

Aladon

The Risk & Reliability

GLOBAL NETWORK

ROOT CAUSE FAILURE ANALYSIS (RCFA)

Asset Performance Improvement

Continuous Risk Reduction

Defect Elimination

Living Program



www.aladon.com

RCFA – CORRECTIVE MEASURES FOR ADDRESSING RISKS ASSOCIATED WITH EQUIPMENT FAILURES

Aladon and the Aladon Network have been assisting customers, improving reliability of their physical assets for more than 30 years. The Aladon Network applied RCM-based reliability improvement projects in more than 100 countries on every asset known to mankind. Aladon is the leading global RCM Network. We understand that proactive failure management is key to safe, reliable and cost effective operation of your assets. However, the many years of experience made us realize that not all failures are preventable, some may even be desirable. The risks associated with these failures (especially where no effective form of proactive maintenance exists) should be clearly understood and managed. Our RCFA methodology addresses the risks associated with unanticipated failures and ensures through corrective actions (proactive maintenance or one-time change) that the risks are eliminated or reduced to within tolerable levels. Where possible, the failure will be eliminated through defect elimination by addressing issues like poor design and human error. Safe operations (operating envelopes) and/or routine maintenance issues (such as precision lubrication) are addressed when applying defect elimination through RCFA. Our methodology is supported by world-class integrated software.

WHY USE ALADON?

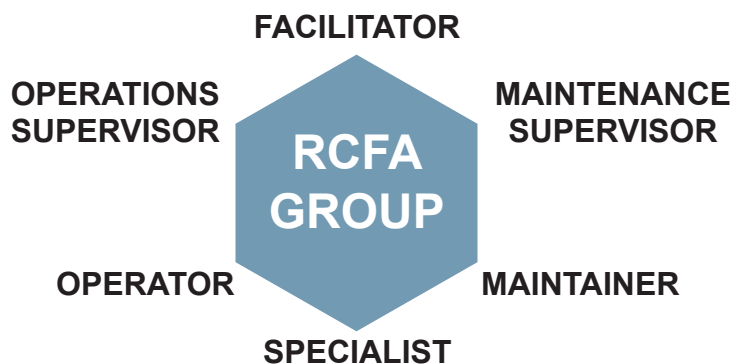
Aladon has worked on all continents in every endeavor known to mankind and is now using that experience to offer industry-centric solutions. The Aladon RCFA process is based on years of experience implementing reliability improvement programs across the globe and focuses on equipment capability, design integrity and operational sustainability. The Aladon track record speaks volumes and includes references from leading industries around the globe. Aladon understands the challenges faced by all industries and offers a comprehensive experienced-based solution which includes templates and forms to expedite a Root Cause Analysis process.

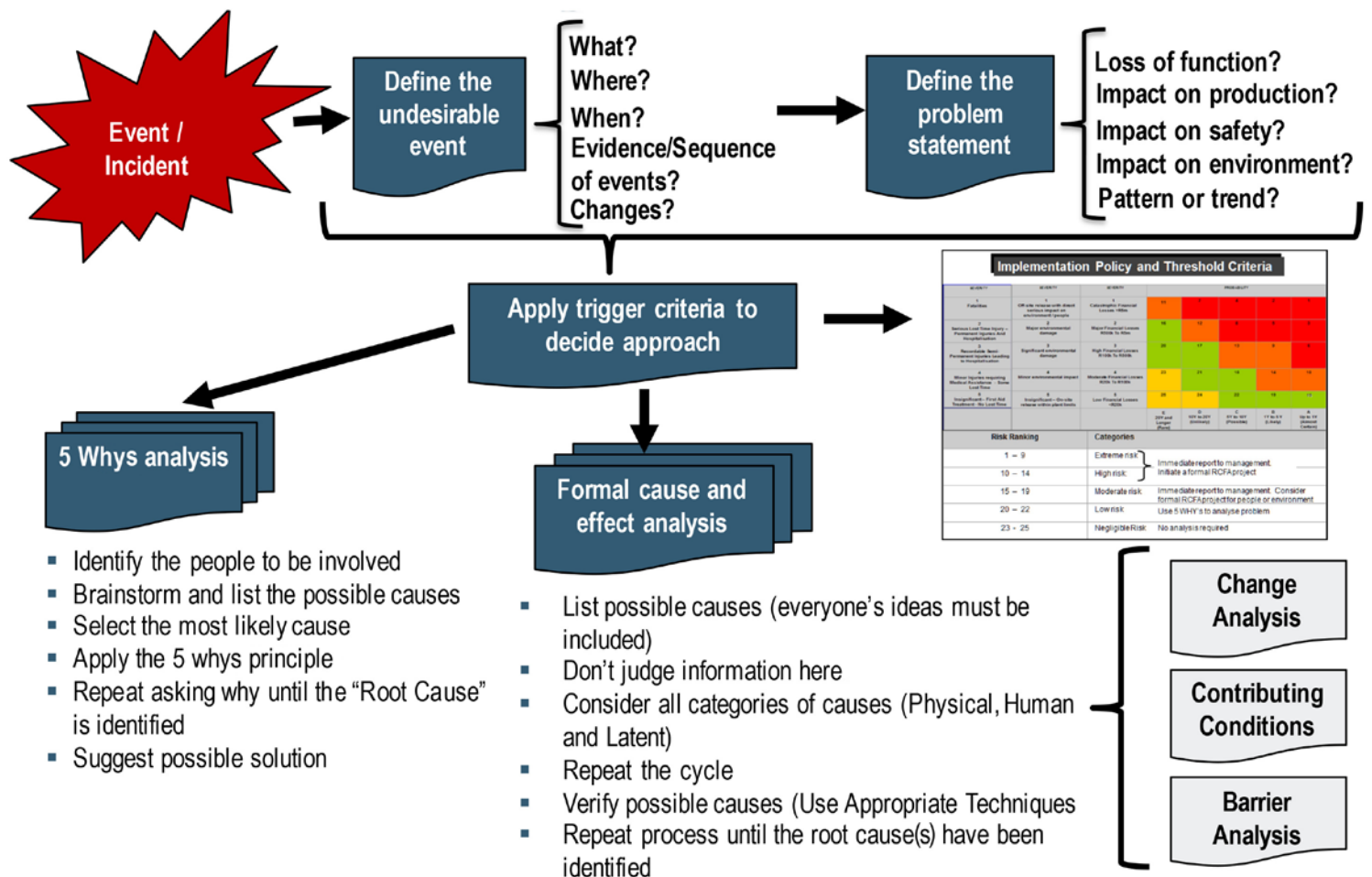
THE ALADON RCFA PROCESS OFFERS THE FOLLOWING:

- *Two-tier approach* for managing all equipment failures (tolerable and intolerable risks), which includes the valuable input from OEMs, Engineers, Operations and Maintenance
- *RCM-based* decision logic delivering pragmatic and effective solutions
- *Defined Operating Context* - meets specific requirements and sustainable solutions
- *Integrated Solution* - prevents duplication and omissions through integration with other reliability processes like RCM
- *Continuous Improvement* - lower overall risk and defect elimination (where applicable)
- *Implementation and Sustaining Results*

A ROBUST ANALYSIS PROCESS:

This ensures that not only Reliability Engineers are responsible for continuous improvement and sustainable operations, but the valuable and important input from Operations and Maintenance as well as Administrative personnel are captured during the process. The people who know the equipment and processes best and who will ultimately be responsible for implementing the recommendations are involved.





THE RCFA PROCESS:

The RCFA process starts by defining the **FAILED STATE** (loss of function that occurred) and, like the RCM process, will consider the Operating Context, or the environment in which the equipment operates. The Aladon RCFA methodology provides a robust decision logic for determining whether an informal (5 Whys) or formal RCFA approach should be followed. The decision is typically based on the risk associated with the failure (physical or economic risks) and the tolerance for the same. The RCFA process should be applied to repeat failures (bad actors) and one-time failures.

The **OPERATING CONTEXT** provides information that determines the risk (consequence of failure), asset reliability and performance. The Operating Context is further important for developing effective solutions and corrective actions. The Operating Context should include the following:

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| <ul style="list-style-type: none"> • The Operating Environment & Environmental Regulations • Product Quality Standards • Duty / Standby Arrangements • Skills and Skills Availability • Batch or Flow Process | <ul style="list-style-type: none"> • Safety & Safety Regulations • Duty Cycles • Shifts and Shift Arrangements • Spare Part Policies • Work in Progress | <ul style="list-style-type: none"> • Market Demand & Raw Material Supply • Seasonal Demand • Logistics • Protection • Repair Times |
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RCFA leads to optimized and sustainable Operations & Maintenance through finding effective solutions to unanticipated failures. The outcomes from the RCFA process will:

- Prevent the failure and associated risk from happening again or at least reduce the likelihood of reoccurring to within tolerable levels
- Recommend one-time changes to design or the way it is operated to reduce the risk to tolerable levels
- Provide asset owners with the knowledge and understanding of how equipment behaves and which failures cannot be prevented or managed proactively
- Target repeat failures and bad actors
- Design and implement the most effective corrective action plan

The RCFA process not only delivers a robust review of equipment and process failures but through its integration with a proactive failure management strategy (such as RCM) provides the most comprehensive risk management approach for all your assets. Operations and Maintenance involvement ensures practical solutions that can be implemented almost immediately. The Aladon process will first favor solutions that can be implemented without redesigning the equipment, where possible defect elimination will be pursued. If RCM analyses exist on systems where RCFA has been performed, the RCM analyses and implementation will be reviewed to ensure all recommendations are still valid and applicable.

The RCFA process allows quick and inexpensive analysis and verifications for low impact failures and a more robust approach for more serious impact failures through the application of a process that includes a unique combined cause and effect analysis. It further allows for quick evaluation of alternative strategies and solutions. Once the RCFA team can verify that all business objectives are met through the recommended solution (risk associated with the failure will not happen again), risks are eliminated or reduced to tolerable levels, the maintenance program and spare parts are available to support operations, and the implementation of the solution can start.

The Aladon RCFA process is supported by an integrated user-friendly software application that allows for capturing every identified cause, contributing condition, barrier analysis (lack of or failure of), and modifications to process or equipment that preceded the failure or incident. This allows for seamless reporting and sharing of lessons learned organization wide.

BENEFITS OF RCFA

- Stakeholder involvement ensures effective solutions
- Robust process, reliability-based solutions
- Transparency, elimination of personal preferences
- Maintenance including critical spare parts and operating parameters defined
- Well defined protective systems (barriers) and maintenance of the same
- An integrated process of failure prevention and management

