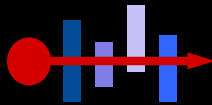


Standard Work

Lean Solutions for the Real World !

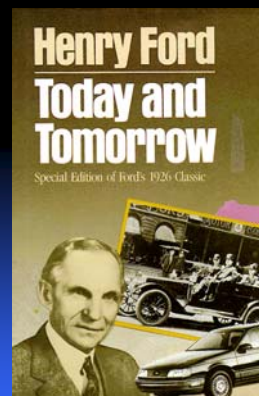


Henry Ford - Standard Work

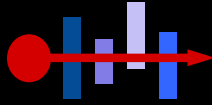
“To standardize a method is to choose out of the many methods the best one, and use it. Standardization means nothing unless it means standardizing upward.

Today’s standardization, instead of being a barricade against improvement, is the necessary foundation on which tomorrow’s improvement will be based.

If you think of “standardization” as the best that you know today, but which is to be improved tomorrow - you get somewhere. But if you think of standards as confining, then progress stops.”



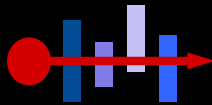
*Henry Ford, 1926
Today & Tomorrow*



What is Lean?

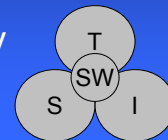
A way of thinking that relentlessly eliminates waste

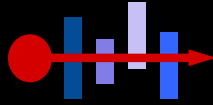
- Find a problem
 - Create an environment where problems stand out and are not tolerated. *Visual Management.*
- Fix a problem
 - A set of proven Lean tools that lead to resolution quickly with team involvement. *Kaizen.*
- Prevent it from coming back
 - A system of visual management and leadership that maintains standard processes. *Leader Standard Work*
- Go back to step 1!
 - Continuous improvement on every level



Standard Work Definition

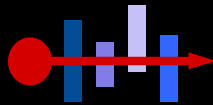
- The consistent performance of a single workers task according to procedures devoid of waste and focused on human activities
- Composed of three elements
 - Takt time
 - Worker sequence
 - Standard work in process inventory





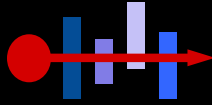
Objectives

- **To make rules explicit**
These rules form the core of production, and of management, for they establish the methods for manual tasks with respect to quality, quantity, cost and safety
- **A tool for KAIZEN**
There can be no improvement in the absence of standards (i.e. when normal and abnormal phenomena are undifferentiated). Find MUDA, MURI and MURA (waste, unreasonableness, unevenness)



Requirements to Standard Work

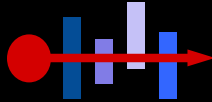
- People must be a significant part of the operation
- Their work must have significant respective aspects
- It must be a key component to the management of the operation



Standard Work


- A tool that defines the interaction of people and their work space
- It provides a routine for consistency of an operation.
- It is the current “one best way” to do the job.
- Provides a basis for improvement by defining the normal and highlighting the abnormal.

Without standard work there can be no improvement!

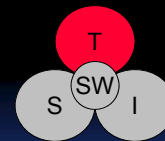


Takt Time

Pace of sales: how many seconds to make each item
♩=102

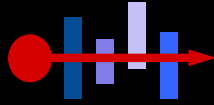


102 ♩ beats per minute



The average rate of customer demand

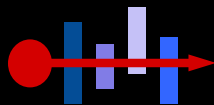
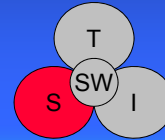
$TT = \text{Available working time per shift} / \text{Customer demand}$



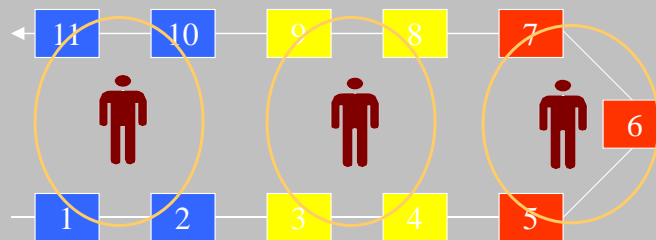
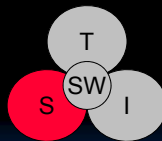
Work Sequence

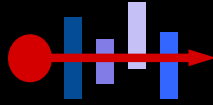
- The order of operations in which a worker carries objects, mounts them on machines and removes them, etc.
- This should be separated from the “*processing sequence*” according to which a product is made.

– *Cross-functional skills are essential.



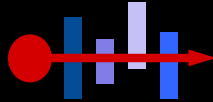
Separate Operator Flow from Product Flow



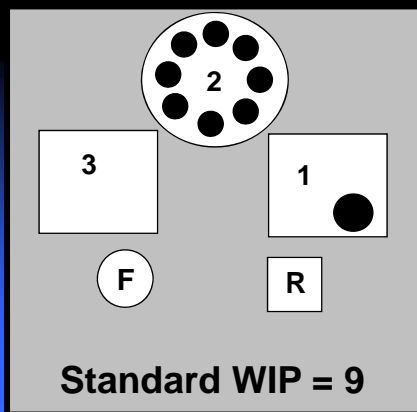
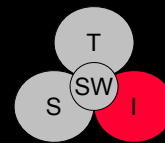


Standard Work in Process

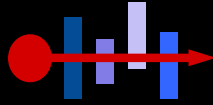
- Refers to the correct work-in-process needed to maintain flow
- Examples.
 - Active jobs on computer desk top
 - Files in queue
 - Parts mounted on machines
 - Patients in exam rooms



Standard WIP



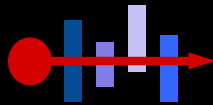
Standard WIP = 2



Cycle Time

There are three types of cycle time

- Operator Cycle Time
The amount of time it takes an operator to complete one full cycle in their work sequence.
- Machine Cycle Time
The amount of time it takes a machine to completely finish one full cycle (start/stop time).
- Processing Cycle Time
The machine cycle time plus the manual time it takes an operator to unload, load, and cycle start the machine, and amortized tool change time.



Process of Standard Work

1. Time Observation Form
2. Process Capacity Form
3. Operator Loading Chart
4. Standard Work Combination Sheet
5. Standard Work Sheet

These Forms are Management Tools!!

Process for Observation		TIME OBSERVATION FORM										Observation Date	Analysis Number	
Write on Board												Observation Time	Observer	
No.	Component Task	1	2	3	4	5	6	7	8	9	10	Low est Elemental Time	Adjustment	Adjusted Elemental Time
1	Get up from chair	2	29	58	1:30	1:59	2:28	3:03						
2	Walk to board	7	35	1:05	1:35	2:04	2:36	3:08						
3	Pick up pen	9	38	1:08	1:37	2:07	2:40	3:11						
4	Write on board	15	44	1:15	1:45	2:14	2:46	3:18						
5	Put pen down	18	48	1:19	1:48	2:18	2:51	3:22						
6	Walk to chair	24	53	1:25	1:53	2:23	2:58	3:27						
7	Sit down	26	55	1:28	1:56	2:26	3:00	3:29						
Time for 1 Cycle														

Step 2: Record time with a running stopwatch

Process for Observation		TIME OBSERVATION FORM										Observation Date	Analysis Number	
Write on Board												Observation Time	Observer	
No.	Component Task	1	2	3	4	5	6	7	8	9	10	Low est Elemental T	Adjustment	Adjusted Elemental Time
1	Get up from chair	2	29	58	1:30	1:59	2:28	3:03						
2	Walk to board	7	35	1:05	1:35	2:04	2:36	3:08						
3	Pick up pen	9	38	1:08	1:37	2:07	2:40	3:11						
4	Write on board	15	44	1:15	1:45	2:14	2:46	3:18						
5	Put pen down	18	48	1:19	1:48	2:18	2:51	3:22						
6	Walk to chair	24	53	1:25	1:53	2:23	2:58	3:27						
7	Sit down	26	55	1:28	1:56	2:26	3:00	3:29						
Time for 1 Cycle		26	29	33	28	30	34	29				25	1	26

Step 3: Do calculations.

Section Chief	Mary Smith		PROCESS CAPACITY FORM				Part No.	123-A	Part Type	Finished	Operating Time Per Shift in Seconds	27,000 Secs
Supervisor	Bill Johnson						Part Name	Bracket	Daily Demand	350		
Step No.	Process Description	Machine No.	Base Time (Seconds)		Tool Change		Time (Seconds)			Processing Capacity	Remarks	
			Manual	Machine	# of pcs per change	Replacement Time	Tool Change Time	Total Time to Complete				
1	Mill	7502	4	65	100	120	1.2	70.2	385			
2	Drill	6532	3	35	50	75	1.5	39.5	684			
3	Tap	8405	4	25	200	60	0.3	29.3	922			
4	Grind	3271	4	85	-	-		89.0	303			

Capacity Problem

Operator Loading Chart

- Details the cycle time for all operators in a cell.
- Compares operator cycle times to TAKT time.
- Allows supervisor to understand staffing requirements at a glance.
- Facilitates the kaizen opportunities that may exist in a cell.
- Incorporates "Least Waste" concept

Operator Loading Chart

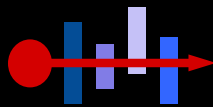
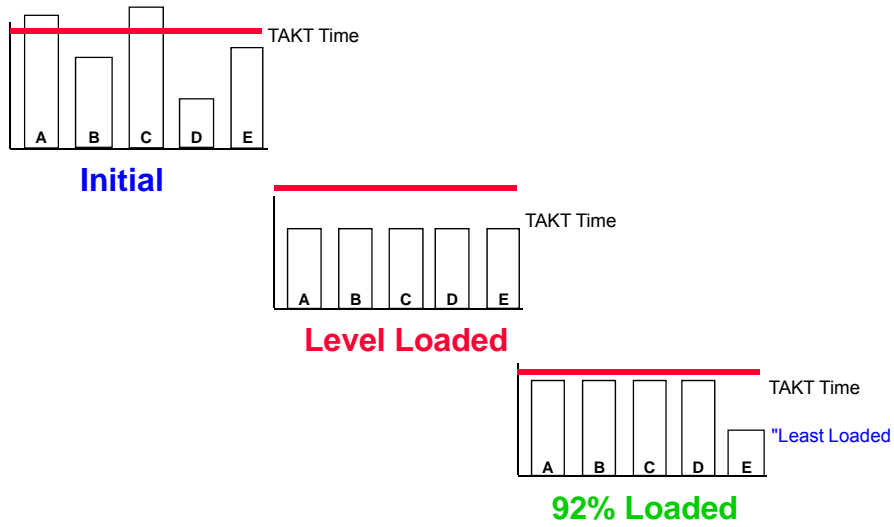


Table of Process Capacity

- Determines equipment capacity relative to Takt time
- Examples
 - Manufacturing equipment
 - Office equipment
 - IT support

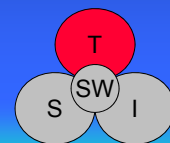
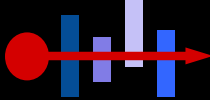


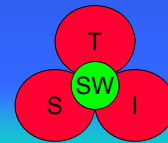
Table of Process Capacity

New / Rev <u>New</u>		Page <u>1</u> of <u>1</u>		Date <u>10/2001</u>		Production Line							
Organization Combustor COE		Area Dome Cell		Supervisor M. Hanson		Part Number							
Process Capacity Table		Part Name		Dome		Manual _____ Travel _____ Auto ----- Wait -----							
Step No.	Process Description	Classification	Machine Number	Travel Time	BASE TIME (S/m.h)			TOOL CHANGES			Processing Capacity	Remarks:	
					Man Task Time	Auto Run Time	Time To Complete	# of pcs Between	Time Per Tool Chg	Time Per Piece			
1	Get Raw Material		-----										
2	Assembly												
3	Turn O.D.	R19	139A	2	5	29	34	200	50	.25	683	<u>5</u>	<u>29</u>
4	Drill Pilot Hole	R17	6280	2	4	27	31	300	100	.33	747	<u>4</u>	<u>27</u>
5	Thread	R16	1324	2	3	12	15	400	30	.75	1486	<u>3</u>	<u>12</u>
6	Inspect Thread	R19	----	2	6	0	6	0	0	0	3900	<u>6</u>	
7	Move Part to Next Op	R19	----	2	2	0	2	0	0	0	11700	<u>2</u>	
Totals				14	26	Available Hours		<u>6.5h/23400s</u>		Daily Demand		<u>531 pc</u>	
Grand Total				40		Maximum Output		<u>683 pc.</u>		Takt Time		<u>44s</u>	
						Operators Needed		<u>1.17</u>		Operators Needed		<u>1</u>	



Standard Work Combination Sheet (SWCS)

- Combine human work spanning multiple processes and identify how much work an person can accomplish within Takt Time
- Shows the combination of manual, automatic, and walk time between processes.



Model No. and Name		STANDARD WORK COMBINATION SHEET			Date Prepared	Quota Per Shift	Manual Work																				
Work Sequence					5/1/2001	350	Machine Work																				
123-A					Group	TAKT Time	Walking																				
Raw Material to Assembly					Bracket	77																					
Step No.	Description of Operation	Time			Operation Working Time (In Seconds)																						
		Manual	Auto	Walk	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100			
1	Pick up Raw Material	2		3																							
2	Unload, Load, Start Mill	4	65	3																							
3	Unload, Load, Start Drill	3	35	3																							
4	Gage Part	10		3																							
5	Unload, Load, Start Tap	4	25	3																							
6	Unload, Load, Start Grind	4	50	3																							
7	Assemble Bracket	25		3																							
TOTAL		52	X	18																							



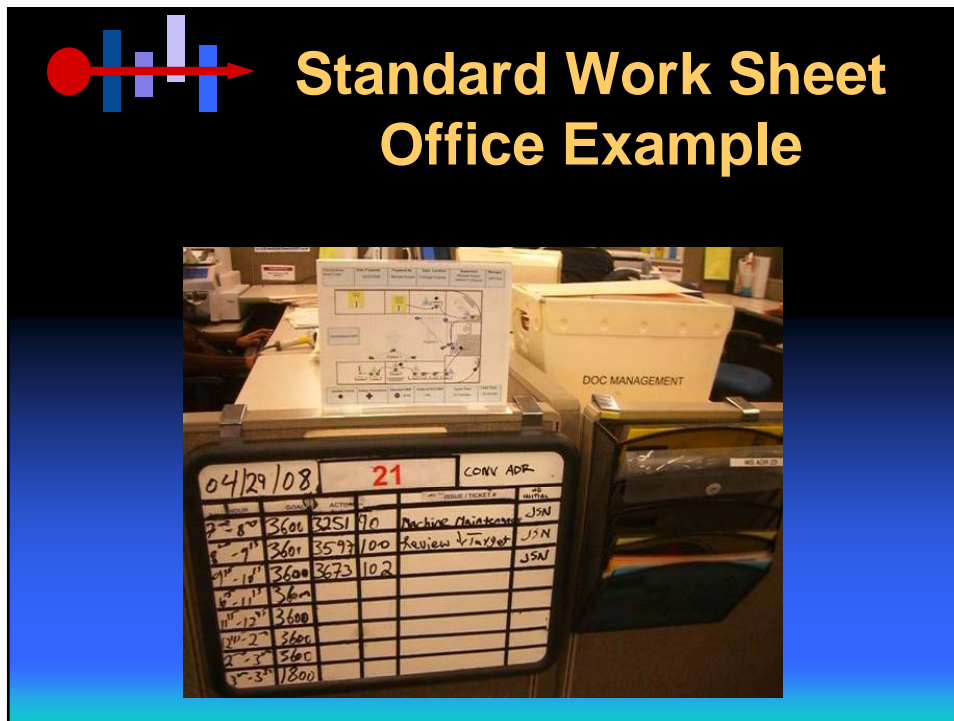
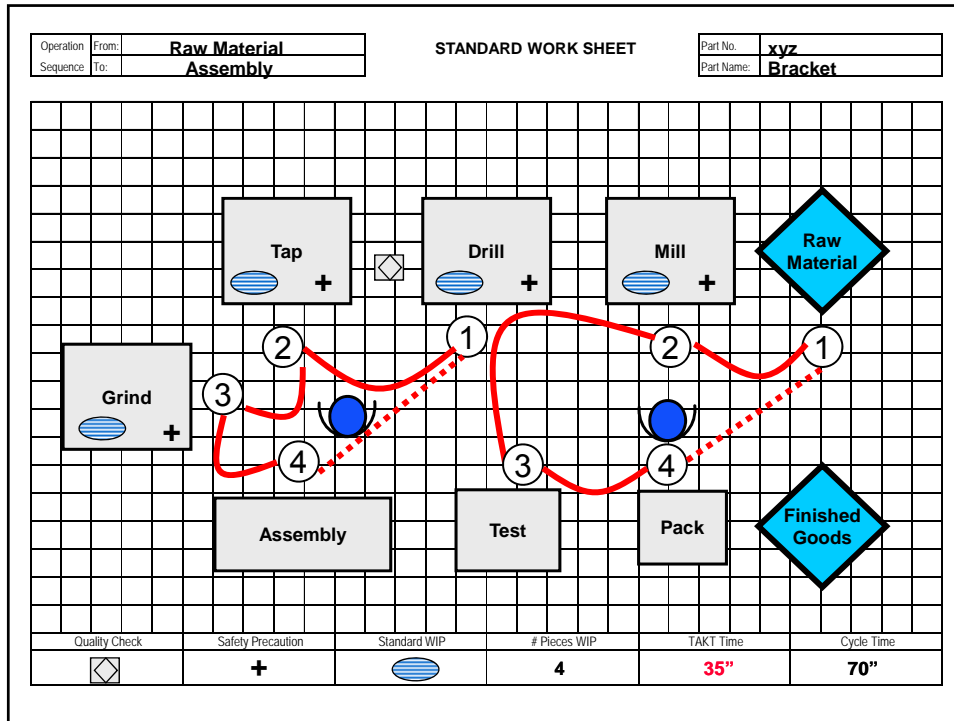
Standard Work Sheet (SWC)

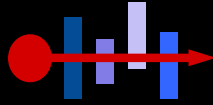
Summarizes and coordinates all activities in the work cell

- People
- Quality
- Standard Work in Process
- Takt time
- Cycle time
- Equipment Layout

Basic Visual Management Tool!

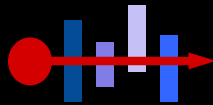






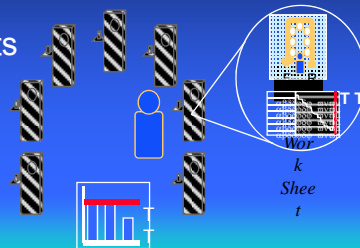
Daily Management & Kaizen

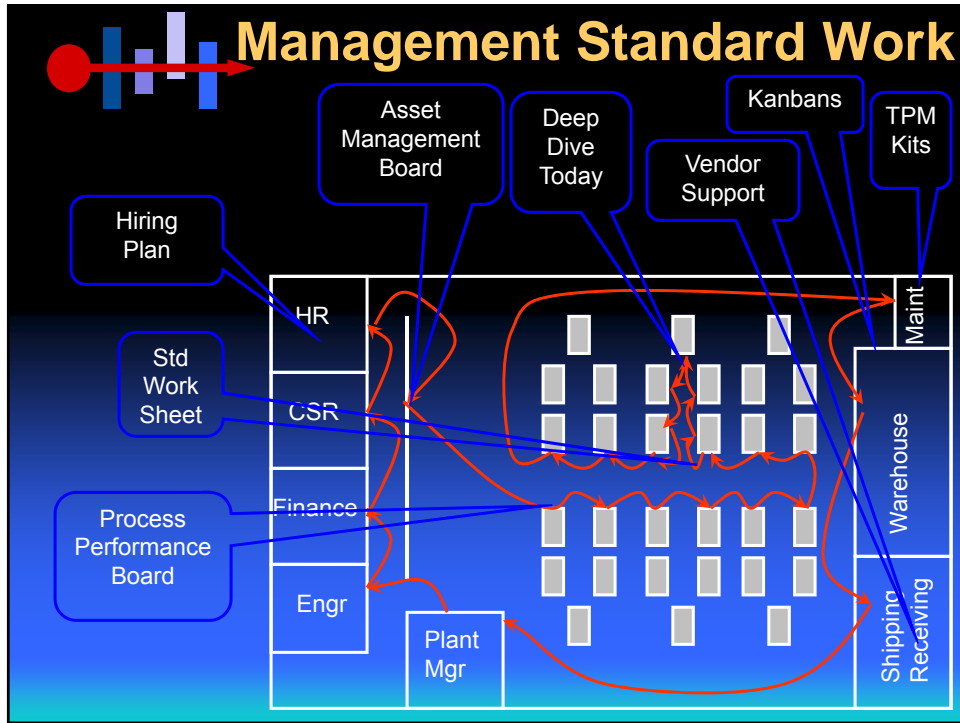
- Management standard work should be centered on bringing things back to standard when abnormalities are observed
- The identification of waste drives kaizen activity



Standard Work Playbook

- Takt time changes and should be re-evaluated as part of an LSOP process
- Over time you will develop a “play book” of standard work for various Takt times.
- Plays include:
 - Operator Loading Chart
 - Standard Work Combination Sheets
 - Standard Work Sheets





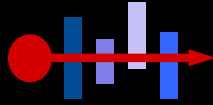
Leadership Standard Work

- Commitment
- Dedicated times
- Backup people at each layer
- Operations calendar

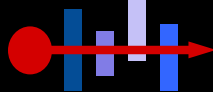
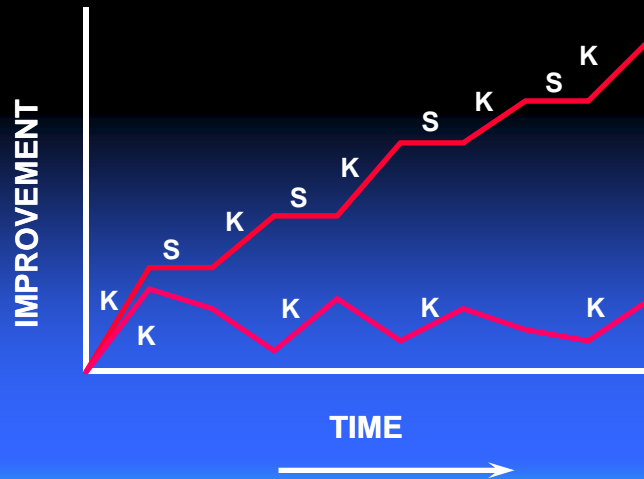


Treat it as though it
were a BOD meeting

32



Standardization and Kaizen

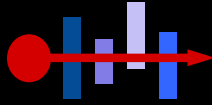


Summary

- If a process is not documented and followed there is no process
- Consistency = improved quality
- Without process there can be no improvement
- Standard work is dynamic not stagnant there is no end to the improvement process

“If you don’t understand Standard Work, you don’t understand the Toyota Production System.”

Senji Niwa (1989)
Shingijutsu Co., Ltd.

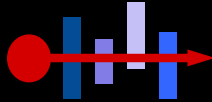
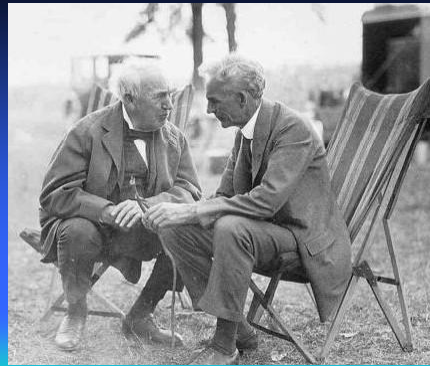


Bottom line

Attitude is Critical:

“If you think you can
or you think you
can’t, chances are
you’re Right.”

Henry Ford



Joe Murli
Murli Associates

Joe.Murli@Murli-Associates.com