Microsoft

AI on the Edge

PJ Johnson
Principal Architect, Microsoft Technology Centers

Key Points – AI at the Edge in IIOT

AI on the Edge is subject to the IIOT data demarc for the last mile

AI at the Edge improves OEE, digitization of the OT, worker efficiency, automated quality control, sustainability, etc.

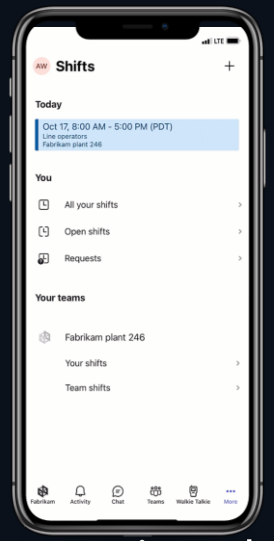
AI at the Edge is part of the larger IIOT architecture from OT to Cloud

Manufacturing - examples of AI

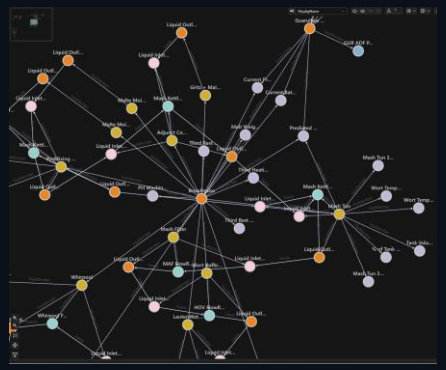
Use case driven roadmaps

OEE improvements

Industrial metaverse



Supporting the Front-line worker



Optimizing Supply chains

Sustainable insights

Intelligent Factory Scenarios for Digital Operations

Industry 4.0	Mfg. Industry Scenarios	Business Outcomes
Gain Visibility	**Factory Digital Twins**	Remote visibility, bidirectional command and control, serialized asset tracking and digital verification and validation through simulation
	MES on Azure	The cloud for a single instance in cloud for reduced costs and operational efficiency
	Edge & OT security	Secure OT end-points through continuous monitoring of assets, alerts and anomaly detection
Improve Productivity	**Production Quality**	Augment human quality inspection through AI and cognitive capabilities
	Predictive Maintenance	Improve OEE through improved uptime and minimized business impact
	Frontline Worker	Empower FLWs with communication and collaboration tools, redefine work with generative AI
Optimize Operations	**Autonomous/Smart Control Systems**	Feedback loops for autonomous process control, optimization, and productivity
	Sustainable Operations	Reduce energy costs by optimizing the consumption and achieving sustainability goals by reducing carbon footprint

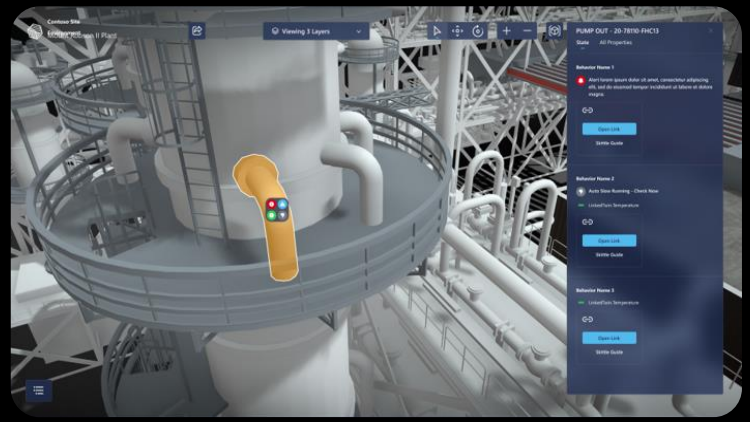
Industrial Metaverse

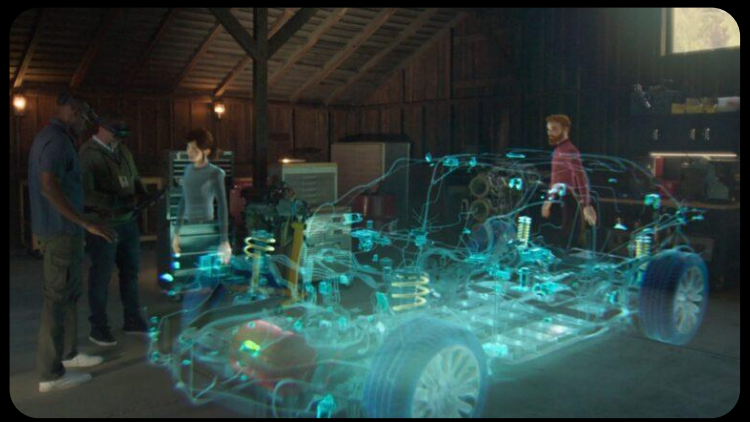
Industrial Metaverse | Definition

Humans and AI working together to

1. Design
2. Build
3. Operate
4. Optimize

physical systems using digital technologies





Industrial Metaverse
Top scenarios in use today

Remote Operations Support

Addresses skill and labor shortages, hybrid work, and mobilize people safely within complex industrial environments.

- Gain real-time insights
- Create, store and publish operational knowledge accessed through generative AI

AI Driven Process and Asset Optimization

Leverage AI to deliver real-time process optimizations and reduce waste while increasing efficiency and sustainability.

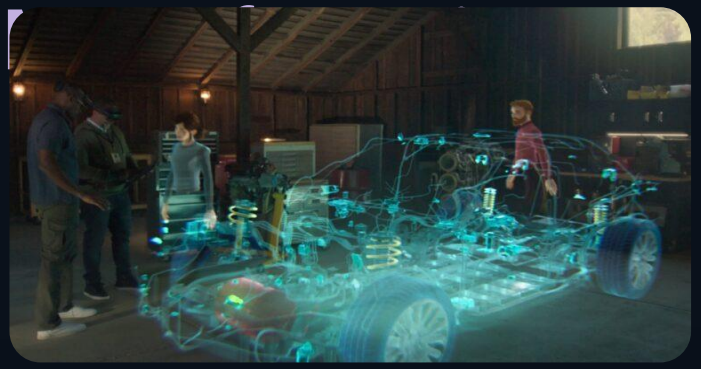
- Detect anomalies in real-time
- Analyze and predict quality
- Uncover efficiency and sustainability gains

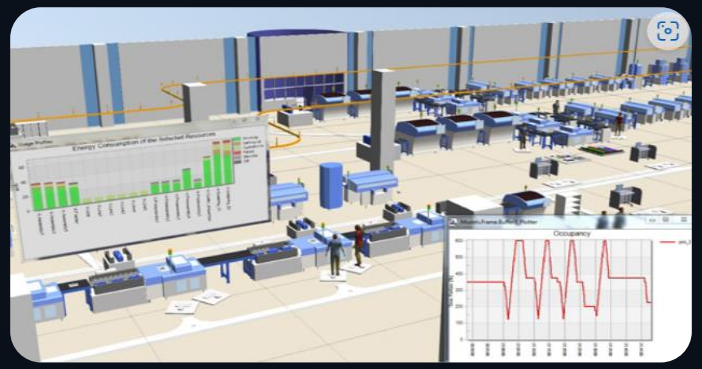
Robotics, Automation & Autonomous Operations

Take advantage of capabilities in simulation, automation, and robotics to discover efficiencies and reduce capital expenditures.

- Predictive maintenance
- Automatically detect quality issues
- Reduce rework

Industrial Metaverse | Additional Scenarios for





Product Development and Engineering Collaboration

Reduce the complicated process of building physical prototypes simplifying research and development, speeding up the design process through remote collaboration, and reducing the number of adjustment rounds, thus significantly cutting the costs on the pre-manufacturing cycle.

Modelling of Physical Factory

Simulation of production and material flows for optimized deployment e.g., greenfield factory/plant implementation, manufacturing line optimization such as cell-based manufacturing, line changeover, Warehouse configuration and route optimization.

Virtual Supply Chain

Enhance supply chain transparency with 3D representations of how products are made, distributed, and sold enabling stakeholders to simulate and gain visibility into lead times, transit times, shipping delays and even real time shipping costs. Collaborate on demand and supply with immersive supply chain network map.

Industrial Metaverse Partners

Example of the industrial metaverse

Capabilities of a Factory Digital Twin

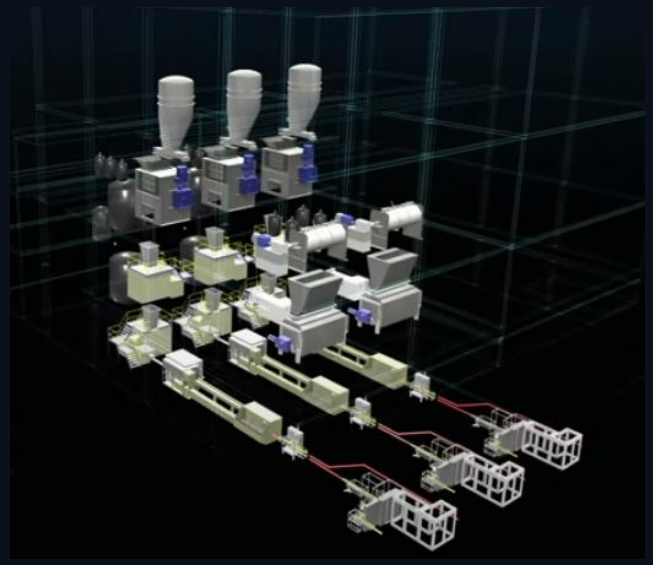
1. Collaboration in the Metaverse
2. Remote Visibility Control Tower
3. Integrated Planning & Scheduling
4. Asset tracking & Digital Maintenance

5. Factory Simulation & Root Cause Analysis
6. Intelligent Process Control & Automation
7. Connected Worker
8. Energy Cost Optimization

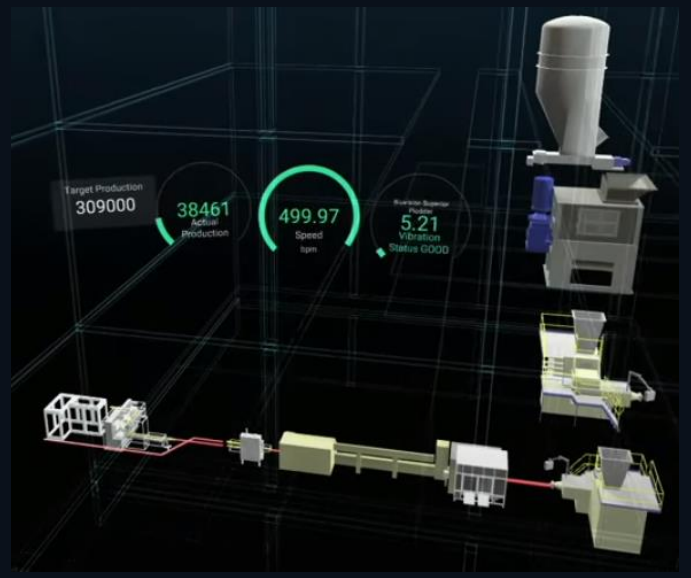
Collaboration · Closed Loop · Optimization · Simulation · Sustainability Impact

Unilever : Digital Twin in Factories and Supply Chains

3 lines in Valinhos



500 bars soap/min



real-time optimized control

Digital Twin + AI - «*2,5 millions euro savings* » Unilever, Dave Penrith, Chief Engineer

Soap-making control variable real-time using Advanced Process Control for optimal consistency in « soap-making » *operators don't want to switch it off anymore !*

Improve Productivity

through Predictive Maintenance, Quality & Frontline workers

Improve production efficiency by leveraging AI tools to improve production quality and reduce inspection costs. Improve asset availability and uptime by leveraging machine learning for predictive maintenance. Empower frontline workers with tools for collaboration, learning and improved health and safety on the factory floor.

Use cases:

Production quality

Anomaly detection

Predictive maintenance

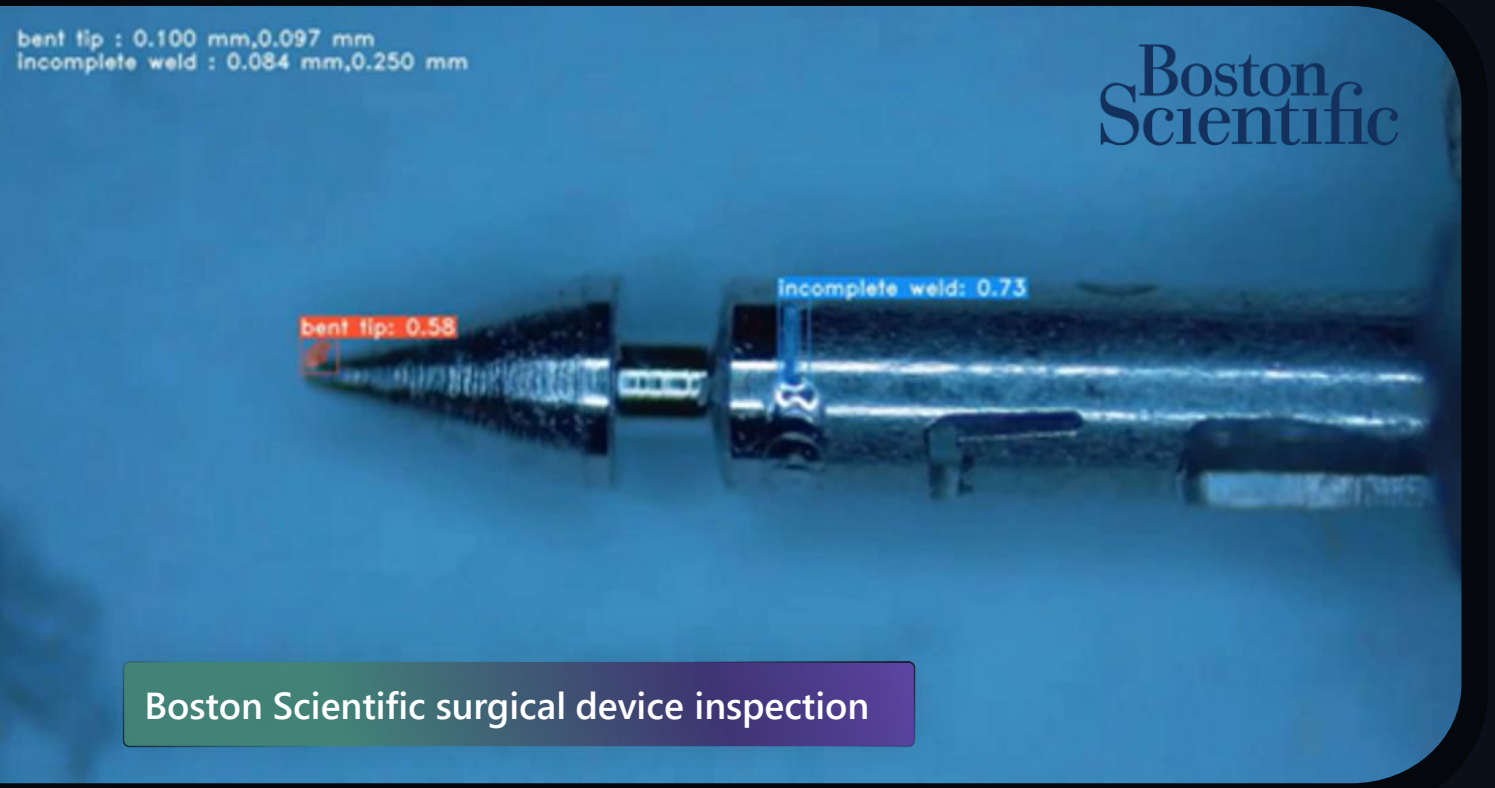
Frontline worker enablement

Training

Health and safety

Machine Vision improves inspection efficiency

Augmenting human inspection capabilities through camera-based machine vision enables scenarios like complete inspection and reduction in false positives during defect detection.



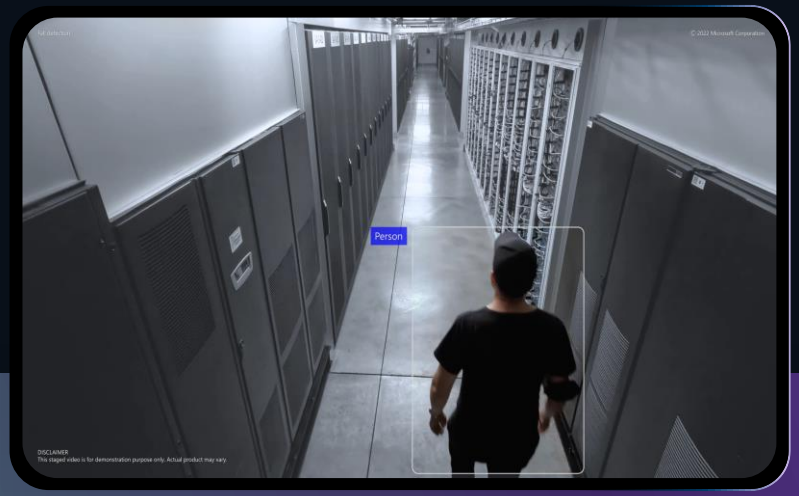
Boston Scientific surgical device inspection

Business Impact Example

- Double human inspection replaced by single human AI augmented inspection.
- 50% reduction in inspection time through faster defect detection.
- $1.5M in labor cost savings for every 10 lines.

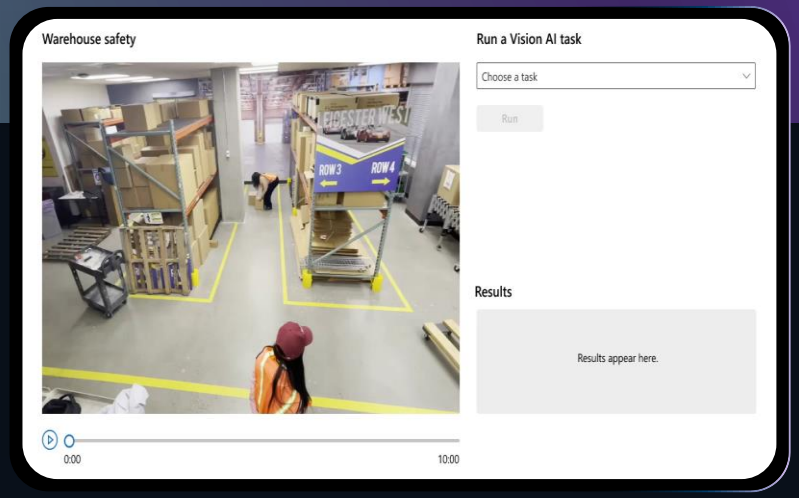
Health, Safety & Wellness scenarios

Monitor PPE Compliance



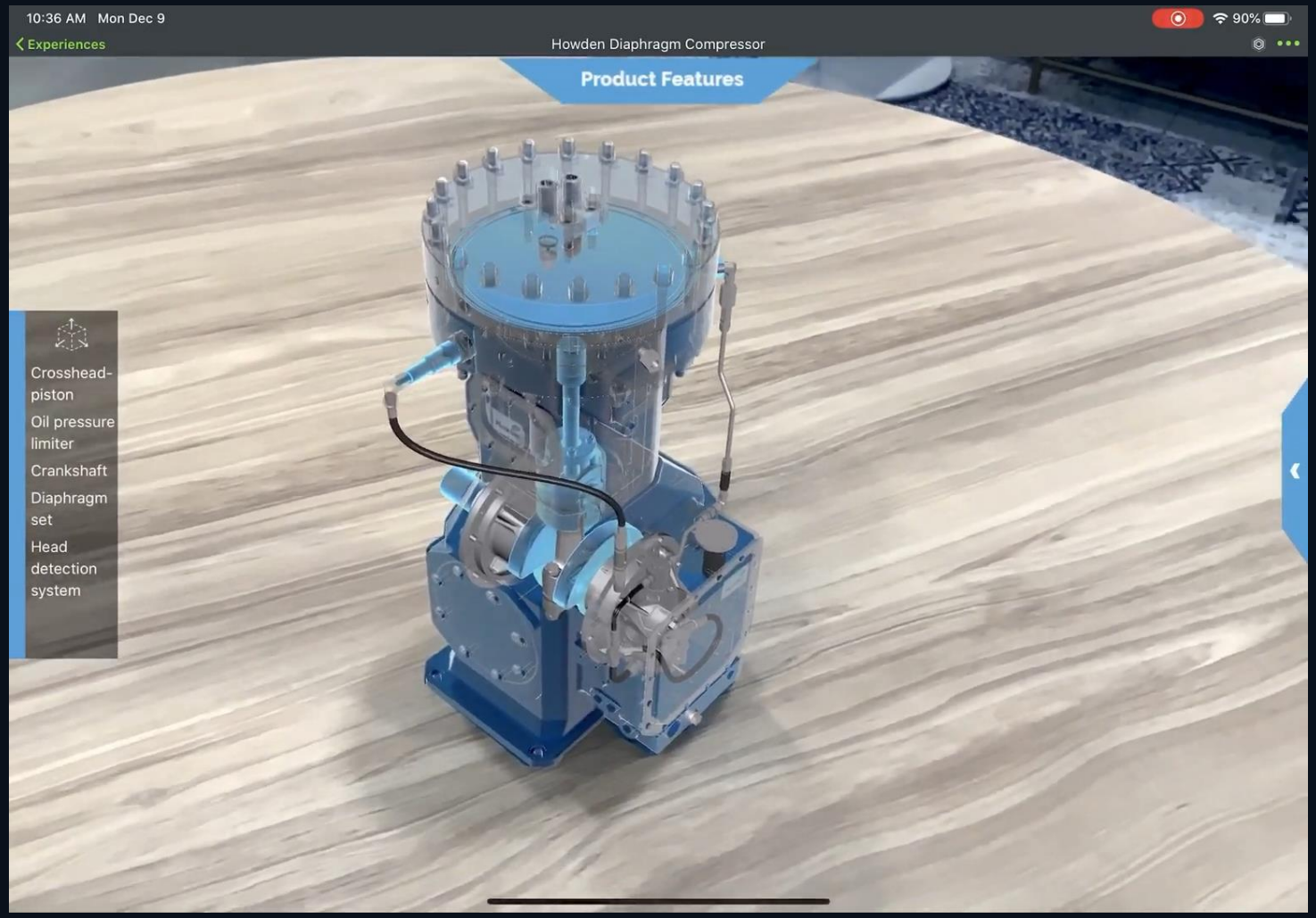
Identify Slips, Trips, and Falls

Analyze Workforce Activity



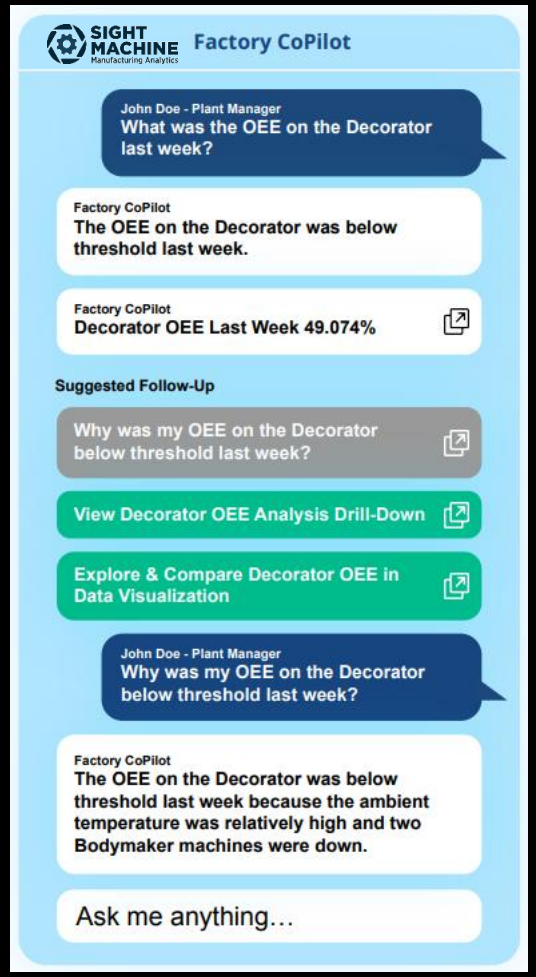
Summarize Video

Demo – helping remotely the field engineer



Generative AI examples in Manufacturing

Copilot



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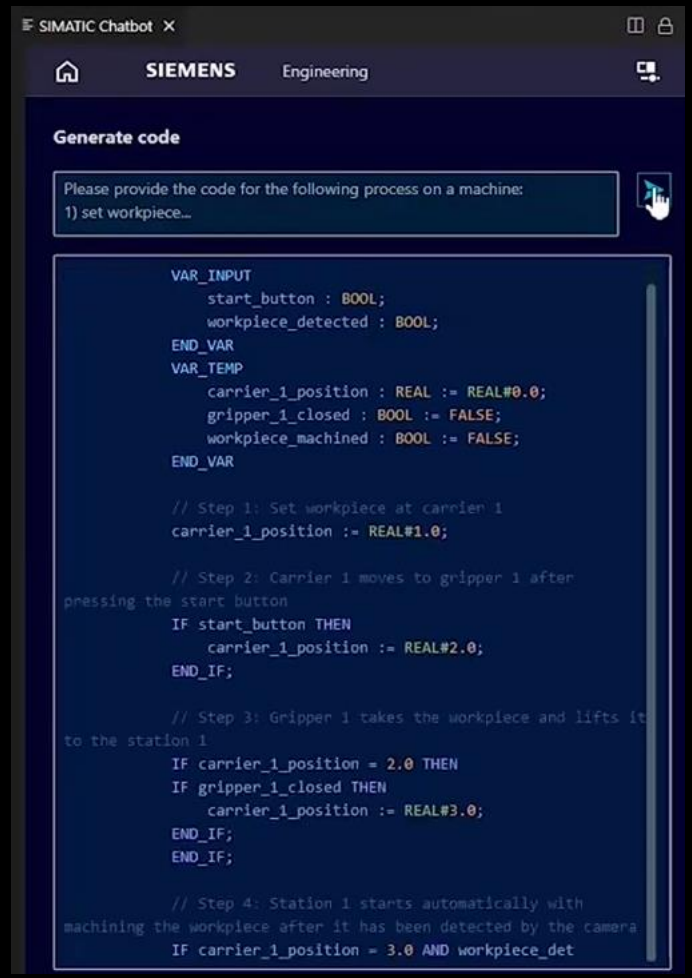

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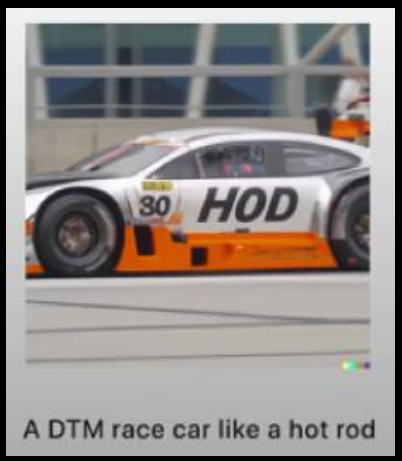
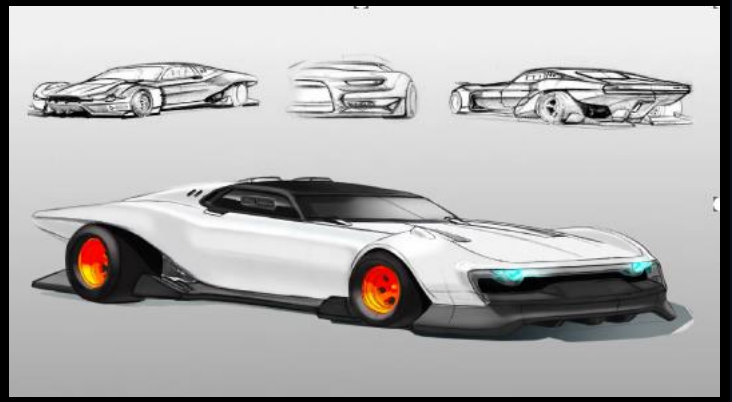




Enterprise OpenAI Use Cases – IIOT and beyond

Plant Operations

- Intelligent remediation/ troubleshooting assistance
- Training guide creation
- SOP checklist creation
- Maintenance schedule creation
- Equipment guide summarization

Supply Chain

- Invoice/PO Processing – Augment AFR for Targeted Data Extraction
- Vendor contract analysis
- Vendor communication summary

R & D

- Summarization of technical reports, internal presentations
- Summarization of external content (competitive analysis, industry trends, patent analysis)
- IP documentation creation

Product Dev

- Generate product code from design docs/pseudo-code
- Find and fix code defects
- Modernize legacy codebases
- Generate internal/external documentation

HR

- Employee materials summarization (internal enterprise chat bot)
- Employee pulse – summarization of surveys, exit interviews
- Job posting creation/curation

Legal

- Contract analysis (summarization, compliance violations, clause extraction)
- Summarization (litigation, regulatory filings, etc.)
- Draft document generation (corporate policies, privacy docs, etc.)

Marketing

- Copy creation (website, social media, email, etc.)
- Competitor summarization
- Sales collateral creation (presentations, brochures [text and image])
- Customer pulse – social media/user review summarization

IT

- Tier 1 service agent (enterprise IT bot)
- Incident report analysis
- Process document creation
- Knowledgebase article drafting
- Ticket classification/routing

Customer Service

- Call center analytics
- Customer response creation (email/chat)
- Service request summarization
- Customer-facing support bot
- FAQ/troubleshooting guide creation

EHS

- Safety document creation/summarization
- Checklist creation for EHS procedures
- Semantic search for safety docs
- Internal safety bot – always on response to safety issues

Optimize Operations
by infusing Artificial intelligence and achieve Sustainability Goals

Develop capabilities for autonomous operations through Intelligent control systems by leveraging AI. Achieve sustainability goals by optimizing operations for energy costs, quality and efficiency.

Use cases:

Intelligent control systems

Sustainable operations

Energy cost optimization

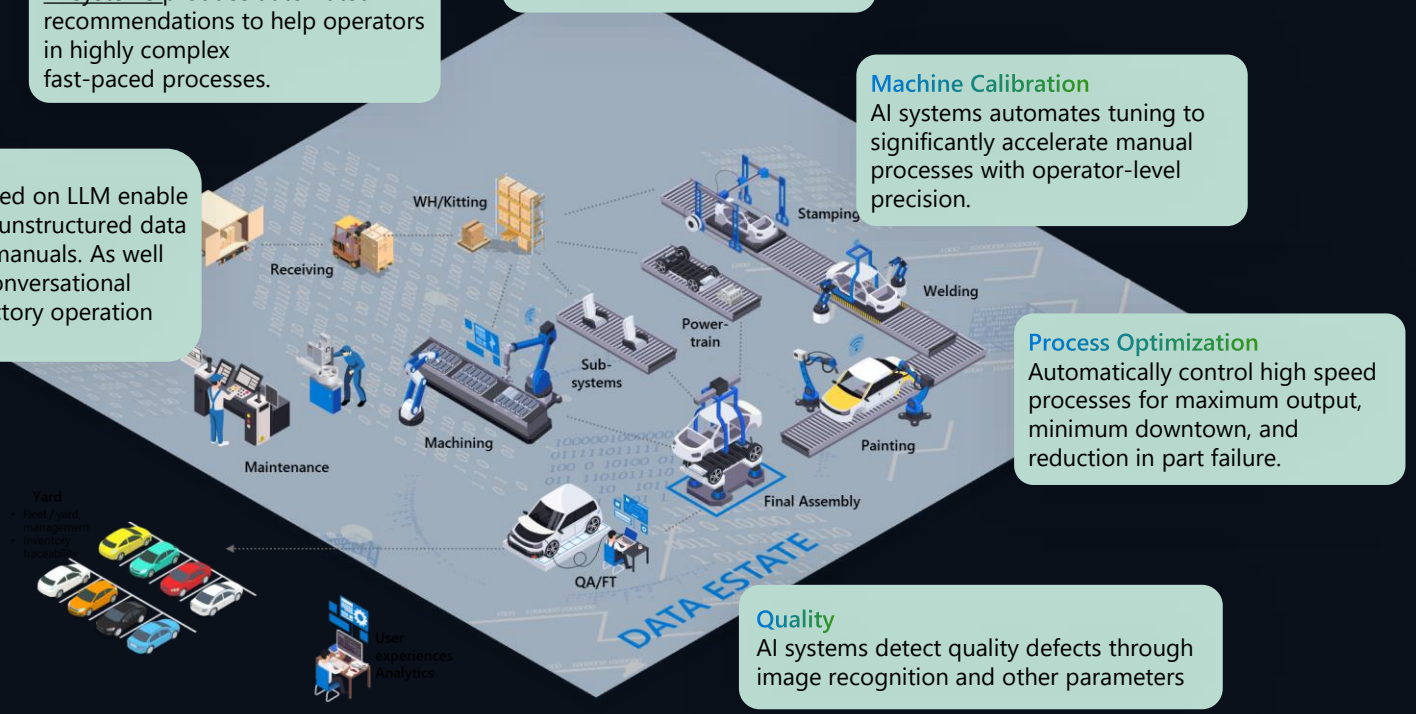
AI and Machine Intelligence in Automation

Industrial Robots/Cobots
Robots use image recognition to automatically adapt to the changing location

Prescriptive Guidance
AI systems produce automated recommendations to help operators in highly complex fast-paced processes.

Machine Calibration
AI systems automates tuning to significantly accelerate manual processes with operator-level precision.

Generative AI
AI systems based on LLM enable greater use of unstructured data like texts and manuals. As well as provide a conversational interface to factory operation data.

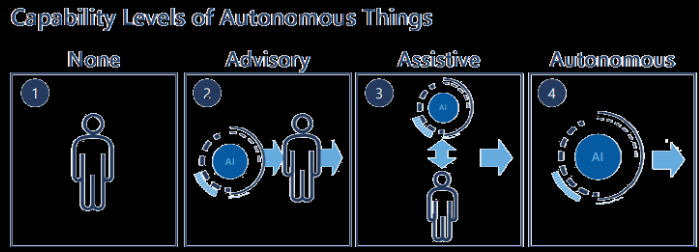


Process Optimization
Automatically control high speed processes for maximum output, minimum downtown, and reduction in part failure.

Quality
AI systems detect quality defects through image recognition and other parameters

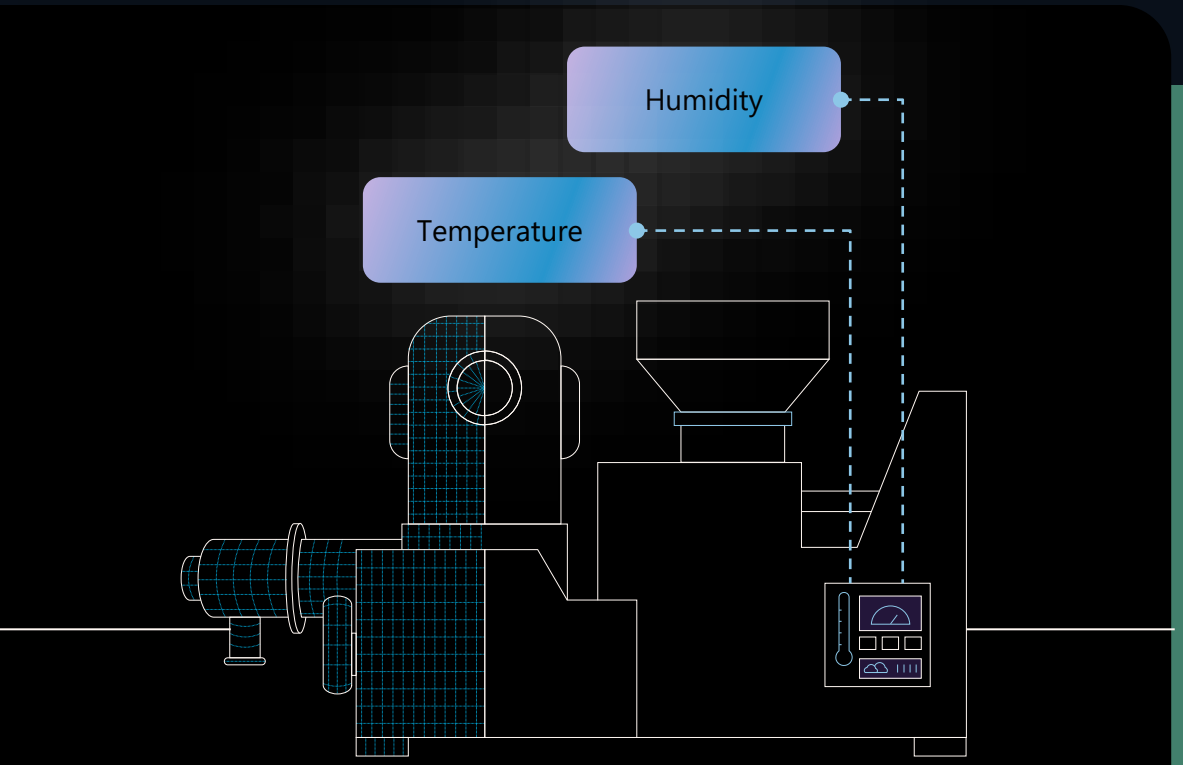
Autonomous systems capabilities:

- **None:** No additional intelligence from machines
- **Advisory:** Machine provides insights, humans decide and act
- **Assistive:** Machine and humans work and act together
- **Autonomous:** Machine decides and acts independent of human



Closed loop process control

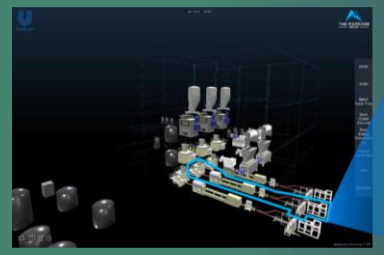
AUTOMATED MOISTURE CONTROL DURING THE SOAP MAKING PROCESS



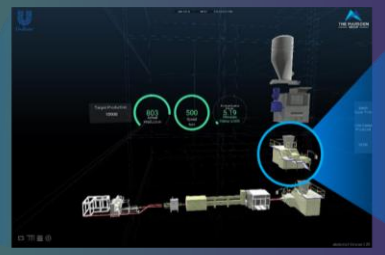
Unilever worked with the Marsden Group to build a digital twin solution for **bidirectional control and communications** for a digitally connected factory. Hosted on the Azure platform, the solution:

- **Connects factory equipment** into the digital twin model.
- Leverages machine learning to optimize both machines and processes.
- Integrates Power BI for real-time data intelligence.
- **Reduces alerts requiring action** by 90% per day, ensuring fewer interruptions.
- **Gives workers automated control** over process consistency.

Factory overview



Line overview



Equipment overview

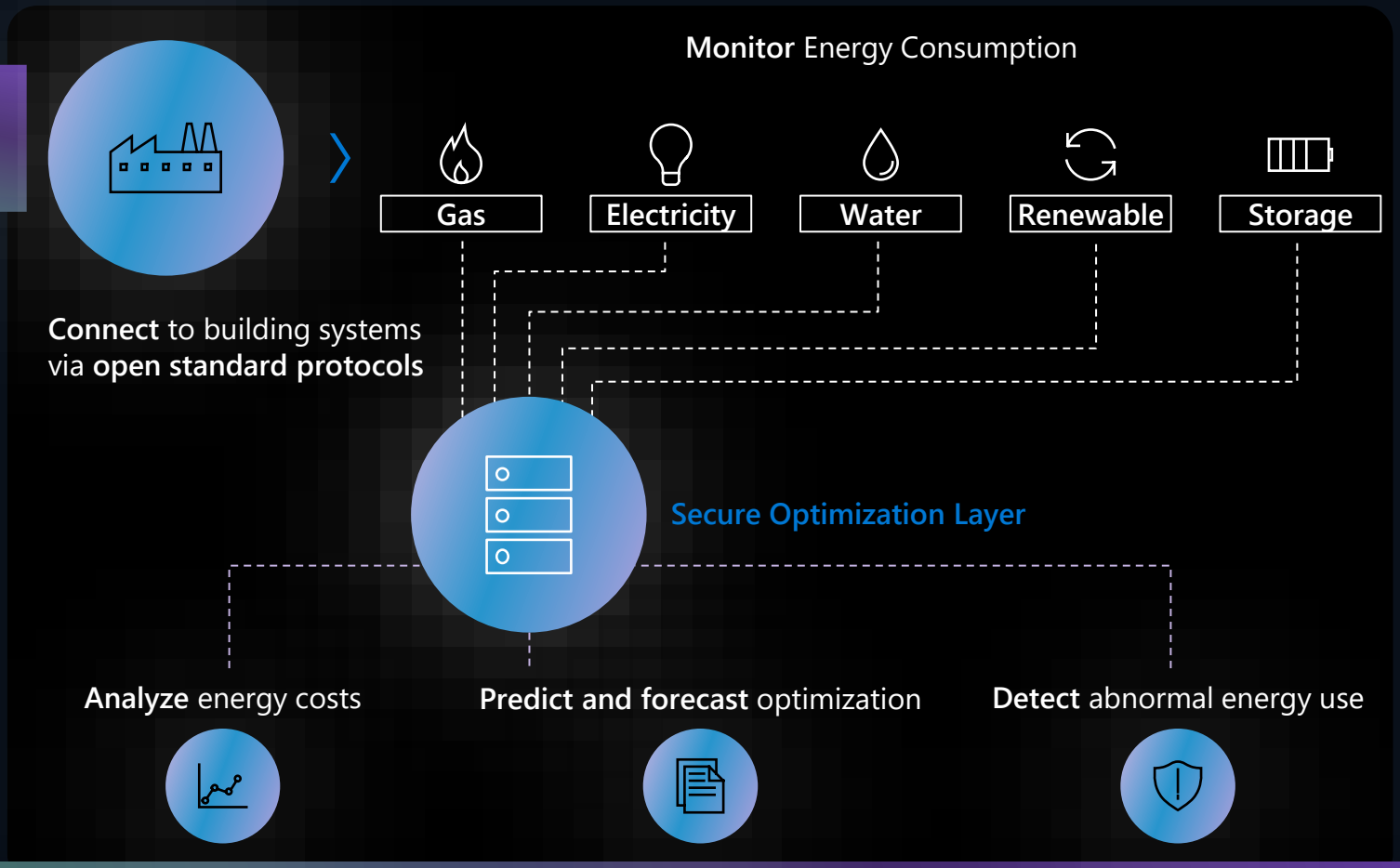
"We are creating a culture and organization which is data-intelligent…to make smarter, faster decisions to understand, anticipate and exceed consumer expectations."

– Dave Penrith, Chief Engineer, Unilever

Sustainable Operations through Energy Cost Optimization

IIoT and Industry 4.0 offer several opportunities to improve energy efficiency

- Visibility of real-time consumption
- Drill-downs into causes of abnormal energy use
- Improve balance between supply and demand
- Realized Cost Savings Through Informed Decisions
- Compliance with government regulations



LET’S DISCUSS AN ARCHITECTURE

AI on the Edge in IIOT

Thank you