ACT OF IMPLEMENTATION OF TOYOTA SYSTEM

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Abstract: The production system developed by Toyota Motor Corporation was developed to provide best quality, lowest costs, and shortest lead time through the elimination of losses. Kiichiro Toyota, son of Sakichi and founder of the Toyota automobile factory, developed the concept of Just-in-Time in the 1930's. He decreed that by this act Toyota would contain no excess inventory and that Toyota would strive to work both in partnership with suppliers and level production. The Toyota production system has been compared to squeezing water from a dry towel. Importance of Toyota system for production process can sum up on the next way: Reducing costs including the elimination of waste, With help without warehouse production – elimination the „excess inventory in production“, Reducing time of handwork using maxim „smallest possible of service“, To reach a production without warehouse – its demand a production in small series, Its not necessary to produce something else except that you really need.

Key words: toyota system, quality control program, Nagara-Concept.

1. INTRODUCTION

At the end of 70-ies to western countries, it became clear that the competitiveness of Japanese industry is largely based on quality control of products. A number of business delegations from the West have visited Japan. Some have concluded that quality circles cure for all diseases. Others have concluded that there is no simple formula that already exists combination of several factors that mobilize all human resources in the company - top executives, middle and lower management staff as well as the usual perpetrators.

Having for a role model Juran Ishikawa could say that the main trends that can be transferred to other countries as follows:

- most administrative and managerial staff takes quality management into their own hands,
- massive training of all levels and business functions for the "quality discipline" from CEO to the lowest perpetrators,
- effectively manage quality by all production workers, trained for that purpose,
- so by those who make "real" quality, not just by the specialists „Quality services“; this practice is related to the application of statistical and methodological "tools" widely available, and
- annual quality control program.

As for the auto industry was Henry Ford's revolutionary production system for mass production of standard products, it is also revolutionary the manufacturing system, which was developed in Japan in the Toyota Koromo factory and in autumn 1937.

2. IMPLEMENTATION OF TOYOTA-SYSTEM

It took for Toyota, 20 years to develop a system to this today's level. Quite naturally, it takes so long for those who want now to introduce this system. The prerequisite for this is, as mentioned earlier, the determination and patience of the management and all employees which should be given the opportunity to understand and participate in it. It is not enough just understanding of each individual element, it must also understand how these elements behave with each other.

In Figure no. 1 schematically shows the steps in the implementation of the Toyota - system. The plan refers to the general case, but in practice it has, quite understandably, adjusted to actual needs. Timetable greatly, depending on the

company and the degree of control they have over their operations. Perhaps in part some of the companies have already introduced these elements, in this case, only parts of the current plan.

Picture no. 1 - Plan for the introduction of the Toyota - concept and Kanban system

2.1. SMED method

In the study of Toyota's system finally come to SMED ("Single-Digit Minute Exchange of Die") - for crimping tool change in less than 10 minutes. The concept of SMED contains drastically time reducing settings on all machines. It is no exaggeration to say that this is the key to Toyota - system. SMED can be viewed in three stages:

Stage 1.

In 1950. time study was performed on a 800-ton presses in „Toyo Kogyo Company“. When adjusting the brakes it was observed that a

lot of time was wasted on finding and securing a bolt that was missing - while in the meantime presses unchanged. Then it was noticed that the "adjustment" actually consists of two main components:

- "internal" adjustment (Inside exchange of die - IED), ie. activities that require the machine is idle.
- "outside" adjustment (Outside of exchange die - OED), ie. activities that can be executed in advance, while the machine is in operation. Not a particular wisdom that the lack of a screw can be seen even while the machine is running, not when it

stops and already start the process of tool change.

Stage 2.

In 1957. in "Hiroshima Dockyard, Mitsubishi Heavy Industries" the lower parts of the block engine on a large dresser was treated. Capacity was insufficient, and it was concluded that it is necessary to reduce the time set. The problem is solved by a special desk made for machine. While dresser worked at the reserve desk were fastened and adjusted following the workpieces. When the previous work piece was finished with treatment, altered the desk and this way was saved a lot of time. "Internal adjustment" (IED) has been replaced with "external adjustment" (OED).

Stage 3.

In 1970. in "Toyota Motor Company" change of tools - sets on a one 1000-ton press required about 4 hours. Meanwhile, in the "Volkswagen" the same work could be completed in 2 hours. Over half year systematically is improved setting operation, in order to "offset" the Germans. It is managed as follows:

- Using the separation, the internal "(IED) and" external "(OED) settings.
- None of the "external" activity could not obtain permission to work while the press unchanged.
- Streamlining and shortening the time for all „external“ and „internal“ activity settings.

In this way it gradually decreased total setup time to hour and a half.

Three months later, the deputy for the "Toyota Motor Company", give an order that the setup time reduced to 3 minutes!

The solution is quite natural in changing the "internal" settings in the "external" setting.

Then came the idea to "SMED"-system formulates in eight points. This finding was a,

quite naturally, only the result of long-standing interest in working on the settings.

This came to a clear conclusion:

- To be able to produce in small quantities and avoid excessive and unnecessary production SMED-system is absolutely essential.
- It is necessary also the production in small series to reduce the flow of time, which also represent SMED.

To allow easy handling with variable and interspersed production, the series was needed, and an absolute prerequisite for this is the use of SMED.

In other words, SMED is a prerequisite if Toyota-system wants to successfully implement and achieve the desired results.

This is probably a background of great interest that Mr. Ohno had for reducing setup time and his order that it must drastically reduce setup time on the presses.

Without this categorical demands unlikely to occur SMED-system.

After many Japanese companies with remarkable success applied the Toyota-system or SMED. And abroad, there are examples of successful application, for example, in the "Federal Mogul Company" in the United States and the "H. Widman Company" in Switzerland. Production in small series is a prerequisite for Toyota-system. Therefore, already in the early stages must apply SMED. In other words: SMED is the front door for the Toyota system. The first problem that we face is psychological.

Must believe that it is possible.

Take for example someone told that it is possible time for changing tools that is now two hours, can reduce to six minutes. 99% of employees will say that they do not believe in it. The answer depends on their experience and partly from mental block (limits). Many assume

that in this case the new equipment is necessary and therefore, a big investment.

2.2. Nagara-Concept

Recently it is introducing NAGARA as the path to Toyota-system. The word NAGARA has a Japanese origin and means roughly "to do something in the meantime, while doing something else", or in other words "a combination of many activities."

Example for NAGARA:

One of the perpetrators was performing spot welding on a some sheet metal pressed part for the car body. Next to the job place it is set a very small presses. The perpetrator put material into the press and put it into operation. During the press operation cycle, the perpetrator was extracted earlier pressed part of the sheet.

When it was over, he bring the following part which is pressed, filled again press, then put into action - and so on.

Since the duty cycle was about one minute there was not required great speed, and that is why all of this could be done with the help of a very simple and inexpensive press. Handling time was only 2-3 seconds per cycle. After all, why should the processing performed by pressing only the preser section? What is important is the production flow. An example from this factory shows how with testing new methods and routes in a simple and elegant method can provide a "one piece production."

Control is eliminated on the way that goods is controlled in order to prevent the occurrence of errors (rejects) - with 100 percent of control and Poka-Yoke.

Transportation is eliminated by better allocation of machines and better placement of process line.

Storage, in fact, has a duty to mitigate gaps and deficiencies in the other three elernents, ie. processing, control and transport. In order to

eliminate them, warehouses must, therefore, achieve better results in the other three areas.

If damage occurs on the machine, if is defective production or if there is a delay in transport - then warehouses absorb noises and prevents the spread of them and cause mayhem in the coming production flows. That was the reason to realize that the warehouse is necessary to ensure a balanced and peaceful flow of production and delivery. Means that storage plays a role of oil in production (like oil in the machine), and thus performs a useful function.

But the warehouse can be seen as a kind of drug, or soporific, that (when we once accepted), adjusting and leads us to abuse, and prevents healing. Toyota-philosophy vigorously argues that the warehouse is not useful - shows just the opposite.

So we must ask whether the warehouse is really necessary, and critical to consider the reasons that it exists.

"The production of free storage" is a basic principle of Toyota - system. The longer we deal with this problem, the more clearly we see addiction and all aspects and areas in industrial production.

This leads to the following conclusion:

- Directing the production to needs of the client creates conditions for the elimination of storages. Customer requests, in turn, are reflected in the large number of different products and small series.
- This is why we must organize flexible production in small series. For those who want to systematically deal with these problems SMED is a necessary and important tool.
- Next, we need to significantly reduce the flow of time, with the one piece production flow and uninterrupted production process organized from making parts to installation of the finished product.

Toyota's consistent work on eliminating storage is a fundamental explanation for the high cost of production.

Try to take its cue from Toyota-system emulation of its external characteristics without a deeper understanding of the basics, would lead to chaos and would give quite different results from those expected.

Eliminating of warehouses is only one of means for reducing costs.

For economic reasons, we might be tempted to store must be accepted, but we must not forget that this is a sign that things are not working as well as it should.

So, as soon as the necessary conditions are achieved, warehouse should re-terminated. Basically, the warehouse should be seen as one of spring of unnecessary costs.

3. CONCLUSION

In this paper, it is important to give the reader a fair view of Toyota's production system, so that more people can understand the system and use it properly.

That is why I focused on the basic concepts, instead of individual presentation, a number of practical examples.

I tried, also, to critically evaluate the advantages and disadvantages of certain parts by extracting and underline some important things.

Instead of explaining the function of the system, I have started from the general principles of production management and after that to show the uniqueness of Toyota production system and in particular the application of these general principles to some given situations.

What is very important in case of Toyota system is that wants to achieve more flexibility, and it is possible by using the system which requires that one perpetrator serving more machines.

Importance of Toyota system for production processes can be summarized as follows:

1. Reducing costs with consequent elimination of all "losses"
2. Two basic ideas of the system:
 - To with help of non warehouse production eliminate "the loss in surplus production," and
 - To reduce the time of manual labor by applying the principle of "least possible handling"
3. To achieve non warehouse production, requires the production in small series, balancing and synchronization operations and one piece flow; so they can achieve extremely low time flow. With this SMED becomes significant instrumentality.
4. There is no need to produce anything other than what is really needed; it means - production on order, with strict adherence to the rules of the warehouse should not appear.

4. LITERATURE

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