Based on who you talk to, AI is either going to save the world, or destroy it. What about Manufacturing?
The Role of AI in Manufacturing
- Use Cases from the SEMI industry -

AI has emerged as a transformative force that can revolutionize manufacturing processes.

Session Objectives
✓ Understanding the paradigms of Industry 3.0, 4.0 & 5.0
✓ Apprehending how AI can revolutionize manufacturing
✓ Realizing how an integrated and modern MES platform can facilitate the emergence of AI in manufacturing
Our 13 manufacturing sites around the globe annually produce millions of wafers, and from their operations, daily generate 13TB of data and 3.3 millions of images running through AI models.
Micron is both enabling and leading the adoption of the 5th Industrial Revolution applications.

Micron’s leading portfolio of memory and storage devices at the core of 5G & AI revolution

- **Cloud**: DRAM, 3D NAND, TLC/QLC SSDs, NVDIMMs, 3D XPoint
- **Automotive**: DRAM, LPDRAM, GDDR6, e.MMC/UFS, NOR, SLC/MLC NAND, TLC SSDs
- **Mobile**: LPDRAM, e.MMC/UFS, 3D NAND
- **Networking**: DRAM, LPDRAM, GDDR5, GDDR6, eUSB/e.MMC/UFS, NOR, TLC/QLC SSDs, HBM
- **IoT**: DRAM, LPDRAM, e.MMC/UFS, 3D NAND, NOR, SLC/MLC NAND, SSDs, MicroSD cards

Micron recognized by WEF as leader in adopting AI technologies in manufacturing Lighthouses

WEF = World Economic Forum

Singapore NAND Center of Excellence

Taiwan DRAM Center of Excellence
The 4th Industrial Revolution Is Upon Us.

From Industry 1.0 To Industry 4.0

**FIRST INDUSTRIAL REVOLUTION**
Introduction of mechanical production facilities with the help of water and steam power

1784
First mechanical loom

**SECOND INDUSTRIAL REVOLUTION**
Introduction of division of labor and mass production with the help of electrical energy

1870
First assembly line

**THIRD INDUSTRIAL REVOLUTION**
Use of electronic and IT systems that further automate production

1969
First programmable (PC)

**FOURTH INDUSTRIAL REVOLUTION**
The Digital Connected World

2000

- Lean
- Six Sigma

**Principles of Scientific Management**

**TQM**
The Role of AI in Manufacturing
- Use Cases from the SEMI industry -

MES = Manufacturing Execution System
RMS = Recipe Management System
SPC = Statistical Process Controls
APC = Advanced Process Controls
MCS = Material Control System
A Typical Automated Manufacturing Step

**Micron Singapore:**
- 50% Decrease in New Product Ramp Up Time
- 4% Increase in Tool Availability
- Improve Labor Productivity

**Micron Taiwan:**
- 18% Increase in Labor Productivity Improvement
- 40% Decrease in Product Downgrade Reduction
- 20% Decrease in Time Reduction in New Product Ramp
- 15% Decrease in Energy Power Saving
When working in concert, automation and analytics create an **effective orchestration** of physical and digital devices.

Physical Automation

- Activity Manager
- MCS

Process Control

- Scheduling
- Dispatching

System Automation

- Host Automation
- RMS
- SPC

Preventive Analytics

- Machine Health
- Root Cause Analysis
- Commonality Analysis

Integration

- Fast Data Platform
- Big Data Platform
- Edge Computing

Industrial IoT

- Mobile, RFID, Sensor Devices & IOT Platform

MES

**The Role of AI in Manufacturing**
- Use Cases from the SEMI industry

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**Definitions**

- MES = Manufacturing Execution System
- RMS = Recipe Management System
- SPC = Statistical Process Controls
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Micron Confidential

Smart Factory

Streaming Analytics

Edge Process Units

IoT Platform

Vibration

Humidity

Temperature

Pressure

Flow

Optical Power

Acoustic

Images

Particle Counter

Gas Analyzer

Arc Detector

Laser Profiling

Current

Profiling

Laser Alignment
AI.1 Intelligent Analytics
Services capable of performing tasks that would typically require human intelligence, and designed to process and analyse vast amounts of data, recognize patterns, and make predictions or take actions based on the acquired knowledge.
AI.1 :: Intelligent Analytics :: Maturity Model

Low   Analytics Maturity   High

Enterprise data management
Operational reporting
Consolidated systems view & data availability
Guided analysis & exception reporting
Scenario simulation
Predictive modelling
Cognitive Intelligence & machine learning

Amplified Intelligence (Prescriptive)

Hindsight (Descriptive)

What happened? Why did it happen?

Insight (Predictive)

What will happen? How can we make it happen?

Foresight (Predictive)

What will happen? How can we make it happen?

Data

Operational reporting

Business Intelligence

Enterprise data management

Advanced Analytics

Guided analysis & exception reporting

Visualization

Prediction modelling

Scenario simulation

Business analytics

Predictive analytics

Visualization

Machine learning

Data cuts

Data cuts

Regression modelling
1. **Process Optimization**: Manufacturing processes often involve complex variables, such as machine settings, material compositions, and environmental conditions. Analytical data models can analyze historical process data and identify patterns, relationships, and optimization opportunities. It can then prescribe the optimal process parameters to enhance productivity, minimize waste, and improve quality.

2. **Supply Chain Optimization**: Analytical data models can optimize supply chain operations by considering various factors such as demand forecasts, inventory levels, transportation costs, and production capacity. By simulating different scenarios and analyzing the potential outcomes, the AI system can recommend optimal strategies for procurement, production scheduling, inventory management, and distribution.

3. **Quality Control and Defect Detection**: Analytical data models can help in quality control by analyzing vast amounts of sensor data, images, or video footage from production lines. By learning from historical data, the AI model can detect patterns associated with defects, identify potential root causes, and prescribe corrective actions. This can improve product quality, reduce waste, and minimize the need for manual inspections.

4. **Energy Efficiency Optimization**: Manufacturing facilities consume significant amounts of energy, and optimizing energy usage can result in cost savings and environmental benefits. Analytical data models can analyze real-time sensor data, energy consumption patterns, and production requirements to recommend energy optimization strategies. These recommendations can include optimal machine configurations, production scheduling, or even the integration of renewable energy sources.

5. **Maintenance and Predictive Analytics**: Analytical data models can aid in predicting equipment failures and optimizing maintenance schedules. By analyzing sensor data and historical maintenance records, the AI system can identify patterns and indicators of potential equipment malfunctions. It can then prescribe maintenance actions, such as scheduling maintenance activities during low-production periods, ordering spare parts in advance, or conducting specific preventive maintenance tasks to avoid downtime.

6. **Resource Allocation**: Analytical data models can analyze resource data, resource consumption, and resource availability to support resource allocation decisions in manufacturing settings. It can recommend optimal resource assignment strategies, scheduling techniques, and resource allocation plans to reduce waiting times, decrease cycle times, and enhance operational efficiency.
A Typical Intelligent Automated Manufacturing Step

- **Pre-Process**
  - Automated Stage & Delivery
  - Automated Validations

- **In-Process**
  - Automated Execution
  - Automated Process Controls
  - Deep learning optical-defect detection created a 2% yield improvement.

- **Post-Process**
  - Automated Reports
  - Automated Dispatch & Pickup

**Advanced Process Controls**

- 22% Scrap & Product Downgrade Reduction
- 3.3 Millions of images running daily through AI models

**Additional Features**

- **Intelligent AMHS**
- **Industrial IOT**
- **Digital Twin**
- **Intelligent Scheduling**
- **Intelligent Equipment Management**
- **4% Tool Availability Improvement**

**Results**

- 22% Scrap & Product Downgrade Reduction
- Deep learning optical-defect detection created a 2% yield improvement.
- 3.3 Millions of images running daily through AI models
- The integrated Deviation Management platform reduced time to resolve quality issues by 50%.
**AI.1 :: Intelligent Analytics :: SEMI Use Case #1**

**Predictive Maintenance :: The Evolution of Maintenance Strategies**

**Benefits**
- Manufacturing Tool Availability Improvement
- Cost of Non-Quality Improvement
- Labor Productivity Improvement

**Digital Roadmap**
- **4.0**
  - **Intelligent Analytics**
    - Automated Machine Adaptation
      - Simulation
      - Yield Prediction
      - Decision Making
  - **Preventive Analytics**
    - Machine Health
    - Root Cause Analysis
    - Commonality Analysis
  - **Predictive Analytics**
    - Fast Data Platform
    - Big Data Platform
    - Edge Computing
  - **Integration**
    - Mobile, RFID, Sensor Devices & IOT Platform

**Integration**
- **Industrial IoT**

**Prescriptive Analytics**
- Simulation
- Yield Prediction
- Decision Making

**Predictive Analytics**
- Machine Health
- Root Cause Analysis
- Commonality Analysis

**Preventive Analytics**
- Fast Data Platform
- Big Data Platform
- Edge Computing

**Integration**
- Mobile, RFID, Sensor Devices & IOT Platform

**Benefits**
- **Let the machines help you decide how to avoid predicted failures!**
- **Predict** exactly when it will break and maintain it accordingly!
- **Maintain** it at regular intervals, so it doesn’t break!
- **Fix** it when it breaks!

**AI.1**

Fix it when it breaks!
Maintain it at regular intervals, so it doesn’t break!
Predict exactly when it will break and maintain it accordingly!
Let the machines help you decide how to avoid predicted failures!
Advanced Process Controls (APC) :: Evolution of the Triple A Paradigm

Benefits
- Yield Improvement
- Cost of Non-Quality Improvement
- Labor Productivity Improvement

Automation Roadmap 3.0

Intelligent Analytics

Optimization
- Predictive Manufacturing

Physical Automation
- Activity Manager
- MCS

Process Control
- Scheduling
- Dispatching
- APC

System Automation
- Host Automation
- RMS
- SPC

Tracking & Monitoring

MES

MES = Manufacturing Execution System
RMS = Recipe Management System
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MCS = Material Control System
Triple A Paradigm within the Manufacturing Step

**Original Scope**
- MFG Equipment
- Host Automation
- IoT Sensors

**Extended Scope**
- IoT Sensors
- Tool Events

**Analytical Process Workflow**
1. **Source**
   - Data Collection

2. **Contextualize**
   - Facility Sensors Data (SCADA)

3. **Synthesize**
   - Streaming Cluster

4. **Orchestrate**
   - Data Analysis for Anomaly Detection
   - Archiving Data for Machine Learning

5. **Engage**
   - Recovery / Maintenance assisted by AR / VR application
   - Notifications & Action Items

**Basic Factory Eco-System**
- R2R
- FD
- MES
- SPC
- CAPA

**Notifications & Action Items**
- Soft Down EQ for Alert
- Hold Lot in MES for Disposition

**Dashboard**
- Advanced Process Controls

**A concept which existed for years in the SEMI industry through FD & R2R.**
Triple A Paradigm extended across 4 analytical layers

- **BIG DATA**
  - Private Cloud Off Premises
  - Cloud Streaming Cluster

- **FAST DATA**
  - Private Cloud On Premises
  - Site Streaming Cluster

**Activities Orchestrator**
- **Stream Event Flow Platform**
- **Containerized Services**

**Data Science Model Management**
- **Containerized Services**
- **Sample Data**
- **Cloud Analytics**
- **Advanced Process Controls**
- **Tool Aggregated**
- **Execution**
- **Tool Edge Computing**

**Enterprise Aggregated**
- **Global Views**
- **Advanced Process Controls**

**Factory Aggregated**
- **Tool Aggregated**
- **Global Views**

**Site Edge Analytics**
- **Tool Aggregated**
- **Global Views**

**Traditional APC**
- **Tool Aggregated**
- **Global Views**

**Interdiction API Services**
- **Actions - Notifications**

**Acquire**
- **Analyze**
- **Act**

**Archiving Data For Machine Learning**
- **Stream Event Flow Instances**
- **Model Optimization (ML)**

**Containerized Services**
- **Stream Event Flow Platform**
- **Activities Orchestrator**

**Data Logger**
- **Automation**
- **Process Tool**
- **Sensor**

**Metrology Tool**
- **Automation**
- **Process Flow**

**Process Flow**
- **Automation**
- **Process Tool**
- **Sensor**

**Advanced Process Controls**
- **Triple A Paradigm extended across 4 analytical layers**

**Stream Event Flow Instances**
- **Actions - Notifications**
- **Model Optimization (ML)**
**Triple A Paradigm extended across 4 analytical layers**

<table>
<thead>
<tr>
<th>Definition</th>
<th>Data</th>
<th>Generic Tasks</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Designed to (1) receive structured or unstructured data from all enterprise & factory data sources and (2) execute Advanced Analytics models capable to analyze excursions, genealogies & complex yield analysis | Aggregated Data at the enterprise level (tool, sensor, manufacturing process step, operator, material & product) characterized by a low sampling rate and a long retention period | ➢ Commonality Analysis  
 ➢ Predictive Models (process optimization on-the-fly)  
 ➢ Prescriptive Models (machine auto-correction)  
 ➢ Model optimization pushed to L3 | ➢ Excursion Analysis  
 ➢ Product Genealogy  
 ➢ Overall Yield Analysis |
| Designed to (1) receive structured or unstructured data from all factory data sources (APC, SPC, MES, RTD, …) and (2) execute on premise Advanced Analytics models capable to predict tool & product attribute behaviors leveraged by floor systems enabling manufacturing intelligence | Aggregated Data at the factory level (tool, sensor, manufacturing process step, operator, material & product) characterized by a low sampling rate and a long retention period | ➢ Data capture, transformation, aggregation & transmission to L4  
 ➢ Commonality Analysis  
 ➢ Predictive Models (process optimization on-the-fly)  
 ➢ Prescriptive Models (machine auto-correction)  
 ➢ Model optimization pushed to L2 | ➢ Test Time Reduction  
 ➢ Test Operation Skip |
| Designed to reduce Raw Data to an aggregated level sufficient to execute Fault Detection, Run-2-Run & Statistical Process Control models monitoring one (usually) or multiple (more rarely) manufacturing steps and their related tools | Aggregated Data at the tool, sensor & manufacturing process step levels characterized by a medium sampling rate and a medium retention period | ➢ Data capture, transformation, aggregation & transmission to L3  
 ➢ Fault Detection Models  
 ➢ Run-To-Run Models  
 ➢ SPC Models  
 ➢ Model optimization pushed to L1 | ➢ Fault Detection  
 ➢ Run-To-Run  
 ➢ SPC  
 ➢ Ongoing Reliability Test  
 ➢ Overall Equipment Effectiveness |
| Designed to (1) meet the latency & reliability demands of a high frequency time series data transmission from a tool or a sensor, (2) collect & (3) analyze its Raw Data in which an automated analytical computation (executing simplistic Fault Detection models) is performed at an appliance located close to the tool (instead of storing the data into a centralized data store & then computing) | Raw Data for one specific tool or sensor characterized by a high sampling rate and a short retention period Parametric data sampling rate can vary from 1kHz (1 thousand measurements per second or lower) to 1MHz (1 million measurements per second). | ➢ Data capture, transformation, aggregation & transmission to L2 and/or L3  
 ➢ Fault Detection Models  
 ➢ Run-To-Run Models  
 ➢ SPC Models  
 ➢ Homegrown Edge Computing Models (Spark, H2O, PMML, R) on single thread or aggregated / correlated threads across multiple sensor / machine parametric data messages  
 ➢ Simplistic SPC Edge Computing Models | ➢ Machine Auto Shutdown  
 ➢ Predictive Maintenance |
| Designed to build & deploy stream event flows enabling data acquisition, data analysis & actionable insights across all analytical layers | | | |

**Analytical Process Workflow**

**Execution Layer**

**Tool Edge Computing**

**Tool Aggregated Advanced Process Controls**

**Factory Aggregated**

**Cloud Analytics**

**Enterprise Aggregated**

**Advanced Process Controls**

**Stream Event Flow Platform**

** Analytics**
AI.1 :: Intelligent Analytics :: SEMI Use Case #3

Image Analytics :: Automated Defect Classification (AOI)
Video Analytics :: Automated Anomaly Detection

Benefits
- Yield Improvement
- Cost of Non-Quality Improvement
- Labor Productivity Improvement

AOI = Automated Optical Inspection
AI.2 Intelligent Robots

Robots capable of comprehending and responding to their environment through sensory perception and cognitive processing, analyzing data, making informed decisions, and collaborating with humans to achieve shared goals, and enhance productivity and innovation.
AI.2 :: Intelligent Robots :: SEMI Use Case #1

Intelligent Robot Transformation :: An Automated Material Handling Perspective

Material Delivery
- Automated Material Handling System
- Automated Guided Vehicle (AGV)
- Automated Mobile Robot (AMR)
- AMR Integration with COBOT

Task Execution
- Industrial Robot
- Collaborative Robot (COBOT)

Benefits
- Yield Improvement
- Cost of Non-Quality Improvement
- Labor Productivity Improvement

AI Introduction
Enabling Human – Robot Collaboration
AI.2 :: Intelligent Robots :: SEMI Use Case #2

Virtual Reality / Augmented Reality Technology

AR :: Remote Expert Conferencing

AR :: SOP

AR :: Overlay In Construction

VR :: Training

Benefits

Yield Improvement
Cost of Non-Quality Improvement
Labor Productivity Improvement

AR Overlay

SOP = Standard Operating Procedure
AI.2 :: Intelligent Robots :: SEMI Assembly Use Case #3

Futuristic Manufacturing Floor

- IoT Sensors for Supply Chain Management
- Modular Equipment
- Collaborative Robots (COBOTS)
- Computer Vision
- Integrated Mobile Robot
- Unmanned Trucks
- Wearables
- Industrial Augmented Reality
- Predictive Machine Analytics
- Intelligent Analytics
- Computer Vision
- Sensors
- High Speed Network (5G / Wi-Fi 6/7)
- Edge Compute
- Futuristic Manufacturing Floor
The Role of AI in Manufacturing
- Use Cases from the SEMI industry -

**AI.1**
- Automated Machine Adaptation
- Simulation
- Yield Prediction
- Decision Making

**AI.2**
- Machine Health
- Root Cause Analysis
- Commonality Analysis

**AI.3**
- Fast Data Platform
- Big Data Platform
- Edge Computing

**Intelligent Collaboration (Generative AI)**
Services capable of generating content based on user inputs and preferences with the purpose to provide users with new ideas and easier access to information, enabling faster iteration and complementing traditional AI.1 to enhance its capabilities

**MES**
- Manufacturing Execution System
- RMS = Recipe Management System
- SPC = Statistical Process Controls
- APC = Advanced Process Controls
- MCS = Material Control System
AI.3 :: Generative AI :: Capabilities

- Generate training materials
- Generate email responses
- Generate all sorts of content

Summarization
- Summarize documents
- Extract key information
- Categorize information

Semantic search
- Search over knowledge bases
- Execute knowledge mining
- Enable intelligent agents

Code generation
- Generate code from text
- Explain code in natural language
- Generate test code

Generative AI Application Landscape
AI.3 :: Generative AI :: Overall Use Cases

- Product Design and Optimization
- Automation of taking and publishing notes during meetings
- Scenario Exploration
- Textual Description Generation
- Visual Content Generation
- Content Personalization
- Creative Content Generation
AI.3 :: Generative AI :: Factory Use Cases

- **SOP Checklist Creation** – Convert written SOPs into simple checklists of required tasks.

- **Training Guide Creation** – Convert transcribed audio content or typed text into a suitable training guide for new personnel.

- **Troubleshooting Assistance** – Summarize maintenance records and produce a knowledge graph linking error messages, equipment issues, and required maintenance.

- **Equipment Guide Summarization** – Summarize equipment documentation for accelerated learning and troubleshooting processes.
AI.3 :: Generative AI :: IT Use Cases

**Prescriptive Monitoring**
Generative AI can analyze and find patterns to identify risk. Predictive AI focus on monitoring, while generative AI can suggest and implement fixes.

**Scenario-Based Troubleshooting**
Generative AI can be trained on past IT events, knowledge base and scenarios. This can be used during risk assessment to "simulate" scenarios.

**Explanation of Code**
This allows for support team to understand business logic embedded in the code simplifying troubleshooting.

**Code Generation**
AI-assisted software development which can include task ranging from simple code completion, to creating entire routines bases on user request.

**Bug Finding and Remediation**
Analyze human/AI generated code for bugs and propose fix.

**Test Case Generation**
Generate test cases for testing. When integrated with Test suite, it can execute test, report result and identify defects.
**AI.3 :: Generative AI :: Limitations & Concerns**

1. **Indifferent to truth**
   - Needs fine-tuning to work with internal knowledge-bases
   - Computationally expansive to train and fine-tune

2. **Data Loss**
   - Company content utilized with these services, may lead to **data-loss scenarios** where parties could access or retrieve the content outside of approved and intended use.
   - Services must be enterprise-managed services.
   - Classifications of content need approval per solution.
   - Data-loss prevention controls must be established.

3. **Output Quality**
   - These tools may produce **inaccurate, inconsistent, or irrelevant** content due to intrinsic limitations and/or limited training.
   - These tools can hallucinate and make **wrong statements** and **recommendations** (for instance, describe how to cook cow eggs).
   - Zero Trust and human-in-the-loop concepts are required forcing the validation of content and disabling the copy paste function.

4. **Legal Considerations**
   - Legal risks can vary greatly depending on the application. Concerns may include, but are not limited to, **third-party rights infringement, ownership concerns** for generated content, **loss of confidentiality, violation of privacy laws, potential negative impact on IP protections**.
   - Engagement must be application-specific.
   - Services must be enterprise-managed services.
   - Privacy, HR, Legal and patent policies and use cases must be reviewed.

5. **Ethical Considerations**
   - These tools may generate content that is **harmful, offensive, misleading, or biased** if they are not aligned with ethical principles or social norms.
   - These tools may also raise **moral dilemmas** about the authenticity and accountability of AI-generated content.
   - A company-wide awareness, education, and training campaign must be undertaken.

6. **End-User Trust**
   - Users will have **difficulty distinguishing between human-generated and AI-generated content**, which may affect their perception of the generated content.
   - A company-wide awareness, education, and training campaign must be undertaken.
AI.3 :: Moving Forward with Generative AI

- Larger Language Model
- Specialized Versions
- Integration with Analytical Model
- Integration with Physical Automation
- Synthetic Data Creation
- Generative Product Design for Chips/Materials/Drugs
By leveraging generative AI, the value of analytical data models can be enhanced by providing additional content, context, explanations, visualizations, and personalized outputs.

This combination of analytical models and generative AI-generated content can lead to more comprehensive and actionable insights for decision-making and problem-solving.
1. **Product Design Optimization**: Generative AI models can assist in product design by generating multiple design alternatives based on specified parameters and constraints. By leveraging intelligent analytics, analytical data models can evaluate and recommend the most efficient and cost-effective design options, considering factors like material usage, structural integrity, and manufacturing feasibility.

2. **Textual Description Generation**: Generative AI models excel at generating human-like text. They can be utilized to generate textual descriptions, summaries, or explanations of the analytical data models' outputs. This helps in providing context, insights, and explanations to decision-makers who may not have the technical expertise to interpret the analytical data model's results directly.

3. **Visual Content Generation**: In scenarios where the analytical data models deal with visual data, generative AI models can assist by generating complementary visual content. For example, in image analysis tasks, generative AI models can generate visualizations, heatmaps, or other visual representations to provide a better understanding of the model's predictions or highlight relevant features in the data.

4. **Content Personalization**: Generative AI models can generate personalized content based on individual preferences and characteristics derived from the analytical data models. For example, in marketing applications, generative AI can generate personalized product recommendations, customized offers, or tailored messages based on customer behavior patterns and historical data.
AI.3 :: Generative AI - supporting - AI.2 :: Intelligent Robots

Intelligent Robot Transformation :: An Automated Material Handling Perspective

Benefits
- Yield Improvement
- Cost of Non-Quality Improvement
- Labor Productivity Improvement

AI Introduction
Enabling Human – Robot Collaboration

Automated Material Handling System
Automated Guided Vehicle (AGV)
Automated Mobile Robot (AMR)
AMR Integration with COBOT
Intelligent Robot (Future)

Material Delivery
Task Execution

Industrial Robot
Collaborative Robot (COBOT)
An Integrated MES Platform Promoting AI

Automation Roadmap: 3.0
Digital Roadmap: 4.0
Artificial Intelligence: 5.0

Optimization
- Predictive Manufacturing
- Automated Machine Adaptation
- Simulation
- Yield Prediction
- Decision Making

Physical Automation
- Predictive Manufacturing
- Automated Machine Adaptation
- Simulation
- Yield Prediction
- Decision Making

Process Control
- Activity Manager
- Scheduling
- Fast Data Platform
- Machine Health
- Root Cause Analysis

System Automation
- Host Automation
- Dispatching
- Root Cause Analysis
- Commonality Analysis

Tracking & Monitoring
- Host Automation
- Scheduling
- Fast Data Platform
- Edge Computing

MES
- Activity Manager
- Scheduling
- Host Automation
- Fast Data Platform

Digital Roadmap
- Code Generation
- User Guide Generation

Artificial Intelligence
- Intelligent Analytics
- Intelligent Robots
- Intelligent Collaboration

MES = Manufacturing Execution System
RMS = Recipe Management System
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APC = Advanced Process Controls
MCS = Material Control System
An Integrated MES Platform Promoting AI

Source: Critical Manufacturing
On the factory floor, pauses can be disastrous. Henceforth, “Fast Data” is of the essence.

State-of-the-art flash-based storage platforms support lightning-quick data analytics.

The future of AI depends on data that moves at the speed of thought.

AI allows robots to work collaboratively with humans as well as to function independently – for AI to work, however, it needs “Fast Data”.

Industry 5.0 needs computers that can take in, sort, and analyze vast quantities of data in nanoseconds.

We applied deep neural nets to wafer images training an AI system of classification differentiating flakes, corrosion or scratches. An AI system keeps running, does not get tired, and does the analysis job in a fraction of second.

Our GDDR6X graphics memory is capable of feeding data to GPUs at extreme speeds.
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THANK YOU!

Didier Chavet

Sep 2023