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## **DEPARTMENT OF AUTOMOBILE ENGINEERING**

### **COURSE NAME : 19AUZ405 – LEAN MANUFACTURING**

**IV YEAR / VII SEMESTER**

**Topic – A CASE STUDY ON TOYOTA PRODUCTION SYSTEM**



- **Company History:** Toyota Motor Corporation was Japan's largest car company and the world's third largest by the year 2000.
- The company was producing almost five million units annually in the late 1990s and controlled 9.8 percent of the global market for automobiles. Although its profits declined substantially during the global economic downturn of the early 1990s, Toyota responded by cutting costs and moving production to overseas markets.
- The company represented one of the true success stories in the history of manufacturing, its growth and success reflective of Japan's astonishing resurgence following World War II.



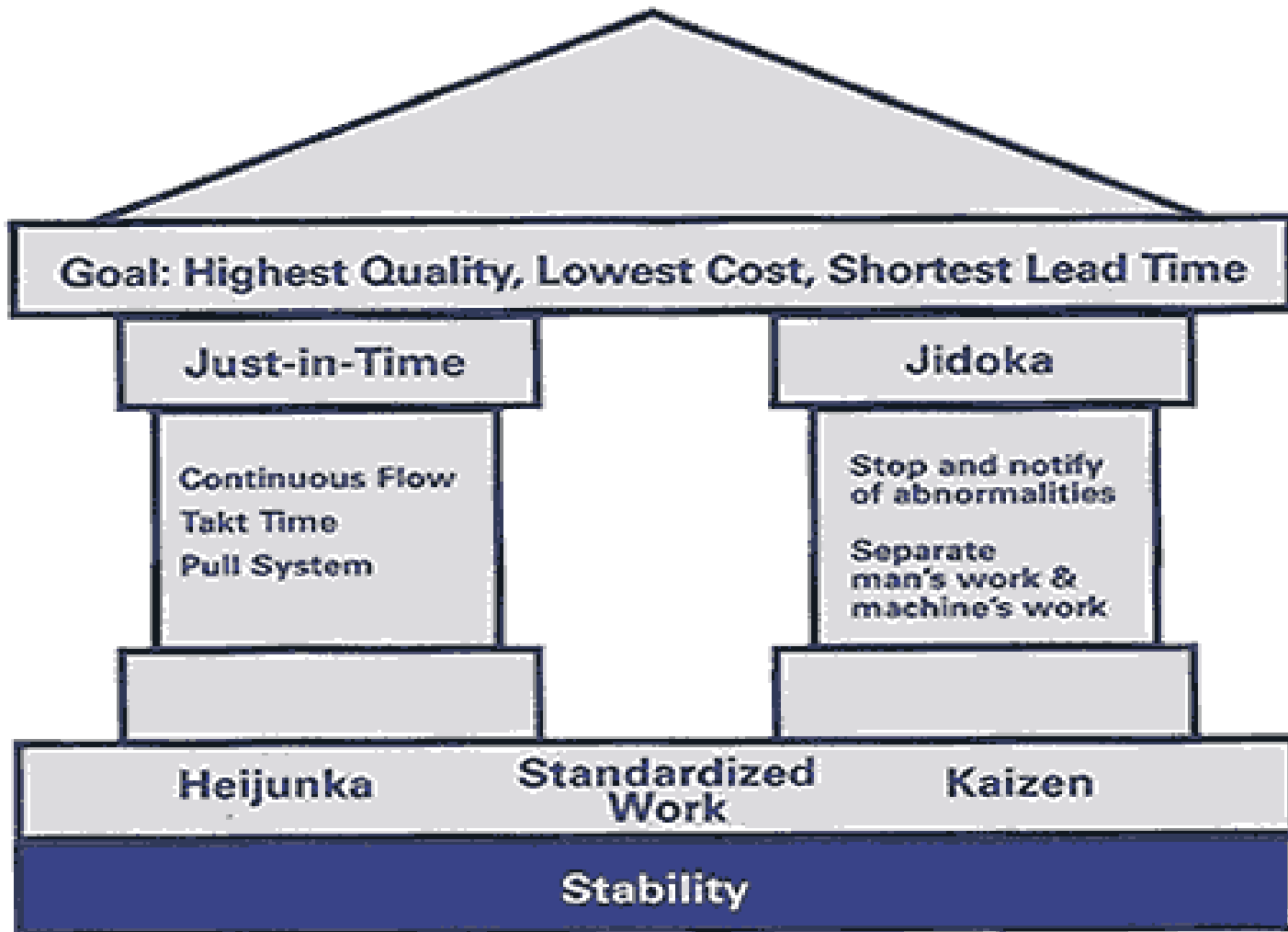
# History of Toyota

- 1867 Sakichi Toyoda born
- 1890 Sakichi Toyoda invented the wooden Toyoda handloom.
- 1929 Kichiro toyoda traveled to Europe and U.S to investigate automobile
- 1930 Kiichiro Toyoda started research into gasoline-powered engine
- 1933 Automobile Department established in Toyoda Automatic Loom Works,Ltd
- 1935 Hinode Motors (currently Aichi Toyota) started operations
- 1936 Toyota's logo established.
- 1937 Toyota Motor Co., Ltd. established.
- 1938 Koromo Plant (currently Honsha Plant) started operations. "Just-in-time" system launched on a full-scale basis.



# Toyota Production System

- 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, and is often illustrated with the "house" shown below. TPS is maintained and improved through iterations of standardized work and kaizen, following PDCA, or the scientific method.



Toyota Production System "House"



- Beginning in machining operation and spreading from there, Ohno led the development of TPS at Toyota throughout the 1950's and 1960's and the dissemination to the supply base through the 1960's and 1970's.
- Outside Japan, dissemination began in earnest with the creation of the Toyota-General Motors joint venture - NUMMI - in California in 1984.
- The concepts of Just-in-Time (JIT) and jidoka both have their roots in the pre-war period. Sakichi Toyoda, founder of the Toyota group of companies, invented the concept of Jidoka in the early 20th Century by incorporating a device on his automatic looms that would stop the loom from operation whenever a thread broke.
- This enabled great improvements in quality and freed people up to do more value creating work than simply monitoring machines for quality. Eventually, this simple concept found its way into every machine, every production line, and every Toyota operation.



- Kiichiro Toyoda, son of Sakichi and founder of the Toyota automobile business, developed the concept of Just-in-Time in the 1930's. He decreed that Toyota operations would contain no excess inventory and that Toyota would strive to work in partnership with suppliers to level production.
- Under Ohno's leadership, JIT developed into a unique system of material and information flows to control overproduction.
- Widespread recognition of TPS as the model production system grew rapidly with the publication in 1990 of "The machine that changed the world", the result of five years of research led by the Massachusetts Institute of Technology.
- The MIT researchers found that TPA was so much more effective and efficient than traditional, mass production that it represented a completely new paradigm and coined the term "Lean Production" to indicate this radically different approach to production.



# Taiichi Ohno and the Toyota Production System



- At the end of the Second World War, the people of Japan were in terrible trouble, their morale, productive capacity, and international relations demolished. An engineer named Taiichi Ohno, in the enterprise today known as Toyota, began the task of building a new capacity for Japanese production on top of Henry Ford's designs, with some important additions.
- For example, Ford incorporated everything into one plant; Ohno designed for operation in a network. The operational heart of Ford's designs was the way the engineers designed the coordination of the work on the assembly line (the employees found the repetition boring and only stayed because of what Ford called the 'wage motive.')
- Ohno centered his design in processes that built the capacity of each person on the production floor to take responsibility for the quality and coordination of their work. His invention became the foundation of the quality movement that swept the world starting in the 1970s and 80s.





# Seven Wastes

For several years beginning after the Second World War, Taichi Ohno and Eiji Toyoda studied and eventually developed a deep understanding of the wastes that occur on a shop floor. After years of effort, seven categories were identified:

- Labor
- Overproduction
- Space
- Defects
- Unnecessary human motion
- Inventory
- Transportation



# JIT

- Just in Time, or JIT is a set of techniques to improve the return on investment of a business by reducing in-process inventory, and its associated costs.
- The process is driven by a series of signals, or Kanban that tell production processes to make the next part. Kanban are usually simple visual signals such as the presence or absence of a part on a shelf.
- JIT causes dramatic improvements in a manufacturing organization's return on investment, quality, and efficiency.



- The technique was first adopted and publicized by Toyota Motor Corporation of Japan as part of its Toyota Production System (TPS).
- Japanese corporations cannot afford large amounts of land to warehouse finished products and parts. Before the 1950s this was thought to be a disadvantage because it reduced the economic lot size.
- An economic lot size is the number of identical products that should be produced, given the cost of changing the production process over to another product. The undesirable result would be a poor return on investment for a factory.



# Kaizen in TPS

- The famous TPS cannot be reduced to its organizational techniques of production such as “just-in-time” and “Jidôka” (making machine tools and production lines autonomous, that is, they stop automatically when an anomaly occurs).
- Its essence resides in the method of keeping up and reducing production costs as well as improving product quality. This method is called “kaizen”.



# The Nature of Traditional **sns** Kaizen Activities

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- The TPS can be understood as a set of systematized ways to reduce the cost per vehicle. These cost reduction activities start from the product design stage.
- After that, the management sets a reference cost of each of the parts and a standard time for their production. Then the shop floor that produces these parts and vehicles firstly endeavors to attain these costs and standard time, and then reduces them by carrying on kaizen activities.
- It is the group leaders, chief leaders and engineers whose responsibility it is to execute these activities. These activities and the kaizen gains are supervised and controlled by management. Thus we call these kaizen activities “organized kaizen activities”.



- Some surprising things occurred. A huge amount of cash appeared, apparently from nowhere, as in-process inventory was built out and sold. This by itself generated tremendous enthusiasm in upper management.
- Another surprising effect was that the response time of the factory fell to about a day. This improved customer satisfaction by providing vehicles musually within a day or two of the minimum economic shipping delay.



# Some Key Elements of JIT



1. Stabilize and level the MPS with uniform plant loading
2. Reduce or eliminate setup times
3. Reduce lot sizes (manufacturing and purchase)
4. Reduce lead times (production and delivery)
5. Preventive maintenance
6. Flexible work force
7. Require supplier quality assurance and implement a zero defects quality program
8. Small-lot (single unit) conveyance



*Thank You !*