

Making stream of production

-7. Making stream of production for “small demand”.

Before going to the main theme, I would respond to the question of my students.

What is Kaizen and how? This was the question.

I shall describe the theme of Kaizen in the column of the factory management more exactly. But now shortly I write this below.

Many times I have got the request of the lecture of Kaizen from the foreign companies. I feel that it is peculiar phenomenon as a Japanese. And one of the reasons might be the different characteristics of European and Japanese.

An European desires to make clear in a definition.

On the other hand a Japanese likes the culture of “Ambiguous”.

And says as follow.

“What is the meaning of Kaizen? It doesn’t matter to me, but let’s kaizen this problem.”

Well--- anyway what is Kaizen?

a) The range of Kaizen.

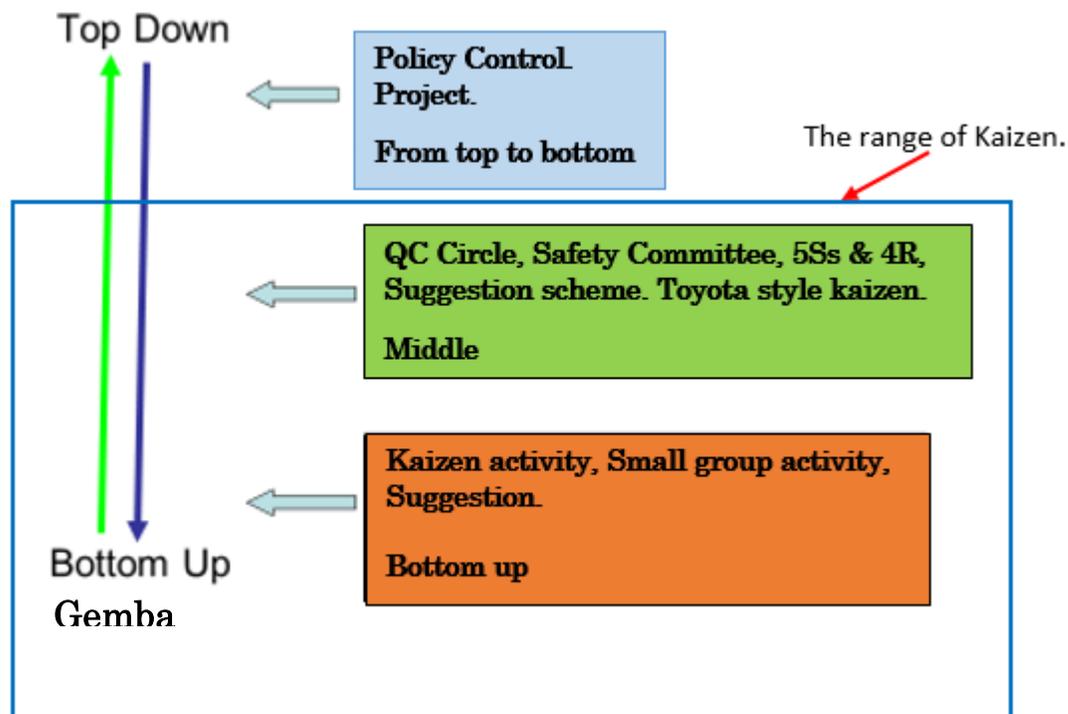
Kaizen; in Japanese Character “改善”.

改 ; Change.

善 ; Well.

Therefore Kaizen is “Changing well”.

And all improvement activity which is from the Top down to Bottom up can be said as Kaizen.



However as the company’s activity, the range of above picture is suitable.

The form of Kaizen.

-Middle range; QC circle, Safety committee, 5Ss & 4R, Suggestion scheme and Toyota style kaizen.

These are not the activity of top down. However are not the activity of bottom up too. Because these activities are supported by the autonomous activity of gemba people, but are executed as political measures.

For instance, suggestion scheme.

It is planned politically and has the target (No. of suggestion and the effects).

Managed in the organization.

Target (Number of suggestions, Number of ideas implemented, estimation of effects).

System of getting ideas, Evaluation and commendation.

-Bottom up

Kaizen by individual worker and the kaizen by small group and suggestion in gemba.

For instance, suggestion is made based upon the complete autonomous activity.

The image of Kaizen in foreign countries is this “Bottom up”.

As above picture there are some forms of Kaizen.

The most difficulty form is the range of “Bottom up” which requires the “Motivation improvement”. (Motivation also I shall describe in factory management.)

b) The definition of Kaizen.

-1. To change for more convenient, cheaper (quicker and better quality), safer.

-2. Small change rather than large.

-3. Conforming to 3G (Gemba, Genbutsu, Genjitsu.)

Gemba; actual working place, actual field.

Genbutsu; Actual thing,

Genjitsu; Actual matter (Not aerial).

Toyota style kaizen

Probably it might be the first time to hear the word of “Toyota style kaizen”.

About Standardization.

Last time I wrote the “Standardization” but a little more.

In the forms of Kaizen there is the “Toyota style kaizen”. Toyota has a little unique means of kaizen.

Toyota has normal means which are QC circle, Suggestion scheme, Safety, 5Ss &4R, gemba suggestion like as above picture.

And additionally he has the unique means which are “Standard and Kaizen” and “Jishu-Ken”.

-Standard and Kaizen

I wrote the means of “Standardization and kaizen” is unique. It is not true and

a standard which mentions the actual best method of the job should be the base of any kaizen.

If there is no standard, it is not possible to know that the new method and ideas are better. Therefore “standard and kaizen” is very much theoretical.

However there is no company who implements the kaizen with standard.

No, it is wrong word, but there might be and I haven't seen yet the company.

In the first place and as I wrote before, the companies who implement certain and animate standardization is quite few.

And Toyota implements the kaizen very much theoretically.

Now here I introduce the case of Toyota line.

The case of line trouble.

1. When a line trouble was happened, the line worker pulls string or pushes Button to inform the occurrence.
2. The line leader takes the proper action.
3. If the problem wasn't solved in the cycle time and the line stopped, engineers, production planners ---- whole gemba staffs get together at the gemba and decide the temporary solution for recover the line.
4. And investigate and discuss the permanent solution in the gemba in the same day. At this time the standards also reviewed to find kaizen points and revised.

This step is one of Kaizen cycle based on the standard.

The case of compare the actual job to the standards.

For instance the factory managers are in gemba 80% of their working hours.

And they watch the flow and workers job and compare to the standards.

Then they find the points of kaizen. Of course managers, supervisors, leaders must have the skill of true working methods and teaching to the workers.

Therefore the standards which are easy to understand at glance are the most important base for Kaizen.

Of course the gemba workers also have the opportunity to make kaizen by themselves. And in this case also, the base is the standards.

In fact, they do this activity always. And the standards are the essential mater for TPS.

-Jishu-Ken. Toyota's Jishu-ken

Toyota has another unique means which calls Jishu-ken.

Jishu; Autonomous activity by themselves.

Ken; Kenshu-kai.

Kenshu; Study. Kai; Workshop.

Therefore Jishu-ken is the autonomous study workshop.

The objects; Managers nominated. 5 managers around.

The subjects of theme; of course gemba kaizen (including office).

Activity; Decide one theme. Endless discussion up to find solution.

Normally from Thursday afternoon up to find solution (All night

work if necessary).

Toyota's manager and/or the candidates should have the opportunity of Jishu-ken more than 20 times and is possible to be called to be full-fledged manager. This manager's initiative and lead by example are emulated.

My Jishu-ken.

In fact I also had the Jishu-ken activity in the F-ken (Foreman study workshop).

F-ken takes one of QC circle style.

Therefore the administration is same to QC circle. But the theme is bigger than general QC circle.

The objects; Supervisor and Foremen or the candidates.

The subjects of theme; bigger and bigger than QC circle.

Activity; same as QC circle. At the first of activity, they implement the KJ method to share the current situation and decide the theme.

And in the F-ken activity when having a difficulty matter or predicament, they do Jishu-ken which is same to Toyota's.

When I was young and worked in SUMITOMO, I was the coordinator and teacher of this F-ken several years.

-Kaizen group of Toyota

Toyota has very unique kaizen group which is consisted of the workers who are noticed "out-of-line" in the individual factory.

Out-of-line, the workers who were noticed? Out-of-line= excluded from forces?

If the baseball, it means that the player has no capacity. However in Toyota the worker who was noticed the "out-of-line" is the excellent player of kaizen and also multi-process job.

In Toyota there is a culture since T. Ohno which is that after a kaizen and getting surplus worker, select the best worker and eliminate from the line. (This thought is against to the common sense which to eliminate the unskilled worker from the line firstly.)

And the worker is given the special task which is kaizen and/or support kaizen. The kaizen group (who is called "maintenance group") is consisted of these selected and eliminated workers.

The tasks of this group are

- 1) Kaizen by themselves.
- 2) Support and realize kaizen ideas which are suggested by line workers.
- 3) As the buffer workers to support the line job at the busy season.
- 4) As the buffer workers to support the line job at the specialty car which is very long working time required against the line takt time.

The worker of the group is not "direct" like as a line assembly worker. But they are not "indirect" like as an engineer. They are middle, but their position is recognized and assured.

Toyota has his kaizen forms which are QC circle, Suggestion scheme, Jishu-ken. And (I believe) most powerful form is this kaizen group in gemba.

I described Kaizen and the forms. Anyway please understand that for kaizen the standards are important particularly the Toyota style standards are useful for line kaizen.

The case of the company (the project team and model line).

This project team told me that “we can’t do the Toyota style standardization”.

And such problem is never rare case, but is common in the general companies.

However everything of company job is dogged by Standardization.

Making new culture.

By the way I am a consultant of TPS, TQM, TPM and Factory management, Kaizen.

(For instance TPS) What is the meaning of teaching TPS?

Teaching the method?

The methods are

JIT (Concept), Jidoka (Also concept), Pull system, Making stream, Kanban,

Heijunka, One piece flow, Andon, Takt Time, Standardization and

Standardized work, SMED, Multi-skilled, Multi-process, Cellular production---

I teach and help the introduction “if the technique or concept is suitable for the company and/or the production gamba”.

Are the teaching and helping to introduce these technique the consultancy job?

30% “yes”. But 70% “no”.

The 70% of my job is

1) To bring up the people of client company.

2) To help to bring up new corporate culture.

If not, even though teaching techniques, the clients can’t take the advantage of the techniques. And in the worst case, the company stops and abandons TPS.

(I saw some cases. For instance 5Ss as well)

I therefore teach the basic factory management which I say the base of TPS in parallel.

And with through the correction of the factory management, I help the formation of corporate culture.

Making corporate culture.

For bringing up the capacity (almost culture) of standardization (kaizen as well), just teaching the methods of standardization is never sufficient.

And it is necessary to improve the factory condition. This company of the model line was not sufficient level in the “Factory Management Check List” (Total; 53% and Standardization; 35%) for challenging TPS.

Do you remember the contents of the check list?

The contents are

①Policy Control, ②Organization and administration,

③Human resources development, ④Information gather and transmission & use, ⑤Cost control, ⑥Standardization, ⑦Factory management,

⑧Production control, ⑨Material control, ⑩Quality control,

⑪Safety control & work environment & Environmental conservation.

As you understand, these items are related each other.

How is it resolved in the company?

I have the means which I use always.

And I require the “whole people’s participation” from top management to bottom and following 4 points to realize the company’s goal.

- 1) Company policy (annual policy. To clear and share the direction.)
Message of the president.
Target; LT, Productivity and cash-flow. Improvement of Factory Management Check List Assessment.
- 2) Formalize the management team and the task.
- 3) Formalize the project team.
- 4) Formalize the Kaizen Committee (5Ss activity and QC circle, Safety committee; as the first level) in the gemba.

The purpose of these is to make the condition of “Whole people’s participation” (to create the new corporate culture from the top management to bottom.)

And with through the management team activity, I formalize the “kata” of excellent company management.

Kata; Form. Judo, Kendo Karate. Always the training is begun from the right form (kata).

(I shall write the contents of the management team activity near future in the column of “Basic Factory Management”.)

5Ss and QC circle. (Bottom up from gemba)

I teach 5Ss and QC circle in gemba (production gemba and office) and teach many things with through these.

Establishment of “Whole people’s participation (to the management), Kaizen, (Enjoyment of Kaizen also), Team work, Leadership.

Quality improvement technique (QC 7 tools, KJ method, FMEA, QC flow chart, QA matrix etc.), Standardization, Time management, 5Ss, 4Rs.

And from the gemba, we cultivate the corporate culture.

5Ss.

The introduction activity of TPS is not only the teaching of technique, but also the system renovation of entire company.

Therefore I teach the improvement of the items of the factory management check list as the top down activity.

On the other hand as the activity of bottom up (from the gemba), I promote the activities of project, Kaizen committee activities (QC circle, Safety, 5Ss).

And first activity in gemba is 5Ss. The purposes are

- Of course the improvement of basic condition of factory management,
- To bring up the leaders,
- Training and Cultivation of Kaizen culture.

And I teach the **true** 5Ss.

As I wrote in the column of 5Ss, 5Ss and Katazuke activity are different.

Sometimes I saw the case of teaching Katazuke activity as 5Ss. It is ridiculous.

Katazuke activity is

Separation of necessary and unnecessary things.

Discard or return (to the warehouse) the unnecessary things.

Decide the proper location for necessary things.

And put them in the location.

On the other hand.

The first S of 5Ss is Seiri.

Seiri is the most difficult item in some meaning, because this requires the standardization to identify the necessary and unnecessary things.

For instance materials and parts.

In the gemba of kanban system implemented, if the articles don't have the kanban card, these are judged as unnecessary things. It is very clear if no kanban, the article is unnecessary and shouldn't be in the location.

Kanban has following information

Parts name, Parts code, Previous Process and next, Quantity in one card,

Bar code, Location, (Cycle of delivery), No. of card/Number of circulation.

And one of problems for maintaining Kanban system is the change of "Number of circulation" based on the following cases.

One is the demand change.

One is LT reduction in Kaizen.

If there is no change or abolition activity, there is no meaning of Kanban introduction.

Number of Kanban circulation is controlled in the computer. But the abolition or change of the number of cards should be reflected the intention of Kaizen.

For instance LT improvement.

If (for instance) one card is eliminated from the process. The circulation speed is accelerated. And as the result, the WIP (work-in-progress) is reduced.

Taiichi Ohno taught us that it is possible to see or find a new problem or kaizen subject in reducing the water level of stream. Reducing "water level" is the meaning of reducing WIP and inventory.

This change and abolition (maintenance of kanban) are troublesome. Really troublesome.

But it is essential for the kanban system maintenance which is same meaning of kaizen cycle.

For introducing TPS, I teach and stabilize the "Basic Factory Management" in parallel because this is essential for the TPS stability.

By the way I am required the introduction of Kaizen (foster the kaizen mind).

And to foster the kaizen mind, there are 4 essential conditions.

One is the leadership of the top management.

(What is the leadership of management? There are many misunderstandings.)

One is visual control.

One is gemba organization with proper job role.

And one is the "Standardization".

If there is no capacity of standardization, it is almost impossible to introduce kaizen activity.

What is the leadership (or job role) of senior management?

At this time I would describe the job role of senior management for the introduction of TPS. The important job role is

“change system, mechanism and management” and cultivate the peoples”.

I have seen many cases of stability failure. When looking the histories of TPS introduction they could gain some or spectacular success in the initial stage of the introduction in most of the cases. However they couldn't continue to improve and became worse than before.

Why? Why they didn't continue and become worse even though it seemed to be successful in the initial stage?

The key factor is the leadership (job role) of senior management.

Now what is the job role of senior management?

It is to be changing “system, mechanism and the management” and also “to cultivate the peoples”.

When introducing TPS in making stream of production, the LT, WIP and inventory are improved very dramatically. And the cycle of the production becomes faster and faster. And the problems (machine trouble, quality trouble, setup delay, material defects and supply delay, line balance, work delay etc.) which were hidden in the deep river (WIP, inventory) are actualized.

For instance quality problems.

If occurred a quality problem, it is required to recover the line immediately with the temporal countermeasures, also is required to make the permanent countermeasures for the prevention of reoccurrence.

If machine down occurred, it is also required the very quick recovery.

These troubles were hidden in the WIP and inventory previously. And the improvement reveals the gap between the problems revealed which require the quick response and current system, organization, mechanism and management methods.

In Toyota, if a problem occurred, whole gemba staffs gather in the gemba and decide the countermeasures immediately. They never carry over the problems to next and have the mechanism.

Senior management needs to pay attention for not only the progress of the introduction, but also the changing system, mechanism, organization and the management for applying the problems revealed.

Why is it necessary the ANDON? When Andon showing a problem with red colour, how many seconds does the maintenance person take to arrive? And how many minutes does the person take to recover? If to be slow, the line stops and the worst case entire line is stop (because of the kanban system).

And if the problems revealed are left and WIP and the inventory are kept in high volume for avoiding line stops, there is no meaning to introduce TPS which has the target of short LT, improvement of cash-flow and efficiency.

Also in same meaning, senior management is required to cultivate the peoples.

Most of the failure case has above senior management failure.

(Idle talk)

Suggestion box

When I was invited and visited a company, I was introduced the kaizen activity in front of the information board and kaizen suggestion box. The suggestion box had some suggestion papers discoloured. Then I knocked the box. Then a cockroach shot out of the box.

After this happening, when I saw a suggestion box which has the papers discoloured, I razz and call the box “Caja de Cucaracha, Cockroach box”.)

QC circle.

DIAGRAMA DE P.C.C.

Producto: _____
Nº de Diseño: _____
Fecha: _____

Nº	1	2	3	4	5
Nombre de Proceso					
Actividad					
Foto de Proceso					
Trabajo					
Punto de Calidad					
Especificación					
Método de Inspección					
Herramientas de Inspección					
Asociación					
Historia de Defectos					

To cultivate the kaizen culture, one of my activity in gemba is QC Circle. And I put the power to teach the “QC flow chart and QA matrix”.



QA Matrix

A.C. MATRIZ

Producto: Cartridge
Nº de Diseño: _____
Fecha: 10/10/2018 Rev:001

Nº	Nombre de Proceso	1	2	3	4	5	6	7	8	9	10	11
Actividad												
Foto de Proceso y Trabajo												
Nº	Problema Identificado	1	2	3	4	5	6	7	8	9	10	11
1	Fuero suelto	1	1	1	1	1	1	1	1	1	1	1
2	Fuero flojo	3	3	3	3	3	3	3	3	3	3	3
3	Fuero mal	1	1	1	1	1	1	1	1	1	1	1

Assumption of defect mode.
FMEA analysis; in the occurrence Frequency x the Gravity if occurred.

Write the Concrete defect and countermeasures for Occurrence prevention and Outflow prevention. (Feedback to Evaluation.)

(Excuse: As you aware the pictures which I use as the examples are not related to the company, because of the obligation of confidentiality.)

TABLA DE EVALUACION (IT)
Standard

G \ F	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

FMEA Evaluation table.

(For instance "Gravity") If occurred.

- 1; There is no influence to the function and safety.
- 2; No claim to be made and still no influence to The function and safety.
- 3; The claim to be made, but still no influence to The function and safety.
- 4; The function lost to be given to the customer.
- 5; The risk of safety to be given to the customer.

With through the activity of QC flow chart and QA matrix, they should and can find the condition of the production in good quality.

QC flow chart has and confirms following items.

Process No. and name, Photos of work, Work contents & procedure, (Safety point), Quality points and Specification, Inspection or Confirmation method, Inspection jig, Record, History of defect occurred.

And QA Matrix has and confirms following items.

Process No. and name, Photos of work, Work contents, Assumption of defect, FMEA score (see above), Concrete defect and countermeasures for Occurrence prevention and Outflow prevention.

These items are considered in each process.

Note: Normally FMEA evaluation uses 3 categories as below.

Gravity (Criticality), Frequency, Difficulty of detection.

However I use just 2 (G and F) because

Implement FMEA simply and more easily.

Even though it is difficult to detect, it is necessary and required to take action, if high score (= G x F).

Utilization of gemba power.

Again the group of the company said that "we can't make the standards".

It is the outcry of truth and so difficult to make "animate standard" as a general company.

Then I recommend to use the gemba power.

Above QC flow chart and QA Matrix activity are executed by the gemba workers in the part of QC circle.

The description of each process is one kind of working standard.

I wrote and recommend the standardization of important work element. Saying easy but doing difficult for the general company who is the level of less than 75% in the factory check list.

Then I use the gemba power and establish the group activity.

QC flow chart is very useful for the problem solving and "Standardization".

They can implement this activity in the "enjoyment".

By the way digression.

Enjoyment?

I recommend to use and cultivate the gemba power (involve the workers in management).

However if there is no enjoyment for the activity, it is not possible to continue.

Is it possible to give an enjoyment to production line workers for the kaizen activity?

Yes and it is not so difficult. And the necessary conditions are

Providing and giving the time of participation to the activity.

Recognizing and prize. (Let them succeed their challenge in good coaching.)

Presentation opportunity (Exhibitionism).

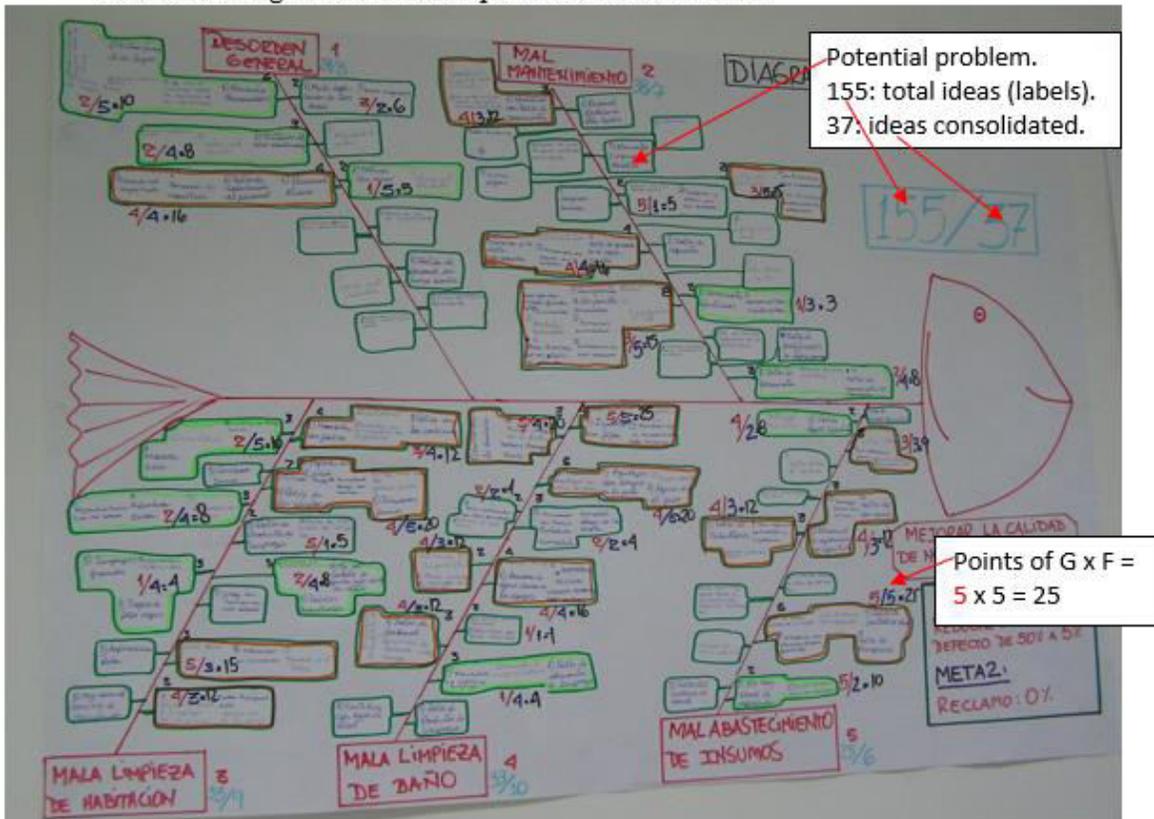
Prize system (Photo, Prize etc.).

Teaching easy methods (peoples wish to learn something new).

Yes it is possible to give the enjoyment to the quality improvement activity.

For instance following picture which my students made as a training of Fish-bone diagram.

Fish-bone diagram (Potential problem in KJ method)



It is possible to give the enjoyment to workers with easy techniques.

QC flow chart and QA matrix are useful as the standards. However.

As you can understand and of course these can't be the substitute of Toyota style standards.

Also the purpose is different.

QC flow chart and QA matrix in a QC circle: made by workers.

Autonomous quality improvement and maintenance.

Toyota style standards: made by supervisor and/or leader.

For managers, supervisors and leaders.

In his lecture T. Ohno emphasized and said.

The manager and/or supervisor must be able to teach and correct, if the worker made mistake or incorrect way.

Also they must be able to make kaizen.

Therefore the standards are necessary in the gemba.

Then the Toyota style standards are most powerful methods for kaizen and maintaining the process (abolition of the variability of the line).

Variability of line; Work delay, Defect, Safety problem.

QC Circle is “Kill 3 birds with one stone”.

(I shall describe the method in the column of factory management. But shortly.)

One is of course the process improvement (including the standardization).

One is to let the workers enjoy the kaizen activity and to cultivate the kaizen culture.

One is to cultivate the mind of “Whole people’s participation (to the management)”.

So as the conclusion of kaizen and standardization.

- 1) If the evaluation result of the factory management check list is less than 75%, your or your client company is required to improve the factory management condition rather than targeting to introduce TPS or Lean management.
- 2) If the company is low level in the check list, and nevertheless desire to introduce TPS, both of “reform of factory management” and “gemba kaizen” should be implemented simultaneously in parallel.
Management team; Reform of factory management in kata.
Gemba; Project and Kaizen activity.
- 3) Kaizen also has the kata which are
5Ss, QC circle, Safety committee, Suggestion scheme, Toyota style.
- 4) For continuous kaizen, the standardization is essential.

When making a conversation with my students, I have told such a following thing

As TPS, the enemy is not only the stagnation of production process, but also the stagnation of changing or creating new culture, management system, organization and mechanism.

Now going back to the main theme.

Making stream of production of the product “7”.

The first gateway to introduce the TPS is to make the stream of production for any production model (from mass production to high mix low volume production) for reducing LT and improve cash-flow.

And a production technology is the challenge to the constraint of the “stream of production”.

This project team succeeded to establish the model line with the product “8”. The purpose of the model line establishment was to show the effect of “Making Stream of Production” for the dramatic improvement of LT, efficiency and Cash-flow. Of course the establishment of the model line was not the final goal. Their final goal was to introduce TPS in all process (from receiving order to shipping, from ordering production to gemba to products shipping). After the model line introduction they targeted to make the case study of small demand and of making the stream of the product “7”. Once again let’s look the following table.

(The results of 6 months of 2009)

	Products									
Machine	1	2	3	4	5	6	7	8	9	10
Large Press				○	○		○			○
A x 5	○	○	○	○	○	○	○	○	○	○
B x 1	○	○	○							
C x 2	○		○	○	○				○	○
D x 3		○		○		○	○	○		
E x 5		○	○	○			○			○
F x 1	○	○								○
Furnace x 1							○			
Production/month	100	500	—	10	—	—	—	1000	200	—

Next target
Model line

They made the discussion to create and decide the idea after my lecture. In the lecture I taught following techniques.

- Cellular Production (with the case of CANON and the model line)
- Kanban system
- Mixed production line and mixed production cell.

Then I required them to make more than 3 ideas for the “making stream of product “7”. And they made following 3 ideas.

First idea.

-Making new cellular.

Firstly they chose the way of independent cell system like as the model line (product “8”) with providing necessary machines without “Large press and Furnace” which are too difficult to relocate in the cell.

And they planned to relocate each one of A;1, D;1, E;1 to the new cell line.

However this plan was not accepted by the management team particularly the plant manager because there was the fear of the machine capacity shortages in above machines.

This was never bad idea if a company has enough machines and capacity to spare for. But in actuality there was no machine capacity to spare for as the total.

This company has appropriate numbers of machine in namely shop-system which most likely the machines are gathered in same area.

-Second idea “Mixed production cell”

Then they chose the method of “mixed production cell with the model line and with additional one machine (E;1).

They wanted to produce the product “7” in the model line as the mixed production.

Then they negotiated to have one E machine to the management team.

There was a small battle talk between the project and the management team.

And as the result of this debate, this idea was rejected as well.

The concern of the management team was that still it was no clear the total picture of this factory.

(At this moment the stage of the introduction of TPS was the feasibility study and before the total action plan.)

On the other hand the project members were in a hurry because the product “8” which was the seasonal but continuous demand of 6 months are finishing after 3 months.

I and Chris Wilkins (the president) were watching the debate.

-Third idea “Mixed production in the model line with current disposition.”

This idea was agreed by the management team.

The idea was

Use the A and D machines of the model line as mixed production.

Beside the model line, install the cell of product 7 assembly.

Create a new stream of production system in machine area (parts fabrication).

At the night of the day, I was invited to the dinner by the president.

After the dinner and when relaxing with brandy, we made a conversation about the method of the training of human resources (for instance the project team members) we made following conversation.

C.W: What is the best method to cultivate people?

K.K: To give the chance of “failure”.

C.W: Failure!?! Do you encourage a failure?

K.K: Yes I do. An experience of success also important to give the confidence and enjoyment for kaizen or reform.

However just the experience of success has the pitfall which narrows the creation of ideas.

This project succeeded to introduce the model line and wants to follow same or similar ideas and created 3 ideas for the next target (product “8”).

C.W: Do you say that they may failure the introduction of TPS in “Small demand (“7”) in these ideas?

K.K: Not “may”. They will fail. And it is easy to stop their ideas and change direction. However one of important purpose of this project is to cultivate the members. The experience of failure gives more learning opportunities than the experience of success.

Am I right?

C.W: Certainly. But why do you say that they will fail?

K.K: The trial of this small demand production will be a key activity for your company because your business model is typical “High-mix low-volume production”.

Toyota makes many varieties cars but has many plants. And each plant makes the models limited. For instance Toyota Kyushu (Miyata plant. 430K cars/year) makes just Lexus. Of course Lexus also has many variations. And if there is a demand which very unique and very much different necessary man-hour for the assembly, he makes it in a side line independently (like as this project considered.).

Assembly man-hour of product “8” is 36.3min.

And the man-hour of product “7” is 53.8hours.

There is the difference of assembly man-hour. However it is possible to assemble by the skilled workers in the cellular.

(image of Canon copy machine.)

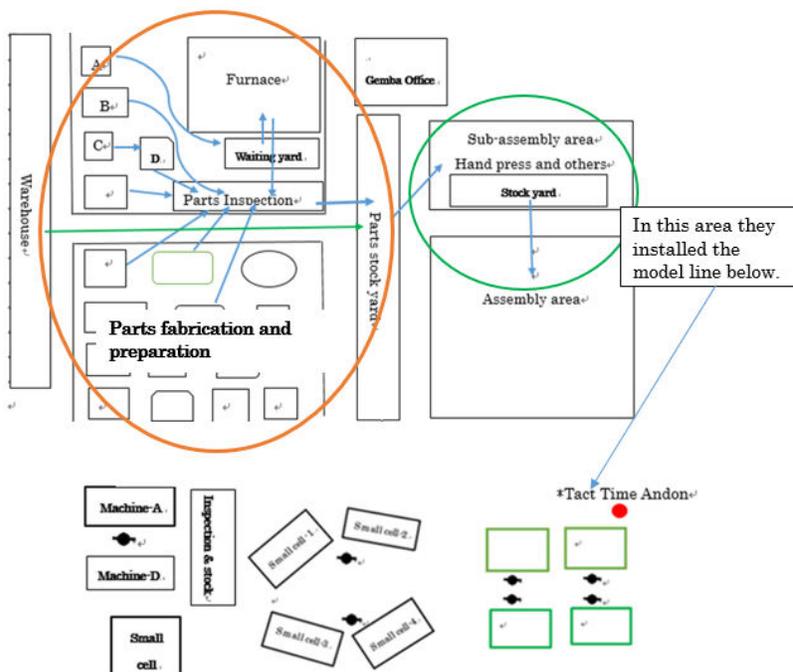
But the bottle neck is not the assembly, but the preparation of parts.

And they will have the deadlock in the process of furnace.

The conclusion of the debate with the management team was

- 1) Second idea with additional machine E was rejected.
- 2) Third idea to create the production system of parts preparation was accepted.
- 3) After the trial of the product “7”, the total picture of TPS in the factory shall be prepared promptly. (Which meant to make up the total action plan.)

Once again following picture.



In above line, the project team planned to add one assembly cell (product “7”) beside the assembly line.

Then they had 3 difficult hurdles which are

- 1) Setup time reduction of Machine A and D of the model line.
Current level 7 minutes to 1minute.
1 minute changeover was a dramatic challenge.
For producing the parts of the product “7” it was required to improve the changeover time reduction in SMED activity.
- 2) Furnace. (Which is the neck process.)
They needed to find the control method of the neck process for the production stream.
- 3) The flow production system of other parts (Press, E and Furnace of the parts fabrication and preparation area.)

Product “7” parts processing.

Total 50 kinds of parts.

Commercially available parts; 13 kinds.

Internal manufacturing; 37 kinds.

Large press; 13 kinds. 7 kinds to Furnace. (And after to inspection.)

Machine A; 11 kinds. 6 kinds to inspection.
3 kinds to Furnace. (And after to inspection.)
8 kinds (Produce in model line).

Machine D; 5 kinds. 5 kinds (Produce in model line).

Machine E; 8 kinds. 8 kinds to Machine D. (And after to inspection.)

I took too much time for the description of kaizen and need to postpone the main theme to next.

Anyway Kaizen is one of essential matter for the introduction of TPS.