REDUCTION OF 3RD OPTICAL INSPECTION YIELD OFF AND FALLEN UNITS AT GTS FRONT OF LINE

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ABSTRACT

For the Fiscal Year 2022 (FY22), Assembly GTS Front of Line (FOL) has the lowest yield. Last September 2021, the 3rd optical inspection is the top contributor of yield off with 99.81% vs 100% target. The top contributor of low yield off are Foreign Materials (21%) and Misoriented Magnet (14%) and when it comes to Human Related Non-conformance FY22, Assembly GTS (Gear Tooth Sensor) has 16 cases over 12 cases target on which Assembly GTS FOL is the top contributor with 11 cases and 4 case of that are Fallen Units.

Using Lean tools and methodologies, such as Pareto Diagram, Process Mapping, Why-Why Analysis and Fishbone Diagram, the team were able to identify the Problem caused. Through effective utilization, the improvement has easily been carried out.

During root cause analysis, it was carried out what are the processes where the problem occurs and its causes that affecting the yield of 3rd optical inspection. Foreign materials and Mis-oriented Magnet occurs at Magnet and Concentrator attach process while the Fallen Units occurs at Wirebond station.

To address the problem, the team immediately provided countermeasures.

The countermeasures have been sustained since the Lean event. Thus, the improvement has been standardized and documents have been updated. A significant improvement has been noticed and result of the beyond what the team have targeted.

a.) Foreign Materials, Target – 50%, Result – 53%,

b.) Misoriented Magnet and Concentrator, Target- 50%, Result -83%

c.) Fallen Units, Target – Zero Fallen Units, Result – Zero Fallen Units by end of Fiscal Year 2022.

1. 0 INTRODUCTION

1.1 Background of the Study

Allegro Microsystems Philippines Inc. FY22 goal is "Back to Basic" or Improving Quality Performance focusing on the Assembly Process. Because of this the team grasped the current situation to determine the area of prioritization.

Based on sales mix distribution, Assembly GTS High Density has the highest sales for FY22 with 18.63%, which means it will have high losses on our profitability if production has high yield off rate.

Grasping the yield off data, of GTS FOL and End of Line (EOL), 3rd Optical Inspection of FOL are consistently not hitting the target of 99.81% (Fig 1) and based on Material Review Board Data, allowable number of cases are 12 Cases, however GTS Assembly had 16 Cases on which 11 Cases was contributed by Assembly GTS FOL (Fig 2).



Fig. 1. Yield Data of GTS HD from July to September 2021



Fig. 2. Human Material Review Board (MRB) Data of FY22

Based on Pareto Diagram (Fig 3) of 3rd Optical Inspection, Foreign Materials (21%) and Misoriented magnet with concentrator (14%) are the top contributors that cause from not hitting the target yield.



Fig. 3. - 3rd Optical Yield Data Pareto Diagram

For Human Related MRB Pareto Diagram (Fig 4) shows that Fallen Units are the top contributor.



Fig. 4. - Human Related MRB Pareto Diagram

1.2 Objective

The team aimed to reduce the foreign materials Defect Per Million opportunity (DPM) into 50% from 414dpm to 207dpm, reduce misoriented magnet and concentrator into 50% from 265 DPM to 133 DPM and Eliminate Fallen Units.

"Double the Good, Half the Bad"



Fig. 5. - Goals of the project

1.3 Scope

The focus of the project is at Magnet and Concentrator Attached Process, 3rd Optical Inspection for Foreign Materials and Misoriented Magnet, and Concentration and Wirebond Station for Fallen units.

2. 0 REVIEW OF RELATED WORK – NOT APPLICABLE

3.0 METHODOLOGY

In Order to determine the cause of the identified problem the team conducted Gemba Walk. During the Gemba Walk, the team conducted process mapping and clearly identified the stations where the problem occurred. Foreign materials and Misoriented Magnet and Concentrator occur at Magnet and Concentrator attach process and Fallen units is at Wirebond attach process.



3.1 Root Cause Determination

Using Fishbone Diagram (Fig 6) the team identified five possible causes of foreign materials which falls under Machine, Man, Method and Materials. Under Machine (1) Frequency of cleaning of work holder was not determine, under Man No stocking level for Lint Less Wipes that why operators tend to (2) use the Wrong Wipes, under Method Operator forgot to change gloves because there is (3) no clear rules for changing, and under materials (4) Lint Less Wipes is not available near the operator and (5) changing of Gloves is unclear.



After the Root Cause Analysis (RCA), the team have confirmed the root causes of the problem foreign materials on which occurs at Magnet and Concentrator Attach process and caused by (1) wrong cleaning materials and no available lint less wipes, (2) established system of cleaning of waffle trays was not enough to remove fiber inside tray and (3) changing of gloves was not clear.



Fig. 7 – Root Causes of the problem foreign materials

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As the team dig more into our investigation of misoriented magnet and concentrator, the team identified the causes of the problem which is worn out rubber tip because the frequency of rubber tip change was not determined and accumulated dirt at work area. The team concluded that Misoriented Magnet (1) no set standard for rubber tip tooling life and (2) no established cleaning of work area.



Fig. 8 - Root Causes of the problem misoriented magnet and concentrator

For Fallen Units, during Gemba, the team observed 2 problems that caused incidents at Wire Bond Attach process where there are 2 cases of fallen units occurred: (1) not supporting the bottom portion of the magazine during product handling and (2) no designated location for magazine stopper.



Fig. 9 - Root Causes of the problem fallen unit

3.1 Root Cause Improvements

Based on the identified problems, the team created improvements that could help resolve identified root causes.

Table 1. Foreign Materials Improvement

No.	Problem	Improvement	
1	Wrong cleaning materials and no available lint less wipes	Placed Lint Less Wipes at the working station	
2	Fiber Inside Waffle	Install Vacuum for Magnet Waffle cleaning	
3	No Clear frequency of changing of gloves and finger cots	Provide Clear rules of changing of Gloves and Finger Cots	



Fig. 10 - Kaizen actions for foreign materials

Table 2. Misoriented Magnet and Concentrator

No.	Problem	Improvement	
1	Worn out Rubber Tip Bond head	Establish Rubber Tip Tooling Life	
2	Accumulated Dirt inside MCA machine	Establish MCA Work Area Cleaning	
3	No checking of actual Strips during Post Bond Error	Check actual strip every post bond error	

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Fig. 11 - Kaizen actions for Misoriented Magnet and Concentrator

Table 3. Fallen Units

No.	Problem	Improvement		
1	Proper handling was not followed	Install visualization for Proper Handling at the Magazine		
2	Operator is carrying one magazine during transportation	Provide small pushcart good for single magazine		

(1) Install visualization as reminder Provide pushcart for single magazine transportation

(2) Provide proper location for magazine stopper, near operator





Fig. 12 - Kaizen actions for fallen units

4.0 RESULTS AND DISCUSSION

The aim of this project is to "Double the Good and Half the Bad" on which the target is to reduce the foreign materials at misoriented magnet to 50% and eliminate fallen units at Wire bond station.

Through collective ideas and efforts, the team managed to reduce 53% on foreign materials (Fig 13), 83% on misoriented magnet and Concentrator (Fig 14) and Zero Fallen Units (Fig 15).



Target: 50% Reduction After Kaizen: 53% Reduction Fig. 13 – Foreign Materials Reduction after Kaizen Result



Target: 50% Reduction After Kaizen: 83% Reduction

Fig 14 – Misoriented Magnet and Concentrator after Kaizen Result



Fig. 15. - Fallen units Result after Kaizen Results

5.0 CONCLUSION

Through this project, the team were able to conclude that the main cause of the problem of yield off at the 3rd Optical Inspection are no established rules for the frequency of changing, cleaning and replacement. Visualization makes a huge difference as it constantly reminds the operators for the proper handling and sustaining of improvement is through standardization on which all action item was included on the Work Instruction, Failure Mode and Effect Analysis and Procedure.

Through collective team effort not just by the members but also the operators and technicians in line giving their inputs for easy identifications of the problem and possible solution and

6.0 RECOMMENDATIONS

It is highly recommended to apply Lean tools and methodologies used in this project such as Pareto Chart, Process Mapping, Fishbone Diagram, Why-Why Analysis, Zero Defect Mindset and Yokoten. The same tool can help with any Foreign Materials related improvement.

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8.0 REFERENCES- NOT APPLICABLE



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