Reliability, Availability & Reliability Centered Maintenance (RCM)

The Mission Critical Triangle
• Brief overview of RCM design considerations

• RCM simulation (software demonstration)

• Questions
• The MAJOR cause of mission critical product failures is caused by human factors (scheduled maintenance etc.).

• 80% of outages and facility shut-downs are caused by internal power problems, not external sources: they are identifiable and predictable

• A key of RCM is running to the “edge”.
• The RCM Triangle

  • Detailed equipment information, modeled for exacting performance.
  • System knowledge of performance and “aging”.
  • Actual performance (so called “real-time” data) compared to predicted performance

• EDSA RCM Paradigm

  • Extensive, detailed “name plate” data via the EDSA DesignBase equipment data base.
  • Modeled for Performance based Power Analytics
  • High performance enterprise data acquisition compares and contrasts predicted vs. actual data.
- All three legs required for RCM to be effective

- Knowledge based decisions

- Equipment Details
- Reliability Centered Maintenance
- Real Time Data
- Systems Modeling
1. Enables organizations to engineer potential electrical problems out of their infrastructure during the design stage.

2. Provides a real-time, expert assessment about the system-level electrical power essential to RCM.

**Predict** Leans to identify conditions that precede power failures

**Prevent** Isolates impending points-of-failure

**Present** Reports potential problems and recommended actions to owner/operator
Routine Facility Planning

- Maintenance is based on real-time insight into system capacity, availability, configurability and reliability
- Modeled system allows “what-if” simulations so that maintenance impact can be simulated before the start of system maintenance procedures
- Knowing exactly how your infrastructure will respond to both routine and non-routine events

Predicting Non-Routine Problems

- Constantly monitoring “actual” and “as-designed” specs, to diagnose potential problems in the formative stages
- Ascertaining the seriousness of potential problems – and their fixes – before they strike
- Maintaining a constantly-updated awareness of all changes made to your electrical infrastructure, and any potential they introduce for electrical systems failures
• A robust knowledge base containing performance and behavioral specifications for all equipment and components (so called name plate data).
• Expert level analytical tools establish the base line for performance
• Ensures that system design is “Perfect on Paper”
• Insert the expert design into the real time environment.
• Immediately identify and report on variations in desired vs. actual performance.
• Decisions are based on expert design compared to actual performance.
Power Quality & Reliability 2006 Conference
• “Design drives operation, and operation informs design”
Paladin “connects” the **virtual** and **actual** worlds, to ensure that facilities operate precisely as they were engineered to.
RCM Concept
Demonstration
To validate electrical system dynamic simulations, measurements of direct on-line starting of existing 6.8 MW induction motors were carried out.

- 13.8 kV bus voltage
- Bus frequency
- GT/G electrical power
- Cooper Rolls gas turbines, 24 MW, 4940 rpm
- Woodward governor
- Siemens generator, 30 MVA, 1800 rpm
- Siemens AVR RG3 - 15
Software Demonstration

• Paladin DesignBase

• Paladin Live
RCM has well documented cost savings over traditional equipment maintenance strategies (annual routine or vendor programs) *IF* you understand thresholds for performance and impact of planned maintenance.

*Thank You*