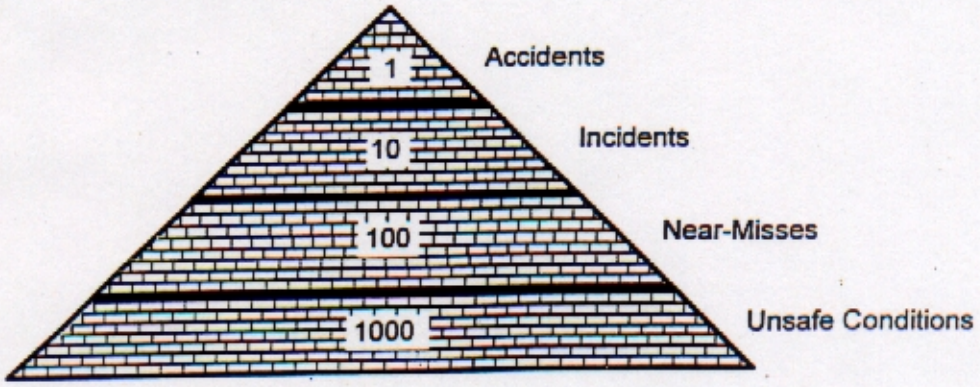
Physics Division ESH Bulletin 95-2

A GAMBLER'S VIEW OF CORRECTIVE ACTIONS

When To Bet/When To Fold

A winning gambler knows the odds. He knows that, in the long run, he can't beat the odds. Therefore, he looks for opportunities where the odds are in his favor. When he finds this, he bets more. And if the odds are against him? He folds and waits for the odds to improve.

Preventing accidents can also be viewed as a numbers game. One can view accidents, incidents, near-misses, and unsafe conditions as proportional. For example, for every major accident, there may be 10 incidents. For every incident, there may be 10 near-misses. For every near-miss, there may be 10 unsafe conditions in the field. We can represent this relationship with a pyramid.



Assessing Your Odds

The shape of the pyramid is determined by the number of accidents you have compared to the number of unsafe conditions. The pyramid above shows the standard safety theory assumption: a factor of 10 difference at each level of the pyramid.

The shape of your pyramid at your facility will determine your odds when trying to prevent accidents by implementing corrective actions to incidents, near-misses, and unsafe conditions. The flatter the pyramid, the more unsafe conditions you have for each accident that occurs. If we assume that we can't tell which unsafe condition will lead to the next accident, then, statistically, for the pyramid above, we must correct 1000 unsafe conditions to prevent an accident.

Are implementing these corrective actions worthwhile? How would a gambler evaluate the situation? If a gambler knows the value of the pot and the odds of winning, she can calculate how much each ticket is worth. For example, if the pot is worth $1000 and there are 100 tickets, the tickets are worth no more than $10 each. If the gambler can buy tickets for $5 each, she knows that in the long run (after playing the game hundreds of times), she'll double her money. On the other hand, if tickets are selling at $20 each, she knows that after playing the game hundreds of times, she'll go broke.

Value of Each Corrective Action

Corrective actions can be viewed the same way. First calculate the total cost of an accident. To do this, imagine the worst accident possible - your worst nightmare. What are the direct costs in damaged equipment, increased insurance costs, and lost profit? What are the indirect costs in injuries, deaths, negative public relations, increased regulatory scrutiny, and future lost opportunities? What are the industry costs? Assume the total costs for the worst accident are $1,000,000,000 dollars. What are the corrective actions worth? For the pyramid below, we would divide the billion dollars by 1000. The result: on average, each corrective action is worth $1,000,000. Therefore, we are playing a winning game is on average each corrective action costs less than $1,000,000.

Changing The Odds

Unlike gambling, you can change the odds when implementing corrective actions. Two examples are:

- Analyze incident statistics to identify which types of problems or which areas or equipment contribute most to severe accidents. Then, prioritize your corrective actions to target severe accidents. This will narrow the base of your pyramid and improve the cost effectiveness of your corrective action.

- Don't spend much time or put much effort into incident investigations and root cause analysis. The result? You'll be playing a losing game because you have effectively widened the base of your pyramid. With poor corrective actions that don't work well you will have to implement more of them and actually reduce the cost effectiveness of your system.

Operating Experience Program, Office of Nuclear and Facility Safety

OPERATING EXPERIENCE
WEEKLY SUMMARY