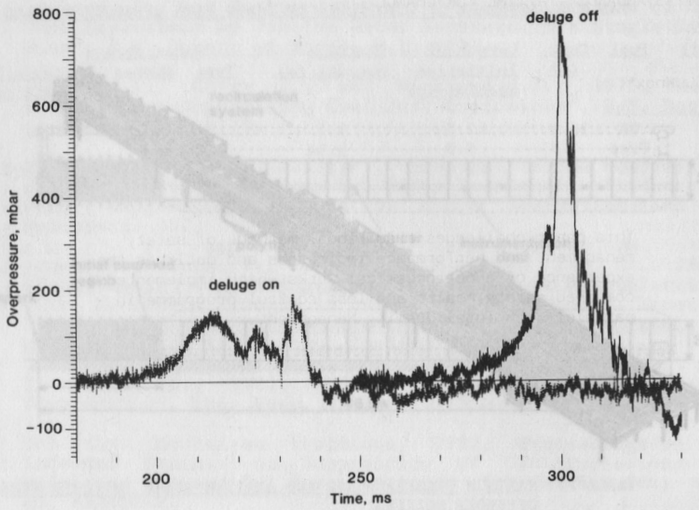

Figure 5: Comparison of overpressure/time profiles recorded at the same transducer for equivalent tests with and without water deluge.

SAFETY STANDARDS - A TIME FOR CHANGE

B. J. Knox*

This paper challenges traditional methods of safety management and performance indicators and outlines the experience of a petrochemical works which implemented a combined safety,health and loss control programme in parallel with Total Quality Management.

INTRODUCTION

Where safety standards have plateaued or the traditional approach of performance measurement/corrective action is no longer achieving sustained results across the full spectrum of health, safety and loss control, a strategy change may be necessary.

A structured programme which applies general management principles to health, safety, environment and loss control has proved beneficial in many instances. It may question cultures, attitudes and existing systems in established organisations, it needs resourcing and a management commitment. Such a programme is compatible with Total Quality Management.

Performance Measurement

It may be said that in many large companies handling chemicals today safety is 'out of control', since statistics show that although over the last 2 decades or so the number or frequency rate of incidents, has steadily reduced, it has perhaps now reached a 'plateau'. Safety Advisers are thus unable to predict whether next years performance standard will rise or fall. The situation is therefore not 'under control'. Also if we are preoccupied with Lost Time Accident Frequency Rate as the basis for safety performance we may well not be applying our remedial actions in the right areas.

One possible explanation for this state of affairs lies in the evolution pattern of the industry. In the early days, technology was relatively simple and many incidents were hardware related, generally simple to identify and to rectify, and when this was done safety improvement was fairly dramatic. (See Fig 1)

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As technology advanced, more incidents were related to the procedures needed to operate with more sophisticated plant, tended to be fewer in number, took longer to surface, identify, and cure, and the reduction over this period slowed.

Over recent years the rate has 'plateaued', rising and falling above a 'norm', and is believed to be due to causes related to workplace culture and or attitudes. These are difficult to identify and correct, since they question why and how people behave.

When looking at safety we generally use a 'reactive' approach in analysing accidents and relating them to past performance using the Lost Time Accident Frequency Rate (LTAFR) (usually the number of LTA's per million manhours worked). Unfortunately many which we investigate so thoroughly and debate so deeply are unlikely to recur. Apart from being 'reactive' this approach has other drawbacks.

Consider the factors which determine LTAFR. Several have no relation to "safety" aspects of the incident and are governed by external events over which the manager has no control. For example, the injured person, may not, attend the following work period purely because of personal attitude. Conscientious employees may return with an injury which may cause discomfort but not stop them from carrying out their normal work, others with the same injury will remain absent.

The doctor could take the view that the victim can return to work despite the injury, or conversely decide that a large company can "afford it" and suggest that time off may be beneficial.

The weighting put on these factors is emotive depending on the viewpoint of the individuals concerned and influence the LTA classification, whilst having no real bearing on the root cause or preventative action for the event.

Another contentious area is that of 'invisible injuries'. If an individual complains of a painful back injury, quite often there is no way of verifying this, or even it is is work-related. A number of LTAs come into this category.

Thus LTAFR, widely used for the assessment of safety performance is based on somewhat shallow foundations. Up to the present however, it has been universally accepted, perhaps the best comparable method available. Pundits may point out that these are just excuses for masking a poor safety performance, ie. we should just discount LTAs as a relevant safety performance indicator only when we have zero.

It may be worthwhile at this point to clarify a few definitions. What is an accident? One definition is an undesired event that results in harm to people, damage to property or a loss from the system. It results from contact by a human body or equipment with a substance or a source of energy (and this may be mechanical, acoustic, thermal, chemical or electrical) beyond the limit which they can stand. What about an incident? "An undesired event which under slightly different circumstances could have resulted in harm to people, damage to property or a loss from the system". Safety is the control of accidental loss.

If LTAFR is not to be the measure of safety performance then what is? There are some indications if we look through some of the classic works on accident prevention and loss control. The 'pyramid principle' (see Fig 2) which is based in research on many areas of industry indicates that for every lost time injury there are likely to be 10 non-disabling types, 30 incidents which involve property damage or significant financial loss and 600 un-reported incidents or 'near misses'. Therefore from a statistical viewpoint, instead of being preoccupied with the one LTA should we not be closely studying the other 600 incidents? It may be argued however, that we should not concentrate on the 'minor injuries' and 'near misses' when there is serious injury to the victim of an LTA. The "Accident Event Sequence Principle" says that once an incident sequence begins neither the victim nor the manager normally has much control over the outcome which can be serious injury, costly damage or major pollution. (see Figs. 3 & 4).

The thin dividing line between a fatality and a near miss is illustrated by the following example:-

Suppose a man slips on a patch of oil. He may temporarily lose his balance and carry on as if nothing happened. He may fall and land in a position which does him no injury whatsoever, fall awkwardly and sustain a sprained ankle, or he may hit his head and the injuries result in an LTA classification. In the extreme it may end in a fatality. Using the traditional approach this latter situation would be addressed very seriously, but what about the other events. How would we respond? Would the minor injury be investigated at all? What about the first situation - would the man even report that he had slipped or even that there was a patch of oil.

Incident Reporting & Investigation

If we report all incidents (including near misses) we will gain a much better idea of our safety awareness and control systems. Other benefits can result if we include unscheduled emissions to atmosphere since we will also be considering environmental impact.

To get the maximum benefits from any investigation we must consider the cost in suffering to those injured by accidents, and in financial terms to the business. The significant cost of damage, repairs, spillages, pollution and other losses from the system are often overlooked by business management. Many line managers do not know the true cost of the damage which results from ignorance, lack of training/maintenance or malpractice by operating and engineering personnel. These are often hidden in the maintenance budget or process variable costs. Safety and loss control are synonymous - remember the "Accident Event Sequence Principle".

Do we need to do a detailed examination of all incidents? The answer is 'no'. How do we decide on which to concentrate?

All incidents must be investigated, but at a very early stage the 'criticality' must be assessed by ascertaining if the incident was likely to give rise to severe damage or serious injury, and what is the likelihood of a recurrence. We can then fairly quickly decide on the investigation time and depth and also how much effort and money to allocate to prevention. Using the 80/20 rule we usually find that 80% of the critical incidents will arise from 20% of the total. These are the ones which should attract our attention and financial resources.

The investigation process must determine the real causes, and should not differentiate between injuries, property damage or losses but use a common form and investigation procedure. Well meaning detailed investigations often make shallow recommendations by focusing on only the immediate causes, and hence dilute the effort of those involved. Typical examples are where the conclusions record the causes as 'human failure', 'in attention to duty' or similar "finger pointing" phrases. These may well be contributory but they do not address the real causes, which are extracted by repeating the question 'why'. 'Human failure' and 'inattention to duty' often mask issues such as a poor working environment, a lack of motivation, or inadequate training/supervision. If the immediate causes of incidents alone are addressed then a repeat is almost certain. Only by establishing the real causes can adequate prevention measures be applied.

Although incident reporting, definition and investigation are important it is essential that we do not become pre-occupied with them. In developing a proactive approach to safety and loss control we must look at areas of our activities which are not traditionally associated with safety.

Safety Management

If we are going to make a fundamental change our approach to safety performance what are we going to change to? How do we change? Any culture change must be led by management, since they have the responsibility for setting up and implementing systems of work, and creating the climate in which they operate. The first step is to adopt a more proactive stance and set positive quantifiable targets, by focusing on prevention rather than analysing events which have already occurred.

We must apply business principles to the management of safety. In other words, tackle safety in the same way we do production, finance and product quality. Firstly, identify the objective to be achieved. (eg. a production tonnage, a financial budget or a product quality parameter). Then, set the standard or units by which this will be measured. Thirdly set up the timescale for measurement of the standard. Fourthly, having carried out this measurement, evaluate against the original standard and finally adjust the performance to bring us back on target. These are the basic principles we must introduce to safety management.

The responsibility for the root cause of a high percentage of all incidents rests with design, operating or engineering management. It is they and not safety personnel who must set and enforce adequate safety standards. We all need to understand the difference between 'rules' and 'standards'. A 'rule' is issued by a person in authority and compels or forbids a certain action. A 'standard' defines a particular activity, identifies who will carry it out, when and how the activity will be measured, evaluated and recorded.

We have too many rules and too few standards. To make real progress in safety and loss control we need 'standards' in many such key areas as management leadership, training, work activity monitoring, wearing of protective clothing, purchasing, plant modification, communication, workplace inspection and emergency response.

In setting a 'standard' for training, for example, we need to define what is the objective. We may decide that "All new employees will attend a safety induction course". This may seem adequate but it is not a standard, since it does not lay down exactly what will be done, to what level, to what timescale, by whom and how it will be evaluated. A training standard should be, "All new employees will attend an induction course to the format provided by Training Section within one week of their commencing employment. The course will be led by the Industrial Training Supervisor and will include the 'attached' course material. There will be end of course certification and refresher training will take place every 12 months". This is something that everyone can understand, is easy to identify and easy to monitor. We need to apply similar standards to other key areas and hence begin to look at the 'broad picture' in terms of safety and loss control.

Leadership should start at the top and managers at all levels must have sufficient training and experience to set a meaningful safety programme and then demonstrate commitment, by allocating sufficient resources, both human and financial for implementation. At the workplace they should have a high visible profile and carry out regular audits to ensure compliance with the programme.

It is a facet of our management style that generally we are very quick to reprimand individuals who disobey the rules but very reluctant to commend them for exemplorary performance.

Communication is the vital link by which all information is transmitted across the workplace. Specialist training in the techniques of communication for personnel particularly at the supervisor level is vital since few people are born communicators.

Unless we begin to manage safety, loss control and apply the principles of identification, measurement, performance and evaluation, then we are destined to proceed along the present path of making little impact, and continuing to injure people and sustain plant and process losses with the ensuing significant financial penalties to the business.

There are several commercial safety & loss control programmes available off-the-shelf but many companies develop their own. Whichever route is selected it must be recognised that like Total Quality Management, safety and loss control is not a 'one off' initiative, but an ongoing process - a journey where the ultimate destination remains elusive.

Authors Notes

1. Although the content of this paper is based on the authors experience the view and opinions expressed are personal and do not necessarily reflect those of the company.
2. The reference work for the company safety and loss control programme is "Practical Loss Control Leadership" by Bird & Germain published by International Loss Control Institute Georgia. USA.

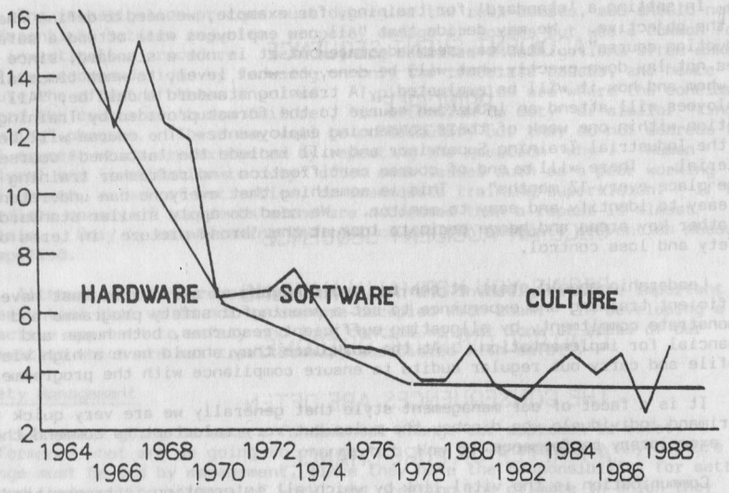

Figure 1

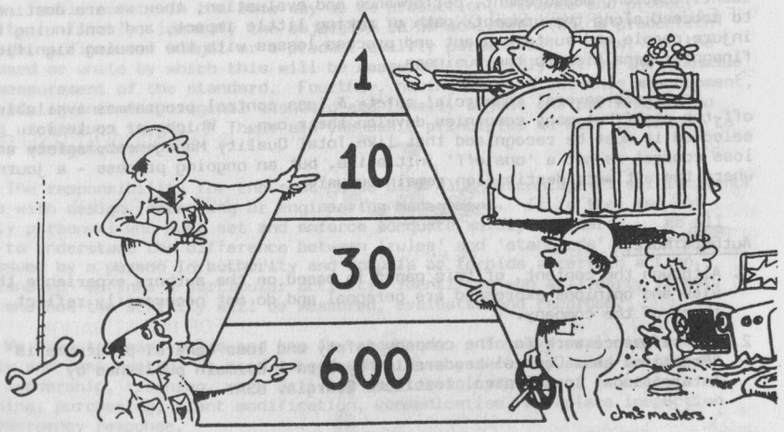

Figure 2

"ACCIDENT EVENT SEQUENCE PRINCIPLE"

ONCE AN ACCIDENT SEQUENCE BEGINS YOU NORMALLY HAVE NO CONTROL OVER THE OUTCOME .... THE CONSEQUENCES ARE OFTEN A MATTER OF PURE CHANCE.

Figure 3

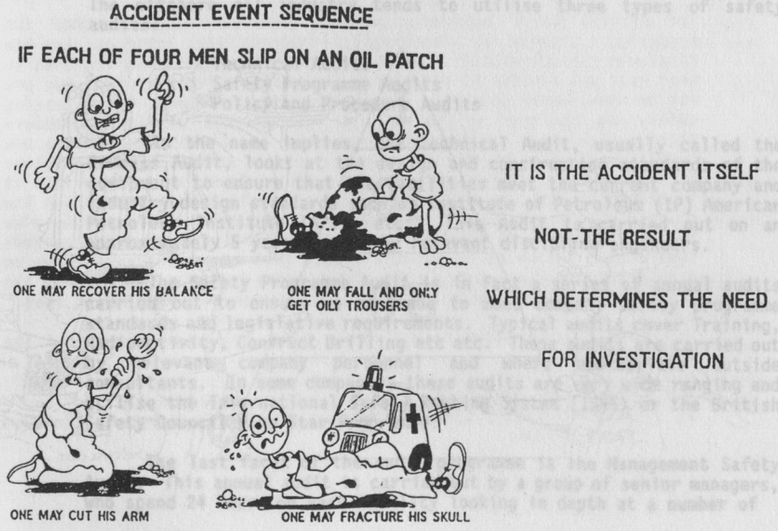

Figure 4