

Why Is It Important To Measure Safety Performance and How To Measure It?

The important question is why should we measure the safety performance? There are many answers to this question and according to HSE, measurement is one of the four part of plan, do, check and act management system .

The other reason that could be mentioned for measuring safety performance is to get early warning signal and act rapidly if emergency action is needed. The other reason is that safety measurement could be the input for bonus and incentive program that is implemented in organization, Yet another reason is that measurement can alter our future behavior so it is necessary and also measuring safety performance is considered as a navigational tool.

The main purpose of measuring safety performance is to check the current status of safety as well as observing progress with current safety management system in comparison with past, in the other way safety performance measurement is a benchmarking tool. There are lots of questions related to measurement of safety performance like, what should we measure? Is OSHA incident records are reliable to decide on our safety performance on that? Which kind of measurement tools are needed in organization? How can we select specific measurement tool for specific type of industry? Why OSHA recordable is not best safety metric? What are advantages and disadvantages of traditional method of measuring? Do we have effective measure in our organization? How much measurement should we have for each kind of hierarchy level in organization?

Traditional Measures

For many reasons in most of organization they still use traditional safety measures like OSHA incident rate which is number of incidents per 200,000 man-hours work in each organization and the other measurement method which is so similar to OSHA incident rate is American National Standard Institute (ANSI) which is the amount of incidents per 1 million man-hour work. Based on SLCCC, injuries that requires physician to treat them (if physician does not perform treatment it is not a recordable injury) and also when workers become unconscious during his or her job, it should be considered as recordable injuries.

The way of calculation of OSHA incident rate is easy and it is calculated as it mentioned above based on 200,000 man-hour works, as an example when the company has 10 employees and each of them works for 2000 hours annually so the sum of the man hour works is 20,000 and if the company had 2 incident records in that year, the incident record is multiplying 200,000 by two, over 20,000 and it is equal to 20, which means in the last year in every 100 employees, 20 of them have been involved in incidents. As it is obvious the IR is so high and it is because of the size of organization and when the size of company or organization is bigger, this rate is become more meaningful.

The other rate which is used for calculating lost time cases is called LTC, which is number of lost time cases multiplying by 200,000 and divided by number of man- hour work. Like the previous example if we assume that both incident cases had lost days related to incident we come up with LTC rate of 20 again and it means that in every 100 employees 20 of them had suffered lost time due to their injuries related to incidents.

The other rate which is used to calculate the amount of lost days due to incident is called LWD rate that is calculated by multiplying number of lost days by 200,000 and dividing by number of man-hour works and eventually you obtain LWD rate which should be used only in large companies in order to get meaningful number. Assuming there were 4 days lost due to 2 incident that we had in the company, we get 40 days which means for every 100 employees, 40 days were lost due to their injuries related to incidents.

The other quantitative rate is DART, which is calculating the number of incidents that had one or more lost days or restricted days which resulted to transfer employee to different job, and it is calculated by multiplying number of DART incidents by 200,000 and dividing it by number of man hour works. And the outcome will be number incident in lost, restricted days or transferring employees to the other job in every 100 employees.

The other rate which is used to give a company an average of number of lost days per incident is called Severity rate which is calculated by dividing number of lost work days by total number of recordable incidents that the result is average number of day lost for every recordable incident which this rate is used by few number of companies because it only gives you the average number of lost days. OSHA will use recordable incident rates to compare safety performance in specific classification of company with their past safety performance.

Some disadvantages of using traditional measurements are :

- In smaller organization the validity of data is low
- Doesn't say that much about whether the company is progressing or not
- This kind of measurement doesn't say about the way of fixing safety issues

- Most of the time they measure luck instead of the real fact within organization
- Cannot rely on accuracy of data
- Lots of paper work and bureaucracy in filing and incident record keeping in order to incident rate measurement
- Near misses are not reported most of the time and this decreases the accuracy of data
- OSHA data are not predictive and cannot predict future incidents based on current data

Different level and types of measurement

Different types of measurement should be useful for different types of level within organization and based on the responsibility and duties, types and methods of measurements are different for them. We should address that output from safety measurement most of the time is needed by internal sections within organization like, CEO, supervisors, superintend and, stake holders, meanwhile these kind of information is necessary and should be reported to external organizational and agencies outside like insurance companies or union and the other types of external organizations.

Outcome from safety performance measurement is so important for companies and organization which work as a member for bigger organizations to report their safety condition. High hazard companies' work under certain type of licensing and permitting that due to safety performance measurement outcome, their activities should be continued or suspended. All safety measurement results are different for any types of purposes that were mentioned above. Based on Dan Peterson there are two general types of measurement which are micro measures and macro measure. Most of the time macro measures are needed by upper management because of:

- Determining the effectiveness of safety program and answering to questions like: is the system better today or not? Or which elements of our Safety Management System are working and which are not? Where should we invest and put effort for our future safety program?
- Providing cost benefit ratio of the safety program
- To analyze the necessity of maintaining and repairing some units of safety program or eliminating some units which are useless Result measures are needed all the time by upper management and, result measure and activity measure is needed by middle management and for supervisors and employees, just activity measures are needed.

Activity measure which was mentioned in middle management is a bit different with activity measurement in supervisor activity, middle manager most of the time their responsibility is to motivate their supervisors and the activity measure in this case could

be, do they meet their supervisors regularly and do they monitor their work's quality or not. The advantages of activity measures for supervisors are:

- They are flexible and suitable for objective setting approaches
- “Activity measurement measures the presence rather than the absence of safety”
- They are simple and easy to use
- They are most valid type of measurement in order to measure the supervisor performance

Failure measure

The outcome of injury record keeping is the most popular part of failure measure and it is necessary to measure upper management safety performance and due to that, injury records should be broken down by unit.

Before the act measures

This type of measure usually measure and assess supervisor work or a kind of work group before the possible accident occurs. As an example when the work environment is periodically inspected to measure whether he or she is doing right or not.

The other example of before the fact measure is safety sampling that supervisor's communication between his or her employees will be measured in order to get information about how safely employees are working. Safety sampling is one of the best tools for this kind of measurement.

Safety sampling measures the effectiveness of line manager's safety activities but not regarding to accident. It is motivational tool for supervisor and line manager because for he/she is important that hen sample is taken his/her employees are working safely and to get this they try to implement safety activities like training before any action, inspecting and using suitable personal protective equipment(PPE).

Procedure of making safety sampling

1. Prepare a list of unsafe acts: In each specific job site there are list of unsafe acts that contains act that occur in the job site which can lead to accidents, we should have a complete list of unsafe acts in order to go through safety sampling. Each unsafe act should have number or code in order to report it easily.
2. Taking the sample: we should assign an inspector to take the sample by using the list of unsafe acts in his/her hand and go through the line and observe and monitor each employee separately and wait until you can determine whether he/she is performing their job safe or not. When you write down any unsafe act for each employee the determination could not be changed.

3. Validating the sample: for validating the sample we should have minimum number of observation which is obtained by this formula; $N = \frac{4(1-p)}{y^2}$, which N is total number of observation required, p is percentage of unsafe observation and y is the desired accuracy.
As an example if we want to have + or – 10% accuracy and we had 126 observation and the total amount of unsafe acts which were observed is 32, so based on this equation we should have minimum of 1200 observation to get that accuracy.
4. Reporting to management: safety sampling report should include total percentage of unsafe activities by each department separately. Report should contain percentage of unsafe activities by supervisor and foreman. It should also contain the types of unsafe activities which were observed.

List of unsafe acts in safety sampling

List of unsafe acts in safety sampling could be items like: incorrect gripping, improper footwear, improper pouring, wearing rings, standing in front of machines, walking under the load, improper lifting, improper material handling, feet under loads, improper and unsafe loading, loosing material and falling material from hand, improper dumping, lack of PPE, repairing moving machine, ladder not tied, unbraced forms, working in height without support, uncovered rebar, it should be considered that list of unsafe acts should be detailed in depth, instead of just mentioning general items and any additional unsafe item that the observer cannot find that in the unsafe acts list should add that to the list that for future observing that unsafe act has specific item for itself.

In front of each unsafe act in safety sampling worksheet, there are columns for department names that each unsafe item could be related to department associated with that easily.

Measurement is divided into two broad categories which are micro measures and macro measures which is obvious that micro measurement is related to middle management, supervisory and line employees and macro measurement is related to measurement in whole organization and give general status of the organization which is upper management concern. Based on Dan Peterson the key driver at the lower level of organization is performance to goal and there are several categories in order to set goals:

1. Routine Goals: there are related to routine, regular and repetitive works and as an example for the supervisor it might be a goal related to number of incidents or inspections.
2. Project Goals: these kind of goals are related to the new or special project or something that is not regular or repetitive and special kind of activities are needed to reach the goal.

3. Creative Goals: These kind of goals could be related to some activities that should be implemented in order to innovate or improve in specific part of management system.
4. Personal Goals: these kind of goals are less common but it is used in order to improve personal skills to get more effectiveness in activities.

We should be aware that in the organization, most of the time the goals are in more than one category it means that the goal could be in both routine and project. The first thing for setting an objective is identifying and measuring our objective that whether they are good or not. Good objective should be in below criteria based on Dan Peterson:

1. Zeroing of Objectives: Good objective aims at the specific and in detail area and not in broad and general range, generalizing the objective makes it useless.
2. Individuality of Objectives: “This refers to the specificity of the objective to the subordinate for whom it is set. An individual objective is one that requires results and performances that the individual subordinate can do alone. This means that the subordinate must have enough control over those things that need to be done to attain the objective. An objective for the staff safety director to improve the record in department A is and objective that is not individual to the safety director because, to attain the objective, that director is dependent on the performance of the supervisor of department A” .
3. Measurability of Objective: objectives should be measurable to everybody could be assessed by his/her management as well as himself. As an example becoming better supervisor in next month is immeasurable and neither upper manager nor him/herself cannot asses that whether he reaches the objective or not.
4. Reality of the objectives: Objectives should be based on the previous performances and data or the other valid facts. Objectives should not be like wish and dream and if they are not based on valid and true facts they become useless. According to Dan Peterson, there are three additional factors for good objective which will be discussed below:
 1. “It would be leveled; that is, it should be aimed directly at the organizational level of the person. A goal that speaks to the results of a supervisor’s department in a specific area is at the supervisor’s level if he or she is the direct supervisor of that department. Requiring a supervisor to help the corporation attain the desired frequency rate is not an objective that speaks to a supervisor’s level. An objective at the supervisory level would spell out specific action that he or she can carry out that will help attain the goal.
 2. It must be understood both by the superior and the subordinate. If it is not clearly grasped by both sides, it is a poor objective. Misunderstandings are one of the biggest reason for unattained objectives.

3. It must be mutually agreed upon by both parties. Neither party to the process may impose his or her will on the other. Without mutual agreement, the objective is relatively useless”.

Based on Pierce, setting the objective has six guidelines;

Objective Guidelines

1. Set goal and objective is a part of planning
2. Objective and goal should be worded clearly without any misunderstanding
3. Goals and objectives should be realistic and based on real facts
4. Accomplishing goal and objective should be under that person or department responsibility
5. Objective and goal should be assigned to someone or department
6. Goals and objectives should have determined completion date

According to ISHN article, objectives and goals should have these attributes:

1. Defined by employees: Needed improvement in each part should be considered for employer and in that area he or she should suggest objective and goal offers that employee can select between those options the one that can fit in that.
2. The acronym SMART is used in order to easily tells the attribute of good objective and it stands for (“S” for specific, “M” for motivational, “A” for attainable, “R” for relevant and “T” for track able.
3. The objectives and goals should be achievable but challenging
4. Objective should be few in number and should have flexibility.
5. Objectives and goals should be reviewed periodically.

There are some possible reasons why objectives and goals are not meet in organizations:

1. The first factor is that the objective is not constructed well and so in many cases this is the main reason for not reaching the goal.
2. The second reason for not reaching the goal is that the employees don’t have sufficient skill to perform that job and reach that goal so lack of ability is the other important factor for not reaching the objective.
3. There might be a change in subordinate following the agreement on reaching the objective.
4. There might be some important problems and issues related to executive line like lack of material and resources or equipment to reach the objective.

Macro measures

As we discussed before, the macro measurement is exclusively for top management within an organization and at top level of management all of the results that could be a concern is result measures instead of performance measures which is related to middle management, line managers and supervisors. Although these kind of measurement are called lagging indicators and just after act will be measured but at top level of management we are focusing more on result measures.

There are three kind of methods for measuring safety within organization which are: incident and accident rate like what should be reported to OSHA which was discussed completely before in this report. The other two methods for measuring safety in organization from macro level standpoint are audit and perception surveys .

Audit

Audit is a way to evaluate effectiveness and to asses compliance in a workplace. Organizations do audit in order to identify what regulation is applied to their organization according to the safety standards and safety agencies, auditing is a way to assess the current safety management system in place and evaluate the methods used to achieve the objectives in the safety management system.

Based on SASA, there are at least 6 type of audit related to health and safety which are: health and safety audit, walk around audit, health and safety management audit, project health, safety and environmental auditing, process safety audit, and product safety audit.

As an example in health and safety management audit based on Croner's the item below will be looked at:

1. "Does the company have adequate procedures for identifying specific H&S requirements which apply to its undertakings?
2. Are the procedures followed and are responsibilities set out clearly and understood?
3. Does the company's H&S policy documentation include adequate procedures for identifying hazards which exists at the workplace, and for assessing regularly the risks to employees and others affected by the workplace and workplace activities in order to identify the measures needed to avoid their exposure to risks of harm?
4. Are adequate risk assessment procedures also set out for hazards of products and /or services supplied by the company in order to identify the measures needed to avoid risks of harm to people such as distributors, customers, end-users and members of the public?
5. Are the procedures in 3 and 4 followed, and are responsibilities set out clearly and understood?

6. Does the company have adequate procedures for setting, reviewing and revising as necessary its health and safety standards for meeting specific H&S requirements and for meeting its general duties to protect employees and others from risks identified in the company's risk assessments?
7. Do the procedures for setting company standards include the identification of measurable targets which can be audited to monitor the level of compliance with company standards?
8. Are the procedures in 5 and 6 followed and are responsibilities set out clearly and understood?
9. Does the company have adequate procedures for planning, implementing, controlling, monitoring and reviewing the measures identified in 3 and 4?
10. Does the company have adequate procedures for carrying out H&S audits to check that the procedures in 9 are followed and that the measures in 3 and 4 are effective?"

Based on Dan Peterson, the Idea and concept of audit came from long time ago and after a while became more popular as we can see today many examples packaged audit like Nosa International System in South Africa, British Safety Council System and International Standard Organization which is called ISO. According to Dan Peterson, there are nine elements identified by National Safety Council and these are Management's credibility, Supervisory performance, employee involvement, employee training, employee attitudes and behavior, communications, accident investigation procedure, hazard control, and stress. As we discussed about the methods of measurement in the organizations like perception survey and audit, there are some metric measurement for above items that will be mentioned below:

Management's Credibility:

The best methods for measure this parameter are perception survey and audit but beside that there are some metrics for measurement management's credibility like percentage of health and safety meetings that top management are attended in that or percentage of safety objectives that achieved based on the schedule.

Supervisory Performance:

The best way to measure this parameter is perception survey but beside that we can mention some metric to measure this like, number of weekly, monthly or daily safety meeting held by supervisor.

Employee involvement and participation:

The best way to measure this factor is perception survey although beside this method there are some metrics to measure this parameter like number of peer observation or amount of employee who participate in safety meetings.

Employee training:

Like previous parameters the best way to measure this factor is perception survey but beside that some metrics could be mentioned in order to measure this factor like the amount of budget which is assigned for health and safety training or percentage of employees that have special training near the usual training.

Employee attitude and Behavior:

Like previous factor that the best way to measure them is perception survey, the best way to measure this parameter is also perception survey and the other metrics that should be considered as methods of measurements are: percentage of participation in any safety observation or percentage of those observation that accomplished on schedule.

Communications:

Additional metrics for measuring this parameter beside perception survey could be number of safety meetings or effectiveness of rewards. Accident investigation procedures: Both audit and perception survey are best ways to measure accident investigation procedure and beside these two ways they are some metrics methods to measure this parameter like percentage of accidents that organization could investigate to get root cause or average time from when incident happens till investigation get completed or the average time from incident occurs till that issue get corrected.

Hazard Control:

Both perception survey and audit are best methods for measuring hazard control item but beside that there are metric methods for measuring like number of accidents or incident that demonstrate the failure in planning or percentage of design staff that has some special training in ergonomics. Stress: some metric methods to measure this item could be average over time or number of safety audits that was carried out.

Conclusion

According to the definition and advantages and disadvantages of methods of measurement which were discussed in this paper, we can conclude that most of the types of measurements are useful but implementation and quality of these kind of measurement should be considered first and after that it should be mentioned that we

should make sure that each specific type of measurement is related and needed by specific level within organization and mixing up these measurement types with unrelated level of organization can cause issue and inaccurate vision from the section under measurement.

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