

STREAMLINE DEVELOPMENT OF INDUSTRIAL MACHINERY AND HEAVY EQUIPMENT

White Paper



OVERVIEW

To succeed in today's competitive global market, manufacturers of industrial machinery and heavy equipment must find ways to compress design cycles and accelerate product time-to-market, while simultaneously controlling costs, increasing product complexity, and delivering consistently high levels of quality. Meeting these challenges requires that you modernize your product development systems and implement an integrated 3D design platform, so you can realize the benefits of automation and eliminate the unnecessary tasks, costs, and delays associated with traditional, non-integrated approaches to machine design. By taking advantage of a proven integrated 3D environment like the SOLIDWORKS® design to manufacturing ecosystem, you can design, validate, and produce higher quality, better-performing machines in shorter amounts of time—and at lower cost.

REVAMPING DEVELOPMENT, MANUFACTURING PROCESSES CRITICAL FOR SUCCESS IN TODAY'S MACHINE DESIGN MARKET

Whether you design industrial machinery or heavy equipment as standard products to be sold at volume, or as unique models engineered to meet the specific needs of a single customer, you face the daunting pressures brought on by increased competition in a global market. Customers today not only demand shorter and shorter lead times for all types of machine design—including custom one-off designs, standard models, or machines having a variety of configurable options—they also want them to perform better and provide greater capabilities.

How your organization responds to these market pressures will have a direct impact on your company's profitability and success. You can't just increase resources—spending freely to produce more sophisticated products more quickly, as if money were no object—or continue working in a manner that was effective in the past, but must find ways to work more efficiently, intelligently, and cost-effectively. Controlling development costs is just as critical to your success as shortening development cycles. Thus, you need integrated 3D design, engineering, and manufacturing tools that can help you accelerate large assembly design, increase design reuse, reduce prototyping requirements, facilitate the transition to manufacturing, minimize warranty claims and field failures, and improve your overall quality processes.

In addition to needing to save time and control costs, competing in today's global industrial machinery and heavy equipment markets demands improved communications. These include streamlined internal data exchanges and better interactions with your customers—during pre-bid exposure via online and traditional marketing materials; and throughout the development process—from the initial proposal through design reviews, and on into the preparation of final documentation and operating manuals. When you combine requirements for time savings, cost reductions, and more effective communications with the need to deliver higher quality, increasingly innovative, more sophisticated products, the traditional, sequential, non-integrated approach to machine design is woefully inadequate for achieving these goals.

Succeeding in today's challenging machine design environment requires manufacturers to automate processes by upgrading from methods that rely on non-integrated, point solutions in favor of faster, better-controlled, data-driven, concurrent, fully integrated 3D design, validation, and manufacturing approaches. This paper examines how traditional machine design methods and technologies can hold your organization back, how you can streamline development with a fully integrated 3D platform, and how the integrated SOLIDWORKS design to manufacturing ecosystem provides you with the greatest competitive advantage.

TRADITIONAL, SEQUENTIAL MACHINERY DEVELOPMENT DOESN'T CUT IT ANYMORE

The traditional, step-by-step, non-integrated approach to developing industrial machinery and heavy equipment carries a plethora of limitations that diminish a product development organization's competitiveness in today's global market. These limitations involve the duplicative effort, unnecessary tasks, and numerous data exchanges associated with working with a variety of non-integrated tools for machine design, validation, manufacturing, quality control, assembly, and documentation, all of which adds time, costs, and a greater probability of errors to the process.

Wasted Time

It doesn't matter if you are using 2D tools or non-integrated 3D modeling applications for machinery design, the lack of data integration across functions that are critically important adds time to your development process and lengthens time-to-market. The lack of data compatibility among your CAD application, finite element analysis (FEA) tools, product data management (PDM) system, quality control software, CAM application, and assembly instruction and documentation preparation tools results in duplicative efforts and unnecessary tasks. Data incompatibility forces you to operate sequentially because of the need to import/export and convert/translate files to support other functions. Working in a non-integrated development environment also inhibits your capacity for making design changes quickly and easily, and complicates your ability to communicate efficiently and effectively with customers, resulting in additional delays.

STREAMLINING THE DESIGN OF INDUSTRIAL EQUIPMENT

1 REQUEST COMES IN

MRD
(marketing request)

RFP/RFQ
(customer request)

2 ASSEMBLE TEAM

Mechanical
Engineers

Electrical
Engineers

Purchasing

Systems
Engineers

Manufacturing



KEY QUESTIONS

How do we solve this?
Is it similar to something we
developed before?
If so, how do we find
the assets?
Can we build it and what
are the risks?
Do we need to
start from scratch?

3 DEVELOP PROPOSAL

With SOLIDWORKS you can easily answer the questions raised in the project request.

PRODUCT STRUCTURE
Use PDM to find existing designs and begin to assemble the product structure with SOLIDWORKS Treehouse.



CONCEPTUAL DESIGN
Determine what complex parts need to be designed.



4 DESIGN ITERATIVELY

With the SOLIDWORKS integrated approach to product development, you can run a concurrent development workflow for design and manufacturing:

Verify performance during design and reduce risk while you explore alternatives

 **DASSAULT SYSTEMES** | The **3DEXPERIENCE**® Company

 **SOLIDWORKS**

Unnecessary Costs

Time is money, but there are also a litany of unnecessary costs associated with developing machinery in a sequential, non-integrated fashion that have nothing to do with time. Do you rely too heavily on physical prototyping or are you utilizing integrated FEA simulation tools to minimize prototyping cycles? Is it easy for you to find and reuse proven design concepts or do you often need to start from scratch? Are you leveraging 3D design data throughout the development and manufacturing process—for design visualization; design validation; electrical schematics creation; electronic (PCB board) design; inspection reports; cost estimating/quoting; generation of bill of materials (BOM), product manufacturing information (PMI), and geometric dimensioning and tolerancing (GD&T) information; CAM tool path generation; and product documentation preparation? Can you make changes quickly and easily at any stage of the process or do such changes cost too much?

Inconsistent Quality

Trying to maintain consistently high levels of quality while also attempting to accelerate time-to-market and reduce costs is a losing proposition if you continue to work in a sequential, non-integrated way, because the steps that many manufacturers choose to cut from the process—the traditional engineering tradeoff—can influence and affect the overall quality of your products. Do you use design simulation technology to check machine performance? Are you maximizing design reuse? Are you assessing the manufacturability of designs as part of your process? Are your quality and revision controls formalized and tightly managed? Have you identified errors related to file transfers and data conversions? Does data incompatibility limit your ability to make design changes quickly and easily? Does this prevent you from making quality improvements late in the process?



...a case in point

Russell Mineral Equipment (RME) is the world's leading manufacturer and supplier of specialized equipment and services for the hard rock mining industry.

Since purchasing SOLIDWORKS 3D design software in 1997, RME has expanded its SOLIDWORKS implementation to include additional integrated solutions, including SOLIDWORKS Simulation analysis, SOLIDWORKS PDM Professional, SOLIDWORKS Electrical 2D schematics, SOLIDWORKS Electrical 3D design, and SOLIDWORKS Composer™ technical communication software.

“With SOLIDWORKS solutions, we’ve grown from a project-based company into a production company,” says RME SOLIDWORKS Coordinator Daniel Haines. “SOLIDWORKS PDM software formalizes and controls our actual procedures and workflows, from initial proposal development through design, production planning, and release of drawings and models to production.”

By implementing the integrated SOLIDWORKS 3D design to manufacturing ecosystem, RME has shortened machine design time from three months to seven days, reduced proposal/quoting preparation time from a week to a day, cut proposal and quote drawing generation time from six hours to 15 minutes, and increased production volume fourfold.

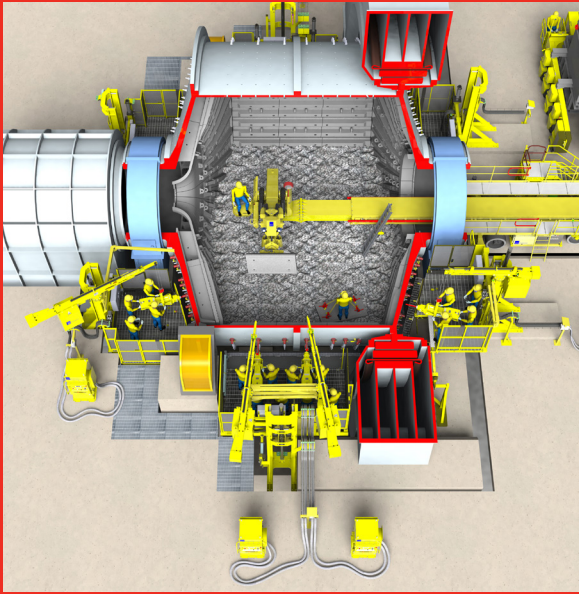
Read the full story here: [Russell Mineral Equipment Case Study](#).

CONCURRENT, INTEGRATED MACHINERY DEVELOPMENT BOOSTS COMPETITIVENESS

Developing and producing more innovative, higher quality industrial machinery and heavy equipment in less time and at lower cost is the very definition of success in today's competitive machine design market. Achieving this success requires a level of automation that is only possible through the use of integrated 3D design technologies, concurrent workflows, total data compatibility/management, and the ability to completely leverage 3D design data across all vital functions. By utilizing an integrated, 3D development ecosystem for machine design, validation, manufacturing, quality control, assembly, and documentation, you can boost efficiency, control costs, and improve quality—all at the same time.

Greater Efficiencies

With an integrated 3D machine design platform, you can take advantage of workflow automation to completely eliminate duplicative tasks and redundant efforts—as well as trim time wasted on file transfers and data exchanges—and achieve additional efficiencies by completing certain steps in the process concurrently instead of consecutively. For example, you can use design configuration tools to automatically create an entire family of products from a single, base design; automatically generate BOM, PMI, and GD&T information for the entire line; and begin creating product documentation in the time that it would take to model a single design in the past. Customer communications in a 3D integrated system become virtually instantaneous, and because 3D design technology is parametric, design changes at any stage of the process ripple across all related data, including manufacturing tools paths, product documentation, and assembly instructions.



...a case in point

SOCAGE s.r.l. is a leading manufacturer of aerial work platforms and specializes in the production of truck-mounted aerial work platforms.

SOCAGE chose to standardize on SOLIDWORKS solutions because they are easy to learn and use, support integrated design simulation, and provide better value for the price. Today, SOCAGE relies on SOLIDWORKS Premium design and analysis, SOLIDWORKS Simulation Professional analysis, SOLIDWORKS PDM Professional, and SOLIDWORKS Composer™ software solutions.

“SOLIDWORKS software makes the whole design process more efficient and faster, because many of the steps that previously required manual tasks are automated—such as drafting, projecting sections, views, and assembling schemes,” says Technical Director Fabio Di Minico.

By implementing integrated SOLIDWORKS solutions, SOCAGE has shortened its development cycles and time-to-market, increased the number of projects completed each year, cut documentation costs in half, and improved product performance and reliability.

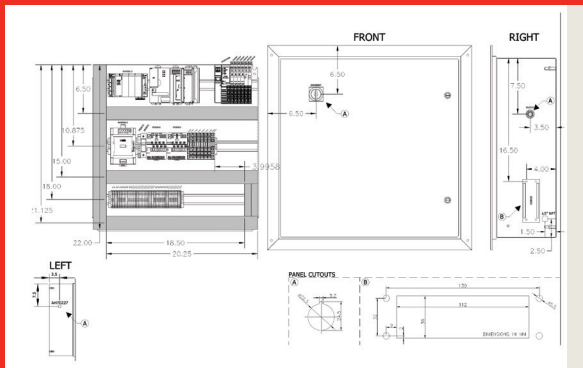
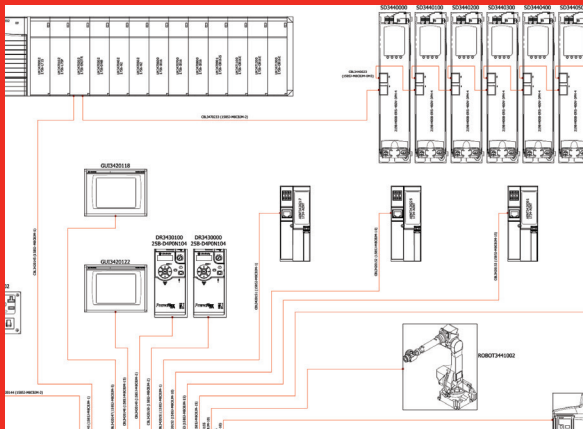
Read the full story here: [SOCAGE Case Study](#).

Cost Savings

Accelerating machine design cycles won't blow the budget if you use an integrated 3D development platform. Potential cost savings related to working in an integrated 3D design environment include reduced prototyping requirements, through the greater use of FEA simulations for virtual prototyping iterations and design validation; increased design reuse by leveraging the PDM system to advance efforts toward modular design; and more extensive use of 3D CAD data to perform other functions, such as design visualization; electrical schematics creation; electronic (PCB board) design; inspection reports; cost estimating/quoting; generation of BOMs, PMI, and GD&T information; CAM tool path generation; and product assembly instructions and documentation preparation. With integrated parametric 3D design technology, you can make design changes at any stage of the process—your change will ripple across all related data, including manufacturing tools paths, product documentation, and assembly instructions—without incurring additional costs.

Improved Quality

An integrated 3D design environment will complement your quality improvement efforts in a number of ways. In addition to supporting the use of integrated FEA simulation tools, to identify and resolve potential performance issues, and an integrated inspection application, to generate inspection requirements and catch errors in manufactured components, an integrated 3D system provides the structure and controls that you need to consistently maintain high levels of quality. Integrated PDM not only provides the workflow constraints needed to drive development processes forward, it also will improve your handling of engineering change orders (ECOs) and encourage reuse of proven design solutions. Increased mechanical/electrical collaboration can eliminate space issues surrounding electrical panels and housings. With an integrated parametric 3D development ecosystem, design changes become so fast and simple that you will be able to take steps to improve quality at any time, instead of waiting to make improvements to a future model.



...a case in point

Manufacturers across North America rely on ProVantage Automation to design, produce, test, install, and support automated manufacturing systems.

ProVantage has used SOLIDWORKS mechanical design software since the company's inception to develop the mechanical aspects of its automation systems. Recently they sought to realize similar productivity gains in the electrical design of its machines. ProVantage chose SOLIDWORKS Electrical Schematics software because of its ease of use, high-quality schematics output, and strong local support.

"When you factor in the added detail and accuracy, our investment in SOLIDWORKS Electrical Schematics software has proven to be wise," notes General Manager Peter Graham. "By integrating electrical and mechanical design with SOLIDWORKS software, we've become more efficient in designing and selling our solutions, which has helped us to become more profitable."

By implementing SOLIDWORKS Electrical Schematics software, ProVantage cut electrical design time by 75 percent, increased productivity by 30 percent, quadrupled its business in just 18 months, and improved the accuracy of assembly documentation.

Read the full story here: [ProVantage Automation Case Study.](#)

SOLIDWORKS INTEGRATED 3D ECOSYSTEM STREAMLINES DEVELOPMENT AND MANUFACTURING

Manufacturers of industrial machinery and heavy equipment can maximize the time, cost, and quality advantages of using an integrated 3D development platform and streamline development processes by implementing the integrated SOLIDWORKS 3D design to manufacturing ecosystem of design and engineering solutions. Using integrated SOLIDWORKS mechanical design, electronic design, electrical schematics, simulation, product data management, model-based definition (MBD), inspection, communication, documentation, and visualization solutions, you will realize the greater efficiencies, cost reductions, quality improvements, and effective communications that are essential to your future success.

Mechanical Design

SOLIDWORKS Premium 3D mechanical design software will help you design better, more accurate products more cost-effectively and rapidly—50-percent reductions in design cycles are common—allowing you to satisfy demands for shorter lead times. Because SOLIDWORKS is parametric, and updates and propagates design changes to models and drawings automatically, making design changes doesn't create duplicative effort or delays. Industry-leading large assembly, interference detection, and sheet-metal design tools—as well as integrated simulation and design for manufacturability capabilities—are perfectly suited to large machine design. And, you can use the same SOLIDWORKS mechanical design model data to support all downstream engineering and manufacturing functions.

Design Visualization and Communication

Using your SOLIDWORKS 3D CAD model, you can efficiently create photorealistic renderings and animations to support design visualization with SOLIDWORKS Visualize software, and easily share design information with customers via email through the use of SOLIDWORKS eDrawings® tools. There's no need to extrapolate complex machine designs from 2D line drawings with the integrated SOLIDWORKS design to manufacturing ecosystem, because you can quickly create 3D renderings that are virtually indistinguishable from photographs, and then use tools like cutaways and transparency to fully interrogate machine designs. With the new SOLIDWORKS 3D Interconnect capability, you will also be able to seamlessly work with design data in other 3D CAD formats, enabling you to collaborate more effectively with customers and partners, and allowing you to reuse design data accurately and efficiently.

Electrical and Electronic Design

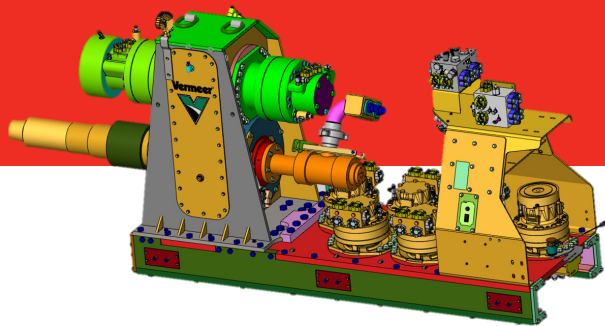
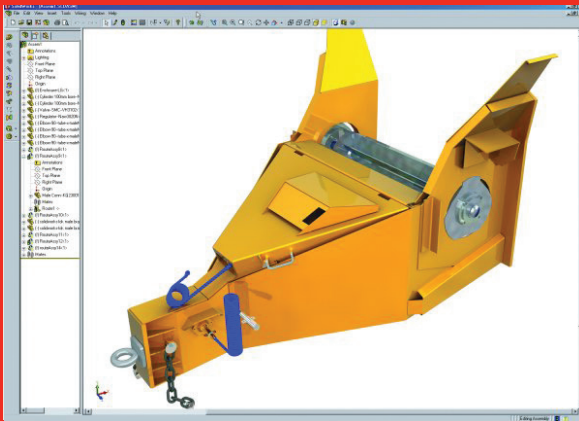
Unlike all other mechanical design packages, SOLIDWORKS supports electronic printed circuit board (PCB) design within the mechanical design environment via SOLIDWORKS PCB software, which provides an unmatched level of mechatronics collaboration between mechanical and electrical engineers. Using SOLIDWORKS Electrical 3D and SOLIDWORKS Electrical Schematics software, you can complete your electrical designs and electrical schematics from within your mechanical design envelope, and then automate the placement of wiring and piping runs, including the configuration and positioning of wire and cable harnesses.

Design Validation/Virtual Prototyping

Integrated SOLIDWORKS Motion (Kinematics and Dynamic Motion) and SOLIDWORKS Simulation (FEA) software provide the tools that you need to conduct virtual prototyping of machine design concepts early in the conceptual design phase without having to incur the delays and costs associated with physical prototyping. Whether you need to perform structural, deformation, vibration, thermal, flow, or nonlinear analysis, SOLIDWORKS Simulation packages provide the capabilities that meet your needs—all from within your 3D modeling environment.

Product Data Management

The SOLIDWORKS PDM solution does much more than manage your product design data. It allows you to fully automate your machine design workflows, tightly control revisions, and encourage designers and engineers to reuse proven concepts. SOLIDWORKS PDM provides fast system search capabilities, so you can find the design, assembly, or component that you're looking for with little effort. With email notifications and electronic signatures, the system is configurable and scalable to your specific requirements. SOLIDWORKS PDM software lets you automate your standard product development workflows, ECO approval and execution processes, and any other processes related to your product development effort.



...a case in point

Vermeer Corporation has become a global leader in the manufacture of machinery and equipment for the agricultural, forestry, excavating, mining, and drilling industries. To build the best possible products, Vermeer utilizes advanced design and engineering tools.

The company was an early adopter of 3D CAD technology, and since then has implemented additional integrated SOLIDWORKS solutions to further automate its development processes.

“At Vermeer, we are continually developing new equipment and machinery designs and expanding our products lines,” explains Senior Applications Specialist Greg Johnson. “To accomplish our goals, we need to consistently become more and more efficient, which is why we’ve added SOLIDWORKS simulation, product data management (PDM), and technical communication tools.... We are getting more and more efficient, and our development and production throughput have grown since we implemented [SOLIDWORKS] PDM. Our machines involve very large assemblies—some in the 10,000-part range—so finding ways to automate processes is important.”

By implementing SOLIDWORKS integrated solutions, Vermeer has automated its development workflows, increased development and production throughput, shortened and formalized its engineering change process, and improved the quality of its products and documentation.

Read the full story here: [Vermeer Case Study](#).

Quality Controls

In addition to realizing the product quality benefits associated with using SOLIDWORKS Simulation technology for virtual prototyping and design validation, and with using SOLIDWORKS PDM to more tightly control revisions and all associated product design data, you can leverage SOLIDWORKS Inspection software to formalize your quality assurance and inspection procedures and generate inspection reports. With SOLIDWORKS inspection, you will be able to document, track, and know when vendors supply inferior or defective parts long before they can negatively affect your business.

Transition to Manufacturing

When it's time to transition a product design into manufacturing, SOLIDWORKS Premium software provides a range of valuable capabilities. You can use the Costing module to estimate what it should cost to build your product and use that information to secure and negotiate quotes. The software's Design for Manufacturability tools enable you to assess whether your current design can actually be made or whether you need to make modifications to support manufacturing processes. SOLIDWORKS Premium also allows you to automatically generate production drawings and BOM information without the tedious effort required by non-integrated systems.

Production

Are you ready to design and manufacture in 3D? SOLIDWORKS MDB software enables you to digitally output all PMI in 3D—including GD&T information—permitting you to completely eliminate paper 2D drawings and drive production with the same 3D design data that you utilized for all other functions. While production proceeds—SOLIDWORKS data is directly integrated with leading CAM machining, milling, and manufacturing systems—you can tap SOLIDWORKS Composer software to automate the preparation of assembly instructions, user manuals, and product documentation, again using the same 3D design data that you leveraged for other functions.



...a case in point

Tajfun d.o.o. is the largest manufacturer of forestry equipment in the world, and the growing manufacturer's winches and firewood processors are the equipment of choice for many logging and firewood operations.

According to Project Manager Srecko Pertinac, Tajfun recognized the potential time savings and quality improvements associated with producing user documentation directly from SOLIDWORKS CAD data. "We immediately understood how SOLIDWORKS Composer would provide additional productivity gains by automating the creation of documentation.... To grow the business, we need to develop new products. With SOLIDWORKS Composer software, our designers can focus on development while others create documentation that is more effective for consumers, whether they be production personnel, distributors, or customers."

By adding SOLIDWORKS Composer software to its SOLIDWORKS mechanical design implementation, Tajfun cut documentation creation time by 50 percent, reduced distributor training from a day to an hour, minimized its translation requirements, and freed up resources for new product development.

Read the full story here: [Tajfun Case Study](#).

IMPROVE PROFITABILITY WITH THE INTEGRATED SOLIDWORKS 3D DESIGN TO MANUFACTURING ECOSYSTEM

As a manufacturer of industrial machinery or heavy equipment, your organization faces mounting pressure to design better products faster and at lower cost. Demand for shorter lead times, improved quality, and greater capabilities in machine design is constant, and competition is increasing from every corner of the globe. How your organization responds to these competitive forces will directly affect your company's future profitability and success.

Addressing these market realities while continuing to utilize the traditional, step-by-step, non-integrated approach to product development and manufacturing is improbable if not impossible. Saving time and controlling costs while ramping up quality and innovation requires a more streamlined, automated approach. With an integrated 3D design, engineering, and manufacturing platform like the integrated SOLIDWORKS 3D design to manufacturing ecosystem, you can achieve your efficiency, cost reduction, and quality goals and secure a real competitive advantage, no matter where your products are sold.

To learn more about how the SOLIDWORKS 3D design to manufacturing software can improve your industrial machinery and heavy equipment development and production processes, visit www.solidworks.com or call 1 800 693 9000 or 1 781 810 5011.

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