JOB SATISFACTION AS RELATED TO SAFETY PERFORMANCE: A CASE FOR A MANUFACTURING FIRM

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ABSTRACT

Many companies have made significant improvements in safety records, but have eventually reached a plateau. This article examines employee safety performance in regards to their job satisfaction and its implications to managers for improving employees safety performance through job redesign.

INTRODUCTION

Accidents commonly occur in organizational operations, particularly in many manufacturing companies. There are certain recognized factors which affect the occurrence of accidents. Robert Cooke of the University of Illinois at Chicago and The Reliability Group, a Miami, FL-based consulting firm, revealed that some 80 variables have a significant statistical effect upon accident rates (Personnel,1991). The factors most consistently associated with job-related injuries include: environment, mood among workers, employee selection practice, types of work procedures, role clarity, and job satisfaction & stress (Personnel, 1991). In a similar study, Sherry (1992) identified five major factors related to potential causes of accidents, i.e. psychological, environmental, ergonomic, physical, and stress.

The consensus among safety professionals is that upwards of ninety percent (90%) of all accidents occurring in the workplace may be attributed to behavioral factors. The importance of understanding how behavior influences safety performance cannot be underestimated. A more important notion is that by increasing concentration and effort placed on the influence of human behavior, accidents and injuries can be significantly reduced in the workplace.

While some managers may wonder: what comes first, job satisfaction or safe work environment? Most safety researchers agree, job satisfaction most often occurs first – satisfied workers are more frequently safe workers, but safe workers are not necessarily satisfied workers (Blair,1999).

Recently, research (Bigos, 1986; Greenwood & Wolf, 1987; Holmstrom, 1992) concentrated on employee attitudes and their job-related stress, which are significantly related to the occurrence of accidents, health and job safety. According to these studies increasing employee job satisfaction is as important as eliminating physical hazards in the workplace. They consistently found that job satisfaction was more predictive of lower accident rates than such factors as: demographic, health, psychological, and stress. A recent study (Grice,1995)

concluded that the search for the true cause of workers compensation claims would never end, but the role of job satisfaction has been one of the most important factors to date in his research. Ineffective leadership practice – such as lack of caring and supportive supervisors, not considering workers opinions, and employees feeling that their jobs are not important – was a critical employee safety performance factor (Kniest, 1997).

Researchers in cognitive psychology generally agree that attitudes can be changed, and that significant behavior change can follow an attitude change. Studies conducted by Kim and Hunter (1993) showed a strong relationship existed between attitude and behavior. Eagly's study (1992) found that attitudes should predict behavior but, more important, that they should cause behavior. Furthermore, these studies suggest that one of the most effective ways to create attitude change is to involve participants in decision making and activities surrounding the targeted attitude. The high safety performance variability may stem from inconsistent job satisfaction in various job-related organizational factors.

From this literature, it becomes evident that managers who provide favorable motivators and hygiene factors (Herzberg, 1966), will affect employees positive job satisfaction. Effective management and positive job satisfaction, in turn, will motivate positive employee behavior including improved safety performance.

The purpose of this study is to demonstrate that employee job satisfaction can significantly impact employee safety performance. This belief is based upon an observation and questionnaire analysis conducted at one manufacturing firm. This finding will provide important information to managers in improving employees safety performance.

THE COMPANY

This company is the world's leading inventor and producer of high performance nickel-base alloys in the Midwest. Nickel alloys are useful in industries such as oil and gas, aerospace, chemical processing, power generation, and pollution control because of their resistance to corrosion and strength at high temperatures. The company has been operating over 70 years at this site and has approximately 1200 employees (1000 hourly, 200 salaried).

Over the past few years, the company has made significant plant-wide improvements in its safety record through changes in its administration, environment, policies and procedures, including a joint union-management safety team within each department. Unfortunately, the company's efforts have reached a plateau and continuous improvement is elusive. To exceed current plateaus and achieve new heights in safety excellence, the company turned its efforts toward behavioral safety techniques rather than employee awareness of safety hazards. Since policies and procedures are uniformly applied throughout the plant, the human behavioral components of safety performance must be examined to understand the variability among different departments.

This research focused on four departments within the company. Department A is composed of 120 hourly people and eight supervisors. Types of work vary from hot rolling,

forging or grinding of ingots and slabs, to cutting, leveling, and cleaning finished plates. The tasks are all very routine, and batched together for higher efficiency with few setups.

Department B is composed of 28 hourly people with four supervisors. The type of work is alloy processing, packaging, labeling and loading of customer material. The tasks involve completing and inspecting material to guarantee that it is at or above customer specifications. The material is then prepared for transport to the customer. The work varies with each specific order, and is processed to different specifications with numerous setups. The job has very high task identity and task significance.

Department C is composed of 100 hourly employees and eight supervisors. Their work involves turning, cutting, and milling small batch or piece work processing. The machining process involves numerous setups, and demands a high skill level and good decision making. There is high task identity, with each piece finished to close tolerances for the customer or the next processing department.

Department D is composed of 88 hourly employees and seven supervisors. This department processes cold flat-rolled products through 10 different automated type machines. Each machine requires minimal setups, minimal training and little attention to detail. Several machines have little task identity, because a flat rolled product may, for example, process through the line for a simple annealing and cleaning function. The processes are batched for higher efficiency, and a schedule is set by supervision for the hourly people to follow closely with no input.

While Departments A and C appear to have riskier jobs, there are certain elements that should equalize the chance of accident. For example, Department A has more workers, so each employee has a smaller number of tasks to perform and can be given more specialized training. In addition, all company employees are well trained on-the-job and given yearly safety training geared to their jobs. Each department also utilizes modern production equipment to lessen the danger to workers (i.e. computers, automation).

METHODOLOGY

A standardized set of Job Descriptive Index (JDI) was distributed to ten individuals in each of the four departments (40 total) to measure employees job satisfaction. While a broad cross-section of each department was attempted, all respondents worked on day shift, which could affect responses in comparison to night shift personnel prospective answers.

The JDI (copyrighted by Bowling Green State University, 1985) consists of five categories of job aspects to provide responses related to job satisfaction. The JDI measures aspects of employee job satisfaction by asking employees to respond to a series of questions describing their job perceptions. The categories are: work on present job, co-workers, present pay, supervision, and job in general. The mean scores of the five categories of JDI for four departments are shown in Table 1. Two sample T tests were conducted to examine any statistically significant differences among the mean scores of JDI sub-scales for the four departments. Numerous company statistics were also reviewed. These included department

demographics, absentee rates, actual number of accidents, OSHA recordable injury accident rates (defined as number of recordable injuries x 200,000 divided by number of hours worked).

ANALYSIS OF RESULTS

As shown in Table 1, except for pay satisfaction, the mean satisfaction scores for employees of Departments B and C are higher than the mean satisfaction scores for employees of Departments A and D. These T tests indicated that employees in Department C had significantly (less than 0.05 level) higher satisfaction in Present Job, Supervision, and Job in General than employees in Department D. Employees in Department C also had significantly higher Present Job satisfaction than employees in Department A. Employees in Department B had significantly higher Supervision satisfaction than employees in Departments A and D.

Table 1
Department Mean Scores for Job Descriptive Index

	Dept. A	**Dept. B**	**Dept. C**	**Dept. D**
Present Job	25.4	26.9	37.4	22.8
Co-worker	33.3	38.2	38.2	37.1
Pay	35.8	28.4	24.5	27.2
Supervision	23.5	39.7	36.9	10.8
Job in General	38.4	38.8	42.2	31.9

Note: Lower limit = 0 (less satisfied) while upper limit = 45 (more satisfied)

As indicated in Table 2, the plant-wide accident rate has decreased gradually every year since 1993. At the same time, the five year mean scores of the accident rates for Departments B and C are much lower than the five year mean scores of the accident rates for Departments A and Department D.

Assuming that the accident rate (plant-wide OSHA recordable injury accident rates) is the Poisson expected rate, and using the actual mean number of accidents for each department as the observed rate, the departmental rates were tested for significant differences at 0.05 level. (Tables
showing the ratio of an observed value of a Poisson random variable to its expectation were used.) The accident rate for Department B was significantly lower than the accident rates for Departments A and D, and the accident rate for Department C was significantly lower than the accident rate for Department D.

Table 2
OSHA Plant Safety Recordable Injury Incident Rates

	1993	1994	1995	1996	1997	Average
Plant wide	13.6	13.4	8.7	7.6	6.9	10.04
Dept. A	11.1	12.3	7.1	11.5	10.2	10.44
Dept. B	7.1	0.0	6.3	8.4	6.4	5.64
Dept. C	19.8	12.8	1.8	3.8	5.7	8.78
Dept. D	17.5	13.3	8.6	11.0	13.5	12.78

Note: Recordable injury incident rates compares accidents to number of hours worked.

From Table 3, we can observe that the average ages for employees of the four departments are very similar, and the average tenure for employees of Department A and C are much longer than the average tenure for employees of Department B and D. The absenteeism scores for Departments B and C are much lower than the absenteeism scores for Departments A and D.

Table 3
Average Ages, Tenure, and Absenteeism

	Dept. A	Dept. B	Dept. C	Dept. D
Average Ages	40.3	39.6	43.6	37.2
Ave. Tenure	13.03	8.11	17.7	8.99
Absenteeism	4.0	2.93	1.79	3.79

The Pearson product correlation coefficients among the averages of performance measures accident rates(AC), and absenteeism(AB), other relevant variables age(AG), and tenure (TN), and the JDI sub-scales satisfaction for present job (PJ), coworker (CW), pay (PA), supervision (SU), and job in general (JG), are shown in Table 4.

Table 4
Pearson Product Correlation Coefficients Among Relevant Variables

Averages	AC	AB	AG	TN	PJ	CW	PA	SU
AB	0.821							
	(0.179)							
AG	-0.803	-0.795						
TN	-0.441	-0.601	0.887					
PJ	-0.811	-0.937	0.951	0.828				
	(0.189)	(0.063)	(0.049)	(0.170)				
CO	-0.422	-0.688	0.109	-0.104	0.392			
PA	0.595	0.596	-0.096	0.279	-0.305	-0.896		
SU	-0.977	-0.703	0.673	0.256	0.667	0.398	-0.651	
	(0.023)							
JG	-0.918	-0.672	0.940	0.640	0.804	0.050	-0.230	0.872
	(0.081)		(0.060)					

Note: The figures inside parentheses are p values.

Even though, due to the limited sample size, p values are generally not statistically significant at 0.05 level, strength and direction of the correlation coefficients strongly support the previous analysis from Tables 1, 2 and 3. Noted from Table 4, the accident rates and the employee absenteeism show high negative correlation with the employee satisfaction (i.e. when employees are satisfied, the accident rate and absenteeism are lower). The satisfaction in their Present Job, Job in General, and Supervision were highly (negatively) correlated with accident rates and absenteeism.

The older and more tenured employees are generally happier than younger and less tenured employees, which is supported by the literature. Only one satisfaction sub-scale, satisfaction for Pay, was inconsistent with other scales. The distribution plots for Pay satisfaction reveal that average values have less significance. It is noted that in all surveyed departments, only about 50% of all workers are satisfied with Pay. This may be the cause of the inconsistent correlation.

CONCLUSIONS

The improved safety performance at the plant has been more consistent and stable in some departments than others. These variations could suggest that either the improvements have not been applied consistently through all departments, or that there are behavioral differences among employees in these departments that affect their attitudes towards safety. The administration of comprehensive safety plans throughout the plant have been designed to

minimize interdepartmental inconsistencies. Thus, behavioral characteristics and influences in the workplace are the most likely major causes for the different safety performances.

The data analysis of the JDI survey and the secondary data have shown that supervision satisfaction and present work satisfaction have a direct correlation with safety performance. Within the two departments with the lowest safety incident rate (Departments B & C), employees rank their supervisors and jobs higher on the JDI satisfaction scale. As Herzberg (1966) suggested, individuals have two levels of needs: the hygiene or maintenance needs (dissatisfiers) extrinsic to the job, which include company policy, supervision, interpersonal relations, working conditions, pay, status and security; and the higher order needs (motivators) intrinsic to the job and related to their ability to achieve and experience psychological growth, which include achievement, the work itself, responsibility, growth, and advancement. Managers should understand that it is important to maintain the hygiene factors at a level that is satisfactory to employees. Although both sets of factors operate to satisfy employee needs, the motivators provide the impetus for improved performance (see Table 5).

Table 5
Summary of Five Behavioral Factors Affecting Accident Rate

Factors	**Increase Job Satisfaction**	**Decrease Job Satisfaction**
	Decrease Accident Rate	**Increase Accident Rate**
Job Design	Organic	Mechanistic
Job Duties	Variety	Routine, Controlled
Task Identity	Autonomous	Repetitious
Decision-making	Decentralized	Centralized
Communications	Open (all directions)	Closed (top to bottom)

Note: These five factors are listed in importance beginning with most important.

Many manufacturers already have re-engineered their work sites with an eye toward safety, introducing ergonomic principles, acquiring improved safety equipment and establishing safer work environments. Companies now need to examine job design for improving safety records. From analyzing the four departments of this study through observation, interviews, and the company records, we were able to gather information about the department's job content, job requirements, and job context. We were able to place the four departments into two distinct identities. Departments B & C were found to be organic: clear task identity, wide variety, and autonomy. The tasks were smaller batch type with non-routine forms of production. These departments were found to have better safety records and more satisfied employees. Departments A & D were found to be mechanistic: vague task identity, lack of variety, controlled assignments, and very routine production. Fortunately, the lack of mental challenge from performing repetitious work can be overcome by a simple strategy – job redesign. Redesign options range from the traditional (job rotation, job enlargement, and job enrichment), to the newest innovations (quality circles, teams, participative decision-making), to increase job satisfaction and prevent accidents.

We also examined the differences in department structure. It was found that the more mechanistic departments have centralized decision-making process with closed communication. The JDI survey showed a lack of satisfaction with supervision and was reinforced by employee interviews (discussion of negative reinforcement and punishment by supervisors). The organic department employees feel more favorable towards supervision. Decision making is more decentralized, and has more participatory elements which appeared to lead to higher levels of job satisfaction.

The mechanistic departments make it difficult to have free moving communication. The information flows downward and tends to be distorted, inaccurate, and viewed with suspicion by subordinates. Geller (1996) says companies need to learn from their employees because safety is best accomplished from the bottom up. Quoting Geller, "You will never be able to eliminate injuries, but you will get a lot closer to the source when you involve your employees." A more organic atmosphere is needed in order to provide more open verbal/non-verbal communication. The supervisor must take immediate action to remedy safety problems and positively reinforce examples of safe behavior. It is not what managers say that will matter to workers, it is what they do that communicates how important worker safety is to the organization.

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