

Cost Analysis and Budgeting: Risk Analysis and Hazard Control

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Introduction

Many of you have heard it said that “The business of business is business” (Davis, 2005). Well, I agree with that statement. I’ll also add that “the business of safety is business.” As safety professionals, it is our responsibility to assure that management:

1. Is aware of safety problems that may exist or have the potential to exist
2. Knows the importance of solving those problems in terms of human and monetary loss
3. Is cognizant of the options available to them for solving the problems
4. Has been clearly informed of the costs and, hopefully, the cost benefits of solving the problems.

As safety professionals, our responsibility is simple. We are hired for two clearly defined roles: to monitor and advise. We monitor by observing the workplace, comparing what we observe to established standards, and measuring the deviation from those standards. For example, we collect information from members of front-line management on near-misses they have observed in their own work area. Based on our own experience, or that of the supervisors, we attempt to estimate how often the near-misses occur, and how many incidents or accidents may occur during the year based on those near-misses. “We’ve been doing this for years and we haven’t had an accident yet,” is a common response we often hear from supervisors when we’re trying to build a case to fix a potential problem.

Once we’ve been made aware of a problem, through personal observation, observation of others, or reports we’ve read in professional journals, it is our responsibility to investigate the problem and determine the depth and the breadth of that problem—not only in terms of dollars and cents, but in terms of human suffering as well. Both need to be accounted for, but we’ll dwell on the latter in this presentation. Once the breadth and depth of the problem has been established, we, as safety professionals, generate possible solutions to the problem and present those to management with the costs and benefits of implementation of each. We give them advice on what problems need to be addressed and the most effective manner of addressing them.

Let’s attack this problem systematically by working our way through each of the above four steps and examining approaches to each.

Awareness of the Problems

Before management can become aware of the safety problem, the safety professional must first identify the problem and be able to describe it. There are numerous ways to become aware of safety problems, and we'll explore some of them here:

1. *Review records to learn where costly problems exist.* The OSHA 300 log, workers' compensation records, first-aid cases, or purchasing records can often provide a trail of costly mistakes needing attention. Of course, the problem with this approach is that it is after-the-fact, but it is a good place to begin.
2. *Use a checklist:* often available from insurance companies, OSHA, or even safety textbooks. Generic and some specific lists can be found online with a simple Google search. Identify hazards by following the list.
3. *Follow the process.* Identify hazards by observing the product as it is process, assembled, painted, and packaged. Start at the point or points where the raw material or goods in any state of finish enter the facility and follow it through to the end. Look for problems along the way. An important part of this approach is to spend time talking and listening to employees who interface with the production process. Typical questions include, "Tell me about an incident where you saw someone get hurt," or "Recall an incident or near-miss."
4. *Study near-miss reports* which are valuable in themselves. I suggest having an anonymous form available for all employees to self report or report on others regarding incidents or accidents that almost happened. Sometimes the difference between a near-miss and a serious accident is simply a matter of chance.

Determining the Importance of the Problem

All of the above methods point to problems that may need your attention. Once the problem or potential problem has been identified, each should be examined carefully as to its cost or potential cost. Of course, the first consideration is the human cost. What potential does this situation have to cause death or physical harm? Ask yourself how a person might be injured and what might be the extent of such an injury. Once you've made that determination, examine records or discuss it with your insurance carrier to estimate the total cost of such an injury. Add to that the cost of property damage likely to result to estimate the direct costs of such an incident. Under certain circumstances, there may be additional direct costs. If this accident is likely to interrupt production that can not be made up without extra costs, that should be considered too. Ask yourself what incremental costs are going to occur as a result of this accident. These are fairly easy to justify as actual costs of an accident.

Once an accident occurs, there will also be additional indirect costs that should be included in considerations. These could include such items as necessary training or education for a substitute for the person injured or killed, additional administrative costs to handle hiring of a replacement, or increased insurance premiums. A well-known rule of thumb is that, for every dollar spent in direct costs for an accident another two dollars will be expended in indirect costs. Indirect costs are much harder to justify and much harder to sell to management and, in turn, may be suspect. Don't base your argument on indirect costs unless you can make a firm case that they are likely to be spent. In any case, your goal is to add up the total costs of dollars expected to be expended. If there are multiple, possible outcomes of the accident with multiple, possible dollar losses, consider what you think will be the average cost of a given accident. Multiply the total cost by the total number of accidents you have per year to get your annual cost.

If this accident has occurred and continues to occur on a regular basis, your job is easy. Calculate the cost of each occurrence and multiply the number of occurrences per year. You know the dollar cost of the event. If the accident does not occur regularly, you may have to estimate the probability of the event in one year. Base this on the number of years of exposure

and the number of years employees have been exposed. If you have an exposure that occurs to seven employees six times per year and an accident only occurs about once every five years or you estimate it is likely to occur once every five years, do the calculation as follows. $7 \times 6 = 42$ exposures per year. If an accident occurred once per year, the probability of occurrence in one year would be $1/42$. Since it only occurs once every five years, the estimate of occurrence in a given year is $1/(42 \times 5)$ or $1/210$ or .005 or one-half of one percent or .5%.

Now that you have estimated the total cost of the accident, as well as the probability of loss in a given year, multiply the annual cost by the probability of occurrence in a given year. If the accident occurs more than once per year and, under the current conditions, you use 1.00 as the probability. You have already accounted for the multiple times per year in the earlier step when you multiplied total cost by total number of accidents per year. If, for example, your total cost of an accident is \$100,000 per year and the probability of an accident occurring in a given year is .005, the estimated value of *annual* dollar savings is $\$100,000 \times .005 = \500 . The key word here is “*annual*,” because you can expect to save this amount of money each and every year from now on, if you have completely eliminated the problem. The question becomes, what is the value of a savings that continues year after year and never ends?

From a practical standpoint, management won't write you a blank check and tell you to spend whatever you want since the savings go on forever. The reality of the matter is that, even a forward-thinking management team isn't likely to look much beyond five to eight years of savings. The most they would typically consider would be that this fix would save the company from \$2500-\$4000 over the life of the change. Another consideration is that \$1 received in the future is not as valuable as \$1 received today. The value of that future dollar depends on the return on investment management can get elsewhere. Safety competes with every other entity in the organization for operating dollars. Money that goes to safety can't be spent on market development, new product design, or pension plans. It must provide a solid return on its own and that return should at least match what is available elsewhere. If management expects to get a ten percent return on money invested in other parts of the operation, then one dollar to be received a year from now is only worth about \$.91 today. You may ask why it isn't worth \$.90. That's because of the compounding of the interest that occurs throughout the year. One dollar to be received two years from now is only worth about \$.83 today. A dollar to be received five years from now is worth only about \$.62 today. In order to calculate the total value of the savings for the five year period, the value of the dollar to be received each year in the future is added together. In this case, total value equals \$3.79 for one dollar saved each year for each of the next five years. Of course for \$5,000 the total value is 500 times one the value ($500 \times \$3.791$) or \$1,896.

These calculations are easily made through the use of a Present Value of an Annuity Table which will tell you the present value factor of \$1 to be received at the end of each year for a given number of years at various percentages. You can easily find “present value tables” by doing a Google Search for the same.

This brings us to the bottom line. In our case we would be willing to spend no more than approximately \$1,900 to save \$500 per year from now on (assuming projected savings are capped at five years and the company expects a ten percent return on its investment). The same technique holds true for any anticipated expenditure designed to save money for the organization. You can do the calculation yourself by using the following formula:

$$FVA = \sum_{t=1}^N \frac{1}{1+i}^N$$

Cognizance of Options for Solving the Problem

This approach gives you ample evidence of the dollar savings eliminating a certain type of accident will offer. The next step is to generate viable solutions within the dollar cost figure. Your options include:

1. Avoid the risk altogether. You may find that you are unnecessarily subjecting your employees to risk that could be avoided by contracting certain hazardous activities out to another firm or eliminating certain activities that contribute nominally to the overall operation of the business. With appropriate investigation you may learn that you can engineer the risk out of the process.
2. Continue to engage in the activity but institute administrative or engineering controls to minimize the risk. Although you may not eliminate it, you may be able to reduce it substantially. You are essentially lowering the probability of loss and you can figure this savings into your formula. In certain cases you may effectively eliminate the risk through the application of certain administrative controls.

Informing Management

As the safety manager, it is your responsibility to explore the options and convey your findings to management. This will include informing management of not only the options, but also the cost effectiveness and benefits of implementing those options to be considered. Through the use of cost analysis and application of present values, this can be done in a concise and logical manner. The job of management will be to weigh your advice based on the various possible loss scenarios against other options that provide a return on investment. If they choose to not follow your recommendations, it should be on a rational basis, in that they have more attractive investment opportunities available to them. The other factor that must weigh into this decision is the cost of human suffering—the moral value of correcting the problem. The safety manager has the job of convincing management that the intangible cost of human suffering must also be considered and must be factored into the equation.

Summary

In summary, the job of the business of safety is knowing the problems that exist and their importance in human and monetary terms, informing management of the problems and viable solutions to the problems, and finally convincing management to act on those solutions in the best interests of the organization and the employee.

Reference

Davis, Ian 2005. "What is the business of business?" New York: McKinsey & Company, The McKinsey Quarterly 2005 (cited 21 December 2005). Available from World Wide Web:
http://www.mckinseyquarterly.com/article_page.aspx?ar=1638&L2=21&L3=37)