



Conquering Complexity in Manufacturing Engineering

A PLM Master Class on Faster
Time-to-Production



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Daunting Demands for Manufacturing Engineering

The complexities of manufacturing engineering pose a critical challenge to today's manufacturers. It requires design and production to coordinate closely—without sacrificing the agility needed to respond to market demands. To stay competitive, manufacturers must continually enhance their own speed and operational efficiency to ensure that all departments align on the product specifications mandated by each customer. A failure to align can result in the proliferation of outdated or bad information, creating a domino effect of manufacturing errors with far-reaching consequences.





For example, **Solar Turbines** produces industrial gas turbines used for electric power generation, gas compression, and pumping. They manufacture up to 350 custom, highly complex units a year. Delivering ultra-reliable turbines is essential as they often operate in remote locations, such as drilling platforms in the middle of the ocean. Overcoming these types of manufacturing engineering challenges gives Solar Turbines a significant advantage within their market, qualifying them as a destination brand.



Choreographing Control over Complexity

Manufacturing engineering teams are the connective tissue between product design and manufacturing. They enter the product design bill of materials (BOM) into the enterprise resource planning (ERP) system. Compiling the BOM requires preparation, expert problem-solving, and resourceful diplomacy. Based on the drawings, parts, and notes, manufacturing engineering collaborates with the product design team to get the design production ready.

The path from design concept to manufacturing reality is plagued with operational hurdles, from costly rework due to poor change management to stunted market performance caused by disconnected systems. Manufacturing engineers often lack communication across departments and cannot reliably access the right information at the right time. But what separates industry leaders from the competition is embracing these challenges as opportunities to achieve a more efficient and collaborative manufacturing engineering process.

-  **Communication Barriers**
-  **Disconnected Information Resources**
-  **Change Management**
-  **Siloed Systems**

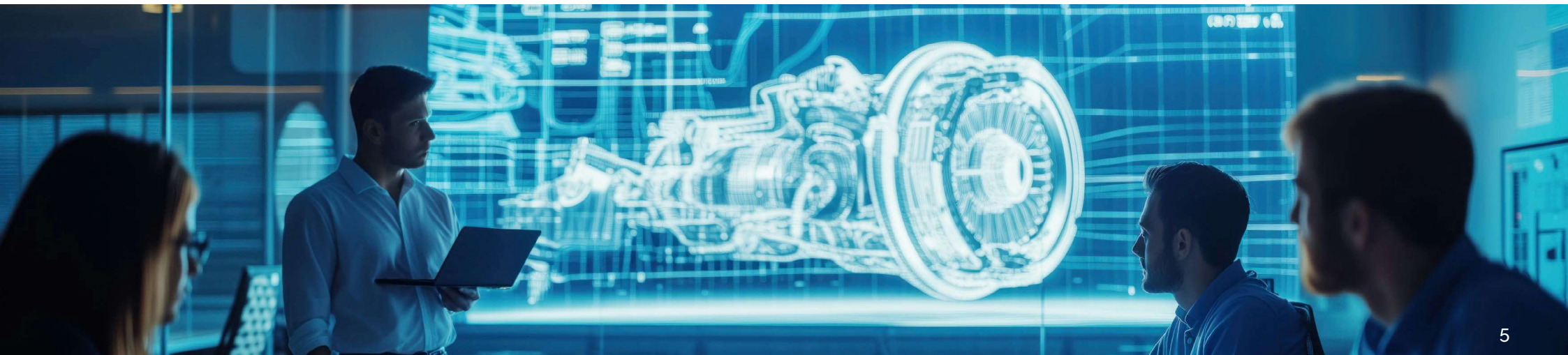
Communication Barriers

Challenge

Teams of manufacturing engineers are rarely integrated with teams of product designers, further hindering alignment. If a manufacturing engineer inputs late-breaking engineering data into the ERP system, inefficiencies are inevitable. From documentation management to quality reviews on parts, misunderstood product characteristics, and inefficient product variations, the entire operation suffers without early consultations with manufacturing engineers.

Solution

Bridge the communications gap by integrating manufacturing engineering early in the design process. By embedding manufacturing engineers within design teams, you can achieve end-to-end design in a product lifecycle management (PLM) solution and manufacturing readiness in an ERP faster than ever before.



Change Management

Challenge

Change management in manufacturing engineering requires precise coordination between design and production, as well as the agility to adapt to design changes. Manufacturing engineers must update work instructions for various configurations, and disconnected systems can lead to delays and extra costs. Each manufacturing site's unique requirements further complicate change management. Poorly executed change management is burdensome for highly skilled employees who need accurate, traceable data. Effective coordination, visibility, and communication across disciplines are essential to manage changes efficiently and maintain workflow continuity.

Solution

Synchronize design and manufacturing activities, so teams can incorporate enhancements as designs evolve. Understanding the evolution of product configurations is crucial for effective change management, especially when collaborating with design partners and suppliers. Making change management data highly visible enables manufacturing decisions to be included in the design process—improving quality overall.



Disconnected Information Resources

Challenge

Disconnected systems are an obstacle to efficient change management and maintaining data integrity. Working with isolated BOMs and various spreadsheets complicates cross-functional requirement handling, impedes collaboration, and undermines quality and compliance. Without a unified and traceable data source, misunderstood and outdated information is easily proliferated throughout the operation.

Solution

Integrate BOMs and spreadsheets into an authoritative system which streamlines information access and ensures each team has accurate data. This enables downstream impact analysis when engineering needs to revise the design, thus identifying problems early to maximize efficiency and minimize costs. An authoritative system can also cope more easily with numerous product configurations and comprehensive data for attributes, parts, raw materials, and more.



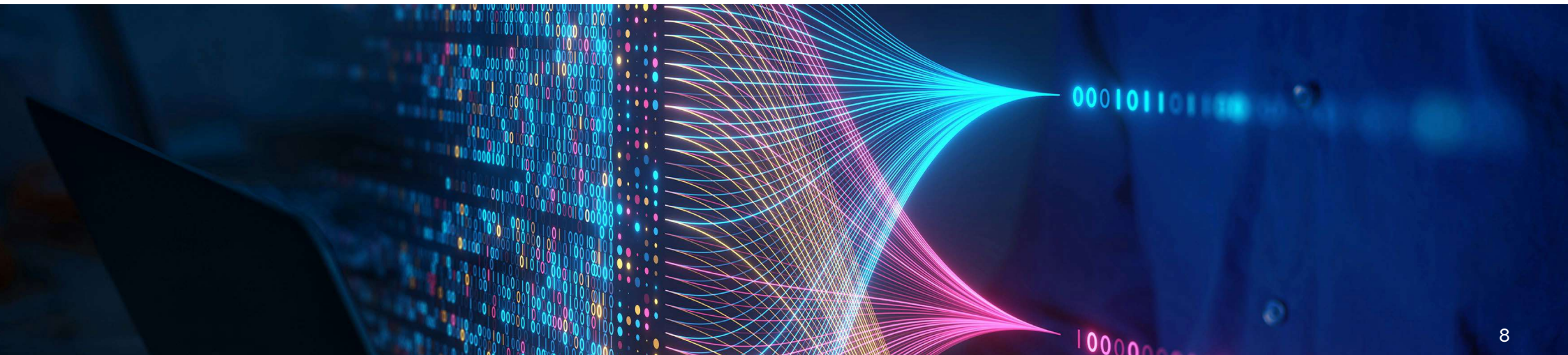
Siloed Systems

Challenge

Engineers struggle to keep work instructions updated across configurations, design centers, and plants, which is exacerbated by handling numerous engineering changes regularly. A disconnection between R&D and Manufacturing systems can delay product definitions and manufacturing deliverables—which can then lead to issues being identified too late, costing time, money, and reputation. Disconnected information sources can also cause poor data quality and misalignments, resulting in misconfigurations, quality issues, and compliance problems.

Solution

Fully integrate systems (PLM, ERP, and MES) to eliminate manual handoffs and time waste through a holistic product view. Standardizing processes and data governance can reduce costs and prevent inaccuracies. Predictive analytics help forecast costs and timelines, while integrated quality management systems support traceability and CAPAs. Embracing digital transformation with data-driven decision-making and the right organizational tools is also crucial for overcoming the challenges of disconnected systems.



Fresenius Medical Care (FMC)

Fresenius Medical Care (FMC) is a leader in integrated healthcare products and services for people facing chronic kidney disease or kidney failure. FMC operates around 40 production sites across all continents.

Challenge

FMC became successful by growing heterogeneously and very locally (one device, one region, one market), which was the right strategy at the time. However, FMC needed a global approach to gain efficiency and increase its pace of innovation, one that required engineering and manufacturing to work together during development and across the globe.

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“Better and more affordable products and with that more affordable treatment for our patients. Windchill is really helping us for global collaboration and to design anywhere, build anywhere, ship anywhere.”

— Oliver Paul, Senior Director of System Lifecycle, Fresenius Medical Care

Solution

With the benefit of top management support, FMC implemented PTC's Windchill PLM solution to transition from paper to digital documents as part of a part-centric approach in its engineering, manufacturing, and customer service functions. This made all pertinent BOMs and product data accessible throughout the enterprise via a shared platform.



Efficiently Manufacture-as-Designed with PLM

The demand for manufacture-as-designed products continues to grow, and manufacturers cannot afford to fall behind. Numerous complexities (disconnected resources, siloed systems) may threaten your operation's flow of information, pushing productivity and quality goals further out of reach.

By integrating PLM with the ERP and MES systems, manufacturers can streamline the planning and analysis required to master fast-growing product complexity, quicken time to market, and improve agility. **Quickly uncover the gaps in your manufacturing engineering systems** and what can be done to resolve them in our visual guide.

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