Maturity Matrix - Reliability Engineering

ATLAS by LCE

Process	Reactive No process or procedure in place	Emerging Informal process in place, or process in place only for regulatory compliance	Proactive A formal process is established and well understood. Process includes flow charts, step definitions and responsibility matrix	Excellent Process effectiveness drives business results. Data is shared and used for decision-making. Process audits drive improvements
Asset Data Collection (ADC)	• No data base exists or not all assets are in the database • If assets exist, ≤25% of assets have a manufacturer and model # identified • Users of system are not familiar with asset data collection, data fields, or requirements • Data fields and requirements are suitable for use	• Over 85% of assets are in the database • ≥50% of assets have a manufacturer and model # identified • Users of system are familiar with asset data collection data fields and requirements • Data fields and requirements are suitable for use	• A documented asset identification process exists; over 95% of assets are in the database and users collect data effectively • 100% of the assets have a manufacturer and model # identified • 50% of assets are classified and asset-type characteristics are populated • Process addresses most data sources and extracts relevant data into intermediate storage	• A documented asset identification process exists; 100% of assets are in the database • Periodic audits of asset data performed to ensure effectiveness • 100% of assets are classified with asset-type characteristics populated • Process addresses all data sources and extracts relevant data into intermediate storage
Asset Hierarchy (AHD)	• Hierarchy established at the highest level only (production line) or partially implemented (≤50%) • Very little information exists for the assets in the database or is incorrect (≤50%) • Costs and reliability metrics are not tracked to the lowest level defined (≤50%)	• Hierarchy partially implemented (≥70%) with limited use • Accurate data associated with each asset exists in the database (≥70%) with reactive audits to maintain accuracy • Costs and Reliability metrics track to the lowest level defined (≥70%)	• Hierarchy policy aligned with a consistent standard (ex. ISO 14224) and hierarchy levels are consistently applied across the asset base (>95%) • Accurate data associated with each asset exists in the database (≥85%) with ad hoc audits to maintain accuracy • Costs and reliability metrics track to the lowest level defined (≥85%)	• Hierarchy levels are consistently applied across the asset base (100%) • Accurate data associated with each asset exists in the database (≥85%) with scheduled periodic audits to maintain accuracy • Costs and reliability metrics track to the lowest level defined (100%)
Asset Criticality (ACA)	• 0% equipment formally ranked • “Critical” equipment is identified based on “tribal knowledge” • If criticality exists, it is not documented • Criticality rankings are not approved	• 50% of equipment ranked for criticality • Critical equipment ranked informally, based on subjective criteria or limited to high-low-medium • Some criticality rankings are loaded in the system (≥70%) • Criticality rankings are approved by maintenance	• 100% of equipment ranked for criticality • A documented risk-based ranking process exists and a cross-functional team determines asset criticality • 100% of criticality rankings are loaded in the system • Criticality rankings are approved by a reliability engineer	• All assets are ranked with less than 10% ranked in highest category; scheduled audits maintain accuracy • Continuous improvement is evident within the criticality process • Criticality ranking is effectively used • Criticality rankings are approved by an asset management team
Control Strategy Development (CSD)	• Asset strategy limited to original equipment manufacturer (OEM) recommendations, are informally identified, and no failure modes and effects analysis (FMEA) • Run to failure occurs but is not a specified, risk-based strategy	• ≥50% of the most critical assets have strategies determined by FMEA • ≥50% mid-level criticality assets have OEM and historical based PMs	• 100% of the most critical assets have strategies determined by FMEA • 100% OEM and historical based maintenance are used for mid-criticality assets • Lowest criticality level assets are considered for a ‘run to failure’ strategy	• 100% of assets ranked to best practice standards and have an effective asset strategy • Maintenances strategies are evaluated for continuous improvement using effective data analysis
Maintenance Strategy Development (MSD)	• Detailed maintenance plans do not exist or are limited • Critical instrumentation is not calibrated • Informal lubrication program exists • Condition-based maintenance activities do not exist. Majority of PMs are calendar based (i.e. monthly, quarterly, etc.) •	• Maintenance plans are built using an informal, ad hoc process and lack sufficient detail or are limited to that provided by the original equipment manufacturer (OEM) • Critical instrumentation is calibrated • Critical equipment is covered (where applicable) with a lubrication program with compliance ≥70% • ≥25% of maintenance strategies contain condition-based evaluation criteria	• Detailed, step-by-step maintenance job plans exist and include operating parameters, craft skill, parts, tools and materials required to complete maintenance tasks • A formal, documented, critical instrumentation calibration program exists with compliance ≥90% • Critical equipment is covered (where applicable) with a formal, documented lubrication program consistent with “best in class standards” with compliance ≥70% • ≥50% of maintenance strategies contain condition-based evaluation criteria, including PdM technologies	• All job plans are detailed and comprehensive. There is evidence of PM evaluations and continuous improvement • A documented critical instrumentation calibration program exists with compliance ≥90% • A “best in class standards” lubrication program is in place with compliance ≥90% • ≥80% of feasible PMs are condition-based. New equipment strategies and PMs are developed before assets are in operation

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Bill of Materials Creation (BOM)	• Bill of materials (BOMs) do not exist, partially exist, or inaccuracies render them useless • As new critical equipment is added BOM additions are not are developed • BOM creation considered to be a maintenance activity	• BOMs exist only for critical equipment with some accuracy ≥70% • As new critical equipment is added BOMs are developed on an ad hoc basis typically by maintenance planners. BOMs for non-critical equipment might be developed as needed • BOMs are limited to parts in stock	• Top criticality ranked equipment have complete BOMs place and contained within the database • As new equipment is added, BOMs are developed as part of the installation project for both critical and non-critical equipment • BOMs identify both stock and non-stock parts	• All equipment (100%) have complete BOMs • A formal, documented and audited BOM process exists and addresses management of change • Metrics tracked with documented trend improvement over time and 3 yr. history of trend results documented
Critical Spares Evaluation (CSE)	• Minimal evidence of parts identified as "critical" in the system • Critical items are not identified in the system • No process exists for identifying critical spares • There are no rules regarding parts substitutions	• Critical spares are reactively identified typically after a severe event • Critical items are clearly identified in the system • Critical spares are determined informally. Typically based on emotion and no data • Parts substitution decisions are informal and ad hoc	• 100% critical equipment spare parts identified in the system • Critical items are identified in the system with a well-defined min/max level, required storage maintenance, and a review process • Critical spares are determined using risk-based criteria (e.g. lead time, failure risk, carrying costs, failure detectability, asset criticality, etc.) • Documented parts substitution rules are followed. Specific parts are identified as "do not substitute"	• Spare parts requirements for all assets have been identified • All spare parts are identified in the system with a well-defined min/max level, required storage maintenance, and a review process • Critical spares are determined using a variety of risk-based criteria and continuous improvement is evident • Substitution, evaluation, stock levels, and storage requirements are routinely audited for compliance and improvements implemented.
Loss Elimination (LEL)	• Major losses in production and costly events are investigated as they occur • No formal root cause analysis (RCA) program • When an informal RCA is conducted, corrective actions are rarely implemented and/or tracked • Bad actor lists do not exist	• Production losses are tracked with limited accuracy • Major losses and cost events are tracked and receive an RCA. Triggers are emotionally driven • Some corrective actions implemented and validated • Bad actor lists may exist but don't drive RCA activities	• Production losses tracked daily and accurately • Major losses and cost events are tracked and receive an RCA based on a formal, documented risk-based trigger system • Corrective actions are implemented and regularly verified • Bad actors tracked based on frequency and cost; costly events receive a formal RCA	• All losses measured, tracked and published in Pareto charts with associated financial costs • Monthly review of results, corrective actions and formal reports • Continuous improvement trends are published and an asset management team reviews losses and bad actor reports • High frequency bad actors are addressed and remediated
Root Cause Analysis (RCA)	• No formal training in RCA exists • No RCA process exists • Bad actors are not being addressed • No defined RCA tools	• Informal RCA facilitators exist • Informal RCA process exists and is sometimes followed • RCA tools limited to 5 why and fishbone diagram • Major losses and bad actors identified with an RCA • Corrective actions typically implemented and sometimes validated	• Some formally trained RCA facilitators • A formal, documented RCA process exists with a defined set of triggers • A wide variety of RCA tools are used as applicable • Most corrective measures are documented, approved, implemented, and verified	• All facilitators formally trained in RCA • RCA tools use is audited for effectiveness and a continuous improvement program exists • All corrective actions are recorded, reviewed, approved, funded, tracked to completion and verified effective
PM Optimization (PMO)	• PMs are not reviewed or evaluated for effectiveness	• PM review and optimization happens informally • Process is informal and may include replacing a PM task with a condition-based task • PM task details are insufficient for consistent execution and have no connection to specific failure mode	• PM optimization is a formal, documented process • Process includes replacing PM tasks with condition-based tasks • PM task details are sufficient for consistent work execution and address a specific failure mode	• PM optimization process is measured based on reviewing failure data, uptime, and cost • 90% of PMs completed on time (10% rule) • PM optimization chooses the appropriate task based on the lowest total cost of ownership • PM task details show evidence of employee feedback and continuous improvement

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Management of Change (MOC)	• Capital project and major manufacturing process changes informally reviewed • The awareness of the need for a formal MOC program does not exist • No defined approval levels • Documentation and drawings are not updated	• MOC requirements are documented with ≥50% compliance • Personnel are not trained in MOC and its application • MOC review and approval levels are limited to engineering personnel • Inconsistent documentation and approvals (does not meet OSHA 1910)	• 100% of changes comply with MOC requirements • Personnel are trained in MOC and its application • The Reliability Engineer, EHS, Quality, and Engineering personnel review and approve MOCs related to facilities and assets • All drawings, maintenance plans and BOMs are revised as required	• 100% of MOCs approved before changes are implemented • Personnel are proficient in MOC application • MOC includes reviewing pre-start-up metrics • All drawings, maintenance plans, and BOMs are revised as metrics are reviewed

	OEE	Unplanned Downtime	Maintenance cost as % RAV	OEE	Unplanned Downtime	Maintenance cost as % RAV	OEE	Unplanned Downtime	Maintenance cost as % RAV	OEE	Unplanned Downtime	Maintenance cost as % RAV
Key performance indicators	<65% batch <70% discrete <75% continuous	>6%	>7%	65-75% batch 70-80% discrete 75-85% continuous	4-6%	5 – 7%	75-85% batch 80-90% discrete 85-95% continuous	2-4%	3.7 – 5%	>85% batch >90% discrete >95% continuous	<0.5 – 2%	0.7 – 3.6%