Implementing and Integrating PLM with SAP Manufacturing Processes

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What the heck is Greenheck Fan?

Market leader in institutional and commercial air movement and controls products
Greenheck Business Background

2003 Greenheck begins SAP 4.7 implementation

2005 Greenheck Consolidates on Autodesk CAD Software (AutoCAD & Inventor)

2008 Greenheck implements PLM using Cideon Vault

2008 Upgrade to 6.0 for Production Client- Development Client still 4.7

SAP at Greenheck

Highly configurable product
- 230,000 active Materials in Material Master
  - 1/3 of these materials are configurable
- 180,000 Bills of Materials for 6,000 Parent or finished goods
- 125,000 unique manufacturing Routings
- 240,000 Documents stored within the vault.
- Heavy ALE and VC user
Making the Case for PLM at Greenheck

Why Implement PLM?
- Enable Inventor 3D model management
- Manage and secure drawings for global engineering and manufacturing locations
- Replace Greenheck-developed legacy drawing management system

A vault is required to meet these strategic initiatives:

Inventor 3D modeling
- Enables Inventor 3D model management, version control, and workflow management

Global engineering, manufacturing, and sourcing
- Enables security, distribution, and effective management of an increasing number of product documents across regional manufacturing sites and international boundaries

Faster time to market
- Enables design collaboration, integration with SAP, and Engineering Change Management

Product quality
- Enables part searching and design reuse
- Significantly reduces data entry and improves accuracy
Greenheck's Chosen Solution:

SAP PLM with Cideon CAD integration
- Tight integration with SAP processes
- Distributed drawing management
- No duplication of data
- Migrate to AutoCAD and Inventor Series II (115 network seats)
Installed a Test and Production content server

Configured DMS
- Document types
- Status Network
- Security

Created a drawing class with 16 characteristics

Configured ALE for documents & drawing class

Developed bulk-load program for legacy data

Developed an interface with legacy PDM system
Phase One - Greenheck's Landscape

DVP
- 100 Configuration Master
- 120 Unit Testing

TST
- 300 QAIntegration Testing

PRD
- 300 Production

DEV
- 099 Central User Admin
- 130 Material Master, BOM, VC

Test Content Server

Production Content Server

Transports

Manual & Automatic ALE
Phase One – DMS Developments

Bulk-load program for legacy drawings
- Bulk-loaded 250,000 documents in 3 weeks

Interface program for legacy PDM
- Uploads hundreds of drawings per day
Phase One – Lessons learned

ALE process makes drawing management more difficult

- Drawings cannot be ALE'd from Production to Test content server. DIR's can be ALE'd.
- Must configure ALE to not break object links on target system when a DIR is ALE'd
- Cannot have more than 50,000 object links on a document in target system

Add time in the project plan for knowledge transfer
Phase Two – CAD Integration Steps

- Expand status network to include entire design lifecycle
- Install & configure conversion server, import, & export tools
- Develop and interface from conversion server to legacy PDM
- Install & configure Cideon Integration for Inventor & AutoCAD
- Test final solution
- Train drafters on new tools
- Use the software in production
Phase Two – Status Network

- IA (In Work)
- CS (Check in / Check out)
- DS (Submit)
- RW (Rework)
- SW (Start work)
- IP (In Process)
- DA (Design Approval (PreRelease))
- ES (Start of work (ESP))
- FR (Final Release)
- OB (Obsolete)

- Drafters Responsibility
- Engineering services
Using PLM – Submitting a Drawing and Pulling Part Attributes
Using PLM – Capturing Part Features
Phase II Post Go Live Storm

- Materials with Multiple and incorrect Engineering Drawings attached
- Production Orders with Multiple and incorrect Drawings attached
- Legacy system didn't match SAP but still viewed as correct
- Lots and Lots of phone calls from unhappy people!
- We Stopped implementation with approximately 1/3 of our company drafters using PLM
Phase II Post Go Live Storm

Steps taken to resolve the issues:

Research system design for attaching materials to production orders and Material Masters. Standard SAP functionality wasn't working properly for us, both in MM03 and Production order/work center priorities transactions.

Research available notes and their functionality- none applied to ECC6

Created 7 scenarios and completed integration testing on each of these before and after the following changes were made.
# Phase II Post Go Live Storm

## Product Lifecycle Management - Scenario Reference

### Transfer Part Number

<table>
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<tr>
<th>Scenario</th>
<th>Doc Type</th>
<th>To Dwg</th>
<th>Part</th>
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### Drawing Conversion

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### Obsolete Part

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<td>1</td>
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Phase II Post Go Live Storm

Our Solution:

**Create Auto Archive Program:** This program runs when a document status is changed to FR or OB to automatically archive previous versions of that document number.

**Create Auto ALE Program:** This program runs when a document status is changed to FR, OB, or AR to automatically ALE that document from DEV to PRD.

**Latest version filter Program:** A program has been modified so non-released revisions of documents will be filtered out and will not show as current in MM03. Non-released drawings will not be allowed to attach to a production order. (non-released also includes archived and obsolete.)
Production Planning

Production needs to know the correct version of the material's drawings to attach to production orders.

- Correct version is based on the drawing status and drawing validity dates.
- Only the latest Released (FR) version is correct and will be attached to production order.
- If no Released versions, then nothing is attached to production order.

None released, none will be used

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## Production Planning

- All released, latest will be used

<table>
<thead>
<tr>
<th>Type</th>
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</table>

- One released, that one is used

<table>
<thead>
<tr>
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Linking Drawings to Production Orders

SAP looks at all DIRs linked to Material Master and BOM.

The correct version of each DIR is linked to production order when order is created.

When order is released, SAP re-determines the correct version of each DIR and links those to the order and will remove any incorrect DIRs.

After order is released, drawing links are static, unless manually updated. (i.e. re-reads)

Multiple DIRs may be linked to a production order. Only one version of each DIR.
- One engineering drawing
- Other supporting drawings
Once a production order is RELEASED, the drawing links do not get updated automatically.

Only a manual Re-Read will update the drawing links to the correct versions and will update the production order with the latest BOM, routing and drawing changes.

If more than one Released version exists (invalid), SAP will use the Order BOM's explosion date to find which released version is to be linked.
## Production Order Example

<table>
<thead>
<tr>
<th>Activity</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>Create Production Order for part</td>
<td>DRW 1234 00 (FR) is linked to Order</td>
</tr>
<tr>
<td>Create new drawing version</td>
<td>DRW 1234 01 (FR) created</td>
</tr>
<tr>
<td></td>
<td>DRW 1234 00 changes to AR</td>
</tr>
<tr>
<td>Production Order (in CRTD status)</td>
<td>DRW 1234 00 (AR) is still linked to Order</td>
</tr>
<tr>
<td>Release Production Order</td>
<td>DRW 1234 01 (FR) is linked to Order.</td>
</tr>
<tr>
<td>Create new drawing version</td>
<td>DRW 1234 02 (FR) is created</td>
</tr>
<tr>
<td></td>
<td>DRW 1234 01 changes to AR</td>
</tr>
<tr>
<td>Production Order (in REL status)</td>
<td>DRW 1234 01 (AR) is still linked to Order</td>
</tr>
<tr>
<td>Production Order Re-Read</td>
<td>DRW 1234 02 (FR) is linked to Order</td>
</tr>
</tbody>
</table>
Phase Two – Lessons Learned

This is not an engineering/ CAD initiative, it is a systems project that touches all parts of SAP.

SAP patch level is critical. Our patch level required us to disable some functionality.

Verify existing document types

- Document type must be the same as file extension
  - Eg. Inventor drawing = Doc Type "IDW"
  - Eg. Inventor part = Doc Type "IPT"

Integration testing must include all touch points including MM and PP modules
SAP PLM Benefits Realized and Next Steps

Realized Benefits:

Integration of drawings with existing SAP processes & transactions- For Greenheck this was huge, we now have one system that connects all of our product data!

Storage of drawings and data in centralized location

Lifecycle management of drawings

Classification of drawings (query capability on 26 characteristics)

Ability to create One to many drawing relationships
Next Steps:

Creation of Materials and Bills of Materials using CDESK and data stripped off of the drawings.

Automated Creation of routings based on part attributes
PLM Next Steps

We are starting to use the attributes pulled from the drawing to create Material Masters and Bills of Materials from CDESK.
Questions?