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Newsletter ~ ROOT CAUSE FAILURE ANALYSIS

"If you always do what you always did,
You always get what you always got!"

How often have you heard the above saying? The simple truth is that behaviors will be repeated and failures will continue until someone finds the true cause and breaks the chain of events. A good reliability improvement plan using an RCFA can break a chain of events.

What is Root Cause Failure Analysis? RCFA is a process that defines system or equipment failure, analyzes the failure down to its latent root cause and develops and implements steps to minimize repeat failures for all similar systems or equipment. RCFA helps identify the hidden problems that need to be addressed so that you won't continue getting "what you always got".

The following is an example of a simplified RCFA on an electrical insulation failure for a large blower motor. The first step is to define the system to be reviewed and, for our case, the system is the motor and blower. The next step is to gather data and describe the failure event: the motor tripped due to an "A" phase ground after continuous operation for four months.

The next step is to perform a Failure Modes and Effects Analysis. (See the example diagram at the end of this newsletter.) FMEA is a technique used to identify the most important failure modes. These in turn help to establish a Failure Decision Tree. It is important to identify and list only problems associated with the system failure—not the symptoms. With each identified problem, a failure hypothesis is derived by asking, **"How can this component fail?"** Then each component hypothesis is tested to prove the source of the failure. If a hypothesis is false, then that branch of the investigation stops.

As shown in our example, the last FMEA level identifies a loss of cooling. By continuing to ask **"How can…?",** the answers reveal physical components causing the reduce cooling. These are the Physical Roots and each one needs evaluation. In the example, the investigation disclosed plugged filters. If your investigation only checked the filters and assigned someone to check them on all motors, then how confident are you in knowing that you found the root cause and not a symptom?

From our "tree", we see that a number of different modes and component failures can cause an electrical insulation failure. The motor could fail again because (1) the true failure mechanism was not identified or (2) there were issues not uncovered. (See diagram.)

Back to the example, asking **"How can…?"** brings us to the next step concerning potential Human Roots failures, i.e. no scheduled filter changes or the wrong type of filter material. The next step is to test these roots. To stop here, the investigation would take on the appearance of a "witch hunt" resulting in reduced cooperation from plant personnel.

The last investigative step identifies Latent Roots. These roots show failures which can become a company's opportunity for improvement via programs, training, documentation, etc. A review of these controls, by asking **"Why?"** will help identify the steps needed to change engineering, operations and maintenance practices to STOP failures.

The final and most important step is to document the RCFA findings, to implement recommended changes, AND to test that the changes have an impact on the system's reliability. Failure to perform this step almost guarantees a repetition of the RCFA.

FAILURE DECISION TREE