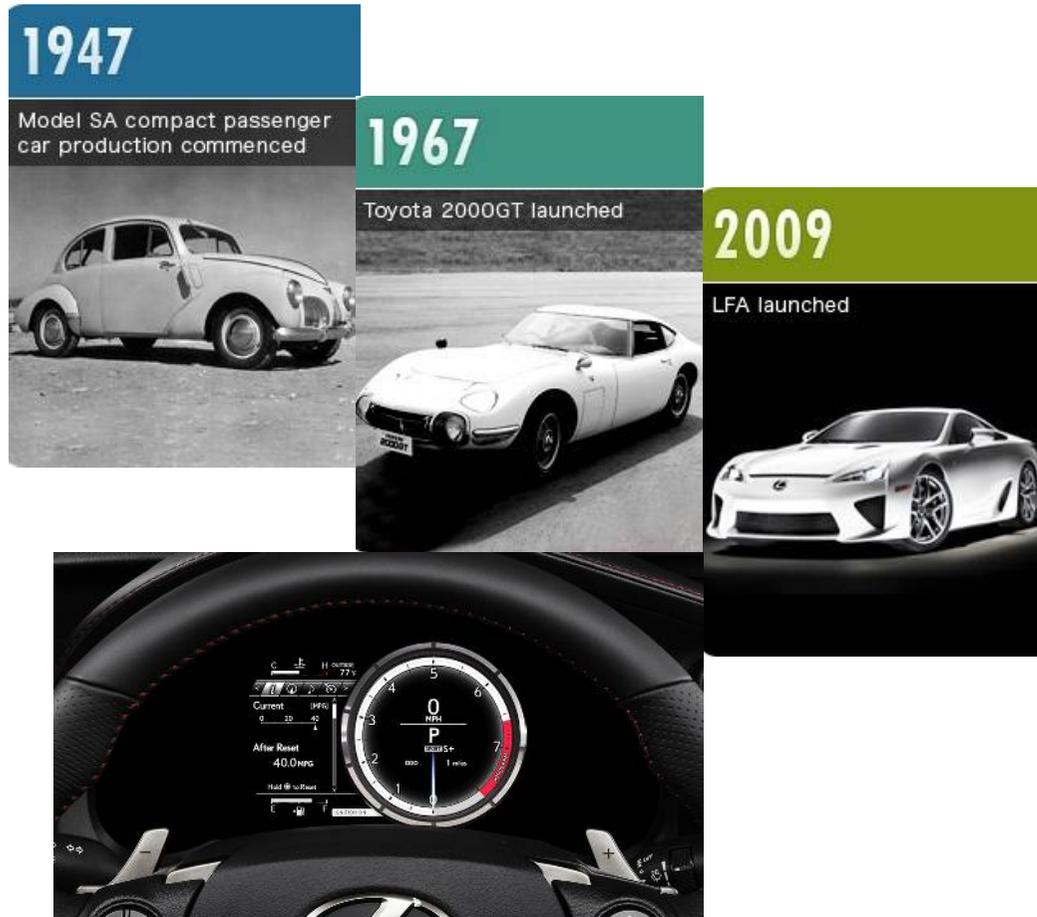


# Toyota Production System

1. Introduction
2. History of TPS
3. House of Toyota
4. Just-in-Time
5. Jidoka
6. Toyota Way



# 1.Introduction

Thank you very much for your attendance despite your busy schedules. It is a great pleasure to be here today. Now I would like to begin the presentation of the Toyota Production System.

First of all, please let me take this opportunity to introduce myself. I am Masahiro Kunishima. I was born and brought up in Ichinomiya city. After majoring in economics in Sophia University, I worked with IBIDEN corporation for 28 years. IBIDEN was established in 1912 as an electric power company to bring growth to the regional economy. So, IBIDEN has just celebrated the 100th anniversary of its foundation in last November. Currently IBIDEN's primary businesses are Electronics and Ceramics related. It's Electronic products include Printed Wiring Boards and Plastic Packaging and DPF and so on. DPF stands for Diesel Particulate Filter which is automotive exhaust system components. In all fields, IBIDEN co-operate with the world's leading businesses, such as Intel Corporation. As for me, I worked in Electronic parts sales department, Finance department, and Productivity promotion department. I learned and practiced much about Toyota production system while working in Productivity promotion department.

It'll take about thirty minutes to finish my presentation.

First of all, do you know the difference between Toyoda and Toyota?

Toyota started in 1933 as a division of Toyoda Automatic Loom Works. The Toyota Motor Corporation was established as an independent company in 1937.

Toyoda Standard Sedan AA were originally sold under the name "Toyoda", from the family name of the company's founder, Kiichiro Toyoda.

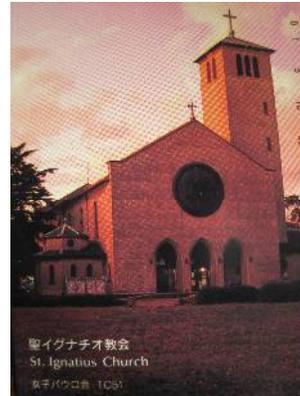
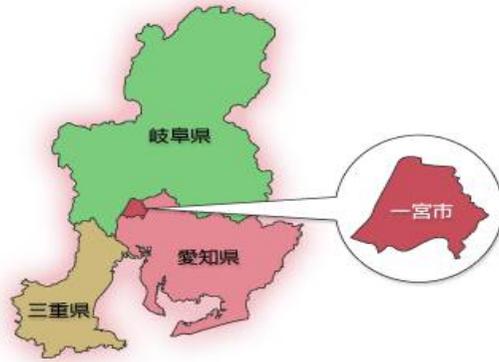
In 1936, Toyota entered the passenger car market with its Model AA and held a competition to establish a new logo emphasizing speed for its new product line. After receiving 27,000 entries, one was selected that additionally resulted in a change of its moniker to "Toyota" from the family name "Toyoda." It was believed that the new name sounded better and its eight-stroke count in Japanese language was associated with wealth and good fortune. Currently the original logo is not found on its vehicles.

The new logo was trademarked and the company was registered in August 1937 as "Toyota Motor Corporation".

# 【 1.Introduction】

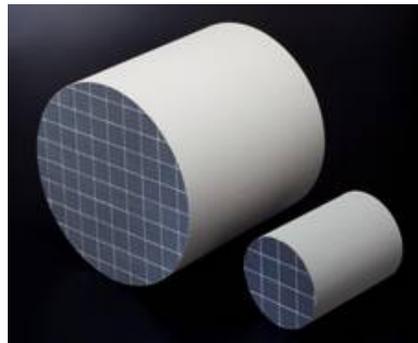


Higashi-Yokoyama Power Plant



## Applications

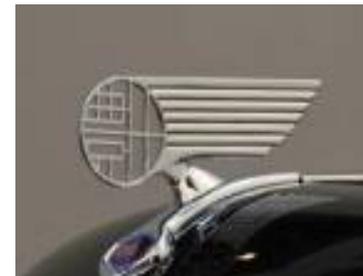
- Mobile Phone
- Digital Camcorder
- Digital Still Camera
- Next Generation Compact Module
- Other Compact Mobile Devices



## Applications

- Car Bus Truck
- Construction vehicle
- Fork lift
- Other powered vehicles, machines

Toyota? Toyota?



## 2. History of TPS

### **TPS The Toyota Production System**

First, let me begin with this story before explaining TPS .

One of the historic breakthrough in the automotive industry occurred when a Japanese walked into a supermarket while on a business trip to the United States. The man's name was Taiichi Ohno. The visit to the supermarket was not even part of his schedule. Ohno was a factory manager at Toyota Motor Corporation, and he traveled to the United States in 1956 to see American automobile plants. This was slightly more than ten years after World War II, when Japan was still struggling to emerge from the depths of postwar poverty.

### **Toyota's History of Implementing Innovations**

Kiichiro Toyoda, who was the CEO of Toyota Motor Corporation, was especially eager to learn from American automotive industries. Henry Ford had pioneered the modern assembly line several decades earlier, and Kiichiro had visited Ford's factories in the United States before the war. He returned to Japan with an understanding of conveyor-fed lines, a key element of Ford's mass production system. However, Toyoda encountered some significant obstacles. Factories in Japan had less floor space than those in the United States, so he couldn't simply copy Ford's layouts. Another problem was the supply of raw materials, which could stockpile in huge quantities. Kiichiro therefore altered Ford's way by feeding each production process with a small amount of materials, often staying just ahead of the production schedule. This practice of providing small, frequently replenished quantities to a factory process would later evolve into the strategy known as "just-in-time manufacturing" or JIT. JIT has been implemented in factories throughout the world. JIT was considered to be cutting-edge when it was "discovered" in the West, but Toyota Motor Corporation and other Japanese companies had been practicing JIT for decades.

## **Linking Manufacturing Process with Customer Demand**

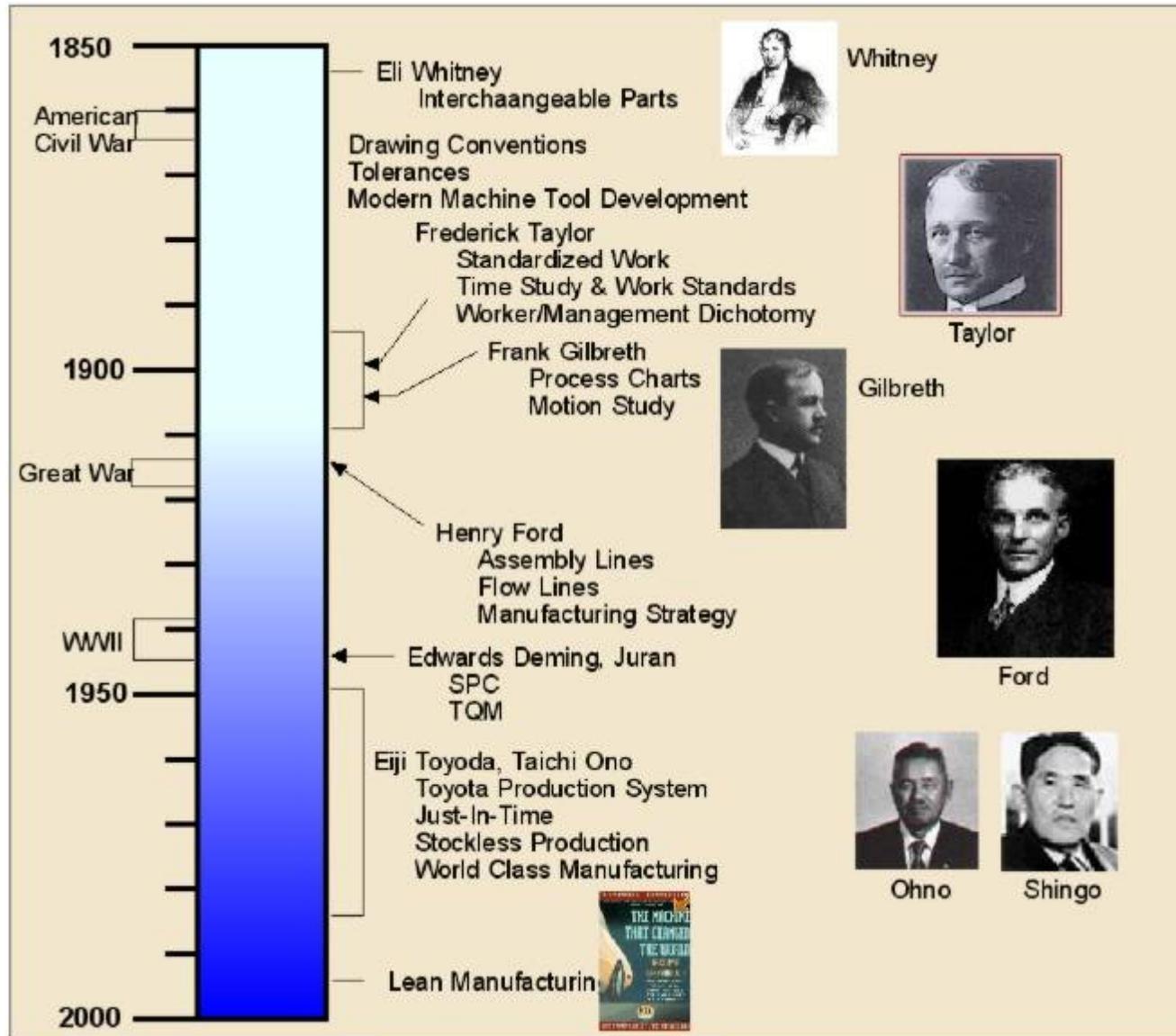
Ohno was impressed by the efficient way in which the shelves in the American supermarket were replenished. Stockers walked around the store, replenishing items as they were purchased by consumers. Inventory levels in the supermarket aisles were carefully controlled within a predetermined range. The shelves were neither empty nor overflowing with excess goods. Using this system, the supermarket was able to control the inventory levels of thousands of items. When Ohno returned to Japan, he attempted to apply the supermarket system to Toyota's production lines. Finally Ohno implemented a "pull" system. Instead of blindly producing intermediate goods and forcing them out to the next process in quantities that might be too large or too small, each process in the plant could be a "supermarket" for the next process.

Ohno, who devoted himself to structuring the Toyota Production System as an integrated framework, received the inspiration for the system, not from the American automotive industry, but from a supermarket. He saw the American supermarket as the model for what he was trying to accomplish in the factory. The center of the philosophy behind its system was to work intelligently and to eliminate waste for minimizing inventory. This format, then, was a pull system, driven by the demand from the subsequent process.

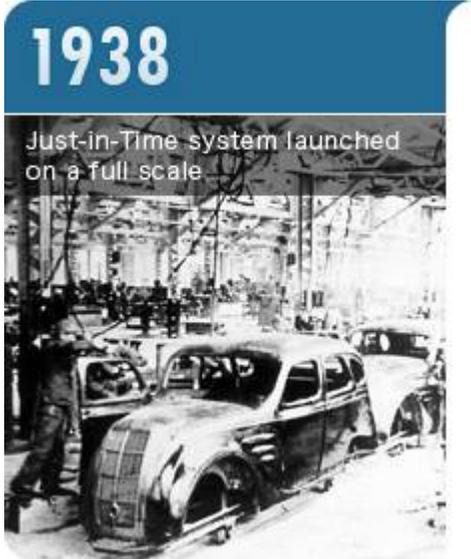
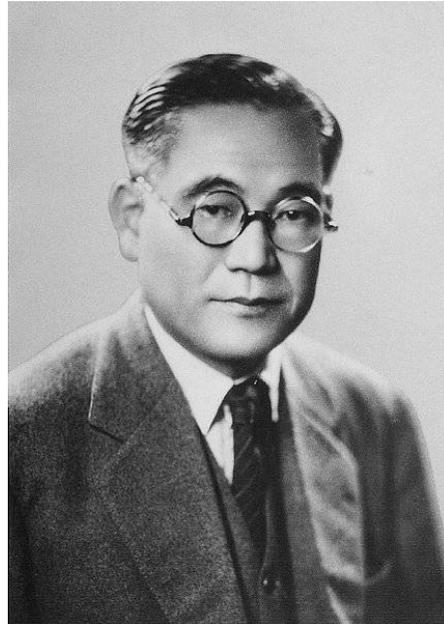
The Toyota Production System is a management concept based on the Just-in-Time system and jidoka which can be generally translated as 'automation with a human wisdom'. At first the system worked very efficiently for Japanese market in the postwar period. For Japan, having been still poor, cost minimization and efficiency were essential. On the other hand, it was also important to satisfy market demand to catch up with rich and prosperous Western nations. The theory might be easily understood, but not very easily practiced. This is an extremely simplified description of the Toyota Production System.

# 【 2.History of TPS 】

## History of Manufacturing Management



# Establishment of Toyota Motor Corporation



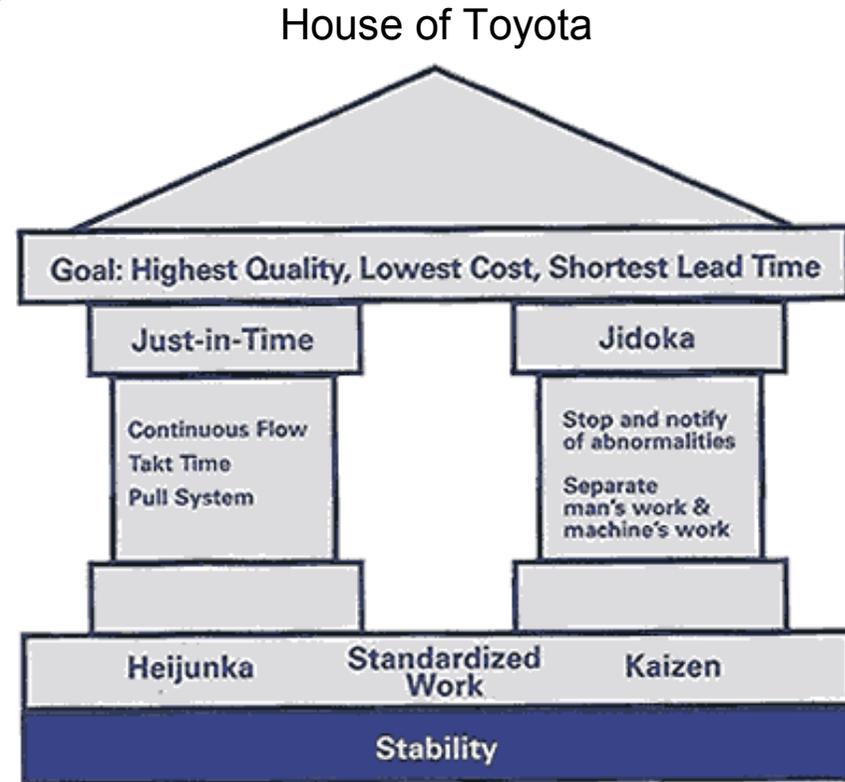
The Toyota Model AA was the first passenger car produced by Toyota. Designed and manufactured under the leadership of Kiichiro Toyoda.

## 【 3.House of Toyota 】

Toyota was able to greatly reduce **lead time** and **cost** using the TPS, while improving **quality**. This enabled it to become one of the ten largest companies in the world. Due to the success, many of these methods have been copied by other manufacturing companies, although mostly unsuccessfully.

### Toyota Production System (TPS)

- Definition: The production system developed by Toyota Motor Corporation to provide best quality, lowest cost, and shortest lead time through the elimination of waste.
- TPS is comprised of two pillars, Just-in-Time and Jidoka (autonomation) , and is often illustrated with the "house".
- TPS is maintained and improved through iterations of standardized work and kaizen (continuous improvement), following Plan–Do-Check-Act .



Toyota Production System "House"

## **Just-in-Time**

— Productivity improvement —

- Making only “what is needed, when it is needed, and in the amount needed!”

Producing quality products efficiently through the complete elimination of waste, inconsistencies, and unreasonable requirements on the production line.

- One of the aims of just-in-time production is to minimize inventory and to reduce production cost.
- Just-in-time production may require careful analysis to be successfully implemented.
- Just-in-time production means the necessary parts and materials are delivered in the right quantity when they are needed.
- Just-in-time production streamlines production processes and clarifies problems at the same time.

## **jidoka**

— Highlighting or visualization of problems —

-Quality must be built in during the manufacturing process!-

- Automation introduces human judgment into machines.
- Automation detects abnormalities and stops the production process.
- Automation helps to find out the root cause of defects.
- Machines are supposed to respond to every abnormality.
- Automated equipment with human intelligence makes the production process more reliable.

## 4. Just-in-Time

Just-in-time manufacturing means producing the necessary items in necessary quantities when necessary. It is a philosophy of continuous improvement in which non-value-adding activities are identified and removed.

Putting this concept into practice means a reversal of the traditional thinking process. In conventional production processes, units are transported to the next production stage as soon as they are ready. In JIT, each stage is required to return to the previous stage to pick up the exact number of units needed.

### **JIT Components**

Production Leveling

Pull System

Kanban system

Small Lot Production

Setup Time Reduction

Line Balancing

## 【 4.Just-in-Time 】

# What Does Just-in-Time Do?

- Reduces waste
  - Anything not adding value to the product
    - From the customer's perspective
- Clarifies problems and bottlenecks caused by variability
- Achieves streamlined production
  - By reducing inventory

## Just-in-Time Production

Just-in-Time production produces what the customer needs, when it is needed, in the quantity needed.

This must be done with minimum resources of manpower, material, and machinery.

The three elements of JIT are:

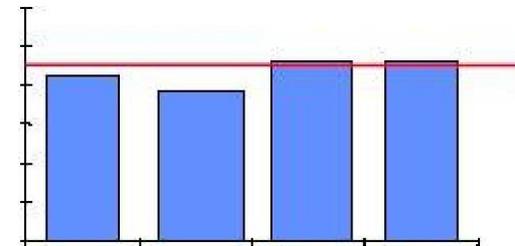
- 1) Takt Time
- 2) Flow Production
- 3) Pull System

(1)



TIME

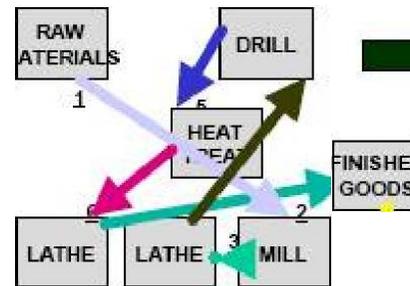
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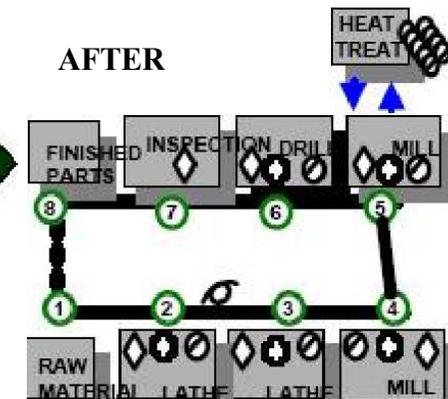
OPERATORS

(2)

BEFORE



AFTER



(3)



## 5. Jidoka

Jidoka means introducing human intelligence to automated machines.

Equipments stop automatically in abnormal conditions.

Jidoka enables reducing excess manpower when it works properly.

If a defect is found in an equipment, the machine in problem automatically stops, and then operators cease production to solve the problem.

For proper operation of Just-in-Time system, all of the parts to be made and supplied must meet predetermined quality standards. This is achieved through jidoka.

Jidoka means that a machine safely stops when the normal processing is completed. It also means that, should a quality or equipment problem arise, the machine detects the problem by itself and stops, preventing further production of defective products. As a result, only products that satisfy quality standards will be passed on to the following processes on the production line. This also means that each operator can be in charge of many machines, resulting in higher productivity

## 【 5.Jidoka 】

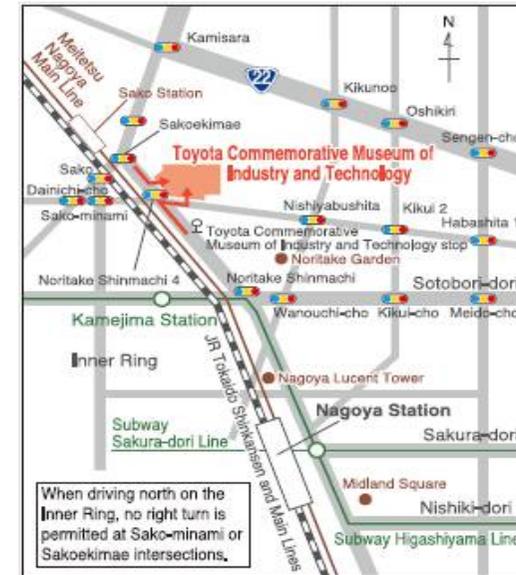
# Jidoka Techniques

- Poka-yoke (mistake or error proofing)
  - A form of device for built-in quality at each production process.
  - Rules of POKA-YOKE
    - Don't wait for the perfect POKA-YOKE. Do it now!
    - If your POKA-YOKE idea has better than 50% chance to succeed...Do it!
    - Do it now....improve later!
  - Goal: Finding defects before they occur = Zero Defects
- Visual management including use of Andon Lamp

English



**TOYOTA** *Commemorative Museum of Industry and Technology*



### Group-operated Type G Automatic Looms

In 1924, Sakichi invented the world's first automatic loom, called the "Type-G Toyoda Automatic Loom (with non-stop shuttle-change motion)" which could change shuttles without stopping operation.

Live Demonstration

Now take a look at the example, find the difference between Stove A and Stove B situations. I think that is a good solution for the initial design mistake.



Stove A

### Stove A

Which control knob operates each burner?

Note: Operator must reach some control knobs over burners.



Stove B

### Stove B

Association between each control knob and burner is clear.

## Andon



## Kanban



- Visual management including use of Andon Lamp
- Visual control indicates what needs to be done and when.
- Electric light and signals are often used to control operations.
- Visual management tools include Kanban, Andon boards, charts, diagrams and schedule boards.
- An Andon board shows the current status of production flow.
- An Andon board also indicates a line stop.
- A red light indicates the production line has stopped.
- A yellow light indicates a machine needs an operator or a machine setup is required.
- A green light indicates the machine is working properly.

## 【 6.Toyota Way 】

By practicing the philosophies of "Daily Improvements" and "Good Thinking, Good Products“, the TPS has evolved into a world-renowned production system. Furthermore, all Toyota production divisions are making improvements to the TPS day and night to ensure its continued evolution.

Recently, the "Toyota spirit of making things" is referred to as the "Toyota Way." It has been adopted not only by companies inside Japan and within the automotive industry, but in production activities worldwide, and continues to evolve globally.

