AUTOMOTIVE INDUSTRY CLUSTER TPM TRAINING MATERIAL KOBETSU KAIZEN Step 0 - 1

15th November 2012

Automotive Industry Development Centre

Mercedes-Benz

NAACAM

the dti
Department:
Trade and Industry
REPUBLIC OF SOUTH AFRICA

Province of the
EASTERN CAPE
ECONOMIC DEVELOPMENT, ENVIRONMENTAL AFFAIRS AND TOURISM

KOBETSU KAIZEN

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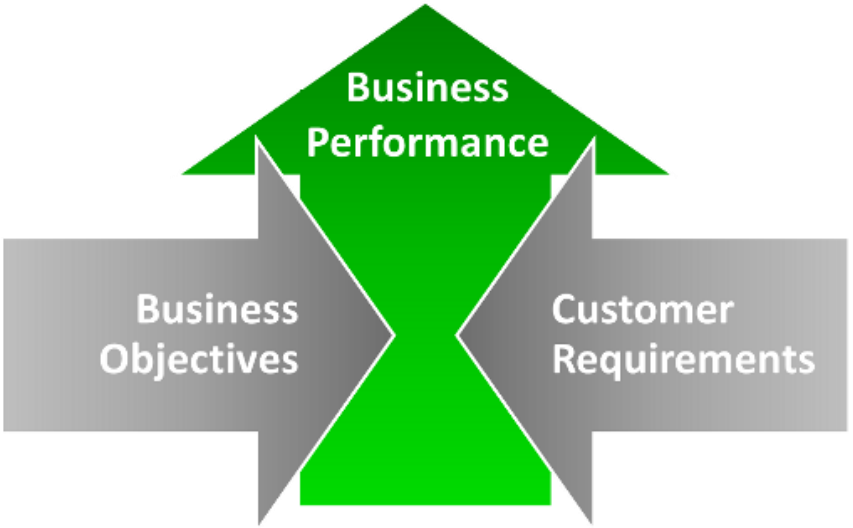
Kobetsu Kaizen is a Japanese word for focused improvement, which means prioritising the most important losses and eliminating them. These are individual improvements and focus on losses, which when eliminated, gives significant improvement in terms of:

Focused Improvement	
Maximize OEE	Eliminate EE losses through continuous improvements and sustained gains
Reduce Transformation Cost	Improve Productivity Reduce Process Waste



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Why losses occur?

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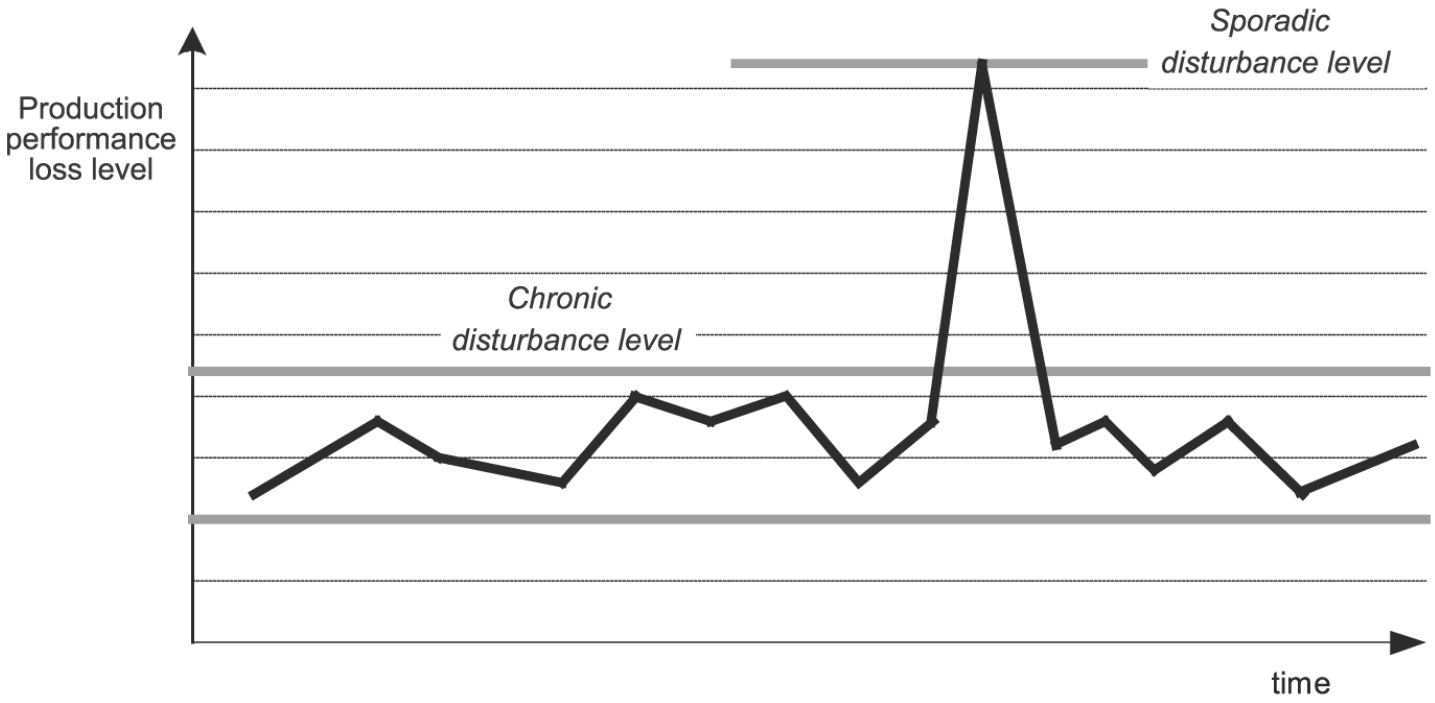
Loss is identified as wastage of material, money, time and energy. Some of the reasons for the wastage is:

- Whenever an operation exceeds its standard timing
- Whenever an operator is intercepted
- Whenever a non-value adding operation is performed
- Whenever a machine is idle when it should have given the rated output
- When a machine and or man do not give the rated output
- Consuming additional time, money and energy than the specified norms.



General Problems Regarding Failures

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- Low level of concern in the manufacturing sector
- Effort for failure analysis are insufficient
- The maintenance system and its operation are unsatisfactory
- Predictive maintenance efforts are weak

HOW DO WE IDENTIFY THE BIG LOSSES??

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Identify 16 Big Losses

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STEP 1: Understand and Categorise the potential losses that could occur

	LOSSES	CATEGORY
1	Failure losses - Breakdown loss	Losses that impede equipment efficiency
2	Setup/adjustment losses	
3	Cutting blade loss	
4	Start up loss	
5	Minor stoppage / idling loss	
6	Speed loss - operating at low speeds	
7	Defect / rework loss	
8	Scheduled downtime loss	
9	Management loss	Losses that impede human work efficiency
10	Operating motion loss	
11	Line organisation loss	
12	Logistic loss	
13	Measurement and adjustment loss	
14	Energy loss	Losses that impede effective use of production resources
15	Die, jig and tool breakage loss	
16	Yield Loss	

7 STEPS FOR KOBETSU KAIZEN ACTIVITIES

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Step	Details	Activity
Step 0	Select the improvement topic	1. Select and register the topic
		2. Form project teams
		3. Plan activities
Step 1	Understand the situation	1. Identify the bottleneck process
		2. Measure failures, defects and losses
		3. Use baselines to set targets
Step 2	Expose and eliminate abnormalities	1. Thoroughly study and expose abnormalities
		2. Restore deterioration and correct minor flaws
		3. Establish the basic equipment condition
Step 3	Analyse causes	1. Stratify and analyse causes (Ishikawa and FMEA)
		2. Apply analytical techniques (why-why)
		3. Conduct experiments, apply specific technology, fabricate prototypes
Step 4	Plan improvements	1. Make improvement proposals
		2. Compare cost effectiveness of alternate proposals
		3. Check for possible adverse effects and advantages (Design FMEA)
Step 5	Implement Improvements	1. Carry out improvement plan
		2. Perform tests, trial runs
		3. Provide instructions to work on improved equipment, operating conditions
Step 6	Check results	1. Evaluate results over a set period (SPC)
		2. Check whether targets have been achieved
STEP 7	Consolidate gains	1. Prepare inspection and work standards
		2. Make drawings and feed information to management

Todays discussion

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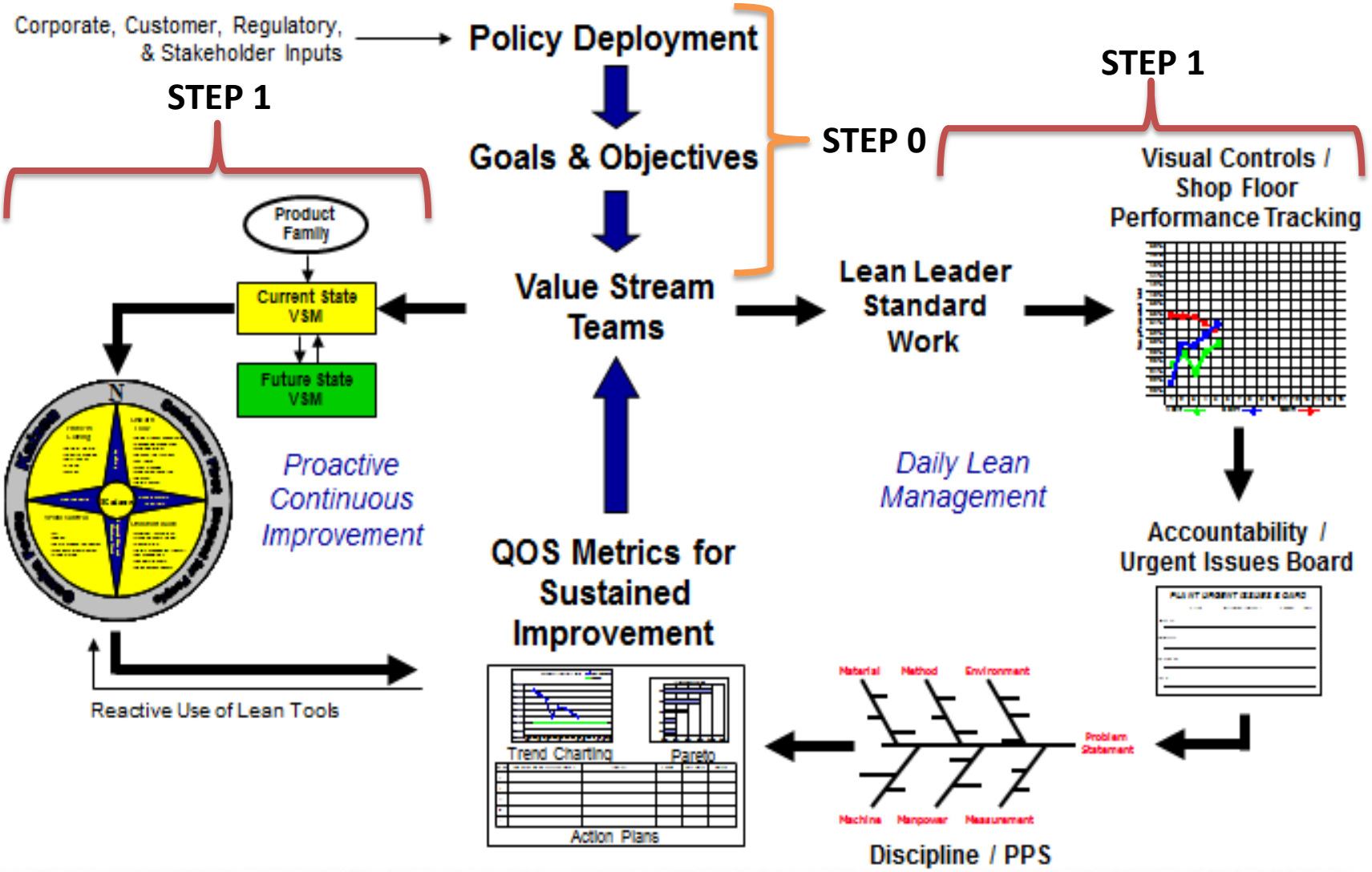
KOBETSU KAIZEN JOURNEY



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STEP 0

SELECT IMPROVEMENT TOPIC

STEP 0
ACTIVITY 2- FORM PROJECT TEAMS

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- A senior level person is nominated as the chairman of the pillar
  - Exposure to plant process activities and equipment
- Members that make up a cross-functional team of the sub-committee include:
  - MD/CEO
  - Production
  - Production Engineering
  - Maintenance
  - System Engineering
  - Quality Assurance
  - Design and development
  - Operators

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STEP 0
ACTIVITY 2- FORM PROJECT TEAMS

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- A Kaizen team is generally made up of six to eight members not including the leader and co-leader.
- Be clear about whom you need on the team.
- Include people who operate the work process being improved, both experienced and new employees.
- Be certain that the proposed team has people who are knowledgeable about the machines and systems.

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STEP 0
ACTIVITY 2- FORM PROJECT TEAMS

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- A representative of every organisation should be directly involved in the problem
- Include a customer representative when the event may have an immediate impact on the customer
- Similarly, include a supplier representative when the event may affect products or services requested from the supplier.

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STEP 0
ACTIVITY 2- FORM PROJECT TEAMS

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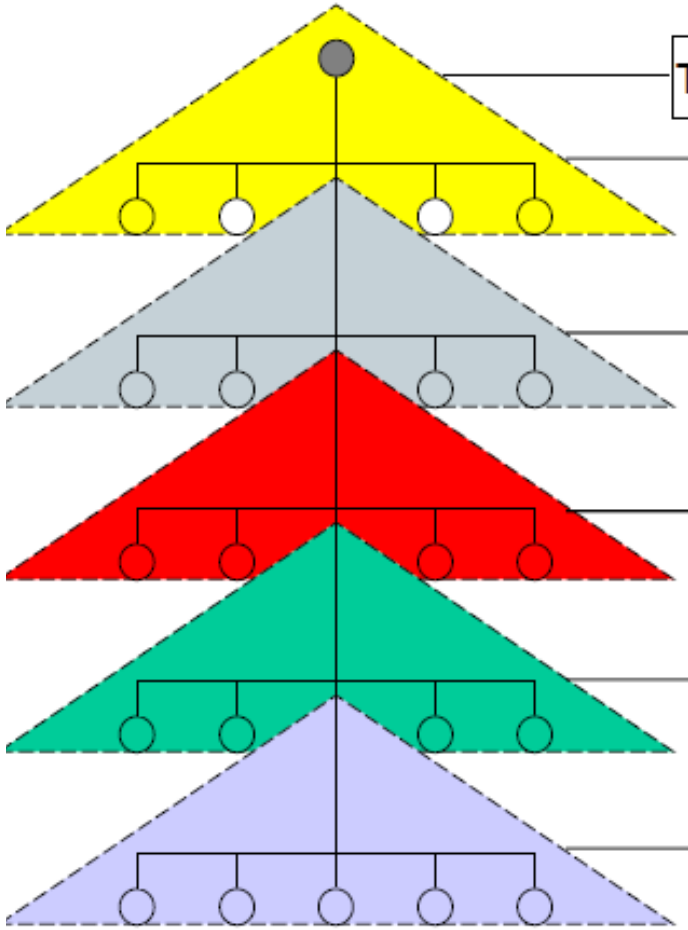

CEO

Plant Manager

Sectional Manager

Production Manager

Supervisor

Operators

TPM Promotion Office

Company wide TPM Promotion committee

Plant TPM promotion committee

Section TPM promotion committee

Foreman TPM promotion committee (Leader Meeting)

Small group formed on the production floor (PM circle)

- "Kobetsu-Kaizen" sub-committee
- "Jishu-Hozen" sub-committee
- Planned maintenance sub-committee
- Initial flow control sub-committee
- "Hinshitsu-Hozen" sub-committee
- Office improvement sub-committee
- Education and training sub-committee
- Safety and hygiene sub-committee

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Kaizen Planning: Facilities

- Pre and post event:
  - Need a quiet area for team discussions/strategizing
- Hands-on event:
  - A quiet area for team discussions/strategizing near the work area
  - A training area may be required at various times during the event
  - An area designated for breaks
    - Supply drinks and snacks if possible
  - An area for the closing presentations

STEP 0
ACTIVITY 2- FORM PROJECT TEAMS

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- Once the 16 losses identified the team will need to focus on the major losses and analyse the current processes that are critical

- Once the major losses have been identified the team will need to agree on a developed master plan in order to successfully manage the Kobetsu Kaizen activities.

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STEP 0
ACTIVITY 3- METHODOLOGY AND MASTER PLAN FOR KOBETSU KAIZEN

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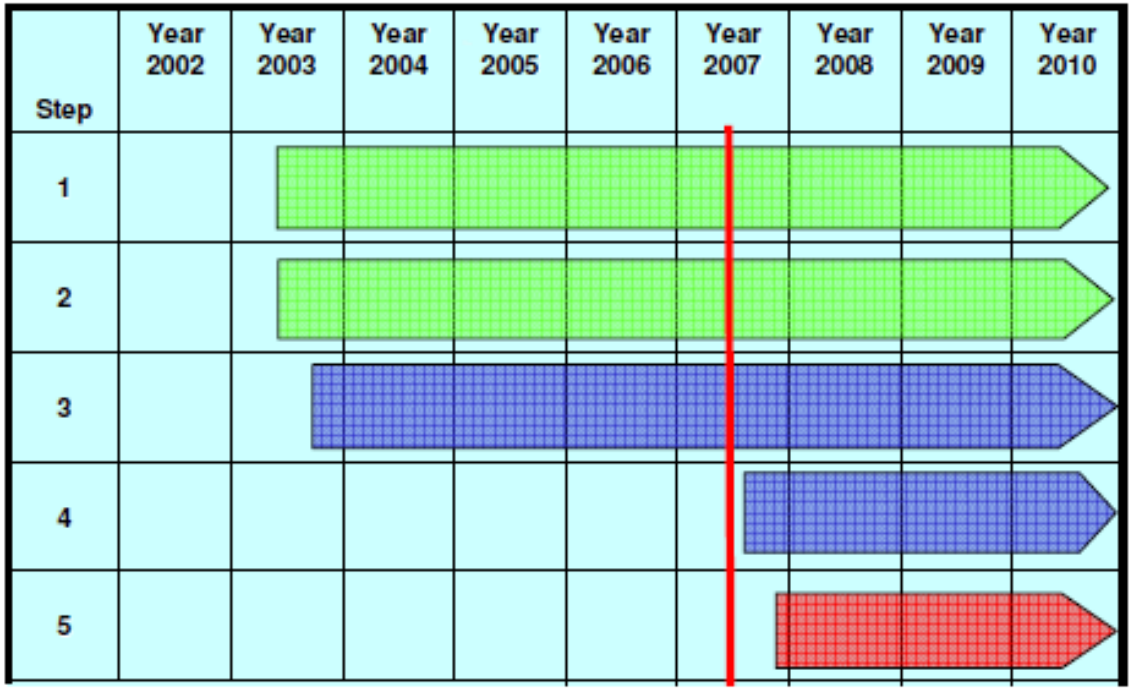
1. Assess Current Situation
2. Deployments second level
3. Improve standards
4. Breakthrough on productivity and flexibility
5. Build the Zero loss system



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STEP 0
ACTIVITY 3- PLAN ACTIVITIES

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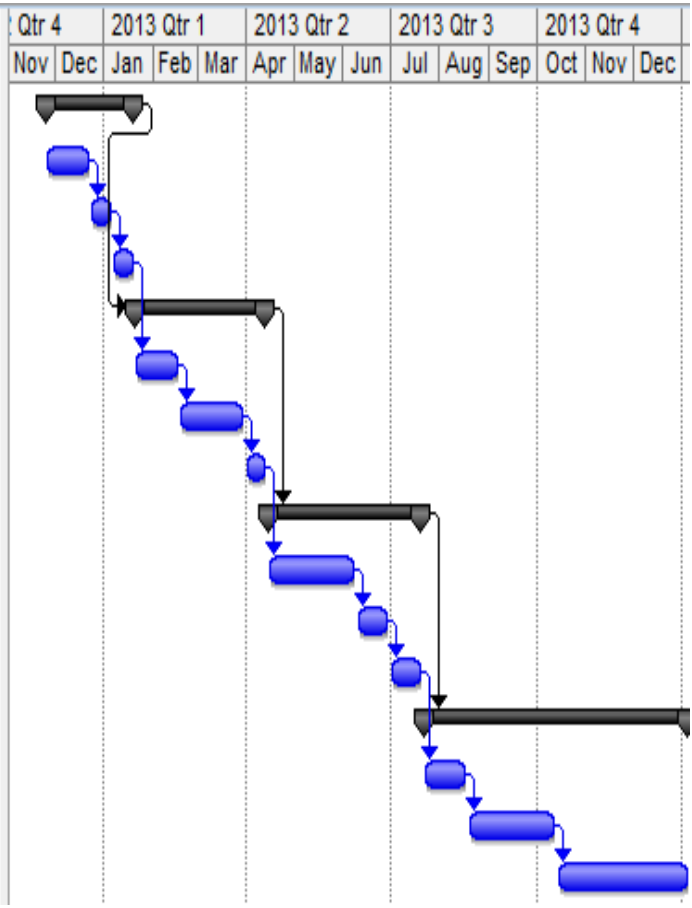
Task Name	Duration	Start	Finish	Predecessors
STEP 0 - Select improvement topic	**40 days**	**Mon 12/11/26**	**Fri 13/01/18**	
Select and register topic	20 days	Mon 12/11/26	Fri 12/12/21	
Form project teams	10 days	Mon 12/12/24	Fri 13/01/04	2
Plan Activities	10 days	Mon 13/01/07	Fri 13/01/18	3
STEP 1 - Understand situations	**60 days**	**Mon 13/01/21**	**Fri 13/04/12**	**1**
Identify bottleneck process	20 days	Mon 13/01/21	Fri 13/02/15	4
Measure failures, defect and other losses	30 days	Mon 13/02/18	Fri 13/03/29	6
Use baselines (Bench mark) to set targets	10 days	Mon 13/04/01	Fri 13/04/12	7
STEP 2 - Expose and eliminate abnormalities	**70 days**	**Mon 13/04/15**	**Fri 13/07/19**	**5**
Thoroughly study and expose abnormalities	40 days	Mon 13/04/15	Fri 13/06/07	8
Restore deterioration and correct minor flaws	15 days	Mon 13/06/10	Fri 13/06/28	10
Establish basic equipment condition	15 days	Mon 13/07/01	Fri 13/07/19	11
STEP 3 - Implement Improvement	**120 days**	**Mon 13/07/22**	**Fri 14/01/03**	**9**
Stratify and analyse the causes	20 days	Mon 13/07/22	Fri 13/08/16	12
Apply analytical techniques	40 days	Mon 13/08/19	Fri 13/10/11	14
Conduct experiments, apply specific technology, fabricate prototypes	60 days	Mon 13/10/14	Fri 14/01/03	15



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STEP 1

UNDERSTAND SITUATION

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STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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- Understand the shop floor
- Understand the detailed processes
- Use data collection tools and techniques such as:
  - **VSM based on the critical area identified by the KK team**
  - Capacity and Line Balancing Studies
  - Time and Motion Studies
  - SMED Analysis

STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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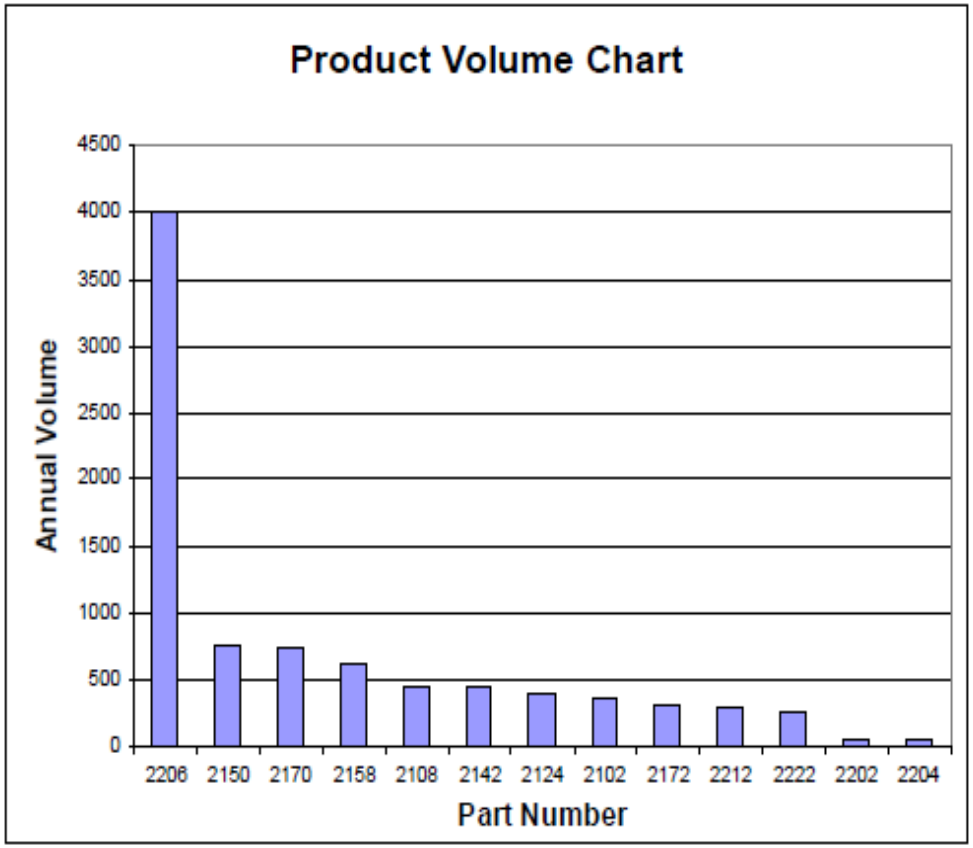
- Identify product categories
- Prioritise volume numbers based on sales value
- Conduct the studies



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STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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This study should typically take between 1 – 2 hours depending on the duration of the process

Supplier:			Part Name:		Part No.:			Annual Volume:		
Operation	Description	Cycle Time(min)	Change over (min)	Available Minutes per day	Batch size	Vendor	Location	Distance from plant (Kilo-metres)	Method of Transport	Lead time (days)
Automotive Industry Development Centre	Total cycle time	0								
	Total change overtime		0							
	Total available minutes			0						
	Total lead time									0

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STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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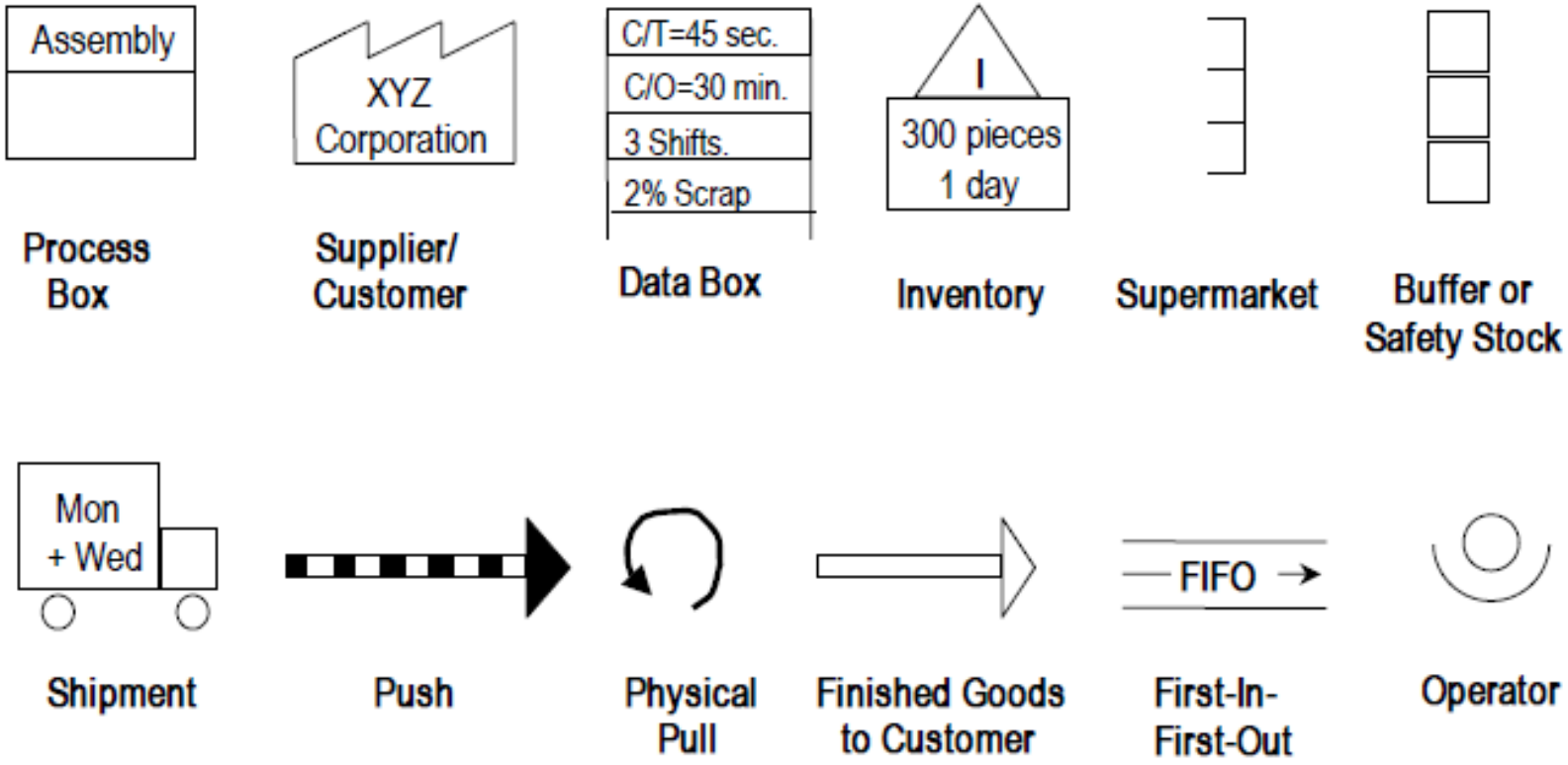
Material Flow Icons



Process Box | Supplier/ Customer | Data Box | Inventory | Supermarket | Buffer or Safety Stock

Shipment | Push | Physical Pull | Finished Goods to Customer | First-In-First-Out | Operator

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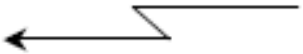
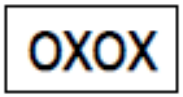
Information Flow Icons

Manual Information Flow



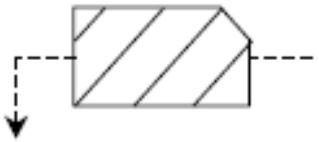
Electronic Information Flow

Schedule



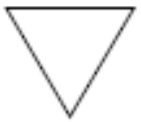
Load Leveling Box

Sequenced-Pull Ball



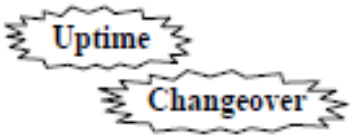
Withdrawal Kanban

Production Kanban



Signal Kanban

Kanban Post



Kaizen Lightning Burst

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STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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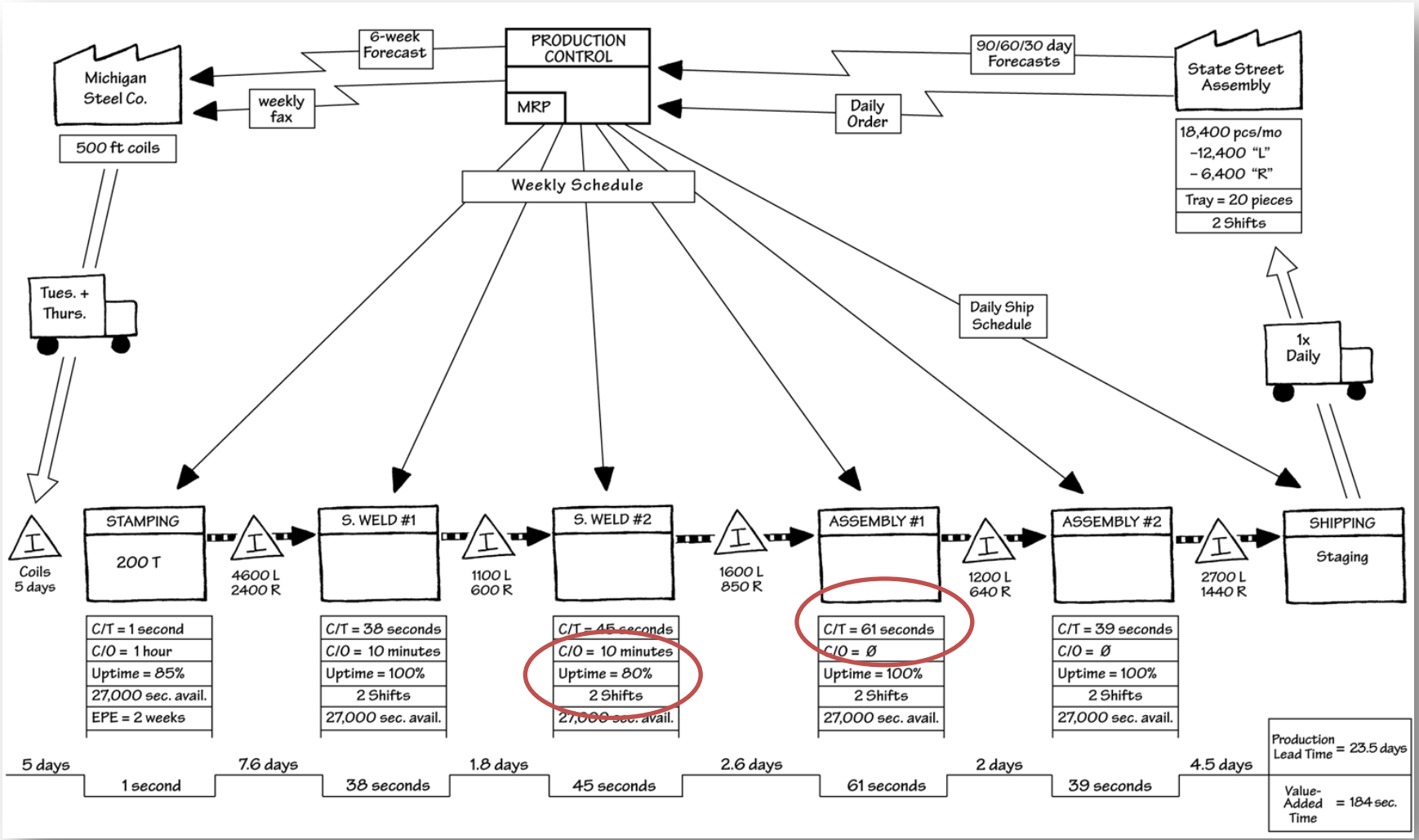

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STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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MANUFACTURING WASTES IDENTIFICATION SHEET

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No.	WASTE IDENTIFIED	Scrap/Rework	Over (Under) Production	Inventory	Motion	Processing	Transportation	Waiting	Underutilised People	5S

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STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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Method 1 : **You balance your line to TAKT time**

This means that work is balanced to customer demand – so you provide the customer with what he wants, not more and not less

Method 2 : **You balance the work between the operators**

This means that work is balanced amongst operators – the work has been equally spread out

TAKT TIME = WORKING TIME / CUSTOMER DEMAND

Working time = time in a day less breaks and planned downtime only!

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STEP 1
ACTIVITY 1– IDENTIFY THE BOTTLENECK PROCESS

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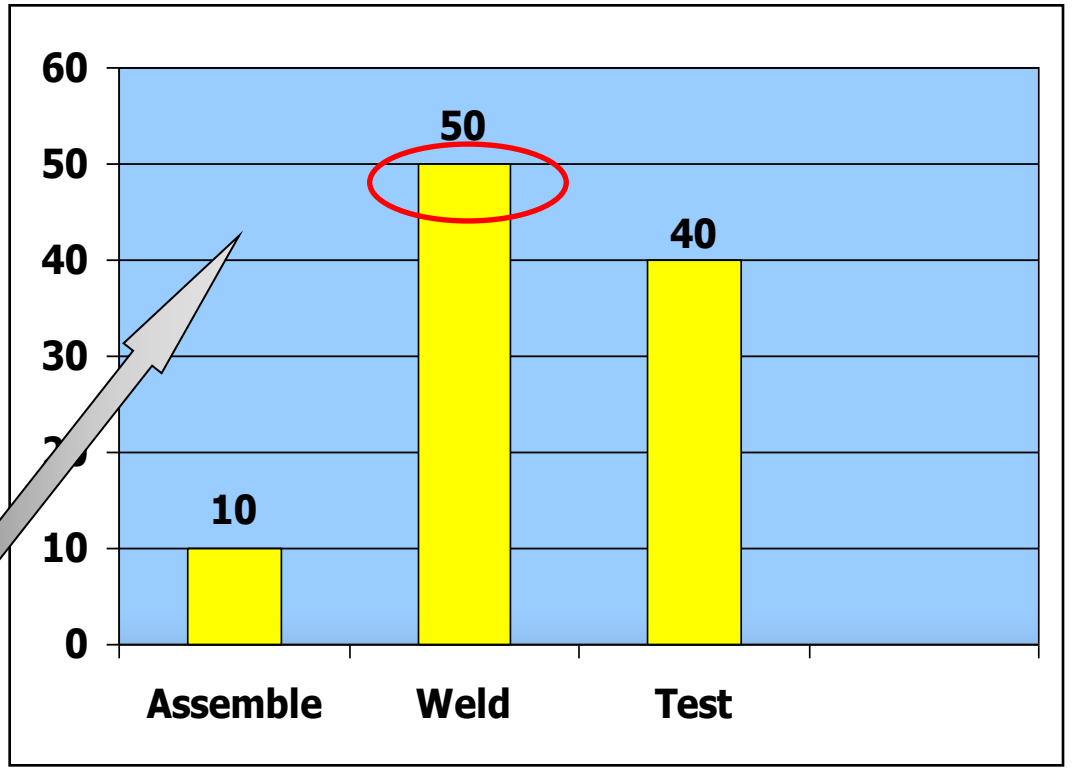
Operation		Seconds
1.	Assemble	10
2.	Weld	50
3.	Test	40



You need to get all the times under 45s!!!

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CLASSIFICATION OF FAILURES

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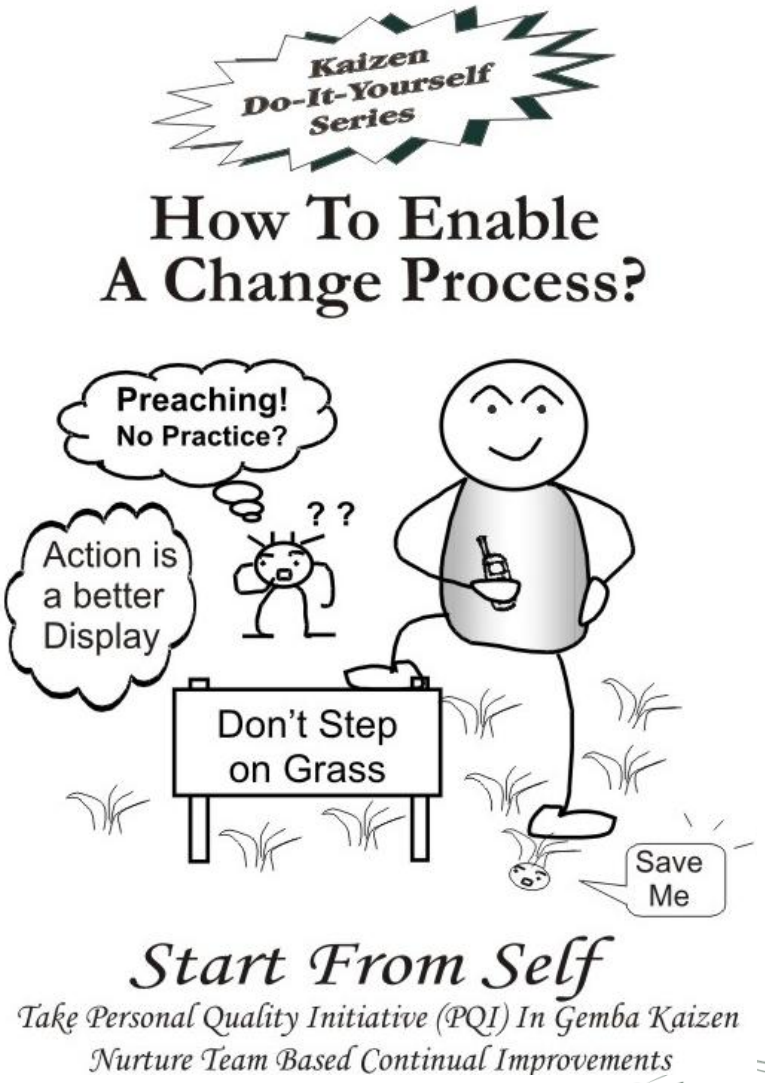
AIM:

- An important part of failure reduction is to ***eliminate simple failures identified by the bottleneck process.***
- Difficult to remedy - usually include *breaking of gears* and *breakdowns of a control system* due to unknown causes.
- Simple breakdowns - usually include *sensor dislocation and line breakages*.
- About 70% of the total failures are simple and the remaining 30% are difficult failures



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CLASSIFICATION OF FAILURES

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Objective:

- To highlight weaknesses of equipment
- To highlight weaknesses of plant management
- To clarify priorities on countermeasures
- To learn tasks that support Jishu-Hozen (training, execution and detection)

Responsibility	Locations where failures occur	Causes of failures
Failures that can be prevented through Jishu-Hozen (70%)	Detector/sensor	Basic conditions are not kept
	Driving system	
	Lubricating system	Leaving deterioration unattended
	Bolts and nuts	
	Pneumatics	Shortage of skills
	Jigs/tools	
	Electric systems	Non observance of use conditions
	Electric/ electronic equipment	
Failures that cannot be solved except through maintenance and Production engineering Departments (30%)	Electric/ electronic equipment	Leaving deterioration unrectified
	Driving system	Inherent design shortcomings
	Hydraulic systems	Shortage of skills
	Lubricating system	
	Electric and air pressure systems	Basic and operating conditions are not kept
	Detectors/jigs/ tools	

Refer to page 75 Kobetsu Kaizen – Loss Sheet

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CLASSIFICATION OF FAILURES
COMBINATION OF FAILURE FACTORS

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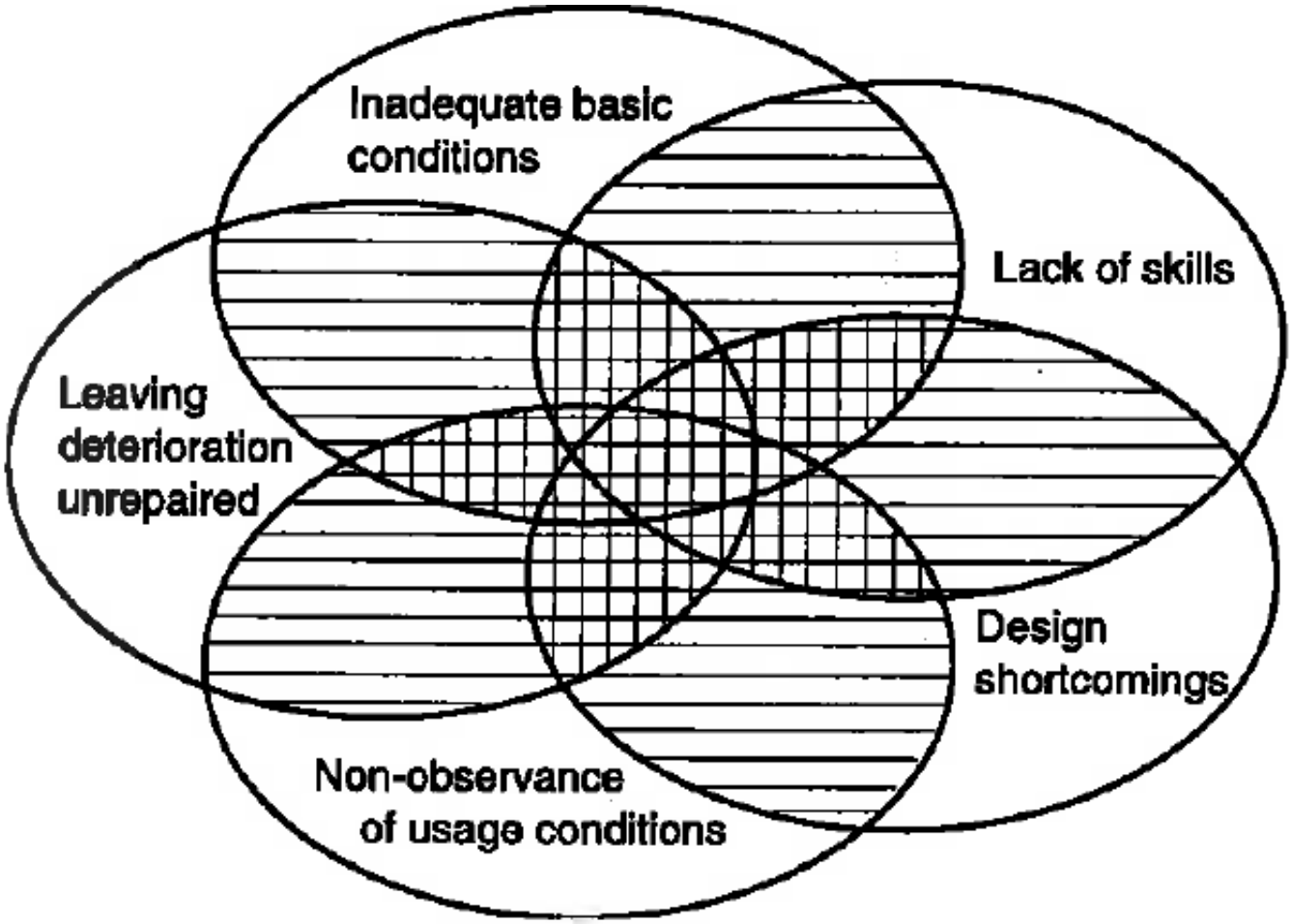

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CLASSIFICATION OF FAILURES MEASURE

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- The type of prioritisation is certain to change as the level of Jishu-Hozen improves.

Table 3.1 Matters to Be Controlled in Jishu-Hozen

Elements		Insufficiency of basic conditions	Non-observance of use conditions	Leaving deterioration unattended	Skill shortage	Inherent design short comings
Causes	Bolts and nuts	G		G	M	L
	Driving systems	G	G	G	M	L
	Lubricating systems	G	M	G	M	
	Hydraulic systems	G	M	G	M	
	Pneumatic systems	G	M	G	M	L
	Electric equipment	G	L	G	M	
	Controls	G		L	M	
	Detectors	G	L	G	M	L
	Jigs/tools	G	M	G	M	

G: Great importance: M Medium-level importance; L: Little importance

CLASSIFICATION OF FAILURES

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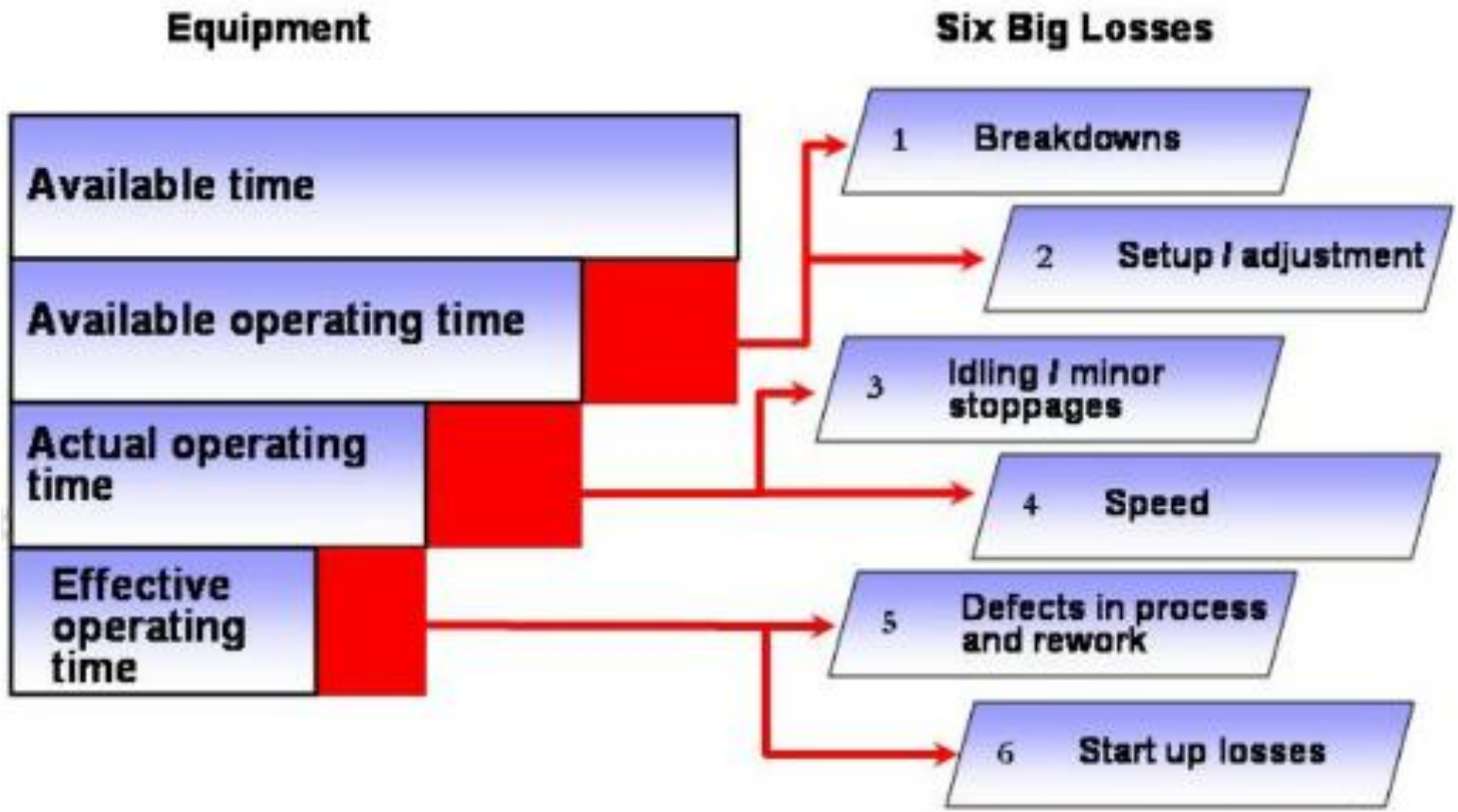

WHEN MEASURING ALWAYS REMEMBER…

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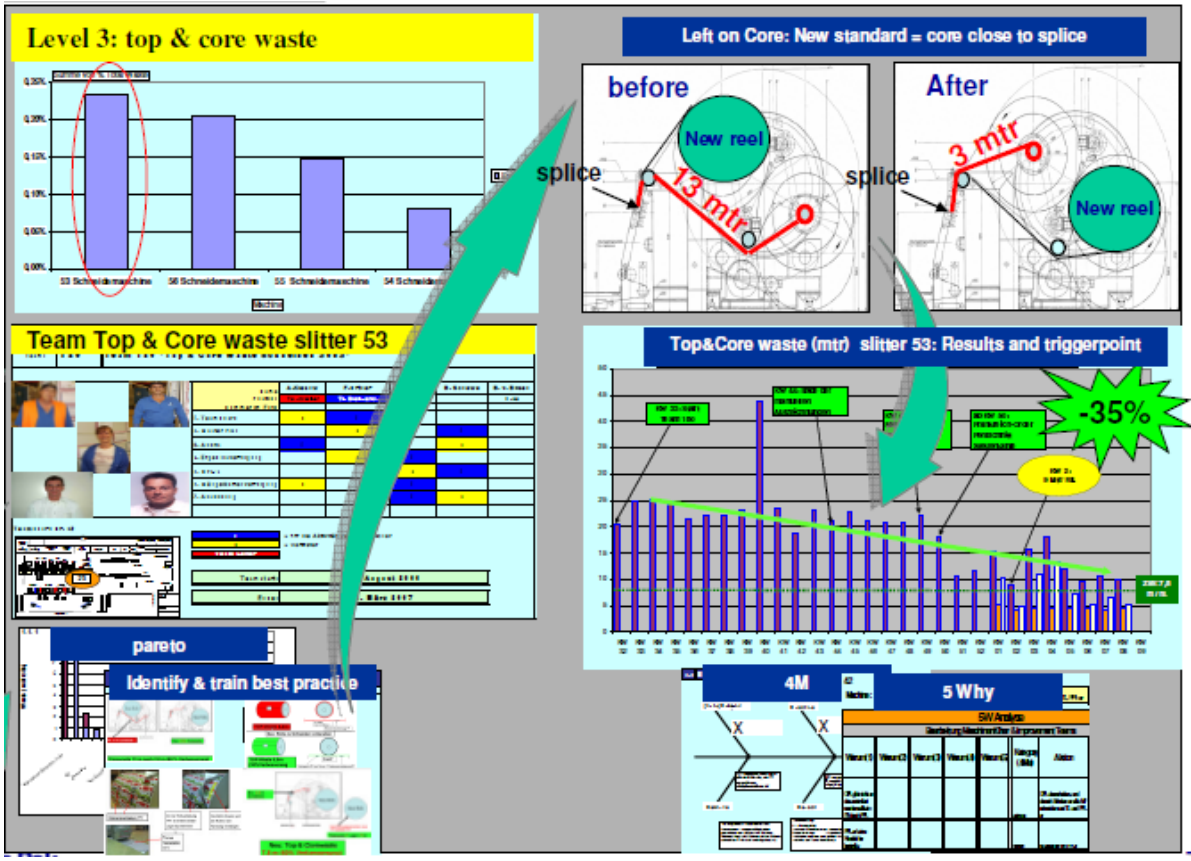
Equipment Failure

Eliminating unplanned downtime is critical to improve OEE. Other OEE factors cannot be addressed if the process is down. It is not only important to know how much down time your process is experiencing but also source or reason for the loss. Reflect to loss sheet on KK p. 75



Refer to pages 12 & 13 Kobetsu Kaizen – Equipment Failure Losses

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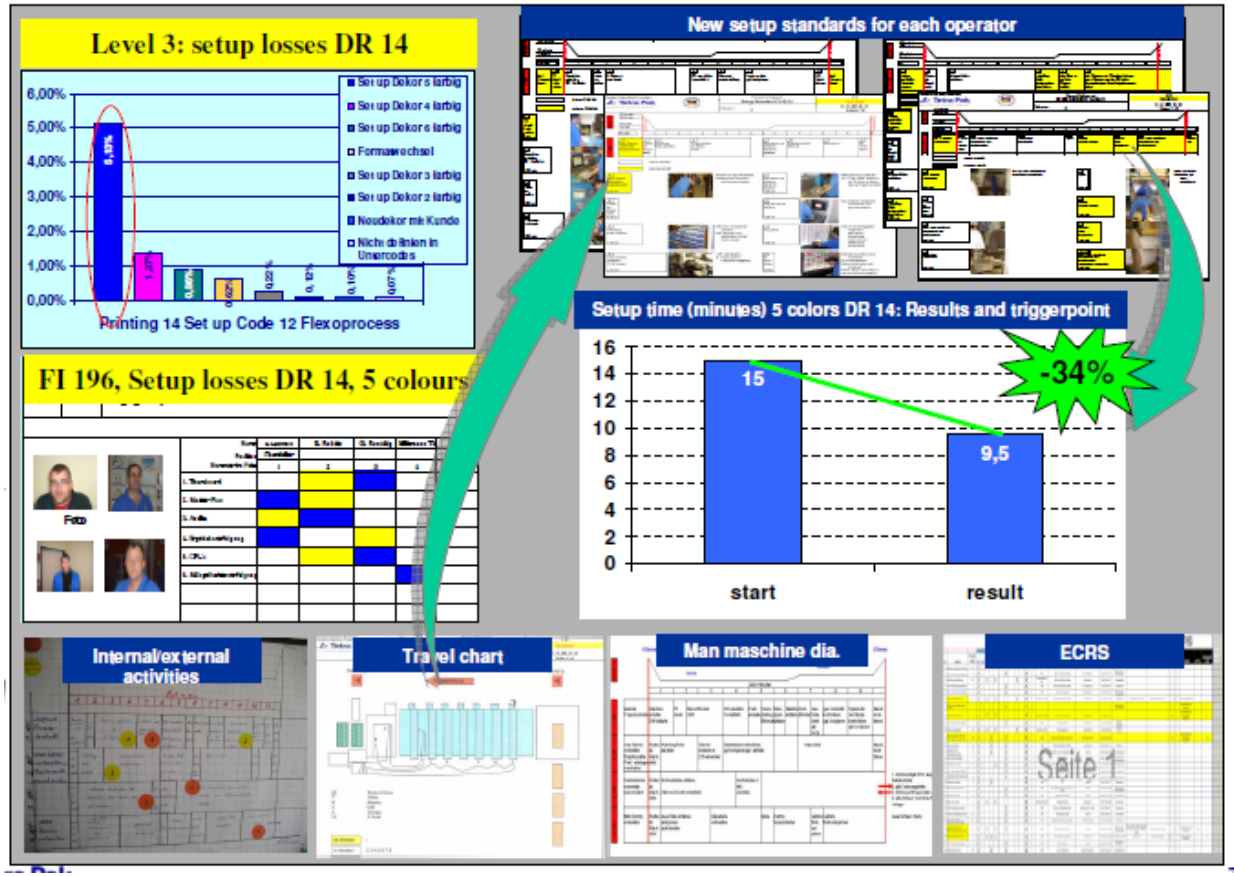
Setup and Adjustment Losses

Setup and adjustment time is generally measured as the time between the last good parts produced before setup to the first good parts produced after setup. This often includes substantial adjustment and/or warm-up time in order to consistently produce parts that meet quality standards.



Refer to pages 15 - 23 Kobetsu Kaizen – Setup and Adjustment Losses

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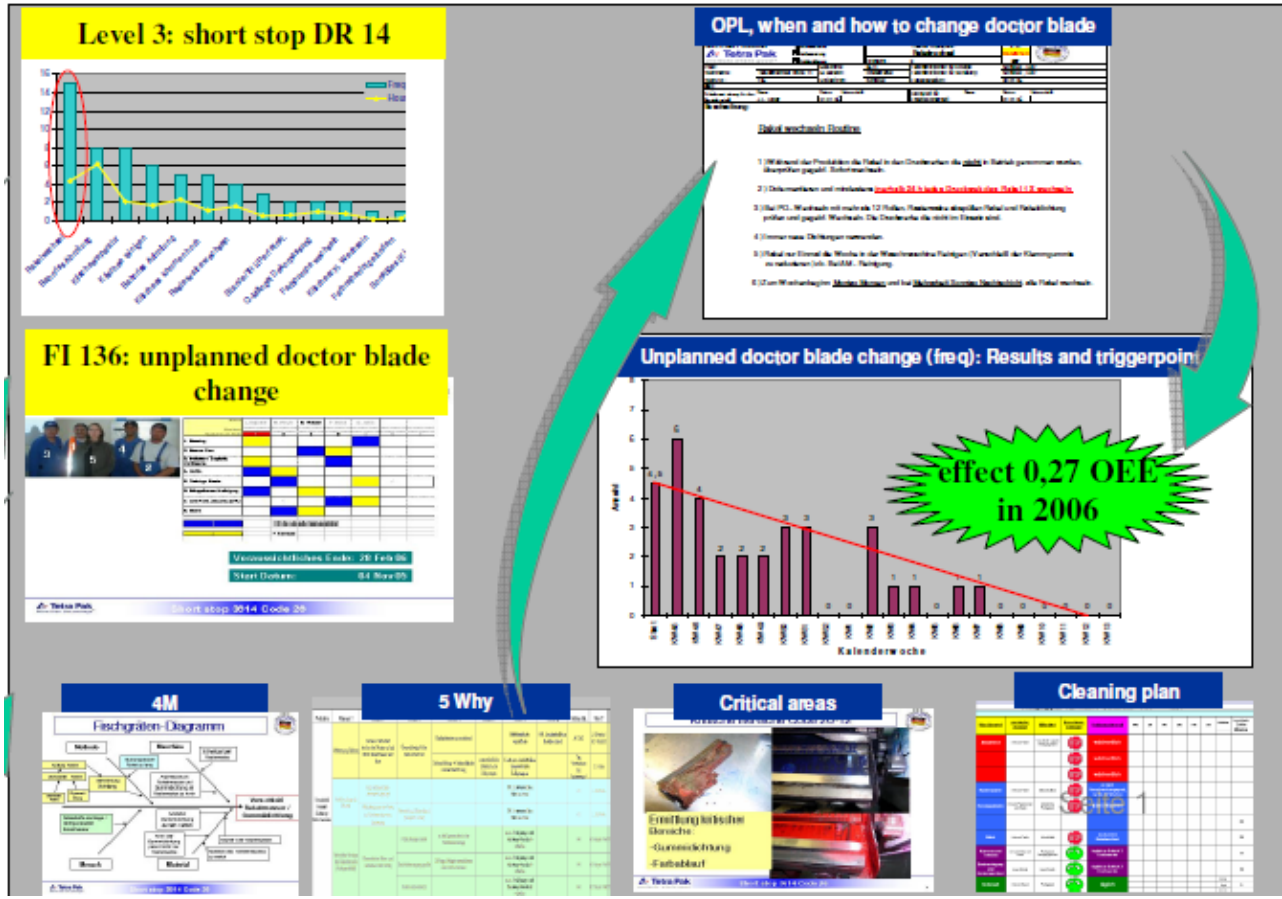
Minor Stops and Reduced Speed Loss

Minor stops and reduced speed are the most difficult of the six big losses to monitor and record. Cycle time analysis should be utilised to pinpoint these loss types. By comparing all completed cycles to the idle cycle time filtering the data through a 'minor stop threshold' and 'reduced speed threshold' the current cycles can be automatically categorised for analysis.



Refer to pages 30 - 36 Kobetsu Kaizen – Minor stoppages and speed loss

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Start-up Rejects and Production Rejects

Start-up rejects and production rejects are differentiated, since often the root causes are different between start-up and steady-state production. Parts that require rework of any kind should be considered rejects. Tracking when rejects occur during a shift/job run can help pinpoint potential causes, and in many cases patterns will be discovered.

Refer to pages 39 - 41 Kobetsu Kaizen – Defect and rework loss

Wika Kaizen.mp4

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How are Baselines Established

1. By an available and reliable existing data source

   A previous implementer or government agency might have the data you require

2. Through collecting data

   When no data exists, you may have to collect it prior to the project implementation

3. By starting at zero

   If this is a new project or if your indicator is related to a specific project activity, your baseline could start at zero

STEP 1
ACTIVITY 3- USE BASELINES TO SET TARGETS

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Performance indicator sheet Reference Sheet1						
Result: Obj.: Indicator 1:						
Description						
Precise Definition						
Unit of measure						
Disaggregated by:						
Justification/ Management Utility						
Plan for acquisition						
Data collection method :						
Data Source(s)						
Frequency / Timing of acquisition						
Estimated cost of acquisition						
Responsible individuals						
Data Quality Items						
Known data limitations and significance:						
Reporting of data						
Notes: Baselines and Targets Other						
PERFORMANCE INDICATOR TARGETS						
Balance		Targets				
Year	Actual	2013	2014	2015	2016	
Total						
THIS SHEET LAST UPDATED ON : DATE						

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STEP 1
ACTIVITY 3- USE BASELINES TO SET TARGETS

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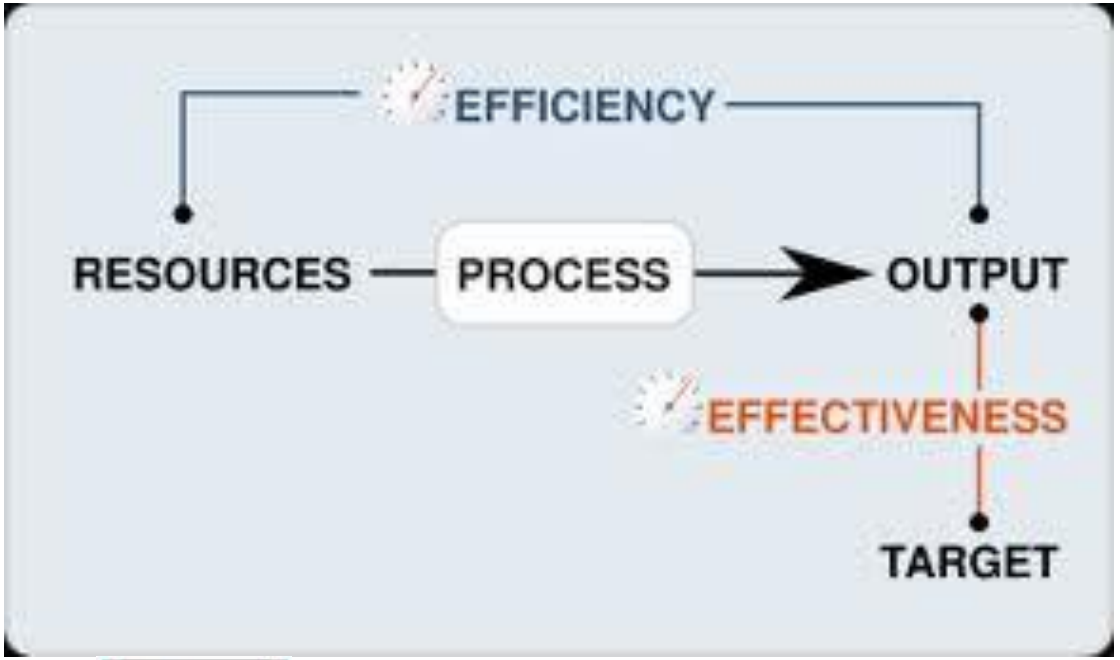
PERFORMANCE TARGETS:

- Can be expressed in quantity, quality or efficiency
- May be determined by setting final target first, then interim targets
- Can be adjusted over time

TARGETS SHOULD BE:

- Motivational,
- Ambitious,
- Realistic,
- Achievable.



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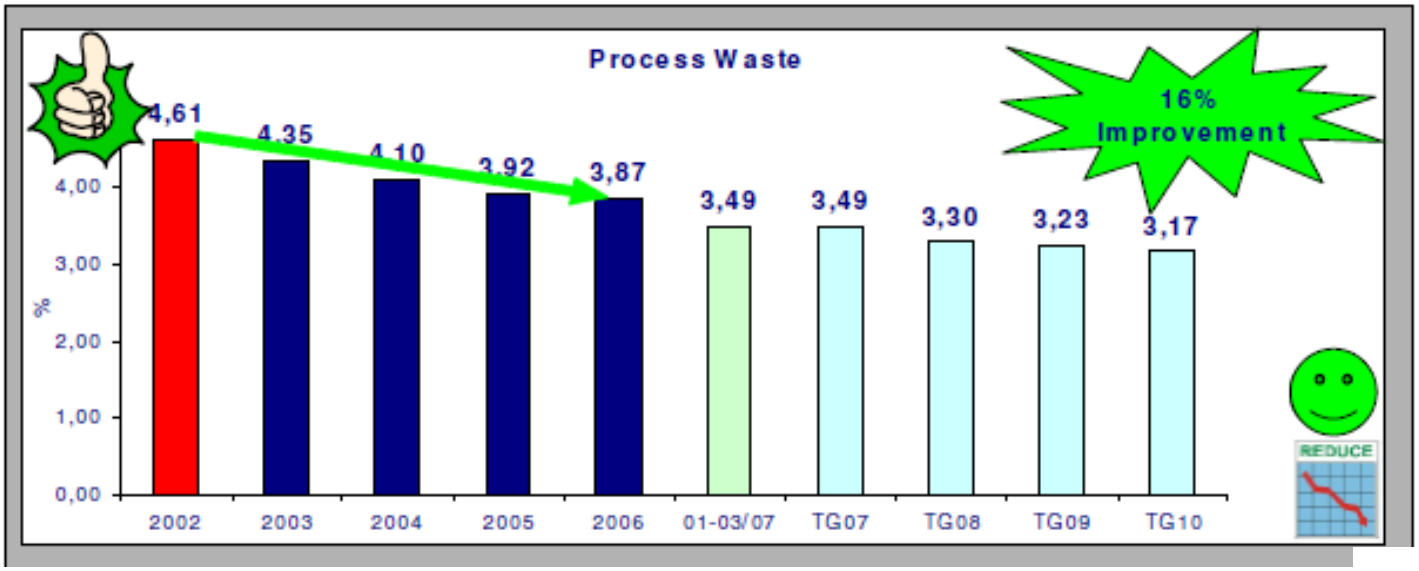
STEP 1
ACTIVITY 3- USE BASELINES TO SET TARGETS

Automotive Industry Development Centre

		A 02	A 03	A 04	A 05	A 06	Quarter 1/07	T 07	T 08	T 09	T 10
Maximize OEE	Printer EE (%)	33,4	38,4	42,1	44,6	52,9	59,5	51,8	53,7	56,1	58
	Laminator EE (%)	62,5	62,9	67,7	68,8	69,9	72,9	70,5	72,4	73,5	74,3
	Slitter EE (%)	17,4	17,4	18,6	18,3	17,9	18,9	18,4	18,9	19,3	19,6
Reduce Transform. costs	Productivity (packs / FTE)	1149	1317	1344	1453	1437	1535	1369	1490	1510	1530
	Process Waste (%)	4,61	4,35	4,1	3,92	3,87	3,49	3,49	3,3	3,23	3,17



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WAY FORWARD

Automotive Industry Development Centre

IDENTIFY THE MAJOR LOSSES

DEVELOPMENT OF THE KOBETSU KAIZEN TEAMS

WASTE IDENTIFICATION OF LOSSES

MEASURE DEFECTS AND FAILURES

DEVELOP POTENTIAL ACTIONS FOR MITIGATION

DEVELOP ACHIEVABLE TARGETS

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WAY FORWARD

Automotive Industry Development Centre

ACTIVITY	TIMING
Declaration to all staff – Internal newsletter, boards, reception are TPM journey	Immediate
Identification of the big losses	November 2012
Sub-committee development based on the losses identified	November 2012
Calibration Exercise	November, December & January
Plan for KK steps 0 and 1	November 2012
Step 0	December 2012/January 2013
Step 1 – Activity 1 & 2	January 2013
Next Review	29 January 2012

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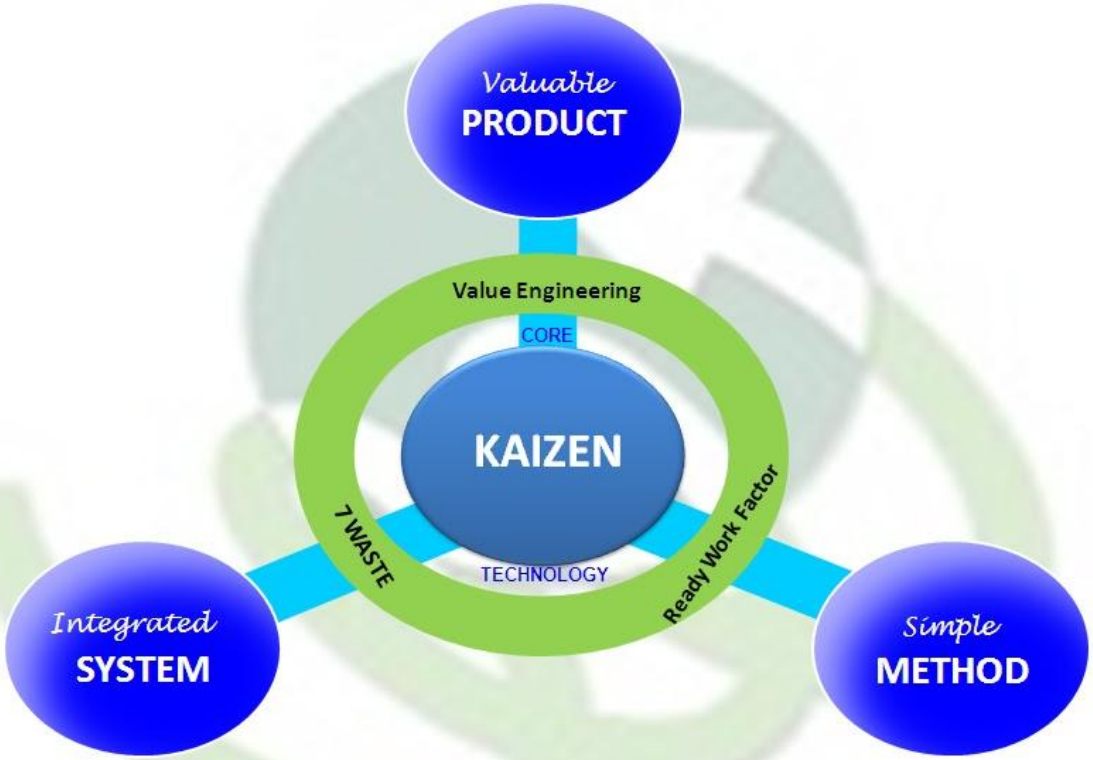
WAY FORWARD

Automotive Industry Development Centre

The Key to Focused Improvement is to Keep the Approach Simple



INTEGRITY TRAINING & CONSULTING

TPM – GEMBA KAIZEN – MANUFACTURING COST IMPROVEMENT

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