

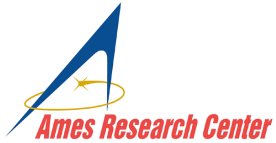
RELIABILITY CENTERED MAINTENANCE (RCM)

FACILITIES MAINTENANCE SERVICES

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RCM DEFINITION AND PHILOSOPHY

- Maintenance strategy that methodically develops the optimum mix of preventive, predictive, reactive, and proactive maintenance practices
- Integrate maintenance practices to take advantage of their respective strengths in order to maximize system availability and efficiency while minimizing life cycle costs
- NASA Reliability Centered Maintenance (RCM) Guide For Facilities and Collateral Equipment
 - <http://www.hq.nasa.gov/office/codej/codejx/Assets/Docs/RCMGuideMar2000.pdf>



PREDICTIVE MAINTENANCE OUTLINE

- Predictive Testing and Inspection (PT&I)
- Acceptance of New/Rebuilt Equipment
- Failure Modes and Effects Analysis (FMEA)

PREDICTIVE MAINTENANCE (PdM) - 1

- Predictive Maintenance (PdM) based on Predictive Testing and Inspection (PT&I) technologies available and Failure Modes and Effects Analysis (FMEA)
- Develop a PdM program under the firm fixed-price contract and implement on-site
 - Take into consideration risk of production loss if equipment fails
 - Possible cost savings
 - Regulatory requirements
 - Primary Goals
 - In- line with best industry practices
 - Economically beneficial

PREDICTIVE MAINTENANCE (PdM) - 2

- Predictive Testing and Inspection (PT&I)
 - Contractor is responsible for performing PT&I as part of its recurring services under the firm fixed price portion of the contract (para. C5.3.B.1)
 - Contractor shall have experience in vibration analysis and thermography at a minimum of Level I certification (para. C1.2.P.8)
 - PT&I Technologies are outlined in Attachment J-C1.6
 - The Contractor may substitute PT&I for time based PM
 - The Contractor may use PT&I results to document proposed changes that reduce (or increase) the current work load

IN-HOUSE PT&I TECHNOLOGIES IN USE

- Technology

- Periodic Vibration Analysis
- Oil & Wear Particle Analysis
- Thermography
- Motor stator analysis & electrical surge testing
- Motor Current Signature Analysis
- Airborne Ultrasonics

- Application

- All Rotating Equipment
- Critical & Low Speed Equipment
- Electrical Components, Heat Insulation, mech. Components
- Motor stator and insulation breakdown
- Motor rotor bars, eccentricity
- Steam trap, compressed gases, vacuum leaks

CURRENT EQUIPMENT MONITORED

- Examples of Current Equipment Types Being Monitored
 - Boilers and Boiler Fans
 - Chillers and Chilled Water Pumps
 - Mixing Pumps
 - Air Handlers
 - Critical Electric Motors
 - Sewage Pumps
 - Electrical Substation Equipment

DATA COLLECTION AND EVALUATION

- Work orders are generated by MAXIMO®
- Route is downloaded to machinery analyzer
- Data is collected and downloaded into RBMWare® software
- After analysis, completed work order is returned to MAXIMO®

Continuous evaluation of program effectiveness to optimize maintenance program

PT&I TO DATE

- Total Buildings Analyzed 135
- Buildings Chosen for PT&I 45
- PT&I Installation Complete 45
- Active Routes and Data Collection 45

PREDICTIVE MAINTENANCE (PdM) - 3

- Acceptance of New and Re-built Equipment
 - Shall participate in the acceptance process of newly installed equipment of value
 - Verified to standards set forth in APD 8830.1, Reliability-Centered Maintenance (RCM) Program for Institutional Equipment
 - Improve initial equipment condition
 - Eliminate Installation defects
- Failure Modes and Effects Analysis (FMEA)
 - Shall perform as part of the on-going RCM/PdM program
 - Shall contain the following information
 - Address functional failure
 - Dominant failure modes
 - Failure cause and effect including root cause analysis
 - Recommended actions to eliminate or prevent reoccurrence

OVERSIGHT

- Oversight for the RCM Program is provided by the Plant Engineering Branch JCM Program Office
- The Plant Engineering Branch will use PT&I technologies to review work performance and PT&I and FMEA data collected by contractor personnel