Session No.511

Systemic Incident Analysis using the Four-Phase Process

Dave Challburg
Scott Brown, ARM
Senior Safety Management Consultants
SAIF Corporation
Bend, Oregon

Introduction

This guide for the development of a comprehensive Incident Analysis system is directed at those who supervise and/or manage injury prevention within an organization. The four-phase process it describes takes the pitfalls and failures of other processes and turns them into an improved system that is more efficient, dynamic, and effective.

This segmentation into four phases helps focus the analysis. Processes that are not segmented can create a loss of focus. Because of this, questions and exploration of the incident are lost, and possible hazards are uncorrected. This leaves an opportunity for injury to occur. By following this four-phase process, you will segment the analysis, be able to gather all the relevant facts, fully explore the organizational systems, develop lasting meaningful countermeasures, and ensure your countermeasures become an important, valued, and imbedded part of the organization. When implemented to its fullest extent, incident analysis becomes a pro-active tool in the prevention of injuries. Remember, this process is not about finding fault; it is about exploring system problems.

The emphasis here is to find the system failures of an incident rather merely document the incident. Documentation is important to the regulators and the insurance companies, but does little to make change. The real reason for system analysis is to prevent the incident from happening again. A focus on learning the facts can lead to action, not just placing blame. Always look for system problems. Systems govern, and all systems are made up of many parts, so a universal approach is necessary. The end result of this process is to transform yourself into a "system" thinker rather than a "parts" thinker. Most of us are "parts" thinkers. What are you? Do you know? "System" thinking will be discussed later in this document.

This process is about making how you look at incidents and events at work – or life in general for that matter – a habit. When this process is internalized, how we observe the world around us becomes second nature. Better understanding and better decisions come from this process when it is used to clarify and create change.

Vocabulary Change

It is important to release some old baggage. I have found old baggage or word usage can get in the way of achieving the changes necessary to develop a new safety culture. In incident analysis, it is important to eliminate some words and introduce a new vocabulary to aid in your safety efforts. The following words should be eliminated from your injury prevention culture: investigation, fault, and common sense. Replace them with analysis, facts, and best practices help to support a more objective and proactive view of incidents versus a negative or punitive approach.

Investigation Who wants to be investigated? When you think of the words police, IRS, and punishment, what are the general feelings associated with them? Most likely the feelings are of a negative or fearful nature. Do you want your employees to tell you what they think you want to hear just to avoid punishment? They probably think you are just looking to find fault or someone to blame?

Fault This is the next word to go. You do not want to look for fault, as it will single track your direction in gathering information. You are looking for **facts** in the systems that are not working. If there is a flaw, it will naturally show itself in the **analysis** of system problems or things that are not working. In your analysis, the gathering of facts will be much clearer and should be done objectively. Remember, one fact is just a fact and has no special importance at this point. When you move to system analysis and possible countermeasures, the prioritization of facts will be more important and will provide more direction for needed changes.

These two words are not too hard to eliminate, but the third word? Come on …. get rid of **Common Sense**? You must be kidding! What is common sense? Webster's Dictionary defines common as "widespread general knowledge falling below ordinary standards," and sense is defined as a "definite, but often vague awareness or past impression." Is this what you want to use as a tool to make change? A vague awareness that's below standard? No, I don't think so.

What does common sense really mean? Common sense is different for each and every individual. Is my common sense the same as yours? Is yours the same as your co-workers'? Is theirs the same as the others in the work area? Of course not, we are all different and have been exposed to different situations throughout our lives. We may experience exposure to the same events, but how we react is as different as each and every person. It is NOT the same or "common." So how can you expect a person to do a task or take an action based on common sense and expect it to be done as you would have done it? You can't. So when you finding yourself saying, "they have no common sense," it is best to stop and ask the following questions. Have they been trained in our best practices? Did they understand the training? Did we give them all the information on how we want the job done?

Now, common sense is important because it is who we are. From the time we start taking in information (when very young), right up to the time this sentence is read, "common sense" is being formed. It will most always predict what we will do next; however, it is very different from person to person. Let me tell you about an event I experienced that better conveys my point:

I was making a presentation to a construction account I worked with. It was a Monday morning breakfast meeting where spouses were invited. The presentation was on incident analysis and as I

had reached this point of vocabulary change and specifically the common sense part. This lady sitting at a table with her husband, who was the construction company employee, just started laughing to the point of interruption. I stopped the presentation and asked what was so funny.

She said, "What you said is so true; it is so true. I just cannot believe how right you are."

Of course, when someone says you have said something that is true, you need to follow up. So I said to her, "Ma'am, can you share with us what is so true?"

"Yes," she said, and she then proceeded to tell us what had happened the day before, on a Sunday afternoon. She and her husband had some relatives coming over in the afternoon for a barbeque, and they had spent most of the day getting the yard and house presentable for the event. When they finished, they went in the house to relax for awhile. Her husband sat on the couch and turned on the television and found a football game. In fact, it was his favorite team in a close game. She went around the house to ensure all was in order. When she looked out the kitchen window, she discovered that he had not run the weed eater along the fence line in the back yard. So she said to him, "Honey, you forgot to weed-eat along the fence. Could you do it?"

He said, "Oh no, I forgot, but my favorite team is playing. It's a close game, and it'll be over in two minutes."

The relatives would be there in 15 minutes, and two minutes in a close football game is usually 45 minutes. He knew this, and she knew this, so he leaned over the couch and said, "Honey, would you mind doing it? It only takes some common sense to run the weed eater."

She said, "Sure, I can do it." (Wouldn't we all like to have that answer.)

Now, she had operated most of the power equipment, just never the weed eater. She went to the shed and located it, choked it, pulled the rope and got it started. She grabbed the handle, squeezed the trigger, and placed the weed eater head at the fence line. It was at that point things started to go badly. You see, the fence line had weeds ***and*** *small rocks, and she had shorts and bare feet. The two did not mix.*

I asked her what she did, and she said, "I threw the weed eater down, ran into the house screaming. I looked down at my legs where little spots of blood were coming from the rock impact. My legs were green and bleeding."

Her husband looked over the couch and guess what he said? (By the way he will pay for having said it for the rest of his life.) He said, "My gosh (or sub a word) lady, don't you have any COMMON SENSE? I always wear long pants and boots."

Accidents and Incidents Defined

Too many organizations only look at accidents where a person gets hurt, and only when it rises to a significant level of injury. In other words, it matters when the event impacts getting the work done. The term "accident" can be defined as an unplanned event that interrupts the completion of an activity and includes significant injury or property damage. An "incident" usually refers to an

unplanned event that did not cause injury or damage but had the potential for harm. “Near miss” or “dangerous occurrence” are also terms for events that could have caused harm but did not. “Close calls” and are events causing no injury or damage, which are recognized, observed, and/or events of concern.

Some would like to separate these terms, but they all are really the same. The only difference between a “near miss,” “close call,” “incident,” and “accident” is the amount of people damage that occurs. Everything else is still the same. To not examine these things, no matter what they are called, is to let risk lie in wait for more victims, when an incident finally rises to the level of someone’s concern.

The term “incident” is used in some situations and jurisdictions to cover both an “accident” and an “incident.” It is argued that the word “accident” implies that the event was related to fate or chance. When the root cause is determined, it is usually found that many events were predictable and could have been prevented if the right actions had been taken -- making the event not one of fate or chance (thus, the word incident should be used). For the purpose of this program, we will use the term **incident** to mean all of the above events: close calls, near misses, unsafe acts, unsafe work practices, hazardous exposures, and accidents.

Conducting the incident analysis

Ideally, an analysis would be conducted by someone experienced in incident causation and analysis techniques. This person should also be fully knowledgeable of the work processes, procedures, and the industrial relations environment of a particular situation. Some organizations provide guidance by requiring that the analysis be conducted jointly, with both management and labor represented, or requiring that the analyzer have knowledge of the work processes involved. An open mind and the ability to put aside bias are critical to the selection of those who conduct the analysis.

It is recommended that the immediate supervisor conduct the initial analysis. The advantage is that this person is likely to know the most about the work and the people involved, as well as the current conditions. Furthermore, the supervisor can usually take immediate remedial action. One counter argument would be that the immediate supervisor may attempt to gloss over the employer’s shortcomings in the incident. This situation should not arise if the incident is analyzed by a team of people, and if the worker representative(s) and the safety committee members review all incident analysis reports thoroughly. If the organization fully understands the process of finding problems in the organizational systems and making change, this should not be a concern. Remind participants that looking for facts is the objective.

Here are some other people to consider:

- Employees with knowledge of the work
- Safety officer
- Safety committee
- Union representative, if applicable
- Employees with experience in investigations

- Outside expert

Look for the “system problems”

Looking into the systems behind the problems means using the linkages and interactions between the elements of a system to understand the whole. Human activity systems are open systems; therefore, they are affected by the organizational systems in which they exist. The organizational systems we will explore are Management, Employee, Equipment, and Environment. Also, system thinking recognizes that in complex systems, events are separated by distance and time. Therefore, small catalytic events can cause large changes in the system. A change in one area of the system can adversely affect another area of the system, thus, it underscores the importance of organizational communication at all levels in order to avoid the silo effect.

An analyzer who believes that incidents are caused by compliance violations or unsafe conditions alone will likely try to uncover these types of conditions as the causes or compliance violations by workers. On the other hand, someone who believes incidents are caused by system problems will attempt to find the organizational shortcomings (people included) that are the causes. Therefore, it is necessary to examine some underlying factors in a chain of events that ends in an incident. Organizational systems will be discussed later in Phase Two.

The important point is that even in the most seemingly straightforward incident seldom, if ever, is there only a single cause or root cause. For example, an “analysis” which concludes that an incident was due to worker carelessness and goes no further, fails to seek answers to several important questions such as:

- Was the worker distracted? If yes, **why** was the worker distracted?
- Was a safe work procedure being followed? If not, **why** not?
- Were safety devices in order? If not, **why** not?
- Was the worker trained? If not, **why** not?
- Why. Why. Why. The question Why is the key to system analysis.

Another example may be; My car will not start. (the problem)

- Why? The battery is dead.
- Why? The alternator is not functioning.
- Why? The alternator has failed.
- Why? The alternator is well beyond its recommended useful service life.
- Why? The company has no system to monitor recommended service life schedules
- Why? I never read the owners manual.
- Why? We don’t do it for any other vehicles or equipment.
- Why? We never had this problem before.

An inquiry that answers these and related questions will probably reveal conditions that are more open to correction than attempts to prevent “carelessness.”

Looking at the cause of an incident

Incident Causation Models: Many models of incident causation have been proposed, ranging from Heinrich's Domino Theory to the sophisticated Management Oversight and Risk Tree (MORT). The Domino Theory suggests that if you remove one of the dominos (steps in a process) you could have prevented the incident. Although this seems logical, it misses a purpose of the analysis - prevention through system analysis. It overlooks all the other system problems by stopping the thinking process of the person or team doing the analysis. Stay away from Domino thinking.

The simple model shown in Exhibit 1 attempts to illustrate that the causes of any incident can be grouped into four systems – Management, Employee, Environment, and Equipment. When this model is used, possible causes in each system should be analyzed for system problems. Each system is examined more closely in the following pages.

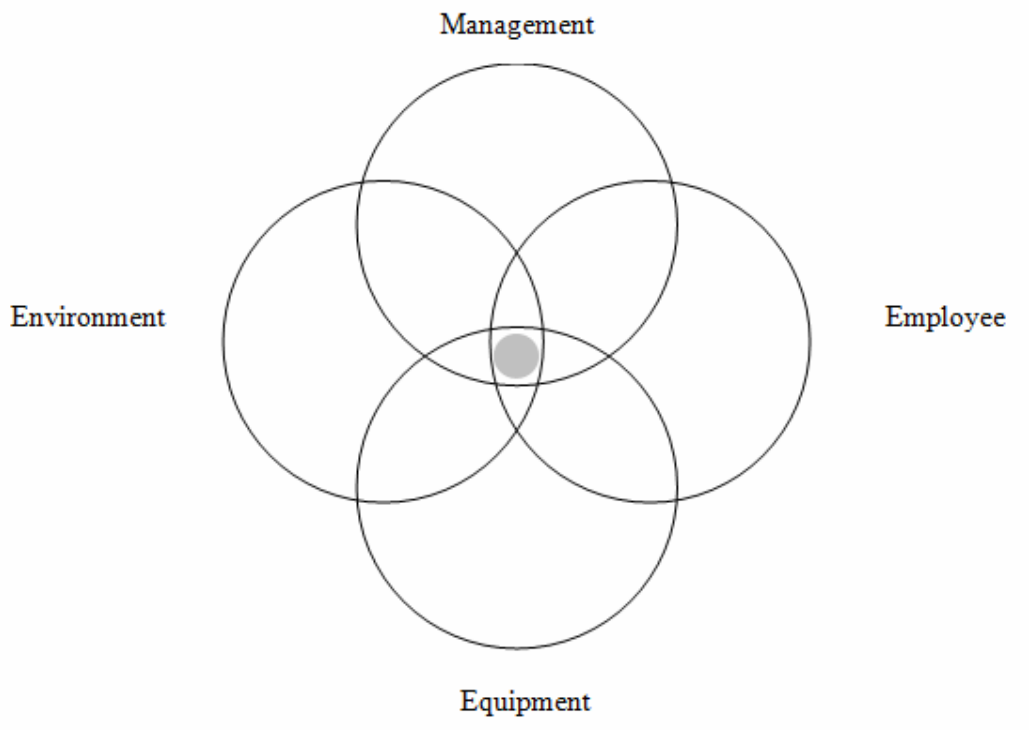


Exhibit 1. Organizational Systems

Steps involved in analyzing an incident

As little time as possible should be lost between the moment of an incident and the beginning of the analysis. In this way, one is most able to observe the conditions as they were at the time, prevent the disturbance of evidence, and identify possible witnesses. Conducting the analysis at

the scene is very important, as it provides visual information critical to fact finding. If you have time and distance (not at the scene) against you, you lose.

The tools needed by members of the analysis team include pencil, paper, camera, film, camera flash, tape measure, etc., and they should be immediately available so that no time is wasted.

The incident analysis process involves the following steps:

- Reporting all incident occurrences to a designated person within the organization - preferably the immediate supervisor
- Providing first aid and medical care to injured person(s) and preventing further injuries or damage

The next four paragraphs provide an overview of the four phases with more detail to follow.

NOTE: Always finish a "Phase" before going to the next. Failure to do so will result in an incomplete analysis.

- **PHASE ONE:** "Fact Finding" ~ Analyze the incident using fact-finding techniques and recording ONLY what was NOT WORKING on the form. Do not put down items that **are** working, like "we have a policy" or "the proper tools were used." Only record what was **not** working, like "no policy" or "wrong tool."
- **PHASE TWO:** "System Analysis" ~ For each identified fact, start your system analysis by asking WHY, several times, each time something that didn't work is discovered and record your findings. You will find the WHY will usually lead to cultural issues within organizations. Systems and cultures are different. Systems can be repaired more easily than cultural issues. Culture change can take more time, as it is often personality and style issues, which are not easily changed. However, it cannot be ignored.
- **PHASE THREE:** "Countermeasures" ~ Develop a plan for corrective action for each fact found in Phases One and Two. Do your best to place the accountability on who will be responsible to correct the item and when you can expect it to be done. As the analysis form moves through the organization, changes may be made in countermeasures: who will do it and the expected completion date, because of additional knowledge and understanding within the organization. You must be aware that any change made may have an impact on how work is done, on work processes, and may present new hazards. Great care should be employed in any recommended change to insure positive results. Any changes should be conveyed to your analysis team.
- **PHASE FOUR:** "Monitoring" ~ Evaluate the effectiveness of the corrective action through a monitoring system. Monitoring systems are needed to ensure changes become new organizational habits. People and organizations tend to revert back to past practices. Monitoring positive change is the only way to ensure old habits or practices are stopped.

The Form

The incident analysis form (last page of this document) was developed specifically for this process. It follows this process well and balances the system analysis.

The first thing you will notice is that there are no questions on the form.

After reviewing hundreds of incident analysis forms, it was found that a high percentage were ineffective at developing any change. Most were not filled out correctly, and almost none provided a solution. When there were solutions, they tended to be simplistic: be careful, follow the rules, don't take chances, or that section was just left blank. Further study showed that the questions tend to do the thinking for the person filling out the form. You can have too few questions or so many that people forget or get confused, which leads to frustration and lack of engagement. It is almost impossible to build a set of questions that would be applicable to the differing incidents that occur, so what you end up is a document of unnecessary questions. Although questions are critical, they need to come from engagement in the process and creativity of those doing the analysis. So, how do you have a form to document your information, one that is in a logical format that will motivate a person to engage and develop solutions? Every organization has systems, and the primary systems of all organizations are management, employee, equipment, and environment. After long discussions and analysis, the form was developed to provide four boxes representing the four systems. On the left side of the page is a list of the systems: management, employee, equipment, and environment, followed by the common issues found in these systems. This is only starter fluid; they are not to be looked at as questions. They are a reminder of what the boxes represent. These four systems were discussed on page 4.

The only information you place in the boxes is what is **not working** in the system, not those that are working: We have a program. Everyone was working safely. The equipment was guarded. Just listing what is working is not the purpose of the analysis. The purpose is to find out what is not working in the system: We don't have a policy. There was no training. The guard was missing, The worker was taking a risk.

Once you have Phase One and Phase Two data entered, it will be easy to review in Phase Three and develop countermeasures. In the countermeasures box, you will identify who will be responsible and when the countermeasures are expected to be completed.

If your organization has a standard form that must be used, you will have little choice in how your written report is presented. Nevertheless, you should be aware of, and try to overcome, such shortcomings as:

- Limited space provided for an answer. The tendency will be to answer in that space despite recommendations to "use back of form if necessary."
- A limited checklist of causes. Possible causes **not** listed may be overlooked.
- Headings that elicits a single response, even when more than one unsafe condition exists.
- Differentiating between "primary causes" and "contributing factors" can be misleading. All incident causes are important and warrant consideration for corrective action.

Your previously prepared draft of the sequence of events can now be used to describe what happened. Keep in mind that readers of your report do not have the intimate knowledge of the incident that you have, so include all pertinent detail. Photographs and diagrams may save many words of description. Identify clearly where evidence is based on certain facts, eyewitness accounts, or your assumptions.

If uncertainty exists about any particular part, say so. The reasons for your conclusions should be stated and followed by your recommendations. Weed out extra material not required for a full understanding of the incident and the causes such as photographs that are not relevant and parts of the analysis that lead you nowhere. The measure of a good incident report is quality, not quantity.

Always communicate your findings with workers, supervisors and management. Present your information "in context" so everyone understands how the incident occurred and the actions put in place to prevent it from happening again.

Phase One: Fact Finding

Collecting Facts

The steps in incident analysis are simple: the incident analyzers gather facts. An open mind is necessary with an incident analyzer. Preconceived ideas may result following the wrong paths, while leaving some significant facts uncovered. All possible causes should be considered. Making notes of ideas as they occur is a good practice, but conclusions **should not be drawn** until all the information is gathered, and you are in Phase Three.

It is very important during Phase One to collect only the facts. Do not go to solutions. We are trained in life to solve a problem when we find it. Competitiveness in finding the answer as quickly as possible and other human interaction issues can cause us to fix issues as we find them. There may be places for this type of thinking, but not here. I am not saying it is wrong, but in the incident analysis process, it causes significant problems. By doing the find it/fix it approach, you stop asking questions. It is very difficult to get back to the fact-finding process. It also lends itself to inadequate fixes, because all the facts may not have been discovered. You can spend countless hours going over and over the same ground, because it was covered well at the start. It is difficult and challenging, but you must only gather facts during Phase One. Stick to the facts and nothing but the facts.

Below are some of the areas you will want to explore. This list does not include everything, but it should get you started ("Starter Fluid"). You will also find these same items on the left-hand side of the Incident Analysis worksheet. These are not questions, only Starter Fluid. The questions are in your mind, and how many you ask is determined by how much you use the process.

Starter Fluid

Management

Management is responsible for the safety of the workplace. Therefore, the role of supervisors, higher management and/or the presence of management systems must always be considered in an incident analysis. Problems in organizational systems are often found to be direct or indirect factors in incidents.

Ask questions like:

- Where is production on the priority list?
- Is there adequate staffing?
- Are there hiring practices in place and are they being used?
- Are additional supervisory skills needed?
- Were safety rules communicated to and understood by all employees?
- Were written procedures and orientation available and conveyed to all employees?
- Were they being enforced?
- Was there adequate supervision?
- Were workers trained to do the work?
- Was regular maintenance of equipment carried out?

Employee

The physical, mental, and decision-making process of those individuals directly involved in the event must be explored. The purpose for analyzing the incident is **not** to establish blame against someone, but the inquiry will not be complete unless personal characteristics are considered. Some factors will remain essentially constant, while others may vary from day to day. Workers do not get up in the morning and say, "I think I'll go to work today and cut off a finger," or "I'm going to blow out my back and cripple myself for the rest of my life." Do employees make mistakes? Yes, just as errors can occur in any of the other systems. Here is more starter fluid for you to use.

Were workers:

- Following procedure?
- Taking short cuts?
- Wearing PPE?
- Experienced in the work being done?
- Adequately trained?
- Physically able to do the work?
- Under stress (work or personal)?

Equipment

Seek out possible causes related to the equipment and materials used. Equipment by itself does not create hazards or cause the incident. The hazard is created by its owner or operator.

Analyzers might ask:

- Was the proper tool selected?
- Was the tool available?
- Was there an equipment failure?
- Was the machinery poorly designed?
- Were hazardous substances involved?
- Were hazardous substances clearly identified?
- Was a less hazardous alternative substance possible and available?
- Was the raw material substandard in some way?
- Was PPE used?

Again, each time the answer reveals a failure, write it in the Equipment box. **Don't go to solutions yet.**

Environment

The physical environments, and especially sudden changes to that environment, are factors that need to be identified. The situation or condition at the time of the incident is what is important, not what the "usual" conditions were. Environmental problems may seem casual or uncontrollable, but they are very important to the analysis process. Controls for all environmental factors can be accomplished. For example, you may want to know the following:

- Plant layout
- Ergonomics
- Vibration
- Noise levels
- Chemicals
- Presence of toxic or hazardous gases, dusts, or fumes
- Lighting
- Weather conditions
- Temperature (too hot or cold)
- Housekeeping practices

This model of incident analysis provides a guide for uncovering all possible causes and reduces the likelihood of looking at facts in isolation. Some analyzers may prefer to place some of the sample questions in different categories; however, the categories are not important, as long as each pertinent question is asked. Obviously there is considerable overlap between categories. This reflects the situation in real life. Again it should be emphasized that *the above sample questions do not make up a complete checklist, but are Starter Fluid only.* Remember, finish Phase One before moving to Phase Two.

Phase Two: System Thinking

The Pinto Story: defining parts thinking

Greg's job is to deliver the mail at the end of each day to the post office by using the company car, a Ford Pinto. The company had been having problems with the Pinto and had just gotten it back from the shop. Greg gets the mail, gets into the Pinto, starts it up, puts it in gear, and releases the clutch. POW! Greg breaks the rear axle. Greg tells his boss he cannot get the mail to the post office on time because of a broken axle on the Pinto.

Greg has done this job for a month or so, has had no problems, and has been very reliable, but his boss's first reaction is that Greg is a younger guy and may not be driving the vehicle with the respect he should. So, the boss sends the vehicle down for a new axle and tells Greg to be more careful driving the Pinto. He tells him the Pinto is an older vehicle but a good one, and he needs to be more cautious. Sounds reasonable, right?

Well, the next day the Pinto is back. Greg gets into the Pinto to take the mail to the post office. Greg starts the Pinto, puts it in gear, and releases the clutch. POW! Greg breaks another axle. Greg is feeling a bit confused, as he was trying to be careful and had never had this problem before. He goes in and tells his boss about breaking the axle and not being able to get the mail to the post office on time. His boss is a little perturbed at Greg for breaking the axles and demotes Greg to the mail sorting job. The boss gives Scott the mail delivery job.

The boss gives Scott some coaching on how to be careful in driving the Pinto. It is old but in good repair (it had just come back from the shop after Greg broke the second axle). Scott assures his boss he is a very good driver and will take good care of the Pinto. Scott gets into the Pinto, starts it up, puts it in gear, and releases the clutch. POW! Scott breaks the rear axle. Scott slinks into the building and tells his boss that he has just broken the axle in the Pinto and was not able to deliver the mail to the post office.

The boss loses it, "I have the most stupid workers I have ever seen. They cannot drive. They don't care about our equipment, and I cannot count on anyone. They have no common sense."

The boss is not happy. Greg is not happy. Scott is going back to the mail sorting job and is not happy. ***This is Parts Thinking. But this is how it usually happens. Fix the people, fix the people, fix the people.*** *A system analysis on why the axle broke would have revealed the repair shop had replaced the 87-horsepower four-cylinder motor with a supercharged 440 with 650 horsepower, too much power for the axle to handle, on the first repair, the transmission on the second repair, and the differential on the third repair. All parts of the entire system and probable problem causes, especially the engine.*

How much of our energy is spent trying to fix the people who work in the system, when the trouble comes from causes built into the system by the policies and actions of the organization? As W.E. Deming once said, "Currently, management works under the assumption that people and not the systems they work in are responsible for safety. We therefore reward and punish people, but the system they work in remains unchanged. The point is ... that focusing on individual differences alone yields possibilities for improvement that are trivial compared with transformation of the entire system that they work in."

System thinkers see things differently. They realize that everything is arranged in systems, and the system is comprised of interrelated and interdependent parts or subsystems. Each system exists to accomplish a purpose, and it requires all of the parts to accomplish it.

"Safety does not stand alone; it must operate effectively, in balance, with other parts for the system to accomplish its purpose."

At this stage of the analysis, most of the facts about what happened and how it happened should be known. This has taken considerable effort to accomplish, but it represents only the first phase of the process. Now comes the key WHY question. The WHY question is key to system analysis and discovery of system/cultural issues often deep within an organization. To eliminate recurrences of similar incidents, the analyzers must find all WHY answers to accomplish system change.

You have kept an open mind to all possibilities and looked for all pertinent facts. There may still be gaps in your understanding of the sequence of events that resulted in the incident. You may need to re-interview some witnesses to fill in these gaps in your knowledge.

- When your analysis is complete, write down a step-by-step account of what happened (your conclusions), working back from the moment of the incident using the WHY question. Why. Why. Why. This may seem like extra and sometimes silly work. However, the whys are the key to system analysis and discovery of system failures. Only lasting and effective change can occur by asking the WHY questions. Each conclusion should be checked to see if:
- It is supported by evidence.
- The evidence is direct (physical or documentary) or based on eyewitness accounts.
- The evidence is based on assumption. Not to say that assumptions are not important, but should be viewed with caution as they may be a misguided opinion.

This list serves as a final check on discrepancies that should be explained or eliminated.

Now you should have added system discoveries that contributed to the incident. You should have also entered some of the possible cultural issues contributing to the incident.

Phase Three: Change/Countermeasures/Solutions

The purpose of Phase Three is to come up with a set of well-considered recommendations designed to prevent similar incidents. Once you know the work processes involved and the overall situation in your organization, it should not be too difficult to come up with realistic recommendations. Recommendations should:

- Be specific
- Be constructive
- Consider organizational issues
- Prioritize using the high impact, low impact, easy or difficult to implement matrix (See the illustration in Exhibit 3.)

When prioritizing controls, you should try to engineer the hazard out whenever possible. The ultimate control is automation with no human contact. (see Exhibit 2 for hierarchy of control)In many cases, this is not a reasonable business option. You may not have the financial resources or adequate facilities, or any one of several other good reasons. It may be that developing engineering controls will take lengthy planning. Either way, engineering controls should be explored as an option to correction.

If engineering controls are not possible, then you should look at administrative controls. This would be the process of policy control where restricting access or restriction from the hazard would be developed as a company policy. The next level of control is personal protective equipment (PPE), where an evaluation of the exposure in relationship to PPE is conducted. A machine with flying particles would require a measure of eye protection. Uncontrolled high noise levels would require a measure of ear protection, and so on. The final and most ineffective control is to conduct training aimed at diminishing the hazard. This is not to say training is not important.

It is paramount in how workers do their jobs. The process of tell, show, demonstrate, and monitor should be followed, but training as a hazard control should be considered the control of last choice. With the exception of total automation, it is often a combination of all these controls that will be needed.

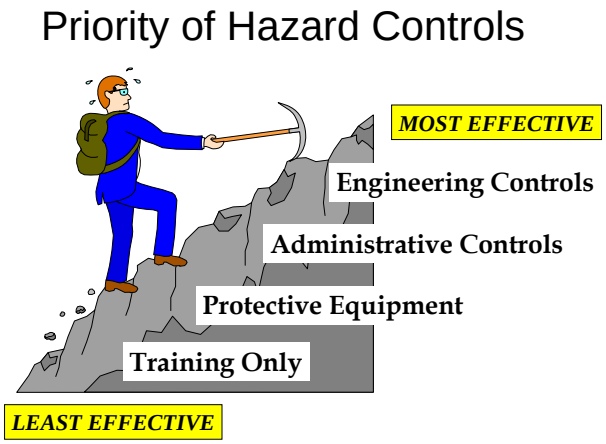


Exhibit 2. Hazard Control Effectiveness

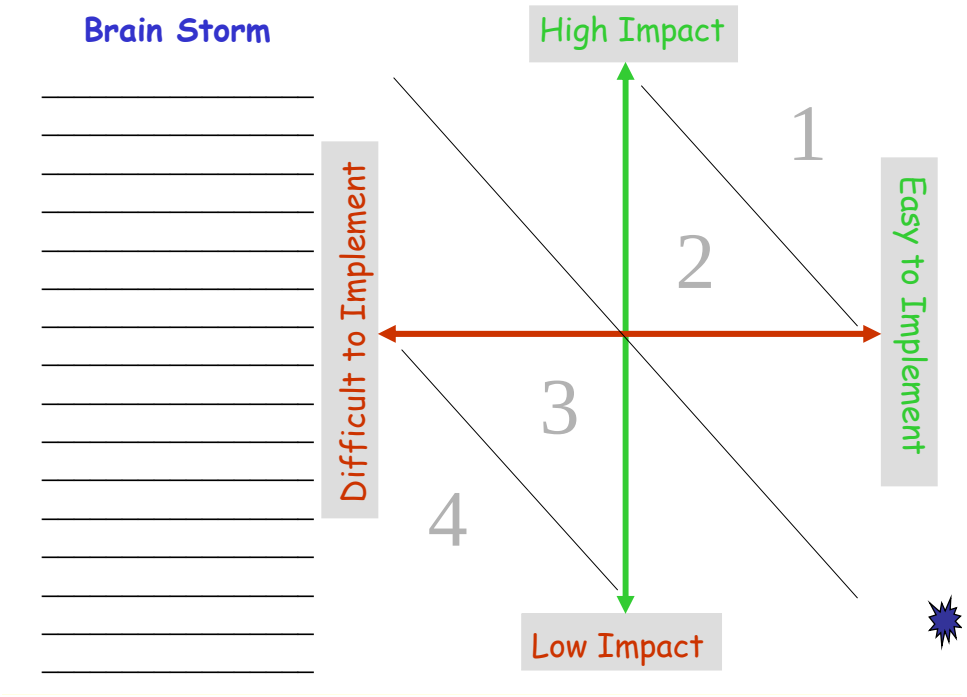
A useful tool in the decision process of implementation is illustrated in Exhibit 3. This tool is used to matrix your decisions of implementation by differentiating things that can be implemented easily with high impact from those that have little impact and are not easy or hard to implement.

The first step is to brainstorm solution ideas and place them on the left side of the page. One very important rule to remember: no idea is a bad idea and all ideas are to be placed on the list no matter how far-fetched they seem. After all the ideas are on the list, review and find commonality amongst the list which allows you to combine ideas. Review again for purpose and application by the person(s) presenting the solution. This will help bring focus to the list.

After a respectful discussion of the list, you should have items you can start moving to the matrix. Solutions of high and low impact are just as they seem. High impact is the elimination or near elimination of the exposure with low being just the opposite. Easy and difficult become the difference of a couple of issues. One thing to consider is the simple ease of change to the process or exposure verses degree of difficulty to change. For example, it would be easy to restrict an area from access but it may be more difficult to move, encase, remove, or automate the equipment creating the exposure. The second is consideration of physical challenges to operations; however, they could become budget issues as difficult solutions often require significant changes to current operations.

Once you have placed solutions on the matrix you will want to have some final discussions on your placements as the bigger system picture takes shape to work with for a final analysis. When

finished, you will be able to put your recommendations into a business plan or management proposal for the purpose of controlling the exposures. The business plan will allow management/ownership to develop the best short- and long-term plan to control the hazard.



(Humantech Inc. Applied Industrial Ergonomics – Version 4.0)

Exhibit 3. Solution Priority Matrix

Resist the temptation to make only general recommendations to save time and effort. Always identify who will be responsible for implementing the recommendations and when they are expected to be completed. This is very useful in the monitoring process. For example, you have determined that a blind corner contributed to an incident. Rather than just recommending "eliminate blind corners," it would be better to suggest:

- Install mirrors at the northwest corner of building X (specific to this incident)
- Install mirrors at blind corners where required throughout the worksite (general)

What should be done if the analysis reveals "employee error”?

An awkward situation that bothers many analyzers is the idea that one does not want to place blame. However, when a thorough worksite incident analysis reveals that some person or persons among management, supervisors, and/or the workers were apparently in error, then this fact should be pointed out. The intention here is to remedy the situation, not to discipline an individual.

If the analysis team doesn't point out human shortcomings that contributed to an incident, it not only downgrades the quality of the analysis, it also allows further incidents to happen from similar causes because they have not been addressed. Make sure that everyone is made part of the recommendations/change process. Any change that an employee is part of, they will own because they were part of the solution.

However, never make recommendations about disciplining anyone who may be in error. Any disciplinary steps should be done within the normal personnel procedures.

Phase Four: Monitoring

Management is responsible for acting on the recommendations in the incident analysis. The safety committee, if you have one, can monitor the progress of these actions; it is part of their responsibilities. After corrections have been made, there is a tendency to relax and conclude, "We are all done; this is great, and we have fixed the problems." You may be correct, but this does not always mean a lasting change. People and organizations will revert back to old systems and practices if not monitored. Monitoring should be periodic until you feel comfortable the changes have become an embedded part of the organization, or they really are new habits or work processes.

Follow-up actions include:

- Responding to the recommendations in the report by explaining what can and cannot be done (including why or why not)
- Developing a timetable for corrective actions
- Monitoring actions scheduled for completion
- Checking often to insure changes are still working
- Informing and training other workers at risk

Some added tips and conclusions

Injured workers(s)

The most important immediate tasks – rescue operations, medical treatment of the injured, and prevention of further injuries – have priority, and others must not interfere with these activities. When these matters are under control, the analyzers can start their work. Put the worker at ease as much as possible by acknowledging that he or she did not get up and come to work to be injured. The worker most likely feels badly about the whole event and, depending on the severity of injuries, will go through the normal phases of remorse or regret, denial, blame, anger, and acceptance. Be aware of these phases and work to move the worker to acceptance as quickly as possible.

Physical Evidence

Before attempting to gather information, examine the site for a quick overview, take steps to preserve evidence, and identify all witnesses. In some jurisdictions, an incident site must not be

disturbed without prior approval from appropriate government officials, such as the OSHA, inspector, or police. It is subject to rapid change or obliteration; therefore, it should be the first to be recorded. Based on your knowledge of the work process, you may want to check such items as:

- Positions of injured workers
- Equipment being used
- Materials or chemicals being used
- Safety devices in use
- Position of appropriate guards
- Position of controls of machinery
- Damage to equipment
- Housekeeping of area
- Weather conditions
- Lighting levels
- Noise levels
- Time of day

You may choose to take photographs before anything is moved, both of the general area and specific items. Sketches of the incident scene based on measurements taken may also help in subsequent analysis and may lend clarity to written reports. Broken equipment, debris, and samples of materials involved may be removed and sent to appropriate experts. Even if photographs are taken written notes about the location of these items at the scene should be prepared.

Eyewitness Accounts

Every effort should be made to interview all witnesses. In some situations, witnesses may be your primary source of information because you may be called upon to analyze an incident without being able to examine the scene immediately after the event. Witnesses may be under severe emotional stress or afraid to be completely open for fear of recrimination. In spite of this, it should not be put off. Time is critical in gathering of information.

It is very important to interview witnesses as soon as possible after the incident. If witnesses have an opportunity to discuss the event among themselves, individual perceptions may be lost in the normal process of accepting a consensus view where doubt exists about the facts.

Interview a witness at the scene of the incident, if possible, where it is easier to establish the positions of each person involved and to obtain a description of the events. On the other hand, it may be preferable to carry out interviews in a quiet office where there will be fewer distractions. The decision may depend in part on the nature of the incident and the mental state of the witness.

Interviewing

The purpose of the interview is to establish an understanding with the witness and to obtain his or her own words describing the event. Interviewing is an art that cannot be given justice in a brief document such as this, but here are a few suggestions:

DO

- Put the witness, who is probably upset, at ease
- Emphasize the real reason for the analysis and explain that this is NOT an investigation
- Let the witness talk and you listen. Use the 90-10 rule. The analyzer talks 10 percent of the time. The interviewed person talks 90 percent of the time.
- Try to sense any underlying feelings of the witness
- Make short notes or ask someone else on the team to take them during the interview
- Close on a positive note
- Make sure that the workers and other contributors are present during Phase Three, when solutions and change occurs.

DO NOT

- Intimidate the witness
- Interrupt
- Prompt
- Show your own emotions
- Jump to conclusions

Ask open-ended questions that cannot be answered by simply “yes” or “no.” If you are getting “yes” and “no” answers, you are asking the wrong questions. The actual questions you ask the witness will naturally vary with each incident, but there are some general questions that should be asked each time:

- Where were you at the time of the incident?
- What were you doing at the time?
- What did you see, hear?
- What were the environmental conditions (weather, light, noise, etc.) at the time?
- What was (were) the injured worker(s) doing at the time?
- In your opinion, what caused the incident?

If you were not at the scene at the time, asking questions is a straightforward approach in establishing what happened. Obviously, care must be taken to assess the credibility of any statements made in the interviews. Answers to the first few questions will generally show how well the witness could actually observe what happened.

Another technique sometimes used to determine the sequence of events is to re-enact or replay them as they happened. Obviously, great care must be taken so that further injury or damage does not occur. When an injured worker is asked to re-enact have them do it in slow motion, step by step. Be aware that person re-enacting an event are nervous and not focused very well. The word is caution.

☐ Near-miss
☐ First aid

FILE 801, IF BOXES BELOW ARE CHECKED

☐ Medical care
☐ Time loss
☐ Fatal

INCIDENT ANALYSIS

Immediate supervisor should complete this form promptly with worker.

1. Employee _____ Dept. _____ Phone #_____

   Employer _____

2. Date/time of incident _____ Date/time first reported_____

   Supervisor _____ Dept _____ Phone # _____

3. Incident location _____

4. Describe injury (nature of injury/part of body) _____

5. Describe incident fully (What happened?):

6. Identify factors that **ARE NOT WORKING**. **(refer to list on left side of page):**

Management:	**Employee:**
Equipment:	**Environment:**

Counter measures/best practice; How do we correct areas identified in the MEEE area above, who will make changes and when will the changes be completed. Use other sided if needed.	**Who**	**By when**

7. Treating physician, if known _____ Phone _____

Completed by: _____ Title _____

Employee signature: _____ Date/time: _____

Note: Complete Workers Compensation claim (Form 801) if injury required doctor's treatment. Form 801 must be received by insurance carrier within five (5) days of your knowledge of doctor treatment.

SYSTEM CHALLENGES

Management:
Do we have;
Policy enforcement
Hazard recognition
Accountability
Supervisor training
Corrective action
Production priority
Proper resources
Job safety training
Good hiring practices
Maintenance
Adequate staffing
Safety observations

Employee:
Was the employee
following procedure
Training
Previous injury
Mental ability
Physical capacity
Equipment use
Short cuts
PPE worn
Safety attitude

Equipment:
Do we have;
Proper tool selection
Tool availability
Maintenance
Visual warnings
Guarding

Environment:

Plant layout
Chemical
Temperature
Noise
Radiation
Weather
Terrain
Vibration
Ergonomics
Lighting
Ventilation
Housekeeping
Biological

Additional Causal Factors
☐ Faulty equipment
☐ Non-employee
☐ Prior injury
☐ Late reporting
☐ Off-the-job Injury
(Explain any checked boxes on separate sheet)