Making Stream of Production

-11. Making Stream of Production for "small demand and constraint process"

The visual control (visual management).

This project team needed to find the factory control methods.
The business of this company is the fabrication of the precise parts and components.
The president of this company had desired to introduce the lean management and was introduced me by my English friend.
Then I started my teaching in one condition which was the deep commitment of Chris Wilkins (the president).
For the contract, I didn't require any other condition without "his sincere commitment".
A bitter experience in a company.

Because I had a bitter experience of failure. The introduction and the activity of the company was very much successful. But after the special term (the project and the introduction stage), the company couldn't stabilize the system sufficiently which I taught.

My biggest mistake was to choose this company and miss conjecture of his commitment to the reform.

C Wilkins was different. He promised and showed his sincere commitment in entire terms (of 5 years). Among the activity, we made the deeper dialogue at least once a week.
The most essential condition for Lean Manufacturing introduction (reform of company) is the "Commitment of the top person".

Now visual control.
In the preceding issue, I presented that it is necessary to use both "push and pull" for lean manufacturing with my experience (wiring harness, circuits preparation process.)
And I described as follow.

Push and pull. Depending upon the occasion, it is necessary to use both properly.

Pull in kanban is good tool for the case of "continuous demand".

On the other hand it is not suitable for the demand of timing unknown.

Also it is not suitable for the process of huge kind of parts preparation.

For seeking lean, TPS is one of good tool, but it is not universal tool.

Te-ban control with visual control, Mizusumasi, reduction of LT and Heijunka is one of good method for seeking lean manufacturing.

In this meaning, not only TPS but also factory management is the good and essential means for lean manufacturing.

Also I described that initially my te-ban control was far from the situation of JIT. The cause was the insufficient progress control in "visual control".
As you understand the visual control (visual genba) is one of essential condition of factory management (TPS as well).
Now what is "visual control (visual management)"?

It is the management or control system which

1) A manager, supervisor and any person can understand the situation which is in normal or abnormal in the production activity “visually and immediately (at glance)”.
2) And the abnormality can be taken the corrective & immediate treatment.
3) Is not to require to watch (to identify) the situation, but is able to be worked on to understand the situation by the objects its self.
4) The treatment procedure and method is shown clearly in the genba.
5) Contributes to the level up of managerial environment in the repeated control cycle.

※ With including 5) article, I call “visual management”.

I like the word of “autonomic nerve” and used it in the column of kanban system. Visual control is one of essential condition of Factory Management. And the autonomic nerve is important for the factory management in the condition of “whole people participation (to the management)”.

Now I attached one of check list (Visual control check list). Please check the degree of visibility of your company.

I chose 100 check points to evaluate the degree of visibility. This check list is constituted of 7 categories which are controls of Safety (21 points), Quality (15) Production (15), Inventory (11), Machine & Equipment (15), Genba (17) and Policy (6). I don’t intend to explain all things in this column. But under the circumstances I explain each categories shortly.

objeto de control	Propósito	Ítems de evaluación	Marca de chequeo	No.	Comentario
Seguridad	Prevención de desastre	Indicación del Materiales Peligrosos		1	
		Indicación del almacenamiento de disolventes orgánicos		2	
		Indicación del la ubicación del extintor		3	
		Indicación de seguridad marca (verde)		4	
		Indicación del punto peligroso (alta voltaje)		5	
		Indicación de señalar con el dedo y pronunciación		6	
		Indicación del altura de amontonarse de palets y contenedores		7	
		Indicación del punto de riesgo de dedo pellizco		8	
		Indicación del gafas de seguridad, tapones para los oídos, Casco, zapatos, trabajo y la correa de carga pesada		9	
		Indicación del Productos de higiene		10	
		Indicación del salida de emergencia		11	
		[Tablero de control de seguridad] Informe oportuno de accidente,		12	
		Diagrama de desfile de Número de días de 0 accidentes		13	
		Informe y mapa de Hiyari y Hatto		14	
		Número de sugerencias y implementado		15	
		Diagrama de Organización y actividades del Comité de seguridad		16	
		resultado regular de inspección de seguridad		17	
		Tabla de Seiso compartido		18	
		Tabla de Seiso herramientas (tipo, cantidad y ubicación)		19	
		Tabla de sagridad chequeo diario, semanal o mensual y Nombre de persona responsable		20	
		Color Línea en el pasaje. Dispositivo para la Prevención de colisión		21	

I believe you understand Safety-1, 2, 3, 4, 5. And omit to explain.

Safety-6. Display of pointing with finger and Utterance.

Please imagine the scene of a train station and the station attendant.

In Japan

In any station you can see the scene of safety confirmation by the station attendant.

(Utterance by the station attendant)

X X X line “yoshi”.

Railway yoshi.

Signal yoshi.

Yoshi; OK confirmed (in utterance).

These confirmation with utterance and pointing are made in all departures of train by the station attendant.

He (or she) confirms the safety in the action (pointing) and utterance.

This method is quite effective for eliminate the human error.

For instance. Before the operation of crane.

The operator of the crane does the safety confirmation with pointing and utterance as follow.

Tamagake yoshi.

Tamagake; Slinging.

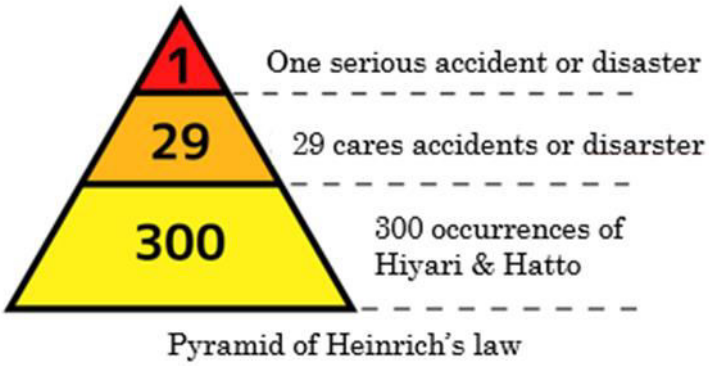
(Around). Nobody yoshi. (There is no people around the crane.)

The display board identifies the necessary points which require the safety confirmation of “Pointing & Utterance”.

I teach this method. But unfortunately it is quite difficult to introduce in the foreign countries because (I think) of the culture difference.

Safety-8. Display of risk point of pinching finger.

Example of the display. Photo of below left hand side.



Pyramid of Heinrich’s law

Safety-14. Hiyari & Hatto report and Map.

The photo above right hand side is the famous pyramid of Heinrich’s law.

Hiyari; Before accident. But the experience of sensing the risk.

Hatto; Also before accident. But the inspiration at the gemba.

Safety-21. Colour line in passage.
Device for prevention of collision.

Quality	Prevention of	Poka-Yoke installation mark		1	
	delivery defect,	Yellow container for defective or unknown parts		2	
	process defect	Red container for defective products or parts, materials		3	
	and quality	Visual aid, working standard or		4	
	improvement	QC process chart to identify quality points			
		[Quality control board]			
		Graphs (defect ratio, defect points index,		5	
		direct pass index, quality cost			
		customer claim		6	
		Quality improvement action plan		7	
		Number of days of 0 claim parade chart		8	
		Best quality line of the month & year		9	
		Prompt announcement of customer claim in genba		10	
		Colour sign uniform for new worker & trainer		11	
		Display of WIP, products (of before inspection &		12	
		inspected, defective and before repair & repaired)			
		Display of quarantine and person in charge		13	
		Measuring tool. Proofreading seal with colour code		14	
		Irregularity display cards in line (Work interruption,			
		new product, first product of design change, first		15	
		product from long term interval, repaired product)			

Quality-2. Yellow container for defective or unknown parts.

Defective parts; which is found by the line worker.

Unknown parts; On the floor. If there is a part on the floor, it shouldn't be used and put in the yellow container to avoid the use of different or defect parts.

Quality-15. Irregularity Display card (Work interruption, new product, first product after design change, first product from long term interval, repaired product).

It is possible to avoid the defect occurrence, if we can maintain the condition of no irregularity in the production flow. Therefore we need to make effort to minimize the occurrence of irregularity. But minimum irregularities are inevitable.

And one of big cause of defective products is the inevitable irregularities.

Work interruption; because of the brake, working shift.
It is quite easy to forget or mistake the continuity.

New product; new method and low skill level.

First product after the design change; also new product.

First product from long term interval; also as a new product.

Repaired product; it is also required the special quality control.

In Japanese I say 3 H which are Hajimete, Henkou, and Hisasiburi.

Hajimete; New product.
Henkou; Design change.
Hisasiburi; long term interval.

These irregularities are inevitable, but it is easy to occur the defects.
And one of countermeasure is to use the display card for the special attention.

Production	Prevention of delay & excess production. Effective control	Andon in machine, line		1	
		Production order kanban or instruction card		2	
		Production order card with colour identification, out-put date or delivery date and next process		3	
		Received Order and Delivery date control board		4	
		[Production control board]			
		Sales KMH, Receiving order KMH & Production KMH daily & weekly & monthly		5	
		Monthly production schedule board (entire)			
		Weekly production schedule board (entire)		6	
		Daily production schedule board (entire)			
		Number of delivery delay & cause & measure		7	
		Daily worker distribution board (name, line and products)		8	
		Planed overtime schedule board (entire & individual)			
		Daily production schedule board (each machine and line, person, hourly out-put)		9	
		Colour identification of Mizusumasi, supervisor & leader		10	
		Colour mark of Fi-Fo		11	
		Location display of prepared material & tool for next production		12	
		Display of working standard, visual aids, Instruction (drawing, sheet)		13	
		Production order card with timing colour signed		14	
		Daily delivery control board		15	

Production-4. Received order and Delivery control board.

The image of this board is as below.

Receiving Order and Delivery control board

Product	June									July			
Part No.	1	2	3	4	5		28	29	30	1	2	3	4
A		39							39				
B			10					10					
C	100						20		20	20		20	20
Total	100	39	10				20	10	59	20	0	20	20
Total KMH	5.6	2.8	1.9				2.2	1.9	5	2.2	0	2.2	2.2

For instance Product A.
At June 2nd, the order received 39. And at June 30th, the delivery date.
Between 2nd to 30th is the delivery LT.
The product C of 20, 20, 20, --- are shown the divided delivery.
Total KMH; Order received KMH and Delivery KMH.

Production-5. Sales KMH, Receiving order KMH, Production KMH.

Firstly KMH.

KMH; Thousands Man-Hour.

It is the unit of work volume in the standard time and actual labour capacity.

For instance.

Product	SH	Quantity		
		Delivered	Received	Production
A	1.8	3000 (5.4)	3100(5.6)	2800(5.0)
B	2.5	2000(5.0)	2500(6.2)	2400(6.0)
C	3.1	4000(12.4)	4100(12.7)	3000(9.3)
D	8.3	3000(24.9)	3000(24.9)	3000(24.9)
Total		12000(47.7)	12700(49.4)	11200(45.2)

SH; Standard hour. 1.8hours/piece.
1.8 x 3,000 = 5,400hours = 5.4kh.
Delivered; Sales
Received; Receiving order

Then in this example, the production schedule of the month is 45.2KMH.
On the other hand.

8 (hours/day person) x 20 (days/month) = 160 man-hour/person.month.

And this factory has 300 workers. 300 x 160 = 48,000 mon-hours = 48KMH.

The labour efficiency = (45.2 ÷ 48.0) x 100 = 94.2%

Production-8. Daily workers distribution board (Name, line and products).

Overtime schedule board.

The worker's distribution should be demonstrated daily basis.

Therefore the pre-notification of the absence should be taught and gain the good cooperation of employees.

However there is a sudden absence, this board should be kept.

Planned overtime schedule board.

However there is the occasion of sudden necessity, because of the (for instance) machine trouble, the overtime should be planned and scheduled in the first place.

Production-10. Colour identification of Mizusumasi, supervisor & leader.

Colour identification; colour working uniform or cap or--- to identify the job role.

Now.

Production-6. Monthly production schedule board, Weekly production schedule board and Daily production schedule board.

Production-9. Daily production schedule board (each machine, line, worker and hourly out-put)

Once again, I said that the production in Te-ban control was better than the Kanban system which was in the pull system in my circuit preparation factory, but initially the Te-ban control was still far from the situation of JIT.

What was the lack in the Te-ban control?

The causes were the lack of Production control-6 and -9.

This is the main theme of this column.

Therefore I write these later and wish to finish the explanation of this check list.

Inventory	Reduction of	Inventory separation with colour (Normal,		1	
		Obsolescence,Excess)			
	inventory.	Indicator of maximum & minimum stock		2	
	Avoidance of	Location map, display of each location		3	
	Excess,	Photo of parts or material in inventory card		4	
	Obsolescence.	Fi-Fo mark		5	
		WIP location in each line & display board		6	
		[Parts/material receiving control board]			
		Receiving schedule (planed)		7	
		Supplier evaluation control board (Keep delivery date			
		& delay , receiving inspection result)			
		Inventory control board			
		Money & amount of normal, obsolescence and excess			
		disposal loss in amount of money		8	
		cycle counting results)			
		Location sign board (receiving, inspection waiting		9	
		warehousing waiting)			
		Machine & equipment control board (maintenance,		10	
		number and location map)			
		Kaizen suggestion board (number of kaizen &		11	
		number implemented, photos)			

Inventory-1. Inventory separation with colour (Normal, Obsolescence, Excess)

Obsolescence (stock); Already design changed or the business to be no expected.

The location area is separated and identified with red colour.

Excess (stock); more than double months to the purchasing LT.

The location area is identified with the yellow colour.

It is quite important to have the inventory standard obsolescence, excess and normal stock.

Is stock (inventory) the assets?

The obsolescence stock is never the assets and should be proceeded.

And it is necessary to investigate the causes like as a quality defect or customer's claim to prevent the re-occurrence.

Inventory-8. Cycle counting result.

Daily (or weekly) inventory. Each day 10 items inventory check and compare the results to the computer registration to monitor the accuracy.

I recommend to implement daily (at least weekly) inventory check.

Of course once or twice a year inventory check should be implemented.

This cycle counting is one of the quality control.

Inventory control in computer to be good accuracy is a superstition because the operation is owed by the human being.

Accuracy rate (defect ratio) =

(1 – Number of mismatch cases ÷ 10) x 100

Daily (or weekly) accuracy rate control graph.

If the trend of the accuracy rate percentage is less than 95%, something of special activity should be implemented.

Machine	Prevention of	Machine name plate with name of person in charge		1	
Equipment	Defect, trouble	Regular inspection & maintenance. Plate of		2	
	Effective TPM	timing planed (before and next)			
		Inspection menu (each kind of machine)		3	
		[Maintenance control board]			
		Regular maintenance schedule			
		Graph (machine down ratio and machine			
		stop frequency index in each machine & total)		4	
		Spare parts control board (money, amount total, order			
		and receiving board)			
		Display of daily weekly monthly maintenance check		5	
		sheet in each machine			
		Display of daily machine performance		6	
		(ratio, out-put, defect, scrap weight)			
		Oil supply level gauge mark coloured		7	
		Oil supply in machine. Mark of Kind of oil, oiling point		8	
		and Timing (cycle)			
		Colour display of each kind of oil in storage & schooner		9	
		Oiler drop speed indication/min			
		Oil quantity upper & lower			
		Oil level gauge			
		Display of direction (rotation, air/liquid)		10	
		Striped pattern in rotating body			
		Cooling fan ribbon streamer			
		Colour mark in instruments (pressure, temperature,		11	
		air flow, liquid flow, vibration) & gauge			
		Mark & display of open & close valve		12	
		Bolt, nut matching mark retighten yellow paint mark		13	
		Hydraulic pressure filter. Inspection (before & next)		14	
		Maintenance training & skill control table		15	

Machine Equipment-4.

Machine breakdown ratio =

∑(Machine stop in breakdown hours ÷ Total hours planned) x 100.

Machine stop frequency index

= (Machine trouble & stop frequency ÷ Total hours planned) x 100.

Breakdown; more than 15 minutes machine trouble and stop.

Stop frequency; less than 15 minutes machine trouble and stop.

In Japanese “Choko Choko Teishi or Choko-tei”.

Choko Choko; Not the heavy trouble, but light. But happens frequently.

Teishi; Stop.

For machine maintenance, it is necessary to cope with both “machine breakdown and choko’tei”.

Therefore I recommend to use both “Machine breakdown ratio and Machine stop frequency index”.

Machine Equipment-14. Hydraulic pressure filter. Inspection (before & next)

Hydraulic device & equipment is used in the manufacturing genba broadly as the drive unit and solenoid valve.
And most of the trouble cause is the dirt of hydraulic oil. And the cause of the hydraulic oil dirt is the maintenance of the filter (and change oil in proper timing).
When visiting a factory, I see the lack of maintenance of hydraulic oil quite often.
Therefore I intentionally picked up this point in the check list and recommend the visual control.
(It is possible to say that "hydraulic oil is a blood of machine & equipment. And this blood is invisible from outside. The health control also is required the visibility.)

Genba	Increase	[Performance control board]			
	efficiency of	Graph Labour efficiency (total & each line			
	managerial	Machine down ratio & stop frequency index		1	
	resources.	Scrap weight total & classified, Scrap ratio			
	Increase	machine performance ratio			
		Total and each process LT average & LTE			
	moral and cost	Scrap & repair cost)			
	mind	Labour man-hour, total standard man-hour			
		Order received man-hour			
		Number of direct & indirect employees		2	
		labour turnover ratio, absence ratio			
		inventory turnover ratio			
		[Kaizen control board]			
		Number of suggestions & implemented		3	
		& amount of saving money			
		Number of QC circle group current & accumulated		4	
		& introduction of Current groups & themes			
		Display of QC Circle Chart			
		Display of kaizen idea implemented in genba		5	
		Multi-skill training & evaluation map		6	
		5Ss & 4R inspection result total & each factory,		7	
		layout map & display board in each			
		Scrap can classified & colour sign		8	
		Rubbish can colour mark		9	
		Project & special activity display board (Project			
		organization, theme & progress,		10	
		Kaizen committee & organization			
		Display of TQM diagnosis result		11	
		Display of organization & information transmission		12	
		route			
		Diagram of education schedule (QC 7 tools)		13	
		Display of slogan & poster of quality		14	
		Name badge of all employees & working uniform		15	
		Display of Future & self education target. Each person.		16	
		Colour identification of supervisor, mizusumasi, trainer		17	

Genba-2. SMED activity result.

Total machine stop for changeover ÷ times of changeover.

Total trend to company target.

Individual machine type to the target.

Genba-5. Display of kaizen idea implemented in genba.

Good idea suggested and applied is displayed in the genba. The name of person of the idea created, photo of the device, effect and the date are in the display.

Genba-8. Scrap can classified & colour sign.

Scrap also is money and should be separated. Also it is required to cultivate the cost mind.

Genba-11. TQM diagnosis result.

TQM diagnosis should be implemented regularly.

Genba-16. Display of future & self-education target. Each person.

For the motivation improvement, a company needs to do many things.

What is the "many things"?

Visual control. Education and training. Target control. The chance of kaizen activity & presentation.

The company's help to the 'Future & self-education target" of each person also is important.

Policy	Unite all	Display of company's philosophy		1	
	employees	Display of annual policy and goal (entire)		2	
	velocity	Display of annual policy and goal (each department)		3	
		Display of logo & slogan		4	
		Annual policy control board (Departmental action plan,		5	
		control graph & charts)			
		My goal card (each employee)		6	

Policy-1. Display of company's philosophy.

Company's philosophy and the annual policy are different.

In the foreign companies, I was presented the company's philosophy as the policy. It is wrong. And the company's philosophy and the policy are different.

In the SNS sometime there is the column of "Hoshin Kanri".

This is a Japanese and the meaning is annual policy control.

The company's annual policy should be delegated to individual department and the departmental policy (and the annual action plan).

I have attached the check list. Then please check your factory and diagnose the degree of your company's visibility.

And if your factory can gain the diagnosis result of more than 75%, it is good level.

Now going back to the main theme "visual control".

What was the lack in the Te-ban control at that time?

The causes were the lack of Production control-6 and -9.

At the last edition (Is "push" bad and is "pull" good?) I wrote the case of my previous company which the principal product is Wiring Harness and finalized with following words.

The Te-ban control was better than the kanban system for our parts (circuits) preparation process. But still it was far from the JIT situation because of the lack of (the progress control in) the visual control.

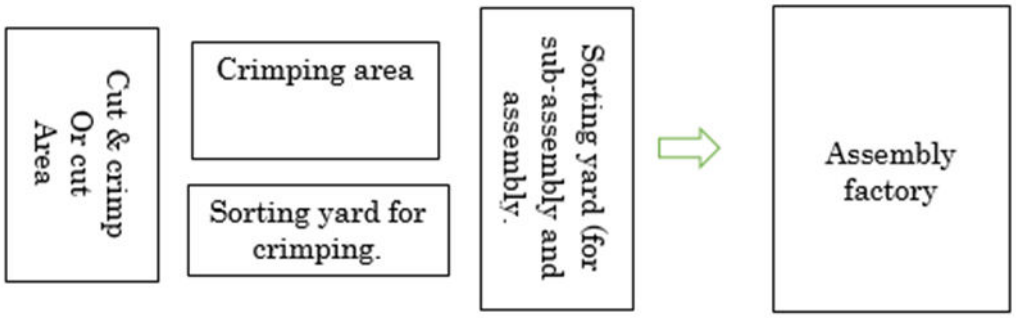
With through the job of Mizusumasi, let's consider the problems and the solutions.
The problem was quite clear and was

"The necessary circuits were not prepared in JIT for the assembly process".

Again the job role of Mizusumasi person is

Handling of the parts & circuits in "deciding working order priority",
Preparation of materials and die tools for next production,
Clean up and return the materials remained and the die tools (to the storage).

Again following image.

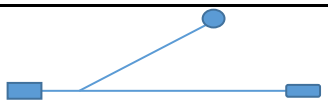


He (Mizusumasi person) needs to decide the working order for each cut and crimp machine (automatic machine) and the hand crimp operator.
After cut & crimp in the automatic machine process, he needs to carry the circuits cut and crimped to the sorting yard if the additional crimp for B end is required.
After crimping, he sorts the circuits and carries these to the joint process (if required).
After the circuits are completed, he needs to sort and arrange all circuits for assembly.
And in all case of handling and sorting job, he needs to consider the working order priority.
He did.
(But still it had the lack and was far to the JIT situation.)
How had he been doing?

Note) The calculation of Te-ban in standard LT by the production planning department.
The Te-ban was calculated as follow.

Delivery date: (Starting point)
Production (assembly) complete date: Delivery date – 1day.
Assembly start date; Production complete date – 1 day (assembly LT)
(Sub-assembly is in the line side of assembly.)
Circuit preparation complete date: Assembly start date – 1 day.
※Cut & crimp & circuit preparation start date (Production start):
Circuit preparation complete date − Individual circuit LT.

Individual circuit pattern

Circuit Pattern	Process	No. of Processes
	Automatic cut & crimp (A and B end)	1
	Automatic cut & crimp (A end) + hand crimp (B end)	2
	Automatic cut & crimp (A end) + hand crimp (B end) +	3
	Insulation putting	
	Automatic cut & crimp (mother circuit A and B end) +	
	Automatic cut & crimp (baby circuit A end) +	4
	Middle strip in mother circuit +	
	Joint crimp baby in mother circuit +	
	Insulation taping in joint	

As I wrote last time, car electrical system is constituted of more than 1,500 circuits. And above images are most simple patterns.
As you aware the number of processes of the single circuit and joint circuit are different which is the meaning of very much different of LT.
For instance an automatic cut & crimp circuit (single circuit) was produced in 1 process. But joint circuit needed 4 processes.

(Back to the theme)
After the production planning, the department gave the circuit cut & crimp instruction cards to the supervisor.
The supervisor and the mizusumasi persons decide working order based on the following their personnel standard.

1. Minimizing the changeover frequency.
2. Maximizing the automatic machine efficiency.
3. Maximizing the labour (hand crimp worker) efficiency.

For instance the changeover process of the automatic machine.

-1. Take off the remained electric cable, terminal reals which were used for the previous work.
-2. Set-up the new cable for the next work with the adjustment for cable size.
-3. Take off the terminal crimping dies (A and B end) from the machine.
-4. Set-up the next terminal crimping die of A end.
-5. Set-up the A end terminal real.
-6. Set-up the next terminal crimping die of B end.
-7. Set-up the B end terminal real.

-8. Adjust the stripping (of insulation of the cable) length and inspection.
-9. Adjust the crimping height and test crimping and inspection (and record in the working report).
-10. Adjust the cutting length and test and inspection (and record).
-11. Then start the automatic cut & crimp.

As you aware the full changeover has 10 processes which are done by the operator.
And (at that time) it was thought that the condition of good skill mizusumasi was to minimize the changeover processes.
Concretely.

Same colour and size cable and same terminals (A and B).
But just cutting length is different. ---- Best.
Same colour and size. But just A (0r B) end terminal change. --- Better.

And the most time-consuming changeover is the changeover of "cable type and size".
Because cable type and size change requires the crimping height adjustment which requires to care especially.

How had the Mizusumasi person been doing?
Production planning department decide the out-put date based on the calculation of Te-ban.
Production complete date (out-put date). Sub-assembly out-put date.
Circuits out-put date.
※And the production start date is calculated in Individual circuit pattern.

But the mizusumasi person decided the circuit preparation priority in the above their standard plus "Production complete date".
One of their standard to decide the priority was "Production complete date".
For example.
There are 3 kinds of wiring harnesses and production order as follow.

Wiring harness	Production Complete date	Circuit Preparation Complete date	Circuit Preparation start date	Preparation LT
C	31st	20th	5th	has joint circuits and hand crimp. Circuit preparation LT: 15days.
D	25th	20th	10th	is constituted of just single circuits, but has hand crimp. Circuit preparation LT: 10 days.
E	28th	23rd	13th	Same to D. Single circuits, but has hand crimp. Circuit preparation LT: 10days.

C wiring harness circuit preparation was started at 5th.
And D and E were started the Circuit Preparation at 10th and 13th.

These start line was correct. And after the automatic cut & crimp process.
He prioritized the hand crimp of D wiring harness, because of the earlier production complete date (25th) than C (31st).
Then he proceeded the hand crimp circuits of C wiring harness which was needed the joint process.
After this, he prioritized the hand crimp of E wiring harness rather than the joint process of C wiring harness, because of the production complete date 28th when is earlier than C (31st).
At last the circuits preparation of C wiring harness wasn't completed until the claim of the assembly supervisor.
Actually the C wiring harness is more difficult to assemble and the LT is longer than D and E.
Therefore the C circuit preparation start date was earlier than D and E.
But he (mizusumasi person) decided the working order priority and proceeded as above.
And he needed to take his special action for the joint circuits to recover the delay.
These troubles occurred frequently and daily at that time.

What was wrong?
1) He and the circuit preparation factory supervisor had decided the working order priority in the machine and labour efficiency.
2) The working priority wasn't decided by the "circuit preparation complete date", but by the "production complete date" which was written in the "cut & crimp instruction card".

Note) Cut & crimp instruction card.
The information contents were
Wiring Harness Part No. Lot No. "Production complete date".
Circuit No.
A end strip length, terminal & height, B end strip length, terminal & height, Cable type & size & colour and cutting length.
(and missing the information of "circuit preparation complete date")
At that time, the date of working order to each machine and line was entrusted to the supervisor. And although the production planning department calculated the reasonable LT in the te-ban and circuit preparation start date.
But as the result the supervisor and the mizusumasi person decided the working order priority as above.
After the visit of Suzumura, we continued the reform project for a while.
And these 1) and 2) were resolved in very hard conflict between the project, production planning department and the manager, supervisors (including mizusumasi persons) of circuit preparation factory.
The point of conflict was
Working order priority in circuit preparation date to be first.
And the machine and labour efficiency to be second.

And after the deeper discussion, we could persuade them.
In parallel the cut & crimp instruction card was improved. And the circuit preparation complete date was printed in the card.

New problem occurred.
3) Lack of SMED for changeover time reduction.
After the improvement of "priority issue", the new problems which we have predicted occurred very soon.
The new problems were the lack of machine capacity because of

Changeover frequency was same, but total changeover time very much increased.
Then the machine performance ratio was worsened.
And the lack of machine capacity was happened.
And for supplementing this lack capacity, the overtime work increased.

I said that the problems were predicted.
And we predicted the necessity of SMED activity which was essential for the reform.
Then the problem of the lack of capacity was resolved gradually with following activity.

SMED activity team. Complete pre-preparation of materials and dies.
Team activity by the machine operators (help mutually when changeover).

Additional difficulty was suggested.
4) Lack of control.
When we made the regular meeting with genba (the factory manager and supervisors), a supervisor expressed his 3 concerns.

-1. Machine work (automatic cut & crimp machine) delay.
When the mizusumasi person sorted the circuits cut & crimped, there were many cases of that the actual circuit preparation complete date had already passed the due date.
※The circuit preparation complete date wasn't kept by the automatic cut & crimp operator.
The te-ban (necessary LT) was decided logically, but wasn't kept by them.
And he hadn't the means to follow up

The work load, out-put & the proper timing.

He needed to have the control means of

Daily work load of each machine,
Out-put schedule and follow up.

-2. Because so many kinds of circuits floated in the gemba.
It was difficult to judge the priority in the "circuit preparation complete date", even though it was written in the instruction card because there were so many kinds of circuits floated in the circuits preparation factory.
Because of so many wiring harness part numbers (800 part numbers in a month), enormous kinds of circuits floated in the circuits preparation factory.
※He (mizusumasi) needed the means to judge the priority in the huge kinds of circuits.
-3. The causes of delay

The causes were many and were machine troubles, quality troubles, and the error of material & die preparation etc.
And these delays were found at the circuit sorting by the mizusumasi person.
This phenomenon was possible to say that there was "no control" during the machine work.
And these phenomena were the causes of the delay of the assembly complete date and also (in the worst case) delivery delay to the customer.

Note) The job role of supervisor.
Execution of the production in safety, human resource & personnel control, efficiency (labour, material, machine) and in the production plan.
With through the execution, to contribute to achieve the plan
(Annual policy & budget).

Now I wrote many things in this column of "visual control".
But from now, it is the main theme.
My project team in the previous company (SUMITOMO) received the teaching of Suzumura and his group.
But after he and his group left, we restored our original control method from the kanban system in the circuit preparation factory.
Our original system was much suitable than the kanban system for our circuit preparation factory.
But at that time our original system was still far from the JIT situation.

- The original system was used the Te-ban calculation and control.
- Even though the Te-ban calculated, the supervisor and mizusumasi person decided the working priority in the consideration of efficiency. And as the result, it was often to be ignored the Te-ban by them. ---- This was improved.
- The due date of circuit preparation date wasn't in the card. --- also improved.
- The lack of machine capacity occurred because of the increase of changeover time and change over frequency. --- This was temporarily dialled with Overtime work, Holiday work (and was resolved with SMED activity later).

And next this project faced with the biggest hardship of the disruption in the relationship with the genba.
The biggest point and issue was the reduction of maximum lot size of the automatic machine.
The previous lot size was the average; 500/lot.
And we proposed to reduce to maximum 50 circuits in one lot.
Our proposal was to reduce the lot size 1/10.
And the shortage of machine capacity occurred because the necessary machine capacity was calculated with this lot size (500) and changeover frequency and time.
Fortunately (or as might be expected, my previous company was SUMITOMO.) the will of the top management was firm.
And our proposal was approved.
In this occasion, I realized that

"TPS (Lean manufacturing) is started with the Changeover Improvement and is finished with the Changeover Improvement."

Despite these improvements, still the delay to the due date occurred quite often.
Why?
Because the "progress control" didn't make well.

Note) 3 poles of basic production control.
3 poles: Production plan, Production order and Progress control.
Progress control.
It has 2 elements of "progress".
-Absolute progress: To identify
When (of a certain point in time), What (articles), Where and How many (are there).
Saying actual goods control.
-Relative progress: The difference between the plan and actual.
For instance.
Necessary quantity was 100, but actually 80, and 20 shortage.
The necessary timing was 21st, but actually 24th and 3 days delay.
Then both of absolute and relative progresses are required for the production control.
At that time the circuit preparation factory had the certain level 5Ss and 4Rs. But the level of "Absolute progress and Relative progress Control" were not sufficient.

Note) The process of production order after the production planning.
Production planner gave the "cut & crimp instruction cards" and the circuit lists (of each wiring harness part number) of next week to the supervisor at the Weekly Production Meeting (Each Friday).
※Initially we had not the "weekly automatic machine work load control board".
Supervisor gave the cut & crimp instruction cards and lists to the Mizusumasi person (to make order and prepare the necessary electric cables, terminals and crimping dies).
The mizusumasi person assigned the cut & crimp instruction cards of the day with the materials & crimping dies to each machine operator.
※The supervisor didn't grasp the work load and the work contents of individual operator (automatic machine).

In such working flow, it was impossible to make the progress control by the supervisor.
Now what was the necessary condition for the supervisor's job (production control)?
The answer is the visual control means.
1) Weekly work load control board.
2) Daily production control board (in individual machine).

Production-6. Monthly, Weekly and Daily production schedule (control) board.

Production-9. Daily production schedule board (each machine, line, person)
These -6 and -9 are the main theme of the visual progress control.
Then I will go back and explain deeply.

(The lack of these were the cause of the lack of the Te-ban control.)
(I said that still "far from the situation of JIT")

Production control-6. Monthly, Weekly and Daily production schedule board.

In production control, there are 3 poles which are Production Planning (scheduling), Ordering (to the factory and supplier) and Progress control.
These also should be in visibility in genba.

The flow of work order to individual machine or line.

-1. Monthly Production Schedule Control Board. (Example)

	Production Schedule (June. 15')													
Product Part No.	1	2	(3),	**(4),**	5	6	7			27	28	29	30	Total
A					5	5	5							39
					0.4	0.4	0.4							15.6
B						2	2							20
						0.4	0.4							8,0
C		5			5	5	5			5	5			95
		0.3			0.3	0.3	0.3			0.3	0.3			28.5
D	10	10			10	10	10			10	10	10		210
	0.5	0.5			0.5	0.5	0.5			0.5	0.5	0.5		10.5
E										7	7	7	7	70
										0.3	0.3	0.3	0.3	3,0
Z	44	44			44	44	44							660
	1.8	1.8			1.8	1.8	1.8							27,0
Total	135	148			131	140	140			133	137	142	140	2,970
Total KMH	3.7	4.6			3.9	2.8	4.5			4.1	3.7	2.9	4.3	80,7
Head Account	463	575			488	350	563			513	463	363	538	AV: 485
Planned Efficiency	95	95			95	95	95			97	97	97	97	96
Attendance ratio (Assum)	98	98			98	98	98			98	98	98	98	98
Necessary head account	497	618			524	376	604			551	497	390	578	516
Enrollment	550	550			550	550	550			550	550	550	550	550
Excess and Deficiency	53	-68			26	174	-54			-1	53	160	-28	

The above is the example of the <u>assembly</u> schedule control board. (Before Heijunka)
(※First stage of planning. And it is necessary to consider in the work load Heijunka and revise for determined Monthly Production Planning.)

Of course additional orders received are added daily basis. And it is revised daily basis.
For instance

June 2nd.
Total 148 sets of wiring harness assembly is required.

And total KMH is 4.6 KMH.
Head account (assembly worker) 575 = 4.6 x 1.000 ÷ 8hr/day person.
In 100 % efficiency to the standard hour and 100% of attendance ratio.
Necessary head account 618 = 575 ÷ 95% ÷ 98%.
Enrolment (of assembly worker) is 550.
Then
The head account shortage is -68 persons = 550 – 618.
June 6th.
The excess head account is 174 = 550 - 376.

For instance The Product No. A. June 5th, 5 productions.

This date shows the "limit date" of the assembly start in the Te-ban from the production complete date and shipping date.

-2. Heijunka.

In this stage still, the work load Heijunka is not considered, but just calculated the Te-ban simply.

-3. Completion of the Monthly Production Schedule Board. (After Heijunka)--- Omit.

And in front of the board, the factory manager, production planner and the supervisor discuss and implement the work load Heijunka.
This work is not difficult and the peak work load and the over work load to the assembly capacity is moved up to earlier date.
(I will write Heijunka more exactly in the next issue.)

Based on the Monthly Production Schedule, Weekly Assembly Schedule and Daily Assembly Schedule are made.
And these control boards are displayed in the relevant genba.
And Daily Assembly Production Schedule Board has
Hourly out-put schedule and the disposition of workers in name.
(I will write more detail in the column of Factory management and in here omit.)

The Circuit Preparation Schedule Board.

-1. Monthly Circuit Preparation Schedule.

Based on the Monthly (Assembly) Production Schedule, the circuit preparation schedule is made.
In my previous company, we used the unit of MH (man-hour) for the work volume and labour capacity for the manual process (Sub-assembly and assembly process).
The circuit preparation process (automatic cut & crimp, hand crimp and joint process) was used the unit of "number of circuit", because the capacity relates to not only the labour, but also to the number of machine.
The circuit preparation complete date is one day before the assembly start date.

Again

Delivery date: (Starting point)
Production (assembly) complete date: Delivery date – 1day.
Assembly start date; Production complete date – 1 day (assembly LT is 1 day)

(Sub-assembly is in the line side of assembly.)

Cut & crimp & circuit preparation complete date:

Assembly start date – 1 day.

※Cut & crimp & circuit preparation start date (Production start):

Circuit preparation complete date － Individual circuit Te-ban (Standard LT)

For instance one assembly line Weekly Production Schedule is as follow.
(After the work load Heijunka; Production levelling)

	Production Schedule (June. 15')									
Product Part No.	12	13	14	15	16	(17),	(18),	19	20	27
J	50	50	50	50	50			50	50	50
	0.6	0.6	0.6	0.6	0.6			0.6	0.6	0.6
K	30	30	30	30	30			30		
	0.3	0.3	0.3	0.3	0.3			0.3		
L			40	40	40			40	40	
			0.5	0.5	0.5			0.5	0.5	

Note) Heijunka has 2 processes.

One is the Work load Heijunka; Production levelling.

Another one is Product kinds Heijunka.

(In the next issue, I explain the step of Heijunka again.)

And anyway to finish the explanation of visual control, I would go ahead.

-The circuit preparation of J and K should be done by 9th (10th; Sat. And 11th; Sun).

One assumption. J wiring harness.

The J wiring harness has 150 circuits including some "joint circuits in 4processes".

Other circuits are cut & crimped by the automatic machine in one process.

※After the maximum lot size reduction, the Te-ban of circuit preparation was shortened. And

The joint circuit Standard LT (; Te-ban) is 7 days (from 15 days).

(4 Processes: Cut & crimp by the automatic machine, middle strip in mother circuit, joint hand crimp and insulation taping.)

Automatic Cut & Crimp plus hand crimp; 4 days (From 10 days).

Therefore the circuit preparation should be started at the 1st of June.

(Before 7 days to the 9th.)

-The production planner gives the circuit preparation work order with the Cut & Crimp Instruction Cards before the "longest Standard LT (Te-ban)".

The all of Cut & Crimp Instruction Cards of 150 circuits should be given to the supervisor at once at May 31st (Wednesday. Before 7 days from the June 9th.).

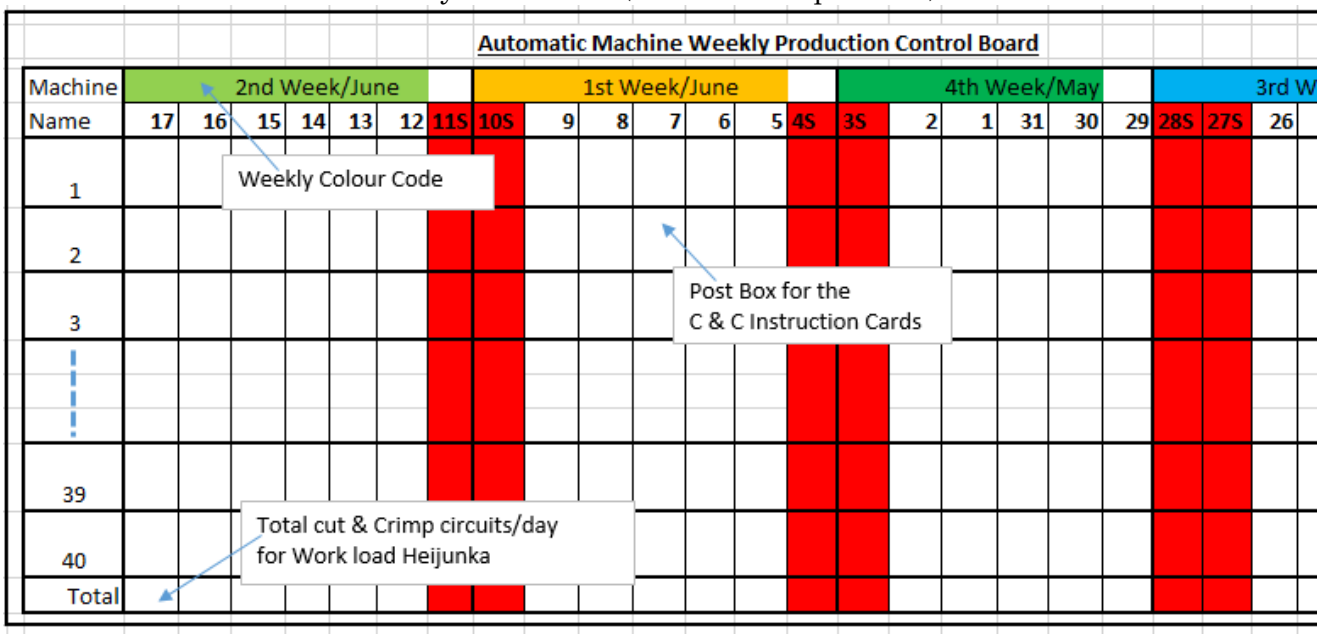
But.

-The production planner gives the working order at the weekly production meeting at each Friday.

And in this example, the Cut & Crimp Instruction cards of J wiring harness are given at the May 26th (Friday).
Therefore at that time, the actual maximum LT was still 11 days.
(7 days Standard Te-ban + ordering timing, once a week)
(※Long days later this weekly order was changed to daily in the reduction of maximum lot size 50 to 10) in the improvement of SMED.)

-The supervisor, Mizusumasi and the group leaders of the automatic machines, hand crimp process and joint process discuss in front of the Weekly Production Schedule Board.
※As a matter of fact, we hadn't these system of Weekly Production Schedule Board and Daily Production Control Board at that time.
We had the Monthly (Assembly) Production Schedule in Heijunka.
We calculated the start date of the circuit preparation process from the circuit preparation complete date and the Te-ban.
We succeeded to reduce the maximum lot size to 50 (from 500).
But still many trouble of the delivery time delay occurred.
And the major cause was the lack of "Progress Control" in visual control.
(Of course there were the machine troubles and quality troubles. But the major problem was the lack of progress control in the automatic machine, hand crimp and joint processes.
In fact we couldn't know that a circuit cutting in a machine is on the schedule or in advance of or already delay.
(※This problem of the visual control related the delay of Kaizen activity.)

Weekly Production (of circuit preparation) Control Board.
We introduced the Weekly Production (of Circuit Preparation) Control Bard.



This board is quite large and has 4 weeks (in horizontal) and (for instance) 40 machines and total (in vertical).
And each Friday (for instance 26th/May), the supervisors, group leaders and mizusumasi persons make the genba meeting to decide following 2 issues.

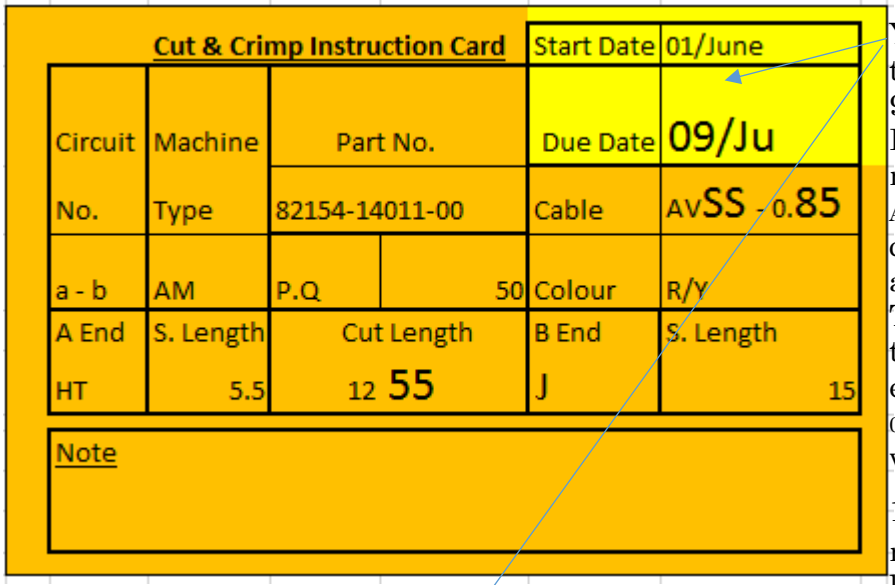
One is the start date of individual C & C Instruction Card.

One is the Heijunka (which is just Work Load Heijunka; Production Levelling).

The working procedure.
Before going to this procedure, I show the Cut & Crimp Instruction Card and the colour code.
Next figure is the example of this card.
The card has the weekly and daily colour code.

4 weeks in a month and 4 colours.

5 days in a week and 5 colours plus red for emergency.



Cut & Crimp Instruction Card				Start Date	01/June
Circuit No.	Machine Type	Part No.		Due Date	09/Ju
		82154-14011-00		Cable	AVSS - 0.85
a - b	AM	P.Q	50	Colour	R/Y
A End HT	S. Length 5.5	Cut Length 12 55		B End J	S. Length 15
Note					

Yellow colour: 5th day of this week (in this case: 9th/Jun).
Beige colour: 1st week of a month.
AVSS: There are similar cable kinds like as AV, AVS and AVSS.
There were the miss use of these. Then SS is emphasized.
0.85: Cable size. Also there were the size of 0.5, 0.75 sq.
1255: 1255mm: There are miss set-up of the cutting length like as 1250.
J: Joint circuit.

Colour	June													May							
Code	13	12	(11 S)	(10 S)	9	8	7	6	5	(4 S)	(3 S)	2	1	31	30	29	(28 S)	(27 S)	26	25	
Week																					
Day																					

Above Colour Code Day shows the due date (Circuit Preparation Complete Date) and doesn't show the Start Date (Circuit Preparation Start Date).

Now the working procedure of Automatic Machine Weekly Production Control Board.

1. Card play for machine assignment.

There are some different types of machines for (for example) small size or large size of cables or special terminal.

On the other hand one wad of C & C instruction Cards (for instance J wiring harness) has 150 cards which includes large size cable circuits, small size cable circuits, joint circuits (mother leads and baby leads),

both side automatic cut and crimp and one end automatic cut and crimped and to be required other end hand crimp.

K wiring harness has 100 circuits. And in the wad of cards, there are many kinds of characteristic circuits.
Then
The first job is to sort the cards based on the "Machine Type".

2. Sort in the Start Date.

After the grouping in same type of machine, the cards are sorted in the "Start Date: Circuit preparation Start Date".
For instance J and K wiring harness have same due date, because both are same assembly start date (12 of June).
But K wiring harness has no joint circuits which don't require longer standard lead time (Te-ban) and has just the circuits of automatic cut & crimp to be the single process and 4 days Te-ban.

L wiring harness has 340 circuits including some joint circuits.
And the Assembly start date is 14th of June (and the Due Date is 13th and the Start Date is 5th).
Once again as follow.

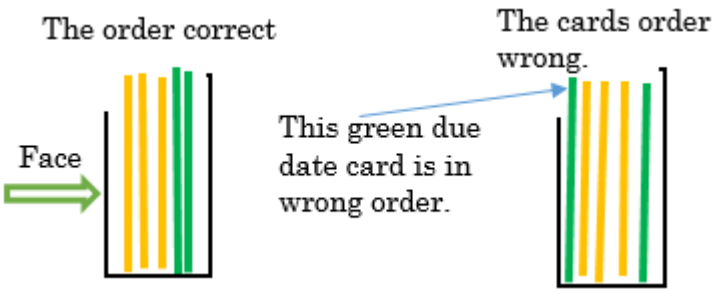
Wiring Harness	Assembly Start	Circuit Complete	Circuit Preparation Start
J	12/Jun	9/Jun	1/Jun
K	12/Jun	9/Jun	6/Jun
L	14/Jun	13/Jun	5/Jun

3. Put in the Post Box.

The cards which were sorted based on the start date and the type of machine, the cards are put in the appropriate post box from the upper to lower (machine 1 to 40) in calculating the machine capacity.
And if (for instance, at the 6th/ Jun) is over the capacity, the cards are given to the date of 5th/Jun (the day before 6th).

4. Work Load Heijunka. (Production levelling).

Each machine and total work load are calculated in each day and group kind of machine for the levelling.
In this process there are 3 rules.
-1. Adjust the work load to the before date of the "Start Date" if the workload is over the capacity.
-2. Put the cards in the box in order the "Due Date", if there are the cards of due date different.

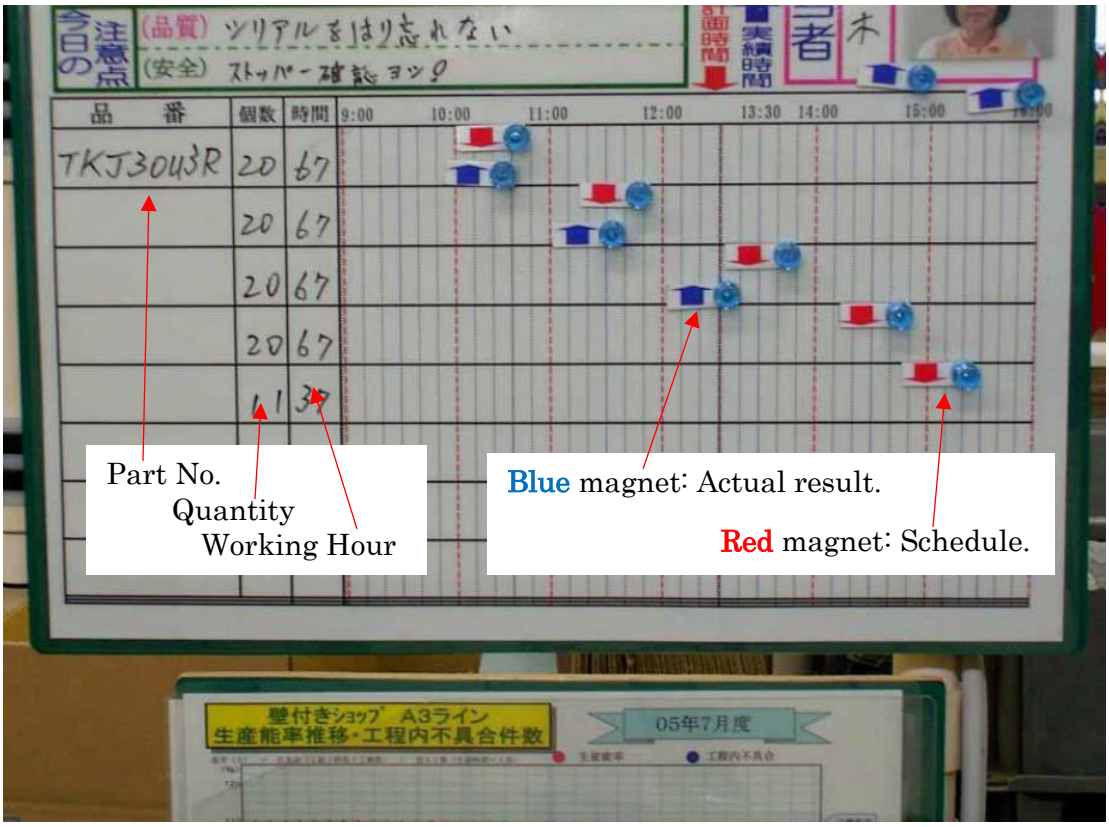


-3. Don't take the work load ːe of the timing even though no or shortage of work loaː ıpacity.
And if there is the case of work load shortages, it should not be hesitate to stop the machine in the planned downtime.

In front of the board, the assignment of machine, work load to capacity, work load heijunka and the start date are discussed.
As I wrote before, Heijunka has 2 steps which are
Work load Heijunka (Production levelling) and Production Kinds Heijunka.
And in the batch production process (for instance press process), it is no necessary to consider the production kinds Heijunka.
"No necessary?" This is the wrong word. But it is always necessary to consider and challenge to minimize the lot size and LT in SMED activity.
One piece flow process (assembly process) should be considered both of the work load Heijunka and production kinds Heijunka.
Anyway in the next description, I will write the detail of Heijunka.

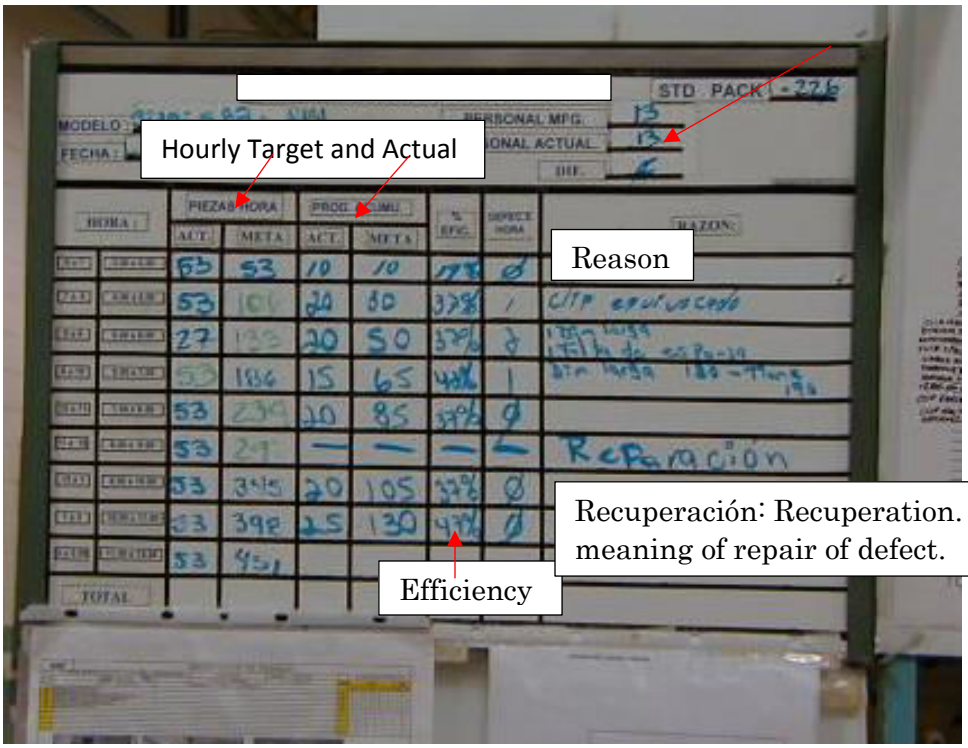
Daily Production Control Board (in each machine and line)
Following photo is one of excellent example.

Quality of the day and Safety of the day Group Leader



In this example, there are red and blue magnets which show the progress of this production.
And (for instance between 11 and 12 hours) the blue magnet shows the product (TKJ30u3R) 2nd lot to have been finished earlier than the red magnet (15minutes).
Now.
This is a control board. And if there is the case of working delay, the group leader and supervisor need to take action to recover.
I show a bad example.

Number of personnel scheduled
Number of personnel actual



This board which there was in an assembly line was maintained by the group leader.
But this board doesn't use as a control board.

The actual is always to be behind to the target.

No recovery action is taken by the group leader and/or the supervisor.

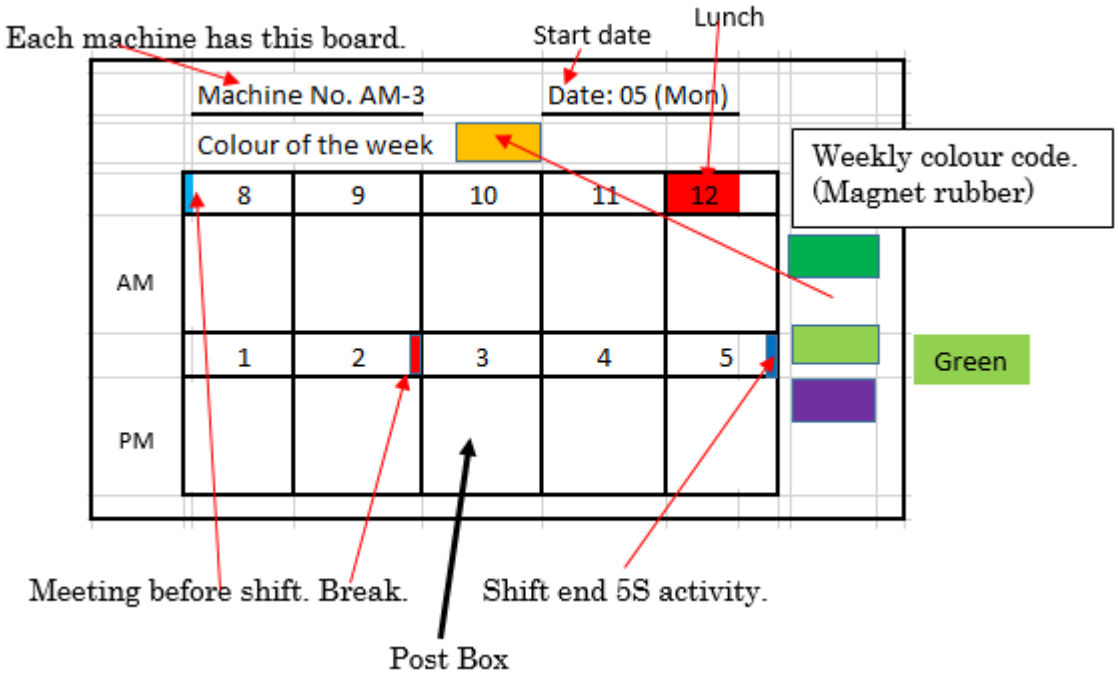
So low efficiency. Lack of training. Standard Time wrong.

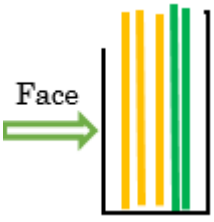
Number of personnel scheduled wrong.

No achievement to the total target out-put.

A control board should be a tool of "Control".
In this true meaning, this factory didn't use this control board as a tool of control.

Going back to the theme of visual control in the circuit preparation factory.
We also introduced the Daily Production Control Board and Andon in each automatic machine, hand crimp machine.
The purpose to introduce these is the progress control.
And the shape of this board is as follow.





The procedure of this control board.
From this control board, the priority colour code is not only the colour code of the day, but also the colour code of the week.
For instance-1.

Machine No. AM-3.
Start date: 5th/June.

In the Weekly Control board, gathered the C & C instruction cards which the start date is 5th, and in Heijunka.
As the image of the left.

For instance-2. There are 120 cards in the wad.
Before start the shift.
1. Divide 120 in 9 plus one (12 o'clock; 15 minutes) boxes.
("Approximately and by eyes" is OK)
12, 2 and 5 o'clock have not full of 1 hour, therefore it is necessary to reduce the number of cards approximately.
2. Put in to the boxes.
In the example there are 2 weekly colours.
And of course the "Colour of this week is the first priority.
The green cards should be arranged in the 5 o'clock box.
For instance-3. Now 10 o'clock.
The supervisor found that some cards are remained in 9 o'clock box.
It shows the work delay and he needs to take action to recover.

Discontent of the operators.

There was a small conflict with the machine operators.
One day (at 5 o'clock 6th of June), the supervisor found the irregularity which an operator was working for the cards of 7th (The job of tomorrow).
The operator finished the work of 6th at 4 o'clock actually.
Then the operator went to the weekly control board and picked up the cards from the 7th post box.

(Before going to the weekly control board, the operator checked the necessary materials and dies which were already prepared for the next day by the mizusumasi person beside of the machine.)

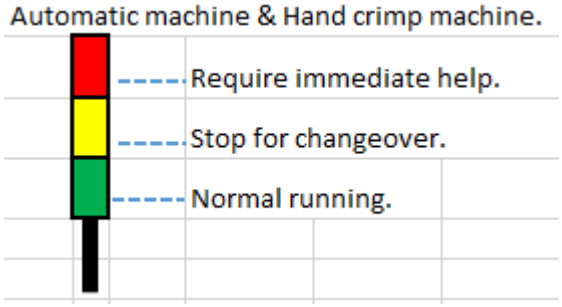
Then he proceeded the cutting job of next day cards.
Of course it is wrong. And the supervisor blamed the operator.
The excuse of the operator was

"I thought that it is better to continue to work than do nothing. I finished the today's quota at 4 o'clock.
What should I do another 1 hour?"

And the supervisor admonished him in his thanks and suggested to tell him.
One of important rule of this system is the strict prohibition to make the job in advance of the day.

ANDON

In the control with the Daily Production Control Board, the factory could approach the condition of JIT. But still the project activity was in the middle of the way.
At the moment to be found the delay in the control board, it has already delayed.
Then our project considered the idea which it is possible to find the problems before delay.
We put the Andons in all automatic machines, hand crimp machines and each process of the assembly lines. The shape is as follow.



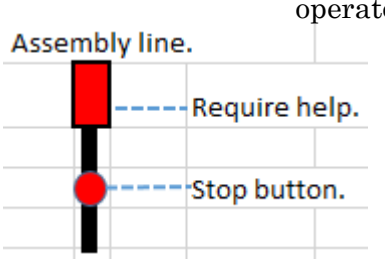
The purpose of ANDON.
※To recover the problem occurred quickly and not only the understanding of the process condition.
Require immediate help: The important thing is to take action before the process problems (Delay).

But in fact there were so many machine troubles. At that time my previous company was in the low level stage of PM (Preventive Maintenance).
However the concept which "Taking recovery action before becoming trouble" is important, the actual situation was in the struggle in time.

Immediate genba meeting: (Manager), Supervisor, Group leader, Maintenance and Mizusumasi.

Initially the machine stop (with red sign) also was decided to be regarded as "Line stop".

Stop for changeover: For not only the changeover, but also any cases, the yellow call sign was used.
Changeover, material, die, tools, container, pallets etc.
and machine troubles (before stop problem): noise, odor, fever, choko-tei and others abnormalities.
Operator physiological needs.
Gathered by: (Supervisor), Group leader, Group member (one of other operator).

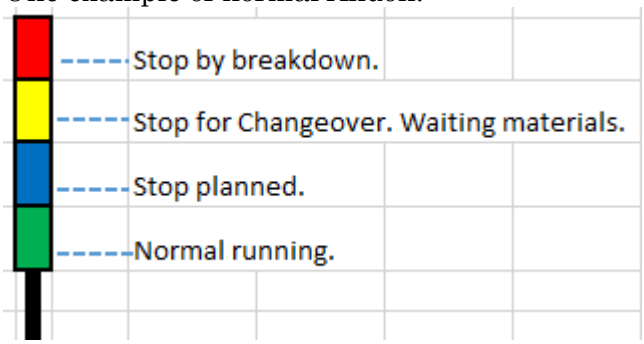


The assembly line has the Andons in equal distances with the stop button.
Stop button: First push- Red sign (Require help); anybody can push.
Second push- stop line; group leader is allowed.

Require help: For any occasions.
Gathered by: (Manager, Supervisor), Group leader.
In the occasion of the line stop, the manager and supervisor gathered immediately.
(There is the other Andon to inform the line stop on the line head.)
Release of stop button: harf turn and pull.

The assembly line had almost no line stop (double push of red button.). And the major trouble was working delay, working mistake, defects including materials and the troubles of assembly jigs.
And most of the working delay and working mistake by a worker is recovered by the line associates.

One example of normal Andon.



Above are the case of my previous company.
And any shape of Andon is acceptable depending upon the purpose and the condition.
The picture left is one of example.

Kaizen.
-1. IMADESHO.
At the last year there was (and there is) a vogue word in Japan.
And the vogue word is “IMADESHO: It is right now”.
The situation of dialogue is
Person A: When should I do this thing?

Person B: (When do you need the effect? Now?)

IMADESHO.

And both adults and children use this vogue word.

Long years ago and when we were working for the TPS introduction project (after the Suzumura visit), our watchword was "It is right now".

I have written regarding Kaizen in "Making Stream of Production-7" and have identified the form of Kaizen and QRKA (Quick Response Kaizen Activity).

Kaizen should be made at the time when the improvement is required.

Then the important attitude of Kaizen is IMADESHO.

This is the Toyota way.

(But I know it is so difficult. But it is the Kaizen of Toyota.)

-2. The control board is a discovery tool of kaizen needs.

Again, when should we carry out Kaizen activity?

The control board is one of important "discovery tool of kaizen opportunity".

A control board is for control.

If a problem is indicated, the problem should be recovered immediately.

And the permanent solution should be made.

-3. Immediate taking action.

It was quite intense battle for us. It is easy to say the necessity of immediate action, if a problem occurred. But actually it was very hard battle.

How intense battle? (The true difficulty of TPS stability.)

The stage of the education of Suzumura team, the creation of Heijunka methods, the creation of idea of visual control system and the implementation were mere beginning of true battle.

And the true difficulty came after the introduction of these and the implementation of true visual control which identifies the problems.

Daily control board of the machines which identified the problems required the immediate kaizen.

At that time the level of our factory was the beginning stage of PM (Preventive Maintenance).

Note: Sensitive stream.

In the activity, the lot size, changeover time and WIP & inventory were reduced dramatically which shows faster and sensitive stream of production.

And as the solution the immediate taking action in the watchword of "It is right now" was required.

In the TPS book, Taiichi Ohno taught us that

"Shallow the depth of stream to find new problems."

And he taught us following kaizen cycle.

-1. To shallow the depth of stream. (Reduction of WIP and inventory)

-2. Problems become apparent. (Material shortages etc.)

Problems: Skill, Line balance, Quality, machine trouble, large lot size, long LT (poor SMED).

-3. Necessity of kaizen and solution.

-4. To shallow the depth of stream anew. (Go back to -1.)

And he taught us to reduce WIP and inventory as the first.

But my project approach was different.
For making stream, we targeted to reduce the process LT.
And to reduce LT, we challenged to reduce and minimize the lot size.
And in parallel, we challenged to reduce the WIP and inventory carefully.
Again LT. There are 2 phases.
LT is one of key word of Lean management. And I use the word quite often.
Now. When understanding LT, it is necessary to understand that there are 2 phases of LT.
One is the LT of (from the point of view of) material.
One is the process LT (including the customer's satisfaction in shorter LT)
Material LT relates to the problem of cash-flow.
Process LT relates to the production cycle.
※ To gain the customer's satisfaction, it is quite natural to have WIP and inventory in sacrificing the material LT.
Of course we need to chase both phases of LT in same time.

Go back to [How intense battle?]
And the machine which occurred the problem were stopping until to find and implement the solution.
My project team was required to take the initiative in all problems.
It was really hard battle.
For supporting our project activity, 3 kaizen teams were established.
One is PM team to improve the preventive maintenance (from the SMED team).
One is QRQC team for resolving quality problems.
One is QC circle in the gemba.

-4. Quality kaizen idea example.
Serious defect in an end user.
One day we got a serious customer's claim which was a vehicle fire.
One car burned in the end user.
And the cause was the defect of our wiring harness which was wrong cable size used.
This defect had occurred frequently, but was found in the self-check inspection or the circuit inspection (anyway internally.).
But at this time it was found in the trouble of the end-user.
And immediate action was taken by the combined team of the customer (car maker) and us.
The number of the object of the car was 50.
The objects cars were found in the cooperation of the customer soon.
And these cars were gathered in the customer's car pool.
Repair cars. It was extremely difficult.
As I wrote before, a wiring harness is mounted in the gap of innermost.
Therefore it was necessary the cars to strip down to some extent (by the specialist of the client.).

And we pull out the wiring harness and repair.
After these treatment, the client specialist reassemble the parts stripped down.

Defect.

The defect was the wrong cable size used.
0.85sq was correct. But 0.5sq was used.
The size difference is the different capacity of electric current.
4 mistake were made.

One was Mizusumasi supplied the wrong size.
One was the operator couldn't find the wrong size.
(It is possible to find the difference in touch.)
One was the circuit inspection also couldn't.
(Cut length, colour, size and the crimp height were inspected.)
(It is not possible to find in final visual inspection and electrical test in the final assembly.)

2 kinds of defects.
The operator used 0.5sq size cable and set-up the crimp height of 0.85.

Cable: 0.5sq--- low electrical capacity.
Crimp height: 0.85sq in the 0.5 cable.--- high electrical resistance.
And burned.

Immediate taking action (Quick Response Kaizen).

In parallel with the activity of car repair, we took the immediate action to resolve the error use of cable. And some countermeasures were implemented.
And based on the idea of an operator following kaizen idea also was implemented.

0.85 to 0.85. AVSS to AVSS.

1255 to 1255.

There were many cards which have been issued in the weekly control board. These all cards also were retouched by manual.

In these activity, our Te-ban control was approached more to JIT.
By the way
If (for instance) the kanban system in pull is implemented, above Te-ban control and other system (Control board etc.) are not necessary?
The answer is yes, and all systems are necessary including the Te-ban calculation in the kanban system.
At this time I wrote the "visual management and control"
And as you already aware, the visual management has 3 faces.

One is for sharing company information for cultivating
"Whole peoples participation (to the management)".
One is to maintain the genba condition which should be.
One is to control the genba (production, safety, productivity etc.)

And in this column I wanted explain the third issue (control gemba).

This column was started from the theme of “Pull is good and Push is bad?”
But this comparison also is ridiculous.
Both pull and push should be used depending on the case.

Next
I write the Heijunka a little more.
As you know Heijunka is an essential matter for JIT production.
And if it will be possible, I write the detail of Kanban system.