

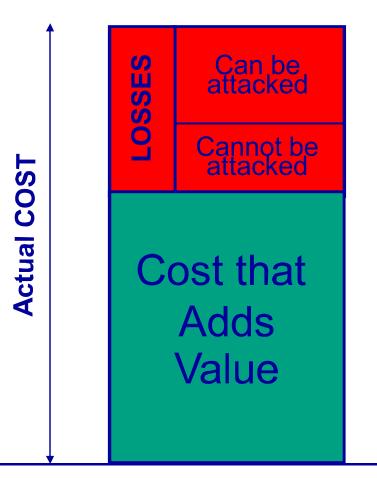




Achieving Zero Breakdowns

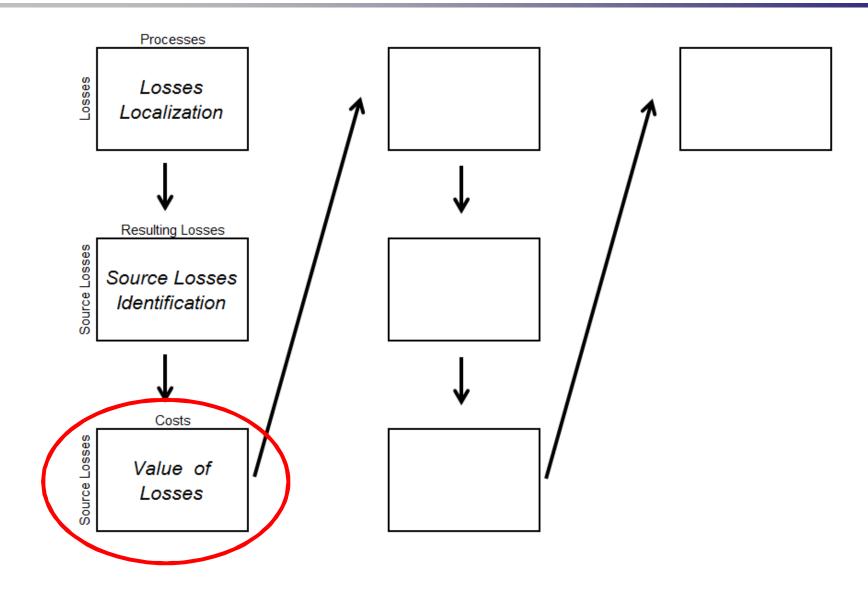
Istanbul, 12 December 2014 Virginio Peluzzi

A Loss is a Cost that does not add any value but that the Company pays for it





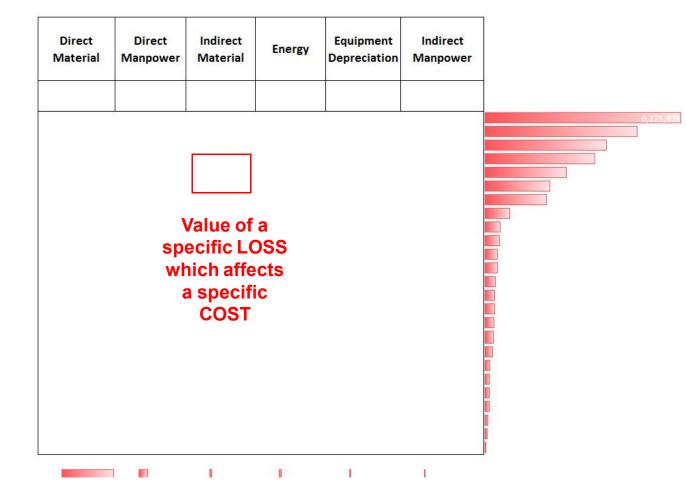
How to evaluate the impact of the MAINTENANCE on the Costs





The Cost - Loss Matrix

Losses



Costs

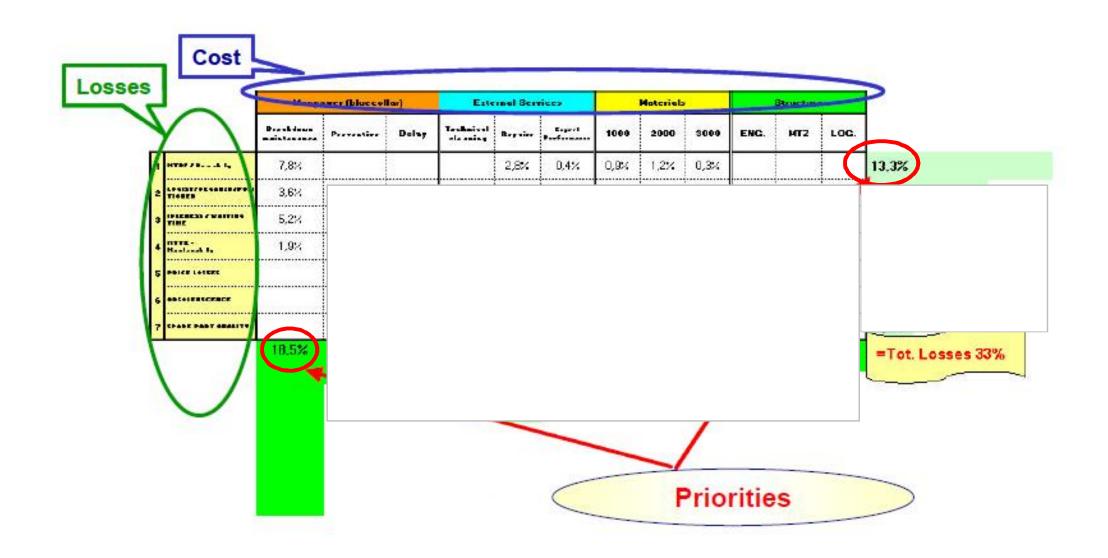


Impact of Maintenance – Automotive case, driveline, 2010, % of TRANSFORMATION COSTS

COSTS	5		La	bour			¢	Jutsourci	ing	Ν	lateria	ıls		Staff		Other	
LOSSES		47,0%6				19,3%		12,2%		18,7%		2,8%					
	Breakdown mtc	Planned	Tooling	Preventive	Outside contract	Warehous e people	Cleaning	Repairs	Extraord. Mitc	CRS	CR5 Store	CRI	ENG	MIZ	LOG	OG. altri	тот
Idling	3,2%	1,3%	0,5%	0,3%	0,0%	0,9%											6,3%
Logistics/Organisation	3,7%	0,5%		0,2%									0,5%	0,2%	0,2%		5,3%
MIBF/Rel.	8,6%							2,1%	3,4%	1,2%	2,2%						17,5%
MITR / Maint.	1,3%	1,1%	0,7%										1,3%	0,4%			4,9%
Spare part quality											0,3%						0,3%
Inadequate stock management	6									5							0,0%
Obsolescence							1				0,4%						0,4%
Sheer losses)									0,0%	0,0%	0,0%					0,0%
Exceeding purchases										0,0%							0,0%
Wrong technical specs										0,0%							0,0%
Price losses							0,2%		0,3%								0,6%
TOT LOSSES	16,8%	2,9%	1,2%	0,5%	0,0%	0,9%	0,2%	2,1%	3,8%	1,2%	2,8%	0,0%	1,9%	0,6%	0,2%		35,2%



Impact of Maintenance – Automotive case, engines, 2011, % of TRANSFORMATION COSTS





Impact of Maintenance – Medical Technology case, components, 2011, % of LOSSES





Toward Zero Breakdown Istanbul 12 December 2014

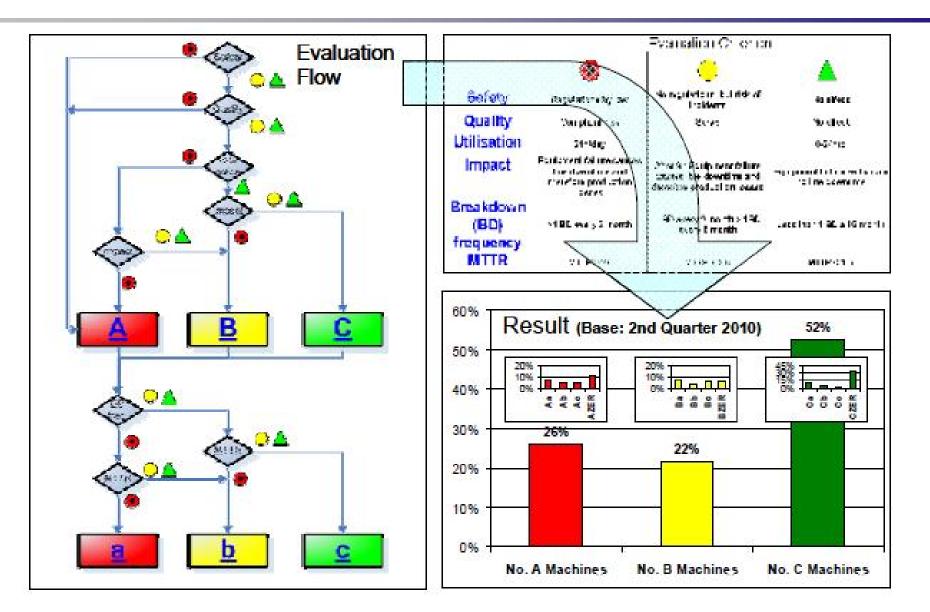
An UNPLANNED stop of a system that:

Has a duration of more than 15 minutes OR Requires an intervention of the Maintenance OR Requires the replacement of a component

OR A COMBINATION OF ALL THESE THREE CHARACTERISTICS



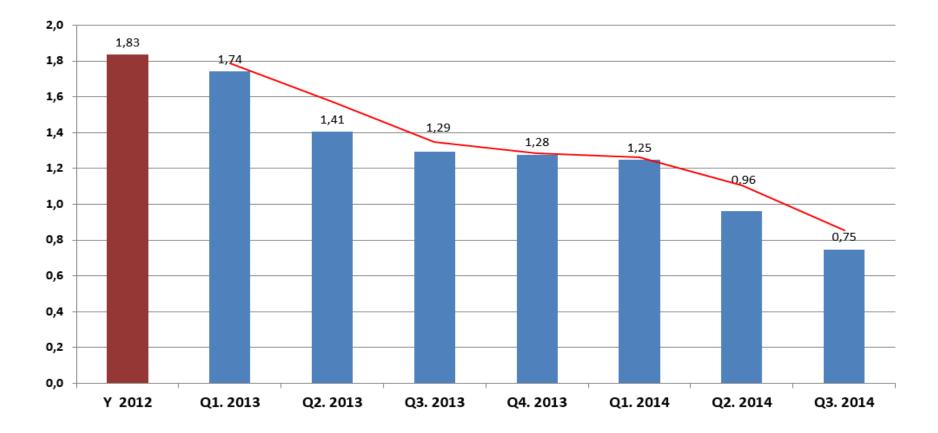
Map and classify the Machines!





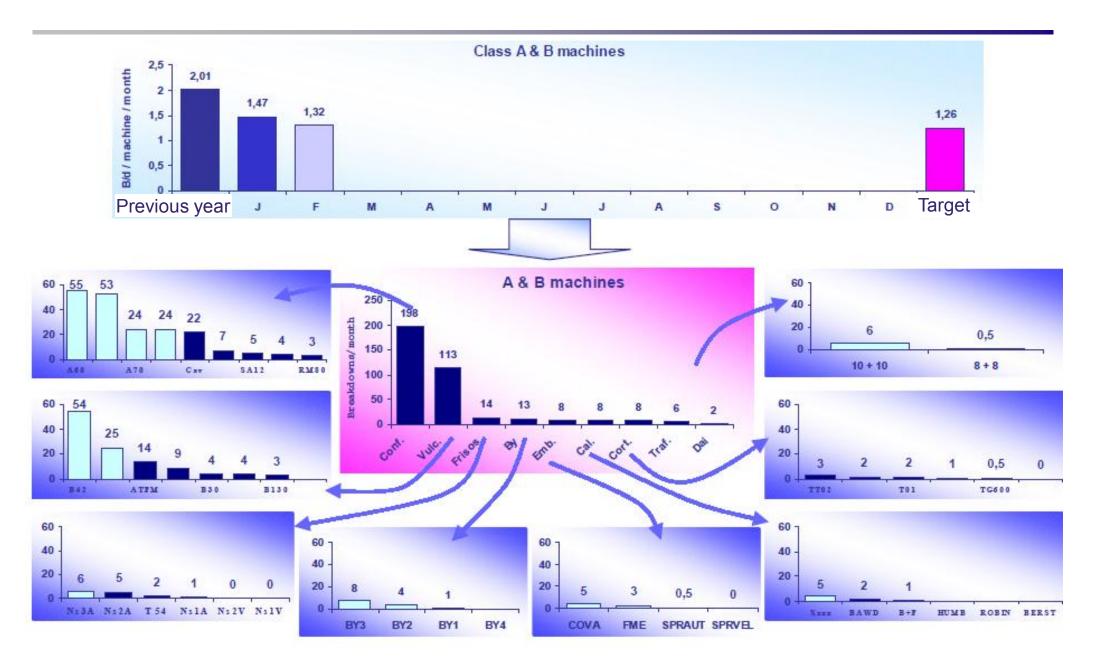
Measure the OCCURRENCE of Breakdowns!

Breakdown / PM' s machine

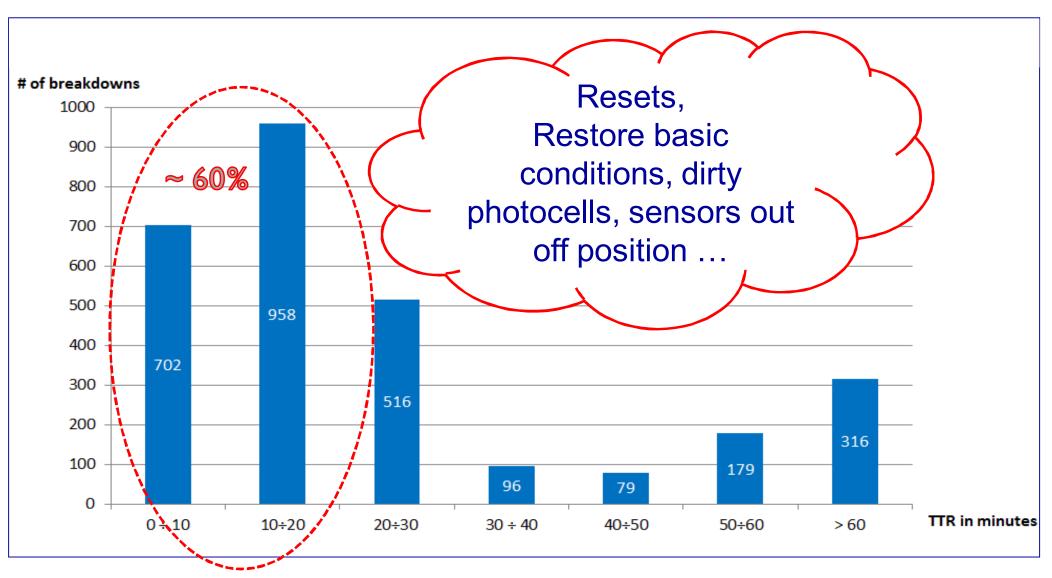




Deploy the Breakdowns!



Breakdowns are not all the same!





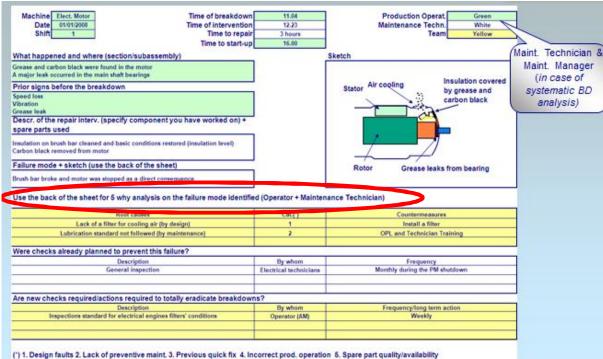
Learn how to analyse the Breakdowns! (example)

Date 01012000 Time of intervention 12.23 Maintenance Techn. What happened and where (section/subassembly) What happened and where (section/subassembly) Sketch Maintenance Techn. What happened and where (section/subassembly) Crease and cancer black were found in the mode Sketch Insulation covered Maintenance Techn. What happened and where (section/subassembly) Crease and cancer black were found in the mode Sketch Insulation covered Maintenance Techn. Maintenance Techn. What happened and basic conditions restared (insulation level) Cancer black were found in the mode Sketch Insulation covered Maintenance Techn.	Machine Elect. Motor Time of break	kdown 11,04	Production Operat. Green	
Time to stari-up 16.00 What happened and where (section(subassembly) Sketch Grease and carbon black were found in the moter Andre leak accurred in the main shaft bearings Prior signs before the breakdown Sketch Speed loss Carbon black were found in the moter Prior signs before the breakdown Sketch Speed loss Carbon black Descr. of the repair interv. (specify component you have worked on) + spare parts used Insulation convend from moter Insulation converse has bearder and basic conditions restored (insulation level) Rotor Failure mode + sketch (use the back of the sheet) Rotor Bruch bar broke and motor was stopped as a direct consequence Cat(1) Lock of a filter for cooling air (by design) 1 Lock of a filter for cooling air (by design) 2 Use the back of the sheet (of low and note (low alignenee) 2 Use the back of the sheet (of low and note) 2 Use the back of the sheet (of low and note) 2 Use the back of the sheet (of low and note) 2 Use the back of the sheet (of low and note) 2 Use the back of the sheet (of low and note) 2 Use the back of the sheet (of low and note) <td></td> <td></td> <td>Maintenance Techn. White</td> <td></td>			Maintenance Techn. White	
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A major leak occurred in the main shaft bearings Insulation covered by grease and carbon black (in Case of systematic Bi analysis) Prior signs before the breakdown Stator Air cooling by grease and carbon black (in Case of systematic Bi analysis) Descr. of the repair interv. (specify component you have worked on) + spare parts used Insulation control black Insulation control black (in Case of systematic Bi analysis) Failure mode + sketch (use the back of the sheet) Insulation standard not back conditions restored (insulation level) Rotor Grease leaks from bearing Use the back of the sheet for 5 why analysis on the failure mode identified (Operator + Maintenance Technician) Insulation of the failure mode identified (Operator + Maintenance Technician) Were the checks already planned to prevent this failure? OPL and Technician Training Were checks already planned to prevent this failure? Insulation to brain a filter Description By whom Frequency General inspection By whom Frequency A re new checks required/actions required to totally eradicate breakdowns? By whom Frequency/forg term action	What happened and where (section/subassembly)		SANGAGIN	
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Description By whom Frequency General inspection Electrical technicians Monthly during the PM shutdown Are new checks required/actions required to totally eradicate breakdowns? Image: Comparison of the provide term action Description By whom Frequency/long term action	Lubrication standard not followed (by maintenance)	1	OPL and Technician Training	
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Description By whom Frequency/long term action				
Description By whom Frequency/long term action				
	Are new checks required/actions required to totally eradicate brev	akdowns?		
Inspections standard for electrical engines filters' conditions Operator (AM) Weekly		By whom	Frequency/long term action	
	Inspections standard for electrical engines filters' conditions	Operator (AM)	Weekly	

6. Lack of AM 7. Improvement or modification untested 8. Lack of CBM 9. Part life span not predicted

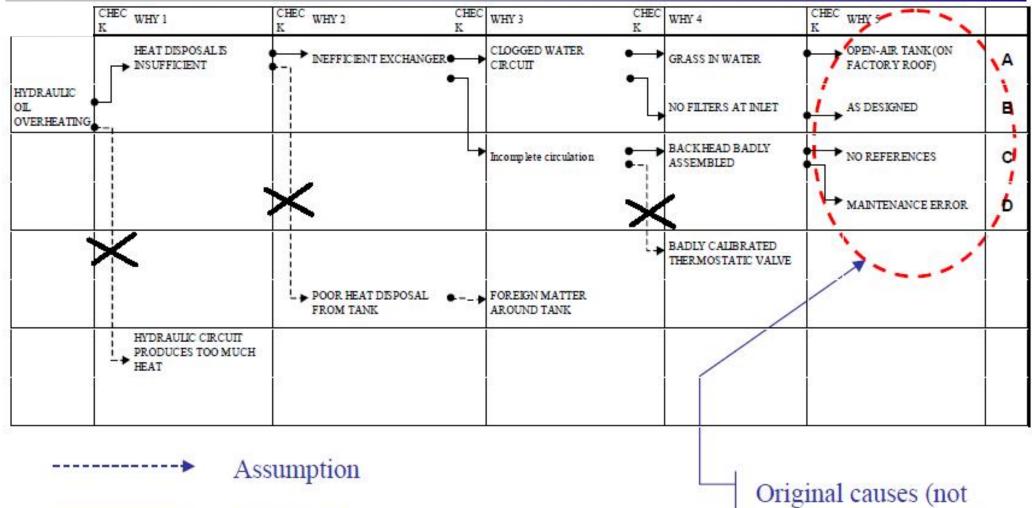
Why it is possible to achieve ZERO Breakdowns

The 5 WHY'S ANALYSIS clarifies the root cause(s) of that BD. When you understand ALL the root causes and have eradicated them, that BD will no more occour!!



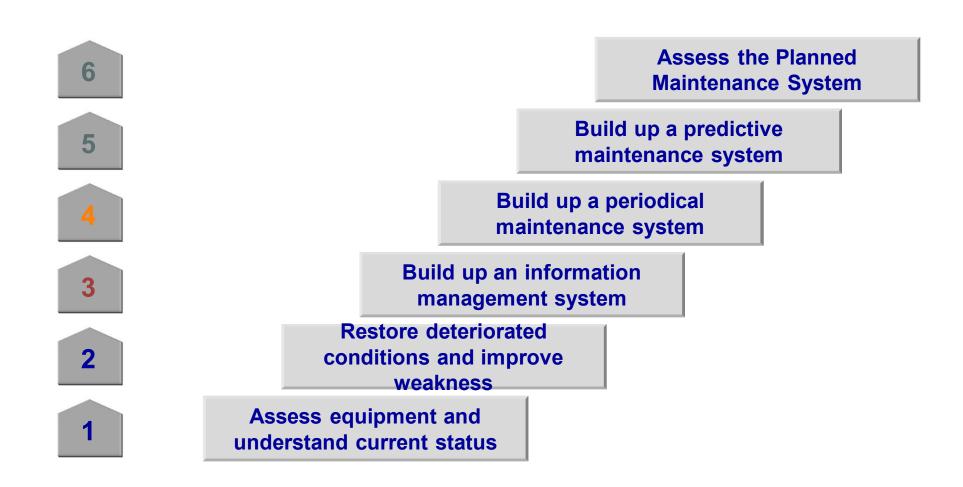
6. Lack of AM 7. Improvement or modification untested 8. Lack of CBM 9. Part life span not predicted

5 Why's Analysis (example)



Confirmed assumption Wrong assumption Original causes (not necessarily found out at the 5th why)

The 6 steps of Planned Maintenance according JIPM





The 7 steps of Autonomous Maintenance according JIPM





AM and PM together with 4 phases

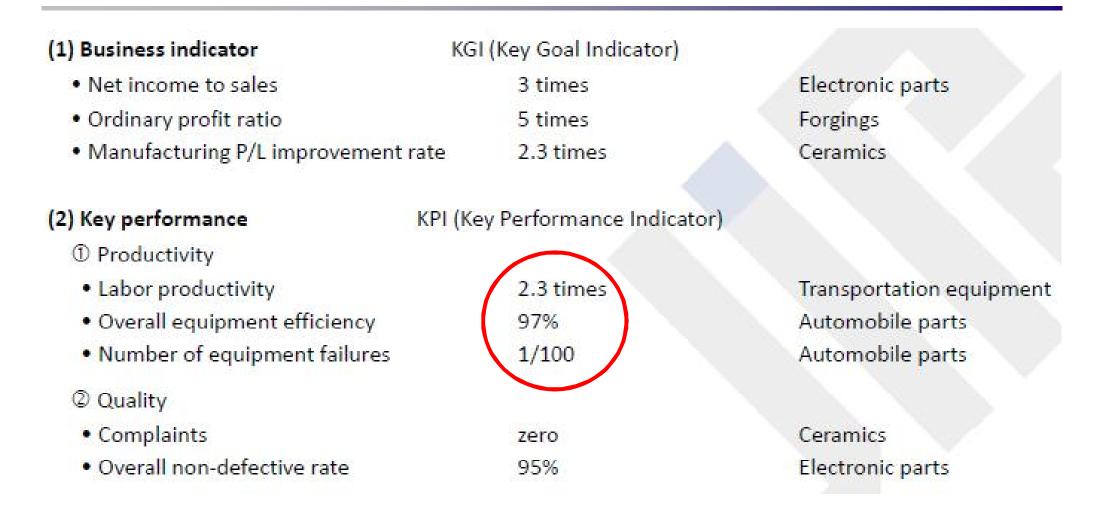
PM Phases Pillars	1 Stabilise failure intervals	2 Lengthen equipment life	3 Periodically restore deteriorated conditions	4 Predict equipment life			
Autonomous Maintenance	Step 1:Initial cleaningStep 2:Eliminate sources of dirt and hard-to - clean & inspect areasStep 3:Create and maintain cleaning, inspection & lubrication standards	Step 4: General inspection	Step 5: Autonomous inspection	Step 6: Standardisation Step 7: Autonomous management			
	Step 1:Assess equipment and understand current status						
ed ance	Step 2:Restore deteriorated conditi	ons and improve weakness	Establish as corrective maintenance Step 6: Assess				
Planned Maintenance		Step 3:Build up an info management system	Establish as periodic m	aintenance Maintenance			
Maii			Step 4: Build up a periodical maintenance system	Systematic			
				Step 5: Build up a predictive Planned maintenance system Maintenance			



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RESULTS



Source: JIPM, Dec 2013, Survey conducted among 300 Companies TPM Awarded, period 2000-2011

