

The Root Cause Failure Analysis Rcfa Of Broken Lever

Root Cause Failure Analysis provides the concepts needed to effectively perform industrial troubleshooting investigations. It describes the methodology to perform Root Cause Failure Analysis (RCFA), one of the hottest topics currently in maintenance engineering. It also includes detailed equipment design and troubleshooting guidelines, which are needed to perform RCFA on machinery found in most production facilities. This is the latest book in a new series published by Butterworth-Heinemann in association with PLANT ENGINEERING magazine. PLANT ENGINEERING fills a unique information need for the men and women who operate and maintain industrial plants. It bridges the information gap between engineering education and practical application. As technology advances at increasingly faster rates, this information service is becoming more and more important. Since its first issue in 1947, PLANT ENGINEERING has stood as the leading problem-solving information source for America's industrial plant engineers, and this book series will effectively contribute to that resource and reputation. Provides information essential to industrial troubleshooting investigations Describes the methods of root cause failure analysis, a hot topic in maintenance engineering Includes detailed equipment-design guidelines

Design, manufacturing, maintenance, and operating professionals often do not have the opportunity for meaningful dialogue. Even when a complete failure analysis is performed, insights gained about how to improve a process or material specification is often not relayed

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back to the designers. Many failures could be prevented if those responsible for making critical decisions had more information, especially regarding previous problems. This May 2000 conference brought together product designers and materials engineers to share knowledge gained over the last 20 years in fractography, stress analysis, and interdisciplinary approaches to engineering in general and failure analysis in particular. Contents: The Roots of Failure Interdisciplinary Failure Analysis Keeping 'an open mind' During Root Cause Analysis Legal Definitions of Failure for Designers and Manufacturers Codes, Standards and Test Methods Comprehensive Failure Analysis on a Complex System Critical Factors in the Design Process New Tools for Design Failure Modes and Effects Credibility Analysis Scientific Materials Selection Processes Materials Specification and Failure Case Histories Characteristics of Castings and Forgings Working with Heat Treaters Using the Right Material to 'Make It Like the Drawing' Machining Issues Finishing Processes Unanticipated Service Conditions Reliability Service Conditions.

This sixth edition of Root Cause Failure Analysis is greatly expanded from earlier editions. In this edition, the material was expanded and modified, based on experience in application of these methodologies. Additionally, an invitation was extended to leading practitioners in the field to contribute chapters that describe their particular approaches to this vital skill set, including Mark Latino, President of The Reliability Center, Inc., Hopewell Virginia, Mark Galley, founder of ThinkReliability, Inc., Houston, Texas, Doug Plucknette, who founded Reliable Solutions, Inc., now closely affiliated with Allied Inspired Reliability, Inc., of Charleston, South Carolina, teamed with Mark Galley to contribute a section on the relationship between Reliability Centered Maintenance methodology and Root Cause Failure Analysis methodology,

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along with Neville Sachs, P.E., of Sachs, Salvaterra & Associates, Syracuse, New York who first contributed a section on mechanical failures to the fifth edition of this text.

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

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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

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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.

Although there are many books on root cause analysis (RCA), most concentrate on team actions such as brainstorming and using quality tools to discuss the failure under investigation. These may be necessary steps during RCA, but authors often fail to mention the most important member of an RCA team—the failed part. *Root Cause Analysis: A Step-By-Step Guide to Using the Right Tool at the Right Time* provides authoritative guidance on how to empirically investigate quality failures using scientific method in the form of cycles of plan-do-check-act (PDCA), supported by the use of quality tools. Focusing on the use of proven quality tools to empirically investigate issues, the book starts by describing the theoretical background behind using the scientific method and quality tools for RCA. Next, it supplies step-by-step instructions for performing RCA with the tools discussed in the first section. The book's clear examples illustrate how to integrate PDCA with the scientific method and quality tools when investigating real-world quality failures. This RCA guide provides root cause investigators with a tool kit for the quick and accurate selection of the appropriate tool during a root cause investigation. It includes an appendix with a guide to tool selection based on the intended use of the tool. There is also an appendix that defines the terminology used in the book. After

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reading this book, you will understand how to integrate the scientific method, quality tools, and statistics, in the form of exploratory data analysis, to build a picture of the actual situation under investigation that will lead you to the true root cause of an event. The tools and concepts presented in the text are appropriate for professionals in both the manufacturing and service industries.

TIME-PROVEN TECHNIQUES FOR REDUCING RISK AND IMPROVING PERFORMANCE IN MISSION-CRITICAL BUSINESS ACTIVITIES Proven in high-stakes, high-risk environments—from defense to healthcare For business functions ranging from marketing to HR, R&D to M&A Indispensable for all executives, entrepreneurs, strategists, and product managers This guide brings together simple, risk-free, and low-cost ways to break cycles of business failure and underperformance. These techniques aren't new or trendy: they've repeatedly proven themselves in mission-critical disciplines ranging from manufacturing to space exploration, with lives and billions of dollars on the line. They work. And they'll work for you, too. First, you'll learn how to use well-proven Failure Mode and Effects Analysis (FMEA) techniques to anticipate potential failure points before you introduce products, implement strategy, or launch marketing campaigns. Next, utilizing Root Cause Analysis (RCA), you'll learn to uncover the root cause of business problems, so you can solve them once and for all. Third, you'll discover how to use an Early Warning System (EWS) to identify “driver” variables in your business, gaining timely and actionable insights without complex predictive modeling. Whatever your role in decision-making, leadership, strategy, or product management, *Breaking Failure* will help you mitigate risk more effectively, achieve better results—and move forward in your career When lives are on the line, when billions of dollars are at risk, failure is not an

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option. That's why industries such as aerospace, chemical engineering, and healthcare have pioneered world-class methods for identifying, anticipating, and mitigating failure. In *Breaking Failure*, Alexander D. Edsel helps you adapt these proven techniques to the realities of your business. You'll discover how to plan more effectively for contingencies, and how to uncover and address the root causes of poor performance in business functions ranging from marketing to hiring. Equally valuable, you'll learn how to systematically improve your situational awareness, so you can uncover problems before they damage relationships, brand reputation, or business performance. Adapted to be 100% practical and actionable, these techniques will help companies of all sizes, in all markets. As you move towards greater speed and agility, they will become even more indispensable. A practical, systematic approach to "Breaking Failure" in your company

- Use Problem Framing to overcome the human bias towards thoughtless action
- Use Failure Mode & Effect Analysis (FMEA) to anticipate problems, prioritize risks, and plan corrective actions
- Use Root Cause Analysis (RCA) to identify true causes of failure in any process, product, or project
- Use an Early Warning System (EWS) to quickly recognize signs of underperformance
- Use Pre-Planned Exit Strategies and Exit Triggers to end failure and underperformance issues you can't fix

Analysis of root cause failure mechanisms in hydraulic systems suggests that poor overall system specification, leakage and contamination issues are the dominant failure contributors. The paper examines how the Russian Theory of Inventive Problem Solving, TRIZ, is beginning to be applied in the specification and design of hydraulic systems and components. Several of the key TRIZ tools, methods and strategies Contradiction Elimination, Ideal Final Result, Trends of Evolution, and Function Analysis have been deployed on a number of case study

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examples. These examples include leak-free coupling and self-cleaning filter component design studies, and an examination of whole system energy management issues.

Fractography in Failure Analysis of Polymers provides a practical guide to the science of fractography and its application in the failure analysis of plastic components. In addition to a brief background on the theory of fractography, the authors discuss the various fractographic tools and techniques used to identify key fracture characteristics. Case studies are included for a wide range of polymer types, applications, and failure modes, as well as best practice guidelines enabling engineers to apply these lessons to their own work. Detailed images and their appropriate context are presented for reference in failure investigations. This text is vital for engineers who must determine the root causes of failure when it occurs, helping them further study the ramifications of product liability claims, environmental concerns, and brand image. Presents a comprehensive guide to applied fractography, enabling improved reliability and longevity of plastic parts and products Includes case studies that demonstrate material selection decisions and how to reduce failure rates Provides best practices on how to analyze the cause of material failures, along with guidelines on improving design and manufacturing decisions

Are you trying to improve performance, but find that the same problems keep getting in the way? Safety, health, environmental quality, reliability, production, and security are at stake. You need the long-term planning that will keep the same issues from recurring. Root Cause Analysis Handbook: A Guide to Effective Incident Investigation is a powerful tool that gives you a detailed step-by-step process for learning from experience. Reach for this handbook any time you need field-tested advice for investigating, categorizing, reporting and trending, and

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ultimately eliminating the root causes of incidents. It includes step-by-step instructions, checklists, and forms for performing an analysis and enables users to effectively incorporate the methodology and apply it to a variety of situations. Using the structured techniques in the Root Cause Analysis Handbook, you will: Understand why root causes are important. Identify and define inherent problems. Collect data for problem-solving. Analyze data for root causes. Generate practical recommendations. The third edition of this global classic is the most comprehensive, all-in-one package of book, downloadable resources, color-coded RCA map, and licensed access to online resources currently available for Root Cause Analysis (RCA). Called by users "the best resource on the subject" and "in a league of its own." Based on globally successful, proprietary methodology developed by ABS Consulting, an international firm with 50 years' experience in 35 countries. Root Cause Analysis Handbook is widely used in corporate training programs and college courses all over the world. If you are responsible for quality, reliability, safety, and/or risk management, you'll want this comprehensive and practical resource at your fingertips. The book has also been selected by the American Society for Quality (ASQ) and the Risk and Insurance Society (RIMS) as a "must have" for their members.

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A Root Cause Analysis is performed to identify the real source (i.e., root cause) of a problem. The process includes a sequential series of steps that will both determine the root causes as well as document the basis for this determination. There are many different technique in use to achieve this same end and are referred to as Failure Analyses, Problem Investigations, etc. A particular Root Cause Analysis Methodology that is employed throughout AMCCOM will be presented. The purpose of this report is to present a description of the specific steps involved

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in this methodology including various procedures that aid in achieving thoroughness and objectivity. Root cause analysis, Problem investigation, Problem analysis, Failure analysis. Red team.

Developed by the Electronic Device Failure Analysis Society (EDFAS) Publications Committee. 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

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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.

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Learning the proper steps for organizing a failure investigation ensures success. Failure investigations cross company functional boundaries and are an integral component of any design or manufacturing business operation. Well-organized and professionally conducted investigations are essential for solving manufacturing problems and assisting in redesigns. This book outlines a proven systematic approach to failure investigation. It explains the relationship between various failure sources (corrosion, for example) and the organization and conduct of the investigation. It provides a learning platform for engineers from all disciplines: materials, design, manufacturing, quality, and management. The examples in this book focus on the definition of and requirements for a professionally performed failure analysis of a physical object or structure. However, many of the concepts have much greater utility than for investigating the failure of physical objects. For example, the book provides guidance in areas

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such as learning how to define objectives, negotiating the scope of investigation, examining the physical evidence, and applying general problem-solving techniques.

This newly expanded edition shows plant engineers and maintenance personnel how to systematically analyze and troubleshoot machinery distress and component problems. You will find complete coverage of gears, rolling-element bearings, sliding bearings, bolting, couplings, and mechanical seals, with more on pumps, compressors, electric motors, steam turbines, and similar equipment. Eliminate just the symptoms, and not the root cause, and you will again face equipment downtime and component failure. This book documents and analyzes actual failure events to give you the know-how to discover not just the problem, but its underlying cause. A new chapter examines root cause analysis and shows how to pursue the cause-and-effect relationship. Details on the practical aspects of metallurgical failure analysis have been added and the chapter on vibration analysis has been thoroughly updated.

For newcomers cast into the waters to sink or swim as well as seasoned professionals who want authoritative guidance desk-side, this hefty volume updates the previous (1999) edition. It contains the work of expert contributors who rallied to the job in response to a committee's call for help (the committee

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was assigned to the update by the Electron

The theme for the November 2017 conference was Striving for 100% Success Rate. Papers focus on the tools and techniques needed for maximizing the success rate in every aspect of the electronic device failure analysis process. This "must have" reference work for semiconductor professionals and researchers provides a basic understanding of how the most commonly used tools and techniques in silicon-based semiconductors are applied to understanding the root cause of electrical failures in integrated circuits. Failure analysis has grown enormously in its scope and utility in recent years. Developments in materials characterization techniques have made the job of a failure analyst easier and more precise, but it still requires not only a strong background in materials science and engineering, but also practical experience--or at least a strong understanding of past failures. Investigation of Aeronautical and Engineering Component Failures offers a systematic presentation of the principles, tools, and techniques of failure analysis and their use in identifying the root cause of failure. The first part of the book presents the technical intricacies of failure analysis, including fracture feature analysis, important aspects of component design and material selection, the origin and control of various defects in metallic materials, and the operational abuses and

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maintenance deficiencies that often cause premature failures. The second part presents 37 classic case studies covering all of the commonly observed failure modes and causes in metallic components. The emphasis here is on the experimental approach, the interpretation of experimental results, and the logic involved in identifying the root cause of failure. Failure analysis can be a difficult, if not daunting, task. Author A. Venugopal Reddy's three decades of investigative experience brings not only authority to this presentation, but also a rare insight that will deepen your understanding and solidify your ability to effectively analyze real component failures.

This book covers recent advancement methods used in analysing the root cause of engineering failures and the proactive suggestion for future failure prevention. The techniques used especially non-destructive testing such X-ray are well described. The failure analysis covers materials for metal and composites for various applications in mechanical, civil and electrical applications. The modes of failures that are well explained include fracture, fatigue, corrosion and high-temperature failure mechanisms. The administrative part of failures is also presented in the chapter of failure rate analysis. The book will bring you on a tour on how to apply mechanical, electrical and civil engineering fundamental concepts and to understand the prediction of root cause of failures. The topics

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explained comprehensively the reliable test that one should perform in order to investigate the cause of machines, component or material failures at the macroscopic and microscopic level. I hope the material is not too theoretical and you find the case study, the analysis will assist you in tackling your own failure investigation case.

Despite precautions taken to ensure food safety, it can happen that contaminated products reach the market and/or consumers. A swift and responsible management of incidents is important to protect consumers and minimize damage to the reputation of the company. While incidents should be prevented, when they occur they should be analyzed and the fundamental factors leading to the incidents must be investigated and addressed to prevent their recurrence. Communication of the root cause of incidents, both internally and externally, is key for effectively improving food safety at the society level.

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

This report presents a proven technique for technical problem analysis. An

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analysis method is described and a format presented which is aimed at the systematic solution of failures. Examples of typical problems and solutions are included in addition to guidance for the organization and operation of teams charged with establishing the root cause of failures. Comments on group processes should be helpful to new root cause team managers in the operation of the teams, and a bibliography of material on problem solving and decision making provides sources of data related to the topics. Although the text focuses on hardware development activities, it can readily be seen that the root cause analysis technique has broad application to general problems, e.g., low sales, business reversals, increased costs, etc. This technique is easy to learn and requires no special skills. Use of the format provides explicit data for the systematic evaluation of postulated failure modes. Rigid adherence to this technique makes the root cause of the problem obvious through the process of elimination and, therefore, assures that the source (root) of the problem, not the symptoms, is dealt with.

Simply put, this book explains what exactly needs to be done if a facility wants to progress from being a one, two or three year pump MTBF plant, and wishes to join the leading money-making facilities that today achieve a demonstrated pump MTBF of 8.6 years.

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Root Cause Failure AnalysisElsevier

Solve the machinery failure problems costing you time and money with this classic, comprehensive guide to analysis and troubleshooting Provides detailed, complete and accurate information on anticipating risk of component failure and avoiding equipment downtime Includes numerous photographs of failed parts to ensure you are familiar with the visual evidence you need to recognize Covers proven approaches to failure definition and offers failure identification and analysis methods that can be applied to virtually all problem situations

Demonstrates with examples how the progress and results of failure analysis and troubleshooting efforts can be documented and monitored Failures of machinery in a plant setting can have wide-ranging consequences and in order to stay competitive, corporations across all industries must optimize the efficiency and reliability of their machinery. Machinery Failure Analysis and Troubleshooting is a trusted, established reference in the field, authored by two well-known authorities on failure and reliability. Structured to teach failure identification and analysis methods that can be applied to almost all problem situations, this eagerly awaited update takes in the wealth of technological advances and changes in approach seen since the last edition published more than a decade ago. Covering both the engineering detail and management theory, Machinery Failure Analysis and

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Troubleshooting provides a robust go-to reference and training resource for all engineers and managers working in manufacturing and process plants. Provides detailed, complete and accurate information on anticipating risk of component failure and avoiding equipment downtime Presents documented failure case studies and analyzes the procedures employed to define events that led to component or systems failure Includes numerous photographs of failed parts to ensure readers are familiar with the visual evidence they need to recognize

Resumen: This newly expanded edition discusses proven approaches to defining causes of machinery failure as well as methods for analyzing and troubleshooting failures.

Succeed in your career in the dynamic field of commercial truck engine service with this latest edition of the most comprehensive guide to highway diesel engines and their management systems available today! Ideal for students, entry-level technicians, and experienced professionals, **MEDIUM/HEAVY DUTY TRUCK ENGINES, FUEL & COMPUTERIZED MANAGEMENT SYSTEMS, Fifth Edition**, covers the full range of commercial vehicle diesel engines, from light- to heavy-duty, as well as the most current management electronics used in the industry. In addition, dedicated chapters deal with natural gas (NG) fuel systems (CNG and LPG), alternate fuels, and hybrid drive systems. The book addresses the latest ASE Education Foundation tasks, provides a unique emphasis on the modern multiplexed chassis, and will serve as a

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valuable toolbox reference throughout your career. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Analysis, Events, Risk analysis, Research methods, Research, Failure analysis
This best-seller can help anyone whose role is to try to find specific causes for failures. It provides detailed steps for solving problems, focusing more heavily on the analytical process involved in finding the actual causes of problems. It does this using figures, diagrams, and tools useful for helping to make our thinking visible. This increases our ability to see what is truly significant and to better identify errors in our thinking. In the sections on finding root causes, this second edition now includes: more examples on the use of multi-vari charts; how thought experiments can help guide data interpretation; how to enhance the value of the data collection process; cautions for analyzing data; and what to do if one can't find the causes. In its guidance on solution identification, biomimicry and TRIZ have been added as potential solution identification techniques. In addition, the appendices have been revised to include: an expanded breakdown of the 7 M's, which includes more than 50 specific possible causes; forms for tracking causes and solutions, which can help maintain alignment of actions; techniques for how to enhance the interview process; and example responses to problem situations that the reader can analyze for appropriateness.

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