Computer-Aided Corrosion Program Management

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Introduction & Overview

- Corrosion at the Kennedy Space Center (KSC)
- Requirements & Objectives
- Program Description, Background & History
- Approach & Implementation
- Challenges
- Lessons Learned
- Successes & Benefits
- Summary & Conclusions
Corrosion at KSC

- **KSC Corrosive Environment**
  - Launch facilities within 1,000 ft. of Atlantic Ocean
  - Acidic exhaust from launch vehicles
  - Documented highest corrosion rate of any U.S. test site

- **Importance of Protective Coatings**
  - Primary means of protection for critical assets in atmospheric exposure
  - Key role in safety & reliability of facilities & equipment
  - Major factor (direct and indirect) driving maintenance costs
  - Large economic advantage from maximizing service life and reliability of facilities, launch structures, and ground support equipment
Corrosion Program Overview

- Interdependent Program Elements
  - Accurate Assessment of Conditions
  - Understanding of Corrosive Environment
  - Knowledge-Based Standards
  - Requirement-Based Specifications
  - Qualified Materials
  - Trained and Qualified Personnel
  - Quality Control and Assurance
  - Data Management (Information System)
Coatings Program Without an Information System

- Difficult to predict where corrosion will occur
- Dispersed throughout facility

- Paper Driven
- Voluminous Data
Information System Objectives

- Manage & better utilize large amounts of program data
- Increase visibility into corrosion program
- Store & access critical asset data
- Collect, analyze, report & track condition data
- Enable a more proactive approach to corrosion & coating related maintenance
- Create a centralized knowledge base for improved organizational memory
- Facilitate accurate planning & forecasting
Computer-aided program initiated in 2000 by United Space Alliance (USA) for Space Shuttle Program assets

Program utilizes commercially available software (information system) developed specifically for coating program management

Field inspection, data collection, data entry, software and reporting costs less than 4% of annual coating maintenance budget
• Started as a small pilot program and has grown to more than 3,600 critical components & 7,750,000 square feet of surface area

• Data collection team consists of two full-time NACE CIP inspectors who also enter data

• Program data and reports accessible to USA and NASA employees via computer network.
  – Currently more than 70 registered users
• Inventory & Organize Facilities Into Manageable Components
• Hierarchy
  – Level 1: Program
  – Level 2: Facility
  – Level 3: Item
  – Level 4: Component
• Components defined by change in substrate, system, service environment, color, etc.
Component Data
- Coating Performance Index
- Coating Appearance Index
- Condition Data Points
  - Defects and Cause
- Photos
- Video
- Trending
- Custom Reports
- Export Data
**John F. Kennedy Space Center**  
**Engineering Directorate Work Management**

- **Three Levels of Work Planning**
  - “Hot Spot” Disposition & Tracking
  - Annual Plans
    - Multiple Projects Within Plans
    - Budget Estimate (Present Value & Future Value)
  - Long Range Forecast

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**Reports**

- Close
- Cancel
- Display
- Future Value
- Present Value
- Recalculate Plan

**Input Date**

- 8/21/2000
- 8/21/2000
- 09/26/2001
- 09/26/2001
- 09/26/2001
- 09/26/2001
- 09/26/2001
- 09/26/2001
- 09/26/2001
- 09/26/2001

**Condition**

- New Assets
- Close
- Systems

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Coating Systems

- Manage systems as an asset as opposed to a commodity
- Focus on Life Cycle costs
- Elements
  - Materials
  - Application Method
  - Surface Prep
Challenges & Lessons-Learned

• Consistent method of rating conditions using multiple inspectors
  – Create and use well defined (ideally visual) rating standards for consistency

• Uniform application of Asset breakdown
  – Determining the “right” amount of detail
  – “Bottom up” hierarchy based on grouping of components
Successes & Benefits

- Increased focus on critical assets and environments
- Improved accuracy of budget requirements needed to maintain required standards of performance
- Optimal use of available funds (prioritization)
- Dramatically increased data collection efficiency
  - Inspection cycle frequency adjusted according to component criticality and corrosive environment
  - Reduced level of data collection (only changes after baseline)
- Reduction of Foreign Object Damage (FOD)
- Performance can be measured & improved
- Overall facility conditions have greatly improved
Summary & Conclusions

- Informed decisions are better decisions
- An "information system" (made possible by software) can be a critical success factor in a large corrosion/coating program
- Added value and cost savings easily justify expense of implementation of a program information system