

# Root Cause Analysis

A SYSTEMATIC ANALYSIS TO UNCOVER THE FUNDAMENTAL OR DEEP-SEATED CAUSES OF AN INCIDENT, FAILURE, OR PROBLEM

STEP 1

STEP 2

STEP 3

STEP 4

STEP 5

STEP 6



Define  
the problem (or  
areas of  
improvement)

Assemble as  
much data  
and inputs as  
possible.

Locate  
the 'root'  
causes

Find  
'Corrective'  
and  
'Preventive'  
solutions

Create  
actionable  
strategies to  
implement the  
solution

Monitor  
the solution  
and confirm if  
it works

# Root Cause Failure Analysis

**Dennis H. Martens**



## **Root Cause Failure Analysis:**

**Root Cause Failure Analysis** Trinath Sahoo,2021-05-06 Root Cause Failure Analysis Provides the knowledge and failure analysis skills necessary for preventing and investigating process equipment failures Process equipment and piping systems are essential for plant availability and performance Regularly exposed to hazardous service conditions and damage mechanisms these critical plant assets can result in major failures if not effectively monitored and assessed potentially causing serious injuries and significant business losses When used proactively Root Cause Failure Analysis RCFA helps reliability engineers inspect the process equipment and piping system before any abnormal conditions occur RCFA is equally important after a failure happens it determines the impact of a failure helps control the resultant damage and identifies the steps for preventing future problems Root Cause Failure Analysis A Guide to Improve Plant Reliability offers readers clear understanding of degradation mechanisms of process equipment and the concepts needed to perform industrial RCFA investigations This comprehensive resource describes the methodology of RCFA and provides multiple techniques and industry practices for identifying predicting and evaluating equipment failures Divided into two parts the text first introduces Root Cause Analysis explains the failure analysis process and discusses the management of both human and latent error The second part focuses on failure analysis of various components such as bolted joints mechanical seals steam traps gearboxes bearings couplings pumps and compressors This authoritative volume Illustrates how failures are associated with part integrity a complete system or the execution of an engineering process Describes how proper design operation and maintenance of the equipment help to enhance their reliability Covers analysis techniques and industry practices including 5 Why RCFA fault tree analysis Pareto charts and Ishikawa diagrams Features a detailed case study of process plant machinery and a chapter on proactive measures for avoiding failures Bridging the gap between engineering education and practical application Root Cause Failure Analysis A Guide to Improve Plant Reliability is an important reference and guide for industrial professionals including process plant engineers planning managers operation and maintenance engineers process designers chemical engineers and instrument engineers It is also a valuable text for researchers instructors and students in relevant areas of engineering and science

**Troubleshooting and Root Cause Failure Analysis** Paul J R

Lanthier,2021-01-08 In the field of maintenance good problem solving practices are among the most important elements to maximizing equipment uptime and by resolving the root cause of the failure in increasing equipment reliability To be successful an organization must be able to resolve the effects of a failure quickly so that it can go back to normal and in some cases determine the cause of the failure so that a permanent solution can be identified and implemented These are two distinct requirements troubleshooting and root cause failure analysis with distinctive requirements Both are important and one cannot exist without the other if we want to be efficient and effective in resolving asset failures This work takes a unique approach to equipment failure related problem solving by presenting both types of failure resolution techniques the purpose

of each and describing how best to use them In presenting root cause failure analysis the book distinguishes between information gathering and failure analysis It provides five information gathering methods and three root cause analysis methods from the 5 Whys to Logic Tree Analysis to Single Functional Failure RCM It follows a structured approach to managing the RCFA from stabilizing the site and gathering information to implementing and sustaining the results to leveraging the solution This book provides practical methods and tools needed to achieve problem solving goals and objectives both when troubleshooting a problem as well as when determining a permanent solution All of this information is kept to a concise and extremely readable length and format The market needs a practical troubleshooting and RCFA guide that is not software specific and that provides a clear structured approach to both This work is that rare find Features Explores problem solving as a science Focuses on how to help an organization be successful both at quickly getting the plant back in operation and defining permanent solutions The only book to detail troubleshooting and RCFA under the same cover

*Root Cause Failure Analysis* Trinath Sahoo, 2021-05-18 Root Cause Failure Analysis Provides the knowledge and failure analysis skills necessary for preventing and investigating process equipment failures Process equipment and piping systems are essential for plant availability and performance Regularly exposed to hazardous service conditions and damage mechanisms these critical plant assets can result in major failures if not effectively monitored and assessed potentially causing serious injuries and significant business losses When used proactively Root Cause Failure Analysis RCFA helps reliability engineers inspect the process equipment and piping system before any abnormal conditions occur RCFA is equally important after a failure happens it determines the impact of a failure helps control the resultant damage and identifies the steps for preventing future problems Root Cause Failure Analysis A Guide to Improve Plant Reliability offers readers clear understanding of degradation mechanisms of process equipment and the concepts needed to perform industrial RCFA investigations This comprehensive resource describes the methodology of RCFA and provides multiple techniques and industry practices for identifying predicting and evaluating equipment failures Divided into two parts the text first introduces Root Cause Analysis explains the failure analysis process and discusses the management of both human and latent error The second part focuses on failure analysis of various components such as bolted joints mechanical seals steam traps gearboxes bearings couplings pumps and compressors This authoritative volume Illustrates how failures are associated with part integrity a complete system or the execution of an engineering process Describes how proper design operation and maintenance of the equipment help to enhance their reliability Covers analysis techniques and industry practices including 5 Why RCFA fault tree analysis Pareto charts and Ishikawa diagrams Features a detailed case study of process plant machinery and a chapter on proactive measures for avoiding failures Bridging the gap between engineering education and practical application Root Cause Failure Analysis A Guide to Improve Plant Reliability is an important reference and guide for industrial professionals including process plant engineers planning managers operation and maintenance engineers process

designers chemical engineers and instrument engineers It is also a valuable text for researchers instructors and students in relevant areas of engineering and science

*Practical Root Cause Failure Analysis* Randy Riddell, 2022-06-07 Root Cause Failure Analysis RCFA is a method used by maintenance and reliability industry professionals as one of the key tools to drive improvement This book offers a quick guide to the applications involved in performing a successful RCFA by providing a foundational view of maintenance and reliability strategies It also highlights the practical applications of RCFA and identifies how to achieve a successful RCFA as well as discussing common equipment failures and how to solve them Case studies on topics including pump system failure analysis and vibration analysis are included Suggests examples on how to solve common failure on many types of equipment including fatigue pumps bearings and mechanical power transmission Highlights practical applications of RCFA Identifies key elements for how to achieve a successful RCFA Presents case studies on topics including pump system failure analysis and vibration analysis The book is a must read for any reliability engineer particularly mechanical reliability professionals

**Root Cause Analysis** Robert J. Latino, Mark A. Latino, Kenneth Latino, Kenneth C. Latino, 2002-04-29 Undesirable outcomes chronic failure incidents and accidents The cost of such events to corporations is high generally adding up to tens and hundreds of millions of dollars in accepted losses Why accept these losses What if you could understand why these errors occur and eliminate chronic events from occurring altogether Root Cause

*Root Cause Analysis* Mark A. Latino, Robert J. Latino, Kenneth C. Latino, 2019-06-26 This book comprehensively outlines what a holistic and effective Root Cause Analysis RCA system looks like From the designing of the support infrastructure to the measuring of effectiveness on the bottom line this book provides the blueprint for making it happen While traditionally RCA is viewed as a reactive tool the authors will show how it can be applied proactively to prevent failures from occurring in the first place RCA is a key element of any successful Reliability Engineering initiative Such initiatives are comprised of equipment process and human reliability foundations Human reliability is critical to the success of a true RCA approach This book explores the anatomy of a failure undesirable outcome as well as a potential failure high risks Virtually all failures are triggered by errors of omission or commission by human beings The methodologies described in this book are applicable to any industry because the focus is on the human being's ability to think through why things go wrong not on the industry or the nature of the failure This book correlates reliability to safety as well as human performance improvement efforts The author has provided a healthy balance between theory and practical application wrapping up with case studies demonstrating bottom line results Features Outlines in detail every aspect of an effective RCA system Displays appreciation for the role of understanding the physics of a failure as well as the human and system's contribution Demonstrates the role of RCA in a comprehensive Asset Performance Management APM system Explores the correlation between Reliability Engineering and Safety Integrates the concepts of Human Performance Improvement Learning Teams and Human Error Reduction approaches into RCA

**Root Cause Failure Analysis** R. Keith Mobley, 1999

**Root Cause Analysis** Augustine E. Magistro, Lawrence R. Seggel, United

States. Army. Missile Command,1975      **Root Cause Failure Analysis** ,2000      **Failure Analysis of Engineering Structures** V. Ramachandran,2005 Failure analysts practicing engineers and students of engineering will find useful guidance and detailed examples in this reference work on the challenging and complex task of investigating service failures and accidents      **Machinery Failure Analysis and Troubleshooting** Heinz P. Bloch,Fred K. Geitner,1994      Root Cause Analysis Robert J. Latino,Kenneth C. Latino,Mark A. Latino,2011-06-17 What is RCA It seems like such an easy question to answer yet from novices to veterans and practitioners to providers no one seems to have come to agreement or consensus on an acceptable definition for the industry Now in its fourth edition **Root Cause Analysis Improving Performance for Bottom Line Results** discusses why it is so hard to get such consensus and why various providers are reluctant for that to happen See what's new in the Fourth Edition **Human Error Reduction Techniques HERT** new chapter **Failure Scene Investigation FSI** Disciplined Evidence Gathering Categorical versus Cause and Effect RCA Tools Analysis Tools Review The Germination of a Failure Constructing a Logic Tree Introduction of PROACT OnDemandSM The Advantages of Software as a Service SaaS The Pros and Cons of RCA Templates Three New Client Case Histories The authors discuss evidence collection and strategy failure scene investigation techniques the human element and the contribution of human performance and human factors to poor decision making They clarify definitions that can be considered ambiguous and underscore the distinctions between applying PROACT manually using a paper based system versus using an automated software tool Written by practitioners for practitioners the book outlines an entire RCA system which involves a cultural paradigm change about how failure is perceived and acted upon in an organization The authors trademark down to earth style provides a step by step action plan for how to construct and implement a root cause analysis system that can be applied to any industry Read **MRI Safety 10 Years Later** co authored by Robert Latino      **Root Cause Analysis** Robert J. Latino,Kenneth C. Latino,1999-06-24 **Root Cause Failure Analysis** The utilization of a disciplined thought process to arrive at a physical human and latent root cause Taking corrective action on these identified causes will eliminate the risk of recurrence of failure in the future The intention of this text is to clarify how to produce bottom line results from utilizing the method of **Root Cause Failure Analysis** This book will cover all levels of the Analysis from the operator and mechanic to the manager      **Microelectronic Failure Analysis** Richard J. Ross,Christian Boit,Donald Staab,1999 Forty seven papers on electronics failure analysis provide an overview for newcomers to the field and a reference tool for the experienced analyst Topics include electron ion beam based techniques deprocessing and sample preparation and physical chemical defect characterization For the fourth ed      **Pressure Vessel and Piping Design and Analysis, 2001** Dennis H. Martens,2001 Pressure vessels heat exchangers and components Piping and components Limit load analysis Fatigue and fracture Fitness for service life extension remediation and repair Student papers      *Creative Problem Solving with Root Cause Failure Analysis* Dean L. Gano,1996      **Root Cause Analysis** Robert J. Latino,Mark A. Latino,Kenneth Latino,Kenneth C. Latino,2006-05-05 There is no easy answer to the question What is RCA

Some will give a general idea of what Root Cause Analysis RCA is designed to accomplish while others will advocate a specific approach In this third edition of the best selling Root Cause Analysis Improving Performance for Bottom Line Results acclaimed experts Robert and Ke **Semiconductor Device and Failure Analysis** Wai Kin Chim,2000 The diminishing size and greater complexity of modern semiconductor integrated circuits poses new challenges in fault detection Photon Emission Microscopy PEM is a physical fault localisation technique used for analysing IC failures Detailing the PEM technique and its application to semiconductor device analysis this unique reference Illustrates the application of the PEM technique in various areas of device reliability in particular hot carrier oxide and ESD reliability Presents the principles of design and calibration for a spectroscopic emission microscope system along with coverage of the three main operation modes frontside backside and spectroscopic PEM Provides an analysis of light emission in semiconductors under hot carrier and high field impulse stressing in MOS transistors and photon emission from biased MOS capacitors Not only an essential reference for researchers and students in the field the numerous practical examples throughout the text also make this an indispensable guide for failure analysis engineers and microelectronics industry professionals Fitness for Adverse Environments in Petroleum and Power Equipment Martin Prager,1997 Contains 39 papers presented at the July 1997 conference Contributors address crack like flaws with reports on treatment in Fitness for Service evaluation review and validation of the basic failure assessment methodology the methods for acceptance of local thin areas and their justifications a **Electronic Failure Analysis Handbook** Perry L. Martin,1999 Annotation In the Electronic Failure Analysis Handbook you ll find top to bottom coverage of this rapidly developing field encompassing breakthrough techniques and technologies for both components and systems reliability testing performance evaluation and liability avoidance BOOK JACKET Title Summary field provided by Blackwell North America Inc All Rights Reserved

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