



## SIGER DATA

Leader of CNC Big Data Analysis



**Jiangsu SIGER Data Technology Co., Ltd**

Tel: +86-512-6742 5209

Mob:189 6235 3927(Manager Zhu)

Email: [marketing@siger-data.com](mailto:marketing@siger-data.com)

2nd Floor, Building 9, Creative Industry Park, No. 328 Xinghu Street,  
Suzhou Industrial Park, Jiangsu Province, China

## Digital and Intelligent Product Manual Of CNC Machining Industry



# Table Of Contents

—  
目录

## CONTENTS

<b>01</b>	SIGER Data Company Introduction	
	Introduction of SIGER Data Company	02
<b>02</b>	CNC Machining Monitor System	
	TMS Tooling Monitor System	07
	TCS CNC Collision Protection System	11
	Thermal Compensation Management System	13
	AMS Efficiency Optimization System	15
	RMS Real-time Measurement System	17
<b>03</b>	Digital Plant System	
	MES Manufacture Executive System	21
	CAPP Production Auxiliary Management	22
	Quality & Traceability Management System	23
	EAM Enterprise Asset Management	24
	WMS Warehousing Logistics Scheduling System	25
	FMS Flexible Line Information System	26
<b>04</b>	Mold Precision Optimization System	
	Mold Precision Optimization System	28
<b>05</b>	Typical Customer Case Examples	
	Industry 4.0 Example	30



1

# SIGER Data Company Introduction

Introduction of SIGER Data Company .....02

## 01 SIGER Data Company Introduction

### ■ Introduction of SIGER Data Company



#### 70% Technology +

More than 70% of the company's team focus R&D. Graduated from well-known universities, and have 15+ years of experience of Fortune Enterprises.

#### 95 + Patents

The company has a total of 95 software copyright and patents, focus in technology of innovation.

#### 100% Focus On CNC Domain

Focus on CNC Domain, such as CNC Precision Optimize, Quality Control, Efficiency Optimize, and Collaborative Management.

#### 1000 + Customer

More than 1000+ Customers from different countries select SIGER.

## SIGER DATA

Focusing on digital factory solutions for the precision machining industry

Jiangsu SIGER Data Technology Co., Ltd. setted in 2016. SIGER Data focuses on intelligent analysis of CNC Domain;Products contains such as Edge Sensor of CNC, Edge Computing of CNC, System application and data mining exploration layer, including machine tool spindle health monitoring services, cutting tool production monitoring service, unmanned measurement RMS services, the overall digital factory MES system services, flexible digital production line services and so on many products and services needed in the precision machining process, covering the precision machining process number intelligent application scenarios, for precision machining enterprise customers to provide the overall number intelligence service application.



# 01 SIGER Data Company Introduction

## Introduction of SIGER Data Company

### Vision of SIGER Data

Innovation with Data, For a Better Industry



### Mission of SIGER Data

SIGER Data is based on IOT, Data Analysis and IT Architecture technologies, Providing Intelligent Analysis and Decision-making services for CNC Process, making CNC manufacturing industrial process more intelligent, and Providing customers with excellent intelligent Data Products and Services, to make SIGER Data become the Leader in the field of industrial Data Analysis Domain.

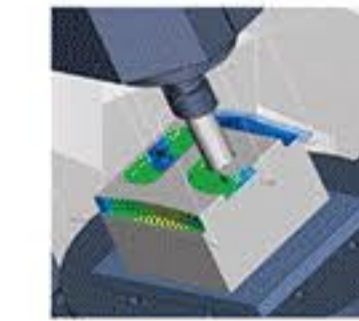
### Appendix: Partial Soft Works and Patent Certification

Soft famous said	Edition	Registration mark	The license time
SIGER Tool Intelligent management System software V1.0	V1.0	2018SR245339	2018/4/11
Tool status monitoring, data model analysis system V1.0	V1.0	2018SR1081106	2018/12/27
Jiangsu West Ge data tool transfer management system V1.0	replenish	2020SR0153562	2020/7/14
The Siegar Data Acquisition Master Software V3.0	V3.0	2021SR1181311	2021/8/10
The SIGER Data Real-Time Measurement System software V1.0	V1.0	2021SR1532134	2021/10/19
Kanban management system V1.0	V1.0	2022SR1056451	2022/8/9
SIGER Data Online detection management system V1.0	V1.0	2022SR1083671	2022/8/11
The SIGER Data Tool Management System Software V1.0	V1.0	2022SR1337318	2022/8/31
Siegar Data TCS collision protection system V1.0	V1.0	2022SR1391681	2022/10/9

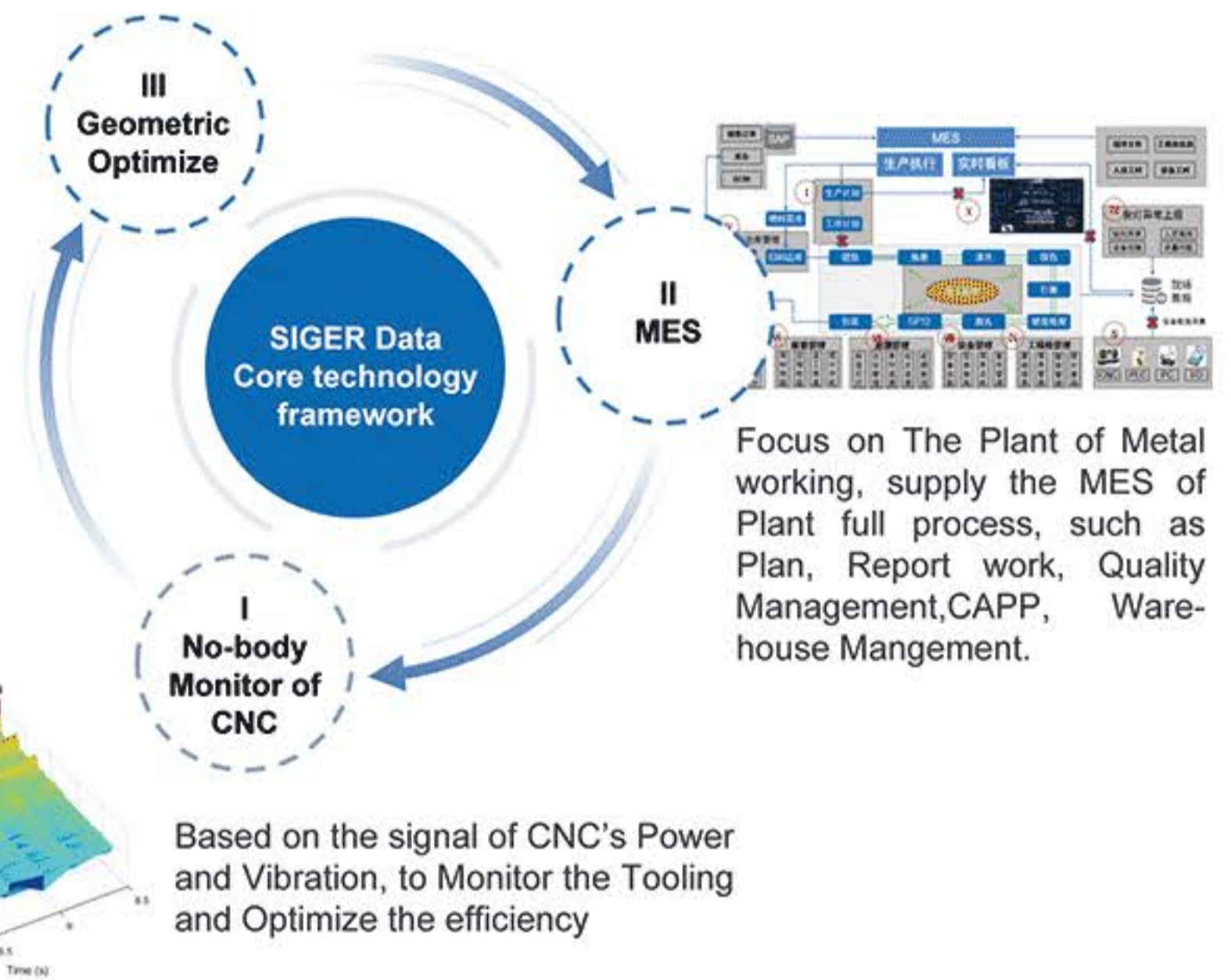
Patent name	Number	Request number	The license time
A risk warning method during tool cutting	ZL-2017-0001	CN201710914485.9	2017/9/30
A machine tool monitoring system	ZL-2018-0003	CN201811114222.0	2018/9/25
A monitoring system for the detection of a cutting tool status	ZL-2019-0005	CN201910997295.7	2019/9/30
Cutting process parameters optimization method, system, computer equipment and storage media	ZL-2022-0008	CN202210462538.9	2022/4/28
Data separation method and the separation system	ZL-2022-0009	CN202210440074.1	2022/4/28
Tool wear state prediction method, device, and storage media	ZL-2022-0010	CN202210555991.4	2022/5/20
Tool wear prediction method, device and computer application based on transfer learning	ZL-2022-0011	CN202210774410.6	2022/7/1

## Introduction of SIGER Data Company

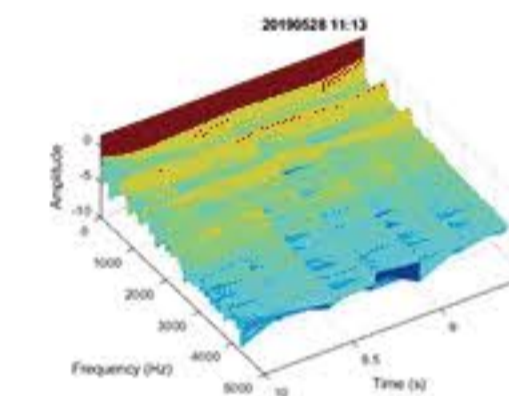
### SIGER Technology Framework



Base on the Geometric fluctuation, to re-calculate the CNC spatial position to ensure the precision of CNC



Focus on The Plant of Metal working, supply the MES of Plant full process, such as Plan, Report work, Quality Management, CAPP, Warehouse Management.



Based on the signal of CNC's Power and Vibration, to Monitor the Tooling and Optimize the efficiency

### Our Strengths

SIGER Data Company's team focus on the R&D of precision machining digital&intelligence technology innovation, have owned more than 100+ Patents in CNC's field. Until now, we can provide Digital factory solutions of CNC Domain, and Nobody Monitor of CNC, Geometric Optimize of CNC. The strength of these three technology fields, that make us can supply CNC Plants can better management the process of Metal-making process. In the domain of Intelligent solutions of CNC, we have had more than 100+ Patents, and also have more than 70+ engineers focus on R&D, to innovate more valueable products in CNC Domain.



# 01 SIGER Data Company Introduction

## Introduction of SIGER Data Company

### SIGER Data-Product Matrix

<b>Enterprise digitization</b>	<ol style="list-style-type: none"> <li>1) Production management system</li> <li>2) The CAPP management system</li> <li>3) Quality traceability system</li> <li>4) Warehousing and logistics scheduling</li> </ol>	
<b>Geometric calculation</b>	<ol style="list-style-type: none"> <li>1) Real-time monitoring of the processing process</li> <li>2) Movement simulation of the machine tool spindle</li> <li>3) Simulation and optimization of tooling path trajectory</li> <li>4) The 3D display of the optimization result</li> </ol>	
<b>Intelligent monitoring of equipment</b>	<ol style="list-style-type: none"> <li>1) Tooling Monitoring System</li> <li>2) Tooling Collision Protection system</li> <li>3) Adjust Machining System</li> <li>4) Online Measurement Module</li> </ol>	
<b>Intelligent acquisition hardware</b>	<ol style="list-style-type: none"> <li>1) Data Collect Module</li> <li>2) Edge Computing Module</li> <li>3) Vibration Sensor</li> <li>4) Power Sensor</li> </ol>	

### SIGER Data-28 Modules of 7 Domains

<b>Order management</b> SO program of production purchasing order purchase-sell-stock management system	<b>Master Data Management</b> System docking    Interface management    Workshop data			<b>3 Quality &amp; Traceability management</b>					<b>4 Warehousing management</b>	
	Production plan docking BOM material docking And PLM process docking Basic data docking	Production scheduling management Report to work management Outreach management Performance analysis	NC device data PLC data Personnel data Material data	Label management Personnel equipment Product materials Binning label Code rule	Station management Scan the code to cross the station Information association Single cross-station Batch station	Quality inspection Inspecting item Data collection Exception handling Hierarchical audit	Rework scrap Rework input Scrapped tracking Abnormal statistics Basic configuration	Statistical analysis Report query SPC analyse Positive and reverse retroactive In product management	Line side library management Call material management Material transportation Virtual library position AGV abutment Inventory synchronization	Store management receiving inspection In-place storage Storage change Warehouse allocation Scan code out of the warehouse statistical analysis inventory warning
<b>6 Intelligent monitoring</b> Machine tool monitoring Machine tool collision protection Intelligent monitoring Processing efficiency optimization The RMS measuring real-time measurement SPC monitor Real-time compensation Compensation kanban	<b>1 Manufacture Executive System (MES)</b>						<b>4 CAPP manage</b>		<b>5 Flexible line management</b>	
	MDC module DA IOT IOT DNC manage Version management Program management Contrast monitoring	Equipment monitoring Equipment section Equipment alarm Device status Device efficiency Time is moving Basic configuration	Schedule production report work Plan to produce Report to work management Outreach management Digital station Working hours performance Synthesize OEE	E-SOP manage Version management Create a signature Upload management View online Personnel performance Performance analysis	TPM manage Account for assets Maintenance management Maintenance management Spare parts management Statistical analysis	Safety lamp management The light trigger Failure logging Trouble-shooting Field processing An lamp kanban Installation lamp configuration	Tooling management Clip management Tool management Mold management Measuring management Laboratory management	State kanban MDA module DNC module Retroactive module reversed control	EHS manage Energy monitoring Energy consumption statistics EHS manage	Kanban management device status    Workshop dynamic    project management    equipment maintenance    Quality light    Energy consumption    KPI manage

2

## CNC Machining Monitor System

TMS Tooling Monitor System	07
TCS CNC Collision Protection System	11
Thermal Compensation Management System	13
AMS Efficiency Optimization System	15
RMS Real-time Measurement System	17



# 02 CNC Machining Monitor System

## TMS Tooling Monitor System

### TMS E3 - Tooling Monitoring System



- Tooling Wear-out Monitoring
- Tooling Broken monitoring
- Tooling life predicting
- Auto-control of CNC

- Broken tooling / blade monitoring: real-time monitoring of tool status, intelligent identification of broken tooling / blade abnormal, and automatic control of the machine shutdown, broken tooling / blade monitoring accuracy of more than 99%;
- Wear monitoring: real-time monitoring of the spindle load current, reflect the tool wear situation, measuring the real life of the tool, the tool life prediction accuracy of more than 99%;

### TMS E3 - 8 Failure Modes of Tooling

1. Tool clamping is abnormal  
Solution: **Vibration/load monitoring**
2. Tool wear  
Solution: **Load monitoring**
3. The tooling cleaves  
Solution: **Load monitoring**
4. Tool breakage  
Solution: **Load monitoring**
5. Cutting chips  
Solution: **Load monitoring**
6. Cutting pads  
Solution: **Load monitoring**
7. Surface vibrating tooling pattern  
Solution: **Vibration monitoring**
8. The product is whitish  
Solution: **Vibration/load monitoring**

### TMS E3 - Typical Setting of TMS E3

1. Classic tool failure scenario

2. Failure mode characteristic curve

1. Tool wear and failure scenario

2. Comparison of wear characteristic curve and abnormal intelligent identification

- Failure Mode 1: Blade recognition
- Failure Mode 2: Broken tooling recognition
- Failure Mode 3: Identification of tangled debris and bedding debris
- Failure Mode 4,7: Abnormal clamp, vibration tooling pattern
- Failure Mode 5: Product hair white
- Failure Mode 6: Product burr
- Failure Mode 8: Wear over limit

## TMS Tooling Monitor System

### TMS E3 - Tyle Selection - CNC Machining Center



Index item	Adapt content
Machine tool type	Vertical / horizontal / gantry / five-axis machining center, etc
Navar	Fanuc, Siemens, Hedeheim and other 95% + systems
Types of knives	Milling cutter   drill bit, wire cone, reamer   composite tooling
Process type	Mass repeated processing, small batch processing, no NC, etc (Cutting amount not less than 10 wire)
Processing scenarios	Auto parts, construction machinery, molds, medical equipment, military aerospace and other common mechanical plus scenarios
Failure mode	8 common failure modes such as broken tooling, broken blade and wear

### TMS E3 - Hardware Configuration

Key components	System indicators	parameter values	Hardware name	Function declaration	Quantity
Vibration pick-up	Ambient temperature	-40°C-125°C	Power transformer	Collect the spindle power load information	1 set
	Vibration acquisition frequency	200-4000Hz	Vibration sensor (optional)	Collect the spindle, and collect the vibration signal	1 set
Current transformer	Power acquisition frequency	200-4000Hz	The SAD conversion module	Digital-to analog conversion of edge signal acquisition	1 set
	Metre fullscale	70A/2000V	E3 operation module	Data storage, analysis, and output	1 set
The SAD conversion module	Monitoring accuracy	0.5%	HMI display terminal	System configuration and monitoring of the interaction	1 set
	Service voltage	DC 12-24V	Other auxiliary materials	Alarm lights, connecting lines and other auxiliary materials	1 set
System terminal	One-way processing time	≤30min			
	Response time	0.005s			
	Receive / send the interface	RS232 serial port			
	SC	Onboard, eMMC 16G			
	Downtime response time	300ms			

Note: The number of sensors depends on the number of spindle and monitoring points!

### Typical Applications & Customers

- Auto parts industry: Engine processing, Bearing class, Transmission processing, Knuckle
- Construction machinery manufacturing: Equipment manufacturing, Construction machinery
- Aerospace: Aerospace & military industry
- Medical manufacturing: Medical instruments
- Machine tool manufacturer and automation: Precision equipment, Machine tool building, Autoline





# 02 CNC Machining Monitor System

## TMS Tooling Monitor System

### TMS E3 - Tyle Selection -CNC Lathe & Gantry



Index item	Adapt content
Machine tool type	Vertical / horizontal / gantry, lathe, turning and milling compound, etc
Navar	Fanuc, Siemens, Hedeheim and other 95% + systems
Types of knives	Milling cutter   car cutter   boring cutter
Process type	Mass repeated processing, small batch processing, no NC, etc (Cutting amount not less than 10 wire)
Processing scenarios	Construction machinery, auto parts, military aerospace, mold and other related to shaft, plate, set of processing
Failure mode	Blade collapse, wear, product burr hair white and other abnormal

### TMS E3 - Hardware Configuration

Key components	System indicators	parameter values	Hardware name	Function declaration	Quantity
Vibration pick-up	Ambient temperature	-40°C-125°C	Power transformer	Collect the spindle power load information	1 set
	Vibration acquisition frequency	200-4000Hz	Vibration sensor (optional)	Collect the spindle, and collect the vibration signal	1 set
Current transformer	Power acquisition frequency	200-4000Hz	The SAD conversion module	Digital-to analog conversion of edge signal acquisition	1 set
	Metre fullscale	70A/2000V	E3 operation module	Data storage, analysis, and output	1 set
The SAD conversion module	Monitoring accuracy	0.5%	HMI display terminal	System configuration and monitoring of the interaction	1 set
	Service voltage	DC 12-24V	Other auxiliary materials	Alarm lights, connecting lines and other auxiliary materials	1 set
	One-way processing time	≤30min			
System terminal	Response time	0.005s			
	Receive / send the interface	RS232 serial port			
	SC	Onboard, eMMC 16G			
	Downtime response time	300ms			

Note: The number of sensors depends on the number of spindle and monitoring points!

### Typical Applications & Customers

Construction machinery & equipment manufacturing

Equipment manufacturing

Construction machinery

Auto parts

Gear wheel

Hub

Transmission shaft

Aerospace manufacturing

Type of axle

Lampstand

Disc class

Tube column / set class

Robotization

Mold tooling manufacturing

模具制造



## TMS Tooling Monitor System

### TMS E3 - Tyle Selection -CNC Centerless Gather



Index item	Adapt content
Machine tool type	Tianjin, West iron city, new generation and other common walking series
Navar	FANUC, Mitsubishi, Xicheng, Xinye, and other control systems
Types of knives	Drill, silk cone
Process type	Mass repeated processing (cutting amount not less than 10 wire)
Processing scenarios	Auto parts, precision electronics, medical equipment, energy, aerospace, etc
Failure mode	Abnormal monitoring of broken tooling, broken blade and feeding;

### TMS E3 - Hardware Configuration

Key components	System indicators	parameter values	Hardware name	Function declaration	Quantity
Vibration pick-up	Ambient temperature	-40°C-125°C	Power transformer	Collect the spindle power load information	3 set
	Vibration acquisition frequency	200-4000Hz	Vibration sensor (optional)	Collect the spindle, and collect the vibration signal	1 set
Current transformer	Power acquisition frequency	200-4000Hz	The SAD conversion module	Digital-to analog conversion of edge signal acquisition	3 set
	Metre fullscale	70A/2000V	E3 operation module	Data storage, analysis, and output	1 set
The SAD conversion module	Monitoring accuracy	0.5%	HMI display terminal	System configuration and monitoring of the interaction	1 set
	Service voltage	DC 12-24V	Other auxiliary materials	Alarm lights, connecting lines and other auxiliary materials	1 set
	One-way processing time	≤30min			
System terminal	Response time	0.005s			
	Receive / send the interface	RS232 serial port			
	SC	Onboard, eMMC 16G			
	Downtime response time	300ms			

Note: The number of sensors depends on the number of spindle and monitoring points!

### Typical Applications & Customers

Automotive precision instrument processing

Precision parts

Lead screw

3C electronics

Electron device

Electronics

Aerospace / military

Medical equipment

The sources of energy

Energy equipment

Aerospace electronics devices

Aviation equipment

Electronic communication

Precision parts





# 02 CNC Machining Monitor System

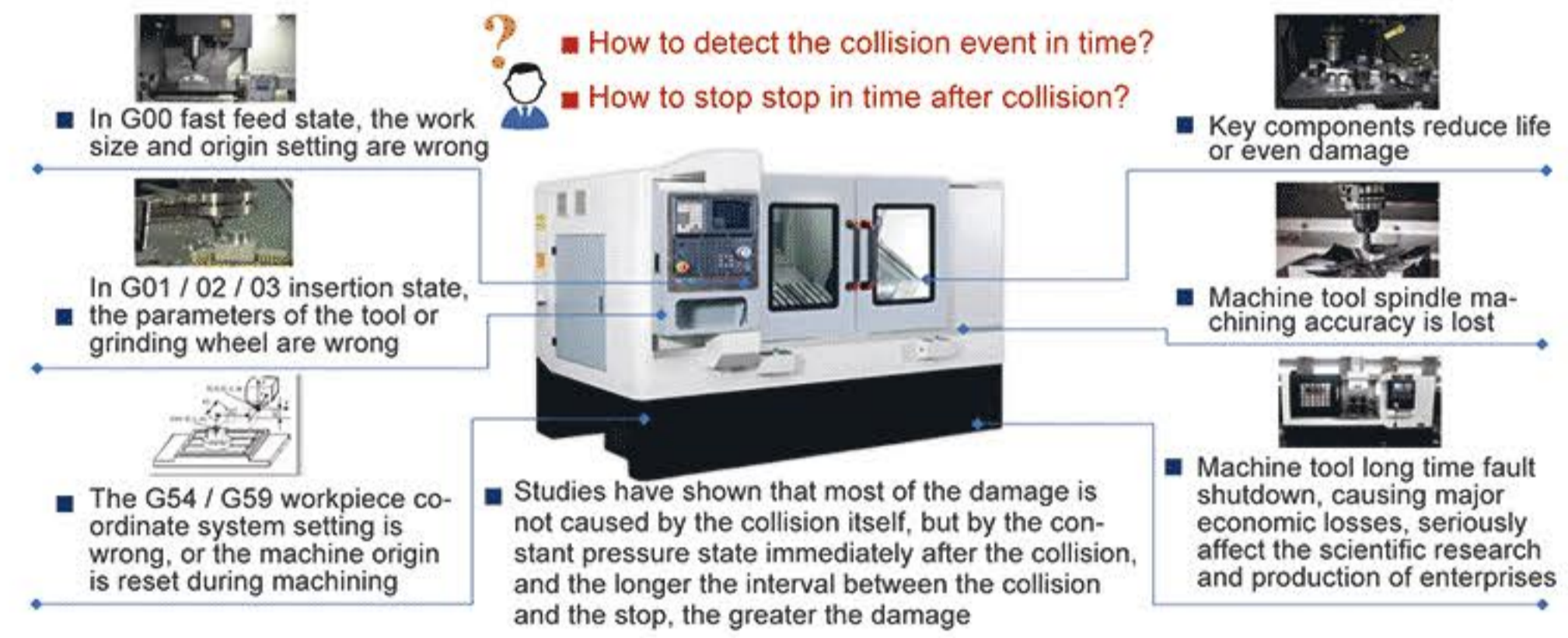
## TCS CNC Collision Protection System

### TCS E3 - CNC Collision Protection System

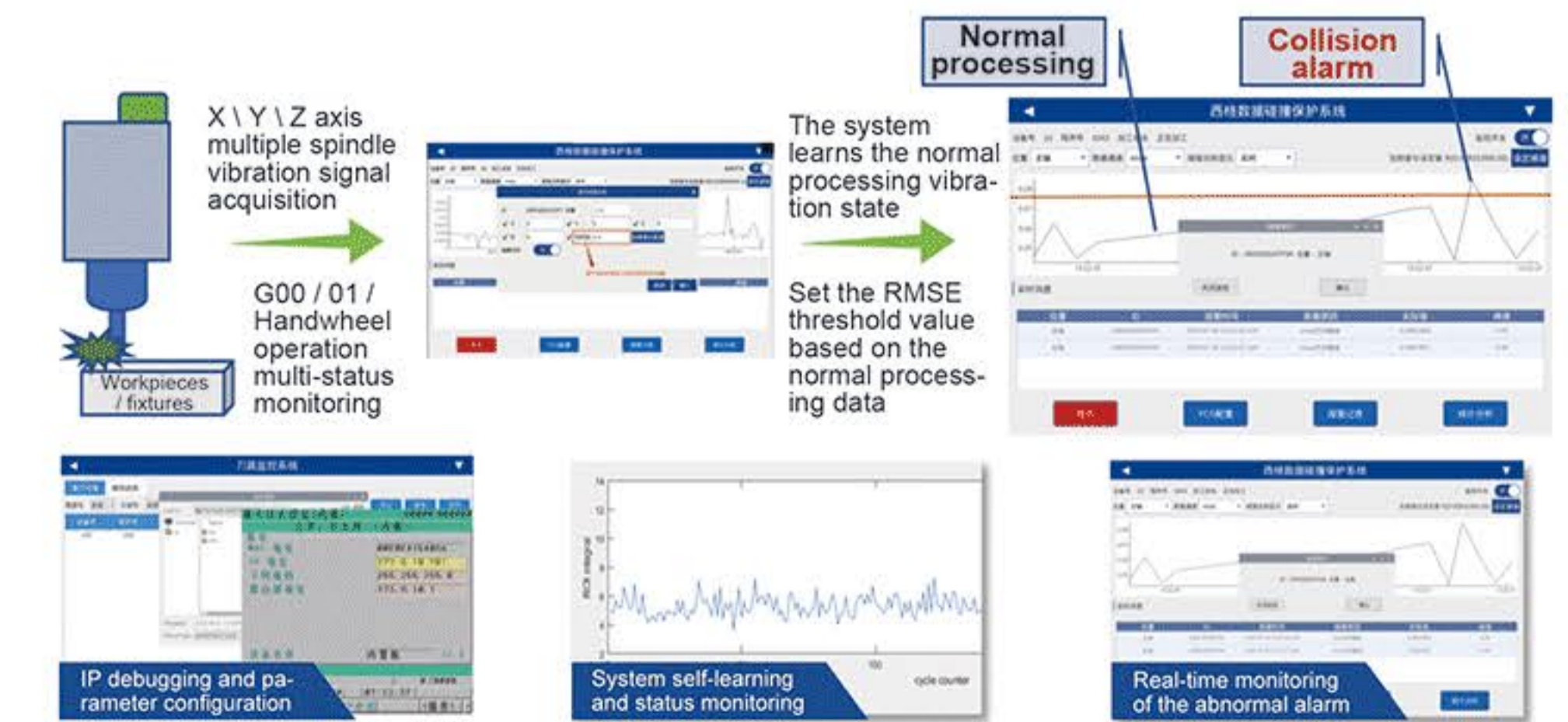
- Vibration real-time monitoring
- Automatic alarm output
- Anomalous 0.25ms response
- Intelligent downtime control

- Based on the vibration sensor real-time collection of the spindle vibration signal, control the machine to stop automatically when the impact occurs;
- Real-time collider alarm: in order to avoid greater loss caused by impact, the impact monitoring rate reached more than 99%;
- Response time of collision system: after collision, the system responds within 0.25ms, and output alarm signal within 2.3ms, and cooperate with the machine tool to complete shutdown control;

### TCS E3 - Typical Failure Mode of Collision



### TCS E3 - Typical Application of TCS



## TCS CNC Collision Protection System

### TCS E3 - CNC Collision Protection System



Index item	Adapt content
Machine tool type	Processing center, vehicle and milling compound, lathe, grinder, etc
Control system	Fanuc, Siemens, Hedeheim and other 95% + systems
Tool types	Milling cutter   car cutter   boring cutter
Process type	Mass repeated processing, small batch processing etc(Feed distance above 1 m)
Processing scenarios	Auto parts, construction machinery, aviation days, military ships, large mold tooling and other manufacturing scenarios
Failure mode	Loss of accuracy of the cutter collider and spindle

### TCS E3 - Hardware Configuration

Key components	System indicators	Parameter values	Hardware name	Function declaration	Quantity
Vibration pick-up	Ambient temperature	-40°C-125°C	Vibration pick-up	Collect the spindle, and collect the vibration signal	1 set
	Power acquisition frequency	100-4000Hz	The SAD conversion module	Digital-to analog conversion of edge signal acquisition	1 set
	Monitoring accuracy	0.5%	E3 operation module	Data storage, analysis, and output	1 set
The SAD conversion module	Service voltage	DC 12-24V	HMI display terminal	System configuration and monitoring of the interaction	1 set
	One-way processing time	0.1s-30min	Other auxiliary materials	Alarm light, connecting lines and other auxiliary materials	1 set
	Response time	0.005s			
System terminal	Receive / send the interface	The RS232 serial port			
	SC	Onboard, eMMC 16G			
	Downtime response time	2.3ms			

Note: The number of sensors depends on the number of spindle and monitoring points!

### Typical Applications & Customers

- Construction Machinery & Equipment Manufacturing
  - Wind power bearing
  - Longmen processing
  - Construction machinery
  - Large-scale processing equipment
- Aerospace / military
  - Large processing parts
  - Mold tooling processing
- Machine tool manufacturer and automation
  - Disc class
  - Column/sleeve type
  - Robotization





# 02 CNC Machining Monitor System

## Thermal Compensation Management System

### Thermal Compensation Management System



- Based on the X axis and Z axis guide rail and bearing the spindle temperature collection, real-time monitoring of spindle temperature information;
- Through polynomial regression analysis of temperature rise and thermal error, the temperature difference compensation model is constructed;
- Combined with the temperature change of machine tool cooling machine to heat machine, combined with the algorithm analysis results, calculate the error compensation value, call the number acquisition service, based on the macro variable assignment method, to send the error compensation value to the machine tool;

Comparative analysis of accuracy

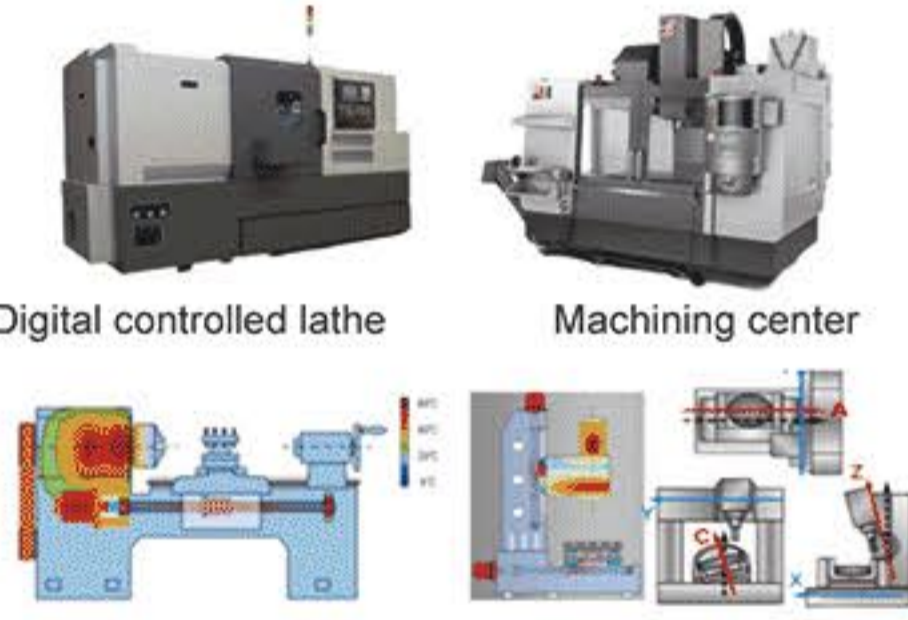
Error compensation model

Precision optimization of cold and cold machine

Optimize the macro variable compensation

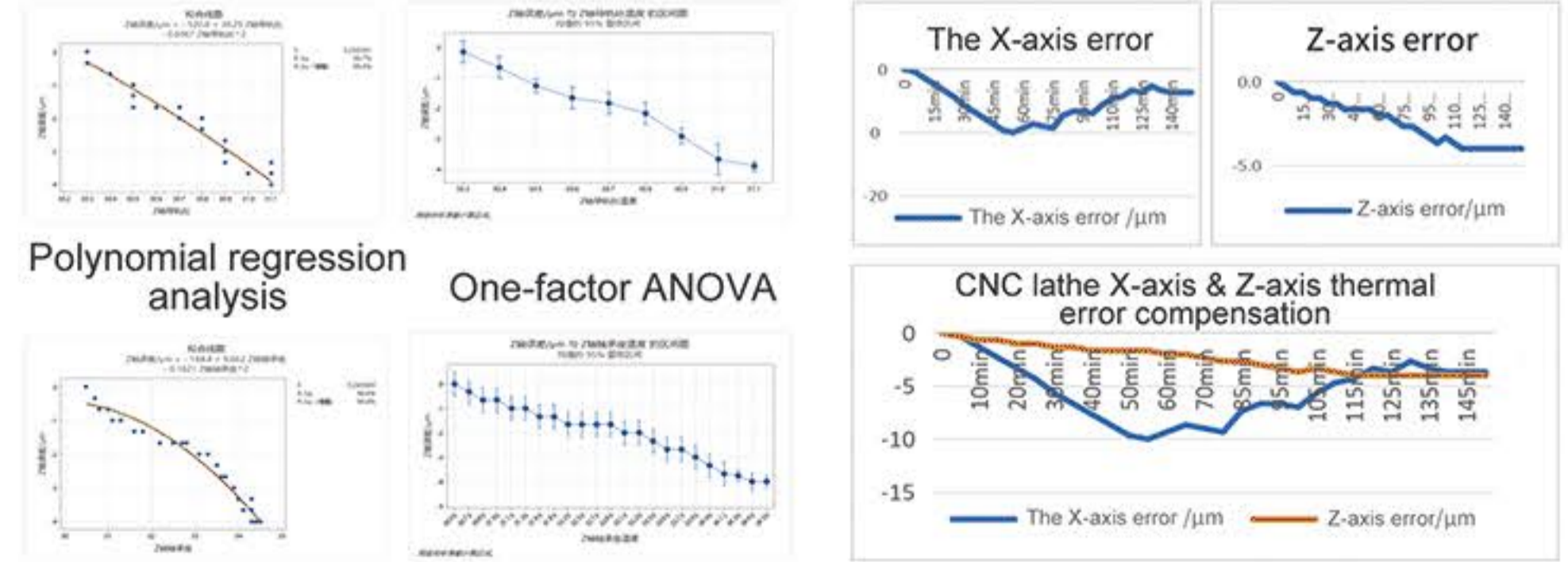
### Thermal CMS - Typical Failure Mode

- Machine tool control technology development, machine tool processing accuracy requirements are increasing day by day;
- The thermal error caused by the temperature change of the machine tool is large and difficult to
- The processing environment is complex, the electromechanical hydraulic coupling, it is difficult to isolate thermal errors;



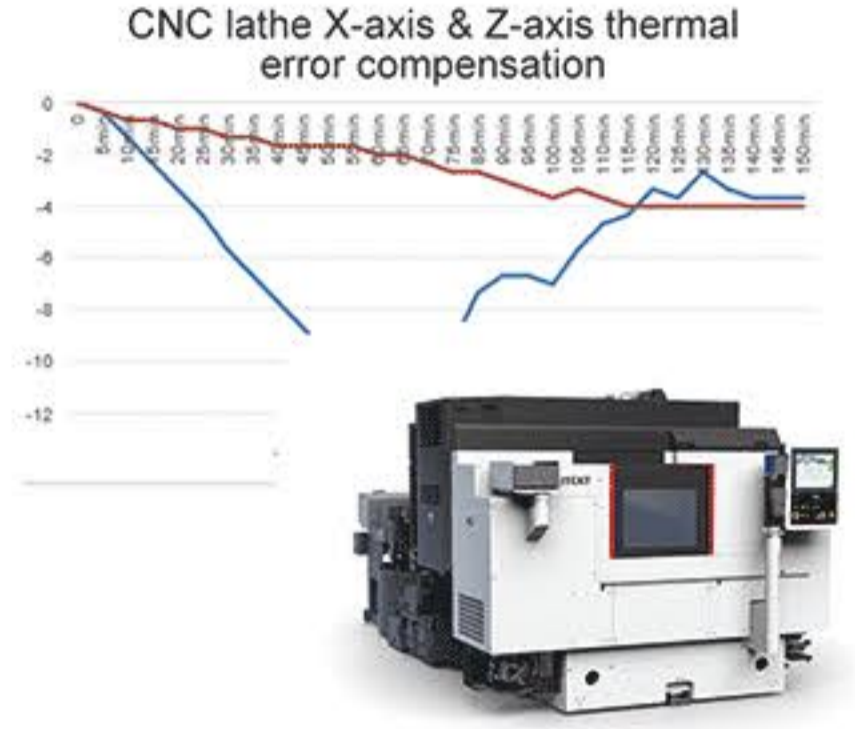
- Thermal compensation is performed based on the device XZ axis
- Thermal compensation is performed based on the device XYZ axis

### Compensation Principle and Function Realization



## Thermal Compensation Management System

### Thermal CMS - Application of the System



Index item	Adapt content
Machine tool type	Processing center, vehicle and milling compound, lathe, etc
Navar	Fanuc, Siemens, Hedeheim and other 95% + systems
Process type	Mass repeated processing, mass nested process processing, long time mold processing, small batch processing, rough / finishing and other process types
Processing scenarios	Mold processing, equipment manufacturing, large auto parts and aerospace and other long-time processing scenarios

### Hardware Configuration

Key components	System indicators	Parameter values
Deformation measurement (Head / cutter)	Temperature acquisition frequency	100-4000hz
	Cable length	1.0m
	Induction direction	±X±X+Z
Thermal temperature measurement	One-way repeatability	2.0μm2
	Measuring the measuring force of needle	Measurement: 0.49N-0.90N, 92.21gf; + Z-direction: 6.79N
	Gas source supply (working pressure)	4.55-6.0bar
The MDC acquisition terminal	Pneumatic joint	3 (extended, retracted, and optional blow)
	levels of protection	IP68

Hardware name	Function declaration	Quantity
Head / tooling instrument	Collect processing product size and tool pair tooling data	1 set
Thermal temperature measurement	Collect the spindle temperature information in real time	1 set
The MDC acquisition terminal	Data storage, analysis, and output	1 set

Note: The number of sensors depends on the number of spindle and monitoring points!

### Typical Applications & Customers

Machine tool manufacturer and automation

Auto parts industry

Construction machinery manufacturing

Aerospace

Medical device manufacturing

Transmission processing

Construction machinery





# 02 CNC Machining Monitor System

## AMS Efficiency Optimization System

### AMS - Efficiency Optimization System



- Spindle load monitoring
- Production beat improvement
- Dynamic adjustment feed
- Machine tool efficiency optimization

- Based on the power load signal acquisition, the real-time monitoring of the machine tool processing process and the power changes;
- Automatic identification of tool cutting process processing smooth stage, acceleration and deceleration stage, instead of manual monitoring!
- Automatic analysis of the stationary stage and acceleration and deceleration interval optimization strategy, optimize the feed rate, processing beat reduced by 25%!

### AMS - Typical Application Scene



- How to complete the process design by combining with the machine tool working conditions?
- How to provide the most efficient process solution?
- How to combine the process process and product quality requirements?

- The process design is focused on the CAM end, and the actual machine tool working conditions are separated;
- Processing process lacks effective monitoring, it is difficult to evaluate the effectiveness of the process;
- The overall production capacity depends on manual experience, and it is difficult to optimize the algorithm model;

### AMS - Optimization Principle and Function Implementation

Edge acquisition side	The edge sensor obtains the spindle power signal in real time			
	Power load acquisition	Signal filter conversion	Processing process learning	acceleration and deceleration process identification
Analyze the optimization side	Air-cutting process separation and optimization		Separation and optimization of the cutting process	
	Add deceleration interval	Growth and deceleration interval optimization strategy 1	Smooth cutting area	Smooth cutting interval optimization strategy 2
Adjust the control side	Real-time adjustment of feed optimization efficiency			
	Dynamic adjustment strategy is distributed to the machine tool	The machine tool adjusts the processing parameters in real time	Spindle feed adaptive adjustment	Improve efficiency record statistics

## AMS Efficiency Optimization System

### AMS - System-Scope of application



Index item	Adapt content
Machine tool type	Processing center, vehicle and milling compound, lathe, etc
Navar	Fanuc, Siemens, Hedeheim and other 95% + systems
Process type	Mass repeated processing, mass nested process processing, and other process types
Processing scenarios	CNC milling, turning, drilling, tooth surface / curved surface, etc

### Hardware Configuration

Key components	System indicators	parameter values
Power sensor	Power acquisition frequency	200Hz
	Metre fullscale	70A/2000V
	Monitoring accuracy	0.5%
The SAD conversion module	Service voltage	DC 12-24V
	One-way processing time	0.1s-30min
	Response time	0.005s
System terminal	Receive / send the interface	The RS232 serial port
	Downtime response time	300ms

Hardware name	Function declaration	Quantity
Vibration pick-up	Collect the spindle, and collect the vibration signal	1 set
The SAD conversion module	Digital-to analog conversion of edge signal acquisition	1 set
E3 operation module	Data storage, analysis, and output	1 set
HMI display terminal	System configuration and monitoring of the interaction	1 set
Other auxiliary materials	Alarm light, connecting lines and other auxiliary materials	1 set

Note: The number of sensors depends on the number of spindle and monitoring points!

### Typical industry & customers

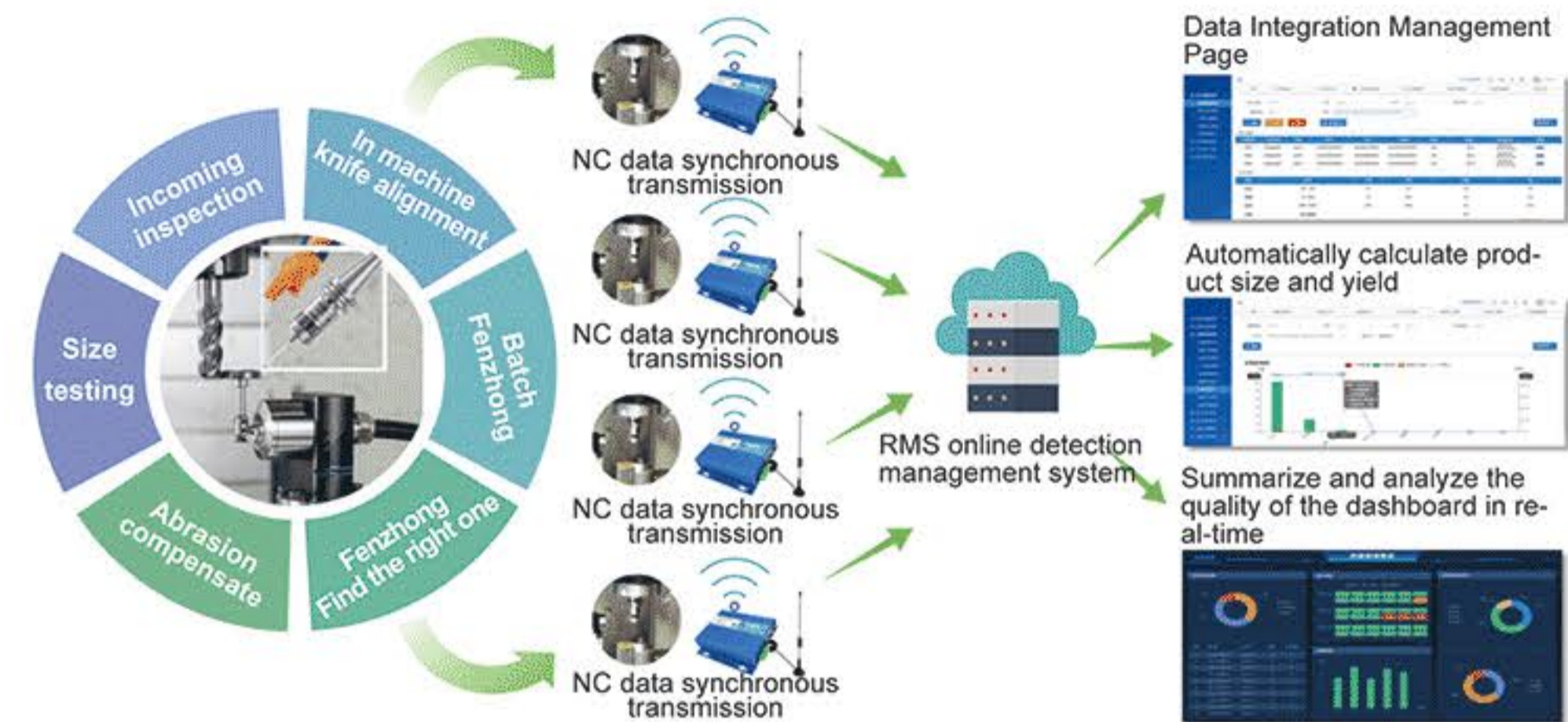
<b>Auto parts industry</b> 中国中车 CRRCC, 中国中铁, 一汽解放, 长城汽车, BOSCH, TUOPU拓普, BOSCH, 江汽集团, JAC GROUP, Allied, TXUAN, TIMKEN, FAW, SHENGLI, ZJOSZ, CBW, Continental, NINGSHING	<b>Construction machinery manufacturing</b> XCMG, 徐工集团, 台朔重工, WEICHAI, LIUGONG, TACW, 三一重工, WOODWLY, STARIVER, HITACHI	<b>Aerospace manufacturing</b> 中国航天, 中航工业, FESHER, CETC, 重庆两江工业有限公司	<b>Medical device manufacturing</b> ThermoFisher SCIENTIFIC, KANOHUI
<b>Hardware and other machining industries</b> DIYUAN, BOSSARD, Konlida, 南京汽轮机(集团)有限责任公司, 海洲铸造, LUXSHARE ICT, KUKA, 孚杰集团, 昌星模具, 平通电子科技, 平通电子科技, 平通电子科技			



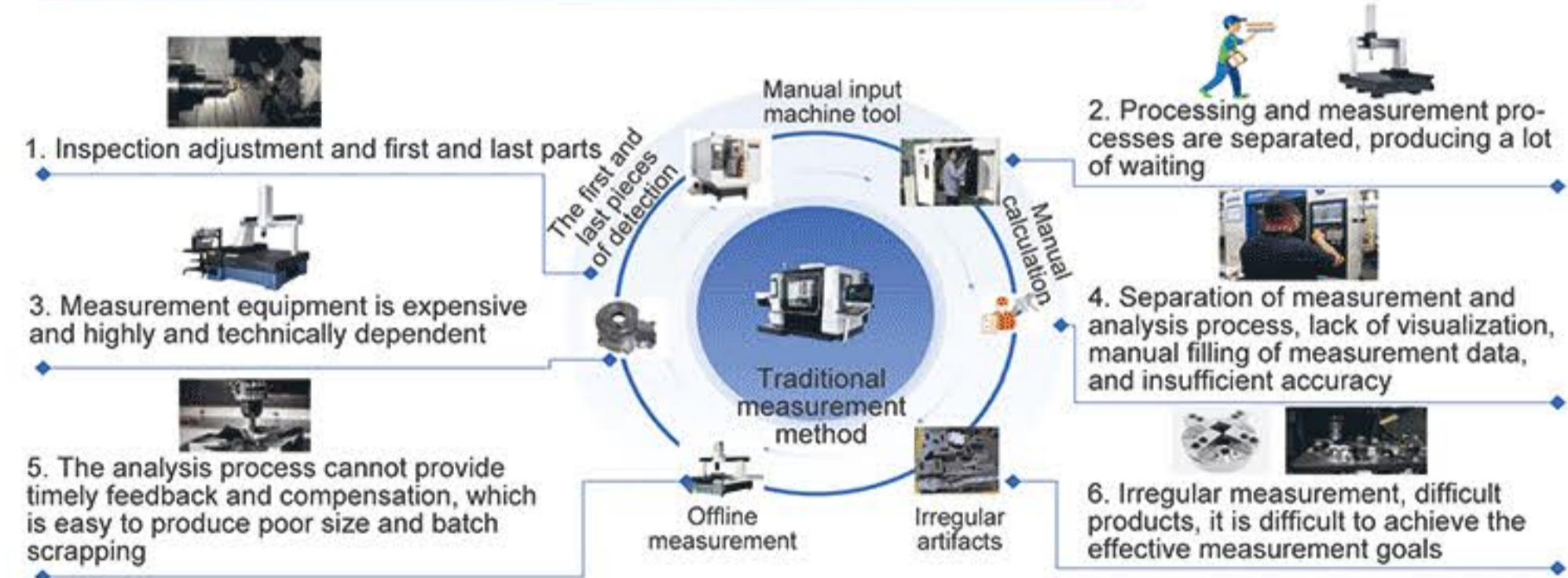
# 02 CNC Machining Monitor System

## RMS Real-time Measurement System

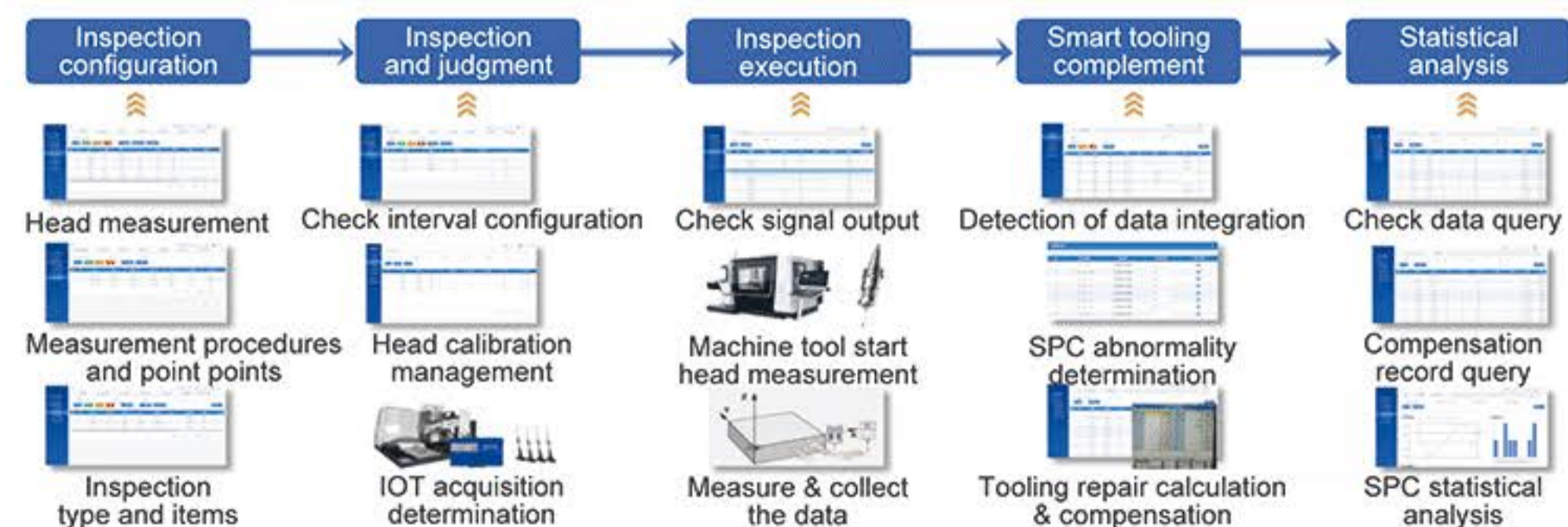
### RMS - Real-time Measurement System



### RMS - Measurement Status and Pain Points

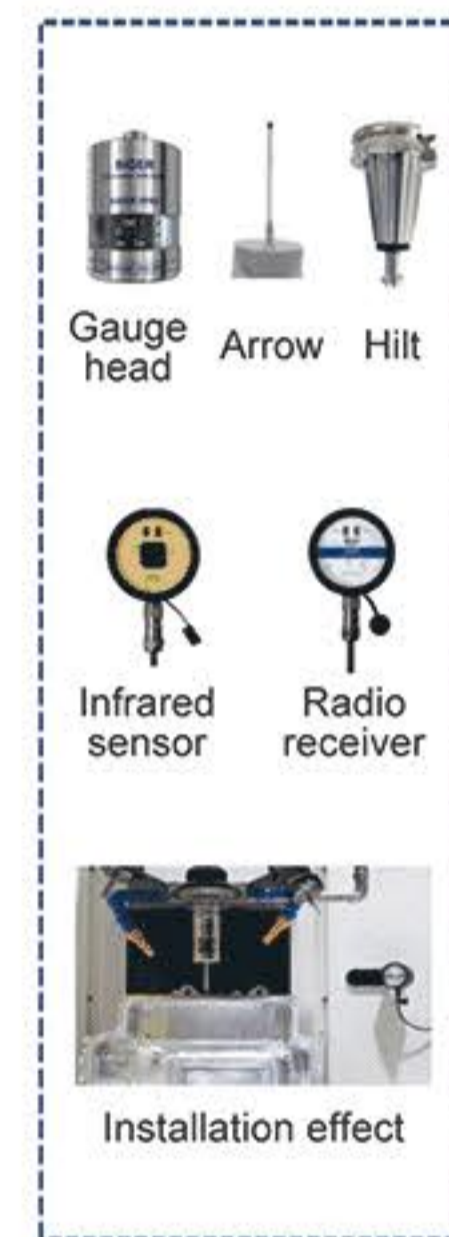


### RMS - Real-time Measurement System-Function Implementation



## RMS Real-time Measurement System

### RMS - Hardware Parameters and Selection



Parameter items	Head-IR 40 / 60	Head-RF40 / 60
Size	Diameter 40MMX70/46MMX75	Diameter 40MMX70/46MMX75
Accuracy	<1um	<1um
Battery type	2X lithium battery, LS15250	2X lithium battery, LS15250
Continuous service time of the battery	150 Days	120 Days
Transmission mode	Infrared ray	Radio
Number of channels	3 (high frequency, medium frequency, low frequency)	/
Head measuring signal transmission distance	Maximum 5 m (near 150 degrees transmission)	The maximum is 15 meters
The fastest response speed	/	5MS (Adjustable)
The fastest measurement speed	1.5 sec / measurement point	1.5 sec / measurement point
Classification of waterproof	IP68	IP68
Applicable processing scenarios	Processing center class	The lathe class
Transfer on	Voluntarily	Voluntarily
Abnormal alarm	Very few	Very few
Working temperature	0-60 degrees	0-60 degrees
Product life	Greater than or equal to 12 million times	Greater than or equal to 12 million times

### RMS- Hardware Selection of CNC Scene



Technical parameter items	1-D tooling-T26	3 D tooling-T20
Transfer type	Hardline connection transmission	Hardline connection transmission
Fiof the tooling surface	Stationary type	Stationary type
To the tooling type	Ball tooling, milling cutter, drill bit, boring cutter	Ball tooling, milling cutter, drill bit, boring cutter
The diameter of the tooling	Φ20	0.3mm~20mm
Touch plate specifications	Hard metal	Hard metal
Cable length	10m	4m
Induction direction	Z	±X, ±Y, +Z
One-way repeatability	1μm	1μm
The measuring needle triggers the force	1.5N (Installation status must be vertical)	0.9N to 2.20N, 95g to 225g (depending on the induced direction)
Protection architecture	The IP68 depth is also waterproof	The IP68 depth is also waterproof
Working temperature	-10°C to + 60°C	-10°C to + 60°C



# 02 CNC Machining Monitor System

## RMS Real-time Measurement System

### RMS - Hardware Parameters and Selection



Number	Technical parameter items	LaT-LT 25
1	Product model	LT25
2	Transfer type	Hardline connection transmission
3	Weight	1250g
4	Cable length	1.0m
5	Induction direction	±X±X+Z
6	One-way repeatability	2.0µm2
7	Measuring the measuring force of needle	XY plane (low force measurement): 0.49N,50.25gf; XY plane (high test force): 0.90N,92.21gf; The + Z direction: 6.79N,692.88gf
8	Gas source supply (working pressure)	Maximum 6.0bar minimum 4.5bar
9	Pneumatic joint	3 (extended, retracted, and optional blow)
10	Install	M4x50mm Long
11	Working accuracy	±1µ
12	Processing beat	2 Seconds
13	Processing scenarios	Vehicle and milling compound, medium and large machine tools, etc. (X axis above 200, maximum turning diameter 400)
14	Head testing protection	Pneumatic protection cover fully protection
15	Tooling cleaning	Clean the chips on the measuring needle of the integrated air blowing system
16	Levels of protection	IP68

### RMS - Laser Tooling Setter Hardware Parameters



Number	Technical parameter items	Laser tooling-LAT 25 to 500
1	Product model	LAT series (customizable)
2	Transfer type	Hardline connection transmission
3	To the tooling type	Non-contact pair tooling
4	The diameter of the tooling	Φ ≥0.03mm
5	Weight (including disc needle)	/
6	Cable-to-interface (specification)	Power supply is 5-core / 24VDC
7	Cable-to interface (length)	/
8	Cable-to Interface (Electrical connection)	Opto-isolators (photocoupled formula)
9	One-way repetition accuracy	2σ±0.1µm
10	Levels of protection	IP68
11	Working temperature	From + 5 °C to + 60°C

3

## Digital Plant System

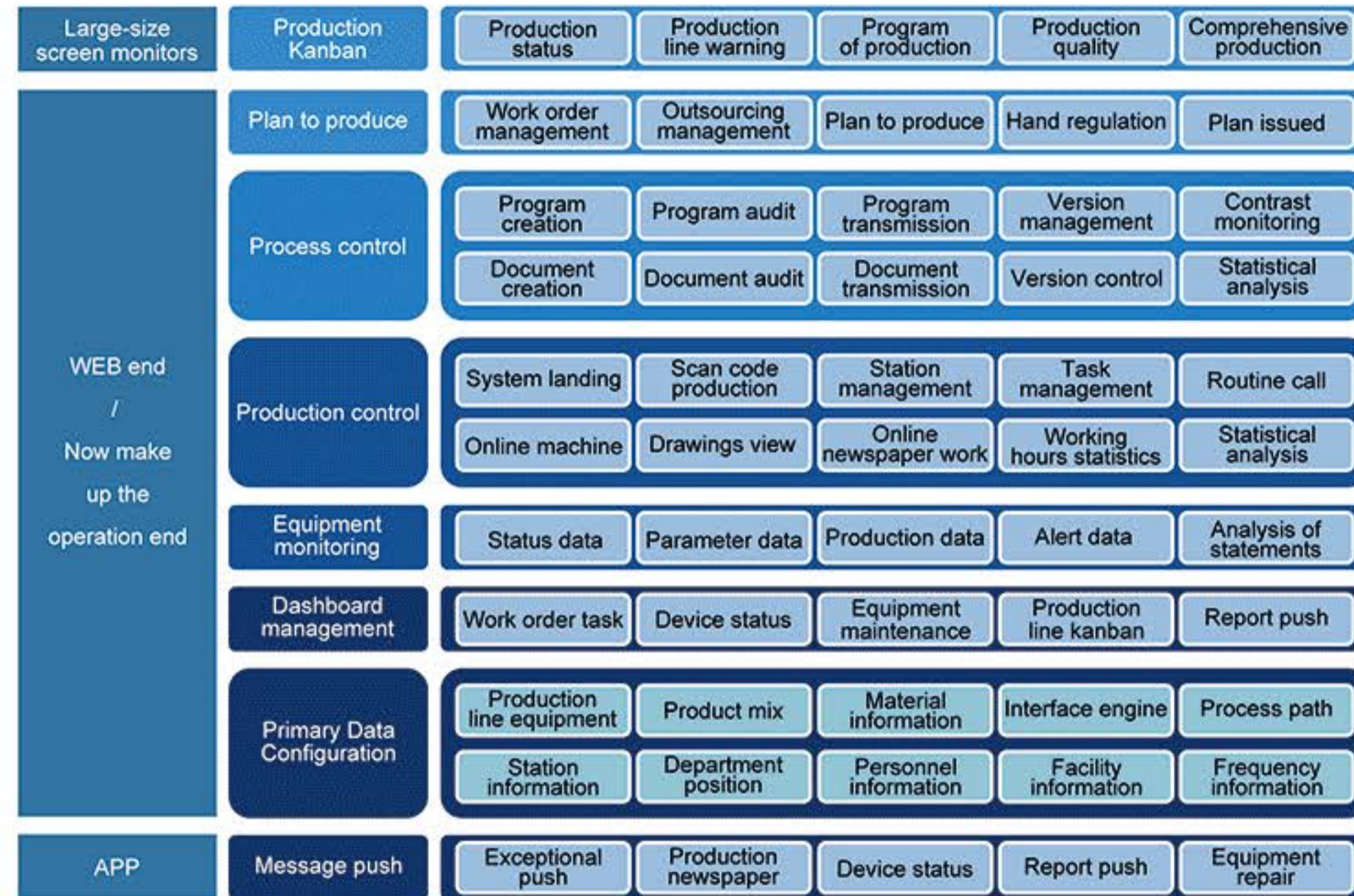
- MES Manufacture Executive System ..... 21
- CAPP Production Auxiliary Management ..... 22
- Quality & Traceability Management System ..... 23
- EAM Enterprise Asset Management ..... 24
- WMS Warehousing Logistics Scheduling System ..... 25
- FMS Flexible Line Information System ..... 26



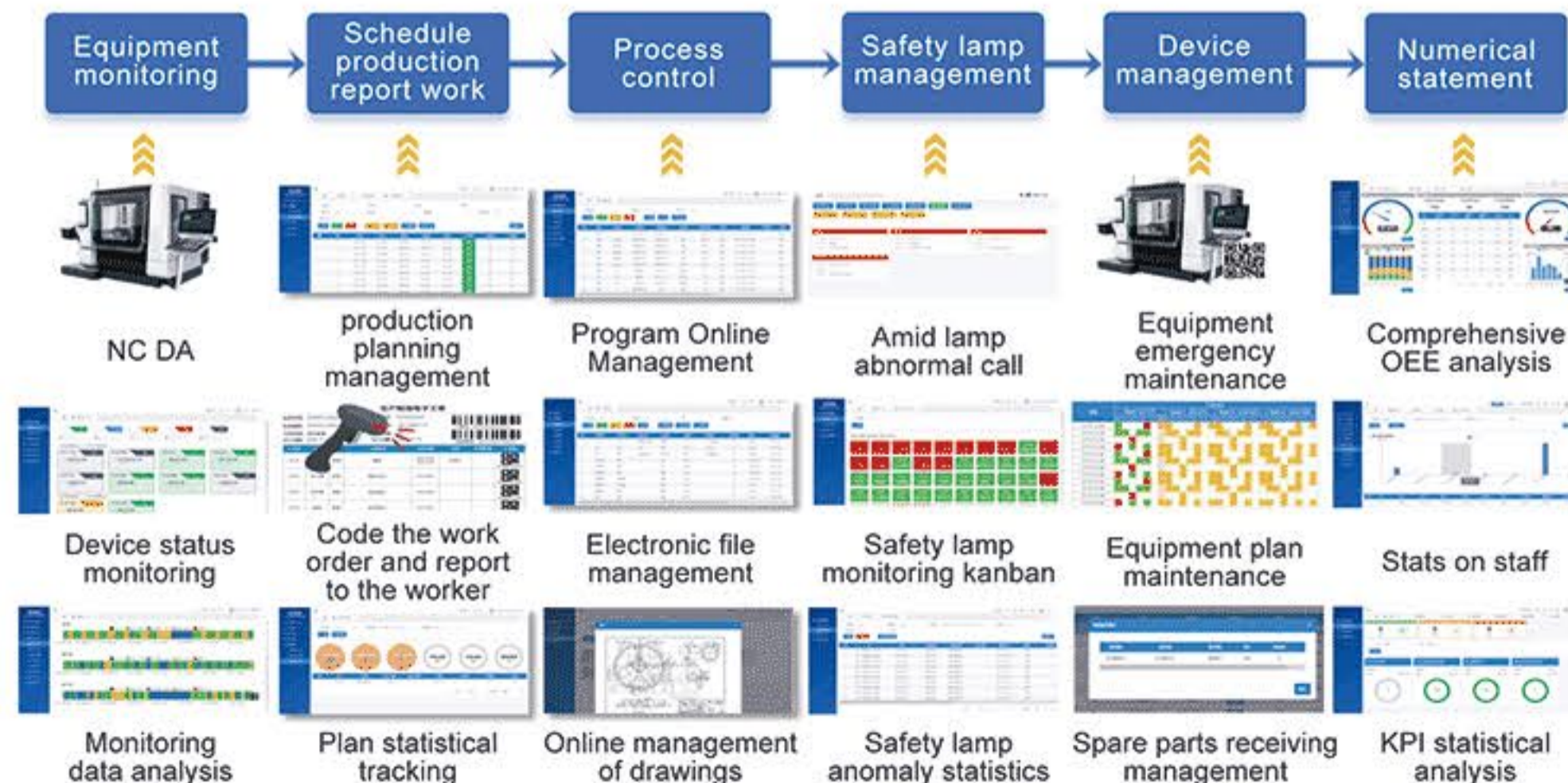
# 03 Digital Plant System

## MES-Manufacture Executive System

### MES-Digital Factory Solution

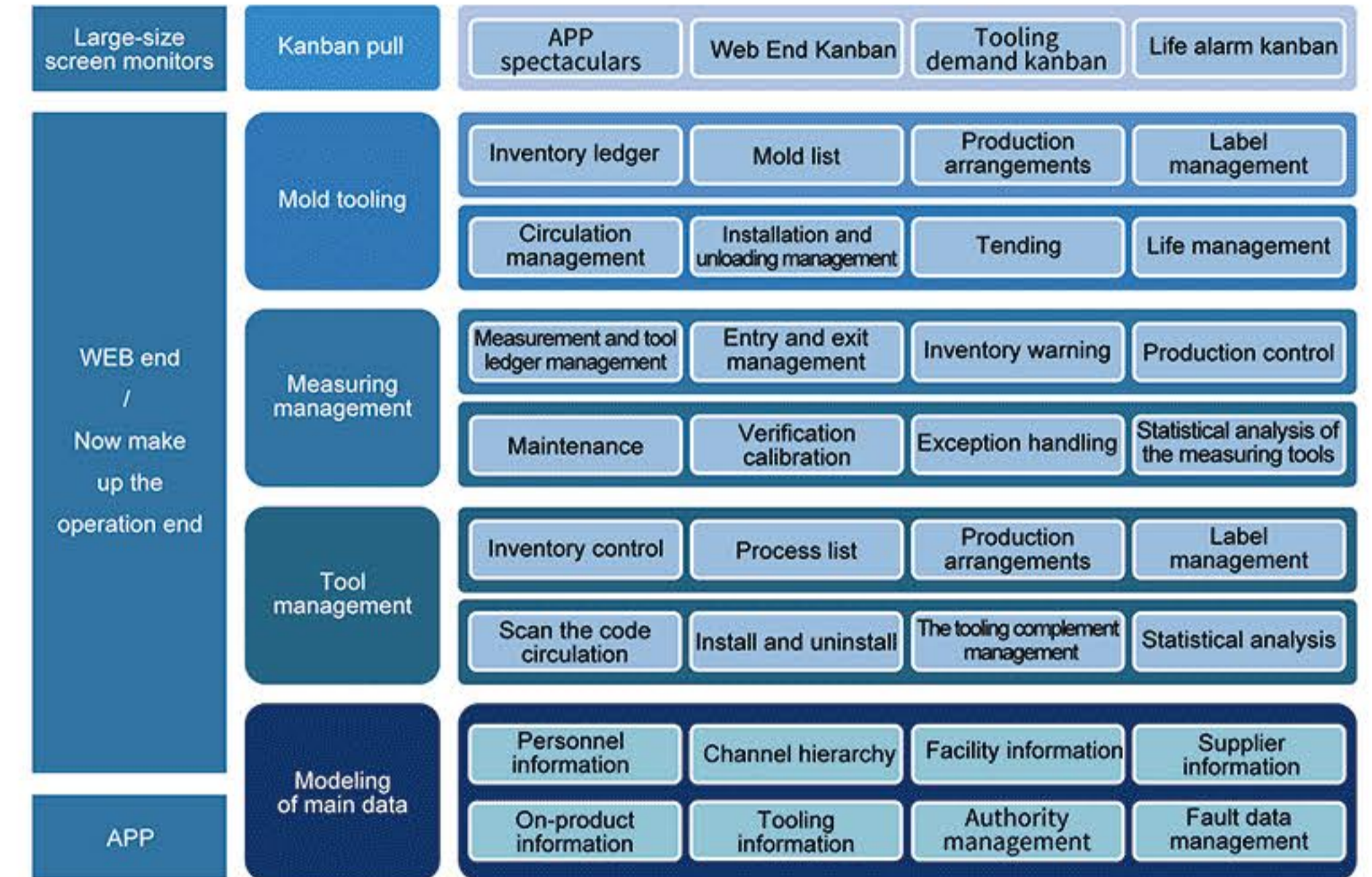


### MES- Flow Charts of Digital Factory

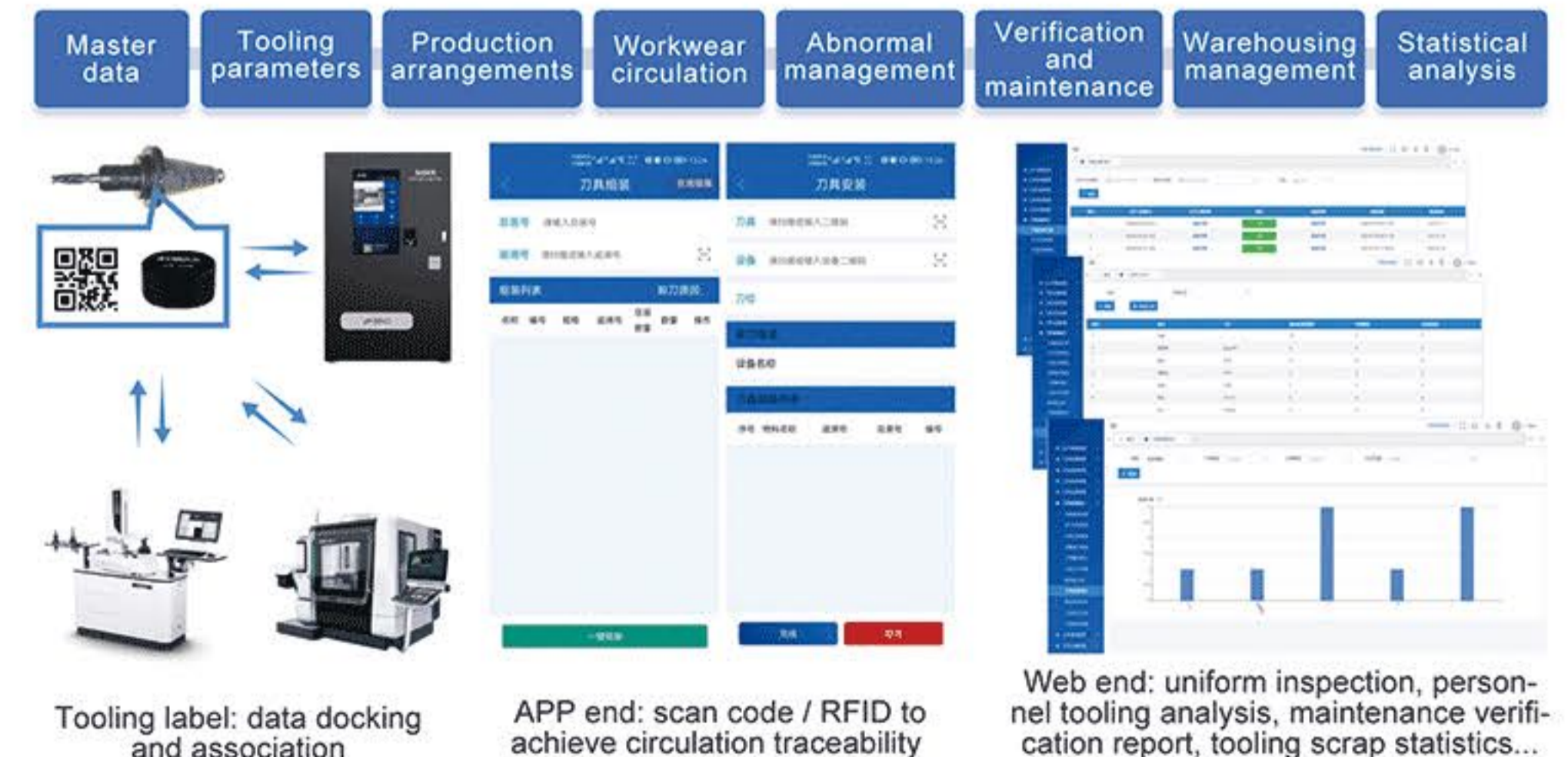


## CAPP- Production Auxiliary Management

### CAPP-Tooling Fixture / Tool / Mold / Measuring Tool, etc



### CAPP-Flow Charts of CAPP





# 03 Digital Plant System

## Quality & Traceability Management System

### Quality & Traceability Management System Matrix

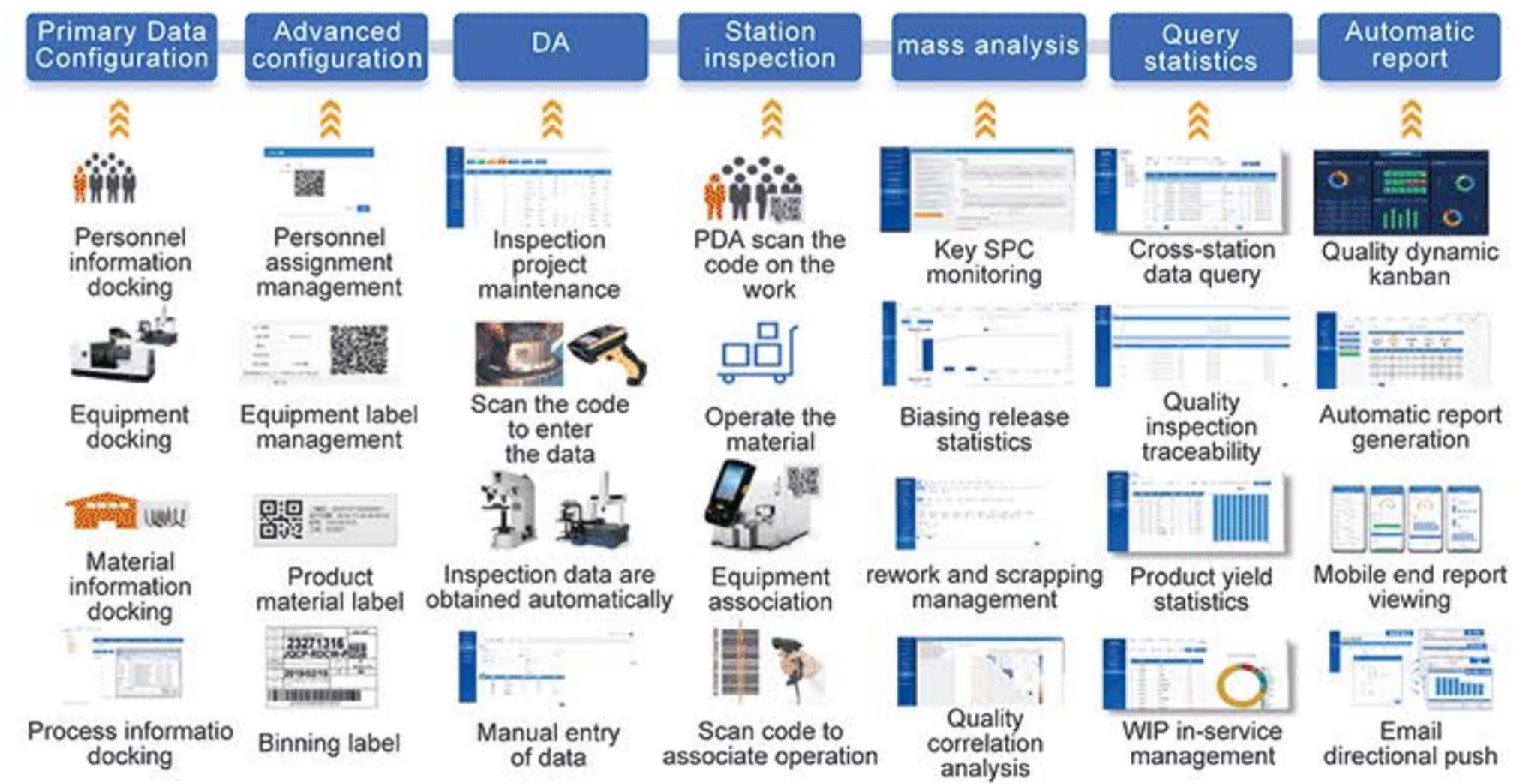
Large-size screen monitors	Kanban pull	CPK supervisory control	Retroactive coverage monitoring	Quality management kanban	Production line qualified kanban
WEB end / Now make up the operation end	Query statistics	Production data traceability	Retracing of reporting data	Test data traceability	Material frame frame traceability
		WIP in the statistics	Traceability of qualified statistics	Entry and exit statistics	The FTQ statistics of the production lines
	Quality control	acceptance standard	SPC supervisory control	Quality light	Rework scrap
	Data collection association	NC data	PLC data	Textual data	Picture data
		Scan code association	Database docking	Agreement communication	Test results data
Advanced configuration	Process path	Code rule	Full box number	Personnel skills	
APP	Modeling of main data	Personnel information	Channel hierarchy	Facility information	Supplier information
		On-product information	Material information	Authority management	Product BOM management

## EAM-Enterprise Asset Management System

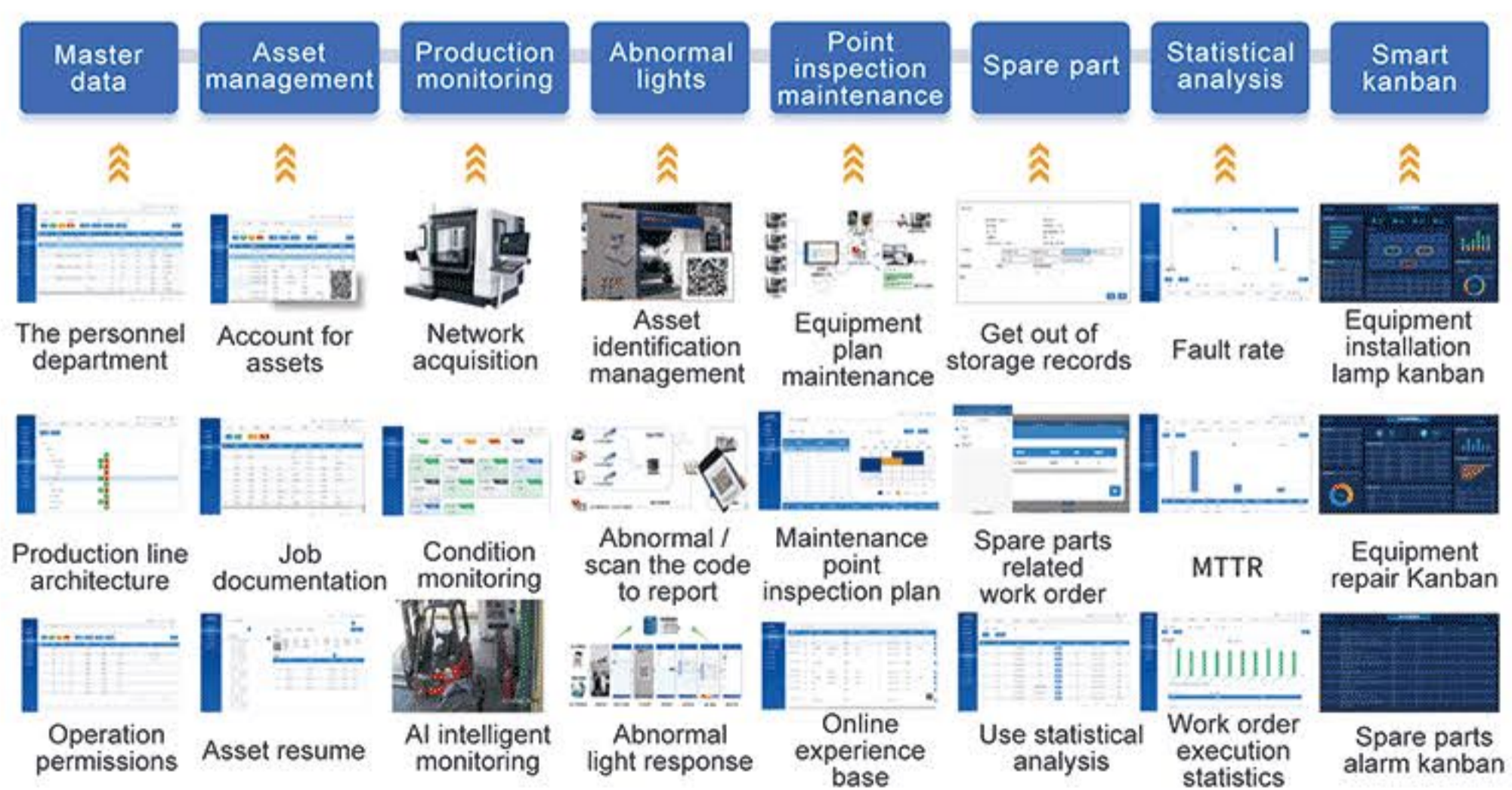
### EAM-Enterprise Asset Management System Function Matrix

Large-size screen monitors	Kanban pull	APP spectaculars	Web End Kanban	Workshop equipment kanban	Workshop spare parts kanban	
WEB end / Now make up the operation end	Statistical analysis	Work order data statistics	Maintenance effectiveness	Maintenance on time rate	Asset cost management	
	Asset inventory	Account for assets	Inventory plan management	Check the difference analysis	Inventory approval management	
	Spare parts management	Spare information management	Entry and exit management	Spare parts inventory warning	Advanced first-out management	
	Plan maintenance	Maintenance status Kanban	Maintain work order management	Maintenance arrangement management	Predictive maintenance	
	Maintenance management	Emergency maintenance	Abnormal report	Failure data collection	Reliability analysis	
	Asset management	Filing management	Asset maintenance inventory	Asset into solid transfer	Asset approval management	
	APP	Modeling of main data	Personnel information	Channel hierarchy	Facility information	Supplier information
			On-product information	Spare parts information	Authority management	Fault data management

### Flow Charts of Quality Traceability Management System



### EAM-Flow Charts of Enterprise Asset Management System





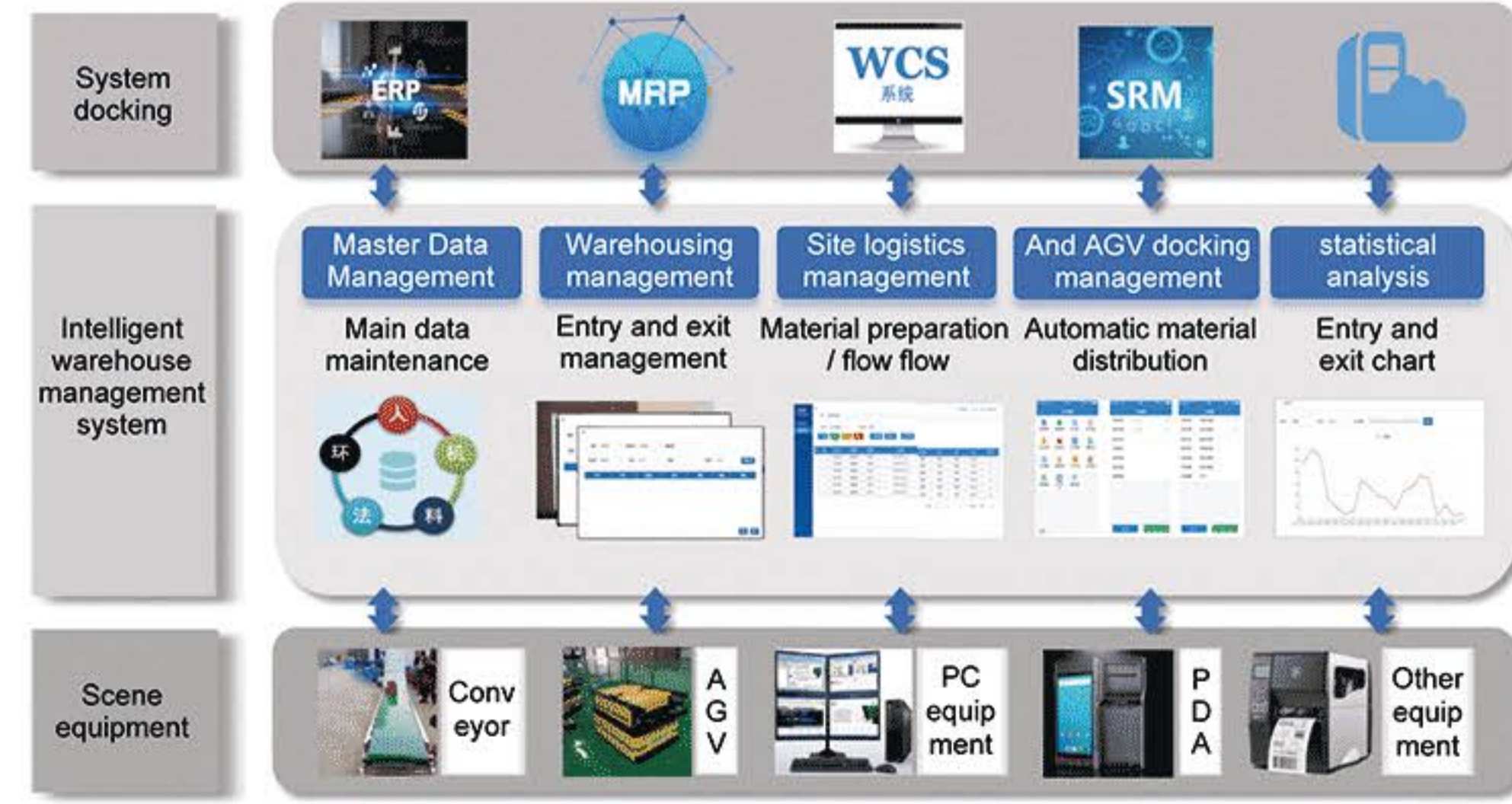
# 03 Digital Plant System

## WMS-Warehousing and Logistics Scheduling System

### WMS-System Function Matrix

Large-size screen monitors	Kanban pull	Entry and exit kanban	Logistics status kanban	Logistics kanban	Spare parts alarm kanban
WEB end / Now make up the operation end	statistical analysis	Summary of warehousing	Logistics task progress	Circulation state	Inventory taking summary
	Logistics scheduling	Material preparation	AGV abutment	Delayed early warning	Call material distribution management
	Outbound management	Outbound management	Scan code out of the warehouse	Get associated	Advanced first-out management
	Warehouse management	Receive return	Storage change	store adjustment	Inventory allocation
	Warehousing management	Warehousing management	godown entry	The material label	Warehousing management
	Warehouse setting	Warehouse information	Storage information	Warehouse type	Storage type
	Modeling of main data	The personnel department	Channel hierarchy	facility information	Supplier information
APP	on-product information	Operation query	authority management	parameter setting	

### WMS-System Construction Framework

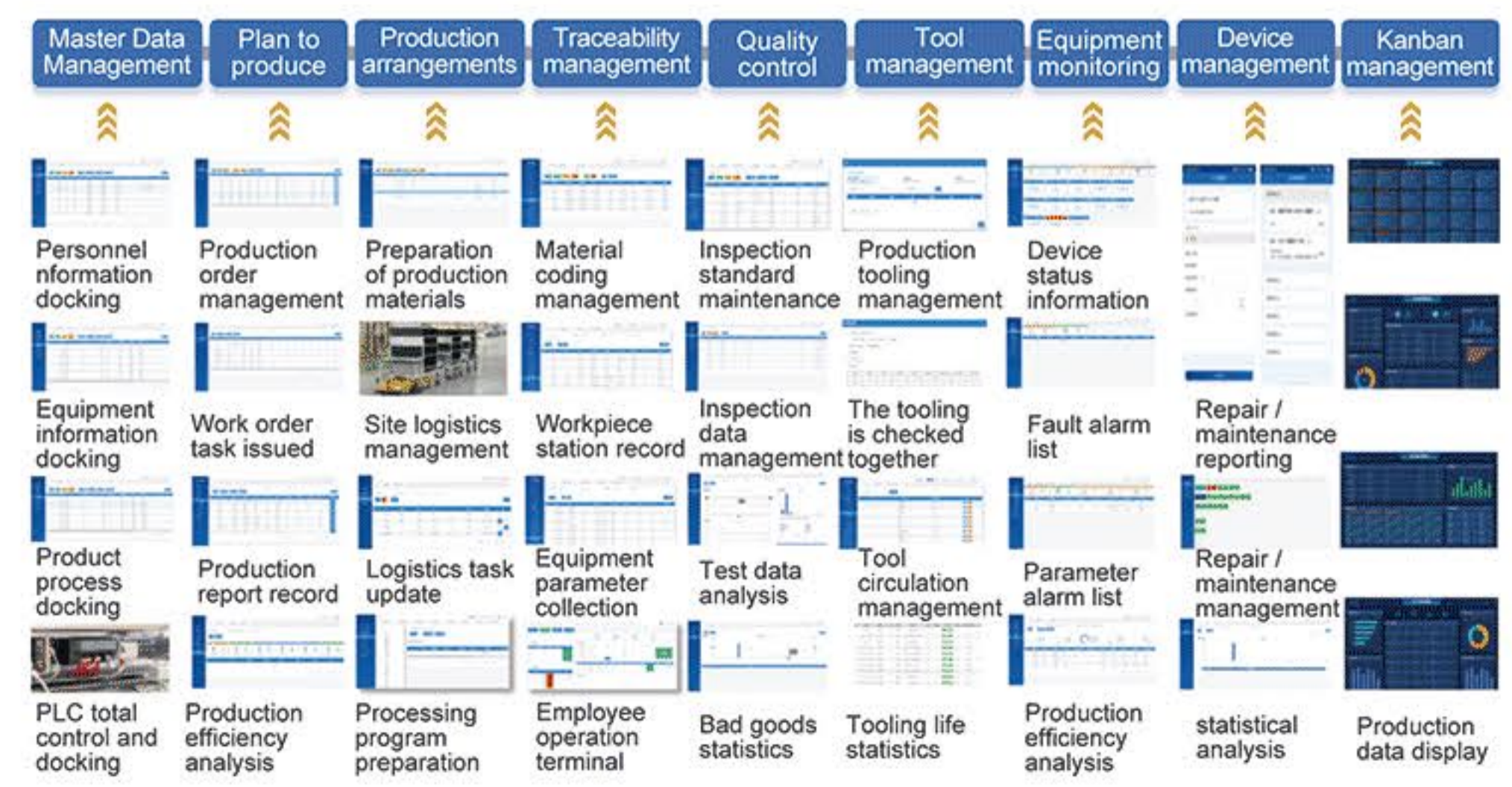


## FMS Flexible Line Information System

### FMS - Function Matrix

Large-size screen monitors	Production Kanban	Production information Kanban	Production line warning kanban	Production plan Kanban	Production kanban	Production line equipment kanban
WEB end / Now make up the operation end	Schedule production report work	Work order management	Work order issued	Production newspaper	Automatic row	Production bottleneck forecast
	Production arrangements	Material preparation	Logistics transportation	Program preparation	Tooling preparation	The tooling preparation
	Quality control	Inspection data management	Test data analysis	Bad goods statistics	Automatic inspection management	Suspicion processing
	Traceability management	Associated work order	Report to the station	Station management	Task management	Routine call
	Equipment monitoring	Online error prevention	Manage of tooling fixtures	Forward query	Reverse query	Statistical analysis
	Device management	Status data	Parameter data	Production data	Alert data	analysis of statements
	Tool management	Maintenance management	Maintenance management	Point inspection management	Spare part	Statistical analysis
	Dashboard management	Tool parameters	Tool list	Qi-set examination	Tool circulation management	Tool data display
	Main data docking	Tool compensation management	Equipment tooling query	Tool distribution query	Tooling life statistics	Tooling status monitoring
	APP	Work order task list	Device status kanban	Equipment repair Kanban	Production line kanban	Report push
	Production line equipment	Product mix	Material information	Interface engine	Process path	
	Station information	Info on tooling fixtures	AGV abutment	MES system	PLC General Control	
	Message push	Device exception push	Production line early warning push	Quality problem push	Production report push	Equipment repair

### FMS-System Business Flow Chart





# FOUR

# 4

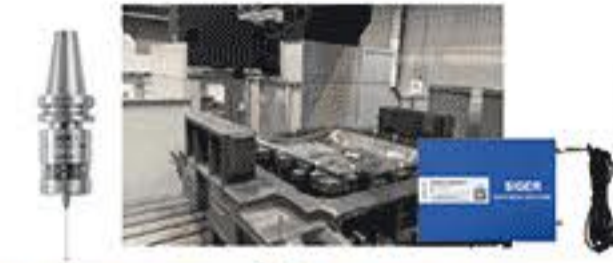
## Mold Precision Optimization System

Mold Precision Optimization System ..... 28

# 04 Mold Precision Optimization System

## ■ Mold Precision Optimization System

### Mold Precision Optimization System



The processing accuracy is improved

AB mode accuracy optimization

The trajectory optimization simulation is true

Effectively shorten the delivery period

Machine tool, measuring system, IOT equipment, i-NCweb system and algorithm engine cooperate with each other to achieve the goal of optimizing the compensation for processing process based on the measurement results, so as to reduce the cost of mold repair;

AB combined mode optimization based on real-time optimization of CAM trajectory: the trajectory optimization of B module performs adaptive optimization calculation based on the error analysis results of A module and AB module assembly relationship

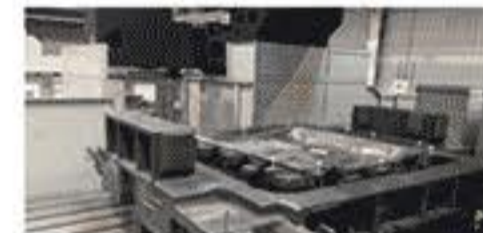
### Mold Precision Management Status and Pain Points



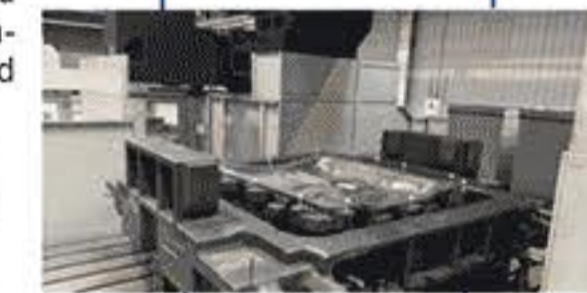
01 Long time processing, movement leads to thermal expansion and cold contraction of wire rod: processing running-in and environmental factors lead to deformation of processing size



03 Due to the loss of accuracy, excessive design of coarse, semi-finishing, finishing and other processes, resulting in processing redundancy and long processing cycle

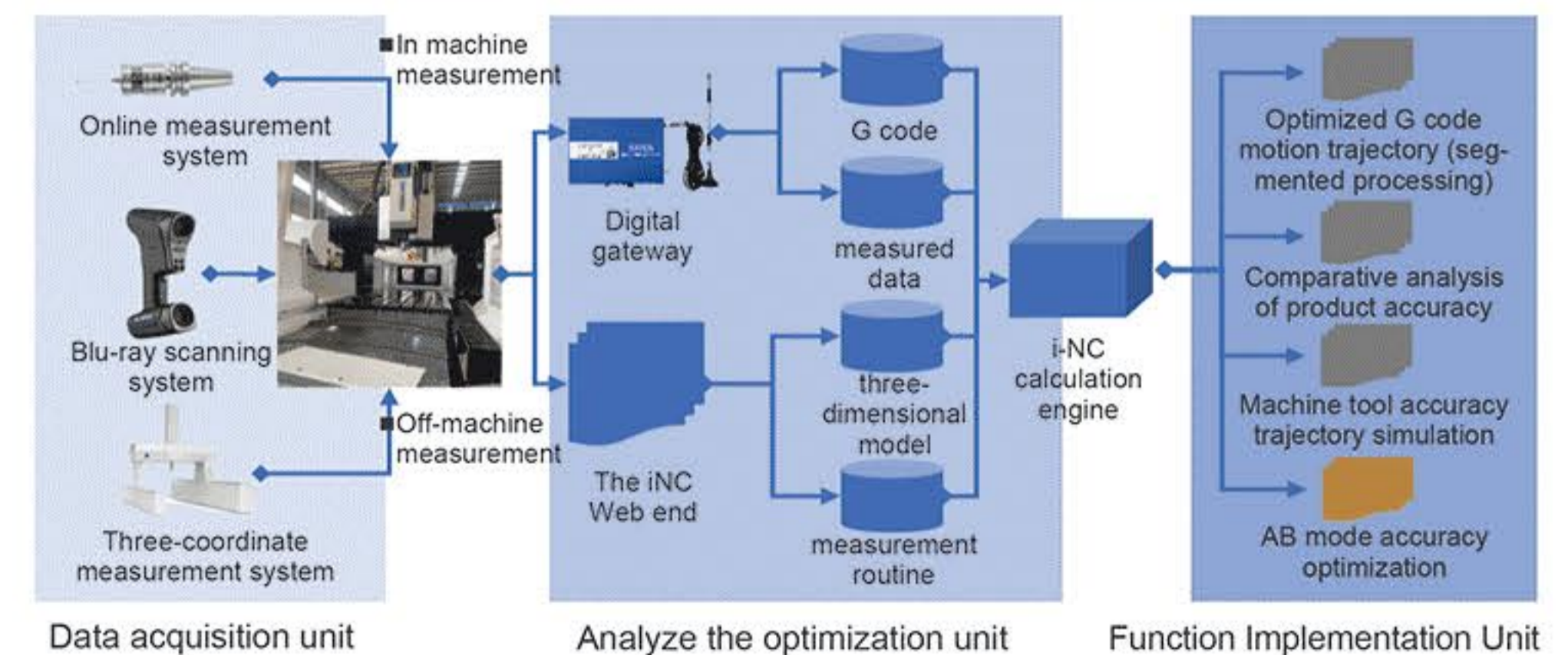


02 Product heavy load leads to the deformation of the machine tool: large parts weigh dozens of tons, and the setting of the original coordinate system of the machine tool shifts due to the influence of weight



04 Based on the absolute drawing size design trajectory superposition error: AB mode superposition error, resulting in the AB mode can not effectively fit the mode, need manual depth to participate in the repair

### Mold Precision Management Function Implementation





# FIVE

# 5

## Typical Customer Case Examples

Industry 4.0 Example

## 05 Typical Customer Case Examples

### ■ SIGER-Industry 4.0 Example I

#### Precision Machining Digitalization Case

This customer is the world's leading bearing manufacturing enterprises, business throughout 130 countries in the world, producing more than 500 million bearings every year, sales network all over the world. At present, it has 200 branches, 80 manufacturing companies, 41,000 employees and 8,000 agents and dealers;

The implementation module involves quality management, traceability management, equipment management, lamp management, KPI management, kanban management and tool monitoring. Combined with the whole process of production equipment networking and system docking, the online collection, correlation traceability and statistical analysis of process data are realized, and transparent management through visual kanban.

Master data	Production control	Quality control	Traceability management	Product release	Store management	Preset	KPI manage	Kanban management
Facility information	Equipment monitoring	Inspection data collection	Material label management	Product release plan	information maintenance	tooling information management	Index setting	Large quality screen display
The personnel department	APS scheduling	Check card management	Operation report management	Release raise hands management	Storage information maintenance	Spare parts tooling ledger	Indicator auto association	Workshop screen kanban
Production line level	Safety lamp management	Quality statistical analysis	In product management	Release process management	Customer information	Spare parts are distributed and recycled	Action plan specified	Channel level kanban
Material products	Device management	Measuring management	Retroactive query	Release task statistics	Entry and exit records	Distribution and recycling of consumables	KPI Kanban tracking	Mobile end report viewing

Quality large screenlarge



Maintenance morning meeting signboard



Equipment maintenance information board



New product release





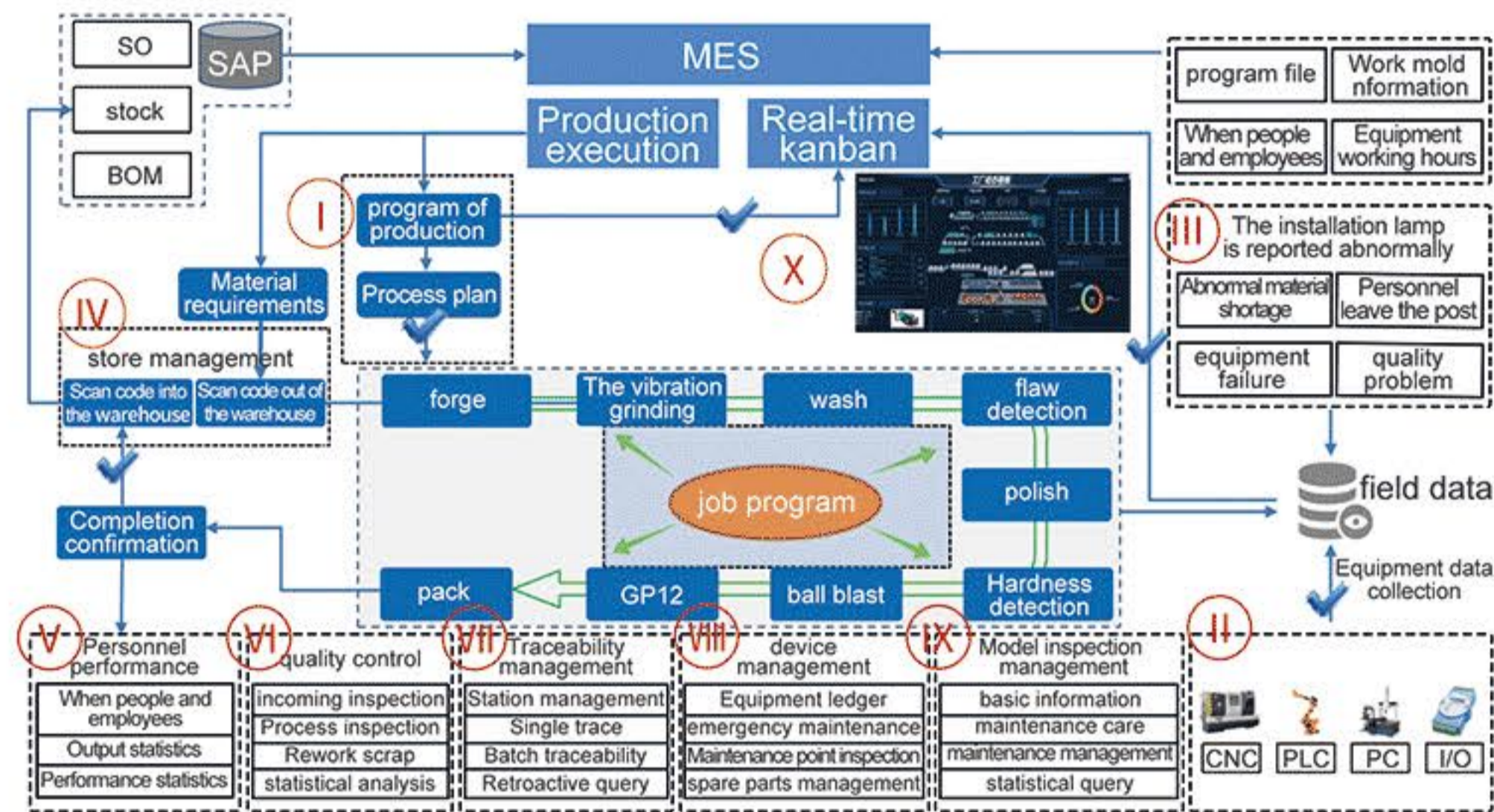
# 05 Typical Customer Case Examples

## ■ SIGER-Industry 4.0 Example II

### Precision Machining Digitalization Case

Headquartered in Ningbo, Zhejiang province, it has a R & D center supporting global projects and leading technology. It has power chassis system, trim system, electronic system and other business units, and mainly produces five series of products;

Top supply delivery products, unable to the precise traceability control of abnormal production process, and tesla, geely customers require 1 set of quality traceability system, make the supply of all products have production process data (people, machine, material, method, ring, test), and can be in the background independent report query such as quality qualified rate, SAP storage, abnormal rate.

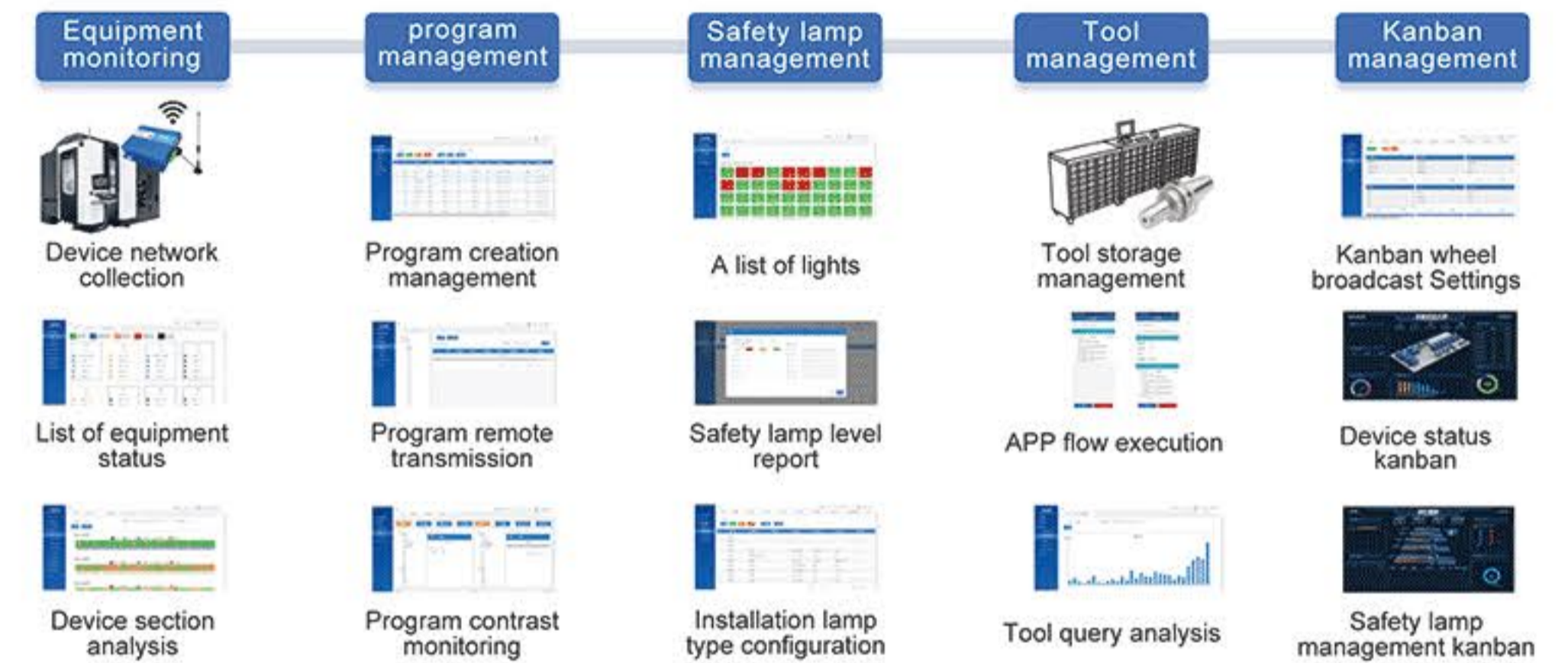


Product module	Major function	Improve the effect
DA	manual input	Automatic acquisition of output, status, fault, equipment and plan data, accurate data, reduce the workload of 2 people;
quality control	Test data were collected online and statistically analyzed	The whole process of quality data automatic analysis, automatic generation of charts, real-time analysis of quality data, abnormal automatic alarm, response efficiency increased by 90%
Traceability management	Collect production submission data online based on material label association process information	Automatic CCD identification of rough material number, laser marking code, automatic scanning of parts QR code, automatic collection of equipment parameters, automatic packaging, the
Report to work management	Manual statistics	Combined with traceability, equipment data automation statistics and reporting, 100% accurate.
Kanban management	Static kanban handwritten display	Man, machine, material, method, ring real-time kanban, pull the production factors, to achieve seamless cooperation.

## ■ SIGER-Industry 4.0 Example III

### Bosch Digital Factory

Bosch Auto Parts (Suzhou) Co., Ltd., founded in 1999, is the business place of four Bosch product divisions. During the manufacturing process, The lack of real-time monitoring in the production process leads to the lack of guarantee of the utilization rate of equipment, and the abnormal on-site production cannot be responded to in time, which greatly affects the production efficiency, and the lack of dynamic visual display, so the construction of digital intelligent factory.



Product module	major function	Improve the effect
Equipment iot	Equipment networking and data collection, equipment status monitoring, efficiency analysis, output analysis	Based on equipment networking, collect equipment status data, monitor equipment status in real time, improve management efficiency; automatic report statistics and regular email push
program management	Program online centralized management, remote transmission, program online monitoring	Improve the program transmission efficiency by more than 90%, save the field walking time of process personnel by 1h / day, and reduce the risk of USB interface damage
Tool management	Tool parameter configuration, tool storage and circulation management	Establish an online tool management platform, trace the whole process of tool circulation, reduce the tool inventory cost by 10%, and accurately manage the tool flow direction
Safety lamp management	Production abnormal online call, smart-watch message push reminder	Improve the field abnormal response efficiency, and greatly reduce the unplanned shutdown time
Kanban management	On-site large-screen visual display, watch board rotation Settings	Kanban pull, realize the site visual management, enhance the image of the factory