



Aladon

The Risk & Reliability

GLOBAL NETWORK

RCM FOR MINING

RISK AND RELIABILITY-BASED SOLUTIONS

World-Class Training and Consulting Services for Mining and Minerals Industry

Best Practices and Templated Solutions



www.aladon.com

MINING & MINERALS-CENTRIC RELIABILITY CENTERED MAINTENANCE

Aladon and the Aladon Network have been assisting customers improving reliability of their physical assets for more than 30 years. The Aladon Network has implemented RCM2™ on all continents in every endeavor known to mankind and are now using that experience to offer industry-centric solutions. The Aladon industry-centric RCM solutions are based on years of experience implementing RCM and reliability improvement programs in specific industries. The Aladon track record in the Mining and Minerals Industry speaks volumes and includes references from the world's largest companies and in all commodities. Aladon understands the Mining and Minerals Industry and the challenges faced by modern Mining Companies and our new Industry-centric programs offer a comprehensive experienced-based solution which includes templates and information to expedite the implementation of an RCM-based reliability program.

THE ALADON MINING AND MINERALS-CENTRIC RCM PROGRAM OFFERS THE FOLLOWING:

- *Standard Operating Philosophy Templates* that cover all aspects of mining
- *Equipment Reliability Templates* for all types of physical assets used in mining and treatment, all types of heavy equipment, process and wash plants, transportation and shipping
- *Best Practice Maintenance and Operating Strategies* based on comprehensive industry experiences and latest technologies (Continuous Monitoring, Predictive Analytics, Autonomous Mining)
- *Implementation and Sustaining Results*

THE STANDARD OPERATING PHILOSOPHY TEMPLATES contain information used to develop the Customer-specific Operating Context, thus saving time and money. It is an essential and very important part of the RCM process and the template provides the basic information required to develop the Operating Context. The templates are developed for specific processes in mining, processing, treatment and distribution and based on generic process design and regulatory standards. It includes equipment specific templates (drills, loaders, shovels, dredgers, drag lines, haul trucks, dozers, graders, etc.) and process (crushing, screening, conveying, separation, washing, water treatment, sorting, etc.) information. We work with the largest suppliers of mining equipment to ensure we stay up to date with the latest technologies and innovations.

Our experience has shown that regardless of where we implement RCM in mining, our customers all use the same or similar equipment to do the same or similar job. We have collected information on these assets over many years and used it to develop the **EQUIPMENT RELIABILITY TEMPLATES**. These templates do not replace our “zero-base” approach for doing RCM, but it is valuable for ensuring equipment reliability programs are derived from not only the experience of the people who know the equipment best (operators and maintainers), but also the experience from peers in the same and like type industries. Our comprehensive template library includes the majority (if not all) of the equipment used in the mining industry. These templates are grouped by different processes for mining, treatment and transportation. The templates are comprehensive and include multiple and different types of assets.

The **BEST PRACTICE MAINTENANCE AND OPERATING STRATEGIES** are based on the experience we gained working with the many Blue-chip Mining Companies around the world and our global Network of Practitioners who work in all industries. Many of our Practitioners have worked for Operating Companies before joining the Aladon Network. The templated solutions and strategies are based on specific Operating Context and equipment specific information and must not be implemented without proper review. The templates are continuously updated and provide our customers a technical base for verification and making sound decisions. The templates include the newest technology information and are especially useful for sustaining Operations and for developing **OPERATOR DRIVEN RELIABILITY PROGRAMS**.

IMPLEMENTATION AND SUSTAINING RESULTS are probably the largest challenge faced by any organization embarking on a reliability improvement program. The biggest downfalls are the lack of executive sponsorship and proper Change Management. The Aladon methodology is focused not only on changing the way maintenance is being done, but also changing the minds of the people involved.

Our award-winning approach starts by introducing the concept of Reliability Centered Maintenance to the executives and senior managers to obtain the necessary support and sponsorship. Our systematic approach continues by involving engineers, maintainers and operators (and anybody else who is involved in the process) who ultimately will be responsible for the implementation and sustaining the results.

Our training programs provide the necessary change management to develop a reliability culture within the organization while our world-class software provides the platform and framework for sustainable results.

THE ALADON MINING AND MINERALS-CENTRIC RCM PROGRAM PROVIDES:

- Mining specific overview and training sessions - available in Multiple Languages
- Mining specific Operating Philosophy and Equipment Reliability Templates
- Mining specific RCM training material and worked case studies
- RCM manual (in book format soon) specific to the Mining Industry
- World-class consulting services from experienced Network members
- Advanced software for effective and efficient RCM facilitation and sustainable implementation of the results

THE ALADON ADVANTAGE TO MINING & MINERALS-CENTRIC PROGRAM IS:

- Extensive experience in implementation of reliability improvement programs with specific industry focus and content
- A well-documented methodology for improving maintenance and operations with proven results
- Sharing in the experience of others in the Mining Industry around the world
- A pragmatic approach to ensure effective use of resources
- Software to capture institutional knowledge and ensure sustainable results
- Template library for verification and guidance



Our clients who have adopted a reliability culture will have access to the templates for hundreds of pieces of equipment. The templates assist our clients in accelerating the implementation of an RCM-based reliability program and further provide them with the information for verification and guidance to ensure failure modes, effects and failure management best practices are consistent with the industry.

Standby Generator Set Protective Devices, Alarms and Status Displays

Note: All Status lamp and display indicators, as well as horn annunciations, occur only at the standby generator and are not evident at the Operations Control Center (OCC)

Row	Protective Device Name	Status Lamps			Horn	Trip level Descriptions	Warnings	Shutdowns	Check		Notes
		Warning Only	Shutdown Only	Warning then Shutdown			Yellow Light Local Display	Red Light Local Display	S	U	
1	AC Sensing Loss				No	Warning when controller does not detect nominal generator set AC output voltage after crank disconnect	AC sensing loss				
2	Air Damper Indicator				Yes	Shuts down when signaled by a closed air damper circuit		air damper indicator			No pre-warning, just shuts down (NFPA 110 fault)
3	Alternator Protection				Yes	Shuts down when alternator overloads or there is a short circuit		altnt protect sdwn			No pre-warning, just shuts down
4	Battery Charger Fault				No	Warning when battery malfunctions	chgr fault				Requires optional battery charger with a malfunction output (NFPA110 fault)
5	Common Paralleling Relay Output				Yes	Warning when there is a relay fault	common pr output				
6	Critical Overvoltage				Yes	Shuts down when voltage exceeds 275 volts		critical overvoltage			No pre-warning, just shuts down. Monitors nominal voltage with a step-down transformer in the 208-240 range
7	Customer Auxiliary (Warning)				Yes	Warning or shuts down when an auxiliary digital or analog input signals the controller (User defined)	Digital input DO1-D21 or analog input A01-A07	Digital input DO1-D21 or analog input A01-A07			Using the remote communications package, user can label auxiliary functions to display selected name instead of digital or analog input. Note: User can define inputs as warnings or shutdowns
8	ECM Red alarm				Yes	Shuts down when controller receives a signal from the engine		ECM red alarm			No pre-warning, just shuts down. Only on DDC/MTU engines with MDEC/ADEC. User can navigate the menus to access the fault code. Engine operation manual provides fault code descriptions
9	ECM Yellow Alarm.				Yes	Warning when yellow alarm signals the controller	ECM yellow alarm				This fault only relates to the DDC/MTU engine with MDEC/ADEC. User can navigate the menus to access the fault coder
10	EEPROM Write Failure				Yes	Shuts down when control logic detects a data save error		EEPROM write failure			No pre-warning, just shuts down
11	Emergency Power System (EPS) supplying the load				No	Warning when the generator set supplies more than 1% of the rated standby output current.	EPS supplying load				(NFPA 110 fault)
12	Emergency Stop				Yes	Shuts down when local or optional remote emergency stop switch activates		emergency stop			No pre-warning, just shuts down
13	Field Overvoltage				Yes	Shuts down when the controller detects field overvoltage		field over volts			No pre-warning, just shuts down
14	Generator Switch Not in Auto				Yes	Warning when generator set master switch is in the RUN or OFF/RESET position	master not in auto				
15	Ground Fault Detected				Yes	Warning when user supplied ground fault detector signals the controller	ground fault				

The above example is a partial template for standby or backup generator maintenance and functional testing. Our comprehensive approach has been developed over 30-years of industry experience working with companies in all industries. The templates are available in our software for use by qualifying customers.

