Measuring Safety Performance

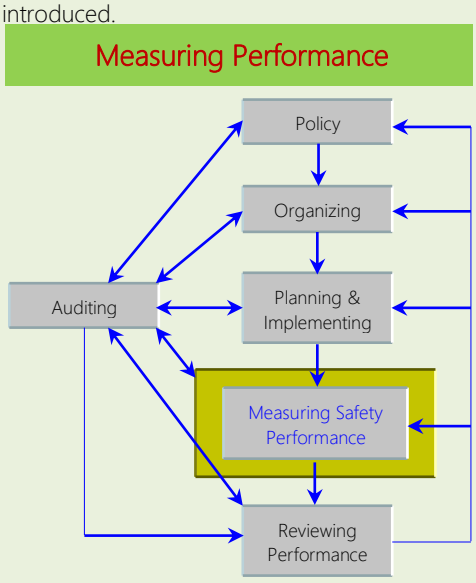
Measurement is a key step in any management process and forms the basis of continual improvement. If measurement is not carried out correctly, the effectiveness of the health and safety management system is undermined and there is no reliable information to inform managers how well the health and safety risks are controlled.
Although there is much information available on performance measurement generally, there is little which looks at health and safety in particular which organisations can apply to their own circumstances.
HSE's experience is that organisations find health and safety performance measurement a difficult subject. They struggle to develop health and safety performance measures which are not based solely on injury and ill health statistics.

Traditional approach to measuring health and safety performance

If directors or CEOs were asked how they measured their companies' performance, they would probably mention measures like percentage profit, return on investment or market share. A common feature of the measures quoted would be that they are generally positive in nature - reflecting achievement - rather than negative, reflecting failure.
If the same people were asked how they measured their companies' health and safety performance, it is likely that the only measure quoted would be injury statistics. While the general business performance of an organisation is subject to a range of positive measures, for health and safety it too often comes down to one negative measure, injury and ill health statistics - measures of failures.
Organisations need to recognise that there is no **single** reliable measure of health and safety performance. What is required is a 'basket' of measures or a 'balanced scorecard', providing information on a range of health and safety activities. Measuring safety is a particularly complex problem. There are two categories of measures for safety:

- **Proactive** (Measures that determine safety performance prior to loss or potential events)
- **Reactive** (Measures that determine performance based on loss events)

Historically, many organisations have measured only one element of their safety culture – Systems and Processes. This measurement has been undertaken via the use of audit tools and/or statistics that assess reactive measures, such as Lost Time Incident (LTI) frequency and severity ratings. It is widely recognised that measuring health and safety performance by the number of incidents alone has little statistical validity and reliability. In order to supplement the deficits, auditing was introduced.
Audits were perceived to be an effective measure, until co-relational studies between audit scores and accident statistics were conducted. It was found that there were often zero correlations and even negative correlations between the two. Organisations need to recognise that there is no single reliable measure of health and safety performance. What is required is a 'basket' of measures or a 'balanced scorecard', providing information on a range of health and safety activities. Effective performance measurement provides information on both the level of performance and why the performance level is as it is.



Measuring health and safety performance is organised under these main headings:

- Why measure
- What to measure
- When to measure
- Who should measure
- How to measure

WHY MEASURE PERFORMANCE

'You can't manage what you can't measure' - Drucker

Measurement is an accepted part of the 'plan-do-check-act' management process. Measuring performance is as much part of a health and safety management system as financial, production or service delivery management. The primary purpose of measuring health and safety performance is to provide information on the progress and current status of the strategies, processes and activities used by an organisation to control risks to health and safety.
Measurement information sustains the operation and development of the health and safety management system, and so the control of risk, by:

- providing information on how the system operates in practice;
- identifying areas where remedial action is required;

- providing a basis for continual improvement; and
- providing feedback and motivation.

Effective performance measurement provides information on both the level of performance and **why** the performance level is as it is.

WHAT TO MEASURE

In order to achieve an outcome of no injuries or work-related ill health, and satisfy stakeholders, health and safety risks need to be controlled. Effective risk control is founded on an effective health and safety management system.

The health and safety management system comprises three levels of control:

Level 3 - effective workplace precautions provided and maintained to prevent harm to people at the point of risk.

Level 2 - risk control systems (RCSs): the basis for ensuring that adequate workplace precautions are provided and maintained.

Level 1 - the key elements of the health and safety management system: the management arrangements (including plans and objectives) necessary to organise, plan, control and monitor the design and implementation of RCSs.

INPUT	PROCESS	OUTPUT	OUTCOME
Uncontrolled → Hazards The "Hazard Burden*"	Health and Safety Management System Management Arrangements (Level 1) Risk Control Systems (Level 2) Workplace Precautions (Level 3) Positive Health and safety culture	Controlled → Hazards/ risks	▪ No injuries ▪ No occupational ill-health ▪ No incidents ▪ Stakeholder Satisfaction

It should be based on a balanced approach which combines:

Input: Monitoring the scale, nature and distribution of hazards created by the organisations activities - **measures of the hazard burden**;

Process: Active monitoring of the adequacy, development, implementation and deployment of the **health and safety management system** and the activities to promote a positive health and safety culture - **measures of success**; and

Outcomes: Reactive monitoring of adverse outcomes resulting in injuries, ill health, loss and accidents with the potential to cause injuries, ill health or loss - **measures of failures**.

*Measuring the Hazard Burden

The range of activities undertaken by an organisation will create hazards, which will vary in nature and significance. The range, nature, distribution and significance of the hazards (the hazard burden) will determine the risks which need to be controlled. Ideally the hazard should be eliminated altogether, either by the introduction of inherently safer processes or by no longer carrying out a particular activity, but this is not always practical. If the hazard burden is reduced and if other things (variables) remain constant, including consistent operation of the health and safety management system, this will result in lower overall risk and a consequent reduction in injuries and ill health. For example, the inventory of hazardous materials might be reduced so that the associated risks are reduced.

Measuring the health and safety management system

Overview

The health and safety management system is the process which turns uncontrolled hazards to controlled risks. The key elements of:

- policy
- organising
- planning and implementation
- measuring performance; and
- audit and review

The performance measurement system must cover each element of the health and safety management system.

Policy

The measuring process should establish that a written health and safety policy statement

- exists;
- meets legal requirements and best practice;
- is up to date; and
- is being implemented effectively.

The information to demonstrate that the policy is being implemented effectively will be collected through the overall process of measuring health and safety performance and from the auditing process.

Organising

The measurement process should gauge the existence, adequacy and implementation of arrangements to:

- establish and maintain management **control** of health and safety in the organisation;

Some problems with injury/ill health statistics

- Under-reporting - an emphasis on injury and ill-health rates as a measure, particularly when related to reward systems, can lead to such events not being reported so as to 'maintain' performance.
- Whether a particular event results in an injury is often a matter of chance, so it will not necessarily reflect whether or not a hazard is under control. An organisation can have a low injury rate because of luck or fewer people exposed, rather than good health and safety management.
- Injury rates often do not reflect the potential severity of an event, merely the consequence. For example, the same failing to adequately guard a machine could result in a cut finger or an amputation.
- People can stay off work for reasons which do not reflect the severity of the event.
- There is evidence to show there is not necessarily a relationship between 'occupational' injury statistics (e.g. slips, trip and falls) and control of major accident hazards (e.g. loss of containment of flammable or toxic material).
- A low injury rate can lead to complacency.
- A low injury rate results in few data points being available.
- There must have been a failure, i.e. injury or ill health, in order to get a data point.
- Injury statistics reflect outcomes not causes

- promote effective **co-operation** and participation of individuals, safety representatives and relevant groups so that health and safety is a collaborative effort;
- ensure the effective **communication** of necessary information throughout the organisation; and
- secure the **competence** of the organisation's employees.

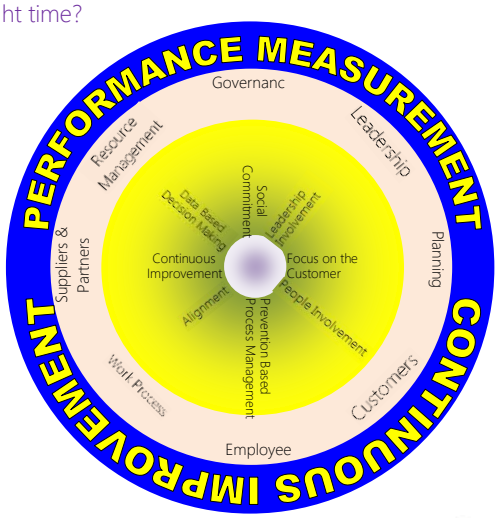
Planning and implementation

The measurement process should gauge the existence, adequacy and implementation of the planning system. The planning system should be able to:

- deliver **plans with objectives** for developing maintaining and improving the health and safety management system;
- design, develop, install and implement suitable **management arrangements, risk control systems and workplace precautions** proportionate to the needs, hazards and risks of the organisation;
- provide **effective prioritisation** of activities based on risk assessment;
- ensure the correct **balance of resources and effort is being targeted proportionately** according to the hazard/risk profile across the organisation (for example, is disproportionate effort being expended on slips/trips relative to control of major accident hazards or fire safety?);
- **operate, maintain and improve** the system to suit changing needs and process hazards/risks; and
- promote a **positive health and safety culture.**

Over a period of time the information from the various measuring activities and from other sources (notably audit) will demonstrate how well the planning system delivers suitable management arrangements and risk control systems. These should be:

- effective, i.e. they are doing the right thing and in the right place at the right time?
- reliable, i.e. they are consistently applied? and
- efficient, i.e. they are doing the right things right?



Measuring performance

The measuring process itself is an essential element of the health and safety management system, so its operation of will also need to be monitored.

Audit and review

Audit and review form the final steps in the health and safety management control loop, so their existence, adequacy and implementation need to be included within the measuring process.

WHEN TO MEASURE PERFORMANCE

Measuring health and safety performance is an ongoing activity, so in one sense the measurement process is continuous. But like any other activity measurement should be both efficient and effective, so the frequency with which it takes place needs to be planned appropriately. You should consider the following factors:

Suitable intervals to ensure that specific planned milestones are achieved

If health and safety plans and objectives are SMART, they will include specific times when specific milestones will be achieved. Monitoring the progress with the plans should be aligned with the particular timescales for achievement.

The potential for change from one state to another over time

For example, the design of a particular management arrangement or risk control system does not change from day to day so that the checks on the design might be appropriate at:

- the initial design phase;
- whenever changes are made which could impact on the operation of the systems;
- when information is obtained which indicates that the system as designed has failed in some way (e.g. when there has been an injury); or
- when data from the monitoring of the operation of the system indicates the design is flawed.

Similarly, the state of a particular work place precaution, for example the integrity of a fixed machine guard, might not be expected to vary significantly from day to day once it has been put in place. A check at greater intervals might be more appropriate.

Suppliers of plant and equipment will often prescribe inspection and maintenance intervals to ensure optimum performance.

- **The relative importance of the activity or particular precaution relative to the overall control of risk**
  Some precautions needed to control a particular risk may need to be monitored on an almost continuous basis, e.g. the flow of cooling water, the presence (or absence) of oxygen, air flow, flammable gas levels, and require effective instrumentation. Systems to control risks associated with high hazards will need to be monitored at more frequent intervals than those for low hazards.
- **Where intervals for monitoring are prescribed by legislation**
  Some legislation requires monitoring to take place at specific intervals, for example, inspection of lifting equipment.
- **Where there is evidence that there is non-compliance**
  Where monitoring has discovered evidence of non-compliance then once remedial action has been taken, it may be appropriate to introduce more frequent monitoring to check that the remedial action has been successful.

- **Where there is evidence of compliance**
  Where monitoring has provided evidence that there is regular compliance with a particular requirement, it may be appropriate to consider reducing the frequency of those monitoring and targeting resources elsewhere.
- **The relative frequency and time at which a particular activity takes place**
  Some work activities only occur at particular times of the day or night or periods of the year. It is important that the measurement process covers these activities effectively and is not just confined to frequent / day/ general activities.

WHO SHOULD MEASURE PERFORMANCE

Health and safety performance needs to be measured at each management level in an organisation, starting with the most senior management. Senior managers must guard against a culture of management, or measurement of health and safety, by exception. This means that unless a problem or deficiency is brought to their attention they presume that everything is working as intended and do not inquire any further. The dangers of this approach leads into major incidents. Senior managers must satisfy themselves that appropriate arrangements to control health and safety risks are:

- in place;
- complied with; and
- effective

Organisations need to decide how to allocate responsibilities for both active and reactive monitoring of performance at different levels in the management chain. They should also decide what level of detail is appropriate. The decisions will reflect the organisation's structure. Managers should be given responsibility for monitoring the achievement of plans and objectives and compliance with standards for which they and their subordinates are responsible. Managers and supervisors responsible for direct implementation of standards should monitor compliance in detail and be competent to do so.

HOW TO ENSURE SAFETY PERFORMANCE

The foundation of effective performance measurement is an effective planning system which produces specifications and performance standards for the management arrangements and risk control systems. These provide the yardsticks for the measurement process. The measurement process can gather information through:

- direct observation of conditions and of peoples' behaviour;
- talking to people to elicit facts and their experiences as well as gauging their views and opinions; and
- examining written reports, documents and records. These information sources can be used independently or in combination.

Assessing health and safety performance requires:

- A clearly identified program;
- Goals at all levels of the organisation;
- A combination of reactive and proactive measures.
- Measures to be applied to all four elements of the safety culture;
  - Systems and Processes
  - Skills and Knowledge of Individuals
  - Behaviours
  - Attitudes, Perception and Leadership

Key Performance Indicators (KPI's)

Key performance indicators for reviewing overall performance can include:

- Assessment of the degree of compliance with health and safety system requirements.
- Identification of areas where the health and safety system is absent or inadequate (those areas where further action is necessary to develop the total health and safety management system).
- Assessment of the achievement of specific objectives and plan, and accident, ill-health and incident data accompanied by analysis of both the immediate and underlying causes, trends and common features.

These indicators are consistent with the development of a 'positive health and safety culture'. They emphasize achievement and success rather than merely measuring failure by looking only at accident data.

Systems and Processes

This is measured via audits and accident statistics.

Skills and Knowledge Measures

The skills and knowledge of employees in the organisation can be obtained through assessing competencies against requirements and measuring the percentage of skill achievement.

Behaviours

The behaviour of employees can be measured through peer based safety behaviour assessments. One of the key issues facing organisations today is how to create the attitudes and behaviours that ensure that every person takes individual and collective responsibility for safety.

Attitudes, Perception and Leadership

Climate surveys measure the internal and external perceptions of the organisation's safety systems and are designed to:

- Evaluate employees' perception of the organisations health and safety issues to discover how close employees and supervisors are in understanding their responsibilities.
- Assess the employee level of involvement in existing safety programmes
- Assess the employee perception regarding the existing safety management system to gain insight into employees' and supervisors' concept of the organisations sincerity regarding safety
- Assess employees and supervisors perception as to whether they have enough training to meet their 'best practice' objectives.
- Identify training needs

Like **planning**, monitoring health and safety performance against pre-determined plans and standards should be a line management responsibility. Monitoring also reinforces management's commitment to health and safety objectives in general and helps in developing a positive health and safety culture by rewarding positive work done to control risk.
Two types of system are required:

- **active** systems which monitor the design, development, installation and operation of management arrangements, RCSs and workplace precautions;
- **reactive** systems which monitor accidents, ill health, incidents and other evidence of deficient health and safety performance. Organisations need to have procedures to allow them to collect the information to adequately investigate the causes of substandard performance.

Active monitoring systems

Active monitoring gives an organisation feedback on its performance before an accident, incident or ill health. It includes monitoring the achievement of specific plans and objectives, the operation of the health and safety management system, and compliance with performance standards. This provides a firm basis for decisions about improvements in risk control and the health and safety management system. There are additional benefits, however. Active monitoring measures success and reinforces positive achievement by rewarding good work, rather than penalising failure after the event. Such reinforcement can increase motivation to achieve continued improvement.
Organisations need to decide how to allocate responsibilities for monitoring at different levels in the management chain and what level of detail is appropriate. The decisions will reflect the organisation's structure. Managers should be given the responsibility for monitoring the achievement of objectives and compliance with standards for which they and their subordinates are responsible. Managers and supervisors responsible for direct implementation of standards should monitor compliance in detail. Above this immediate level of control, monitoring needs to be more selective, but provide assurance that adequate first-line monitoring is taking place. This should reflect not only the quantity but the quality of subordinates' monitoring activity.
Multi-site organisations need to satisfy themselves that different 'satellites' are meeting corporate plans and objectives as well as controlling risks. There need to be performance standards for managers to indicate how they will monitor.
The various forms and levels of active monitoring include:

- Routine procedures to monitor specific objectives, e.g. quarterly or monthly n reports or returns;
- Periodic examination of documents to check that systems relating to the promotion of the health and safety culture are complied with. One example might be the way in which suitable objectives have been established for each manager; regular review of performance; assessment and recording of training needs; and delivery of suitable training;
- Systematic inspection of premises, plant and equipment by supervisors, maintenance staff, management, safety representatives or other employees to ensure the continued effective operation of workplace precautions;
- Environmental monitoring and health surveillance to check on the effectiveness of health control measures and to detect early signs of harm to health;
- Systematic direct observation of work and behaviour by first-line supervisors to assess compliance with RCSs and associated procedures and rules, particularly those directly concerned with risk control;
- The operation of audit systems consideration of regular reports on health and safety performance by the board of directors.

The key to effective active monitoring is the quality of the plans, performance standards and specifications which have been established. These provide the yardstick against which performance can be measured. Active monitoring should be proportional to the hazard profile. Activity should concentrate on areas where it is likely to produce the greatest benefit and lead to the greatest control of risk. Key risk control systems and related workplace precautions should therefore be monitored in more detail or more often (or both) than low-risk systems or management arrangements.

- Regular monitoring may also be usefully supplemented by:
- random observation including senior managers on 'health and safety tours'
- periodic surveys of employees' opinions on key aspects of health and safety.
- inspections by safety representatives or other employee representatives.

Reactive monitoring systems

Reactive systems, by definition, are triggered after an event and include identifying and reporting:

- injuries and cases of ill health (including monitoring of sickness absence records);
- other losses, such as damage to property;
- incidents, including those with the n **potential** to cause injury, ill health or loss;
- hazards;
- weakness or omissions in performance standards.

Each of the above provides opportunities for an organisation to check performance, learn from mistakes, and improve the health and safety management system and risk control. In certain cases, it must send a report of the circumstances and causes to the appropriate enforcing authority. Statutorily appointed safety representatives are entitled to investigate.

Events also contribute to the 'corporate memory'. Information gathered from investigations is a useful way to reinforce key health and safety messages. Common features or trends can be discussed with the workforce, particularly safety representatives. Employees can identify jobs or activities which cause the greatest number of injuries where remedial action may be most beneficial. Investigations may also provide valuable information in the event of an insurance claim or legal action.

Collecting information on serious injuries and ill health should not present major problems for most organisations, but learning about minor injuries, other losses, incidents and hazards can prove more challenging. Accurate reporting should be promoted by:

- training which clarifies the underlying objectives and reasons for identifying such events;
- a culture which emphasises an observant and responsible approach and the importance of having systems of control in place before harm occurs;
- open, honest communication in a just environment, rather than a tendency merely to allocate 'blame';
- Cross-referencing and checking first-aid treatments, health records, maintenance or fire reports and insurance claims to identify any otherwise unreported events.

Monitoring and Measurement Techniques

Reactive Monitoring

The term reactive monitoring stems from looking at events that have passed, arguably monitoring failure. By counting the number of unwanted events such as accidents or incidents (near misses) the safety practitioner can monitor the organizations' performance over a period of time in comparison with similar performance data for different time periods. By examining trends in data, the performance over a period of time can be consistently compared against similar data using the data analysis techniques described earlier.

Accident Investigations

These were covered earlier chapter in detail.

Accident Statistics

Traditionally the main (sometimes the only) way of monitoring health and safety performance was to analyze data on unwanted events such as accidents or incidents and to present the information in the form of statistics. A number of fairly standard formats exist.

Incidence Rate

The average number of accidents per employee (in a given period). Some organizations include all 'lost time' accidents but 'lost time' can be defined as more than a day, more than an hour etc. therefore consistency of information is important.

$$\text{Accident incident rate is: } \frac{\text{Number of defined accidents}}{\text{Average number employed}} \times 1000$$

Frequency Rate

The average number of hours worked per accident. In organizations where many employees do not work standard hours (i.e. where there are many part time employees) relating accidents to the number of people employed does not provide a consistent unit of measurement. In these cases the total number of hours worked during a period is more relevant.

$$\frac{\text{Number of defined accidents in a period}}{\text{Total person hours worked in a period}} \times 100{,}000 \text{ {frequency rate}}$$

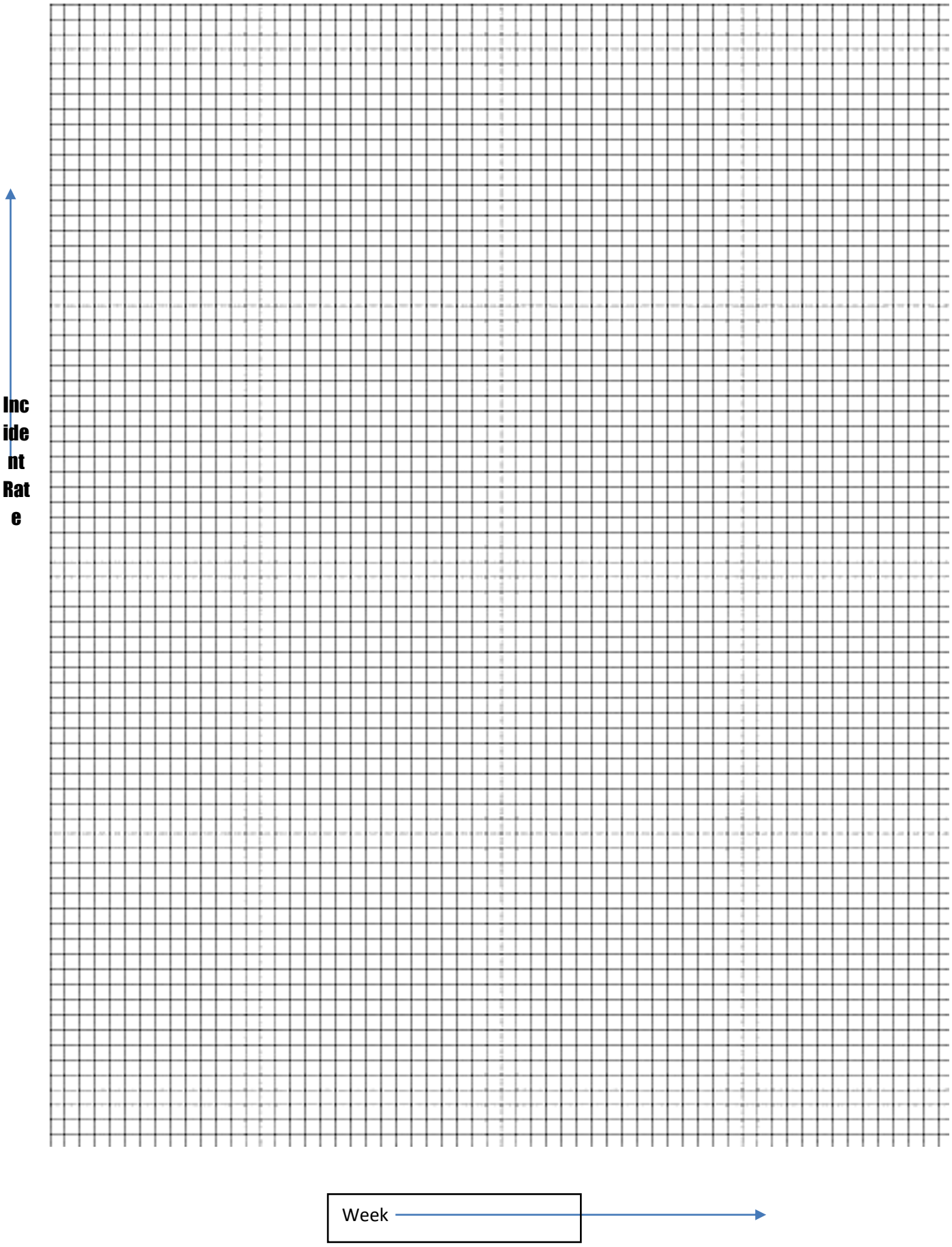
Severity Rate

Severity rate is the number of days lost in a period per 1,000 person hours worked.

$$\frac{\text{Total number of days lost in one period}}{\text{Total person hours worked in a period}} \times 1000 \text{ {severity rate}}$$

Reactive Monitoring Techniques	Active (proactive) Monitoring
Accident Statistics ▪ Data based on past failures. ▪ Historical may not reveal current or future problems. ▪ Data may be inaccurate. ▪ Can reveal trends. ▪ Useful for prioritizing. ▪ Under reporting can be misleading. ▪ Zero accidents do not necessarily indicate low risk. **Accident Investigation** ▪ Many of the limitations as for statistics, thorough investigations can reveal underlying problems. ▪ Thoroughness tends to depend on severity of injury not potential.	**Inspections** ▪ Intended to reveal hazards that are not controlled to a standard. ▪ Done before there is an accident. ▪ Reveal visible noncompliance with standards. ▪ Can be largely reactive if they lead to 'fixes' rather than corrective action. ▪ Relies heavily on visible evidence only. **Sampling** ▪ Attempt to provide a method of comparison to show improvement (or otherwise). ▪ Sample only, not thorough. ▪ Takes little time. ▪ Can be used to involve employees. **Tours** ▪ Intended to provide a general impression. ▪ Not detailed. **Surveys** ▪ Focus on specific topics can be thorough. **Audits** ▪ Tests the existence, adequacy and use of safety management systems - very proactive.

Measuring Safety - Exercise



(Download and practice)

Week	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	5	1000	6	1	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000	(5X100000)/9X6X1000 = 9.259 8hours regular work +1 hour OT= 9		

Week 1	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	8	1100	6	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 2	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	12	1100	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 3	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	16	1200	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 4	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	20	1200	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 5	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:

	22	1200	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 6	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	24	1200	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 7	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	25	1300	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 8	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	20	1300	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 9	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	18	1300	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 10	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	15	1300	7	2	

Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 11	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	13	1200	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 12	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	12	1200	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 13	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	10	1100	7	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 14	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	8	1000	6	2	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Week 15	Number of Accidents	Manpower	Week days work	Overtime per day per employee	Lost-time Accident Frequency Rate:
	6	9000	6	-	
Number of lost-time accidents during a specific time period / Number of hours worked over the same period		X 100000			

Reference

The following websites and books have been referred in compiling this topic. They are also suggested for further readings to increase and enhancement of knowledge in health and safety.

WEBSITES

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