T104 - Reliability Solutions
Driving Asset Optimization & Greater Plant Productivity

PUBLIC INFORMATION
Reliability Solutions

Leading companies are striving for improved **reliability of their critical assets**, that results in greater plant productivity. Changing the game from **reactive to proactive** can be accomplished; ultimately **reducing plant risks** costing you money & time, while **improving asset performance** has huge financial & cultural benefits. Learn how Rockwell Automation's Reliability Solutions can help your company achieve Asset Optimization & greater Plant Productivity.

**Reducing Risk and Creating Value Throughout Your Production Lifecycle**

- **Feasibility & Conceptual Studies**
  - Feasibility Studies
  - Conceptual Design
  - Consulting Services
  - Workforce Readiness

- **Front End Engineering & Design**
  - Information, Control, Power, Safety
  - Process Optimization
  - Instrumentation
  - Electrical
  - Packaged Equipment

- **Design & Engineering**
  - Design & Implementation
  - Construction, Fabrication
  - Testing (FAT)
  - Training
  - Network and Security

- **Installation & Commissioning**
  - Installation Management
  - Start up/Commissioning
  - Training
  - Documentation
  - Parts Management

- **Operation & Maintenance**
  - Remote Support & Monitoring
  - Service Agreements
  - On-site Engineering
  - Asset Management
  - Reliability

- **Upgrades & Migrations**
  - System Audits
  - Obsolescence Risk Mitigation
  - Hardware/Software Upgrades
  - DCS/Control & Safety System Migrations
Pressures and Risks change the way companies behave.

Figure 1: Year-over-Year Comparison of Pressures Driving Focus on Asset Management

<table>
<thead>
<tr>
<th>KPI</th>
<th>2012</th>
<th>2013</th>
<th>Percentage of Respondents, n=149</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced budgets</td>
<td>46%</td>
<td>58%</td>
<td></td>
</tr>
<tr>
<td>Capital or operational</td>
<td>68%</td>
<td></td>
<td></td>
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<tr>
<td>Need to maximize Return on Assets (RoA)</td>
<td>37%</td>
<td>36%</td>
<td></td>
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<tr>
<td>Attrition in skilled workforce</td>
<td>11%</td>
<td>21%</td>
<td></td>
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<tr>
<td>Rising material cost</td>
<td>25%</td>
<td></td>
<td></td>
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<tr>
<td>Aging assets</td>
<td>26%</td>
<td>17%</td>
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</tbody>
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Table I: Top Performers Earn Best-in-Class Status

<table>
<thead>
<tr>
<th>Maturity Class</th>
<th>Mean Class Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best-in-Class:</td>
<td></td>
</tr>
<tr>
<td>Top 20% of aggregate performance scorers</td>
<td>3.5% Unscheduled Asset Downtime</td>
</tr>
<tr>
<td></td>
<td>89% Overall Equipment Effectiveness (OEE)</td>
</tr>
<tr>
<td></td>
<td>+24% Return on Assets (RoA) vs. Corporate Plan</td>
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<tr>
<td></td>
<td>-13% Reduction in Maintenance Costs</td>
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<tr>
<td>Industry Average:</td>
<td></td>
</tr>
<tr>
<td>Middle 50% of aggregate performance scorers</td>
<td>8.3% Unscheduled Asset Downtime</td>
</tr>
<tr>
<td></td>
<td>83% Overall Equipment Effectiveness (OEE)</td>
</tr>
<tr>
<td></td>
<td>+4% Return on Assets (RoA) vs. Corporate Plan</td>
</tr>
<tr>
<td></td>
<td>-4% Reduction in Maintenance Costs</td>
</tr>
<tr>
<td>Laggard: Bottom 30% of aggregate performance scorers</td>
<td>16.9% Unscheduled Asset Downtime</td>
</tr>
<tr>
<td></td>
<td>69% Overall Equipment Effectiveness (OEE)</td>
</tr>
<tr>
<td></td>
<td>-7% Return on Assets (RoA) vs. Corporate Plan</td>
</tr>
<tr>
<td></td>
<td>+1% Increase in Maintenance Costs</td>
</tr>
</tbody>
</table>

Source: Aberdeen Group, December 2013

$20B Cost Of Unscheduled Down Time

8% Is spent figuring out if there is a real problem

21% Is spent diagnosing the problem

47% Is finding the resources to fix the problem

76% of the time before the fixing even starts

Six Sigma
Kaizen
Streamlined RCM
CbM
PM Optimization

TPM
Lean
5S
TLC
Root Cause Analysis
Proactive Maintenance
PAM
Rbd
Asset Optimization
Industry Challenges For the Next Decade

- Pressure on Efficiency and Reliability
- Shrinking Expertise in Workforce
- Aging Assets
- New Assets Increasing in Complexity
- Increasing Regulatory Pressures

Manufacturers spend 40% of their time on reactive maintenance vs. their 12% ideal (Maintenance Technology)
Is a Reliability Centric approach part of your game changing strategy?

Driving standardized processes within both asset management and process / production systems can be a big business differentiator!

As you seek to achieve higher level maintenance and reliability to improve uptime:

- How will you be managing your most critical assets?
- Are you leveraging smart device information to drive predictive maintenance decisions?
- Are my networked devices running within known control limits and healthy?
- How am I tracking asset data?
- Will replacement parts meet required specifications?
- How much downtime is caused by parts issues?
- Do I have governing policies to manage asset change and alternative configurations?
- How can I culturally evolve maintenance program to be more predictive?

“Reliability is more than asset management and quality control. It’s a company-wide mindset that never veers from the goal.”
- Jeff Dudley, Dow Chemical

Rockwell Automation is here to help maintain your control assets as well as optimize your assets driving greater productivity!
Turning Challenges into Opportunities

Reliability Services mission is to partner with our clients towards their journey of achieving Plant Asset Optimization

Plant Asset Optimization

Reduce Maintenance & Storeroom Costs
- Storeroom Management Solution
- Asset Management program
- Installed Base Evaluation
- Obsolescence migration projects

Improve Asset Uptime & OEE, amid workforce changes
- Reliability Services
- CMMS/ EAM utilization projects
- Remote support services
- Assurance service
- Workforce development solutions

Reduce production risk & costs due to aging equipment
- Reliability Services (Assessments)
- Lifecycle extension solutions
- Safety/ Network Services
- Migration projects

Comply with increasing compliance requirements
- Reliability - DR Service
- Network/ Safety Solutions
- Embedded Engineers
- Industry project teams

Diagnostic Reliability Service
Journey toward Asset Optimization

- Good Baseline Data
- Maintenance Strategy
- Storeroom Processes
- Asset Change Mgmt.
- Warranty Tracking
- Obsolescence Status
- Risk/ Criticality
- Asset Diagnostics
- Integrated Contracts
- Cross functional teams
- Dynamic Data Platform

Asset Optimization

Advanced Analytics & Intelligence

Execute evolving Predictive strategies

Integration of Lifecycle & Reliability data

Asset Management Foundation

Best in Class results!
Agenda

Asset Reliability Program

Diagnostic Reliability Solution

Point Service Solutions

Assessments
Asset Reliability Program

Asset Reliability Program is a comprehensive solution that leverages people, processes and technology to drive sustainable predictable results!

Our Program helps our customers accomplish their manufacturing productivity goals in the following manner:

• Continual Costs Savings across your Maintenance/ Storeroom budgets
  – Warranty Recovery on all repairable assets
  – Inventory Reduction thru rationalization, duplication elimination and consolidation
  – Process efficiencies in parts processes, time utilization, system standards
  – Supplying quality parts remanufacturing/ repair lowering MTBF

• Improved Asset Reliability across your production lines
  – Obsolescence risk mitigation & migration
  – Reduction of reoccurring failures thru reliability techniques and processes
  – Proactive/ preventative maintenance strategies improving line OEE
  – Storeroom efficiencies in equipment criticality driving spares, lead time/ delivery and kitting
Asset Reliability Program Elements

Understanding the Asset Baselines

Stores and Plant Floor Assessment

Equipment Reliability Analysis

Critical Spares/Support Analysis

Storeroom Management/Operations

Asset Tracking & Repair Management

Reliability Professional & Program Mgmt.

Diagnostic Reliability Data Intelligence

Operational Continuous Improvement

KPI / Metric Driven Performance

INTEGRATED STOREROOM SOLUTION

Best-in-class solution is derived from proven business solutions

Integration of Lifecycle & Reliability data
Asset Management Foundation

Rockwell Automation
Reliability Professional/Program Manager

Highly skilled professional
Improving productivity & cost reduction focused
Root cause problem solving
Implementation of program processes
Development of SOP’s
Drive equipment reliability processes
Drive maintenance/ reliability improvement activities

Reliability Professional = Driver + Consultant + Detective
Program/ Improvement steps - examples

1. Prioritize Opportunities
2. Accepted Top Priorities
3. Monitor Results & Additional Opportunities
4. Strategy Alignment

Preventative Maintenance Improvement

KPIs

1. Perform Equipment Criticality Analysis
2. Perform Failure Mode Effects Analysis
3. Identify mitigation preventive/predictive maintenance tasks
4. Evaluate PM frequencies based on actual failure mode history
5. Document PM spare kits required
6. Obtain customer approval
7. Build PM plans in customer CMMIS
8. Monitor PM completion
9. Monitor unplanned downtime reduction caused by PM completion

Rockwell Automation
Reliability Centered Maintenance
MAAR process used by PM - examples
Typical Program

Our Asset Reliability Program structure typically consists three steps that range depending on client specific needs evolving over time.

1. Develop Program Structure tied to Business Objectives
2. Implement program consisting of services, parts and solutions
3. Evolve program as results are driving need for new business objectives
Addressing User Case Scenarios

What if I could simply...

- **Locate/ Identify status of troubled devices** in centralized view enabling decisive actions to occur with proactive information in good data context.

- **Mitigate high risk equipment risks** by leveraging criticality analysis tools using in-service equipment health information.

- **Perform a critical/ spare parts gap analysis** dynamically based on add/ changes, part reliability or lifecycle data allowing better asset/ resource plans.

- **Verify migration plans to reduce legacy obsolescence** improving budget management and improving plant reliability

- **Track device service cycles** by location, IP address and S/N providing detailed knowledge of device service history within a specific application.

- **Identify device/ system firmware** reducing line/ equipment mean time to restore and improves system availability.

- **Proactive notice of device change/ history** allowing verification of management of change process effectiveness, improving system reliability.

- **Determine product safety/ service advisories impact**, reducing production risks of known/ unknown device issues from OEM per my system design.
Diagnostic Reliability Solution
Client specific on premise asset diagnostic system

Diagnostic Reliability ‘DR’ Service provides our clients improved risk mitigation & control system compliance on their most critical production assets.

Asset Knowledge
• Complete installed asset records of networked devices (live/ historic)
• Device profiles with status/ fault identification
• Critical spares inventory analysis

Risk Reduction
• Lifecycle obsolescence status, prioritization and mitigation plan validation
• Security/ Safety safeguards – device monitoring, detecting threats early, MOC validation, advisory impact analysis
• Asset support strategies, firmware/ version compatibility mgmt.

Asset Performance
• Device & system health diagnostics
• Dynamic user interface with unified data model provides good analytics
• Simplified user tools

Maximizing RoA - Uptime - Compliance
DR Solution Information Portal

- DR System continuously scans plant control network Assets
- DR System buffers and exports data to DR SQL
- Data model & hierarchy is aligned to your operations with workflow
- Information presented to Users through Web Portal & Systems UI
**Diagnostic Reliability Service**

DR Service is commonly rolled out in following steps:

- **Core technology deployment** onto plant control systems
  - Live Process BOM - components and subcomponents
  - System-wide visibility to health of networked devices
  - SMART Drill Down to firmware, series, serial number
  - Standard device diagnostics, trending, alerts

- **Client Specific** system configuration with **user dashboards**
  - Asset profile configuration per operational baseline
  - System Change management reporting including firmware
  - Real-time and historical device information
  - Business intelligence for predictive maintenance actions

- **Reliability services** within annual contract agreement
  - Optimize Asset strategies as equipment lifecycle evolves
  - Critical Spares evaluation to minimizing risk thru change
  - EAM-CMMS Utilization Improvements & data validation
  - Program manager consulting services thru contract roadmap
  - Continuing systems support with latest features
Real Results: Diagnostic Reliability Service

**Large Producer & Refiner of Oil**
- Multiple sites within a region
- Critical control systems
- Highly regulated
- Validation/ auditing requirements
- Many layers of devices & systems

**Challenges**
- Accurate Management of Control Assets
  - Accuracy and Completeness of Control Asset Records
  - Spares Inventory Correctly Supports Installed Base
  - Sustainability of Enterprise System Data Records
  - Verify Lifecycle Management / Obsolescence & Migration Plans

**Solutions**
- Implement Rockwell Automation Diagnostic Reliability Service
  - Including Network Assessment
  - System Implementation to IT requirements
  - User Training with specific dashboard design
  - Ongoing service contract

**Results**
- Diagnostic Reliability Service Implemented on 6 Site locations (~500 devices/ site)
  - Online monitoring and auditing
  - Ongoing equipment health trending within Dashboards
  - Proactive maintenance activities driven by analysis
  - Asset Management improvement plan roadmap to drive operational and maintenance efficiencies

*Specifics are client confidential*
Real Results: Diagnostic Reliability Service

Large Food Manufacturer
- Producer of hot dog, bratwurst & sausages
- High volume lines with extensive automation
- Uptime is critical
- High downtime costs
- Regulatory compliance issues

Challenges
- Ineffective maintenance KPI’s
- Unclear equipment risks
- Old and outdated maintenance practices
- Mostly reactive maintenance – high costs
- Inventory management controls and infrastructure not in place

Solutions
- Implement Rockwell Automation Diagnostic Reliability Service
- Evaluation/ Study on the following Areas:
  - Captured environmental issues and equipment reliability practices
  - Reviewed SAP including equipment hierarchy and BOMs
  - Reviewed maintenance system processes
  - Reviewed E&I spare parts (AB Components)
  - Equipment Evaluation

Results
- Diagnostic Reliability Service Implemented on 6 Major Control Networks (200+ devices)
  - Online monitoring
  - Ongoing equipment health trending
  - Proactive maintenance activities driven by analysis
- Maintenance Process & Equipment improvements
  - Conversion of Unplanned to Planned work with Reduction
  - MRO Carrying Cost Reduction
  - Equipment Reliability Improvement
  - Reduced time to repair

Specifics are client confidential
Asset & Reliability Services Portfolio

- Installed Base Evaluation™
  - Lifecycle and Criticality Analyses
- Reliability Services
  - Strategic Maintenance
  - Diagnostic Reliability Services
  - Storeroom
- MRO Process Management (RAAMP™)
  - Warranty Tracking and Management Services
  - Vendor-Managed Inventory and Spare Parts Programs
- Remanufacturing/Exchange Services
  - Remanufacturing & Repair Services
  - Inventory AssuranceSM Service
  - Annual Repair Agreement
- Lifecycle Extension & Migrations

**Reliability Services**
- Preventative and Predictive Maintenance Planning
- Equipment Criticality Analysis
- Failure Mode Effects Analysis (FMEA)
- Root Cause Affects Analysis (RCA)

**Diagnostic Reliability Services**
- Condition Monitoring / Change Management
- Firmware Management

**CMMS/ EAM Services**
- System Process Mapping
- Data Cleanse
- Work Order Execution
- Turn-Key Solutions

**Storeroom Services**
- Process Assessment
- Parts Usage Analysis
- Layout and Design
- Storeroom Management
- Physical Inventory

*Improve your reliability and bottom line performance*
Asset Management: Storeroom Services

Storeroom Services

- Right parts, people, design, spares, kits, processes and inventories
- Cost effective support of operations to increase machine availability

Benefits

- Reduce inventory levels and MRO costs
- Improve MRO management process
- Improve KPIs (inventory accuracy, shipped on time, cycle count accuracy, etc.,
- Improve maintenance decisions
- Reduce storeroom costs
- Manage obsolescence
- Reduce stockouts

Features

- Point or complete solutions
- Usage analysis identifies areas for SKU reduction
- Increase capacity without adding space
- Streamline reporting structure and standardize processes
- Move and reorganize storeroom
- Efficient Labor Utilization

Convert your storeroom into an asset instead of a liability
Your productivity and bottom line depend on it.
Building Materials Manufacturer

- Produces insulation products for roofing
- Storeroom efficiency problems
  - Only 17% of MRO inventory moved in 1.5 yrs
  - Large amount of excess/obsolete inventory
  - Additional storeroom space needed to add motors to the storeroom
  - Poor storeroom organization with little SOPs
- Approx. 11,500 SKU’s worth $4.5M

Challenges

- Evaluate inventory stocking levels to identify gaps and excesses.
- Optimize storage units and storage capacity to reduce storeroom footprint. Add bar code scans.
- Goal to separate storeroom into two rooms; general parts and maintenance team parts.
- Goal to increase storeroom storage capacity without increasing storeroom floor space

Solutions

- Inventory Usage Analysis
- Research optimum storage unit systems
- Design new and improved storeroom layout
- Perform physical inventory and reconcile business system
- Assist in installation of new storage units into recommended layout
- Design barcode label and implement on new storage systems
- Move all storeroom parts into new storage system and layout
- Bar code label each part

Results

- Improved Storeroom Layout & SOPs
  - Developed new min/max inventory level for all storeroom parts
  - New storeroom layout developed and working to make it a reality
  - Barcode labels applied to all storage locations and parts large enough to fit the label
  - Replaced 95 shelving units with 55 storage cabinets
  - New storeroom layout will increase available floor space by about 45%
Real Results: Storeroom Solution

Storeroom Clean-Up

- **Project Summary**
  - Moved 7,859 parts total
  - 68% of total parts moved so far

- **Excess Inventory**
  - Part Numbers: 1,329
  - Inventory Value: $282,781
  - Annual Holding Cost: $56,556 (20% CC)

- **Excess & Obsolete Inventory Removed to Date:**
  - Part Numbers: 2,692
  - Inventory Value: $641,418
  - Annual Holding Cost: $128,284

- **Projected ROI (Inventory Reduction Only):** 153%

- **Obsolete Inventory**
  - Part Numbers: 1,363
  - Inventory Value: $358,637
  - Annual Holding Cost: $71,727 (20% CC)

- **Commodity Group Changes Identified:** 454 part numbers

**Before**

**After**
Getting Reliability efforts going
Assessment/ Analysis phase

Assessments of Improvement Areas
- Equipment Reliability
- Maintenance Processes
- Critical Spares/ Inventory
- EAM/ CMMS utilization effectiveness

Equipment Risk/ Criticality analysis
- Develop a Risk Matrix
- Installed Base data report
- Optimum tactics/ strategies

FMEA/ RCA analysis
- Understand the failure modes, effects and how to mitigate them
- Document mitigation strategies
- Develop troubleshooting techniques to improve operator efficiencies and reduce downtime
Real Results: Risk & FMEA Solution

### Challenges
- High Volume Mfg. with high downtime costs
- Regulatory concerns for lost production
- Combination of new and old equipment
- Undefined and unmitigated equipment risks
- Limited engineering and maintenance resources; minimal reliability expertise.

### Life Sciences
- Biotechnology
- Medicine Production
- Mission Critical Systems – No unplanned downtime
- Highly Regulated
- Validation Requirements

### Solutions
- Prioritize Activities via Risk / Criticality Analysis
  - Quantify Risk – Safety, Environmental and production
  - Production Downtime and Maintenance Labor costs are also assigned to produce a consequence value ($)
- Develop PM Strategies for Automation Devices via Failure Mode Effects Analysis FMEA
  - Identifies Failure Modes, Causes, Effects
  - Develop risk mitigation strategy via appropriate maintenance strategies
  - Develop Preventive maintenance plans

### Results
- Risk / Criticality Analysis – 43 Systems
  - Prioritized Resource Utilization
  - Mitigated Risk / Unplanned Downtime
  - Identification of Maintenance Strategies
    - Reactive, Preventive, Predictive
- Failure Mode Effects Analysis FMEA – 59 Systems
  - Preventative Maintenance Plans
    - Strategy, Tactics, Frequencies, Spares

Specifics are client confidential
Assessments

‘2 Assessments with 1 common Reliability Vision’

- Stores supports maintenance and needs to be as reliable as the people and equipment on the plant floor; the maintenance manager or Supt. “owns” the stores performance.
- There are roughly 40 criteria per assessment that we analysis and detail ---tying an ROI and financial impact back to Industry Standards.
Final Thoughts

Changing the game from reactive to proactive… Greater Plant Productivity!

- **NOW** Companies & **Industry leaders** are changing the game, **making the transformation** – factors: Global competitiveness (RoA), Convergence (tech./ standards) & Workforce skills
- Knowing what you know now… **Where is your company in its journey** towards asset optimization, embracing a reliability centric culture & driving business growth?
- As a leader within your organization **what is your learned new idea, best practice or innovative approach** you plan to share at your next team meeting?
- **Trusted industry service providers** such as Rockwell Automation **have the knowledge, tools & resources** to execute client solutions with excellent financial returns.
- We are here to help!