Reliability Center, Inc.
www.Reliability.com
804-458-0645
info@reliability.com

Is Your Root Cause Analysis Effort Trigger Happy?

Mark A. Latino, SrVP Operations, RCI
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Most work environments are reactive in nature. There is always more work to be done in a day then there is time to perform work. This is because of unexpected changes in the work environment that cause the workforce to respond immediately and without preparation to return their environment back to the status quo.

Because of this some companies have elected to do root cause analysis on these unexpected events. When dealing from a reactive point of view the management will initiate a trigger that will execute the performance of a root cause analysis based on vibration level, hours of downtime, financial impact, etc. Trigger placement is a GOOD and necessary first step.

The reason it is a good first step is because the natural progression is to first realize the facility is reactive to an excessive level. This discovery is usually through daily or weekly downtime reporting. Once it is determined there is a problem, measures to control the situation are implemented. Triggers are almost always the first response. Some companies measure employee problem solving performance based on a weighted system of problem types. The more times the problem recurs the more points the employee accumulates and is then scored at the years end. Other companies measure employee problem solving performance by assigning 10 or 12 failure investigations to be completed by the end of each year.

All this effort is based on the activation of some undesired event. The events can range from an electrical fault shutting down an entire section of a facility to a critical pump breaking shafts every two months. Why wait for triggers to trip and incur downtime and asset damage. It is much more difficult to do root cause analysis when severe secondary damage is incurred. The fact is triggers are a reactive means to control unscheduled events.

The natural progression from this new knowledge is to stop waiting for triggers to be activated and get proactive. When this step is achieved the facility can move to the next level, GREAT. This will also eliminate employee pressure to deliver scores for performance appraisals that may be done in haste to meet requirements.

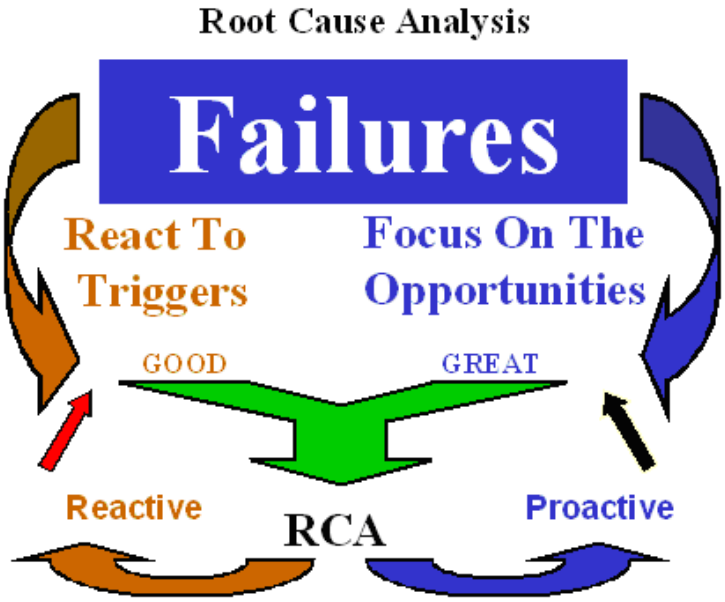


Figure 1

Performing a Failure Modes & Effects Analysis (FMEA) is a way to replace triggers and inform the management the root cause analysis effort is based on sound monetary results. Each root cause analysis completed will have a predetermined value that has been identified using the FMEA. This is going from GOOD to GREAT.

Proaction is the insight to look at operating areas with a structured approach designed to uncover potential events that would cause a trigger to activate. This can be accomplished using failure modes and effects analysis (FMEA). FMEA is a term used often, but means different things to different people. The common thread for all is, FMEA analysis provides focus and points to the opportunities that will deliver a pre-measured improvement to a facility.

The FMEA is a proactive approach to uncovering what you don't know about your operation. This is important because there is an assumption that we already know what our manufacturing problems are. This is for the most part NOT TRUE. Some may know what the worst problem is but it is very likely that facilities don't know what the second worst problem is or the third, fourth and so on. In many cases we don't know what the problems are truly costing us because they have been below the radar and have become a part of doing business.

An example of this would be a piece of equipment that makes a tangible good like a cigarette making machine or paper converting machine. This type of equipment can be turned on and off many times during a shift for various reasons. Sometimes operators shut equipment down because of quality defects or run at reduced rates because the full capacity rate causes excessive start-ups and shut downs which in-turn cause the operators to work harder than if the equipment was run at a reduced rate.

I will use an example from the cigarette industry because I have worked in that environment in the past. This example could just as easily apply to making candy, bolts, or paperclips. In the cigarette industry there is an electronically generated downtime called a rod break. When this condition occurs the operator will respond by collecting the paper part of the cigarette rod and disposing of it into the waste can. The operator will then return the tobacco lost from the rod into the rework container, re-thread the cigarette paper and push the start button to return the equipment to the producing mode.

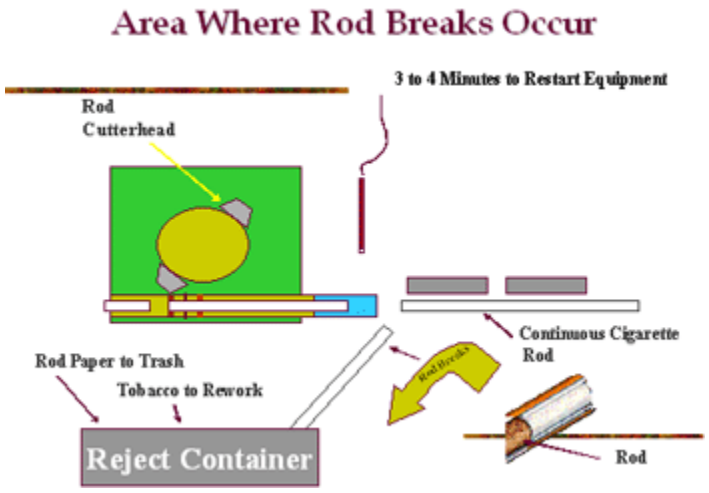


Figure 2

This process takes the operator about three to four minutes. The operator's response is a tasked response learned during the operator's training cycle. This response was taking place 40 to 50 times a shift reducing the end of year productivity of the machine by more than 20 million cigarettes. This was not on the radar screen because it was a task that was done regularly and was considered a part of doing the job.

There are many small occurrences of loss that happen daily in facilities and are considered as the way we do business. When these occurrences are exposed and calculated for annual loss in hours and dollars it becomes clear what the financial impact is to the facility.

Where do you get the data to perform failure modes & effects analysis (FMEA)? Managers and others often say that the greatest assets are our employees. However, because of technology analysts prefer to retain information from the maintenance management systems. This is a fast way to get downtime data, parts usage data, etc. Most often the data provided by the maintenance management system is what's on the radar screen or what we already know. When below the radar data is sought, it is collected from the most likely source of undetectable or below the radar information, the employees.

I spent many years in the manufacturing of products and can confidently say the people who operate and maintain a facility know things about their environment that will never be made known unless asked. Most employees find a way around problems that cause them pain or extra exertion to perform work. This may include bypassing alarms that go off with no apparent reason, running at reduced rates, changing filters prematurely, adding set-screws to loose couplings, pinning bearings so that they won't move, tack welding cracked impellers, and the list can go on and on. These kinds of things effect productivity and most likely will never show up in the maintenance management system.

The management can open this door and learn from employees by following a three-step method of performing a successful FMEA:

1. Create a process flow diagram of the system that you want to analyze
2. Create a failure definition to be communicated from the top tier of management to the hands on work level
3. Create a FMEA data collection worksheet that reflects the issues that are of concern like: material waste, defect rates, downtime, safety incidents, etc.

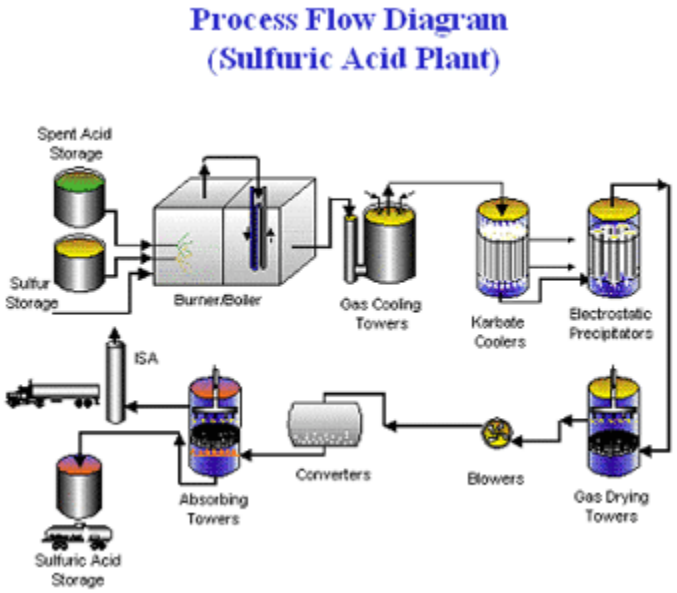


Figure 3

Create a Process Flow Diagram:

The process flow diagram reflects the routing of the process. This is usually from the raw material input to the point of storage or shipping. See figure 3. The reason for doing this is to give the FMEA facilitator and employees a visual for reference during the interview process.

Create a Failure Definition:

A clear and concise failure definition is needed to make sure the employees and the management has the same understanding of what is considered a failure. Without this understanding confusion results and your analysis is compromised. Failure definitions are usually surrounded by the business climate, a sold out condition or slow sales cycle. Failure definitions can also surround a current problem an area is experiencing, such as a high rate of re-work, high quality defect rate, high hand injury rate, etc. Some examples of failure definitions are:

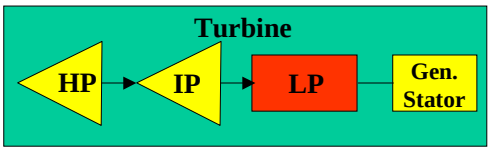
1. Failure is when secondary defects are incurred.
2. Failure is any adverse happening that has human roots.
3. Failure is when the asset becomes inoperable.
4. Failure is when the asset can no longer perform its intended function.
5. Failure is any event or condition that interferes with production.
6. Failure is any event or condition that causes the expenditure of unexpected budget money.

When consensus is gained on failure definition you are ready to compile a FMEA data collection worksheet.

Create a Data Collection Worksheet:

The data collection worksheet's task is to create the capacity to capture the necessary data to identify the significant few failures from all the rest. To do this a very simple rule is used frequency multiplied by impact. The data collection worksheet configuration does a number of things for the analysis; it identifies the event, the modes that cause the event, the frequency of the mode, and the impact of the event mode combination on the system being analyzed. See figure 4 & 5.

Data Collection Worksheet



Sub System	Event	Mode	Frequency	Impact = (Labor $ + Material $ + Production Loss $)	Total Annual Loss
Turbine Failure	LP Turbine Failure	Hogger Boot Failure	1/5yr	$3,026,800 Labor $1,800 Materials $25,000 LPO $1,000,000/day	$605,360
		Blade Failure	1/2yr	$2,920,000 Labor $60,000 Materials $60,000 LPO $2,800,000	$1,460,000

Figure 4

Data Collection Electronic Worksheet

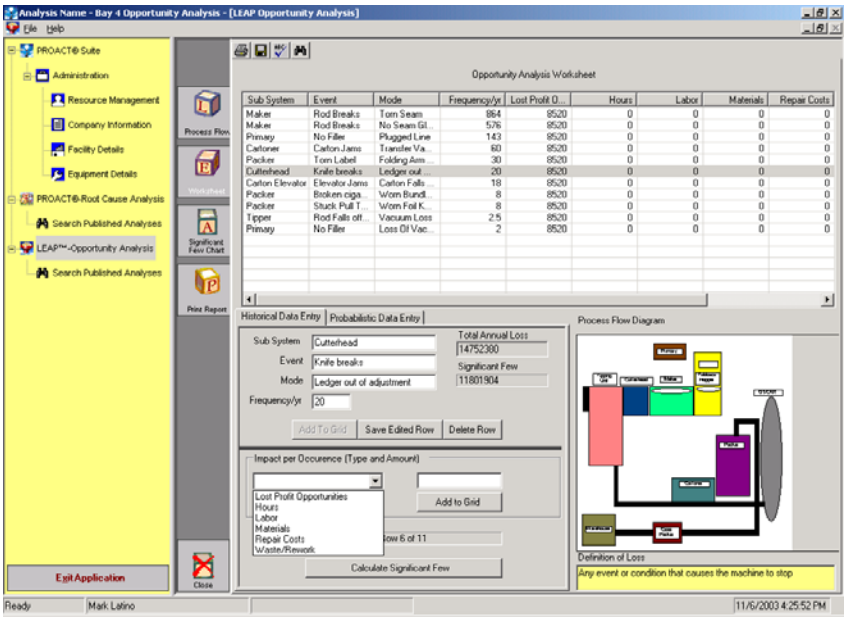


Figure 5

The findings allow us to uncover what we don't know. This enables us to change the outcome because we know what our current cost of doing business is. I call this being in the catbird seat. The catbird seat in this case means you can see what others can't because you took the time to look, now you can make decisions according to solid information giving you the business advantage.

With this advantage you can pick the project you would like to do root cause on by the loss incurred to the facility over a years time. This will not be the case when reacting to a triggered root cause analysis project. Triggered projects may in some cases tie up valuable human assets that could be better utilized on projects where there is greater return to the organization.

Mark Latino is Vice President of Operations for Reliability Center, Inc. (RCI). Mark came to RCI after 19 years in corporate America. During those years a wealth of reliability, maintenance, and manufacturing experience was acquired. He worked for Weyerhaeuser Corporation in a production role during the early stages of his career. He was an active part of Allied Chemical Corporations (Now Honeywell) Reliability Strive for Excellence initiative that was started in the 70s to define, understand, document, and live the reliability culture until he left in 1986. Mark spent 10 years with Philip Morris primarily in a production capacity that later ended in a reliability engineering role. Mark is a graduate of Old Dominion University and holds a BS Degree in Business Management that focused on Production & Operations Management. Mark can be reached via e-mail at mlatino@reliability.com He can be contacted at 804/458-0645 or mlatino@reliability.com.