

CHAPTER III

INVESTIGATE THE HISTORY OF CUSTOMER COMPLAINTS

3.1 Introduction

In order to improve the right portion of products quality in factory, the most critical quality problems in the factory should be known. Quality can be related to be money and money can lead to the easier of identification of quality problem.

In Molex Thailand, the quality problems can be classified into five criteria by activity area. Molex Thailand recorded the number of line items which incurred in quality problems every month for 12 months in fiscal year 1997 and also recorded the total line items which company produced every month. We observe and collect these quality data from the customer points of view. This information was tracked from quality deficiency report in fiscal year 1997. The example of quality deficiency report is shown in appendix I. In table 3.1 show the record of quality deficiency report in fiscal year 1997 by activity area. This was recorded from July 1996 to June 1997.

Table 3.1- Quality deficiency report by activity area in fiscal year 1997

	July 96	Aug 96	Sep 96	Oct 96	Nov 96	Dec 96	Jan 97	Feb 97	Mar 97	April 97	May 97	June 97
A	2	3	8	7	7	2	5	3	2	6	5	3
B	0	0	0	2	1	0	0	1	0	0	0	0
C	0	2	1	3	0	0	0	0	0	0	0	1
D	0	1	1	0	0	0	1	0	2	0	0	0
E	1	0	1	0	1	1	0	1	1	1	0	0
Total line items produced	1,021	1,019	1,124	1,192	1,189	1,152	1,210	946	970	1,075	966	935

Remark: A is the manufacturing area
B is the buy and resell area
C is the application area
D is the warehouse
E is the sales and customer service area

3.2 Analysis customer complaint record in fiscal year 1997

As the data shown in table above in table 3.1, there are seventy eight customer complaint items in quality deficiency reports (8D report) which faced quality problems in fiscal year 1997 and it shows that quality problems happened in the manufacturing area is fifty three customer complaint items. For buy and resell area, there are four customer complaints items shown in the record which faced quality problem in this area. And there are seven customer complaint items that have quality problem in application area and there are five customer complaint line items shown in record that happened from warehouse area. In sales and customer service area, there are seven customer complaint items that show in this area. The example of quality deficiency report is shown in appendix I. This report will identify the problem area.

In table 3.2 show the percentage of customer complaint year to date in fiscal year 1997 in each activity. In this table 3.2, it shows total line items shipped in each month from July 1996 to June 1997. Not only that, this table show the percentage of customer complaint items in each area against the total line items shipped in each month. For example, in September 1996, the total line item shipped was 1124 line items and there are eight customer complaint items faced quality problem in manufacturing area which is 0.712 percent of the total line items shipped in September.

In table 3.1 and 3.2 show that the manufacturing area was the highest percentage of customer complaint items from the total line items shipped in each month. For example, in November 1996, there was 0.589 percentage which is the highest percentage in that month. Another example, in April 1997, there was 0.558 percentage which is also the highest percentage of that month as well. In table 3.3 show the summation of the customer complaint items in each activity.

Table 3.3- Summation of customer complaint items in each activity in fiscal year 1997

Activity area	Total customer complaint items in fiscal year 1997
Manufacturing	53
Buy and resell	4
Application	7
Warehouse	5
Sales and customer service	7

In figure 3.1 show the graph of percentage of customer complaint items per line items shipped by area. In this figure 3.1, the most percentage is in the manufacturing area. Therefore, manufacturing area is needed to be investigate in order to reduce customer complaints.

Table 3.2- The percentage of customer complaints year to date in fiscal year 1997 in each activity

		FY 1997											
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Total Line Item Shipped		1,021	1,019	1,124	1,192	1,189	1,152	1,210	946	970	1,075	966	935
Manufacturing		2	3	8	7	7	2	5	3	2	6	5	3
% Complaints		0.196	0.294	0.712	0.587	0.589	0.174	0.413	0.317	0.206	0.558	0.518	0.321
Purchased Parts (or Direct Ship)		0	0	0	2	1	0	0	1	0	0	0	0
% Complaints		0.000	0.000	0.000	0.168	0.084	0.000	0.000	0.106	0.000	0.000	0.000	0.000
Design/Application		0	2	1	3	0	0	0	0	0	0	0	1
% Complaints		0.000	0.196	0.089	0.252	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.107
Cust. Service Sales		1	0	1	0	1	1	0	1	1	1	0	0
% Complaints		0.098	0.000	0.089	0.000	0.084	0.087	0.000	0.106	0.103	0.093	0.000	0.000
Warehouse		0	1	1	0	0	0	1	0	2	0	0	0
% Complaints		0.000	0.098	0.089	0.000	0.000	0.000	0.083	0.000	0.206	0.000	0.000	0.000
Total Line Item Complaints		3	6	11	12	9	3	6	5	5	7	5	4
% Complaints (Month)		0.294	0.589	0.979	1.007	0.757	0.260	0.496	0.529	0.515	0.651	0.518	0.426
Shipped		1,021	2,040	3,164	4,356	5,545	6,697	7,907	8,953	9,823	10,898	11,864	12,799
YTD. Line Item Complaints		3	9	20	32	41	44	50	55	60	67	72	78
% Complaints (YTD)		0.294	0.441	0.632	0.735	0.739	0.657	0.632	0.621	0.611	0.615	0.607	0.564
Monthly Goal		0.920	0.900	0.880	0.850	0.830	0.810	0.780	0.760	0.740	0.720	0.700	0.680
YTD. Goal		0.920	0.910	0.900	0.890	0.880	0.870	0.850	0.840	0.830	0.820	0.810	0.800

Source: Molex Thailand, 1997

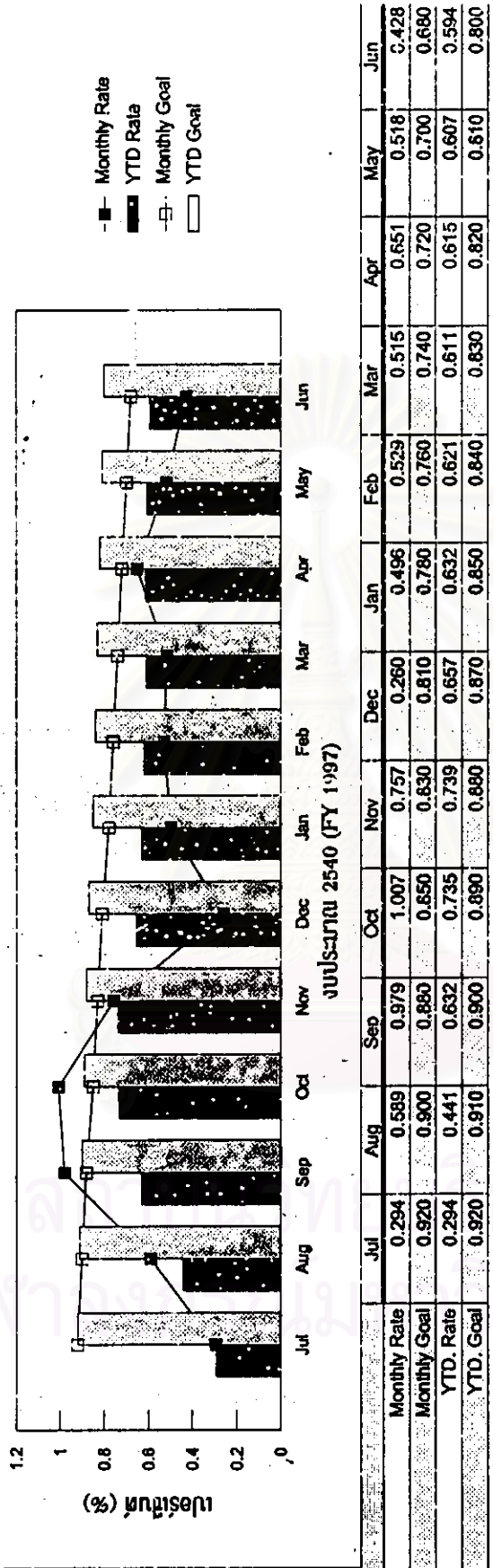


Figure 3.1- The percentage of customer complaint Items per line items shipped by area

Source: Molex Thailand, 1997

3.2.1 Analysis of customer complaints from credit note record

From credit note record in financial department, there are ten main issues which why customers charge Molex Thailand back and return products back to Molex Thailand as well. In Table 3.4 show the customer complaint issue and also how much customer charge back in term of money.

Table 3.4- Customer complaints charge

Quality issue	Value in Baht
Mating problem	115,000
Retained strip wire does not have conductor	96,329
Alternation wire	44,879
Wrong colour wire is assembled	29,822
Modular jack mating problem	22,561
Solder tail length is out off specification	15,035
Wire is out off housing	6,176
Short circuit	5,563
Ferrite core broken	2,160
Wrong housing be assembled	992

Source: Molex Thailand, 1997

In figure 3.2 is the demonstration of Pareto diagram of customer complaint charge. This pareto diagram show that there are ten quality issues. The top most percentage of pareto diagram for customer complaint charge are shown in figure 3.2

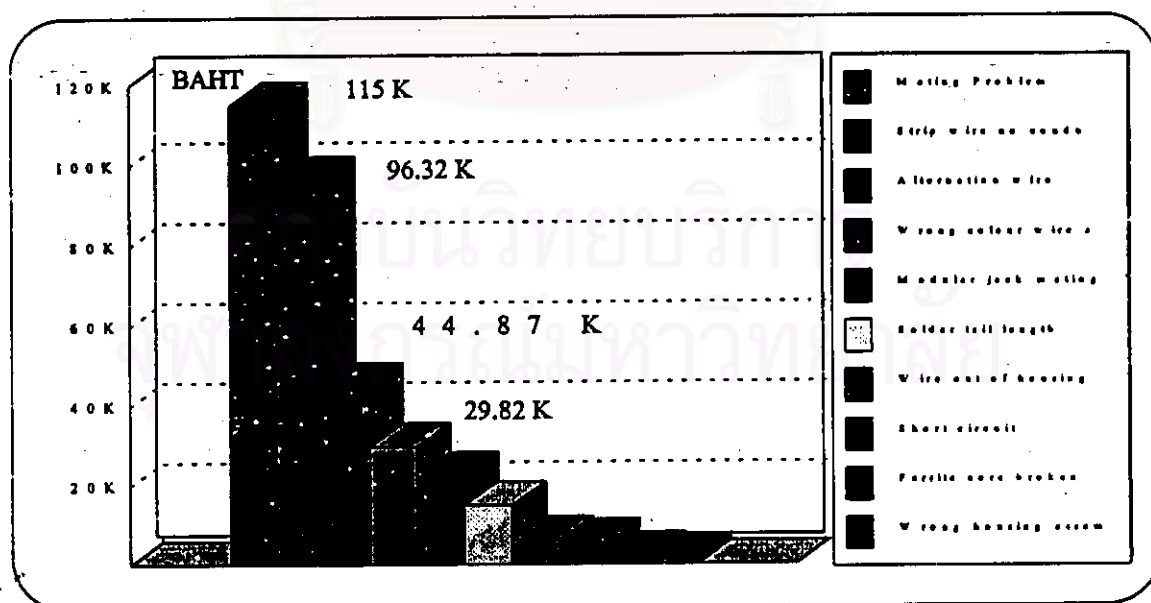


Figure 3.2- Pareto diagram of customer complaint charge in term of value

In table 3.5 show the number of return parts in fiscal year 1997 and it comes from the credit note record in financial department. This table show the number of goods which have the quality problem in each quality criteria and was returned to Molex Thailand.

Table 3.5- The number of return parts from credit note record

Quality issue	The number of return parts
Mating problem	50,000
Retained strip wire does not have conductor	18,621
Alternation wire	5,906
Wrong colour wire is assembled	9,620
Modular jack mating problem	4,102
Solder tail length is out off specification	2,624
Wire is out off housing	6,176
Short circuit	1,279
Ferrite core broken	76
Wrong housing be assembled	160

Source: Molex Thailand, 1997

In figure 3.3 show pareto diagram of the number of defect parts from credit note record. The most percentage of return parts are identified in figure 3.3

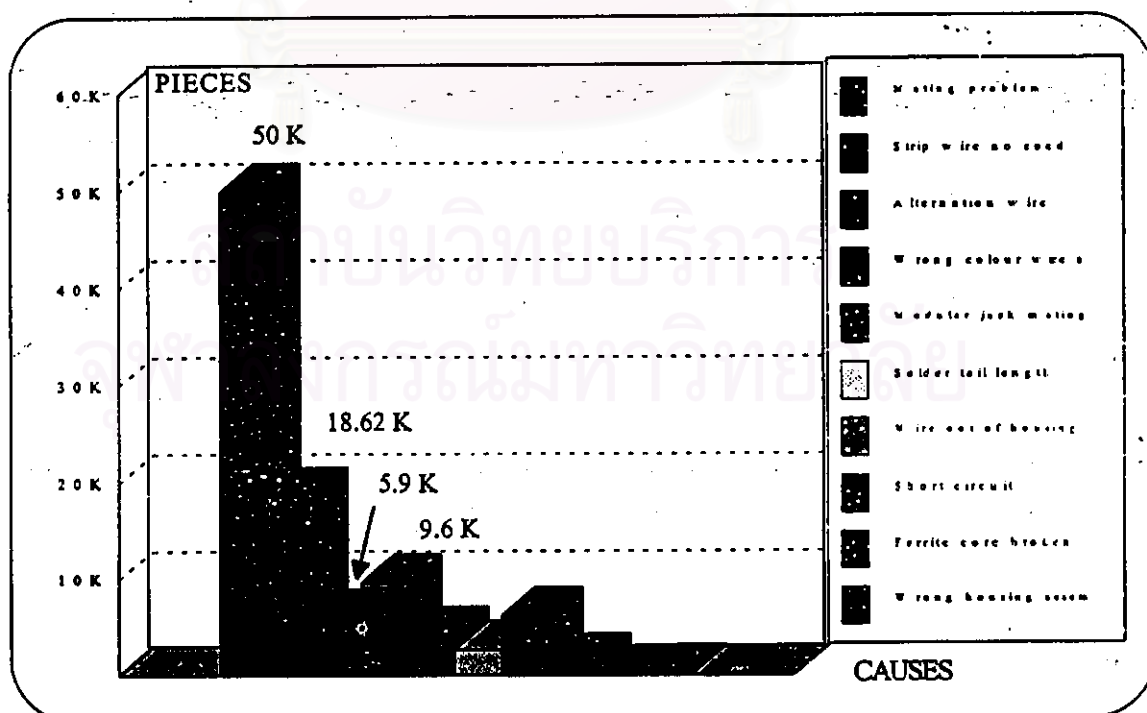


Figure 3.3- Pareto diagram show the number of defect parts

3.2.2 Selection of quality criteria

The multiplication of customer complaint value per unit and the percentage of the frequent of quality criteria show the priority of each quality criteria. The customer complaint value per unit and the percentage of the frequency of quality criteria are described first, then the priority of quality criteria will be shown later by using the multiplication of customer complaint value per unit and the percentage frequency of quality criteria.

Customer complaint value per unit

In table 3.4 show customer complaint charge and table 3.5 show the number of return part. The result of the value of customer complaint divided by the number of return parts will show how much customer complaint value per unit. This divided result is shown in table 3.6

Table 3.6- Customer complaint value per unit

Quality issue	Customer complaint value per unit
* Mating problem	2.30
Retained strip wire does not have conductor	5.17
Alternation wire	7.59
Wrong colour wire is assembled	3.10
Modular jack mating problem	5.50
Solder tail length is out off specification	5.70
** Wire is out off housing	1.00
Short circuit	4.34
Ferrite core broken	28.34
Wrong housing be assembled	6.20

Source: Molex Thailand, 1997

* Mating problem's main causes

Any defects that hinder the mating between harness wire and header are called mating problem. There are three main causes that lead to mating problem. Each cause has different frequency but they have the same output which is called mating problem. Customer complaint value per unit for mating problem is equal to 2.3. Therefore, terminal damaged, housing damaged and extrude wire is out off housing are equal to mating problem.

Main causes of mating problems are listed as following

1. Terminal damaged
2. Housing damaged
3. Extrude wire is out off specification

**** Wire is out off housing main causes**

Any defects that decrease the retention force are called wire is out off housing. There are nine main causes that lead to wire is out off housing. Each cause has different frequency but they have the same output which is called wire is out off housing. Customer complaint value per unit for mating problem is equal to 1.0. Therefore, One side crimped, Insulator come out off specification, Insertion is too deep or too shallow, Burr on crimping, Unlocked, Short mold, Lance height is out off specification, Insulator is over/under crimp, Missing insertion are equal to wire is out off housing.

Note: Retention force is the force that needed to hold terminal and housing together when they are assembled.

Main causes of wire is out off housing are listed as following.

1. One side crimped
2. Insulator come out off specification
3. Insertion is too deep or too shallow
4. Burr on crimping
5. Unlocked
6. Short mold
7. Lance height is out off specification
8. Insulator is over/under crimp
9. Missing insertion

2 The percentage of the frequent of quality criteria

To know the percentage of each quality problem. The frequency of each quality problems are needed to be identified.

From source of Molex Thailand, the type of defect and frequency are listed as following.

No	Type of defects	Frequency
1	Alternation wire	30
2	Retained strip wire does not have conductor (Missing conductor)	20
** 3	Unlocked	16
4	Wrong colour wire be assembled	15
* 5	Terminal damaged/bent	10
6	Total wire length is out of specification	10
7	Shrink tube is out off specification	2
8	Strip wire bend	2
** 9	Lance height is out off specification	1
10	Solder tail is out of spec	1
** 11	Insulator come out off specification	1
12	Ferrite core broken	1
** 13	One side crimped	1
14	Wrong housing is assembled	1
15	Wire orientation	1
** 16	Missing insertion	1
17	Modular jack engage problem	1
18	Loose shrink tube	1
** 19	Burr on crimping	1
20	Loose terminal	1
* 21	Extrude wire	1
22	Short circuit	1
* 23	Housing damaged	1
** 24	Housing short mold	1
** 25	Insert too shallow/deep	1
** 26	Insulator over/under crimp	1
Total		123

Source: Molex Thailand, 1997

From source of Molex Thailand about frequency of each criteria. The frequency of mating problem is equal to the summation of the frequency of Terminal bent (10), Extrude wire (1) and Housing damaged (1). Therefore, the frequency of mating problem is equal to twelve.

The frequency of wire is out of housing is equal to the summation of the frequency of Unlocked (16), Lance height is out off specification (1), Insulator come out off specification (1), One side crimped (1), Missing insertion (1), Burr on crimping (1), Housing short mold (1), Insert too shallow/deep (1) and Insulator is over/under crimp (1). Therefore, the frequency of wire is out off housing is equal to twenty four.

Table 3.7- The frequency of each quality criteria

No	Type of defects	Frequency
1	Alternation wire	30
**	2 Wire is out off housing	24
3	Retained strip wire does not have conductor (Missing conductor)	20
4	Wrong colour wire be assembled	15
*	5 Mating problem	12
6	Total wire length is out of specification	10
7	Shrink tube is out off specification	2
8	Strip wire bend	2
9	Solder tail is out of spec	1
10	Ferrite core broken	1
11	Wrong housing is assembled	1
12	Wire orientation	1
13	Modular jack engage problem	1
14	Loose shrink tube	1
15	Loose terminal	1
16	Short circuit	1
	Total	123

The percentage of frequency of each quality criteria come from the divide of each frequency and the summation of all frequency which show in table 3.7.

In table 3.8 show the percentage of the frequent of quality criteria. For example, the percentage of frequent of Alternation wire is equal to thirty is divided by one hundred and twenty three which the result is equal to 0.2439. Therefore, the percentage of this Alternation wire is equal to the multiple of one hundred to 0.2439 which is equal to 24.39

Table 3.8- The percentage of the frequent of quality criteria

No	Type of defects	The percentage of frequent of quality criteria
1	Alternation wire	24.39
**	2 Wire is out off housing	19.51
3	Retained strip wire does not have conductor (Missing conductor)	16.26
4	Wrong colour wire be assembled	12.19
*	5 Mating problem	9.75
6	Total wire length is out of specification	8.13
7	Shrink tube is out off specification	1.62
8	Strip wire bend	1.62
9	Solder tail is out of spec	0.81
10	Ferrite core broken	0.81
11	Wrong housing is assembled	0.81
12	Wire orientation	0.81
13	Modular jack engage problem	0.81
14	Loose shrink tube	0.81
15	Loose terminal	0.81
16	Short circuit	0.81

Source: Molex Thailand, 1997

3 The priority of quality criteria from customer complaint

The result of multiplication between the percentage of frequency of quality criteria from table 3.8 and customer complaint value per unit from table 3.6 will identify the number which show the priority. With this result, it show the priority of each quality criteria. The higher number, the higher ranking of that quality criteria.

In table 3.9 show the result of multiplication between percentage of frequent of quality criteria and customer complaint value per unit. In this table 3.9, the information from table 3.6 and table 3.8 are needed to be considered. This result of multiplication show the priority of each quality criteria. The more number, the higher priority.

Table 3.9- The result of the multiplication between customer complaint value per unit and the percentage of frequent of quality criteria

No	Type of defect	Result from Table 3.6	X	Result from Table 3.7	=	Result of multiplication
1	Alternation wire			7.59	X	0.2439 = 1.85
** 2	Wire is out off housing			1.00	X	0.1951 = 0.19
3	Retained strip wire does not have conductor (Missing conductor)			5.17	X	0.1626 = 0.84
4	Wrong colour wire be assembled			3.10	X	0.1219 = 0.38
* 5	Mating problem			2.30	X	0.0975 = 0.224
6	Total wire length is out of specification			0	X	0.0813 = 0
7	Shrink tube is out off specification			0	X	0.0162 = 0
8	Strip wire bend			0	X	0.0162 = 0
9	Solder tail is out of spec			5.70	X	0.008 = 0.045
10	Ferrite core broken			28.42	X	0.008 = 0.227
11	Wrong housing is assembled			6.2	X	0.008 = 0.049
12	Wire orientation			0	X	0.008 = 0
13	Modular jack engage problem			5.50	X	0.008 = 0.044
14	Loose shrink tube			0	X	0.008 = 0
15	Loose terminal			1	X	0.008 = 0.008
16	Short circuit			4.34	X	0.008 = 0.034

Source: Molex Thailand, 1997

In table 3.10 show the priority of quality criteria which come from the information in table 3.9.

Table 3.10- The priority of quality criteria

Priority	Quality criteria	The value from table 3.9
1	Alternation wire	1.85
2	Missing conductor	0.84
3	Wrong colour be assembled	0.38
4	Ferrite core broken	0.227
5	Mating problem	0.224
6	Wire is out off housing	0.19

From table 3.10 show the selected quality criteria that will be implemented by FMEA technique. However, pricing of the products are needed to be considered for each quality criteria.

Therefore, collecting the part number that used to faced selected quality problem was done before implementing proposed FMEA method to reduce customer complaints. Investigate the pricing of each part number for each quality criteria was done so as to be able to find the top five highest unit price from six selected quality criteria.

Table 3.11 show the unit price of each part number which used to have quality criteria in each selected quality criteria.

Table 3.11- Part number and pricing in each quality criteria

No	Quality criteria	Part number	Unit price (Baht)
1	Alternation wire	889-4859	32.40
		889-3480	7.64
		889-3388	6.40
		889-4125	6.00
		889-4753	5.65
2	Missing conductor	599-4292	7.80
		889-4126	7.65
		889-4942	4.48
		889-4779	4.70
3	Wrong colour be assembled	889-4941	27.20

4	Ferrite core broken	889-5206	11.00
5	Mating problem (Terminal bent)	889-5034	64.00
6	Mating problem (Unlocked)	889-4529	13.78
7	Wire is out off housing	889-0692	19.55
		889-0869	5.57
		889-2933	2.83

Source: Molex Thailand, 1997

From table 3.11, the most top five highest unit price part number are selected.

Alternation wire

From table 3.11, there are five part number that used to face alternation wire as quality problem. Part number 889-4859 has the highest unit price (32.40 Baht) in this selected quality criteria. Therefore, this part 889-4859 was selected to implement FMEA technique in Chapter VI.

Missing conductor

From table 3.11, there are five part number that used to face missing conductor as quality problem. But the highest unit price for this quality criteria is 7.8 Baht which is lower than other part number in other criteria and it is not in the top five highest unit price. So, it was not selected.

Wrong color wire be assembled

In this selected quality criteria, the unit price of part number is 27.2 Baht which is in the top five highest unit price. This information come from table 3.11. This part number (889-4941) will be implemented by FMEA technique in Chapter VI.

Ferrite core broken

From table 3.11, part number 889-5206 used to face ferrite core broken as quality problem. But the highest unit price for this quality criteria is 11.00 Baht which is lower than other part number in other criteria and it is not in the top five highest unit price. So, it was not selected.

Mating problem (Terminal bent)

In this selected quality criteria, the unit price of part number is 64.00 Baht which is in the top five highest unit price. This information come from table 3.11 This part number used to face mating problem (terminal bent) as a quality problem. This part number (889-5034) will be implemented by FMEA technique in Chapter VI.

Mating problem (Unlocked)

In this selected quality criteria, the unit price of part number is 13.78 Baht which is in the top five highest unit price. This information come from table 3.11. This part number used to face mating problem (Unlocked) as a quality problem. This part number (889-4529) will be implemented by FMEA technique in Chapter VI

Wire is out off housing

There are five part number that used to face wire is out off housing as a quality problem. Part number 889-0692 has the highest unit price (19.55 Baht) in this selected quality criteria. Therefore, this part 889-0692 was selected to implement FMEA technique in Chapter VI

In table 3.12 show the top five highest unit price part number that will be implemented by FMEA technique in Chapter VI. In table 3.12 use the information from table 3.11

Table 3.12- The top five highest unit price part number

Top five highest unit price part number	Quality criteria	Unit price
889-5034	Mating problem (Terminal bent)	64.00 Baht
889-4859	Alternation	32.40 Baht
889-4941	Wrong wire color be assembled	27.20 Baht
889-0692	Wire is out off housing	19.55 Baht
889-4529	Mating problem (Unlocked)	13.78 Baht