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**Title:** *Integrating Performance Measures & Accountability into the Safety Management System of Company XYZ.*

The accompanying research report is submitted to the **University of Wisconsin-Stout, Graduate School** in partial completion of the requirements for the

**Graduate Degree/ Major:** MS Risk Control

**Research Adviser:** Elbert Sorrell, Ed.D.

**Submission Term/Year:** Spring, 2012

**Number of Pages:** 58

**Style Manual Used:** American Psychological Association, 6<sup>th</sup> edition

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**Shrestha, Amit K. *Integrating Performance Measures & Accountability into the Safety Management System of Company XYZ***

**Abstract**

The purpose of this study was to develop a safety management / accountability system that promotes active involvement of supervisors and management and creates a sustainable framework where safety is inextricably related to quality and productivity. Establishment of a sustainable safety management system, measurement of safety performances and supervisor's accountability were the key areas where Company XYZ was struggling to make safety as competitive as productivity and quality. There were three specific goals of this study; identify present safety performance measures and their utilization at Company XYZ, determine the potential applicability of other performance measures and develop a framework for performance measurement system that would encompass supervisors' accountability towards a sustainable safety management system.

A semi-structured interview with open-ended interview questionnaire was conducted to identify current safety performance measures while the literature review information was utilized to explore the potential application of both leading and trailing indicators in measuring safety performances at Company XYZ. A safety performance measurement framework involving supervisor's accountability was developed by designing a comprehensive safety performance metrics and a department wise cost allocation system.

### **Acknowledgments**

I would like to thank Dr. Elbert Sorrell for meticulously guiding my entire research study. I would like to express my gratitude to the Risk Control Department and the faculties for invaluable support throughout my studies. I would also like to extend my cordial thanks to Company XYZ and the staffs for constant encouragement. Finally, I am grateful to my family and friends for their untiring support throughout my life.

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## Chapter I: Introduction

“Standards are the basis of measurement, evaluation, checking and correction”. Such a simple statement it is and yet so compelling and suited for every organizational management system. Management needs the results of evaluation to make new decisions and set objectives for the future growth. In other words, “what gets measured and rewarded gets done”, hence the safety management system is no exception here (Petersen, 1996). The safety control programs within a safety management system serve as the standards whose performances need to be measured both qualitatively and quantitatively to ensure adequate management. As Dan Petersen famously stated, “Without measurement, accountability becomes an empty and meaningless concept”, in today’s world where performance without accountability is not sustainable, the measurement of performance becomes critical for success. Thus, a lack of performance measurement system can prevent line supervisors and managers from being held accountable for the safety related losses that are occurring in their respective departments (Petersen, 2003).

Company XYZ is a mid size meat processing company employing over five hundred employees working in two shifts, six days a week. For a company where safety is not managed as an integral part of the overall management system, it tends to become one of those prioritized tasks, which can be ignored quite often and easily. Safety should be managed like any other company function (Petersen, 2003). Excluding safety from line management and lack of proactive safety practices could eventually lead the company to increased number of accidents, lost time and other safety related losses. Establishment of a sound safety management system, buy-in from top level management, measurement of safety performances and supervisor’s involvement and accountability are the key areas where Company XYZ is struggling to make safety as competitive as productivity and quality.

An effective performance measurement system provides with various tools including leading and trailing indicators to assess the effectiveness of various safety control programs and procedures implemented throughout the organization. It also helps evaluate the safety achievements and compliance requirements. Safety performance measurement system provides an effective and sustainable way to monitor and manage an organization's occupational health and safety. Within the performance measurement system, the proactive and the reactive performance measures allow an organization to measure its safety performances both qualitatively and quantitatively. The results of such measures would produce meaningful numbers to the management helping them increase the accountability of supervisors as well as line management of the organization. Thus, the lack of safety management system, performance measures and accountability system hinder a company's ability to manage safety as an integral part of the operations. This eventually diminishes the company's potential to enhance profits by focusing on safety related cost.

### **Statement of the Problem**

The absence of a safety management / performance measures / accountability system hinder the ability of company XYZ to manage safety as an integral part of the operations, increasing the potential to enhance efficiency and effectiveness of the manufacturing operations.

### **Purpose of the Study**

The purpose of this study was to develop a safety management / accountability system that promotes active involvement of supervisors and management and creates a sustainable framework where safety is inextricably related to quality and productivity.



## **Research Objectives**

1. To identify present safety performance measures and how they are used at Company XYZ.
2. To determine the potential applicability of other performance measures that could improve the existing safety processes.
3. To develop a framework for performance measurement system that encompasses supervisors' accountability towards a sustainable safety management system.

## **Significance of the study**

This study helps to identify and analyze current performance measures utilized by the Company XYZ. Both leading and trailing indicators can provide information that is helpful to manage an organization's safety management system. Therefore, to reduce the number of accidents, lost time and other safety related losses, this study indicates the need of other performance measures within the existing safety management system in Company XYZ. Supervisors' accountability would play a pivotal role in implementing and sustaining such framework. Thus, the study also seeks to develop a performance measurement system, which holds line management accountable for safety related costs such as injuries, workers' compensation, medical supplies, production downtime, litigation and regulatory fines etc.

## **Assumption of the study**

- The safety related historical data, safety matrices and workers' compensation cost related data provided by the Company XYZ was accurate.

## **Limitations of the study**

1. Data was collected only in Company XYZ so the study was limited to the company and employees working there.

2. Analysis was performed strictly based on the data provided by the Company XYZ and any generalizations made to other companies would be inappropriate.
3. Lack of defined safety responsibilities was evident due to the absence of integrated safety management system in Company XYZ.
4. The study's recommendations might not be acceptable to the Company XYZ due to management, safety culture and training issues.

### **Definition of Terms**

**Leading indicator.** Predictor of future safety performance based on selected criteria (Leading Indicators, 2011).

**Safety culture.** An ethical attitude that helps ensure construction and maintenance activities are performed without injury (HRO Safety Culture Definition, 2010).

**Safety metrics.** Refers to the body of knowledge used to quantify and measure safety performance (US Department of Transportation, 2011).

**Trailing indicator.** After-the-fact measure of safety performance (Leading Indicators, 2011).

## Chapter II: Literature Review

### Organizational Management and Safety

A business model is a set of assumptions about how an organization will perform by creating value for all players on whom it depends, not just its customers. An integrated management system should be capable of looking at the bigger picture rather than focusing on only a few of its parts. The bigger picture of an integrated management system should focus on creating value by maximizing efficiency through lean, producing quality goods or services for customers, providing safe working environment for employees, creating value for the shareholders as well as the stakeholders (Magretta, 2002).

When lean, green and safe are aligned, the organization, its customers and the environment all benefit (Taubitz, 2010). The author emphasizes that implementing lean can work as a driving force towards achieving safety and sustainability within an organization. If identifying and eliminating waste describe the “what” for lean, then respect for people and environment are the foundations for “how” lean tools are applied. This brings employee safety into the equation because one cannot be lean without being safe (Taubitz, 2010).

Safety should be managed like any other company function. Management should direct the safety effort by setting achievable goals and by planning, organizing and controlling them (Petersen, 2003). Managing safety and other loss-related areas provides significant opportunities for managing costs (Bird & Germain, 1985). The authors view safety related expenditures as cost saving opportunities rather than business related losses. Safety/Loss Control Management System provides an operational strategy to improve overall management.

## Safety Management Systems

We should manage safety in the same way we manage all the aspects of our organization (Petersen, 2003). Dan Petersen observes that the companies which have performed, sustained and succeeded over the last fifty years have mostly followed the above principle. These companies are not driven by profit alone, but by the values and safety is definitely one of them. Most of these companies act proactively to improve their process rather than worrying about the results. If safety should be one of those values of an organization, the author emphasizes that the safety performances should be consistent over the time and understood by the management as well as all the employees.

Safety performance is related to accident prevention (Raouf & Dhillon, 1994). Accident prevention programs play major role in reducing the safety related losses throughout the organization. The authors discuss the necessary ingredients that are vital to an accident. Workers, machine, tools, physical environment and social environment must be present for an accident to take place. Dan Petersen points out that these ingredients could be broadly classified as unsafe acts and unsafe conditions; although he also suggests that they might only be the proximate cause of the accident and not the root cause. Root cause often relate to the management system (Petersen, 2003). In the book *Techniques of Safety Management*, Petersen (2003) illustrates ten management principles which help manage safety efficiently and effectively. The author assures that the ten principles can provide improved approach to reduce safety related losses. Petersen's ten management principles are summarized in the table below.

Table 1.

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Exhibit 3.9 Principles of safety management

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1. An unsafe act, an unsafe condition, an accident: all these are symptoms of something wrong in the management system.
  2. Certain sets of circumstances can be predicted to produce severe injuries. These circumstances can be identified and controlled: Unusual, nonroutine, nonproduction activities, high-energy sources and certain construction situations.
  3. Safety should be managed like any other company function. Management should direct the safety effort by setting achievable goals and by planning, organizing, and controlling to achieve them.
  4. The key to effective line safety performance is management procedures that fix accountability.
  5. The function of safety is to locate and define the operational errors that allow accidents to occur. This function can be carried out in two ways: (1) by asking why searching for foot causes of accidents, and (2) by asking whether certain known, effective controls are being utilized.
  6. The cause of unsafe behavior can be identified and classified. Some of the classifications are overload (improper matching of a person's capacity with the load), traps, and the worker's decision error. Each cause is one which can be controlled.
  7. In most cases, unsafe behavior is normal human behavior; it is the result of normal people reacting to their environment. Management's job is to change the environment that leads to the unsafe behavior.
-

- 
8. There are three major subsystems that must be dealt with in building an effective safety system; the physical, the managerial and the behavioral.
  9. The safety should fit the culture of the organization.
  10. There is no one right way to achieve safety in an organization; however, for a safety system to be effective, it must meet certain criteria. The system must:
    - a. Force supervisor performance.
    - b. Involve middle management.
    - c. Have top management visibility showing their commitment.
    - d. Have employee participation.
    - e. Be flexible.
    - f. Be perceived as positive.
- 

*Note.* (Petersen, 2003)

Recent estimates indicate that workplace injuries and illnesses cost our nation's businesses \$170 billion per year in wasteful and often preventable expenses (OSHA, 2008). If accidents are caused by management system weaknesses, safety professionals must learn to locate and define these weaknesses (Petersen, 2003). A properly administered safety and health management system can significantly reduce the extent and severity of the work related injuries and eventually cost. Occupational Safety and Health Administration (OSHA) has devised its own health and safety management system called Voluntary Protection Program (VPP). OSHA offers three levels of VPP participation namely Star, Merit and Demonstration. Star status is for the employers who are at the leading edge of the safety control program. Merit status is for the

employers who show commitments to achieve Star status. Demonstration status is for the employers who follow specific program criteria and can be a prospective Star quality in the future. As per OSHA – VPP, the critical elements of an effective safety management system are management commitment and employee involvement; worksite analysis; hazard prevention and control programs; trainings for employees, supervisors and managers (OSHA, 2008).

Occupational health and safety assessment series OHSAS 18001 has been developed to be compatible with the ISO 9001:2000 (Quality) and ISO 14001:2004 (Environmental) management systems standards, in order to facilitate the integration of quality, environmental and occupational health and safety management systems by organizations, should they wish to do so (BSI, 2007). For the implementation part, ISO 9001 auditors would be the appropriate third party to be used for the implementation of ISO 14001 and OHSAS 18001 because the requirements, methodology and control documents of the three are very similar and comparable to each other. Enhanced product quality thru ISO 9001, loss prevention thru OHSAS 18001 and environmental protection programs thru ISO 14001 can provide an organization with competitive advantage, business sustainability and fulfilling social & environmental obligations in the long run. This provides with a comprehensive approach of integrating lean, green and safety under one umbrella. For leaders who want to do the right thing for the right reasons, leading lean, green and safe will result in improved organizational performance (Taubitz, 2010). The overall aim of this OHSAS 18001 standard is to support and promote good occupational health and safety practices, in balance with socio-economic needs (BSI, 2007).

### **Safety Performance Measurement and Accountability**

A consideration of measurement concepts and measurement scales is important in the occupational safety context (Tarrant, 1980). There are many reasons which make it a lot more

important to measure safety performance. The safety performance measurement provides basis for causal factor detection, trend comparison, current safety state, future accident problems, evaluating accident prevention program, making decisions as well as quantifying probable injury related losses. The main function of a measure of safety performance is to reveal the level of safety effectiveness in the organization within which establishment of accident control is desired (Tarrants, 1980). A thorough approach to safety measurement should encompass accountability measures, downstream performance measures and upstream performance measures predictive of outcomes (Stricoff, 2000). Although, result-oriented measurements are misleading sometimes, such indicators must remain part of a firm's overall "business metrics for safety". However, these indicators should not be the entire basis for review of safety and health performance (O'Brien, 1998).

One of the major functions of a safety professional as described by Dan Petersen (1984) is to measure and evaluate the effectiveness of the accident and loss control system and to modify needed changes to achieve optimum results. The safety professional establishes measurement techniques, develop methods to evaluate the cost effectiveness of the control system and provides feedback and recommendations as indicated by the analyses. The function of the safety professional, then, is similar to that of a physician who diagnoses symptoms to determine causes and then treats those causes or suggests appropriate treatment (Petersen, 1984).

For well over 50 years we have been preaching the principle of line responsibility in safety work and yet there are still supervisors today who say, "Safety is the safety director's job," or "If that's a safety problem, take it up with the safety committee." (Petersen, 2003). The author explains that holding someone accountable for something will make him/her responsible for the job. While prescribing accountability system, the author describes System of Counting and



Rating Accident Prevention Effort (SCRAPE) which indicates the amount of work done by a supervisor and by the company to prevent accidents in a given period. SCRAPE consists of six distinct weekly tasks for the supervisors namely (i) Making physical inspection, (ii) Training or coaching people – five minute safety talk, (iii) Attending management/safety meetings, (iv) Investigating accidents, (v) Establishing safety contacts with the people and (vi) Orienting new people. Management, on the basis of this form, spot checks the quality of the work done in all six areas and rates the accident prevention effort by assigning points between zero and the maximum (Petersen, 2003).

Without measurement, accountability becomes an empty and meaningless concept (Petersen, 2003). The author further asserts that the managers and supervisors are motivated by the measures used by their boss. In another words, they react according to the kind of measures used by their boss. Two basic categories of measures are activity (performance) measures and result measures. As a general rule, in selecting measuring devices, the author suggests using only activity measures at the lower managerial levels, primarily activity measures (with some results measures) at the middle-upper-management levels, and reserve the pure results measures for the executive level (Petersen, 2003). Safety measures prescribed by Dan Petersen fall into three categories; (i) activity (did the supervisor do what was supposed to be done?), (ii) results before the accident (are things better around here because of what this supervisor has done?), and (iii) results after the fact of accident (how many did we have?) (Petersen, 2003).

We can use either activity measures or result measures to determine performance, and we can use them at the supervisory, the managerial, or the system wide levels, provided we use some caution in measurement selection (Petersen, 2003). The author emphasizes that the activity measures are equally appropriate at all levels. Result measures can also be used at all levels as

long as care is taken at lower levels. The traditional safety measures such as frequency rate or severity rate cannot be used at the lower levels except over long periods of time and then probably only as a quality check (Petersen, 2003). The table below shows the variety of choices in determining which measure to use.

Table2.

Exhibit 6.2 Activities and results measures		
ACTIVITY		
SUPERVISOR	MANAGER	SYSTEM-WIDE
For: Objectives Met	Objectives Met	Audit
# Inspections	Use of Media	# Questionnaires
# Quality Investigations	# Job Safety Analyses	# Interviews
# Trained	# Job Safety Observations	
# Hazard Hunts	# One-on-Ones	
# Observations	# Positive Reinforcement	
# Quality Circles	# Group Involvement	
RESULTS		
SUPERVISORS	MANAGER	SYSTEM-WIDE
# Safety Sampling	# Safety Sampling	# Safety Sampling
# Inspection Results	# Inspection Results	# Safety Performance Indicator
	# Safety Performance Indicator	# First Aid or Frequency
	# Estimated Costs	# Near Misses or Frequency
	# Control Charts	# Property Damage
	# Property Damage	# Frequency-Severity Index
		# Estimated Cost Control Charts

*Note.* (Petersen, 2003)

Safety metrics fall into two basic categories; leading indicators, which are measurements linked to preventive actions and trailing (lagging) indicators, which are linked to the outcome of an accident (Petersen, 2003). The examples of leading indicators could be improved housekeeping, appropriate training or adequate personal protective equipments. Similarly, the examples of trailing indicators could be type of injuries, OSHA recordability, near-miss reporting or accident investigation.

Safety is a process like any other in your facility, and if you don't measure the right things (data and activities), you won't know if your performance is acceptable and if it benefits your company (Pile, 2001). The author points out that although incident rate, severity rate and incident cost are traditional safety measures, they are only downstream or trailing indicators and thus not sufficient. They give us a good idea of what happened after an injury or occupational illness; how serious the incident was, if it caused the employee to miss time from their regular work duties, and how much the incident cost the company. On the other hand, measurements of accident prevention activities are considered leading indicators because they look at activities that occur prior to an injury or illness (Pile, 2001). The author focuses on starting to measure the activities over which the supervisors or employees have complete control. If supervisors and team leaders are required to hold one safety meeting each month, then include that in your metrics program (Pile, 2001). The author encourages that the activities such as attending one safety meeting per month, participating in one training program per month or making four safety observations per week should be strictly included in the safety metrics.

This is not to minimize their importance as a management tool, but reliance on activity measures alone is analogous to grading a student on effort alone, with no consideration of actual achievement (Stricoff, 2000). The author emphasizes that activities are rarely direct predictors of

results. Just as production quality requires a company to understand and measure upstream factors that permit intervention well before a defect occurs, safety management requires good upstream measures of the results that safety systems are delivering (Stricoff, 2000). The view expressed here by the author coincides with the results before the accident measure illustrated above by Dan Petersen (2003).

Results-oriented metrics, such as OSHA recordables, lost-time accidents and severity rates are valuable tools for internal and external safety measurement (O'Brien, 1998). In contrast with the preceding argument, safety professionals, union leaders, regulators and managers are all dissatisfied with the status quo-reliance (almost exclusively) on recordable and lost time injury rates as safety performance measures (Stricoff, 2000). Incident rates, severity rates and incident cost are traditional safety measures often referred to as "Trailing Indicators" and are unable to tell you where you went wrong. To do that, you need to measure your incident prevention activities or "leading indicators" (Pile, 2001). To simplify the contradiction of picking whether the leading or the trailing indicators, the author (O'Brien, 1998) suggests a mix approach. As Dan Petersen (2003) stated in his tenth principle of safety management that there is no one right way to achieve safety in an organization. Despite its misleading representations at times, trailing indicators must remain part of a firm's overall business metrics for safety. Although, they enable a firm to benchmark its safety efforts against other similar companies, the company should not entirely review its safety performance based on trailing indicators. The author indicates the need of more proactive approaches and continuous improvement efforts. It is also important to include a mix of both leading and trailing indicators, with emphasis on leading indicators (O'Brien, 1998). The tables below show such mix in basic and comprehensive forms.

Table3.

---

 TABLE2. BUSINESS METRICS FOR SAFETY BASIC
 

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OSHA Recordable	10 points
Severity Rates	10 points
Insurance Reserves	10 points
Safety Meetings	10 points
Safety Observations	10 points
Safety Audits	10 points
Safety Incentives	10 points
Housekeeping	10 points
Documentation	10 points
Management Involvement	10 points
TOTAL	100 points

---

*Note.* (O'Brien, 1998).

Table4.

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 TABLE3. BUSINESS METRICS FOR SAFETY COMPREHENSIVE
 

---

OSHA Recordable	5 points
Severity Rates	5 points
Insurance Reserves	5 points
Safety Meetings	5 points

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Safety Observations	5 points
Safety Audits	5 points
Safety Incentives	5 points
Housekeeping	5 points
Documentation	5 points
Management Involvement	5 points
Contractor Severity Rates	5 points
One-On-One Safety Observations	5 points
Root-Cause Analysis	5 points
Compliance	5 points
Employee Empowerment	5 points
Contractor Interface	5 points
Employee Behaviors	5 points
Employee Perceptions	5 points
Overall Safety Culture	5 points
Statistical Process Control	5 points
TOTAL	100 points

---

*Note.* (O'Brien, 1998).

In both the above tables the metrics are equally weighted such as safety incentive is equal to that of housekeeping. This does not mean to show that they are equally important but the idea arises from the fact that both have been predetermined to be integral components of the company's safety system where continuous improvement is primal. Another reason of equal weighting is to make the system easier to design, implement or track. Uneven weight can produce an array of subjective pressures which may distort the system. The author emphasizes that neither systems showed above in the tables are ultimate solutions; however, an organization may blend the two or even better develop company-specific metrics. The focus is constant

improvement of leading-edge indicators that will ultimately improve the trailing-edge indicators (O'Brien, 1998).

### **Safety Measurement and Workers' Compensation Cost Control**

What is the best way to measure safety – audits, incident rate or workers' compensation costs? The answer may be “all of the above” and more (Petersen, 2001). Depending on traditional measures alone does not necessarily diagnose why the improvement or deterioration has occurred. Thus organizations have shifted their focus from incident data to safety audit. This approach was also not sufficient since the studies showed zero correlation between audit scores and accident statistics. Another study showed no correlation between audit scores and workers' compensation losses. In light of today's management thinking and research, the audit concept has become a suspect. The trend today is toward multiple measures to assess safety system effectiveness (Petersen, 2001). In this multiple measure scorecard approach the author includes safety audit, incident rate, perception survey and workers' compensation costs. The organizations should seriously decide what elements should go into the scorecard and the upper management must be convinced about the appropriateness of the scorecard elements. As with safety system content, it is also true with safety metrics: There is no one right way to do it. Each organization must determine its own “right way” (Petersen, 2001).

Creating visibility for safety and claims management results and creating the economic incentive for cost reductions will provide operating managers all the incentive they need to take an active interest in workers' compensation cost control (McGavin, 2001). The author explains in detail about the three management processes which would create the necessary visibility and economic incentive. The three management processes are measurement, cost allocation and developing performance information.

Providing concise data that enables top management to easily and quickly identify workers' compensation performance variations is perhaps the greatest single step a risk manager or loss control manager can take to create a climate for cost control (McGavin, 2001). Safety should be measured in terms of injury rates and cost should be measured in terms of incurred losses including paid to date and estimated reserve for future cost. Both injuries and workers' compensation costs should be expressed in rates to account for the difference in size of operation. The number of injuries should be converted to rate using the standard OSHA formula (incidents X 200,000/hours worked) that yields the number of incidents per 100 employees per year. Cost can be reported in terms of cost per hour. This data enables senior managers to quickly analyze the performance of all operations and identify the poor performance (McGavin, 2001). The author puts up an example as shown in table below.

Table5.

Figure A. Safety and Workers' Compensation Summary Report

<b>Plant Name</b>	<b>Hours Worked</b>	<b>OSHA Recordable Cases</b>	<b>Recordable Case Rate</b>	<b>Workers' Compensation Cost (\$)</b>	<b>Cost Per Hour</b>
Duluth	2,000,000	100	10.00	500,000	0.25
Livonia	1,750,000	73	8.34	359,000	0.21
Tampa	1,800,000	69	7.67	377,000	0.21
Louisville	1,200,000	44	7.33	250,000	0.21
Phoenix	1,450,000	28	3.86	175,000	0.12
Peoria	2,000,000	20	2.00	40,000	0.02

*Note.* (McGavin, 2001).



Cost allocation is another way to encourage operations managers to be involved in safety and claim activity (McGavin, 2001). Allocating actual workers' compensation costs back to the operations will affect the profitability of the operating units thus making the operations managers accountable for the profitability of their operations. The author emphasizes that performance – based cost allocation is necessary to accurately assess the profitability of operations. To prove the point, the author makes a profit comparison for Duluth plant and Peoria plant in the table below. The table shows that the Duluth plant is more profitable, earning \$1,750,000 compared to the Peoria plant's \$1,500,000 before workers' compensation cost is factored in. After the cost of workers' compensation is deducted from each plant's earnings, the Peoria plant is more profitable (McGavin, 2001).

Table 6.

Figure B. Safety and Workers' Comp. Summary Report

<b>Plant Name</b>	<b>Gross Profit</b>	<b>Workers' Compensation Cost</b>	<b>Profit Net of Workers' Compensation Cost</b>
Duluth	\$1,750,000	\$500,000	\$1,250,000
Peoria	\$1,500,000	\$40,000	\$1,460,000

*Note.* (McGavin, 2001).

The cost allocation program should be simple, easy to understand and should quickly track the performance. Most employers that develop simplified cost allocation programs do so because of the complications created by loss development. Loss developments are the continued growth in the cost claims after the end of the policy year and after all claims are reported. A typical employer may see its cost of claims double after the end of policy period, even if almost all claims are reported by year-end. Charging back the known cost at the end of the year would

create a false impression of performance. This means an employer must use some estimate of loss development when allocating costs to operations (McGavin, 2001).

Assuming an employer keeps a reserve for workers compensation cost, it can be allocated effectively following three steps (McGavin, 2001). Firstly, the employer should develop experience-based budgets for all of its locations based on historical workers' compensation cost for each operation. Table C assumes the estimated total cost for all plants is \$3,200,000. Duluth plant has generated an average of \$750,000 in workers' compensation cost over the last five years, accounting for thirty three percent of the average cost for the entire company. Therefore, the Duluth plant must budget for thirty three percent of the total \$3,200,000 expected cost of claims for the upcoming year or \$1,048,493. Accordingly, the Peoria plant has caused only two percent of the company's cost and must only budget \$76,889 (McGavin, 2001).

Table 7.

Figure C. Sample Budget Allocation

<b>Plant Name</b>	<b>5-Year Average Cost</b>	<b>Percent of Total</b>	<b>Cost Allocation</b>
Duluth	\$750,000	33%	\$1,048,493
Livonia	\$400,000	17%	\$908,694
Louisville	\$275,000	12%	\$559,196
Phoenix	\$159,000	7%	\$222,280
Peoria	\$55,000	2%	\$76,889
<b>Total</b>	<b>\$2,289,000</b>	<b>100%</b>	<b>\$3,200,000</b>

*Note.* (McGavin, 2001).

The second step is to adjust the cost charged to each plant based on results during the year soon after the year has ended. The employer would review and revise its total accounting reserve for workers' compensation cost after the end of the fiscal year. The revised reserve can be allocated to the plants in a similar fashion to the budget. Table D shows how each plant's loss

allocation can be derived from the accounting reserve. It assumes that the revised reserve is \$3,000,000. The new reserve of \$3,000,000 is allocated among the plants based on the percentage of total losses a plant accounted for during the year. If Duluth plant incurred \$630,000 (thirty eight percent) of the total losses for the company then it would be allocated \$1,150,335 (thirty eight percent) of the total \$3,000,000 reserve. This is more than the plant's original budget of \$1,048,493, so an adjustment of \$101,842 would be required. This would be the additional expense that would reduce the profitability of the Duluth plant (McGavin, 2001).

Table8.

Figure D. Sample Budget Adjustment

<b>Plant Name</b>	<b>Current Year Losses</b>	<b>Percent of Total</b>	<b>New Loss Allocation</b>	<b>Original Budget</b>	<b>Required Adjustment</b>
Duluth	\$630,000	38%	\$1,150,335	\$1,048,493	\$101,842
Livonia	\$425,000	26%	\$776,019	\$908,694	-\$132,674
Tampa	\$80,000	17%	\$511,260	\$559,196	-\$47,936
Louisville	\$169,000	10%	\$308,582	\$384,447	-\$75,865
Phoenix	\$100,000	6%	\$182,593	\$222,280	-\$39,688
Peoria	\$39,000	2%	\$71,211	\$76,889	-\$5,678
<b>Total</b>	<b>\$1,643,000</b>	<b>100%</b>	<b>\$3,000,000</b>	<b>\$3,200,000</b>	<b>-\$200,000</b>

*Note.* (McGavin, 2001).

The third step in the process is to repeat the adjustment process every year until all claims are closed. At that point, there will be no more estimated costs and each plant will have been charged exactly what it incurred (McGavin, 2001).

The final management processes in creating the necessary visibility for safety and claims management results and creating the economic incentive for cost reductions is to regularly provide information to managers that will enable them to monitor safety performance and

identify issues that need attention. Simple loss summaries that show the nature of injury, the part of body injured and the cause of injury sorted by the frequency and cost claims can help management focus prevention efforts (McGavin, 2001). Negative consequences may result when operations managers fail to understand the loss development. The author further suggests a rather rudimentary loss development calculation in the form of performance-to-budget report. An example of such a report is shown in table below.

Table9.

Figure E. Budget Report for 2001 as of July 30, 2001

<b>Fiscal Year</b>	<b>Month</b>	<b>Incurred Losses</b>	<b>Estimated Ultimate Losses</b>	<b>Budget</b>	<b>Variance</b>
2001	July	\$350,000	\$1,400,000	\$1,048,493	\$351,507

*Note.* (McGavin, 2001).

It shows a summary of performance for calendar year 2001 as of July 30, 2001. At this point, losses were \$350,000 compared to a budget of just over \$1 million. This might convey a wrong conclusion that the plant is doing well even after the reserve is adjusted in the future. In the table, the column headed “Estimated Ultimate Losses” more clearly indicates performance. It assumes that the losses will continue to be reported at the same pace through the second half of the year thus the losses will double. Also, it assumes that the incurred losses will double continuing next year too. That means the \$350,000 will likely reach \$1,400,000 (\$350,000 doubled twice). When an operations manager sees a report projecting a variance of more than \$350,000, he or she will be forced to develop an understanding of the problem in order to correct it (McGavin, 2001).

Martin McGavin (2001) assures that the involvement of operations managers is the key to the success of workers' compensation cost control effort. Operations managers could be heavily involved in these efforts by utilizing aforementioned three processes namely safety measurement, workers' compensation cost allocation and timely management information. These processes will create an environment where cost containment through prevention and claim management is an expected part of every operations manager's job.

### **Summary**

In today's world safety management, performance measures and accountability systems are becoming more and more critical to the overall success of an organization. Safety management system's success is highly dependent upon its level of integration and alignment with the overall management system. At the same time, performance measurement and accountability should also be deeply embedded into the safety management system. Hence, the safety performance measurement system is an effective and sustainable way to manage occupational health and safety.

The proactive and the reactive performance measures allow an organization to measure its safety performances both qualitatively and quantitatively. As Dan Petersen famously quoted, "Without measurement, accountability becomes an empty and meaningless concept", the measurement of safety performance becomes critical for the success of any organization. A mix of leading and trailing indicators can be a practical approach to measure organizational safety performances. The focus is to constantly improve leading-edge indicators that will ultimately improve the trailing-edge indicators (O'Brien, 1998). Once safety performance metrics are in place, the accountability aspect of the system can become functional easily. Line management and supervisors can be held accountable for their safety performances. Safety related costs such

as workers' compensation cost can be controlled by employing workers' compensation cost control / charge back system.

As the companies are becoming more and more competitive, saving on safety related costs can prove profitable for any organization. Implementing workers' compensation cost control system and effective performance measures such as leading and trailing indicators can drastically improve the safety processes and performances of an organization. This overall approach introduces an innovative way of increasing efficiency and making profit for a company rather than focusing on productivity and quality all the time.

### **Chapter III: Methodology**

The purpose of this study was to identify the current safety performance measures and how they were utilized at Company XYZ. The study was also conducted to determine other possible performance measures which could be used to improve the existing safety initiatives at Company XYZ. The study was focused on developing a sustainable framework for safety performance measurement system involving management and supervisors' accountability. The three objectives of the study were as follows.

4. To identify present safety performance measures and how they are used at Company XYZ.
5. To determine the potential applicability of other performance measures that could improve the existing safety processes.
6. To develop a framework for performance measurement system that encompasses supervisors' accountability towards a sustainable safety management system.

The details of the method for conducting the study are given below. This chapter includes instrumentation, data collection procedures, data analysis and limitations of the study.

#### **Instrumentation**

A semi-structured interview methodology was conducted to identify current safety performance measures utilized at Company XYZ and how they were used to measure safety. The open-ended interview questionnaire was divided in two segments. The first part targeted to extract information related to ongoing safety performance measures and their utilization within the Company XYZ. The second part focused on gathering information about supervisors' accountability towards safety performance and management's willingness for a sustainable safety performance measurement system. E-mail correspondence was utilized to receive

Company XYZ's historical safety related loss data such as incident rate, loss time, DART (Days/Away/Restricted/Transferred) rate and workers' compensation costs. A copy of the interview questionnaire format is included in Appendix A.

### **Data Collection Procedures**

Two participants, one within the safety department and the other from top management, were interviewed over the phone. The open ended questions presented to the participants helped to analyze how the current safety performance measures were being used. The safety related historical data such as incident rate, loss time, DART rate and workers' compensation costs were provided by the safety personnel working at Company XYZ over the e-mail. The literature review information was utilized to explore the potential of both leading and trailing indicators in measuring safety performance. It also helped to determine the applicability of such metrics to improve the performance measurement system at Company XYZ. Literature review, historical data and the information obtained from the semi-structured interview were utilized to design a new performance measurement framework which would encompass supervisor's accountability in building a sustainable safety management system.

### **Data Analysis**

Data was analyzed to identify current safety performance status of the Company XYZ. Historical data such as incident rate, loss time, DART rate and workers' compensation costs were used to identify the limited safety performance metrics utilized at Company XYZ. These metrics were compared with other best practices of safety performance measurement through literature review information. Potential applicability of other performance metrics were determined to improve the existing safety processes at Company XYZ. Workers' compensation cost allocation system was utilized to make supervisors accountable for the safety related losses



in their respective departments. Finally, a framework for performance measurement system was developed by utilizing literature review information and the Company XYZ's existing safety performance metrics.

### **Limitations**

The limitations of the study are given below.

1. Data was collected only in Company XYZ so the study was limited to the company and the employees working there.
2. Analysis was performed strictly based on the data provided by the Company XYZ and any generalizations made to other companies would be inappropriate.
3. Lack of defined safety responsibilities and supervisors' accountability were evident due to the absence of integrated safety management system in Company XYZ.
4. The study's recommendations might not be acceptable to the Company XYZ due to management, safety culture and training issues.
5. The semi-structured interview was conducted for limited number of employees at Company XYZ and may not reflect the view of the organization as a whole.

## Chapter IV: Results

The purpose of this study was to identify the current safety performance measures at Company XYZ and to focus on developing a sustainable framework for safety performance measurement system involving supervisors' accountability. The three objectives of the study were as follows.

1. To identify present safety performance measures and how they are used at Company XYZ.
2. To determine the potential applicability of other performance measures that could improve the existing safety processes.
3. To develop a framework for performance measurement system that encompasses supervisors' accountability towards a sustainable safety management system.

To achieve the first objective, the semi-structured interview was analyzed to identify the existing safety performance status of the Company XYZ. The results from the semi-structured interview are given in Table10 below. Historical data such as incident rate, loss time, DART rate and workers' compensation costs, provided by the interview participants, were used to identify the limited safety performance metrics utilized at Company XYZ. The relevant historical data of past five years and the industry average (Bureau of Labor Statistics, Industry Injury and Illness Data, NAICS Code 311612) comparisons are shown in Table11 and Table12 below.

To achieve the second objective, the literature review was utilized to explore and determine the applicability of other performance metrics such as leading and trailing indicators to improvise the present safety processes at Company XYZ. Although Company XYZ was already utilizing some popular trailing indicators such as Incidence rate and loss time, it would be helpful for the management to draw a wide picture of safety performance by including other

trailing indicators such as DART rate, workers' compensation cost and insurance reserves. A list of these potentially applicable comprehensive performance metrics is given in Table13 below.

Workers' compensation cost allocation system was utilized to make supervisors accountable for the safety related losses such as Incidence rate, Workers' compensation cost and Cost per hour in their respective departments.

Finally, the third objective was achieved by utilizing the historical data, the literature review and the Company XYZ's existing safety performance metrics. In congruence with all the findings, a framework for performance measurement system was developed to help manage a sustainable safety management system at Company XYZ.

### Results from Semi-Structured Interview

Table10.

#### Semi-Structured Interview Responses

<b>Question 1.</b>	<b>Does the Company XYZ have a safety management system which is integrated within the line management of the company?</b>
Response 1.	Yes. Safety management system is integrated with the management system because they involve accident investigation, promotion of safety and preventive solution for the recurrence of accidents. First line managers/supervisors play important role.
Response 2.	Essentially safety manager has all the responsibilities including running safety meetings, promoting safety in the plant and keeping records of the accidents.
<b>Question 2.</b>	<b>What are the safety performance measures currently utilized at Company XYZ?</b>
Response 1.	Tracking incidents in weekly basis. Besides, Incident rate, DART rate and loss time rate are major performance measures.
Response 2.	OSHA records. Daily bingo game when we do not have any accident

	reported on that day.
<b>Question 3.</b>	<b>Please describe in detail how the existing safety performance measures are used at Company XYZ.</b>
Response 1.	By setting goal for new year. We see the previous year's performance. We make comparisons in year to year basis. Employee reward programs are in place. Individuals are awarded annually for not have any incident record throughout the year.
Response 2.	Play bingo game for no accident day. Reward is \$80 per person. Employees get helmet sticker for no accident records for 1 year up to 6 years. Employees with annual accident free history get 1 jacket each.
<b>Question 4.</b>	<b>Can you provide historical safety data of the Company such as incident rate, loss time rate, DART (Days / Away / Restricted / Transferred) rate?</b>
Response 1.	Yes.
Response 2.	Yes. Safety manager should be able to provide that.
<b>Question 5.</b>	<b>Who is responsible for the safety related losses? Please describe.</b>
Response 1.	Hard question. Everyone in the plant is responsible. Ultimately it falls back to the safety manager. Losses fall back to the management. There is not one person responsible actually. We realize that we collectively didn't do what we should have done to prevent the loss.
Response 2.	I do not know who that would be? Cannot pin point at one person. It should be a combination of employee, supervisor, safety manager and the management.
<b>Question 6.</b>	<b>Are the supervisors directly or indirectly accountable for the safety related losses such as injury or workers' compensation cost?</b>
Response 1.	They are more indirectly accountable. Not directly held accountable for accidents or injury. They do not tie up with workers' compensation losses.
Response 2.	I don't know. I haven't seen them doing accident investigation. In safety meetings and management meetings they mention accidents

	though. I don't think they are directly responsible.
<b>Question 7.</b>	<b>Are the supervisors evaluated for their safety improvement efforts?</b>
Response 1.	No, not yet.
Response 2.	I do not think so.
<b>Question 8.</b>	<b>Are you willing to develop a sustainable safety performance measurement system which includes supervisor's accountability?</b>
Response 1.	Absolutely. We have a long way to go in that direction. We are trying to put pieces together. Supervisors should be a part of the safety system. Supervisors should be the primary focus since they have most exposure. They often concentrate on productivity and quality rather than safety. We want to make them more proactive than reactive.
Response 2.	That would be great. Recently, near-miss reporting and investigation has had significant impact. Supervisors are encouraged to report near misses.
<b>Question 9.</b>	<b>Can you provide Company XYZ's previous years' workers' compensation costs and employee hours worked in each department?</b>
Response 1.	We can provide the workers' compensation cost and employee hours worked for the year 2010-2011.
Response 2.	Yes, safety manager should have those.

Although one of the interview respondents argued that the Company XYZ has a safety management system integrated with the line management of the company, it is less supported by the rest of the responses throughout the interview. This is more evident by the fact that front line supervisors are not directly responsible for the accidents and injuries in their departments. Company XYZ is mostly dependent on trailing indicators such as incidence rate, DART rate and loss time rate for its safety performance measurement. Rewarding employees through bingo

games, jackets and “Accident Free” helmet stickers in the absence of accidents could impact the safety process negatively. Employees would be encouraged to hide accidents rather than talk about it. Besides safety manager there is hardly anyone responsible for the safety related losses in Company XYZ. This shows clear lack of accountability within the safety management system. Front line supervisors seem to be more worried about productivity and quality while caring less about proactive safety measures. One of the interview respondents shows the willingness and accepts the fact that the Company XYZ has a long way to go towards establishing a sustainable safety performance measurement system which includes supervisors’ accountability.

Table 11.

Historical data (Loss time, DART rate, Incidence rate & Workers’ compensation cost) of Company XYZ

Year	Loss Time Injury Rate (DAFWII)	DART Rate	Incidence RATE	Workers' Compensation Cost (\$)
2006	0.61	4.90	6.74	\$13,683
2007	1.75	5.24	7.99	\$19,444
2008	2.21	5.74	6.62	\$110,191
2009	0.85	4.05	6.61	\$157,969
2010	0.79	8.72	8.92	\$197,679

Table 12.

Comparison of Industry Average (NAICS Code 311612) Loss time, DART rate & Incidence rate with Company XYZ’s historical data

Year	Loss Time Injury Rate (DAFWII)	Industry Average1	DART Rate	Industry Average2	Incidence RATE	Industry Average3
2006	0.61	2.20	4.90	6.60	6.74	9.80
2007	1.75	1.70	5.24	5.30	7.99	8.20
2008	2.21	1.50	5.74	4.40	6.62	6.80
2009	0.85	1.40	4.05	4.40	6.61	6.60
2010	0.79	1.40	8.72	4.10	8.92	6.50

*Note.* (Bureau of Labor Statistics, Industry Injury and Illness Data, 2006, 2007, 2008, 2009, 2010)

The semi-structured interview and the safety related historical data were able to depict a clear picture of current safety performance measures and their utilization at Company XYZ. The Table11 and Table12 above show an increasing trend of workers' compensation cost at Company XYZ. This is also true for the incidence rate of the Company XYZ. Although the loss time rate is showing a decreasing trend, DART rate is still shooting up. While comparing with the Labor Statistics Data, only the loss time rate measures below the industry average in recent years while DART rate and Incidence rate are either on a par with the industry average or way above it. Loss time rate might be improving because of well execution of "Employee's return to work" program. This is evident with increasing DART of the Company XYZ. Increasing Incidence rate cannot be imposed upon the increasing number of employees or increasing work hours. This might just be a clear indicator that the Company XYZ's injury prevention programs are not effective enough or they are poorly managed. This shows that dependence on trailing indicators alone is probably deteriorating the overall safety performance at Company XYZ.

### **Results from Literature Review**

To achieve the second objective of the study, the literature review information was utilized to explore the potential performance measures of safety. Literature review presented some of the leading and trailing performance measures that could be utilized to improve the safety processes at Company XYZ. Safety metrics fall into two basic categories; leading indicators, which are measurements linked to preventive actions and trailing (lagging) indicators, which are linked to the outcome of an accident (Petersen, 2003). Although, result-oriented measurements are misleading sometimes, such indicators must remain part of a firm's overall "business metrics for safety". However, these indicators should not be the entire basis for review of safety and health performance and it is important to include a mix of both leading and trailing

indicators, with emphasis on leading indicators (O'Brien, 1998). A potential applicability of such mixed approach to the performance measurement at Company XYZ is shown in Table13 below.

Table13.

Comprehensive safety performance metrics for Company XYZ		
1	OSHA Recordable	5 points
2	Severity Rate	5 points
3	Insurance Reserves	5 points
4	Safety Meetings	5 points
5	Hazard Identification Team Meeting	5 points
6	Safety Audits	5 points
7	Safety Incentives	5 points
8	Housekeeping	5 points
9	Recordkeeping	5 points
10	Near-miss Incident reporting	5 points
11	Near-miss Investigation	5 points
12	Accident Investigation/Root Cause Analysis	5 points
13	OSHA Compliance mock audit	5 points
14	Employee Behavior	5 points
15	Employee Perception Survey	5 points
16	Hazard Communication Program	5 points
17	Emergency Preparedness Drill	5 points
18	Job Safety Analysis	5 points
19	Ergonomic Analysis	5 points
20	Routine Inspection	5 points
21	Statistical Process Control	5 points
22	Supervisor's Performance Evaluation	5 points
23	Potential Risk Assessment	5 points
24	Employee Return to Work Program	5 points
TOTAL		120 points

All twenty four metrics are equally weighted in the above Table13. Although there is not a single best way to develop a comprehensive performance metrics, the above table definitely



provides an idea that these performance metrics can be integral components of Company XYZ's safety management system where continuous improvement and sustainability is primary. Equal weighting (5 points each) of the performance metrics also makes it easier to design, implement and track.

Comprehensive safety performance audit alone cannot assess the improvement or deterioration of safety measurement system within an organization. The trend today is toward multiple measures to assess safety system effectiveness (Petersen, 2001). Workers' compensation cost allocation system is one such method to measure safety performance in terms of injuries and incurred losses. Both injuries and workers' compensation costs should be expressed in rates to account for the difference in size of operation. The number of injuries should be converted to rate using the standard OSHA formula (incidents X 200,000/hours worked) that yields the number of incidents per 100 employees per year. Cost can also be reported in terms of cost per hour. This data enables senior managers to quickly analyze the performance of all operations and identify the poor performance (McGavin, 2001). The data (year 2011) provided by the Company XYZ was utilized to develop a workers' compensation summary report as shown in Table14 and Table15 below.

Table14.

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Safety and Workers' compensation summary report for Company XYZ (Day Shift)

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<b>Work Departments</b>	<b>Number of Employees</b>	<b>Employee Hours Worked</b>	<b>Number of Recordable Injuries</b>	<b>Recordable Case Rate</b>	<b>Workers' Compensation Cost (\$)</b>	<b>Cost (\$)/ Hour</b>
1	70	135030	12	17.77	\$33,922	\$0.25
2	73	140817	6	8.52	\$9,876	\$0.07
3	37	71373	1	2.80	\$0	\$0.00
4	60	115740	7	12.10	\$705	\$0.01
5	11	21219	5	47.13	\$0	\$0.00
6	4	7716	0	0.00	\$0	\$0.00

Table 15.

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 Safety and Workers' compensation summary report for Company XYZ (Night Shift)
 

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<b>Work Departments</b>	<b>Number of Employees</b>	<b>Employee Hours Worked</b>	<b>Number of Recordable Injuries</b>	<b>Recordable Case Rate</b>	<b>Workers' Compensation Cost (\$)</b>	<b>Cost (\$)/ Hour</b>
7	52	100308	2	3.99	\$1,739	\$0.02
8	73	140817	7	9.94	\$20	\$0.00
9	26	50154	1	3.99	\$0	\$0.00
10	85	163965	9	10.98	\$11,036	\$0.07
11	13	25077	0	0.00	\$0	\$0.00
12	7	13503	4	59.25	\$3,775	\$0.28

---

Allocating actual workers' compensation costs back to the departments will affect the profitability of individual departments thus making the supervisors accountable for the profitability of their respective departments. From the above tables, department 1 and 12 are costing \$0.25/work hour and \$0.28/work hour respectively to the Company XYZ. This shows inadequate injury prevention initiative in those departments. Department 5 and 12 have incidence rate 47.13 and 59.25 respectively. These figures are strikingly high compared to the Labor Statistics data. Besides medical reserves, department 1, 2 and 10 have significantly high workers' compensation cost of \$33,922, \$9,876 and \$11,036 respectively. After deducting these costs from the profit of those individual departments at Company XYZ may not make them look as profitable.

It is important to accurately assess the profitability of departments based on the safety performance such as incidence rate, workers' compensation cost and cost per hour of every individual department. The department wise workers' compensation cost as calculated in the above tables should be deducted from the respective department's earnings to calculate the actual profitability of individual department at Company XYZ. Since the earning of each department is

not available, we cannot deduct workers' compensation cost and calculate the profitability of each department at Company XYZ.

### **A framework for performance measurement system**

The third objective was achieved by utilizing the literature review and the Company XYZ's existing safety performance metrics. A thorough approach to safety measurement should encompass accountability measures, downstream performance measures and upstream performance measures that are predictive of outcomes (Stricoff, 2000). Within an organization, safety should be managed like any other company function (Petersen, 2003). Safety related losses should be viewed as cost saving opportunities rather than business related losses (Bird & Germain, 1985). For an organization to succeed, safety management system and performance measures should be well aligned with the organization's overall goal. OHSAS 18001, OSHA-VPP and Petersen's principles of safety management can provide the best guidelines to set safety standards congruent with an organization's goal. These standards thus can serve as the basis of the development of the leading and trailing performance measurement.

As with safety system content, it is also true with safety metrics: There is no one right way to do it. Each organization must determine its own "right way" (Petersen, 2001). As shown in Table 13 above, a suggested comprehensive safety performance metrics include both leading and trailing indicators for Company XYZ. Results of performance measurement can be utilized in two major levels. Supervisors and managers should focus on leading indicators to prevent future losses while system-wide performance can be evaluated using the trailing indicators (Petersen, 2003).

The second important part of the third objective focuses on the supervisors' accountability towards a sustainable safety management system. Without measurement,

accountability becomes an empty and meaningless concept (Petersen, 2003). Safety measures prescribed by Dan Petersen fall into three categories; (i) activity (did the supervisor do what was supposed to be done?), (ii) results before the accident (are things better around here because of what this supervisor has done?), and (iii) results after the fact of accident (how many did we have?) (Petersen, 2003). Activity measures are better implemented if supervisors are involved and accountable. As one of the respondents of the interview explained that supervisors are the first line of management with maximum exposures at Company XYZ, their involvement in the loss prevention initiatives would make a lot of difference. Supervisors could be evaluated on the basis of their proactive approaches to reduce accidents and safety related losses in their respective departments at Company XYZ. The leading indicators mentioned in the comprehensive safety performance metrics above in Table13 could be set as standard basis for the measurement and evaluation of the supervisors.

Another way, discussed by McGavin (2001), to increase supervisor's accountability is to measure safety in terms of injury rates and cost in terms of incurred losses including paid to date and estimated reserve for future cost. Both injuries and workers' compensation costs could be expressed in rates to account for the difference in number of employees and size of the individual departments. Accurate assessment is important to determine the profitability of individual departments as well as their supervisors. The workers' compensation cost allocation system would make supervisors accountable for the number of injuries, OSHA rates, total workers' compensation cost and the cost of safety related losses per hour in their respective departments. These numerical facts would compel them to take responsibility for the safety related losses as well as take proactive measures to prevent them from recurring.

## Summary

The purpose of this study attempted to identify current safety performance measures and their utilization at Company XYZ. The study was also performed to explore other performance measures to improve the safety processes at Company XYZ. The methodology of research was focused on developing a sustainable framework of safety performance measurement system which primarily includes supervisors' accountability. To attain the first objective, a semi-structured interview methodology was conducted to identify current safety performance measures utilized and how they were used to measure safety at Company XYZ. The open-ended interview questionnaire helped to extract information related to ongoing safety performance measures and their utilization within the Company XYZ. The responses of the phone interview were posted in Table10 above. The safety related historical data such as incident rate, loss time, DART rate and workers' compensation costs were used to identify the limited safety performance metrics utilized at Company XYZ. These data were later used to compare with the Bureau of Labor Statistics data and finally generate Table11 and Table12 which clearly showed Company XYZ's complete dependence on trailing indicators for the safety performance measurement.

To achieve the second objective, the literature review information was utilized to explore the potential of both leading and trailing indicators in measuring safety performance. The literature also helped to determine the applicability of such metrics to improve the performance measurement system at Company XYZ. A Comprehensive safety performance metrics consisting of both leading and trailing indicators was suggested for Company XYZ in Table13. On the other hand, workers' compensation cost allocation system is a method to measure safety performance in terms of injuries and incurred losses. This system was utilized to make supervisors

accountable for the safety related losses in their respective departments. The previous year's (2010-2011) information provided by the Company XYZ was utilized to develop a workers' compensation summary report as shown in Table14 and Table15. Allocating actual workers' compensation costs back to the departments would affect the profitability of individual departments hence the supervisors would be more accountable and responsible towards safety.

To achieve the third objective, the literature review, Company XYZ's historical data, existing safety performance metrics and the information obtained from the semi-structured interview were utilized in developing a framework which would primarily include supervisor's accountability and responsibility in building a sustainable safety management system. The development of framework was basically divided into two major parts. The first part discussed about the design of a comprehensive safety performance metrics which include both leading and trailing indicators for Company XYZ. Another part discussed about evaluating supervisors' performance and increasing their accountability. To measure safety in terms of injury rates and costs in terms of incurred losses a workers' compensation cost allocation system was suggested for Company XYZ. The system is capable of making supervisors accountable for the safety related losses in their respective departments. The cost allocation system produces safety related data that are more transparent and easy to interpret for the top managers. Further, Chapter V would include the conclusions and recommendations based on the findings resulted in this chapter.

## **Chapter V: Summary, Conclusions and Recommendations**

### **Summary**

The summary section of this chapter includes restatement of the problem, purpose of the study, objectives of the study and finally methods & procedures of the study.

### **Restatement of the problem**

The absence of a safety management / performance measures / accountability system hinder the ability of company XYZ to manage safety as an integral part of the operations, increasing the potential to enhance efficiency and effectiveness of the manufacturing operations.

### **Purpose of the Study**

The purpose of this study was to develop a safety management / accountability system that promotes active involvement of supervisors and management and creates a sustainable framework where safety is inextricably related to quality and productivity.

### **Objectives of the study**

The objectives of the study were identified as listed below.

1. To identify present safety performance measures and how they are used at Company XYZ.
2. To determine the potential applicability of other performance measures that could improve the existing safety processes.
3. To develop a framework for performance measurement system that encompasses supervisors' accountability towards a sustainable safety management system.

### **Methods and procedures**

The goals of the study were achieved by first identifying the existing safety performance measures at Company XYZ. Secondly, the literature review was performed to explore other

performance measures such as leading and trailing indicators to improve the safety processes at Company XYZ. Finally, the study was focused on developing a sustainable framework of safety performance measurement system by involving supervisors' accountability. Below three paragraphs explain the "what" and "how" of the methodology and procedure to obtain above mentioned three specific objectives of the study respectively.

A semi-structured interview with open-ended interview questionnaire was conducted to identify current safety performance measures utilized at Company XYZ. This also helped to extract information and understand how the performance measures were used to measure safety at Company XYZ. The interview responses were posted in Table10. One of the interview respondents also e-mailed the safety related historical data of Company XYZ such as incident rate, loss time, DART rate and workers' compensation costs. These data were later used to compare with the Bureau of Labor Statistics data and finally generate Table11 and Table12 to develop a clear understanding of the existing safety measures at Company XYZ.

The literature review information was utilized to explore the potential application of both leading and trailing indicators in measuring safety performances at Company XYZ. Table4 of literature review presented such a comprehensive safety performance metrics consisting of both leading and trailing indicators. To involve supervisors' accountability, the workers' compensation cost allocation system was explored in detail to measure safety performance in terms of injuries and incurred losses. This system was later utilized to explain the step by step implementation to make supervisors accountable for the safety related losses in their respective departments at Company XYZ.

The literature review, Company XYZ's historical data and the information obtained from the semi-structured interview were utilized in developing a safety performance measurement



framework involving supervisor's accountability. The first part of the framework included the design of a comprehensive safety performance metrics which would include both leading and trailing indicators. The second part of the framework design focused on evaluating supervisors' performance and increasing their accountability at Company XYZ. This framework primarily helped measure safety in terms of injury rates and costs in terms of incurred losses by utilizing workers' compensation cost allocation system.

### **Conclusions**

The conclusions of the study are presented below to satisfy the three major objectives of the research. The first objective was to identify present safety performance measures and how they were used at Company XYZ. Following conclusions were drawn based on the results of the study.

- Company XYZ was dependent upon few trailing indicators such as incidence rate and loss time for the measurement of its safety performances throughout the plant. Depending on few trailing indicators alone was probably deteriorating the overall safety performance of Company XYZ. Proactive measures such as leading indicators were completely missing in the safety performance measurement system.
- Employees were awarded in the absence of "accident reporting" encouraging the practice of hiding the accidents rather than reporting it.
- Company XYZ showed an increasing trend of incidence rate, workers' compensation cost and DART rate as shown in Table 11.
- While comparing with the Labor Statistics Data, only the loss time rate measured below the industry average in recent years while DART rate and Incidence rate

were either on a par with the industry average or way above it as shown in Table12.

- Company XYZ did not have a safety management system integrated with the line management of the company. Safety management system was mostly isolated from the rest of the business functions such as production and quality.
- Front line supervisors were not directly responsible for the accidents and injuries in their respective departments. It showed clear lack of accountability of supervisors for safety related losses.
- During the interview Company XYZ employees accepted the need of establishing a sustainable safety performance measurement system which included supervisors' accountability.

The second objective of the study was to determine the potential applicability of other performance measures that could improve the existing safety processes at Company XYZ.

Following conclusions were drawn based on the results of the study.

- Although, result-oriented measurements are misleading sometimes, such indicators must remain part of a firm's overall "business metrics for safety". However, these indicators should not be the entire basis for review of safety and health performance and it is important to include a mix of both leading and trailing indicators, with emphasis on leading indicators (O'Brien, 1998).
- Although there is not a single best way to develop a suitable performance metrics, a comprehensive safety performance metrics consisting of leading and trailing indicators is a practical approach to the performance measurement at Company XYZ as shown in Table13.

- Comprehensive safety performance measurement alone could not assess the improvement or deterioration of safety measurement system within an organization. To move beyond performance audit, the trend today is toward multiple measures to assess safety system effectiveness (Petersen, 2001). Workers' compensation cost allocation system is one such method to measure safety performance in terms of injuries and incurred dollar losses.
- The work injuries and workers' compensation costs could be expressed in rates to account for the differences in size of departments at Company XYZ. This data would enable senior managers to quickly review the performance of all departments and identify the poor performance of respective supervisors (McGavin, 2001). Company XYZ's data was utilized to develop such a workers' compensation summary report as shown in Table14 and Table15. Allocating actual workers' compensation costs back to the departments would affect the profitability of individual departments thus making the supervisors at Company XYZ accountable for the profitability of their respective departments.

The third objective of the study was to develop a framework for performance measurement system that encompasses supervisors' accountability towards a sustainable safety management system. Following conclusions were drawn based on the results of the study.

- Within an organization, safety should be managed like any other company function (Petersen, 2003). Safety related losses should be viewed as cost saving opportunities rather than business related losses (Bird & Germain, 1985).

- A thorough approach to safety measurement should encompass accountability measures, downstream performance measures and upstream performance measures that are predictive of outcomes (Stricoff, 2000).
- Safety management system and performance measures should be well aligned with the organization's overall goal. OHSAS 18001, OSHA-VPP and Petersen's principles of safety management can provide the best guidelines to set safety standards congruent with an organization's goal. These standards would then serve as the basis of the development of the leading and trailing performance metrics.
- As with safety system content, it is also true with safety metrics: There is no one right way to do it. Each organization must determine its own "right way" (Petersen, 2001). Table13 reflects such comprehensive safety performance metrics including both leading and trailing indicators for Company XYZ.
- Without measurement, accountability becomes an empty and meaningless concept (Petersen, 2003). Supervisors were not being evaluated on the basis of their proactive approaches to reduce accidents and safety related losses in their respective departments at Company XYZ.
- The workers' compensation cost allocation system, as summarized in Table14 and Table15, would make supervisors accountable for the number of injuries, OSHA rates, total workers' compensation cost and the cost of safety related losses per hour in their respective departments. These numerical data would prepare them to take responsibility for the safety related losses and prevent them from recurring in their respective departments at Company XYZ.

## **Recommendations**

The recommendations of the study are divided into two parts; Recommendations related to the study and the Recommendations for future study.

### **Recommendations related to the study**

Based on the results of the study, various recommendations were made to develop a sustainable safety measurement system which includes leading indicators, trailing indicators and supervisors' accountability at Company XYZ.

- Rather than depending upon few trailing indicators such as incidence rate and loss time for the measurement of its safety performances, Company XYZ should also employ other trailing indicators such as DART rate, insurance reserves and workers' compensation cost per department. Comparing these data periodically with the Labor Statistics Data would help to set standards and goals for future. These trailing indicators could be effectively used to measure Company-wide safety performance.
- Leading indicators, such as timely safety meeting, safety audit, near-miss reporting, accident investigation, job safety analysis, routine inspection, periodic hazard identification etc as shown in detail in Table13, should be incorporated into the comprehensive safety metrics of Company XYZ.
- At Company XYZ, supervisors and managers should mostly focus on leading indicators to prevent future accidents and injuries while trailing indicators should be used to evaluate the Company-wide performance. The supervisors should be evaluated on the basis of standards set by leading indicators mentioned in the comprehensive safety performance metrics Table13.

- The culture of rewarding employees through bingo games, jackets and “Accident Free” helmet stickers in the absence of accidents should be eliminated at Company XYZ. This way of rewarding encourages employees to hide accidents rather than talk about it. Rewarding employees with best “near-miss reporting” could be a better substitute here.
- Company XYZ should focus on a safety management system which is well integrated with the line management of the company. Front line supervisors should be directly responsible for the accidents and injuries in their respective departments. Establishing a sustainable safety performance measurement system should essentially include supervisors’ accountability. Supervisors should be evaluated on the basis of their proactive approaches to reduce accidents and safety related losses in their respective departments at Company XYZ.
- For quick reviews of safety performances at various departments or of respective supervisors, Company XYZ should utilize workers’ compensation summary report as shown in Table14 and Table15. Allocating actual workers’ compensation costs back to the departments and their respective supervisors would affect the profitability of individual departments thus making the supervisors at Company XYZ accountable.
- To accurately assess the profitability of individual departments at Company XYZ, the actual earnings of each individual department should be obtained. Later, the department wise workers’ compensation cost as calculated in Table14 and Table15 should be deducted from the respective department’s earnings to calculate the actual profitability of individual departments at Company XYZ. Due

to the lack of department wise earning data, the actual profitability of each department could not be calculated in this study. It is recommended to do such calculations in the future to promote supervisors' responsibility and accountability at Company XYZ.

- Safety management system should not be isolated from the rest of the management functions such as production or quality at Company XYZ. Safety should be treated as any other business function and should be an integral part of the overall management system.
- Safety management systems such as OHSAS 18001, OSHA-VPP and Petersen's principles of safety management should be used as guidelines to set safety standards at Company XYZ. Finally, these safety standards and safety performance measures should be well aligned with Company XYZ's overall goal.

### **Recommendations for future study**

Recommendations for future study are given below.

- Applicability of various statistical process control tools could be explored to measure safety performances and improvements.
- Department wise earning data could be gathered to access the actual profitability of individual department within an organization.
- Various other measures could be studied to further increase supervisors' accountability and responsibility towards safety related losses.
- Safety management systems such as OHSAS 18001 and OSHA-VPP could be studied and replicated to develop a model of sustainable safety management system which is aligned with the overall goals of any prospective organization.

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### Appendix A: Employee Interview Questionnaire

1	Does the Company XYZ have a safety management system which is integrated within the line management of the company?
2	What are the safety performance measures currently utilized at Company XYZ?
3	Please describe in detail how the existing safety performance measures are used at Company XYZ.
4	Can you provide historical safety data of the Company such as incident rate, loss time rate, DART (Days/Away/Restricted/Transferred) rate?
5	Who is responsible for the safety related losses? Please describe.
6	Are the supervisors directly or indirectly accountable for the safety related losses such as injury or workers' compensation cost?
7	Are the supervisors evaluated for their safety improvement efforts?
8	Are you willing to develop a sustainable safety performance measurement system which includes supervisor's accountability?
9	Can you provide Company XYZ's previous years' workers' compensation costs and employee hours worked in each department?