

Mike Taylor:

[inaudible] Hello Everyone. And welcome to the next episode of the workplace safety review podcast. I'm your host, Mike Taylor. I am the chair of the OSHA practice group at Greenberg Traurig and, uh, based out of our Washington DC and Northern Virginia offices. I've been practicing OSHA law for roughly about 20 years now. And if you want to find out more about me or our OSHA practice group, you can go to [www.gt.law.com](http://www.gt.law.com). Today I have the honor and privilege of having a premier guest on our show, Quentin Baker of Baker Engineering and Risk Consultants, which is headquartered in San Antonio, Texas. Bigger Engineering is an engineering company that specializes in prevention and mitigation of potential explosion, fire, and toxic release hazards. In addition to engineering services to assist clients in managing risk Baker Risk has R and D activities focus on improving safety and investigation services to help clients determine the cause of incidents or accidents. Quentin holds a BS in mechanical engineering from Texas A and M University and an MBA from the University of Texas at San Antonio. Quentin has over 40 years of experience in the fields of combustion explosion and blast effects. He has investigated well over 120 explosion incidents in a wide variety of industries. Quentin welcome.

Quentin Baker:

Thank you, Mike. Good to be with you.

Mike Taylor:

Quentin wanted to talk to you today about major accident, response or investigations. And I know you're an expert in this. Are there many different ways to do an accident investigation if you will?

Quentin Baker:

Yes, there are. There's a, there's numerous methodologies that a company could follow to, uh, conduct an investigation. There is no single standard or a methodology that you could call best. Um, there's a myriad of investigation methods out there. It, it really comes down to, uh, the method that best suits a company for their processes, their company, culture, their people, um, and, and, and, and many of them are successful. So, uh, many choices Mike, and what are some of those? Well, let's see. Um, if we go to the end of the process, which is getting to root cause the best approach are some structured approaches that give you a systematic process for actually getting to the root cause. One method is called the five whys, for example, uh, another method uses a predefined causal tree or published predefined causal trees when we get to the root cause why you can see these, these structured processes upstream of that one, we're more in the data gathering data analysis and really the deliberation stage.

Quentin Baker:

There's a whole bunch of more choices. For example, one tool that's commonly used as a type of a timeline, just to be tracking the sequence of events. And, you know, one is just a simple timeline. Like you could draw up on a board or using an Excel spreadsheet. Alternatively, there's something called the sequence diagram, which is a more sophisticated diagram that brings in the action items that caused certain events to take place. That's on the timeline, a huge number of, of different techniques that have been developed over the years, um, from which the users can choose

Mike Taylor:

Now, based on your experience over the last 40 years, do you prefer one over the other

Quentin Baker:

Actually, um, not in terms of say the root cause, methodologies, we very much defer to what our clients feel comfortable with in terms of our processes for working through the investigation. One of the things that we have really circled about and then pressed hard on these use of scientific method. Now that scientific method can be used with any number of the investigation processes, but it's a matter of, of using scientific principles and rigors to gather information from the accident and then develop, consider, and test hypotheses for what happened. It's that scientific rigor that we have found leads to a successful investigation, regardless of what other methodologies are used. And it's just, it's the, it's the objectivity than the rigor and especially the testing that really makes an investigation successful. So that, that is the key now to all of our investigations is following the scientific method.

Mike Taylor:

When a client asks you to come out and do a major accident response, let's say, hypothetically, you have an explosion in an oil refinery. Do you tip, do you tend to put a team of you together? Um, uh, and if so, how large is the team?

Quentin Baker:

The answer is yes, I'm in a major case, it's always a team effort tends to be a multi-disciplinary effort because of the problems are quite complex and it's, it varies from case to case. So we usually tend to send out a small pilot team, typically a couple of people based on the feedback we have gotten from the scene on what's transpired. So we'll pick, you know, what we think are a couple of folks who can get out there and get their arms around the situation quickly, given their skill sets. And then as the situation develops, why we make call in additional resources, different disciplines, change out personnel as time goes on, as we need a new discipline for certain help is most definitely a team effort. Um, and it, and it's, it's just situation specific. Mike, we just have to see what the situation is with is with each scene and see which resources are best needed to help in that particular scene

Mike Taylor:

When you're, uh, investigating a major accident, uh, over the years, have you tended to have problems because so many different people are involved like the police, um, chemical safety board, OSHA, EPA, FBI, uh, alcohol, tobacco firearms. Um, everybody tends to get involved when you have this major catastrophic event, has that been an obstacle in doing accident investigations over the years or, or not?

Quentin Baker:

It has been, but it's the reality of doing major investigations, particularly in the United States, in other parts of the world, there are different stakeholders. So we, we, we tend to see fewer of the, uh, outside stakeholders internationally than we do in the U S but it is a reality in our, in our country that we will have to deal with these, these various stakeholders, all of them have a legal right to investigate. So the scene management and the, uh, gathering, uh, and sharing of information, why it, it has to be done in a fashion that accommodates the needs of all of these groups. Um, it needs to be an objective investigation. There needs to be good preservation of the scene could gathering and handling of evidence is very, very tight and consistent processes, such that the needs of all the stakeholders can be addressed. Time-wise with that number of stakeholders, everything slows down. That's just the reality of that. It just takes more time to accommodate the interest of all of those parties. Um, but it has to be done. That's the reality of it

Mike Taylor:

Now, is there generally some focal person or a commander, if you will, that tries to coordinate between all the agencies and you, when you're doing an accident investigation, or is it kind of, um, a wild, wild west type thing? You'll get to it when you get to it,

Quentin Baker:

You, you, you don't want the wild west. That is a, that is chaos, right. Very, very hard to manage. So it is very helpful to have leadership appointed such that it is all coordinated and organized. Now, there that's it that leadership's at two different levels. So at one level is the incident command now, and these major incidents, there's a need for getting the scene under control, managing all of the hazards, managing environmental issues that all falls under an incident command structure. And there is coordination that instrument and command structure with outside agencies who are helping an emergency response. That's a necessity, okay. That the situation has to be rendered safe. There is a coordination activity that takes place with incident command, such that for investigation purposes, it liked to be gathering data on. You'd like to have some input into preserving things as best you can, but rendering safe comes first.

Quentin Baker:

Then there's the investigation side for which it's really a different function. And really a different leader is best to a point that the leadership can be internal. And I just want to talk about leadership leadership of this whole collective investigation activity. It could be internal within our client's organization, someone who's appointed to that. And it was also seen it an external, uh, for example, someone from a law firm who was put into this role of being the coordination and the communication link among all of these different stakeholders, we've seen that done both successfully, both internally and externally from a leadership perspective, ordination is most definitely needed. That makes things go smoothly and everybody's needs to be met. Um, but without that coordination, if everything slows to a crawl and it's very hard to make progress on a scene.

Mike Taylor:

Yeah, that being said, I, you know, a lot of companies don't assume that they're going to have a catastrophic event. Would you say it's crucial for them to be proactive and have someone maybe designated beforehand so that if it does happen, uh, they're not scrambling around to try to put a couple people together to be the communication, uh, commander, if you will.

Quentin Baker:

I think it's highly advantageous for companies to pre-plant and actually appoint people, and then do some practicing the time to figure out how to address these, these kind of issues is not when you've had a major incident. Okay. There there's so much stress at the time of major incident to re to handle the emergency response and to handle the onslaught of demands from external Seiko stakeholders that it's, it's hard to gear up and handle it, uh, when you're just trying to address all of these rush needs. So pre-planning is highly advantageous, so that if you've decided on your methodologies, you've assigned personnel, you, they know their roles. If a call comes in, they know how to mobilize, they have resources ready to mobilize that saves so much difficulty compared to someone who is ill-prepared to address a major incident. It's really hard to describe how involved and how demanding a major incident is on the resources of a company. It can be all consuming and that takes away people from running other essential functions in their company.

Mike Taylor:

Right. Right. And it's kind of hard to perceive based on my experience over the last 20 years to persuade companies, to be proactive and have a catastrophic management plan in place. Because the last thing you want to be doing is trying to run around and dealing with all these different agencies and scrambling, because it makes it look like you're not, you don't know.

Quentin Baker:

I agree. The major companies have, have developed their programs and they have plans in place, but both the low that the next tier of companies down and smaller, Y typically we find that they don't have their resources in place, and they'd never confronted a major issue like that, and never felt the need to put the resources in place, but we certainly encourage, um, doing that. Um, and, and that leads into another point here, which is we're strongly encouraging companies to be more diligent about investigating small incidents and near misses. If they do that, why they get practice correction and that helps them out so that they're better prepared for a major incident. Heaven forbid one should occur.

Mike Taylor:

Good point, good point. When you're doing a major accident investigation, do you tend to start looking at the equipment first? Do you interview employees first? Do you request documents? Is there any kind of plan that you follow or is it all based on feel of what you start

Quentin Baker:

With? No, no, it's definitely a plan. And we, we have emphasized that the first priority is what we call time sensitive data. There is data that ages or goes away if you don't with urgency, go collect the data. So we immediately, from the outset, sitting down with a client, begin talking about what's time, sensitive data. So one example of very important these days is electronic data, especially the process data, but most of the plants now have a fairly sophisticated process control system that has a lot of data recording. So they're recording all kinds of process, parameters, pressures, temperatures, flow rates levels, a huge volume of very beneficial data. We want that data now it's time sensitive because a lot of those systems have a buffer of data that say 72 hours long. Right? Okay. So the oldest hour of that data is continuously getting overwritten by the newest hour of that data.

Quentin Baker:

So the clock is ticking to go and capture that data before you simply run out of time. And it's all gotten overwritten. We're always pushing very hard to get that data that has every time snapshot that they have. There's older data that's kept in a historian, but it may be data that is a one hour average or data. That's not every data point, but a lot of data points have been parsed out to reduce the memory. Alright, so electronic data is, is one example. Um, if we're dealing with an equipment failure, we want to find those failures as fast as possible and preserve them. For example, if we have a, a carbon steel pipe that fails the fracture surfaces will corrode amazingly fast. If we can get to them fast and preserve them, why metal versus have a good shot at interpreting the fracture surfaces to figure out why it failed?

Quentin Baker:

That's that's time sensitive, chemical samples. If we have process equipment that's open and, and chemicals that are inside pipes and vessels, for which we want samples, the exposure to the environment can change those chemicals or chemicals can simply weather often evaporate away. You

mentioned witnesses, witnesses are on our time sensitive list. And the reason is that human memory unfortunately fades with time. So we want to get the eyewitnesses and the folks who are directly involved with any activities related to the accident. And we want to get them interviewed as, as quickly as possible and do so before their memory fades. It just, you know, unfortunately humans don't have good memory retention for all the fine details that we would love to have. So those are examples of the time sensitive data that we would like to get that gets the first priority. There's the, on the other end of the spectrum, this historical data, for example, drawings and the like historical maintenance record. That's not time sensitive investigation team very, very likely wants those items, but they can be lower priority in terms of the data gathering. And then in the near the front is the scene investigation getting into the scene, documenting the scene in its, as found condition and doing that quickly because unfortunately the scene is weathering and patterns are fading over time. So that, that helped you in terms of the priorities. Have you ever gotten

Mike Taylor:

Data, let's say from a control room that talks about temperatures flows and pressures and the like, and you looked at it and you thought, oh, you know, right away. Um, this is where, this is where I need to look. In other words, does the, as the data ever led you down the right path, uh, right away,

Quentin Baker:

It has indeed. Now there's millions of data points. So there's always the hope that we can pull up the control system data. And it's going to take us right to the point of failure. We have not enjoyed that success. We, the data we'll take, take us to a portion of a process unit, um, and tell us that in certain area of the process unit, we suddenly, for example, lost pressure, or we suddenly saw an increase in flow or a drop in level, right. That gets us in the right neighborhood, but it doesn't tell us exactly what pipe broke. Okay. Unfortunately, the result of most of these major accidents is a fire. Um, so in the area of first release, often there's heavy fire damage and there's secondary failures. And now the challenge is to figure out what the primary failure was amongst those secondary failures. The process data is really helpful. It does help greatly to narrow the field of play in terms of where you need to concentrate your effort. And that's tremendously beneficial, but rarely has it led us to immediately say, we know exactly where the failure was and while folks have the hope that'll happen, we've not ever had that success,

Mike Taylor:

Right? What's the largest team you've ever had to, to do an investigation. If you can recall,

Quentin Baker:

Let's see. I need the separate activities here in terms of actually working on the investigative, supporting the investigation team and its deliberations. We typically only have one person actually sitting on our client's investigation team, but we might have anywhere up to a couple of people to half a dozen providing technical support behind the scenes, such as doing an engineering analysis or doing some modeling or doing some laboratory forensic work. Okay. Um, now another function we've had on many accidents sites is actually managing the scene itself, controlling the scene, writing protocols for recovery of evidence, performing the protocols out in the scene with all the parties present. And for that, when we have a major case that goes on for many weeks, we could have a, of say a dozen. We actually have to put it on shifts because we have to rotate folks in and out because they, it just, it goes on long enough

that we need relief for some of those team members. So on the scene management and evidence collection, we could have a team of a dozen people.

Mike Taylor:

Wow. That can be a lot. It

Quentin Baker:

Can be. And it's, you know, the, these major incidents I have to caution folks, there are a marathon, not a sprint, right? Especially with all of the stakeholders that you mentioned, it is going to be an activity that is going to take quite a while to undertake. And you just have to have the resources to stay with it until you get to the end of the whole process. When you ultimately

Mike Taylor:

Get towards the end to D to determine what was the root cause of the major accident, what benchmark do you use? And what I mean by that is, is it, this it's more likely than not the, not the failure was

Quentin Baker:

X, right? Um, the, typically the benchmark is that you've, you've determined your causal factors. The causal factors are, are actions or events that had some negative outcome that, that caused the event. Um, if you go to the CCPs investigation book as a real good definition, and then one of the things they point out is if you removed any one of the causal factors, the incident wouldn't have happened. So the benchmark is you've determined all your causal factors. You figured out what all these key causal factors were that in combination led to the event, once you've hit that benchmark, now it's time to go and work on your root causes. If you're jumping to root cause before determining those causal factors, why you might actually not get the proper root causes. And we've seen that happen, we've seen companies perform a root cause analysis. And when you took a hard look, a lot of it was based on assumed, causes, not proven causes, right? And that's where the rigor of really figuring out those causes by the scientific method is really important. You can do what looks like a perfectly good root cause analysis, and you can come up with recommendations, but they may not have addressed the true causes of the incident. So get the causal factors right first, then go into the root cause analysis next. Perfect, terrific.

Mike Taylor:

What's one of the most difficult accident investigations that you've ever participated in and determining ultimately what was the root cause?

Quentin Baker:

I can actually kind of put them into a bucket and the bucket is one where there's so much scene destruction that you, you just have little left the work with. We've had a few instances where the initial event took place. It just devastation, one case, a runaway reaction and a chemical reactor. It exploded and completely fragmented the reactor. Okay. There there's just no pieces left of nannies to appreciable size. Well, a key issue became the internal operation in that reactor. And then more specifically where inside the reactor, the runaway reaction actually started. Um, so, you know, without the pieces remaining, it became a huge challenge to try to get to the root of that.

Mike Taylor:

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And imagine, you know, particularly when there's hardly anything left in terms of major accident response, does baker provide a major accident response plans for employers from a proactive perspective? Do you work with a lot of clients laying out a plan in advance?

Quentin Baker:

We do. We do. And we, we enjoy that. It's, it's great to see clients planning in advance and we enjoy working with them on the response planning on emergency response, besides the investigation planning, the emergency response planning. So yes, by all means, uh, we're, we're there to assist if we can help them plan. Hopefully they never have to use that plan. But if they do, while they, they do have their, their plan and their resources lined up,

Mike Taylor:

You bet. You bet. Well, Hey Quintin, thank you so much for agreeing to be on our podcast. It was an honor and a privilege. I know we've never been able to work together in the past or have been able to work together and pass, but hopefully we'll be able to work together sometime in the future and good luck to you and baker engineering and risk consultant.

Quentin Baker:

Many thanks, Mike, really enjoyed being on your podcast,

Mike Taylor:

Everyone. That's the end of our latest episode of the workplace safety review podcast. Stay tuned for another edition. [inaudible].