

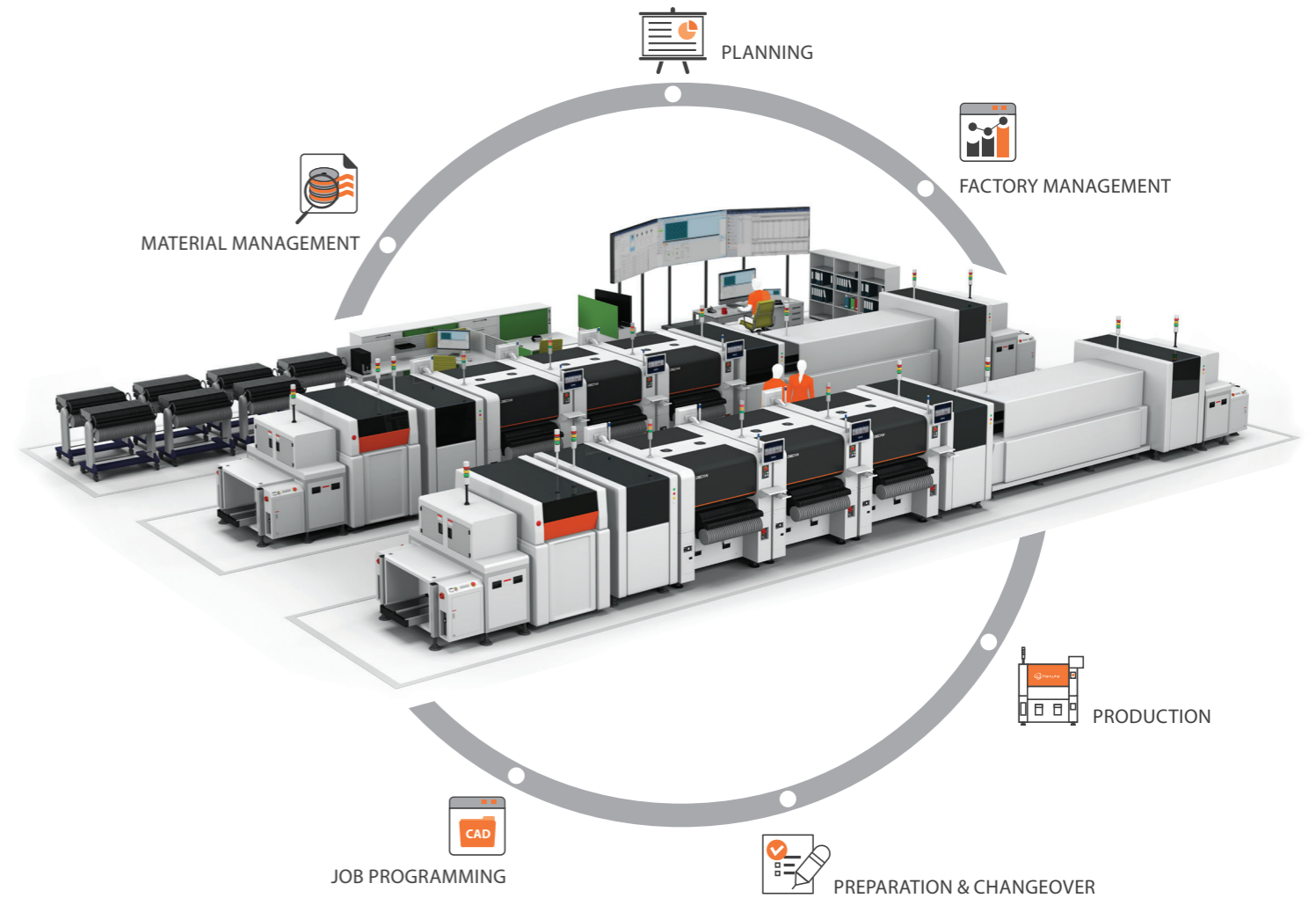
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T-SOLUTION

Hanwha Smart Factory Solution



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T-SOLUTION

Hanwha Smart Factory Solutions

As a software solution that represents the Smart Factory of Hanwha Precision Machinery Co., Ltd., **T-SOLUTION** helps its customers improve production efficiency and quality at lesser cost by realizing high efficiency, high quality, and low cost. It can provide its customers with the best value by supporting software that can realize optimum productivity regardless of the capability of a worker.



Based on its technologies and know-how accumulated over 30 years in the field of SMT, Hanwha provides various software solutions that can intellectualize and automatize all production processes systematically, from material warehousing to production planning and preparation, maintenance, as well as factory management functions interlocked with upstream MES.

FACTORY UNIT

PLANNING

- Possible to be Interlocked with Upstream System (MES)
- Production Planning
- Multi JOB Creation
- Production Simulation
- Reel Barcode Issue and Registration
- Warning function for Remaining Component Management and Component Exhaustion

MATERIAL MANAGEMENT

- Reel Barcode Issue and Registration
- Maintaining Optimum Screen Printer Quality
- Warning function for Remaining Component Management and Component Exhaustion
- Remote Request and Release of Components in Shortage
- Support to Component Storage and Component Warehousing and Release

FACTORY MANAGEMENT

- Production Index History Analysis and Reporting
- Remote Monitoring
- Traceability
- Data Sharing between Inline Machines
- Possible to be Interlocked with Upstream System (MES)
- Integrated Maintenance Management System

LINE UNIT

JOB PROGRAMMING

- New JOB File Creation
- Offline Component Registration Device
- Optimizing the PCB program
- Production Planning
- Multi JOB Creation
- Integrated JOB File Management

PREPARATION & CHANGEOVER

- JOB Order Output
- Support to Component Storage and Component Warehousing and Release
- Offline Feeder Setting
- Mobile Alarm
- Feeder Searching and Finding
- Feeder Maintenance Support
- Support to Automatic Model Change
- Assigning to JOB File Line

PRODUCTION

- Material Verification during Production
- Warning function for Remaining Component Management and Component Exhaustion
- Mobile Alarm
- Check and Remote Request for Component in Shortage
- Remote Monitoring
- Program Modification and Reflection during Production
- Data Sharing between Inline Machines



PLANNING



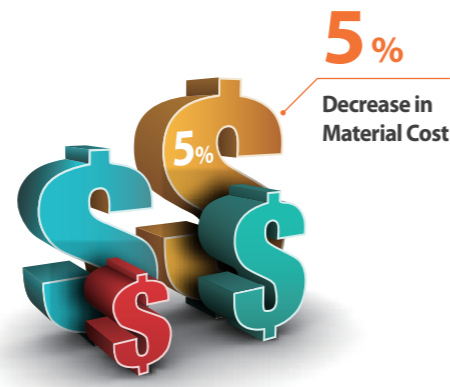
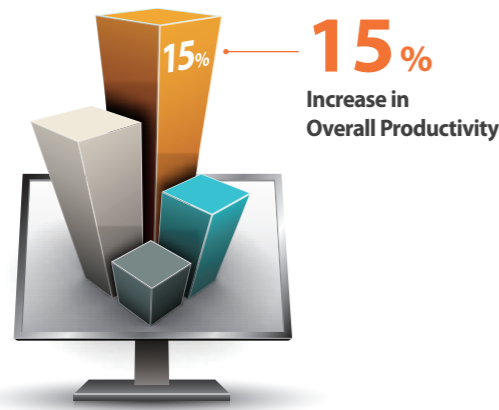
Production planning can be the first step for the systematic management of the entire processes, not the production in the unit of line or machine. Using Hanwha's Planning Solution will allow easier and more efficient production planning.

The Planning Solution can establish optimized production planning taking into consideration the target quantity and delivery provided by upstream systems (MES, ERP, SCM), helping a user establish

efficient production planning by predicting the time through stocked component quantity management and simulation necessary for production planning.



CUSTOMER BENEFITS



- Establishes an optimum production plan based on the information on orders
- Finds the BOM error of the production program early through MES interlocking
- Sets efficient production order taking into consideration the priority and model changing time
- Establishes a production plan of high effectiveness by predicting production quantity per day and week.
- Increases operation time by minimizing the model changing time
- Ensures correct prediction of production finishing time by performing simulation
- Can check the inventory of components necessary for the achievement of target production quantity and obtain them easily
- Possible to perform integrated Part DB management in the factory and verification of production in advance

PROCESS SCENARIO

- Importing order data from the upstream MES system
- Checking for the quantity of necessary materials in stock
- Assigns a job to each line and determines optimum production order by considering the delivery and production quantity
- Reduces model changing time by grouping similar jobs for common feeder arrangement
- Verifies production schedules in advance by performing production simulation

Possible to be Interlocked with Upstream System (MES)

T-SMART Link
T-PNP

Allows efficient line operation by interlocking the production status and history with a customer's system.

Allows stable data communication between a customer's system (ERP, SCM, MES, etc.) and SMT inline machines to make it possible to interlock with the production data of a line without changing over to a separate solution in the customer's workflow system.

- Production Data (Production Result, JOB Information, etc.)
- Event Data
- Interlocking Data
- Component Management Data (Reel Data, Mis-insertion Check)

Production Planning

T-OLP

Establishes an optimum production plan for multiple production lines and models.

Establishes an optimized production plan suitable to the factory environment by considering the total component quantity, shift, break time as well as feeder / nozzle / backup pin replacing time, and optimizes the JOB file order for fastest production through this.

Multi JOB Creation

T-OLP

Connects several production models to one multi Job for programming.

Performs programming of the feeder arrangement / component arrangement / optimum production group / optimum placement order for a similar production model and, through this, reduces production line stops due to job change.

Production Simulation

T-OLP

Verifies the production schedule in advance by performing production simulation.

Predicts the expected production quantity and time of the prepared JOB program, and analyzes and compares the target quantity and production time based on this information to allow efficient line operation.

Reel Barcode Issue and Registration

T-SMART ID

Manages each reel individually by assigning its own barcode to it.

Issues a barcode to each reel for new or existing components and registers it to the system for its management. When desired, the reel can be used by creating an inquiry.

Warning function for Remaining Component Management and Component Exhaustion

T-IT

T-SMART ID

Allows efficient production by managing the remaining component quantity in real time.

Saves the quantity of components remaining in a reel in use to the DB automatically in real time for easy reel inventory management and reuse, and by monitoring the quantity of components remaining in the reel, the machine generates an alarm against component shortage to secure sufficient time for the preparation of components in advance.

JOB PROGRAMMING



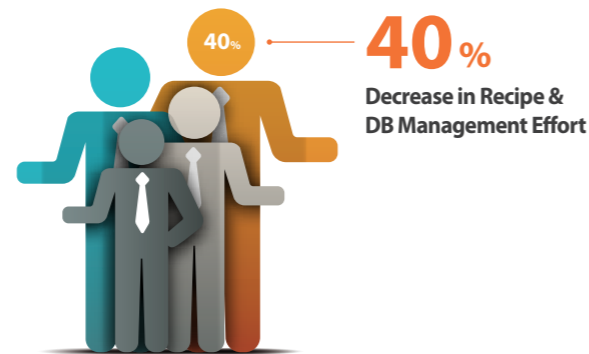
Helps a user plan for the initial production and supply of components easily, quickly, and accurately by using Hanwha's Job Programming Software in the course of the evolution of SMT production methods to small quantity batch production methods as the component groups become diversified.

Using Hanwha's T-OLP can maximize production efficiency with the optimized programming method that considers the machine

configuration and creates a job program without production time loss by registering a component easily via offline.



CUSTOMER BENEFITS



- Easy, quick, and accurate NPI (New Product Introduction)
- Prevents an operation error through verification with reference data
- Possible to register components via offline without stopping the line.
- Maximizes production efficiency through line balancing
- Performs integrated management in the job file server for easy revision and history management
- Minimizes an initial production error by checking placement position and angle in advance
- Maximizes machine efficiency through optimized programming

PROCESS SCENARIO

- Extraction of Placement Points from CAD data
- Comparison and Verification of BOM List
- Off-line Component Data Registration
- Verification of Placement Points and Angle through Gerber Overlay
- Optimizing the PCB program
- Integrated JOB File Management

New JOB File Creation

T-OLP

Imports various files to create a new job program easily.

Can convert placement point CAD files of various forms easily (a total of 24 CAD interfaces provided including Auto CAD, Gerber, etc.), and allows angle verification and editing of a placement point file through T-OLP's Gerberay function, helping efficient production by performing line balancing suitably according to the line environment.

Offline Component Registration Device

T-ELITE

T-OLP

Registers component information by recognizing a component shape even via offline.

Can create a part library via offline using T-ELITE and automatically finds the parameter suitable to the created component (nozzle, feeder, speed). In addition, provides the following functions in real time from the part library.

- Registering a new component
- Editing and deleting the component information
- Part Library Management
- Searching a registered component

Optimizing the PCB program

T-OLP

Creates a job file optimized for the line and machine configuration.

T-OLP can perform optimization by registering variables including feeder arrangement, optimization order, nozzle arrangement, etc., for placement point optimization.

In addition, in order to reduce the phenomenon that placement points are unequally concentrated on a specific machine, it provides a guide to allow more efficient line balancing by adjusting the number of feeders and components.

Production Planning

T-OLP

Establishes an optimum production plan for multiple production lines and models.

Establishes an optimized production plan suitable to the factory environment by considering the total component quantity, shift work, break time, as well as feeder / nozzle / backup pin replacing time, and optimizes the JOB file order for fastest production through this.

Multi JOB Creation

T-OLP

Connects several production models to one multi Job for programming.

Performs programming of the feeder arrangement / component arrangement / optimum production group / optimum placement order for a similar production model and, through this, reduces production line stops due to job change.

Integrated JOB File Management

T-OLP

Performs integrated management of several job files in the server so that they can be opened anywhere and anytime.

Performs integrated management of several job files after saving jobs in the server, and can import a job file saved in the past from the server.

MATERIAL MANAGEMENT

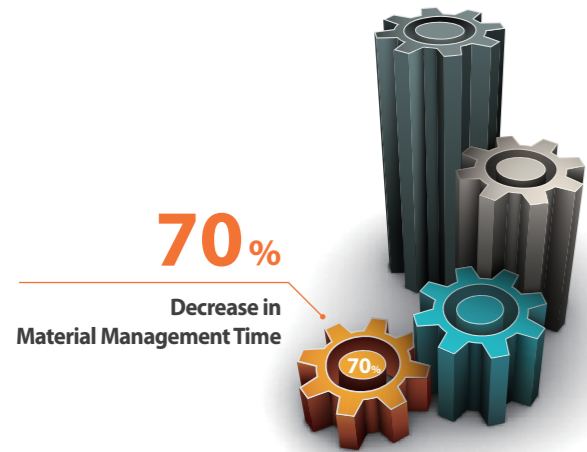


Accordingly, as the types of components configuring a product become more diversified, individual inventory management of materials and quick supply of necessary materials have become an essential factor in the SMART Factory production process. Hanwha's MATERIAL MANAGEMENT Solution allows more efficient material management by smartly performing integrated management of material flow from material warehousing to exit end.

Provides tools that can manage components systematically through T-SMART ID and prevents the occurrence of a situation leading to a temporary production stop by performing component inventory management in real time. In particular, interlocking with T-SMART

Rack or T-SMART Storage allows an inquiry of inventory and location information on necessary components in real time so that the material preparation time can be reduced significantly.

CUSTOMER BENEFITS



- Performs detailed component management by using existing IDs or assigning new IDs
- Manages the quality and life time of printing materials
- Allows distribution of refill materials in real time using the system requesting for components in shortage
- Allows even an inexperienced user to store and deliver components
- Can track problems by performing component delivery history management
- Secures the convenience of component management and reduces the model changing time significantly by using T-Smart Rack.

PROCESS SCENARIO

- New Component Registration, Barcode Issue and Attachment
- Management of Printer Materials including Solder Cream / Mask / Squeegee, etc.
- Check for Current Material Inventory by Job Unit
- Check for Required Materials through Status Board for Components in Shortage
- Check for Material Location and Material Delivery through the Smart Rack
- Management of MSL, etc., through interlocking with the Storage Tower
- Material Usage History Tracking Management

Reel Barcode Issue and Registration T-SMART ID

Manages reel information individually by assigning its own barcode ID to each reel.

Issues a specific barcode to each reel for new or existing components and registers it to the system for its management. When the reel's own information is desired, it can be inquired of for use.

Maintaining Optimum Printing Quality

Maintains an optimum state by managing the information on the use of solder / mask / squeegee.

SPSC can check the unattended time of solder at ambient temperature, agitating time, solder container open time, expected time of solder disposal, so that the solder quality state can be maintained under optimum conditions. In addition, SPMM can maintain the mask / squeegee under optimum condition.

Warning function for Remaining Component Management and Component Exhaustion T-IT T-SMART ID

Allows efficient production by managing the remaining component quantity in real time.

Updates the quantity of components remaining in the reel in use to the DB in real time to increase the ease of inventory management and reuse, and warns of a component shortage in advance during production by monitoring and predicting the quantity of components remaining in the reel, minimizing production downtime.

Support to Component Storage and Component Warehousing and Release T-SMART Rack/Storage T-OLP | T-SMART ID | T-IT

Provides component inventory and location information and supports easy storage and delivery.

Allows quick material delivery by visually displaying the component reel position information and component quantity information necessary for production by being interlocked with T-OLP and can reduce preparation time by preventing delivery errors.

Remote Request and Release of Components in Shortage T-IT T-SMART ID

Performs remote request materials in shortage to allow a timely response.

When a component shortage is expected during production, immediately checks the materials necessary for the production line remotely to allow quick preparation of the corresponding material in the Part Station, and provides the following information additionally.

- Components requested from the material preparation room
- Components under preparation at the material preparation room
- Components supplied to the production line
- History of a component supplied to the production line
- Monitoring the component request from the production line, component preparation and delivery



PREPARATION & CHANGEOVER



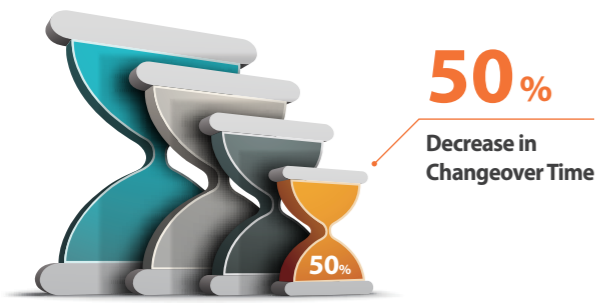
Quick and accurate job change is an essential factor in realizing a Smart Factory. Hanwha's PREPARATION & CHANGEOVER Solution helps such preparation processes.

First, it indicates the location of a component or feeder necessary for the preparation for production through a monitor or LEDs to help find it easily. Since it prepares for the next production via offline, no production loss occurs. It notifies the production manager of the

model changing time, helping him/her change a model quickly. Helps establish a complete Smart Factory by only assigning minimum time and workers for the preparation of the next production job.



CUSTOMER BENEFITS



- Prevents the omission of a job through a checklist for job preparation before production
- Minimizes material preparation time using the Smart Rack
- Prevents a material preparation mistake by checking the kitting and component.
- Maximizes the machine operation rate by warning against the model changing time in advance.
- Reduces the job preparation time by checking the location of the feeder in real time to which the necessary material is connected.
- Helps perform a model change easily without user intervention through automatic non-stop model changing.

PROCESS SCENARIO

- Opening a Job and Outputting Job Order
- Quick Material Delivery from Smart Rack/Storage Tower
- Advance Feeder Preparation on Kitting and Docking Cart
- Component Conformity Check Using Barcode
- Searching/Finding a Feeder Necessary for Next Job, Checking Feeder Status
- Warning and Checking against Expected Model Changing Time
- Automatic Model Changing by Using Barcode
- Collective Transmission of Job Files to Machine in Real Time and Production Reservation

JOB Order Output

T-OLP

Prepares components to be used for production in advance by printing the list of components to be used for production.

Can prepare the next production model on site easily by printing out a job order for job change. If the existing job file has been modified, only the modified portion is outputted, reducing unnecessary jobs.

Support to Component Storage and Component Warehousing and Release

T-SMART Rack/Storage
T-OLP | T-SMART ID | T-IT

Provides component inventory and location information and supports easy storage and delivery.

Allows quick material delivery by visually displaying the component reel information and component quantity information necessary for production by being interlocked with T-OLP and can reduce preparation time by preventing delivery error.

Offline Feeder Setting

T-Feeder

Connects the reel information to a feeder to prepare for model change. After model change, the machine verifies the conformity via the network.

Rechecks the information on the feeder and reel installed in the docking cart to check for any misplacement before using them for production.

Mobile Alarm

T-SMART App
T-PNP

Generates an alarm to the user in advance at the time he/she needs to take an action, helping him/her prepare to take an action.

Transmits an alarm generated from the machine to a mobile device (tablet PC, smart watch) to take immediate measures.

Feeder Searching and Finding

T-Feeder

Finds a tape feeder easily and installs it quickly before production. Helps find the feeder easily, quickly and correctly by turning on the LEDs of the feeder to find.

Feeder Maintenance Support

T-Feeder

Can check for the history management of defects, repair, and calibration feeder.

Maintains the feeding quality by managing the feeder repair and calibration history. For a feeder which needs calibration, it can be managed by registering it as a defective feeder.

Support to Automatic Model Change

T-OLP

Helps start production of the next model automatically without stopping the machine.

Allows production model change in order without intervention of the user during production by setting the feeder base and component reel of the Family Jobs with similar or identical component types.

Automatic model changing methods include the model changing method through external barcode scanning, one click model changing method (batch job), etc.

Assigning to JOB File Line

T-OLP

Downloads a PCB program from the machine.

Performs integrated management of several PCB programs with the DB and transmits necessary jobs to the machine to allow production immediately.

PRODUCTION



Hanwha has great interest in solutions that can automatize and intellectualize the production process while introducing the Smart Factory in various industries including the manufacturing industry. Applying Hanwha's Production Solution will allow a more speedier approach to a future-oriented factory with minimum cost and time.

First, it can minimize defects due to user's mistakes using various Part Verification functions provided by the IT System. In addition, the user can check the production status of the factory anytime and from anywhere without the need to stand in front of the machine. It is

possible to realize a smart automatic control system by transmitting a warning alert to a mobile device to enable them to take remote measures.



CUSTOMER BENEFITS

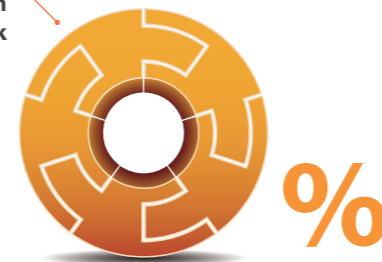
30%

Increase in Production Quality



100%

Material Verification Check



- Secures ease of job file management by reflecting modified data automatically.
- Prevents misplacement due to user's mistakes using various verification systems
- Manages the line efficiently using a system that requests and supply necessary materials
- Performs brief monitoring the production status in real time with a mobile device
- Prevents time delay by warning the user of the time of component exhaustion and model changing time in advance
- Realizes high quality placement by sharing data (M2M) between machines

PROCESS SCENARIO

- Program Modification and Reflection during Production
- Examining Component Conformity When Changing the Material / Feeder during Production
- Warning against Component Shortage from the Machine
- Remote Request for Component in Shortage and Quick Preparation
- Brief Monitoring of Production Flow and Operation Status with Mobile Device
- Alarming and Remote Measures when Problem Occurs to the Machine / Process
- Production Optimization by Sharing Data between Inline Machines

Material Verification during Production

T-IT
T-SMART ID

Misplacement Examination

Prevents a defect of component misplacement by checking whether each component (reel) has been installed as programmed during production.

SCAN	Reel Barcode
CLAMP	Saves data in the corresponding feeder
VERIFY	Compares / verifies the reel data

- Case 1: When an inspection cycle arrives, verifies the conformity of the component by scanning barcodes to check whether the components supplied by all feeders are identical to the PCB program set components.
- Case 2: Checks the reel data of the feeder during replacement to verify the conformity automatically.
- Case 3: Checks whether the reel matches the slot of the corresponding feeder by scanning the barcode when splicing a material.
- Case 4: Saves the reel data for each feeder via offline when changing a job for checking conformity in advance.

LCR Check (Component Capacity Check)

Checks the component capacity before starting production when changing materials or performing a new material setting to prevent mis-insertion in advance.

MSL

Can prevent a defect of original materials by registering a material according to the temperature and humidity level and using a barcode before using the material.

Warning function for Remaining Component Management and Component Exhaustion

T-IT
T-SMART ID

Allows efficient production by managing the remaining component quantity in real time.

Updates the quantity of components remaining in the reel in use to the DB in real time to increase the ease of inventory management and reuse, and warns of a component shortage in advance during production by monitoring and predicting the quantity of components remaining in the reel, minimizing production downtime.

Mobile Alarm

T-SMART App
T-PNP

Generates an alarm to the user in advance at the time he/she needs to take an action, helping him/her prepare to take an action.

Transmits an alarm generated from the machine to a mobile device (tablet PC, smart watch) to take immediate measures.

Check and Remote Request for Material in Shortage

T-IT
T-SMART ID

Performs via remote control the request for emergency release of materials in shortage occurring during production.

The machine can control the corresponding component remotely without the need of user's going to the Changeover Preparation Room when a component shortage warning occurs or a component shortage is expected.

Remote Monitoring

T-SMART App
T-PNP

Monitors the production status briefly with a mobile device and controls it remotely.

Can monitor the production status briefly inside and outside of the factory using a mobile device or PC, and can check the control of the machine condition through remote access to the machine system individually.

Program Modification and Reflection during Production

T-OLP

Rearranges the nozzles or feeders used to produce the models being produced or modifies the placement data.

The machine can perform production conveniently through real time synchronization with the DB data when performing component data modification, nozzle / feeder rearrangement or modification of placement data, etc., in the job program used for production in the machine.

Data Sharing between Inline Machines

T-PNP

Can perform automatic system control by sharing data between inline machines.

Can prevent defective placement and increase productivity by sharing data between peripheral equipment (SPI, AOI, reflow) and chip mounter.

FACTORY MANAGEMENT

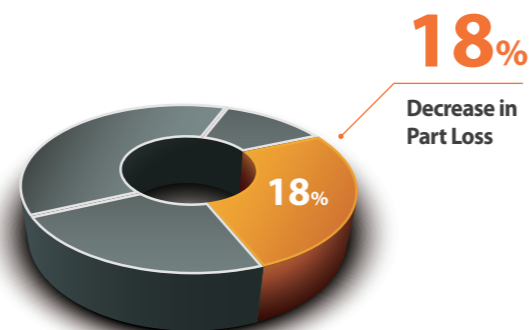
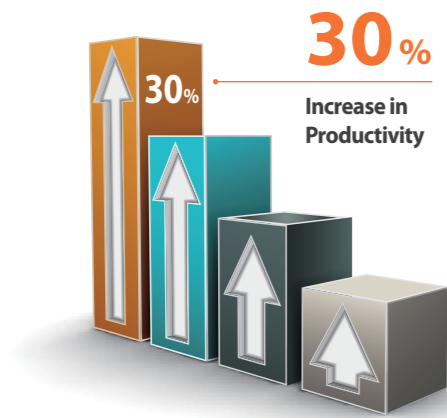


For the materialization and automatization of Industry 4.0, the importance of tools that can improve the operational capability of each process unit becomes influential.

Using Hanhwa's T-PNP system of the FACTORY MANAGEMENT Solution can reduce the difference in technical capability between experienced engineers and beginners and improve manufacturing activities through remote control of the machine or informatization of collected data by monitoring the machine status in real time.

In addition, it can induce quality standardization by analyzing and optimizing the collected data obtained through the connection of a customer's MES system and production data systematically and by preventing defects through autonomous exchange of information between inline machines.

CUSTOMER BENEFITS



- Performs effective production status management by checking major indexes of the factory in real time
- Reduces the frequency and time of machine downtime through efficient machine management
- Improves production efficiency through real time response to the machine to which an error occurred
- Derives items that need to be improved by tracking and analyzing production history data
- Improves line operation rate and quality through data sharing between inline machines
- Performs integrated management of preventive and predictive maintenance of the machine using the integrated maintenance system

PROCESS SCENARIO

- Monitoring of Major Production Indexes of the Entire Factory and Lines
- Real Time Production Status and Warning against Model Change
- Screen Print Status Monitoring
- Production Index Analysis and Report Output
- Outputting Guide for Measures against Interlock Alarm
- Brief Production Status Monitoring and Remote Measures Using a Mobile Device
- Data Sharing between Inline Machines
- Easy Interlocking with Upstream Systems (MES)
- Integrated Machine Maintenance



MONITORING

T-PNP

Factory MONITORING

Checks the line operation status of the entire factory from anywhere using a mobile device or PC.

Production MONITORING

Helps the user take immediate action for improvement since it is possible to compare differences in values by indicating planned quantity and production quantity together.

Interlock Alarm

When defects or dumping occurs too frequently, it is possible to perform setup to generate an alarm or stop production and help to take quick measures on site by providing causes / guide to measures to be taken together.

Job Change Alarm (MONITORING)

Sends an alarm to the operator in advance in real time when changing a production model and checks the status of preparation for the job change so that the preparation can be made without delay.

KPI MONITORING

Indicates the KPI trend by entire factory and line by monitoring changes in major KPIs by time (trend), allowing index status by every time unit.

Part Alarm (MONITORING)

Monitors the remaining quantity of components in each slot per line and generates an alarm against the remaining component quantity when its remaining quantity is less than the set value so that it may be possible to secure a time for component request / delivery time.

Line MONITORING

Indicates the production status of a selected line and helps examine the quality and production indexes including a bottleneck machine / downtime / defects / dumping.

Printer Alarm (MONITORING)

Indicates the operation / production index / defect rate of each screen printer and helps manage the mask cleaning cycle / mask change / parameters and examine the operation status.

Production Index History Analysis and Reporting

T-PNP

Inquires and analyzes the production history by major index, presenting a report and solution for it.

Provides the statistics and analysis results about previous production by graph and chart, and allows reporting in Excel format, etc. In addition, it provides the defect history DB search service for a specific period of time, helping check the cause of a defect easily.

Remote Monitoring

T-SMART App

T-PNP

Monitors the production status briefly with a mobile device and controls it remotely.

Can monitor the production status inside and outside the factory using a mobile device or PC, and check and take measures against the problem with a machine through remote access to the machine system individually.

Traceability

T-IT

Saves the individual production history of all PCBs to prepare for recall and supplementary work.

Records the production data for reels, feeders, etc., during production in the unit of PCB Barcode ID (1D/2D). Therefore, if a defect occurs, it minimizes the recall range by tracking the cause and range of the defect in the unit of reel or PCB to repair the defective PCB easily.

Data Sharing between Inline Machines

T-PNP

Refers to the automatic control system by sharing data between inline machines.

It is possible to prevent defective placement and improve productivity through data sharing between peripheral devices (printer, inspection device, reflow) and the chip mounter. High quality production is realized by correcting the printing position by correcting the placement position using the information from the AOI and correcting the printing position using the information from the SPI.

Possible to be Interlocked with Upstream System (MES)

T-SMART Link

T-PNP

Updates the production status and job history by interlocking with a customer's system.

Allows stable data communication between the customer system (ERP, SCM, MES, etc.) and SMT inline machines to make it possible to interlock with the production data of a line without changing over to a separate solution in the workflow system of the customer.

Integrated Maintenance Management System

T-PNP

Performs preventive maintenance by managing the maintenance schedule for the machine and consumables.

Manages the check items for maintenance daily / weekly / monthly so that the manager may manage the machines and consumables systematically, and improves the facility operation rate and saves facility preservation cost by allowing efficient preventive maintenance activities.