INVESTIGATION AND ANALYSIS OF LOSSES ASSOCIATED WITH POWERED INDUSTRIAL TRUCKS AT COMPANY X

by

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Abstract

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1. Powered Industrial Truck
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The purpose of this study was to identify the losses associated with powered industrial trucks (PIT) at Company X from January 1996 through September 1999. This task was accomplished through loss tab analysis. A review of accident reports from PIT-related accidents was performed in attempt to identify possible root causes of the accidents. Seventy-seven PIT-related accidents were identified. These accidents resulted in significant economic losses for Company X. Medical and indemnity payments from Worker's Compensation claims resulting from these accidents totaled $347,966.42. Employees 19-25 years of age and/or with under 5 years of employment were found to be at highest risk to be involved in PIT-related accidents. Accident claims involving these groups resulted in approximately 40% of incurred losses from PIT-related accidents at Company X. Additional risk factors were identified, such as speed of PIT operation and uneven surfaces. To reduce the impact of these risk factors, several control measures were recommended including enhanced PIT operator training, workplace hazard assessments, and more thorough accident reporting methods.

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CHAPTER ONE

Statement of the Problem

Introduction

The company that has agreed to participate in this project has asked to remain anonymous and therefore will be referred to as Company X. Company X is a privately owned manufacturer of finished wood products with customers nation wide. Since their inception nearly 100 years ago, Company X has grown to be the largest manufacturer of its' particular type of products in the nation. On the average, approximately 4,000 people are employed at Company X's facility, with 2,500 of these person involved in production activities. Production employees are directly compensated with hourly wages, in addition to daily production incentive bonuses and end of year profit sharing.

Powered industrial trucks play a critical role in nearly every aspect of production and distribution at Company X. A powered industrial truck is defined by OSHA as "fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines." (OSHA, 1999). Several tons of raw and finished products are moved in and out of Company X's facility yearly. Powered industrial trucks are expected to perform many different tasks and, therefore, a large number and variety of powered industrial trucks are needed. In a recent inventory, it was calculated that Company X currently operates 367 powered industrial trucks of 10 distinct varieties and three different power sources. In addition, it is anticipated that every production employee has the potential to use a powered industrial truck as part of his or her job functions. With each separate use and different operator, the exposure to losses through injury to operator, injury to another employee, property damage and equipment damage increase substantially. After considering the high exposure for losses' concerning this equipment, Company X's concerns were not limited to regulatory ones.

Company X began evaluating its' powered industrial truck policy and training program in response to OSHA's adoption of increased training requirements in CFR 29 1910.178. The new training requirements under this standard went into effect on December 1, 1999. In addition to increased regulatory requirements, the evaluation of the powered industrial truck policy and training program revealed several other areas of concern regarding this type of equipment. An initial loss tab analysis of costs associated with powered industrial truck injuries at Company X since 1996 has indicated that exposures are not being adequately controlled and that increased training requirements for all powered industrial truck operators would be beneficial from both a regulatory and financial perspective. Losses associated with powered industrial trucks at Company X indicate the management driven system currently in place is not adequately addressing associated risks.

Purpose

The purposes of this study was to analyze and evaluate Company X's current powered industrial truck policy and training program and identify areas of uncontrolled risk factors and regulatory deficiencies.

Objectives

The objectives of this study were to:

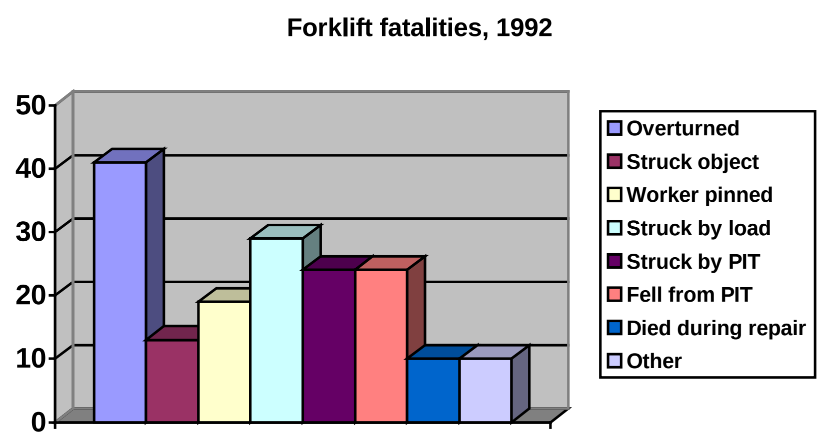
1. Determine the total dollar losses of powered industrial truck-related injuries at Company X from January 1996 through September 1999 through loss tab analysis.

2. Identify variables that may be contributing to the incidence of powered industrial truck injuries and establish root causes through analysis of accident reports.

3. Ensure that any resulting recommendations are in compliance with regulatory requirements for powered industrial trucks under 29 CFR 1910.178.

Significance of the Study

According to R. Blake Smith, materials' handling is responsible for one of the greatest exposures for injury from both a frequency and severity standpoint. Forklift accidents, when coupled with back injuries, make up the largest share of lost work days and worker's compensation dollars in the distribution industry (1999). It is estimated that 95,000 injuries occur as the result of powered industrial trucks each year (OSHA, 1998). Furthermore, the Bureau of Labor Statistics (1992) has released the following information concerning powered industrial truck fatalities in 1992. Graph 1 depicts the distribution of events that lead to the 170 fatalities due to forklift accidents.



Graph 1 – Forklift Fatalities, 1992 (Bureau of Labor Statistics, 1994)

Statistics such as the ones previously presented have led OSHA to investigate injuries and fatalities due to powered industrial trucks further in order to determine if increased regulatory requirements would reduce these numbers. Following their investigation, OSHA concluded that increased training and evaluation requirements would indeed make a considerable impact. An estimated 11 deaths and 9,500 injuries will be prevented yearly as a result of the new standard. The annual cost of compliance is approximated at $16.9 million annually. While this is a substantial figure, these costs are offset with predicted savings of $83 million in direct costs, such as medical savings, administering worker's compensation and lost production. It is projected that an additional $52 million will be saved in accident related property and product damage. As a result, OSHA adopted a new standard in 29 CFR 1910.179 (l) on March 1, 1999 (OSHA, 1998).

Limitations:

This study and resulting recommendations apply only to the main production facility at Company X.

Assumptions:

The following assumptions are made for this study:

1. Loss tab information provided to the researcher is accurate and complete.
2. Accident reports concerning powered industrial truck losses accurately represent the events that occurred.

CHAPTER TWO

Review of Literature

Introduction

The purpose of this study was to assess the incidence of PIT losses at Company X. In order to effectively evaluate the situation, a review of relevant literature has been conducted. In this literature review, the opinions and experiences of individuals, companies and regulatory entities have been summarized. These experiences can then be compared to those of Company X to provide a framework for establishing effective controls, as deemed necessary.

This literature review utilizes several different sources of information. First, case studies investigating the incidence and possible causes of PIT accidents have been summarized. Second, the written PIT Safety Programs of two companies have been surveyed to identify the key elements included to control PIT losses. Finally, the regulatory requirements have been encapsulated. These sources will subsequently be summarized to provide a foundation for the collection of information regarding PIT losses at Company X.

According to the U.S. Department of Health and Human Services (USH&HS), the first step to controlling losses of any kind is to establish the major accident causative factors that exist at a company or in a population. The USH&HS continues to state that the base for measurement is the accident, because it represents an undeniable manifestation of an underlying problem. Often, companies use an analysis tool called loss tab analysis to identify major losses and significant trends that have occurred. Based on the results of loss tab analysis, additional research can be focused on problem areas and control measures can then be instituted to address the causative factors of the accidents (USH&HS, 1988).

Case Studies

Considering the frequency and severity of PIT related losses, it is not surprising that several studies have been conducted on this type of accident in attempt to establish trends in the circumstances that lead to losses. PIT losses are usually multi-causational, meaning there are a combination of vehicle, environmental and driver-related issues that led to the loss. Most PIT case studies have been limited to descriptive, retrospective accounts of PIT accidents. Investigation generally takes place long after the event of the accident. As a result, limited information is available to researchers and, since there is not a control group, the conclusions may have insufficient reliability (Collins, Smith, Baker, Landsittel, and Warner, 1999).

Methodology. Recently, a case controlled study on PIT losses was published. This is the first study of its kind relating to PIT losses. The researchers attempted to bring the "wealth of knowledge and experience from road safety…inside the factory gate." (Collins et al, 1999, p. 523) To achieve this, the researchers used a methodology similar to that used to study factors in motor vehicle crashes. Some studies of motor vehicle crashes not only collect data from the parties involved in an accident, but also from individuals that passed the area of the accident safely during in the same relative time frame. Thus, a control group is created. The case-control methodology has proven effective in identifying factors that were over represented in crashes (Collins et al, 1999).

According to Collins et al (1999) this case controlled study focused on the risk factors associated with PIT injuries with an emphasis on factory design, PIT loading and safety features, and driver characteristics. The study included information from injury producing PIT accidents at eight automotive manufacturing facilities from July 1992 through March 1995. To ensure complete and accurate data was collected on all PIT related crashes, a real-time computerized surveillance system was used to identify cases. As site employees entered work-related injuries into the computer, a field in the database identified potential cases and asked if a PIT was involved in the injury. Later, a key word search of the database identified additional cases. When a PIT was involved in an injury, certain information was required to be entered into the database by the worker's supervisor, the Safety Department and the Plant medical staff. If the accident met the studies criteria, the driver of the PIT was then interviewed. The information collected was compared to data gathered from individuals with similar working conditions and driver characteristics who had not been involved in a PIT accident for three years prior to the study (Collins et al, 1999).

<u>Results of case control study</u>. Collins et al. identified 171 PIT incidents during the course of the study. Seventy-five (44%) of these incidents resulted in lost workdays. A total of 3065 workdays were lost, averaging 41 days per accident. Hospital treatment was necessary for 39% of the injured workers. Table 1 shows the circumstances involved in these incidents (1999).

Nature of Incident	Frequency	Percent
Pedestrian struck by PIT	86	50.3
Collision with obstruction	39	22.8
Collision with another PIT	29	17.0
PIT fell from tractor-trailer	6	3.5
PIT drove over pothole	4	2.3
Passenger fell from PIT or	4	2.3
Rack fell onto driver	1	0.6
Load fell off rear or	1	0.6
Steering wheel knob broke	1	0.6
Total	171	100

Table 1 – Circumstances of Incidents in Collins et al, (1999) study

Analysis of data. As previously stated, the data collected on these crashes was compared to data collected where no crash occurred. Site characteristics, vehicle characteristics and driver characteristics categorized information collected. When considering site characteristics, the presence of temporary and/or permanent obstructions was significant in locations where collisions occurred. In both case, permanent obstructions were thought to decrease aisle width and temporary obstructions were thought to decrease visibility. Obstructions were present in 60% of injury sites, while present in only 50% of non-accident sites (Collins et al, 1999).

The presence of mirrors to improve driver and pedestrian visibility was also a factor. Only 8% of accident sites had overhead dome mirrors present within 50 feet of the collision site. On the other hand, 19% of the control groups in similar sites had overhead dome mirrors. Table 2 summarizes the data collected regarding site and vehicle characteristics for both the case and control sites (Collins et al, 1999).

Characteristics	Cases		Controls	
	Number	Percent	Number	Percent
Mirrors present within 50 feet of site				
Yes	10	7.9	72	19.2
No	116	92.1	303	80.8
Total	126			
Obstructions at the site				
Not present	44	34.9	186	49.6
Present	82	65.1	189	50.4
Total	126			
PIT carrying a load				
No	61	48.8	279	59.5
Yes	64	52.1	190	40.5
Total	125			
Floor Surface				
No incline	124	98.4	372	99.7
Incline	2	1.6	1	0.3
Total	136			
Volume of Pedestrian Traffic				
<40 pedestrians / hr.	112	86.9	348	89.9
> 40 pedestrians / hr.	17	13.2	39	10.1
Total	129			
Walkways for Pedestrians				
Yes	1	0.8	7	1.9
No	125	99.23	367	98.1
Total	126			
Guardrails to separate pedestrian and PIT				
Guardrail	2	1.6	4	1.1
No guardrails	124	98.4	370	98.9
Total	126			
Volume of PIT Traffic				
<40 PITs / hr.	80	62.0	244	63.1
> 40 PITs / hr.	49	38.0	143	36.9
Total	129			
Stop Sign at site				
Yes	15	11.9	46	12.3
No	111	88.1	329	87.7
Total	126			
Aisle width				
>12 ft.	52	40.3	157	40.6
< 12 ft.	77	59.7	230	59
Total	129			
Vehicle equipped with flashing light				
Yes	93	78.8	369	79.2
No	25	21.2	97	20.9
Total	118			

Table 2 - Site and Vehicle Characteristic in Case and Control Sites.

Some data presented in this study was rather surprising. Considering that 50.3% of the accidents involved a pedestrian being struck by a PIT, the volume of pedestrian traffic, aisle width and the presence of walkways or guardrails to separate pedestrian and PIT traffic were not found to be significant factors. However, it should be noted that the presence of guardrails and walkways was rare in both the case and control groups.

Therefore, the effectiveness of guardrails and walkways in controlling PIT/Pedestrian collisions cannot be established from this study (Collins et al, 1999).

Driver characteristics such as age and years of employment were also analyzed. The automotive manufacturing industry generally has a very stable workforce with little employee turnover. Therefore, the years of operator experience found in this industry is likely to be higher than what would be found across all manufacturing environments. While younger operators were more likely to be involved in an incident, the differences in age distribution were not found to be statistically significant. However, when length of employment was considered, it was found that operators who had worked at the corporation for 5 – 15 years were most likely to be involved in an accident. This data can be misleading. It is necessary to look at operator experience in their job class to draw accurate conclusions about employee experience and PIT losses. Within the 5 – 15 year group, 38% of the operators involved in accidents had been in their job class for less than one year and 26% had been in their job class for less than one month. When all groups were considered, it was found that one-third of all injuries occurred to employees during their first year in a job class. One-fifth of all injuries occurred to employees with less than one-month experience in their job class (Collins et al, 1999).

Concluding that less experienced operators are much more likely to be involved in PIT accidents suggests that more complete training for new operators is needed (Collins et al, 1999). In their interviews, several operators stated they felt uncomfortable with their ability to operate PIT equipment safely when first assigned to their jobs. In addition, the high number of pedestrian injuries indicates training on the hazards of working in areas where PITs are used should be provided to all employees (Collins et al, 1999).

Other case studies. As previously stated, other case studies have been descriptive and retrospective in nature. While different in their methodology, several case studies support the revelations of Collins et al. (1999). Williams and Priestly (1980) conducted a study of individuals with PIT-related injuries that presented themselves at a hospital in Great Britain during an 18-month period. This hospital is located near Trafford Park, one of largest concentrations of manufacturing facilities in Europe. During the 18-month period, employees from 47 of the 80 local factories received treatment for PIT related injuries. A total of 60 injuries were presented, resulting in 1314 lost working days. It should be noted that the distribution of victims between PIT operators and pedestrians is similar to the study previously outlined. The authors of this study speculate, through analysis of case notes on the accidents, that poor factory layout, driver incompetence and lack of training were key contributing factors (Williams and Priestly, 1980).

A study conducted by the Lifschultz and Donoghue of the Cook County Medical Examiners Office (1994) gathered information on 14 PIT-related fatalities. Of these 14 deaths, nine were operators and five were pedestrians. In these cases, toxicological data was collected in nine of the fourteen cases. While this is a very small sampling group, it is important to note that positive blood alcohol levels were found in two of these fatal cases (Lifschultz and Donoghue, 1994). Therefore, alcohol, as well as drug use can be added to the myriad of driver characteristics that may result in a PIT related loss.

PIT losses are highly likely to be multi-causational in nature. Any combination of uncontrolled risk factors from the environment, the vehicle and/or the driver can lead to a loss. However, the majority of the case studies read for this literature review list facility design and lack of operator training as major contributing causes (Collins et al, 1999; Lovestead, 1977; Lifschultz and Donoghue 1994; N. Stout-Weigland, 1987). It is important to consider PIT and pedestrian traffic when designing and renovating facilities to reduce the number of permanent obstructions pedestrians and PIT operators must navigate around. Good housekeeping policies will aid in reducing the number of temporary obstacles blocking aisle and reducing vision. It is noted that these risk factors are more difficult to control in older facilities and those which that have experienced a great deal of growth since their inception, as Company X has (Lovestead, 1977).

While the case studies examined did not quantify speed of PIT operation as a specific risk factor, it is very important. According to Miller (1988), PITs can weight up to 2.5 tons and carry an additional 2 tons of freight. If this PIT were traveling at 10 mph, it would have as much force as a large automobile traveling at 20 mph and may take up to 40 feet to bring to a stop. When high speeds are combined with poor facility design, the implications can be deadly. A speed limit of 3 mph is recommended to allow PIT operators to navigate safely in the presence of uncontrolled risk factors and reduce severity the event of a collision (Miller, 1988).

The risk factor of speed has additional implications at Company X in two ways. First, a piece-rate production incentive has been in place since the company was founded and the incentive is imbedded in the company culture. Second, Company X uses Just-In-Time manufacturing where raw materials are fed to and finished products are removed from production lines with little intermediate storage. According to Templer (1993), just-in-time manufacturing results in increased pace and pressure on PIT operators, which in turn increases the potential for a PIT related accident. Establishing and enforcing speed limits for PITs would result in slowing production of every job at Company X. While enforced speed limits may be more cost effective than allowing high PIT speeds to contribute to losses, the scope of this research project does not allow full investigation into the implications of PIT speed limits versus incentive systems.

Increased driver and pedestrian training were identified as a control of PIT accidents in every case study examined. Operator training can decrease the incidence of operator's performing unsafe activities, such as traveling at speeds too high for conditions present, and lifting and traveling with unbalanced loads. In addition, training of operators and pedestrians can enhance their capability of safely dealing with hazardous workplace conditions, such as blind corners and poor facility design (Lovestead, 1977). This point can be summed up in the following axiom - to the degree that people cause loss, trained and aware employees can prevent loss (Goodstein, 1980).

Developing training programs and written policies to address uncontrolled risk factors appear to be an important step in controlling PIT losses. However, these programs and policies must be enforced to be effective. Lovested (1977), recommends a comprehensive PIT program that combines a thorough training program with continued monitoring of operator performance after training and strict enforcement of safe work practices. Furthermore, Collins et al (1999) also states that enforcement of systematic traffic controls is a necessary component of effective PIT risk management. At Company X, frontline supervisors are the members of management that generally have the most contact with PIT operators. Since frontline supervisors will be required to enforce internal standards, it is advisable to include these persons in developing and implementing policies and procedures, as well.

Written Safety Programs from other Companies

A written PIT Safety Policy/Training Program is an important first step in controlling the many risk factors associated with PITs. At the time of this research project, Company X did not have a written PIT Safety Policy other than operator disciplinary procedures. For the purposes of this literature review, the written programs of two different organizations have been analyzed.

United Auto Workers (UAW)/Ford Training Program. Recognizing the safety issues presented by PITs, the UAW – Ford National Joint Committee of Health and Safety (NJCHS) developed a comprehensive training program for their employees. The UAW – Ford NJCHS refer to PITs as powered material handling vehicles (PMHV). The UAW – Ford PMHV Operator's Manual and Workbook is by far the most comprehensive document reviewed during the course of this research project. Following a needs assessment at eight Ford facilities and extensive input from both production workers and management, the UAW – Ford NJCHS developed a 418 page PMHV Operator's Manual and Workbook. As part of the program, all employees must first attend a one-hour pedestrian training session. In this session, employees are trained in the hazard assessment skills necessary to work safely around PMHVs. Next, those who will be operating PMHVs must successfully complete an operator-training program that consists on four modules (UAW-Ford, 1993).

While the operator-training program is lengthy, several key concepts are repeated throughout the training sessions to add emphasis and increase likelihood of information retention. These key ideas are that an operator must remain AWARE, ALERT, ACTIVE AND ALIVE. These concepts are capitalized in the UAW – Ford training manual and will be in the following outline of the content in each of the four modules (UAW-Ford, 1993).

Module 1: Skills + Commitment = Accident Prevention

Section 1: Overview

Content: Informs the trainee of the purpose and importance of safety training, how he/she can contribute to safety and what he/she can expect to learn from the training sessions.

Section 2: PMHV Operation – The Safety Factor

Content: Educates the trainee on what is meant by 'multiple causation' and how safety training will make him/her a better operator.

Section 3: Be AWARE of Safety Guidelines

Content: Explains how the trainee can become more AWARE, where safety guidelines come from, and the responsibilities of the employer and employee.

Section 4: Be ALERT to Changing Conditions

Content: Informs the trainees how he/she can become more ALERT, identify potential changing conditions, recognize hazards, and perform safe vehicle/ pedestrian and vehicle/vehicle interaction.

Section 5: Consider the Consequences

Content: Stresses to the trainee how the key concepts of AWARE, ALERT, ACTIVE and ALIVE can help them reduce accidents. Includes specific cases for emphasis.

Module 2: Controlling Your Vehicle and Handling the Load

Section 1: Introduction

Section 2: Controlling Your Vehicle

Content: Outlines fundamental safety guidelines, hazard recognition and changing job conditions to be ALERT to.

Section 3: Handling the Load

Content: Instructs trainee on preparing to handle a load, vehicle capacity, load stability, and other transportation guidelines.

Section 4: Special Load-Handling Circumstances/Refueling and Battery Change Procedures

Content: Educates the trainee on safety guidelines for inclines, elevators, railroad tracks, truck trailers, potentially explosive areas, refueling and battery changing/charging.

Section 5: AWARE, ALERT, ACTIVE, ALIVE

Content: Stresses importance of ‘choosing safety’ while on the job.

Module 3: The Responsible Operator – Mastering the Details

Section 1: Operator Certification

Content: Informs trainee how to become certified and consequences of operating equipment that he/she is not certified for.

Section 2: The Daily Inspection

Content: Trainee is instructed on how and why to perform a daily inspection.

Section 3: Vehicle Specific Operations

Content: Special instruction for lift trucks and stackers, motorized hand and hand/rider jacks, tow tractors, and other unique vehicles.

Module 4: Skills Performance

Section 1: The Final Phase of Operator Certification

Content: Trainee demonstrates skills learned through quizzes and hands-on evaluation (UAW-Ford, 1993).

The operator training does not end there. After completing all of the modules, the employee keeps the Operator's Manual/Workbook. The employee is expected to refer to it as a reference and occasionally review it to sharpen skills. The UAW – Ford PMHV Operator's Training Program is very extensive. However, the broad use and inherent hazards of PMHVs in the automobile manufacturing industry warrants such scope and detail. While the training is lengthy, key ideas are repeated through the program to help the trainee retain the lessons and apply them while on the job (UAW-Ford, 1993).

Supervalu Powered Industrial Truck Safety Manual. Supervalu is a major grocery chain that uses a large number and variety of PITs. The Supervalu program is not nearly as extensive as the UAW – Ford PMHV program. Following is an outline of the elements addressed in the Supervalu PIT policy and training program.

I. Equipment Inspection Procedures

Content: Inspection procedures and responsibilities of management and operators are very specifically defined. Disciplinary procedures for non-compliance with procedure are given.

II. Employee Orientation / Training

Content: Orientation / Training topics, method of delivery and duration of training are given. The breakdown of these topics is provided on Table 3.

Subject	Delivery	Duration
Walk thru warehouse	Training Sup.	15 min.
Orientation w/ Pallet Jack	Training Sup.	10 min.
Job requirements	Pamphlet	10 min.
Correct Lifting	Video	20 min.
Warehouse Selection	Video	15 min.
Selection Tips	Pamphlet	10 min.
Rider jack	Video	15 min.
Rider Jack	Booklet	5 min.
Grocery Selection	Pamphlet	10 min.

Table 3 – Topics In Supervalu's Employee Orientation/Training Program

As part of the SuperValu program, new employees are also given information on the rules of employment, three days of training, 45 minutes of instruction on PIT operation, and a written PIT examination. Supervalu dedicates about 1 hour and fifteen minutes to formal PIT training. Many of the primary risk factors are addressed during this training through a list of safe operating procedures. These procedures include instruction on: personal protection, maintenance, starting and stopping, travel, loading, stacking, parking, and entering trailers. In addition to classroom instruction, a supervisor or trainer must verify through the use of a checklist that the employee has received instruction on twelve specific items. The employee must also pass a written examination and an operator performance test before they are authorized to operate PITs. Employees must carry a license with them stating which pieces of equipment they are authorized to use and any restrictions on operation, such as wearing corrective lenses (SuperValu, 1998).

Regulatory Requirements

On March 1, 1999, OSHA enacted the first changes to 29 CFR 1910.178 (Powered Industrial Trucks) since its' inception in 1971. The new training requirements went into effect of December 1, 1999 and while many parts of the standard remain unchanged, regulations concerning training PIT operators have changed significantly. It is now required that employers have existing employees trained to the new criterion and that new employees be trained to the criterion before they are allowed to operate a PIT. The new criterion includes formal instruction and practical training on specific truck and workplace topics. In addition, the employers must evaluate the employees' skills on the specific equipment they will be using and more stringent requirements for retraining employees are included in the standard (Feare, 1999). The OSHA powered industrial truck standard contains the following sections:

General requirements. This section covers the scope and application of the law.

- Types of equipment covered.
- Equipment design and labeling specifications as referenced in American National Standard for Powered Industrial Trucks, Part II, American National Standards Institute (ANSI) B56.1-1969.
- Restrictions on modifications.

Equipment designations. It is necessary to classify atmospheres and locations as either hazardous or non-hazardous before equipment selection. The criteria for location designations will be provided later in this. Following are eleven different equipment designations for powered industrial trucks.

- G - Gasoline powered units having minimum acceptable safeguards against inherent fire hazards.
- D - Same as G except diesel powered engine.
- DS - Diesel powered units provided with additional safeguards to exhaust, fuel and electrical systems.

- DY - Diesel powered units with safeguards of the DS unit, but also do not contain any electrical equipment (including ignition) and are equipped with temperature limitation features.
- E - Electrically powered units having minimum acceptable safeguards against inherent fire hazards.
- ES - Electrically powered units that in addition to the safeguards for E units, have additional safeguards to the electrical system to prevent emission of hazardous sparks.
- EE - Electrically powered units that in addition to the safeguards for E and ES units, the electric motors and all other electrical equipment must be completely enclosed.
- EX - Electrically powered units that differ from the E, ES and EE units in that electrical fittings and equipment are designed, constructed and assembled so that units can be used in combustible atmospheres.
- G - Gasoline powered units with minimal safeguards against inherent fire hazards.
- GS - Gasoline powered units with additional safeguards to the exhaust, fuel and electrical systems.
- LP - Similar to G unit but LP gas used as fuel, rather than gasoline.
- LPS - Liquefied petroleum gas powered units provided with additional safeguards to the exhaust, fuel and electrical systems.

Designated locations and Converted Industrial Trucks. A summary of classification criteria is located in 29 CFR 1910.178, Table N-1 (1999). In brief, locations are divided into four classes. Unclassified locations do not possess hazardous atmospheres. Class I locations contain flammable gases or vapors which may be present in quantities to produce explosive or ignitable mixtures. Class II locations contain combustible dust. Class III locations are areas where ignitable fibers and flyings are present, but are not likely to be suspended in sufficient quantities to produce ignitable mixtures. These classes are then broken into groups and divisions. Within the groups, specific materials that can produce explosive atmospheres, such as acetylene, are listed. The divisions are concerned with the likelihood of the hazardous condition being present.

Safety guards. This section states that high-lift rider trucks must be fitted with an overhead guard and that a load backrest must be used if the load carried presents a hazard. Both must meet criteria in section 29 CFR 1910.178 (a)(2) and (a)(4).

Fuel handling and storage. Storage and handling of fuels must be in compliance with 29 CFR 1910.6.

Charging and charging storage batteries. Changing and charging PIT batteries presents hazards not only from the chemicals used in the batteries, but also from the weights of the batteries. Batteries serve as a power source and a counterbalance for the load carried._Their weights can exceed 500 pounds. OSHA has requirements for the changing/charging area and the procedure for changing/charging PIT batteries. Key requirements are:

- Battery charging must take place in designated areas.
- Among the items the area must contain are facilities for flushing/neutralizing spilled electrolyte, spill containment, fire protection, adequate ventilation, and a hoist for handling batteries. The area must also be designed to protect

charging apparatus from damage by trucks. Smoking must be prohibited in the area. Specific procedural items are also listed in the section.

Lighting for operating areas. If lighting is less that 2 lumens/sq. ft., the truck shall be equipped with auxiliary lighting.

Control of noxious gases and fumes. Carbon monoxide concentrations must comply with requirements in 29 CFR 1910.1000.

Dockboards. Dockboards must comply with 29 CFR 1910.30(a).

Trucks and railroad cars. Brakes on trucks must be set and the wheels must be chocked before loading or unloading. Positive protection must ensure railcars cannot be moved with dockboards/bridgeplates are in place.

Operator training.

- Safe Operation. The employer must ensure each PIT operator is competent through completion of specified training and evaluation. The employer may only allow qualified persons to operate PITs, except in training situations where certain safeguards must be in place.
- Training Program Content. Employers must provide training on the following.

Truck-related Topics	Work-place related Topics
• Truck specific operating instructions, warning and precautions • Differences between PIT and automobile operation	• Closed environments and other areas where CO and diesel fumes may build up. • Surface conditions
• Location and operation of truck controls and instruments • Engine/motor operation	• Composition of loads/load stability • Load manipulation, stacking, unstacking
• Steering and maneuvering	• Pedestrian traffic
• Visibility, including restriction from loads • Fork and attachment adaptations, operation and limitations • Required inspection and maintenance	• Narrow aisles and other restricted areas • Hazardous locations • Ramps and other sloped surfaces
• Any other operating instructions, warnings or precautions in the operator’s manual. • Refueling and/or charging batteries	• Other unique or potentially hazardous environmental conditions that could affect safety.

- Refresher training, evaluation, avoidance of duplicative training and certification.

  Each operator must be evaluated at least every three years. Refresher training must be completed when:

- The operator has been observed operating in an unsafe manner.
- The operator has been in an accident or near-miss incident.
- The operator has received an evaluation showing deficiencies.
- The operator is assigned to a different type of vehicle.
- A condition in the workplace has changed which could affect safe operation.

Existing employees were required to be trained in the listed manner before December 1, 1999. Employees hired after December 1, 1999 must be trained and evaluated before being allowed to operate PITs. If an operator has previously received training in a specified topic, it is not necessary to retrain on that topic unless one of the above criterions has revealed deficiencies. The employers must certify each operator has been trained and evaluated through documentation of the operator's name, date of training, date of evaluation and name(s) of trainer and evaluator.

Truck operations. This section lists requirements for safe PIT operation around pedestrians, transporting people with PITs, keeping appendages inside PIT during operation, leaving PITs unattended and safety features PITs must have. Many of the items are covered in training section.

Traveling. Requirements for traveling safely, such as observing safe speeds, traveling on grades and turning. Again, many of these topics are covered in the training section.

Loading. Safe procedure for load capacity, stability and tilting are covered.

Operation of truck. This sections gives the procedure for fueling and states that PITs in need of repair must be taken out of service.

Maintenance of industrial trucks. Guidelines for whom can repair PITs, where the repairs must be made and certain maintenance and inspection requirements.

Other Related Literature.

According to the U.S. Department of Health and Human Services (1988), the first step to controlling losses of any kind is to establish the major accident causative factors that exist at a company or in a population. The base for measurement is the accident, because it represents an undeniable manifestation of an underlying problem. Often, companies use an analysis tool called loss tab analysis to identify major losses and significant trends that have occurred. Bases on the results of loss tab analysis, additional research can be focused on problem areas and control measures can then be instituted to address the causative factors of the accidents and prevent the accident (USH&HS, 1988).

The ideas expressed by the USH&HS are echoed by Grimaldi and Simonds (1984), who state that an important step in the accident reduction process is to periodically index all work-related injuries and illnesses. Again, loss tab analysis will aid in identifying which accident classes are predominant in the data. It can shed light on where to focus efforts for implementing controls. Often, this information is not sufficient to determine which controls to apply and it is necessary to gather data that are more refined. This is often accomplished through a review of accident reports (Grimaldi and Simonds, 1984).

As previously stated, PIT training programs were identified as a significant means of controlling risk factors in several of the case studies examined. Indeed, training is an effective tool to control PIT related losses. The U.S. Department of Health and Human Services (1988) reports that safety training has many benefits, including accident reduction, reduction of unsafe acts, greater hazard recognition ability, and increased productivity. However, they caution that a training program should follow identification of causative factors associated with an accident. In doing this, the company can tailor the training program to fit the specific needs of their company and, consequently, their employees (1988).

Summary

Based on the preceding literature review, uncontrolled risk factors associated with PITs can lead to injury, death and/or financial losses. Several case studies have concluded that significant risk factors often include a combination of vehicle, environmental and driver-related issues. Areas presenting significant uncontrolled risks include untrained/under-trained operators and poor facility design.

In addition to compliance with regulatory requirements, establishing causative factors for losses experienced is often the first step in controlling the hazards that have led to losses. In the Risk Control profession, this is often accomplished through loss tab analysis. Loss tab analysis allows the Risk Control professional to identify which causative factors are uncontrolled in his/her situation. Since most accidents are multi-causational, further investigation into the losses is often necessary to determine how the risk is best controlled. This can be accomplished through accident analysis or detailed review of accident reports.

In the case of PIT losses, the development of a written PIT policy that includes operator training is often identified as an effective control measure. As shown in the outlines of written PIT safety programs from UAW and SuperValu, there are several key elements that are present in an effective written policy and training program. These include tailoring training content to address specific risk factors, strict enforcement of safe practices and monitoring of operator performance to measure program effectiveness.

CHAPTER THREE

Methodology

The purpose of this chapter was to outline the necessary steps in order to complete the research project. First, the direct economic losses associated with PIT accidents at Company X were determined through loss tab analysis. Next, the accident reports from these losses were examined in attempt to identify root causes and trends. Finally, recommendations for control of PIT risk factors at Company X were developed based on the information collected during loss tab analysis and review of accident reports.

Procedure

Determination of Direct Economic Losses from PIT accidents. Losses associated with PIT accidents since 1996 were determined through Loss Tab Analysis. Company X's insurance company provides information on each claim submitted, including the claimant's age, job class, as well as the total incurred losses and nature of injury. All of this information was recorded on a computer spreadsheet program. Key word searches of the database fields were used to identify possible PIT-related accidents. This information will also be used to aid in identifying possible root causes of accidents.

Review of Accident Reports. After a claim was identified as PIT-related through the loss tab analysis, the individual accident code was determined so the accident report could be accessed. The accident report was then reviewed to identify additional operator, equipment and workplace factors that may have contributed to the accident. This review provided additional information on the events that may have led to the accident that were not available through loss tab analysis, such as if the accident occurred at an intersection, if an uneven surface was present and if the operator was traveling at a high rate of speed.

The data gathered on individual accidents and operators was recorded on a computer spreadsheet program. Next, the data was sorted and categorized in several ways in order to find trends. The analysis included finding the total number of accidents attributed to each root cause, number of claimants in each age category and number of years of operator employment. In addition, the total incurred costs for accidents in each possible root cause category, claimant age group and years of operator employment.

Summary

The methodology used to perform the research allowed the objectives of this project to be accomplished.

CHAPTER FOUR

The Study

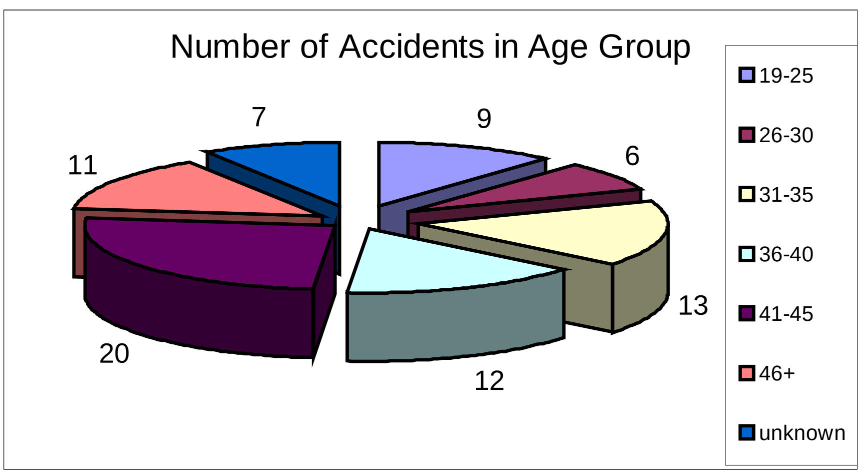
In Chapter Four, an analysis of the data collected for Company X is presented. The pertinent data includes a determination of economic losses from PIT related worker's compensation claims through loss tab analysis and identification of possible variables that contributed to PIT losses through analysis of accident reports. Information on PIT accidents from January 1996 through September 1999 is included.

Loss Data

Many loss control efforts begin with identification of problem areas through loss tab analysis. Company X's insurance company provides them with a database containing information about each worker's compensation claim that has been filed. Included in this database is a field that gives a one-word description of the cause of the injury. This field is titled "agency description". While this field should give indication as to the cause of the injury, the descriptors used are inconsistent. For example, some accidents involving PITs were given agency descriptions of object, machine, earth, roof, or glass. In one claim, a PIT carrying glass struck an employee. The agency description was entered by the insurance company as glass. While it was glass that caused the laceration to the employees arm, it would be more accurate to identify that the PIT striking the employee is the event that caused him/her to be lacerated by the glass. As a result of these reporting inconsistencies, the large size of the database and time constraints, it was not possible to investigate each claim and determine if it was PIT related. Consequently, it is reasonable to assume that not all of the PIT-related losses experienced by Company X from January 1996 through September 1999 were identified through this loss tab analysis.

Regardless of possible omissions, the losses that were clearly identified as PIT-related were substantial. In all, 77 PIT-related injuries were sustained during the period of time included in loss tab analysis. The total cost of these injuries was $347,966.42. The cost of the individual injuries ranged from $44.00 for a minor head laceration to $61,766.00 for injuries sustained by a woman who lost control of her forklift and hit a wall while she was being trained.

It is important to note that not all of the costs associated with these accidents are included in the $347,966.42 figure. This sum only accounts for the medical and indemnity payments made to or reserved for injured employees. Not included are indirect costs such as the costs for replacing injured employees, delayed production and claim management. In addition, property damage costs to the equipment, building and product are not included.



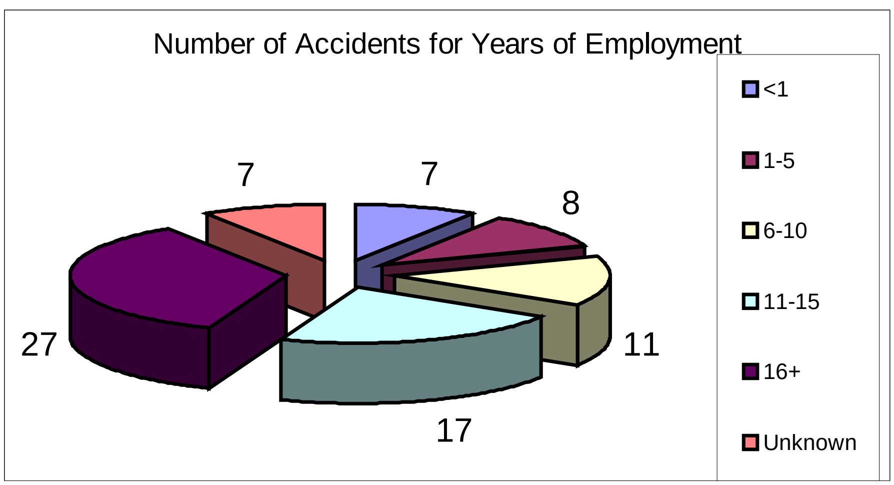
Graph 2 – Number of PIT-related Accidents by Age

While the younger worker force did not have the highest number of accidents, the cost of the accidents involving employees 25 and younger is considerably higher than those involving older employees. The 19-25 years old group were involved in 11.5% of all PIT related accidents, yet these accidents contributed to nearly 40% of the costs.

Age of Employee	Number of Accidents	Percent of Total Number	Cost of Accidents	Average Cost of Claim	Percent of Total Cost
19-25	9	11.5	137,880.90	15,320.10	39.6
26-30	6	7.7	1,456.83	242.81	.5
31-35	13	16.7	37,600.66	2,892.35	10.8
36-40	12	15.4	79,378.13	6,614.84	22.8
41-45	20	25.6	51,166.41	2,558.32	14.7
46+	11	14.1	17,869.95	1,624.54	5.1
Unknown	7	9.0	22,613.54	3,230.50	6.5

Table 4 - Comparison of Accidents Costs and Age of Operator

The number and costs of PIT-related accidents was also compared to years of operator employment.



Graph 3 – Number of PIT-Related Accidents by Years of Employment

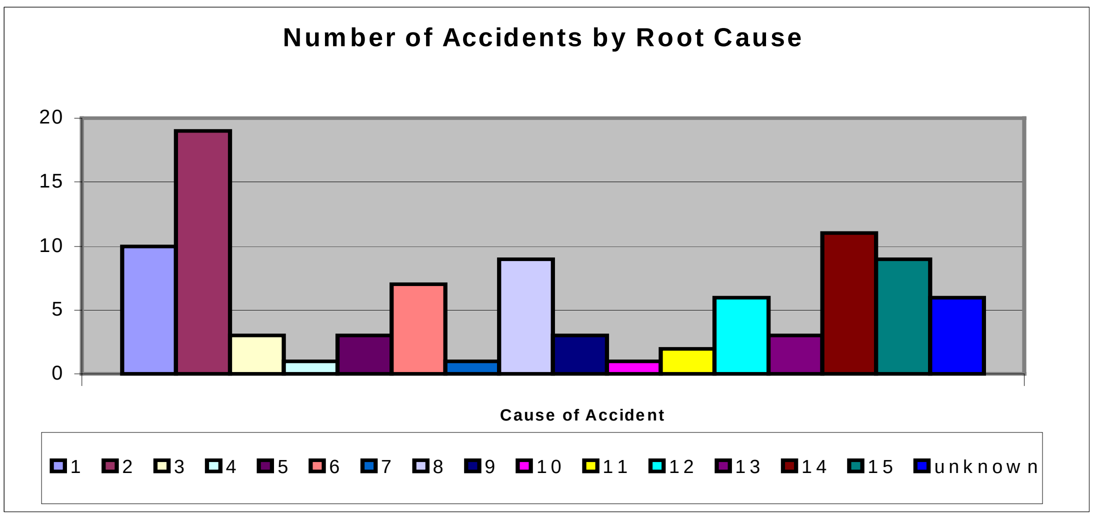
Years of Employment	Number of Accidents	Percent of Total Number	Cost of Accidents	Average Cost of Claim	Percent of Total Cost
<1	7	9.1	68,162.65	9,823.24	19.6
1-5	8	10.3	72,770.41	9,096.30	20.9
6-10	11	14.3	45,469.79	4,133.62	13.1
11-15	17	22.1	45,618.21	2,683.42	13.1
16+	27	35.1	81,603.38	3,022.35	23.5
Unknown	7	9.1	34,341.98	4,906.00	9.9

Table 5 - Comparison of Accidents Costs and Years of Employment

As indicated on Table 5, years of employment do not give a direct indication of how much experience an employee has operating PITs. The actual experience level can either be over or under represented. For example, an employee could have worked at Company X for 10 years at a job where PIT operation was not required. If this employee changed jobs within Company X and was involved in a PIT-related accident their years of employment would state 10 years, even though they were in that particular job for only a short time. Regardless, the data collected shows that less experienced employees are more likely to be involved in more costly PIT accidents than their more experienced co-workers. Employees with less than 5 years of employment were responsible for 40.5% of the incurred costs associated with PIT-related accidents at Company X.

Accident Reports

Following loss tab analysis, the accident report from each claim was examined to verify if the claim was PIT-related and to attempt to identify root causes of the accident. It should be noted that all of the data presented in the previous section is from verified PIT-related accidents. Unfortunately, the accident descriptions gave little information regarding the events that led to the accident. The descriptions generally consisted of a few words, such as 'hit pole with forklift'. Pertinent information, such as exact location of the accident, operator statements, witness statements, and photographs of the area were either not obtained or not recorded. However, there was enough information available to give a general idea of what happened in most of the collisions and some conclusions could be drawn. The following graph shows the number of accidents in which each of the various risk factors appeared to be present. Several of the accident reports provided enough information to identify the presence of more than one risk factor. In these cases, both of the risk factors were tabulated. As a result, the total number of accidents shown in the graph is greater than the actual number identified.

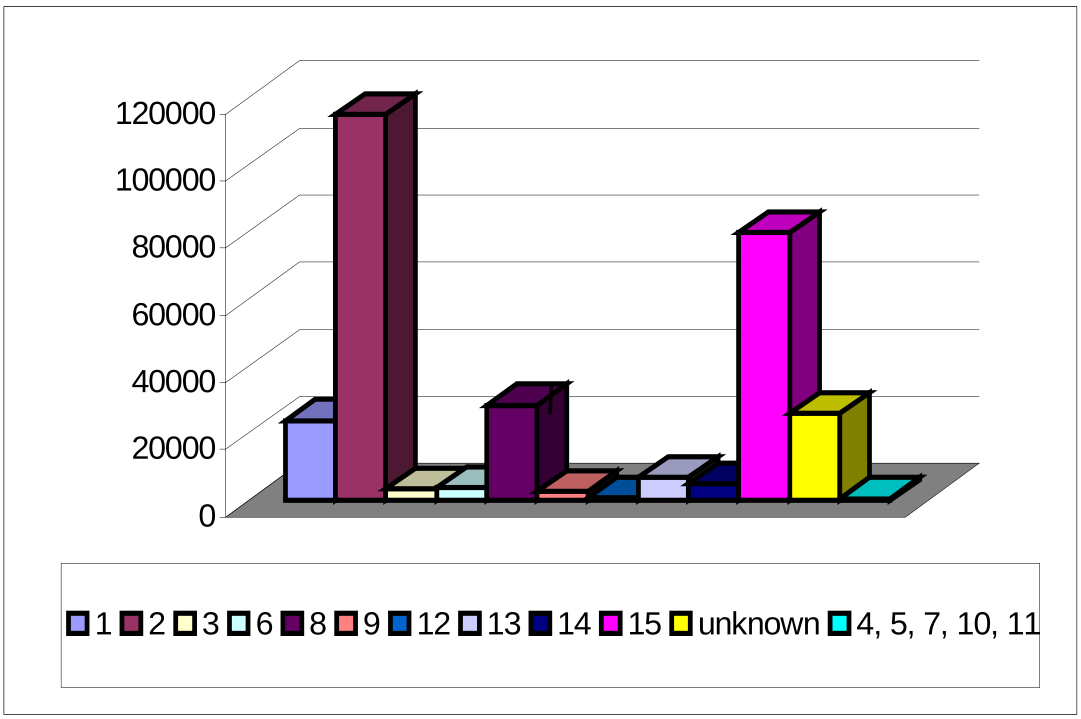


Legend Key

1	Intersection/Corner	6	Shifted load (other)	11	Improper dismount
2	Speed	7	Forks too low	12	Body part outside cage
3	Maintenance (performing)	8	PIT moved after dismount	13	No Maintenance/Inspection failure
4	Shifted load (corner)	9	Uneven surface	14	Hit object (obscured vision)
5	Housekeeping	10	Improper PIT used	15	Repetitive bouncing

Graph 4 – Possible Causes of PIT-related Accidents

The cost of the accidents associated with each possible root cause was also tabulated. However, in contrast to Graph 4, the costs of the accidents were not entered twice in cases where more than one risk factor could be identified. Rather, the costs of the accident were assigned to the risk factor that appeared to have contributed most to the accident. Risk factors that presented total accidents costs less than $500.00 were combined on Graph 5.



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2	Speed	7	Forks too low	12	Body part outside cage
3	Maintenance (performing)	8	PIT moved after dismount	13	No Maintenance/Inspection failure
4	Shifted load (corner)	9	Uneven surface	14	Hit object (obscured vision)
5	Housekeeping	10	Improper PIT used	15	Repetitive bouncing

Graph 5 – Cost of Accident by Risk Factor

Risk Factor	Number of Accidents	Cost of Accidents	Average Cost of Claim	Percent of Total Cost
1	10	23,984.82	2,398.48	6.9
2	19	134,950.34	7,702.65	38.8
3	1	34,433.65	34,433.65	9.9
6	7	3,866.77	552.40	1.1
8	9	28,438.38	3,159.81	8.2
9	3	2,739.28	913.09	.8
12	6	850.09	141.68	.2
13	3	6,963.91	2,321.30	2
14	11	4,994.39	454.04	1.4
15	9	79,868.03	8,874.23	23
4,5,7,10,11	8	882.64	110.33	.3
Unknown	6	25,994.12	4,332.35	7.5

Table 7 –Number of and Costs of Accidents by Risk Factor

The risk factor of speed was found to be a significant factor in both a high number of accidents and in high cost accidents. In addition, it remains possible that speed contributed to the severity of other accidents and/or resulted in the operators' inability to avoid the hazard that led to the loss. For example, several accident reports listed uneven surface as the cause of the accidents. It is possible that these accidents could have been avoided or less severe if lower traveling speeds were observed. It should be noted that Company X does not post or enforce PIT speed limit in their facility.

Summary

The number of PIT-related accidents and the high costs associated with them indicates that uncontrolled risk factors are present at Company X. The data indicates that operator, equipment, and workplace characteristics have contributed to the $347,966.42 in identified medical and indemnity losses incurred from January 1996 through September 1999. Operator factors suggest that PIT operators under 25 years old and/or with less than 5 years of employment at Company X are most likely to be involved in a PIT accident. In addition, the data indicates that the accidents these employees are involved in will have a higher cost than those involving their older and/or more experienced coworkers. High speed of operation was found to be a risk factor present in accidents that led to 38.8% of the losses, totaling $134,950.34. The lack of a PIT maintenance/inspection program may have led to the losses the occurred in these areas. The contributing workplace factors were varied, ranging from housekeeping issues to uneven surfaces. The lack of thorough accident reporting and investigation makes it difficult to address these issues.

CHAPTER FIVE

Conclusions and Recommendations

Introduction

The objectives of this study were to:

1. Determine the total dollar losses of powered industrial truck injuries at Company X from January 1996 through September 1999.
2. Identify variables that may be contributing to the incidence of powered industrial truck-related injuries and establish root causes through analysis of accident reports.
3. Ensure that any resulting recommendations are in compliance with regulatory requirements for powered industrial trucks under 29 CFR 1910.178.

Conclusions

The study determined costs associated with PIT-related injuries at Company X. Losses incurred from medical and indemnity payments totaled $347,966.42 from 77 identified PIT-related accidents. As indicated earlier, these costs are not all inclusive due to possible omission of claims and non-inclusion of indirect costs such as property damage losses.

Possible contributing variables for these claims were identified. These variables included operator factors, equipment factors and workplace factors. Operator age and years of employment indicated that younger and/or less experienced operators were more likely to be in PIT-related accidents and that these accidents were more likely to be severe. The lack of a PIT inspection and maintenance policy at Company X may have allowed uncontrolled risk factors relating to equipment to remain. Finally, a variety of workplace factors appear to have contributed to the PIT-related losses at Company X. Again, the lack of a thorough accident reporting and investigation policy may have allowed these issues to remain uncontrolled.

Recommendations

In order to reduce the losses associated with PITs at Company X, the following measures are recommended:

Written PIT policy/program. It is recommended that Company X develop a written policy/program regarding PITs. Development of a written PIT policy/program is an important first step toward controlling the losses associated with PITs. An effective written program will identify objectives, goals, determine requirements, assign responsibilities, and provide means for continuous program improvement. By establishing internal standards, Company X can begin to move toward controlling the risk factors related to PIT operation in their facility.

PIT operators at Company X were not required to wear seat belts in the past. During loss tab analysis and review of accident reports, it was estimated that eight injuries and nearly $30,000 in losses could have been avoided or made less severe if the operators of the PITs had been wearing seat belts. In addition, while it is not specifically stated in the standard it should be noted that OSHA has cited employers for failing to require PIT operators to wear seat belts. Therefore, it is recommended that Company X adopt a policy in their written program that requires all PIT operators to use seatbelts, if the equipment can be fitted with one.

Comprehensive initial and ongoing training program for new and existing employees. The higher incidence and severity of PIT accidents involving young and inexperienced PIT operators indicates a need for enhanced training. It is recommended that Company X develop a more comprehensive PIT training program and expand that program to include all types of PIT equipment. Currently, only sit-down counterbalanced forktruck operators receive formal training. All employees must interface with PITs as pedestrians and nearly all employees are required to use powered pallet jacks as part of their job functions. Therefore, it is recommended that pedestrian and powered pallet jack training is included in new hire orientation classes.

OHSA's Powered Industrial Truck Standard (29 CFR 1910.179) provides an excellent framework to address general operator, equipment and workplace hazards. While the OSHA standard is recommended to provide a framework for training content, it is necessary to include specific information about risk factors present at Company X. While a formal hazard assessment is recommended and will be discussed later, training PIT operators in hazard recognition will provide these individuals with the tools they need to identify and correct/avoid hazards themselves.

As mandated by OSHA, authorized PIT operators must be formally evaluated after initial training and at least every three years after that. Re-training is required in areas in which they are not exhibiting safe behaviors. Retraining must also be done following observance of an unsafe act and following an accident or near hit situation. This procedure will ensure that training is effective and that safe behaviors continue throughout the worker's employment.

<u>Hazard assessment.</u> As previously stated, a formal hazard assessment is recommended to identify and correct hazardous workplace conditions such as explosive atmospheres, blind intersections and uneven surfaces. Information about these areas should be included in PIT operator training.

In order to establish continued proactive controls, it is further recommended that PIT hazards should be included as a required inspection in each Cost Center's bi-weekly inspection report.

PIT information systems. According to Meczes (1996), several types of vehicle-oriented information systems are available for PITs. Lansing Linde had developed an instrument called the Data Logger which provides vital information for both the operator and management. The operator is provided with information on the condition of the PIT such as brake fluid levels and battery charge. Information of the load to be carried is also available to the operator. The Data Logger system can alert the operator if the load being lifted is too heavy for the equipment being used and if the load is not properly balanced (Meczes, 1996).

Meczes (1996) points out several ways that a management team can use information compiled by systems like the Data Logger. First, the Data Logger requires a personal identification number (PIN) to be entered before it will start. This reduces the chance that unauthorized and untrained employees will be using the equipment. This feature also allows the management to compile information on lift and travel periods. This information is logged over an extended period of time, allowing management to study driving habits of individuals, job classes and age groups on a daily, weekly or monthly basis (Meczes,1996).

The information provided by this system could be especially useful for Company X in dealing with speed issues. Excessive operation speed was found to have contributed to nearly $135,000 in losses during the study period and thus indicates this is an area that requires attention. As previously stated, Company X uses just-in-time manufacturing techniques and provides production incentives to their employees. This makes it more difficult to address the risk factor of speed. If control measures such as speed limits or governors were implemented, it is reasonable to predict that the entire production incentive structure would have to be changed. Information gathered through the Data Logger would assist the Time Study and Safety Departments in establishing safe speed limits that work with the production systems in place at Company X.

The vehicle orientated information systems described above cost approximately $2,000 each. With the number of PITs at Company X, the investment would be considerable. However, the use of this equipment would serve as an excellent tool in controlling the losses associated with injuries from PIT equipment. It is also important to note that this equipment would improve preventative maintenance measures and enhance the operators' sense of responsibility. In addition, the units have scanning devices that can be altered for use in inventory control.

Supervisor training on proper completion of accident report and accident investigation. While identified as a deficiency in PIT accident reports, supervisor training in this area will have benefits in all types of accidents. Supervisor training will result in more complete and accurate information being gathered at the scene of a PIT-related accident. In addition, a thorough investigation will increase the likelihood that true root causes are identified. Proactive measures can then be implemented to address the hazards present and prevent future accidents.

Following supervisor training, it is recommended that for the first few months of the program the Safety Department be notified immediately in the event of a PIT accident to facilitate investigation, documentation and installation of preventative actions. Meczes (1996) described an instrument that would be useful in this application also. Systems like the previously mentioned Data Logger have options that can also assist in accident investigation. A company called Atlet has introduced a device that is attached to the PIT. This unit senses when an impact has occurred between the PIT and another object. Information is then logged into the computer, such as the operator PIN, speed of PIT at time of collision and wheel direction. This information can be useful in reconstructing the events of a collision, as well as identifying collisions that may have gone unreported (Meczes,1996).

Reporting guidelines for Company X's insurance company. It is recommended that Company X’s insurance company be provided with the necessary information to facilitate loss tab analysis. As identified during the course of this research project, the insurance company is inconsistent in their use of key words used to describe accident causes. As previously stated in Chapter 4, the agency description for one PIT-related accident was entered by the insurance company as glass. While glass caused the laceration to the employees arm, this descriptor fails to identify that the employee was struck by a PIT carrying glass. Consequently, loss tab analysis could not fully identify losses resulting for a particular hazard, such as PIT operation. It is necessary to provide the insurance company with two pieces of information to eliminate this problem. First, the insurance company must be provided with the necessary information from accident reports to assist them in identifying the root causes of the injuries. Second, the insurance company should be provided with some guidelines to assist them in determining which key words should be entered into the database to describe an accident. By providing this information, loss tab analysis can become a more effective means of identifying uncontrolled risk factors present at Company X.

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