SAP PLM & DMS Implementations in Diversified Global-Manufacturing & Engineering Environment

Cooper Industries: Mladen Milter & William Stoiber
Learning Points

- The PLM is not “That CAD or Engineering thing!”
- What we have implemented and how
- Real life example from Cooper Power Systems on PLM usage
- Lessons Learned from the Project and Functionality
Cooper Manufactures In 23 Countries, Sells In ~100, and has 26,000 Employees Worldwide
Energy & Safety Solutions Market Size

- **Power Systems**
  - $1,300 +/- million
  - *Market Size: $40B*

- **Crouse-Hinds**
  - $1,000 +/- million
  - *Market Size: $28B*

- **Safety**
  - $600 +/- million
  - *Market Size: $8B*
Electrical Products Group Market Size

- **Lighting**
  - $1,100+/- million
  - Market Size: $10B

- **Bussmann**
  - $650+/- million
  - Market Size: $24B

- **B-Line**
  - $400+/- million
  - Market Size: $19B

- **Wiring Devices**
  - $350+/- million
  - Market Size: $17B
Cooper Industries EBS Landscapes

- SAP ERP ECC 6.0 Ep4
  - Modules FI, CO, MM, PP, SD, QM, PS, and CA
  - Internally hosted on HP-UX platform using Oracle Db 11.2.0.2.0
- SAP BI
  - Internally hosted on HP-UX platform using Oracle Db 11.2.0.2.0
- SAP cProjects/cFolders 4.5
  - Internally hosted on Windows platform using Oracle Db 11.2.0.2.0
- SAP SRM
  - Internally hosted on HP-UX platform using Oracle Db 11.2.0.2.0
Key drivers for SAP PLM Project

- Increase Vitality Index to maximize revenues from new products
- Support of global processes (same tools, methods, platforms for New Product Development & Introduction (NPDI)) such as:
  - Tracking of Six Sigma Processes in NPD
  - Value Engineering and Value Analysis (VE/VA)
- Increase usage of Global Design & Technical Centers
- Efficiency Improvements between Global Design, Manufacturing and Sourcing centers
- Real-time access of Product Data to sourcing, manufacturing, and sales
- Standardize and unify Engineering Product Data & Development

Revenue from New Products, Productivity Improvements and Cost Reductions
Return on Investment

Sometimes it is hard to justify “Hard Savings”, we focused on following:

- Revenue from New Products
  - Collaborate and Exchange Ideas
- Productivity Improvements
  - Do more with existing resources
  - Be lean
- Cost Reductions
  - Reduce scrap
  - Improve Quality
Best Practices

- Standardize Engineering Business Applications Globally
- Have Lean Collaborative Project Management
- Standardize Product Data Management
- Manufacturing and Supply Chain Readiness
Key Learning

- Build strong project team with Business Super Users
- Make it Global
- Make it Grassroots
- Implement in Phases
Product Lifecycle Management (PLM)

- SAP Product Lifecycle Management refers to the management of all product-related information.
- The following are some of the SAP Product Lifecycle Management activities in our business:
  - Project Management and Collaboration Management
  - New Product Development and Introduction
  - Sourcing – Internal/Collaborative and External/Competitive
  - Service of Products in the Field and their retirement
  - Product Document Management/ Document Exchange
  - Engineering Change Management
  - BOM and Configuration Management
  - CAD/CAM data management
  - Compliance and Quality Management

PLM is not “That CAD or Engineering thing!”
About Cooper Industries PLM Project

Phase I: ‘06/’07 (NAM)
- SAP DMS
- SAP CAD Integrations
- CIDEON CAD Conversion

Phase II: ‘07/’08 (APAC)
- Continued NAM
- SAP DMS
- SAP CAD Integrations
- cProjects/cFolders
- SAP ECM Enhanced

Phase III: ‘08/’09 (EMEAI)
- SAP DMS
- SAP CAD Integrations
- SAP PS

Phase III: ‘09/’10 (global)
- SAP DMS
- SAP CAD Integrations
- SAP PS
- cProjects/cFolders
- SAP ECM Enhanced

Phase III: ‘10/’11 (global)
- SAP DMS
- SAP CAD Integrations
- SAP PS
- cProjects/cFolders
- SAP ECM Enhanced
- SEAL Systems Document Distribution
Functionality Overview

WHAT WAS IMPLEMENTED?!
SAP DMS

- Content Vaults
- Version Management
- Change Management
- Document Classification
- Integration: MM-PP, PS, QM
- Document Distribution
- Document Collaboration
- Document Security

Object Links make Docs available everywhere
SAP PLM Integration for Inventor CAD

Embedded into CAD Application
SAP PLM Integration for SolidWorks

Embedded into CAD Application
SAP PLM Integration for AutoCAD

Embedded into CAD Application
The Standard ECM process with Change Notification (ECN) is intended to provide a consistent Engineering Change process for larger sites that includes Workflow Notifications and Reporting facilitating the timely completion of tasks.

- Engineering change management
- Issues, Change Requests
- Order Change Management
- Link with ECN Document Info Records
- Route for approvals
- Reporting

SAP ECM Makes Your Job Easier
**ECN Template DIR Contents**

Add the Engineering Change relevant documents:
- **ECN Forms**
- **Redlined Documents**
Custom and Standard ECM Reports

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<th>Request ID</th>
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<th>Request Date</th>
<th>Request Tm</th>
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User Comments: X is true. Double Click to view.
Status if user decision made: Blank if no decision.
Custom and Standard ECM Reports

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Object Type | Object
---|---
Alternative Date | Valid From Description
Document
ECN/CLF-148597 | 09/20/2011 ADD 4 AND 6 INCH LED MEDIUM LED TRIMS

Change No. | Valid From Description | Change No. | Status | Del.Ind. |
---|---|---|---|---|
| CLF-148598 | 09/21/2011 ADD 4 AND 6 INCH LED NARROW LED TRIMS | 01/01 | 01 | |
| Object Type | Active | Lock | Object |
| Bill of Material | ✓ | | |
| Task List | ✓ | | |
| Document | ✓ | | |

Object Type | Object
---|---
Alternative Date | Valid From Description
Document
ECN/CLF-148598 | 09/21/2011 ADD 4 AND 6 INCH LED NARROW LED TRIMS

Product Structure: Validity date 03/01/2012

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In Routings

- N 51995578 01 5022 Electrode, CEP21
- N 51995579 01 5022 Electrode, YP-50F
- N 51995580 01 5022 Single Cell, CR 0.1F
- N 51995581 01 5022 Single Cell, CR 0.22F
- N 51995582 01 5022 Single Cell, CR 0.33F
- N 51995583 01 5022 Single Cell, CR 0.47F
- N 51995585 01 5022 Single Cell, CR 1.0F
- N 51995586 01 5022 Single Cell, CR 1.5F
- N 52087743 01 5022 CAP, 0.1F, 5.5V, CR VERT COIN
- N 52087744 01 5022 CAP, 0.22F, 5.5V, KR VERT COIN
- N 52087745 01 5022 CAP, 0.33F, 5.5V, CR VERT COIN
- N 52088440 01 5022 Electrode, YP-50F, 0.51-0.53mm
- N 52088514 01 5022 Electrode, CEP21, 0.51-0.53mm
- N 52088529 01 5022 CAP, 0.47F, 5.5V, KR VERT COIN
- N 52088536 01 5022 CAP, 1.0F, 5.5V, KR VERT COIN
- N 52088542 01 5022 CAP, 1.0F, 5.5V, KR VERT COIN

Documents for Change Number

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SAP Project Systems

SAP Project System is a Project Execution & Management tool. PS is integrated into SAP FI, CO, MM, SD, PP, HR, DMS. This module coordinates and controls all the phases of a project, and a project related requirements, from the production planning, procurement, capacity planning to delivery, from quotation to design and approval, from resource management, to cost settlement and profitability.

Do not think Project Management Software! Think ETO & MTO!
More than just PM, it is demand and capacity planning tool!
Projects
- Project Scheduling, WBS, Stages & Gates
- DMVP/TMVP/MVP Project templates, Checklists, Doc. Templates
- Links to SAP R/3 Objects
- Resource assignment, qualifications

Collaboration & Integration
- Automated Gate/Deck Dashboard
- MS Project synchronization
- Quality Management (Control Plan)
- Financials, time entry (budget & actual)
- R/3 Project Systems integration
- Adobe Forms integration
SAP PLM and DMS in design Automation, product development, manufacturing, CAD Data Management, and servicing.

COOPER POWER SYSTEMS
Accomplishments & Benefits

What did CPS implement?

- CAD Integration to SAP CAD Desktop & DMS for AutoCAD, Inventor and SolidWorks
  - Active management of 760,000 CAD related files in SAP DMS PDM (Cooper Industries has 1.4M)
  - CPS Growth of 125,000 files/versions each year (230k in first 9 months – 2007/8)
  - Custom developed global DMS/PDM security system of PLM documents
- Full integration with PTP (MM-PP) and RTC
  - Neutral files (pdf) available for viewing and/or markup in Material Masters & BOMs
- Collaboration and NPD Project Management
- Global access using SAP DMS and cFolders/cProjects with KPRO and its federation of servers

Benefits to Sales, Engineering, Sourcing, Manufacturing, QA, Service, etc.

Collaboration in areas of: Projects, Manufacturing, Sourcing, etc. (integration of cProjects/cFolders)
- Global Project/Portfolio Management
- Support of doc storage, control, authorizations, exchange and doc creation in virtual project teams
- Connects Customers, Sales/Marketing, Engineering, Operations, Service, etc.
- Project teams take ownership of globally managing their docs/projects without using IT services.

Digital Data that is accurate, easily accessible and controlled in real-time to the business
- Digital project files available for efficient use and future generation projects.
- Eliminated storing copies of same docs on multiple servers - minimize data redundancy
- Minimized “document tag” from past practices of using emails and multiple servers that led to “who has what, where, when, how …”
- Improved productivity with controlled availability of meta-data, documents, etc.

Benefits to All Functional Areas – More than “just” Engr’g
PDM: Global & Secure Access

Global Authorized Access **controlled locally**

- Files **managed by SAP DMS but stored local** to each design center to optimize performance
  - Implement federation of Content/Cache servers using KPRO technology.
  - CPS uses 5 Content/Cache Servers strategically located globally to maximize performance (minimize read and check-in/out response times; critical for large files) (xx for all of Cooper)
  - CPS 760,000 CAD/Neutral files, growing by 125k files annually

- Secured CAD files by making them available to Engineering only (exclusions allowed for collaboration)

- *Do not need to contact IT* to collaborate or share access of files – done by local Engineering Center or respective organization that owns the document (e.g., CAD file).

Automatic Versioning of Released documents

- Includes automated conversion of CAD files to .pdf/.dwf

Global & Secure with Fast Access + Doc. Owners control Access
PDM: Challenges & Solutions

1. **Global Security System**
   - CAD files to be accessible only by the Engineering group that created them but yet allow collaboration globally as needed to other Engineering groups on an individual DIR basis.
   - Neutral format of CAD (.pdf) accessible to the whole business (exclusions allowed)
   - Non-CAD files (e.g., .pdf) accessible by much larger set of users at multiple locations but not all locations (e.g., region specific).

2. **CAD Conversion to Neutral Format**
   - Using automated conversion software & hardware
   - Standardized on PDF for all 2D
   - Standardized on DWF for all 3D Inventor files
   - Execute conversion as a function of document status, e.g., convert at Release (RL)

3. **Automated Check-in of programmatically generated CAD files**
   - Automate import to DMS either real-time or daily -- as required
     - When imported to DMS, conversions to neutral format takes place
     - Processes are completely automated – no use of CDESK and no manual intervention
   - Automated import of ~100 CAD files each day (2D and 3D parts and assemblies)

Global, Secure Collaboration + Automated CAD check-in
4. Data Synchronization of CAD metadata and DIR data

- Values entered to CAD meta-data fields (e.g., I-Properties) are mapped to the drawing title block and to the appropriate fields on the DIR.
  - Examples: Drawing Number (=DIR number), Drawing Description (=DIR description), etc.

- Master source of “all” data entered on DIR comes directly from the CAD file itself (e.g., from its properties)

- Achieved goal that “Designer/Engineer does not need to edit DIR during or after the check-in of a CAD file” via automated SAP data entry from the CAD file itself

(see illustration on next page)
Synchronize: CAD Meta-data + Title Block + DIR

Data is entered only in the meta-data of the CAD file (above), then is automatically mapped to the Title Block of the Drawing and appropriate fields in the DIR.

Single Point of Entry – Synchronized CAD+SAP
5. Training and Post Go-Live Support

- Training at each go-live
- CAD Designers/Engineers – Detailed CDESK training and PDM.
- General User – Non-CAD users in all functional areas
  - “What’s In It for Me (WIIFM)?” Answer this question at each training session; make it relevant to them, i.e., what does this mean in my everyday job.
  - Training sessions targeted by group, e.g., Marketing, Sales, Production, Purchasing, etc. – allows you to customize the training to their specific needs
  - Each session took about one hour and included demonstrations.

- Monitor how PDM is being used, then provide “refresher/update” training sessions to emphasize certain aspects of PDM as needed

Make training relevant to users AND follow-up/refresh training
6. **Infrequent user problem - How to make drawings and other files readily accessible to infrequent (and/or not strong) SAP/DMS users?**

   - **Enhancement** – developed a z-transaction to give doc visibility on the BOM without creation of a separate BOM item and therefore no increase in BOM maintenance. (see next page)
     - User can view drawing/document from the BOM itself with a single click.
     - No need to navigate/drill down into a material item using multiple clicks to view and no need to create a separate BOM item to see document.

   - **Enhancement** - list DIRs linked to materials on Production Orders (see 2nd page). (Also list on Purchase Orders)
     - Scan the [bar code on the Production Order](#) to display the actual file; user does not need to learn/use any new SAP transactions to view.

   - **Enrich** -- use classification/characteristics to simplify and improve search capabilities for documents from the basic DMS search transaction (cv04n).

   - **Enrich** - link documents to materials. Users do not need to know the document numbers, types, etc. to find the documents relevant to a material because they are listed as links on the material.

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**Enrich & Enhance to make PLM easy to use for everyone**
SAP PLM = View BOM + Documents/CAD

- SAP PLM – View BOM and Integrated Documents (CAD, Specs, etc...) via z-transaction.
  - To view any item (MM, Model, Drawing, Spec, etc ...), click on it
  - CAD not needed to view drawings/models (option to view neutral exchange format)
  - Secure PLM access - Uses DIR security
  - Uses validity dates to always get correct versions/revisions.

**Easy & Secure business access** to PLM documents integrated into ERP
DA integrated to SAP PLM that makes available Engr’g documents on the production order.

- Bar code may be scanned on the production floor to view (CAD, .xlsx, .docx, .pptx, etc…)
Bar-Coded documents from PDM on Production Paperwork

- Under each material item that has qualifying document, a bar code is printed.
- Under the bar code is the PDM Document ID (drawing numbers), its Revision ("Doc_Rev") and its "title/description".
- The Revision printed will match that shown in the drawing title block (as does document title).
- Electronic viewing on Mfg floor with swipe of bar code.

PLM Integrated to Mfg Floor
7. How to ensure compliance with best practices?

- Developed z-transactions to monitor performance and compliance to best practices.
- Tracking results on a monthly basis with follow-up corrective actions.
  - Report back to individuals for corrective actions & coaching
  - Report back to Engineering management only as needed
- Provide additional training as needed if trending poorly

Monitor and Re-Train as needed
cFolders & cProjects Accomplishments

**cFolders (cFP) Accomplishments**

- CPS implemented in 2008 globally (1800+ users)
  - Collaboration Scenario implemented (within Cooper firewall only, no Competitive Scenario)
- Use KPRO and same federation of content servers as SAP PDM
- Initial scope for Projects only has been expanded to other business needs
- High usage (1.3M files) – used as both a temporary and permanent repository
- *Do not need to contact IT* to collaborate or share access of files/folders
- Have a few non-IT admin’s

**cProjects (cPP) Accomplishments**

- CPS initial implementation late 2008, today more than 2500 projects
- Created custom “z” web application that compliments cPP
  - Projects and security/access setup in cPP
  - Created new entry screens and data tables for info specific to Businesses (many fields added)
  - Created custom ALV reports – Flexible reporting options and output.
  - Used to manage project decks

Global Collaboration, High Usage and Project Deck Management
Collaboration: Implementation Strategy

- **cFolders (cFP)** First (early 2008)
  - Use of internal collaboration only (no competitive scenario)
  - Can be rolled out much quicker while allowing collaborative use by PM’s
  - Expand usage beyond PM (late 2008 and beyond)

- **cProjects (cPP)** Second (late 2008/09)
  - Develop custom “z” web application to compliment cProjects
    - Much of the data needed to manage CPS projects not present in cProjects
    - Create User Interface/screens specific to businesses
    - Do not customize cPP itself since that complicates future upgrades to cPP
    - Use ALV reporting with export features

- Global Roll-Out to Full Organization - “Big-Bang” roll-out by division.
  - Big-Bang because many projects are need global collaboration
  - Easier go-live with “Big Bang” than CAD PDM and ERP R/3, i.e., documents can be loaded as needed allowing for a graduated ramp-up.

- **K.I.S.S.** – **K**eep **I**t **S**imple and **S**hort
  - Learn to crawl before you walk or run
  - Scale back on implementing/training on all features at initial roll-out

Use for Global Project and Deck Management
SAP PLM Projects at Cooper Industries

LESSONS LEARNED
SAP DMS and CAD Integrations – Lessons Learned

- Limit the scope of the project
- Implement in phases and target mature yet open minded organizations
- Have a simple working prototype in sandbox before you decide how to configure it to fit your business
- Limit the scope of documents. Ask if document is product relevant and how?
- Limit the number and flavors of CAD systems. This is not a CAD centric solution. It is all encompassing, business holistic solution

Adopt it! Do not be afraid to change process. Streamline!
cProjects & cFolders – Lessons Learned

- cFolders First
  - Use KPRO if you can
  - Standardize the collaboration structure
  - Have the dedicated administrators for each organizations
  - Work closely with SRM teams if cFolders will be used in RFx scenarios
  - Organize security by user groups

- cProjects Second
  - Create project templates by process and organization
  - Keep the project structures simple. More detailed structure more maintenance you will have
  - Organize security by user groups

Standardize and keep it simple!
SAP Project Systems – Lessons Learned

- Define the process that will start the SAP PS
  - In our case products that are one-of, never the same and delivered over a long periods of time (i.e. delivering Alerts & Warnings System to a Campus)
  - Service Contract management that could have production oriented demands

- Work closely with you FI-CO.
  - You will need to have FI-CO experts for ETO & MTO type of environment

- Work closely with your SD and MM-PP people.
  - Keep it simple! Remember PS Network is just another Production Order type
  - Define your Standard Networks specific to product you need to deliver

- Remember, it is not just Project Mgt. Has implications in FI-CO and Logistics

SAP PS is cross functional application!
Contact Info

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Thank you for participating.

Please remember to complete and return your evaluation form following this session.

For ongoing education on this area of focus, visit the Year-Round Community page at [www.asug.com/yrc](http://www.asug.com/yrc)