CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

From inspections and analysis of the impact of implemented corrective actions, it could be concluded that:

- The problem of abnormal noise, sliding operation failure and dirty from seat product has been eliminated.
- The complaints of seat problems from customers in after market have been reduced continuously.

FMEA technique was applied by forming FMEA members from many responsible peoples, they are included the engineer, supervisor, line operators of ABC Company. FMEA members systematically brainstorm and analyze the process for inspection to identify failure modes at process. After brainstorming, the team found factors that could be causes of failure. These factors can describe as table below:

Seat Problem	Root Cause / Factors	Action	Target Achieve
Abnormal Noise	Bracket Control Cable looseness	- Add plastic washer t = 0.5 mm C = 3 mm - Mark check.	O (17/01/06)
Sliding Operation Failure	Sliding Groove Width out of specification	- Control sliding groove width 9.7 $\pm$ 0.2mm by using Go/No Go Gate.	O (23/1/06)
Dirty on Passenger Seat	Operator unintentional touch part in stocking area.	- Implement new plastic cover on passenger seat.	O (17/4/06)

Remark: O = O.K (Target Achieve) X = N.G

Table 5.1: Seat Problem Summarize

After applying FMEA technique, it was found that the bracket clearance failures are the real cause of noise. Corrective action is done after the real cause is found. The team found noise came from bracket mechanism after simulate problem symptom on bench test. The failure mechanism has been investigated for the root cause by measurement method. The drawing of mechanism has been reviewed and keeps as reference for the standard value. As a result, the clearance of mechanism was out of standard when compared to the standard value of drawing.

According to problem of seat sliding operation failure, root cause of problem has been integrated by using FMEA technique. Teamwork has brainstormed and finding root cause of failure which it could be found sliding groove width was out of specification. The RPN number has been calculated which result was 200 RPN. Problem investigation and analysis was conducted step by step to identify correction for eliminate and detect defect out flow to customer. Countermeasure method was found by using Go/No Go Gate to control sliding groove width in standard and 100 % detected problem. As a result, the complaint of seat sliding operation failure was reduced respectively.

Using FMEA technique, it was help teamwork to analyze and investigate seat dirty problem. The seat production process has been reviewed to cross check with dirty problem. RPN number was calculated and considered as 180 RPN. The investigation was conducted since delivery process to vehicle assembly process. Root cause was identified that problem come from operator mistaking by unintentional touch part at stocking area. The correction method has been introduced by implemented new plastic cover on passenger seat.

This research is achieves the objective of eliminating failure and also prevent customer complaint in after market of ABC Company. There are lots of benefits obtain from this research including reduced defect claim part, increase customer satisfaction and reduced after market complain. Others benefit include meeting schedule and building awareness for applying FMEA in ABC Company.

Problem	Root Cause / Factors	Sev	Occ	Det	RPN		Action Result			
							Sev	Occ	Det	RPN
Noise	Gap between arm & bracket	6	6	7	252	RESULT	6	1	4	24
No Sliding	Sliding groove width out of specification	8	5	6	240		8	1	4	32
Dirty	Packing for part Fr. Seat no good	6	4	6	144		6	1	1	6

Table 5.2: RPN Result Before and After Improvement

The above table was represented RPN value which compares result between before and after improvement. RPN from noise problem was reduced from 252 to 24, no sliding problem reduced from 240 to 32 and dirty problem reduced from 144 to 6 by respectively. The effectiveness of improvement could be described as difference value of RPN.

PROBLEM: SEAT ABNORMAL NOISE FAILURE				
Year	**Month**	**Seat Production (Units)**	**Defect Part claim in aftermarket (units)**	**% Defect**
2005	September	6841	57	0.83
	October	7219	61	0.84
	November	7498	48	0.64
	December	7581	49	0.64
2006	January	7729	53	0.68
AFTER IMPROVEMENT (JAN 11, 2006)				
2006	February	4843	42	0.86
	March	9097	46	0.50
	April	7366	34	0.46
	May	10426	27	0.25
	June	11401	14	0.12
	July	6553	16	0.24

Table 5.3: Seat Abnormal Noise Defect Complaint in After Market (2005-2006)

The table above was compared result between before and after improvement of seat product. The result was shown as defect units/month. According to the table, the trend of seat abnormal noise complaint in after market was decreased but there was some variation due to some of defects still remains in market before improvement period.

PROBLEM: SEAT SLIDING OPERATION FAILURE				
Year	**Month**	**Seat Production (Units)**	**Defect Part claim in aftermarket (units)**	**% Defect**
2005	September	6841	32	0.46
	October	7219	18	0.24
	November	7498	7	0.09
	December	7581	29	0.38
2006	January	7729	37	0.47
AFTER IMPROVEMENT (JAN 23, 2006)				
2006	February	4843	27	0.55
	March	9097	15	0.16
	April	7366	28	0.38
	May	10426	6	0.05
	June	11401	9	0.07
	July	6553	2	0.03

Table 5.4: Seat Sliding Defect Complaint in After Market (2005-2006)

The second table was shown comparison result between before and after improvement of seat product. The result was shown as defect units/month. According to the table, the trend of seat sliding defect complaint in after market was decreased obviously since May to July, however there was some variation due to some of defects still remains in market before improvement period and could impact in current data of after market complaint.

PROBLEM: PASSENGER SEAT DIRTY				
Year	**Month**	**Seat Production (Units)**	**Defect Part claim in aftermarket (units)**	**% Defect**
2005	September	6841	12	0.17
	October	7219	8	0.11
	November	7498	8	0.10
	December	7581	14	0.18
2006	January	7729	11	0.14
	February	4843	13	0.26
	March	9097	7	0.07
	April	7366	18	0.24
AFTER IMPROVEMENT (APRIL 17, 2006)				
	May	10426	6	0.05
	June	11401	4	0.03
	July	6553	7	0.10

Table 5.5: Seat Dirty Defect Complain in After Market (2005-2006)

The last table has compared result between before and after improvement. The data represented as defect units/month. The amount of defect units was still varied due to improvement period just started on April 17, 2006 and there was some of defects still remain in market before improvement period. These could impact to defect complaint data in current market.

We have evaluated the problem step by step which using Quality tools. The result of implementation was the improvement of product quality and eliminated the root cause of problem.

In the other hands, from the problem case in ABC Company, it could be summarized and explained about FMEA in the other side that:

- In case of ABC Company, implement FMEA was an advantage to reduce customer complaint in after market.
- From the study, we found that FMEA is not a problem solver. It was used in combination with other problem solving tools. In case of ABC Company, FMEA presents the opportunity but does not solve the problem
- After starting FMEA, the team developing turns out to be one individual.
- FMEA is created to satisfy a customer not to improve process.
- FMEA is perceived either as too complicated or as taking too much time
- In case of FMEA team in ABC Company, it was obviously seen that FMEA ends with the calculation of RPNs, the team doesn't consider the consequence of failure in terms of costs. FMEA team do not check that their design changes for avoiding failures cost less than the failures.

5.2. Recommendations

The recommendations after improvement the product quality for automotive seat production are as follow:

1. Regarding to abnormal noise defect of seat, this problem couldn't detect in production line process because the main focus from engineer side has focused only design and product usage condition.

2. Before starting vehicle production (SVP) period, the product should mainly focus not only production process but it should focus to final inspection process before delivery to customer also.

3. Countermeasure plan and action should quick and effectively. From the study, it was found that the timing for countermeasure plan and schedule was too long. From receiving problem until countermeasure was used five months to identify root cause. These make high amount of defect outflow to after market.

4. According to RPN calculated result, company should reduce the scope of RPN from 125 to 100, and then the responsible will hurry to take action for solving problem within target date.

5. This research was aimed to reduce customer complaint in after market which defects have already outflow to market. In fact to achieve zero complaint from customer, the defect should be detected before product launched to customer in market.