What Is Root Cause Failure Analysis?
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Abstract: Oftentimes in industry you hear new “buzzwords” that are politically correct to use. However, most of the time lip service will suffice until the fad has passed. Root Cause Failure Analysis (RCFA) is such a buzzword and many organizations, in order to be politically correct, claim to perform RCFA. But what really is Root Cause Failure Analysis?

In order to be able to communicate effectively, people must have a common understanding of the definitions of words. If words mean different things to different people, then poor communication is the end result. It is like talking two different languages where the intent of words is misinterpreted by the receiver. This is the case with the term “Root Cause Failure Analysis” (RCFA).

No matter where I go or who I train, if I ask any group to write down their definition of RCFA I will surely get as many answers as people in the group. This is the problem with RCFA that we see today. Everyone who solves problems in their own way calls it Root Cause Failure Analysis. There is a general lack of consistency and discipline in how people apply, resolve and communicate RCFA.

While Reliability Center, Inc. (RCI) uses and teaches their own method, I will discuss the necessary elements of any analytical technique to resolve problems.

I will be discussing these necessities using another acronym we call PROACT. This stands for the following:

1. Preserving Failure Data
2. Ordering the Analysis
3. Analyzing the Data
4. Communicating Findings and Recommendations
5. Tracking for Results

PRESERVING FAILURE DATA

No matter what the nature of the failure or loss, trying to solve a failure with little or no data is like a detective trying to solve a crime with no evidence or leads. Any failure will leave clues as to the sequence of events that lead to its surfacing. Typical failure data includes parts from the failure scene, positioning of where parts and people were, timing of events and paper data such as DCS information, specs, procedures and the like.

Depending on the circumstances, some data is more fragile than others. For instance, what is the likely type of data to be disturbed the quickest at a failure scene? More than likely, the “clean up and get started” mentality sets in and as a part of the general clean up operation, the position of where things are, is lost forever. Such data is extremely important to an analysis.

Conclusion: Strategize to collect pertinent failure data to ensure that necessary facts are available for the analysis.
ORDERING THE ANALYSIS

It is a common belief that when a failure occurs that the correct course of action is to assemble a team of experts, sit them in a secluded room and days later they will come out with the answers. While this may seem to work for some, most times I have seen it fail miserably. I recall one failure we were involved with where a certain bundle of tubes in a sulfur boiler would rupture every year in the same location. This problem persisted for 10 years! Every time the failure occurred the natural reaction was to assemble a team of metallurgists to analyze the problem. Every time the metallurgists analyzed the failure their resolution was metallurgical. This is predictable and to be expected.

However, when we were called upon to assist, we sent an Aerospace Engineer in to lead the analysis. He knew very little about boilers. That made him the perfect candidate for the lead role. When you are not expected to have all the answers, you can ask any question you want without ridicule. After just a couple of sessions with the experts, they determined that the tubes were in an area of the boiler that was below the dew point of sulfuric acid and that the remedy was to move the tubes over 18” and return to the base metals.

Conclusion: The best RCFA analyst’s are those that are unbiased and can facilitate the expertise of the team members.

ANALYZE THE DATA

After you have an ideal team put together and good data collection strategies, then you need a means to logically deduce what the data is telling you. All failures are the result of a string of cause and effect relationships. Of the numerous RCFA methods on the market, they must accept this fact. The only difference between the various methods is how they develop and graphical represent the logic sequence that lead to failure. We have heard all the “buzzwords” such a fishbone, fault tree, why tree and the like. They all represent a means by which to sort out the failure data and determine the sequence of events and errors that lead to failure.

All of these methods represent how the mind utilizes deductive logic to draw conclusions. However, the conclusions must be based on fact and not assumptions. This is where some RCFA methods may differ. True “Root Cause” Failure Analysis will identify not only the physical causes of failure, but also the flawed human decisions that lead to errors of omission and errors of commission. The true roots are not in “whodunit” but in why they made the decisions that they made. This will uncover what we call organizational system roots. Things such as flawed procedures, ineffective training systems, problem purchasing systems and the like are examples of organizational system causes.

Conclusion: Analysis methods should represent a disciplined approach to graphically depict the sequence of events and errors that lead to failure. This sequence of errors should be validated with factual data. Root causes should include physical, human and organizational causes.

COMMUNICATE FINDINGS AND RECOMMENDATIONS

No matter what method of analysis is employed, if the approved recommendations are not acted on then it was a waste of time and money to perform the analysis. I am sure that many agree that you have had good projects on the table that were approved but never got any further than that. Another barrier is that sometimes these RCFA recommendations are “low priority” items in a reactive work order system. Therefore, if the recommendations are to be executed, something has to change in the work order system to raise their priority.

Communicating RCFA results is of the utmost importance to your organization because more than likely others in your company can benefit from the information. Chances are that there are similar systems in other parts of your plant or at sister plants that have the same problems. Therefore, if someone has already performed an
analysis, then you do not have to go through one yourself. The analysis actually becomes an expert system, a troubleshooting thought process on paper.

**Conclusion:** Make sure that approved recommendations are given a high priority to those that distribute resources to accomplish work. Also make sure that others in your company that can learn from your analysis are on the report distribution list.

**TRACKING FOR RESULTS**

No analysis is successful if you implemented corrective actions and nothing improved. We cannot be successful unless we measure an indicator of our success. Some believe that a successful RCFA is the identification of root causes, some think its the acceptance of recommendations but the fact is that the true measure is that the failure does not recur. RCFA analysts are essentially in the business of “eliminating the need to do reactive work!”

**Conclusion:** Develop performance metrics and track them monthly to prove your success.

These are the essential elements of any RCFA in order for it to be successful. The magnitude of the success will be dependent on the adherence to discipline of the analysis method, degree of confidence in hypothesis verifications and the persistence involved in executing recommendations.

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Mr. Latino has over 20 years of experience helping organizations implement reliability solutions. He has a Bachelor's of Science Degree in Computerized Information Systems. He began his career developing and maintaining maintenance software applications for the continuous process industries. After working with clients to help them become more proactive in their maintenance activities he began instructing industrial plants on reliability methods and technologies to help improve the reliability of their facilities. He has co-authored two Root Cause Analysis training workshops for engineers and hourly craftspeople. He has written numerous articles and books related to this topic. He currently serves as the President of the Practical Reliability Group, www.practicalreliabilitygroup.com, klatino@practicalreliabilitygroup.com.