

THE DISTINCT CHALLENGES OF INDUSTRIAL EQUIPMENT DESIGN

Optimize Your Entire Production Process Using the Newest Technology Breakthroughs for Maximum Benefits

INTRODUCTION

The latest developments in technology, including automation, cloud-based computing, artificial intelligence (AI), industrial internet of things, big data, and machine learning are changing how manufacturers work and interact with customers. These new technologies offer advanced solutions for industrial equipment (IE) manufacturers, enabling the creation, production, and delivery of more efficient and complex machinery, tools, and parts.

IE manufacturers have long grappled with their unique challenges in product development. Whether crafting custom systems for a single client, producing standard products for a larger customer base, or designing one-off equipment for specialized applications, these manufacturers are required to produce increasingly intricate electromechanical systems faster, more efficiently, and less expensively than their competitors.



STAYING AHEAD OF THE GAME

IE manufacturers must stay updated with the latest innovations and incorporate them into their processes to remain competitive and exceed customer expectations, which is no easy task. To stay ahead of the game, manufacturers must fast-track development cycles and expedite product time-to-market, all while enhancing quality and driving innovation.

The traditional step-by-step approach to developing heavy equipment carries too many limitations. Your company's best and brightest from various disciplines—design, engineering, manufacturing, and others—need a simple way to work together and leverage integrated tools. When the common goal is to build, test, and deliver faster and more efficiently, departmental silos must also become a thing of the past.

Moving to an iterative, multi-disciplinary approach can be streamlined with a suite of cloud-based technology solutions that automates the product development process—as much as possible—from concept to delivery. Bringing together all aspects of your business into a single collaborative environment on the cloud can rocket your team's development productivity and its ability to freely work and collaborate from any internet-connected location.

Here are just some of the challenges IE manufacturers face:

1. Customization and Adaptability: Industrial equipment often needs to cater to customer-specific requirements or unique processes. Manufacturers must be able to design adaptable and customizable equipment to meet these varying needs while maintaining internal efficiencies.



2. Data Management: In a competitive environment, getting products to market quickly is critical. Manufacturers must streamline their design processes, optimize their workflows, and leverage modern design tools while improving data management strategies to shorten product development cycles to bring products to market faster.

3. Safety and Reliability: Industrial equipment is subjected to harsh operating conditions such as extreme temperatures, vibration, dust, and corrosion. Designing durable and reliable equipment under these conditions is critical to ensuring uninterrupted operation and minimizing downtime for maintenance or repairs.

4. Environmental and Regulatory Compliance: IE manufacturers must adhere to stringent safety standards and regulations. Ensuring that equipment meets these safety standards and complies with various regulations can be a complex and time-consuming process.

5. Controlling Costs: IE manufacturers must balance the need for advanced features and high-quality materials with the need to keep the budget under control. Designing cost-effective equipment without compromising performance, durability, or efficiency presents a significant challenge.

Furthermore, manufacturers must comply with both local and global environmental laws and regulations.



CHALLENGES AND OPPORTUNITIES

Today's top industrial equipment manufacturers seek innovative production strategies to bring their products to market faster and at competitive prices. They want their manufacturing and production to be data driven, enabling them to keep pace with the broader data economy and utilize big data and analytics to boost profitability. Most importantly, today's IE manufacturers seek suppliers that adopt a product-as-a-service approach to development to facilitate inventing and capitalizing on new markets.

Continue reading to delve into the challenges and opportunities offered by a progressively more demanding industrial equipment market, along with how cutting-edge technologies can enable you to meet and exceed customer and market expectations.



CUSTOMIZATION AND ADAPTABILITY IMPROVE PRODUCTION

An increasing number of industrial equipment manufacturers are investing in cloud-based technologies to streamline the product development process with integrated digital tools—from concept to delivery. Companies that quickly adopt these technologies are more resilient and adaptable to unforeseen market conditions. By implementing digital capabilities, manufacturers can continually optimize operations, making the most of the raw materials, labor, and energy that they invest in producing finished goods.

But what about the flow of the work through the factory?

A factory floor layout can significantly impact the overall performance and productivity of an IE manufacturing operation. A layout not carefully designed for optimal output can disrupt workflow and potentially cause delays or increase the chance of error. Or worse, a poorly designed shop floor could increase the risk of accidents or injuries. A layout that is inflexible can be difficult to adapt to

new processes, technologies, or changes in production requirements. This can lead to increased costs and missed opportunities.

A well-designed factory or production floor layout can reduce waste and increase efficiency. Sequencing equipment and production processes minimize the time and resources required to produce a product. An efficient workflow reduces bottlenecks and ensures that no part of a production process waits for another. A smooth workflow can increase throughput, or the rate at which a product is produced.

Modern cloud-based technology systems should enable you to analyze multiple production scenarios within a virtual environment that digitally depicts your current setup fully rendered in 3D. This makes it much easier to diagnose problems and make better factory layout decisions to improve overall performance.

BEHLEN STREAMLINES FACTORY FLOW

A large fabrication, production, and assembly facility leverages DELMIA's Factory Simulation Engineer to optimize factory layout and flow to produce better products at a lower cost.

[Behlen Mfg. Co.](#), a world-leading metal manufacturer with over 1,100 employees, was founded in 1936 in a garage in Columbus, Nebraska. Three of Behlen's diverse business units operate out of its fabrication, production, and assembly facility in Columbus. Due to over 80 years of operations at the massive Columbus factory, the multiple business units have overlapping production lines and processes, resulting in a stockpile of old, new, and custom-made equipment.

"Our plant layout has become something of a hodgepodge with certain jobs moving back and forth from one end of the building to the other when they could have benefitted from better flow within the factory plant layout," explains Process Engineer James Kucera. "The ultimate goal is to configure the plant to produce better products at lower costs."

After an intensive search, Behlen invested in the cloud-based Factory Simulation Engineer, part of the [3DEXPERIENCE® Works](#) Manufacturing portfolio of solutions. Using a combination of detailed scans, the 3D, 2D, and point-cloud data enables Behlen to model production facilities and simulate the reconfiguration of plant layouts to maximize material flow, boost productivity, and enhance collaboration.

With Factory Simulation Engineer, Behlen has laid the foundation for coordinating many lean manufacturing approaches of smart factories. Behlen will also use the solution to evaluate material, process, and other workflows to improve standardization, efficiency, and collaboration of business and engineering groups across the factory.



"We now have the capability to [digitally] show the business units where there is commonality across their machines, equipment, and processes," says Kucera. Factory Simulation Engineer makes it easy to visualize how individual moves—like bringing in new equipment or tearing out something old—will affect not just their individual operations, but the overall factory flow."

Kucera concludes, "This is critically important for driving lean principles and ensuring that a reconfiguration makes sense. For instance, one move may result in 20 related moves. With Factory Simulation Engineer, we can [virtually] visualize all related moves, make better decisions, and avoid situations where we need to reconfigure two or three times because something was missed."



EFFICIENT DATA MANAGEMENT REDUCES TIME TO MARKET

Every person working in product development knows that product changes are a fact of life. The innovation process, especially with IE design, is replete with changes from the earliest stages of design through final delivery. Changes must be captured, recorded, and stored for easy access in the future. Key stakeholders need to assess the value of any change before signing off on it.

In today's business environment, work is conducted from homes and offices and on the road. Managing the influx of files and storing them in an organized fashion is only the beginning of many challenges. File-naming conventions are often obscure and confusing to many in the organization. Duplicate files can too easily be saved in multiple locations. Released files get reworked without permission. Changes made in one location are not updated in all locations.

For IE manufacturers to remain competitive, technology that captures and shares maturity states and controls file access, permissions, and

privileges is no longer optional. Real-time data is critical to avoiding the risk of being out of sync on model revisions or assembly configurations. Efficiently capturing and managing all that data is no easy task without technology that is purpose-built for handling all that product development data. Efficiently managing design data, assigning tasks, conducting reviews, and sharing ideas give IE manufacturers a strategic advantage.

Modern-day, cloud-based data management solutions can make communicating concerns, identifying issues, and proposing resolutions faster and easier. The shared common data in the cloud updates automatically, so the entire team stays in sync, which increases efficiency. All team members, including customers and suppliers, can participate in the design review process in the cloud from any geographic location. Therefore, potential issues are discovered earlier in the process, making them less costly to resolve. Designers have instant access to other contributors' updates, enabling real-time concurrent design, better decision-making, and faster design maturity.

MP AGRO REDUCES DEVELOPMENT COSTS 50 PERCENT

*MP Agro eliminates revision errors, increases collaboration and innovation, and reduces development costs with **3DEXPERIENCE Works** and **SOLIDWORKS**®.*

Founded in 2012, [MP Agro Máquinas Agrícolas](#) makes agricultural equipment more efficient, productive, and reliable in the field. In just 10 years, the company has become the leading manufacturer of fertilizer dispensers and spreaders in the Brazilian market.

Although MP Agro was successful, it needed to make its development cycles more efficient, cost-effective, and accurate to support a more aggressive R&D effort. “We had a lot of problems related to revision control with our previous product data management [PDM] system,” Engineering Supervisor Willian Sartori explains. “We were spending a lot of time and money on reworking designs due to people working with the wrong revision or overwriting someone else’s work.”

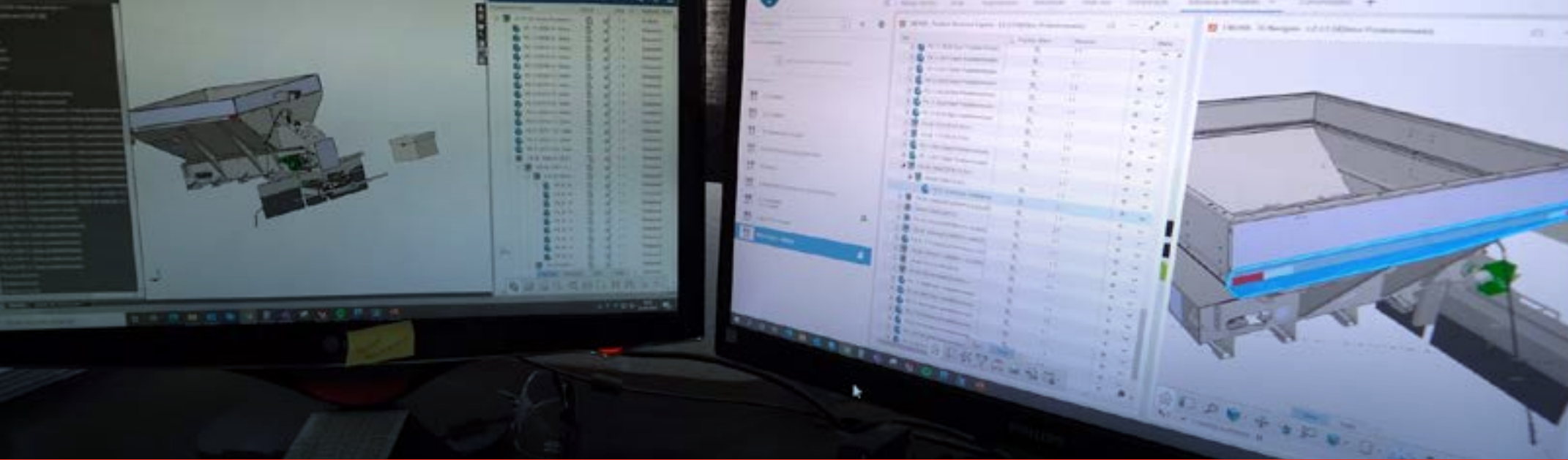
MP Agro also struggled with manually managing product data because its PDM system was not integrated with [SOLIDWORKS](#). The tide turned when the company implemented automated management of **SOLIDWORKS** design data using cloud-based [3DEXPERIENCE Works](#) solutions.

Since implementing **3DEXPERIENCE Works** solutions, MP Agro has cut its development cycles in half and decreased development costs by 50 percent because **3DEXPERIENCE Works** solutions have enabled the company to tighten revision controls and eliminate revision errors, which had occurred frequently. “Our problems ... had more to do with having five people working on the same project and either using the wrong revision or overwriting the right revision,” Sartori recounts.



Because data management solutions on the cloud-based **3DEXPERIENCE** platform make MP Agro more efficient and productive, the company is more able to focus on R&D. For example, increased collaboration and innovation facilitated by the **3DEXPERIENCE** platform led to the development of Bunker, a new insecticide sprayer filling system that reduces the time required to reload a sprayer from an hour to a few minutes.

“As our R&D effort continues to grow and intensify, and our products become more sophisticated, we’ll be adding **3DEXPERIENCE Works Simulation** to expand the types of analyses that we can conduct,” Sartori says. “Our quality has always been good, but with access to **3DEXPERIENCE Works Simulation** analysis capabilities, we anticipate further reductions in the amount of [physical] product prototyping required, helping us to reduce development costs even more.” **3DEXPERIENCE Works Simulation** enables running advanced simulations in the cloud, freeing up local computing resources to maximize productivity.



PRODUCT SAFETY AND RELIABILITY CREATE BUSINESS SUCCESS

Designing industrial equipment with safety and reliability in mind is not just good practice. It's a business necessity that helps IE manufacturers comply with regulations, protect workers, control costs, and build a strong brand reputation.

The foremost concern of IE manufacturers is ensuring the safety of those using the equipment. Due to several factors, including the size and weight of the final products, industrial equipment can be dangerous to operate if not designed properly. Safety features must be integrated into the design to minimize the risk of accidents or injuries. Reliable equipment is also crucial for maintaining productivity. A piece of equipment that breaks down or doesn't perform as expected can cause significant downtime, disrupting the production schedule and incurring additional repair or replacement costs.

Laws and regulations, both national and international, concerning the safety and performance of industrial equipment abound. Failure to comply with these standards can lead to hefty fines, legal complications, and even forced closure of a production facility. Reliable equipment that has been designed to be durable can be significantly less expensive to own because the need for repairs and replacement parts is minimized.

IE manufacturers must rely on technologies that aid in designing and simulating parts and assemblies. Testing designs at regular intervals predicts how parts and assemblies will perform under different conditions, leading to better product quality. It also helps identify potential design flaws earlier in the process, before actual production begins, avoiding unexpected downstream costs. Furthermore, modeling and simulation can predict malfunctions in a virtual environment, preventing costly field failures.

RESEMIN DOUBLES PRODUCT DEVELOPMENT

Resemin combines SOLIDWORKS and 3DEXPERIENCE Works to drastically reduce prototypes by 70 percent, improve product performance, and cut machine delivery times in half.

Founded in 1989 and headquartered in Lima, Peru, [Resemin](#) is the third-largest global manufacturer of underground mining, drilling, and related equipment. The company's drilling equipment provides a better, more cost-effective alternative to traditional drilling rigs for mining and tunneling applications.

Shifting from AutoCAD® 2D tools to SOLIDWORKS in 2008 enabled Resemin to shorten analysis run times from two days to two hours, reduce prototyping by 70 percent, cut its machine delivery times in half, and increase throughput, according to Engineering Manager Fernando Díaz.

"The productivity gains with SOLIDWORKS prompted us to evaluate the [3DEXPERIENCE Works](#) solutions from Dassault Systèmes when we encountered a need to run nonlinear vibration and fatigue analyses to extend the durability of our equipment and develop more innovative products," Díaz explains. The company benchmarked 3DEXPERIENCE Works Simulation against some of the market's top FEA software products.

The results of this benchmark and the solution's compatibility with SOLIDWORKS prompted Resemin to acquire a three-year subscription for Durability Performance Engineer in addition to the 3DEXPERIENCE platform in 2021.

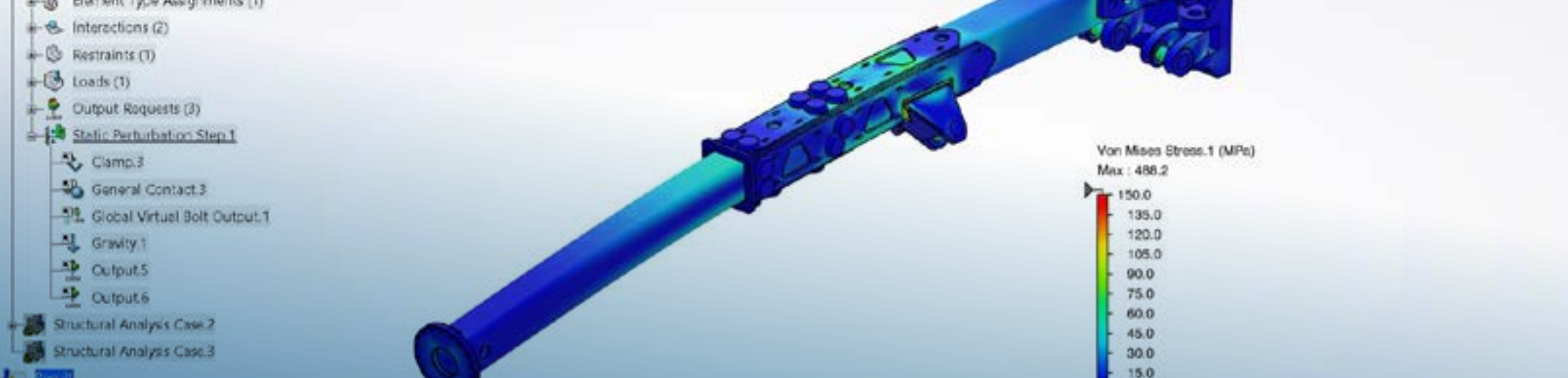
"With the capability that we've gained with Durability Performance Engineer, we are both improving the performance of our existing designs as well as increasing innovation in the design of new



products," Díaz notes. "Working with Dassault Systèmes solutions, we've expanded our product line and doubled throughput from 60 to 115 machines each year."

The simulation tools also support Resemin's overarching product and business objectives that are particular to its underground heavy equipment mining market. "Top manufacturers in our market spend 1.5 to 2 percent of revenue—close to \$2 billion—on product failures and warranty claims," Díaz stresses. "In addition to the loss of revenue, such claims typically result in a loss of customer trust and market share, both of which we need to avoid."

Díaz concludes: "The combination of SOLIDWORKS for design and Durability Performance Engineer for running simulations in the cloud gives us a seamless solution for a synchronized design, modeling, and simulation process, which is critically important for improving product reliability, durability, and performance."



ENVIRONMENTAL AND REGULATORY COMPLIANCE BUILD A SUSTAINABLE FUTURE

The United Nations Sustainable Development Goals suggest that sustainable production is characterized by using resources more wisely to make better products with less. This includes considering everything from material selection to producing products that are easy to recycle. Essentially, sustainable production involves using less energy while creating less waste.

IE manufacturers must comply with local and global environmental laws and regulations, which involve reducing waste, emitting less CO₂, and adhering to industry standards for safety and sustainability. Consequently, sustainability is often among the top priorities for businesses. Global sustainability initiatives require significant changes to business strategies and processes. Beyond creating eco-friendly products, companies must run green production and supply chains that can stem only from a comprehensive sustainability strategy across all aspects of the business.

By leveraging the latest cloud-based technologies that support structured collaboration and data management across the product life cycle, IE manufacturers can help advance sustainability across all points in a product development process, from design through production.

During concept design, engineers can accurately define product requirements that conform to sustainability standards that can be adhered to throughout the life cycle of a project. Designers can optimize product performance by aggregating data from virtual simulation studies and what-if scenarios to determine the overall sustainability footprint. Manufacturing can collaborate with engineering to provide input during the design phase to best leverage lean manufacturing processes and optimize raw material consumption.

Cloud-based technologies enable everyone in the value chain to easily contribute their expertise, which makes it faster and easier for IE manufacturers to hit sustainable production targets with eco-designed products.

YOGIJI DIGI SAVES ENERGY AND INCREASES INNOVATION

SOLIDWORKS and 3DEXPERIENCE Works enable YOGIJI DIGI to dramatically optimize design and cultivate cross-departmental teamwork.

A leading flat steel processing equipment manufacturer in Faridabad, India (just south of Delhi), [Yogiji Digi](#) is saving energy with its sustainable innovations. For example, the company's cold rolling mill designs have resulted in a 2 to 3 percent reduction in rolling power consumption. Additionally, it reduces CO₂ emissions by 356 tons every year.

"We have always focused on energy conservation and the environmental impact of the equipment we develop," says Managing Director Navneet Gill. "Most steel production mills use lots of water in the process. We have designed our mills to use less water compared to other mills. Every year, we save around 3.2 million liters of water [about 845,350 gallons] on each mill."

One of the biggest challenges Yogiji Digi faces is the sheer size and complexity of its flat steel processing equipment. "It takes lots of time to build the equipment from scratch," according to Navneet. "We have been able to overcome this challenge using SOLIDWORKS."

High-speed rolling mill design demands accuracy and precision within microns. "There's no scope for error," says Head of Project Management Aseem Gill. "The design needs to be absolutely perfect." Due to size alone, most industrial machinery contains a staggering number of mechanical and electrical components. "SOLIDWORKS has made life a lot easier," emphasizes Aseem. "Generating the bill of materials used to take me two days. With SOLIDWORKS, it takes just two hours."



Yogiji Digi also leverages SOLIDWORKS to improve the designs of its behemoth machinery. "We designed the mill housing and complete cold rolling mill assembly for one of our customers," explains Chief Operating Officer Varun Rana. "It ultimately helped us reduce the mill housing weight by up to 30 percent."

The cloud-based 3DEXPERIENCE Works portfolio of product development solutions has helped the design and manufacturing teams at Yogiji Digi to collaborate in real time. "It [cloud-based collaboration] also helps in the assembly of the goods because we manufacture such big lines," says Gill. "Each of the lines is more than 150 meters [over one football field long], sometimes 200 meters."



DESIGN OPTIMIZATION SUPPORTS COST CONTROL

Industrial equipment design often involves a high degree of complexity, including an abundance of interacting parts containing diverse materials. Equipment often performs numerous functions in harsh operating conditions. Designers must consider all these factors while ensuring the final design is cost-effective without compromising safety, durability, or performance—equipment failure is not an option.

When leveraging design validation and optimization solutions for conducting simulation studies, IE manufacturers typically require fewer physical prototypes in the product development process, which means fewer costs and faster time to market. By simulating various load cases and working conditions, designers can understand how an industrial machine will perform before it is built. Therefore, they can optimize the design in a digital environment to ensure it performs well under worst-case scenarios.

Furthermore, IE manufacturers must often meet important safety requirements. Digitally validating designs for rigorous stress and strain analysis ensures a product will not fail under expected loads, reducing the risk of accidents and improving overall safety. By strengthening these critical areas before manufacturing, designers can improve a product's lifespan and reliability. Equipment that customers can rely on produces repeat business.

Cloud-based simulation solutions can significantly accelerate the process through virtual testing at any design stage, enabling engineers to quickly analyze and modify models to reach the best solutions faster and more efficiently. Thorough simulation testing should also discover potential manufacturing problems during the design phase, well before the parts are sent to production, thereby saving potential time and money downstream.

KOSES SPEEDS DESIGN OPTIMIZATION BY 40 PERCENT

*KOSES slashes design optimization time, shortens product development cycles, and streamlines data management and collaboration with SOLIDWORKS and **3DEXPERIENCE Works** solutions.*

Korea Semiconductor System [KOSES](#) was established in 1990 and has grown steadily ever since, with the goal of expanding beyond the Korean market to become a global leader in the rapidly changing IT industry. Already a leading Korean information technology company, KOSES is on track to leap forward as a world-class advanced semiconductor manufacturing equipment producer.

KOSES used [3DEXPERIENCE Works](#) solutions along with its existing SOLIDWORKS installation to dramatically shorten the product development cycle for its OffLoader.

KOSES had routinely outsourced their vibration analyses but now had the tools to conduct tests internally. “It takes 40 percent less time to run vibration simulations in the cloud using Structural Performance Engineer versus outsourcing analysis,” says CTO Jung Jai-Lee. “With **3DEXPERIENCE Works** solutions, we have been able to shorten product development time overall by about 20 percent.”

In addition to shortening design cycles, implementing **3DEXPERIENCE Works** solutions helps KOSES reduce development costs that extend beyond outsourced analysis fees. For example, a five-person development team using **3DEXPERIENCE Works** solutions completed work on the OffLoader in record time, reducing costs substantially.

“Based on the fact that the application of **3DEXPERIENCE Works** solutions has reduced the design cycle completed by a five-person development team by 10 days, it’s expected to reduce the total development cost for the OffLoader by about 7 percent,” says Jai-Lee.



Jai-Lee concludes: “Multiple times a year, new versions of the **3DEXPERIENCE Works** solutions, with additional [and enhanced] features, are released on the cloud [and immediately available to our team]. The advantages of the cloud—the ease of use wherever you go—will not only increase the efficiency of our internal operations but also help accelerate time to market by allowing us to share and collaborate with external partners easily.”

The company can collaborate more effectively on a cloud-based platform without the costly IT overhead and without replacing its SOLIDWORKS design tools, resulting in an accelerated development cycle and faster times to market.

“The **3DEXPERIENCE** platform allowed us to fast-track collaboration by providing instant access to data uploaded by multiple users without the need for a top-level assembly organizer,” O’Connell stresses. “The solutions enabled us to improve communication within and efficiency across the development team, eliminated the delays we previously encountered, and helped us accelerate development.”



TRANSFORM YOUR BUSINESS TODAY

To address these and future challenges, IE manufacturers must shift from disconnected tools and processes to fully integrated, cloud-based, 3D design-through-manufacturing solutions to keep pace with ever-changing technology and ever-evolving customer wants and needs.

Industrial equipment customers have high expectations for quality and reliability. They demand robust, consistently reliable equipment made from superior materials that are designed to withstand constant use without faltering. Safety must never be compromised. In addition, eco-friendly products and materials, such as electric motors, bio-degradable lubricants, and solar-powered generators, are becoming more and more popular.

In this era of rapid technological improvements, IE customers expect their equipment to continually evolve to stay up-to-date. In today's tech-laden landscape, AI technology, automated product features, and internet-connected capabilities are no longer nice-to-haves but must-haves in tools and equipment.

Rather than conducting business as usual, IE manufacturers can leverage integrated product development tools from the **3DEXPERIENCE Works** portfolio to beat the competition and increase agility in a shifting economic landscape. Existing **SOLIDWORKS** customers can connect to the portfolio to expand and optimize their current investment in **SOLIDWORKS** to increase efficiencies, facilitate collaboration, foster innovation, and speed time to market.

The **3DEXPERIENCE Works** portfolio connects all the people, applications, and data needed to take products from idea to delivery. It leverages the cloud-based **3DEXPERIENCE** platform to provide a single, unified collaborative environment, enabling everyone involved in product development to contribute to the innovation process. Industry-leading tools and technologies are accessible to everyone on the team.

- **Design** – Create and share product designs quickly, enabling key stakeholders to give and receive feedback throughout the product development process.
- **Simulation** – Quickly validate designs to gain insights into product performance, reliability, and safety at any point in the development process to inform decision-making.
- **Data Management** – Automatically capture and manage all development-related data to manage revisions, work through formal change actions and approvals, and keep project tasks in check.
- **Manufacturing** – Streamline communication between departments—from the back office to the shop floor—to identify and reduce errors at any phase in the process for faster release to production.

Easy remote access to design data is a must for every business. IE manufacturers can easily and securely connect to design, simulation, and manufacturing data in the cloud and then access it from the **3DEXPERIENCE** platform, a single source of truth. Communications among team members are automatically tracked in one accessible location. Plus, data management on the platform is built in, so as designs change, the shared common product data updates automatically in real time so everyone on the project is always in sync.

Contact your local reseller if you'd like to see a demonstration of how you can grow your business and secure a competitive advantage by investing in the right tools that can elevate your IE business to the next level.

Leverage the power of **3DEXPERIENCE** Works to lead the next generation of product development.
To learn more, visit www.3dexperienceworks.com or
contact your local SOLIDWORKS reseller.

Our 3DEXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the 3DEXPERIENCE Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating virtual twin experiences of the real world with our 3DEXPERIENCE platform and applications, our customers can redefine the creation, production and life-cycle-management processes of their offer and thus have a meaningful impact to make the world more sustainable. The beauty of the Experience Economy is that it is a human-centered economy for the benefit of all – consumers, patients and citizens.

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