

The Safety Professionals Handbook

MANAGEMENT APPLICATIONS INSTRUCTORS' GUIDE

Joel M. Haight, Editor

THE PENNSYLVANIA STATE UNIVERSITY

Preview



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Preview

FOUNDATION PRINCIPLES AND APPLICATIONS

Basic Economic Analysis and Engineering Economics

Anthony Veltri and James D. Ramsay

END-OF-CHAPTER QUESTIONS

1. Describe the main motivation for applying economic analysis to occupational safety, health, and environmental investments.
2. Describe the rationale supporting and the logic behind incorporating economic analysis findings into safety, health, and environmental investments.
3. What are the critical components of a firm's decision-making process during investment allocation?
4. State the beneficial outcomes that should be expected and leveraged when safety, health, and environmental economic analyses are effectively conducted.
5. What internal organizational barriers must be overcome when applying economic analysis to SH&E investments and what is the recommended strategy for overcoming internal organizational barriers?
6. What are the four levels of investment strategy typically used by firms?
7. Construct a SH&E economic analysis blueprint; be sure to include both the stages and substages in your response.
8. What is the recommended structure for a SH&E economic analysis model?
9. Explain what will be needed for economic analysis to become an on-going practice within the occupational safety, health, and environmental profession.

SECTION 1

MANAGEMENT OF SAFETY ENGINEERING WORK

Regulatory Issues

Anjan K. Majumder

END-OF-CHAPTER QUESTIONS

1. What is the goal of safety engineering management?
2. Give an example to show how, given that mandatory requirements are the same, a more stringent or less stringent company policy could be adopted.
3. What is system safety?
4. How often is the CFR updated?
5. What is the *Federal Register*?
6. What is “construction work”?
7. How does “incorporation by reference” help the federal government?
8. How would you decide which occupational safety and health regulation to follow in a workplace?
9. What is an authority having jurisdiction (AHJ)?
10. What is the general duty clause? When is it used?
11. What is the goal of the Occupational Safety and Health Act of 1970?
12. What is the goal of the Occupational Safety and Health Administration (OSHA)?
13. How does the National Institute for Occupational Safety and Health (NIOSH) differ from the Occupational Safety and Health Administration (OSHA)?
14. How does the Occupational Safety and Health Act of 1970 relate to the Workers’ Compensation law or any other common laws?
15. What cooperative programs does OSHA offer?
16. What are some consensus standards that are frequently followed by industry ?
17. What two regulations are most widely used for occupational safety and health in workplaces?
18. What are “threatened and endangered species” as stated in the Endangered Species Act of 1973?
19. Why is the RCRA called the “cradle to grave” act?
20. What is special about the Toxic Substances Control Act (TSCA)?
21. What are the key factors that should be considered in applying regulatory requirements to safety engineering management?

SECTION 1

MANAGEMENT OF SAFETY ENGINEERING WORK

Applied Science and Engineering: Managing a Safety Engineering Project

Joel M. Haight

END-OF-CHAPTER EXERCISE

You are the health and safety engineer for a paper company and have been asked by your manager to explain why a serious problem exists and then to solve the problem. Over the last two years, some alarming apparent trends have been observed in the administrative, operating, and maintenance areas of the business.

- Cumulative trauma injuries (CTI) at your plant are up more than 60 percent in the last ten years. Injury costs associated with cumulative trauma injuries are up more than 85 percent over the same period.
- In the last two years twelve injuries due to inadvertently released energy have occurred to maintenance mechanics as they repaired equipment.
- Within the last year three trenches have collapsed, and one excavation involved the puncturing of an underground gas line. While no one was injured, work was slowed by the collapses and two people narrowly escaped injury in one collapse; there could have been a fire when the gas line was punctured.

Your preliminary investigation of the safety problem shows that all of the cumulative trauma incidents have occurred in the administrative areas of purchasing and accounting, and 100 percent of these injuries

occurred with people whose job puts them at a computer workstation 95 percent of the time. The plant's lockout/tagout procedure is two pages long, its contents would best be described as superficial, and no one has been trained in the use of the procedure. Your area has a light alluvial soil, and the groundwater table is approximately 0.5 meters below grade. No equipment or materials are currently on site for shoring excavations. The plant has many underground utility and product lines, only about 60 percent of them are documented, and you are not sure this documentation is up to date. There is no permit system or procedure for performing excavations.

To fix this safety problem (too many incidents), you first have to understand where and what the individual problems are. Even though at this point you are not sure exactly what you will have to do to fix the problems, you have to ask for funding, human resources of the appropriate expertise, and time to do the project now. You may not need all of what you ask for, but if you do not justifiably ask for what you need now, you will not get it later. There have been 27 injuries (CTI and energy-release) over the last two years from the three problem areas (administration, operations, and maintenance) and, in addition, work slowdowns due to the trench collapses and lost gas product have resulted in losses of approximately \$225,000. Assume that industrial injuries cost \$25,000 each. Please ensure that your proposed solution is economically justified. (While the human

costs may be greater than the dollar cost, they are a very large unknown, so for the purposes of this exercise, do not attempt to consider human costs in your feasibility assessment.)

Assumptions and Constraints

A safety engineer's rate is \$5,000 per week, and they have incident and trend analysis expertise as well as procedure-writing and training capability. A civil engineer's rate is \$4950 per week, and they have expertise in soils and underground infrastructure analysis. An industrial engineer's rate is \$5100 per week, and they have expertise in workstation analysis and design. A mechanical engineer's rate is \$5100 per week, and they have expertise in piping design and layout and engineering drawings. An electrical engineer's rate is \$5200 per week, and they have expertise in underground wiring diagrams and electrical controls as well as engineering drawing. A medical doctor's rate is \$7800 per week, and they have expertise in medical examinations of injuries. An operations and or maintenance specialist/technician's rate is \$3400 per week, and they have expertise in procedure-writing and training. An administrative assistant's rate is \$2200 per week, and they have a wide range of administrative expertise.

You have access to only one of each type of engineer except that two safety engineers are available. One operations expert, one maintenance expert, one administrative assistant, and one medical doctor are available to you. Each category of incident investigation will take one full week to complete. Each trend analysis will take 13.33 hours. A soil analysis at your plant is a week-long process, and an underground infrastructure analysis will take two weeks to complete, and if you hire a civil engineer for this work, these two analyses cannot be done concurrently. To map the underground structures, the civil engineer will need two more weeks. It will take three weeks for an ergonomics engineer to complete a workstation analysis, and if redesign is required, it will take another two weeks for a new workstation design to be developed. Identifying sources of energy and isola-

tion points will take about three weeks for each category of energy—mechanical and electrical—but some of the energy sources may be mechanical (steam and fluids in piping, and so on) and some may be electrical, which is a different area of expertise. Any drawings from this work will take four weeks to complete (two for mechanical and two for electrical). Medical examinations of fifteen cumulative-trauma incidents will require a week's worth of medical input. Procedures take approximately four weeks to complete (considering drafting, review, approval, and distribution). Presentation of the new procedures to employees will take two weeks, training your workforce of 500 employees will take eight hours for each employee for each procedure, and the maximum class size is 50 people per training session. The cost for trainees is approximately \$2000 per week. The lockout/tagout course is eight hours and the excavation course is eight hours. You must account for a 35 percent fringe and overhead rate and a 12 percent general and administrative rate.

Expectations and Final Products

Develop a needs statement, goals, and objectives for each problem area. Develop task statements, statements of work, and a work breakdown structure. Determine your staffing requirements and a task responsibility matrix, and develop a project schedule using a Gantt chart. Develop a project budget and a cost budget by week. From this information and what you know about the costs of all of the incidents and work slowdowns, determine the feasibility of your solution (neglect the human costs for this exercise). Convince your manager (or professor) that your method for handling the solution to this safety problem/project is justified. Provide a report that contains an executive summary (one page); a detailed report of findings, conclusions and recommendations (3 pages); and all of your results (budgets, matrix, schedule, and so on) in an appendix. In addition to writing your results, be prepared to present them verbally to the management team.

SECTION 1
MANAGEMENT OF SAFETY
ENGINEERING WORK

Cost Analysis and Budgeting

T. Michael Toole

END-OF-CHAPTER QUESTIONS

1. Your boss has tasked you and a co-worker with estimating the average cost of injuries to your company's employees. Your co-worker simply finds out the total medical costs associated with treating injuries the last three years and divides this sum by the number of reported injuries. You know better. List at least three additional direct costs and two indirect costs that should be included in the estimate. Also list two intangible costs that you could include in your e-mail to your boss.
2. Your daughter thinks she has saved up enough money to buy her first car. Educate her about life-cycle costs by identifying at least five sets of costs she will incur over the life of the vehicle.
3. Draw a cash flow diagram for purchasing a car that includes at least three different sets of cash flows. Assume a service life of ten years, and expect that the car will save you \$400 per year in bus costs.
4. What is the expected value of rolling a die once if you get \$100 per dot shown?
5. If you deposited \$1000 now, how much will you have in three years if you earn 4 percent compounded annually?
6. Bank A offers a five-year certificate of deposit (CD) that pays 5.5 percent per year compounded annually while Bank B offers a five-year CD that pays 5.4 percent per year compounded quarterly. Which is the better CD?
7. Your boss has directed you to choose between two safety investments. Investment A will cost \$4000 up front and result in \$2000 savings annually for five years. Investment B will cost \$4000 up front and result in no savings during the first year, \$1000 during the second year, \$2000 during the third year, \$3000 during the fourth year, and \$4000 during the fifth year. If your boss directs you to base your decision solely on payback period, which investment will you choose?
8. What is the net present worth values of each of the investments in Question 7, assuming an interest rate of 6 percent?
9. What is the uniform annual cost of the investments in Question 8?
10. Your boss asks you to perform a sensitivity analysis for Question 8. What does she mean by this, and how might you perform one?

SECTION 1
MANAGEMENT OF SAFETY
ENGINEERING WORK

Benchmarking and Performance Criteria

Christopher Janicak

END-OF-CHAPTER QUESTIONS

1. Describe two main aspects of an organization that influence a safety program's effectiveness.
2. What is an organization's culture?
3. What is meant by a control chart with a given standard?
4. How can ISO standards be used to improve safety performance?
5. What is statistical process control?
6. What is the Pareto Principle, and how can it be applied to safety performance?
7. Using the set of data presented in the right-hand column, determine the central line, upper control limit, and lower control limit for an X Chart.
8. What is Plan-Do-Check-Act, and how can it be applied to safety performance?
9. What are the six steps of the benchmarking process?
10. What does a safety management system consist of?

Period	Average Number of Injuries Reported Each Period	Standard Deviation
1	1.20	1.30
2	3.33	1.52
3	2.33	1.41
4	5.40	1.33
5	3.12	1.21
6	6.45	1.67
7	7.13	1.45
8	2.33	1.25
9	2.23	1.68
10	3.55	1.22
11	6.12	1.46
12	2.11	1.22
13	4.70	1.87
14	3.34	1.33
15	5.21	1.98
16	4.42	1.40
17	2.25	1.22
18	3.44	1.02
19	4.11	1.42
20	3.10	1.21
21	3.01	1.43
22	3.33	1.38
23	4.32	1.55
24	4.67	1.87
25	6.21	1.11

SECTION 2

HAZARD COMMUNICATION AND RIGHT-TO-KNOW

Regulatory Issues

James M. Miller

END-OF-CHAPTER QUESTIONS

1. Complying with the OSHA HazCom requires adequate implementation of what five steps?
2. How should one expect the required information on material safety data sheets to be formatted?
3. Assume that you are provided with a chemical with an on-product label that has only the identity of the chemical along with the name and address of the manufacturer. Would such a label be considered in compliance with the OSHA HazCom requirements?
4. The ANSI Z535 series of standards is frequently referenced for nonchemical types of labels, signage, and other hazard communications. Which ANSI Z535 standards would one reference to find guidelines addressing the following circumstances?
 - (a) Hazard communication or instructional signs that are to be positioned in or around an industrial facility
 - (b) Precautionary procedures and information associated with temporary hazard conditions, maintenance, repair, or construction
 - (c) Warnings to use in operator or instruction manuals, or other collateral information
5. When is it acceptable to use safety symbols in a warning or instruction with *no verbiage* describing the particular hazard to which the symbol is referring?
6. When producing warning signs, labels, instructions, or operator manuals, what are the requirements for having such communications available in another language besides English?
7. If one is using a product that has minimal hazard information on the label, how can additional hazard information be expeditiously found?

SECTION 2
HAZARD COMMUNICATION
AND RIGHT-TO-KNOW

Cost Analysis and Budgeting

James D. Ramsay and Anthony Veltri

END-OF-CHAPTER QUESTIONS

1. Describe the essential differences between cost effectiveness analysis and cost benefit analysis, and when each should be used.
2. Assume an SH&E practitioner’s annual wage is \$32,500, and that in your company fringe benefits are 25 percent of wages. What is the SH&E practitioner’s loaded (wage plus fringes) hourly cost to the company? Once you have determined the loaded hourly wage, calculate the cost to the company for the SH&E practitioner to spend 800 hours on this program in the next fiscal year.
3. Define the “time value of money” and explain why the process used to determine the time value of money is a critical to SH&E programs.
4. List at least five components of a HazCom program that need to be monetized for the purpose of performing a cost benefit analysis.
5. Assume you are planning to run a HazCom program for the next three years. Find the PV given a 3 percent discount rate and the following net benefit (NB) data:
 Year 3 NB = \$15,736, Year 2 NB = \$13,456,
 Year 1 NB = \$5,000
6. Assuming you had an initial (one time only) expense of \$9,500, what is the three-year NPV given the data in Question 5 above?

7. Consider the following data:

Project	I ₀	NPV	B/C
A	\$2,000	\$200	1.08
B	\$1,500	\$180	1.15
C	\$600	\$120	1.30
D	\$200	\$30	1.10

- Assume your annual HazCom training and education budget is \$2,000, and each of the following four projects needs to be accomplished. Which project(s) might you prefer and why?
8. Identify and define the three decision rules for cost benefit analysis as discussed in the chapter.
 9. Using Microsoft Excel or a similar spreadsheet, develop a three-year NPV cost analysis proposal for a HazCom program, listing at least three inputs and three outputs as defined in the chapter. Pick one discount rate and use a high- and low-end estimate for each cost and for each benefit. Also choose at least two inputs that are treated as initial investments. Now calculate the annual NPV and the NPV for years 1 and 2, and for years 1, 2, and 3.
 10. Using the precepts of organizational culture, discuss how you would “sell” to management a HazCom program that has a zero or slightly negative NPV.

SECTION 2

HAZARD COMMUNICATION AND RIGHT-TO-KNOW

Benchmarking and Performance Criteria

David Fender

END-OF-CHAPTER QUESTIONS

1. Where in the Code of Federal Regulations is the Hazard Communication Standard found?
2. What is the purpose of the Hazard Communication Standard?
3. OSHA written program requirements consist of what three major elements?
4. What are the MSDS exceptions to the Hazard Communication Standard?
5. What employees need to be trained, and when do they need to be trained, per HCS?
6. For hazard communication training to be considered effective, what should each employee need to understand upon completing training?
7. For what substances does OSHA require MSDSs to be readily available to employees?
8. What does OSHA mean by employee "immediate access" to MSDSs?
9. What requirements must the company meet if deciding to make MSDSs available electronically?
10. What information must be on labels of containers holding hazardous chemicals?
11. Name some acceptable alternative labeling requirements.
12. Does OSHA require employees to be trained on each chemical an employee may be exposed to? If not what are the acceptable alternative practices?

Exercise

The Dosit Corporation is a chemical manufacturer, and its products are sold to other manufacturers and used in household cleaning products. The company has 290 employees, with about 220 involved in the production process, 30 working as maintenance personnel, and the remainder in clerical, sales, engineering, and senior management positions. The company has never had a safety manager before recently hiring you. The company president instructed you to find out what is wrong regarding safety and health, and then to fix it. Several binders and files are given to you with the explanation that they are the existing safety policies and records. Looking through one folder, you find a chemical inventory list from two years ago that included 780 chemicals. You find no records of Hazard Communication training, and the existing written program is very minimal and inadequate. You also look at the MSDS files and find considerably fewer than 780 MSDSs.

1. What steps should you take to bring the company into compliance with the HCS considering best practices?
2. Develop a written program for this company that addresses all the critical elements.

Problems

1. You went on a tour of your company's chemical processing area with the production

- foreman. As with any such operations, there are pipes going everywhere and numerous tanks. You noticed that few of the pipes, and none of the tanks, have visible labels indicating what is in the tanks or pipes.
- a. Is this a problem from a safety or regulatory point of view? Why?
 - b. What would be your recommendation on labeling considering the regulatory requirements?
2. You have just finished training the entire workforce about chemical hazards. The training was not well received by the workforce, and they generally appeared to be bored; end-of-class quizzes indicated that they did not really grasp the essential information. You don't understand how this could be, because you carefully went over the MSDS for each chemical that a given group of workers were potentially exposed to and explained in detail the precautions they needed to take.
- a. What most likely went wrong in this training?
 - b. How could future training be improved, including the explanation of chemical hazards without specifically addressing each chemical?
3. During the inventory, you find in the maintenance shop a quart can of a chemical with a label. You find out that shop personnel only use it occasionally and for unfreezing rusted bolts. They don't seem to know anything about the chemical's potential hazards, and the wording on the container is not totally legible, so you aren't sure what the hazards are, either.
- a. How would you find out about the proper use, storage and disposal of this chemical?
 - b. How would you identify the chemical as hazardous, or as not hazardous?
4. During an inventory, you come across an unlabeled 5-gallon container of a chemical across which someone has written a chemical name. What should you do, if anything, about this container?

SECTION 3

ENVIRONMENTAL MANAGEMENT

Solid Waste

William Fink

END-OF-CHAPTER QUESTIONS

1. Exposure to harmful substances or environments accounted for how many fatalities out of 100,000 within the occupation of solid waste collection (NAICS 562111) in 2004?
2. Transportation incidents accounted for how many fatalities out of 100,000 within the occupation of solid waste landfill operations (NAICS 562212) in 2006?
3. Which regulation specifically excludes nineteen materials from hazardous waste definitions and includes them as solid waste?
4. What is the primary goal of RCRA?
5. Many new landfills collect potentially harmful landfill gas emissions and convert the gas into energy. Bioreactor landfills use aerobic, anaerobic, and hybrid technologies to increase the feasibility for cost-effective LFG recovery, which in turn reduces fugitive emissions. What are the advantages of this technology versus the dry tomb technology?
6. In 2005, U.S. residents, businesses, and institutions produced how many tons of municipal solid waste, translating into how many pounds per person per day?
7. Why is it important to leave out diseased and insect-ridden plants from a compost pile?
8. What are the three largest scrap-tire markets?
9. A landfill safety plan is a crucial safety management element for landfill operations. What four key elements need to be emphasized in such a plan?
10. An important facility safety consideration is traffic safety. Indicate the important safety considerations to make when designating haul routes to and from the waste transfer station.
11. What are odor-reduction operating procedures, and how can building ventilation and doorway positioning factor into odor control?
12. Reversing is a high-risk activity. The site should be laid out so as to eliminate or minimize the need to reverse wherever possible. Wherever reversing is required, all-around vision is essential wherever achievable. What are means and methods employed to reduce the risks of reversing?
13. Guiding vehicles through the use of spotters on the ground is a very high-risk activity. Actions to eliminate their use should be evaluated and implemented when reasonably practicable by improving site layout or traffic control and driver vision aids. In situations where spotters must be used, indicate the protective measure to be employed by management and the spotters themselves.

14. Tipping areas often have localized air-quality problems (dust and odor) that constitute a safety and health hazard. Dust can be particularly troublesome, especially in locations where dry, dusty commercial loads are tipped. Prolonged exposure to air emissions from

waste and motor-vehicle emissions operating in the building poses another potential health threat to facility employees. Facility air-quality issues can be addressed through which type of design and operational practices?

Preview

SECTION 3

ENVIRONMENTAL MANAGEMENT

Hazardous Material Spills and Response

George and Cherie Walton

END-OF-CHAPTER QUESTIONS

1. Name the three major federal agencies involved in the regulation of hazardous material spills and releases and their associated Code of Federal Regulations title number.
2. If a transportation accident results in a person being killed as a direct result of a hazardous material, to whom is the accident reported?
3. Which federal agency regulates the disposal of hazardous waste generated from spill clean up?
4. In most cases, individual states may require more stringent standards and regulations than the federal regulations require. What is the major exception?
5. Define "lower explosive limit."
6. (a) Will materials with a specific gravity of less than 1 float on or sink in water? (b) Do liquids with low flash points ignite more or less readily than liquids with high flash points?
7. Which of the following should be used as the last resort: engineering controls, administrative controls/safe work practices, or personal protective equipment?
8. What is the first step in development of an effective spill response plan?
9. Which kind of hazards pose an internal or external physiological threat to one or more parts of the human body?
10. Name the key elements of a spill prevention and response plan.
11. What does "PID" stand for and what is it used for?
12. What is the minimum number of hours of training required for workers who will respond to hazardous material spills and releases?
13. Must all employees engaged in HAZWOPER work be enrolled in a medical screening or surveillance program?
14. Name the three main factors that influence the selection of personal protective equipment.
15. What is the process of stopping a release or preventing its spread through mechanical means called?
16. What is the process by which contaminants adhere to the surface of a material called?
17. What is the primary purpose of decontamination?
18. What factors influence the extent of permeation?
19. In most situations, is it best to delay medical treatment until the victim has been decontaminated? Why?
20. As a container of hazardous materials is being unloaded from a delivery truck, the container is dropped and the package begins to leak. Is this a transportation accident? Why or why not?

SECTION 4

SAFETY AND HEALTH TRAINING

Regulatory Issues: OSHA

Lon Ferguson

END-OF-CHAPTER QUESTIONS

1. In OSHA's publication, *Training Requirements in OSHA Standards and Training Guidelines*, three methods for prioritizing training needs are discussed. What are these three methods?
2. Safety training is being influenced by workplace and workforce changes which, as a rule, tend to complicate the task of training. Identify three of these changes.
3. The Construction Safety and Health Outreach Program publishes *Tools for a Safety and Health Program Assessment*. This publication identifies three ways to assess the safety training intended to ensure that all employees understand the hazards they are exposed to. What are these three areas?
4. The documentation of safety and health training is a critical consideration. Identify five items that should be included in training documentation.
5. What is the first step in developing safety training, according to the OSHA training guidelines?
6. According to the OSHA training guidelines, what are the characteristics of well-written training goals and objectives?
7. The OSHA Training Institute's Education Centers support OSHA's training and education mission by providing what for OSHA?
8. What is the purpose of the OSHA Outreach 10-hour general industry course?
9. How can a safety professional use the safety and health topics Web pages?
10. What are some of the methods suggested by the OSHA training guidelines for evaluating training programs?

SECTION 4

SAFETY AND HEALTH TRAINING

Cost Analysis and Budgeting

Brent Altemose

END-OF-CHAPTER QUESTIONS

For Questions 1–3:

Fancy Foodstuffs Inc. is evaluating the costs to conduct ongoing ergonomics training at its manufacturing facility. Two safety professionals (hourly pay rate = \$30/hr.) are to deliver the training. The course materials have already been developed, and the yearly ongoing cost for development and for materials is negligible. They offer fifteen different one-hour sessions per year, and an hour is required for scheduling and preparation for each session. Approximately 450 paid employees from the plant attend the training each year, with an average hourly pay rate of \$15 per hour. In addition to the training time, cost of employee benefits is approximately 50 percent of the employee's pay rate.

1. Compute the total yearly cost of the training.
2. What percentage of the total cost of the ergonomics training at Fancy Foodstuffs Inc. are student costs?
3. Now consider the indirect costs of ergonomics training at Fancy Foodstuffs based on the following data: Each time wage employees attend the ergonomics training, production slows down. Although jobs are rotated to minimize the impact, historical data has shown that production drops by 5 percent on days when the training is delivered. The average profit value of one full shift of production at this plant

is \$5000. What is the total cost of ergonomics training when these indirect costs are included?

4. A large research hospital is considering a new computer-based training course for lab safety. The total cost of the hospital's current training program is \$80,000 per year. If the new training program will reduce these costs to \$60,000 per year, what is the maximum acceptable cost to initiate the program to reach the break-even point within three years? What is the return on investment for that scenario?
5. Compare the two training alternatives below using the net-present-worth equation for a rate of return of 10 percent:

Conversion of Future Costs (F) to Net Present Worth (P) at Year 1

	Outsourced training	Internal training
Year 1	P = \$150,000	P = \$200,000
Year 2	F = \$150,000; P = ?	F = \$150,000; P = ?
Year 3	F = \$150,000; P = ?	F = \$125,000; P = ?
Year 4	F = \$150,000; P = ?	F = \$100,000; P = ?
Present cost	P = ?	P = ?

6. Three years ago a multinational insurance company implemented a defensive driving training program for its sales force worldwide.

The first year cost of the training was \$400,000; the cost in years 2 and 3 was \$200,000 each year. The total cost of vehicle accidents did not drop for the salespeople in the first year, when it was \$3,250,000, but it has dropped 10 percent per year in the second and third years of training. Has the program paid for itself yet? If not, when will it?

7. Name five possible financial benefits of safety training.
8. What is the first step in a cost-benefit analysis of training?
9. Why is it important to keep a log of expenditures from a departmental budget even if the finance department keeps track of these for you?
10. If a cost-benefit analysis indicates that a training course is not financially beneficial to the organization, why might you still conduct the course?

Preview

SECTION 6

FLEET SAFETY

Regulatory Issues: OSHA and Other Regulations

Nancy Bendickson

END-OF-CHAPTER QUESTIONS

1. OSHA has jurisdiction over off-highway loading and unloading. Provide seven examples of where off-highway loading and unloading takes place.
2. If a truck driver becomes an emergency responder in the event of a spill, DOT has jurisdiction. True or False
3. List the top three types of injuries for employees in the truck-driving industry.
4. What are the events or exposures that lead to truck-driver injuries?
5. List the five commonly cited standards for the trucking industry.
6. Describe the key requirements of CFR 1926.600, Equipment.
7. Rollover protective structures (ROPS) requirements are included in construction and agricultural vehicle regulations. Identify the regulation number for ROPS.
8. Marine terminal vehicle regulations are outlined in CFR 1917.44. List 5 general areas that are covered by the standard.
9. The number of occupational motor-vehicle fatalities is more than 30 percent of the annual number of fatalities from occupational injuries. True or False
10. Although the roadway is not a closed environment, employers need to develop strategies that combine traffic safety principles and sound safety management practices. List two resources for motor-vehicle safety.

SECTION 6
FLEET SAFETY

Benchmarking and Performance Criteria

Edward Musal

END-OF-CHAPTER QUESTIONS

1. Compare the advantages of a centralized and a decentralized accident-reporting systems for a large fleet.
2. Explain why the critical incident technique would be more effective in a small fleet than a large fleet.
3. Vehicle accident analysis of a nationwide fleet has determined that a fleet location in rural Iowa has the best accident statistics in the country. Explain why this would be a poor benchmark for a New York City fleet location.
4. During one year a fleet had four vehicle collisions and traveled 80,000 miles. Calculate the accident incidence rate per 1,000,000 miles.
5. To the right is a chart showing fictitious data for a fleet unit. Calculate the accidents per million miles for each month as well as the rate for the 24-month period. Calculate the upper and lower control limits for a 99 percent confidence interval.
6. What is the major difficulty that must be overcome in running a safety incentive program?

Time Interval	No. of Accidents	Miles Traveled	Accidents Per Million Miles
1	13	200,013	
2	14	190,111	
3	12	201,208	
4	10	199,678	
5	12	201,968	
6	10	200,500	
7	11	199,249	
8	12	199,357	
9	11	200,213	
10	13	201,498	
11	12	200,138	
12	13	201,225	
13	14	201,123	
14	12	198,014	
15	13	200,113	
16	12	200,167	
17	10	201,212	
18	11	201,491	
19	11	199,985	
20	12	200,034	
21	11	200,250	
22	11	201,313	
23	10	200,118	
24	10	201,200	
Sum	280	4,800,178	
\bar{p}			
$\frac{\bar{p}(1-\bar{p})}{n}$			
$\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$			
$2.576 \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$			
UCL			
LCL			