Obsolescence Management and System Safety Directed Asset Management for Technology-Based Rail Transit Systems

Rail and Transit Systems

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Introduction

- The Challenge
  - Maintaining existing rail transit operating systems in a state-of-good-repair, within the constraints of available funding
  - Continuing to provide safe, reliable service to passengers as rail transit operating systems approach the end of their design life
  - Responding to demand for more capacity and enhanced capabilities
- The Solution
  - Innovative approaches to the management of equipment obsolescence to obtain the best return on investment; a holistic "total systems" approach throughout the life span of the system

Rail Transit Operating Systems

- Complex integration of many systems, facilities, processes and people supporting safety functions
  - Control centers
  - Rolling stock
  - Trackwork
  - Traction power
  - Signaling and train control systems
  - Communications and passenger information systems
  - System operational monitoring
  - Operations
  - Maintenance
  - Security and Emergency Preparedness
- Asset management and obsolescence management are today typically handled reactively
  - At what cost to safety?

So What is Changing?

- Traditional rail transit operating systems
  - Did not use microprocessor-based technology
  - Equipment suppliers provided spare parts directly to the agency over the long-term

- Recent trends
  - Rapidly evolving microprocessor-based technology
  - Software supported mission-critical functionality
  - Outsourcing to 3rd-party vendors
  - Computer-based maintenance and inventory systems
  - Increased use of commercial off-the-shelf systems (COTS)

Implications of using COTS

- Pros
  - Potential lower initial equipment costs
  - Important in a competitive procurement process that does not consider life cycle costs

- Cons
  - COTS can have shorter life cycles than that of the rail transit operating system
  - COTS may not have historic safety performance record
  - Expectation gap between transit agencies and 3rd party vendors

Obsolescence Management

- The need to manage obsolescence is now being faced at an unprecedented rate
- Obsolescence occurs when a product becomes unavailable as a result of:
  - Newer Technology
  - Expired Material
  - Global Economy
  - Company Bankruptcy
  - Company Merger
  - Evolving Policy
  - Evolving Requirement
  - Evolving Regulation

Obsolescence Management

- Fundamental questions
  - How to anticipate and detect obsolescence?
    - Indicators that can be collected transparently
  - What alternatives and contingencies are in place?
    - Multiple suppliers, replacement strategy
  - When need exceeds available funding, what criteria guide choices?
    - Safety criteria, business criteria (e.g. customer comfort)
  - Should the system be replaced rather than maintained?
    - RIO analyses
  - How to ensure system safety is not compromised?
    - Monitor safety application conditions

Obsolescence Risks

- Major risk contributors
  - Relying on suppliers to identify and mitigate obsolescence
  - Insufficient consideration of obsolescence during procurement
  - Insufficient understanding of demand for spare parts
    - Life cycle cost models can be validated during O&M and procurement plans revised accordingly.
- Risk mitigation requires a pro-active approach to obsolescence management
  - Engage your supply chains with win-win strategies
  - Review the procurement process for indicators and gaps
  - Consider the system as an integrated whole; the performance of one part may cause ripples or tidal-waves across the system

Proactive Asset Management Approach

- Define objectives and prioritize initiatives by
  - Categorizing assets wrt safety and RAM significance
    - SIL, MTBF, MTBSAF, A, MTTR
  - Refine estimates for useful life and replacement schedule
  - Address obsolescence during initial design and procurement
  - Monitor trends of major and minor repairs, incidents
  - Forecast future needs with consideration of remaining useful life and replacement costs
- Assess the effectiveness of each initiative
  - to ensure future decisions are based on a solid foundation and to support the case for funding needs

Design Considerations

- Life cycle costs as design criteria
  - Factor the costs of preventative and corrective maintenance including downtime, spares and manpower
- Exploit Technology with Intelligent Assets
  - Intelligent asset has pertinent system status
  - Designs with intelligent assets integrated into the O&M program during the design can enhance safety and reduce the risks/costs associated with O&M oversights
    - confirm maintenance task to be performed upon arrival on site
    - confirm operating restrictions are in place
    - replay the safety brief
    - record the work done

Procurement Considerations

- Identify indicators for approaching obsolescence
- Consider long-lead replacement constraints
- Classic EOL strategies have potential benefits and risks; an innovative approach can find the balance
  - Life Time Buy
  - Last Time Buy
  - Substitution (form/fit/function equivalent)
  - Re-design
  - After-market supplier
  - Emulation
  - Inventory Survey
- Develop evaluation criteria for selection of suppliers to manage EOL risk
- Warranty criteria and warranty recovery program

Asset Management Considerations

- Decision support
  - "What-if?" analyses
  - Multi-factor investment prioritization
  - Coordinated investment planning
  - Contingency and alternative planning
  - Review performance of decisions

System Safety Considerations

- A transit system operates as the integration of many functions supported by people, equipment and processes
  - When one element degrades or is replaced, what is the impact on other elements and on the transit system overall?
    - Monitor indicators supporting system safety program
- Ensuring safety is maintained as assets degrade
  - Safety is dependent upon the reliability and availability
    - Degraded performance can manifest as dormant failures, increased safety risk
  - New technologies may not have historic safety data
  - Software cannot be tested exhaustively; a rigorous process must be followed

Final Words

- Obsolescence is a fact of life and can be managed
  - Requires a full life cycle approach that considers all operating system elements
- Transit Agencies, Consultants and Suppliers working together can:
  - Define and execute a proactive asset management process
  - Proactively manage equipment obsolescence
  - Provide for the continued safe and reliable service to passengers

Question and Answer

Thank You

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