CHAPTER IV

RESULT, ANALYSIS AND DISCUSSION

4.1 Introduction

In this chapter, all data and information that have been listed from Chapter 3 which utilizing Kobetsu Kaizen as a tools for productivity improvement will be elaborated in detail. As stated in Chapter 1 previously, the main objective of this study is to improve yield quantity discrepancy in semiconductor back-end process. The findings and analysis for each step in order to meet the objectives are as follows:

4.2 Model Selection (Equipment/Line/Process)

Model selection is the most important step where the selected line, machine, product/package will be chosen based on the highest contribution to the production losses. Before the model have been selected, all the previous yield data have been reviewed and studied in order to get the best model selection for determining the source of the problem occurred at the line. At this stage, all related personnel from manager,

engineer, technician and group leader have to sit down together to discuss the main issue arise at the line based on their expertise area concerned. For this case study, the selected models are:

Line : Transistor Diode Matrix Line

Machine : Testing, Marking and Taping Machine (T01)

Product/Package : 2pSSP ZeDi Matrix

As per mentioned on above data, 2pSSP Zedi Matrix or 2 Pin Super Small Package Zener Diode Matrix have been selected as the product for this study. One of the Quality Control Tools which is Fishbone Diagram has been utilized in order to determine the root cause of the problem as figure 4.1 below:

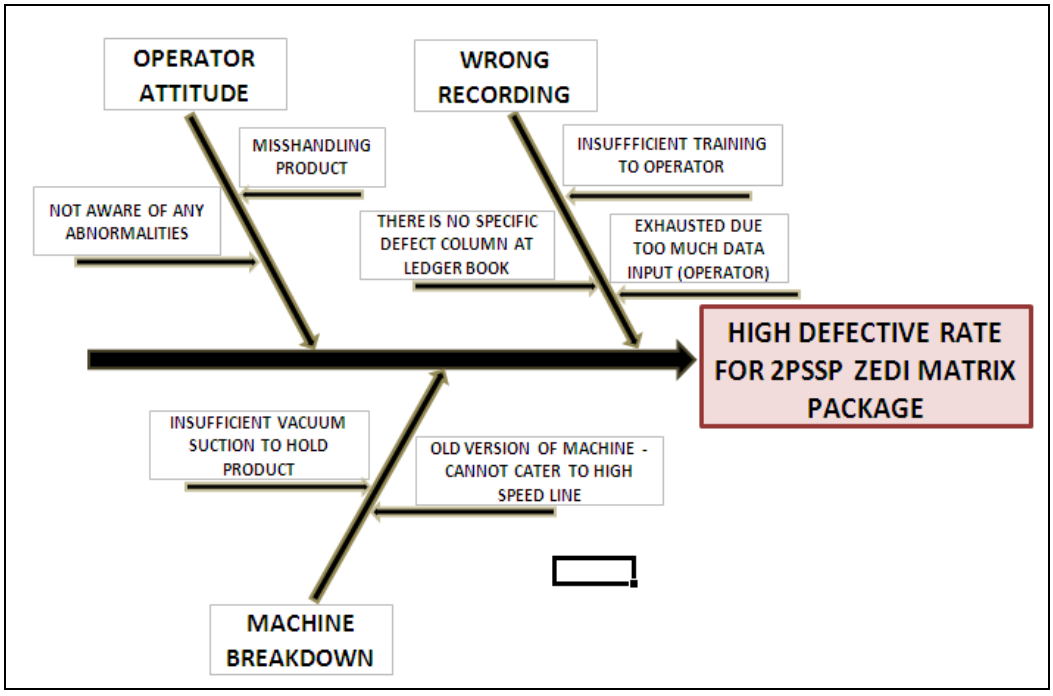


Figure 4.1: Fishbone Diagram or Ishikawa Diagram

As mentioned above, yield data have been reviewed and studied before the model has been selected. Figure 4.2 shows that the selected package 2pSSP ZeDi Matrix contribute the highest defective rate from overall monthly data. Based on the figure 4.1, 2pSSP ZeDi Matrix overall defective rate are deviate far away from the target which is average 7.0% and above.

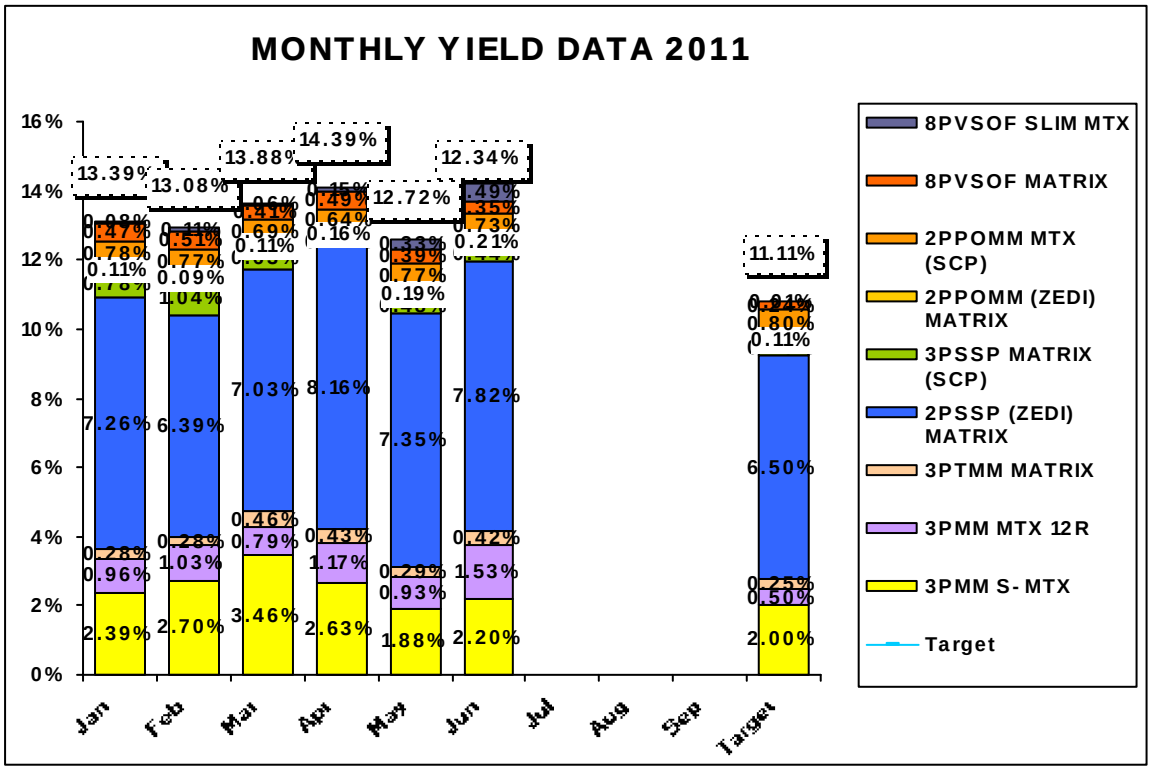


Figure 4.2: Yield Monthly Data for Individual Package Defective Rate

From the package data above, the overall data have been stratified to find out the highest contribution for defect. From figure 4.3, discrepancy shows the highest percentage of defective rate contribution. It contributes almost 2.5% to 3.0% defect to overall defective rate data.

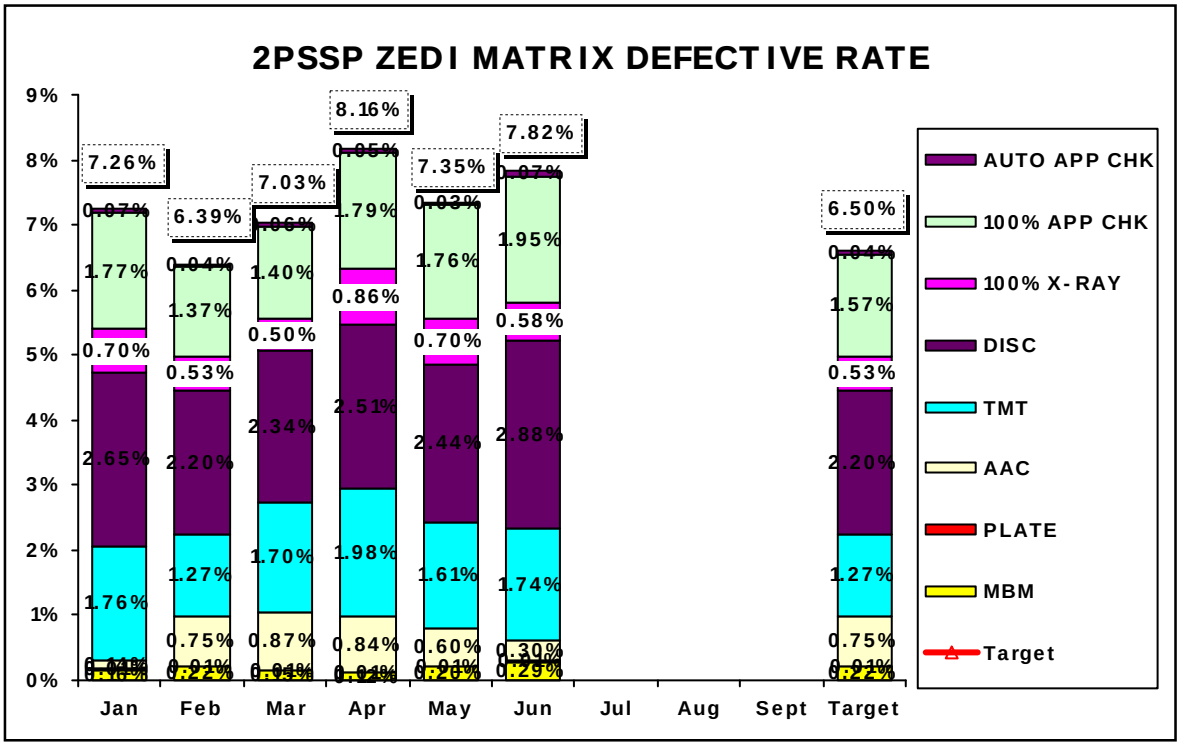


Figure 4.3: Defective Rate for 2pSSP ZeDi Matrix

4.3 Organize Project Team

The second step stated from Kobetsu Kaizen procedure is to organize project team. Based on business need, the team has set priorities on losses and projects looking at resource constraints. Selecting Kaizen themes based on losses, setting targets and assigning teams to take responsibility for each identified project. The utmost important tasks for the teams are to:

- Identified bottleneck areas, fix targets and set priorities
- Launched of project teams with pilot projects

- Helped all support functions to arrive at the Loss versus cost matrix and measures.
- Identified aim and scope of Kobetsu Kaizen, training requirement and guided the facilitators to focus losses on company performance.
- Knowledge sharing through horizontal deployment activities
- Developed the Master plan for Kobetsu Kaizen and track progress of Kaizens.
- Motivate people to do Kaizens.
- Give inputs to the education and training pillar for training matrix development.
- Worked in close co-ordination with other sub-committees for achieving the targets. This committee will meet at least once a week or month for the above mentioned points.

As for our team, we have form a small group activity (SGA) to conduct this case study which consists of four people covered from each respective department in order to optimize the implementation of this Kobetsu Kaizen step:

Product Engineering Discrete (PED)	**:**	Allina Abdullah
Manufacturing Engineering Discrete (MED)	**:**	Nadiah Norzemi
Production Engineering Discrete (PRODDIS)	**:**	Abdul Hafiz Mohaidin
Production Engineering Discrete (PRODDIS)	**:**	Norlina Ismail
Quality Assurance (QAD)	**:**	Shaiful Hafiz Mutadza

The organization structure is as figure 4.4:

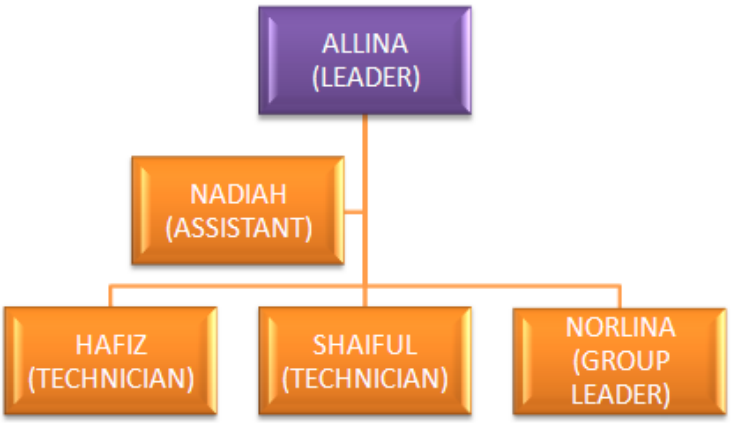


Figure 4.4: Organization Structure for SGA

4.4 Identify Present Losses

Kobetsu Kaizen pillar deals only with those losses that cannot be handled by any other pillar. All 16 losses have to be considered by the Kobetsu Kaizen committee and make up the loss structure for the company (Losses due to defect/rework losses through Quality Maintenance, failure losses through Planned Maintenance).

Next, the Kobetsu Kaizen sub-committee will identify the priorities and assign project teams to work on specific losses on different machines and areas. Remaining losses will have to be addressed by Kobetsu Kaizen sub-committee. Each company has to make up their list and collect data. The highest losses will be the priority for the Kobetsu Kaizen pillar. In some companies this list may be different. For example:

- Loss no. 2: Set-up
- Loss no. 4: Start-up loss
- Loss no. 10: Operating motion loss
- Loss no. 11: Line organization loss
- Loss no. 13: Measurement and adjustment loss
- Loss no. 15: Tools, jigs and consumables loss
- Loss no. 16: Yield loss

For this case study, Loss no. 16 have been chosen which is yield loss and as per mentioned in step 1, this case study it is only focused on discrepancy since it was the highest contributor to the yield loss. For detailed calculation of yield loss will be attached in Appendix A and Standard Cost for individual package will be in Appendix B.

Month	*Quantity Discrepancy (pcs)*	*Loss Cost (RM)*
January	120186	4207
February	108330	3792
March	128426	4495
April	125446	4391
May	175657	6148
June	250555	8769

Table 4.1: Table for Loss Cost

4.5 Theme Selection and Goal Setting

For theme selection, all the data and information have been gathered and studied in order to choose the best theme for this case study. Based on data mention in Step 1, the theme for this case study is to choose:

Line : Transistor Diode Matrix Line

Machine : Testing, Marking and Taping Machine (T01)

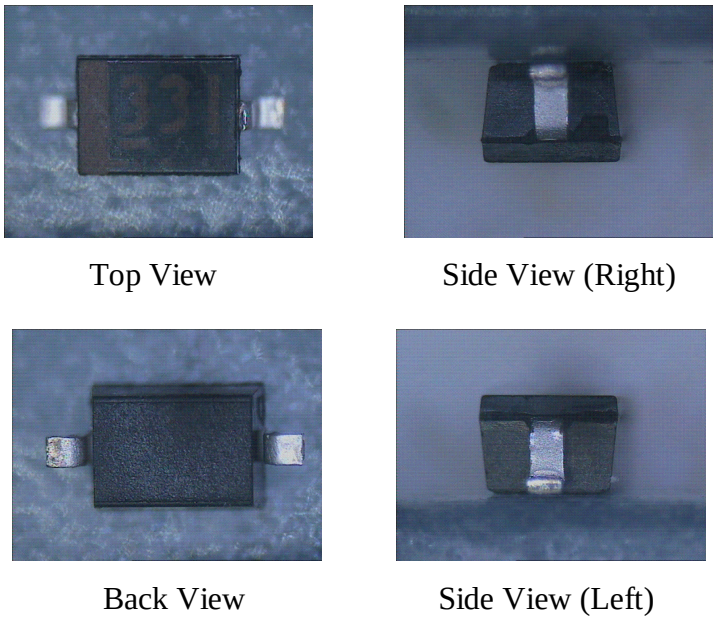
Product/Package : 2pSSP ZeDi Matrix

Defect Mode : Discrepancy

There are four machines which running for 2pSSP Zedi Matrix but for this case study, machine T01 have been chosen. Based on survey conducted, T01 are the highest contributor to yield loss and machine breakdown.

Figure 4.5: Machine T01 for 2pSSP Zedi Matrix

Based on yield loss data monthly, all the team members have agreed to choose 2pSSP Zedi Matrix as the selected package. This package is the smallest package from the entire package at Transistor Diode Matrix line. Due to the size of this package, this is one of the reasons that caused the high discrepancy of this package yield loss. Figure below shown the package appearance:



Top View | Side View (Right)

Back View | Side View (Left)

Figure 4.6: Package Appearance

For the goal setting, after the implementation of Kobetsu Kaizen, percentage of discrepancy for 2pSSP Zedi Matrix on July will reduce to 80% from the previous yield data from month of June.

4.6 Scheduling

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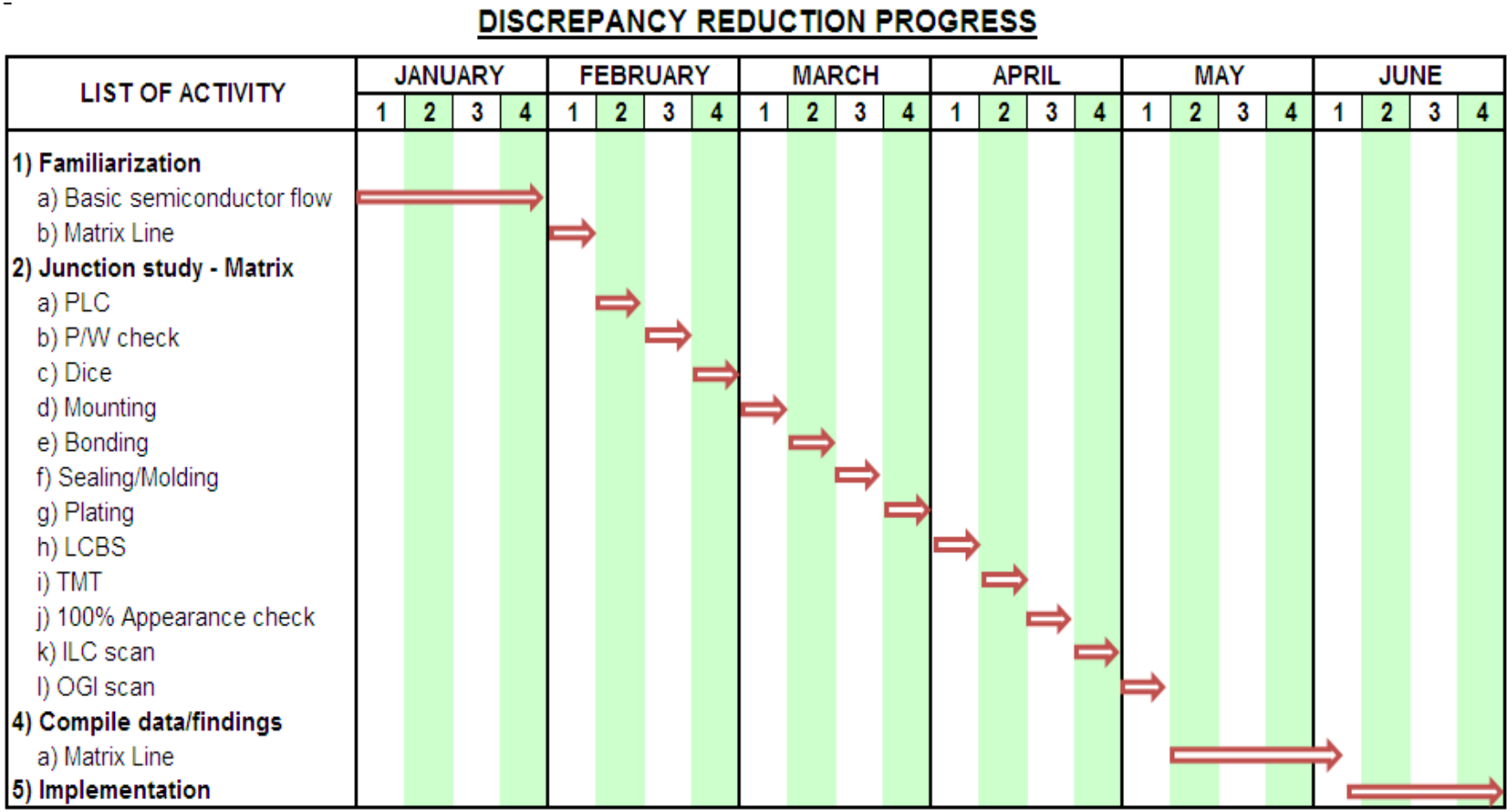

Figure 4.7: Discrepancy Reduction Progress Schedule

4.7 Analysis and Countermeasure

Mapping out Kaizen are important in order to analyze and give suitable countermeasure. For this case study, why-why analysis has been used to analyze the problem. The why-why analysis is a questions-asking method used to explore the cause/effect relationships underlying a particular problem. Ultimately, the goal of applying the why-why analysis method is to determine a root cause of a defect or problem.

Phenomena	Why 1	Why 2	Why 3	Why 4	Why 5	Judge	Countermeasure
Product Discrepancy  	Drop product	Vacuum suction is not working properly	Technician do not know how to repair	Not enough training and skills to repair	Old machine do not have specification	FALSE	
		No data recorded	Operator do not record	Do not know how to measure the drop product	No jigs to measure drop product	TRUE	Introduce weighing method and jigs
	Wrong recording	Operator wrong input the data	Too many data to write and confusion	Too exhausted to write all data	Working for 12 hours	TRUE	Introduce new system to input all the data
				Not enough column to record defect input	Ledger book not revised	FALSE	

Table 4.2: Table for Why-Why Analysis

4.8 Implementation

From the analysis done above, there are two countermeasures that have been made in order to reduce discrepancy:

4.8.1 Introduce Weighing Methods and Measuring Jigs

This countermeasure is one of the effective methods to reduce the discrepancy. All the drop products have been weighing in and the readings have been taken. For undeclared bent leadframe, the same method also has been utilized using measuring jigs. Next, the result will be keyed in to the system to declare the defect.

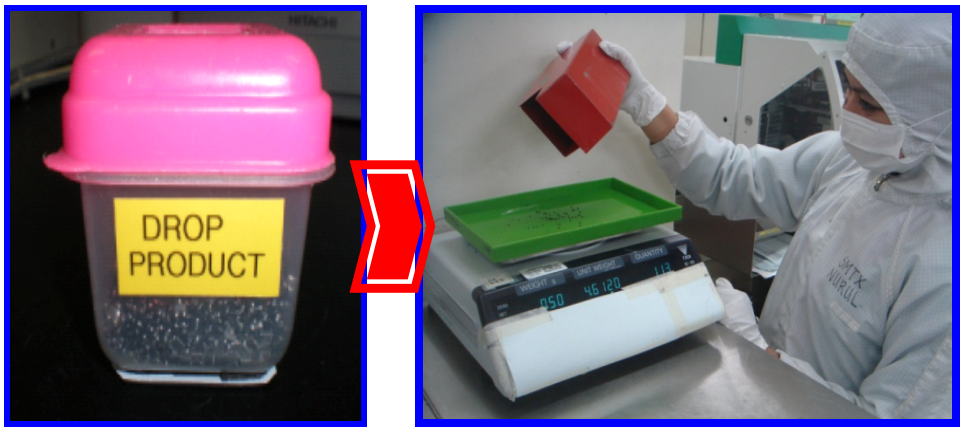

Figure 4.8: Weighing the Drop Product

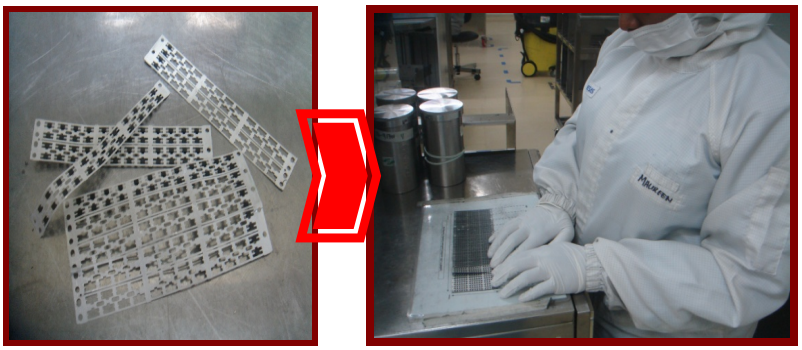

Figure 4.9: Measuring the Bent Leadframe

4.8.2 Introduce New System to Input All Data

As to replace the tiring recording job done by operator, a new system have been introduced to key in all the data and input from each junction. This system will reduce wrong recording, eliminate missing input at certain junction and also easy tracking for the data. Before the operators are eligible to use this new system, they will undergo a training conducted by system expert to avoid any confusion from the operator.

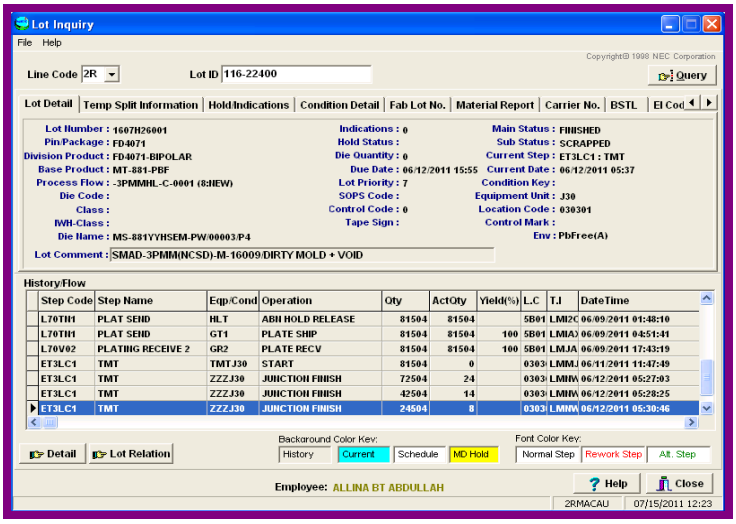

Figure 4.10: New Data Input System

4.9 Confirm Effectiveness

After the implementation of above countermeasure, the yield data for month of July have been monitored and figure below shown that all the discrepancy rate have reduced tremendously hence the defective rate also decrease.

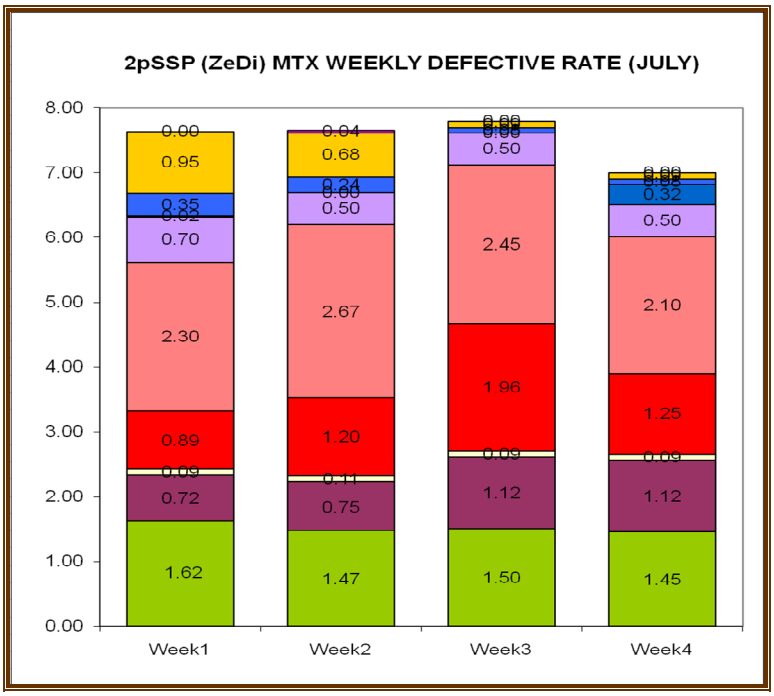

Figure 4.11: After Improvement Weekly Result for July

Process	Week1	Week2	Week3	Week4
BOND	1.62	1.47	1.50	1.45
SEAL	0.72	0.75	1.12	1.12
PLATE	0.09	0.11	0.09	0.09
TLCBS	0.89	1.20	1.96	1.25
TMT	2.30	2.67	2.45	2.10
Discrepancy	0.70	0.50	0.50	0.50
Reel Wind	0.02	0.00	0.00	0.32
X-RAY	0.35	0.24	0.08	0.08
100% APP CHK	0.95	0.68	0.09	0.09
Auto APP CHK	0.00	0.04	0.00	0.00
Total	**6.52**	**6.80**	**7.47**	**6.72**

Table 4.3: Table for After Improvement Weekly Result for July

4.10 Taking Measure to Prevent Recurrence

In order to prevent recurrence of this problem, all the specifications for the weighing technique, measuring methods and system input have been issued out. All of these specifications have been standardized in order to ease the production team in the future.

4.11 Horizontal Replication

After being successfully implemented and taken measures to prevent recurrence, all the specifications that have been made will be used over the other Testing, Marking and Taping (TMT) machine.