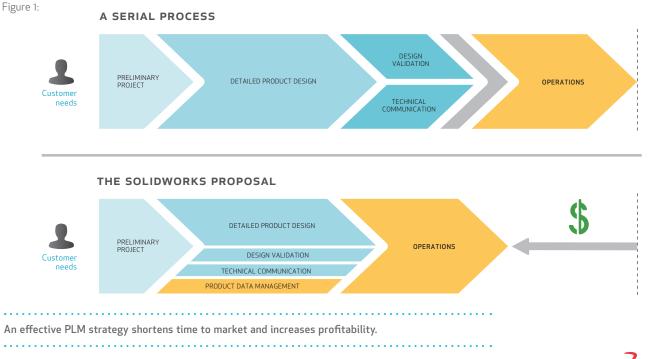# PRODUCT LIFECYCLE MANAGEMENT MADE EASY

OVERVIEW

Businesses want to automate the connection between Product Design and Operations to be more efficient and innovative throughout the product lifecycle. But traditional, top-down approaches to Product Lifecycle Management (PLM) are often too complex, time-consuming, and costly—making PLM impractical for many businesses. Dassault Systèmes SolidWorks Corp. has radically simplified the approach to Product Lifecycle Management—just as we simplified product design by making parametric 3D design easier to use and available on Windows. Today, companies can build PLM strategies on three pillars: (1) simple integrated design, simulation, documentation and data management solutions from SolidWorks; (2) links to critical production systems (such as ERP, MRP and CRM) using industry standards; and (3) integration with Microsoft Windows, Microsoft Office and Microsoft SQL Server for business collaboration. Simple technologies—familiar or attractive to business and engineering professionals—can help you gain control of your product data and make it an asset that complements Operations.

A more productive Product Development organization not only achieves time-to-market goals and project cost reductions, but also dramatically improves company operations with higher-quality products and reduced material, labor and scrap costs. By focusing on the practical problems that PLM is trying to solve, DS SolidWorks is helping many businesses achieve their PLM goals faster, with better performance, and at less cost than with traditional approaches. (See Figure 1):

Figure 1:

An effective PLM strategy shortens time to market and increases profitability.

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The promise of PLM

Businesses that build products are on a continual quest to increase market share, lower costs, improve quality, and simplify compliance for their products. To achieve these goals, many businesses are turning to Product Lifecycle Management (PLM).

PLM is a business strategy for managing products more effectively by cohesively linking Product Design with Operations. PLM promises both efficiency improvements and innovation gains, which proper automation can expedite.

PLM is not a software product that you buy from a single vendor. Rather, it's a strategy for meeting your business goals by deploying the right technologies, implementing best practices, and training your people correctly.

PLM involves linking the technologies and processes for Product Design—3D computer-aided design, simulation, technical communication, and product data management—with the technologies and processes for Operations, specifically those for building, manufacturing, selling, and supporting products. Product Design technologies and processes automate design and engineering; Operations technologies and processes automate business infrastructure management. Business infrastructure includes office productivity applications and Enterprise Resource Planning (ERP), Material Requirements Planning (MRP) and Customer Relationship Management (CRM) systems.

PLM got its start in automotive, aerospace, and other industries that build very large, very complex products and systems. It was designed to provide everyone involved with an up-to-date view of every product throughout its lifecycle so people could make the right decisions and take the proper actions.

Overcoming PLM complexity

Some PLM proponents choose to take a top-down, monolithic approach, moving everything into a single architecture with a common data store just for PLM. Think ERP but for Product Development. The resulting infrastructure is often called a "PLM backbone."

Not surprisingly, PLM's ambitious scope makes it too complex, time-consuming, and costly for many businesses. PLM projects often demand lots of customization by consultants, specialist programmers to make updates, and high administrative overhead to keep everything running. Too often, end users' needs are compromised in the quest for a single system, in the spirit of PLM. Projects often fail or fall short of senior-management expectations, damaging IT careers in the process. Far too many "PLM systems" end up underutilized or not used at all: they've become over-priced document management systems after significant investments of time and money.

This experience can make PLM impractical for many businesses. Yet, increasingly, companies, including smaller businesses, want the benefits of PLM for competitive advantage and to participate more effectively in supply chains.

Fortunately, PLM no longer has to be a complex or time-consuming science project. There's a better way.

Dassault Systèmes SolidWorks Corp. simplifies PLM with a practical approach. This approach takes advantage of easier-to-use technologies that engineers and business people already use; industry standards that simplify connections between people and data; and the business applications and infrastructure that you already have in place.

PLM: Boiling it down

Because PLM is a business strategy, it can seem intimidating and unapproachable—until you take a closer look.

Most SolidWorks customers base their PLM strategies on four specific initiatives to improve the business. (See Figure 2):

- Create compelling products
- Move products through the pipeline faster
- Connect Product Design with Production (Operations) more efficiently
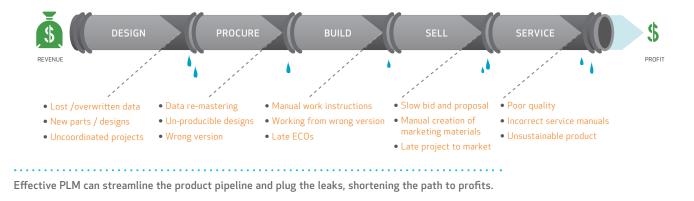- Be compliant

Boiling it down, here's what is required to carry out each initiative successfully:

- Create compelling products: Technology doesn't provide creativity, but it can make it easier for creative people to create more compelling products. With the right, easier-to-use technologies, engineers can visualize design alternatives in 3D, simulate scenarios to optimize product performance characteristics, and create realistic renderings to convey concepts to future customers. Engineers can try more things, take risks, and innovate—all without ever building a physical prototype.

- Move products through the pipeline faster: You design, procure, build, sell and service many products. Think of the product lifecycle—design, procure, build, sell and service—as a pipeline moving products from concept to profits. In getting to profits, you create significant documentation: 3D design and simulation files; Microsoft Office documents, Excel spreadsheets and PowerPoint presentations; assembly instructions; technical communication materials; and more.

In an ideal world, everything would flow together nicely and correctly. Designers would never lose hours of project time because of lost files. Production would always work from the correct design version. Marketing would never have to re-draw a model to create graphics for product brochures.
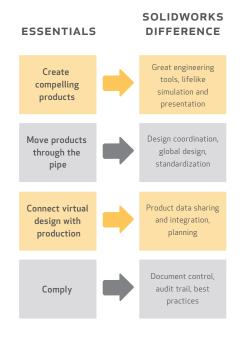
But, in the real world, designs are complex: a typical project has thousands of files. Now, multiply that by tens or hundreds of products. As a result, most product development suffers from the "leaky pipe" syndrome: systematic leaks that affect profit, time-to-market and quality. (See Figure 3): Effective controls can help prevent or plug the leaks.

Figure 2: PLM – Boiling it Down

Figure 3:

PROFITABILITY LEAKS IN PRODUCT PIPELINE

REVENUE — DESIGN → PROCURE → BUILD → SELL → SERVICE → PROFIT

- Lost /overwritten data
- New parts / designs
- Uncoordinated projects

- Data re-mastering
- Un-producible designs
- Wrong version

- Manual work instructions
- Working from wrong version
- Late ECOs

- Slow bid and proposal
- Manual creation of marketing materials
- Late project to market

- Poor quality
- Incorrect service manuals
- Unsustainable product

Effective PLM can streamline the product pipeline and plug the leaks, shortening the path to profits.

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- Connect Product Design with Production (Operations) more efficiently: To bring compelling products to market, the Operations side of the house needs good data. Your ERP system needs to know what parts to order. The shop floor needs documentation to show workers how things go together. The Service team needs detailed documentation to troubleshoot problems post-sale. The more efficiently and accurately you can describe the intentions of Product Design to Operations, the more efficiently and accurately Operations can produce the product. The height of efficiency, of course, is being able to describe the product accurately without building physical prototypes: the Digital Product.

  The Digital Product defines product development. It captures the collection of concepts, 3D CAD models, documentation, and other data that describe a product before it is physically produced. Think of the Digital Product as the technical data package that contains clear, concise documentation describing the product design, performance, behavior, applicable standards and supporting documentation. When the Digital Product is linked with the Physical Product, it is possible to have an entire view of the product, including practices and procedures for manufacture, test, sales, service and support.

- Be compliant: Whether you're in a regulated industry subject to the FDA or ISO—or you just demand that product designs comply with internal best practices—you need to simplify and systematize compliance. A good PLM strategy simplifies compliance by providing robust document control, approvals and workflow.

By using the right processes, technologies and best practices, you can implement these initiatives without creating a big, expensive new software infrastructure just for PLM. You can make improvements to your current processes and practices, and take advantage of standards and infrastructure already in place to connect them. You can take an incremental, bottom-up approach to PLM—one that can grow with your business and your budget.

By making Product Design more efficient, you can make Operations—the most capital-intensive part of the product lifecycle—more efficient. You can improve product functionality, avoid mistakes that lead to manufacturability problems or production cost overruns, ensure compliance with environmental laws and other laws, reduce service costs, expedite product updates or product-line extensions, and extend product life.

You can shorten the path from product concept to profits.

A practical approach to PLM

SolidWorks simplifies PLM through a practical, three-step approach based on a combination of people, processes and technologies. This approach builds on a foundation of:

- Good product engineering and practices, including 3D CAD that incorporates sustainable design, simulation, technical communication, and specialty applications

- Comprehensive but simple management of the information and processes that make up the technical data package for the product

- The ability to share the technical data package efficiently with downstream users, supply chain partners, and systems

- Secure, auditable document controls

Simple, standards-based 3D authoring tools from SolidWorks are the practical choice for improving Product Design and the Digital Product. SolidWorks tools simplify how designers and engineers visually conceptualize, design and prototype the Digital Product, create effective technical communications materials and documentation, and design for sustainability before investing in costly physical prototypes or committing to production. More than a million engineering professionals worldwide—including the next generation of engineers training in schools—use SolidWorks 3D/2D CAD tools.

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The three steps are:

1. Choose the right architecture

2. Implement using well-established best practices

3. Focus on your people

The following sections discuss these three steps in more detail.

Step 1: Choose the right architecture

First, start with the right architecture. PLM is a combination of technologies from different sources. Start by defining your technology needs and identifying how best to fulfill them. For each technology need, the best solutions are generally simple, well-established technologies that people are already using. (See Table 1)

For many organizations, the optimal PLM technologies will be:

• SolidWorks solutions to create and manage Product Design and the Digital Product

• ERP/MRP and CRM to manage Operations

• Microsoft to provide the collaboration infrastructure

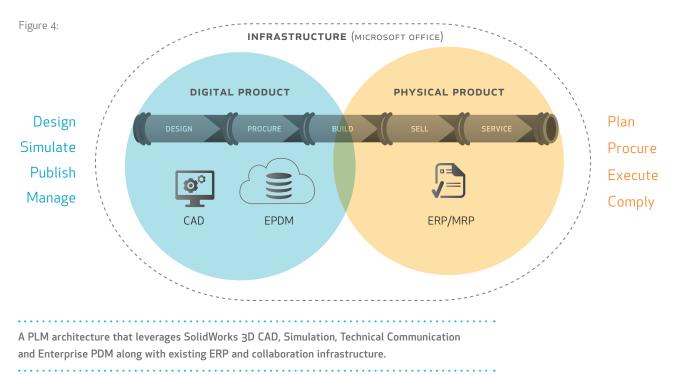| PLM Technology Need	What It Is	How to Achieve It
Concept and detail design capture	2D/3D parametric, feature-based CAD, detail drawings	SolidWorks 3D/2D CAD, DraftSight
Design validation and simulation	Simulation using Finite Element Analysis (FEA), kinematic & motion studies, tolerance analysis, etc	SolidWorks 3D/2D CAD, SolidWorks Simulation
Technical communication	Technical manuals, marketing collateral, sales proposals, shop floor documentation, assembly instructions	SolidWorks 3DVIA Composer
Documentation	Documents, spreadsheets, presentations	Microsoft Office
Office collaboration	Infrastructure	Microsoft Outlook, Microsoft SharePoint, WebEx, GoToMeeting or similar Web services
Document controls	Secure vaulting, electronic routing and approvals, check-in/check-out, version control	SolidWorks Enterprise PDM
Support for global R&D	Multi-site, high-performance replication	SolidWorks Enterprise PDM
Adherence to best practices	Workflow, routing and approvals	SolidWorks Enterprise PDM
Production & Operations	Part masters, bills of materials, inventory, catalogs, suppliers, financials	BoM module of "PLM systems," ERP/MRP or CRM systems

Table 1: PLM is a Collection of Technologies from Different Sources

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Microsoft Office productivity solutions are obvious solutions for managing collaboration. Engineers and business people use Microsoft Office for communications, document creation and collaboration as part of their daily work, often supplemented by Web technologies.

SolidWorks uses industry standards and open technologies to link product data with ERP/MRP, CRM and collaboration infrastructure to optimize production of the physical product.

In this scenario, the new architecture will utilize SolidWorks authoring tools with SolidWorks Enterprise PDM connected to the ERP/MRP system. Typically, bill of materials (BoM) roll-ups and product configuration activities will be controlled by ERP/MRP based on an engineering BoM and possibly a drawing in PDF format from Enterprise PDM. Figure 4 illustrates this architecture.

Figure 4:

INFRASTRUCTURE (MICROSOFT OFFICE)

Design
Simulate
Publish
Manage

DIGITAL PRODUCT

DESIGN   PROCURE   BUILD   SELL   SERVICE

PHYSICAL PRODUCT

Plan
Procure
Execute
Comply

CAD   EPDM

ERP/MRP

A PLM architecture that leverages SolidWorks 3D CAD, Simulation, Technical Communication and Enterprise PDM along with existing ERP and collaboration infrastructure.
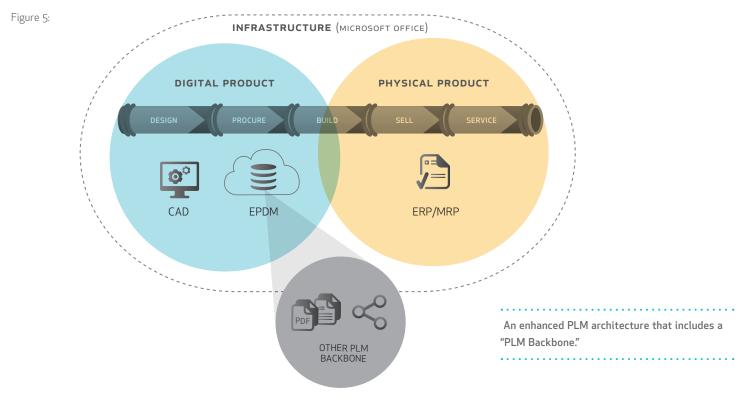
SolidWorks Enterprise PDM software dramatically simplifies the management of product data, so any engineering organization—large or small—can get better control of its engineering data. No special skills or programming are required. Simplified enterprise product data management removes a big architectural hurdle to PLM.

ERP/MRP and CRM systems are the obvious solutions for managing Operations. They automate, connect and simplify materials sourcing and handling, part numbers, manufacturing BoMs, supplier management, finance, sales and service.

At times, companies will be upgrading their PLM strategies from a previous generation and will have legacy systems in place to manage BoMs, product configurations, and so on. Depending on the circumstances, the new architecture may then include a "PLM backbone." If the existing

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PLM infrastructure provides value at the "enterprise level," the legacy system may be utilized to manage higher-level enterprise tasks, such as document distribution, BoM roll-ups and product configuration management outside the control of the ERP/MRP system. In this scenario, the SolidWorks solution would complement the existing infrastructure, managing the technical data package from Engineering and publishing a subset to the PLM backbone. Figure 5 illustrates this architecture.

Figure 5:

An enhanced PLM architecture that includes a "PLM Backbone."

By deconstructing PLM into a set of defined technology needs, you will build the right architecture for your business—not one arbitrarily defined for you by the constraints of a single-vendor system.

Case in Point: A worldwide developer, manufacturer, and marketer of medical devices replaced the 3D CAD component of its single-vendor PLM system with a combination of SolidWorks 3D CAD and Enterprise PDM software. The SolidWorks solution is easier and more intuitive for engineers to use, resulting in lower administrative overhead and total cost of ownership over time. It also integrates easily with the rest of the PLM backbone components on the Product Design side. The SolidWorks solution provides well-structured CAD data and documentation that's "PLM-ready" for the company's SAP ERP system on the Operations side, which handles production activities.

Step 2: Implement using well-established best practices

As you define your architecture, write a plan. Successful PLM strategies start with good processes and thrive with well-established best practices. For example, use well-defined implementation phases of no more than 30 days. Breaking implementation into manageable phases lets you manage change while minimizing disruption. Plus you can demonstrate early success and return on investment (ROI) to senior management. The SolidWorks solution can help you be successful with this phased approach.

First, gain control of your engineering data: it's the cornerstone of a successful PLM strategy. The technical data package needs to be securely managed under revision controls. Design standardization is possible only when your design standards are controlled in a library and easily searchable by engineers and designers. SolidWorks Enterprise Data Management meets these needs and enforces best practices for controlling your data.

Second, automate routine document controls with electronic workflows. This will help move designs through the pipeline smoothly, while expediting manual troubleshooting required for exceptions. Good product data management fixes the "leaky pipe" problem, the natural inefficiencies that occur between processes across the product lifecycle. Product data management with SolidWorks Enterprise Data Management:

• Prevents overwriting of product designs

• Manages check-in, check-out

• Simplifies engineering change orders

• Enables easier design re-use

• Captures history and creates an audit trail

• Creates efficient and accurate engineering bills of materials

Third, look for ways to leverage your 3D Virtual Design content outside Product Design. One area that can deliver big productivity and strategic gains for many companies is technical communication, the creation of technical data to support the sale, assembly and use of your products.

Technical communication used to be the domain of engineers or the Technical Documentation Department. With the availability of easier-to-use publishing tools, however, departments from Sales & Marketing to Field Service to Manufacturing now want to create their own technical communication independently. Today, you can empower these departments to use 3D Virtual Design content directly, using SolidWorks 3DVIA Composer (a multimedia technical communication tool for non-engineers) and the centralized data library managed by SolidWorks Enterprise PDM. For example, a manufacturing engineer could use 3D CAD data to create 100% graphical assembly instructions for an offshore manufacturing plant where the workers speak little English, or Sales & Marketing could create animated "fly-through" videos of a complex mechanical product.

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Fourth, extend the use of your 3D Digital Product data into ERP and other business systems. SolidWorks makes it easy to integrate product design data with the corporate systems (such as ERP) and office productivity infrastructure (Microsoft Office) that run the business and cooperate in PLM.

Case in Point: A German-based manufacturer of mobile ticketing and parking systems uses SolidWorks 3D CAD and Enterprise PDM software to streamline product engineering, design, and innovation. The SolidWorks solution enables easier search and reuse of parts, simplified management of drawings and BoMs, and improved workflow, with minimal customization and low total cost of ownership. SAP is used for managing production data, items and BoMs for released products and configurations, and requires quite a bit of customization. XML handles data transfer between SolidWorks Enterprise PDM and SAP.

Step 3: Focus on your people

A successful PLM strategy requires technology adoption by many people, from engineers in Product Design to manufacturing planners, buyers and technical staff in Operations. By choosing technologies for PLM that are intuitive, easy to use and based on standards, high user adoption will drive success. Be sure to include training for each phase of the project rollout, focusing on key topics such as 3D modeling best practices, use of standard design libraries, document control processes, and design release.

By following this three-step approach, many SolidWorks customers will be able to achieve their operations goals with a combination of their 3D CAD design, simulation, technical communication and product data management applications plus Microsoft Windows and Office applications plus their ERP, MRP and CRM systems.

SolidWorks solutions for practical PLM

SolidWorks makes PLM easy with product design tools that are easy to use, standards-based, integrated and scalable for achieving practical PLM.

SolidWorks 3D CAD software is used by more than 1.7 million design professionals worldwide, representing 146,000 organizations. SolidWorks 3D CAD users like the combination of power and simplicity, which enhances their productivity and creativity. They also like being part of an active, growing, enthusiastic and supportive worldwide user community—one that readily shares ideas and tips. Business owners benefit from a broadly available global market of SolidWorks skills, whether they are hiring, outsourcing, or looking for partners.

SolidWorks 3-D CAD is part of an integrated suite of products for 3D design, simulation, product data management, technical communication, and sustainable design. All products use standards-based interfaces and core technologies based on Microsoft Windows and Microsoft SQL Server.

By helping you integrate and automate your product design and engineering tools, SolidWorks solutions enable detailed product design to take place simultaneously with design validation, technical communication and product data management. You can iterate, test and fine-tune designs more quickly, and make better decisions faster and with more confidence.

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SolidWorks Enterprise Product Data Management manages CAD models plus all documentation as they evolve, effectively administering the technical data package that defines the Digital Product. Enterprise PDM is based on standards: it uses Windows Explorer and Microsoft SQL Server database for storage, fast indexing and search of data vaults, and it provides access either through Windows or a Web interface. Enterprise PDM works the way your people work—intuitively via Windows and the Web, with no programming or data management experience required. Workflow enables adherence to best practices for document controls and signoffs. Integration with ERP/MRP, CRM, PLM backbones and other corporate IT infrastructure is based on XML standard interfaces.

Leveraging 3D design content in technical communication is easy and straightforward with SolidWorks 3DVIA Composer and Enterprise PDM. Engineering can share designs with Sales, Marketing and Manufacturing—without re-mastering any data. Data associativity ensures that design changes propagate automatically to downstream documents, eliminating mistakes and costly rework.

Case in Point: A German-based manufacturer of machine tools uses SolidWorks 3D CAD, Simulation and Enterprise PDM software for engineering and product design. The SolidWorks solution enables easier management of drawings and BoMs for parts and smaller assemblies, easier search and reuse of parts, and more control over workflow, along with lower total cost of ownership and simpler customization. The company uses Infor10 ERP Enterprise (Infor LN) for secure management of high-volume production data, items and BoMs for released products. XML handles data transfer between Enterprise PDM and Infor LN.

With SolidWorks' products and practical, three-step approach to PLM, you can securely and simply manage your most important intellectual asset: your product designs. You can strengthen your Digital Product data and create better, more complete engineering data for Operations. Results become more predictable and ROI is faster, because users are more likely to adopt PLM—it works the way they already work.

Get going with PLM today

SolidWorks is capitalizing on its legacy of radically simple design tools to bring PLM into the modern world. Our practical approach to PLM reduces the risk and speeds the rewards. So, you can create more-compelling products, move products through the pipeline faster, connect Product Design and Operations more efficiently, and achieve compliance.

CAD / Simulation

+

EPDM

+

ERP/MRP

= PLM

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To learn more about SolidWorks and its practical approach to PLM, please see the
additional resources below or call 1 800 693 9000 or 1 781 810 5011.

Additional Resources

Solutions

3D Design

http://www.solidworks.com/sw/products/10141_ENU_HTML.htm?scid=hp_tab_products_3d

2D CAD Software for DWG Files

http://www.3ds.com/products/draftsight/overview/

Simulation

http://www.solidworks.com/sw/products/10169_ENU_HTML.htm?scid=hp_tab_products_sim

Sustainable Design

http://www.solidworks.com/sw/products/10187_ENU_HTML.htm?scid=hp_tab_products_sustainability

Technical Communication

http://www.solidworks.com/sw/products/3dvia-composer-product-communication-software.htm?scid=hp_tab_
products_techcomm

Product Data Management

http://www.solidworks.com/sw/products/10157_ENU_HTML.htm

ROI Tools and Calculators

PDM ROI tool

http://www.solidworks.com/sw/products/epdm-roi-tool.htm?scid=ba_pp_ epdmonlinecalculator _nov11

Customer Stories

ACUTRONIC

http://www.solidworks.com/sw/successes/customer-story.htm?record=ACUTRONIC&id=4036

Anderson Dahlen, Inc.

http://www.solidworks.com/sw/successes/customer-story.htm?record=Anderson-Dahlen-Inc&id=4405

Automatic Systems, Inc.

http://www.solidworks.com/sw/successes/customer-story.htm?record=Automatic-Systems-Inc&id=2497

Babcock & Wilcox Company

http://www.solidworks.com/sw/successes/customer-story.htm?record=Babcock-and-Wilcox-Company&id=1725

Burlington Technologies, Inc.

http://www.solidworks.com/sw/successes/customer-story.htm?record=Burlington-Technologies-Inc&id=3709

ECCO

http://www.solidworks.com/sw/successes/customer-story.htm?record=ECCO&id=4537

FL Smidth and Co., A/S

http://www.solidworks.com/sw/successes/customer-story.htm?record=FL-Smidth-and-Co-A/S-&id=4073

Huddig AB

http://www.solidworks.com/sw/successes/customer-story.htm?record=Huddig-AB&id=2872

Matti Technology AG

http://www.solidworks.com/sw/successes/customer-story.htm?record=Matti-Technology-AG&id=4272

Munters Corporation

http://www.solidworks.com/sw/successes/customer-story.htm?record=Munters-Corporation&id=982

NEXX Systems, Inc.

http://www.solidworks.com/sw/successes/customer-story.htm?record=NEXX-Systems-Inc&id=3684

Roche Diagnostics Graz Gmbh

http://www.solidworks.com/sw/successes/customer-story.htm?record=Roche-Diagnostics-Graz-GmbH&id=3577

Zaugg Maschinenbau-AG

http://www.solidworks.com/sw/successes/customer-story.htm?record=Zaugg-Maschinenbau-AG&id=4102

Partner Applications and Deployment Assistance

Service Partners for Enterprise PDM

http://www.solidworks.com/sw/products/service-partners.htm

Partner Products

http://www.solidworks.com/sw/products/10469_ENU_HTML.htm

Forums

https://forum.solidworks.com/thread/41521

Blogs

http://blogs.solidworks.com/solidworksblog/2011/09/configurable-pdm.html

Screencasts

http://www.solidworks.com/sw/resources/videos/product-data-management-screencasts.htm

White Papers

http://www.solidworks.com/sw/data-management-pdm-whitepapers.htm

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