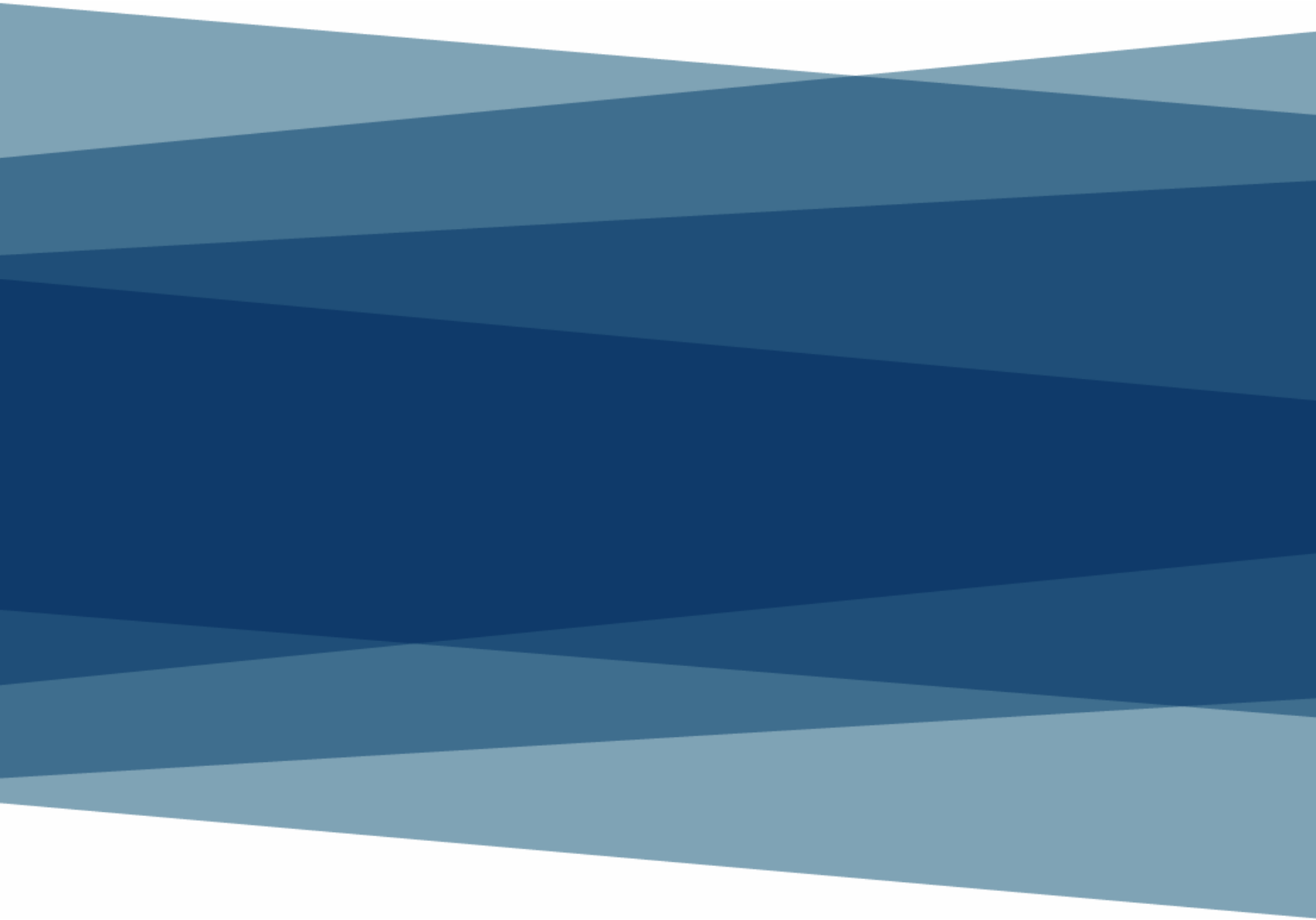




Vantage Product Lifecycle Management



Abstract

PLM enable companies to manage all information regarding a product, from the initial design and engineering through to manufacture, sourcing, support and run down. Traditionally ERP solutions have successfully managed the manufacturing related information but have at best had limited integration to the engineering systems such as PDM and CAD. The Vantage manufacturing solution offers a complete 'end to end' solution that manages all aspects of a product's life. Vantage, therefore, delivers unprecedented opportunity for an enterprise to better control its costs and increase profitability. Vantage PLM is the product data management system that supervises the entire process and product life history.

Table of Contents

Table of Contents	i
What is Product Lifecycle Management?	2
PLM Components	3
Product Data Management	3
Design & Change Management	5
Drawings and Version Administration	6
Searching Capabilities	7
Data Protection & Security	8
Customization	8
CAD Integration	9
Key CAD Integration Features	9
Document Management	11
Key Functions	12
Integration with Office Applications	13
Loading of Existing Documents	13
Loading of Existing Documents	14
Scanning of External Documents	14
Organization of Documents	14
Document Storage in the Electronic Vault	14
Retrieval and Viewing of Documents	14
Export / Import of Documents for External Collaboration	14
Document Management on the Web	14
Workflow Management of Documents	15
Plot Management Systems	15
Document Archival	15
Production Engineering	16
Manufacturing Execution	17
Summary	18

What is Product Lifecycle Management?

There are many different interpretations and definitions of what PLM entails. In short, PLM allows a company to manage all information regarding a product from the initial design and engineering through to manufacture, sourcing, support and run down. Many people associate PLM with only the engineering department. However, a true PLM solution involves all those who touch a product throughout its life. This is virtually everyone both internal and external to an enterprise. From sales and marketing making the initial contact with the customer and generating the forecast, through to the manufacturing team who builds it and the purchasing department sourcing materials and the ongoing service and support. And finally, the service team who installs and supports the product. Including, of course, the engineers. All these people have direct influence on the continued cost effective profitable design of the product. Traditionally ERP solutions have managed the manufacturing related information well, but have at best had limited integration to the engineering systems such as PDM and CAD. Other new initiatives, such as Customer Relationship Management (CRM) and Supplier Relationship Management (SRM), have also helped company's better control the product lifecycle. The Vantage manufacturing solution offers a complete 'end to end' solution that manages all aspects of a product's life. Vantage, therefore, delivers unprecedented opportunity for an enterprise to better control its costs and increase profitability.

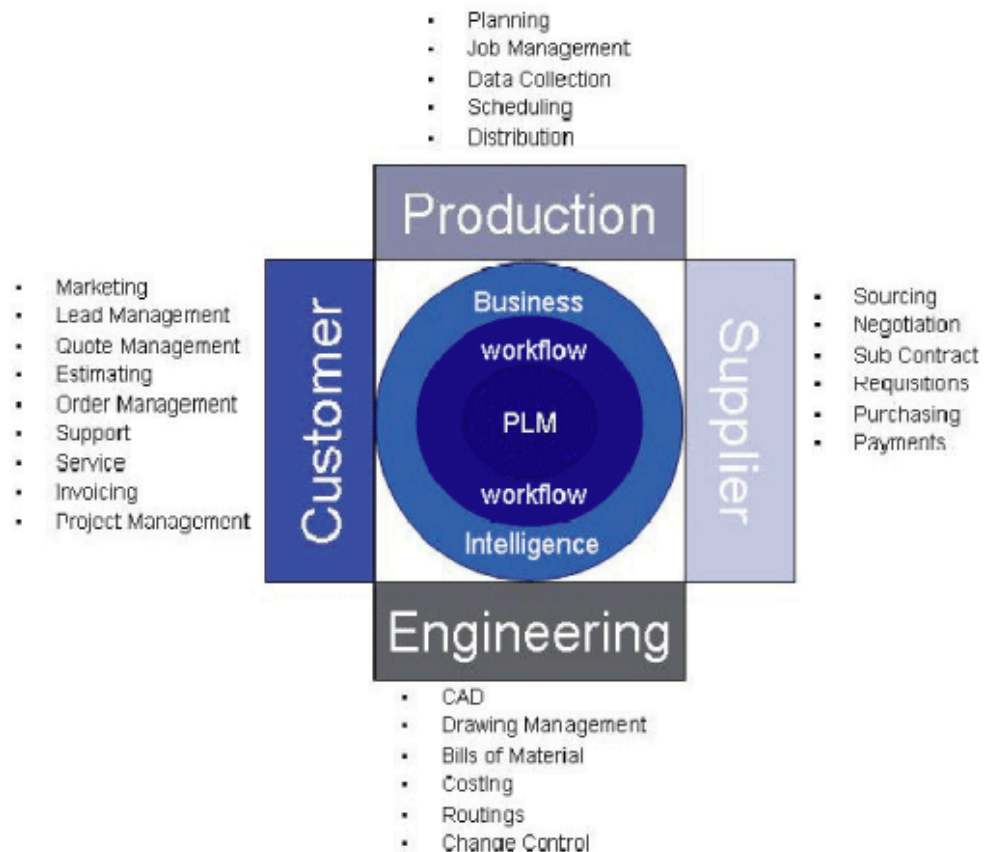


Figure 1: Overview of Product Life Cycle Management

Throughout all stages of a product's life, Vantage PLM provides storage, administration and supply of all product related and supplemental information. Vantage PLM is the product data management system that supervises the entire process and product life history. It interacts with project managers, engineers, sales people, buyers, quality assurance, machine operators – in short, everyone who touches the product.

PLM Components

PLM is an omnipresent theme throughout the Vantage solution. Every aspect of Vantage is geared towards capturing and presenting the right information at the right time to the right people. In some ways the whole of the Vantage system could be described as a PLM solution. However, this paper discusses the major components that help companies gain control of their product data and ensure comprehensive inclusion of people who otherwise fall outside the control of a traditional enterprise solution, thus enabling them to collaborate with all other members of the enterprise.

These components are:

- Product Data Management
- CAD Integration
- Document Management
- Production Engineering
- Quoting and Estimating
- Sourcing
- Manufacturing Execution

Product Data Management

Traditionally ERP systems have focused on product data that surrounds the sale, planning, production and sourcing of products. Engineering information generally focused around production engineering requirements, rather than design engineering requirements. With the explosion of electronic information many product specific pieces of information are held in many systems: CRM, ERP, Sourcing, CAD, documentation in emails and on file servers. One of the cornerstones of Vantage PLM is the product data management (PDM) solution.

One basic element of PDM is the extremely flexible selection of characteristics that can be given to the classification of parts and assemblies. This multi-level flexibility streamlines the future re-use of parts and assemblies, and thus improves the productivity of the design department. Through simple inquiries, parts can be easily recovered from old designs and used in new machines and components. Users can quickly review corresponding documents and drawings, easily moving from one part to the next. Costly re-designs and duplication of parts are avoided.

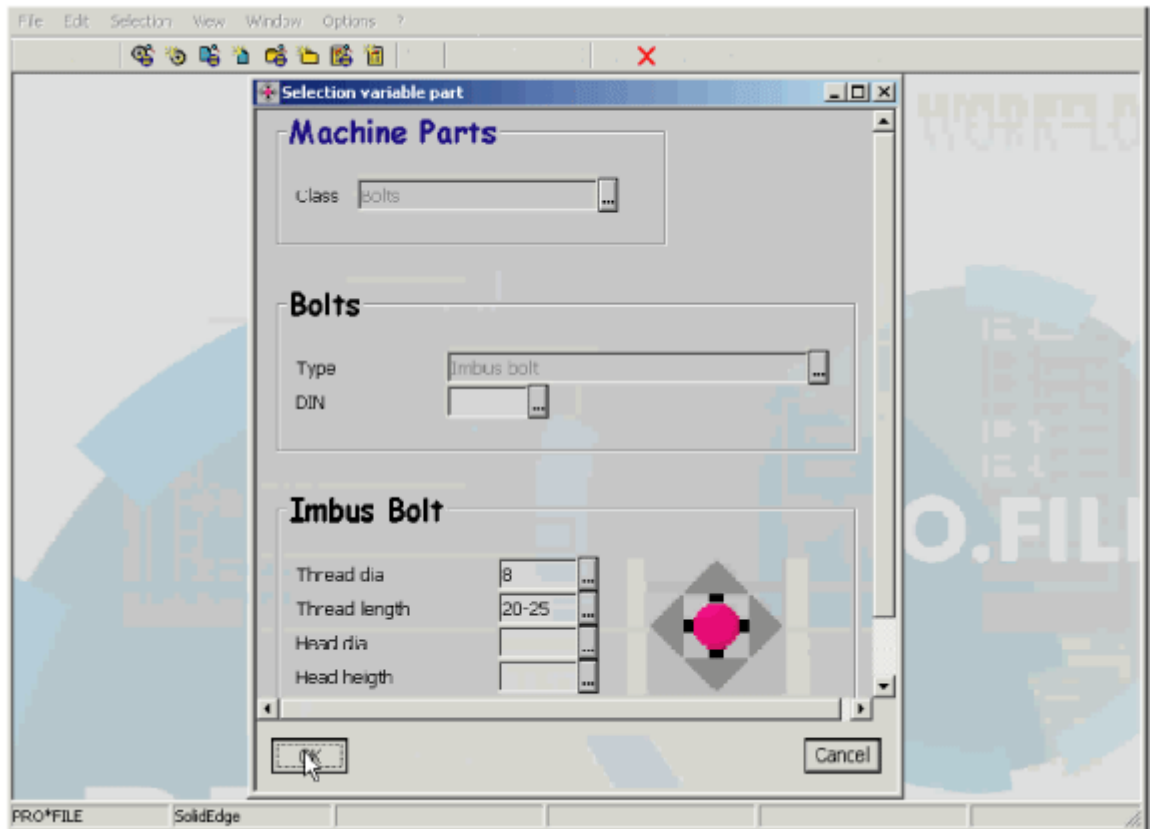
Efficient storage of digital drawings and document management can also reduce administrative cost. By phasing out obsolete systems such as microfilm archives and repro unit, duplication and distribution costs are lowered considerably. Normally digital archives pay for themselves after one or two years.

Consistent use of PDM can lead to profitable time and cost reductions. Through classification and indexing, the time required for the recovery and management of information – parts data, bills of material, drawings, specifications, certifications, sketches - is significantly reduced. Furthermore, administrative cost - especially in large design or engineering change projects - is

reduced drastically. PDM allows the sound management and control of documents, whether the drawing department is opened or closed.

PDM also provides a tight level of security controlling who can view or access documents. Specifications, CAD models, drawings, and NC-programs are examples of major competitive assets of a company. Protecting these records from loss or unwarranted access is vitally important. Vantage PLM allows only those users with the correct privileges to view or access any product information a company chooses to control.

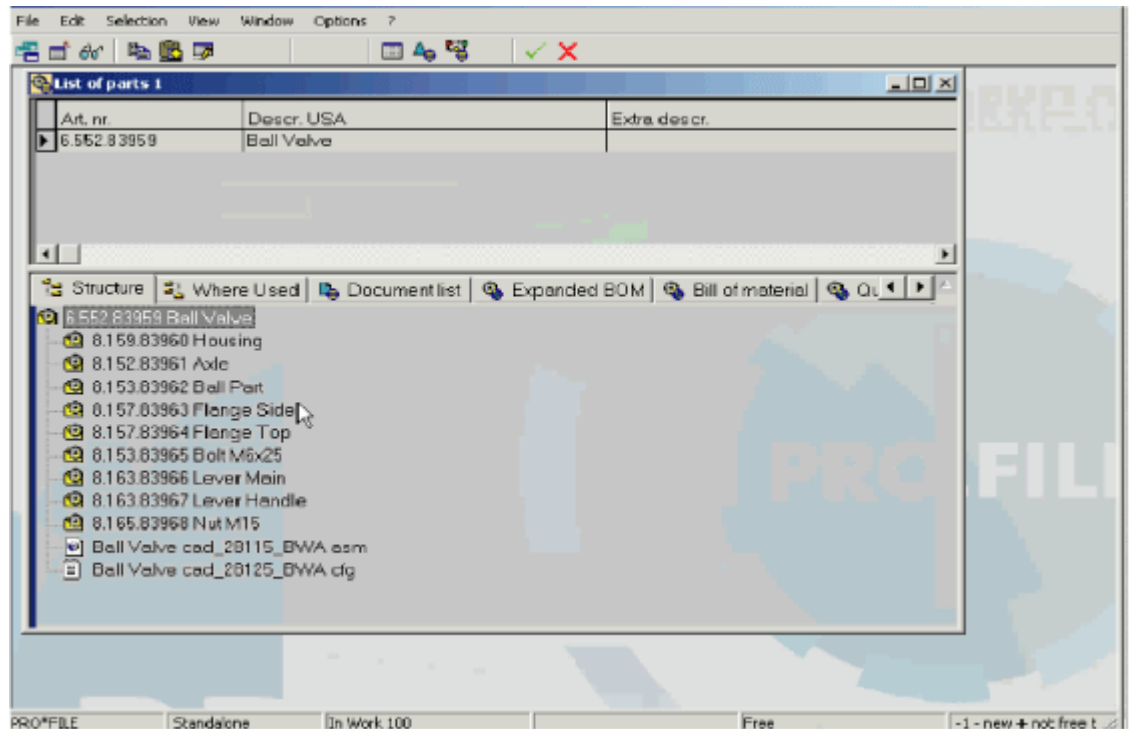
PDM structures product information such that engineers and designers can maximize their productive time, while ensuring that they are working within the boundaries of the company. Engineers can define their own multi-tier classification of products, while at the same time looking at current costs, actual manufactured cost, and quantity on hand information to ensure they best optimize the company's resources.



Criteria held against a bolt

Design & Change Management

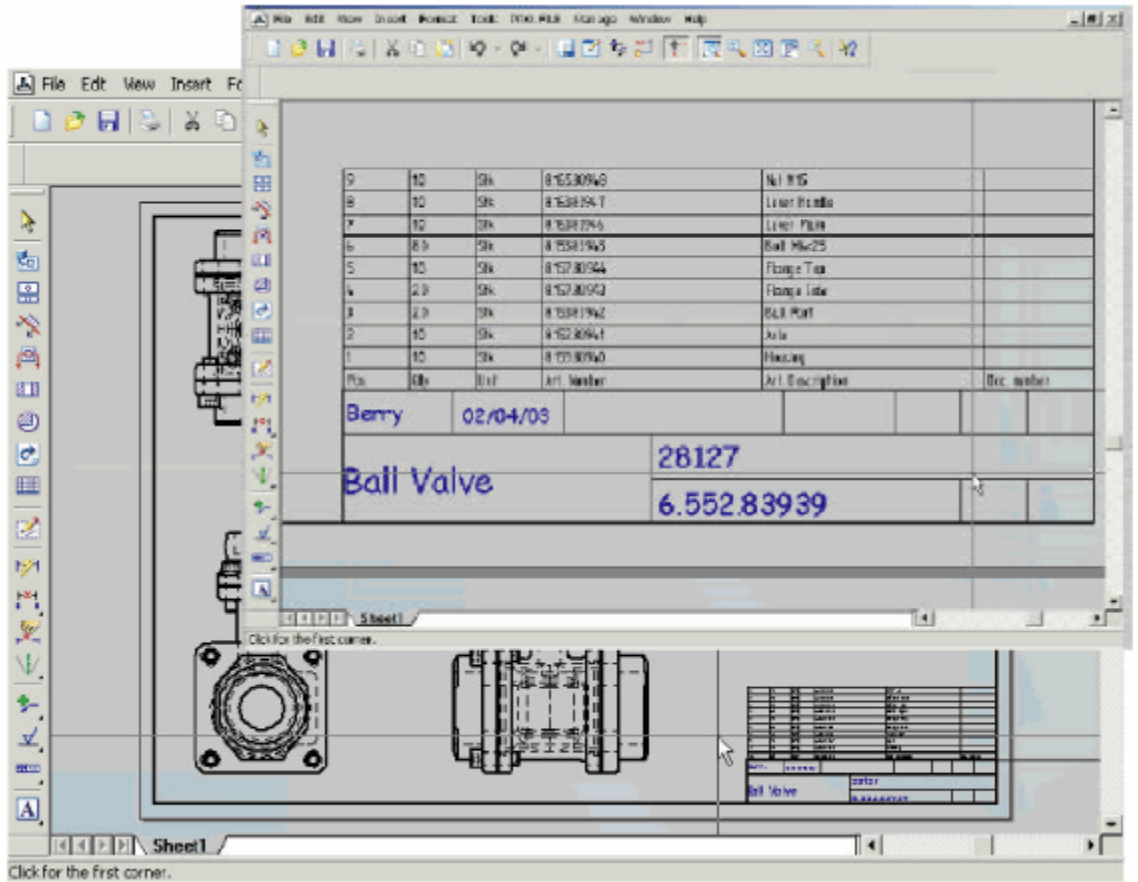
Control of changes can be imposed by the use of robust workflow. The workflow system manages the movement of documents and multiple product stages, from design through production. Drag-n-Drop techniques allow engineers to easily execute changes. Real-time integration from production (to manufacture and plan the correct revision) and sales (to quote, price and cost the correct revision) allows changed information to be presented to users as needed.



Complete view of all items associated with a part. Status of part shown at bottom of form.

Drawings and Version Administration

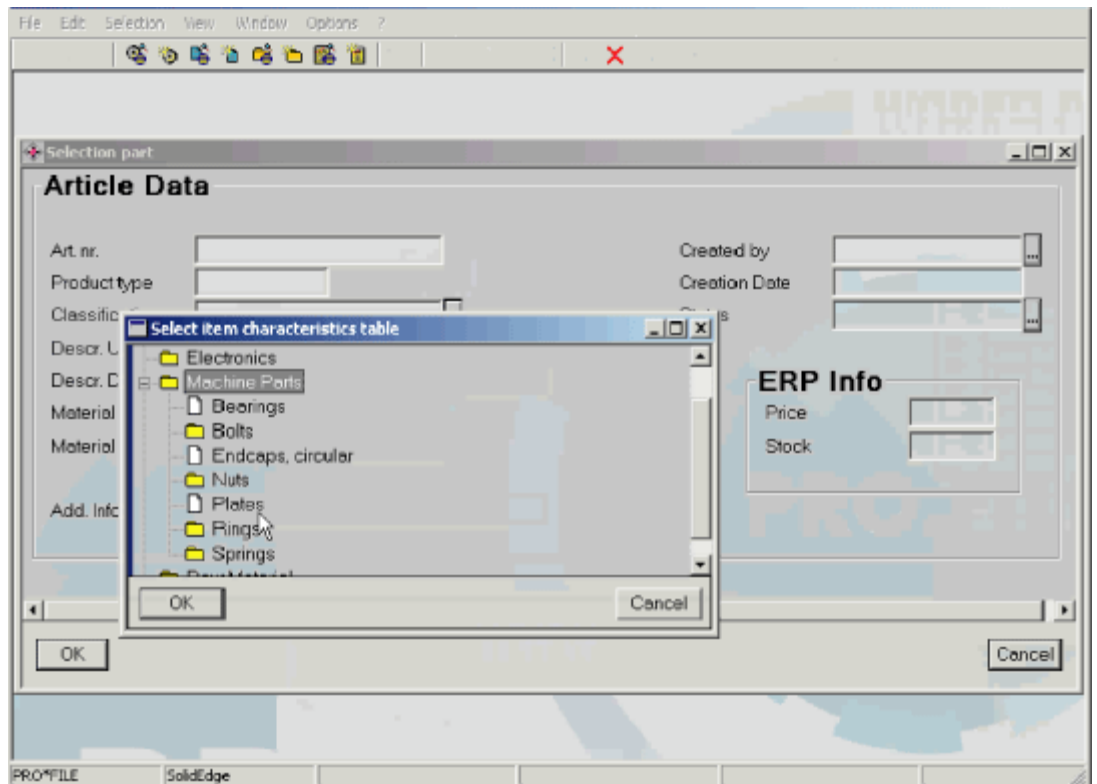
Many 3D-models, as well as technical drawings, can be assigned to a component from one or more CAD systems. Changes to part master information are transferred onto the title block of any associated drawings automatically. Bill of material information can also be dynamically inserted and updated on drawings. The PDM system supports the management of different versions of CAD drawings and thus helps companies achieve their ISO9000 requirements. At all times the PDM system informs users when a drawing was valid and where it was used.



Bill of Material from PDM system not text on the drawing.

Searching Capabilities

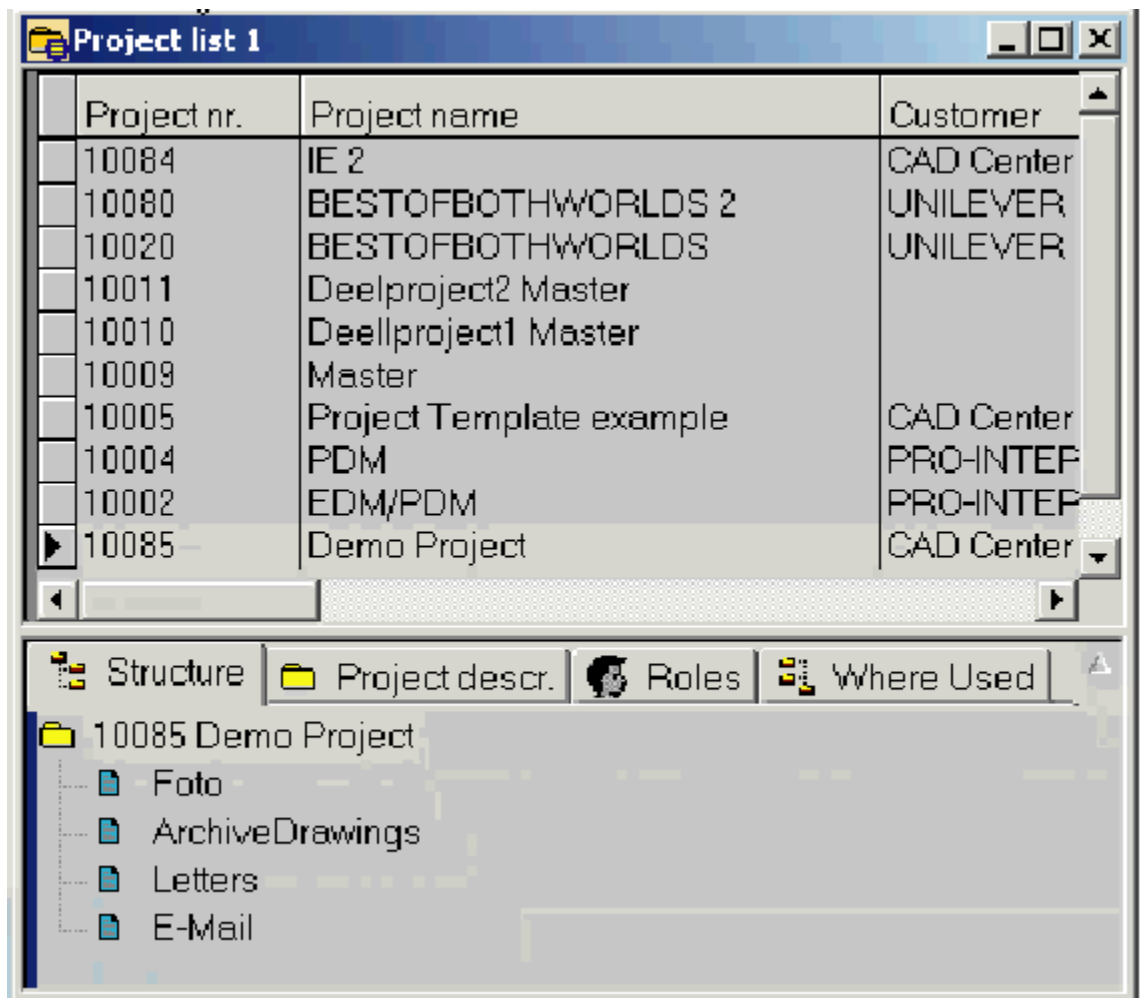
One of the primary functions of PDM is to enable users to quickly find parts, drawings and other documents. The PDM system offers extensive search and retrieval capabilities. Searching by multi-level classification, key fields or graphical navigation through the document hierarchy, are all possible. Preview functions are available for quick overviews of drawings or documents. This allows engineers to quickly view a large drawing without downloading it to their CAD-system. The relationships between parts and documents (as well as document contents) can be viewed via a structured tree view so engineers can quickly see the impact and use of all documents.



Multi-tiered search for an item

Data Protection & Security

The PDM system allows the definition of users and multi-level work groups. All access to PDM information is password protected. Security rights can be defined at the user or group level. These rights determine which documents the user can access and what level of access is allowed. (The workflow status of a document or part determines whether a user can view, update, or copy documents.) Unauthorized access to documents is impossible. All meta data (e.g. for parts, projects, and documents) is held in a database; all physical documents are held in an electronic vault. Access to this vault is only via the PDM system. As said before, users can be assigned to work groups and also to project teams. All types of documents can be assigned to projects. A user's access to these documents can be relevant to their roles within the project.



Documents associated with a project

Customization

In response to the dynamic types of information companies need to store regarding their products, the PDM system allows companies to create their own fields, forms and workflows.

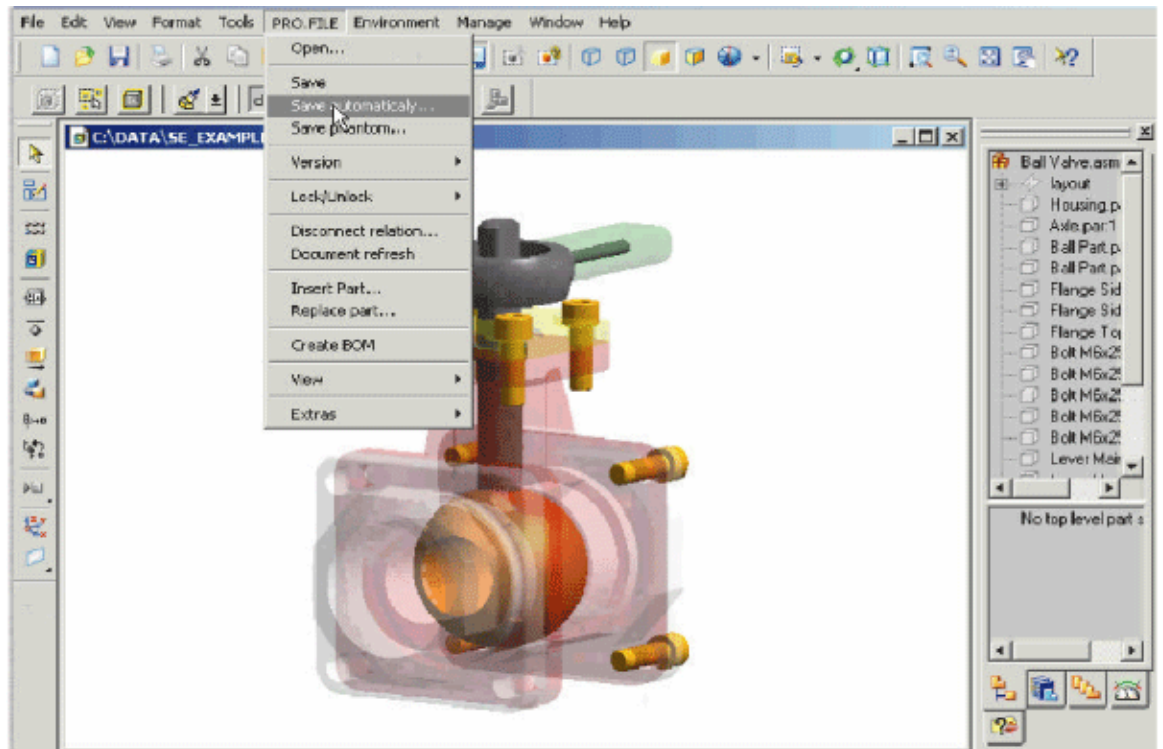
CAD Integration

The CAD system is generally the center of the designer's activities. The remainder of an engineer's workload supports other functions within an enterprise; for example, maintaining bills of material and parts master data for sales, production and purchasing. Vantage PLM promotes creative work by relieving engineers of these mundane tasks, and allows them to concentrate on value-add work. The tight integration with most of the leading CAD systems is one of the main strengths of Vantage PLM.

The Vantage PLM functions are fully integrated into the CAD program's native menu system. This tight integration promotes the acceptance of the PLM system with the engineers, which in turn improves overall productivity, product quality and generation of profitable products. Product data, version, revision and bill of material information are directly transferred and documented into the drawing title block, which is automatically updated whenever a modification occurs.

Key CAD Integration Features

- Initiating PDM functions directly from the CAD application (e.g. part look up)
- Processing of CAD models controlled by PDM
- Check in / Check out
- Drawing administration
- Updating of title blocks
- Automatic generation of BOM and 'where used' information
- Change reports
- Version and revision management of CAD documents
- Automatic generation of drawing copies in a neutral data format (e.g. HPGL and TIFF)



Call to PDM system within SolidEdge

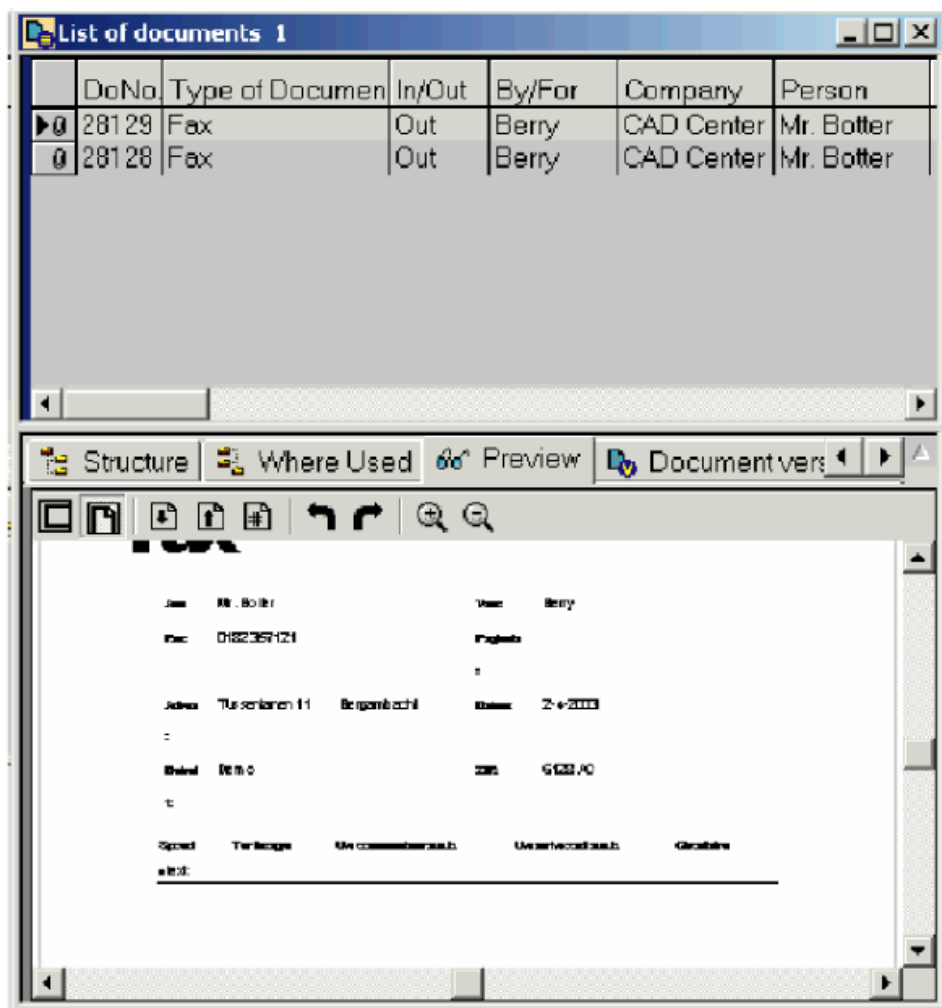
The following CAD systems have integrations:

- AutoCAD
- AutoCAD Mechanical 2000
- Autodesk Mechanical Desktop
- Catia
- I-DEAS
- Inventor
- ME10
- MEDUSA
- MicroStation
- PRO*CAD 2D
- Pro/ENGINEER
- Solid Edge
- SolidWorks
- Unigraphics

Document Management

Documents are usually created in a context relevant to a project, a customer, a design process, etc. Today, more than ever, electronic documents are created and distributed to almost everyone within a company. In these days of corporate liability it is imperative for a company to control who, when and what is electronically created and distributed. Many companies maintain strict control over drawing revisions and versions, but almost no control over the endless ancillary documents – for example emails, sketches, WORD documents, and Excel spreadsheets. Vantage PLM provides a firm but flexible document control system that can be deployed throughout the entire enterprise. Vantage PLM classifies and manages documents originating in multiple operational areas. For example, text documents such as manuals, contracts, specifications, correspondence and meeting minutes emerge from different disciplines. Vantage PLM will manage any type of document – for example digitized photographs, video, audio, and machine control programs.

Each document can be assigned a type (e.g. sketch, WORD document, photo) in conjunction with additional classification information based on the document type. Documents can be maintained independently or assigned to parts, projects, or assemblies.



Status on a fax document

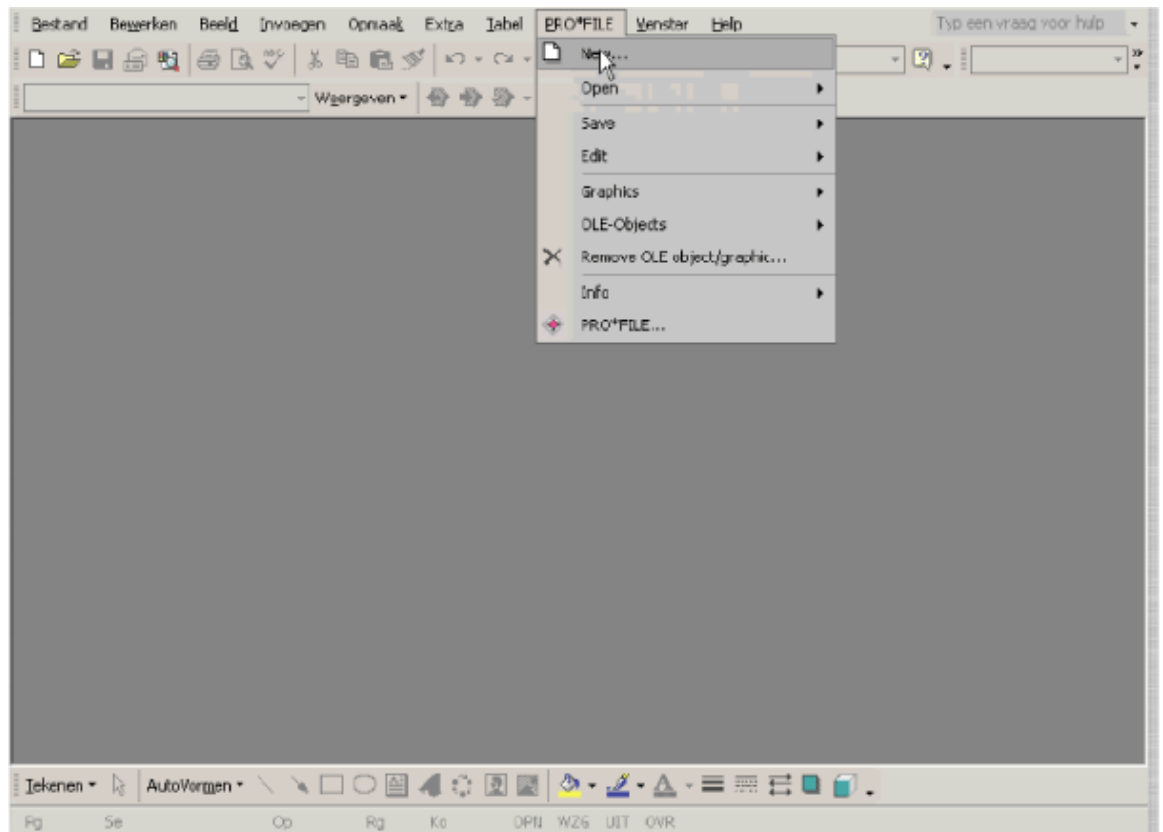
Key Functions

- Classification of documents with determined or user definable fields
- Relationship maintained between documents and parts, projects, and customers
- Change log
- Digital folders
- Electronic vault
- Export / import of documents with traceability for collaboration
- Integration with Office applications such as WORD or Excel
- Searching based on document characteristics

Integration with Office Applications

Vantage PLM records documents at their place of origin. Hence a user's normal MS-Office applications such as WORD or Excel have embedded PLM functions within them. Documents that have been written in these applications are directly stored within the PLM system rather than anywhere else on a user's network.

Each document is indexed with characteristics and attributes when it is saved for the first time. These attributes enable the quick retrieval of the document in the future. Check in / check out features ensure that conflicts such as concurrent modifications are avoided. Users are not allowed to alter documents that are currently check out by other users. Vantage PLM also maintains dynamically linked documents with 'Contains' and 'Where Used' functionality. When a document is comprised of multiple components – e.g. pictures, text, text from other documents - Vantage PLM controls each of the sub-documents separately, then builds the end document dynamically when needed.



Integration with Microsoft word

Loading of Existing Documents

A company's existing drawings or documents can be imported automatically into PLM with the DocumentLoader module.

Scanning of External Documents

With the use of a suitable scanner, incoming documents can be cataloged, classified and stored. Small size keyboard, desktop, A4 or large format scanners can be used.

Organization of Documents

Documents can be bundled using electronic folders, as well as attached to projects or products. This allows direct access to all documents needed within a particular business process. A graphical browser allows the viewing of these grouped documents. The entire document structure or links within it can be easily be modified using the Drag-n-Drop functions.

Document Storage in the Electronic Vault

All documents managed by Vantage PLM are stored in the electronic vault. This vault establishes a protected area within the system. Access to it is only possible via the integrated document management system. No costly administration of user access rights at the file level is required.

Retrieval and Viewing of Documents

Documents can be easily retrieved independently of the application in which they were created. Documents can be searched via document characteristics and attributes. Document viewers are available, enabling users to view documents without the applications that created them.

Export / Import of Documents for External Collaboration

Documents can be retrieved from the PLM electronic vault for external collaboration, and at any time in the future the document can be imported back in. While the document is checked out it is 'locked' and cannot be changed. Transmittals (digital transmission lists) document when documents are sent to customers, suppliers or partners. Each transmittal records all of the sender, recipient and date / time data, as well as the composition of the forwarded documents. Transmittals are highly useful documents when questions arise concerning warranty obligations or data security.

Document Management on the Web

Collaboration of documents is an important part of any enterprise's operation in the modern economy. Vantage PLM allows documents to be searched and accessed over the Web. This is a simple yet comprehensive benefit as many Web users tend to be infrequent users of the system (for example customers and suppliers). Access to documents over the Web is still controlled by Vantage PLM, ensuring only those people with the correct security can gain access.

Workflow Management of Documents

Vantage PLM contains workflow processes that ensure the correct and timely management of all documents within a company. Workflows allow companies to define and control specific business processes and release procedures for documents and drawings. Organizational structures such as users, departments, work groups and projects are defined along with the appropriate access rights. Additionally, different workflow states can be defined for documents, drawings, parts and assemblies. Rules can be defined that process these documents between states (for example new, approved, checked out, with customer). Email is used to alert users they have tasks to complete. On opening an email the user is brought to the document that requires action.

Plot Management Systems

Plot management enables the management of printer and plotter output for drawings and other documents, even in a geographically distributed work environment. Users can generate documents on the nearest or most suitable output device. Additional functions including set generation, paper choice and markings can also be installed.

Document Archival

Obsolete drawings and other documents need to be consistently archived in a manner that allows them to be used and referenced by the PLM system at any point in the future. Vantage PLM allows documents and technical drawings up to A0 format, as well as microfilm and electronic formats (usually TIFF G4). All documents are classified and vaulted into the PLM system. Long term archiving of large quantities of scanned documents and CAD drawings is made possible by the use of optical storage media. CD-ROM or WORM-based systems with jukeboxes are established, that in turn provide a high degree of security, speed and flexibility. Vantage PLM supports location-wide access to document archives. A harmonized, scalable arrangement of solutions facilitating distributed data storage guarantees fast access times and a high degree of data protection.

Production Engineering

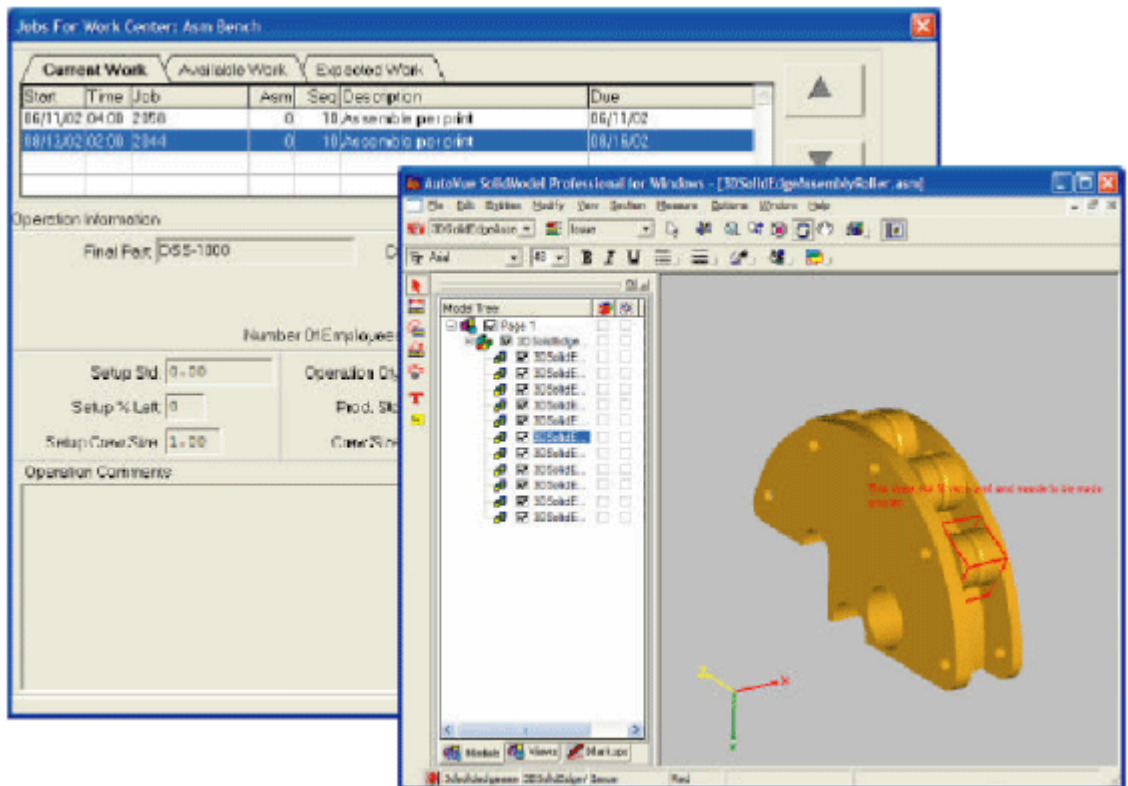
The integration between design engineering and production engineering is seamless with Vantage PLM. Many times the bill of materials derived by the design engineer does not match the bill of resource required to manufacture the product. Vantage PLM makes the design bill of materials available to the production engineer, then either copied directly as the production BOM or rearranged to match the way in which the product will be produced. This bill can be saved as either a standard multi-level structure or saved against a quote for a one-off engineer-to-order product. At all times the production engineer or estimator has access to the drawings and other associate documents. Concurrently, the production engineering department can add to the document set any additional documents such as quality specifications, test specifications and machine programs. Again, Vantage PLM ensures that information is passed quickly and efficiently to all those need it.



Manufacturing Execution

Vantage PLM ensures that those actually manufacturing the product are able to access all the information needed to produce the product effectively. At the same time, those on the shop floor can influence the forward design of the product, ensuring that the design engineering team can take advantage of techniques that will develop better, higher quality, more effective products.

With Vantage PLM, those on the production floor always see up-to-date design specifications, drawings and bill of material information. It allows them to reline, request real-time clarity on details and suggest engineering improvements. Throughout the process, this provides a feedback and control loop for the status of suggestions and statuses.



Production floor can view drawings and provide feedback to production and design engineering.

Summary

Vantage PLM allows a company to greatly improve the overall quality, cost effectiveness, competitiveness and profitability of its products by ensuring that information is stored only once, and is available to all employees, partners, customers and suppliers as and when they need it.

About Epicor

For 20 years, Epicor has been a recognized leader dedicated to providing leading edge enterprise software solutions to midmarket companies around the world. With over 15,000 customers, Epicor delivers end-to-end, industry-specific solutions that enable companies to immediately improve business operations and build competitive advantage in today's real-time global economy. Epicor's comprehensive suite of integrated software solutions for Customer Relationship Management, Financials, Manufacturing, Supply Chain Management, and Services Execution and Control provide the scalability and flexibility to support long-term growth. Epicor's solutions are complemented by a full range of services, providing a single point of accountability to promote rapid return on investment and low total cost of ownership.

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