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Manufacturing Execution System (MES) Training WorkBench

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A Manufacturing Execution System (MES)-sometimes referred to in specific contexts as a Machine Execution System-is an advanced software platform designed to manage, monitor, and control manufacturing operations at the shop-floor level. It serves as a critical integration layer between enterprise systems, such as ERP solutions, and operational technologies including PLCs, SCADA systems, sensors, and other automation equipment. By enabling seamless data exchange, real-time visibility, and end-to-end traceability, an MES ensures synchronized, efficient, and data-driven production processes.

The Scientech 2486 MES Training WorkBench is an Industry 4.0-oriented training solution developed to replicate the architecture and core functionalities of a modern smart manufacturing environment. Built on the principles of intelligent automation and real-time data analytics, the platform provides immersive, hands-on training aligned with current industrial standards. It effectively bridges machine-level control with enterprise-level decision-making, connecting academic learning to practical digital manufacturing applications.

The system consists of eight integrated stations, each representing a critical stage in a modular production process:

1. Feeding / Buffer Station - Manages material loading and workflow balancing between stations.
2. Filling Station 1 & 2- Performs primary and secondary controlled filling operations.
3. Inspection Station-Conducts quality verification using sensors or vision-based systems.
4. Lid Insert Station-Automatically places lids onto filled containers.
5. Lid Pressing Station-Secures and seals lids to ensure product integrity.
6. Tracking Station-Enables real-time product tracking through identification technologies such as RFID.
7. Warehouse Station-Simulates finished goods storage and inventory management within the MES environment.

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Key Features

- Designed to prepare students and trainees for modern industrial careers, the system delivers hands-on experience across electropneumatics, mechanical systems, electronic controls, automation, sensor technology, electrical drives, production engineering, and PLC & HMI programming.
- The platform includes eight integrated stations simulating a complete modular production workflow: Feeding/Buffer Station, Filling Station 1, Filling Station 2, Inspection Station, Lid Insert Station, Lid Pressing Station, Tracking Station, and Warehouse Station. Each station provides practical exposure to specific manufacturing processes.
- Built with industrial-quality components-PLCs, HMIs, cloud-based SCADA, VFDs, AI-enabled vision systems, pneumatic modules, sensors, and actuators-the system replicates real-world factory conditions to ensure learners gain authentic, industry-aligned training.
- Supports Overall Equipment Effectiveness (OEE) monitoring, downtime analysis, and productivity tracking. Centralized MES operations include production scheduling, resource allocation, work order management, traceability, and quality control, providing students with exposure to real-world manufacturing execution processes.
- Equipped with a 7” touchscreen HMI for intuitive process visualization and interaction, along with programming cables and HMI software for designing screens, configuring parameters, and learning advanced interface management.
- Secure cloud-connected SCADA enables real-time remote monitoring, control, and data logging. Features include graphical dashboards, alarms, alerts, and web-based SCADA interfaces for process optimization and integration with PLC data.
- Integrated vision system with AI capabilities for object detection, quality inspection, and classification, providing real-time feedback to PLCs for automated sorting and decision-making.
- RFID modules allow real-time tracking, part genealogy, and traceability, supporting Industry 4.0 compliance and enhancing production monitoring capabilities.
- Built-in tools measure and display availability, performance, and quality metrics, helping learners identify inefficiencies and optimize production processes.
- Enables remote monitoring and control via smartphones and tablets, supporting IIoT integration and flexible smart factory demonstrations.
- The workbench features castor wheels with locking mechanisms for mobility, a heavy-duty M.S. epoxy-coated frame for durability, and integrated AC supply with MCB and RCCB for safe operation in training environments.
- Provides a visual representation of the MES workflow and architecture, clearly illustrating system connectivity, data flow, and integration between shop-floor equipment and enterprise-level systems to enhance conceptual understanding.

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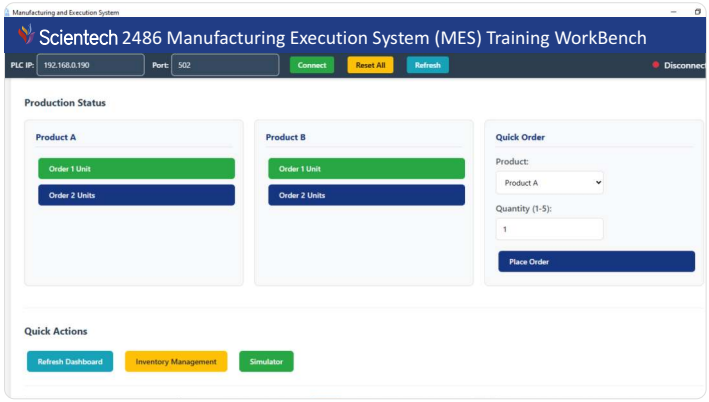
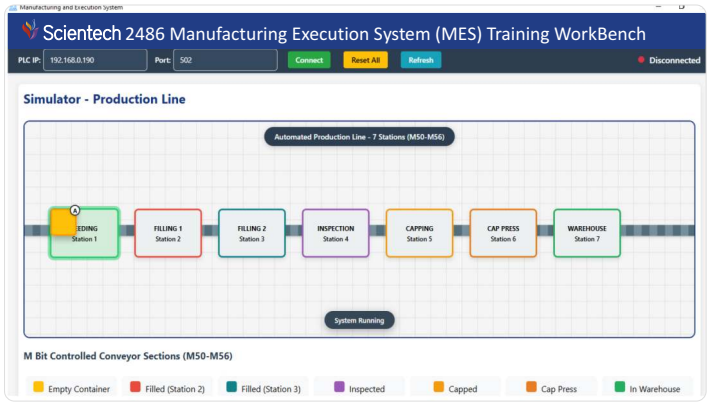
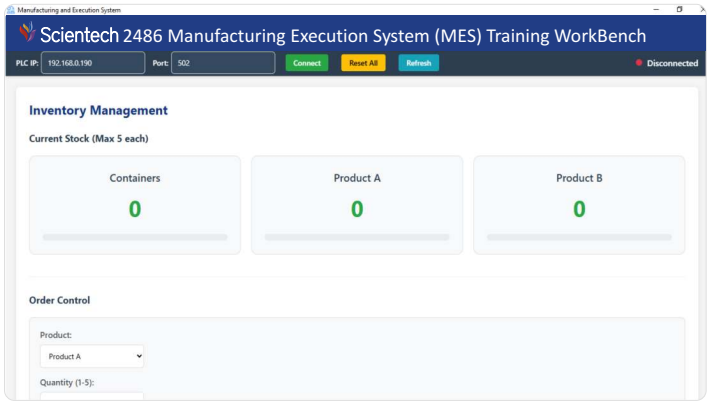
Learning outcomes

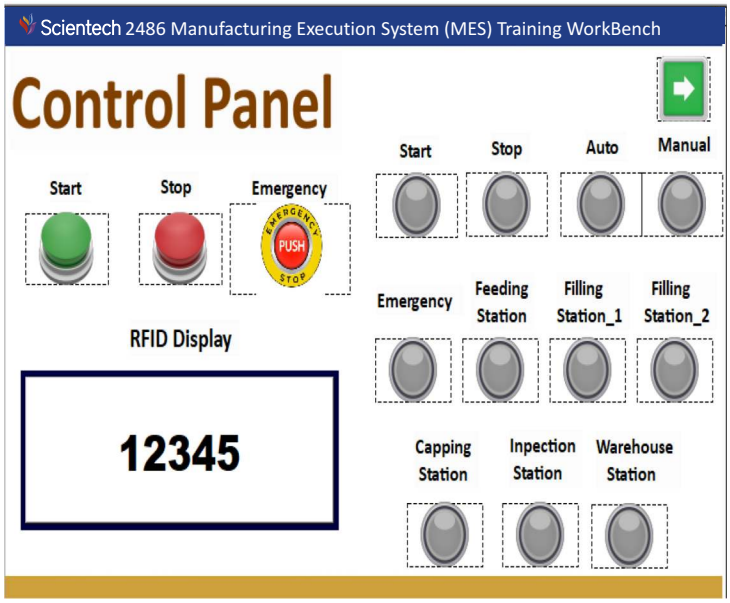
- Explain the architecture and role of MES.
- Differentiate between ERP, MES, SCADA, and PLC systems. Industrial Automation Fundamentals.
- Understanding PLC, HMI, and SCADA systems.
- Industrial communication protocols PLC Programming and Simulation.
- PLC hardware configuration.
- Ladder logic programming.
- Input/Output mapping.
- Real-time PLC simulation HMI Development and Operation.
- Screen design and navigation.
- Alarm configuration.
- Data logging and visualization.
- Operator interface best practices SCADA and Cloud Monitoring.
- Supervisory control concepts.
- Real-time data acquisition.
- Dashboard development.
- Alarm management.
- Remote monitoring using Cloud SCADA MES Integration and Production Monitoring.
- MES architecture and workflow.
- Production order execution.
- OEE monitoring.
- Lot and serial number tracking.
- Quality inspection management Data Collection and Reporting.
- Real-time machine data capture.
- Production and downtime analysis.
- Compliance report generation.
- ERP integration basics Practical Implementation and Troubleshooting.
- System configuration exercises.
- Simulation-based learning.
- Industrial case studies.
- Basic fault diagnosis and resolution.

MES Software









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Technical Specifications

Control Panel :1 no.

PLC : 1 no.

- Digital inputs :24 nos.
- Digital outputs :20 nos.
- Communication: Ethernet ,RS485

Human Machine Interface (HMI)

- Supply : 24VDC
- Display :10.1”(1024*600) 65536 Colors TFT
- Processor :Cortex-A8 800MHz CPU
- RAM :512 MB
- ROM :256 MB
- Communication Port :Ethernet , 2 sets of COM ports / 1 extension COM port
- USB :Host and Client
- Supports :SD card

Switch Gear module

- Pushbutton NO :2 nos.
- Pushbutton NC :1no.
- Selector Switch : 1 no.
- Emergency Stop : 1 no.

Variable Frequency Drive : 1 no.

- Input : 230VAC
- Output Frequency : 0 to 599Hz
- Communication : RS485

AC Motor : 1 no.

- Type :Synchronous Gear Motor
- Operating Voltage :220V AC
- RPM : 110

IIOT Gateway : 1 No.

- I/O ports
- USB host : USB 2.0 × 1
- Serial port: RS232/RS485
- Ethernet : 3 ports
- Wi-Fi module: Yes
- Software Real-time data monitoring:600 (points)
- Alarm data monitoring : 300 (points)
- History data monitoring : 100 (points)
- History data monitoring : 180 days
- Normal pass-through : Yes
- HTTP interface : Yes
- Remote update : Yes
- Configuration backup : Yes
- Off-line transmission : Yes

Photo Electric Sensor : 8 Nos.

- Type: Diffuse Reflective (Photoelectric) Sensor.
- Design: Cylindrical M12 housing.
- Output: PNP - Normally Open (NO) / NO+NC.
- Sensing Range : 10mm

Feeding / Buffer Magazine : 1 no.

- Number of Container : 5 nos.
- Pneumatic Cylinder : 1 no.
- Electro Pneumatic Solenoid Valve : 1 no.

Filling Magazine 1 : 1 no.

- Number of Material : 5 nos.
- Pneumatic Cylinder : 1 no.
- Electro Pneumatic Solenoid Valve : 1 no.

Filling Magazine 2 : 1 no.

- Number of Material : 5 nos.
- Pneumatic Cylinder : 1 no.
- Electro Pneumatic Solenoid Valve : 1 no.

Inspection Camera : 1 no.

- Resolution : FHD
- Communication : USB Cap (Lid) Inserting Magazine : 1 no.
- Number of Lids: 5 nos.
- Pneumatic Cylinder : 1 no.
- Electro Pneumatic Solenoid Valve : 1 no.

Cap (Lid)Pressing Station : 1 no.

- Pneumatic Cylinder : 1 no.
- Electro Pneumatic Solenoid Valve : 1 no.

Tracking Station : 1 no.

RFID read/write device: 1 no.

- Operating frequency 13.56 MHz
- function display : Dual-LED
- Connection :(M12 x 1) plug connection
- Degree of protection :IP67
- Interface :integrated RS-485
- Protocol :ASCII

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RFID Transponder : 5 Nos.

- Operating frequency: 13.56 MHz
- Fixcode:64 bit
- Memory :896 bits available
- Degree of protection: IP68

Warehouse Station : 1 no.

- Electro Pneumatic Solenoid Valve :3 no.
- Pneumatic Pick and Place Arm with Suction Cup : 1 no.

DC Power Supply : 1 no.

- Input Type: 1-Phase / Single Phase
- Output Power: 120 W
- Input Voltage: 90 VAC to 264 VAC
- Output Voltage: 24 VDC
- Output Current: 5 A

Filling Magazine 1 : 1 no.

- Number of Material : 5 nos.
- Pneumatic Cylinder : 1 no.
- Electro Pneumatic Solenoid Valve : 1 no.

Filling Magazine 2 : 1 no.

- Number of Material : 5 nos.
- Pneumatic Cylinder : 1 no.
- Electro Pneumatic Solenoid Valve : 1 no.

Inspection Camera : 1 no.

- Resolution : FHD
- Communication : USB Cap (Lid) Inserting Magazine : 1 no.
- Number of Lids: 5 nos.
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Wireless Keyboard and Mouse : 1 no.

Industrial Tower Light : 1 No.

- Operating Voltage :DC 24V
- No. of LED Light Source :3 (Red ,Green, Yellow)
- Buzzer : yes

Air Compressor : 1 no.

- Voltage / Frequency: 220V/ 50HZ
- Power: 1HP / 0.75 KW
- Tank Capacity: 9 L
- Pressure: 8 BAR / 115 PSI
- Flow: 106 L/MIN
- Speed: 1400 RPM

MCB : 1no.

- Supply : 230V AC
- Current : 16Ampere

RCCB : 1 no.

- Rated Current (In): 25A
- Poles: 2P
- Rated Voltage (Ue): 230V (2P)
- Rated Frequency: 50/60Hz
- Residual Operating Current (IΔn): 30mA,

Power Indicator :1 no.

- Castor Wheel : 4 nos. (2 with lock & 2 without lock)
- Size : 75mm

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PC: 1 no.

- CPU : AMD Ryzen 3 4300U (4C / 4T, 2.7 – 3.7 GHz, 15W)
- Graphics : AMD Radeon Graphics (up to 1400 MHz)
- Memory : Dual-channel DDR4-3200 SO-DIMM, up to 32 GB (8GB DDR4 3200MHz installed)
- Storage : Dual M.2 slots: M.2 2280 NVMe / SATA (up to 4 TB) + M.2 2242 NVMe / SATA (up to 2 TB) - (128GB M.2 2280 included)
- WIFI : Wi-Fi 6 (RTL9851)
- Bluetooth: BT 5.3
- Ethernet: 1 × RJ45 (Realtek, 2.5 Gbps)
- I/O: 3 × USB 3.2 Gen2 (10 Gbps), 1 × USB 2.0, USB-C with Display Port + data + PD charging support, 2 × HDMI 2.0 (4K @ 60 Hz) + USB-C DP., 3.5 mm combo audio jack (CTIA standard)
- OS: Windows 11 Pro (pre-installed).
- Power Adapter : DC 12 V / 3 A

Subject to Change

Designed and Manufactured in India by -

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