

Production Grand Design of Monozukuri (Manufacturing) Reforms

-JVCKENWOOD Nagano Corporation
Automated Production of Car Navigation Systems-

Progress Report on “VISION 2023: Change for Growth”

Yoshio Sonoda
Director of the Board, Managing Executive Officer, Chief Technology Officer (CTO)

March 29, 2022

1. Production Grand Design of Monozukuri (Manufacturing) Reforms
2. Returning to Domestic Production (JVCKENWOOD Nagano Corporation)
3. Manufacturing Security Measures

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Facilities (Japan)

 Principal business centers

 Principal manufacturing sites




Hachioji Business Center

 Mobility & telematics equipment




Hakusan Business Center

 Land mobile radio, video surveillance equipment, etc.



Head Office & Yokohama Business Center

 Projector, video cameras, AV accessories, home audio, etc.

 Optical components




JVCKENWOOD Yamagata Corporation

 Communications equipment and professional wireless products



JVCKENWOOD Nagaoka Corporation

 Medical equipment, medical image display monitors
In-vehicle substrates



Yokosuka Business Center

 CD and DVD discs (prerecorded)



Kurihama Business Center

 D-ILA devices, laser diodes, etc.



 Optical components, projectors



JVCKENWOOD Nagano Corporation

 Mobility & telematics equipment

Facilities (Global)

-  Operating companies: 17 sites
-  Manufacturing companies: 5 sites



JVCKENWOOD Optical Electronics (Thailand) CO., Ltd.

JKOT



JVCKENWOOD Electronics (Thailand) Co., Ltd.

JKET



JVCKENWOOD Electronics Malaysia Sdn. Bhd.

JKEM



PT. JVC Electronics Indonesia

JEIN



Shanghai Kenwood Electronics Co., Ltd.

SKE

JVCKENWOOD Group: Redefining Company-wide Technology Development Functions

■ Prospective Creation Research Laboratory

A cost center aiming to become a “**profitable laboratory**” as a specialized unit that conducts open-minded research and studies not bound by business domains, always focusing on the future 10 years from now

→ Introducing the OODA* process

* OODA: Observe, Orient, Decide, Action

- By continuously implementing intellectual creation activities that are not influenced by business domain, we are preparing for the future as a group that uses technology to solve social issues
- Further strengthening the balance between income growth and business protection by adding a highly skilled intellectual property group and increasing the use of development products as industrial property rights

Key themes

- Solve social issues
- Enhance incubation
- Upgrade intellectual property and skills

Security
Information confidentiality
Ensuring robustness
Tamper detection

Inference-type AI
High-precision data analysis
Automatic processing

5G/6G
Ultra high speed
High capacity
Low latency

UX/UI
Human center
Visibility
Notification & warning tones

Biological information
Certification
Mind and body safety
Social coexistence

Location information
Time
Space
Reconstruction

JVCKENWOOD Group: Redefining Manufacturing Policies

■ Engineering Innovation Department

A head office function that serves as a **manufacturing skill group** linked to business domains, responsible for design environment reform, advanced skill acquisition regarding production technology, quality control functions, and strategic material procurement

→ Thorough implementation of the PDCA* process

* PDCA: Plan, Do, Check, Action

- It is time to review the changes in the environment of overseas production, which has expanded in search of inexpensive manufacturing labor costs, and reexamine the possibility of local production for local consumption with a good balance between revenue and profit acquisition in our business
- Standardization of design output unifies manufacturing site input conditions. By minimizing individual conditions, it is possible to achieve both automation and manual assembly through direct work
- Strategic partnerships with suppliers of mechanical materials such as molds, sheet metal, resin molding, and coatings. Enhance social value by strengthening business relationships with local suppliers. By increasing our contribution to the SDGs and ESG and providing added value such as preparatory processing to suppliers, we will also contribute to the promotion of automation throughout the Company's production processes

Total cost reduction

Not single direct cost improvements for each field, business, or product group, but improvements from the perspective of total efficiency, including indirectly at the company-wide level.

Overall optimization eliminates undesirability, waste, and unevenness, minimizing the redundancy caused by individual optimizations

JVCKENWOOD Group: Manufacturing Grand Design

- **Accelerate a return to Japanese production for the Japanese market, the Company's earnings base**
 - The Mobility & Telematics Services Sector product group will return to Japan as soon as possible
 - Transfer of production of JEIN*¹ commercial car navigation to JK Nagano -> Design reform based on automation
 - Promote RFQ*³ responses at JK Nagano from new orders for SKE*²-produced OEM supplies
- **Optimize the layout of manufacturing sites in consideration of in-house design and total production capacity, while at the same time aiming to reorganize manufacturing sites as a group standard by breaking away from the individual optimization of each division**
 - Accelerate consolidation and reorganization of Japanese and overseas sites
 - Establish a JVCKENWOOD Group production policy to move away from the individual optimization tied to each division
 - Aim to be the core of S&OP*⁴ management, itself aiming to follow a production layout in line with the business portfolio strategy in the New Medium-Term Management Plan and reduce inventories to improve profitability
- **Establish and implement a restructuring of manufacturing sites based on the cash allocations by 2023 linked to VISION 2023**
 - Estimate investment plans through 2025 and redevelop and redefine manufacturing sites
 - Implement design reforms as well, and standardize the input information sent to manufacturing sites

Strengthen cost competitiveness

Strengthen production capacity

New Medium-Term Management Plan linked investments

*1: PT. JVC Electronics Indonesia, *2: Shanghai Kenwood Electronics Co., Ltd., *3: Request for Quotation,

*4: Sales and Operations Planning (refers to a method that optimizes the entire supply chain)

Creating New Value Through Manufacturing/Production, Design, and Procurement

- Integration into a manufacturing site scale that matches total production volume and total man-hours, focusing on the promotion of automation, a returning to domestic production, construction of a supplier ecosystem, etc.

Manufacturing reforms

- Manufacturing Policy centralization
- A return to domestic production and coexistence with suppliers
- Promotion of automation and reduction of fixed manufacturing costs

Review of design process standards

- Minimization of individual business optimization
- Efficient use of tools and equipment
- Overall optimization with design diagram standards

Procurement reforms

- Maintaining freshness and adopting a trend-following system
- Integrated VE*¹ and CD*² design activities
- Building an ecosystem with cooperative suppliers

*1 Value Engineering *2 Cost Down

★ Technology development, product design, quality assurance

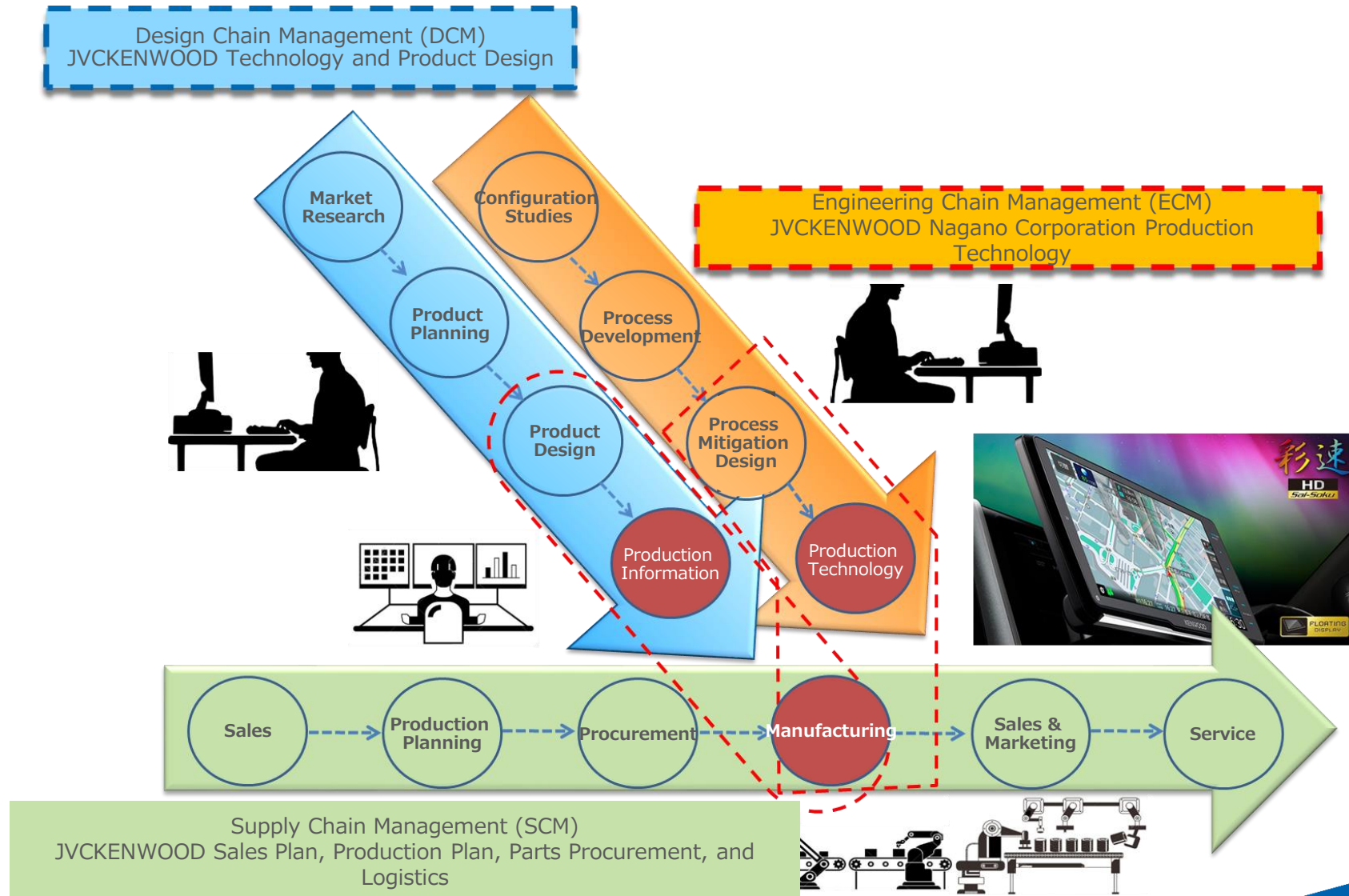
- Improving technological capabilities through integrated management across fields
- Reduction of fixed costs through efficient use of facilities
- Improving freshness of management resources by improving human resource liquidity

★ Production technology, product manufacturing, site optimization

- Integrated operation of production and manufacturing technologies at manufacturing sites
- Maintenance of appropriate man-hours and reduction of fixed costs through reorganization of sites
- Enhancement of management resources through promotion of automation

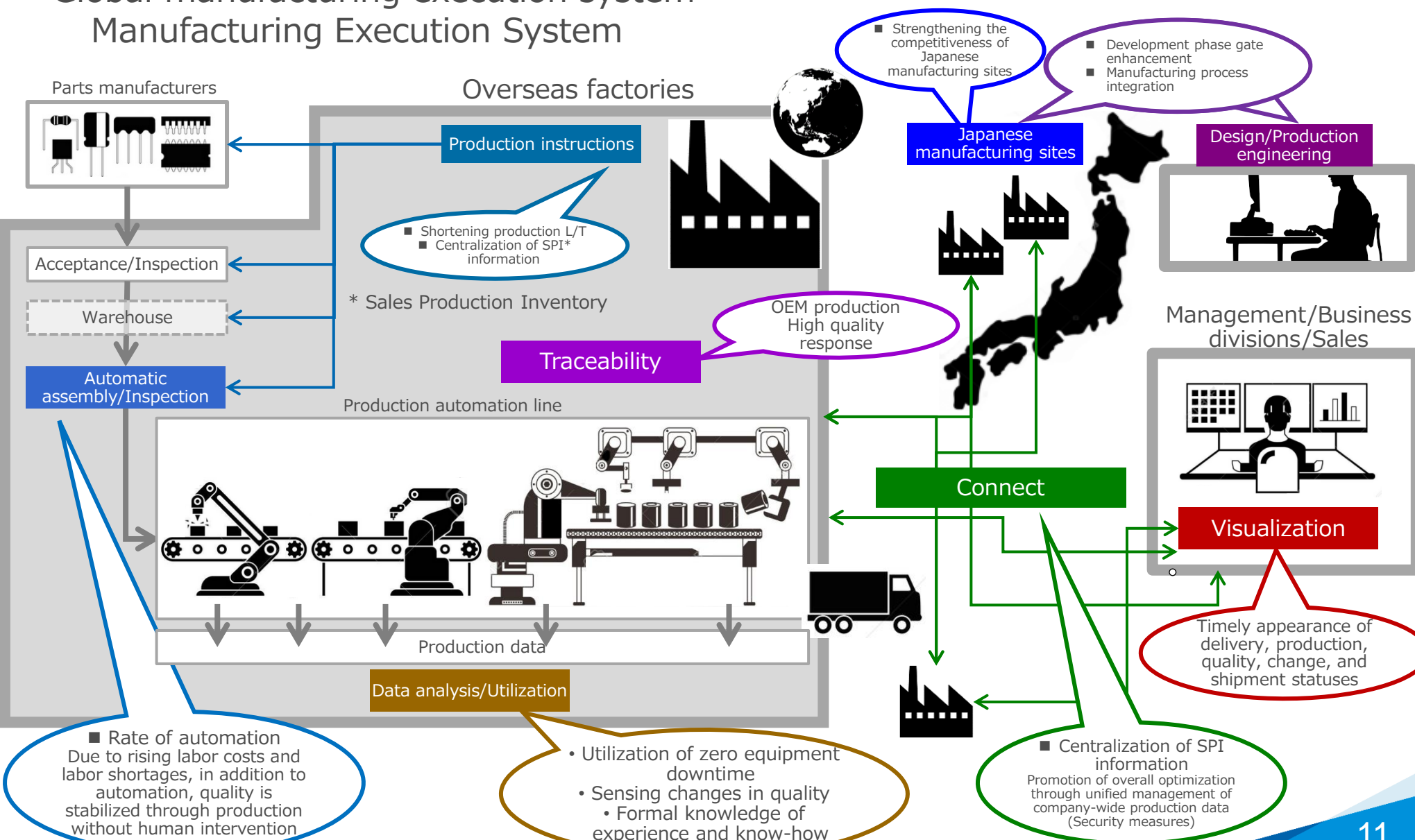
Creating New Value Through Manufacturing/Design, Production Technology, Manufacturing, and Sales

- Integrate into a manufacturing site-based process to ensure total cost reduction activities



Manufacturing that Can Provide High-quality Products Within a Short Delivery Time and at an Appropriate Cost

Global manufacturing execution system Manufacturing Execution System



Manufacturing Reforms for the Enhancement of the Business Structure

- Liquidation proceeding (dissolution) of the manufacturing site in Thailand (JKET^{*1}) has started, and production activities at JKET will end in the fiscal year ending March 2022 as scheduled. The liquidation proceeding (dissolution) is progressing as planned. For major production items, production of professional video cameras will be transferred to JKOT^{*2}, and production of projectors will be transferred to the Yokosuka Business Center, promoting the optimization of manufacturing sites commensurate with total production volume

JVCKENWOOD Electronics (Thailand) Co., Ltd.

JKET



JVCKENWOOD Optical Electronics (Thailand) CO., Ltd.

JKOT



Yokosuka Business Center

*1: JVCKENWOOD Electronics (Thailand) Co., Ltd.

*2: JVCKENWOOD Optical Electronics (Thailand) Co., Ltd.

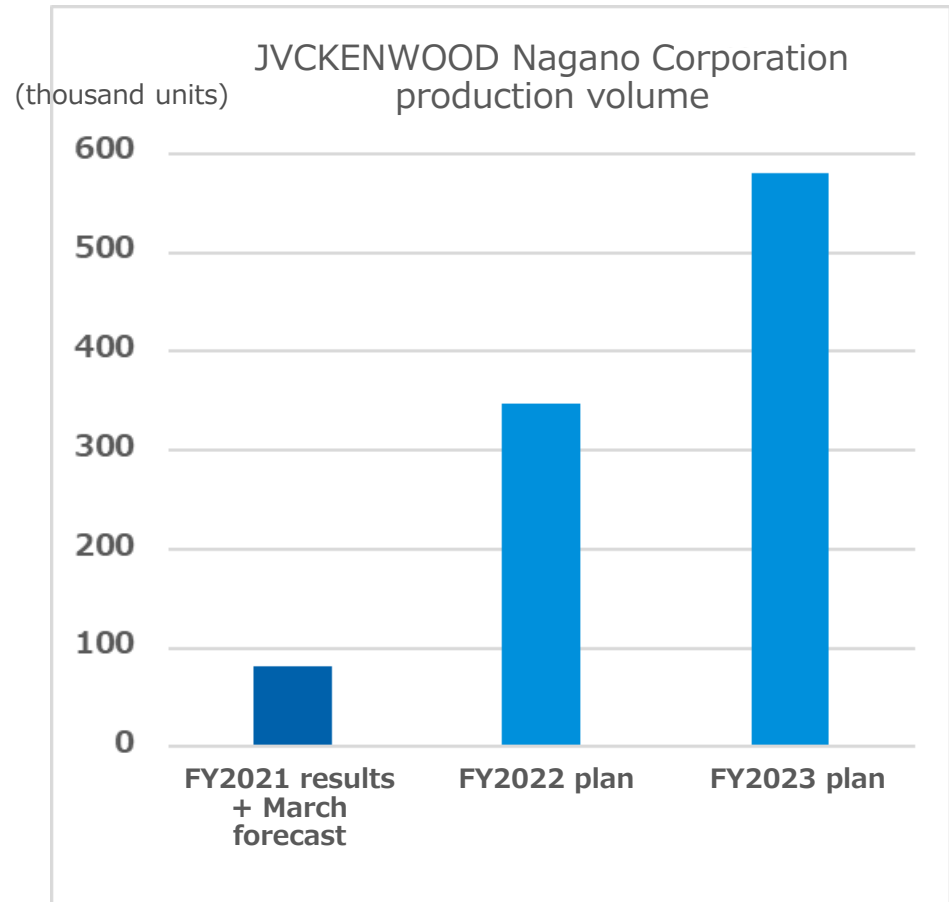
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Full-scale Operation of the Automation Line

- Full-scale production of car navigation systems for the Japanese aftermarket began in late February 2022
- In FY2022, the production of car navigation systems for the Japanese aftermarket will exceed 300,000 units, and from Q3 onward, the production of dedicated car navigation systems for Japanese automobile manufacturers is scheduled
- Plans call for annual production of more than 500,000 units starting from FY2023.

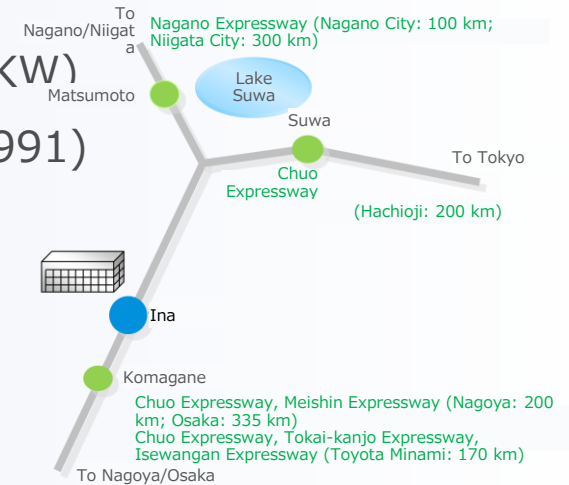


JVCKENWOOD Nagano Corporation
assembly automation system



JVCKENWOOD Nagano Corporation: Company Profile

- ◇ President, Representative Director of the Board Makoto Shirasu
- ◇ Address 2676-1 Nishi Minowa, Ina, Nagano (inside the Ina Inter Industrial Park)
- ◇ Capital Stock 50 million yen (100% owned by JVCKW)
- ◇ Established 1990 (Operation started in August 1991)
- ◇ Site Area 34,146m²
- ◇ Total Floor Area 16,939m²
- ◇ Number of Employees 169 (as of November 1, 2021)



- ◇ International Certifications
 - ISO 9001 October 1993
 - ISO14001 December 1998



Roles and Functions of JVCKENWOOD Nagano Corporation

1. As a key domestic factory in the Mobility & Telematics Services Sector

- As a key domestic factory, implement “manufacturing process design proposals and prototype verification” and “high manufacturing level factories,” adding value to overseas manufacturing sites. These will be shared with each site, contributing to improving the profitability of the Mobility & Telematics Services Business
- Lead and implement the enhancement of production technology and the promotion of automation in order to increase profit for domestic navigation

2. As production technology with manufacturing sites in the Mobility & Telematics Services Sector

- Maximize added value by reflecting proposals for optimum product structure in the product design from the viewpoint of the manufacturing site
- Design and trial manufacture are carried out in Nagano, and the results continue to be obtained by cost reduction through improvement of manufacturing processes and methods
- Aiming for automation and new construction methods, competitiveness is maximized by achieving both reductions in labor costs and improvements to quality
- Promote improvements to quality loss and productivity, including those at overseas sites, and contribute to the entire Group (create and expand globally applicable improvements)

Promoting the Automation of Car Navigation Production Processes

◇ Introduction of automated equipment in the production process of car navigation systems for domestic customers

- (1) Reduced personnel costs
- (2) Process quality stability
- (3) Acquisition of in-house production technology and development of technology for overseas factories

Replacing manual work with robotic arms to promote automatic assembly processes



Substrate transfer machine
(inspection/division)



Automatic assembly machine



Automatic inspection equipment

Design Evaluation and Analysis: Various Analysis Equipment and Utilization

◇ Analysis and measures for items related to product reliability

- (1) Soldering reliability evaluation and defect analysis
- (2) Analysis of organic substances
- (3) Component X-ray evaluation and defect analysis



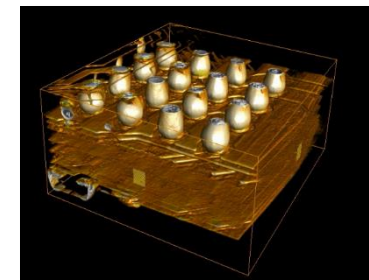
Observation of solder condition by digital microscope

◇ Evaluation and analysis equipment

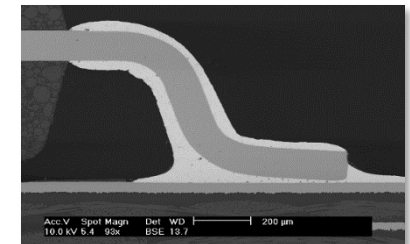
- SEM (Scanning Electron Microscopes)
- Digital microscopes
- 3D X-ray observation equipment
- Infrared spectrometers (organic substance analysis)
- X-ray fluorescence analysis equipment
- Tensile testing machines (solder joint strength testing machine)
- Metal microscopes
- 3D, 2D measuring instruments
- Various types of environmental testing equipment



3D X-ray inspection equipment



BGA 3D CT image



Cross-sectional image of SEM soldering element

Total Cost Reduction Activities

Overview: Design and procurement reform, production reform, and logistics reform in order to create a significant increase in model profitability by reducing total costs

- Reduce basic assembly time by drastically reducing the number of parts through thorough design reforms
- Aim to significantly reduce distribution costs (shipping and warehousing costs) by completing everything from domestic production to domestic distribution and sales
- Implement production reforms through the introduction of automated machines in the assembly process, and significantly reduce manufacturing fixed costs through thorough labor saving

■ 2021 model MDV series



Margin improvement

■ 2022 model MDV series



■ Major initiatives

1. Design and procurement reforms

- VE (reduction in number of parts) -40%
- Assembly man-hours (working hours) -35%

2. Logistics reforms

Transportation costs for products and parts -10%

<Specific measures>

- Reduction of transportation costs for products and parts
- Reduction of emergency response AIR costs

*1: Final Assembly, *2: Printed Circuit Board,
*3: PT. JVC Electronics Indonesia

3. Production reforms (automation STEP10) **Labor saving by introduction of automatic machines**

FA^{*1}/PCB^{*2} work personnel

JEIN^{*3} currently 38 people -> 9 people at JK Nagano
(excluding 4 people from preparatory work)/line

Reduce man-hours by more than -40% (including automation, process improvements, and design reforms)

Design Reforms: Our Past Models, Comparison with Models from Other Companies, and 2022 Model Improvement Initiatives

Overview

- Make bold structural changes to **build a competitive platform** and realize significant cost reductions
- By significantly reducing the number of parts and assembly times, as well as taking automation into account, we are able to achieve **cost competitiveness in domestic production that is comparable to overseas production**
- **Implement preliminary verification of product design and process mitigation measures that take into account** not only the aftermarket but also **product models**

Development policies

- Reduce assembly times through drastic structural review and simplification
- Significantly reduce and consolidate the number of parts
- Thoroughly promote automated assembly



- Thorough analysis of competitors' products, including overseas products
- Review of structure from zero, parts almost completely new
- Thoroughly incorporate the knowledge of domestic parts suppliers
- Concerted efforts to promote automation throughout the JVCKENWOOD Group

Accelerating economic growth through accelerated innovation

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



17 PARTNERSHIPS FOR THE GOALS



Technology

INNOVATION

Research

Creativity

Improvement

Concept

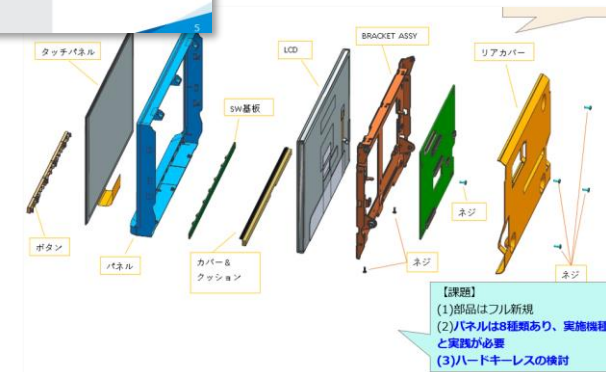
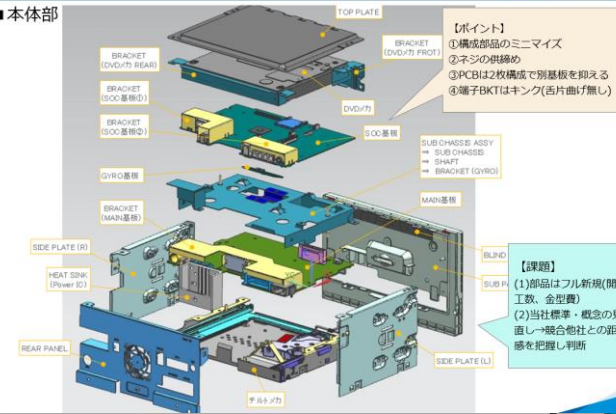


Component composition and assembly man-hour benchmarks (target values)

構想案の具体化検討

CONFIDENTIAL

■本体部



Procurement Reforms: Reduce Material Costs and Consider Strategic Alliances with Domestic Partners

Activities

- Aim to **eliminate material cost differences** between domestic and overseas production -> Supplier changes, currency changes, etc.
- Harness the **merits of local production and local consumption** by **local procurement of main mechanical parts** (procurement in Japan)
-> Shorter delivery times + reduced part distribution costs
- Expand quality improvement and cost improvement activities in cooperation with domestic partners -> Reduce in-house man-hours by commissioning preparation processing
Through these and other activities, we will **comprehensively achieve material costs that are equal to or lower than those of overseas products**

Actions

Strategic cost reductions through medium- to long-term strategic partnerships with domestic parts manufacturers

- ◆ Reduce logistics and packaging costs through preparatory processing by parts partners -> Simplify internal lines through the purchase of semi-finished products in line with automation
- ◆ Yield improvement cost reductions through production in Japan, labor saving by promoting automation (reduce fixed costs), and improving productivity
- ◆ Hedge risks by changing the transaction currency (yen) with domestic parts manufacturers
- ◆ Aim to reduce distribution costs and environmental impact by exploring ways to deliver parts in line with automation

- Our mission is to reduce greenhouse gases and marine plastics



- Commitment to CDP Scope 1, 2, & 3

- Efforts to reduce plastic packaging

- Promote standardization of returnable parts containers under the promotion of automation, work to reduce environmental impacts, such as with the disposal of individual parts packaging

Logistics Reforms: Implement Measures Specific to Domestic Logistics

Improving distribution costs through domestic production (ideal and actual values)

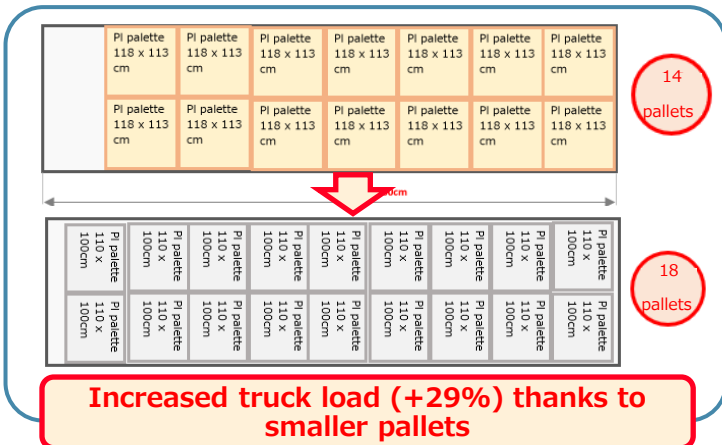
- Reduced product transportation costs for existing overseas production and Japan transportation (marine and air transportation) to only a portion of parts transportation costs
- By shifting production to Japan, the total transportation cost of products from the factory to the warehouse will be significantly reduced => In addition, transportation costs will be further reduced with a **view to direct transportation to dealers**
- Dramatically reduce airfreight costs for products, and improve efficiency with **exterior design** that takes into account the efficiency of pallet loading for domestic transportation by truck

Improvement effects

- Improved loading efficiency for domestic land transport trucks: 40% improvement in loading efficiency by increasing the number of stages
- 29% improvement in loading rate by reducing the size of the individual product packaging boxes to match the standard pallet (□ 110 cm => 110 x 100 cm)
- Consideration of direct delivery to distributors without going through warehouses (Reduction of warehouse storage fees, cargo handling fees, administrative fees, etc.)

Improving transportation efficiency by adopting standard (small) pallets and reducing the size of individual packaging boxes II

Reduction of storage fees, cargo handling fees, and administrative fees through domestic production and distribution



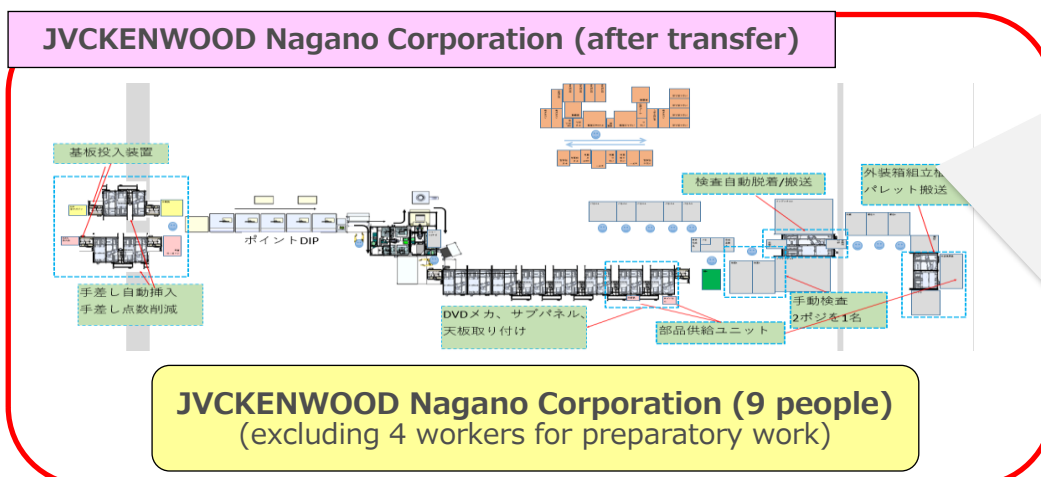
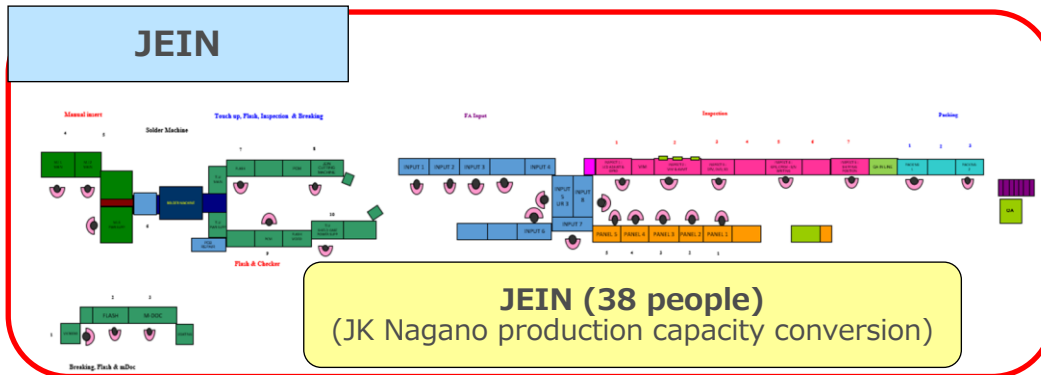
- Reduce environmental impact by reducing product transportation from overseas



Manufacturing Reforms: Strong Promotion of Automation (Revitalizing the Japanese Manufacturing Industry)

Overview

- Shift to a production system that aims to ensure stable quality, continuous production, and effective labor saving by **promoting automation strongly** in the product assembly process
- **Revitalize the Japanese manufacturing industry** by increasing domestic production and **returning to coexistence and co-prosperity with domestic partners**



Labor saving by introduction of automatic machines

- FA*1/PCB*2 work personnel JEIN*3 currently 38 people -> 9 people at JK Nagano (excluding 4 people from preparatory work)/line
- Reduce man-hours by more than -40% (including automation, process improvements, and design reforms)

Automation STEP 10 As of February 4, 2021

| | |
|---------|--|
| STEP 1 | Automatic assembly machine Automatic inspection equipment |
| STEP 3 | Substrate transfer machine Automatic screw tightening machine |
| STEP 5 | Automatic parts feeder Top plate + SUB panel automatic screw tightening machine |
| STEP 9 | Automatic insertion machine for PCB discrete components Inspection automated conveyor |
| STEP 10 | Automated packing machine |

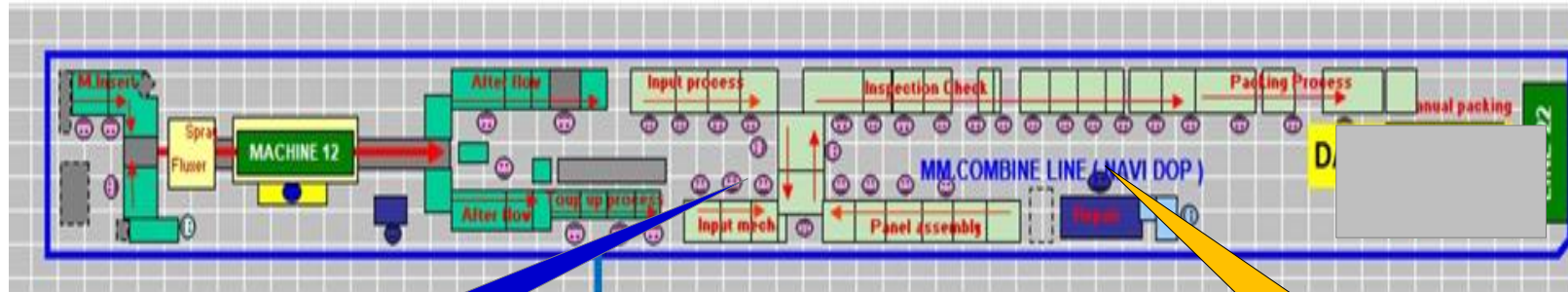
*1: Final Assembly, *2: Printed Circuit Board, *3: PT. JVC Electronics Indonesia

Situation Regarding 2022 Model Returning to Japan

Comparison: JEIN*1 (2021 model) car navigation system for aftermarket PCB*2-FA*3 line

PCB Lay Out Line

MA Lay Out Line



PCB line



FA line



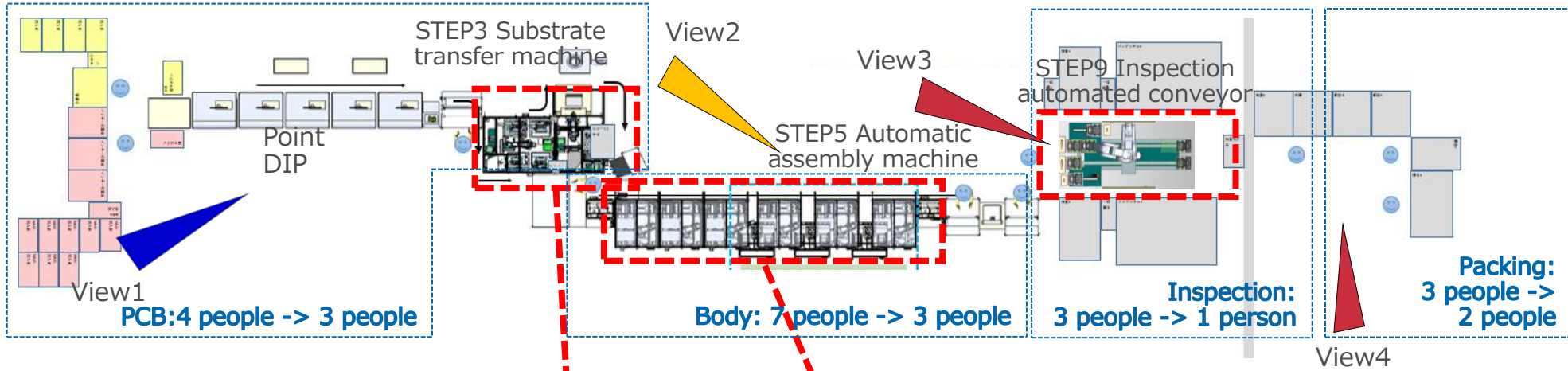
*1: PT. JVC Electronics Indonesia,
*2: Printed Circuit Board, *3: Final Assembly

PCB-FA process: 38 people (existing)

* Estimated number of people based on Nagano 500 units/day

Situation Regarding 2022 Model Returning to Japan

Comparison: JVCKENWOOD Nagano Corporation (automation) car navigation system for aftermarket PCB*1-FA*2 line



*1: Printed Circuit Board, *2: Final Assembly

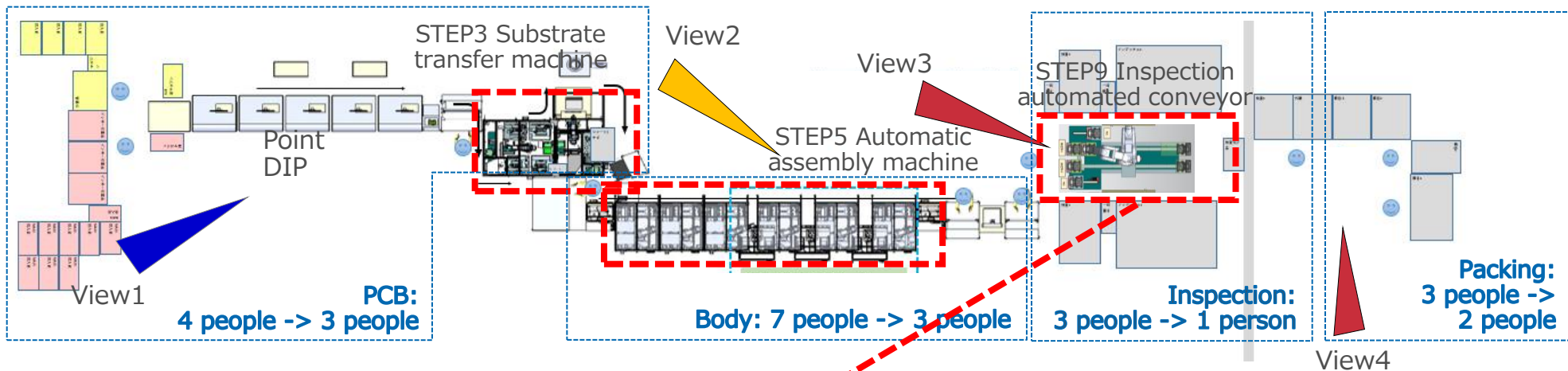
PCB line (3 people)

FA line (assembly: 3 people)

PCB-FA process: 9 people (from 2022 model)

Situation Regarding 2022 Model Returning to Japan

Comparison: JVCKENWOOD Nagano Corporation (automation) car navigation system for aftermarket PCB*1-FA*2 line



*1: Printed Circuit Board, *2: Final Assembly



PCB-FA process: 9 people (from 2022 model)

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Global Trends in Security



Security standards previously established for each country and region are now rapidly moving in a particular direction



Now fundamental to the basic concept of security standards in various industries around the world

NIST SP800 Series*1

Balanced standards for requirement definitions, control measures, technology, etc.

*1: Computer security reports from the National Institute of Standards and Technology

One of the consequences of AI and IoT → Supply chain attacks

Crimes committed for fun and flaunting => For the purpose of ransom => Corporate economic loss => National security

| Rank | Organization | Previous year's rank |
|------|---|----------------------|
| 1 | Damage from targeted attacks | 1 |
| 2 | Damage caused by business e-mail fraud | 3 |
| 3 | Damage caused by ransomware | 2 |
| 4 | Growing number of attacks exploiting supply chain weaknesses | New |
| 5 | Information leaks due to internal wrongdoing | 8 |
| 6 | Service outages due to obstruction of service | 9 |
| 7 | Theft of personal information from Internet services | 6 |
| 8 | Revealing vulnerabilities in IoT devices | 7 |
| 9 | Increasing misuse due to disclosure of vulnerability countermeasure information | 4 |
| 10 | Inadvertent information leakage | 12 |

Comprehensively examine the cybersecurity required for stable business continuity, share specific requirements and control measures from NIST SP800-171*2, and promote top-down activities to improve security literacy based on the concept of overall optimization

*2: NIST guidelines for security standards for government procurement



NIST SP800 Series
New certification system that effectively uses security standards

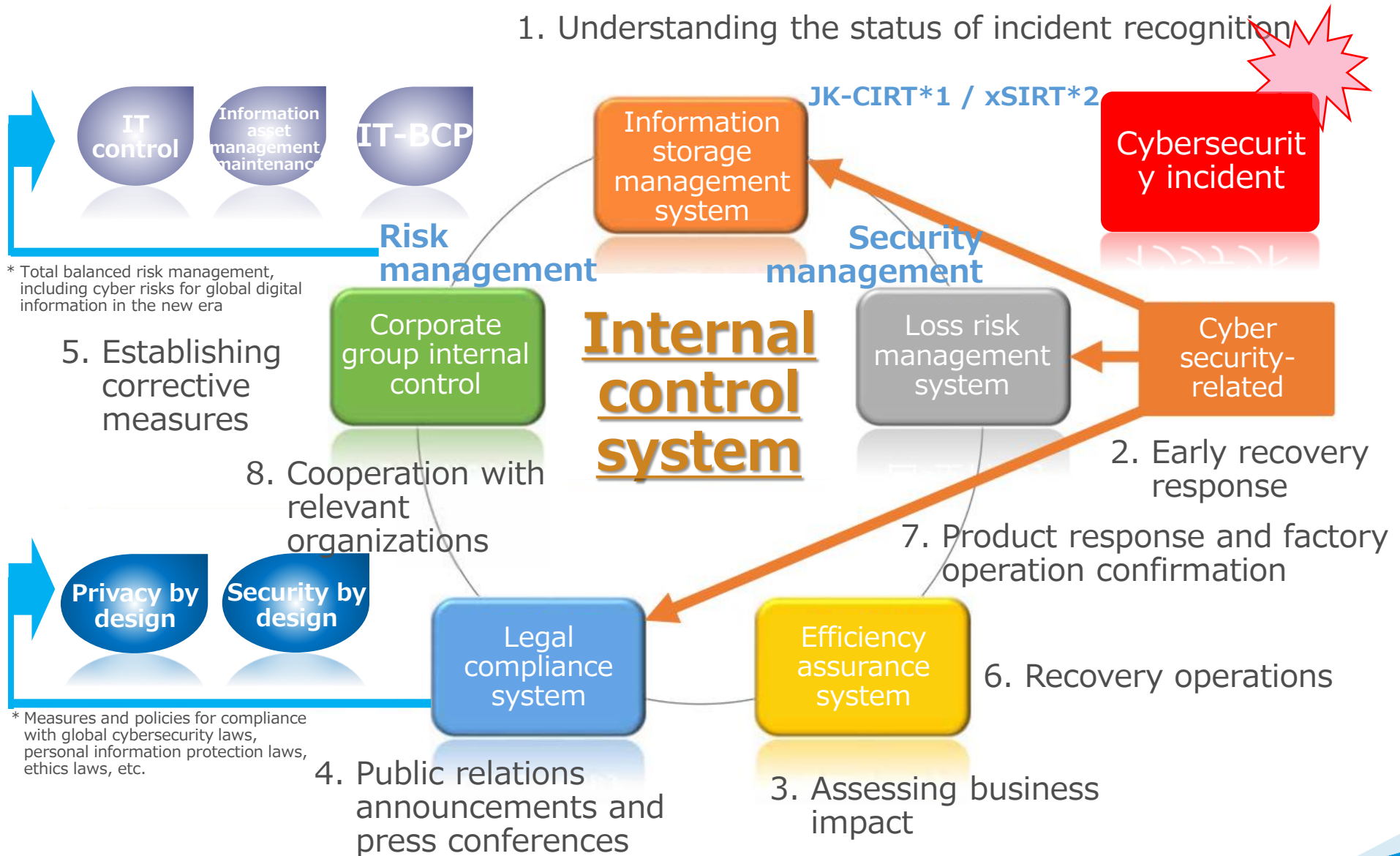
Cybersecurity Maturity Model Certification (CMMC)

Points

- (1) Be applicable to the global network
- (2) Can support the supply chain
- (3) Cost => Investment => Company-wide optimization (rationalization)

Internal Control System Synchronization During a Serious Incident

1. Understanding the status of incident recognition



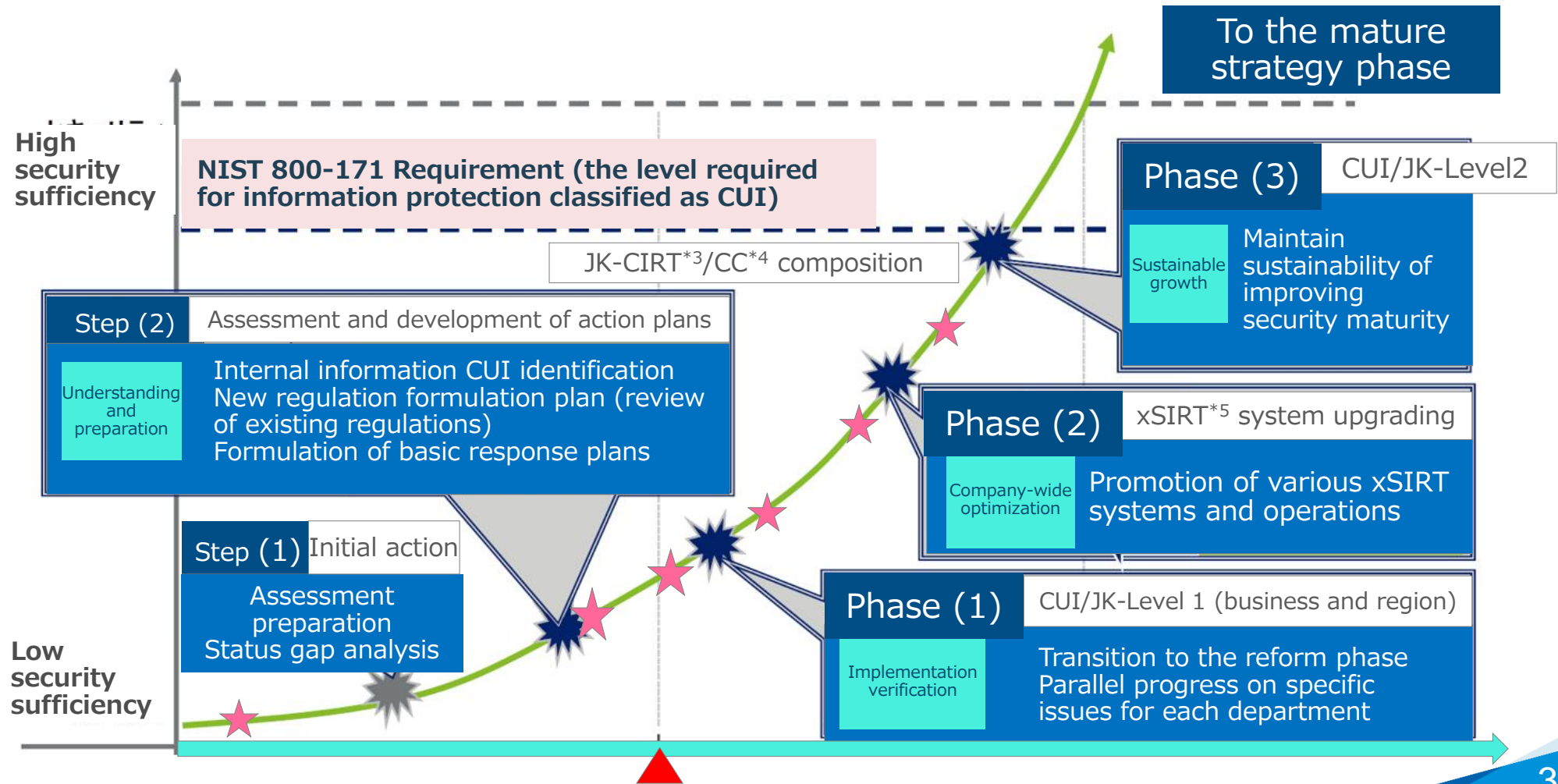
*1: JVCKENWOOD Central Incident Response Team (company-wide response team to enhance cyber security resilience)

*2: Security Incident Response Team (the name of the organization that receives, investigates, and responds to reports of "security incidents")

Planning for the Regulation and Implementation Phases

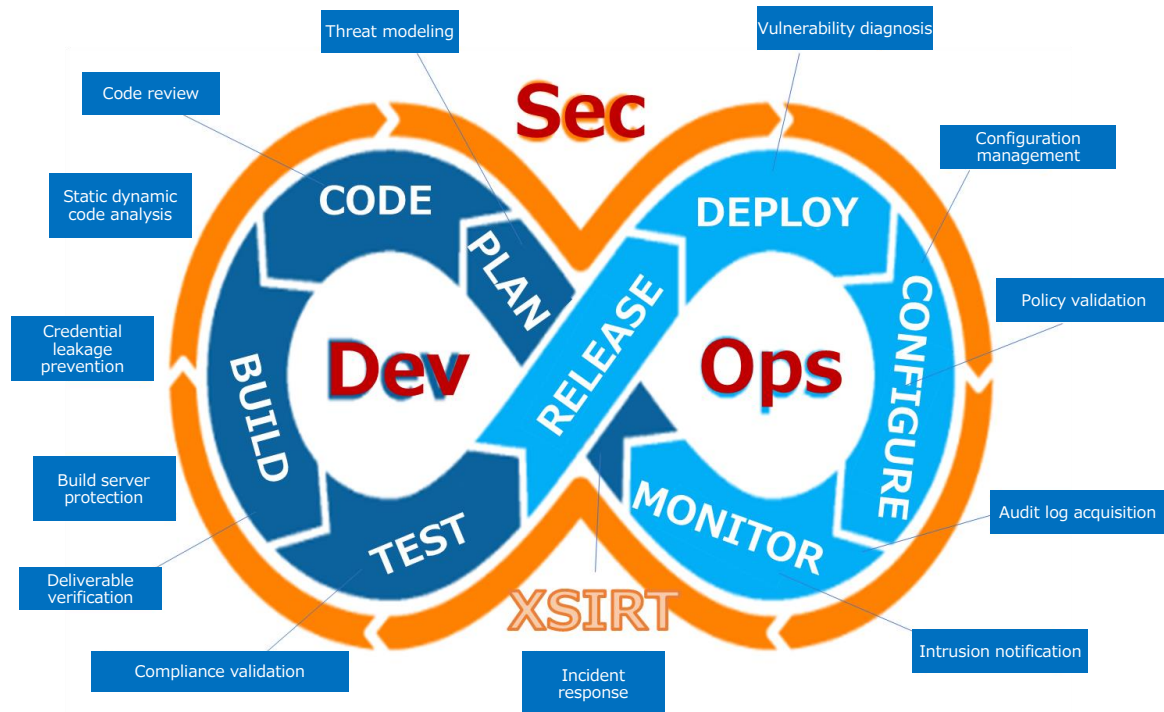
*1: NIST guidelines for security standards for government procurement
 *2: Controlled Unclassified Information (important information that is not classified)
 *3: JVCENWOOD Central Incident Response Team (company-wide response team to enhance cyber security resilience)
 *4: Coordination Center
 *5: Security Incident Response Team (the name of the organization that receives, investigates, and responds to reports of "security incidents")

- Realization of basic CUI*2/JK-Level 2 requirements based on NIST SP800-171*1 throughout the company
- In response to the adoption of a proposal for legislation requiring vehicle cyber security measures by the World Forum for Harmonization of Vehicle Regulations (WP29) and aiming for a declaration of compliance to prove that the Cyber Security Management System (CSMS) has been established, the organization, rules, and processes shall be established in accordance with the international standard ISO/SAE 21434, and an internal system shall be established to explain the appropriateness to third parties

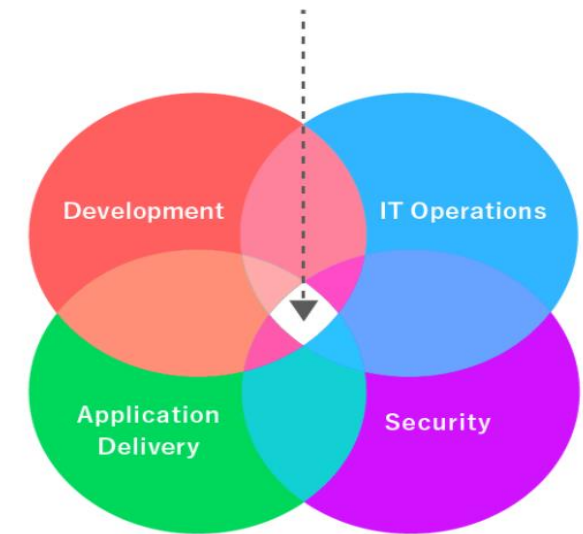


Automation Model from a Security Perspective

- Security system construction: Automate security gates for DevSecOps (Development Security Operations) workflows
- Transform the corporate culture brought about by DevSecOps to realize an effective security system and promote comprehensive activities to realize security resistant functions



DevSecOps



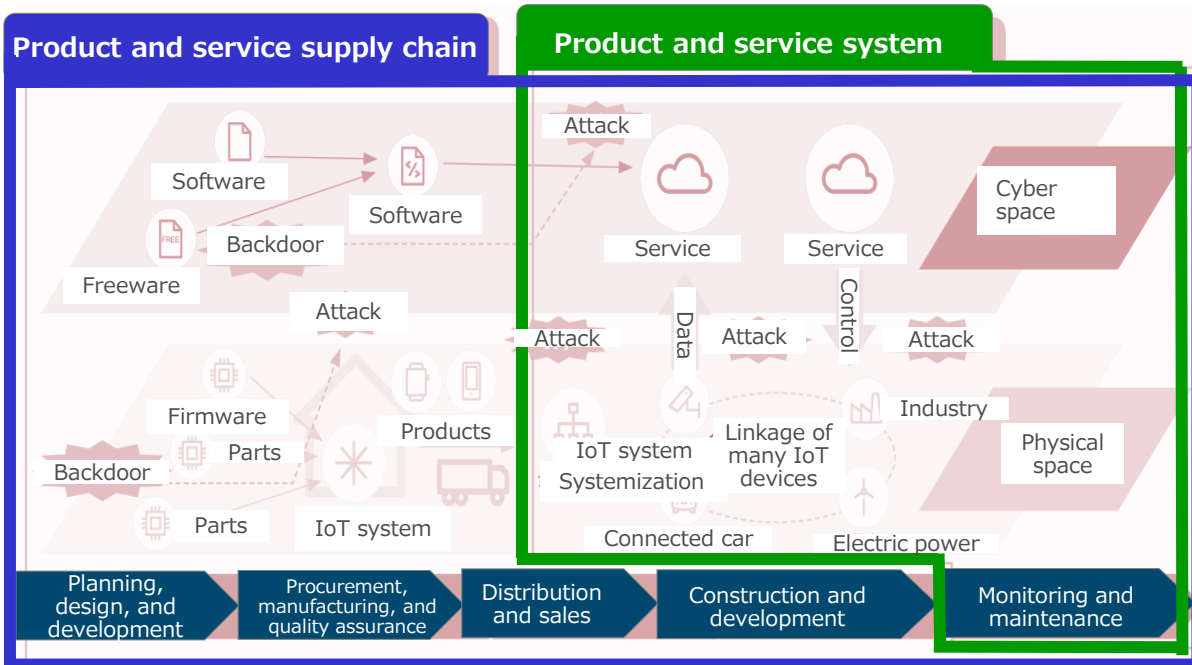
DevSecOps is a stable, automated delivery model for DevOps and CI/CD* security

* Continuous Integration/Continuous Delivery

Responding to Supply Chains for Products and Services

- If JVCKENWOOD's security level meets NIST* procurement criteria, preconditions for business continuity will be met without deviating from the suppliers of governments and global companies

* National Institute of Standards and Technology



- Aiming to build a sustainable development model from a security perspective and contribute to society

| | | |
|--|--|--|
| <p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p> | <p>11 SUSTAINABLE CITIES AND COMMUNITIES</p> | <p>17 PARTNERSHIPS FOR THE GOALS</p> |
| <p>◆ Technologies cultivated in manufacturing and production</p> | <p>♥ Safe and secure quality developed from the customer's perspective</p> | <p>♠ Safe and secure quality developed from the customer's perspective</p> |
| <p>Based on these three principles, JVCKENWOOD is engaged in sustainable information security activities. We are contributing to local communities through our telematics and information services business, and promoting ESG management that takes into consideration the environment, society, and governance.</p> | | |

JVCKENWOOD

The expressions in these presentation materials that refer to the outlook for the Company shall be deemed as future forecast statements. Such statements are inherently susceptible to risks, uncertainty, and other factors, whether known or unknown, and may significantly differ from future performance. These statements represent the Company's targets at the time of disclosure of these materials. The Company is under no obligation to update and publicize its future forecast statements in the event there are changes in the economic climate and market conditions affecting the performance of the Company. Risk factors and other uncertainty which may affect the Company's actual performance include: (1) violent fluctuations in economic circumstances and supply and demand systems in major markets (Japan, the U.S, the EU and Asia); (2) restrictions including trade regulations applicable to major markets including Japan and other foreign countries; (3) sharp fluctuations in the exchange rate of the U.S. dollar, euro, and such like against the yen; (4) market price fluctuations in capital markets; and (5) changes in social infrastructure due to short-term changes in technology and such like. Please note, however, that the above is not a comprehensive list of all the factors that may exert a significant influence on the Company's performance.