Appendix 1a: Questionnaire for Factory Manager

Date of Interview:

Name of the Company:

Name of Factory Manager:

Reference of accident:
  - How did the accident occur:

  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

  - Other details of the accident:

  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

<table>
<thead>
<tr>
<th>Sr</th>
<th>Questions</th>
<th>Process in place</th>
<th>Rating (1 – 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How do you rate the safety culture of the company</td>
<td></td>
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<tr>
<td>2</td>
<td>Rate the top management participation in safety management</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>Rate the participation of shop floor managers and workers in Safety management</td>
<td></td>
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<tr>
<td>4</td>
<td>Rate the Safety Management in the company</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>Rate the Safety Training process</td>
<td></td>
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<tr>
<td>6</td>
<td>Rate the Hazard Identification process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Rate the Safety communication process and channel (Line management gives feedback on their own or you have to ask them for it)</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>Rate the corrective action taking process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rate the Behavior correction process</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Your comments on this accident: Was the major reason Unsafe actions / Unsafe Conditions?

• What are your recommendations for further improving Safety Management System in the organization?

• What are your recommendations for further reducing accidents in the organization?
Appendix 1b: Questionnaire for Safety Officer

Date of Interview:

Name of the Company:

Name of Safety Officer:

Reference of accident:
  • How did the accident occur:

• Other details of the accident:

<table>
<thead>
<tr>
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<tr>
<td>6</td>
<td>Rate the Hazard Identification process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Rate the Safety communication process and channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• You give feedback to Top management without asking / or give after asking</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• You get feedback from workers / Line management without asking / or you get it after asking</td>
<td></td>
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<tr>
<td>8</td>
<td>Rate the corrective action taking process</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>Rate the Behavior correction process</td>
<td></td>
<td></td>
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</tbody>
</table>
• You comments on this accident: Was the major reason Unsafe actions / Unsafe Conditions?

• What are your readings about the accidents that occur in your factory? Are those mainly due to unsafe actions or due to unsafe conditions?

• Will Behavior correction program help to improve in accident reduction?

• What are your recommendations for further improving Safety Management System in the organization?

• What are your recommendations for further reducing accidents in organization?

• Do you think that Behavior modification process would help to reduce accidents in your company and in other industries too?
Appendix 1c: Questionnaire for Line Supervisor

Date of Interview:
Name of the Company:
Name of Line Supervisor:
Reference of accident:
  - How did the accident occur:
  - Other details of the accident:

<table>
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<tr>
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<th>Process in place</th>
<th>Rating (1 – 10)</th>
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<td>Rate the Safety Training process</td>
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<td>6</td>
<td>Rate the Hazard Identification process</td>
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<tr>
<td>7</td>
<td>Rate the Safety communication process and channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• You give feedback to Top management without asking / or give after asking</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• You get feedback from workers without asking / or you get it after asking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Rate the corrective action taking process</td>
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<td></td>
</tr>
<tr>
<td>9</td>
<td>Rate the Behavior correction process</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- You comments on this accident: Was the major reason Unsafe actions / Unsafe Conditions?
• What are your readings about the accidents that occur in your factory? Are those mainly due to unsafe actions or due to unsafe conditions?

• Will Behavior correction program help to improve in accident reduction?

• What are your recommendations for further improving Safety Management System in the organization?

• What are your recommendations for further reducing accidents in the organization?
Appendix 1d: Questionnaire for worker who met with accident

Date of Interview:

Name of the Company:

Name: T.no:

Department: Shop:

Age: Experience:

Date of Accident: MDL:

Injury Type:

How did accident occur:

- **Personal Information:**

  Habits: Smoking / Drinking / Drugs:

  Frequency:

  Disease: Blood Pressure / heart Problem / Vertigo / Arthritis, etc:

  Treatment / Medicines:

  Any Stress (Work / family / personal):

  Physical Fitness level:

  What happened on the day of the accident (Morning to Evening) *(To find out stress)*

- **Unsafe Condition:**

  Were you trained to do the particular task / operation?

  Was there proper communication about the hazard present in the work?
Was the work properly planned?


Were there any improper working conditions?


Was the equipment defective or unsafe?


Was the design / operating systems safe?


Was it possible to reach or see controls?


Were there any physical hazards (no guarding, inadequate guarding, slippery surface, etc)


- **Unsafe Actions:**

Do you normally perform the job within time / before time or after time? *(hurry up attitude)*


Did you assess the risk before performing the job? *(Risk Perception)*


If, yes what was your perception about it:

- Knowingly accepted high risk:
- Misjudges actual risk :
- Did not monitor job progress / conditions. *(carelessness)*:
- Used incorrect task priorities.
- Knowingly deviated from safe procedure *(over confidence)*:
- Intentionally violated safety standard or regulation *(arrogant)* :
- Yielded to social pressure *(Supervisor / peers)* :

Did you make a mistake while reading the instrument?

Did you fail to respond to warning signals?
Did you perform the job under any stress (Physical / psychological)?

**Communication:**

Does the line management give you information about safety matters (shop’s unsafe conditions / acts, minor accident, activities of other sections, other safety related issues) on their own:

________________________________________________________________________

________________________________________________________________________

Any more information that you have about this accident or Safety management of the company?
Appendix 2: Sample Accident Investigation form

VICKERS

Accident/Injury/Illness/Near Miss/Dangerous Occurrence/Incident Report Form

Details of accident/incident

What happened? Give cause (how and why) if known.

Mr. G R Shewale was honing a compensator on Honing machine in Honing section of Valve department. During honing, compensator got trapped on the rotating hone causing it to rotate suddenly. This caused cut injury to his right hand ring & middle finger.

When it happened? Date: 8th August 2006 Time: 07:30 p.m.
Where it happened? On Honing machine in Valve

Details of any persons injured

Full name: Mr. G R Shewale T.No: 3130 Dept: Valve
Nature of Injury: Cut injury to Right hand ring & middle finger
Treatment given: Wound treated by doctor and injured person was sent home for rest. No stitching was done. He has not joined duties till 16th August 2006.
Treatment given by: Dr. Chavan at Chavan hospital
Taken to hospital: Yes If yes, which hospital: Chavan Hospital near Company

For completion by the Manager - MESH Incidence No. 03/08-06

Accident/Incident investigated: Yes Written investigation report necessary: Yes
Written investigation report completed: No OSH reportable: Yes, if yes, date reported N/A OSHG reportable: Yes.

Accident details are yet not available as the injured person has not joined duties & no other person knows the exact reason of accident. Possibly the job was not held by Mr. Shewale properly, causing entangling the same with rotating hone.

Underwrite job may also cause such accident but possibility is very low.

Corrective action: 1. Operators to be instructed to be very cautious on this manual operation of Honing. 2. It is to be ensured that jobs given for honing are not undersized.

Responsible person: S D Sarode Completion Date: 12/08/2006

Preventive action: Same as above
Appendix 3: Statistical tools used for analysis of Quantitative data

The quantitative data which was collected through the interviews conducted with the management personnel were subjected to Karl's Pearson Chi-Square test under the guidance of an expert statistician. The results of the same are discussed in the earlier chapters.

The following is a brief description of the test.

**Karl Pearson's chi-square test**

**Pearson's chi-square** ($\chi^2$) test is the best-known of several chi-square tests – statistical procedures whose results are evaluated by reference to the chi-square distribution. Its properties were first investigated by Karl Pearson.

It tests a null hypothesis that the frequency distribution of certain events observed in a sample is consistent with a particular theoretical distribution. The events considered must be mutually exclusive and have total probability 1. A common case for this is where the events each cover an outcome of a categorical variable. A simple example is the hypothesis that an ordinary six-sided die is "fair", i.e., all six outcomes are equally likely to occur. Pearson's chi-square is the original and most widely-used chi-square test.

The first step in the chi-square test is to calculate the chi-square statistic. The chi-square statistic is calculated by finding the difference between each observed and theoretical frequency for each possible outcome, squaring them, dividing each by the theoretical frequency, and taking the sum of the results.

Where

\[ O_i = \text{an observed frequency}; \]
\[ E_i = \text{an expected (theoretical) frequency, asserted by the null hypothesis; } \]
\[ n = \text{the number of possible outcomes of each event.} \]
The chi-square statistic can then be used to calculate a p-value by comparing the value of the statistic to a chi-square distribution. The number of degrees of freedom is equal to the number of possible outcomes, minus 1.

Pearson's chi-square is used to assess two types of comparison: tests of goodness of fit and tests of independence. A test of goodness of fit establishes whether or not an observed frequency distribution differs from a theoretical distribution. A test of independence assesses whether paired observations on two variables, expressed in a contingency table, are independent of each other – for example, whether people from different regions differ in the frequency with which they report that they support a political candidate.

A chi-square probability of 0.05 or less is commonly interpreted by applied workers as justification for rejecting the null hypothesis that the row variable is unrelated (that is, only randomly related) to the column variable. The alternate hypothesis is not rejected when the variables have an associated relationship.
Certificate issued by Managing Director of OTIS Elevators India Limited, Mumbai.

July 24, 2008

Dear Ankit,

Thank you for sharing the key details of your PhD presentation on improving the safety at workplace.

I found your Accident Reduction Model and Human Risk Assessment Model to be practical and I have found many of the key elements in these models being practiced in a few organizations.

Your study brings out all the key issues in a comprehensive manner and presents a nice compendium of recommendations, with a focus on understanding and improving the behaviour of people who perform the work.

The study will certainly help practicing managers in industry to develop and deploy processes to understand safety-related risks and formulate risk mitigation strategies and actions.

I compliment you on this work and wish you many successes in your pursuit of improving workplace safety, that you so passionately are going after.

With regards,

Sundar Perthesanthy

To: Mr. Amit Ravindra Palli
J-103, Vrindavan Heights
Vrindavan Housing Society
Opp. Guru Guresh Nagar, S.No.52,
Near Kumbre Park Bus Stop
Kothrud – Pune
Maharashtra,
India.
Appendix 5: Certificate issued by Principal of National Safety Organisation, Pune.

This is to certify that, MR. AMIT R. PATIL has given a presentation on his research topic for Ph.D. "Analysis of unsafe human behaviour related accidents in the mechanical engineering industry and benchmarking its solution" to the health, safety & environmental professionals from the industry in and around Pune to the students of Advance Diploma in Industrial Safety Course of National Safety Organisation, Pune on 19th July 2008.

The Question and Answer session was held after the presentation & the group found that, the model developed by him to reduce accidents due to unsafe behaviour was appreciable & found to be suitable to be adopted by industry.

We wish him all the best & success in his research.

(S. D. POTNIS)
Principal
Certificate issued by Mr. S.G. Kshirsagar, HSE consultant, Pune.

I have gone through the thesis on research topic "Analysis of Unsafe Human Behavior Related Accidents in the Mechanical Engineering Industry and Benchmarking its Solution" by Amit R. Patil. It was found that the model developed by him to reduce accidents due to unsafe behavior was appreciable and found to be suitable to be adopted by industry.

I wish him all the best and success in his research.

S.G. Kshirsagar
(HSE Consultant)

Note: - This certificate is issued via e-mail, hence no signature is required.
CERTIFICATE

This is to certify that the ‘ACCIDENT REDUCTION MODEL’ put forth by Mr. Amit Patil in his thesis for PhD, has a very good potential for use in practical planning and implementation of a sound Occupational Health and Safety Management System (OHSMS).

The model directly deals with a KEY FOCUS AREA of the revised OHSMS standard: OHSAS 18001:2007, i.e. consideration of ‘HUMAN BEHAVIOR, CAPABILITIES AND OTHER FACTORS’ in Hazard identification and risk analysis process and also other issues such as, ‘PARTICIPATION and CONSULTATION’ of the work force in Occupational Health and Safety Management.

The model will help in dealing with these requirements in a systematic Plan-Do-Check-Act manner, and as such, the users will find it as a very useful tool to comply with related requirements.

SHASHANK GOKHALE
Proprietor
Win-Win Quality Associates

DATE: 01/01/2009