

WELCOME TO MSME UPGRADATION THROUGH MACE CLUSTER APPROACH AT GENBA USING QC TOOLS

1

METHODOLOGY ADOPTED

- Cluster Approach
- Pricol and Tier -2 Vendors Top Management Commitment And Active Involvement
- Goal Setting Based On The Future Challenges
- Monthly Visits At Genba Along With MACE Counselor
- Step by Step Activities Implementation As Per Decided 4 Phase Model
- Monthly Progress Review
- Trainings and Motivation
- Two way communication

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PRICOL LIMITED OVERVIEW

OUR CUSTOMERS

CARS & MUVs Maruti Suzuki India Ltd General Motors India Honda Mot Cars India Ltd Mahindra Motors Ltd TATA Motors Tata Nano Tata Nano Tata Nano	TRUCKS Ashok Leyland Ltd Eicher Motors Ltd Feroz Motors Ltd Mahindra & Mahindra Ltd Mahindra & Mahindra Ltd Mahindra & Mahindra Ltd	Two Wheelers Hero Cycles India Ltd Bajaj Motors Ltd Honda Motorcycle & Scooters India Ltd KTM India Pvt. Ltd Royal Enfield Motors Ltd TVS Motors Ltd Yamaha Motor India Pvt. Ltd	Construction Equipment Caterpillar JCB Terebra Caterpillar JCB Terebra	Other Lear Denso Visteon Lear Denso Visteon
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2

DEMING CYCLE FOLLOWED IN EACH ACTIVITY

PLAN DO CHECK ACT

Selection of Suppliers, Data Collection, Target Setting, Phase wise Improvement Plan → Implementation Action Plans → Checking Of Results (Supplier's Performance) → Standardization

FORMATION OF CLUSTER-1

- Selected 7 Vendors Based On Share Of Business (Approx 60 % of Total Buying), Criticality Of Components Supplied & Past Performance of At Least One Year.
- Cluster was launched in May-2009.
- Commodity of Vendors - Plastics, Sheet metal & Wiring Harness

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PRICOL LIMITED OVERVIEW

PRODUCTS FOR CARS & MUVs

PRODUCTS FOR MOTORCYCLES & SCOOTERS

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MACE ROADMAP FOR WORLD CLASS EXCELLENCE

MODEL FOR WORLD CLASS EXCELLENCE

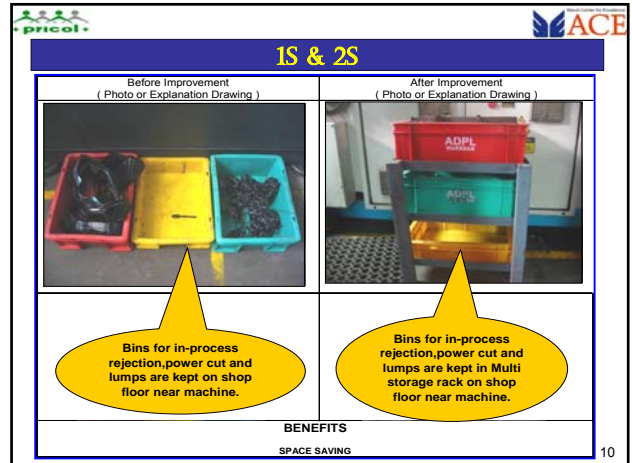
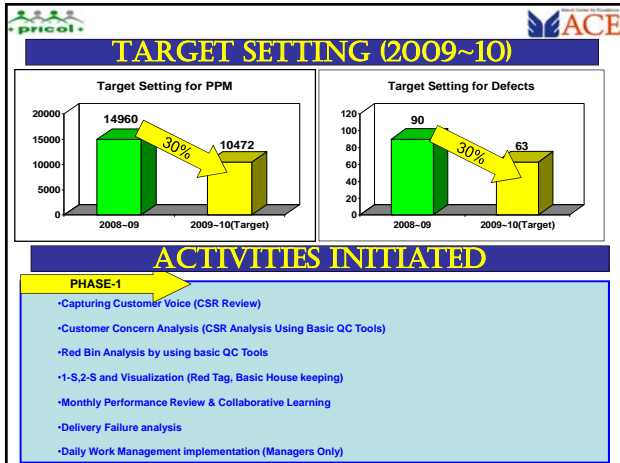
PHASE 1: Capturing Customer Voice, 1-S, 2-S and Visualization, Customer Concern (GCD) through why-why Analysis, Red Bin Analysis using basic QC Tools, Daily Work Management for Target Monitoring, Monthly Performance Review at Gemba & Collaborative Learning, New Kaizen/monthly vendor, Training on 5S, YUD, 7 QC tools, CAPA

PHASE 2: TEI through SSQC activities, Single Piece Flow using Model Line, Identifying Lean Manufacturing Projects (MPS) based on Customer Requirements, Inventory Turns Ratio Management, Energy Consumption Management, Cost of Poor Quality, Initial Supply Control, Value added per employee cost (VAPCO), Training on SSQC, MPS, EMS, QMS, NPD

PHASE 3: Complete 5-S, Up-gradation through advance Quality Tools, Hoshin-Kami (MFO), Autonomous Maintenance; OEE, Yield Improvement, Implementation of 8 Pillars Check sheet, Training on advance tools like DOE, DMAIC

PHASE 4: TPM Cluster, Certified Quality Engineer, Six Sigma Black Belts, Benchmarking Visits, Horizontal Deployment of Cluster Activity through Tier-2

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CUSTOMER SATISFACTION REPORT AND GAP ANALYSIS

CSR - Pricol

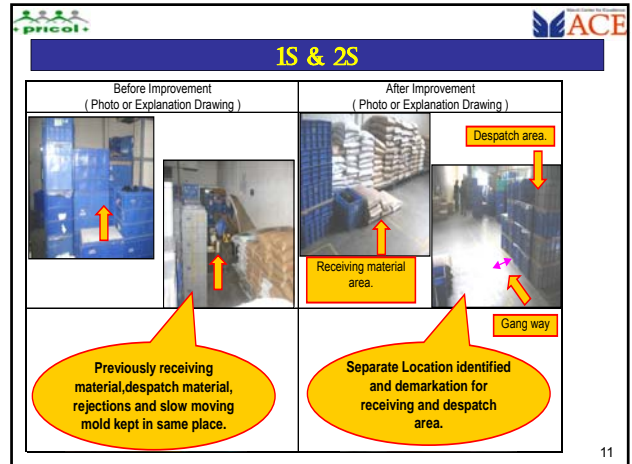
Sl. No.	Control parameter	KPI	Previous Value (2008-09)	Current Yr. (2009-10)	MONTHLY - APRIL 2009												Trend	Status
					Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10		
1	Rejection at Pricol	PPM	23729	13463	14512	4024	4988	13293	10655	7927	12923	14933	15312					
2	Slow Rejection at Pricol	PPM	5818	3025	2228	3024	1317	11080	7587	7927	2320	7861	2195					
3	QPR Raised by Pricol	No./Mo	68	12	3	3	2	3	3	3	3	3	3					
4	QPR Response Time (days)	Days	5	5	5	5	5	5	5	5	5	5	5					
5	Quality Review / Loss	Rs.	66.94	66.25	66.94	66.51	66.67	66.93	66.24	66.26	66.51	66.47						
6	Rejection at pricol	A.M. Grade	C	B	C	B	C	B	C	B	C	B	C					

GAP ANALYSIS REPORT

Month: Dec-2009

Sl. No.	KPI (Key Performance Area)	Target	Actual	Gap	Problem	Part No./Name	Root cause	Action Taken	Tgt dt.	Resp.	Current status
1	Rejection at Pricol (Max.)	5500	15312	9812	Shrinkage	WISOR-CLUSTER HBAL P17/P21 MAC	Insert Length Less	Tool rectified	30th Dec-2009	ADPL	Done
					Broken	HOLDER/SPEED QI-MUL VY4	Operator & Deflasher Negligence	Work instruction Display in work area	09th Dec-2009	ADPL	Done
					Extra Material	CASE/SPEED-QI-MUL VY4	Ejector Pin Wear out and Pin Replacement frequency was not decided	Ejector Pin replaced after monitoring	25th Dec-2009	ADPL	Done
2	QPR Raised by Pricol/year	0.5	1	0.5	Extra Material	CASE/SPEED-QI-MUL VY4	Ejector Pin Wear out and Pin Replacement frequency was not decided	Ejector Pin replaced after every 500c shots after monitoring	25th Dec-2009	ADPL	Done

Prepared By: Anil Sharma Approved By: R D



DAILY RED BIN MEETING

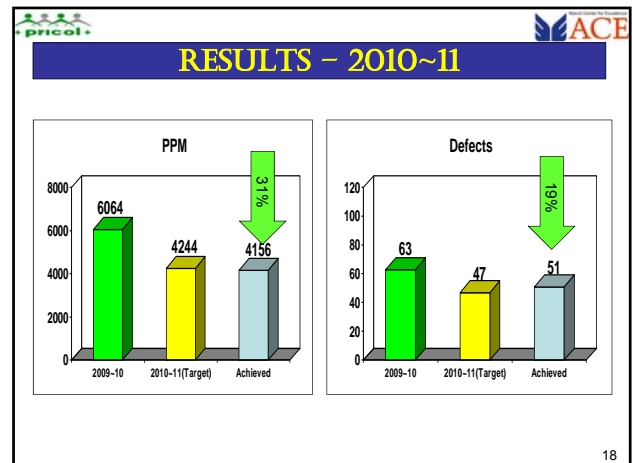
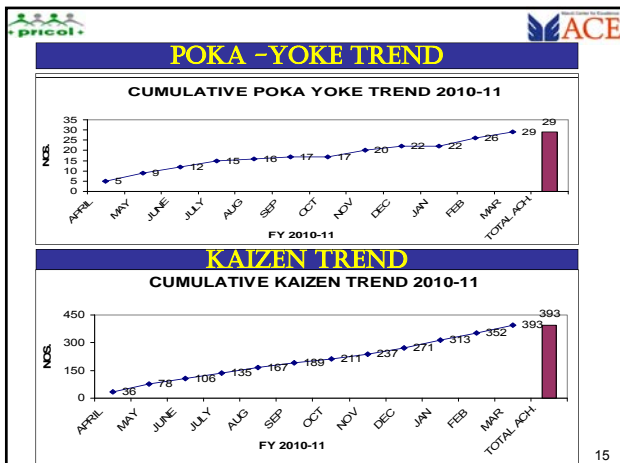
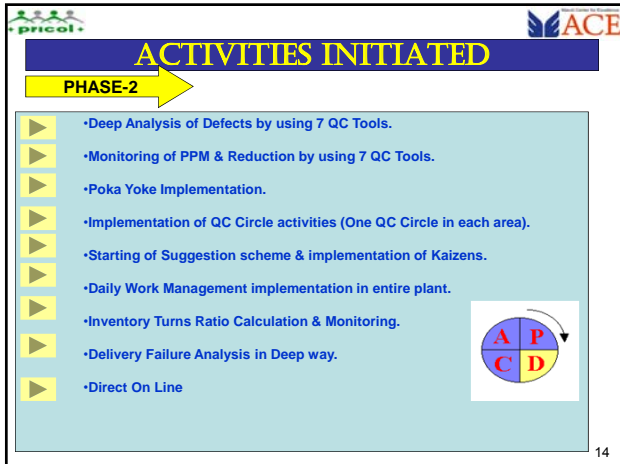
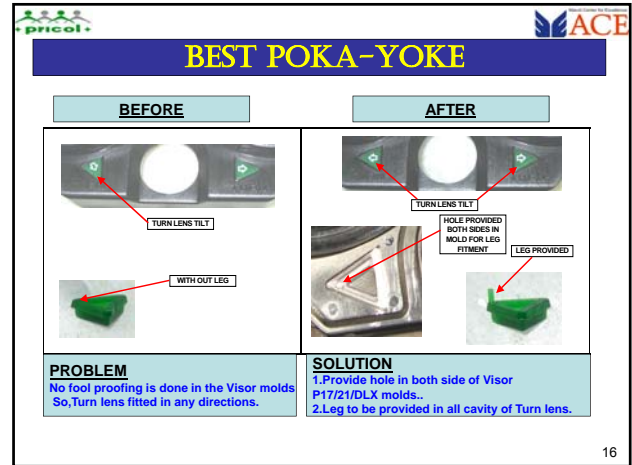
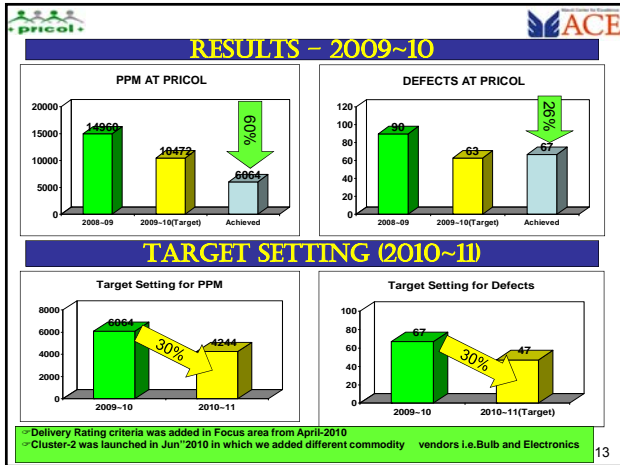
RED BIN ANALYSIS - Procedure

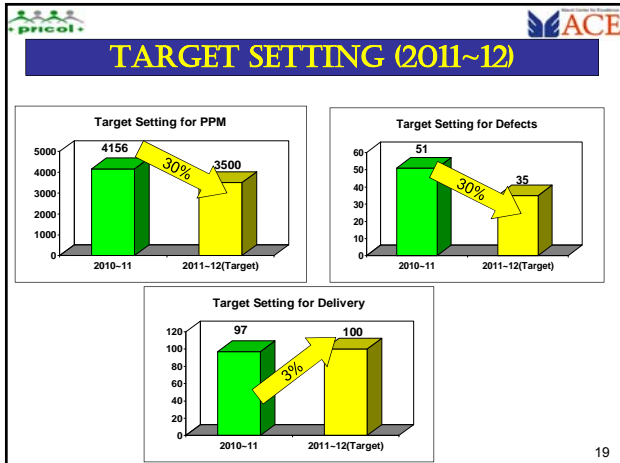
Red Bin Analysis

GENBA Visit by MACE, Pricol and Cluster Members

Step No.	Activity
1	All members of CFT to meet at defined time to discuss previous days rejections.
2	All members should sign the daily attendance sheet.
3	RBA leader should start the brainstorming session regarding the top defect of previous week.
4	Views / Comments should be noted down in cause/effect diagram on board which includes 4M analysis.
5	Treat all the above views as a probable causes.
6	Now list out these causes with controlled / non controlled activities.
7	Now start elimination of probable causes to reach at only potential causes.
8	Start validating the points one-by-one.
9	Find out the root cause of defect.
10	Prepare action plan to take countermeasure with target date of completion & define the responsibility of a person.
11	Note down all the points of countermeasures taken in RBA summary sheet.
12	Record the effectiveness of lots after countermeasure taken in RBA summary sheet.
13	Make / Prepare the weekly Pareto Graph.
14	Put the graph on board for display purpose to all the employees.
15	There should be two Pareto-graphs: 1) Part - Wise 2) Defect - Wise.







FOCUS AREAS FOR 2011~12

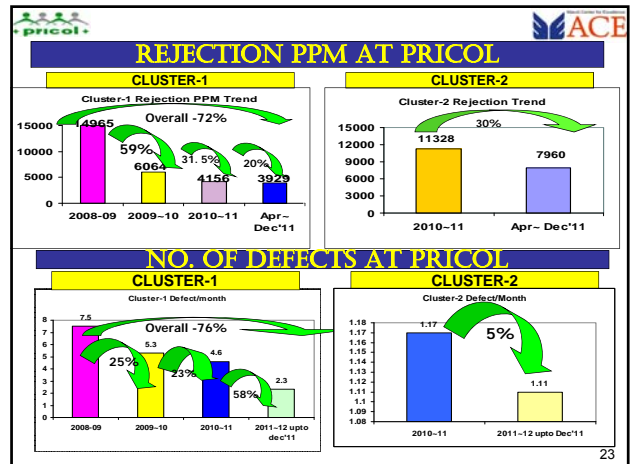
- ▶ Lean Projects Implementation
- ▶ Strengthening of QC Circle activities
- ▶ Implementation of Direct On Line Activity
- ▶ Daily Work Management implementation in entire plant at all level

INTERNAL QC CIRCLE COMPETITION (NOV-2011) FOR PROMOTING QC CIRCLE ACTIVITIES

Winner-Aar-Aar Technoplast

1st Runner up-ADPL

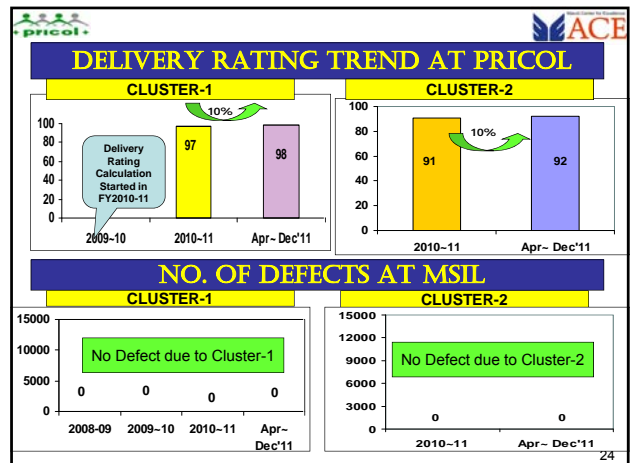
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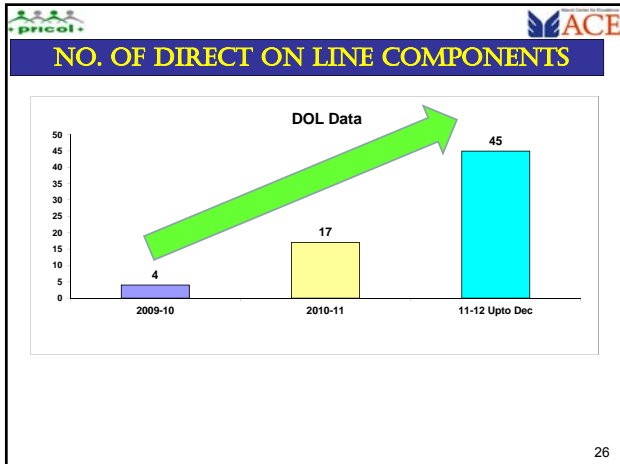
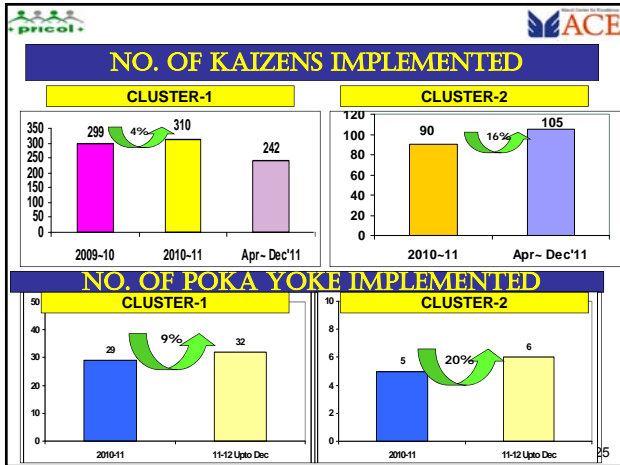


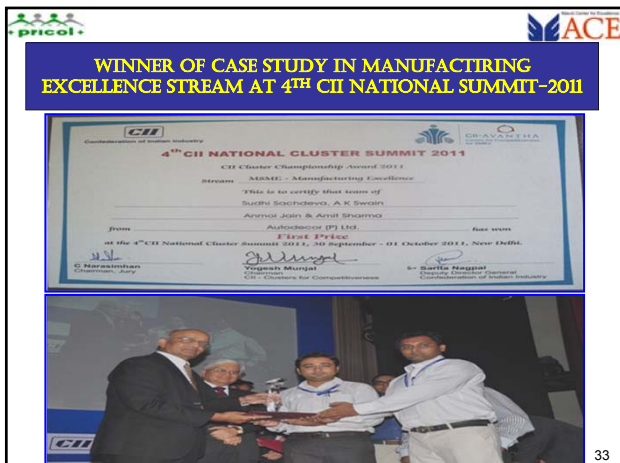
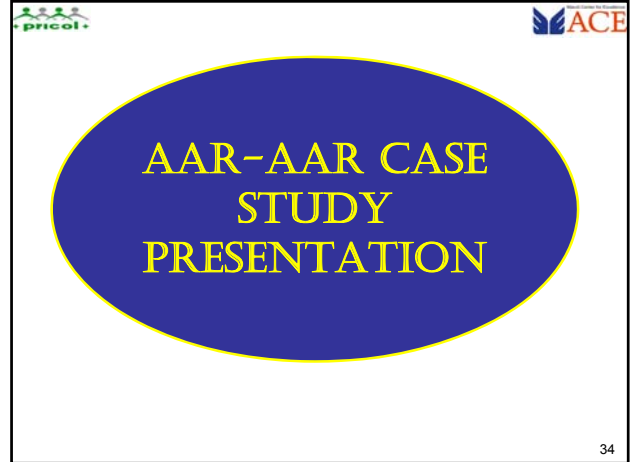
LEAN PROJECTS IDENTIFIED 2011~12

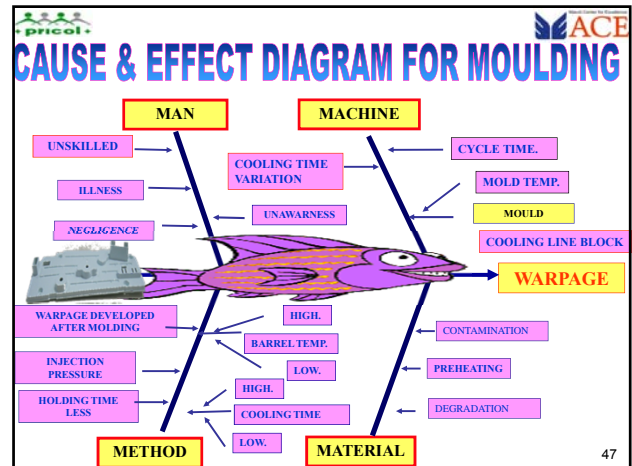
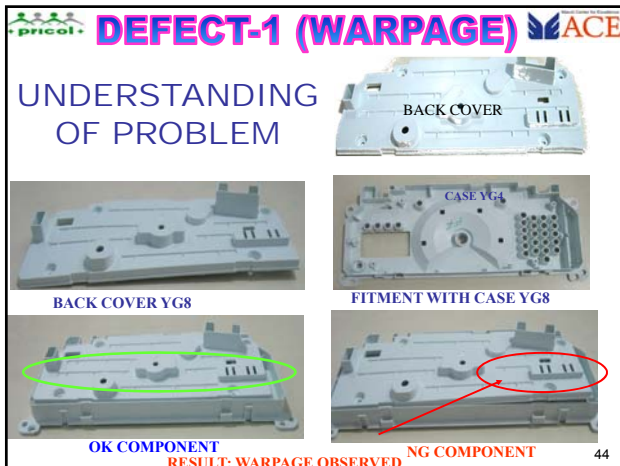
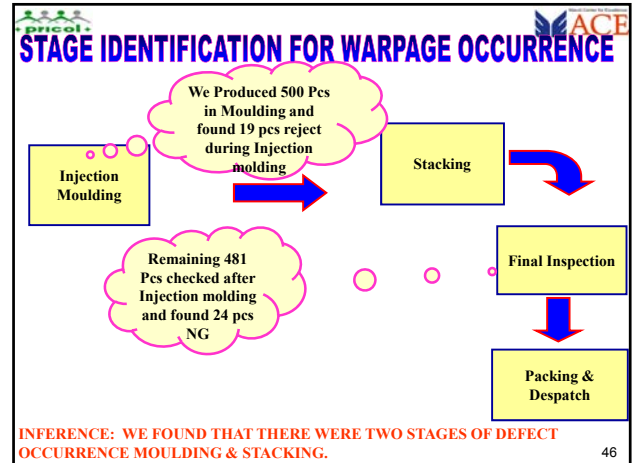
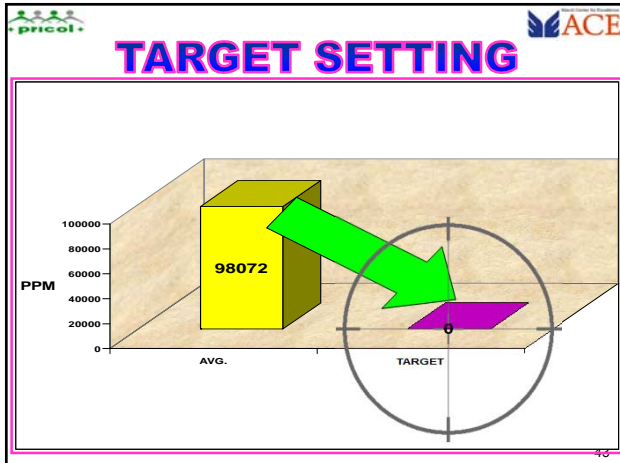
S.No	Project Title	No. of vendors	Project Completed (till Dec-11)	Project Under Progress
1.	SMED	5	3	2
2.	Tool Break down Reduction	4	1	3
3.	Machine Break down Reduction	3	1	2
4.	Inventory Turn Over Ratio Improvement	4	1	3
5.	Productivity Improvement through idle time reduction	4	1	3
6.	Quality Improvement	4	1	3
7.	Energy Consumption Reduction	4	1	3
TOTAL		28	9	19

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SAMPLE SIZE CALCULATION FOR ANALYSIS

$np \geq 5$

Where n = sample size

p = proportion of rejection

Our PPM is 98072

$p = \frac{98072}{1000000} = 0.098072$

$n * 0.098072 \geq 5$

$n = \frac{5}{0.098072} = 50.98$

$n \geq 51$

MINIMUM 51 PCS ARE REQUIRED BUT WE DECIDED TO TAKE 500PCS FOR ANALYSIS

RANKING TO IDENTIFY POTENTIAL CAUSES

S.NO.	STAGES	CAUSES	DEEPA	MEENU	NEEL KAMAL	MAMTA	PUSHPA	OVERALL RATING
1	MAN	UNSKILLED	4	4	3	3	2	16
2		UNAWARENESS	1	1	1	2	3	8
3		ILLNESS	1	2	1	1	2	7
4	MACHINE	NEGLECTANCE	1	2	2	2	1	8
5		MOLD TEMPERATURE	3	2	4	3	3	15
6		COOLING LINE BLOCK	2	1	1	1	1	6
7		CYCLE TIME	1	1	1	2	3	8
8	MATERIAL	COOLING TIME VARIATION	4	5	4	5	3	21
9		BARREL TEMPERATURE HIGH	4	3	2	2	3	14
10		BARREL TEMPERATURE LOW	1	2	1	1	2	7
11	METHOD	COOLING TIME HIGH	1	1	1	2	3	8
12		INJECTION PRESSURE	1	2	1	3	2	9
13		COOLING TIME LOW	1	1	1	2	3	8
14		WARPAGE DEVELOPED	3	4	5	4	4	20
15	MATERIAL	HOLDING TIME	4	2	3	4	5	18
16		DEGRADATION	1	2	1	1	2	7
17		CONTAMINATION	1	2	1	1	2	7
18	MATERIAL	PREHEATING	1	1	1	1	1	5

RANKING MORE THAN 10 IS CONSIDERED AS POTENTIAL CAUSES

SUMMARY OF POTENTIAL CAUSES

S.NO.	STAGES	POTENTIAL CAUSES	RANKING
1	MAN	UNSKILLED	4 TH
2	MACHINE	COOLING TIME	1 ST
3		MOLD TEMPERATURE	5 TH
4		HOLDING TIME	3 RD
5	METHOD	WARPAGE DEVELOPED AFTER MOLDING	2 ND
6		BARREL TEMP.	6 TH

Why Why Analysis for Warpage Developed after Moulding

Why-1	Why? Warpage developed after Moulding
Answer:	Because –No Cooling Fixture after moulding
Why-2	Why? No Cooling Fixture after moulding
Answer:	Because – Not Considered during Development.
Root Cause	Not Considered during Development

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Validation of Potential Cause

S. NO	POTENTIAL CAUSE	VALIDATION METHOD	VALIDATION DATA		JUDGMENT
			SPEC:	OBSRV:	
1	COOLING TIME	THROUGH SCATTER DIAG	50 ± 5		We checked the relationship between Cooling Time & Warpage through Scatter which has been shown below

Decision Criteria:- $R^2 \geq 2 / \sqrt{N} = 0.36$, Where N = 30

INFERENCE:- Since R^2 is 88.5% which is greater than 36%. So there is a relationship b/w cooling time and Warpage but our spec is 45-55. As shown in graph within our spec there is no rejection. So, this cause is not significant

Validation of Potential Cause

S. NO	POTENTIAL CAUSE	VALIDATION METHOD	VALIDATION DATA		JUDGMENT
			SPEC:	OBSRV:	
3	HOLDING TIME	SCATTER DIAGRAM	3 ± 1		We checked the relationship between Holding Time & Warpage through Scatter which has been shown below

Decision Criteria:- $R^2 \geq 2 / \sqrt{N} = 0.63$, Where N = 10

INFERENCE:- Since $R^2 = 88\%$ which is greater than 63% means there is a relationship between Warpage & holding time. As shown in graph there is rejection developed within spec. It means our spec, needs to be revised. So, this is a significant cause.

Validation of Potential Cause

S. NO	POTENTIAL CAUSE	VALIDATION METHOD	VALIDATION DATA		JUDGMENT
			SPEC:	OBSRV:	
2	WARPAGE DEVELOPED AFTER MOLDING	DIMENSIONAL REPORT MADE FOR 500 PCS TO CHECK THE WARPAGE AFTER IMMEDIATE MOLDING & AFTER 5 MIN, 1 HR	PCS SHOULD NOT WARP		Valid Cause

	Immediate on machine	After 5min	After 1hr
0.42	0.54	0.39	
0.36	0.48	0.44	
0.48	0.5	0.56	
0.42	0.54	0.39	
0.38	0.5	0.86	
0.42	0.54	0.39	
0.48	0.5	0.56	
0.22	0.64	1	
0.58	0.7	1.06	
0.42	0.54	0.39	
0.62	0.74	1.1	
0.38	0.5	0.86	
0.48	0.5	0.56	
0.42	0.54	0.39	
0.36	0.5	0.86	
0.48	0.5	0.56	
0.22	0.64	1	
0.56	0.68	1.04	
0.42	0.54	0.39	
0.56	0.68	1.04	
0.62	0.74	0.96	
0.48	0.58	0.94	

Validation of Potential Cause

S. NO	POTENTIAL CAUSE	VALIDATION METHOD	VALIDATION DATA		JUDGMENT
			SPEC:	OBSRV:	
4	UN SKILLED	CHECK THROUGH SKILL MATRIX			In- Valid Cause

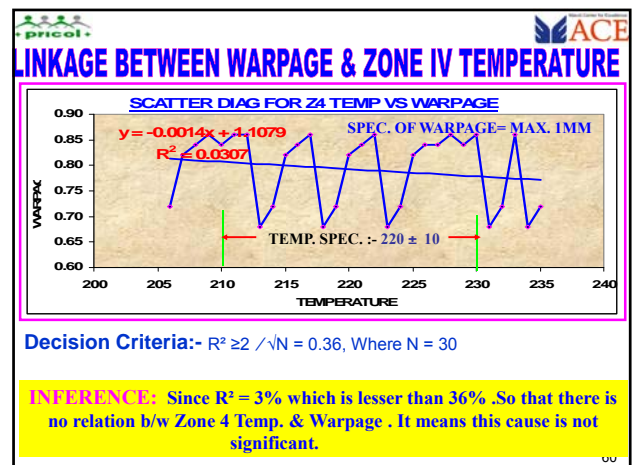
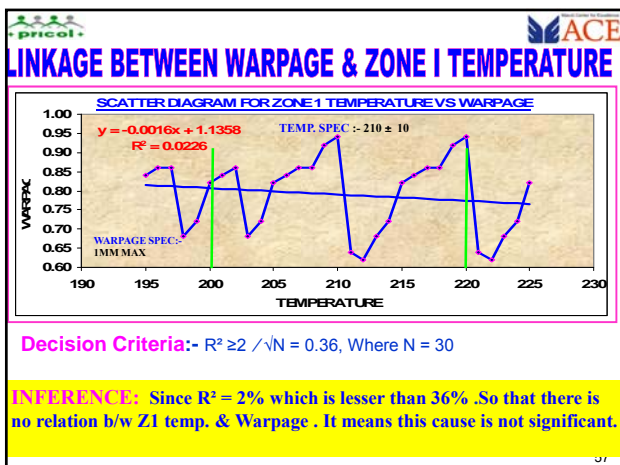
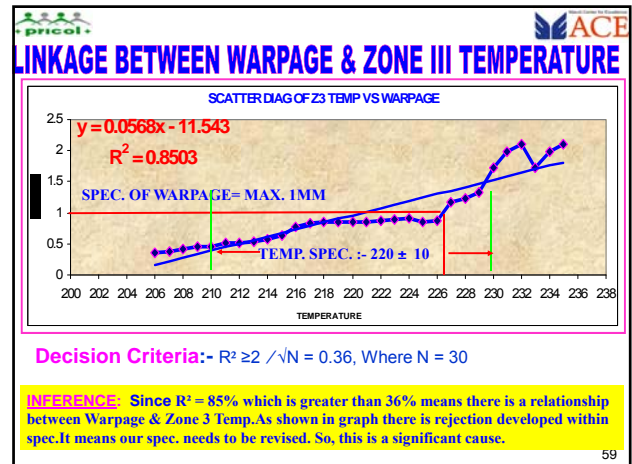
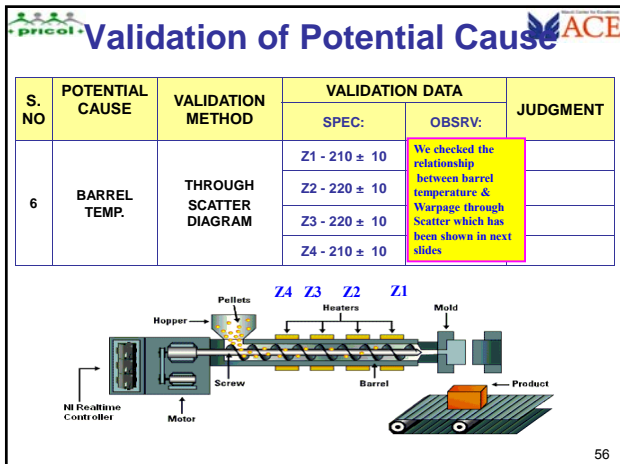
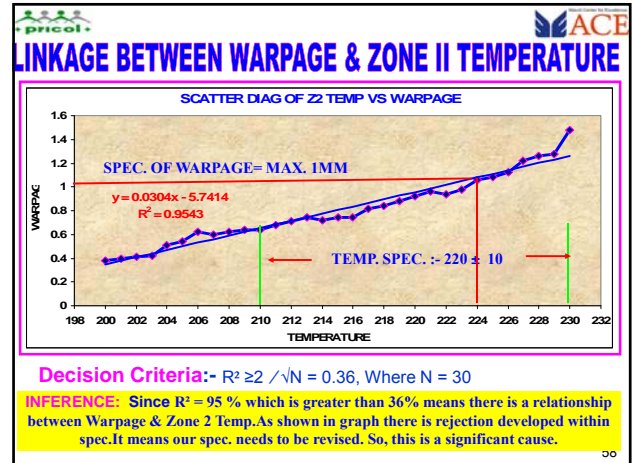
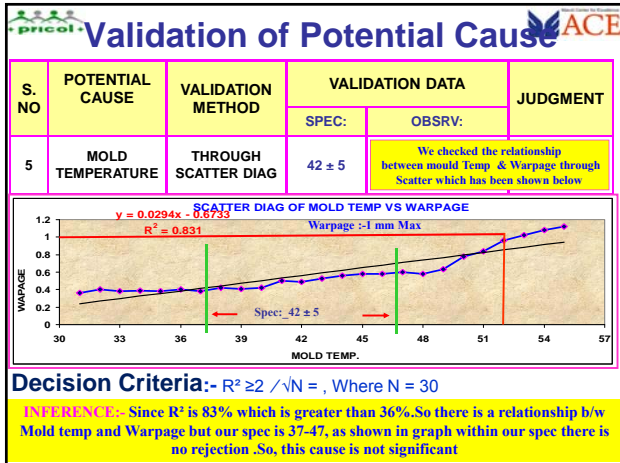
Skill Matrix		Skill Matrix						
Sl. No.	Name	Mould Setting	Trouble Shooting	M/C Operating	Preventive Maintenance	Defects Detection	Part Inspection	Packing
1	Ram villas	+	+	+	+	+	+	+
2	Anil	+	+	+	+	+	+	+

NEW OPERATOR: CAN WORK UNDER GUIDANCE, HE UNDERSTANDS KEY POINTS OF PROCESS, CAN WORK INDEPENDENTLY, UNDERSTAND THE ENTIRE PROCESS

CAN TEACH OTHERS

OPERATOR NAME	SHIFT	PRODUCTION QTY	REJECTION QTY.	PPM
RAMVILLAS	A	500	11	22000
ANIL	B	500	10	20000

INFERENCE: AS THERE IS NO SIGNIFICANT DIFFERENCE IN REJECTION OF OPERATORS SO THIS IS NOT THE SIGNIFICANT CAUSE



LIST OF VALID CAUSES		
SL. NO.	VALID CAUSE	PICTURE
1	HOLDING TIME.	
2	BARREL TEMPERATURE OF ZONE II & III.	
3	WARPAGE DEVELOPED AFTER MOLDING	

COUNTERMEASURE NO. 3					
S.N O.	COUNTERMEASURE	LOCATION	IMPLEMENTATION DATE	VERIFICATION DATE	STATUS
3	BARREL TEMPERATURE FOR ZONE III IS FROZEN i.e: 210 ± 5°C EARLIER IT WAS 220 ± 10°C	PROCESS DATA SHEET	04 JUNE 2011	04 JUNE 2011	OK

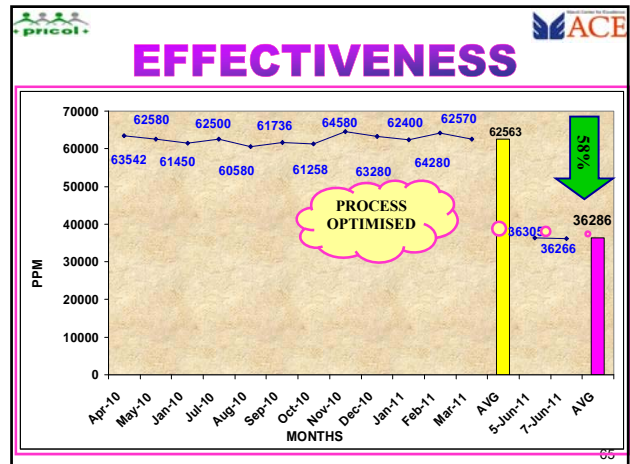
As shown in graph
Equation $Y = m x + c$, hence
 $Y = 0.0568 x - 11.543$
Warpage = $0.0568 * \text{zone 2 Temp.} - 11.543$
Customer spec of warpage = Max- 1mm
RR Tgt = 0.80 mm
 $0 = 0.0568 * \text{Zone Temp.} - 11.543$
Zone 2 Temp. = $11.543 / 0.0568 = 203^\circ\text{C}$
 $0.8 = 0.0568 * \text{Zone 2 Temp} - 11.543$
Zone2 Temp = $11.543 + 0.8 / 0.0568 = 217^\circ\text{C}$

Spec as per Equation :- 203 - 217°C
so we decided to revised this spec is 210 ± 5

COUNTERMEASURE NO. 1					
S.N O.	COUNTERMEASURE	LOCATION	IMPLEMENTATION DATE	VERIFICATION DATE	STATUS
1	HOLDING TIME FROZEN FROM . 3 ± 1 i.e. 5 ± 1	ON MACHINE	04 JUNE 2011	04 JUNE 2011	OK

As shown in graph, Equation $Y = m x + c$
 $Y = 0.1173 x - 1.362$
Warpage = $0.1173 * \text{Holding Time} - 1.362$
Customer spec of warpage = Max- 1mm
RR Tgt = 0.80 mm
 $0 = 0.1173 * \text{Holding Time} - 1.362$
Holding Time. = $1.362 / 0.1173 = 11.61$
 $0.8 = 0.1173 * \text{Holding Time} - 1.362$
Holding Time = $1.362 + 0.8 / 0.1173 = 8.18$

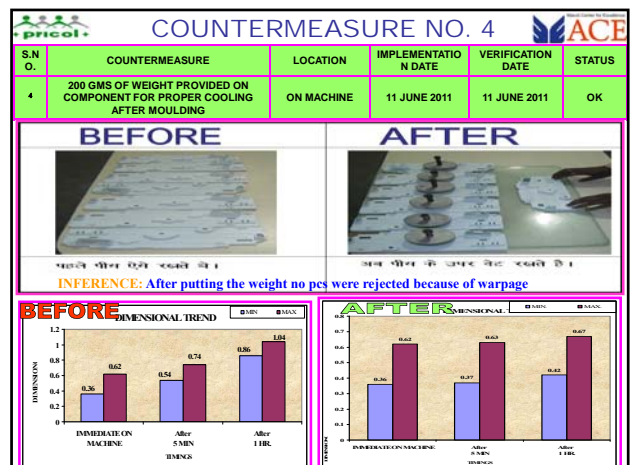
Spec as per Equation :- 11.61 - 8.18
But on this spec Cycle Time Increased. So that As per scatter plot we decided to revised this spec is 5 ± 1

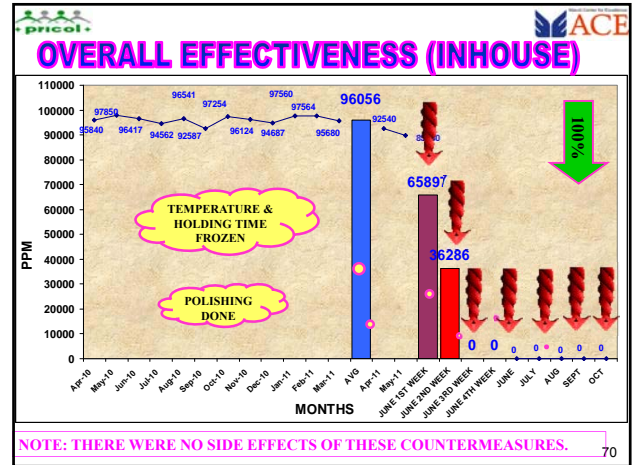
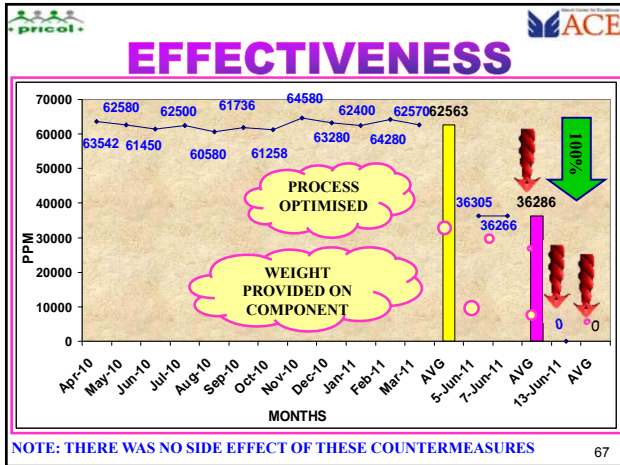


COUNTERMEASURE NO. 2					
S.N O.	COUNTERMEASURE	LOCATION	IMPLEMENTATION DATE	VERIFICATION DATE	STATUS
2	BARREL TEMPERATURE FOR ZONE II IS FROZEN i.e: 205 ± 5°C EARLIER IT WAS 220 ± 10°C	PROCESS DATA SHEET	04 JUNE 2011	04 JUNE 2011	OK

As shown in graph,
Equation $Y = m x + c$, hence
 $Y = 0.0304 x - 5.7414$
Warpage = $0.0304 * \text{zone 2 Temp.} - 5.7414$
Customer spec of warpage = Max- 1mm
RR Tgt = 0.80 mm
 $0 = 0.0304 * \text{Zone Temp.} - 5.7414$
Zone 2 Temp. = $5.7414 / 0.0304 = 189^\circ\text{C}$
 $0.8 = 0.0304 * \text{Zone 2 Temp} - 5.7414$
Zone2 Temp = $5.7414 + 0.8 / 0.0304 = 215^\circ\text{C}$

Spec as per Equation :- 189 - 215°C
We produce 500 pcs on this spec. , but pcs were rejected because of short mould so we decided to revised this spec is 205 ± 5

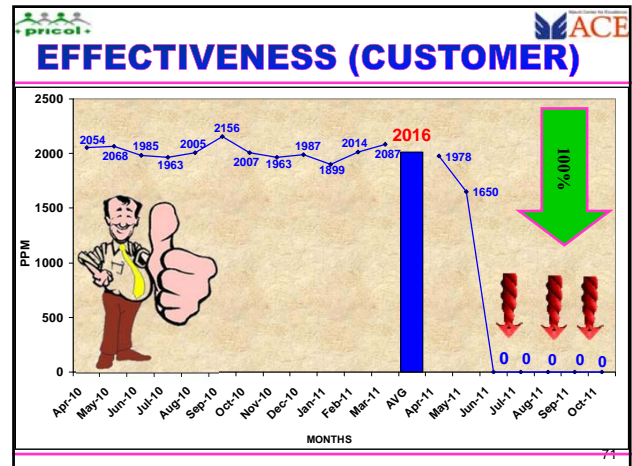




DEFECT-2 CRACK

UNDERSTANDING OF PROBLEM

Root Cause identified for crack – Ejector Speed High due to Catching developed in Mould at Rib Area (Same Methodology was used for analysis as used for Warpage)



COUNTERMEASURE TAKEN

S.NO	COUNTERMEASURE	LOCATION	IMPLEMENTATION DATE	VERIFICATION DATE	STATUS
1	High polish done in mould and frequency decided in 20,000 shots.	Inhouse	08 June 2011	08 June 2011	Ok

COUNTERMEASURE EFFECTIVENESS FOR CRACK

STANDARDIZATION

S.no	What	When	Where	Who
1	PROCESS DATA SHEET UPDATED	25 JUNE 2011	PROCESS DATA SHEET	NEEL KAMAL
2	PM CHECK SHEET AND HISTORY CARD UPDATED FOR (RIB AREA POLISHING FREQUENCY 20K SHOTS)	29 JUNE 2011	PROCESS DATA SHEET	NEEL KAMAL
3	WORK INSTRUCTIONS UPDATED	28 JUNE 2011	WORK INSTRUCTIONS	NEEL KAMAL
4	PFMEA AND CONTROL PLAN UPDATED	28 JUNE 2011	PFMEA	NEEL KAMAL

HORIZONTAL DEPLOYMENT

S.no	What	When	Where	Who
1	SEPARATE POLISHING FREQUENCY DECIDED FOR RIB AREA	05 JULY 2011	HOUSING FRONT FOG LAMP AND ROOM LAMP SWIFT	MR. R.L.DOGRA

TANGIBLE BENEFITS

- Customer rejection ppm reduced from 2016 to 0 on account of Warpage & Crack.
- Inhouse Rejection reduced from 96056 PPM avg to 0. Per month to 0 PPM on account of CRACK & WARPAGE.
- Productivity increased by 9.6 % (Man per unit per hour)
- Spray Consumption Minimized & save Rs. 2170 per Year after polishing done
- Direct cost saving = $1440 \times 12 \times 8.96 = \text{RS. } 154829$ (approx) Rs per Year on Account of Saving by Eliminate Warpage & Crack from Back cover YG8

INTANGIBLE BENEFITS

- Most intractable problem resolved
- Horizontally Deployment done benefiting other Component
- Computer skill developed for making Presentation
- Knowledge of new tools & techniques
- Knowledge gain for all
- Team morale high to take up More challenges.

LESSON LEARNT

- > COOLING FIXTURE SHOULD BE THERE AFTER MOLDING TO ELIMINATE DEFECT WARPAGE FOR MATERIAL PPTE.
- > POLISHING FREQUENCY SHOULD BE SEPERATELY DECIDED FOR EACH AFFECTED AREA OR REMOVAL ITEMS.
- > PROCESS PARAMETER OPTIMISATION SHOULD BE DONE DURING DEVELOPMENT

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QC TOOLS & TECHNIQUES USED

CHECKSHEET

DATE	NO	NO	NO	NO	NO
24/04/20	06	1	06	0	0
24/04/20	06	1	06	0	0
24/04/20	06	1	06	0	0
24/04/20	06	1	06	0	0
24/04/20	06	1	06	0	0

PARETO DIAGRAM

PROCESS FLOW

```

    graph TD
      A[New Material] --> B[Receiving of New Material]
      B --> C[Injection Molding]
      C --> D[Final Inspection]
      D --> E[Packaging & Storage]
      E --> F[Dispatch]
  
```

SCATTER DIAG.

CAUSE & EFFECT DIAGRAM FOR MOULDING

GRAPH

CAUSE & EFFECT DIAGRAM

BRAIN STORMING

Why Why Analysis for ELECTOR SPEED HIGH

- Why 1: The Motor speed High
- Why 2: The Motor speed is not properly controlled
- Why 3: The Motor speed is not properly controlled
- Why 4: The Motor speed is not properly controlled
- Why 5: The Motor speed is not properly controlled
- Why 6: The Motor speed is not properly controlled
- Why 7: The Motor speed is not properly controlled
- Why 8: The Motor speed is not properly controlled
- Why 9: The Motor speed is not properly controlled
- Why 10: The Motor speed is not properly controlled

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THANK YOU

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