WHY A SMALL CARROT BEATS A BIG STICK

or

How to Motivate Continuous Improvement in Safety Performance

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SUMMARY

The greatest challenge in health and safety is to establish a trend of continuous improvement in performance. This is just as difficult for a company whose performance is 'stuck' at a high accident rate, as it is for one where the rate is so low that measures such as LTIFR become meaningless.

Incentive programmes have had a bad press in the past. This paper examines those that have failed and those that have succeeded in order to discover the essential ingredients for success. Several case studies and references are given in support of the underlying theory of 'Risk Homeostasis'- one of the most powerful theories of modern day risk management - which governs whether such incentive/recognition approaches work.

All in all, the paper describes a practical approach, based on sound, and tested theory, to motivate a cycle of continuous safety improvement. The adoption of these principles will act to drive down accident rates and workers compensation costs by creating a culture based on recognising and rewarding good, desirable performance.

INTRODUCTION

To those of us who lived through the 'behaviour modification' phase of safety management thinking in Europe, during the 1980's, some of the recent activity in Australia creates a strong sense of déjà vu. Undoubtedly, it is possible to motivate changes in behaviour by the use of certain techniques. However, it is now generally appreciated that one-off exercises are unlikely to stimulate sustained changes in behaviour.

Long term, good 'safety behaviour' can only be achieved by the creation of a good safety culture, where peer group pressures act to encourage individuals to conform to the societal norms within a company or workplace. Unfortunately, there do not seem to be any 'magic bullets' when it comes to positive culture change. Culture is often described as "the way we do things around here", or "the virus you catch when you join our company". Developing a good culture is no accident; it takes a great deal of time and effort. On the other hand, getting a bad culture is all too easy.

This paper is about a well tested approach to motivating desirable safety behaviour, which has often been tried in the past, but has mostly failed: incentives. Often the causes of failure are not well known and almost a mythology has grown up around why such approaches will never work. However, where incentives have worked, they have worked very well. This paper considers what are the secret ingredients that will ensure that a safety incentive scheme will work.

> *"The basic philosophy, spirit and drive of an organisation have far more to do with its relative achievements than do technological or economic resources, organisational structure, innovation and timings. All these things weigh heavily on success. But they are transcended by how strongly the people in the organisation believe in its basic precepts and how faithfully they carry them out."*
> Tom Peters

RISKY BEHAVIOUR AND PERCEPTIONS

A large number of human mishaps are the consequence of our daily actions, habits and lifestyles. We add to the probability of these mishaps every time we drive our car, board a plane, climb a ladder, have another cigarette or alcoholic beverage, cross the street, lift a heavy object, light a fire, go swimming or jogging, handle work tools, and so on.

When mishaps occur, they usually involve comparatively few people, but as they are so common, these 'minor' disasters add up to large numbers in a country or state's statistics. Millions of people engage routinely, if not daily or even several times per day, in potentially hazardous activities.

When reviewing risks taken by large numbers of people it is possible to find some surprising results.

For instance, we all know that smoking cigarettes is associated with various diseases of heart and lungs, and thus with early death, and we know that stopping smoking reduces the likelihood of contracting these diseases. Most people would therefore expect a lower incidence of lung and heart disease amongst people who stopped smoking. They would be correct, these illnesses do, in fact, develop less often in this group.

However, against common belief, we do not find a lower fatality rate for this group. In one comparison between a group of stoppers and a control group, the life span of the stoppers was found to be a little shorter[1]! The difference in mortality rates between the stoppers and the control group was not statistically significant, meaning that the probability of its occurrence on the basis of mere chance was greater than one in twenty. But, these findings do not confirm common popular belief that if you stop smoking you live longer.

If you wear a seat belt in a car, most people would expect that you are more likely to survive a crash than if you don't. So you might therefore expect that laws compelling drivers to wear seat belts, and that increase the seatbelt-wearing rate, would reduce a country's traffic fatality rate per head of population. You would also probably expect similar results from the construction of 'safer', more crash resistant cars and the building of better, straighter highways. However, this again is not the case,[2, 3]. Our perceptions about risk and its control can be surprisingly wrong.

To many it is also a surprise that, in most developed countries, the rate of death due to accidents (per person) has remained virtually the same throughout this century (except during wars). These rates include fatal accidents of all types per head of population, and are corrected for historical variations in the gender and age composition of the populations concerned. They show no clear downward trend, despite the massive technological, legislative and medical advances made during this time.[4]

These results seem difficult to comprehend. It also seems hard to appreciate why these rates have not been influenced by the obvious progress in safety engineering, by the enforcement of safety laws, by safety campaigns, or following the advances in the acute medical treatment of accident victims. Clearly there is some 'law' or practice occurring here that we do not understand.

All these surprising results can be explained by Risk Homeostasis Theory. This says that, in any activity, people accept a certain subjective level of risk to their health and safety, in exchange for the subjective benefits they feel they will receive from that activity. They balance the risk against the benefit, a sort of 'implicit' 'so far as is reasonably practicable' calculation.

RISK HOMEOSTASIS THEORY[5]

In any activity, people unconsciously estimate the amount of risk they feel they are exposed to. They compare this with how mush risk they are willing to accept, and try to minimise the difference between the two. So, for example, if the person feels that the level of risk to which he perceives he is exposed, is lower than he feels comfortable with, he will do something to compensate so as to increase his exposure. If, on the other hand, he feels that the level of risk is higher than he find acceptable, then he will take action to reduce it.

Consequently, he will choose his next action so that its subjectively assessed risk matches an acceptable level. During that next action, perceived and accepted risks are again compared and the subsequent adjustment action is chosen in order to minimise the difference, and so on.

It can be seen, therefore, that people change their behaviour so as to bring their perceived level of risk to as close to that which they feel is acceptable, under the circumstances. They do this, very much as a thermostat moderates the temperature in a room. If it gets too hot, it switches the heating off. When it gets too cold again, the heating is switched back on. This 'acceptable' level of risks varies between individuals, but is mostly influenced by the society and peer group the person find himself in. This risk 'set point' is often called, somewhat misleadingly, the 'Target Level of Risk', or the risk appetite of the person or social group concerned.

It can be seen that there is also a closed loop in that past actions and their acceptance by society, influences both the present and the future risk performance: the accident/incident rate essentially depends on the amount of risk people are willing to accept.

This has very important implications for safety management. It means that if we attempt to impose certain safety requirements, they may not work at all in bringing down the overall accident rate. The employees concerned will still find some other way of satiating their risk appetite. To be successful, our approach must involve measures that act to reduce the risk set point, to reduce the individual and also his social group's appetite for risk.

This theory therefore provides a way of understanding why although people might alter their behaviour in response to the implementation of health and safety measures, but the riskiness of the way they behave does not change. This will only occur if those measures are capable of motivating people to alter the amount of risk that they are willing to tolerate.

Figure 1: Homeostatic risk model

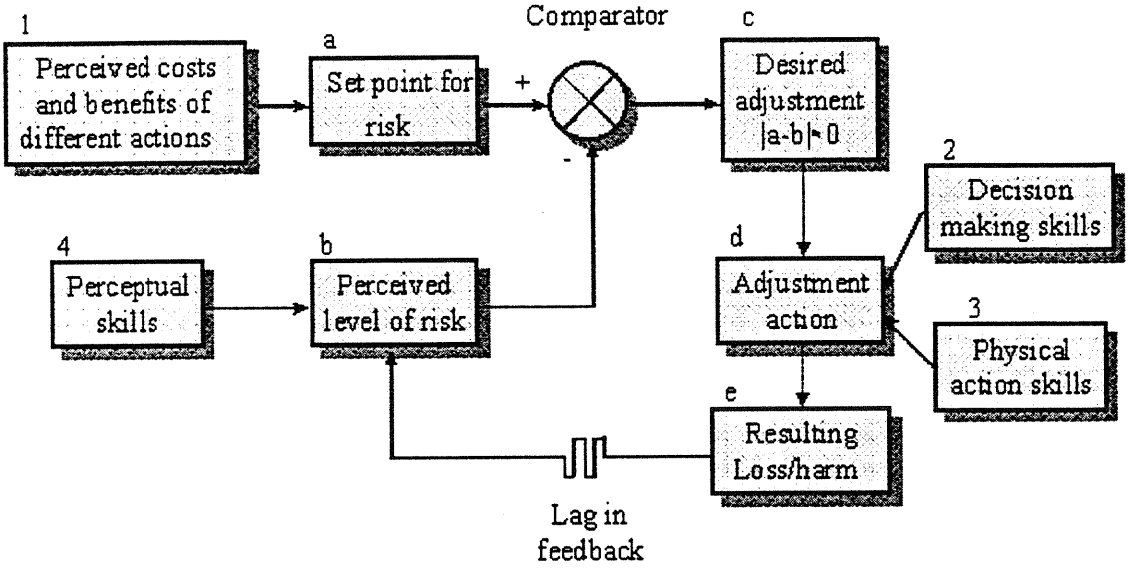


Figure 1, (taken from Reference 5) shows how the homeostasis theory works, like a thermostat in action. A variety of factors (Box 1) determine the level of risk that different people are willing to take during any given time period. When the expected benefits of risky behaviour are high and the expected costs are perceived as relatively low, the set point for risk (Box a) will be high.

The set point for risk is determined by considering four types of motivational factors:

1. The expected benefits of riskier behaviour such as, gaining time by speeding, making a risky manoeuvre to fight boredom.

2. The expected costs of riskier behaviour such as injury and suffering as a result of the accident or misery and hardship for your family if you die.

3. The expected benefits of safer behaviour such as a longer or higher quality life.

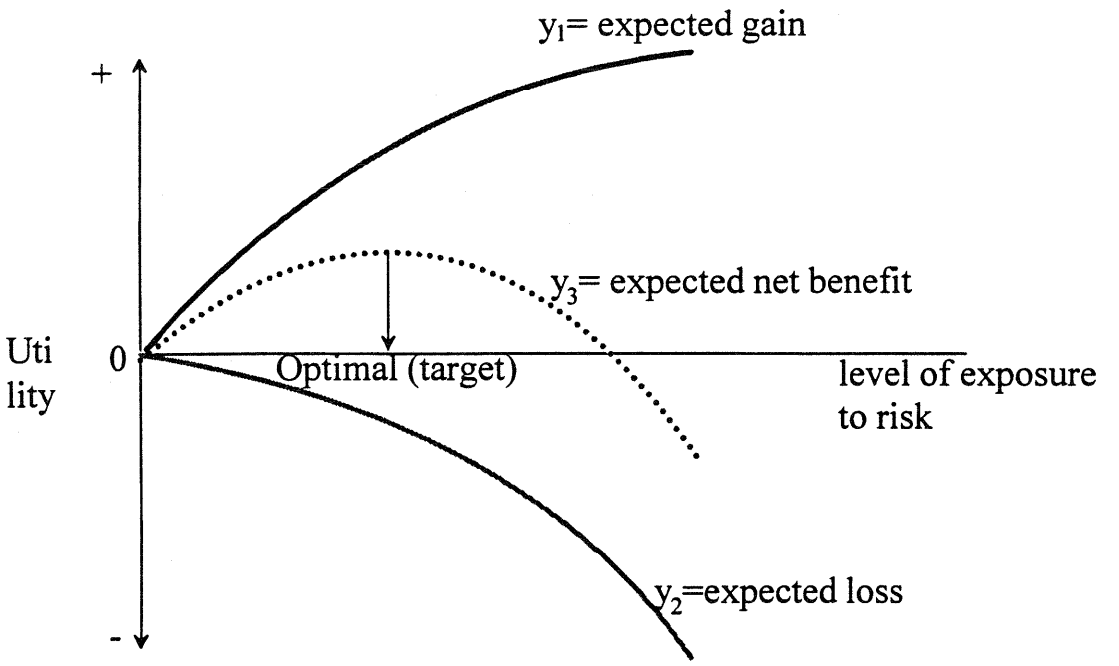
4. The expected costs of safer behaviour such as using an uncomfortable safety belt or being called a wimp by one's peers.

The higher the values in categories 1 and 4, the higher the risk set point. The risk set point will be lower as the values in categories 2 and 3 rise. Sometimes the factors in all four categories can be economic in nature; sometime they are of a cultural, social or psychological kind. This implies a further level of subjectivity in that persons also equate financial costs again levels of harm and suffering.

While I have described a step-wise, explicit process here, this is normally so internalised that most people, most of the time, are not consciously aware of it going on. Thus, the risk set point should not be viewed as something that people arrive at by explicitly calculating probabilities of various possible outcomes and their respective positive or negative values.

In our materialistic society it is obvious that economic forces play an important role among the motives that influence anybody's risk set point. However the risk of an accident may also be accepted for the purpose of seeking variety, fighting boredom, curiosity, and adventure. For example, people actually seek uncertainty and therefore risk, to improve their 'quality of life'. This is the reason they travel long distances or wish to visit strange places on holidays or at weekends. This also may be why they break safety rules and change out of a safe method of working, why they take 'risks'.

Figure 2: Optimising Net Benefit



Why people opt for a level of accident risk that is greater than zero can be explained by referring to Figure 2. As you move from left to right along the horizontal axis of exposure to risk, both expected gains and expected losses increase. As you take greater risks, the benefits increase. But so too do the potential losses. For example, if you drive faster, you both get to your destination quicker, and get a thrill from speeding. However, you have less time to react and face much more serious injuries if you crash.

For each level of risk, the expected net benefit equals the expected gain minus the expected loss. In Figure 2, the curves describing expected gain and expected loss have been drawn such that the expected net benefit curve rises from left to right, then reaches a maximum, before declining. At zero speed or zero subjective risk, there is no mobility and no net benefit of mobility. When speed is extremely high, the expected loss is greater than the expected gain and the expected net benefit falls below zero.

People therefore avoid the extremes and neither minimise nor maximise the risks of accidents. What they do, instead, is attempt to maximise the expected net benefit from road travel and choose a speed and other actions accordingly. Since zero risk is obviously not a meaningful goal, because there is no behaviour with total certainty of outcome, people optimise their risk level above zero.

TRAINING FOR SAFETY

This model also has interesting implications for safety training.

Figure 1 shows that there are three types of skill that have an effect on the level of risk perceived and the risk control actions performed: perception skills, decision-making skills and practical skills. Perceptual skill (Box 4) influences how well the person's subjective assessment of risk (Box b) will correspond to the actual level of risk. Perceptual skill includes the ability to correctly assess one's level of decision-making and the ability to take action. This is important, because it implies that persons with limited decision-making skills are at no greater accident risk, provided they realise their limitations and act accordingly. Conversely, if the more skilful overestimate their level of skill to a greater extent due to overconfidence, they may be at a greater level of risk than the less skilful. Similarly, individuals with superior levels of all three types of skill are more likely to get involved in accidents than people with lower levels of skill, if their risk set points are higher.

Decision-making skill (Box 2) refers to the operator's ability to decide what she or he should do in order to produce the desired control action (Box c) so that the difference between the set point and the perceived level of risk is minimised, that is, [a-b] equals about zero. It then depends upon the person's physical action skill (Box 3) as to how

effectively he or she can carry out that decision.

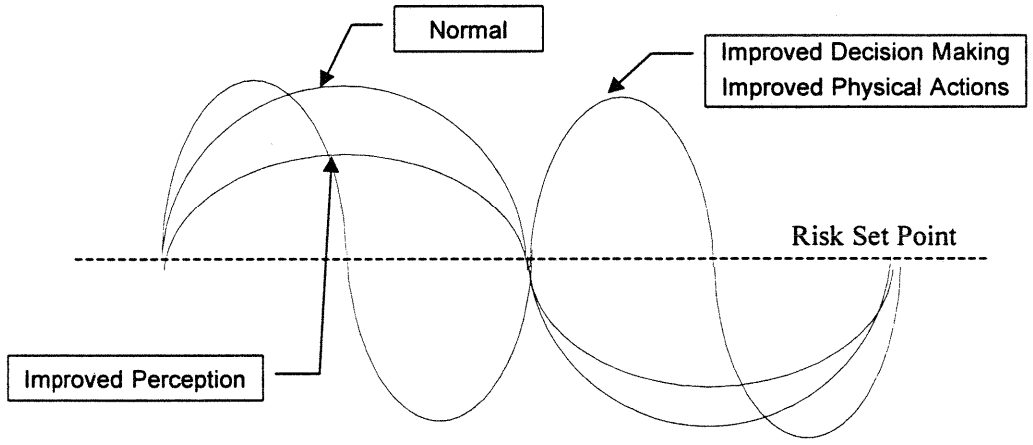
> *"He who fears dangers will not perish by them"*
> Leonardo de Vinci

The level of performance in any task can be improved by two contrasting methods:

- fitting the operator to the task; and/or,
- fitting the task to the operator.

The first can be achieved by providing good training procedures, by repeated practice on the task, and by providing people with knowledge of their level of performance. The second can be achieved by creating a workstation and a physical work environment that enable the operator to perform the task at a more efficient level. Thus, the level of work performance can be improved by proper training on the one hand, and, on the other, by an ergonomically designed human-made environment, including controls and displays that act to reduce human error.

Figure 3 ***Effect of Training***



Many of these actions, however, are unlikely to have a lasting effect upon accident rate, unless they also affect the risk set point. The employee's task is not to minimise accident risk, but to maintain it at a level that is in keeping with his risk set point, that is, his optimal level of risk. He acts in accordance with what is reflected in popular sayings such as "nothing ventured, nothing gained", "no pain, no gain", "no guts, no glory". The desire to maximise overall benefit offers the strongest motivation toward the improvement of one's skills.

The better one's skills, the easier it is to take actions that optimise the expected net benefit, to get closer to the risk set point. The bad news is that training your workforce to improve these skills is not likely to act to reduce the accident rate. This is shown in Figure 3.

REDUCING THE RISK SET POINT

This is the challenge: to act to reduce the accident rate one must act to reduce the level of risk that is tolerated in a social class such as a workforce or an industry.

The approach to this involves examining four potential tactics:

Increase the perceived benefit of safer behaviour	Tactic A
Decrease the perceived cost of safer behaviour	Tactic B
Increase the perceived cost of risky behaviour.	Tactic C
Decrease the perceived benefit of risky behaviour	Tactic D

Penalising Risky Behaviour

The traditional approach to safety management is to use tactic 3, to penalise and punish those who adopt risky behaviour. The enforcement of punitive laws is the normal response by society to motivate people towards safety. However, the evidence of its effectiveness has to be questioned. For punishment to work, firstly the crime has to be detected, then the criminal has to be 'processed',

convicted and an appropriate sentence imposed and implemented. There are many problems and risks with this process, not least that a 'legal' response has to be seen to be 'correct' and appropriate by the society on which it is imposed. There seems to be a natural law that says that a law cannot be enforced if it is stricter than public opinion feels is warranted by the crime committed: the penalty must fit the crime.

There is also a self-fulfilling aspect to labelling people as criminal; they then tend to act like criminals and may exhibit the behaviour that you are wishing to curb. The other downside is that by adopting a punitive approach, we do not focus on the outcome of safety. Often, the controls put in place seek to control separate actions, not to encourage safe working in general. For example, road signs say what you shouldn't do rather than indicating what you can do. They seem to be designed to ensure that blame can be attributed rather than to encourage safe behaviour.

> *"It is not cruelty or severity that renders punishment an effective deterrent, but rather it's certainty."*
> Cesare Beccaria, 18th Century

Punishment also brings negative side effects such as a climate of resentment, un-cooperativeness, antagonism, sabotage and so on. In this way, the behaviour to be prevented may, in fact, be stimulated. Punishment certainly increases the inclination to beat the system and creates 'folk heroes' out of those who do.

Rewarding Safe Behaviour

Incentive programmes for safety have both the effects of focussing on greater safety and of creating a more favourable social climate.

Study 1[6]

In the mid-1970s an innovative and relatively large-scale experiment was conducted in California. The Division of Highways in that state contacted 9,971 drivers who had caused collisions or committed violations in the previous year and, thus, had incurred recent demerit points. These drivers were informed by letter that they would receive a free 12-month extension to their driver's licence on the condition that they achieve a clean record during the coming year. Apart from the financial incentive, amounting to a few dollars per year, this offer also implied deferral of the obligation to submit oneself again to the written part of the driver's examination, which, in California, is administered repeatedly throughout a driver's career.

A control sample of another 9,976 drivers was not approached in this manner, but they too were followed up, along with the experimental group, over a period of several years. The findings include the following: In the first follow-up year, there were significantly fewer accident-involved drivers in the experimental group, particularly among the younger drivers and among those drivers whose licence renewal was to come up within one year after receipt of the letter. In this latter group, the accident rate was 22% lower than in the appropriate controls. The drivers who actually earned the bonus after one year showed 33% fewer accidents in the second follow-up year than did the controls.

Study 2[7]

Professional drivers employed by the German branch of Kraft Foods Corporation, with a fleet of about 600 trucks and vans, were told in 1957 that they would receive a bonus of 350 Deutschmark for every half year of driving without culpable accidents, that is, without accidents in which they were judged to be at fault.

In the first year after the initiation of this incentive scheme, the frequency of culpable accidents per 100,000 km driven fell abruptly by about one-third, and subsequently continued to drop more smoothly. In 1981, the accident rate per km amounted to about 14% of what it had been in 1956, prior to the programme. The rate of all accidents, culpable or not, fell to 25% of what it had been in 1956.

The direct financial accident costs per km driven showed a steeper decline than the accident frequency per km driven. This indicates that the incentive programme was particularly effective in reducing the occurrence of more serious accidents. The total implementation costs of the programme were estimated at some $35,000 U. S. per annum, but these costs are reported to be far outweighed by the reduction in insurance fees resulting from the much-improved safety record. This programme has been in force for over three decades without showing signs of waning effectiveness.

In a recent review[8] of over 120 published evaluations of different types of occupational accident prevention approaches, incentives were generally found to be more effective in enhancing safety than were engineering improvements, personnel selection and other types of intervention (including disciplinary action, special licensing, and exercise and stress reduction programmes). Reductions in accidents per person-hour of between 50% and 80% of the base rate are not uncommon in manufacturing, construction and other industries.

Other Studies

1 An American team-based incentive programme addressed at transit bus operators yielded a 25-35% reduction in accident rates as compared to randomly selected controls within the same company. The ratio between programme costs and benefits was estimated at almost seven-to-one. After the programme was withdrawn, the safety records of the incentive group dropped to a level that was still better than that of the no-treatment employees, but no longer significantly so.

2 Hash Decamp Fruit Packaging reduced accidents from 21 to 2, a drop of 90% during the first year using a safety incentive approach. This saved $26,000 in Workers' Compensation Costs.

3 Texas Iron works reduced their workers' compensation claims from $351,035 in 1995 by 60% to $136,000 in the next year. The safety incentive scheme cost them $5,202 to implement; a benefit cost ratio of 41:1.

4 Incentive programmes at two American mines were studied over periods of 11 and 12 years, respectively. In one mine, the number of days lost due to accidents was reduced by 89% and in the other by 98%. From year to year, the cost benefit ratios varied between 18 and 28 for one mine and between 13 and 21 for the other.

The degree of cost-effectiveness of any accident countermeasure is naturally of great interest to those who are responsible for such programmes. These are often expressed as benefit/cost ratios: the amount of money saved through the programme divided by the money needed to run it. This can be calculated and constitutes a benefit over and above the reduction in human pain and suffering, which are more difficult to quantify in monetary terms. The ratios are usually greater than two-to-one.

While any ratio greater than one means that the company is making money out of the accident prevention program. The economic attractiveness of incentive plans is largely due to discounts in fees payable to workers' compensation boards and other insurance; companies with favourable safety ratings pay lower insurance premiums. The table below shows the impact on Workers' Compensation Premium of reducing numbers of injuries as a result of implementing the NOSA system at HI Dampier Operations in Western Australia.

Impact of Reductions in Number of Accidents on Workers Compensation Premium at HI Dampier, WA

Year	No. of Injuries	Estimate ($)	Actual ($)
1991	124	504,107	462,869
1992	118	199,825	84,334
1993	64	49,809	29,132
1994	58	44,599	11,987
1995	27	38,757	-

EFFECTIVE INCENTIVE PROGRAMMES

The major negative side effect often quoted against incentive programmes is the tendency to under-reporting. This is especially true for minor incidents. This, of course is a function of the programme: if the programme is not designed to penalise negative performance, but rather is focussed on rewarding positive safety improvements such as improving audit results, then this is avoided.

Often, incentive schemes have been tried, like many ill-conceived safety initiatives, as a 'quick fix'. Certainly they can be very effective, but like any other safety programme, they need careful design, appropriate funding and clear, visible management support for them to work. If they are skimped or rushed the chances of success are significantly reduced.

There are clearly some 'secret ingredients' which can act to ensure success. These seem to be[5, 9, 10]:

Managerial Vigour

The introduction and long-term support of incentive programmes should be conducted with managerial vigour, visible commitment and uniformity of view.

Rewards the Bottom Line

Incentive programmes should reward the desired outcome (not having an accident or, better still, having achieved some positive measure, such as achieving an improving audit score), not some process variable like wearing the seatbelt or obeying a safety rule. This is because rewarding specific behaviours does not necessarily strengthen motivation towards safety. There is a risk that while the rewarded behaviour may improve, other related safe behaviours may deteriorate.

Attractive Reward

Incentive programmes can be expected to be the more successful the greater the perceived benefit of not having an accident and the perceived disadvantage of having an accident. Rewards for accident-free operation in industry have taken many different forms, ranging from cash to public commendation. They include trading stamps, lottery tickets, gift certificates, shares of company stock, extra holidays and other privileges. There are differences of opinion as to the most appropriate type of reward. While money is always attractive, it has no special significance and there is no symbol of remembrance. Often the cash is used for existing financial needs and can often become a source of family conflict. Non-cash awards such as golf clubs appeal to, and satisfy, a person's need for personal indulgence and enjoyment. Gift certificates hold a middle ground between cash and merchandise; they can be put to flexible use and yet be personalised and imprinted with a commemorative message.

Awards do not have to be very large to be effective. In fact, a case can be made for relatively small awards. Small awards can be handed out more frequently, they are probably less conducive to under-reporting of accidents, and they act to reinforce pro-safety attitudes.

Progressive Credits

The amount of the incentive should continue to grow progressively as the individual operator accumulates a larger number of uninterrupted accident-free periods or achieves successive safety goals.

Simple Rules

The operational rules of the programme should be kept simple so that all persons to whom the programme applies easily understand them.

Perceived Equity

The incentive programme should be perceived as equitable by all those involved. The bonus should be such that it is viewed as an appropriate reward for achieving a safety goal in a period of time.

Perceived Attainability

Programmes should be designed in such a way that the bonus is seen as attainable. This is of particular importance if the bonus is awarded in a lottery system. Lotteries make it possible to hand out greater awards, and this may enhance the excitement of an incentive programme. But fewer of the people will receive the award and this may discourage others who have negative views of their potential for success.

Short Incubation Period

The scheme should start to pay back soon after inception to retain interest.

Group as Well as Individual Performance Rewards

Incentive programmes should be designed in such a way that they strengthen peer pressure towards good performance. This is very important in Australia where the 'tall poppy' syndrome ensures that schemes that single out individuals for recognition are unpopular and ineffective.

Employee Participation in Programme Design

Employee participation in the design and implementation of the programme is essential to ensure 'buy-in' and 'fairness'.

Prevention of Under-reporting

Appropriate controls should be put in place to minimise this. This is an important matter of perception. If the employees perceive the scheme as ineffective, then it will have no credibility.

Reward all Levels of the Organisation

All should be involved and eligible, especially first line supervisors and middle managers.

Maximizing Benefit/Cost

The reasons for the programme and its justification should be well research before it is started. They should also be well communicated before it begins.

Careful Planning and Research

They should not be rushed, but should be carefully researched, developed and agreed before they are implemented.

CONCLUSIONS

Continuously improving the behaviour of employees is not a simple or quick exercise. There are no 'magic bullets'.

Risk Homeostasis explains why so many safety initiatives fail to achieve their long-term goals of a continual improvement in performance. Even safety training may not be as effective as we might believe in that it does not act to reduce a person's or group's appetite for risk.

To properly motivate change we have to influence the cost/risk balance to make safe behaviour more attractive than risky behaviour. Incentive programmes generally meet with approval from the people to whom they are addressed, and in this respect they compare favourably with the much less popular action of penalising poor safety performance. With the high level of Workers' Compensation costs being felt by companies in Australia, they also seem to make good business sense.

To put it simply: a small carrot is not only much better liked than a big stick, it is also much more effective.

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