APPENDIX 1
QUESTIONNAIRE

Process Failure Mode and Effects Analysis (PFMEA)

1. General

1.1 Name of your company?

1.2 Approximately how many people are employed in your company?

1.3 What is your approximate sales/turnover? Total

1.4 In which industry sector(s) Does your Company operate?

1.5 Which Automotive Manufacturers Do you supply?

1.6 Is your company registered to/or achieved

   a) ISO 9000
   b) Q1
   c) TS 16949:2002
   d) Others

   Yes .....  No .....
2. **Motivation**

What were your motives for starting to use PFMEA and how important were they?

Specify Importance

<table>
<thead>
<tr>
<th>Not</th>
<th>Very</th>
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<tr>
<td>0</td>
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</tbody>
</table>

2.1 Competitors were using PFMEA

2.2 Part of your Total Quality effort

2.3 Provide a driver for continuous effort/improvement

2.4 To achieve customer quality award e.g. Q1

2.5 Increase commitment of line management to quality

2.6 To avoid making mistakes

2.7 There is no other appropriate tool

2.8 Part of customer requirements

2.9 Other internal benefits please specify

3. **Organizational Characteristics**

What Organizational Characteristics impact on the use of PFMEA and how important are they?

Specify Importance

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<thead>
<tr>
<th>Not</th>
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<tbody>
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</table>

3.1 Management understanding of technique

3.2 Management commitment

3.3 Management involvement

3.4 Considered to be “just another management burden”

3.5 Understanding of contribution to Continuous Improvement

3.6 Involvement of all relevant managers e.g. design to service

3.7 Usefulness as an ‘up front’ planning tool

3.8 Management understanding of detailed product requirement

3.9 Customers clearly communicating their requirements
3.10 PFMEA is driven by management .......... 
3.11 Management recognition of need to allocate resources .......... 
3.12 Management review process against program? E.g. gateway .......... 
3.13. How many of your managers actively participate in PFMEA .......... %
3.14. Do managers review PFMEA progress against program? Yes ..... No ..... 

4. Managing the Process

What aspects of managing the process of PFMEA impact on its use and how important are they?

Specify Importance
Not Very
0 1 2 3 4 5

4.1. Clear definition of Roles and Responsibilities ...... 
4.2. Inclusion of sub-suppliers ...... 
4.3. Use of standard PFMEA pro-formas ...... 
4.4. Use of realistic rating values ...... 
4.5. Tailoring rating values to specific product ...... 
4.6. Effective management of time ...... 
4.7. Prioritising actions ...... 
4.8. Follow-up of recommended actions ...... 
4.9. Regular review and update ...... 
4.10. Revisiting PFMEA when part is categorized “carry over” ...... 
4.11. Close-out of concerns ...... 
4.12. Do you include sub-supplies in your PFMEA
Yes ..... No ..... 

4.13. How frequently do you review existing PFMEAs?

a) Not at all Yes ..... 
b) 1 – 3 months Yes ..... 
c) 4-6 months Yes ..... 
d) 7-12 months Yes ..... 
e) More that 12 months Yes .....
5. **Team Characteristics**

What team characteristics impact on the use of PFMEA and how important are they?

<table>
<thead>
<tr>
<th>Specify Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not 1 2 3 4 5</td>
</tr>
</tbody>
</table>

5.1. Use of the Team Approach ............
5.2. Use of the cross functional teams ..........
5.3. Trained team leaders ............
5.4. Trained team facilitators ............
5.5. Team’s shared understanding of objectives ............
5.6. Team should include representatives from all departments ............

  e.g. Sales, Manufacturing, Engineering, Quality, Service etc.
5.7. Has your Company participated in any team building programmes?

  Yes ..... No .....

5.8. Who attended?

  a) Directors Yes ..... No .....
  b) Managers Yes ..... No .....
  c) Supervisos Yes ..... No .....
  d) Engineers Yes ..... No .....
  e) Operators Yes ..... No .....

5.9. How long was the Programme?

  a) 1 day Yes ..... 
  b) 2 – 3 days Yes ..... 
  c) More than 3 days Yes ..... 

6. **Technical Characteristics**

What technical characteristics impact on the use of PFMEA and how important are they?
6.1. Design FMEA is available
6.2. Understanding the differences between a Design and A Process FMEA
6.3. Defining the scope of the PFMEA
6.4. Clear understanding of the Process Purpose
6.5. Clear process flow chart and description
6.6. Clear understanding of Fit and Function
6.7. All failure modes being considered
6.8. Clear definition of failure mode e.g. total/intermittent/partial/degraded
6.9. Clear understanding of effects on Operator through to Customer and Service
6.10. Clear definition of root causes
6.11. Use of Brainstorming to identify root causes
6.12. Use of Fishbone diagram to show Cause & Effect relationship
6.13. Clear understanding between Cause and Effect
6.15. Difficulty in determining Ratings i.e. Severity, Occurrence and Detection
6.16. Identifying critical CC and Significant Characteristics SC
6.17. Understanding the ranking of CCs and SCs
6.18. Initial focus on high Risk Priority Numbers only
6.19. Reliance on Inspection to resolve issues
6.20. Generic PFMEA used in lieu of individual PFMEA
6.21. Establishment of clear links between PFMEA Control Plan and Instructions
6.22. Clarity and Usefulness of customer’s PFMEA guidelines
6.23. Do you use Process Flow Charts
   Yes ..... No ..... 
6.24. Do you identify failure modes in terms of Total / intermittent / partial / degraded?
   Yes ..... No ..... 
6.25. Do you use the Brainstorming technique
   Yes ..... No ..... 
6.26. Do you use Fishbone diagrams?
   Yes ..... No .....
6.27. What alternative/similar techniques to PFMEA do you use? Please give details:

………………………………………………………………
………………………………………………………………

7. Training Process

What training issues impact on the use of PFMEA and how important are they?

<table>
<thead>
<tr>
<th>Specify Importance</th>
<th>Not</th>
<th>Very</th>
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<tbody>
<tr>
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<td>2</td>
<td>3</td>
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<td></td>
<td>4</td>
<td>5</td>
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<tr>
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</thead>
<tbody>
<tr>
<td>7.1. Training by customer</td>
<td>............</td>
</tr>
<tr>
<td>7.2. Training by Third Party</td>
<td>............</td>
</tr>
<tr>
<td>7.3. Ongoing training programmes</td>
<td>............</td>
</tr>
<tr>
<td>7.4. Training for managers</td>
<td>............</td>
</tr>
<tr>
<td>7.5. Training for supervisors</td>
<td>............</td>
</tr>
<tr>
<td>7.6. Training for operators</td>
<td>............</td>
</tr>
</tbody>
</table>

7.7. What training programmes has your Company used?

- a) Customer training  Yes .....  No ..... 
- b) Institutes/colleges  Yes .....  No ..... 
- c) Laser Video/computer aided  Yes .....  No ..... 
- d) Other, please specify:  Yes .....  No ..... 

7.8. Duration of Training

- a) None  Yes ..... 
- b) Half – 1 day  Yes ..... 
- c) 2 – 3 days  Yes ..... 
- d) More than 3 days  Yes ..... 

7.9. Who has received training?

- a) Directors  Yes .....  No ..... 
- b) Senior management  Yes .....  No ..... 
- c) Middle management/Dept. Head  Yes .....  No ..... 
- d) Supervisors  Yes .....  No ..... 
- e) Operators  Yes .....  No ..... 
8 Resources

What resource aspects impact on the use of PFMEA and how important are they?

<table>
<thead>
<tr>
<th>Specify Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

8.1. Amount of time spent
8.2. Lack of user-friendly software
8.3. Lack of process capability data
8.4. Lack of back-up data e.g. Design of Experiment Design, FMEA, Cause & Effect diagrams etc
8.5. The cost of completing and maintaining PFMEA
8.6. How much time on average does your Company spend on completing and maintaining PFMEA?
   a) Less than 1 hour a week
   b) 1 – 5 hours per week
   c) 6 – 10 hours per week
   d) 11 – 20 hours per week
   e) If more than 20-hours, please specify?

8.7. How many people regularly participate in completing the FMEA?
   a) 1
   b) 2 – 3
   c) 4 – 6
   d) 7 – 10
   e) More than 10

8.8. How many PFMEAs do you have to action at any one time?
   a) 1
   b) 2 – 3
   c) More than 4

8.9. Do you use PFMEA software?
   Yes ..... No .....  
8.10 Is your software user friendly?
   Yes ..... No ..... 
8.11 Name the FMEA software you use?

........................................................................
........................................................................
8.12. How it helps you?  ........................................

8.13 What extra features you desire?  
.................................................................

8.14 Does your company measure the cost of completing and maintaining PFMEA?
Yes .....  No ..... 

8.15 How much do you estimate each PFMEA costs?
..............

9. Benefits and Effectiveness

How important do you think it is to measure the benefits and effectiveness of PFMEA?

9.1. Do you measure the benefits and effectiveness of FMEA
Yes .....  No ..... 

9.2. Do you measure the benefits in terms of
a) Improved First Run Capability  Yes ...  No ...
b) Increase in process potential capability  Yes ...  No ...
c) Increase in process efficiency  Yes ...  No ...
d) Reduction in internal scrap/reject areas  Yes ...  No ...
e) Reduction in parts per million (ppm)  Yes ...  No ...
f) Reduction in Customer returns  Yes ...  No ...
g) Reduction in warranty  Yes ...  No ...
h) Improvement in maintenance frequency  Yes ...  No ...
i) Improvement in Reliability  Yes ...  No ...
j) Others, please state:  
.................................................................
.................................................................

10. External Factors

What factors outside your control impact on PFMEA and how important are they?

Specify Importance
Not     Very
0   1   2   3   4   5

10.1. Late engineering changes/releases
.................

10.2. Need for tooling design before PFMEA
.................
10.3. Good timely PFMEA compromised by ongoing changes

10.4. Frequently changing personnel dilutes expertise

10.5. PFMEA not required by other customers in same industry

11. Challenges/difficulties

Which if any, of the topics listed below do you consider to be your major concerns or difficulties in completing FMEA? Please rank in order of priority. 1 being highest Ranking

11.1. Cost [ ]
11.2. Lack of design FMEA [ ]
11.3. Time [ ]
11.4. Document format [ ]
11.5. Lack of suitable software [ ]
11.6. Management commitment [ ]
11.7. Regarded as just more paperwork [ ]
11.8. Understanding Function [ ]
11.9. Inadequate customer manual/guidelines [ ]
11.10. Allocating resources [ ]
11.11. Regular reviewing and updating [ ]
11.12. Availability of training [ ]
11.13. Linking PFMEA to Control Plan & Instructions [ ]
11.14. Ranking Severity, Occurrence and Detection [ ]
11.15. Others please list:

…………………………………………………………………
…………………………………………………………………
…………………………………………………………………

11.16 Which of the above would you most like to be improved and how?

…………………………………………………………………
…………………………………………………………………

12. Suggestions

Considering all of the foregoing please outline, up to six ways, in which you feel that the PFMEA process can be improved

…………………………………………………………………
…………………………………………………………………
APPENDIX - II

SEVERITY EVALUATION CRITERIA
Source: AIAG (1995)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Effect</th>
<th>Criteria: Severity of Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Hazardous without Warning</td>
<td>Very high ranking when a potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulations without warning.</td>
</tr>
<tr>
<td>9</td>
<td>Hazardous with Warning</td>
<td>Very high severity ranking when a potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulation with warning.</td>
</tr>
<tr>
<td>8</td>
<td>Very High</td>
<td>Vehicle/item inoperable, with loss of primary function. 7 High Vehicle/item operable, but at reduced level of performance, Customer dissatisfied.</td>
</tr>
<tr>
<td>7</td>
<td>High</td>
<td>Vehicle/item operable, but at reduced level of performance, Customer dissatisfied.</td>
</tr>
<tr>
<td>6</td>
<td>Moderate</td>
<td>Vehicle/item operable, but comfort/convenience item(s) inoperable. Customer experiences discomfort.</td>
</tr>
<tr>
<td>5</td>
<td>Low</td>
<td>Vehicle/item operable, but comfort/convenience item(s) inoperable at reduced level of performance. Customer experiences some dissatisfaction.</td>
</tr>
<tr>
<td>4</td>
<td>Very Low</td>
<td>Cosmetic defect in finish, fit &amp; finish/squeak or rattle item that does not conform to specifications. Defect noticed by most customers.</td>
</tr>
<tr>
<td>3</td>
<td>Minor</td>
<td>Cosmetic defect in finish, fit &amp; finish/squeak or rattle item that does not conform to specifications. Defect noticed by average customer.</td>
</tr>
<tr>
<td>2</td>
<td>Very Minor</td>
<td>Cosmetic defect in finish, fit &amp; finish/squeak or rattle item that does not conform to specifications. Defect noticed by discriminating customer.</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
<td>No effect.</td>
</tr>
</tbody>
</table>
**OCCURRENCE RANKING EVALUATION CRITERIA**

Source: AIAG (1995)

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Probability of Failure</th>
<th>Possible Failure Rates of Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Very high: Failure is almost inevitable</td>
<td>≥ 0.5, (greater than 1 in 2)</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>0.331 (1 in 3)</td>
</tr>
<tr>
<td>8</td>
<td>High: Repeated failures</td>
<td>0.125, (1 in 8)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>0.05, (1 in 20)</td>
</tr>
<tr>
<td>6</td>
<td>Moderate: Occasional Failures</td>
<td>0.0125 (1 in 80)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.0025 (1 in 400)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0.0005 (1 in 2000)</td>
</tr>
<tr>
<td>3</td>
<td>Low: Relatively few failures</td>
<td>0.0000667 (1 in 15,000)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.00000667 (1 in 150,000)</td>
</tr>
<tr>
<td>1</td>
<td>Remote: Failure is unlikely</td>
<td>≤ 0.000000667 (1 in 1,500,000)</td>
</tr>
</tbody>
</table>
Detection Ranking Evaluation Criteria

Source: AIAG (1995)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Detection</th>
<th>Criteria: Likelihood of Detection by Process control</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Absolute Uncertainty</td>
<td>Process Control will not and/or cannot detect a potential cause/m Mechanism and subsequent failure mode; or there is no Process Control.</td>
</tr>
<tr>
<td>9</td>
<td>Very Remote</td>
<td>Very remote chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td>8</td>
<td>Remote</td>
<td>Remote chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td>7</td>
<td>Very Low</td>
<td>Very low chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td>6</td>
<td>Low</td>
<td>Low chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td>5</td>
<td>Moderate</td>
<td>Moderate chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td>4</td>
<td>Moderately High</td>
<td>Moderately high chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>High chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td>2</td>
<td>Very High</td>
<td>Very high chance the Process Control will detect a potential cause/m Mechanism and subsequent failure mode.</td>
</tr>
<tr>
<td></td>
<td>Almost Certain</td>
<td>Process Control will almost certainly detect a potential cause/mechanism and subsequent failure mode.</td>
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