
John F. Kennedy Space Center
Engineering Directorate
Materials Science Division
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

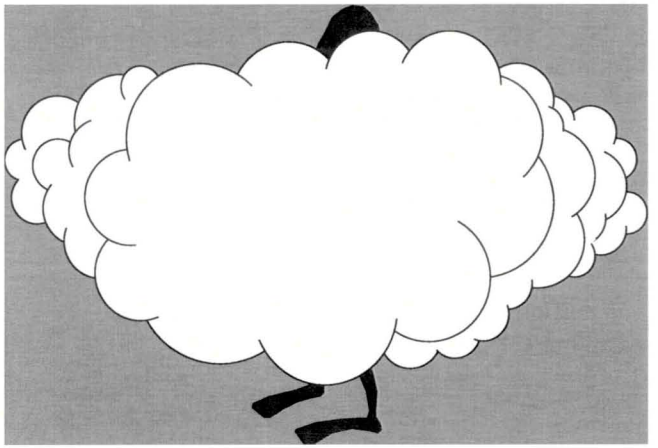
Corrosion at KSC

- 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

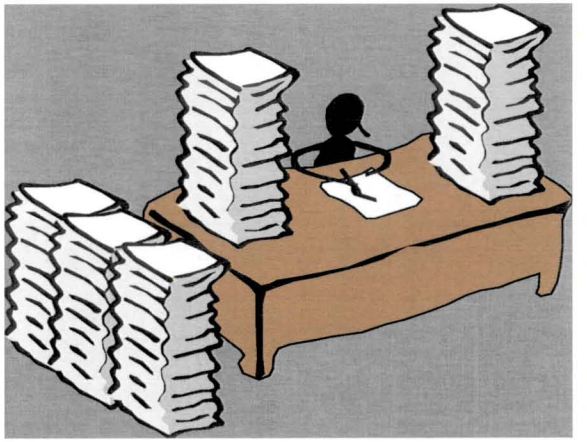
Corrosion Program Overview

- 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

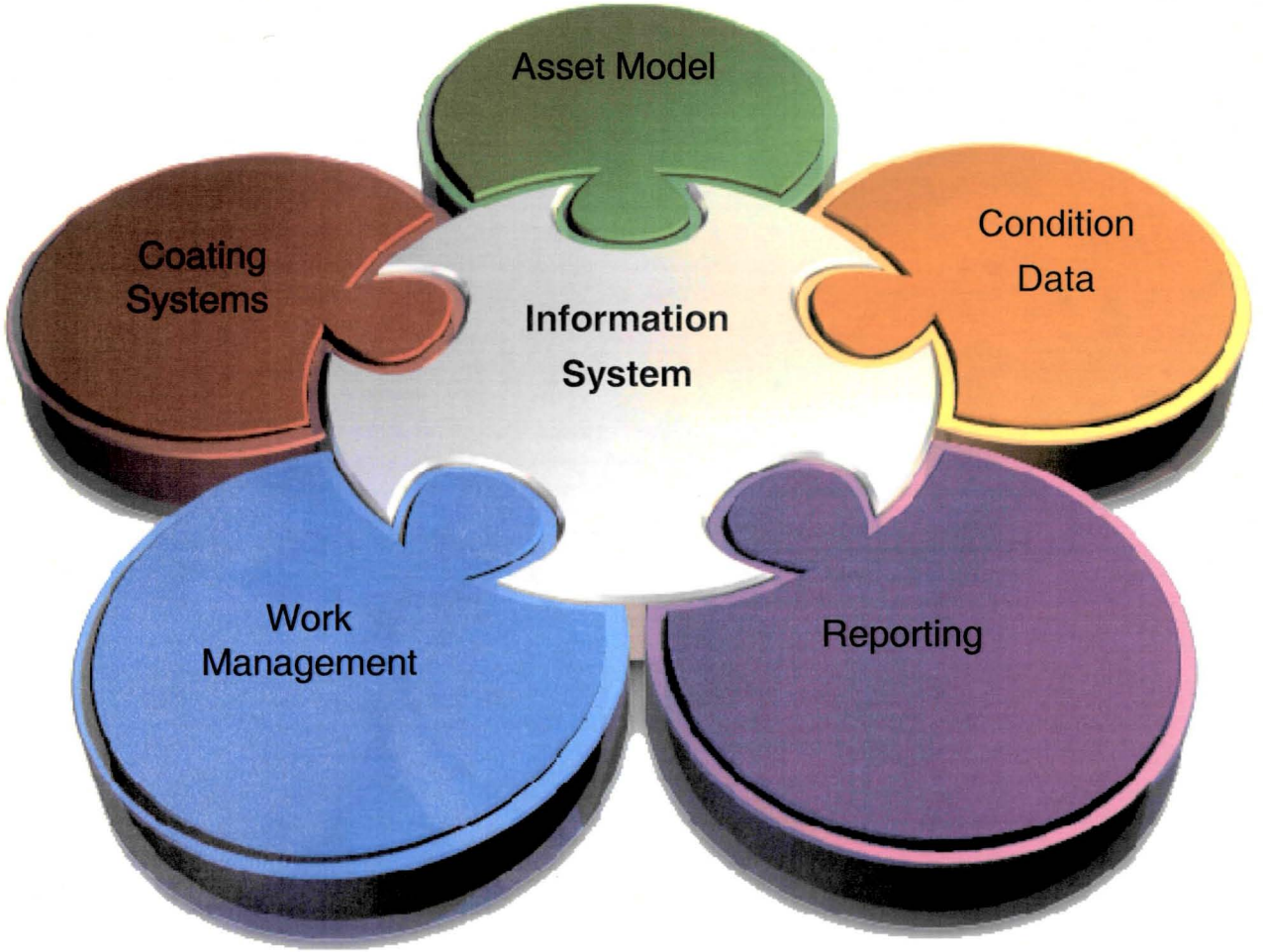
Program Background & History

- 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

Program Scope & Description

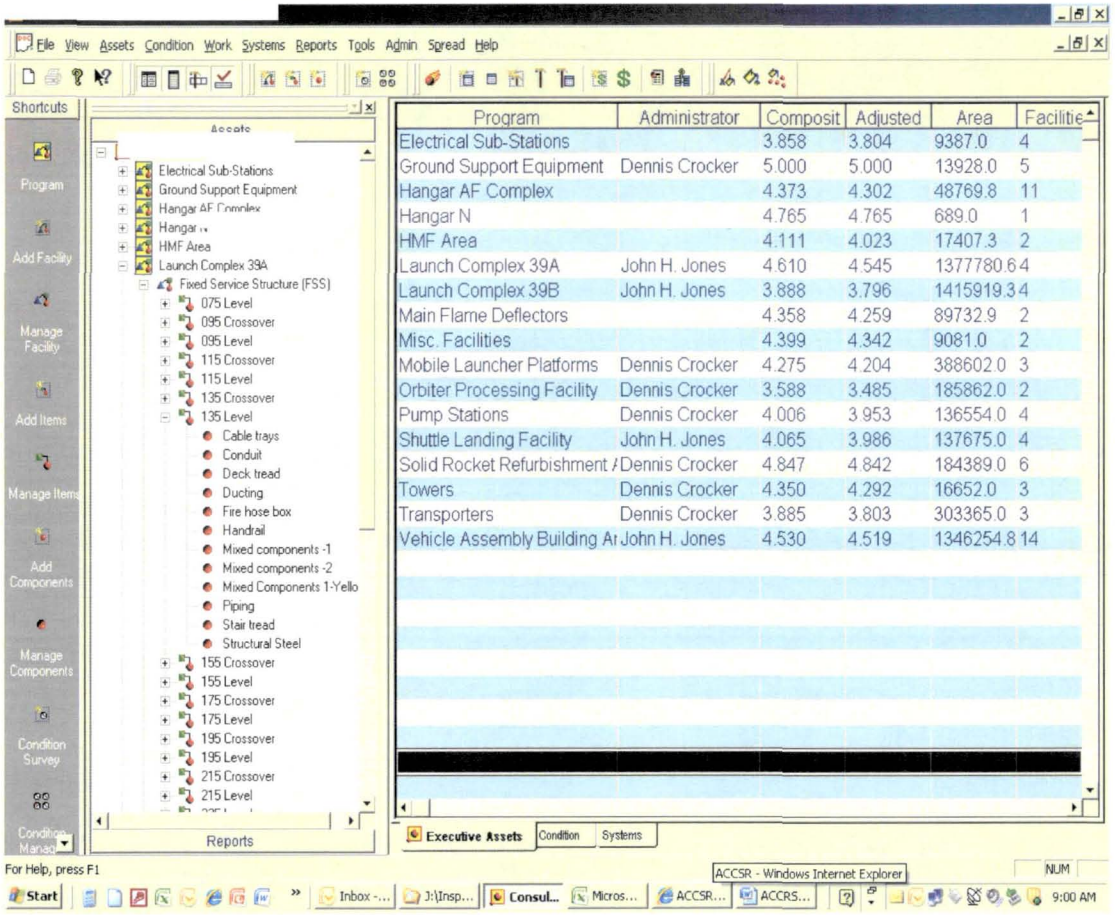
- Started as a small pilot program and has grown to more than 3,600 critical components & 7,750,000 square feet of surface area
- Data collection team consists of two full-time NACE CIP inspectors who also enter data
- Program data and reports accessible to USA and NASA employees via computer network.
  - Currently more than 70 registered users

Program Approach

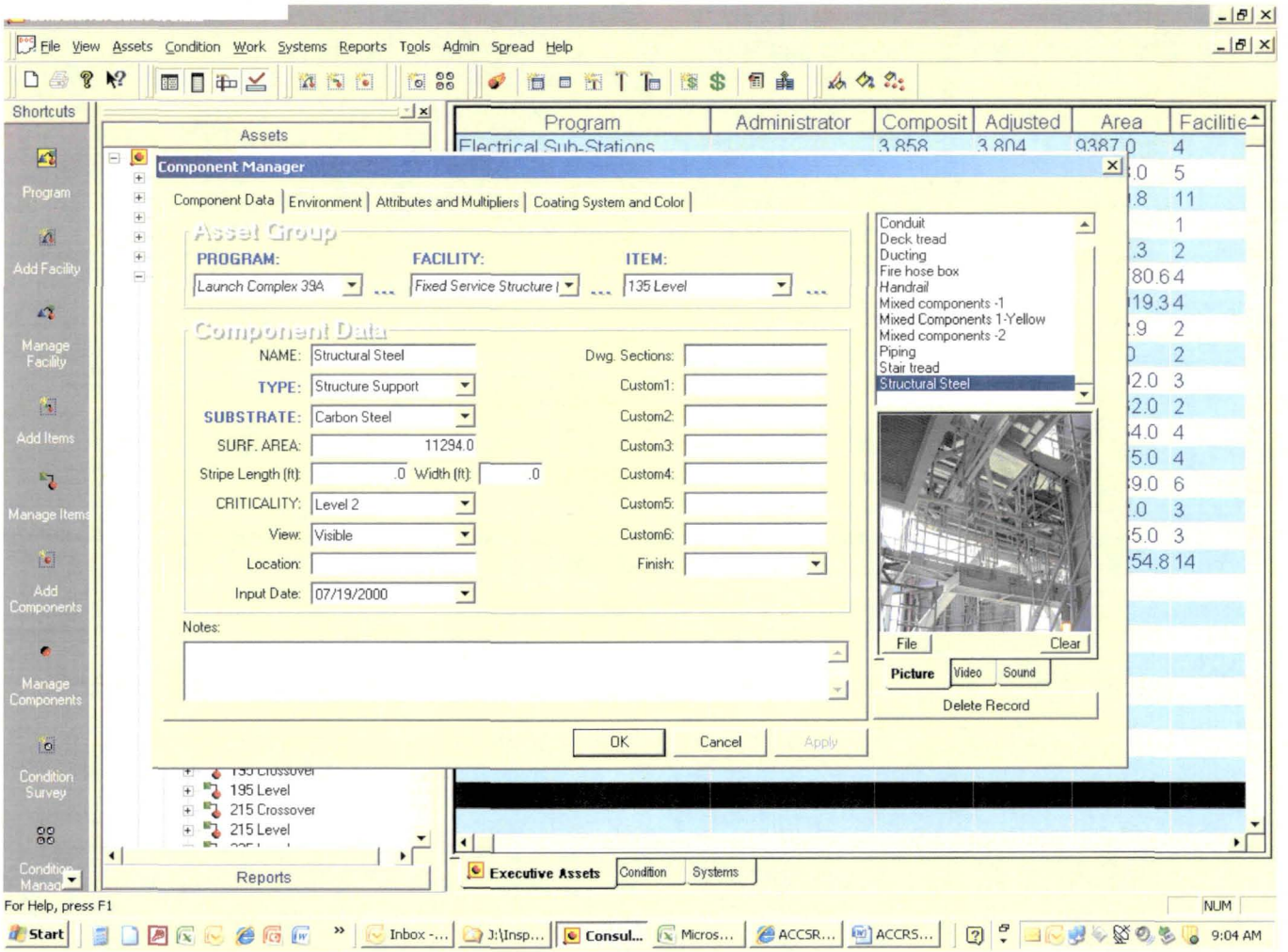


Asset Modeling

- 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.

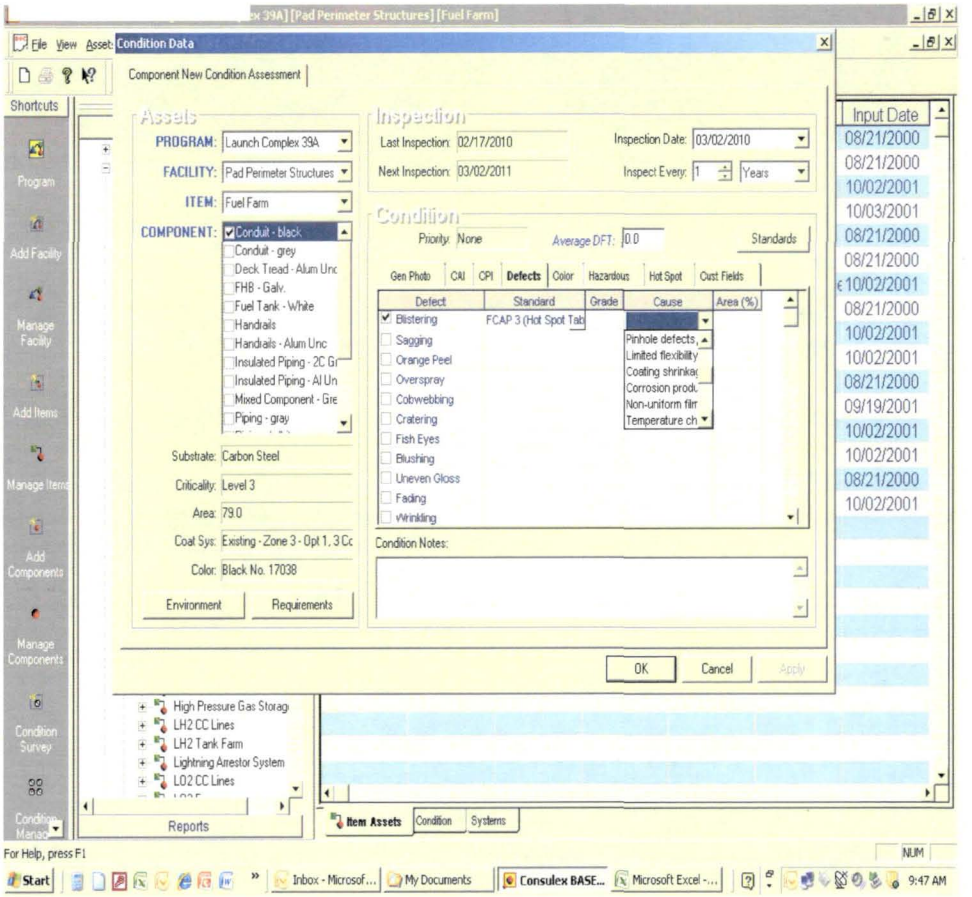


Component Data

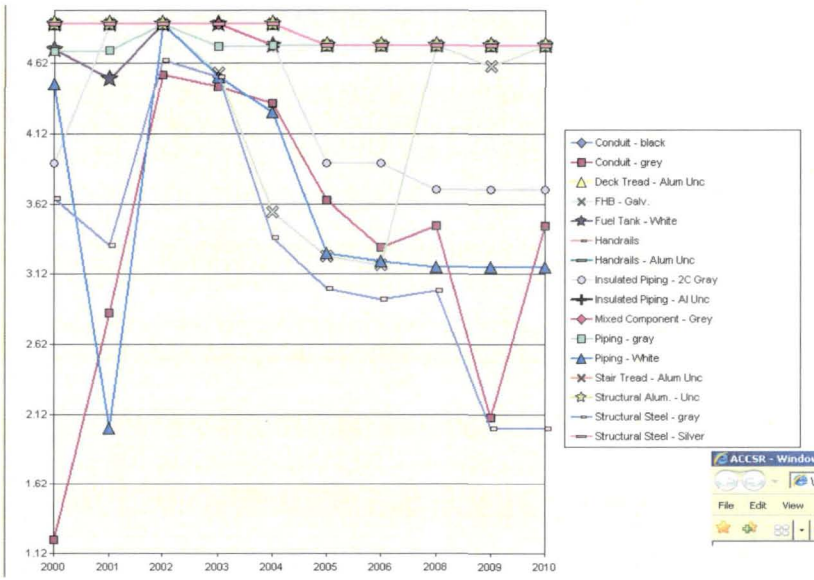


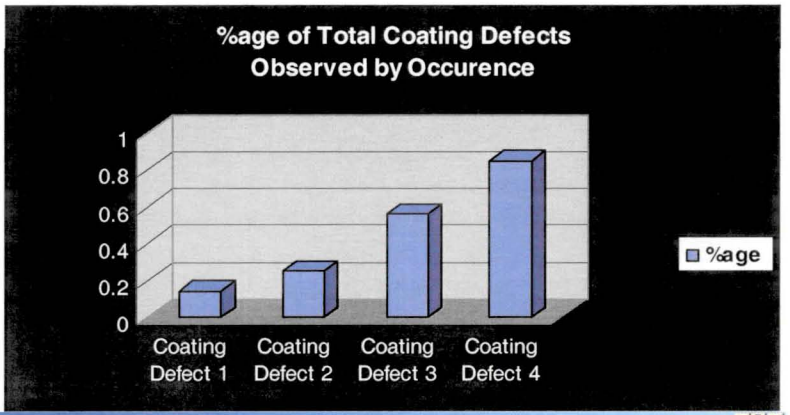
Condition Data

- Coating Performance Index
- Coating Appearance Index
- Condition Data Points
  - Defects and Cause
- Photos
- Video



Reporting

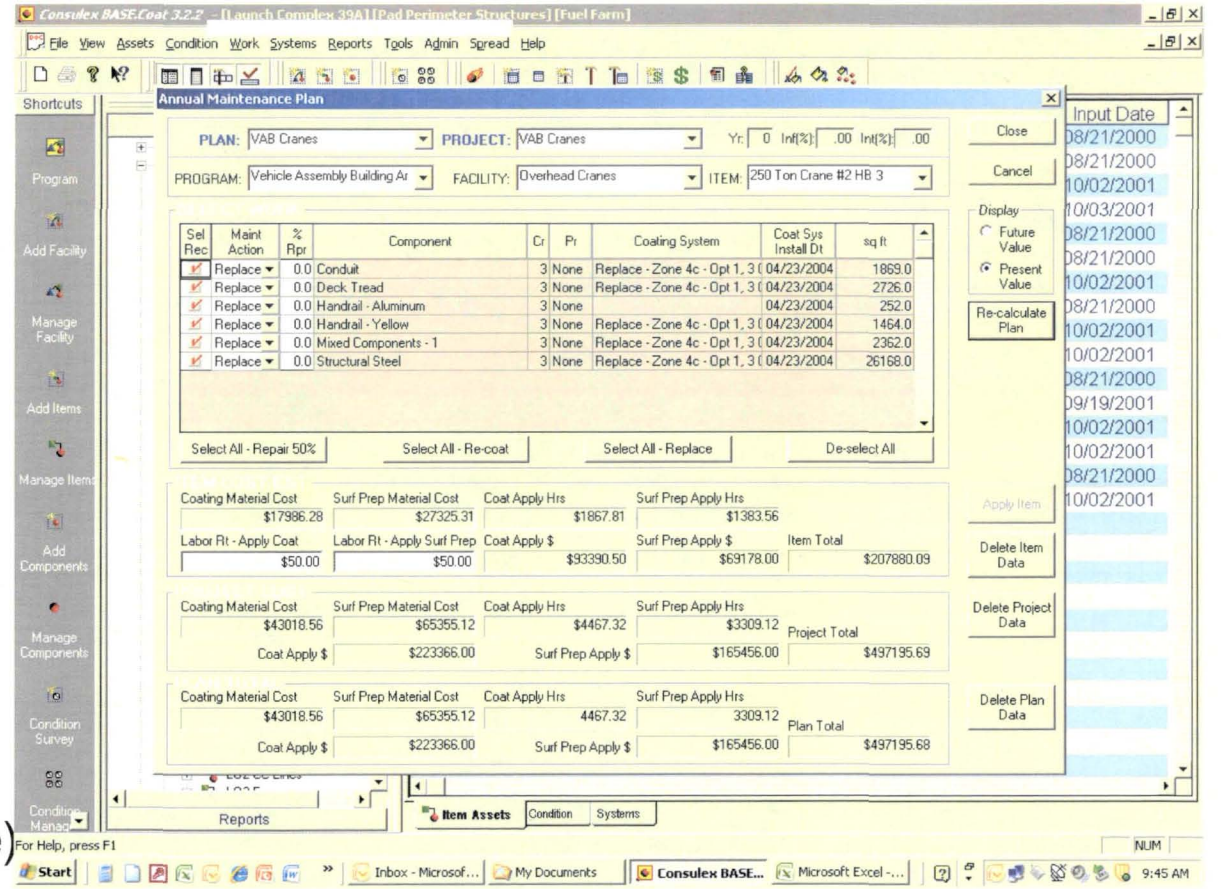




- Trending
- Custom Reports
- Export Data

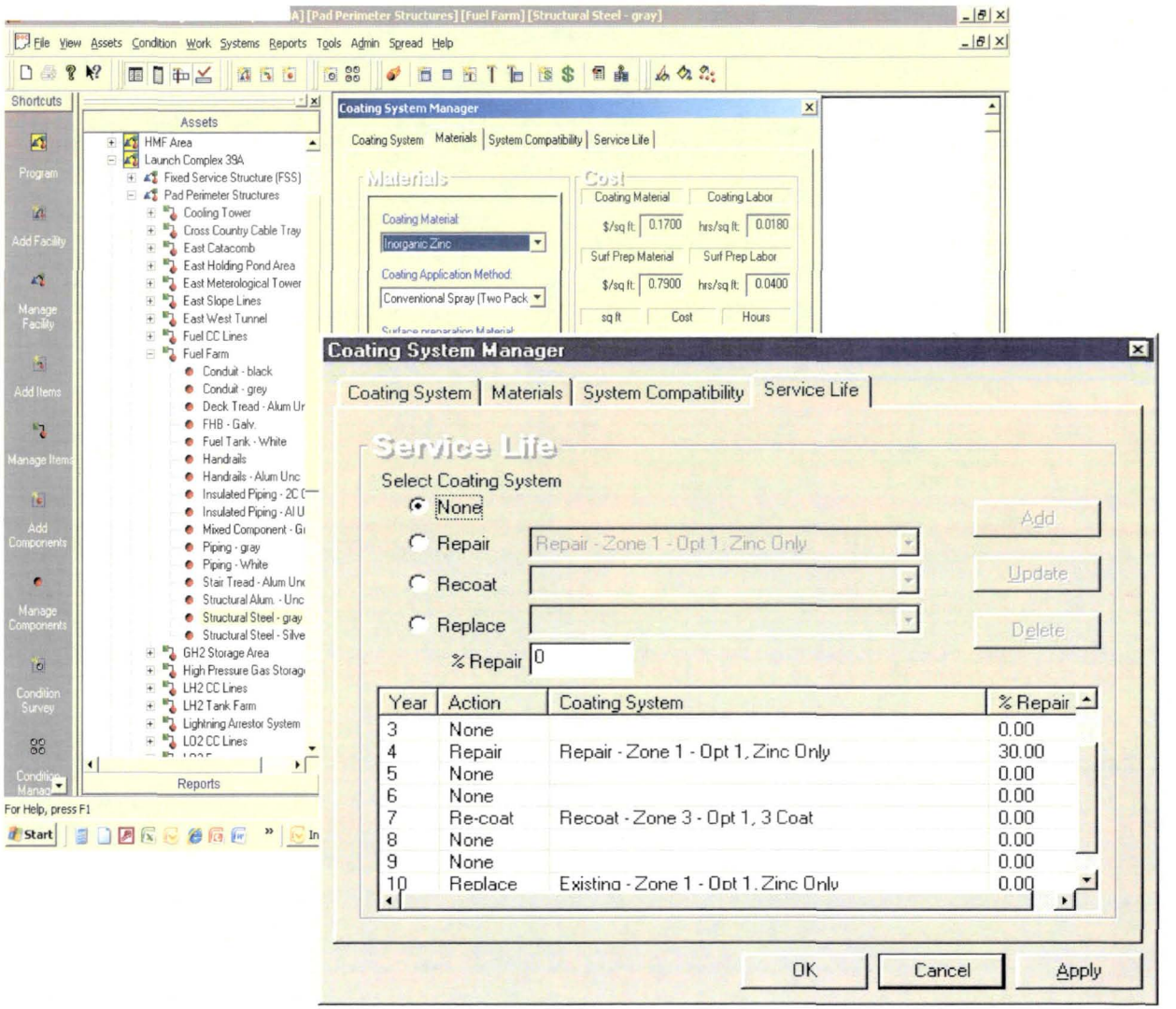
Work Management

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



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