

POWERED INDUSTRIAL TRUCK TRAINING

by

James Steinmeyer

A Research Paper

Submitted in Partial Fulfillment of the  
Requirements for the  
Master of Science Degree in  
Training and Development

Approved for Completion of 4 Semester Credits  
198-750 Field Problem in Training and Development

---

Dr. Joseph A. Benkowski  
Research Advisor

The Graduate College  
University of Wisconsin-Stout  
May, 2002

**The Graduate College**  
**University of Wisconsin-Stout**  
**Menomonie, WI 54751**

**ABSTRACT**

(Writer)	Steinmeyer (Last Name)	James (First)		
(Title)	Powered Industrial Truck Training			
Training and Development (Graduate Major)	Dr. Joseph A. Benkowski (Research Advisor)	May, 2002 (Month/Year)	71 (No. of Pages)	
	American Psychological Association (Name of Style Manual Used in this Study)			

For many years forklifts have been used widely in industry. Unfortunately in some cases, proper training has not been given to operators. Each year forklifts are involved in accidents resulting in serious injuries or death. The need for safe operations training cannot be overemphasized.

The company used for this research is Federal-Mogul Corporation, located in LaGrange, Georgia. Federal-Mogul produces Powertrain Systems, such as pistons and rings for engines. Federal-Mogul has 200 employees. Approximately 50-60 of the 200 employees operate forklifts. Forklifts are used to move baskets of pistons and pallets of raw materials throughout the facility.

Federal-Mogul has never had formalized training on powered industrial trucks. The purpose of this research is to develop a training class for forklift operations.

#### Significance of the Study

The significance of the study is to develop training for forklift operators at Federal-Mogul. Forklifts are used in many industries today, and with more and more operators not having appropriate training, the potential for serious injury is high. Federal-Mogul has never had formalized forklift training. Developing the training class, conducting the training, and getting feedback from the participants through training evaluations, is what this research intends to accomplish.

## Table of Contents

<b>Chapter 1: Introduction</b>	1
Statement of the Problem	2
Significance of the Study	3
Assumptions	3
Limitations	3
Methodology	3
<b>Chapter 2: Literature review</b>	5
OSHA Standard	5
History of OSHA	5
History of Powered Industrial Trucks	6
OSHA Regulations	8
Operator Training	8
Truck Operations	10
Traveling	10
Loading	11
Mechanical Operation of the Truck	11
Basics of Forklift Safety	11
Key Points	11
Operator Guidelines	12
Personal Protective Equipment	13
Changes in the OSHA Standard and How to Comply	14

<b>Chapter 3: Methodology</b>	20
Overview of Federal-Mogul	20
How to Develop Forklift Training	20
Core Knowledge	21
Training Implementation	22
Developing Evaluation	22
Developing Likert Scale	23
How to Administer the Scale	23
Meeting OSHA Requirements for Forklift Training	24
Overview of 29CFR 1910.178(l)	24
Code of Federal Regulations Training Requirements	25
<b>Chapter 4: Results</b>	29
Program Evaluations	34
Evaluation Responses	35
Results from Questions on the Evaluation	37
<b>Chapter 5: Conclusions and Recommendations</b>	39
Summary	39
Conclusions	42
Recommendations	46
<b>References</b>	48
<b>Appendix A: Participant Manual</b>	50
<b>Appendix B: Evaluation</b>	65

## Chapter 1

### Introduction

For many years forklifts have been used widely in industry. Unfortunately in some cases, proper training has not been given to operators. Each year forklifts are involved in accidents resulting in death. Many more accidents occur causing injury, and company losses in damaged products and equipment.

The need for safe operations training cannot be overemphasized. Every authorized operator must be constantly aware of the need for 100% safe operations. Anything less could result in a tragic accident.

The forklift is commonly referred to as a powered industrial truck, and lift truck. Those terms will be used synonymously throughout this research paper.

Driving can become complacent, it is second nature. Our cars are designed to travel fast and stop quickly, and that is the way many people drive them. The first important thing to realize with powered industrial trucks is that they are not cars. The weight of the truck and the weight of the load being carried, propel the momentum of the truck. This makes stopping and turning, even at low speeds, potentially hazardous.  
(Daniels, 1999)

On December 1, 1999, the Occupational Safety and Health Administration (OSHA) released the new version of 1910.178, the regulations regarding the training of powered industrial truck operators. The regulations are now in effect. (Hinkelman, 1999)

Training is an ongoing process that should continue after the classroom and hands-on demonstration. Forklift operators must demonstrate that they can safely operate

in the specified environment, with particular loads, and with the designated truck, for the facility they work in. OSHA says the evaluation of this process can be delegated to outside organizations, but the responsibility should be with the operator's supervisor, who sees the operator at work everyday. If a supervisor chooses to delegate the evaluation responsibility, they must conduct the training in the environment the operator will be working, to master the challenges of the loads the operator's facility can pose. (Hinkelman, 1999)

Last year (1998) over 100 fatalities and approximately 95,000 injuries occurred due to unsafe operations of fork trucks. This has prompted the Occupational Safety and Health Administration (OSHA), to revise its training requirements regarding powered truck operations. OSHA estimates 11 deaths and 9,500 injuries can be prevented each year through compliance with the new standard. (The new OSHA standard will be discussed in more detail in the literature review). This will save employers \$135 million annually. (Daniels, 1999)

Statistics like these make it clear that training is not only invaluable regarding safety in the workplace, but creates a better work environment and is also good business. (Daniels, 1999)

#### Statement of the Problem

The company used for this research is Federal-Mogul Corporation, located in LaGrange, Georgia. Federal-Mogul produces powertrain systems, such as pistons and rings for engines. Federal-Mogul has 200 employees. Approximately 50-60 of the 200 employees operate forklifts. Forklifts are used to move baskets of pistons and pallets of raw materials throughout the facility.

Federal-Mogul has never had formalized training on powered industrial trucks. The purpose of this research is to develop a training class for forklift operations.

### Significance of the Study

The significance of the study is to develop training for forklift operators at Federal-Mogul. Forklifts are used in many industries today, and with more and more operators not having appropriate training, the potential for serious injury is high. Federal-Mogul has never had formalized forklift training. Developing the training class is what this research intends to accomplish.

### Assumptions

It is the assumption of the researcher that Federal-Mogul does not have a powered industrial truck training program. It is also an assumption that the workforce is primarily made up of inexperienced forklift operators. Another assumption is that Federal-Mogul has a definite need for forklift training.

### Limitations

The limitations of the study will be within the confines of one particular organization and the participation of existing powered industrial truck operators.

### Methodology

As stated earlier, the purpose of this project is to develop a powered industrial truck training program. In order to acquire this specific information, the researcher will research:

- How to develop training programs.
- How training is applied or implemented.
- How to develop evaluations.

- How to meet OSHA requirements for fork trucks.

The training program will be completed. The training program will consist of a training manual, an instructor manual, visual aids, such as overhead transparencies, and training program evaluations. The evaluations will be developed with a Likert scale. Upon completion of the training program, with present forklift operators, the evaluations will be tabulated.

## Chapter 2

### Literature Review

The literature review will explore OSHA regulations governing forklift operations, historical background of OSHA forklift regulations, and forklift training in general, basics of forklift safety, changes in the OSHA regulations standard/how to comply with the new standards, and this chapter will answer the questions regarding why forklift training is required and necessary.

### OSHA Standard

The OSHA standard for powered industrial trucks is standard number: 1910.178. The standard covers: general requirements, designations, converted industrial trucks, safety guards, fuel handling and storage, changing and charging batteries, lighting for operation areas, control of noxious gases and fumes, loading trucks and railroad cars, operator training, truck operations, traveling, general loading, and maintenance of trucks. (OSHA Standard 1910.178)

The standard listed above is the latest revision. The standard will be discussed in more detail later.

### History of OSHA

The Occupational Safety and Health Administration (OSHA) was created in the Department of Labor on April 28, 1971. That was the date the Williams-Steiger Occupational Safety and Health Act became effective. Each year new standards are developed and existing standards are revised. However, the original OSH Act still is in effect with few if any changes. (Becker, 1992)

Under the OSH Act, OSHA was created to:

- Encourage employers and employees to reduce workplace hazards and to implement new or improved existing safety and health programs.
- Provide for research in occupational safety and health to develop innovative ways of dealing with occupational safety and health problems.
- Establish “separate but dependant responsibilities and rights” for employers and employees for the achievement of better safety and health conditions.
- Maintain a reporting and record keeping system to monitor job-related injuries and illnesses.
- Establish training programs to increase the number and competence of occupational safety and health personnel.
- Develop mandatory job safety and health standards and enforce them effectively.
- Provide for the development, analysis, evaluation and approval of state occupational safety and health programs.

While OSHA continually reviews and redefines specific standards and practices, its basic purposes remain constant. (Becker, 1992)

#### History of Powered Industrial Trucks

In 1917 World War I brought automobile production to a halt. The war department needed a specially designed electric truck to handle and stack large artillery shells and bombs. Baker R&L produced a design with a power hoist, the world’s first lift truck, and an entire new industry was born. (Linde, 1999)

Baker R&L continued its leadership role in the evolving material handling industry, and by the 1930s, when it changed its name to the Baker Raulang Company, the

name was synonymous with the best powered industrial trucks in the world. (Linde, 1999)

The powered industrial trucks evolved as follows:

- 1917 – The beginning of the industrial truck industry, which started with only electric industrial trucks.
- 1930 – The first lift trucks with a seat.
- 1936 – The development of the first trucks with “wobble tail” action. Wobble tail is a forklift that is separated in the middle to allow the rear of the truck to swing around.
- 1937 - The beginning of gasoline-powered industrial trucks.
- 1952 – The Gas-O-Matic forklift. The Gas-O-Matic is the first gasoline-powered, electric motor-driven fork truck without a clutch or transmission.
- 1974 – The introduction of the General Electric EV-1, a system featuring low current draw.
- 1977 – The first 3 wheel electric and the first hydrostatic drive, diesel-powered trucks.
- 1983 – Introduction of the first walk behind powered pallet trucks.
- 1989 – The first powered trucks with 9000-lb capacity hydrostatic drive, pneumatic tire models.
- 1995 – Introduction of the first trucks with capacity up to 35,000 lbs.

This time line shows the significant accomplishments and introductions to the powered industrial truck industry. The time line does not include insignificant introductions. (Linde, 1999)

## OSHA Regulations

The following information comes from the OSHA standard, 1910.178. The intent of this portion of the research is to answer the question, what are OSHA's expectations for forklift training and operations. To answer this the researcher will look at sections of the OSHA standard, 1910.178, including:

- Operator Training, Section (l)
- Truck Operations, Section (m)
- Traveling, Section (n)
- Loading, Section (o)
- Mechanical Operation of the Truck, Section (p)

### Operator Training

The employer shall ensure that each operator is competent to operate a forklift. This is demonstrated by the successful completion of the training program. Prior to permitting an employee to operate a fork truck, the employer shall ensure that each operator has successfully completed the training.

When implementing training programs, trainees may operate only:

- Under the direct supervision of persons who have the knowledge, training, and experience to train operators and evaluate their competence.
- In an area where such operations do not endanger the trainee or other employees.

Training should consist of a combination of formal instruction (e.g., lecture, discussion, video tape, written material), practical training (demonstration performed by trainer and practical exercise performed by the trainee), and evaluation of the operator's performance in the workplace.

Forklift training shall include the following:

- Truck related features
- Operating instructions, warnings, and precautions
- Differences between forklifts and automobiles
- Truck controls and instrumentation
- Engine or motor operation
- Steering and maneuvering
- Visibility
- Fork and attachment adaptation and operations
- Vehicle capacity
- Vehicle stability and the three point stance
- Vehicle inspection and maintenance required
- Refueling and/or charging of batteries
- Surface conditions where forklift will be operated
- Load manipulation, stacking, and unstacking
- Pedestrian traffic in areas of operation

Another issue that should be discussed with trainees is ventilation. Closed environments and other areas with insufficient ventilation, or poor vehicle maintenance can cause a buildup of carbon monoxide.

Refresher training, including an evaluation of the effectiveness of that training, shall be conducted to ensure that the operator has the knowledge and skills needed to operate the powered industrial truck safely.

The refresher training should be provided when the operator has been observed operating in an unsafe manner, or been involved in an accident or near-miss incident. Refresher training shall also be provided if the operator is assigned to a different type of lift truck.

Refresher training shall be provided for all operators at least once every three years.

### Truck Operations

OSHA specifies certain operation guidelines for forklift operators and pedestrians in the area. The following is a summary of the guidelines. No person shall be allowed to stand or walk under an elevated load. No riders are allowed on a powered industrial truck. When a powered industrial truck is left unattended, the forks must be lowered to the ground, power shall be shut down and brakes set.

A safe distance shall be maintained from the edge of ramps or platforms. Brakes on trucks being loaded shall be set and wheels must be blocked. An overhead guard must be used to protect against falling objects.

### Traveling

This section will cover traveling with the forklift. All traffic regulations shall be observed. The driver shall be required to slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the operator shall travel in reverse. Railroad tracks shall be crossed diagonally, and parking closer than 8 feet from tracks is prohibited.

When traveling with a load on an incline always keep the load facing up the incline. While negotiating turns, speed shall be reduced to a safe level.

## Loading

This section of the guideline covers proper loading. Only stable or safely arranged loads shall be handled. Only loads within the rated capacity of the truck shall be handled.

A load engaging means shall be placed under the load as far as possible. The mast shall be carefully tilted backwards. Extreme care shall be used when tilting the load forward or backward. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

## Mechanical Operation of the Truck

If at any time a truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition.

Fuel tanks shall not be filled while engine is running. Spillage of oil or gas shall be carefully washed away or completely evaporated before restarting the engine.

## Basics of Forklift Safety

The next section will discuss the basics of forklift safety. This section will cover key points on forklifts, operator guidelines, and personal protective equipment.

## Key Points

Forklifts can travel between 5-10 miles per hour. Forklifts weigh three to four times as much as an automobile. Lift trucks can easily inflict damage to the workplace and/or bodily harm to workers. Many workers falsely assume forklifts and cars operate the same way. Both vehicles have a steering wheel and tires, but this is where the similarity ends. (Swartz, 2000)

Forklifts have a narrow wheelbase and a much higher center of gravity. Forklifts operate on a teeter-totter principle. A counterweight on the rear of the truck helps balance the load on the forks. When a lift truck is empty, there is a significant weight imbalance—an empty forklift is much more unsafe. A forklift carries its load outside of its supporting base. Forklifts have only three points of suspension. (Swartz, 2000)

### Operator Guidelines

Knowledge of the workplace and safe operations rules are essential for safeguarding operators. Safety can be compromised by hazards in the work environment. The following guidelines help prevent injuries:

- Inspect the equipment prior to the start of each shift. Use a detailed checklist to document the inspection. Identify the items that need correction.
- Wear a seat belt on a sit-down lift.
- Operators must know the plant safety rules and the guidelines in the operator's manual.
- Operator surfaces should be smooth and free of holes, bumps, ruts or any other debris that could restrict safe operations.
- Paths of travel should be free of oil, grease, sand, ice, water or any other element that could affect turning, traveling, starting or stopping.
- Travel up or down a grade slowly, and never turn on a ramp or grade.
- Travel at a speed that allows the operator to have full control of the truck. Always bring the truck to a stop in a safe manner. Operators must stop without damaging or spilling the load being handled.

- Reduce speed when making turns. Keep loads as low as possible and anticipate obstructions or pedestrians when turning through a blind corner.
- Keep a good distance between you and other operators in front of you.
- Operate in reverse when load obstructs your vision.
- Overloading a truck can affect the steering.
- At docks, inspect the trailer before entering and chock the wheels.
- Follow plant traffic regulations such as speed limits, right of way, and use of horns.
- Use flashing light on forklifts as well as back-up alarms.
- Follow manufacturer guidelines for charging and recharging batteries as well as rules regarding safe fueling.
- No one is allowed to walk under an elevated load.
- No one other than the operator is allowed on the forklift.

#### Personal Protective Equipment

Eye protection protects the sight of the operator from sparks, dust, and airborne particles. Loads being raised can strike lights, dusty racks and loose product that could fall. (Swartz, 2000)

Steel toe boots are effective for operators when they are manually handling product. In addition, one's foot could be caught in a pinch point between the tire and the floor. (Swartz, 2000)

Hard hats prevent injuries to forklift operators, either on or off their forklift. Loads being lifted stand a chance of falling and the load could hit the forklift operator as he gets off the forklift. Smaller items may fall through the overhead guard and to the operator's head. (Swartz, 2000)

## Changes in the OSHA Standard and How to Comply

This section will discuss the new OSHA training standard. A series of articles have been written regarding the new standard. These articles will be reviewed. The Powered Industrial Truck Operator Training standard will be referred to as PITOT to simplify it.

The original 1910.178 standard was pretty vague: “Only trained and authorized operators shall be permitted to operate a powered industrial truck. Methods shall be devised to train operators in the safe operation of powered industrial trucks.” There are big loopholes in the old standard. (Knill, 1999)

The new standard, PITOT, mandates three specific things:

- Operators must be trained on the type of truck they operate on the job. An operator gets trained on all the types of forklifts they operate.
- Operators must be trained in the environment in which they work.
- Operators shall be evaluated and certified in both functions by a qualified person.

Training has to be conducted on the truck itself. PITOT calls for:

- Operating instructions, warnings and precautions for the types of truck the operator will be authorized to operate.
- Controls and instrumentation, where they are located, what they do, and how they work.
- Engine or motor operation.
- Steering and maneuvering.
- Visibility, including restrictions due to loading.
- Fork and attachment operation, and use limitations.

- Vehicle capacity.
- Vehicle stability.
- Vehicle inspection.
- Refueling and/or charging and recharging batteries.
- Operating limitations

Any other operating instructions, warnings or precautions listed in the operator's manual should be covered in the training. (Knill, 1999)

PITOT lists a number of subjects related to the workplace that should be included in the training. They are:

- Surface conditions where the vehicle will be operated.
- Composition of loads to be carried and load stability.
- Load manipulation, stacking and unstacking.
- Pedestrian traffic.
- Narrow aisles and other restricted places.
- Hazardous locations.
- Ramps and other sloped surfaces that could affect the forklift's stability.
- Closed environments and areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.
- Other unique or potentially hazardous environmental conditions that could affect safe operations.

The topics mentioned are only starters. A person familiar with the company's policies and with the work environment will have to add content. (Knill, 1999)

According to Daniels (1999), OSHA requires that trainees have a complete grasp of the way their trucks handle and operate. OSHA is raising operator training. Under the new revised regulations (PITOT), OSHA has focused on employers providing comprehensive training programs for their operators. (Daniels, 1999)

The new directive takes a hard line on videotapes. The instruction cannot be limited to videotapes. OSHA requires a combination of formal instruction and practical training. Formal training is valuable for teaching the principles of forklift operation, but it is the hands-on training and evaluation that proves the adequacy of the training and the ability to use the training successfully. (Knill, 2000)

This new standard is necessary to reduce the number of workplace accidents and incidents. All material handling equipment, powered pallet jacks, conveyors and lift trucks

Are capable of killing and maiming people if misapplied or used carelessly. (Knill, 1999)

PITOT takes up 36 pages in the Federal Registry. It is a performance standard, which means an individual has to achieve certain results. The methodology isn't always spelled out for you. (Knill, 1999)

The original version of 29 CFR 1910 *Powered Industrial Truck Operator Training* stated that its effective date would be March 1, 1999. The problem with that schedule is that it left a gap between March and December of 1999. If OSHA promulgated a new version of 1910.178 in March, the existing version would have been supplanted and industry would temporarily be without an operator training regulation. Even though the original version was too general, OSHA needed something to hang on to, so the effective date was moved to December 1, 1999. (Knill, 1999)

This next section will discuss who can conduct the forklift training and evaluation. According to PITOT, all operator training shall be conducted by persons who have the knowledge, training and experience to train powered industrial truck operators and evaluate their competence. The trainer and the evaluator need not be the same person. The company may hire an outside training provider but the company must administer the training. The employer has ultimate responsibility for training and evaluation. The employer's training team must spell out the responsibilities for the trainers. (Knill, 1999)

There's more to training than just knowing how to make a lift truck travel, steer and lift. The trainer can't just show the controls, the trainer has to train the operator. Show them how to use the controls. Most training can be straightforward but because of some characteristic like size, shape, storage location, or some other factor, a different kind of training is required. It's not just operating the truck; it's operating the truck to handle your specific product safely in the operator's regular workplace. (Knill, 1999)

One of the difficult tasks is identifying the training needs. The results of conducting a detailed analysis of a facility, and making recommendations, or changing an unsafe process within the facility, are an important part of the training. Safe operation is the key element in implementing PITOT. An operator can't be operating safely in an unsafe area. The training team has to look beyond the operator/truck interface to build a training program that complies with all the provisions of PITOT. (Knill, 1999)

The training and evaluation is not a one-time thing. PITOT says evaluation of each operator shall be conducted at least once every three years. The employer shall conduct refresher training when it seems to be required, such as when:

- The operator has been involved in an accident or a near miss.

- A different type of truck has been assigned to the operator.
- The work area has been changed.
- The operator has been assigned to a different work area.
- The operator has had a poor evaluation or has been observed violating the safety rules.

The operator does not need to go through the whole training program, just a refresher.

The purpose of PITOT is to make sure that every operator is trained and evaluated in every designated aspect: theory and practice of operation, and integration with the work environment. PITOT calls for refresher training in relevant topics. (Knill, 1999)

The focal point of the legal disputes arising from forklift accidents will become whether the employer has properly trained the operator. Employers benefited from the fact that the old regulation was vague and difficult to define. With PITOT the standard is no longer vague and amorphous. (Knill, 1999)

Training must be completed to avoid OSHA violations. OSHA guidelines say that a \$7,000 penalty will be assessed for each serious violation; willful or repeat violations will be assessed a penalty up to \$70,000 per violation, but not less than \$5,000 for each willful violation. Failure to exercise good faith to correct a violation within the abatement period will result in a fine up to \$7,000 a day until abatement is accomplished. (Knill, 1999)

Compliance with PITOT can be expensive. It depends on what kind of training you have in place already and what training components you have to add. One could look at the cost savings for justification, but more importantly the saved lives and reduction of injuries. PITOT should reduce the costs of workers' compensation costs and total injury

costs including the cost of training replacement operators. Damage to equipment and product should be reduced. (Knill, 1999)

Lawsuits involving lift truck accidents have cost beyond attorneys' fees and settlements. There is the suffering of the injured, which could dampen morale. There is time lost in investigating the accident and building a defense. Employees are pulled away from their jobs to discuss the accident with attorneys and OSHA investigators, and there are many more costs. Forklift training and compliance with the OSHA regulations gives one the opportunity to eliminate forklift accidents, their repercussions, and improve the safety in the entire facility.

## Chapter 3

### Methodology

The purpose of this project is to develop a powered industrial truck training program. In order to acquire this specific information, the researcher will discuss:

- How to develop forklift training program.
- How training is applied or implemented.
- How to develop evaluations.
- How to meet OSHA requirements for fork trucks.

The training program will be completed. Upon completion of the training program with present forklift operators, the evaluations will be tabulated.

### Overview of Federal-Mogul

The company used for research project is Federal-Mogul. Federal-Mogul is located in LaGrange, Georgia. There are 170 facilities in 55 different countries. Federal-Mogul headquarters are in Southfield, Michigan. Federal-Mogul employs 55,000 people. The LaGrange facility has never had formalized forklift training. There are approximately 200 employees in LaGrange, 50-60 operate forklifts. Forklifts are operated in three main functional areas, shipping and receiving, material handling, and foundry operators. Each of the areas mentioned has unique safety concerns. The training will address these concerns.

### How to Develop Forklift Training

The first thing to complete is an evaluation of the operations at Federal-Mogul. This will show the site-specific information that needs to be included in the training. The key to a successful training program is knowing the potential problems one faces in order

to overcome them. After analyzing the operations, research should be completed for compliance and then develop a training program. The training program will consist of a training manual (appendix A), an instructor manual, visual aids such as overhead slides, evaluation of an operator competence checksheet, and training program evaluations (appendix B). The evaluations will be developed with a Likert scale. Specific information in the training program should include complete review of how forklifts work, vehicle inspection, capacity and stability, steering and maneuvering, load handling and safe operations. (Koenig, 1999, Shephard, 2000)

### Core Knowledge

Training materials should review the different types of powered industrial trucks (PIT), including electric and combustion. The training materials should also include techniques for positioning, proper stacking, raising and tilting of cargo. Materials should provide instructions on daily safety checks. Guidelines for loading, unloading, parking, docking and traveling up or down ramps should be included. Information on traveling forward and reverse should be included. (Koenig, 1999)

Knowledge of fundamental PIT physics is needed in training materials. An operator who understands what makes a PIT tip over is more likely to respect the vehicle's limits. Training materials should present materials in a manner that is easy to comprehend and remember. For example, operators must know first that a PIT's appearance is deceiving. Though smaller than a car, a PIT with a 5,000 pound capacity weighs 9,000 pounds. If one includes the 5,000 pound load, the weight approximates 14,000 pounds and can be as heavy as six cars. The center of gravity and the combined

center of gravity (truck and load) needs to be understood as well as the three point stance of a PIT. (Koenig, 1999)

### Training Implementation

A group of twenty individuals will be selected for the training program. These individuals will be chosen from the operators at Federal-Mogul that have not had formalized PIT training previously. The group will first be presented the classroom portion of the training. This will consist of the trainer covering the information in the written operator's training manual (appendix A). To aid the classroom portion, the trainer will use visual aids in the form of overhead transparencies, and videotape on safe operations of a PIT. The trainer will allow ample time for questions throughout the program. The classroom portion will last approximately two hours. After the classroom portion is complete, individuals will move on to the practical, hands-on portion of the program. The trainer will show the truck controls and instrumentation: where they are located, what they do and how they work. The trainer will then demonstrate the use of controls and he/she will demonstrate the activities that the trainees will be required to complete. The instructor will evaluate each individual on the activities they are asked to demonstrate. The instructor will complete a checklist of the activities that each trainee demonstrates. Each activity completed successfully will be marked complete on the checklist. Three different checklists will be used for evaluation, depending on which area the individual will be operating the PIT.

### Developing Evaluation

After the training program and practical training and evaluation are complete, each participant will complete a course evaluation (appendix B).

Thurstone, Guttman, and Likert scaling are all unidimensional scaling methods. For this research project, the Likert scale method will be used for evaluations.

### Developing Likert Scale

As in any scaling methods, the first step is to define what it is you are trying to measure. The measurement for this research project is how successful the powered industrial truck training program was. Next, one has to generate the set of potential scale items. These should be items that can be rated on a 1-to-5 or 1-to-7 disagree-agree response scale. (Trochim, 2001)

### How to Administer the Scale

Each respondent is asked to rate each item on a Likert response scale. For instance, they will rate each item on a 1-to-5 response scale where:

1. = strongly disagree
2. = disagree
3. = neutral
4. = agree
5. = strongly agree

There are a variety of response scales, 1-to-7, 1-to-9, and 0-to-4, all of which are odd numbered scales. Odd numbered scales all have a middle value, which is labeled neutral or undecided. It is also possible to use a forced-choice response scale with an even number of responses and no middle neutral or undecided choice. In this situation the respondent is forced to decide whether they lean more towards the agree or disagree end of the scale for each item. The researcher will use a 1-to-5 scale for this project. (Trochim, 2001)

The final score for the respondent on the scale is the sum of their ratings for all of the items (this is why this is sometimes called a summated scale). On some scales you will have items that are reversed in meaning from the overall direction of the scale. These are called reversal items. One would have to reverse the response value for each of these items before summing the total. That is if the respondent gave a 1, it is made into a 5. The Likert scale used for this project can be reviewed in appendix A. (Trochim, 2001)

### Meeting OSHA Requirements for Forklift Training

In order to meet the OSHA requirements for powered industrial truck training, the researcher will review the Code of Federal Regulations, 29CFR, Part 1910.

Part 1910.178(l), 1-8, discusses operator training regulations. The regulation will be discussed in detail later.

### Overview of 29CFR 1910.178(l)

OSHA requires that employers develop a complete training program. Operators of powered industrial trucks shall be trained in the operations of such vehicles before they are allowed to operate them independently. The training must consist of instruction (both classroom type and practical training) in proper vehicle operation; the hazards of operating the vehicle in the workplace; and the requirements of OSHA standards for powered industrial trucks. Operators who have completed training must then be evaluated while they operate the vehicle in the workplace. Operators must also be periodically evaluated (at least once every three years) to ensure that their skills remain at a high level and must receive refresher training whenever there is a demonstrated need. To maximize the effectiveness of the training, OSHA will not require training that is duplicative of other training the employee has previously received if the operator has been evaluated

and found competent to operate the truck safely. Finally, the training provisions require that the employer certify that the training and evaluations have been conducted.

(Occupational, Health and Safety, 2000)

#### Code of Federal Regulations Training Requirements

Development of the training Program is done through research of articles on the subject, but mainly from the Code of Federal Regulations 29 CFR 1910. The following information details all the specific requirements of 1910.178 in their entirety.

#### **1910.178(L) Operator Training**

##### *(1) Safe Operations*

- (i) The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by the successful completion of the training and evaluation specified in section (L).
- (ii) Prior to permitting an employee to operate a powered industrial truck (except for training purposes), the employer shall ensure that each operator has successfully completed the training required by section (L).

##### *(2) Training Program Implementation*

- (i) Trainees may operate a PIT only:  
[A] Under the direct supervision of persons who have the knowledge, training and experience to train operators and evaluate their competence; and

[B] Where such operation does not endanger the trainee or other employees.

(ii) Training shall consist of a combination of formal instruction (e.g., lecture, discussion, videotape, written material), practical training (demonstrations performed by trainer and practical exercises performed by the trainee), and evaluation of the operator's performance in the workplace.

(iii) Persons who have the knowledge, training, and experience to train PIT operators and evaluate their competence shall conduct all operator training and evaluation.

(3) *Training program content.* Powered industrial truck operators shall receive initial training in the following topics, except in topics that the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace.

(i) Truck-related topics:

[A] Operating instructions, warnings, and precautions for the types of trucks the operator will be authorized to operate,

[B] Differences between the truck and an automobile,

[C] Truck controls and instrumentation, where they are located, what they do, and how they work,

[D] Engine or motor operation,

[E] Steering and maneuvering,

[F] Visibility (including restrictions due to loading),

[G] Fork and attachment adaptation, operation, and use limitations,  
[H] Vehicle capacity,  
[I] Vehicle stability,  
[J] Any vehicle inspection and maintenance that the operator will be required to perform,  
[K] Refueling and/or charging and recharging of batteries,  
[L] Operating limitations,  
[M] Any other operating instructions, warnings, or precautions listed in the operator's manual.

(ii) Workplace-Related Topics

[A] Surface conditions where the vehicle will be operated,  
[B] Composition of loads to be carried and load stability,  
[C] Load manipulation, stacking and unstacking,  
[D] Pedestrian traffic in the areas of operation,  
[E] Narrow aisles and other restricted places where the vehicle will be operated,  
[F] Hazardous locations where the vehicle will be operated,  
[G] Ramps and other sloped surfaces that could affect the vehicle's stability,  
[H] Closed environments and other areas where insufficient ventilation could cause a build-up of carbon monoxide,  
[I] Other unique or potentially hazardous conditions.

- (4) *Avoidance of duplicative training.* If an operator has previously received training in a topic specified in paragraph (L)(3) of this section, and such training is appropriate to the truck and working conditions encountered, additional training is not required if the operator has been evaluated and found competent to operate the truck safely.
- (5) *Certification.* The employer shall certify that each operator has been trained and evaluated as required by this paragraph (L). The certification shall include the name of the operator, date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.
- (6) *Dates.* The employer shall ensure that operators of powered industrial trucks are trained, as appropriate, before the employee is assigned to operate a powered industrial truck.

## Chapter 4

### Results

The purpose of this chapter is to relay the results of the training program. In review the training program was presented on the topic of powered industrial truck. The program was developed for Federal-Mogul Corporation, located in LaGrange, Georgia. Federal-Mogul produces powertrain systems, such as pistons and rings for engines. Federal-Mogul has 200 employees. Approximately 50-60 of the 200 employees operate forklifts. Forklifts are used to move baskets of pistons and pallets of raw materials throughout the facility, and various other uses. Forklifts are used in 4 different departments or functional areas, shipping and receiving, maintenance department, material handling, and foundry operations.

Twenty people volunteered to participate in the forklift training program. The names of the participants will be kept completely confidential. The participants represented all four of the areas where forklifts are commonly used, one participant from shipping and receiving, seven from the maintenance department, four participants are material handlers, and eight participants from the foundry operations. Although much of the training is general across all functional areas, each of the departments or functional areas have unique tasks completed with the use of forklifts, and each of the areas have unique safety concerns. Two classes were conducted. The first class had 9 participants and the second class had 11 participants. None of the participants had completed formalized powered industrial truck training prior to this program.

The program began with the classroom portion, or lecture portion of the program. The trainer discussed all of the material in the training manual (appendix A). The trainer

used visual aids in the form of overhead transparencies. After each section of the manual was presented the trainer stopped for questions or comments. Trainees were also able to ask questions and make comments throughout the program. The last portion of the manual covers unique safety concerns and operating suggestions for all four of the areas where forklifts are used. The trainer discussed this portion of the program with all of the participants. After the lecture portion of the training was completed, the participants moved on to the hands-on demonstration portion. The trainer moved the entire group of participants to a training area in the warehouse, away from day-to-day operations. The trainer started this portion of the program with information on the controls and instrumentation of the truck. The trainer told the participants the names of all of the controls and instruments, then the trainer showed the locations of the controls and instruments, and finally he/she demonstrated what the controls and instruments are used for and how they work. The trainer then demonstrated how the forks are used and adjusted. The next topic covered was the safety features and how they are used. After this portion of the training was completed, the participants were separated according to their department or functional area. The trainer(s) then demonstrated the common tasks associated with that department or area, along with general forklift operations and safety. Each of the functional areas or departments had a forklift trainer/evaluator that is familiar with that area.

The general operations of the forklift that were demonstrated include, mounting and dismounting the truck, starting and stopping, proper speed, driving forward and backward, steering and maneuvering (taking corners correctly), and driving in the area of

pedestrians (sounding the horn, yielding to pedestrians). This was completed in the warehouse training area.

The trainer demonstrated job specific tasks for each area, in that area of operations. The first group was the shipping and receiving participant(s). The specific tasks in the shipping and receiving area include, stacking finished goods (in pallet form) on shelves, loading trucks with finished goods, unloading trucks with items for receiving (these items may be on pallets, in crates, or in barrels). The trainer demonstrated the tasks associated with this area, such as, checking the load (pallets of pistons) for proper stacking, squaring the forklift to the pallets of pistons, raising and lowering pallets, stacking pallets on the shelves, traveling with pallets, driving backwards with two pallets stacked on top of one another, driving up and down the ramps in the shipping area, checking to make sure trucks are secured properly before entering the truck, unloading trucks, and using the barrel attachment to unload and move barrels.

The second group was the maintenance participants. Forklift operations associated with the maintenance department include, changing out crucibles, moving machinery, and assembling heavy machinery. The trainer demonstration included maneuvering the forklift in tight spaces, using the chain hoist attachment to lift crucibles, and squaring the truck and properly raising awkward loads (machinery).

The third group was the material handlers. Material handler forklift operations include, emptying chip hoppers, moving baskets of pistons from the foundry to heat treat, from heat treat to the machine lines, from machine lines to assembly, from assembly to the shipping holding area, stacking baskets of pistons in the holding area, and keeping assembly stocked with rings and rods. The trainer demonstrated squaring the truck to the

chip hoppers, proper lifting, lowering, and traveling with chip hoppers. He/she also demonstrated raising, lowering, stacking and traveling with baskets (metal baskets used to haul pistons).

The last group was the foundry operators. Foundry operators use forklifts to dump scrap into the crucibles, load baskets of pistons into the heat treat ovens, and stack baskets of pistons in the holding areas. The trainer demonstrated traveling in tight spaces (driving the forklift between the foundry cells and behind the foundry cell), traveling in a high pedestrian area, raising, lowering, and stacking piston baskets, loading piston baskets into the heat treat ovens, and finally, raising, lowering, and dumping scrap hoppers into the crucibles.

After the trainer(s) completed the demonstrations for all four of the departments or areas, each participant was asked to complete various hands-on exercises. The exercises followed the same structure as the demonstrations that the trainer(s) completed.

The shipping and receiving department participant completed exercises associated with that area. The first action the trainee completed was, he/she explained to the trainer/evaluator what each of the controls and instruments did, and where they were located. The trainee then demonstrated use of the levers to raise and lower the loads. Next the trainee raised a pallet of finished product and drove the pallet from one end of the shipping department to the other. The trainee then stacked the pallet on top of another pallet and placed the pallets outside (traveling backwards down a ramp). The trainee then brought the pallets into the shipping department and stacked them on the shelves.

The trainer/evaluator observed the entire exercise and determined if the trainee completed each portion of the exercise satisfactorily. The trainer used the performance checklist for shipping and receiving to document the exercise.

The maintenance department was evaluated next. The participants from the maintenance department explained to the trainer/evaluator what each of the controls and instruments did, and where they were located. The trainee then demonstrated use of the levers to raise and lower the loads. Next the trainee drove the forklift through the production area to a stockroom of old machinery. The trainee placed the chain hoist attachment onto the forks and secured the attachment to a piece of machinery. The trainee then raised the piece of machinery and moved it to another location. After the machine was moved the trainee removed the attachment from the machine and from the forklift, and returned to the warehouse. The trainer/evaluator completed the performance checklist for the maintenance area, for each participant.

The third group of participants was the material handlers. The participants explained to the trainer/evaluator what each of the controls and instruments did, and where they were located. The trainee then demonstrated use of the levers to raise and lower the loads. Next, the trainee moved a basket of pistons from one holding area to another holding area. The trainee then stacked two baskets on top of one another and moved those baskets to a holding area. Finally the participant moved a chip hopper to the chip trailer and dumped the chips into the trailer. The trainee documented the evaluation of the exercise on the material handler checklist.

The last group was the foundry operators. These participants explained to the trainer/evaluator what each of the controls and instruments did, and where they were

located. The trainee then demonstrated use of the levers to raise and lower the loads. The foundry participants loaded a basket of pistons into the heat treat oven, raised a scrap hopper and demonstrated how to dump the hopper, and stacked two baskets on top of one another. The participant moved the baskets from one holding area to another. The trainer/evaluator completed the evaluation using the performance checksheet for foundry operators to document the exercise.

After all of the functional areas or departments had completed their exercises and the trainer/evaluator(s) had completed their performance checksheets, the trainer(s) explained the evaluation findings with the participants. The participants then completed the program evaluation. All satisfactory trainees were given a certificate for successfully completing the powered industrial truck training program.

#### Program Evaluations

The program evaluation consists of six statements that each participant responded to using a Likert scale. The six statements were:

- (1) The program met my needs.
- (2) The program gave me useful information on PIT operations.
- (3) The program was presented well.
- (4) The trainer used time efficiently.
- (5) The trainer was able to answer questions.
- (6) My overall reaction to the program is positive.

The participants rated each of the above statements by circling 1-5, one meaning strongly disagree, two meaning disagree, three meaning neutral, four meaning agree, and five meaning strongly agree.

There are two questions on the bottom of the evaluation form for participants to write a response if they so choose. The questions were:

- (1) What were the strong points of the program?
- (2) How could the program be improved?

Participants were given room to write comments under the questions.

### Evaluation Responses

The purpose of this next section is to list the statements and the corresponding ratings on the evaluations. All written responses to questions six and seven on the evaluation will be listed.

#### **1. The program met my needs.**

- Strongly disagree 0
- Disagree 0
- Neutral 2
- Agree 12
- Strongly agree 6

#### **2. The program gave me useful information on PIT operations.**

- Strongly disagree 0
- Disagree 0
- Neutral 0
- Agree 13
- Strongly agree 7

#### **3. The program was presented well.**

- Strongly disagree 0
- Disagree 0
- Neutral 0
- Agree 9
- Strongly agree 11

**4. The trainer used time efficiently.**

- Strongly disagree 0
- Disagree 0
- Neutral 3
- Agree 13
- Strongly agree 4

**5. The trainer was able to answer questions.**

- Strongly disagree 0
- Disagree 0
- Neutral 0
- Agree 13
- Strongly agree 7

**6. My overall reaction to the program is positive**

- Strongly disagree 0
- Disagree 0
- Neutral 0
- Agree 12
- Strongly agree 8

The following represents the average rating for each statement:

- The program met my needs 4.2
- The program gave me useful information on PIT operations 4.4
- The program was presented well 4.6
- The trainer used time efficiently 4.1
- The trainer was able to answer questions 4.4
- My overall reaction to the program is positive 4.4

The overall rating for all six statements is: 4.32

#### Results from Questions on the Evaluation

The evaluation consisted of the six statements above and two open ended questions listed below. This section will list all of the responses to the two questions. Not all of the evaluations collected contained responses to the questions. The responses that were given are listed below:

- **What were the strong points of the program?**

Safety

The actual driving part

All was good

Good information

Hands-on training

The class was very in depth; the trainer did a good job of keeping everyone involved

The program met my needs

Good material

The class has good information and covers a lot of OSHA requirements

Forklift safety

Safety, knowing equipment, knowing work environment

- **How could the program be improved?**

The visual aids were ok, but a PowerPoint program would be better

Better video

It's ok like it is

More visuals

More hands on

Give class on my day off

I see no problems with the program

The film was interesting, however more interesting tapes would be enjoyable

Interpretations and suggestions from the data collected will be discussed in

chapter 5.

## Chapter 5

### Conclusions and Recommendations

This chapter will discuss the findings from the evaluations that participants completed at the conclusion of the forklift training. Recommendations will then be made based on the findings.

### Summary

Chapter 1 of this research paper discussed the need for forklift training. Last year (1998) over 100 fatalities and approximately 95,000 injuries occurred due to unsafe operations of fork trucks. OSHA has changed the forklift training requirements as a result of all the injuries. On December 1<sup>st</sup>, 1999 OSHA released the new Powered Industrial truck operator training standard. The new standard says forklift operators must demonstrate that they can safely operate in the particular environment, with the particular loads, and with the particular truck, for the facility they work in. The new standard prompted employers to look at the training they conduct for forklift operators.

The company used for this research is Federal-Mogul Corporation, located in LaGrange, Georgia. Federal-Mogul produces powertrain systems, such as pistons and rings for engines. Federal-Mogul has 200 employees. Approximately 50-60 of the 200 employees operate forklifts. Forklifts are used to move baskets of pistons and pallets of raw materials throughout the facility.

Federal-Mogul has never had formalized training on powered industrial trucks. The purpose of this research is to develop a training class for forklift operations.

Chapter 2 includes a review of literature. The OSHA standard for powered industrial trucks is standard number: 1910.178. The standard covers: general

requirements, designations, converted industrial trucks, safety guards, fuel handling and storage, changing and charging batteries, lighting for operation areas, control of noxious gases and fumes, loading trucks and railroad cars, operator training, truck operations, traveling, general loading, and maintenance of trucks. Chapter 2 discussed each of the above sections of the standard in more detail.

Chapter 2 discussed the history of OSHA. The Occupational Safety and Health Administration (OSHA) was created in the Department of Labor on April 28, 1971. That was the date the Williams-Steiger Occupational Safety and Health Act became effective. Each year new standards are developed and existing standards are revised. However, the original OSH Act still is in effect with few if any changes. (Becker, 1992)

Chapter 2 also discussed the history of the powered industrial truck and a complete overview of the new powered industrial truck standard. According to Daniels, 1999, OSHA requires that trainees have a complete grasp of the way their trucks handle and operate. OSHA is raising operator training. Under the new revised regulations (PITOT), OSHA has focused on employers' providing comprehensive training programs for their operators. (Daniels, 1999)

Chapter 3 discussed the methodology, training implementation, how to develop a Likert scale, administering the Likert scale and how to comply with the new training standard. OSHA requires that employers develop a complete training program. Operators of powered industrial trucks shall be trained in the operations of such vehicles before they are allowed to operate them independently. The training must consist of instruction (both classroom type and practical training) in proper vehicle operation, the hazards of operating the vehicle in the workplace, and the requirements of OSHA standard for

powered industrial trucks. Operators who have completed training must then be evaluated while they operate the vehicle in the workplace. Operators must also be periodically evaluated (at least once every three years) to ensure that their skills remain at a high level and must receive refresher training whenever there is a demonstrated need.

Chapter 4 discussed the actual training and the results. Twenty people volunteered to participate in the forklift training program. The participants represented all four of the areas where forklifts are commonly used, one participant from shipping and receiving, seven from the maintenance department, four participants are material handlers, and eight participants from the foundry operations. Although much of the training is general across all functional areas, each of the departments or functional areas have unique tasks completed with the use of forklifts, and each of the areas have unique safety concerns. Two classes were conducted. The first class had 9 participants and the second class had 11 participants. None of the participants had completed formalized powered industrial truck training prior to this program.

The trainees completed a training evaluation form. The program evaluation consisted of six statements that each participant responded to using a Likert scale. The participants rated each of the six statements by circling 1-5, one meaning strongly disagree, two meaning disagree, three meaning neutral, four meaning agree, and five meaning strongly agree.

There are two questions on the bottom of the evaluation form for participants to write a response if they so choose. The questions are:

- (3) What were the strong points of the program?

(4) How could the program be improved?

Participants were given room to write comments under the questions. The results were tabulated in chapter 4. Chapter 5 will discuss the conclusions based on the findings.

### Conclusions

Each statement and question on the evaluation will be discussed. The statement and questions will be restated, the results given, and then discussion of those results.

- **The program met my needs.**

Twelve of twenty responded with Agree, six participants strongly agree, and two participants were neutral. The average rating for this statement is 4.2, falling between agree and strongly agree. The program seems to have met the needs of the majority of participants. The two participants that responded neutral shows that there may or may not require improvements to meet all participants' needs. No responses were given for disagree or strongly disagree which would have shown a definite need for improvement.

- **The program gave me useful information on PIT operations.**

Thirteen out of twenty participants responded agree and seven responded strongly agree. No responses of neutral, disagree, or strongly disagree were given. The average rating for this statement is 4.4. With this average approaching the mid point between agree and strongly agree, it suggests that the program gave useful information. The question here is how useful? If more participants would have rated this statement as strongly agree, one would conclude that the information was very useful. With thirteen agree responses and only seven strongly agree responses, this suggests that the training was useful but could be made more useful.

- **The program was presented well.**

Eleven participants out of twenty responded strongly agree, and nine responded agree for an average rating of 4.6. These responses suggest that the program was presented well. More people strongly agree than just agree, and no participants responded neutral, disagree, or strongly disagree. Although eleven strongly agree, nine participants just agree, which suggest some room for improvement.

- **The trainer used time efficiently.**

Thirteen of twenty participants responded agree. Three participants responded neutral and four responded strongly agree. The average rating for this statement is 4.1, falling between agree and disagree but much closer to agree. It is the researcher's opinion in this discussion that the trainer is able to use time efficiently if the material is developed to meet the time requirements. If the class flows very slowly or if the trainer is hurrying through the material the class needs to be adjusted for the time allotted. The responses for this statement suggest that the time was used well. There may be room for improvement based on the fact that thirteen agree but only four strongly agree, and more so on the fact that three participants responded neutral. No responses of disagree and strongly disagree were given, again suggesting there may be room for improvement but that there is not a definite need based on the responses.

- **The trainer was able to answer questions.**

Thirteen of twenty agree with that statement, while seven strongly agree. No other responses were given. The average of 4.1 suggests that the trainer answered questions well as the average falls between agree and strongly agree.

- **My overall reaction to the program is positive.**

Twelve out of twenty agree with the statement. Eight strongly agree, and no other responses were given. The average for this statement is 4.4. This data suggests the overall impression of the program was good, not excellent, but not poor. This data suggests an above average impression of the program.

The overall average rating for all six statements is 4.32, suggesting that the program was fairly good overall, with some room for improvement.

Next the researcher will review the two questions that are on the evaluation. The responses were given in short answers. The answers will be given and discussion will follow.

- **What were the strong points of the program?**

Safety

The actual driving part

All was good

Good information

Hands-on training

The class was very in depth, the trainer did a good job of keeping everyone involved

The program met my needs

Good material

The class has good information and covers a lot of OSHA requirements

Forklift safety

Safety, knowing equipment, knowing work environment

The above responses are fairly general, but they reinforce the data that was received in the first six statements. One participant stated that the program met their needs. The responses are good but not excellent, and that is how the overall response to the class was, good but not excellent. More useful information can be taken from the next question on how to improve the class.

- **How could the program be improved?**

The visual aids were ok, but a PowerPoint program would be better

Better video

It's ok like it is

More visuals

More hands on

Give class on my day off

I see no problems with the program

The film was interesting, however more interesting tapes would be enjoyable

Based on the above responses there are improvements that could be made. The responses were not offensive, they just show some needed room for improvement. With only twenty participants it is difficult to gather a great deal of information. The responses given are a good representation for the amount of participants. Interestingly enough, there was not a lot of duplication in the written responses. This definitely makes the information more useful. One item that had more than one response is the visual aids; this is a part of the program that needs improvement. The videotape was listed as needing improvement. The responses are somewhat general and do not identify the problems with the videotape, but one could conclude that the tape was not very interesting. The

researcher will now use all of the information given on the evaluations and develop recommendations.

### Recommendations

The first recommendation would be to conduct more classes and gather more data through evaluations. The twenty participants did a fine job of filling out the evaluations, however more data is needed to make the findings more accurate, valid, and reliable. I would recommend using the responses from several more classes before making a final decision of major changes. Many small changes can be made based on the information, but to make significant change the researcher would recommend gathering more data to make the information more valid.

Visual aids seem to surface in a number of responses. The first thing to consider would be adapting the program into a PowerPoint presentation. One could add many more pictures and graphics to make the class more enjoyable.

The videotape used for the class could be improved as well. The tape has good information but the participants do not all seem to like it. A more entertaining tape still containing good information would be recommended.

It is the opinion of the researcher that the class went fine, but based on the evaluations, there does not seem to be any suggestion that the class was very good. The researcher would recommend some activities to give the class a more satisfying result. One thing that may be added is group discussions on the potential safety risks, or other topics.

The main recommendations based on the evaluations would be to add more enjoyment to the class. A large amount of change should not be made until many more

participants have completed the class and the evaluations. More evaluations will give much more accurate information on the good and bad points of the class.

## References

AST Inc. (2001) 29 CFR Code of Federal Regulations. American Safety Training Inc. (2<sup>nd</sup> ed.).

Bittner, A. (2000) Lift truck training moves online. Occupational Health & Safety. 69(12), 45-46.

Daniels, D. (1999). Raising operator safety. Occupational Health & Safety 68(12), 30-31.

Knill, B. (1999). OSHA's final rule on operator training and how to comply, Part 1. Material Handling Engineering 54(20), 43-46.

Knill, B. (1999). OSHA's final rule on operator training and how to comply, Part 2. Material Handling Engineering 54(3), 67-70.

Knill, B. (1999). OSHA's final rule on operator training and how to comply, Part 3. Material Handling Engineering 54(5), 82-84.

Knill, B. (1999). OSHA's final rule on operator training and how to comply, Part 4. Material Handling Engineering. 54(7), 73-75.

Knill, B. (1999). OSHA's final rule on operator training and how to comply, Part 5. Material Handling Engineering. 54(9), 73-75.

Knill, B. (1999). OSHA's final rule on operator training and how to comply, Part 6. Material Handling Engineering 54(1), 79-80.

Knill, B. (1999). OSHA's final rule on operator training and how to comply, Part

7. Material Handling Engineering 54(12), 63-66.

Knill, B. (2000). Operator training: Inspections begin. Material Handling Management 55(5), 28.

Knill, B. (2000). OSHA Says: Don't fudge operator training. Material Handling Management 55(13), 32.

Koenig, J. (1999). Choosing training for forklift operators. Safety & Health 160(5), 46-49.

Laws, J. (2000). OSHA'S Compliance Directive. Occupational Health & Safety 69(12), 47-50.

Olander, S. (2000). Solutions. Safety & Health 162(3), 60-61.

Shephard, J. (2000). OSHA's final rule on operator training and how to comply, Part 1 Year 2000. Material Handling Management 55(2), 79-82.

Swartz, G. (2000). Forklift safety, getting back to basics. Safety & Health 163(1) 1, 56-58, 63.

Trochim, W. (2001). Likert Scaling. Research Methods Knowledge Base.  
<http://Trochim.Human.Cornell.edu/kb/>

## Appendix A

**POWERED INDUSTRIAL  
TRUCK  
OPERATIONS & SAFETY**

PARTICIPANT MANUAL

**PRESENTED BY:  
FEDERAL-MOGUL TRAINING  
DEPARTMENT**

# PIT OPERATIONS AND SAFETY

---

## Table of Contents

### Program Objectives

### The Powered Industrial Truck

#### Definition

#### Equipment features

- Counterweight
- Three Point Balance System
- Mast
- Carriage
- Forks
- Functional Levers
- Pedals
- Overhead Guard
- ID Plates

### Types of Powered Industrial Trucks

#### Electric

#### Liquid Propane (LP)

### Counterbalance Principle

#### Stability & Center of Gravity

### Operating the PIT

#### Daily Inspection

#### Load Handling Procedures

- Load handling procedures
- Back up procedures
- Travel procedures with and without a load

### Safety Techniques

### OSHA Regulations

## PROGRAM OBJECTIVES

---

**By the end of this program participants will be able to:**

- Identify the equipment features of a forklift
- Describe proper traveling techniques
- Describe the proper loading/unloading sequences
- Describe the counterbalance principle
- List safe operating techniques

# THE POWER INDUSTRIAL TRUCK

---

## Definition

- Any vehicle used in a working environment to haul or hoist
- The Forklift is the Power Industrial truck used at Federal-Mogul, LaGrange.

## Equipment Features

### Counterweight

- Exists to balance the forklift
- Located at the back of the truck
- If the load is too heavy, counterweight is unable to balance and the forklift may tip.
- Never place more weight onto the back of the forklift to maintain a heavier load, the forklift may tip.

### Three Point Balance System

- Three points instead of four wheels support most PITs.
- The three balancing points are located underneath the forklift and help balance the forklift.
- Moving too quickly can cause the forklift to tip because the combined center of gravity could move outside the three points.

### Mast

- Located at the front of the forklift.
- Mast should be tilted back when a load is on the truck to prevent the load from sliding off.
- Functional levers on the forklift tilt the mast and move the forks up and down.
- Never put your hands on the mast, moving parts could cause severe injury.

## EQUIPMENT FEATURES

---

### **Carriage**

- Support structure for forks or attachments
- Generally roller mounted, traveling vertically with the mast.

### **Forks**

- Located at the front of the PIT, suspended from the carriage.
- Used to engage and support loads.
- Forks can be adjusted for different types of loads.
- Should be spaced as far apart as the pallet will allow.
- Always position the forks as far forward, through the pallet, as possible, at least three-quarters of the way under the load.
- Have the pallet touch the mast if possible.
- Adjust forks with feet instead of hands to prevent hands from being pinched.

### **Functional Levers**

- There are three functional levers on a forklift.
- The first lever moves the forks up and down.
- The second lever tilts the mast forward and backward.
- The third lever is for side-to-side shifts. (Not all lifts have this lever.)

### **Pedals**

- Gas pedal on the right and brake on the left. (Some forklifts have a clutch to the left of the brake to accommodate a manual transmission.)
- Action of gas pedal may vary for each PIT.
- Allow enough stopping distance because brakes will not stop the PIT immediately.

## EQUIPMENT FEATURES

---

### **Overhead Guard (Protection Cage)**

- Framework fitted to the lift truck over the head of the operator.
- Provides protection from falling objects.
- Do not put hands on outside of guard or fingers may be pinched.

### **Identification Plates**

- All lift trucks must bear an identification plate.
- The plate must be filled out completely with:
  - ✓ Proper Capacity Weight
  - ✓ Truck Configuration
  - ✓ Attachments
  - ✓ Fork Height
  - ✓ Load Center
- ID plates should be replaced when they become illegible, and if configurations or load centers change.

### **Types of Power Industrial Trucks**

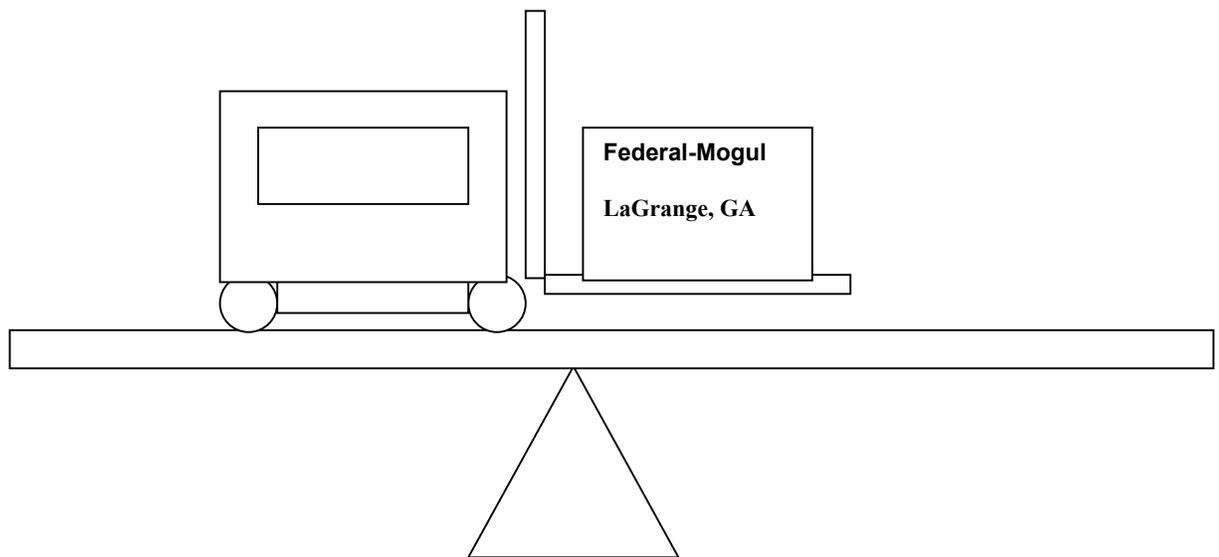
#### *Electric*

- Principal energy is transmitted from power sources to motors in the form of electricity.
- Power source is a battery that must be recharged.
- No need to worry about combustion or ventilation.

#### *Liquid Propane (LP)*

- PIT fueled with liquid propane.
- LP is highly flammable and carbon monoxide poisoning is possible without proper ventilation.
- Do not smoke or use open flames near liquid propane tanks.

## Counterbalance Principle



- The lift truck is based on the same principle as a seesaw.
- Two weights are balanced on the opposite sides of a pivot.
- The load on the forks is balanced by the weight of the lift truck.

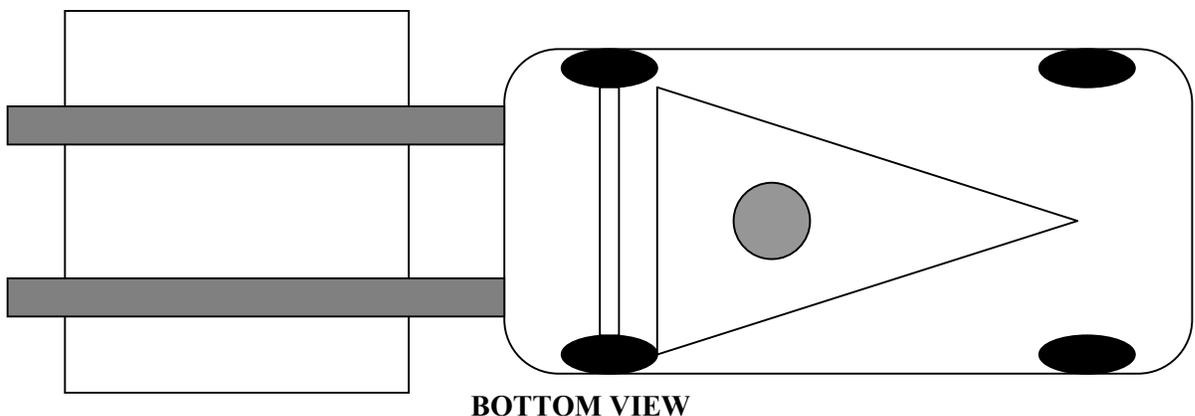
## Stability and Center of Gravity

- The center of gravity (CG) of an object is the point about which the object is balanced in all directions.
- Every object has a center of gravity.
- When the lift truck picks up a load, the truck and the load have a new combined center of gravity (CG).
- The stability of the truck is determined by its CG or if it is loaded, its combined CG.
- The lift truck has moving parts and therefore has a CG that moves.
  - The CG moves forward and back as the carriage is tilted forward and back.
  - The CG moves up and down as the load moves up and down.

## STABILITY AND CENTER OF GRAVITY

---

- The center of gravity, and therefore the stability of a loaded truck, is affected by a number of load factors such as:
  - Size
  - Weight
  - Shape
  - Position
  - Elevation Height
  - Tilt Forward and Backwards
- The dynamic forces created when the truck is moving also affect the center of gravity and stability of the truck. These forces are caused by operations such as:
  - Acceleration
  - Braking
  - Turning
  - Operations on uneven surfaces or inclines
- These factors must be considered when operating an unloaded or loaded truck. ***An unloaded truck may tip over easier than a loaded truck with the load in the lowered position.***
- In order for a truck to remain stable, the CG must stay within the area of the lift truck represented by a triangle drawn between the drive wheels and the pivot of the steering axle.



### Daily Inspection

- Before operating a PIT, operators should go through a daily inspection checklist. (Typically done by Material Handler.)
- Return checklist form to the Safety Coordinator (Jamie Steinmeyer).
- If there is a problem, this should be noted on the checklist and appropriate personnel should be notified to correct the problem.

### Load Handling Procedures

#### Load Retrieving

1. Square the fork truck to the load you wish to lift.
2. Raise the forks to eye level, and then level forks to a horizontal position.
3. Raise the forks to proper entry height and enter the load, maintaining clearance around the forks to avoid load disturbance.
4. Raise the load so it is suspended from its resting position.
5. Tilt the load back.
6. **Visually inspect the rear area of the truck to ensure there are no pedestrians around the forklift.**
7. Back up the forklift using proper backup procedures.
8. Stop and lower load to proper traveling height (about 4 inches above the ground).

#### Back Up Procedures

- Visually inspect the area at the rear of the forklift.
- Blow horn to alert pedestrians that may or may not be visible.
- When backing up after placement of a load:
  - ◆ Concentrate on removal of the forks from the load to avoid load disturbance.
  - ◆ Stop the fork truck and lower the forks to proper traveling height and angle.

### Traveling with a Load

- Tilt the load back.
- Position the load so the forks are about 4” off the ground.
- Uphill, travel forward so the load rests against the carriage.
- Downhill, travel in reverse so the load does not fall forward.
- If traveling over railroad tracks, drive slowly at an angle.
- If visibility is a problem, travel in reverse.
- **Any load above 4’- operator must travel in reverse.**
- When approaching a corner or blind spot, sound the horn to alert pedestrians.
- A safe operating speed is comparable to someone walking.

### Entering a Trailer

- Make sure trailer is secure to the bay or dock plate.
- Make sure the truck and trailer wheels are chocked.
- Ensure that the trailer floor is in good condition.

### Safety Techniques

- Under no circumstances should an untrained individual operate a forklift.
- Safety tips for safe operations:
  - ❖ Avoid wearing loose garments when operating a PIT.
  - ❖ No passengers are allowed on a forklift.
  - ❖ Pedestrians have the right of way except when you are stacking a load overhead. They must wait until you have finished.
  - ❖ Never allow pedestrians to walk under a load or between the forklift and the wall.
  - ❖ Keep hands and legs inside the forklift to avoid pinching.
  - ❖ Mount and dismount the lift truck using the 3-point stance.
  - ❖ If the lift truck tips, do not jump off, hold on tight, brace yourself, and lean away from the fall.
  - ❖ When finished with the truck, turn off engine, set brake, and put forks to the ground, slightly tilted forward.

## Code of Federal Regulations - OSHA Requirements

---

### 1910.178(L) Operator Training

#### (1) *Safe Operations*

- (i) The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by the successful completion of the training and evaluation specified in section (L).
- (ii) Prior to permitting an employee to operate a powered industrial truck (except for training purposes), the employer shall ensure that each operator has successfully completed the training required by section (L).

#### (2) *Training Program Implementation*

- (i) Trainees may operate a PIT only:
  - [A] Under the direct supervision of persons who have the knowledge, training and experience to train operators and evaluate their competence; and
  - [B] Where such operation does not endanger the trainee or other employees.
- (ii) Training shall consist of a combination of formal instruction (e.g., lecture, discussion, video tape, written material), practical training (demonstrations performed by trainer and practical exercises

performed by the trainee), and evaluation of the operator's performance in the workplace.

- (iii) All operator training and evaluation shall be conducted by persons who have the knowledge, training, and experience to train PIT operators and evaluate their competence.

(3) *Training program content.* Powered industrial truck operators shall receive initial training in the following topics, except in topics that the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace.

- (i) Truck-related topics:
  - [A] Operating instructions, warnings, and precautions for the types of trucks the operator will be authorized to operate;
  - [B] Differences between the truck and an automobile;
  - [C] Truck controls and instrumentation, where they are located, what they do, and how they work;
  - [D] Engine or motor operation;
  - [E] Steering and maneuvering;
  - [F] Visibility (including restrictions due to loading);
  - [G] Fork and attachment adaptation, operation, and use limitations;
  - [H] Vehicle capacity;
  - [I] Vehicle stability;
  - [J] Any vehicle inspection and maintenance that the operator will be required to perform;

[K] Refueling and/or charging and recharging of batteries;  
[L] Operating limitations; and  
[M] Any other operating instructions, warnings, or precautions listed in the operator's manual.

(ii) Workplace-Related Topics

[A] Surface conditions where the vehicle will be operated;  
[B] Composition of loads to be carried and load stability;  
[C] Load manipulation, stacking and unstacking;  
[D] Pedestrian traffic in the areas of operation;  
[E] Narrow aisles and other restricted places where the vehicle will be operated;  
[F] Hazardous locations where the vehicle will be operated;  
[G] Ramps and other sloped surfaces that could affect the vehicle's stability;  
[H] Closed environments and other areas where insufficient ventilation could cause a build-up of carbon monoxide; and  
[I] Other unique or potentially hazardous conditions.

(4) *Avoidance of duplicative training.* If an operator has previously received training in a topic specified in paragraph (L)(3) of this section, and such training is appropriate to the truck and working conditions encountered, additional training is not required if the operator has been evaluated and found competent to operate the truck safely.

- (5) *Certification.* The employer shall certify that each operator has been trained and evaluated as required by this paragraph (L). The certification shall include the name of the operator, date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.
- (6) *Dates.* The employer shall ensure that operators of powered industrial trucks are trained, as appropriate, before the employee is assigned to operate a powered industrial truck.

## Appendix B

# Federal Mogul Powered Industrial Truck Training

## Evaluation Form

Date: \_\_\_\_\_

Name of Trainer: \_\_\_\_\_

Trainee's Department: \_\_\_\_\_

Please rate the following aspects of the program by circling the appropriate number.

1=strongly disagree, 2=disagree, 3=neutral,

4=agree, 5=strongly agree

- |    |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|
| 1. | The program met my needs.                                 | 1 | 2 | 3 | 4 | 5 |   |
| 2. | The program gave me useful information on PIT operations. | 1 | 2 | 3 | 4 | 5 |   |
| 3. | The program was presented well.                           | 1 | 2 | 3 | 4 | 5 |   |
| 4. | The trainer used time efficiently.                        | 1 | 2 | 3 | 4 | 5 |   |
| 5. | The trainer was able to answer questions.                 |   | 1 | 2 | 3 | 4 | 5 |
| 6. | My overall reaction to the program is positive.           | 1 | 2 | 3 | 4 | 5 |   |

7. What were the strong points of the program? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. How could the program be improved? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_