FEM/MAXIMO Application at NWD Power Generating Plants and its Role in Asset Management

US Army Corps of Engineers

Asset Management Workshop
Alexandria, VA
August 23-24, 2005

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TOPICS

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- What is USACE's FEM/MAXIMO and its current application?
- Why is it so important to use FEM/ Maximo for management of our assets?
- What will FEM do for us upon further application?

FEM/MAXIMO

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- MAXIMO Version 4.1.1 interfaced with Corps of Engineers financial management system (CEFMS)
- Currently applied at 29 hydroplants in Columbia and Missouri basins at operational/initial utilization level

Current FEM Use

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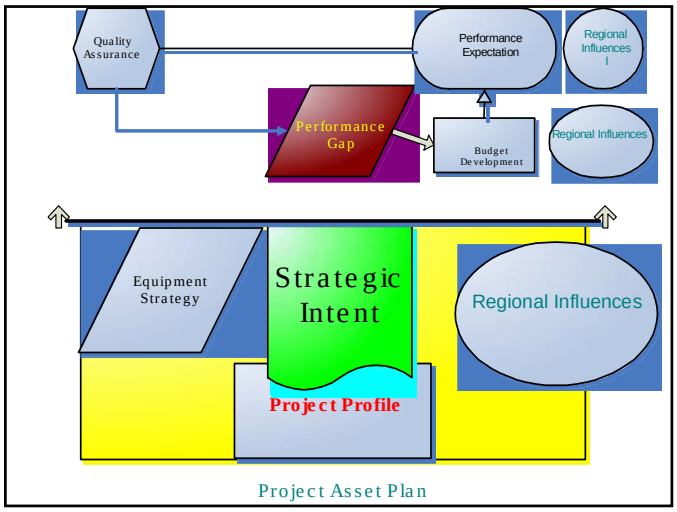
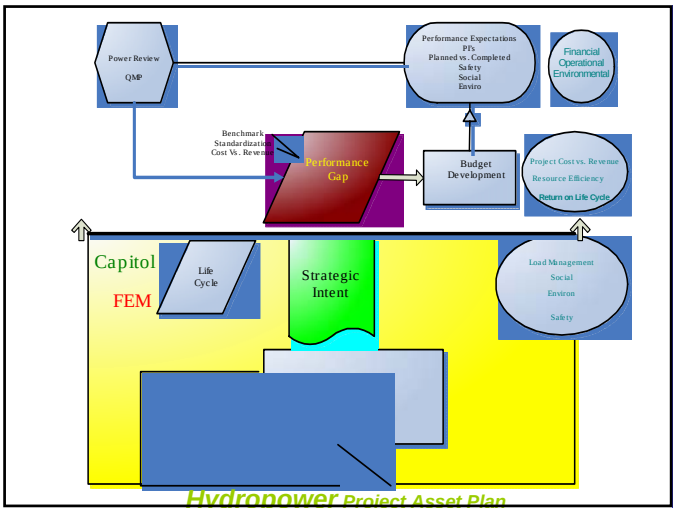
- Issuing preventative maintenance (PM) work orders and capturing labor hours
- Capturing some corrective maintenance otherwise accomplished during PMs
- Purchasing parts, materials and supplies
- Some basic analysis of maintenance results, failure patterns
- Gearing up to support HydroAMP and Power Reviews to full utilization
- Thorough Evaluation of Application and Use to Determine Business Line(s) Effectiveness -Hydropower First - PROOF of CONCEPT





Life-Cycle Infrastructure (Asset) Management

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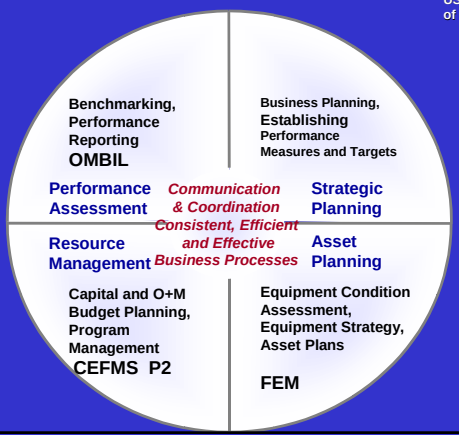

FEM Application Stages

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- Implemented: Software available to selected sites
- Operational: Basic data and permissions available to issue, track and record work via work order
- Utilized: Work, material/parts and costs captured
- Fully Utilized: Work and Equipment Data Available and Analyzed in Lifecycle Orientation

FEM as an Essential Tool for Life-Cycle Infrastructure (Asset) Management

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- O&M Work management
- Spare parts and inventory management
- Data repository of/for equipment and O&M standards, practices and accomplishment, augmented by data warehouse
- Analysis tool for predictive and reliability centered maintenance in life cycle mode
- Facility/Equipment Cost summary from receipt to disposal
- Key Performance Indicators, Leading and Lagging
- Decision assistance tool for asset recapitalization

FEM Use in Maintenance and Reliability Engineering

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- Discovery of the cause of failures
- Evaluating preventative maintenance action effectiveness
- Developing PdM techniques/procedures
- Performing condition monitoring/equipment testing
- Employing engineering techniques to extend equipment life
  - Specifications for new/rebuilt equipment for reliability and minimizing O&M burden
  - Precision rebuild and installation
  - Failed part analysis
  - Root cause failure analysis
  - Reliability Engineering
  - Rebuild verification
  - Age exploration
  - Recurrence control

Life Cycle GDACS Procurement, O&M To Replacement

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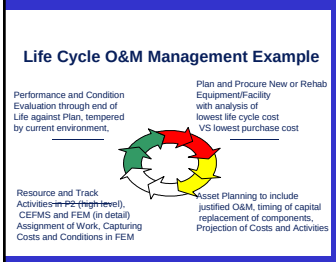

Status of FEM Application

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- Partial Implementation Underway in CENWS and CENWK, Completing CENWD
- Thorough Evaluation of Application and Use to Determine Business Line(s) Effectiveness -Hydropower First - PROOF of CONCEPT
- Maintaining and Building Further Contacts in other Divisions
- Inventory/Purchasing Interface Correction Underway
- Time and Attendance Interface Scoping

Path Forward

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- RBC Centric Implementation
- Chartering Support Cell
- Application Standards/Guidance Generic for All Business Lines
- Specific Business Line Structure, Standards and Performance Measures
- Transition Plan to New Version of Maximo
- Stable Funding Source

eFEM

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- *e*FEM is more than just a move to web
  - Stands up organization structure to support asset management
  - Provides central system for Asset Management
  - Eliminates redundant asset tracking systems
  - Reduces IT footprint
  - Meets the requirements of what DoD is looking to achieve through the President's Management Agenda
  - Challenges us to get better

Policy on Equipment Hierarchy for Use Within Facilities and Equipment Maintenance System (FEM)

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The following graphic displays the standard hierarchy that shall be used when implementing FEM/MAXIMO within the U.S. Army Corps of Engineers. The fundamental principle upheld when applying this hierarchy is system centric:

1. A **system** fundamentally provides an end product, such as hydropower, navigation passage, floodwater control, camping opportunity, environmental stewardship, etc.
2. A **sub-system** in turn provides a product that directly supports the system providing an end product. An example is a navigation lock tainter gate with its hoist assembly.
3. A secondary system provides a product normally recognized as being produced by a sub-system but because that secondary system provides the product to 2 or more systems it has system status as opposed to sub-system. An example is a compressed air system that provides air to two or more generating units' governors.
4. Equipment can be permanently mounted or mobile; they may be hierarchically equal to a sub-system, or system (primary or secondary). FEM is a computerized maintenance management system for facilities and equipment; equipment is considered equal in statute to facilities or plants and thus will not use its nominal definition as a portion of a system or subsystem that produces something in support of the subsystem or system's product. Component is used for that purpose.
5. A **Component** is an identifiable part of equipment, sub-system or system that can be maintained or replaced separately. An example is a motor that drives an air compressor.
6. A **Part** is an integral item within the component that usually is replaced instead of repaired and is usually unique to that component. An example is a faucet cartridge to a restroom lavatory faucet. This also highlights the critical spare part stores in inventory.
7. **Material and supplies** can be used on various systems, sub-systems, or components. An example is a section of copper pipe used either for water or oil delivery systems.

Mandatory level of application of the described hierarchy is to the sub-system level for all business lines or mission areas. This would include the sub-system level of the secondary system. Further levels are encouraged to allow reliability centered maintenance analysis, especially root cause analysis, as an integral element towards life cycle asset management. Peer comparison of component reliability is encouraged among like equipment and will be enhanced by reliability determining analysis such as root cause analysis and failure cause trending.

FY05 Tasks

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- Confirm Maintenance Plans in Place and Accomplishment Recorded for Critical Equipment (NWS,NWP and NWW)
- Use Work Orders for All Work, start failure code use and analysis
- Record Labor Against Work Orders
- Implement and Assure Operability of FEM in NWS and NWK
- Re-implement, Assure Operability and Improve Utilization in NWP,NWW and NWO.
- Finish Inventory/Purchasing Fix (Phase I)
- Initial Scoping of Time and Attendance Function
- Publish NWDR Maintenance Management Regulation utilizing FEM for multipurpose hydroelectric projects within NWD
- Adopt reviewed Facility Instructions and Standards (FISTs) cooperatively with BoR.
- Do AAR on NWD application of FEM and provide RBC centric model for further implementation of FEM

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Questions?