Rework Reduction of Gaps and Alignments in an Automobile Assembly Plant

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Abstract

India is one of the fastest growing hubs for auto manufacturing industry. Most of the global auto manufacturing leaders are moving towards Indian market. In this study, the productivity of an automobile assembly plant XYZ is improved by implementing lean techniques and IE tools. The focus of this study is tackling a frequent problem of nonconforming gaps and alignments in a particular car model assembled in the plant. This paper explains the methodology implemented to reduce cycle time as well as rework caused by nonconforming gaps in a detailed manner.

Index terms— root cause analysis, gaps, alignments, cause effect, graphical analysis.

1 Introduction

he XYZ assembly plant consisted of four major production units namely Body shop, Paint shop, Assembly line and Finish line. Body shop, Assembly line and Finish line each has a quality-check workstation at the end of their respective lines. Nonconformity of gaps and alignments, of a certain car model assembled in the plant was observed frequently. This nonconformity to standards resulted in excess rework after the quality-check of Assembly line. The workstation where these gaps and alignments were set acted as a bottleneck for the entire assembly line (because operators of this workstation were required for heavy rework frequently) which in turn affected the productivity of the entire plant. Process standardization was required along with verification of Body shop and Assembly line standards for gaps and alignments. The cause of excess variation in dimensions wastobe identified.

2 II.

3 Preliminary Analysis a) Root Cause Analysis

Defined problem was rejection of cars due to measure of gaps and alignments present not conforming with the allowed specifications. Checkpoints between 'door and fender' of the car were identified to be in the crash zone and 100% cars were affected by this problem. Location of the problem was identified to be the workstation of Assembly line where gaps and alignments were set. For future reference, the workstation will be named -Station 18.

4 b) Cause Effect Diagram

The cause effect diagram revealed that the operator checking process for gaps and alignment was improper and could be a potential cause of excess variation. Another plausible cause identified was irregular recalibration of filler gauges rendering them to show incorrect values of gaps.

5 Methodology

Four major tasks were implemented to tackle this issue. These tasks included identification of missing checkpoints in Body shop, collecting data for four important checkpoints at four different stages and plotting graphs. IV.

On performing root cause analysis and analyzing the trends of different measurements of gaps and alignment, recommendations of gap setting at Body shop are provided. Apart from that, standardization of the process, placing skilled operators for setting gaps and revising the standards was recommended.

6 a) Identifying missing checkpoints for gaps and alignments

7 Results and Conclusion

Similar methodology can be implemented for other crucial gaps and alignments. Bonnet and front bumper gaps can be considered as cycle time is increased drastically if the process is not efficient and standardized. Further an electric measurement system could be used to minimize time required to take readings. [1]

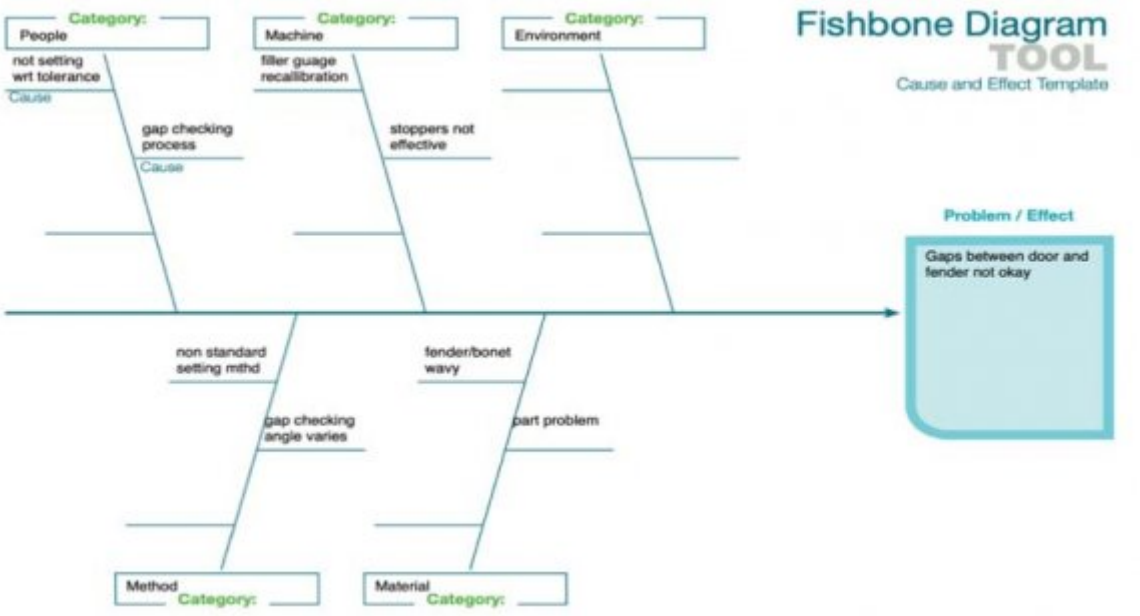

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Figure 1: Figure 1 :

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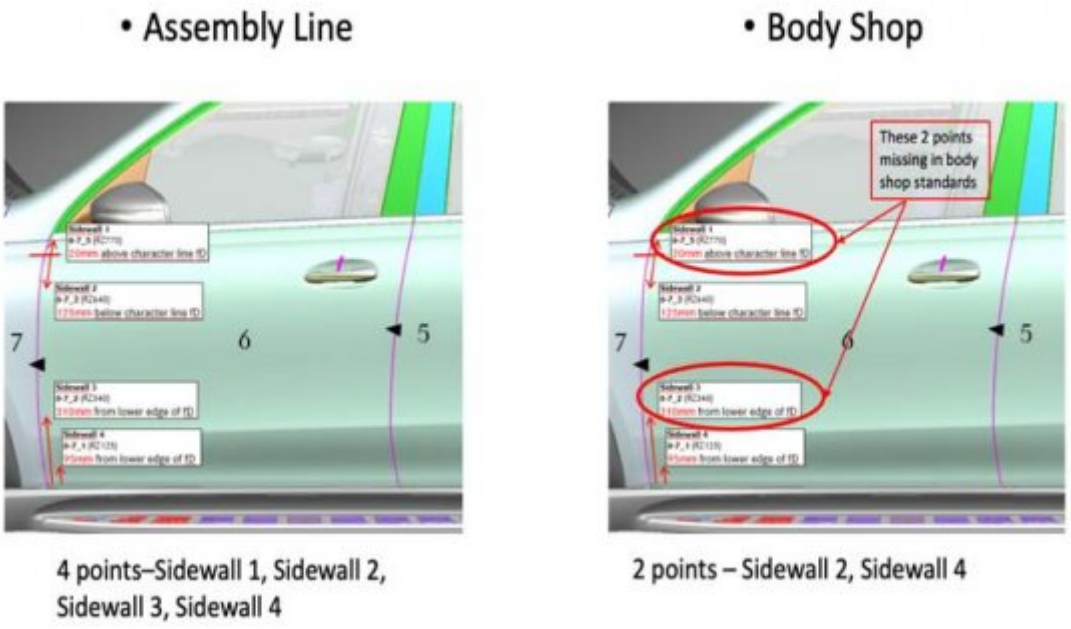

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Figure 2: Figure 2 :

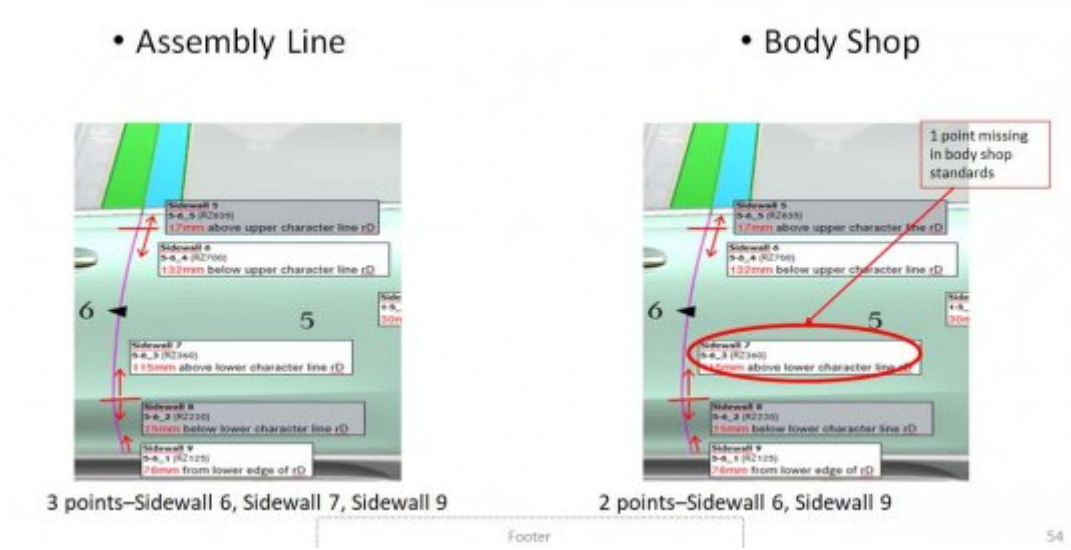

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Figure 3: Figure 3 :

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Figure 4: Figure 4 :

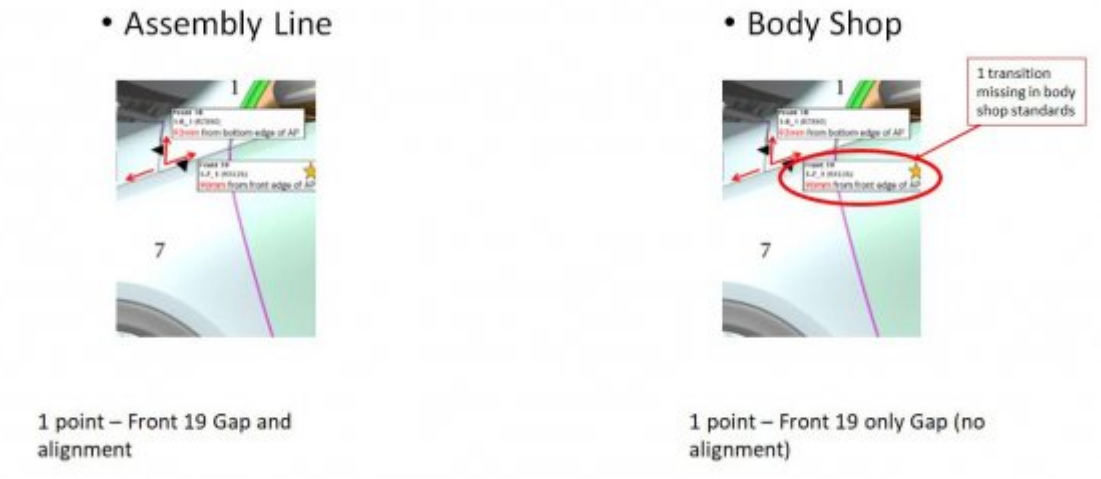

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Figure 5: Figure 5 :?

	Body No.	Major points LH															
		Body Shop				Panorama				ST.18 (BS)				ST.18(AS)			
		Front 15	Front 19	Sidewall 2	Sidewall 10	Front 15	Front 19	Sidewall 2	Sidewall 10	Front 15	Front 19	Sidewall 2	Sidewall 10	Front 15	Front 19	Sidewall 2	Sidewall 10
1	20389557	2.7	3.2	3.5	4.8	2.8	3.1	3.6	4.7	4.5	3.5	3.4	4.5	3.4	3.6	3.1	3.9
2	20388112	2.7	3.7	3.9	4.7	3	3.7	3.7	4.6	4.3	3.8	3.8	4.4	3.5	3.6	3.5	3.8
3	20388427	3.2	3.5	4	4.5	3.3	3.5	3.8	4.6	4.0	3.5	3.8	4.4	3.5	3.1	3.4	3.8
4	20388104	2.7	3.6	3.7	4.8	2.9	3.7	3.5	4.9	3.9	3.4	3.2	4.5	3.6	3.6	3.1	3.9

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Figure 6: Figure 6 :

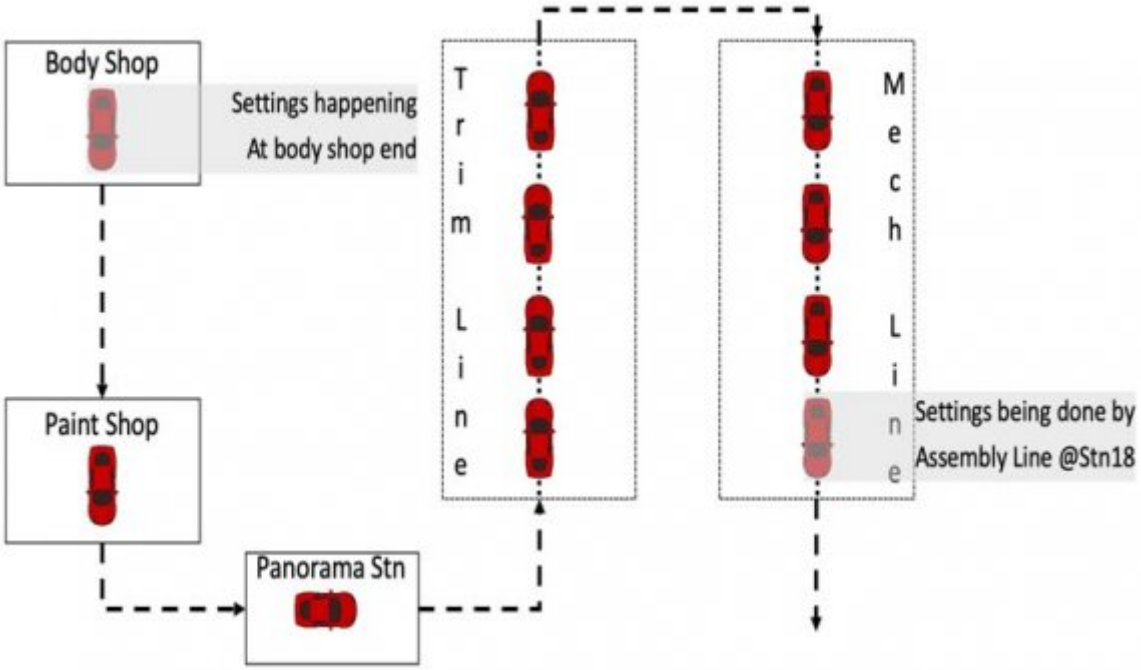

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Figure 7: Figure 7 :

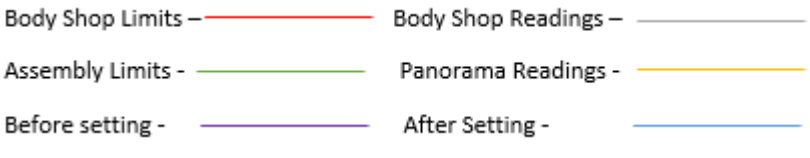

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Figure 8: Figure 8 :Figure 9 :

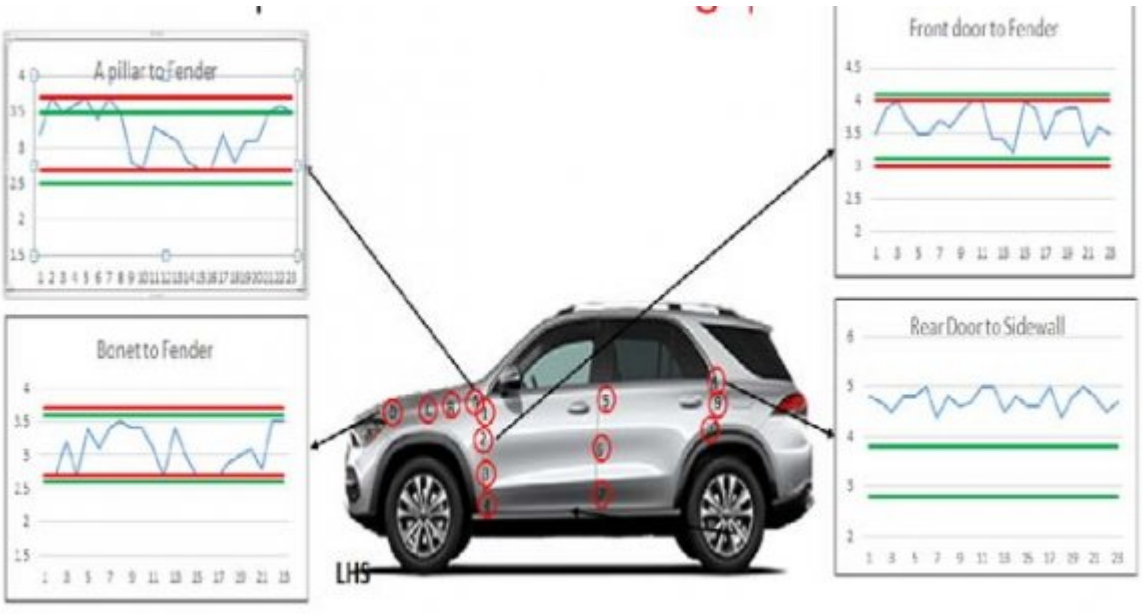

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Figure 9: Figure 10 :

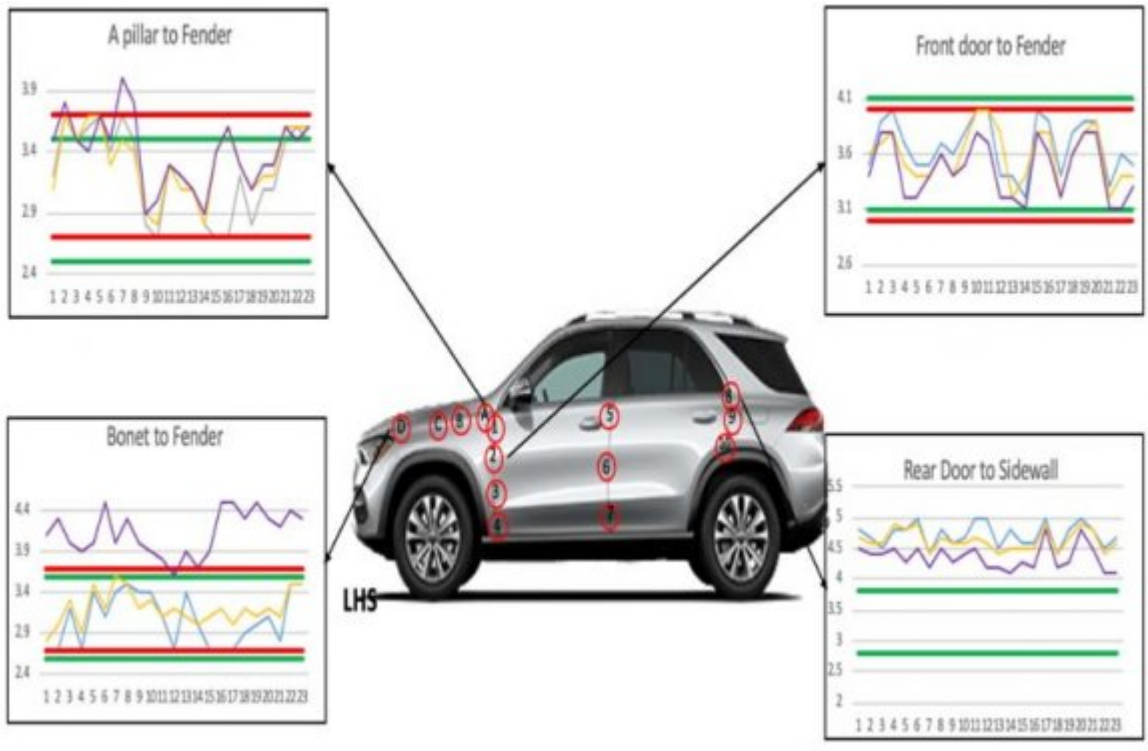

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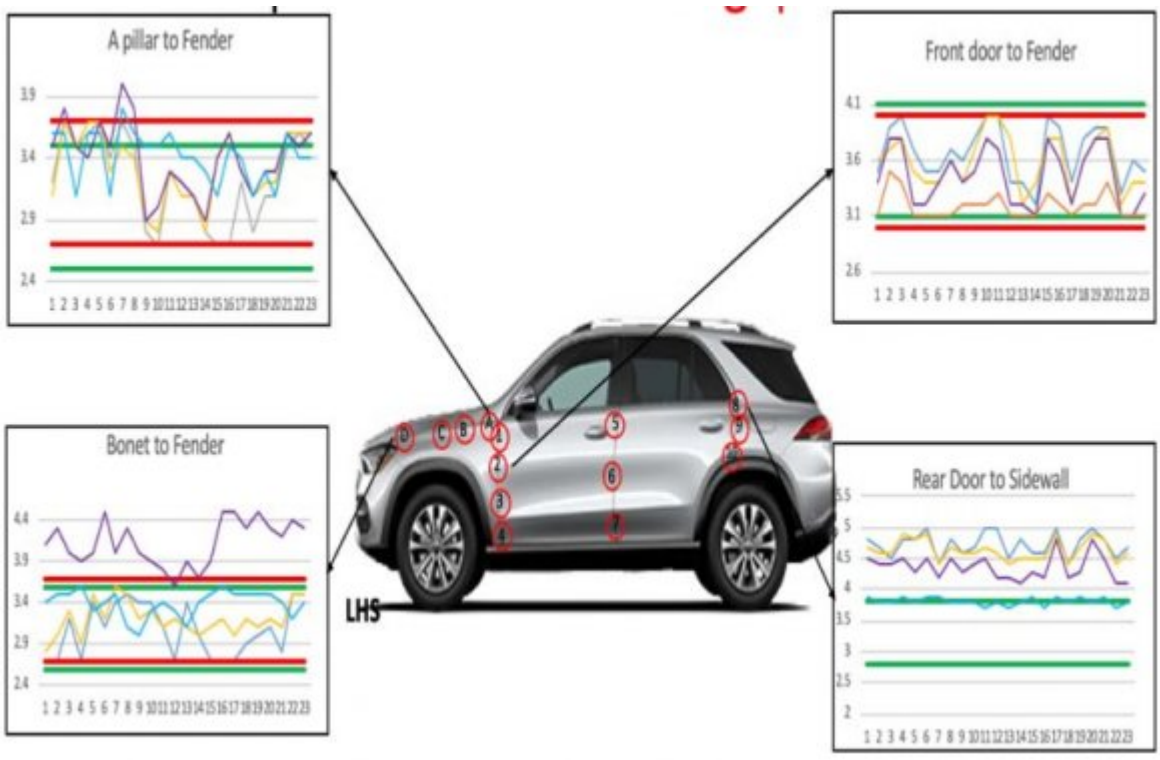
Figure 10: Figure 11 :



12

Figure 11: Figure 12 :

1

Checkpoint	Body Shop Standards	Recommendation	Remarks
A pillar to Fender	3.2+0.5 3.2-0.5	2.7-3.2mm	Within Body Shop Standards
Bonnet to Fender	3.2+0.5 3.2-0.5	2.7-3.2mm	Within Body Shop Standards
Door to Fender	3.5+0.5 3.5-0.5	3.1-3.6mm	Within Body Shop Standards
Rear Door to Sidewall	-	4.0-4.5mm	Checkpoint to be added

Figure 12: Table 1 :

.1 Acknowledgment

I would like to thank the management of XYZ plant for providing me this special opportunity to undergo training in this esteemed organization.

I would like to thank my professor, Anand Umrani, for the patient guidance, encouragement and advice he has provided throughout my time as his student. I have been extremely lucky to have a supervisor who cared so much about my work, and who responded to my questions and queries so promptly.

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