



SKYQUAD ELECTRONICS & APPLIANCES PVT. LTD.
Plant B

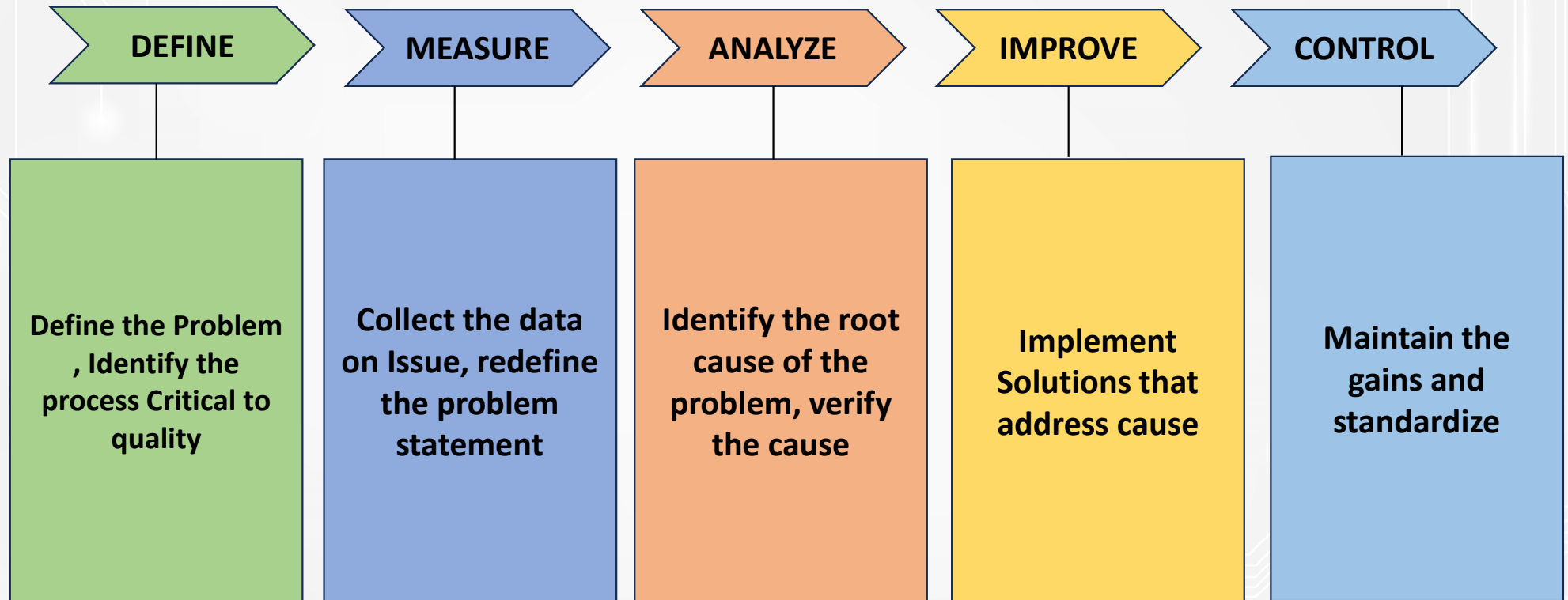
Problem Statement: The yield is dropped to < 90 % against the Target > 98.5%

- Project : IDU
- Model : JIDU6911
- Date : 12/02/2025 to Date 17/02/2025

Issue : The yield is dropped to < 90 % against the Target > 98.5%

Major contributors is flash programming information in IC U51 is invalid/ corrupted

DMAIC Improvement Process



DMAIC Improvement Process

DEFINE

The Yield is not within customer specified target yield (>98.5%)

The yield at both the Board level test and Unit level test is currently below 90%. The primary contributors to this low yield are defects categorized as Login Fail, Initial Fail, and Power On Test Fail.

Impact on the product quality and productivity due to above yield leads to loss of production and increased repair costs

1. Internal Failure Costs: Costs associated with defects found before the product reaches the customer, such as rework, scrap, and re-testing.
2. External Failure Costs: Costs incurred when defects are found after the product has been delivered to the customer, including warranty claims, returns, and repairs.

DMAIC Improvement Process

DEFINE

Project Team:

#	Name	Function	Department	Roles and Responsibilities
1	Amol R	Manager	Engineering	Project Lead
2	Dipak S.	Manager	SMT	Machine Programming and analysis
3	Gaurav S.	Manager	Quality	Allocation of assignment to IPQC for analysis, yield monitoring and control
4	Sandeep Y.	Manager	Production	Production Slot availability for trail and analysis
5	Suresh G.	Lead Engineer	Engineering	Meetings, commuication and availability of machines for trails and analysis
6	Manoj M.	Process Engineer	Engineering	Conduct Analysis and Trial
7	Vishal J.	SMT Production Engineer	SMT Production	Provide production slot and machine/ line availability
8	Shubham	Production Engineer	FATP Production	Provide production slot and machine/ line availability
9	Vikas M.	IPQC Engineer	SMT_Quality	Prepare Analysis and Trial report
10	Chitrasen B.	IPQC Engineer	FATP_Quality	Prepare Analysis and Trial report
11	Md. Abdul	Test Engineer	Test Engineering	Prepare Analysis and Trial report of Test defects
12	Nikhil	Debug Engineer	TRC	Analysis of defects and provide report

DMAIC Improvement Process

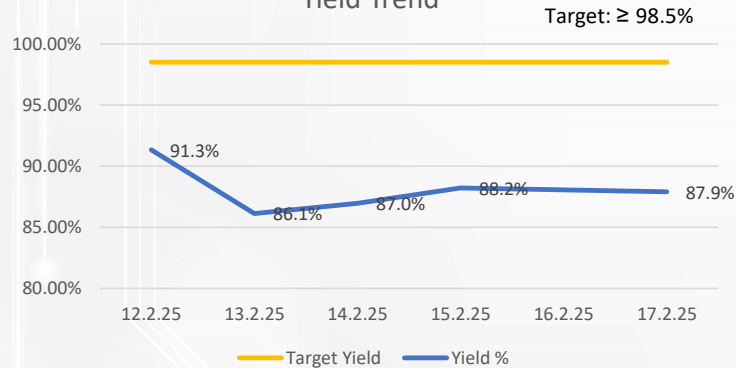
MEASURE

Date	12.2.25	13.2.25	14.2.25	15.2.25	17.2.25	Total
Production Qty	7349	7259	7050	7851	7710	37219
Passed Qty	6711	6252	6130	6925	6776	32794
Rej Qty	638	1007	920	926	934	4425
Target Yield	98.50%	98.50%	98.50%	98.50%	98.50%	98.50%
Yield %	91.3%	86.1%	87.0%	88.2%	87.9%	88.1%
Rej %	8.7%	13.9%	13.0%	11.8%	12.1%	11.9%

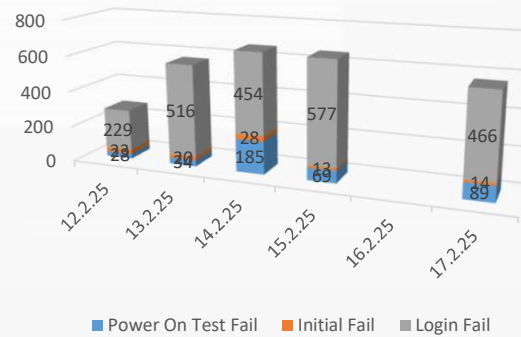
Defect Contribution	12.2.25	13.2.25	14.2.25	15.2.25	17.2.25	Total
Power On Test Fail	28	34	185	69	89	405
Initial Fail	23	20	28	13	14	98
Login Fail	229	516	454	577	466	2242

Component Location	12.2.25	13.2.25	14.2.25	15.2.25	17.2.25	Total
Total Defect Qty	638	1007	920	926	934	4425
IC U51 Fail	280	570	667	659	569	2745
Other Fail	358	437	253	267	365	1680
IC U51 Fail %	43.89%	56.60%	72.50%	71.17%	60.92%	62.03%
Other Fail %	56.11%	43.40%	27.50%	28.83%	39.08%	37.97%

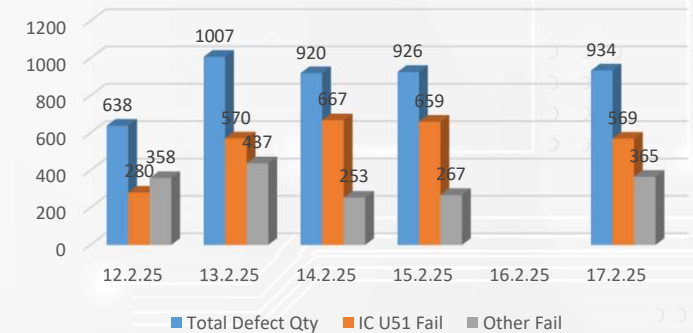
Yield Trend



Defect Contribution



Total Defect Vs IC U51



DMAIC Improvement Process

Analyze

Why-1. The overall yield is 88.1% against the target 98.5 %

Why-2. In the defect % (i.e.11.9%), The major contributors are
Power on fail (405#) , Initial fail (98#) and login fail (2242#)

Why-3. The defects Power on fail, Initial fail and login fail have recovered after replacing the IC-U51 for the
phenomenon program corrupted/ no program IC

Why-4. Due to IC U51 flash programming abnormality, the above defects occurred

METHOD:

1. Program selection-NG
2. File Selection-NG
3. Selection of Options in Settings-NG
4. Verification of Checksum- NG

ENVIRONMENT: Components are not baked and used- Components being used as per Shelf life and baked, recorded and monitored by IPQC Engineer- OK

MAN:

1. Input and output mix up with no identification- Machine control available for Pick and place- OK
2. Marking on IC for programmed and non programmed IC's- Machine control available for identification- OK

EFFECT

IC U51
fail

MEASUREMENT: NA

MATERIAL: NA

MACHINE: Abnormal behavior

1. Checksum found Ok and
2. Validation at every two hr. is available-OK

DMAIC Improvement Process

Analyze

Verification of Root cause:

1. The Suspected ICs of program abnormality (50#) have checked for booting during Power on, it has indicated no booting.
2. Comparison done for Good and NG Flash ICs in command prompt using console. Have found, no information in NG board IC compared to Good Board IC
3. It has indicated either ICs have not programmed, or program is corrupted

```
COM4 - PuTTY
t=8p== @==@B @o<== F==@== A==@==,
Op==
==@rD(==
@RA1k=q@@B1@? (@b L"== Fco(==T==J EXJEB==>@ @1==h==n==
d==d==p== @==@==
@e==|==@ed @piL==+== H и(== R==@==@==
Format: Log Type - Time(microsec) - Message - Optional Info
Log Type: B - Since Boot(Power On Reset), D - Delta, S - Statistic
S - QC_IMAGE_VERSION_STRING=BOOT.XF.0.3.1.1-00078-IPQ90xxLZB-1
S - IMAGE_VARIANT_STRING=IPQ9574LA
S - OEM_IMAGE_VERSION_STRING=crm-ubuntu147
S - Boot Interface: NAND
S - Secure Boot: Off
S - Boot Config @ 0x000a602c = 0x000002e5
S - JTAG ID @ 0x000a607c = 0x001ad0e1
S - OEM ID @ 0x000a6080 = 0x00000000
S - Serial Number @ 0x000a60a8 = 0x073319b2
S - OEM Config Row 0 @ 0x000a4048 = 0x0000000000000000
S - OEM Config Row 1 @ 0x000a4050 = 0x0000000000000000
S - Feature Config Row 0 @ 0x000a4010 = 0x0000800000000000
S - Feature Config Row 1 @ 0x000a4018 = 0x0000002000000000
S - Feature Config Row 2 @ 0x000a4020 = 0x0100300000000000
S - FM VERSION @ 0x000a4004 = 0x00000003
S - TAG VERSION @ 0x000a4004 = 0x00000006
S - FEATURE ID @ 0x000a4000 = 0x00000000
S - PBL Patch Ver: 0
S - TME-L LCS: 0x0b
S - I-cache: Off
S - D-cache: Off
```

Good Board IC information

```
COM4 - PuTTY
t=8p== @pF== @V==", @B @r== A==@kR)v0==
```

NG board IC information

DMAIC Improvement Process

Analyze

Why flash IC program abnormality found...?

- The existing machine (Model : Dediprog) have replaced with New machine Model (U848 Pro) in order to increase the UPH
(Before : 16 IC Sockets & 1 Nozzle with 160 Sec)
(After: 64 Sockets& 4 Nozzles with 40 sec)
- The ICs have programmed with Machine-Model U848 pro and used in production
- The program setting is done as per SOP defined by machine provider with the Firmware file to be loaded (Main File + Partition file)→ Checksum: C05B9374

Name	Date modified	Type	Size
 RTQ6400-D347 ALL-300G IC Burn SOP_20240620-R74	2025-01-06 18:38	Microsoft PowerPoint...	1,092 KB
 RTQ6400D-D374-RT_V_240620-74_MX35UF2GE4AD_mp.bin	2025-01-06 18:38	BIN File	2,74,198 KB
 RTQ6400D-D374-RT_V_240620-74_PartitionTable.def	2025-01-06 18:38	DEF File	1 KB
 RTQ6400D-D374-RT_V_240620-74_PartitionTable.mbn	2025-01-06 18:38	MBN File	1 KB

- Required Checksum is verified, and trail has been conducted for 480 #
- The result have found 98.75% yield against 98.5 % and hand-overed to mass production. Trail report as follows:

Date	20/01/2025
Production Qty	480
Passed Qty	474
Rejection Qty	6
Target	98.50%
Yield %	98.75%
Rej %	1.27%

DMAIC Improvement Process

Analyze

- The machine in-use have started from 10/02/25
- During Mass production of Qty > 35000 #, observed yield found deteriorated i.e. Average defect Yield is 11.9 % in which average contribution of IC U51 is 62.03 %
- **Containment action** : The usage of machine stopped and programmed qty with this programmer quarantined. The earlier programmer (Dediprog) have re-installed again and validated with trail qty 480 Nos. The result have found 99.38% yield against 98.5 % and hand-overed to mass production.
- Trail Yield report:

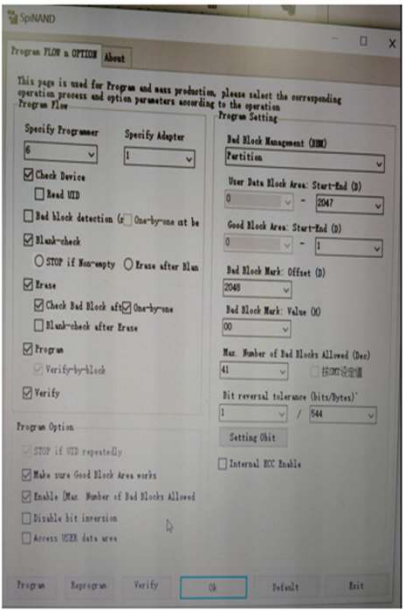
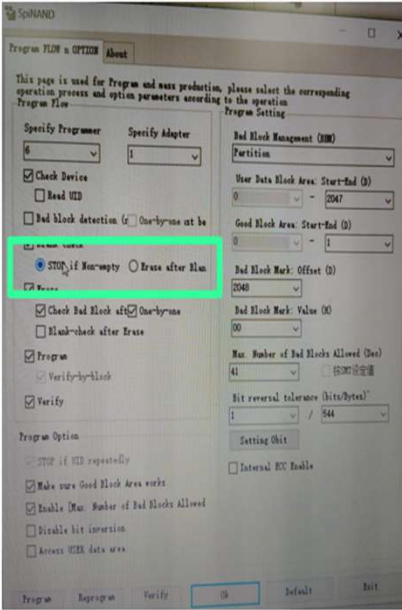
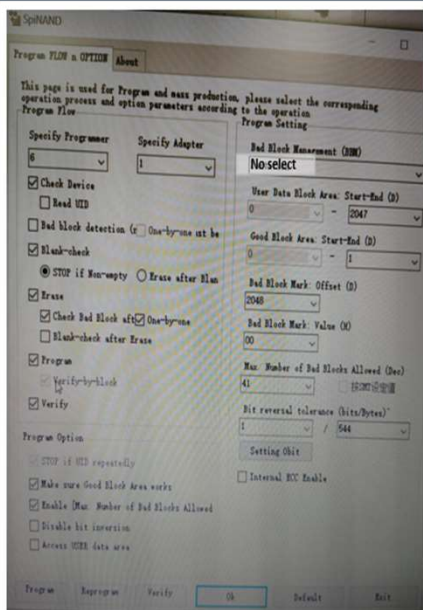
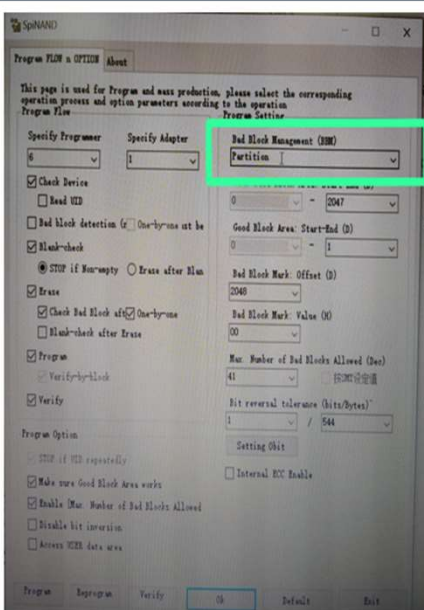
Date	18/02/2025
Production Qty	480
Passed Qty	477
Rejection Qty	3
Target	98.50%
Yield %	99.38%
Rej %	0.63%

- **Corrective action:**
- The settings in Dediprog Programmer have sent to U848pro Programmer machine technical support team.
- Have found the Options for partition have not been verified during programming although checksum was reading as required.
- The settings has made aligned as per Dediprog programmer.
- Trail-1 have conducted for 300 # followed by additional trails (Trail-2 and Trail-3) to ensure yield consistency.

DMAIC Improvement Process

Analyze

The U848 pro programmer Setting :

Sr. No.	Before	After
1		
2		

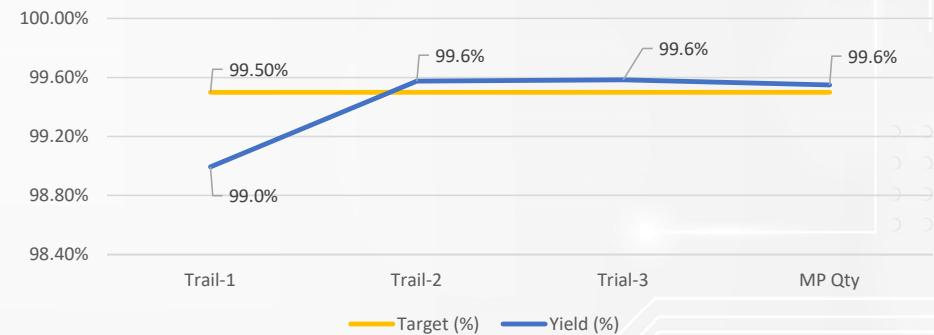
DMAIC Improvement Process

Analyze

- **Trail 1 report of 300 #: Date 04042025**
- Observation during trail-1- 298 #, ICU51 defect found – 03 #
- **Trail-2 conducted for 480 #: date 05042025**
- Observation during trail-1- 471 #, ICU51 defect found – 02 #
- **Trail-3 conducted for 1440 #: date 06042025**
- Observation during trail-1- 471 #, ICU51 defect found – 06 #
- The Overall Yield and its defect trend is as follows:

Date	04/04/2025	05/04/2025	07/04/2025	10/04/2025
IC-U51 Trails	Trail-1	Trail-2	Trial-3	MP Qty
Sample Production Qty	298	471	1440	2000
Passed Qty	295	469	1434	1991
Rejection Qty	3	2	6	9
Target (%)	99.50%	99.50%	99.50%	99.50%
Yield (%)	99.0%	99.6%	99.6%	99.6%
Rej (%)	1.0%	0.4%	0.4%	0.5%

IC-U51 Defect Trend



DMAIC Improvement Process

Improve

Scope of improvement, implementing solutions

1. With respect to final yield at trail-3 (1440 #, 99.6%) , the programming with U848 Pro buy off given to mass production.
2. The major factor of failure i.e. Options in programming setting have incorporated in SOP.
Document No: SEAL/E/AIP/227
3. Validation of flash programming must be done for >1000 Qty to validate the yield during the machine change/ program change before hand overing to mass production followed by PCN document.
Doc Number: SEAL/E/PCN/124
4. Below are the milestones defined and its status – Closed.

Milestones	Date	Status	Remarks
Define the Problem statement	18-2-25	Closed	
Define the Team and its responsibilities	18-2-25	Closed	
Collection of Data and Measurement	19-2-25	Closed	
Root Cause Analysis and Verification of Root Cause	10-3-25	Closed	Analysis w.r.t. Dediprog Programmer data and U848 Programmer data with machine provider support leads to time consumption
Corrective Action implementation and its trial yield analysis	7-4-25	Closed	
Mass Production initiation and yield monitoring	10-4-25	Closed	
Actions and Controls incorporation in SOP's, Checksheet	11-4-25	Closed	

DMAIC Improvement Process

Control

Maintaining and standardization control

1. Daily Validation of Checksum at Flash IC programming included in FAI process
Document Number: SEAL/IPQC/IPVS/197
2. Machine Authorization list have been displayed to avoid any changes in program
Document Number: SEAL/PSMT/AIPM/056
3. Trail report of > 1000 Qty (Machine Buy off report) with Pass Criteria of < 0.5 % of IC U51 defect. (Doc Number: SEAL/E/PCN/124)

Conclusion:

With respect to solution reached and achieved desired result, the machine buy off process to be followed as per the control mechanism with yield of 99.5 % at IC U51 (i.e. Defect < 0.5 % of IC U51) at minimum trail qty is > 1000 Nos.

DMAIC Improvement Process

THANK YOU