Organizational Safety Climate - A Case Study of Comparing Two OHSAS Certified Food Processing Plants

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Abstract—Current study determines the level of safety climate in food sector of Pakistan that has been done two different milk processing plants of the same organization, with different management and locations. Safety climate was measured through survey using questionnaire. Reliability of the questionnaire prepared to measure safety climate was found good. Response rate of the respondents was quite encouraging (69%) as 226 out of 300 respondents replied back. Mean scores of safety climate at plant A is 4.16 and plant B is 4.19 out of 5, which indicates good safety climate at both plants. Out of eight safety climate dimensions ‘safety training’ and ‘safety priority over production’ have low mean scores which indicates need for improvement in these areas. Results of independent sample t-test show that two dimensions ‘management commitment to safety’ and ‘safety priority over production’ differ significantly between two plants. Results further conclude that out of 226 respondents only 01 respondent reported an accident during period of twelve months and this accident was non-fatal, which is also an indication of good safety climate at both plants.

Index Terms—OHSAS (Occupational health & safety assessment series), Safety Climate, Occupational Health, Workplace Safety

I. INTRODUCTION

Occupational Health & Safety is not only the concern of developed countries but growing in developing countries as well. Industrialized countries have much better Occupational Health & Safety awareness than developing countries [i]. Pakistan is also a developing country where education and workforce unions are considered as barriers in promoting a true safety culture. Factory Act 1934 clearly defines rules and regulations regarding workplace safety; however there is no regulatory body that can ensure their implementation. Many multinational and local organizations in Oil and Gas, Chemical, Food and Manufacturing sectors have implemented OHSAS 18001:2007 (Occupational Health & Safety Management System) for ensuring health, safety and wellbeing of workers; however, there are still many which are not certified and have not healthy working conditions. Food sector of is one of the sectors in which safety awareness is growing and firms are acquiring OHSAS 18001 certification. OHSAS 18001:2007 Standard is an Occupational Health and Safety Assessment Series for Health and Safety Management System in organizations [ii]. OHSAS guidelines can be applied for promoting safety culture and improving social image of the organization by adopting OHSAS certification, where ultimate objective is to ensure human wellbeing by promoting safe and risk free work practices so that organizations can utilize their human capital optimally. This standard provides complete guideline procedures for implementing safety in any organization. It involves policy making, hazards identification and risk assessment, training, documentation, emergency preparedness, corrective and preventive actions.

Safety at work is determined through the assessment of ‘Safety Climate’ in that area. Safety Climate is defined as ‘perceptions of employees about safety of their area’ [iii]. Dedobbler and Blend (1991) have also defined safety as ‘perceptions of people about management actions regarding safety’ [iv]. Safety Climate measures attitude and perceptions of employees about safety in their work place and helps management to design and improve their Occupational Health Safety program. So through
improvement in the attitude of management and employees, safety climate can be improved. Safety Climate includes areas as work practices, work style, operator training, and industrial hygiene, priority of safety over pressure for production. [v]

In previous researches many dimensions of safety climate has been defined, such as management commitment, safety training, safety communication, safety participation behavior etc. However, there is no consensus on which dimensions to be included in safety climate study. Zohar (1980) who is considered as the major contributor, in the area of occupational safety research, concluded that ‘management commitment’ is the major contributor in occupational safety. Management Commitment includes role of the organizational management in different aspects of safety such as safety policy, safety objectives, safety training, and safety audits. This dimension is the key in studying safety climate in any organization and considered in multiple researches of safety climate. [vi]

Safety training is also one of the major factors which are considered important for improving workplace safety. Safety training changes the behavior of people about safety. This includes the training of workforce regarding the use of safety equipment, emergency procedures, and safety practices. Safety training has been used as a factor to assess safety climate of organizations. ‘Workers attitude towards safety’ is the feelings of workers about necessity of safety at their work which drives their behaviors towards safe work. [vii]

Safety and Production are two key aspects that run parallel in industries as in order to achieve production targets workers and production supervisors ignore safety as they want to meet their production commitments at any cost and for that purpose they usually violate safety procedures. In multiple studies “Safety priority over production” has also been used as a measure of organizational safety climate and measured quantitatively by using questionnaire and multiple researches have explored the role of work pressure on safety. ‘Safety communication’ plays a key role in the improvement of safety climate in organizations. This aspect includes communication about hazards, risks, policies and objectives etc. Communication about hazards, policies and objectives is initiated by management and delivered to workers; whereas, communication about incidents, near misses are given from workers to management. Like other dimensions, ‘safety communication’ has been used to measure safety climate of organizations. ‘Safety Knowledge’ involves the level of awareness of workers with their safety environment which includes having knowledge about hazards, risks and use of safety equipment.[viii] [ix]

‘Safeness of work environment’ involves the level of risk and hazards and their impact on workers and has been used as a key contributor in measuring safety climate. ‘Supervisor commitment’ to safety is also one of the prominent facts that influences safety climate, as supervisor is the direct in charge for implementing safety procedures at workplace. Like others, supervisor’s commitment has been given the prime importance in previous researches. [x]

It is evident from the literature that safety performance of any organization is assessed through the measurement of safety behaviors which are estimated quantitatively (using questionnaire) or by self-reported accidents. [xi] It is clear from the literature review, those previous researches of safety climate which have been done internationally are mostly done on chemical, construction, and manufacturing and at offshore environments, so there is need to explore food sectors safety climate. Rashid & Sara (2014) studied perceptions of workers about occupational health and safety in food sector of Pakistan but limited dimensions (management commitment, safety climate, safety committee, risk management) have been explored in a single organization.[xii]

This highlights the importance and need of this work at Pakistan. Also there is need to explore the fact that what is the impact of adopting safety management certification (OHSAS18001:2007) on different plants in terms of improving safety culture, linked with the perception of workers about safety.

II. OBJECTIVES AND METHODOLOGY

The following objectives were set for this study

1. To develop an instrument to measure safety climate in food industry and to check it’s reliability.

2. To compare the difference in safety climate in different food processing plants.

3. To find out the correlations among different safety climate dimensions.

4. To find relationship between safety climate and safety performance (self-reported accidents).

In order to achieve above mentioned objectives study was carried out on two milk processing plants at different province of the country. Recruitment criteria at both plants (A&B) is minimum qualification of DAE (Diploma of associate engineers) but few of these were graduate also, but overall education level of workers at both plants is same because more than 70% workers at both plants have done only DAE. Most of the workers in Plant B are in the age of 30-35 years while in Plant A most of the workers are within the age of 18-25. Also plant B workers have more work experience than plant A. So workers at both plants A&B differ in age and experience. Keeping in view previous researches
mentioned in the reference section a questionnaire was developed and a pilot study (on 38 workers) was conducted to check reliability of the data collection instrument. Five point likert scale (complete agree, agree, neither agree/nor disagree, disagree, complete disagree) was used to record extent of their agreement or disagreement of with safety climate perceptions about organization. If respondent ticks on ‘completely agree’ with the question statement it was given score of 5 and if he ticks on ‘completely disagree’ with the statement it was given score of 1. In the light of pilot study results, final questionnaire was designed and distributed among production line workers in one of the understudy plants for pilot testing of questionnaire .Keeping in view the education level of production line workers, questionnaire was translated into local language (Urdu), so that they can understand and conveniently reply to the questions. Reliability testing of questionnaire was done finding out cronbach’s alpha value using SPPS V20 software. SPSS V20 is a statistical software package used for data analysis in social science and natural sciences. In this software data file was prepared by entering mean scores of safety climate dimensions in data file and required analysis of correlation, reliability, mean scores calculation and difference was done using analyze command. In current study statistical analysis of reliability, correlation, mean scores calculation, independent sample t-test have been done using this software. Initially, 52 questions were designed and distributed in the pilot study; however, 49 questions were selected for the final data collection. 3 questions which were having inter item correlations below 0.3 were dropped, which also improved cronbach’s alpha values of safety climate dimensions. Table 1 shows results of reliability testing of questionnaire which was tested in the pilot study. George and Mallory(2003) defined the rule of thumb to determine reliability of questionnaire, according to this rule if cronbach’s alpha value of the questions added in the questionnaire falls below 0.6 than questions are deleted from questionnaire[17]. So on the basis of this rule of thumb results of reliability have shown in table 1. Table 1 shows that most of the dimensions of questionnaire have cronbach’s alpha value greater than 0.7 so their reliability is ‘Good’. Questions included in ‘supervisor commitment’ have cronbach’s alpha value of 0.912 so according to above mentioned rule its reliability is excellent. Questions in ‘safety priority over production’ have lowest cronbach’s alpha value of 0.624 and it’s reliability stands in acceptable range, these results of reliability testing in table 1 shows that no dimension has cronbach alpha value below 0.6 so questionnaire is reliable. So final questionnaire contains 12 questions of ‘management commitment ’, 04 questions of ‘safety training’ and number of questions of remaining dimensions have been shown in the table1 and total number of questions of all items are 49 .After finalizing questionnaire final study was carried out at both plants and questionnaires were personally distributed among the workers where they were briefed about the objectives of this research, how this can be used for workplace improvement and finally how to record their response. Total 300 questionnaires were distributed at both plants and 226 responses were received (121 from plant A and 105 from plant B), where overall response rate was about 69%. Plant A and B have 310 and 210 workers respectively, out of which we have collected data of 121 (plant A) and 105 (Plant B) respondents. To maintain confidentiality of the data, there were no questions about personal information like name, designation, signatures etc.

<table>
<thead>
<tr>
<th>S. NO</th>
<th>Dimension</th>
<th>Total items</th>
<th>Cronbach’s alpha</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Management commitment to safety</td>
<td>12</td>
<td>0.899</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>Safety training</td>
<td>4</td>
<td>0.746</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Safety priority over production</td>
<td>4</td>
<td>0.624</td>
<td>Acceptable</td>
</tr>
<tr>
<td>4</td>
<td>Workers attitude towards safety</td>
<td>6</td>
<td>0.805</td>
<td>Good</td>
</tr>
<tr>
<td>5</td>
<td>Safety communication</td>
<td>6</td>
<td>0.716</td>
<td>Good</td>
</tr>
<tr>
<td>6</td>
<td>Safety knowledge</td>
<td>6</td>
<td>0.720</td>
<td>Good</td>
</tr>
<tr>
<td>7</td>
<td>Work environment safeness</td>
<td>4</td>
<td>0.763</td>
<td>Good</td>
</tr>
<tr>
<td>8</td>
<td>Supervisor commitment</td>
<td>7</td>
<td>0.912</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

### III. RESULTS

As mentioned previously, response of the workers has been recorded by using a five point likert scale (complete agree, agree, neither agree nor disagree, disagree and complete disagree) where score of 5 shows ‘complete agreement’ and 1 shows ‘complete disagreement’. Table 2 shows mean values of the responses against all eight dimensions of safety climate included in this research at plant A (121 respondents) and plant B (105 respondents). Mean value of all the eight dimensions are near or above 4, which show that over all safety climate is good at both plants – means worker’s perception about workplace safety is significantly positive. The highest agreement is seen in factors like management commitment, workers attitude towards safety and work environment safeness.
also worker’s perception about safety is comparatively more positive at plant B. However, there is only one value which is less than 4 at plant B is ‘safety priority over production’, which shows that workers at plant B feel that during high production load, their organization gives relatively less priority to safety. As the value is 3.86, which still shows an inclination towards positive agreement. Interestingly, it can be noted from table 2, that standard deviation values for plant B data are on the higher side as compared with plant A, which show that workers at plant B have more diversified opinion about safety climate in the organization. The highest variation has been seen in ‘supervisors commitment’, shows that workers have more difference of opinion about this factor.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Plant</th>
<th>Sample Size (N)</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management commitment to safety</td>
<td>A</td>
<td>121</td>
<td>4.1132</td>
<td>0.56774</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>105</td>
<td>4.3104</td>
<td>0.63606</td>
</tr>
<tr>
<td>Safety training</td>
<td>A</td>
<td>121</td>
<td>4.0967</td>
<td>0.58849</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>105</td>
<td>4.0333</td>
<td>0.68031</td>
</tr>
<tr>
<td>Safety priority over production</td>
<td>A</td>
<td>121</td>
<td>4.0612</td>
<td>0.55428</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>105</td>
<td>3.8643</td>
<td>0.75402</td>
</tr>
<tr>
<td>Workers attitude towards safety</td>
<td>A</td>
<td>121</td>
<td>4.2835</td>
<td>0.46104</td>
</tr>
<tr>
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<td>B</td>
<td>105</td>
<td>4.2031</td>
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<tr>
<td>Workers knowledge</td>
<td>A</td>
<td>121</td>
<td>4.1612</td>
<td>0.34702</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>105</td>
<td>4.2174</td>
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<tr>
<td>Work environment safety</td>
<td>A</td>
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<td>4.3430</td>
<td>0.50311</td>
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<tr>
<td></td>
<td>B</td>
<td>105</td>
<td>4.3619</td>
<td>0.59240</td>
</tr>
<tr>
<td>Supervisor commitment</td>
<td>A</td>
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<td>4.1298</td>
<td>0.59912</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>105</td>
<td>4.0968</td>
<td>0.89831</td>
</tr>
</tbody>
</table>

Pearson’s correlations were determined using SPSS V20 statistical software package in order to find out the impact of safety climate dimensions on each other. As mentioned earlier that SPSS V20 is a statistical package that is used in this study for data analysis. In this analysis mean scores of the safety climate dimensions are put in data file and Pearson’s correlation command is run from analysis tools to get results. Table 3 shows results of Pearson’s correlations among variables and shows that all the variables have positive correlation with each with in the significance level of 0.01. This positive correlation among these eight dimensions is the indication that all these eight dimensions are interrelated to each other and are measuring safety climate in similar direction. Highest positive correlation exists between ‘safety communication’ and ‘workers knowledge’ ($r = 0.711, p = 0.000 < 0.01$) which indicates that good ‘safety communication’ in these plants has increased ‘workers knowledge’ about safety. Second strong positive correlation exist between ‘workers attitude towards safety’ and ‘safety communication’ ($r = 0.645, p = 0.000 < 0.01$) which indicates that good ‘safety communication’ from top management and through supervisors changes ‘workers attitude towards safety’ Weak positive correlation exist between ‘management commitment to safety’ and ‘workers attitude towards safety’ ($r = 0.345, p = 0.000 < 0.01$) which indicates that ‘management commitment to safety’ has least positive impact on ‘workers attitude towards safety’ as compared other dimensions.

**Table 2**

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<td>Safety training</td>
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<td>0.58849</td>
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<tr>
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An independent sample t-test was performed to compare whether mean values of all eight dimensions of both plants (A&B) differs significantly or not? Table 4 shows results of comparisons of both plants (A&B). Results from Table 4 shows that significance values (p values) of safety climate dimensions at 95% confidence interval. Out of eight safety climate dimensions ‘management commitment to safety’ ($t = -2.442, p = 0.015 < 0.05$), safety training ($t = 0.743, p = 0.425 > 0.05$), safety priority over production ($t = 2.207, t = 0.028 < 0.05$), workers attitude towards safety ($t = -1.086, p = 0.279 > 0.05$), safety communication ($t = -1.042 , p = 0.299 > 0.05$), workers knowledge ($t = -0.696, p = 0.487 > 0.05$), work environment.
safeness \((t = -0.259, p = 0.798 > 0.05)\), supervisor commitment \((t = 0.320, p = 0.750 > 0.05)\). Two dimensions ‘Management commitment to safety’ & ‘safety priority over production’ have \(p\)-value less than 0.05 which means ‘Management commitment to safety’ and ‘Safety priority over production’ differs significantly among two plants (Plant A & Plant B). Other six dimensions have significant \(p\)-value greater than 0.05 which means these six dimensions do not differ significantly among two plants (Plant A & Plant B).

In order to determine the safety performance of two plants question about self reported accidents was added in the questionnaire, whether respondent has suffered an accidents during period of one year or not? and what is the time lost during this accident? From the data gathered only one respondent from sample of 121 respondents of plant A reported an accident. No respondent from sample of 105 respondents of plant B reported even a single accident. Data gathered through questionnaire was also compared with the accident log book of both plants.

### IV. CONCLUSIONS

As mentioned earlier that ‘perception of workers about safety at their workplace’ was measured by using a five point likert scale (strongly agree to strongly disagree). It has been noted that safety climate at both plants is good as the mean score of safety climate is 4.19 and 4.16 out of 5, for plant A and B respectively. These statistics are an indication of workers positive perception about safety practices at their workplace. As we know that in this research, safety climate has been measured by capturing workers response over eight factors, where it has been found that all the factors are positively correlated with each other. These correlations also indicate that good safety climate improves overall safety performance and different factors of safety climate measurement are linked with each other.

Comparison of the mean values of safety climate dimensions for both plants shows that two dimensions, ‘management commitment to safety & safety priority over production’, are different at two plants that indicates that workers perceptions at two plants about ‘management commitment to safety’ and ‘safety priority over production’ are different. As these two plants are at different locations, although both plants belong to the same company; however, they have different management and producing different variety of products. That might be a possible cause for this difference. We may further say that although the safety climate overall score is fine; however, these two factors should be taken up critically for further improving the safety climate of the organization. ‘Safety priority over production’ is a quite common problem in many organizations, where relatively less committed supervisors can go for such practices that are less safe and force their workforce to adopt such procedures that can lead towards injuries, illnesses and accidents during and after their work. For maintaining a good safety climate, management must have to place ‘safety’ as the top priority in any kind of circumstances. Moreover, all other six dimensions do not differ from each other, shows a similar kind of worker’s perception. There is only one self-reported accident on plant A and no accident on plant B during period of previous one year which is the indication of the fact that good safety climate which is reflected in safety climate scores and also reflected through dependent variable - self-reported accidents. This further indicates the predictive validity of the instrument as good safety climate score means good safety performance which is indicated by self-reported accidents. Lesser number of accidents is an indication that safety procedures are practically followed during work.

This research has some limitations as well. As this research is limited to food industry, further studies can be carried out to validate the reliability of instrument and measurement of safety climate in different industries like oil and gas, chemical processing industries, and manufacturing etc. industries of Pakistan.

It can be concluded that workers of both the plants have positive perception about safety at their work. The instrument developed for this research, validates the above statement as safety climate scores of both plants are good so very little number of ‘self-reported accidents’ has been found at both plants. The same instrument can be used in variety of industrial applications. Furthermore, safety climate has a direct relationship with safety performance. There are two factors that are needed further improvement, ‘management commitment’ and ‘safety priority over production’. However, still there is a need to explore how workplace safety at developing countries can be improved by exploring the underlying factors associated with this.
REFERENCES


[ii] Occupational health and safety management systems-Requirements, BSI standard, July 2007


APPENDIX

Items used in the questionnaire are given below and five point likert scale (complete agree, agree, neither agree/nor disagree, disagree, complete disagree) has been used in the questionnaire. Workers are instructed to record the extent of their agreement or disagreement with the safety measures given below about each safety dimension. Following are the items used in the questionnaire to assess safety climate

Management Commitment

1- Management continually assesses safety hazards and risks in the organization.
2- Management continually reacts and takes actions on outcomes of safety (accident rate).
3- Management guides workers about implementation of action plans on safety problems.
4- Management rewards workers who are excellent in implementation of safety rules.
5- Management takes effective countermeasures to avoid repeating of accidents.
6- In case of any accident management listens and investigates workers carefully.
7- Management continually uses better technology and do not save cost for betterment of safety.
8- Management encourages suggestions of workers about safety.
9- Management reviews injury and accident records after regular intervals.
10- Management provides complete equipment of safety to workers.
11- Management regularly conducts audits and inspections in production areas.
12- Management encourages workers to register accidents in their accident log books.

Safety Training

13-Every worker is given safety training after regular intervals.
14-New workers are not allowed to work without complete safety training.
15-Safety expertise of every worker is checked after regular intervals of time.
16-Safety training has complete information about hazards and risks of working area.

Safety priority over production

17-In safety training workers are trained to give priority to safety in every circumstance.
18-Management or supervisor does not put pressure on workers to complete production by ignoring safety measures.
19-Management punishes workers who ignore safety in order to complete production targets.
20-Workers are advised to keep safety first daily before start of work.

Worker’s attitude towards safety

21-Workers feel that safety is first priority for them and for coworkers.
22-Workers feel that to act upon safety rules is compulsory for them.
23-Workers help their coworkers to improve safety in their work area.
24-Workers feel the responsibility to inform management about hazards and risks in their work area.
25-Workers feel that to participate in safety training is compulsory for them.
26-Workers feel that complete knowledge of safety is urgent for them.

Safety communication

27-Supervisors gives complete information to management about hazards and risks present in work environment.
28-Workers are regularly informed about equipment and new hazards in their work area.
29-Workers give complete information to management about hazards and risks in their work area.
30-Workers inform each other about benefits of safety measures.
31-Management informs workers about good practices of safety measures taken by other departments.
32-Workers completely shares better suggestions of safety with their top management.

Safety Knowledge

33-Workers have complete knowledge of about use of safety equipment (gloves, goggles, helmets) in production area.
34-Workers know complete procedure of emergency exit in work area.
35-Workers have complete knowledge of hazards and risks in their work place.
36-Workers have complete knowledge about use of fire equipment in case of emergency.
37-Workers have complete understanding of safety policy of the company.
38-Workers know about safety targets of the company.

Safeeness of work environment

39-Machines and work environment have complete equipment (control switches, sensors, alarms) to control hazards in work place.
40-Preventive maintenance of machines are done regularly to maintain their safety in work environment.
41-Workers feel safe about use of machines during work.
42-Complete safety equipment (shoes, gloves, safety dress) is present in work area.

Supervisor commitment

43-Supervisor daily inspects safety of work area.
44-Supervisor regularly assesses hazards and risks present in the work area.
45-Supervisor takes workers suggestions in hazards and risk assessment.
46-Supervisor guides workers in safety issues.
47-Supervisor regularly attends health and safety meetings.
48-Supervisor encourages suggestion of workers for betterment of safety.
49-Supervisor listens problems of safety and makes efforts for solutions.
Respondent’s information

Have you suffered an accident during period of last twelve months?
   Yes  No

What was the absence time as a result of that accident/injury?
   a) One shift   b) More than one day   c) More than three days

What is your age?

How many years you have work experience?