insight to !nspiration

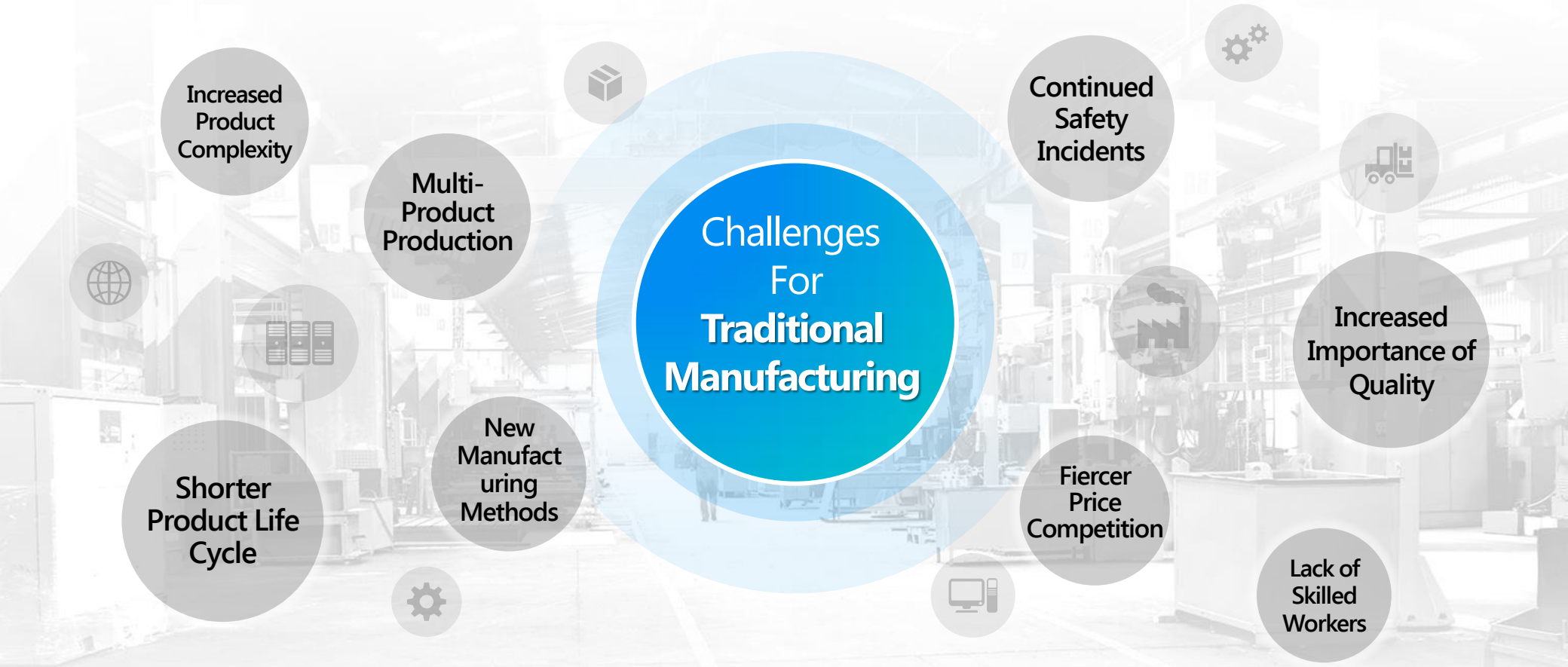
Samsung SDS

Nexplant MES

Solution Overview

SAMSUNG SDS SAMSUNG

With the traditional manufacturing methods reaching their technological tipping point[1], manufacturers can maintain their competitiveness only through process innovation.



[1]Technology Tipping Point: A point in time when disruptive technologies emerge to drive transformational changes such as a shift from a typewriter to a word processor or from a 2G mobile phone to a smart phone.

Smart Factory is the key to efficient resource operation and successful manufacturing

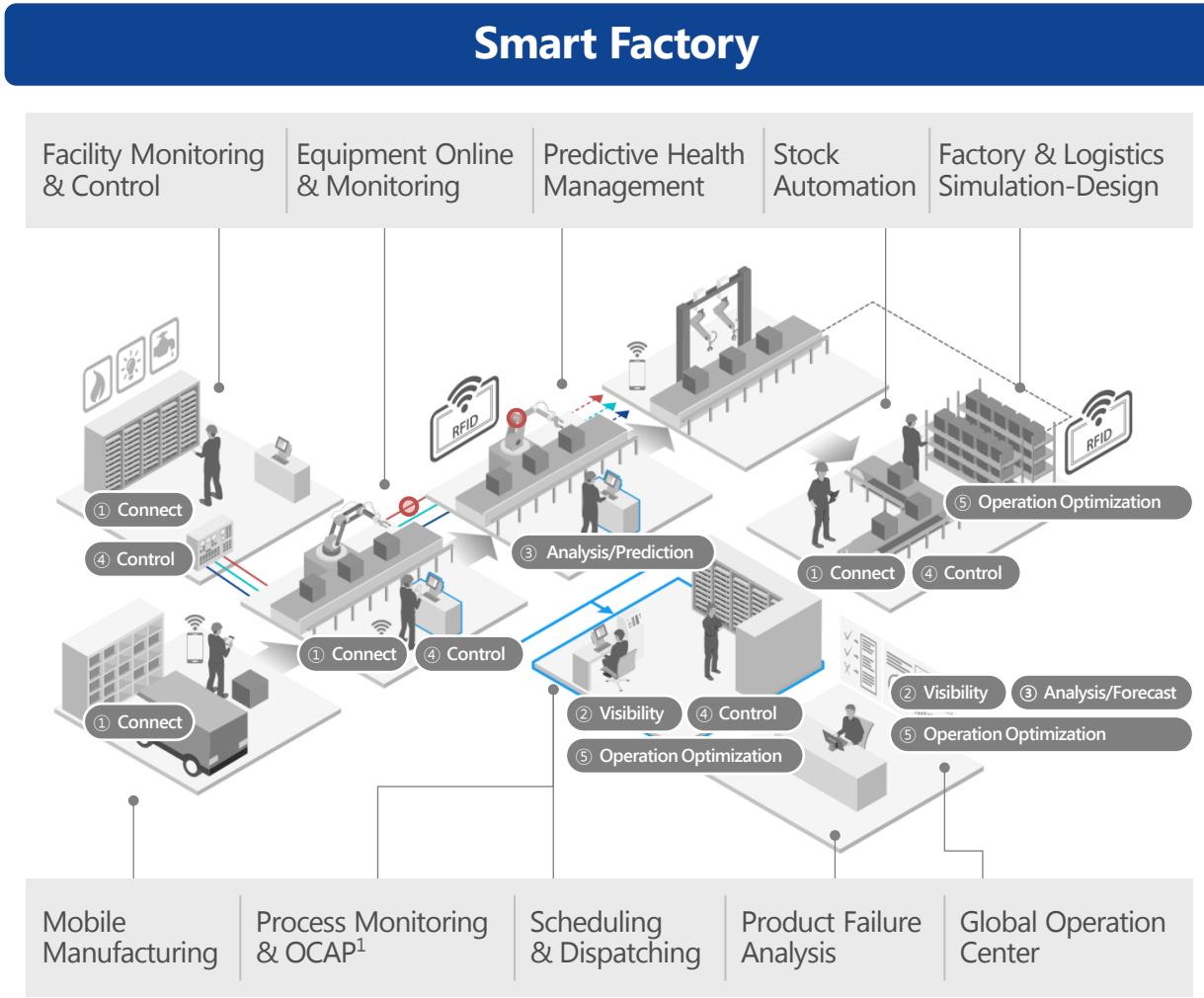
What is Smart Factory?

A manufacturing system where errors are minimized and all resources operate efficiently.

Elements of **Smart Factory**

① **Equipment Connectivity**
② **Production Visibility**
③ **Analysis/Prediction**(early detection)
④ **Equipment Control**
⑤ **Operational Optimization**

[1]OCAP : Out of Control Action Plan



Start manufacturing smart

with **Samsung SDS Nexplant MES solutions.**

AGENDA

I. **Nexplant MES** – Overview

II. **Nexplant MES** – Solution Line-up

III. **Nexplant MES** – Use Cases

I

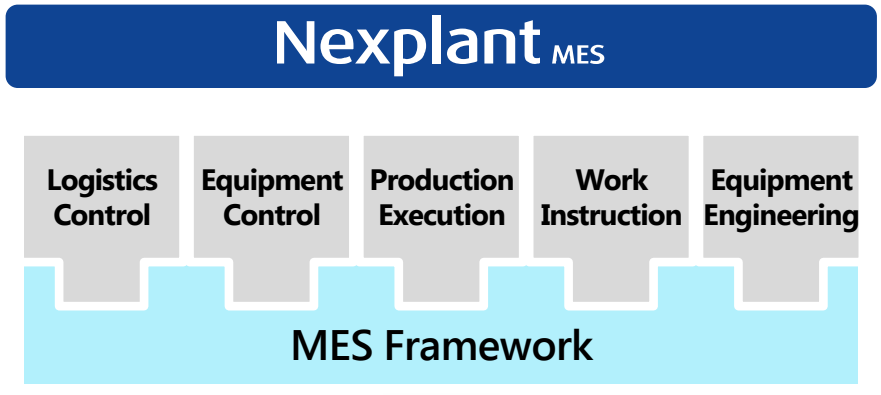
Nexplant MES – Overview

Samsung SDS Nexplant MES is

A manufacturing data management and control solution that optimizes your entire manufacturing process, improves productivity by reducing lead time, and ensures stable production by providing reliable data.

Requirements for Smart Manufacturing Environment

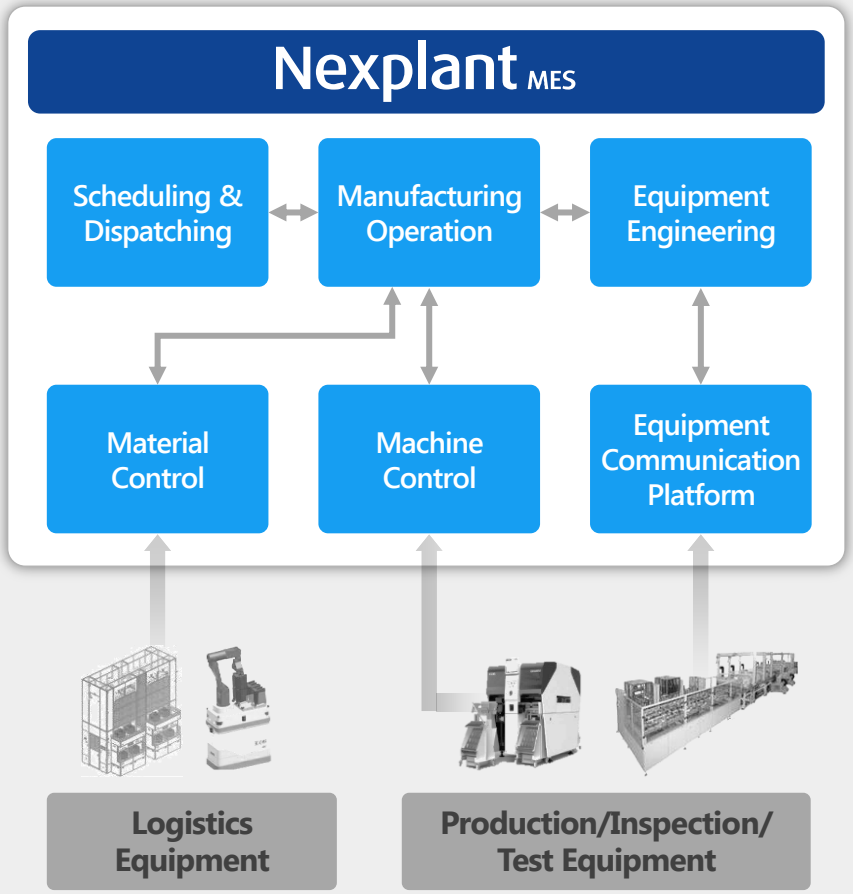
- ☑ Flexible system to swiftly respond to uncertainties and changes
- ☑ Fast implementation of complex business logics
- ☑ Large volume data processing
- ☑ Continuous operation without downtime
- ☑ Error prevention rather than post-error handling
- ☑ Maintenance cost reduction



Nexplant MES

Brings flexibility and expandability, ensures high performance and stability, and provides real-time visibility using a standard framework optimized for manufacturing in order to transform your plant into a smart factory.

Nexplant MES Solution Line-up



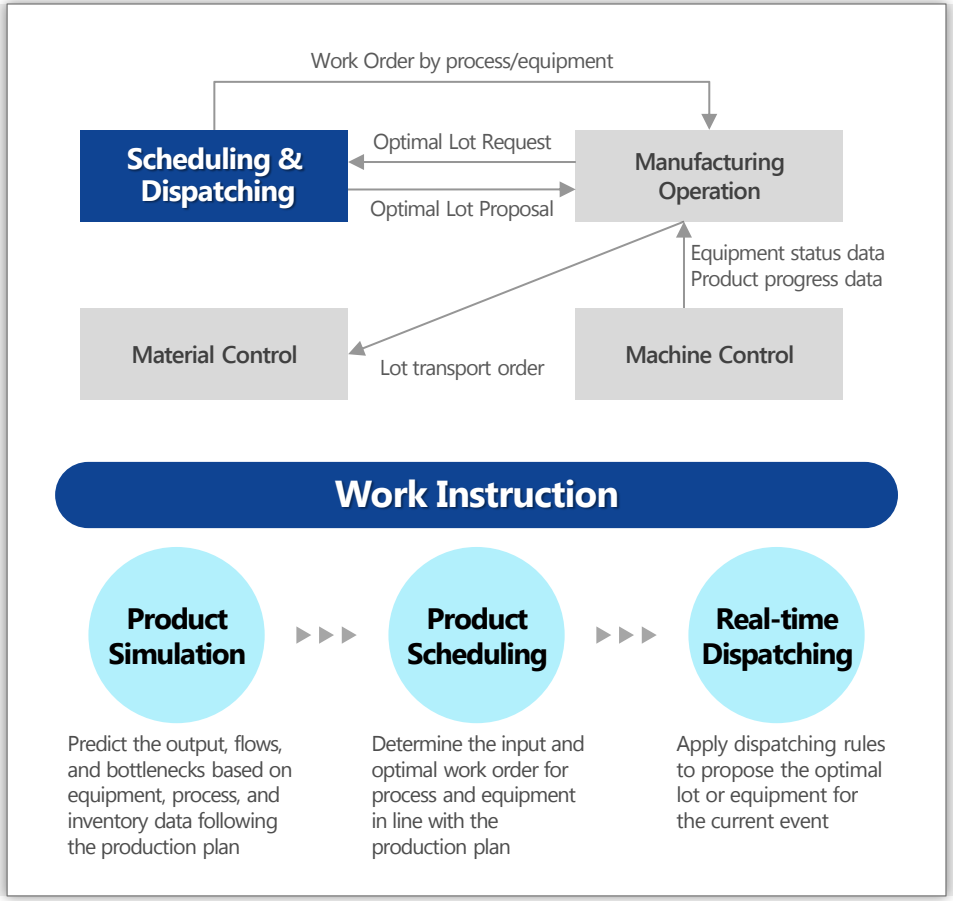
- **Nexplant MES Scheduling & Dispatching**
  Establishes production plans by line, determines work priorities in real time and executes work instructions
- **Nexplant MES Manufacturing Operation**
  Enables integrated management of manufacturing processes and resources
- **Nexplant MES Equipment Engineering**
  Collects, processes and analyzes data from sensors, events, logs, and alarms
- **Nexplant MES Material Control**
  Controls factory logistics for smart material flows
- **Nexplant MES Machine Control**
  Implements and controls interfaces between equipment and systems for execution and equipment engineering based on standard protocols
- **Nexplant MES Equipment Communication Platform**
  Enables intelligent management of equipment for high-speed data collection, and real-time analysis and prediction by connecting directly to core equipment

Ⅱ

Nexplant MES – Solution Line-up

Nexplant MES – Scheduling & Dispatching

Use resources efficiently by **simulating, scheduling,** and **dispatching** plans and instructions



Feature

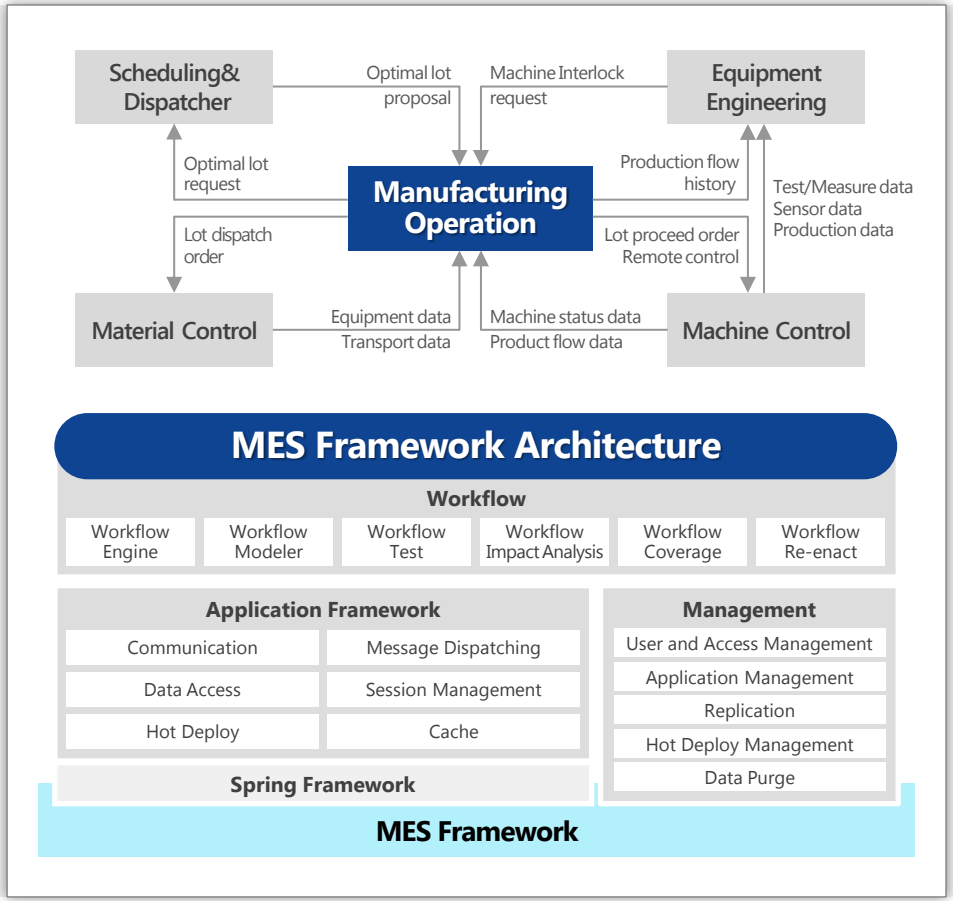
- Establish and execute optimal work order rules by considering various inputs, goals, limits and priorities simultaneously
- Establish plans through reproduction function and trace work instruction progresses and results

Benefit

- Improved productivity by predicting materials and work load by work, shift, and time and taking preemptive measures to prevent bottlenecks
- Efficient use of expensive equipment by allocating products to the correct equipment based on real-time operational status and work priorities
- Automated dispatching system with optimal work allocation and material logistics instructions based on real-time equipment events

Nexplant MES – Manufacturing Operation

Manage production processes and resources to enable efficient factory operation and automate manufacturing activities from product input to shipping by capturing real time plant floor data



Feature

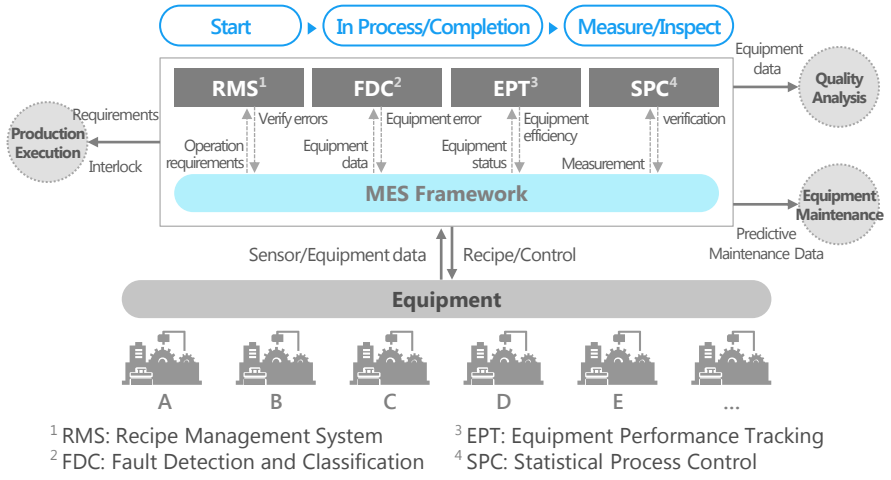
- Provide a correct framework optimized for factory automation applications
- Incorporate business logic without interrupting workflow
- Analyze production operation logic based on workflow, enabling fast response to change requests, and minimize errors

Benefit

- Improved quality through systematic production management
- Automated real-time data collection and statistical process management
- Efficient workforce utilization through system-based production management and data collection
- Real-time WIP products monitoring by equipment
- Precise identification of the root cause of loss for swift responses
- Improved visibility that enables coherent management for workers, managers and executives

Nexplant MES – Equipment Engineering

Improve equipment efficiency and product quality by capturing, processing, and analyzing a wide range of data such as sensor data, events, logs, and alarms generated during manufacturing.



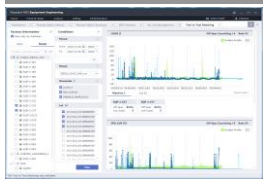
[1] RMS: Recipe Management System
[2] FDC: Fault Detection and Classification
[3] EPT: Equipment Performance Tracking
[4] SPC: Statistical Process Control

Equipment Engineering

Dashboard

Operation Status

Sensor Data Analysis



Feature

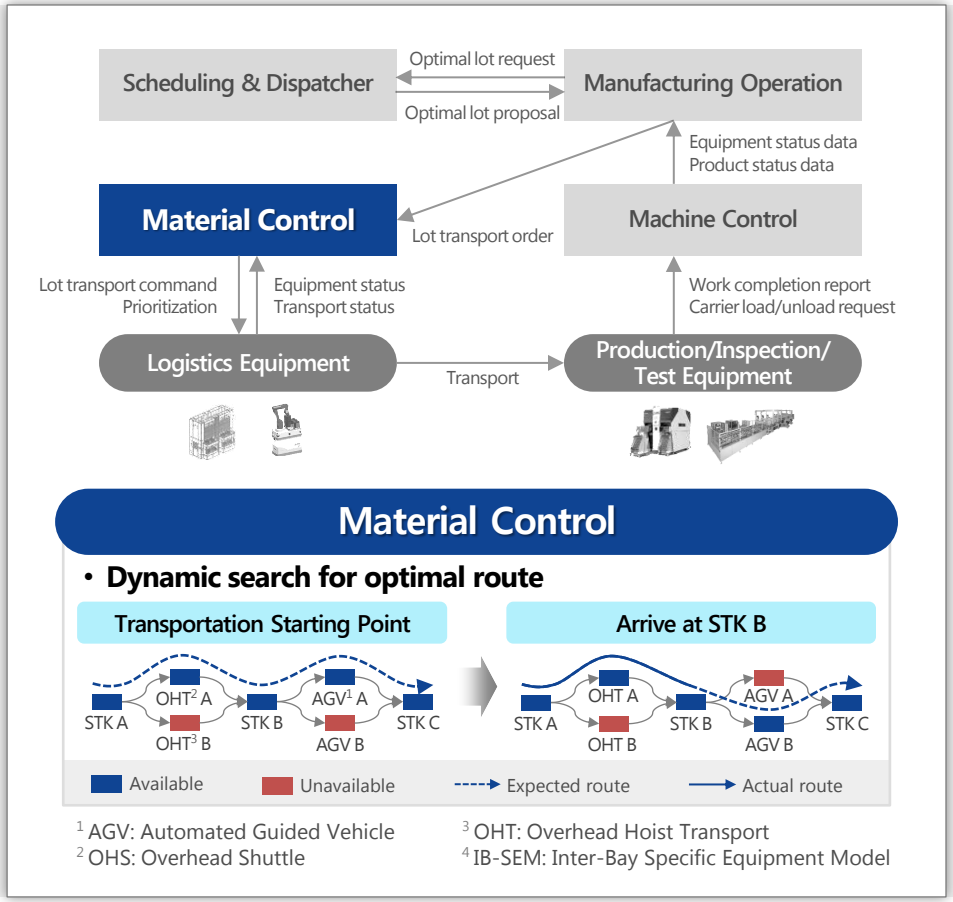
- **RMS**: prevent operational incidents by managing and controlling standard equipment recipes
- **FDC**: monitor sensor data, detect abnormalities and control feedback in real time
- **EPT**: Improve efficiency by analyzing equipment status and performance metrics and the root cause of loss
- **SPC**: Detect abnormalities early through statistical analysis of process and measurement data

Benefit

- Improved equipment efficiency and management capabilities with the optimal amount of investment
- Fewer operational incidents through real-time monitoring and abnormality detection
- Improved product quality by micro-managing equipment data
- Automate repetitive operational work and resolve equipment issues based on analytics

Nexplant MES – Material Control

Automate logistics on the shop floor through the management of carriers and transport orders for material handling equipment. Maximize production efficiency by optimizing carrier's transport time.



Feature

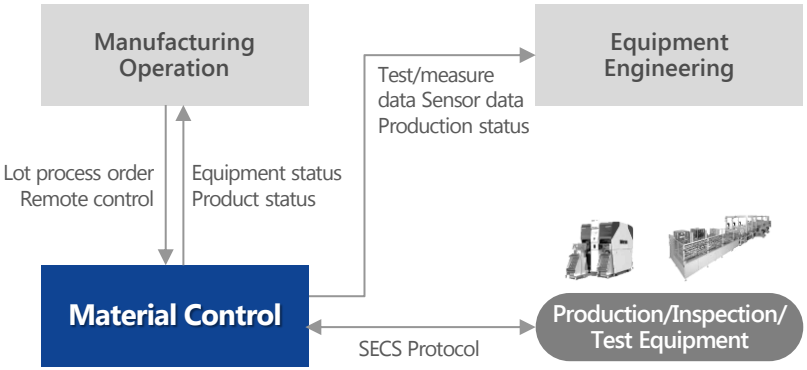
- Complies with standard logistics control protocols IB-SEM4/ Stocker-SEM
- Identifies optimal transport routes
- Monitors material transportation in real time and control unexpected situations
- Supports algorithm to optimize dynamic route searches
- Improve performance DS semiconductor Mega FAB
- Visualize business logic change based on workflow

Benefit

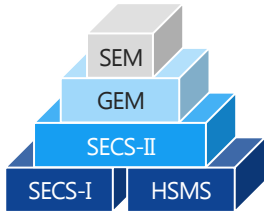
- Improved system stability through distributed server deployment
- Minimum downtime with Hot Deploy and Auto Failover
- High-speed distributed data processing through multi-processes and multi-thread

Nexplant MES – Machine Control

Build and control interfaces among equipment, production execution and equipment engineering systems for factory automation which enables automated equipment data collection and remote equipment control based on standard protocols



Machine Control



I SECS Protocol I

- **SEM(Specific Equipment Model)[1]:** SECS-II standards for specific equipment
- **GEM(Generic Equipment Model)[2]:** SECS-II standards for generic equipment
- **SECS-II[3]:** Message communication protocol that defines the format and content of messages sent over SECS-I or HSMS
- **SECS-I/HSMS:** communication protocols

[1]HSMS: High Speed Message Service
[2]SEMI: Semiconductor Equipment and Materials Institute, Inc,
[3]SECS: Semiconductor Equipment Communication Standard

Feature

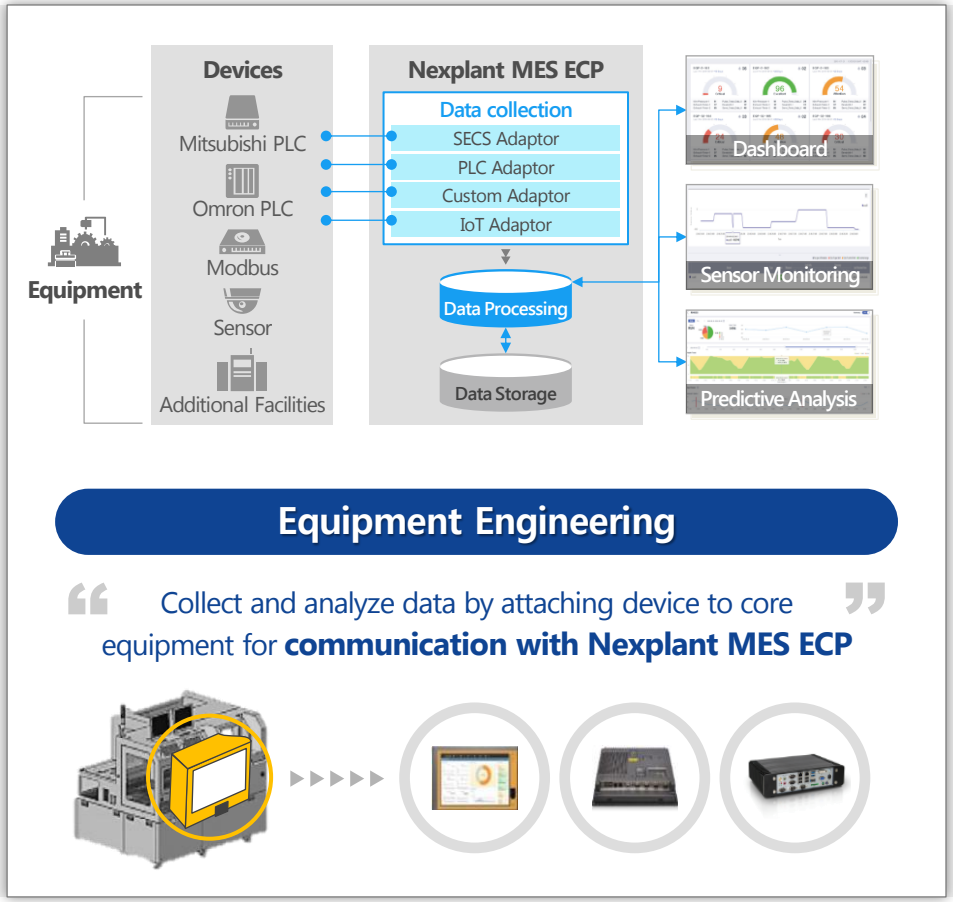
- Complies with the SEMI standards
- Secures flexibility and visualizes business logic based on workflow
- Upgrades system functions and modifies business logic without interruption of work
- Monitor and Auto Failover for continuous operation

Benefit

- Compliance with the SECS/GEM standards
- Customized optimization based on workflow-oriented business logic changes
- High-speed distributed data processing through multi-processing and multi-threading (Process over 100 event/sec per equipment)
- Improved responsiveness for various equipment operational scenarios

Nexplant MES – Equipment Communication Platform

Connect to core equipment directly for high-speed data collection and real-time predictive analysis through intelligent equipment engineering



Feature

- Provides a wide range of industrial protocols for manufacturing equipment and high connectivity for IoT devices
- Supports stable data collection and standard API for duplex services
- Improves equipment error detection and management capability
- Monitors equipment health in real time and predict the optimal predictive maintenance time
- Creates equipment modeling data and support higher MES interface for factory automation
- Supports edge computing and analysis for real-time optimization

Benefit

- Better plant environment by building equipment communication infrastructure without large investment
- Increased work efficiency with intuitive equipment monitoring and management
- Capable of implementing preemptive and automated equipment assessment system
- Reduced implementation costs by adopting the package tailored to meet the client's requirements

III

Nexplant MES – Use Cases

Use Case 1.

Upgrade the module lines of a semiconductor fabrication plant

Challenge

- Poor data connection between FAB and modules
- Lack of standards for excessive WIP products and stocks
- Obstacles to advanced full-automation
  - Non-unified, distributed workflows
  - Unclear definition for abnormal WIP status

Solution

- Standardized in-plant logistics
- Established base data system for production execution
- Tracked raw materials in real time by connecting with panels
- Adopted standard workflows for advancement
  - Optimized entire process and defined abnormality clearly through unified workflow control

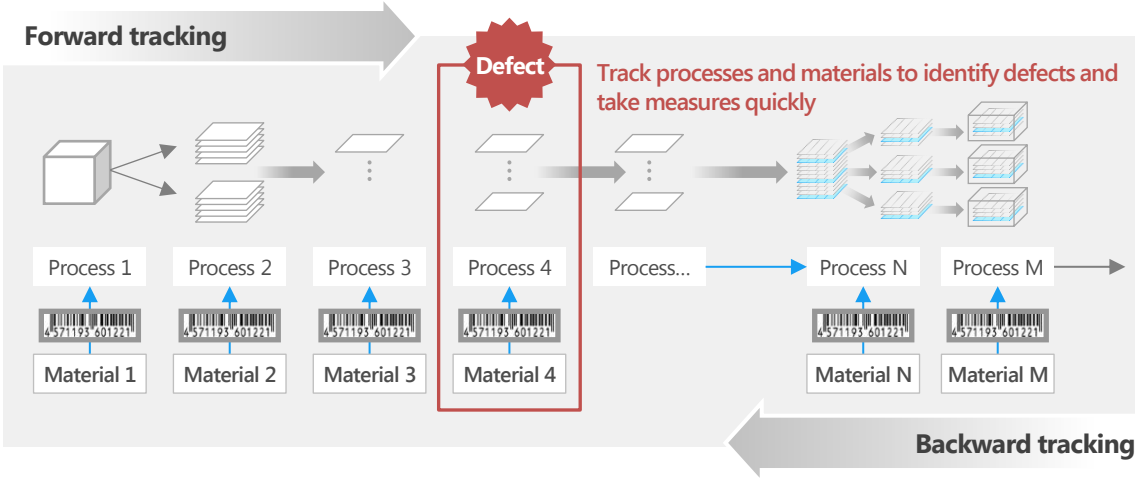
Benefit

Quantitative

- Work order compliance(0% → 95%), Full Automation(0% → 70%)
- Minimization of loss during replacement (item, panel, raw material) (8H → 5H)
- Reduced lead time from performance/quality analysis to taking measures (200min. → 20min.)

Qualitative

- Establish the foundation for data automation by gathering real time raw material usage data and production history
- Establish a real-time quality control system for in-line product assembly and finished goods



Use Case 2.

Implement an automation system for in-plant logistics

Challenge

- Change from manual in-plant material transportation to standardized and automate production line
- Need logistics automation facility and system
- Poor quality control leading to high defect rate

Solution

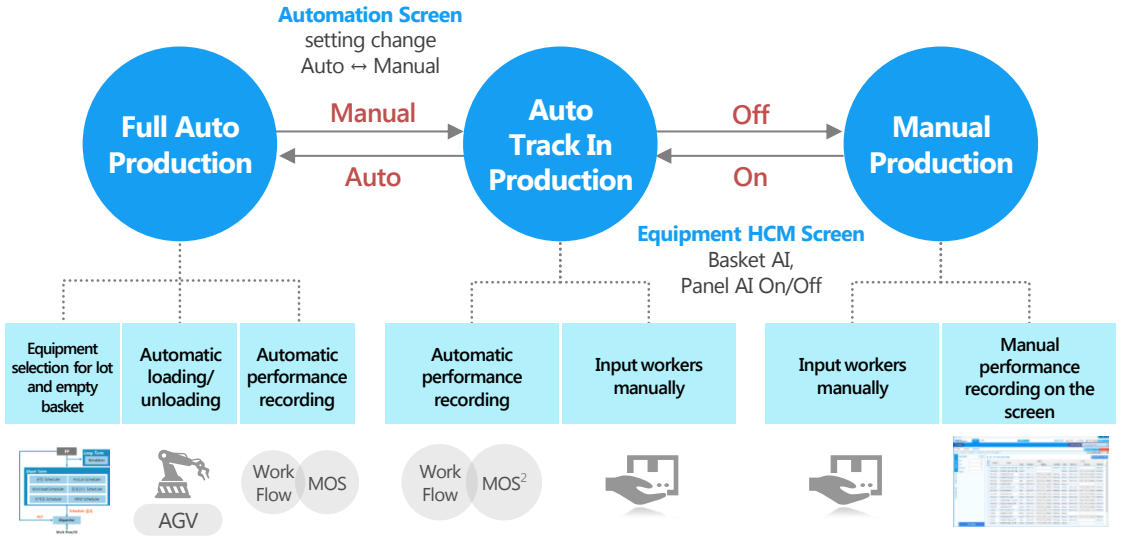
- Provided logistics hardware for storage and transport automation
- Implemented logistics control system
- Implemented transport management system for workflow automation

[1]AGV: Automated Guided Vehicle

[2]MOS: Manufacturing Operation System

Benefit

- Automatic input using conveyors from AGV[1]/worker basket load/unload to circuit preprocessing equipment
- Circuit processing within clean room (AGV)
- AGV transport system from preprocessing to drying using automated warehouse
- Automatic loading and unloading with shuttle car



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