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
• 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
Program Approach

- Asset Model
- Condition Data
- Information System
- Coating Systems
- Work Management
- Reporting
Asset Modeling

- 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

**Program:** Electrical Sub-Stations
**Environment:** Facility
**Attributes and Multipliers:** Component Data
**Coating System and Color:** Carbon Steel
**Surf. Area:** 1,129.4 ft²
**Strip Length (ft):** 0.0
**Width (ft):** 0.0
**Critically:** Level 2
**View:** Visible
**Location:** Finish

**Notes:**

For Help, press F1

**Reports:**
- 135 Level
- 215 Level
- 215 Crossover

**Delete Record**

**File**

**Clear**

**Picture**

**Video**

**Sound**

**Delete Record**
• Coating Performance Index
• Coating Appearance Index
• Condition Data Points
  – Defects and Cause
• Photos
• Video
- Trending
- Custom Reports
- Export Data
• Three Levels of Work Planning
  - "Hot Spot" Disposition & Tracking
  - Annual Plans
    • Multiple Projects Within Plans
    • Budget Estimate (Present Value & Future Value)
  - Long Range Forecast
Coating Systems

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