JIT・SCM Now!

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JMA Management Education Instructor
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To attain shortest Lead Time and Non defect production

1. How and Why Toyota was TPS produced?
   Mr. Taichi Ohon’s Efforts and History to make TPS at 1950–1970

2. Structure and Technologies of JIT (Major elements)
   JIT key methods (For example): PokaYoke and Stop String to keep non defect production, SMED(Single-Minute Exchange of Die), Kanban, Etc. With Practices and Results of TPS by Video: NUMI, Cell-System, SMED

3. SCM & the Influences by Natural Disasters on JIT
   For example: East Japan great earthquake and Thailand Flood
1. How and Why Toyota was TPS produced?
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Problems: Very Low Car Assemble Productivity System

Ford 1st Look at Cow meat Foundry and get a good Idea

1913年

Rope Usage Conveyor

Ford 1st made the Conveyer System

Car Parts shelf

Movement state of the person

Very much movement
Production Flow of Toyota to make a car

Processing
- Casting
- Machining Process
- Forging
- Modeling

Press
- Body Production Start
- Body Production Finish
- Painting Finish
- Final Assembly

Assembly
- Line off

Painting Finish
- Body Production Finish
- Press
- Body Production Start
- Assembly
How and Why Toyota was JIT produced by Mr. Taiichi Ohno?

At 1953 Toyota Profit was very Big Minus but had a Big W.I.P on Toyota Plant. The number of employees was 8,000 Car Production was 700(Truck production). At this Time Mr. Taiichi Ohno (Vice-president) inspect the world Best companies. And get the Supermarket System.
Elements of Work System

*Waste, inconsistency, and irrationality* are the translations of three Japanese words — *muda, mura, muri*. These checkpoints, known as “3M,” refer to situations when the effort outweighs the goal, when the effort fails to reach the goal, or when results swing inconsistently between these two poles.
A production process and cost outbreak

**Step 1** Grasp the actual status of cost accumulation and time spent at each process.

**Step 2** Estimate problems in terms of cost of wastes, quality, opportunity losses.

**Step 3** Ideal – Reality = Improvement opportunities
With this concept, clarify priority measures and cost improvements.
The improvement method that JIT aims at Production Area

State of the present W.I.P.

- Many Bottleneck
  Which you should reduce

- Machine Trouble
- Low Skill worker
- Defects & Re-Work
- Appointed time of delivery delay

Reduction of W.I.P.

The measures that we gave up in the past

Come to light Problem Causes And Improvement to a start
Three sorts to Time reduction

① Kaizen:
Loss Elimination

② The work which should be
done is omitted.
Japanese: Tenuki

③ Compulsion of speedup

Concept of Kaizen

Generalities at a Low Level
Kaizen Company

Quality

Ancient thought

Cost

Delivery & Time

Kaizen Thinking & Action

Quality

Paradox Resolution is the mission of a technology

Cost

Delivery & Time

 Improvement technology
Quadruple Productivity Improvement, Dr. Mandel’s Secrets

① Method efficiency improvement: In the west, driven by labor shortages and high labor costs, work analysis with IE tools are used to establish the best methods before hiring people and for setting wages and education & training. In Japan, new comers are assigned to a job and expected to learn over time. The gap results in 65%.

② Work Pace: The work pace, especially at the bottleneck processes, is only at 70% of the international standards. Planned overtime in mind, people tend to conserve energy for later.

① Method improvement × ② Work pace improvement: In the sluggish economic time around 1975, JMAC proved doubling productivity by utilizing standard times without spending money.

③ Operating rate: Without reviewing optimal production plans or taking measures on equipment since its purchase, “working hard” yields only 70%. There is dichotomy between manufacturing and maintenance.

③ TPM activities since 1980s proved this factor of operating rate improvement.

④ Synchronization efficiency: Only 70% effective due to accumulated work-in-process, lack of support between processes, lack of multi-skilled operators, and intensified production at the end of the month.

④ Many factors related to this measurement have been revealed as the JIT production system has spread in the industry since 1980 when Toyota initiated its efforts in this area.

Result? 24% of the western first-call companies
Two Additional Productivity Indices (Time Productivity)

5. Speed productivity

AKA, Space Productivity. Defined in 1995 for JMA/TP Prize.

Big home-run like projects yield the results at the end of the term when they are finished. Small projects carried out throughout the term accumulate the results as they are finished, and the total results can surpass those from the big projects.

6. Start-Up productivity

Vertical Star-up

Gradual start-up

This area represents sales/profits gain.

7. Delivery productivity

Examples: Housing and Large Equipment

First Item

Second Item

Delivery. Then next.

Three Item Produced

Shortened delivery

Sales increase by one item
2. Structure and Technologies of JIT (Major elements)

TPS key methods (For example): PokaYoke and Stop String to keep non-defect production, SMED (Single-Minute Exchange of Die), Kanban, etc. With Practices and Results of TPS by Video: NUMI, Cell-System, SMED

a) The global image of JIT

Market Needs
Build-to-Order manufacturing
1. Many kinds small quantity production
2. Short delivery production

Deficit fall

Taking Actions To thoroughly cost reduction

Loss Elimination Trials

JIT

Supermarket Method

Later Process Pull System

Visible Control System

Man-hour reduction

Work Standardization And Kaizen

Production Corresponding to the demand change

Flexible Capacity

Single Time Die Change

Surplus Man Hour

Surplus Machine Hour

Synchronization

Super Class Production Lead Time Reduction

One Pease Flow

Multi Jobs Production

Small Lot

Single Die Change

Moment Die Change

Stop String System

POKAYOKE

If Find a Defect ↓ Line Stop

Zero Defect Production

Non Machine downtime Production

All Items Inspection

Zero W.I.P.

Multi Skill Supply

Non defect Automation

Company made Low Cost Automation

Automation

Cell Production System

Small Waiting Time Production

Elimination of Isolated island Production Methods

Leveled Production Schedule

Zero W.I.P.

Multi Skill Supply

Cell Production System

Small Waiting Time Production

Elimination of Isolated island Production Methods

Prohibiting Non Sales Goods

Smallest Human production

Market Needs
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Smallest Human production
JIT Thinking by Mr. Taiichi Ohno

1, Just-in-Time is a system where necessary items are received just in time as they are needed in the production time like a supermarket.

2, To use JIT, Every production process should move and function together at the same pace. This is the Production Leveling on a Production car assemble line.

3, To keep JIT Production System. Toyota uses “KANBAN”.
   Kanban is a tool to achieve just-in-time production and eliminates all useless W.I.P. on any Production Line.
   a, The Kanban prevents over-production on a production Line
   b, The later(rear) process picks up the number of parts indicated by the Kanban at the earlier(front) process.
   c, Kanban is a pull-based replenishment system.

4, Autonomation with a human element has Poka-yoke(device) and automatic stopping device to help clarify when a defective part is produced. (Non defect Machine Production System)

5, Flexible Manpower Line, Multi-Skilled Development and One-Piece-Flow manufacturing(Multi-Machine Handling)

6, Setup Time to change a item to other item reduction has to down ten minutes.

   To attain JIT Toyota starts to eliminate all kinds of waste on Toyota Plant
This process involves welding parts A and B to make a single part. The parts are welded on an automated machine, but occasionally the parts are fed poorly, and the weld is not accomplished. Because the following process is also automated, seven operators are used for inspection. Come up with away to mistake-proof this job. Your options are limited by the fact that time considerations make it impossible to use a mistake-proofing device in the previous process, where the weld is actually performed.

From the automated welding machine

Visual inspection (requires one inspector)

Weld defect

Good part

Conveyor

Remove by hand

Send to next operation

Conditions:
1. All products have a similar configuration

Part A

Part B

Practice Problem 3-3
Using the Shape of the Parts

The shape of the parts and a chute were used to isolate the parts with defective welds.
Example of Pokayoke
Case Study: For Zero Defect

How do you use this statistics to get zero defect production?

Practice Problem 3-2
Using a Checksheet Example

- Problems Recorded:
  1. Defective rubber (2 cases)
  2. Cracks (1 case)
  3. Problems with holes (62 cases)

Problem:
The "Bamboo Shoot" QC circle is made up of four employees of the Design Department of company T. Three months ago, their department purchased a new model large-scale dry photocopy machine, but they found that, due to their lack of familiarity with the operation of this machine, there were many problems with copying letters and much time was wasted. They thus determined to take up the question of problems with making copies, in order to use the equipment more effectively.

To begin with, they need to understand the current situation, which they would like to do by surveying all of the defective copies made within the past week. Create a check sheet that can be used for surveying defect items caused by a dry copy machine.
Practice Problem 3-2
Check Sheet for Surveying Copying Defects

<table>
<thead>
<tr>
<th>MACHINE: JS9100</th>
<th>UNIT: Number of pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day</strong></td>
<td><strong>Monday May 10</strong></td>
</tr>
<tr>
<td>Defect Item</td>
<td></td>
</tr>
<tr>
<td>Too Dark</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Too Light</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Dirt</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Crissed</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Off Position</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Paper Tears</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Paper Jam</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Wrong Size</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td>Other</td>
<td>1/1/1/1/1/1/1/1/1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>31</td>
</tr>
<tr>
<td><strong>No. of pages</strong></td>
<td><strong>copied</strong></td>
</tr>
</tbody>
</table>

Some Key Points in This Exercise:
- The purpose of this exercise is not simply to collect data. If there are problems, we must always analyze them to find their causes, and then consider what corrective actions can be taken.
- Discover problems where they occur! This requires visual controls in the workplace.
- Don’t just write data down on paper — the use of actual items as a part of your control system can result in outstanding applications, lead you to short cuts in dealing with defects (by bringing problems to the surface, where everyone can see them), and speed up corrective measures.

The basic idea of quality control is simple: “No more post-mortems — take action instead!!

1. Discover problems early on, as they occur on the shop floor, with the actual products being made. Take action exactly where the problems occur.
2. Prediction by highly skilled person is important. For example, SPC:
   - Establish an alarm line within the control limits
   - Display both the alarm line and action keys
   - Stress prediction and prevention.
   
   ![Control Chart]

3. Remember to use reliable problem-solving methods (skills and techniques):
   - Diagram the factors
   - Focus on the Three "Actuals"
   - Analyze by asking "Why" five times and using the "5Ws and 1H" method
   - Conduct problem solving at the time the problem is discovered.
Devilish cycle

Insufficient prior examination (Not enough Design Review)

The shortage of risk eliminations

Many Troubles Occurs

Determination hurried too much

Works of useless following

Un-useless All-night works

A lots of Paper works & meetings
Outbreak probability is One Ex. Trouble, Defect Machine Downtime, etc.

Law of Heinrich

Achievement of quality level

Incidents number is 29

Collapse

Non Problem

Trouble Zero Status
Stop String System on JIT war used at NUMI(USA)

Once a operator find out a Quality problem on the floor(at Production Line), Quality Team gather the JIT Process and change the problem status. And The Team takes a action to find out the cause of the Problem and make a Beset Countermeasure on the floor immediately.
### 6σ on GE

<table>
<thead>
<tr>
<th>σ</th>
<th>The number in 1 million</th>
<th>Reference example</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>66,807</td>
<td>Random inspection</td>
</tr>
<tr>
<td>4</td>
<td>6,210</td>
<td>TQC</td>
</tr>
<tr>
<td>5</td>
<td>233</td>
<td>PPM</td>
</tr>
<tr>
<td>6</td>
<td>3.4</td>
<td>Best Company</td>
</tr>
</tbody>
</table>

**Graph:**

- **Y-axis:** Profit [Hundred million dollar]
- **X-axis:** Year (`'70 `'75 `'80 `'85 `'90 `'95 `'98`)

**Big Effects**

1. Poor zero measures from a new product development stage
2. Gate System
   - a) Worker guarantee of quality
   - b) Examination of next process
   - c) A problem are taking measures at the time of outbreak

**Reference Example:**

- The number in 1 million
- σ
- σ on GE
c) Production leveling

**Situation of the order**

Product A

B

C

D

Equalization to an order at Production Line

The present work load

Equalization line

Kaizen: Even out of production by using grouping
TOC (Theory of Constrains)

I improve a bottleneck and plan Throughput increase

Process of Production

1 → 2 → 3 → 4 → 5

Input

Materials

Product

4min. 3.5Min. 3.0 4.0 3.5 3.5

Production Process

use the drum to keep same Cycle-time

Use Rope to prevent delay

Cause of delay

One of the TPS Approach

Input Materials

1

2

3

4

5

Product

4min./PCS

3.5min./PCS

move five minutes from No.4 to No.3
To make good Line balance

Line Balance ratio = \frac{7.1\text{min.}+8.50+7.6+8.1}{8.5\text{min./PCS} \times 4/\text{processes}} \times 100\% = 92.1\% \text{ Very Low!}

8.5\text{min./PCS}
ラインバランス改善前の状況

<table>
<thead>
<tr>
<th>プロセス</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min/PCS</td>
<td>7.1</td>
<td>7.6</td>
<td>8.5</td>
<td>8.1</td>
</tr>
<tr>
<td>Balance Ross</td>
<td>1.4</td>
<td>0.9</td>
<td>0.0</td>
<td>0.4</td>
</tr>
</tbody>
</table>

待ち時間

<table>
<thead>
<tr>
<th>ライン</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ラインタイム</td>
<td>1.4</td>
<td>0.9</td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

ボトルネック
Best balance = \frac{7.9+7.9+7.6+7.9 \text{ (Min./PCS)}}{7.9 \text{ (min./PCS)}} \times 4 \text{Processes} = \frac{31.3}{31.6} = 99.1\%
d) SMED: SMED (Single-Minute Exchange of Die)

Mass Production → Lot Production → One-by-One Production

Old Production System

SMED System

SMED Line

W.I.P. Cost

Decreases by increase of the quantity

Many Number of each Product Cost&Time

Small

SMED Time Change

$8H \rightarrow 5\text{Min.}$

$100\text{PCS}$

$1\text{Min.} + \frac{5\text{Min.}}{100} = 1.05$
SMED Techniques

1. The preparation chassis use
   - Pull Old Die
   - Tr. Two Dies
   - Set New Die

2. One touch Setting Tool
   - Bolster makes Exact position Setting

3. One-touch Fixture
   - Every time keeping Same Highest
   - 16 times of screws turn but final turn decides the Fixture

4. Positioning Part setting

5. One Touch Cassette method

Washer extraction method

Shaped Hole slide Method
Multi-machine Handling

<table>
<thead>
<tr>
<th>No</th>
<th>Work Process</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
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<tr>
<td>①</td>
<td>Material handling</td>
<td></td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>②</td>
<td>Machine A setting</td>
<td></td>
<td></td>
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<td>③</td>
<td>Machine B</td>
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</tr>
<tr>
<td>④</td>
<td>Machine C</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>⑤</td>
<td>Inspection</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>⑥</td>
<td>Machine D</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>⑦</td>
<td>Machine E</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

Work Process

- ① Material handling
- ② Machine A setting
- ③ Machine B
- ④ Machine C
- ⑤ Inspection
- ⑥ Machine D
- ⑦ Machine E

Movement

Machine operation

One-Piece Flow Production

- ① Reduce W.I.P
- ② Reduce Production Lead Time
- ③ Decrease of the defectiveness
- Need Multi-Skill Operator
e) Visual Production Control System

① Place management

② Production achievement situation

<table>
<thead>
<tr>
<th>Plan</th>
<th>OOPCS</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>results</td>
<td>OOPCS</td>
<td>±OPCS</td>
</tr>
</tbody>
</table>

③ One by One Production instructions

④ Andon

④ Communication board

Reserved seat management

For Measures to get abnormality early in the production area
3. SCM & the Influences by Natural Disasters on TPS

For example: East Japan great earthquake and Thailand Flood

To bone a new Product Production+Sales makes a good Team work

Use The new product development method that assumed the sale results the basis (90% change/Year)

Sales forecast with the group

VOC: Voice of Customers

Information communalization system between supplier and parent companies

All the members share the latest information
SCMの体系をモデル化した例

The past: Wholesale dealer sale method

Image of SCM

One by one order from sales shop to supplier
**Difference between SCM and TPS**

<table>
<thead>
<tr>
<th>Item to compare</th>
<th>SCM (Ex. Convenience store)</th>
<th>TPS (Toyota Production Sys.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, Ordering to Production cycle</td>
<td>Each tow Hr.</td>
<td>The production schedule that selected a period as one week or one month</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, Fluctuation in Production</td>
<td>More than 10%</td>
<td>Less than 10%</td>
</tr>
<tr>
<td></td>
<td>Sometimes more than 50%</td>
<td></td>
</tr>
<tr>
<td>3, Between order and production information</td>
<td>The factory production item is the same as a market include small Prediction of the store</td>
<td>Sales plan of the Toyota Motor Sales section</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4, Guarantee of quality responsibility</td>
<td>Charge supplier of each industrial goods</td>
<td>Toyota Product line and delivery company (keiretsu) of Toyota</td>
</tr>
</tbody>
</table>

**Image of SCM**

- Supplier
- Customer
- Store
- IT Net Work
- One by one order from sales shop to supplier

**Image of TPS**

- Customer Order
- Sales section
- Toyota Plant
- Supplier
- Kanban: pull-based replenishment system
For One-Pease-Flow : Cell Production

**Allegory**

- Hard Ware
  - Car Assemble itself

- Soft Ware
  - Production Control

- Hart ware
  - Make each Car for each Customer

**JIT-CIMの場合**

- To make Good Production Line

**良い管理のための装備（IT活用、目で見る管理など）**

**顧客に評価され継続的改善が進む活動**
SLP was made by Richard Muther
Process Analysis Method for a Work Process Kaizen

### Process Analysis Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>⬤</td>
<td>Operation</td>
<td>Check for 100% efficiency in operation speed and contents of operations.</td>
</tr>
<tr>
<td>🔷</td>
<td>Transport, conveyance</td>
<td>Transport does not add value to the product and should therefore be eliminated whenever possible. Items that must be moved should be moved along wide paths and across short distances.</td>
</tr>
<tr>
<td>■</td>
<td>Inspection</td>
<td>A square within a circle indicates an inspection process that builds quality into products. Consider ways to increase the precision of inspections, such as by installing mistake-proofing devices (poka-yoke). When this cannot be done, try to establish rapid feedback regarding defects.</td>
</tr>
<tr>
<td>△</td>
<td>Delay, standby</td>
<td>Such nonproductive time should be minimized. Bottlenecks results from poor process balancing, poor conveyance methods, inappropriate lot organization, poor production scheduling, and so on. Make corrective improvements.</td>
</tr>
</tbody>
</table>

### Layout of Electrical Outlet Assembly Operations

- finished product bin
- screws
- electrical outlet parts bins
- wire work table
- wires that need rework
- wire bin
- electrical outlet box bin
- work table
- 2m, 3m, 5m distances
## Analysis of Current Conditions in Electrical Outlet Assembly Operations

<table>
<thead>
<tr>
<th>Step</th>
<th>Work</th>
<th>Transport</th>
<th>Hold</th>
<th>Inspect</th>
<th>Distance (m)</th>
<th>Time (min.)</th>
<th>4WH</th>
<th>Who?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.04</td>
<td>✓</td>
<td></td>
<td>Can wire bin be placed closer to work table?</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.29</td>
<td>✓</td>
<td></td>
<td>What if she picks up exactly 20 wires?</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.04</td>
<td>✓</td>
<td></td>
<td>What if the wires were cut at this process?</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0.02</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>0.03</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>0.03</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>0.06</td>
<td>✓</td>
<td></td>
<td>Can a can be used to carry sets of parts and wires?</td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.00</td>
<td>✓</td>
<td></td>
<td>Can this be moved closer to the work table?</td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Worker gets tired in order to move violently with right and left.

The sitting-down repetition which stands

Useless Work Flow line

Before Kaizen

Case Study 4-1, cont'd
Process Analysis of Electrical Outlet Assembly Operation

Improvement Points:
• Wires and other electrical outlet parts were brought closer to the operator’s work table.
• Wire is kept on a reel to make it more easily accessible.
• A foot-operated wire cutter is used to free the operator’s hands for other work.
• The operator can pick up all needed parts and perform the assembly work while seated at the work table.
• The finished product bin has been moved next to the work table.

New Standards for Electrical Outlet Assembly Operations (After Improvement)

<table>
<thead>
<tr>
<th>Step</th>
<th>Work</th>
<th>Transport</th>
<th>Hold</th>
<th>Distance (in)</th>
<th>Time (sec.)</th>
<th>MW/HH</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The diagram illustrates the new assembly process after Kaizen implementation.
Before Kaizen

The sitting-down repetition which stands

Worker gets tired in order to move violently with right and left.

Useless Work Flow line

Use JIT Assemble Work system

Very Easy Job!

Keep the company Cycle Time

Eliminate Useless Work Flow line by using Turn Table

Kaizen to a kind of cell System
Please look at this Kaizen on URL: qcd.jp

Estimated Reduction Time 568 by Improvements
Current Working Time 22:24 = 1344 Sec.

$\frac{568}{1344} = 42.26\%$ Reduce

**Current Job System**

**Improvement Idea**

### Improvement Idea about Parts Assemble Job Step

**Before Improved Working Style**

1. **New Assemble Table Job**
   - Set three Parts on the Parts Clamping Die, and Drill jobs make holes after that set Parts by set tool

2. **Slide Table**: Positioning treatment and Fixing device
   - Major jobs are Measurement, Check Parts Position and Making Marks & Writing on Parts.
   - This Die can turn 360° (Angle)

3. **Instruction sheet**

4. **File cabinet**

5. **Clamping tools**

6. **Air Drill**

7. **Assemble Parts**

8. **Calipers**

9. **Pen**

10. **Drawing out type shelf**
   - Tape, Measure tool, Gloves in Here

**After Improved Working Style**

1. **New assemble Die**

2. **Slide Table**

3. **Slide Table**

4. **Instruction sheet**

5. **Drill cabinet**

6. **Tape, Measure tool, Gloves**

7. **Assemble three Parts**

8. **New assemble Die**

9. **Under table Assemble Part**

3. Practices of DVD job Process on your Company

実例テーマへの適用

①**Instruction sheet**

②**Pen**

③**Drawing out type shelf**
   - Tape, Measure tool, Gloves in Here

④**File cabinet**

⑤**Clamping tools**

⑥**Air Drill**

⑦**Assemble Parts**

⑧**Calipers**

⑨**Pen**

⑩**Drawing out type shelf**
   - Tape, Measure tool, Gloves in Here
Part of a Parts Assemble job

Work that danger is somewhat attended
Reason Why:
1. The fixation of the part unit is unstable.
2. If the nether part unit slips, the drill might become be broken and ease to make a injury status on this Job.

<table>
<thead>
<tr>
<th>No.</th>
<th>Work Process</th>
<th>IE</th>
<th>DVD Time</th>
<th>Net Time</th>
<th>Example of a Improvement Idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>Back tool</td>
<td>→</td>
<td>10:45 → 10:49</td>
<td>0:04</td>
<td>Cell Layout will reduce 0.02</td>
</tr>
<tr>
<td>52</td>
<td>Take Pen &amp; Scale</td>
<td>→</td>
<td>10:49 → 10:53</td>
<td>0:04</td>
<td>Cell Layout will reduce 0.02</td>
</tr>
<tr>
<td>53</td>
<td>Mark &amp; Sign on Parts Unit</td>
<td>○</td>
<td>10:53 → 11:27</td>
<td>0:34</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Take Glove &amp; Drill</td>
<td>→</td>
<td>10:27 → 11:36</td>
<td>0:09</td>
<td>New Assemble Die has no Gloves 0:07</td>
</tr>
<tr>
<td>55</td>
<td>Drill</td>
<td>○</td>
<td>11:36 → 11:44</td>
<td>0:08</td>
<td>Work that danger is somewhat attended</td>
</tr>
<tr>
<td>56</td>
<td>Back Drill and Take Parts</td>
<td>→</td>
<td>11:44 → 11:50</td>
<td>0:06</td>
<td>Cell Layout will reduce 0.03</td>
</tr>
<tr>
<td>57</td>
<td>Assemble Part</td>
<td>○</td>
<td>11:50 → 12:02</td>
<td>0:12</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Turn Parts Unit</td>
<td>→</td>
<td>12:02 → 12:07</td>
<td>0:05</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Takes off one's gloves.</td>
<td>→</td>
<td>12:07 → 12:10</td>
<td>0:03</td>
<td>New Assemble Die has no Gloves 0:03</td>
</tr>
<tr>
<td>60</td>
<td>Take Parts</td>
<td>→</td>
<td>12:10 → 12:20</td>
<td>0:10</td>
<td>Cell Layout will reduce 0.05</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>95 Sec.</td>
<td></td>
<td>Estimated Reduction Time: 22 Sec.</td>
</tr>
</tbody>
</table>
Comparison between conveyor line and cell production

The conveyor line which needs the long-Hour for SMED

Process A B C D E F

For ordered Products

Ross

For a product left by a production change

Cell Production One production method

A operator takes care a large number of processes

Process A~F

Product is X

Process A~F

Product is Y

Process A~F

Product is Z

In the case of a Product item change from Z to N, The Company changes only one cell

This method is very flexible for the change of the product, but needs Multi-Skill operators.
JIT Assemble needs of Big Plant Maker Products

Each company needs its own Production Control System

<table>
<thead>
<tr>
<th>TPS</th>
<th>General mass production</th>
<th>Special order production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluctuation in Production is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10%</td>
<td>Fluctuation in Production is more than 20 or 50%</td>
<td>Method to always contain design changes</td>
</tr>
<tr>
<td>Production Order</td>
<td>Input Order</td>
<td>Order</td>
</tr>
<tr>
<td>One order System</td>
<td>Shipping Order</td>
<td>Design Change Information</td>
</tr>
</tbody>
</table>
## Quality and Delivery Strategies (Now!)

### Shichifuku Towel (Imabari, Ehime)

Towel manufacturers: 500 in 1976; 100+ in 2008. While most are struggling, Shichifuku maintains excellent profits.

### ① Quality Strategy

1. Developed high-end products per Tokyu Hands’ request
2. Targeted hotels to sell high absorption towels.
3. PR on design ability at a Trade Show in US. Hollywood stars embraced it. (flexible design)

### ② Delivery Strategy

1. Put company name and phone number on the products.
2. Established a direct sales system.
3. Accepted design requests. The words of mouth, especially from Hollywood stars. Responded individualized needs.
the Influences by Natural Disasters

East Japan great earthquake

Example of East Japan great earthquake

URL: https://skydrive.live.com/?cid=E1DE36C8302689A8&id=E1DE36C8302689A8%21577 2011-5震災ボランティアより
Influence on auto sales by the East Japan great earthquake disaster

Sales Status at Y11 June

<table>
<thead>
<tr>
<th>Car Number</th>
<th>Ratio to One Year ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM</td>
<td>215,358</td>
</tr>
<tr>
<td>Ford</td>
<td>194,114</td>
</tr>
<tr>
<td>Chrysler</td>
<td>120,394</td>
</tr>
<tr>
<td>Toyota</td>
<td>110,937</td>
</tr>
<tr>
<td>Honda</td>
<td>83,892</td>
</tr>
<tr>
<td>Nissan</td>
<td>71,940</td>
</tr>
</tbody>
</table>

Main points
1. Toyota and Honda got East Japan great earthquake disaster influences and not enough for parts supply
2. Sale of Toyota car Prius sales down was 62%
3. Toyota revive it in July, but there are many problems

Supply Chain Problems by East Japan great earthquake disaster: Examples of some parts

1. Semiconductor integrated circuit (ASIC):
   At Ibaragi Naka Area: Products made by Runesasu-Electronics were not able to be received for three months. The situation that has difficulty in substitute for an absolutely confidential study-like product
2. Synthetic rubber for Thailand and brakes made by Fukushima Kotaka-Fujikura Rubber and Additive to Rubber made by Ohouchi-Shinnko Kagaku are hard to be get.
3. Toyota Plant can not get parts soon which is more than 3,000 items.
The situation of the submergence in the November, 2011 Thailand country

URL: http://ja.wikipedia.org/wiki/%E3%82%BF%E3%82%A4%E5%A4%A7%E6%B0%B4

Honda Plant was buried in water and the operation are not possible.

The situation of the flood in the Bangkok city.

The situation of the submergence that a satellite photo shows.

533 dead people
Two missing people
October 27, 2011 influence of East Japan great earthquake disaster and the country flood in Thailand

<table>
<thead>
<tr>
<th>Company name</th>
<th>Domestic production</th>
<th>Export</th>
<th>Offshore production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>1,235,011 (▼23.4)</td>
<td>665,105 (▼21.2)</td>
<td>1,912,150 (▼ 7.8)</td>
</tr>
<tr>
<td>Nissan</td>
<td>539,798 (▼ 6.1)</td>
<td>349,860 ( 4.1)</td>
<td>1,712,196 ( 18.4)</td>
</tr>
<tr>
<td>Honda</td>
<td>294,234 (▼39.5)</td>
<td>89,822 (▼45.6)</td>
<td>936,938 (▼29.1)</td>
</tr>
<tr>
<td>Suzuki</td>
<td>474,654 (▼13.2)</td>
<td>122,712 (▼13.9)</td>
<td>842,019 (▼ 3.9)</td>
</tr>
<tr>
<td>Matsuda</td>
<td>409,393 (▼10.6)</td>
<td>301,971 (▼13.7)</td>
<td>159,999 (▼12.2)</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>281,954 (▼12.6)</td>
<td>207,363 (▼ 4.4)</td>
<td>274,238 ( 14.3)</td>
</tr>
<tr>
<td>Daihatsu</td>
<td>283,130 (▼14.6)</td>
<td>19,004 (▼48.1)</td>
<td>180,922 ( 3.4)</td>
</tr>
<tr>
<td>Subaru</td>
<td>177,996 (▼27.2)</td>
<td>114,054 (▼30.6)</td>
<td>68,619 (▼11.8)</td>
</tr>
</tbody>
</table>

For natural disaster evasion, what kind of preparations should the company plan? I would like to present some countermeasures on a TPS seminar.
### Evaluation of the risk

\[ P \times S \]

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>5: Fatal</td>
<td>5: Very High</td>
</tr>
<tr>
<td>4: Very Big</td>
<td></td>
</tr>
<tr>
<td>3: So-So</td>
<td>3: So-So</td>
</tr>
<tr>
<td>2: Small</td>
<td></td>
</tr>
<tr>
<td>1: Nothing</td>
<td></td>
</tr>
</tbody>
</table>

### Measures entry column

<table>
<thead>
<tr>
<th>Item of Risk</th>
<th>Cause of Problem</th>
<th>P</th>
<th>S</th>
<th>Precaution</th>
<th>urgent measures</th>
<th>Act.</th>
</tr>
</thead>
</table>

- **P**: Certainty of the realization
- **S**: Easiness of the enforcement

- **Them**: By When
- **We eliminate natural Hazards**
Model Idea of risk reduction to Delivery stabilization of each supplier

1. Decentralization of the risk looking for many production bases

2. The limitation of the production base and important point reinforcement of natural disaster measures: Financial support

3. In-house production to Key Parts
Thank you for the participation in today's seminar.