CACB RASCO JUPITER 2 COMMITTED MANUFACTURING CAPACITY (CMC) INSERTION IMPROVEMENT

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ABSTRACT

High, Medium or Missed Risk Assessment in Line Item Performance Against Schedule (LIPAS) of Finish Goods (FG) may result to potential miss on FG required quantity Shipment. On Fiscal Year 2023 (FY23) Q1 and Q2 Test on Sensor CB, risk assessment resulted to 9 occurrences of High/Medium Risks since Workweek 14 to 34 (WW14 to WW34) including 1 missed.

The actual utilization from FY23 WW14 to WW34 is 61% vs the 59% standard utilization. The Mean Unit Before Assist (MUBA) is 1,129 actual vs 500 target. Problem still observed in test insertion resulted to 92% vs 100% weekly Committed Manufacturing Capacity (CMC) with weekly High/Medium Risk Assessment occurrence and one missed of LIPAS due to Jupiter Issue. The insertion is one major key in attaining the low risk assessment, therefore the team focused on improving the insertion in Rasco Jupiter 2.

The team used problem solving tools (Fishbone and 5 Why Analysis) to identify the root cause, used Lean tools and methodologies to identify the current process and different types of wastes (Process Mapping, 8 wastes, Gemba) and applied Total Preventive Maintenance (TPM).

Root cause analysis showed different factors affecting the low insertion: a) Undesired soaking time, b) insufficient impact in rotary track tapper pin, c) tube centering jamming at unloader, and d) shift transition of the operators. To improve the insertion, the main countermeasures are a) replacement of worn out rotary track, b) replacement and improvement of rotary track tapper, c) modification of tube clamp design, and d) special instruction to ensure that the machine is working before they change the shift.

After the Kaizen, the team were able to sustain all the counter measures implemented with improvement on Insertion from 92% to 114% with reference to weekly CMC target output improving 22% with Zero LIPAS missed cause by Jupiter 2 with Zero Medium/High risk assessment by manufacturing of weekly FG commit.

1. 0 INTRODUCTION

1.1 Background of the Study

Allegro Microsystems Philippines Inc. (AMPI) aims to deliver high quality products on time. One of the production's Key Performance Indicator (KPI) is the Line Item Performance Against Schedule (LIPAS) that aims to monitor the performance per line item. To attain this, AMPI monitors the Finish Goods Risk Assessment. The purpose of the monitoring is to assess the factors from production line that may affect to the delivery of the product to the warehouse.

Last FY23 from WW14 to WW31, the package with highest variance of LIPAS performance is Sensor with 12% variance, but due to limited scope of the study, the team focused on the Current Sensor (CS) package with 8% variance from the target (see Figure 1). contributor of Finished Goods Risk is SEN CB resulting to 9 FG Risks including 1 High Risk. Upon assessment, 9 out of 9 risks is due to the handler related issue resulting to low insertion (see Figure 2).

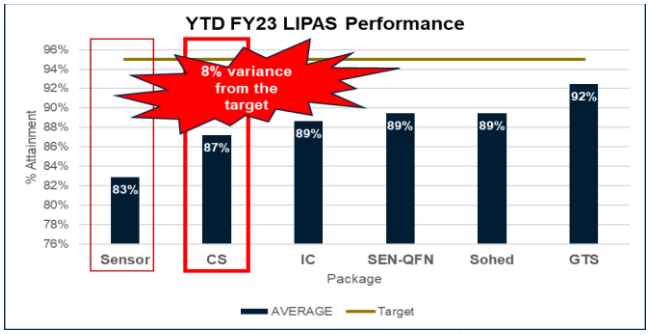

Figure 1. Sensor being highest variance in LIPAS performance and CS being the top 2

Figure 2. SEN CB being highest on Finished Goods Risk Commit Monitoring

Further investigation on the machines for SEN CB on FY23 WW14 to WW31 data, TST-117 or Jupiter 2 Hot Set-up shows lower machine utilization and insertion performance (see Figure 3).

SEN CB - Machine Performance

TST-073 (Jupiter 1) Ambient Set-up *Average data from WW14 to WW31*		TST-117 (Jupiter 2) Hot Set-up *Average data from WW14 to WW31*	
*MUBA:	470	*MUBA:	1181
**PMEE DT:	17%	**PMEE DT:	19%
Utilization:	66%	Utilization:	62%
Insertion:	85%	Insertion:	77%

Figure 3. SEN CB Machine Performance – Jupiter 1&2

Using fishbone analysis (see Figure 4), the top contributors for low insertion at Jupiter 2 are: a) Undesired soaking time, b) insufficient impact in rotary track tapper, c) tube centering jamming at unloader, and d) shift transition of the operators.

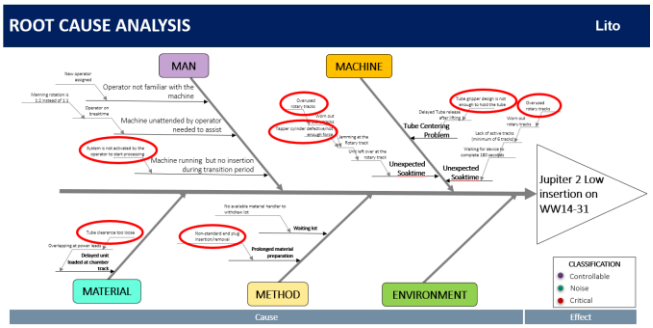

Figure 4. Fishbone analysis showing the contributors of low insertion on Jupiter 2 hot set-up

1.2 Objective

The team aimed to eliminate high/medium risk and missed occurrence per week on weekly production output commit at SEN CB through improvement of Rasco Jupiter 2 Insertion.

1.3 Scope and Limitation

The focus of the project is Rasco Jupiter 2 machine hot set-up, and the coverage of FG Commit is only limited to the reason of low insertion particularly due to unaccounted downtime.

2.0 REVIEW OF RELATED WORK – NOT APPLICABLE

3.0 METHODOLOGY

To identify the issue with regards to the misses on LIPAS, the team conducted Gemba walk to observe the nature and actual processing versus the documented procedures and specification. The team recorded all the possible contributor that affects the productivity as to align with the required target stated in the FY23 KPI. All affected personnel – operators, supervisors and equipment technicians were also consulted to further assess and evaluate the initial issues encountered. The team then reorganized the data gathered and performed RCA (root cause and analysis) using the Fish Bone diagram and Why-Why tool as to trim down the top contributors and provide solutions that will address the identified discrepancy.

3.1 Soak Time Process anomaly through Rotary Track

Based on the RCA, jamming is one of the contributors in terms of equipment related issue – specifically at Rasco Jupiter 2. The last machine related issue that was identified is the unusual soaking time during lot processing. Based on the investigation, it was found out that the rotary track is already worn-out that causes unit stuck up during unit flow. Statistics shows that the soak time incurred 1.09hrs/shift which was also verified as undocumented downtime.

To address the issue, the rotary track was replaced to compensate with the current issue (see figure 5). Also, an OPL (One-Point Lesson) was also released stating that all rotary track tappers should be replaced to new design once found worn-out or causes unit jamming at track. This is documented under OPL#00001 Rev.0

Figure 5. Replacement of rotary track and one-point lesson

3.1.1 Soak Time Process anomaly through Tapper

Another contributor related to soak time issue is the Tapper design by which it doesn't fully perform its intended purpose. Tapper should assist the units to smoothly pass through the track thru vibration. Current design of the tapper head is 7.5mm in diameter and 4 mm bore size of cylinder shaft (see Figure 6).

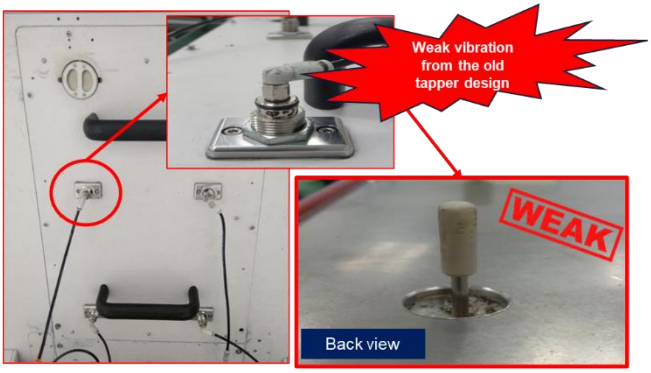

Figure 6. Old tapper design attached in Jupiter 2

The team saw an opportunity to improve the design of the tapper to support the flow of units from the track during lot processing. The tapper head was modified to 19 mm diameter and 6 mm bore size of cylinder shaft (see Figure 7). Which resulted in a stronger vibration as seen during the actual verification.

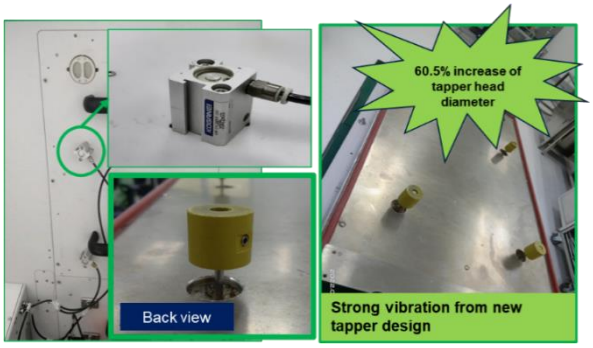

Figure 7. Improved tapper design

3.2 Tube Centering Problem

Another identified item on RCA is the tube centering problem. Current data shows that the Tube centering problem incurred 72 occurrences equivalent to 80.64 mins a week or 1.12 mins per occurrence that were not being recorded or considered as major downtime as this can be done or repaired easily by just re-aligning the tubes to the stacker. As observed, the design of the clamper greatly affects the alignment of tubes at the stacker (see Figure 8).

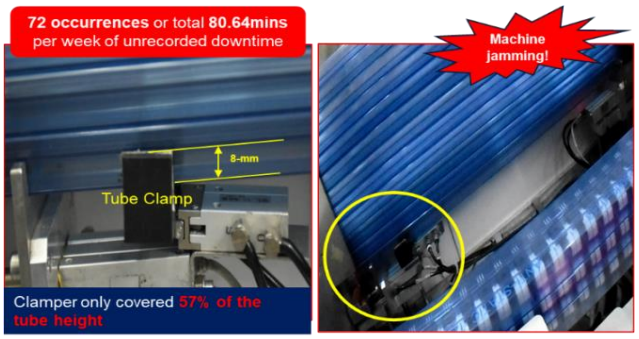

Figure 8. Old design of the clamper resulting to 80.64mins unrecorded downtime

With this, issue was addressed by adjusting the tube clamp height from 8mm to 6mm to align with the tube height with respect to the clamp's clearance. The action was then monitored and resulted to the significant decrease in occurrences from 72 to 27 which is equivalent to 29.79 mins per week or 36% additional uptime to machine in terms for tube transport from stacker to shuttle (see Figure 9).

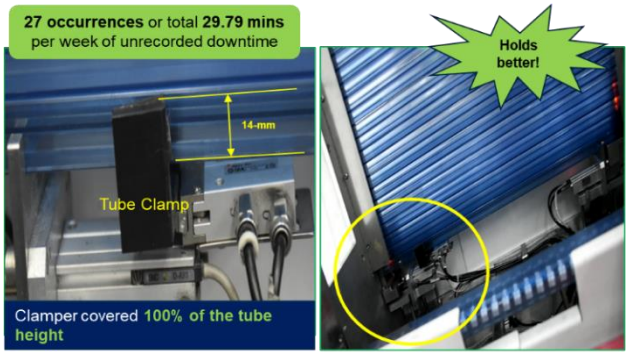

Figure 9. New design of the clamper resulting to 29.79mins unrecorded downtime or 50.85mins saved time from previous design

3.3 Operator Transition Shift

Last identified contributor was related to the method of endorsement/transition of operators from day to night shift and vice versa. It was found out that transition took 15.71 mins on the average per shift just for the endorsement itself (see Figure10). During the endorsement, machine is not in production mode thus resulting to loss of insertion.

Figure 10. Previous shift transition resulting to 15.71mins downtime per shift

A re-orientation was conducted to address this issue, all operators should ensure the machine is in production mode while being engaged in the endorsement. Correct machine status and the endorsement flow was also discussed by the trainers. As a result, from 15.71 minutes average downtime per shift was brought down to 5.58 minutes average per shift which is equivalent to an additional 35% uptime on the machine (see Figure 11).

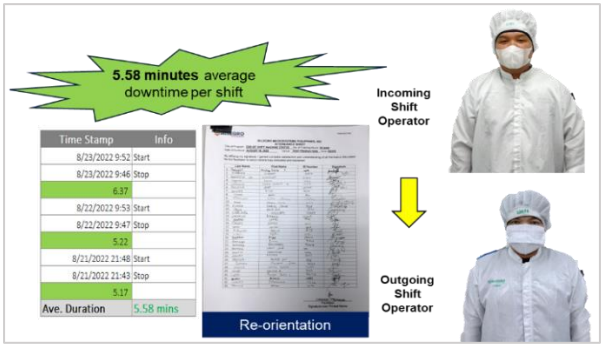

Figure 11. Updated process in shift transition resulting to 5.58 mins downtime per shift saving 10.13 mins per shift

4.0 RESULTS AND DISCUSSION

This project aims to improve the CMC insertion of Rasco Jupiter 2 from 92% to 100% or 8% increase which will add up to the Current Sensor (CS) LIPAS to meet the 100% target. After the Kaizen, we are able to sustain all the counter measures implemented with improvement on Insertion from 92% to 114% with reference to weekly CMC target output with Zero LIPAS missed cause by Jupiter 2 with Zero Medium/High risk assessment by manufacturing of weekly FG commit starting from the week after kaizen (see Figure 12 & 13).

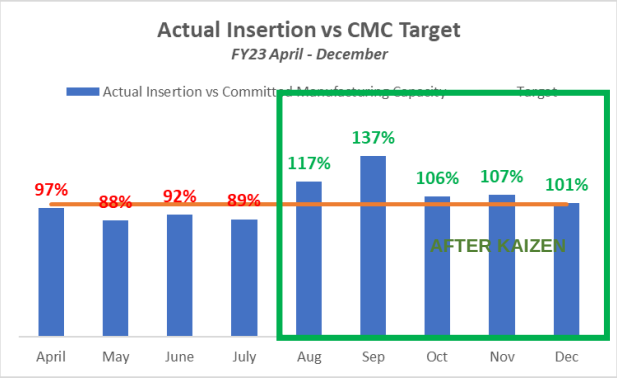

Figure 12. FY23 April – December Actual Insertion vs CMC Target

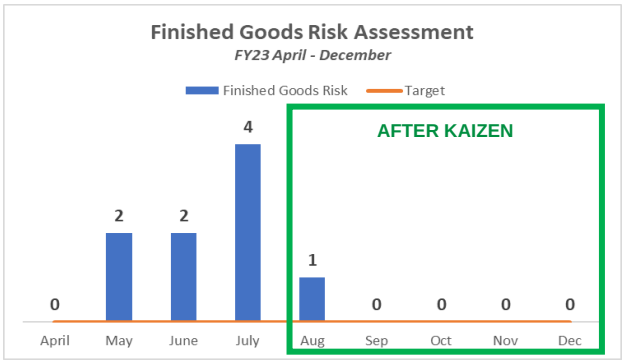

Figure 13. FY23 April – December Finished Good Risk Assessment

5.0 CONCLUSION

Missed in LIPAS for Current Sensor was due to the unrecorded downtimes. Based on the data it was verified that there are underlying issues which was not being properly documented or recorded which should be tagged as downtime. These are the tube centering issue, soak time processing anomaly and the operators transition shift process.

As Corrective And Preventive Action (CAPA), tube clamper was adjusted to its optimal height to align with the tube clearance from clamper to shuttle loader. Replacement of rotary track and re-designing of tapper was also conducted to help address the soak time process issue. As for the method, re-orientation of proper machine downtime and endorsement procedure was also performed to align with the ideal endorsement activity of operators during shift transition.

With this actions, significant increase in terms of insertion vs the target was met and exceeded.

Actions made were recorded/documented under PRC-0001450 AMPI PMEE PM Final Test RASCO SO9000 JUPITER CA CB Package Preventive Maintenance Procedure and in WIN-0000665 Test Production Work Instruction.

6.0 RECOMMENDATIONS

It is recommended to utilize the Lean tools and methodologies such as Fish Bone Diagram, Why-Why Analysis, PDCA (Plan Do Check Act) and GEMBA that were used in this project to other issues arises within the production floor and to other areas. These tools will help the team in identifying the real root cause of any quality and productivity issue and formulate robust solution in addressing such. With this, the team was able to profoundly outline improvements that produced significant positive results.

7.0 ACKNOWLEDGMENT

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8.0 REFERENCES – NOT APPLICABLE

9.0 ABOUT THE AUTHORS

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Jose Quinto is a graduate of Bachelor of Technology in Computer Engineering from Technological University of the Philippines Cavite Campus. He has 8 years of experience in semiconductor industry and currently assigned in PMEE as Senior Test Engineer.

10.0 APPENDIX – NOT APPLICABLE