

Making Stream of Production -6. Thinking of standardization.

The doubt of the supervisor who was a member of this project.

Doubt? Claim? Exactly it was an appeal.

When I finished the coaching of making standards (Working Standard, Standardized Work Chart, Standardized Work Combination Table, Process Capability Table and Standardized Work Instruction Sheet), the supervisor appealed and told.

“Master. It is almost impossible to make and keep these standards by us.

Particularly I'm the supervisor of the line and have no confidence to promise to implement them.

Also it is impossible to eliminate the work-variation in the takt time of 9.6 min because our people are never robots or machines.”

“Do all companies who implement Lean Manufacturing run these standardization activity?”

When organizing his doubts there are 2 factors.

- (1) It is impossible to keep non-variation work in so long takt time (9.6 min).
- (2) It is difficult to introduce the standardization job. And even though it was introduced, it might be difficult to maintain.

His points of view were very much regrettable but essential issues for sustain the Lean manufacturing. He and the members of this project never denied, but recognized the importance of standardization work to sustain the system. But they say “we can't”.

Let us look one by one factor without escape.

- (1) It is impossible to keep non-variation work in so long takt time (9.6 minutes).

This pointing out is correct. And it is impossible to keep same work procedure and same working time. Toyota assembly line takt time is about 1 minute and shorter than their model line (9.6).

Then we can say that in short cycle time (takt time) it is possible to keep standardized work in non-variation (or minimized variation) with these standards.

And for minimizing the work variation, one of method is to divide to smaller working time like as Toyota

By the way.

(Divert from the story.)

About the car manufacturing.

1 minute (or 2 whatever) takt time means 480 products per day, 9.600 products per month in same product (20 days/month. 8 h/day). Also the car manufacturing is very long product life cycle (The model change cycle; 4 years. The minor model change; 1 year). However is there such large volume and very long life cycle which more than 1 year for general companies? Yes there are. And if the company is car manufacturer or the supplier to the car manufacturer or popular home electric appliances company.

In such companies, it is possible to have the process of “repetitive work in short takt time” and have to divide the work in the line formation.

But still there is a doubt that is it possible to keep the work procedure even though short takt time (1 min) by a human beings? The answer is No. And it is impossible to avoid the work variation, but possible to reduce it in the short cycle time. And it is

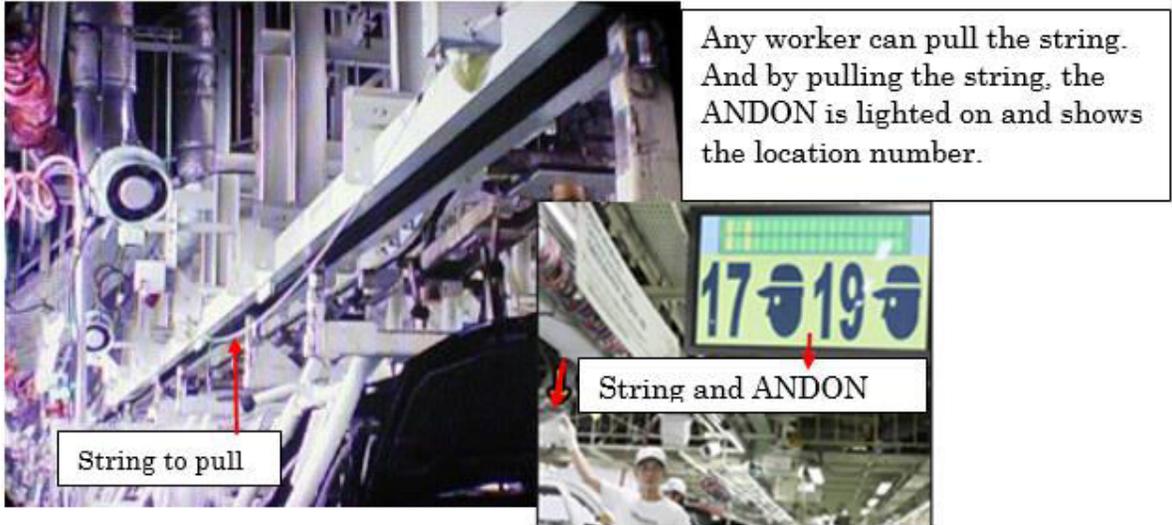
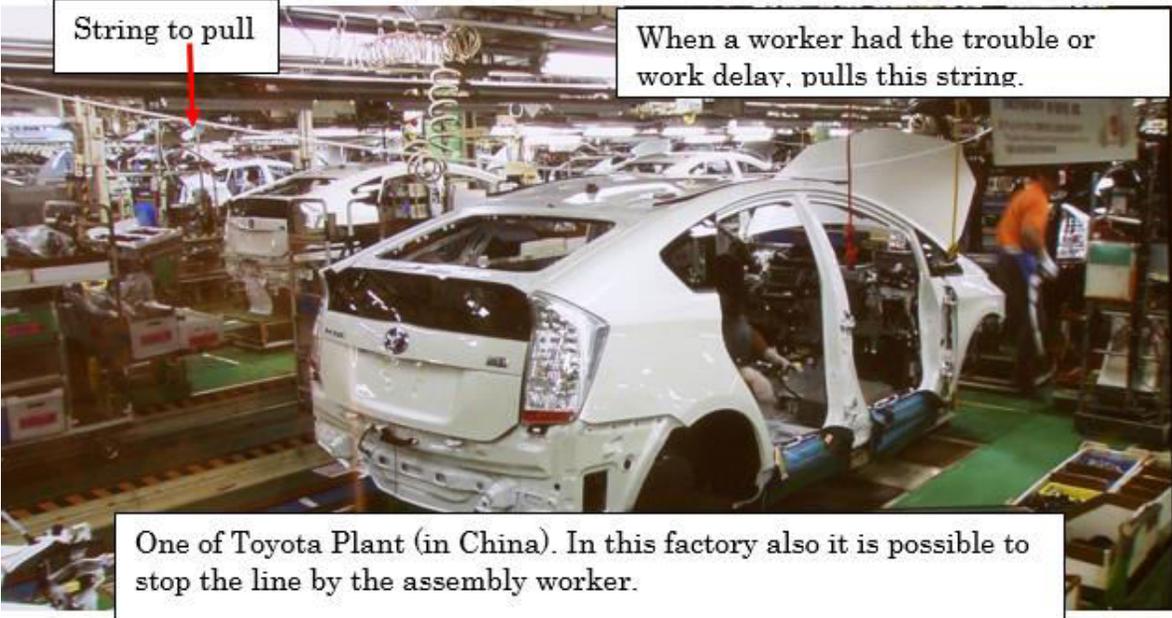
difficult or almost impossible to keep non-variation work in so long cycle time like as the model line. In the first place, does Toyota line have no work-variation in the takt time (for instance 1 min)? In fact is there no variation in his assembly line? Yes there is and this question is barren.

Because Toyota doesn't expect the work of non-variation, but supposes that a human being makes mistake. And on the assumption, Toyota makes the line.

(As you know) in the gemba organization of Toyota assembly line, he has one team leader with several workers. And one of job of the line leader is to help the worker of group member when he had a trouble or delay.

Also any worker can stop the line when he had some trouble.

Toyota assembly line and the string and ANDON



1. When the ANDON showed the help call, the leader needs to come running and help the job of the line worker.
2. The leader needs to help and recover the job within the remaining portions of the takt time. For instance if the remaining portion of takt time is 30 seconds, he needs to recover with in 30 seconds.
3. If it isn't recover within the remaining portion of takt time, (still the line doesn't stop) still he can recover within the remaining portion of remained working area (for instance 5m of working area).
4. If (nevertheless) he can't recover, the line stops.

Digression

I have visited the Toyota assembly line many time, but haven't seen the occasion of line stopped in a trouble. But I saw the occasion of that a worker pulling the string to call and the line leader came running and recover the problem.

I have made the question to the Toyota man "was there the occasion of stopping line in working delay or other troubles?"

He told that the plant had no experience of stopping line with a work variation.

Toyota assembly line. (for instance, Miyata Plant in Kyushu; Currently producing Lexus)

Total 18 lines (11 main lines and 7 sub-lines) has more than 2Km length.

In dividing lines, making easy to stop line by the workers. (Toyota encourages to stop line by any worker when he had some trouble.)

Each line has the inspection system. Self-inspection, Poka-Yoke, line end inspection. (And there is the final inspection line after the assembly line.)

Of course these lines are controlled with Kanban-system. But even though a worker made a mistake or delay, the total line doesn't stop.

The answer for

"Is it impossible to keep non-variation work in so long takt time (9.6 min)?"

No, it is not realistic to expect non-variation, and it is necessary to make the line-formation in the assumption of work variation.

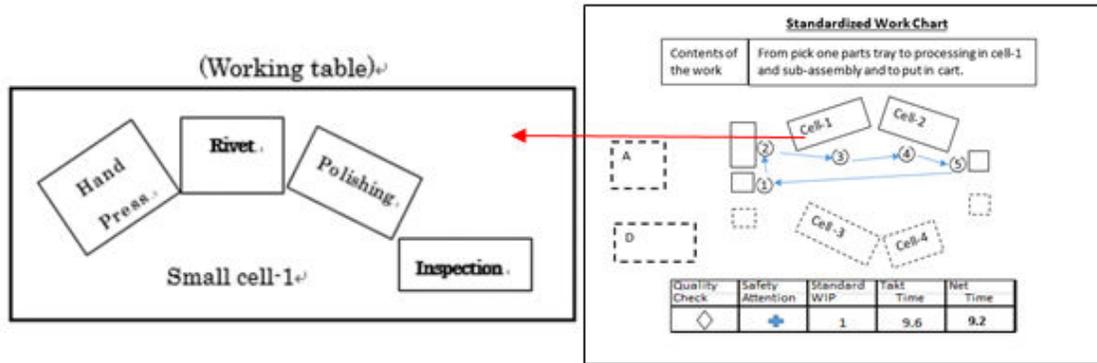
For absorbing the work variation, it is necessary to have proper WIP (work in progress).

(2). It is difficult to introduce the standardization job.

"Do all companies who implement Lean Manufacturing run these standardization activity?"

By the way I didn't explain another one of important standard which is Standardized Work Instruction Sheet. It should be made by the supervisor or the team leader of the line. And this sheet is used for the job training.

(Do you remember the cell of sub-assembly-1 in the model line?)



Normally the sheet is made as the total job cycle of (for instance) subassembly-1 which the job range is ① to ⑤ including the cell-1 and cell-2 and the takt time is 9.6 minutes. (But now as an example, just I show the job of ③ which the takt time is 55 sec as below.)

Job Instruction Sheet

M/g	S/v	Job Instruction Sheet			Part number: KE-0025	Type: XT-5	Plant: Mode
R.B	M.E				Part name: RMJT-assy	Quantity: 50	Process: Par
No	Work Content	Quality Check	Gauge	N. Time sec	Vitals points (Safety, Quality, Easiness)	Standardized Work	
1	Take K part and fit in press and press			2.3	See the angle and depth.		
2	Take off from the press and check quality and put the K part on the tray	1/1.		2.4	Check the shape and burr.		
3	Take M part and fit in press and press			2.5	See the direction and angle.		
4	Take off from the press and check quality	1/1.		2.5	Check the shape and burr.		
5	Take one rivet and fit in the M part			1.8	See the angle in the hole of M.		
6	Take K part and fit to M in the rivet				See the angle after M fitted.		
7	Fit in the riveting machine and rivet			1.5	See the centre and angle in the die.		
8	Take off and check quality	1/1.		2.2	Check the situation of the rivet.		
9	Fit in polishing machine and polish			9.1	See the luster and no burr.		
10	Check and polishing	1/1.		6.3	Check the luster and no burr.		
11	Take inspection jig-1 and inspection and put in the tray	1/1.	gauge	3.4	Check the angle and looseness.		
12	Take G part and fit in the polishing machine and polish			7.5	See the luster and burr.		
13	Take off and check quality and polish	1/1.		6.2	Check the luster.		
14	Take inspection jig-2 and inspection and put in the tray	1/1.		3.3	Check the luster and the shape.		
				Total time	51		

It is indeed when coaching this diagram, the supervisor complained of the job being too difficult (or complicate or overload or troublesome). It is never the meaning of that the supervisor had no capacity to implement this job. And it is also indeed that nobody of supervisor can implement the standardization job (Working Standard, Standardized Work Chart, Standardized Work Combination Table, Process Capability Table and

Standardized Work Instruction Sheet) like as Toyota, because the gemba organization is different.

Different gemba organization and the job role.

(For instance)

When I taught to a Canadian manufacturing company, I was surprised with one thing which was very much different job role of a supervisor. Now I compare the job role of my previous company supervisor and the Canadian factory in the 6 categories and total 15 points.

Job role	Japanese supervisor	Canadian factory
1) Production		
Make daily line-formation and adjust the line balance	yes	No (given by engineer)
Keep the production schedule	yes	yes
Check materials and jigs	yes	yes
Support and help the job of line worker	yes	No (no skill of the job)
Follow up of hourly production and take action	yes	yes
2) Quality		
Feed back of defect information and take action	yes	No (inspection and QA)
Review quality and take countermeasure with the engineer	yes	No (inspection and QA)
3) Control		
Maintain daily control chart	yes	No (gemba staff)
Follow and take action for monthly target	yes	No (gemba staff)
Follow daily check sheet for TPM	yes	No (maintenance Dep)
Lead 5Ss, Safety regulations	yes	No (gemba staff)
Keep the working condition of the gemba	yes	No (gemba staff)
4) Kaizen		
Encourage kaizen activity (QC circle, Suggestion scheme, Kaizen)	yes	No (no activity)
5) Standardization		
Working standards	No (job role of engineer)	No (job role of engineer)
6) Training		
Training for new worker	yes	No (no organization)

And the situation of the model line factory was very similar to the Canadian factory.

A Japanese supervisor is required the excellent skill to her (or his) products and has it because she made a rise from a line worker or machine operator. She knows the design specification of her products more than anyone (sometimes the design engineer).

On the other hand the Canadian (or general European enterprises) supervisors are hired as a supervisor at the beginning and has no skill. (The supervisor of the model line who was one of the member of this project had the skill of the assembly. It was good, but was never general thing.) The condition of employment, promotion, salary and gemba organization and job role between Japan and Europa (or US ---) is very much different.

And I believe this situation is not changeable easily.

Also individual company has individual history and individual gemba organization. But I emphasize that for introducing Lean manufacturing with the system of TPS, not only the introduction of techniques, but also the modification of gemba organization is essential.

(Very near future I shall go back to the theme of “Gemba organization”. But now I need to go ahead.)

I taught the method of standardization. And they understood the importance of standardization for keeping quality, avoiding or minimizing the work-variation. They understood that a work-variation can be one of critical condition for keeping takt time line.

However they said that “we can’t”.

There is a reason of their reluctant thinking. The indication was shown in the result of the diagnosis which was made before starting the TPS introduction activity.

In the Factory Management Check List, there is the item of “Standardization”.

Then the result of their self evaluation was as follow.

Theme	Check Items	Check Points	Points & Comment
5. Standardization	(1) Clear Structure of Standards	Functions rule, Standards (of Products, Materials, Parts, Equipment, Tools & Jigs, Production, Working, Design, Quality, Inspection, Procurement, Material handling),	2
	(2) Make Proper method of enactment and Change & abolition	Record, Date, Contents, Responsibility and authority	2
	(3) Appropriate contents of the standards	Contents in 5W1H, Objects & effects 4R activity	2
Do you remember the Factory Management Check List?			1
This company also implemented his self-evaluation with the check list. And the score of “Standardization” was 35% which is not acceptable level to introduce TPS, TPM (Kaizen whatever).			1
Therefore in parallel of the introduction of TPS, I required to the company to learn and improve the Basic Factory Management.			2
			3

The doubt of the supervisor.

“Do all companies who implement Lean Manufacturing run these standardization activity?”

This question was very much essential for the general companies. In the general text books (of TPS or Lean) still teach the importance of making Toyota style standards.

Now let’s consider to respond to the question of “Do all---?”

For getting the answer let’s look the situation of several big companies and the usage of “working standards” in their gemba (mainly in assembly line).

I show the assembly lines of international famous companies (Chrysler in US, Mazda in Japan, Nissan in Spain, Famous sewing machine maker in China, DAIKIN in Japan and China, Canon in Japan)

I know these companies don't implement "Toyota" system, but succeed to realize good performance.

I have visited the plant of NUMMI (New United Motor Manufacturing Ink. In US California Fremont. Joint venture of GM & Toyota. 1983~2010).

The assembly line of this plant was likely complete copy of a Toyota plant including the OJT (on the job training) by the supervisors and the standards.

However the plant already has disappeared.

After NUMMI plant I haven't seen the Toyota style standardization in any foreign factories.

I could recognized very few companies to have the working standards in their lines (example-1; Chrysler. -6; Sewing machine. -7; DAIKIN).

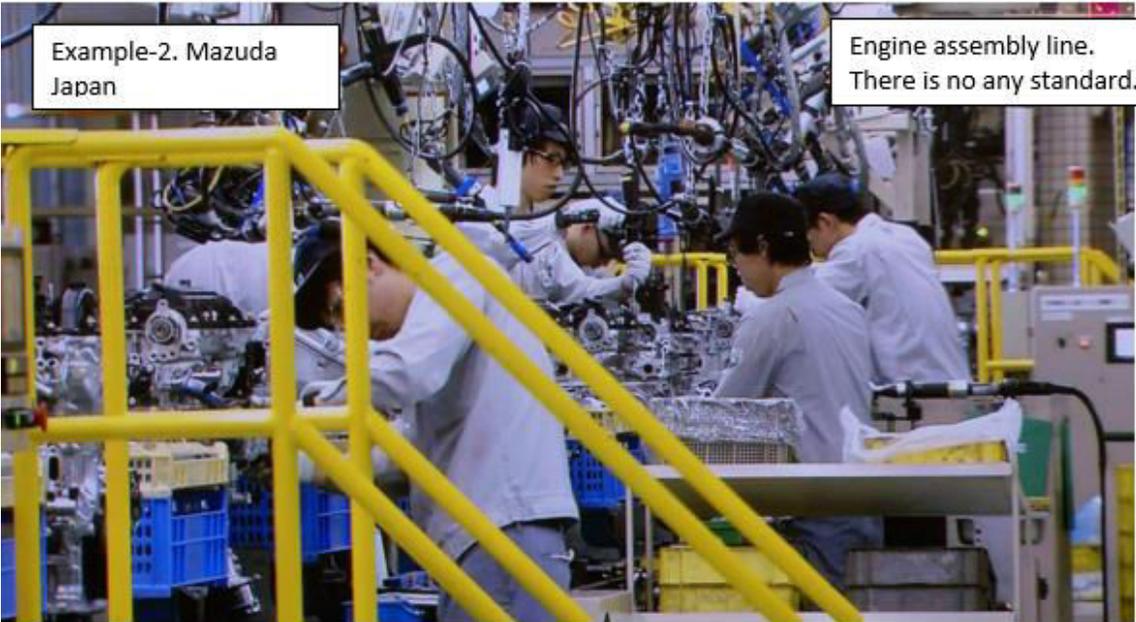
These examples are the case of short takt time and the repetitive work.

Let's look the gemba in the photos.

Working standards are displayed.



Example-1. Chrysler. But not the Toyota style



Example-2. Mazda
Japan

Engine assembly line.
There is no any standard.



Example-3. Assembly
line Nissan Spain

Example-5.
Honda in China.
The view of OJT.
No standards of
Toyota style.



The examples of 1 to 5 show the assembly line of famous car maker (without Toyota). And as you can recognize these are not Toyota style standards, but they have their own standards.

Next let's look the situation of other case which are short takt time and the repetitive work like as car manufacturing.

Working Standards



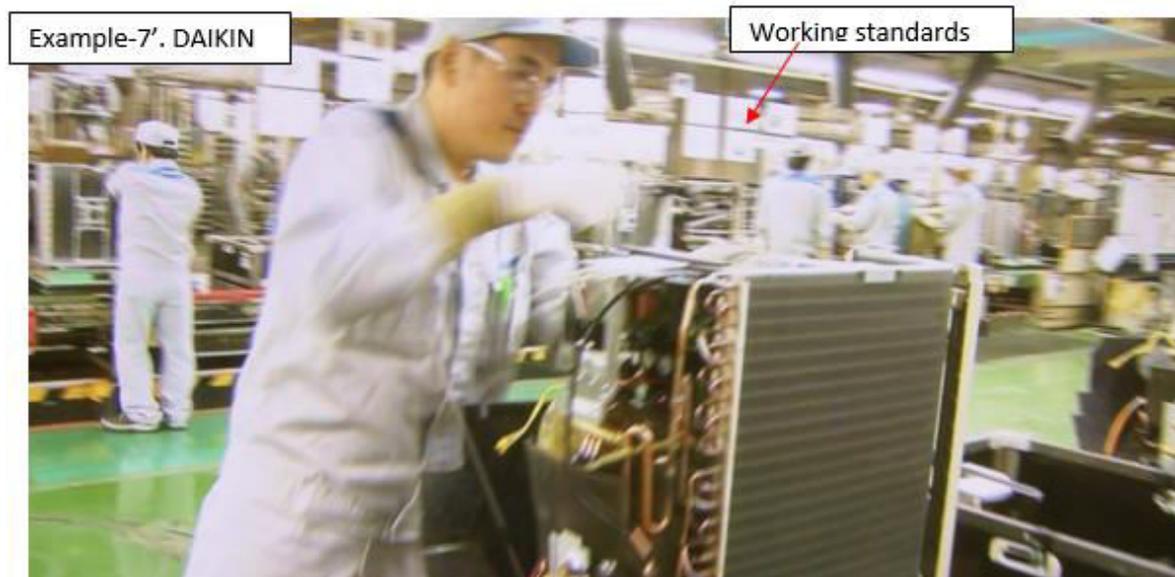
Example-6. Assembly line of sewing machine. Japanese factory in China.

There were the standards.

This Japanese company has the working standards in the assembly line of Chinese plant. But these standards are also not like Toyota.



Above photos are DAIKIN (a worldly famous air conditioner maker) plant in Japan and China. Then we can not recognize any standard in the assembly lines. But in the photo below which is also the DAIKIN plants in Japan, we can recognise many working standards in the each process.



This plant has certain working standards in the process. The examples of 7 and 7' are same company. But there is a variation of the standardization. However I can understand that the Toyota style is unique and just in Toyota plant. We looked the case of “repetitive work and short takt time” working process.

A little more let's look the photos of examples (CANON, Aircraft and Shinkansen) which are the case of long takt time (cycle time).



Example-8. CANON. Assembly cell of copy machine.

The photo left. 2 workers assemble one copy machine. And they assemble one copy machine in one day.

CANON uses the cellular production system in his "Mister system" in well controlled "Skill level evaluation".

This case is the long takt time.

Of course CANON has his working standard for stable quality and avoiding work-variation.

But the standard is not like Toyota style.

Let's look the case of longer takt time and heterogeneous products.



The case of CANON is the long takt time but still repetitive work.

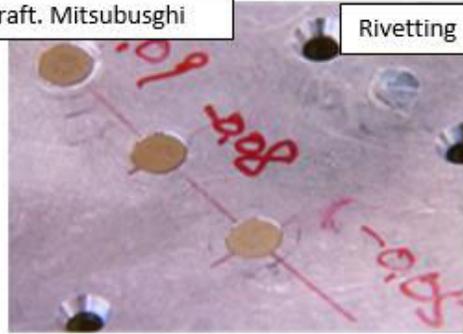
Aircraft, Shinkansen.

Have these manufacturing cases their working standards?

Yes they have. They have standards for the essential work elements, but don't display them in the gemba.



Example-9. Aircraft. Mitsubusghi

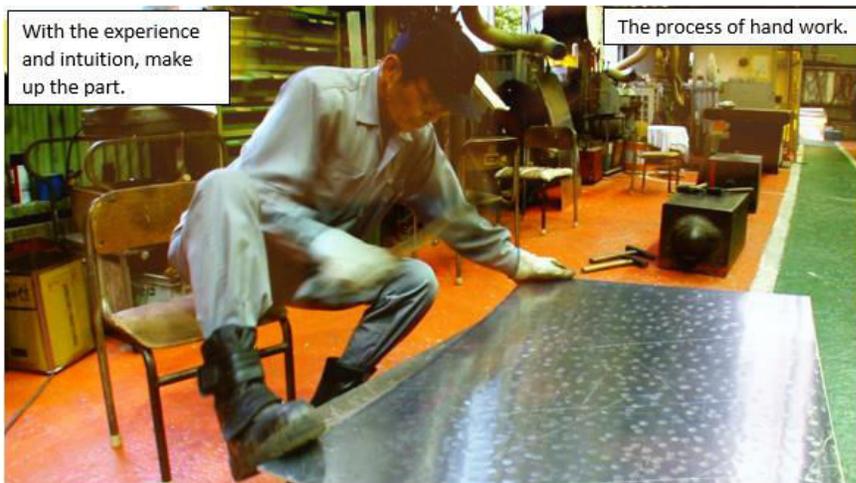
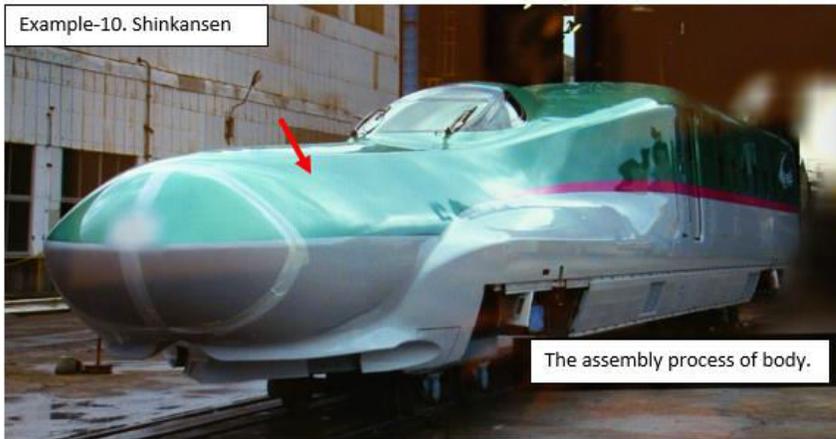


Rivetting



Aircraft. Of course it is very long takt time and has no working standard for keeping the takt time.

In the first place there is no concept of takt time working.



The example-10 shows the hand work of the nose part of “Shinkansen” (Bullet train and Japanese World-class technology). But this hand-made process has no working standard, but is supported with the experience and intuition of the mister. These cases have no working standard. (It is indeed that there is a desire of standardize of such mister technique which is supported with the long term experience and intuition.)

I have visited the assembly plant of space shuttle of McDonnell Douglas in US and looked the hand work process and assembly process. Then I understood that such business model is out of the thought of efficiency (and takt time working). Then I can say that there appears to be the limit of standardization for anything and everything.

Now going back to the question of the supervisor.

“Do all companies who implement Lean Manufacturing run these standardization activity?”

My answer is No. No, they don’t except Toyota.

I haven’t seen the Toyota style (except Toyota plant who has the Toyota DNA).

I have introduced various manufacturing cases which do not implement the Toyota System (TPS). They have their working standards, but don't display in their gemba. Working standard is important for avoiding quality and work variation.

It is quite true.

Now let's consider why Toyota makes such standards and display in the gemba. And why other companies do not display them?

When we got the education of TPS (1975) by the team of K. Suzumura there was a person whose name was Kinoshita-san. And I remember well him with his gentlemanly attitude unlike Mr. K Suzumura.

One day we made following conversation.

Kinoshita. Kimura-san what is the purpose and for whom is a working standard necessary?

K.K. A working standard is important to unite the working method which should be the best at the time.

Also it should be used for the education and training of the worker.

Kinoshita. This thought is wrong and a working standard is for the managers. The managers need to control and manage the gemba. And what is the meaning of "Control".

The meaning of control is to find an error and correct the error. Now who does need to find the error? Workers? Yes. But not only the workers, but also the managers need to find it and lets the worker correct.

How can the managers find the out of standard?

K.K. I understand, therefore the working standard which should be understandable at a glance is necessary and is displayed in the individual working place.

Now as you already understand this concept is one of Toyota style visual control. And the Toyota way gives the importance to the saying "3G".

3G principal (Gemba, Genbutsu, Genjitsu) also one of Toyota word.

Gemba; Actual field. Genbutsu; Actual thing. Genjitsu; Facts.

And Toyota encourages the manager to go to gemba for the control and management. This thought is important for any company. However I think this thought is more thorough in Toyota plant.

I believe the Toyota style standards and the application are better than others for the factory management.

(I don't have the comparable data between Toyota and other companies. But I believe "yes")

Conclusion

- a) Working standard is essential for any kind of company as the base of job.
- b) The standards (Working Standard, Standardized Work Chart, Standardized Work Combination Table and Job Instruction Sheet) are useful to avoid the work-variation including the quality-variation.
- c) But any company except Toyota doesn't (and can't) apply this style.

- d) These standards and the application are one kind of Toyota style visual control.

And this company couldn't introduce the Toyota style visual control with these working standards until the establishment of Basic Factory Management.

"There was no choice." In fact not only this company, but all of my clients who wished to introduce TPS were same situation.

And how did I do?

1. I had to wait the introduction of the Toyota style standards later timing.
2. I recommended them to choose the essential work elements and standardize.
3. QC flow chart activity with the QC circle.

(I will describe this again. But just show the example of QC flow chart.

This is an example of QC flow chart when I taught and lead the QC circle in the company of my Chilean friend.)

DIAGRAMA DE P.C.C.

Producto : _____
N° de Diseño : _____
Fecha : _____

N°	1	2	3	4	5	6	
Nombre de Proceso							
Artículo							
Foto de Proceso							
Trabajo	_____	_____	_____	_____	_____	_____	_____
Punto de Calidad							
Especificación							
Método de Inspección							
Herramientas de inspección							
Anotación							
Historia de Defectos							

Chat

Now I'm writing the theme of TPS (Toyota Production System).

However it doesn't mean that I recommend to implement TPS in you factory.

The purposes to write is the next 2 things.

- 1) To get good understanding about the Japanese origin technique.

2) I wish to expand the option of your thought. (For you, TPS is mere one of option.)

Why do I say that TPS is mere one of option of thought?

Because there are many business models and techniques and additionally the technique of TPS has no universality to all kind of manufacturing process.

Then you should consider carefully to choose the suitable technique for your company.

A little more we shall look the TPS techniques and the universality.

Have following Toyota words the universality?

JIT	No (Origin of Lean Concept. Yes, but just internal process)
Kanban System	No
Heijunka	Yes
Takt Time	No
SMED	Yes (it is not the technique of TPS, but S. Shingo.)
One piece flow	No
5S	Yes (Toyota and S. Shingo origin)
Pull System	Yes (But just internal process.)
ANDON	Yes
Kaizen	Yes (But not the Toyota origin)
Fi-Fo	Yes (But not the Toyota origin)
Jidoka	Yes
Poka-Yoke	Yes (But not the Toyota origin)
3M	Yes (Muri, Mura, Muda)
3G	Yes (Gemba, Genbutsu, Genjitsu)

In here I describe just 2 words (JIT and Kanban) as the examples.

JIT

Is JIT (Supply or make necessary things in necessary quantity and in necessary timing.) universal to all type of manufacturing?

Taiichi Ohno taught us the importance of “Making Stream of Production” in his lecture and the book. And “Making Stream of Production” is the base of realizing the concept of JIT in the production gemba. And long year later James P. Womack rephrased the “Stream of Production” to the word of “Stream of Value” and introduced the Lean concept world widely.

I know and believe that the concept of JIT (Lean) is important. However this concept has the universality for any type of business?

The answer is “No”.

More exactly.

JIT or Lean manufacturing based on the TPS techniques has no universality in the total business process, but has in just internal process. But the philosophy is ideal for any business model.

For instance.

When I was in Chile, I have taught to a company who was a chocolate manufacturer. Generally a chocolate maker has 2 peaks of production in a year. One is before Easter. And another is before Christmas. Before these seasons, the chocolate maker is very busy to make sufficient stock to meet the peak of demand. And to meet these peak

demand, the factory needs to hire the part time workers, also needs to use all space including meeting room, passages and (of course) warehouse for the temporal stock. In such business pattern, do you think that JIT concept is still useful?

I come to think of Christmas, the shopping season,

In US the amount of personal consumption accounts 2/3 of total GDP. And the total amount of personnel consumption in Christmas shopping season (from Thanksgiving day of November to Christmas; one month) accounts for 30% of all year consumption.

In such purchasing trend, the company needs to make the products in the “Make-to-stock production” in the prospect. And he needs to prepare many stock before the peak demands and also risks the obsolescence when the prospect is a disappointment.

In such purchasing tendency which the personnel consumption is concentrated in the one month, does JIT concept work?

As I have introduced the words of Kiichiro Toyoda and Eiji Toyoda in the column of Toyota DNA (in Making Stream of Production-4), the purpose of JIT concept is to minimize the WIP and inventory in shorter LT (lead time) and increase the cash-flow and Throughput.

Above 2 stories are typical “Make-to-stock production”. Such case the concept of JIT doesn’t work.

Generally LT has the categories of “LT of Products development, Procurement, Production, Delivery”.

However for the business, additional category which is the LT of Investment Recovery also is necessary.

For the make-to-stock of chocolate, the company needs to purchase the material and stock in the warehouse. And after the production he needs to stock the finished products until to sell. And all of the space is flooded with the products.

Now in such cases.

Production LT (internal)	Yes it is possible to minimize.
(But)	
Investment Recover LT	No, there is no effect.
Cash-flow	No.
Throughput	No

The concept of JIT or Lean is important for any business model. But when looking the purpose and effect (LT, Cash-flow and Throughput) as the total business flow, it hasn’t the universality (for the case of “make-to-stock” production). The case of the company which I’m writing is complete “make-to-order” production.

And even though such business model (chocolate maker or “make-to-stock” production), JIT is useful in just internal process.

Kanban.

Kanban system is one of important method for the JIT and I like to teach this.

However Kanban system also doesn’t have the universality. (I write exactly in the column of Kanban.)

Basically the Kanban system (for instance “Production Order Kanban”) is based on to have the minimum stock and says that if having more than 2 demands, the kanban

should be prepared. (The important thing is that it is possible to expect the second demand after the first production.)

The number of kanban card is calculated as follow.

$$N = [D \times (CT + LT) + SS] \div M$$

In the formula, SS is the meaning of Safety Stock. Namely the kanban system is based on the stock. Then (if introduce) in some type of industry, the managerial situation becomes rather worse (stock increase, stock space increase and loss of disposal increase) with the introduction of the kanban system.

Long years ago (1975) I was taught the kanban system and introduced it with the coaching of K.Suzumura in our machinery area. But we couldn't find the merit of kanban in our machinery process. And after Mr. Suzumura and his team gone back, we removed all kanban store from the process and returned to our original.

The system which we were taught wasn't suitable to our production model.

(I will describe more detail this thing in the chapter of Kanban system again.)

TPS wasn't improved for multi-purpose use, but for the business model of the car manufacturing.

Next I go back to the main theme "Making Stream of Production" and (possibly) the Kanban system.