Applying Six Sigma to reduce customer complains for Rice Cooker of Walton Brand Using DMAIC

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Introduction

Walton, the largest electronics appliance manufacturer brand in Bangladesh, delivered 213 ,296 products (rice cookers) in 2023 to the customers with 1 year warranty period. Despite being one of the popular products, customers complaints regarding the quality of this was concerning. Our aim is to implement six sigma approach in lieu of conventional solutions to improve the quality of this product.

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Problem

- In 2023, Walton Customer Service received 90,768 customer complaints about the quality of the products which were within warranty period.
- Presently, all of these complaints are being resolved by providing free provision spare parts, technical servicing and few replacements.
- This leads to External Cost of Quality increase which is reducing the overall revenue of the company by significant level.

Data Collection

The data has been collected from the QC department of Walton. The following table shows the monthly breakdown of the customer complaints from January-2023 to August-2024.

Months	Number of Customer Complaints
Jan-23	8801
Feb-23	7807
Mar-23	8489
Apr-23	6500
May-23	7536
Jun-23	6065
Jul-23	7022
Aug-23	7355
Sep-23	7230
Oct-23	8029
Nov-23	7856
Dec-23	8078
Grand Total	90768

Months	Number of Customer Complaints
Jan-24	8006
Feb-24	7596
Mar-24	7871
Apr-24	5007
May-24	5760
Jun-24	4964
Jul-24	5524
Aug-24	5856
Grand Total	50584

SIPOC Diagram

Suppliers	Inputs	Processes	Outputs	Customers
• Raw Materials Suppliers • Circuit board manufacturers • Packaging Suppliers	• Raw materials (plastic, metal) •Circuit boards • Packaging materials • Assembly tools and machineries	• Material inspection • Body part production • Heating plate production • Assembling of all parts • Quality check • Packaging and dispatch	• Assembled rice cookers • Quality-tested products • Packed units ready for shipment	• Retailers • Distributors • End consumers (households, businesses)

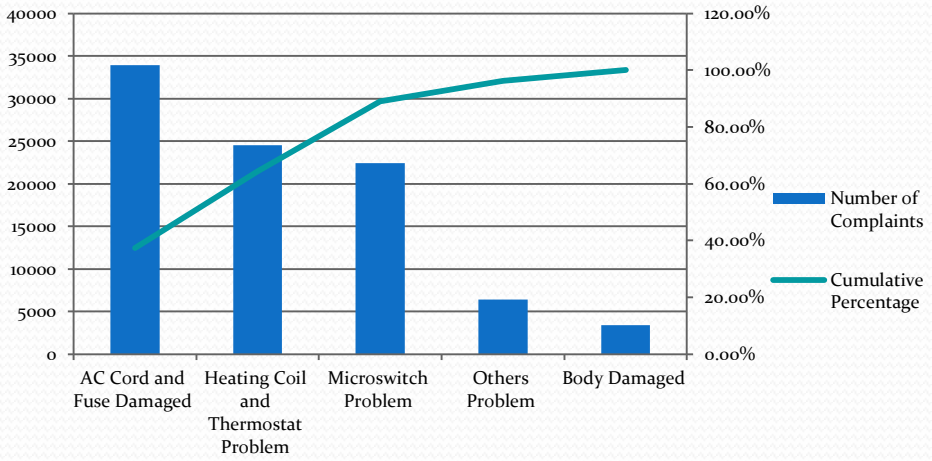
DPMO & Sigma Level

- Number Of Opportunities = 213296
- Number of Defects = 90768
- DPMO = (Number of Defects / Number of Opportunities) × 10^6
  = 425549.47
- Sigma Level = Normsinv (1 – 90768/213296) + 1.5
  = 1.69

Process Capability

Mean	425.5495
Standard Deviation	20.62885
Upper Control Limit	450
Lower Control Limit	350
Cp = (UCL - LCL) / 6σ	0.80793
Cpu = (UCL - μ) / 3σ	0.395086
Cpl = (μ - LCL) / 3σ	1.220774
Cpk = min (Cpu, Cpl)	0.395086

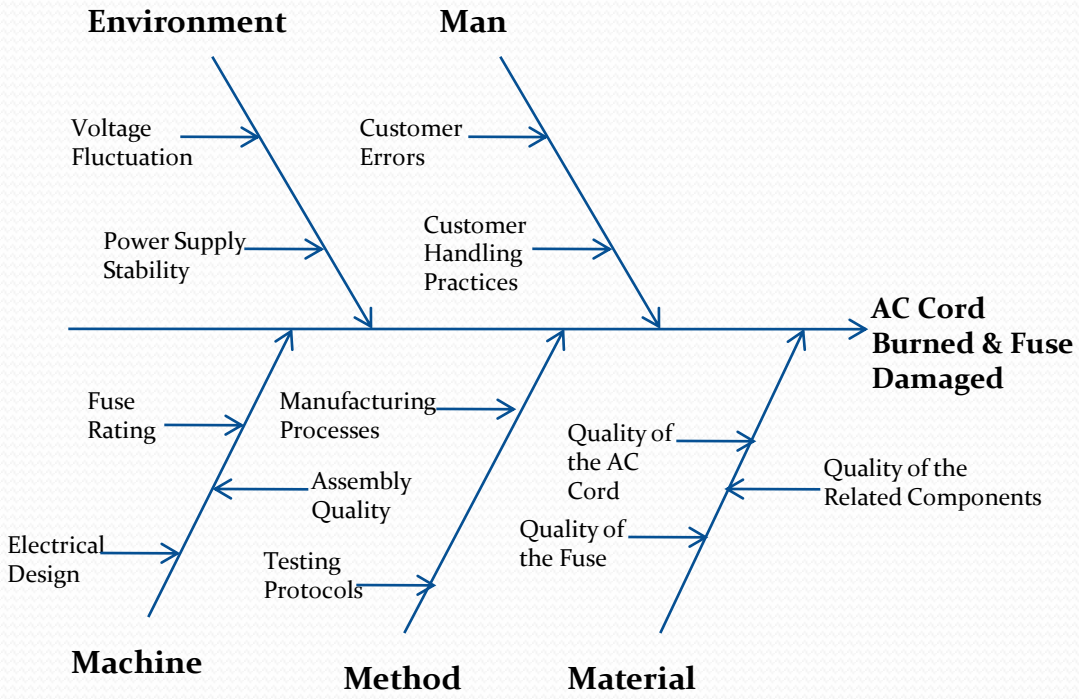
Pareto Analysis

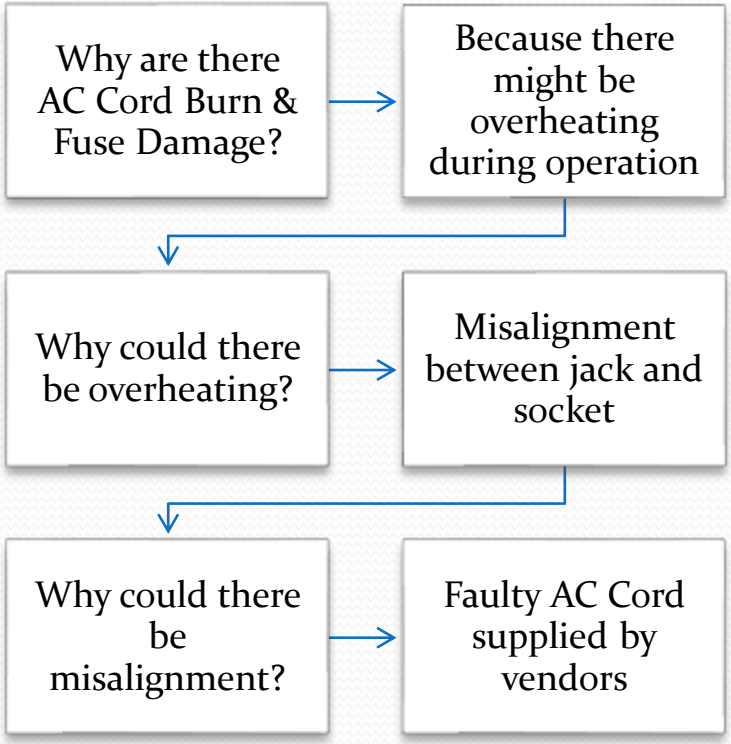


Customer Complaints Category	Number of Complaints	Percentage	Cumulative Percentage
AC Cord Burned and Fuse Damaged	33932	37.38%	37.38%
Heating Coil and Thermostat Problem	24560	27.06%	64.44%
Micro-switch Problem	22424	24.70%	89.15%
Other Problems	6420	7.07%	96.22%
Body Damaged	3432	3.78%	100.00%

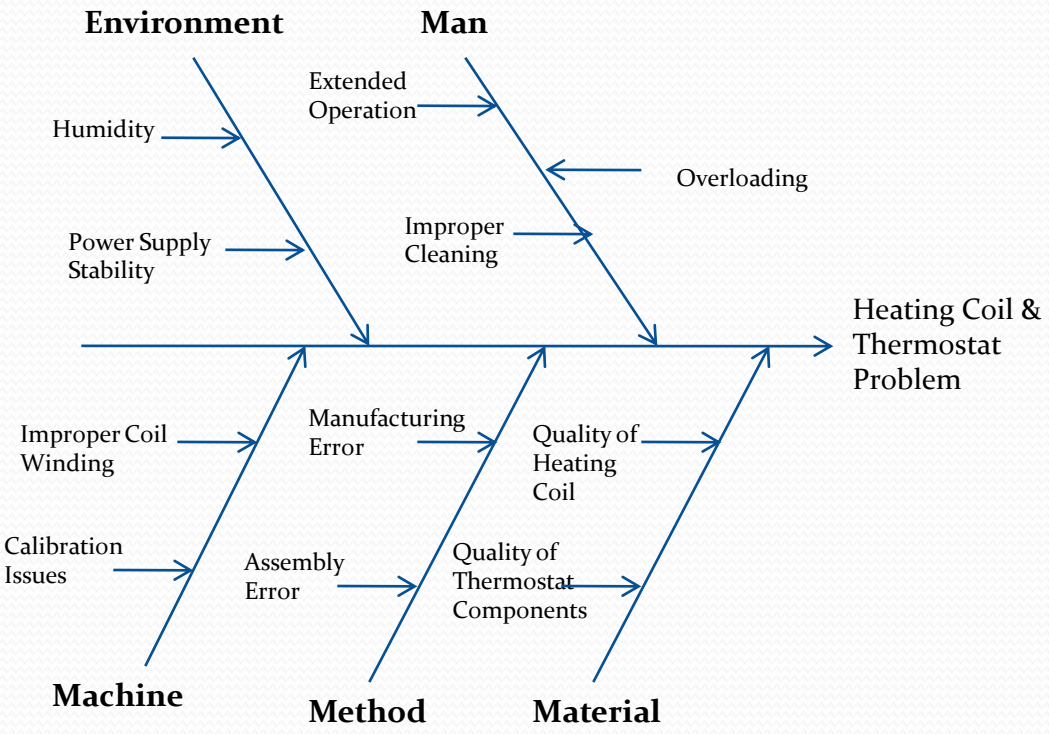
Interpretation: The Ac Cord Burned and Fuse Damaged, Heating Coil and Thermostat Problem and Micro-switch Problem are the top 3 categories of customer complaints and 3 of them consists of 89.15% of the problems.

Root Cause Analysis





Root Cause Analysis



Why are there Heating Coil & Thermostat Problem?

Because there might be overheating during operation

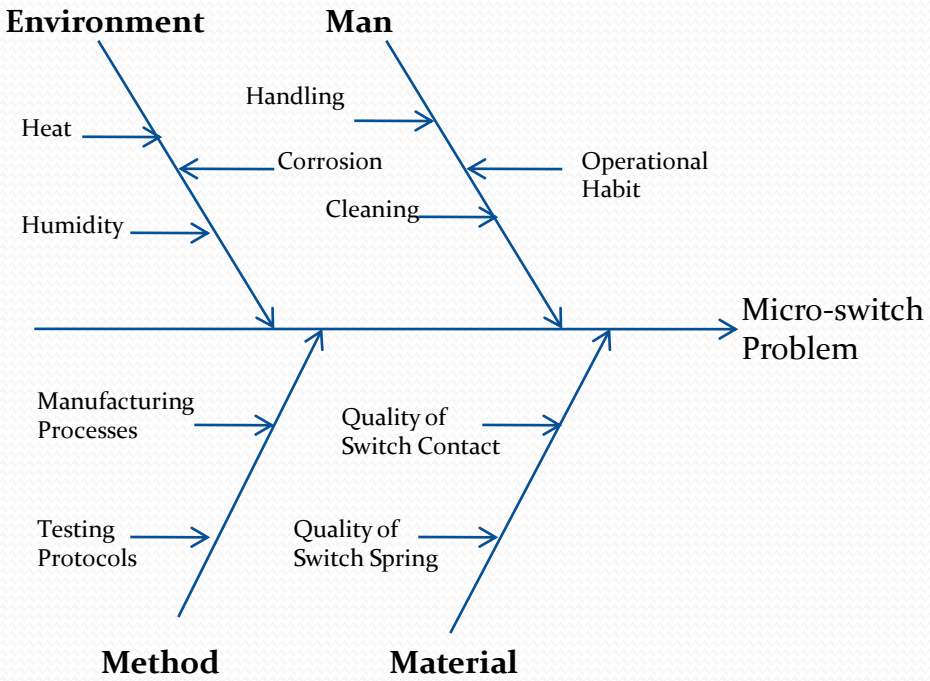
Why could there be overheating?

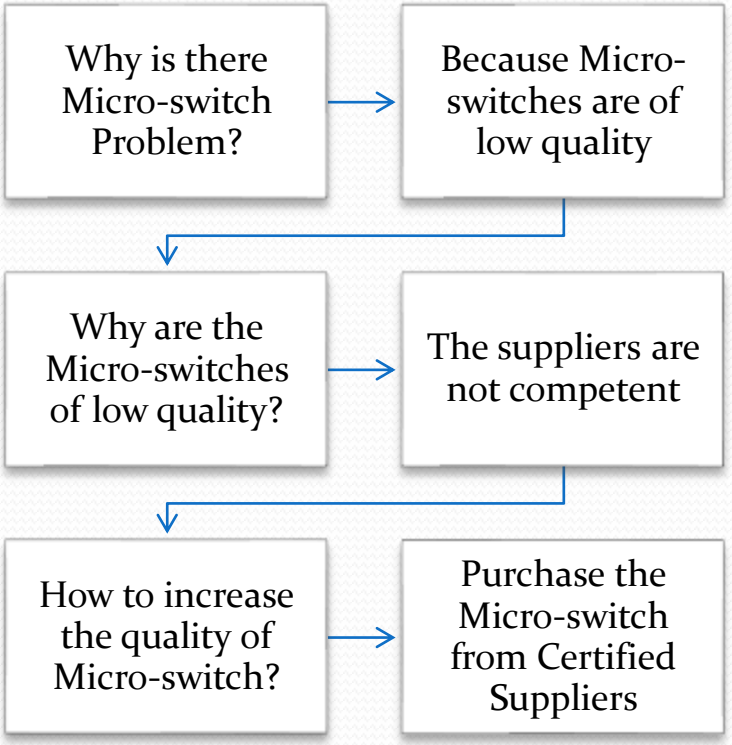
Deposition of Rust in Thermostat spring and the deformation of heating coil

Why could there be rust deposition and deformation?

Material of Thermostat spring and inefficiency of the QC operator

Root Cause Analysis





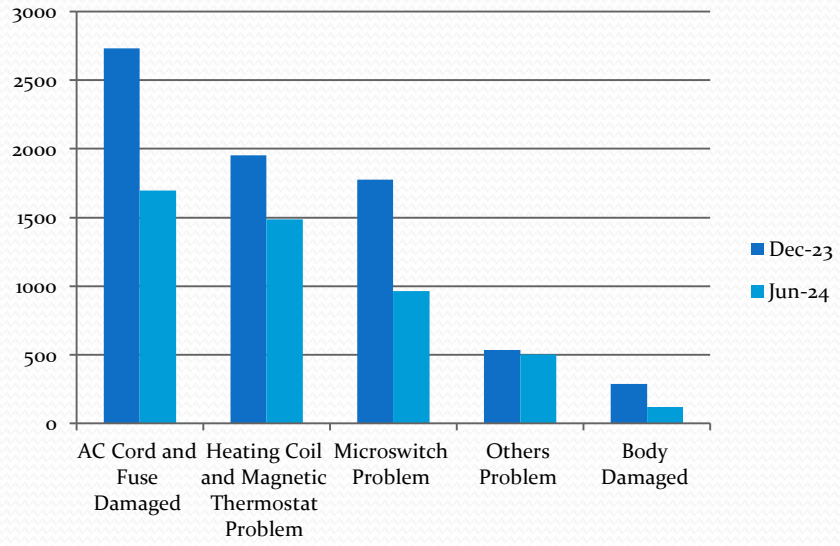
Actions Taken

Problem Category	Steps Taken
AC cord Burned and Fuse Damaged	• In-house production of sockets to remove misalignment.
Heating Coil and Thermostat Problem	• Use of Stainless Steel for Thermostat spring Material. • Bimetallic type thermostat usage in upcoming models. • Train QC operators to sort out faulty heating coil more efficiently.
Micro-switch Problem	• Purchasing Micro-switch from VDE or TUV certified suppliers.

Pilot Results

This is a comparison between the customer complaints of months of Dec-2023 and June-2024.

Problems	Dec-23	Jun-24
AC Cord Burned and Fuse Damaged	2733	1695
Heating Coil and Magnetic Thermostat Problem	1952	1489
Micro-switch Problem	1774	965
Others Problem	535	503
Body Damaged	286	121
Total	**7280**	**4773**



Improved DPMO & Sigma Level

- Number Of Opportunity = 17775
- Number of Defects = 4773
- DPMO = (Number of Defects / Number of Opportunities) ×10^6
  = 26853.21
- Sigma Level = Normsinv (1 – 90768/213296) + 1.5
  = 2.12

Improved Process Capability

Mean	279.2686
Standard Deviation	16.71133
Upper Control Limit	350
Lower Control Limit	250
Cp = (UCL - LCL) / 6σ	0.997327
Cpu = (UCL - μ) / 3σ	1.410846
Cpl = (μ - LCL) / 3σ	0.583808
Cpk = min (Cpu, Cpl)	0.583808

Result Summary

- Customer Complaints reduced over 34%.
- Reduced External Cost of Quality and Increased Revenue.
- Sigma Level increased from 1.69 to 2.12
- Process Capability increased from 0.39 to 0.58

THANK YOU