windchill®

BOM:
A FOUNDATION FOR PLM BEST-PRACTICES

5 Advantages of a Part-Centric Product Definition

ptc

DIGITAL TRANSFORMS PHYSICAL

With engineering and manufacturing trade media clamoring over pioneering technologies, like digital twin and machine learning, it's easy for those looking to improve their business to overlook and undervalue the basics. And for discrete manufacturers, practicing fundamentals – especially in product lifecycle management (PLM) – is more valuable than ever.

The reason is two-fold. First and foremost, a foundation built on PLM best-practices yields well-documented business benefits in areas of product innovation, quality, manufacturing, and service. Secondly, these processes and tools are a prerequisite for the very same cutting-edge digital transformation projects that make today's headlines.

So where do you start when curating a strong PLM foundation? With part-centric product definitions and bill-of-materials (BOMs).

windchill®

The Part-centric Product Definition

What it means to be part-centric: Historically, engineering drawings were the basis of the product definition and a product's BOM was listed in the drawing or in separate spreadsheets. This way of representing the product is a holdover from an era before computers and makes little use of todays' digital technology. Unfortunately, companies that continue to use drawings and spreadsheets as their product definition can find themselves struggling with fundamental business functions (like product data governance and change management). Even seemingly straightforward requirements, such as ensuring all parties are working with the most up-to-date product definition, present a challenge when that definition is document-based and prone to mishandling.

With a part-centric approach, the BOM becomes the basis for the product definition and serves as a hierarchical database. Each part within its structure represents a different mechanical, electronic, or software component with its own associated data. This data could include drawings, specifications, technical documents (such as failure modes and effects analysis), or other BOMs.

What a part-centric product definition enables: By defining the product this way, manufacturers can realize a holistic digital product definition that configures, manages, and stores all product-related content—from final assembly structures to individual components—in a single, central repository.

There are many ways discrete manufacturers can take advantage of the associativity, traceability, and governance of the complete product definition. This E-book will explore the following five ways (offering real-world examples) that significant business value can be achieved with part-centric BOMs:

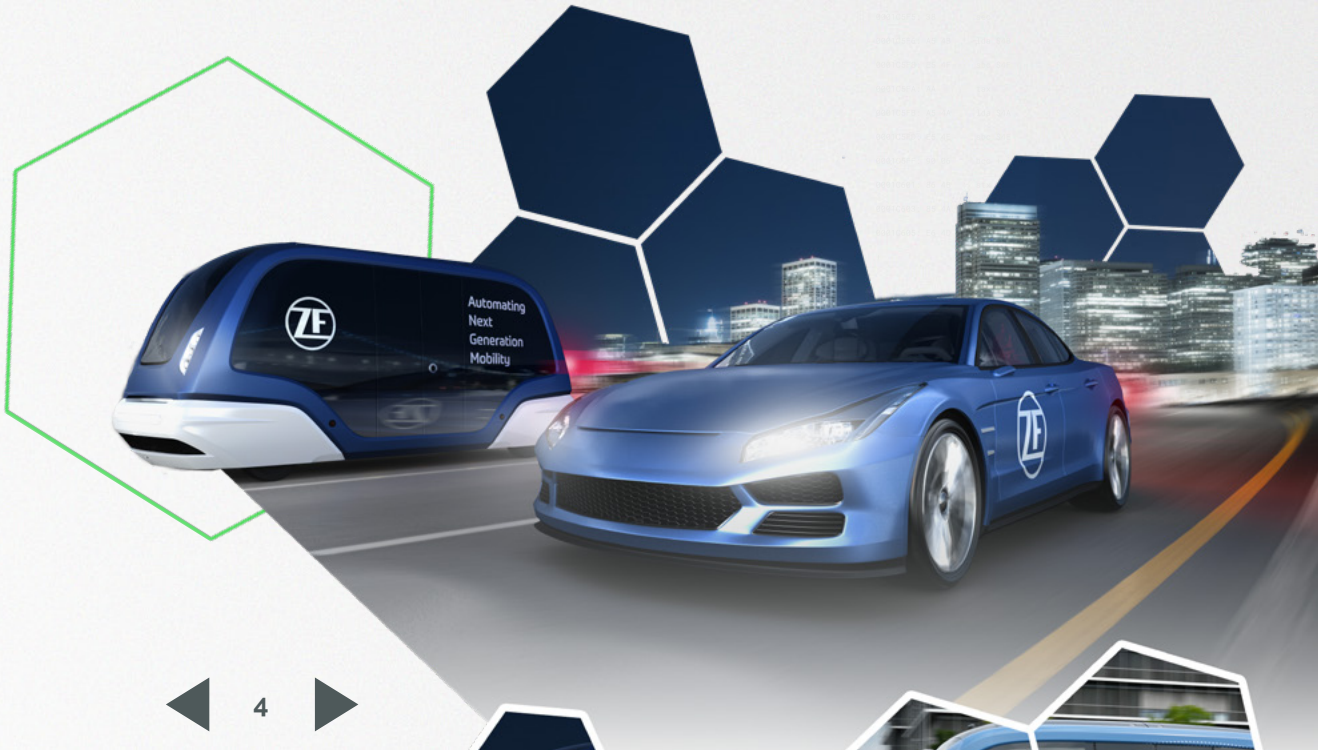
- Streamlining multidiscipline collaboration
- Eliminating product and process complexity
- Establishing the product's digital thread
- Extending design value and reducing part cost
- Improving product and program management

windchill®

STREAMLINING MULTIDISCIPLINE COLLABORATION

Product development requires communication and collaboration of multiple disciplines within the enterprise and extended supply chain. This is increasingly important as mechatronic design and software-driven products become more popular across industries.

Mechanical and electrical designers, software developers, and manufacturing engineers each have unique responsibilities that require different views of the product definition. But despite their different perspectives, the decisions made by one stakeholder can (and often should) influence the decisions of the others. If product development teams still rely on drawings and excel spreadsheets as their product definition, this dynamic becomes a recipe for project delays, quality issues, and antagonistic rather than collaborative cross-discipline work. Without a part-centric, digital product definition, there is no reliable way to ensure each stakeholder has access to an up-to-date product definition – or that their changes will propagate across the various perspectives of the other disciplines.



windchill®

With a modern BOM architecture, discrete manufacturers create and manage parts with a holistic product definition that captures related MCAD, ECAD, and software data as well as requirements, drawings, and more. This improves collaboration by providing:

A SINGLE SOURCE OF TRUTH

Silos between disciplines are removed or drastically reduced by providing a complete product definition. All product stakeholders can work from and reference this holistic definition with confidence that it represents the latest iteration of the product.

AUTOMATED CHANGE IMPACT ANALYSIS

Users can leverage mass change capabilities and change impact reports to automate and standardize change processes, to track items that are affected by engineering changes, and to communicate changes across the enterprise.

CROSS-DISCIPLINE VISIBILITY

A shared product definition provides better project visibility between disciplines, departments, and along the supply chain to reduce confusion and errors during design and changes.

"It's no longer that we have these divisional boundaries. It's working together at the same data sets and being able to see the impacts right away."

Wolfgang Ruedell, Manager Engineering Tools, ZF

See how ZF is using part-centric BOMs to solve its collaboration challenges.

windchill®

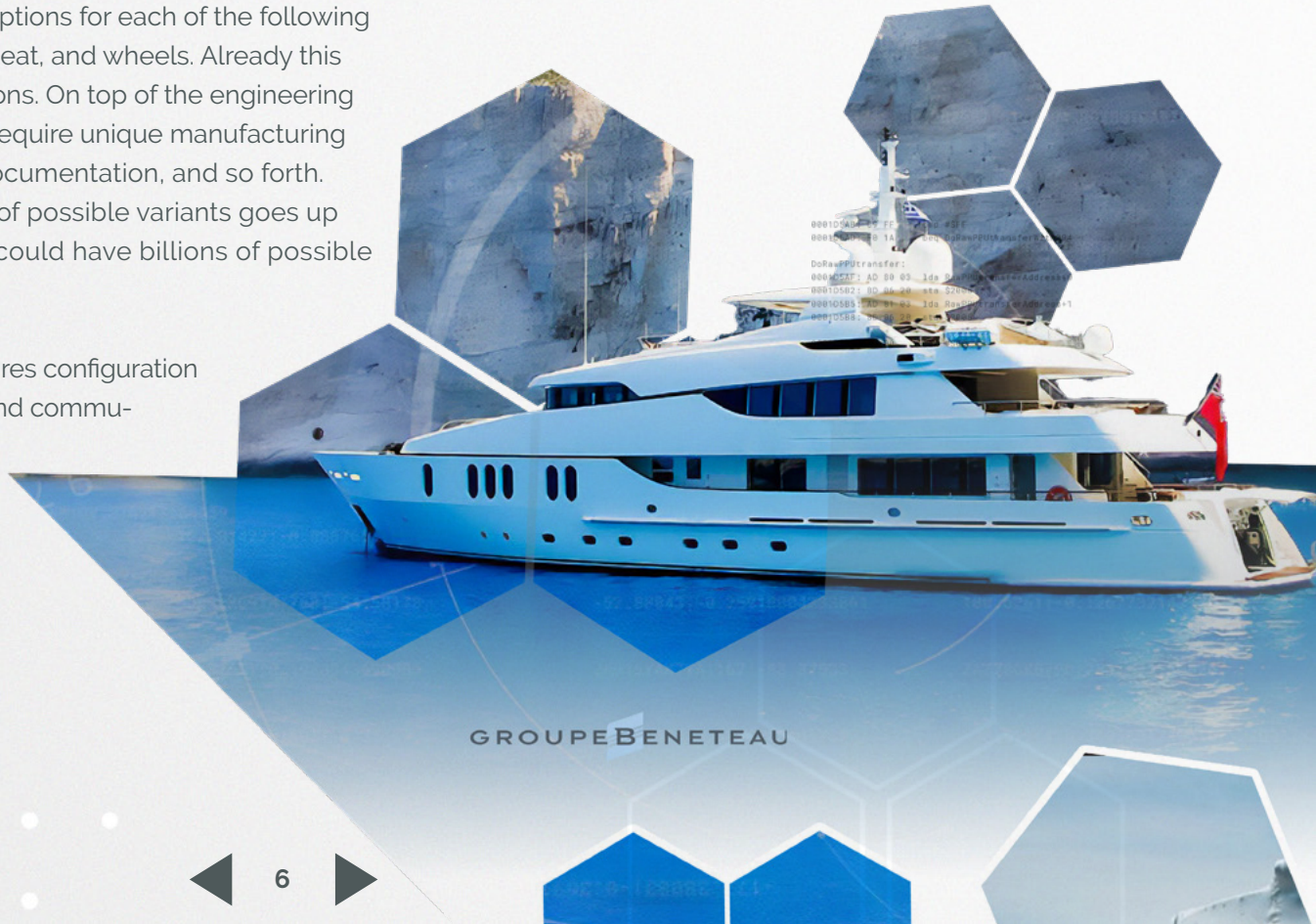
ELIMINATING PRODUCT AND PROCESS COMPLEXITY

Whether it's called mass personalization, mass customization, or lot size one, satisfying unique customer requirements at an optimal cost is a growing competitive imperative.

And these business models are tough to achieve and impossible to scale if drawings, BOM spreadsheets, workorders, and a litany of other documents must be manually created, updated, and communicated to stakeholders for each product variant.

For example, consider a bicycle that comes with four options for each of the following components: the derailleur, brake system, handlebar, seat, and wheels. Already this product represents over one thousand possible variations. On top of the engineering effort to support this complexity, these variants might require unique manufacturing processes, packaging, quality inspection, technical documentation, and so forth. As more options are added to a product, the number of possible variants goes up exponentially. An automobile or yacht, for example, could have billions of possible configurations.

Ensuring the right variant makes it to the customer requires configuration management capabilities that streamline the creation and communication of each product variant and its corresponding documentation.



windchill®

Using part-centric BOMs with modular architectures enables an organization to collaborate around a product family with one dataset regardless of the number of variants created. When paired with configuration management capabilities, this helps to deliver the right customer offering with reduced complexity and cost through:

RAPID, SYSTEMATIC PRODUCT CONFIGURATION

Engineers can leverage configuration management capabilities to define and manage list-based options, as well as parameters for advanced selection logic that describes all permittable product configurations. With these options established, users can quickly and confidently filter the product structure to meet specific order needs.

VARIANT GENERATION AND REUSE

When a user has configured the product they want, a variant can be generated along with the initial deliverables needed to release it to manufacturing (such as part structures and other documentation). When future products are configured in the same way, the same variant can be leveraged rather than creating a new one. This automated generation process eliminates redundancies as well as potential clerical errors each time a variant is ordered.

PRODUCT FAMILY CHANGE MANAGEMENT

Using a configurable, part-centric BOM approach to define product families allows issues to be addressed at the product family level in lieu of updating the product definition – be it drawing or spreadsheet – of each affected variant one-by-one.

"It is important to master what we put in our work; to control the operational flow of work, to have the ability to control all the changes and variants that are being created at a rate much faster than has ever been in the past."

Eric Jung, Quality Systems & Innovation Project Manager, Groupe Beneteau

See how Groupe Beneteau addressed its configuration challenges with a part-centric approach.

windchill®

ESTABLISHING THE PRODUCTS DIGITAL THREAD

For discrete manufacturers, continued success relies on improving operational efficiency, growing service revenue, improving supply chains, and a host of other business initiatives.

Despite these initiatives being driven outside of core engineering, the decisions and activities that happen within the engineering department can have a tremendous impact – both positive and negative.

If a company relies on document-based product definitions and their inherently manual workflows, the efficiency and quality of a production line is at risk every time engineering makes a change to the product definition. That change must cascade down to the factory floor and pass through a series of ungoverned, untraceable points of potential failure. Those could include administrative (ensuring the product line is aware of the change) or clerical (manually updating the manufacturing BOM (mBOM) spreadsheet to reflect the changes to the engineering BOM (eBOM) spreadsheet). Even if all goes correctly, the time it takes to process the changes can have a significant impact on operational effectiveness. The same types of risks exist for any business initiative or activity that touches the product lifecycle.

windchill®

The best way for engineering departments to facilitate cross-enterprise business initiatives is to adopt product definitions that are more than reference tools. BOM management systems should be able to create and manage multiple product structures that provide value in different contexts throughout the product lifecycle. By employing a part-centric approach, the eBOM can be used as a source for derivative product structures and for different purposes, such as mBOMs and service BOMs (sBOMs). When a change is made to the eBOM, all the relevant derivatives are automatically updated. This capability establishes a digital thread foundation and helps discrete manufacturers:

ACCELERATE TIME-TO-MARKET

Companies can get products to market faster, at lower cost, and with less quality issues at launch by keeping suppliers, manufacturing stakeholders, and customers in the loop about changes made during new product development (NPD) in real time.

IMPROVE MANUFACTURING EFFICIENCY AND QUALITY

Eliminating manual re-entry of BOM information for derivative product views prevents data errors and improves workforce efficiency. Additionally, the more automated this process is, the faster up-to-date information can be delivered downstream and the less risk of downstream stakeholders working from old or incorrect information.

FACILITATE SERVICE AND OTHER FIELD OPERATIONS

Creating and associating derivative service and other field documents in a part-centric eBOM ensures product changes and their implications are communicated to all stakeholders – regardless of how far downstream they are in the product's lifecycle.

"Using one PLM and CAD platform will act as a key enabler in our digital engineering transformation. Leveraging this foundation, we see great possibilities in connecting PTC's IOT and AR solutions into our digital thread strategy."

Lars Stenqvist, CTO, Volvo Group.

See how Volvo Construction Equipment leveraged digital thread capabilities to reduce design, manufacturing, and service complexity.

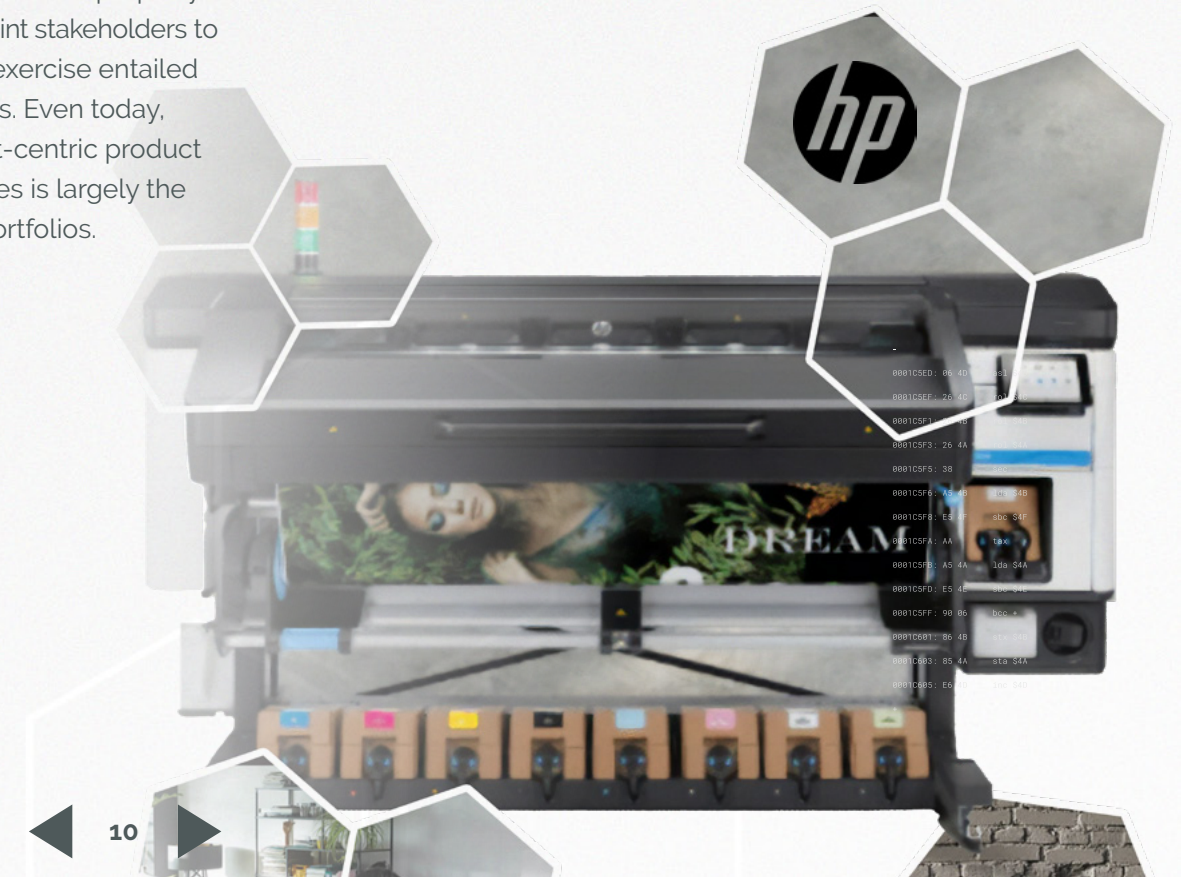
windchill®

EXTENDING DESIGN VALUE AND REDUCING PART COST

A common executive goal for many companies is to reduce part proliferation through part reuse. As the business grows, the product portfolio expands and so too does the cost and complexity of managing all the parts that make it up.

Every NPD program that doesn't reuse parts where possible can add undue burden for every function in and downstream from engineering. Procurement, quality, manufacturing, and service must all account for this increase in part diversity – even for basic things like O-rings or fasteners (which should be commoditized).

At the same time, leveraging the company's engineering-based intellectual property (IP) becomes increasingly difficult without a system in place that can point stakeholders to the IP that is relevant to their project. Before the computer age, this exercise entailed combing through banks of file cabinets to find paper-based drawings. Even today, for companies that have moved on to digital documents but not part-centric product definitions, the process of manually browsing through folders and files is largely the same: painstakingly slow and less likely to yield benefits for larger portfolios.



windchill®

With a part-centric BOM as the product definition, companies can classify parts into related categories, including function and physical characteristics. Using parametric search functions, users can quickly find parts already in their database, with preferred vendors, and approved for production. This enables engineering teams to identify like-parts for easy design reuse and to reduce part duplication. Companies that take this approach benefit from:

ACCELERATED DESIGN CYCLES

Classification and reuse enables the standardization of objects and parametric searches and accelerates design cycles by leveraging proven IP. Requirements, parts, CAD models, and complete BOM structures can all be searched and reused with change control.

REDUCED PART COST & SUPPLY CHAIN COMPLEXITY

Consolidating like-parts with preferred vendors reduces cost by leveraging economies of scale and purchasing power. It also reduces administrative costs associated with supply chain management and supplier quality management.

ALLEVIATED PRODUCT STAKEHOLDER WORKLOAD

Consolidating like-parts also has a big impact on workforce efficiency and productivity. By reducing the number of parts that make up their product portfolios, businesses cut down drastically the number and complexity of activities for which stakeholders across the lifecycle are responsible.

"It's important to go to a project and just know what parts and what kind of technologies we are using. This is really useful for searching for reuse parts, and to exchange information between our HP divisions."

Laura Laconcepcion, Procurement Engineer, HP

See how HP is using parts classification to improve part reuse and sustainability.

windchill®

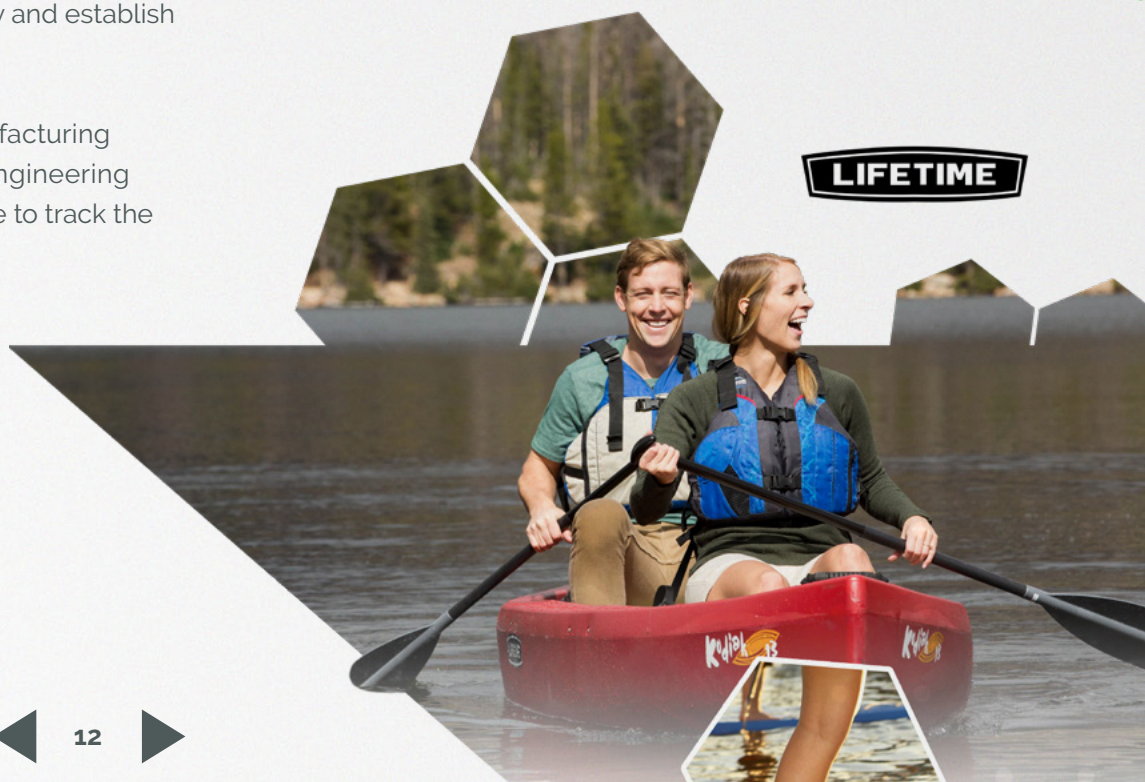
IMPROVING PRODUCT AND PROGRAM MANAGEMENT

Developing and launching new products is fundamental to improving market share and revenue, maintaining competitive differentiators, and improving customer experiences – that's why good product and program management is so critical.

However, managing NPD can be especially tricky if the management tools and workflows are not linked to the product data being created.

Reporting to higher-level management, for instance, can become a full-time responsibility if there is no system in place to aggregate and analyze program and part status. A pile of engineering drawings and Excel spreadsheets does little to provide a holistic view of the evolving nature of an NPD project. Consequently, this makes it difficult for product managers to hit their milestones on time. At the enterprise change management scale, this lack of knowledge inhibits the ability to identify and establish improvements to the company's NPD approach.

The concept of continuous improvement is already ingrained in manufacturing to enhance processes, and the same philosophy can be applied to engineering workflows as well if the right tools and product definitions are available to track the appropriate metrics.



windchill®

A common product structure that supports a holistic product definition enables easily repeatable reporting and analysis. Information stored in the BOM, such as materials, suppliers, component costs, weight, compliance, release statuses, and data from ERP and other enterprise systems can be leveraged for executive-level and team-based decision making. An example of this in engineering is stage-gate meetings or design releases, which require a combination of management and individual contributors to move the project forward. A product definition that allows for easy reporting and analysis of the product, the projects it is connected to, or an entire product portfolio, provides the following advantages:

BETTER RESOURCE ALLOCATION

A part-centric BOM in concert with connected project management tools make it easier to identify adherence to or divergence from planned project timing. Identifying impending project roadblocks and general resource consumption gives businesses opportunities to reallocate resources and budget to improve balance across products and programs. This visibility also engenders executive engagement and support.

MORE EFFICIENT, COMPREHENSIVE REPORTING

A holistic product structure ensures the activities that require very specific views of the product definition (e.g., design reviews) are comprehensive and easier to execute. The same reporting capabilities can be used to improve activities outside of engineering as well, such as responding to third-party audits quickly and accurately or providing regulatory bodies with materials necessary for certification.

IMPROVED PORTFOLIO MANAGEMENT

With all parts and products defined digitally, it becomes much easier to identify broad portfolio characteristics and execute mass change. Green initiatives and cost savings programs are prime examples of where this capability is necessary.

We were able to empower the people and the process. Responsibilities were spread throughout the organization, which is now engaged in standardized process and all the pressure and work doesn't fall on engineering shoulders."

Brady Buchanan, PLM Director, Lifetime Products

See how Lifetime Products is using part-centric BOMs to solve its product and program management challenges.

windchill®

A part-centric PLM approach is foundational to better business results – as proven by PTC Windchill customers over the last three decades. As for new adopters, these transformations can be implemented simultaneously or take place incrementally. Because with all parties and stakeholders operating with a part-centric product definition and PLM solution, they achieve enterprise-wide visibility and establish a digital thread foundation that enables collaboration and traceability.

Now, with Windchill+, companies looking to adopt or expand part-centric capabilities can do so significantly faster and more easily by leveraging SaaS technology with out-of-the-box workflows. Windchill+ provides accelerated implementation, optimized performance, and seamless upgrades. This translates to faster return on PLM investment, whether by achieving quicker time to market, improving quality, reducing scrap and rework, eliminating duplicate parts, or any of the other previously mentioned benefits.

windchill+™

Learn more about the benefits of part-centric BOMs and start building a strong PLM foundation.

ptc

DIGITAL TRANSFORMS PHYSICAL