

Using Feedback to Improve Your Incident Investigation Process

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Trevor Kletz once explained that it was relatively easy for him to create his monthly Lessons Learned Bulletins, because ICI had a requirement that investigation reports be complete and well-written. As a result, he could easily understand what had happened and could explain it in simple language. Several years ago, Honeywell's Performance Materials & Technologies division embarked on a specific effort to improve the quality of our incident investigations, and of the learnings flowing from them. The purpose was – and remains – to reduce the number of process safety events by learning from smaller events and applying those lessons broadly. One important aspect of this broader program was to provide a “critique” of several important aspects of the investigations of our process safety incidents. The aspects we chose to focus on first included things like “was a proper team formed to examine the aspects of the incident” and “did the team collect the right information, including creating a timeline of the events leading up to the incident”, “did they identify the cause(s)” plus several others. The degree to which the investigation complies with each criterion is evaluated by a team of seasoned professionals, and an Investigation Maturity Index is fed back to the investigators as well as reported upwards to leadership.

In this paper, we will explain the criteria we use, the work process of the evaluation team as well as some of the insights and improvements we have made as a result.

1. The Issue

Learning from incidents is not as easy as it sounds. For many years, Honeywell has been working to improve our incident identification, classification, investigation and corrective action management systems. And we're doing pretty well. We have low incident rates for LOPCs and Safety incidents and our ratios of near miss to small incidents to a handful of more serious Tier 1 incidents forms the right “pyramid” shape. It took work. We started internal corporate reporting of process safety incidents about 10 years ago.

About 5 years ago, we developed on a strategic vision to further reduce incidents and process safety risks. We started by looking back at our historical performance. We noticed there were some patterns of “recurring” incidents where something similar had happened either at the same site or at another one. And when we evaluated the prior year's investigation reports, we noticed some room for improvement. For that and for some other reasons, we determined to improve the quality of our incident investigations and the sharing of lessons from them. This paper focuses on one way we improved the quality of the investigations.

2. The Response

- a. We had already done a lot of training on Incident Investigation techniques for both simple incidents (5 Why) and more complex investigation (Apollo¹ method). So the skills were available at the sites.
- b. We added two processes in parallel, both aimed at improving the quality of our investigations. One was a requirement that any² more serious incident (like a recordable injury or a tier 2 incident) would be presented by the site manager to the Operations and HSE VPs. The other was a formal Maturity Index grading system for each of the formal investigations. This latter process took some effort, but has helped us a lot. Having a VP engaged also helped by giving it all some focus.
- c. Leadership had realistic expectations from the Maturity Index work. They said specifically that they didn't expect sites to be perfect at investigations right away. After all, we had convinced them that this was something we weren't as good at as we wanted to be and we all agreed incident

¹ The Apollo method for incident investigation has been around for decades. It uses a Fault-Tree-like logic diagram to show how underlying Conditions and Actions lead to intermediate Causes, following Fault-Tree logic rules. It's a powerful investigation tool, but requires training and experience to get the best results.

² The program was expanded to all EHS incident categories, not just Process Safety.

investigation quality could help us get to the next level of performance, so it was important enough to work on.

3. The Team

- a. To do this, we set up a team of experienced site and corporate HSE and process safety professionals. We also included some technical folks and even a plant manager. We didn't have difficulty getting volunteers. Having a substantial cross-functional team was an important success factor because we always had a few people who were away or couldn't read the investigation reports or do their ratings each month. This team has evolved over time.

4. The Process

- a. The process is simple in principle. The team evaluates the quality of an investigation using information in the report and provides an averaged numerical index for each report and for the business as a whole. This goes into the monthly management review. The specific ratings and comments on why a rating was selected get fed back to the issuers of each investigation report so they can use it to improve for next time. Details always matter, so the rest of this paper is intended to give advice to anyone considering a similar approach to improving their investigations.

5. Selection of Criterion Categories

- a. The team first selected about 20 questions to rate each investigation on, but that proved cumbersome and time consuming. In the end, we settled on 5 key areas to focus on first. I say 'first', because we will likely move on to others once we reach habit-strength (to borrow a phrase from Behavior Based Safety) on these five. But that's still a little ways off. The five are:
 - i. Team Composition
 - ii. Physical Data-gathering, Effective interviews, Experts consulted and Analysis performed as needed
 - iii. Cause and Effect Tool
 - iv. Root Cause Identification
 - v. Corrective Action Recommendation
- b. These seemed to capture all the right aspects to improve the results of the investigation process. The order was deliberate also. We expected it would be both easier to improve the team composition and also a necessary precursor to improving the other four aspects.

6. The Maturity Index rating criteria

- a. Because the criteria would be used to rate the Maturity of the investigations from site to site, we knew it would be very important for the ratings to be as objective as possible. Everyone on the team rated every incident investigation report from the previous month. We rated each aspect of the investigation from 0 (missing) to 4 (completely mature). More on the numerical criteria later.
- b. We collected our individual ratings in a spreadsheet, averaged them and that became the draft maturity index. To help us get more consistent with each other, we also looked at reports where we had a high standard deviation amongst our scores. We then discussed how we had each rated the scores where there was a large standard deviation. Typically, this would lead to some people changing their scores. It also caused us to adjust our rating criteria to clarify some point and capture the consensus requirements better.
- c. As an example of this, the rating criteria for Team Composition is shown below.

Team Composition
0: No Team
1: Two functions only, or no trained investigation leader

2: Multiple functions participating but missing at least one key participant; Hourly employee, process/mechanical-knowledgeable person (depending on nature of failure), supervisor, HSE, Contractor if involved
3: All core functions represented, but lacking in at least one area of expertise or knowledge important to the investigation
4: Cross-functional team with all required functions represented

It evolved as we did more assessments. For example, “Contractor if involved” was added along the way.

7. Which reports to review

- a. We had to build support for this effort amongst our operations sites, HSE staff and leadership. One way we did this was to have IQT members review the process and rating criteria with the stakeholders and seek their input. For example, that led us to focusing on Tier 1 or 2 incident investigations. All could agree these were serious and we needed to learn the lessons from them.
- b. Reviewing the process we were embarking on for the ratings, as well as the rating criteria in small groups as well as on the monthly HSE virtual meeting helped build support and credibility for the process. It also helped prepare forward-looking sites and let them start the improvement process that we were looking for. The ratings were just a means to an end – better investigations with thorough corrective actions.
- c. One snag we ran into early in the process was that not all investigation reports had been making it into the corporate incident management system - “the System of Record” quickly enough or in a few cases not making it in at all. Some argued that all investigations were supposed to be completed within 2 weeks, so after 2 weeks they would be “late”. The IQT extended the grace period slightly for practical reasons. The team would work on a monthly schedule, using the investigations completed during the previous month. The monthly focus led naturally to rating investigations for incidents that had occurred up to two months earlier. At first, we chased sites to get their investigation reports in by sending reminders. Eventually, we “let the chips fall where they may” and let the ratings and feedback do the job of improving adherence to the timeline. Which it has.

8. Feedback Systems

- a. The ratings are only helpful if someone reads them and takes action to improve them. As we built support for the process, we engaged leadership and used our early ratings to show there was room for improvement. The maturity index is displayed monthly to leadership. Leadership then builds a natural “pressure” to improve and a positive reinforcement when improvement occurs. Working with leadership we developed reasonable goals for annual improvement based on where we knew we were starting and what we felt we could improve over the first year (Team Composition).
- b. The feedback to the site issuing the investigation report comes in two forms. Of course, they already have the rating criteria so there *should* be no surprises when it comes to what is required. They get the overall numerical rating (out of 20) as well as the 0-4 ratings for each of the five aspects of the index.
- c. One thing we added along the way was asking the quality rating team members to add comments to support why they had selected a rating if it was less than 4. That was helpful when we got together for the level-setting session. It forced the individuals to be more objective and follow the ratings criteria. We then included those comments in the feedback back to the investigation teams so they could see where they could improve.

9. Results

- a. Ratings have improved substantially. In the first year scores improved only about 5%. In the second year things went better with a 12% improvement.
- b. Because of the laws of probability, larger sites tend to have more incidents, so this system gives them more learning opportunities. And it’s easier for them to share the lessons on how to score

more points. We're perfectly happy to have the sites pay attention to the score, because we're confident they're focusing on things that matter. And they agree with that.

- c. Smaller sites may go a year or more without an incident that triggers the investigation criterion. You want them to learn from others if possible, but eventually they will learn from the feedback process.

10. Next steps (Improvements)

- a. The workload on the investigation quality rating team was initially substantial. Two-four hours reading, interpreting, rating and commenting on all the investigation reports, plus another 2 hours in level-setting meeting. Once the process became a bit more repeatable and team more experienced – and once the sites got some 0's for not putting the reports into the system of record – the time required dropped to about one hour of reading/rating and the meeting could focus more on how to help sites improve. Also, the workload was divided so that only four people rated each report instead of the initial twelve.

11. Conclusion

- a. Developing and implementing a rating and numerical feedback system for investigations has helped improve the process and the results. Having an enterprise incident reporting and investigation data system is critical to operating such a system.
- b. What we have described is a “secondary inspection” process. It may seem back-to-front, but it is a natural outcome of applying behavioral science, which says that feedback changes behavior. The IQT provided actionable feedback to both the initial investigation team leaders as they conducted investigations and created their reports. It also guided the “primary inspection” by plant management as reports were finalized on-site before entry into the Intelex system-of-record.
- c. As intended, the incident rates have also improved. It's hard to say how much of the improvement is due to the investigation quality program but anecdotally, it has helped sites do better. At 15 man-hours per month for a business with more than 50 operating sites, it hasn't cost a lot to operate.

Investigation Maturity Index: Categories & Criteria				
Team Composition	Physical Data-gathering, Effective interviews, Experts consulted and Analysis performed as needed	Cause and Effect Tool	Root Cause Identification	Corrective Action Recommendation
0: No Team	0: No Data provided beyond the brief incident description	0: No Cause and Effect tool used	0: Immediate Cause only	0: Immediate Containment or Repair Actions only
1: Two functions only, or missing a trained investigation leader	1: Complete description of actual incident, some data gathered, but many questions remain	1: 5-Why, FMEA, 6M or other simple tool	1: Physical causes only partially explored	1: Weak or generalized corrective actions (retrain, re-emphasize), &/or actions aimed only at preventing this particular incident (single SOP, single hardware or control logic improvement)
2: Multiple functions participating but missing at least one key participant; Hourly employee, process/mechanical-knowledgeable person (depending on nature of failure), supervisor, HSE	2: Significant data gathering, but 1 or more areas are lacking in evidence; e.g. interviews, documents, photos, timeline, DCS history, other physical evidence, previous/similar incidents	2: Multiple 5-Why	2: Physical root causes thoroughly assessed but systemic causes missing	2: Corrective actions address physical causes only (no actions to improve management systems)
3: All core functions represented, but lacking in at least one area of expertise or knowledge important to the investigation	3: Thorough data gathering to provide evidence (ref. Block 2), but analysis is limited (e.g. no/little interpretation of the significance of the evidence) and/or expertise (ref Team Composition) is lacking in at least one important area	3: Cause & Effect Diagram, missing evidence &/or branches	3: Physical root causes are thoroughly identified but only generalized systemic or contributing causes; e.g. worker distraction, fatigue, lighting, competing priorities, ...	3: Strong corrective actions likely to prevent recurrence of the particular incident but not other, similar incidents
4: Cross-functional team with all required functions represented	4: Thorough and Complete data gathering & analysis; experts consulted as needed	4: Thorough and Complete Cause and Effect Diagram with Evidence	4: Physical Root Cause(s) & Systemic Root Cause(s) identified with evidence (e.g. attached evidence in Apollo chart)	4: Strong Corrective Actions to address the physical and systemic causes for the particular incident and other, similar incidents

