NEC's MONOZUKURI Strengthening Activities

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Abstract

In the 1990's, concerned that the survival of its domestic factories was at stake, NEC started its "Production Innovation" scheme. Subsequently, this policy has been advancing supportive improvements in its factories by the creation of a "pull" based mechanism that deals with the demands from customers. By this mechanism the logistics system is reformed by information on individual orders from customers being transmitted directly to the factory. Production innovation is now positioned as a management innovation that features "MONOZUKURI strengthening" activities that cover all of NEC's departments. This paper is intended to introduce a summary of the "MONOZUKURI strengthening" and production innovation activities of NEC.

Keywords

MONOZUKURI, production innovation, Toyota Production System, KAIZEN (continuous improvement) logistics, delivery, quality, fostering of human resources

1. Introduction

In recent years, aiming at a restoration of the tradition of "MONOZUKURI," the Japanese fabrication industries as well as utilizing their inheritance of traditional skills have also been enhancing their development methods by applying improved technologies that are only available in Japan. At NEC, in 2005 the MONOZUKURI-related departments that had been distributed across the corporation, were integrated into the MONOZUKURI Innovation Unit. This policy enabled the promotion of the strengthening of MONOZUKURI at the corporate level. In 2007, functions related to the improvement of the corporate-level quality of the unit were improved even further. With the cooperation of various departments of NEC, the MONOZUKURI Innovation Unit is currently promoting the strengthening of MONOZUKURI throughout the entire NEC Group. This paper discusses the MONOZUKURI strengthening activities of the NEC Group and the production innovation activities that provide their foundation.

2. MONOZUKURI Promotion Activities

2.1 What are MONOZUKURI Promotion Activities

The term "MONOZUKURI" is often used in daily Japanese language and the definition varies depending on the person using it. At NEC, the MONOZUKURI strengthening activities are given the following definition: [*1]

In order to build overwhelming competitiveness in terms of cost, quality and delivery and to effectively deploy production innovation activities that serves the "elimination of wastefulness and the creation of flow." This state of affairs exists mainly at our production sites but also applies to the NEC departments that are either directly or indirectly involved in the value chain (**Fig. 1**).

The production innovation activities are detailed in Section 3 below. A value chain means a chain that can provide value for the customer and covers all of the functions of an enterprise from product planning to the development, procurement, production, delivery and maintenance/after-sales servicing. This means that the MONOZUKURI strengthening activities not only cover improvement activities at factories but also those in the development departments (of hardware and software products) and in other indirect or administration departments.

[*1] "Monozukuri" is a Japanese word meaning production; "Monozukuri" in this paper covers a value chain including product development, production and delivery processes.

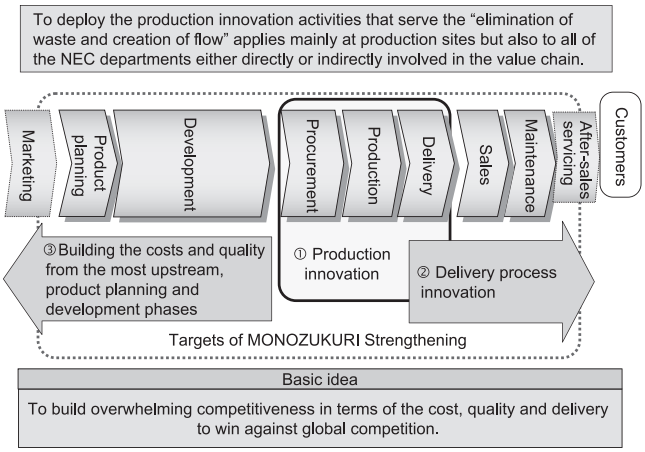

Fig. 1 MONOZUKURI strengthening.

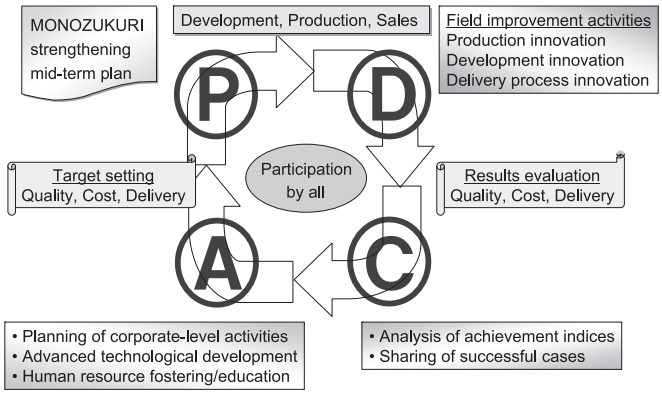

Fig. 2 Concept of promoting the MONOZUKURI strengthening activities.

It is important to improve the quality, competitiveness and profitability of products and services by MONOZUKURI strengthening, but this strategy necessitates improvements in the quality of the technologies and processes as well as in workers and organizations activities. As mentioned in the book entitled "MONOZUKURI-DOU (Road to MONOZUKURI)" by Eizaburo Nishobori [1], we should stress the importance of the need for workers to conduct their work wholeheartedly and of their own free will, to challenge and make use of their originality and inventions, contribute to the society with their world class standards of workmanship, and realize their own wellbeing.

2.2 How to Promote MONOZUKURI Strengthening Activities

What is important in the promotion of MONOZUKURI strengthening is to advance the PDCA cycle quickly based on participation of all hands (**Fig. 2**). The Planning stage should be started by indicating the guidelines of activities and establishing the "MONOZUKURI strengthening mid-term plan" as a measure for achieving the mid-term management plan of each business unit and each department. In order to achieve the aims of the plan, unambiguous procedures and schedules should be applied to the related processes, such as those of development and production, etc. The Do phase consists of autonomous activities in the field based on the "MONOZUKURI strengthening mid-term plan." The Check phase consists of an evaluation of the results from the viewpoints of QCD (Quality, Cost, Delivery) and, in addition to the analysis of the achievement indices, it is also required to share information on the successful cases at the corporate level via results exhibitions and conventions. Finally, the Action phase should promote the planning of the corporate-level activities that are carried out by all departments beyond the barriers between them; advance the development of technologies and the fostering of human resources and set the QCD targets to be subsequently challenged.

In order to carry out the mid-term plan, it is first necessary that the top management explains its function to the field staff in his or her own language. The top management and the field staff share the mid-term plan and break down the targets by deploying the plan and the field staff should develop autonomous activities by compiling individual execution plans. In the Check and Action phases, the top management visits the field to align the orientation of all of the field staff. Field activities can be activated when the top management shares a problem with the field via direct conversations with the field staff, gives the appropriate advice and assists thus in the elimination of obstacles.

2.3 Fostering MONOZUKURI Human Resources

MONOZUKURI is also a development of human resources, and the entire NEC Group is promoting the fostering of MONOZUKURI human resources from this conceptual viewpoint. We have arranged an education system of human resources related to MONOZUKURI from the aspects both of training of experts and of expanding awareness among a wider range of staff (**Fig. 3**).

Education for expanding awareness includes lectures, factory visits and practical training as well as the positive use of e-learning. E-learning courses for learning the importance of

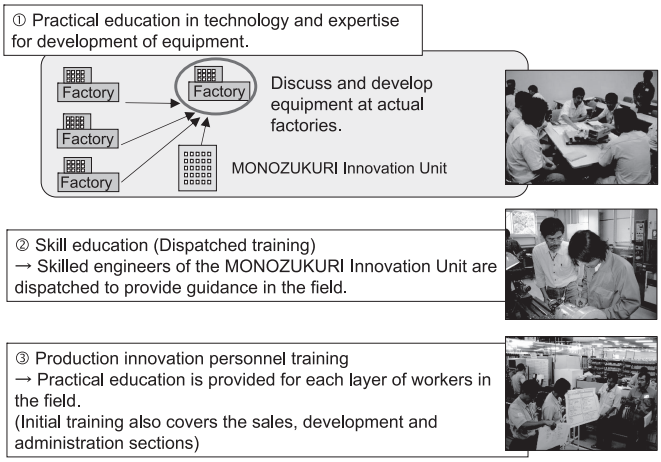

Fig. 3 Fostering and education of MONOZUKURI human resources.

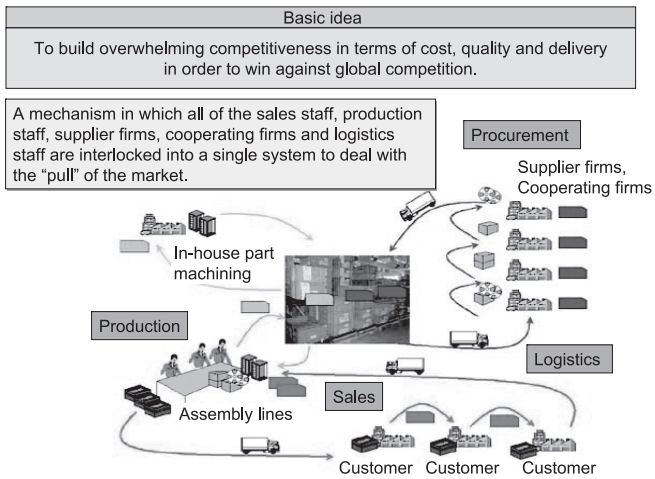

Fig. 4 Strengthening of SCM.

production innovation and MONOZUKURI strengthening in 30 to 60 minutes are prepared and given to more than 3,000 NEC Group members for the training of new employees and newly promoted administrators every year. These courses are very well approved even by the trainees from sales and other indirect and administration departments, who usually have few opportunities for visiting the factories. After completing the course, a trainee from the sale department remarked, "I understand that the factories are making very good efforts. I will advise our customers about this point in my sales talk," and another one from an administration department said, "I will apply the idea of production innovation in my own work."

3. Production Innovation Activities

In this section, we will describe production innovation activities [2,3] as the basis for the MONOZUKURI strengthening activities described in Section 2.

3.1 Beginning and Development of Production Innovation Activities

Since the 1990's, diversification of customer needs and variations in demands have become so noticeable that serious countermeasures have become necessary. Moreover, the appreciation of the yen has tended to reduce the export competitiveness of Japan and resulted in the emergence of Southeast Asia and China in the field of production. To deal with this trend, NEC introduced the Toyota Production System in our domestic factories as early as in the first half of the 1990's, thereby challenging improved productivity, lead time and quality with a thorough elimination of wastefulness by utilizing good judgment based on all-hands participation in the field of production. Perceiving the wastefulness of excessive production, value-less behavior and wasteful transport processes, we have succeeded in reducing production costs and factory inventories by changing our production methods. At present, production innovation activities have been expanded to include all of NEC's domestic factories.

Subsequently we took action to strengthen the SCM (Supply Chain Management) by creating a mechanism in which the sales department, production department, suppliers, cooperating firms and logistics firms are interlocked so that the whole supply chain can deal with the "pull" of market by functioning as a single system (**Fig. 4**). Concurrently with the promotion of production innovation activities we also created the order fulfillment system and reformed the logistics networks. This was in order to thoroughly eliminate wastefulness and establish an appropriate flow at the factories by aiming at the creation of a "pull" based mechanism that deals with the demands of customers. It is only when the three main factors of production innovation, order fulfillment system and logistics innovation have been established that we are able to lead the results of production innovation toward success for the whole business.

3.2 Creation of a "Pull" Based Mechanism That Deals with the Demands of Customers

We introduced a mechanism called BTO (Build to Order), in which information on individual orders from the sales department (customers) is transmitted directly to the factory. The BTO mechanism deals with the diversification of customer needs by installing the main components of a PC or server (CPU, memory, HDD, software, etc.) at the factory according to the specifications ordered by each customer. It then delivers the product to the customer after guaranteeing that the product will operate correctly. Even though the specification for each product is different, the delivery term can be approved at the same time as the order receipt and delivery is completed in less than a week afterwards. The traditional production system was based on estimation and presupposed the presence of a product in the inventory and was found to be unsatisfactory. The current trend of the BTO production system without the need for a product to be in the inventory was therefore introduced.

3.3 Logistics Innovation

We radically reviewed the previous logistics system of NEC in which different NEC divisions operated trucks with no interdivisional communications between them. It was decided to switch to a system in which a single transport/delivery network was built on a national scale, to be shared by various NEC divisions (**Fig. 5**). This transport/delivery network could be used both for the delivery of products from the factories to the customers and for the collection and supply of parts from the parts suppliers to the factory. Its effects include a reduction in the number of tracks, improvement in their loading ratio, a decrease in product inventories at the warehouses and a reduction in logistics costs.

3.4 Delivery Process Innovation

At NEC, we frequently deliver sets of various products to the customers, including PCs, servers, printers and routers. We carried out a "delivery process innovation" by improving order fulfillment during FY 2000, for which we prepared products according to the "pull" based mechanism that deals with the demands of customers and delivered them simultaneously on the delivery date requested by the customers (**Fig. 6**). The new system allows the sales department to arrange delivery based on a single rule, regardless of differences in products and factories. Instead of preparing inventory products in advance, the products required by each customer are produced in factories according to the delivery date, which is calculated based on the reception of customer orders. They are delivered simultaneously to the customer after the products are prepared by cross-docking at the logistics terminal closest to the customer.

The sales, production and logistics departments conducted these improvement activities jointly, aiming at a timely implementation of the new system. Now, the delivery dates promised for the customers are observed by almost 100%. The costs for operations such as the delivery term coordination, which used to be done by the sales departments, are greatly reduced and an effective reduction of the overall inventory is also achieved. Our delivery process innovation was to lead the entire

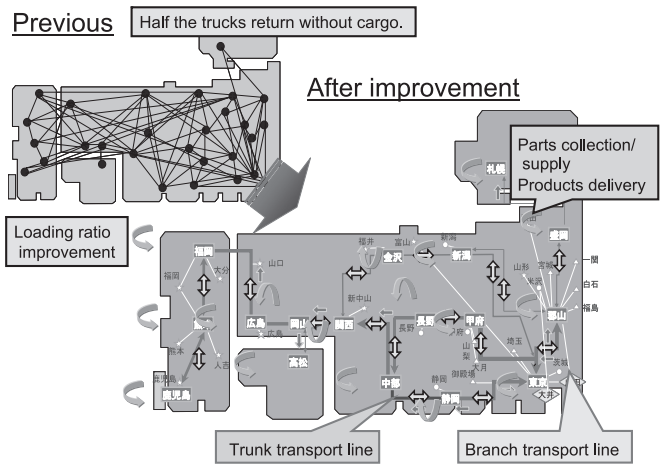

Fig. 5 Reform of the transport/delivery networks.

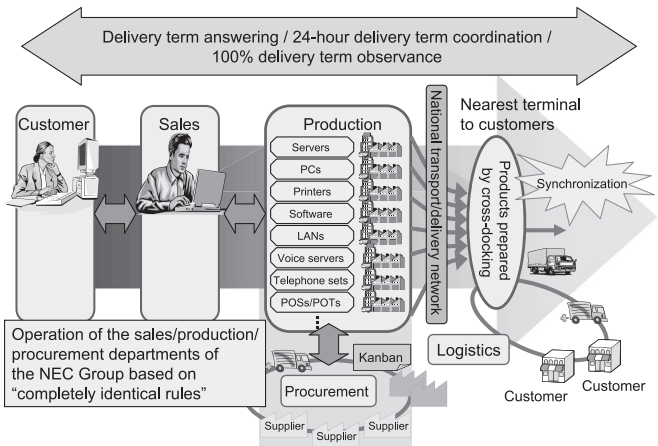

Fig. 6 Delivery process innovation.

Japanese electronics industry.

3.5 Results of Production Innovation

The effects of production innovation include a shortening of the lead time, reduction of inventory taking operations (with the inventory turnover days decreased by 30% from 2000 to 2006) and a reduction of the warehouse area (by an area equivalent to 6 times the area of the Tokyo Dome baseball field). By producing only the products that have a guaranteed sale and not producing wasteful products, our efforts for production innovation and logistics innovation also contribute to the conservation of the global environment. This is achieved by reducing CO_2 emissions, wastes and energy consumption. By introducing the Toyota Production System, we were also able to learn the pursuit of overall optimization, the importance of creating a culture of autonomous work and developing the human resources. We were also made aware of the fact that leadership from the top management can effectively change an enterprise.

4. Conclusion

The frequent occurrences of quality problems in the fields of products and services in recent years have caused anxieties concerning deterioration in the MONOZUKURI spirit in Japan. NEC is tackling quality improvements under the slogans of "Do not input, produce or output defective products" and "Build quality in the product development and production processes." However, we also know that the persistence of quality in the wider sense of the term lies in the inherited intellectual DNA of NEC.

When NEC was established as the first foreign-affiliated enterprise (Japan-US joint venture) in 1899, the Japanese foundation staff proposed the setting of the slogan of "Better Products, Better Service" as one of their basic corporate policies. This slogan means a promise to customers that we offer the top class products of the world and take a thorough responsibility in their after-sales servicing. This was an innovation that led the times because it was only after the 1950s that after-sales servicing became a common practice in Japan.

After World War II, the U.S. GHQ (General Headquarters) occupying Japan emphasized the need for the restoration of the Japanese communications network in order to communicate their occupation policies. However, this attempt was hindered by the low quality of the vacuum tubes used in the communication equipment of those times. As a result, the GHQ proceeded to provide direct guidance on quality improvements for Japanese communication equipment manufacturers in 1946 [1]. With this opportunity, NEC learned the excellent quality control techniques of the United States, such as statistical quality control methods and succeeded in becoming a pioneer of quality control in Japan. The Quality Control Section NEC established in 1947 was the first corporate department carrying the name of "quality control" in Japan.

In 1965, NEC started the ZD (Zero Defect) campaign in order to eliminate any defects in its corporate activities. This campaign aimed at encouraging not only the staff of the quality control department but also the staffs of all our departments including the development, procurement, production, sales departments and administration departments in the improvement of their business practises [4].

As seen in this record, we still believe that it is important to enhance corporate power. We also believe this can be achieved by all members of the corporation participating in improvement activities by sharing in a healthy work ethos and in corporate creation and growth at the field level. Application of the ZD spirit based on our slogan "Better Products, Better Service" has enabled enthusiastic support for this aim since the establishment of the company. In the future, too, we are determined to reconfirm the NEC spirit as mentioned above and to reinforce the quality of each product with the knowledge that the action of each member of the team is embodied in it, aiming thus at our target of supporting smooth business procedures for customers and contributing to their economic growth and development. Commitment, not only at the present time, but also in the future after the products are delivered - this is our "MONOZUKURI."

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