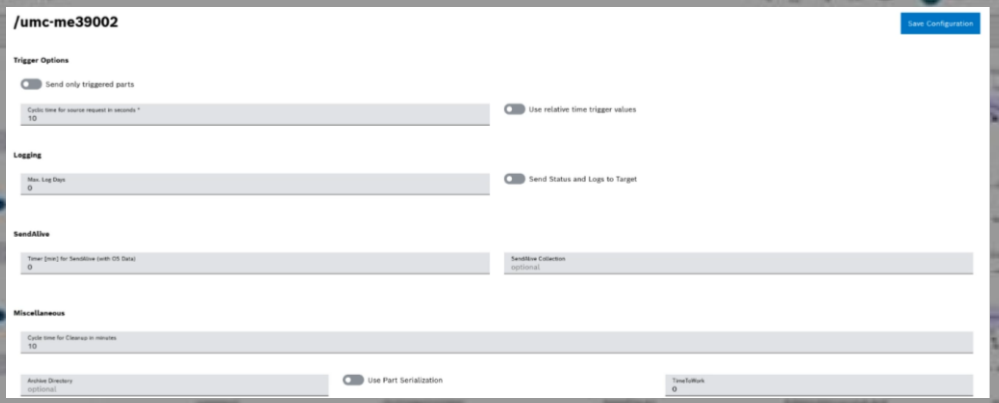
- BMG-developed
- Integration of Python, Matlab and C#-scripts
- Interfaces to machine (via OPC-UA)
- Interfaces to Message Broker
- Interfaces to databases

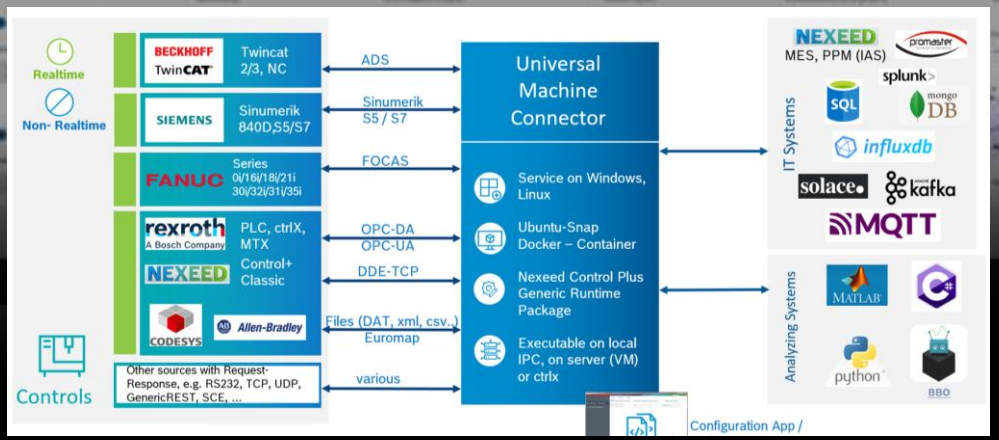
Which modules is the solution connected to?

- Asset Health
- Process Monitoring
- Further IPSuite Modules

What is the business model?

- Software as a Product (SaaP)





IPSuite | Foundation

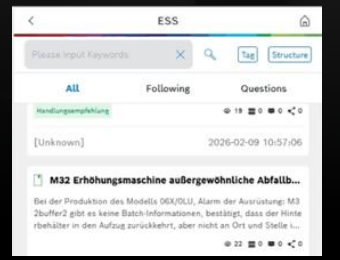
Structured Experience Sharing

- Prevents loss of critical expertise due to workforce changes
- Provides instant access to best practices, troubleshooting and work instructions
- Reduces variability between operators, shifts and locations
- Allows operators to contribute insights, feedback and improvements
- References: > 21 Bosch production plants
  (Bosch Mobility & Bosch Powertrain Solutions)

Benefits

- Reduced downtime through faster troubleshooting
- Improved quality via reuse of best practices
- Increased efficiency through continuous learning
- Sustainable knowledge retention across the organization

Experience Share System



Available Module

BOSCH

Experience Share System

AI in use

How does the solution work?

- Capture production experiences and best practices
- Structured knowledge base for lines, stations and machines
- Link solutions directly to machine errors and events

What are the technical specifications?

- Mobile and desktop access for operators and experts

What are the customer benefits?

- Reduced downtime
- Reuse of experiences across lines and plants
- Preserve expert knowledge

Which software components are involved?

- BMG-developed
- Maintenance Ticket System App

Does the solution use AI?

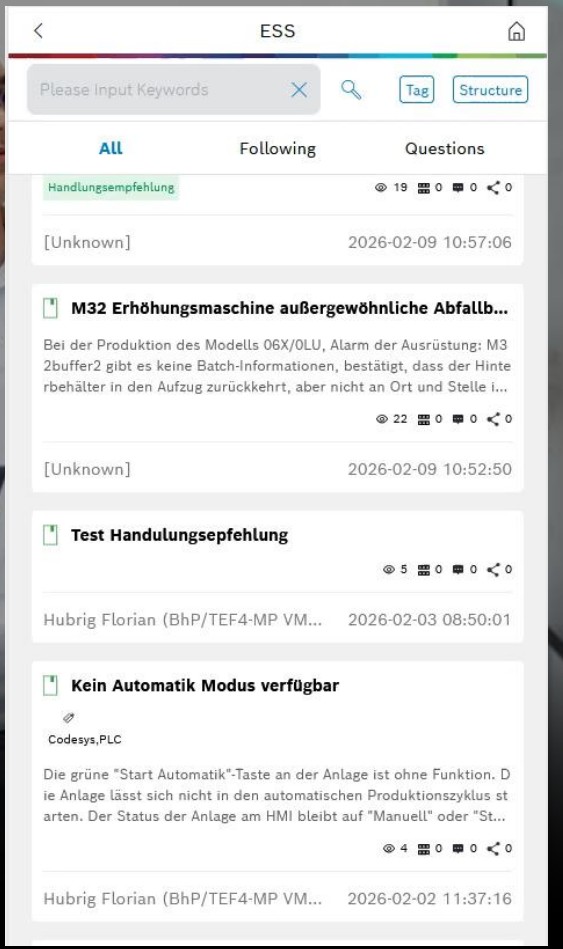
- Yes, AI/chatbot-supported translation engine

Which modules is the solution connected to?

- Maintenance Ticket System (MTS)

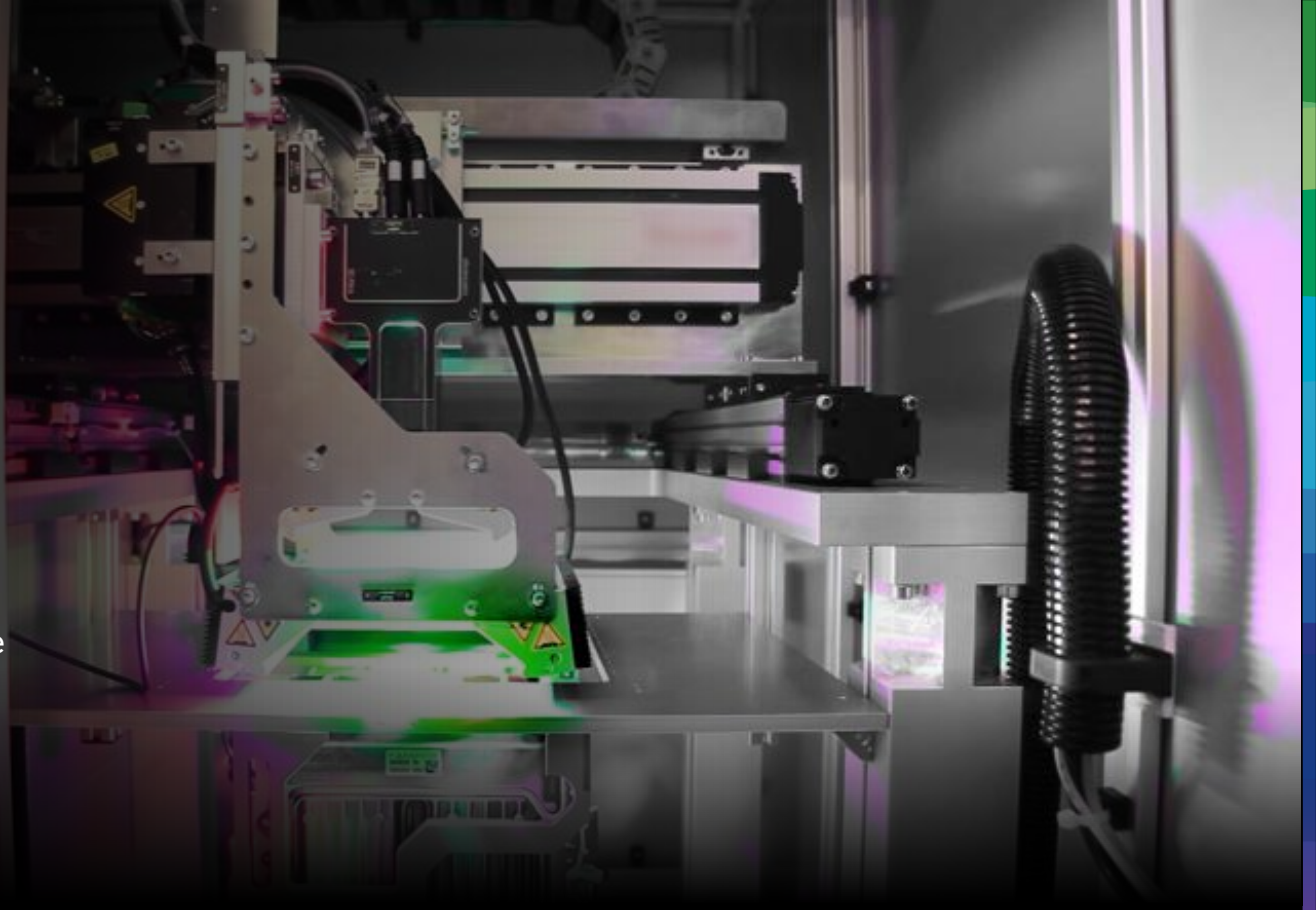
What is the business model?

- Software as a Product (SaaP)



AI-powered Machine Operation Optimum

- Process parameters and machining strategies are determined fully automatically based on a trained process model, without the need for predefined machining parameters
- The system can automatically detect deviations from the target state and, if necessary, recalibrate itself autonomously



The system is consistently operating at optimal performance
→ reduced costs, outcome optimum, reduced scrap rate

Significantly improved process efficiency & quality

Complex processes need less operator know how
→ self operating and self learning machine

Assistance for operator to understand multidimensional parameter space

Less downtime of machine, less parts, less human capacity needed to find optimal settings

BMG | AI-powered Machine Operation Optimum
Process Parameter Optimization & Control

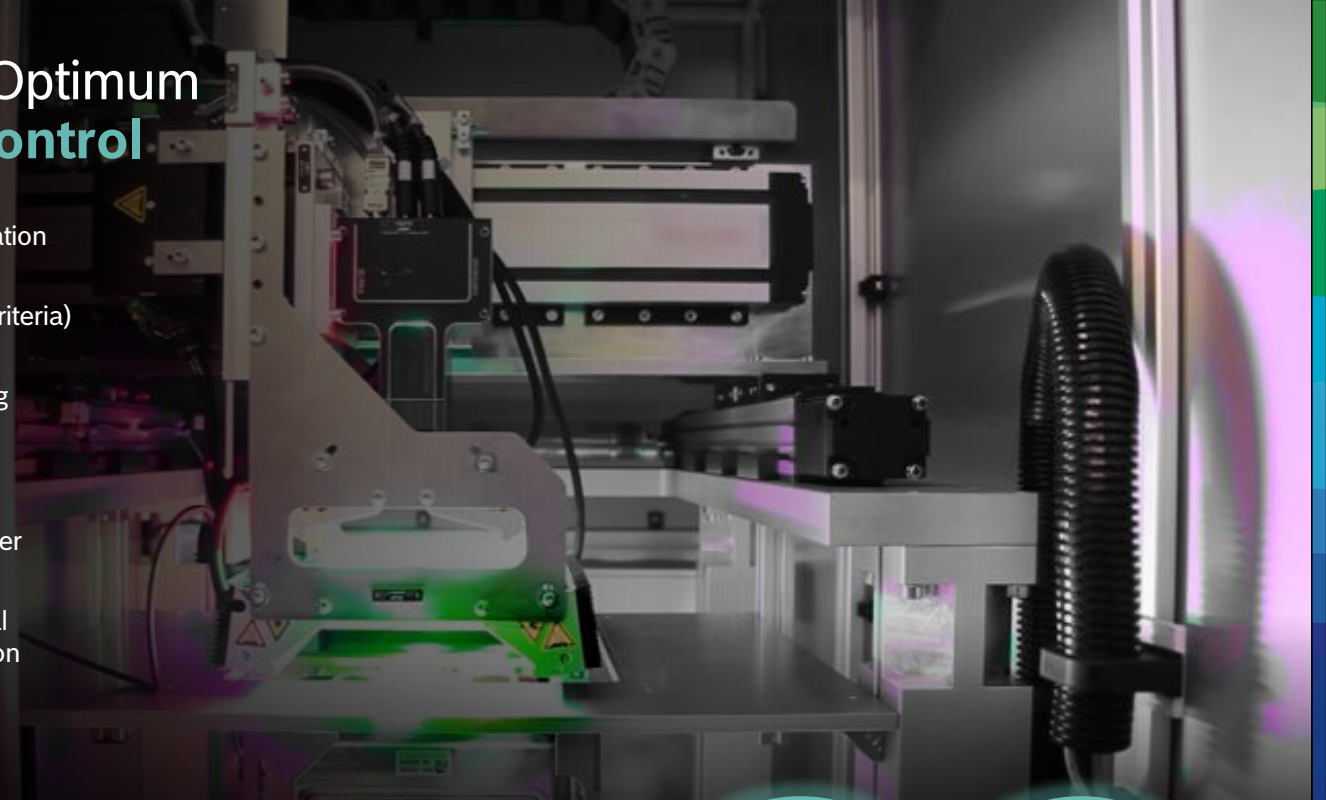
- Optimum parameter settings for production based on AI models and optimization methods
- Assistance in multidimensional space (many different parameters & quality criteria) by visualization of models and optimal areas for production
- Trained models or derived algorithms in control loops to keep machine during production in optimum parameter settings

Benefits

- Scrap reduction by keeping machine (e.g. against drifts) in optimum parameter settings (proven use case: 250k€ savings per line per year)
- Reduction of needed parts, time, machine and human capacity to find optimal parameters → e.g. > 80% time reduction finding initial parameter set based on trained process models
- Structured data storage enables reuse of data and further AI usage (LLM)

Technical specifications & AI Models

- Web applications with user guidance
- Machine interface via different communication protocol (e.g. OPC – UA)
- Flexible interface to integrate customer algorithms (e.g. Python) for control loops
- Bayesian Optimization (ML) & Gaussian Process Models (ML)



Up to **250.000 €** savings per line by established control loops

Up to **80%** time savings in parameter finding

BMG | AI-powered Machine Operation Optimum

AI-based multi-stage hybrid laser process

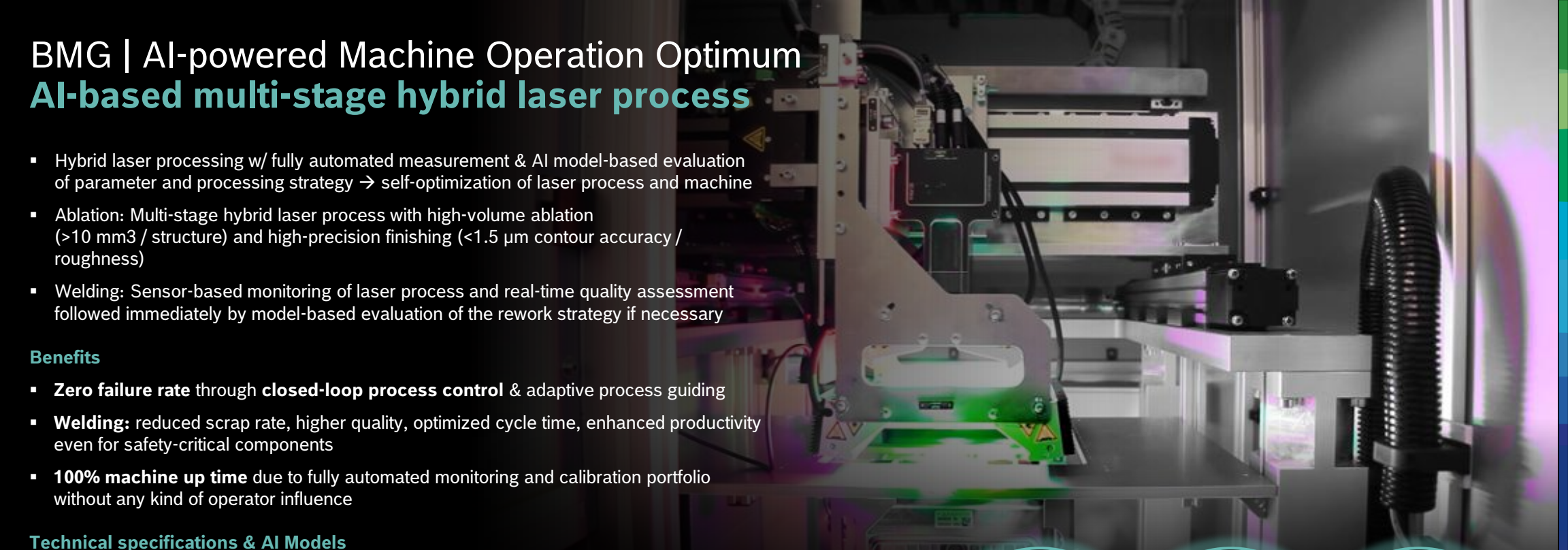
- Hybrid laser processing w/ fully automated measurement & AI model-based evaluation of parameter and processing strategy → self-optimization of laser process and machine
- Ablation: Multi-stage hybrid laser process with high-volume ablation (>10 mm3 / structure) and high-precision finishing (<1.5 µm contour accuracy / roughness)
- Welding: Sensor-based monitoring of laser process and real-time quality assessment followed immediately by model-based evaluation of the rework strategy if necessary

Benefits

- **Zero failure rate** through **closed-loop process control** & adaptive process guiding
- **Welding:** reduced scrap rate, higher quality, optimized cycle time, enhanced productivity even for safety-critical components
- **100% machine up time** due to fully automated monitoring and calibration portfolio without any kind of operator influence

Technical specifications & AI Models

- **Ablation ratio** >0.5 mm3/s combined with high surface quality (Sa < 0.5 µm) & **positioning accuracy** of laser structures relative to references 6s <5 µm
- Welding: Strength values of base material are achieved
- **Large language model (LLM)** for process software development
- **Deep learning (DL)** methods for analyzing sensor data, process monitoring & anomaly detection
- **Machine Learning (ML)** methods for dynamic adaption of process parameters in real time



Testing Suite

Testing everything – BMG‘s future testing platform

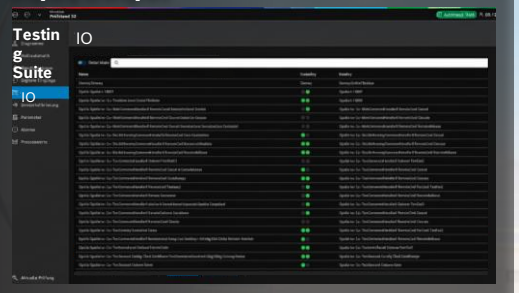
- Uniform software foundation for various machine types
- Testing of **Energy Systems** (e.g. Fuel Cells, Electrolyzers), **Electrification** (e.g. eDrives, Batteries), **Hydraulic & Combustion**, **Mechatronics** & **Electronics** (e.g. ECUs)
- A platform that grows with requirements, instead of being redeveloped for each project
- Scalability and suitability for both small pilot projects and highly complex industrial test systems
- Extensive test bench and application know-how from numerous customer projects
- Close integration of mechanical design, electrical engineering, automation, and software

Benefits

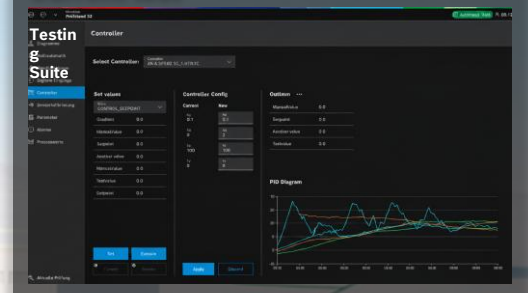
- Long-term maintainability and extensibility
- Consistent user experience across different shopfloor machines
- Seamless connectivity across multiple systems
- Easy-to-use completely flexible sequences and evaluation

Available Modules

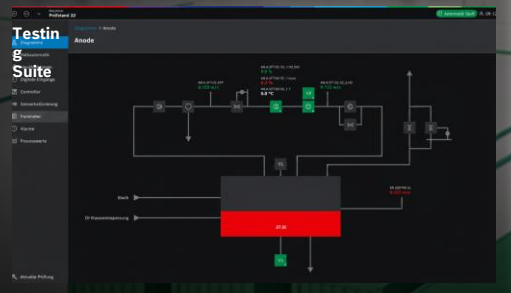
Input/Output



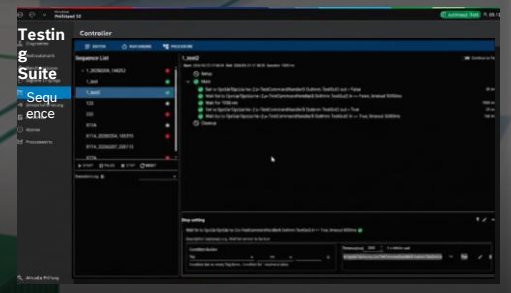
Current test



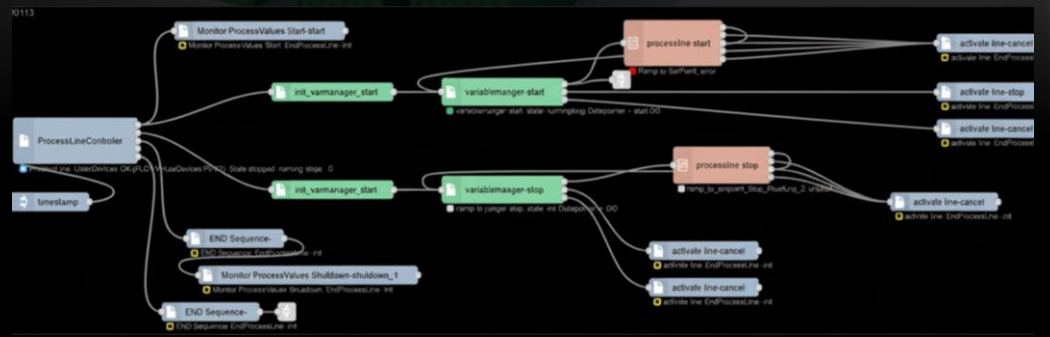
Piping and instrumentation diagram



Automatic mode



Sequencer



BOSCH

Efficiency in Engineering and Operation

Nexeed Automation

- Software portfolio to optimize and speed up the creation of machine software
- Ensuring consistent production operation, maintenance and optimization
- Independent of PLC and device provider, e.g. CtrlX, Siemens, Beckhoff

Benefits

- Complexity, risk and cost reduction for software engineering
- Predictability of machine construction projects
- Quality improvement and consistency
- Quick ramp-up and on-time project completion

Nexeed Automation

Control plus

- Application framework for rapid and standardized software development for production equipment
- Automatic PLC/HMI code generation
- Extensive function and device library → configure instead of program
- Hardware-independent architecture
- Integrated simulation possibility to test machine code

Benefits

- PLC manufacturer independence → high flexibility, no lock-in
- Reduced engineering effort and costs
- Faster project ramp-up, deployment and process optimization
- Standardized maintenance
- Consistent software quality and machine design, low error rate
- Standardized training and enabling concept
- Clear project effort predictability, lower project risk

40%
faster application creation

> 45 000
installations within Bosch worldwide

> 250
customers

Nexeed Automation | Q&A

Control plus

How does the solution work?

- Application framework for rapid and standardized software development for production equipment
- Automatic code generation using powerful engineering tools based on a large software library

What are the technical specifications?

- Configure instead of program
- Hardware-independent software building blocks with template technology
- Thinking and modeling in functional terms, not hardware
- Engineering model covers all target systems

What are the customer benefits?

- Hardware-agnostic at the control and device levels → No PLC vendor lock-in
- Consistent design through all machines due to the ready-made views in same look and feel

Which software components are involved?

- Control plus Engineering Studio, Object Browser, Control plus Object Library
- ctrlX, Beckhoff and every CODESYS-bases PLC
- EPLAN, open to connect to every PLM system

Does the solution use AI?

- Designed to be used in AI solutions
  → AI Agents build Automation applications based on Control plus object methodology

Which other modules does it connect to?

- All IP suite, HMInow, Robotic, MachineVision and process solutions

What is the business model?

- Software as a Product (SaaP)
- One-time sale for the runtime (required per machine)

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Nexeed Automation

HMInow

- Software solution - independent of the PLC manufacturer - for the efficient creation of HMI views
- One HMI solution for all of your machines
- Customizable to your demands
- Short ROI already in the first project

Benefits

- Considerably lower HMI engineering costs
- Usable with almost any PLC
- Works with a wide range of HMI panels
- World class UX and HMI design Consistent look and feel though all machines

38%
faster HMI creation with our ready-made views

67%
less effort to maintain your HMI

Nexeed Automation | Q&A

HMInow

How does the solution work?

- Visualization of machine data to operators on a web-based HMI software
- Quick creation of HMIs without expert knowledge

What are the technical specifications?

- Web-based solution which runs on arbitrary operating panels
- All major PLC systems can be connected

What are the customer benefits?

- Availability of ready-made views to speed up engineering time
- No PLC vendor lock-in
- Consistent design across all machines due to ready-made views

Which software components are involved?

- Connects PLCs such as Siemens, Allen Bradley, Beckhoff, Rexroth, and other data sources via OPC UA or MQTT
- Frontend can be integrated into other web-based solutions and allows integration of other web-based solutions

Does the solution use AI?

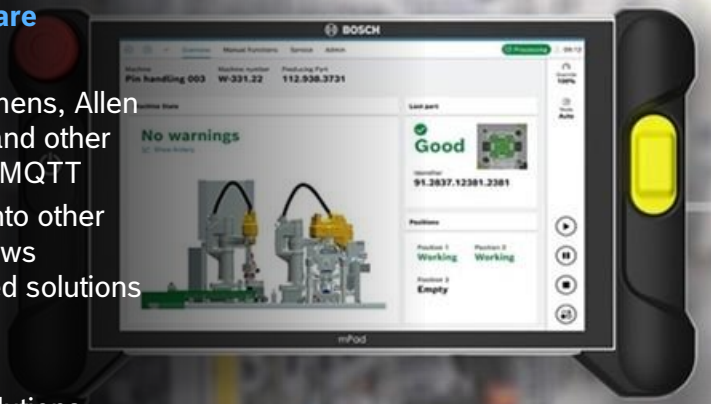
- Designed to be used in AI solutions
  → Open file formats allow for AI usage

Which other modules does it connect to?

- All IPSuite and Nexeed Automation solutions

What is the business model?

- Software as a Product (SaaP)
- One-time sale for the runtime (required per machine)



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