ELIMINATION OF DAMAGE CARRIER TAPE FOR DFN8 2X2 PACKAGE IN PICKER MACHINE

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ABSTRACT

Rework/de-tape process is one contributor that may affect the cost particular to the material will be used to. Damage carrier tape is anything that was induce with excessive force that creates deformity on the material appearance. It is an external visual defect, which can be seen on the low power scope magnification or even the naked eye alone. The appearance can be located at the bottom part of the pocket.

During design, validation of carrier tape seen that bottom corner pocket of DFN8 2X2 has pointed corner pocket compare to other package type that has curved/rounded bottom corner pocket and no occurrence of damage carrier tape.

This technical paper intends to eliminate the damage carrier tape for DFN8 2X2 package on specified machine model.

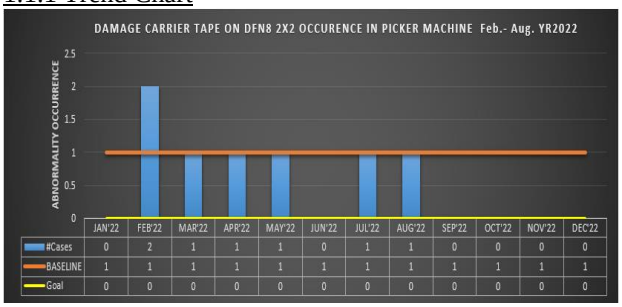
DMAIC approach was utilized to systematically understand the problem. Probable root causes vital to the occurrence of damage carrier tape were exposed and validated leading in determining improvement actions in eliminating the occurrences of damage carrier tape. The result of these actions showed a significant eliminating the occurences.

1. 0 INTRODUCTION

1.1 Background/History

An alarming increased in occurrence experience due to damage carrier tape on DFN8 2X2 package type at picker machine. Occurrences start on February 2022 until August 2022. With this problem, Operations group consists of engineering, quality assurance; and production experience an increase in Rework/de-tape process, this will add to rework and add cost in delayed in cycle time, delayed in shipment and additional cost for manpower to do the rework/de-tape and re-inspection.

1.1.1 Trend Chart



	JAN'22	FEB'22	MAR'22	APR'22	MAY'22	JUN'22	JUL'22	AUG'22	SEP'22	OCT'22	NOV'22	DEC'22
#Cases	0	2	1	1	1	0	1	1	0	0	0	0
BASELINE	1	1	1	1	1	1	1	1	1	1	1	1
Goal	0	0	0	0	0	0	0	0	0	0	0	0

Fig 1 ICAR Occurrences baseline of 1 and Goal of 0

Figure 1. This figure is the damage carrier tape performance in terms of Occurrences start on February 2022 until August 2022 and provides an opportunity for improvement, thus the process of pinpointing the root cause was pursued. Increased of occurrences for damage carrier tape is either contributed by machine, method of inspection, proper handling of material or weak design of mold tool which will be the focus of discussion.

1.1.2 Sample photo of affected units

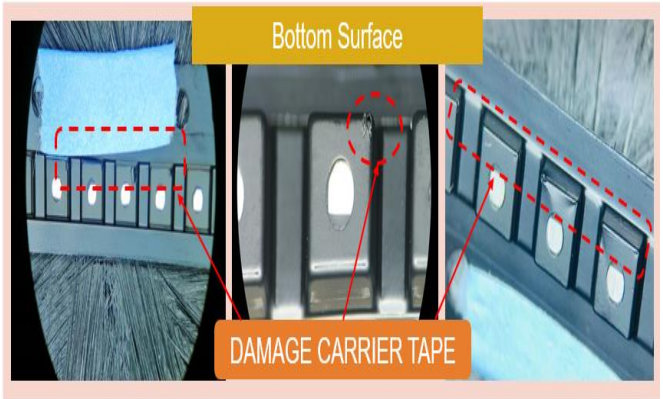


Figure 2. This defect can be seen that bottom corner pocket of DFN8 2X2 that has pointed corner pocket compare to other package type that has curved/rounded bottom corner pocket

2. 0 REVIEW OF RELATED WORK

Not applicable.

3.0 METHODOLOGY

3.1 Define Phase

Damage Carrier Tape is the top 2 contributor for internal abnormality and will focus on DFN8 package in PICKER Machine.

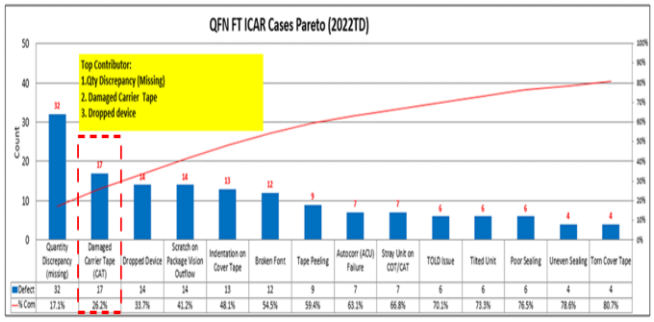


Figure 3. QFN FT ICAR CASES

There are 3 specific package type under damage carrier tape, DFN8 2X2 is the top among other and Picker machine were most occurred as shown in Fig.4. This will be the focus of the project.

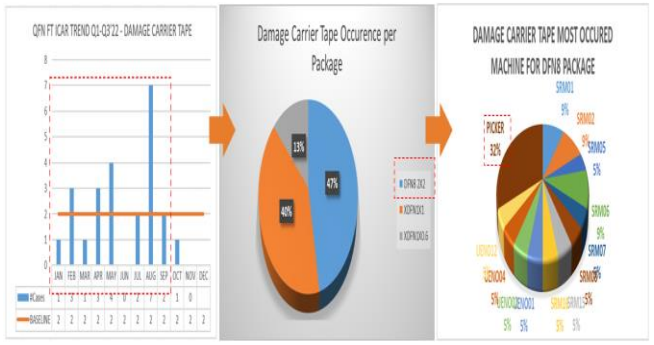


Figure 4. Damage Carrier tape cases, DFN8 2X2 and Picker Machine is the top.

The project aims to eliminate the damage carrier tape for DFN8 2X2 from its baseline of one occurrence per month.

3.2 Measure Phase

3.2.1 Process and Process Step Analysis

The SIPOC and Top chart shown the seven (7) sub-process critical to the occurrence of damage carrier tape.

3.3 Analyze Phase

3.3.1 SIPOC, Fishbone Diagram, Cause and Effect Analysis & Matrix (Detailed Process Mapping)

Thirty(30) probable rootcauses related to the occurrence of damage carrier tape were identified and listed through SIPOC, Fishbone diagram and Cause and Effect Analysis Matrix (Detailed Process Mapping). After scoring, prioritization, grouping and validation, four (5) major root causes was known valid. (1) No standard design of push cart use for Carrier Tape transportation (2) Poor design of carrier tape pocket (3) Insufficient Design of table (4) No detailed set up procedure on proper installation (5) Proper Distinction/design of tool is out of study

3.3.2 Potential root cause 1: No standard design of push cart use for Carrier Tape transportation

Pushcart is the tool in transporting the material in production area. No standard design of pushcarts will have an impact in occurrence of damage carrier tape. Currently push cart design allow different stocking position of carrier tape which violate the carrier tape stocking requirement (vertical position) and it is not standard because the design layout was not registered on the document system repository.

3.3.2.1 Verification

Through actual pushcart checking and performing actual staging of carrier tape. It was confirmed that proper design of pushcart may vary in occurrence of damage carrier tape but this will may cost a lot if we do the redesign but through creating a procedure in proper staging of carrier tape on push cart all the material handler will have proper knowledge on how to handle this causes.

3.3.3 Potential root cause 2: Poor design of carrier tape pocket

Carrier tape design is critical during start of the project.

Design of carrier tape is proven that this has impact in occurrence of damage carrier tape.

3.3.3.1 Verification

During design validation of carrier tape seen that bottom corner pocket of DFN8 2X2 has pointed corner pocket compare to other package type which has curved/rounded bottom corner pocket and no occurrence of damage carrier tape.

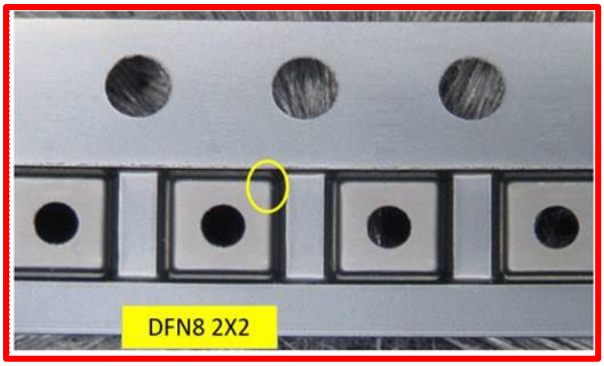


Figure 5. Design with pointed corner pocket

Bottom corner of the pocket was not included at the drawing design of the part number.

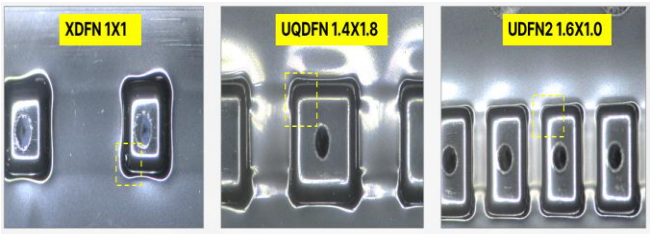


Figure 6. Design with curved/rounded

Above the 3 samples of Carrier Tape were the bottom corner of the pocket has curved/rounded corner

3.3.4 Potential root cause 3: Insufficient Design of table Inspection table

Sharp edge of inspection table is suspected to induce damage carrier tape during inspection

3.3.4.1 Verification

Validation of sharp edge inspection table conduct hypothesis testing of Inspection Table (Sharp edge / not sharp edge) will cause damage carrier tape

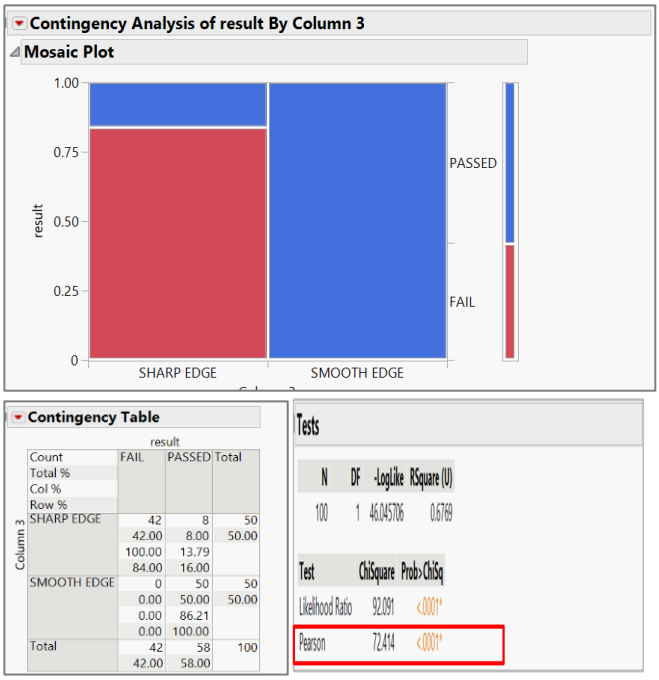


Figure 6. Based on the result of hypothesis testing, since the P-value is less than 0.05. Sharp edge of the inspection table will cause damage carrier tape.

3.3.4.2 Verification

The back of carrier tape pocket might hook on the edge of inspection table and when carrier tape was forced to pull it will create dent up to damage carrier tape

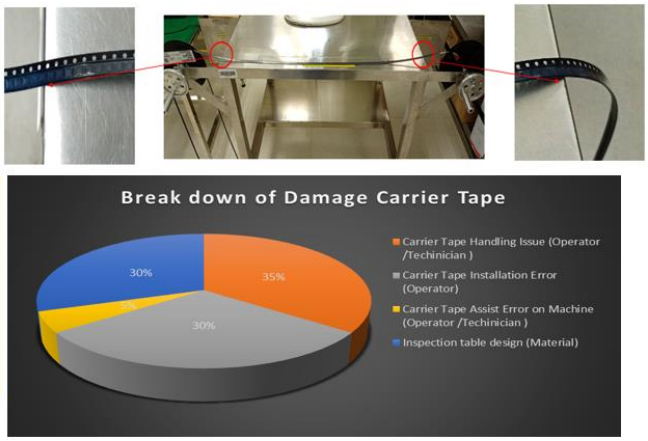


Figure 7. Inspection table design has big impact on carrier tape in terms of damage carrier tape

3.3.5 Potential root cause 4: No detailed set up procedure on proper installation

Good procedural can make the process much easier.

Detailed set up procedure on proper installation of carrier tape may contribute to the occurrence of damage carrier tape

3.3.5.1 Verification
Conduct actual check if the set up procedure on proper installation is available and sufficient

Figure 8. No detailed procedure on proper installation of carrier tape at the handler and can contribute to damage carrier tape

3.3.6 Potential root cause 5: Proper Distinction/design of tool is out of study

Tool is a mold used to build carrier tape material.
Proper Distinction/design of tool is out of study may cause damage carrier tape

3.3.6.1 Verification
Check and validate the existing of tool used that may cause damage carrier tape

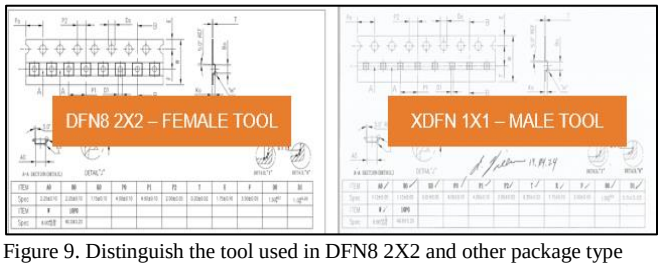


Figure 9. Distinguish the tool used in DFN8 2X2 and other package type

4.0 RESULTS AND DISCUSSION

4.1 Improve Phase

4.2 No standard design of push cart use for Carrier Tape transportation: Create a procedure in proper staging of carrier tape on push cart

The implementation of action was effective upon creation of procedure was validated in proper staging of carrier tape on push cart.

4.3 Poor design of carrier tape pocket: Design and fabricate a carrier tape has curved/rounded bottom corner pocket

Fig.10 shows the difference of design of corner pocket which has big impact in robustness of the material. Upon validation of improved material this will totally eliminate the damage carrier tape.

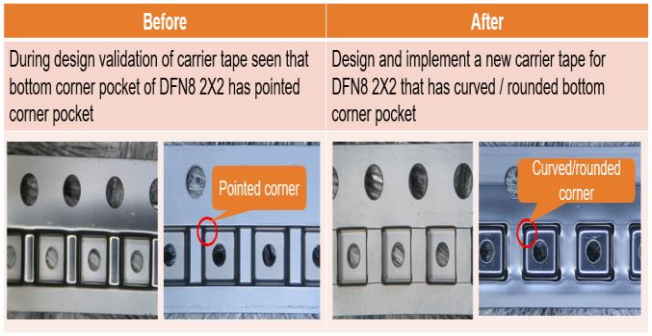


Figure 10. Distinguish the tool used in DFN8 2X2 and other package type

4.4 Insufficient Design of table Inspection table: Create a jig that can hold the carrier tape during inspection

Reel jig shows on Fig.11 was identified as proper tool to improve the inspection table in elimination of damage carrier tape. Damage of the carrier tape was occur at bottom

pocket which jig holder can hold the carrier tape during inspection.

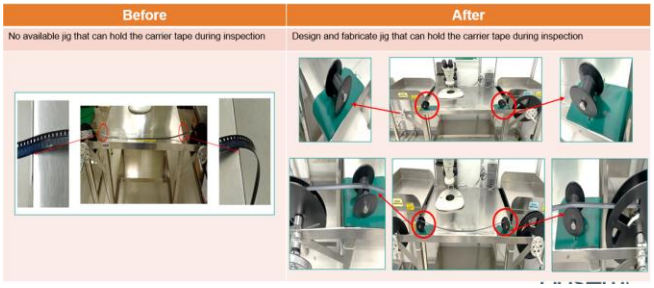


Figure 11. Reel jig that holds the carrier tape at the inspection table

4.5 No detailed set up procedure on proper installation: Create a detailed procedure in proper installation of carrier tape

The effectiveness of action was implemented upon creation of procedure was validated in proper installation of carrier tape. Proper handling during insertion was critical for the quality of the material. Next is the correct way in handling the carrier tape during insertion to the machine.

Figure 12. Detailed procedure in carrier tape insertion

4.6 Proper Distinction/design of tool is out of study: Redesign the carrier tape pocket that can control damage carrier tape

Fig.13 shows the difference of design of corner pocket which can control damage carrier tape. It has big impact in robustness of the material. Proper distinction of tool was also declared at drawing specs.

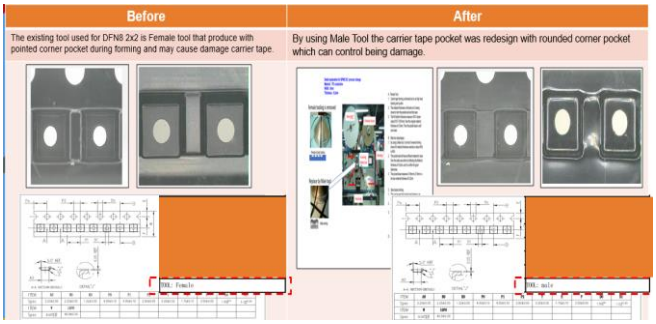


Figure 13. Distinction of Tool declared at drawing specs.

5.0 CONCLUSION

Target of eliminating damage carrier tape for DFN8 2X2 was achieved thru implementation of all identified CAPA's, procedure in proper staging of carrier tape on push cart, design and fabricate a carrier tape has curved/rounded bottom corner pocket that can control damage carrier tape, design and fabricate a jig that can hold the carrier tape during inspection, detailed procedure in proper installation of carrier tape.

6.0 RECOMMENDATIONS

This paper, upon validation of impact, recommends assessing applicability of implemented actions to other package type, carrier tape design and tool.

7.0 ACKNOWLEDGMENT

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8.0 REFERENCES

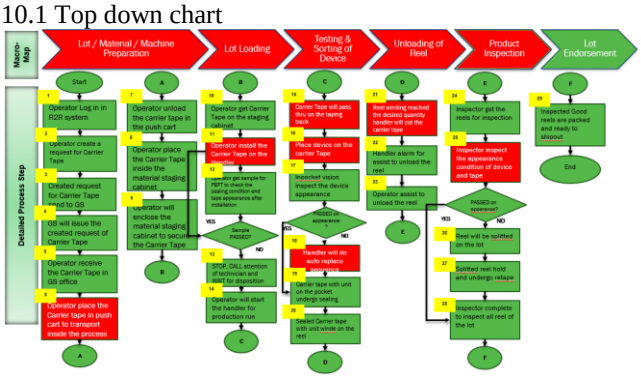
1. LSS Training Material- Lean Six Sigma Pocket Tool Book
Michael L. George, David Rowlands, Mark Price and John Maxey

9.0 ABOUT THE AUTHORS

Aprilyn C. Beñan is currently a Process Engineer 2 under Final Test Department who has been with Onsemi for 7 years. Handling shipping materials included the evaluation and Cost savings. She is a graduate of Industrial Engineering.

10.0 APPENDIX

10.1 Top down chart



10.2 Fishbone Diagram