PLM CHANGE MANAGEMENT / A Case Study

Vaillant Group - German manufacturer of precision HVAC equipment for over 140 years

PLM BRINGS ENGINEERING CHANGE MANAGEMENT SUCCESS:
A Case Study on Vaillant Group's Efforts to Improve ECN Efficiency

— **Nick Iandolo**, Content Marketing Specialist, PTC

Change Management in manufacturing is taking on increased importance with enterprise demands, for improving product differentiation, productivity and quality, and overall operational effectiveness. Complexities arise when data is out-of-date and tasks such as when Engineering Change Notifications (ECNs) are handled inefficiently with static applications such as spreadsheets. The potential for errors, causing losses in time and increasing expenditures, can quickly mount to unwieldy proportions. Such challenges can uncompromisingly hold back engineering teams from delivering better products on time contributing to the company's top and bottom lines. This is where PLM comes in to not only mitigate these challenges but digitally transform an organization's data management processes into a thriving ecosystem of communication, product development, and dynamic expansion into new growth opportunities.

Vaillant Group is taking a long-term approach to their digital transformation, considering release and engineering change management as a key foundational element of their far-reaching PLM strategy.

Mindful of delivering value to the business, every step of the way, they also focused on keenly measuring the impact of the new PLM change management process as a proof-point for how a small interconnected implementation can have huge results driving future innovation for this century-old international organization. The following study details their effective strategy of integrating and balancing PTC Windchill and SAP MDG-M (Master Data Governance for Materials) systems as core elements of their End-to-End PLM solution and reaping greater overall efficiency with their workflows.

About the Study

Data collected by Vaillant Group comes in two batches: 2011–2017 Baseline without PLM, and with PLM from January 2018–May 2019. Metrics also include the start of PLM implementation for Vaillant beginning in May 2015.

This study is built around the following KPIs (i.e. Key Performance Indicators):

• Release & Engineering Change Process Run Time Improvement

• Workflow Management Improvements

• Digital Transformation

Getting the Digital House in Order

The Vaillant Group is a global market and technology leader in the field of heating, ventilation, and air-conditioning (HVAC) technology. For over 140 years, the company has been following a strategy designed to achieve sustainable and profitable growth. Today, the family-owned company conducts its research, development, and production activities at 10 sites in 6 European countries and China—and sells high-efficiency and environmentally-friendly products in more than 60 countries worldwide.

Vaillant utilizes a good number of different design and productivity software platforms such as CAD (Creo, AutoCAD, Mentor), PLM (Windchill), and ERP (SAP).

Initially, the Windchill to SAP interface did not exist. Process and data management tasks were manually handled through a combination of spreadsheets and emails. There were many drawbacks to this approach: inadequate access-control, lack of concurrent engineering functionality, high efforts for spreadsheet handling, lack of traceability and version control, lack of transparency, lack of status tracking, long wait times to implement changes, and a flawed error-prone manual data entry process.

These issues were confirmed by an independent consultant (Ernst & Young) after an extensive analysis and evaluation process. The results of which, precipitated a digital transformation project for the management of product lifecycle that spans an eight-year phased approach, with deliverables in three phases.

Phase I

This phase, 2015–2017, focused on the core elements of PLM such as workflow-controlled creation of parts and Bill of Materials (BOM), release and change management, first sample part approval process, management of product documents, and automatic transfer of product data from Windchill to SAP, workflow-controlled enrichment of SAP views, and other tasks after design freeze.

Phase II

In the second phase, 2017–2020 (estimated) of the roadmap, advanced functionalities are added to the PLM infrastructure mainly to manage and track product compliance/sustainability; manage product costs during developments; and to manage the entire process to collect, consolidate, approve, and test product requirements and system engineering as well.

Phase III

In the final phase, 2020–2023 (estimated), after the delivery of PLM basic and advanced functionalities, Vaillant plans to close the information loop between phases of the product lifecycle by applying digital transformation technologies. For example, they plan on using service information acquired from IoT (Internet of Things) sensors to predict failures and optimize new and existing products through fielded product input to design. They also plan to provide service departments with AR (augmented reality) work instructions for improved service delivery and to create and apply Digital Twins for different use cases among other ambitious long-term goals.

Since Phases II & III are still in process, the remainder of this case study will focus on Phase I and its KPIs
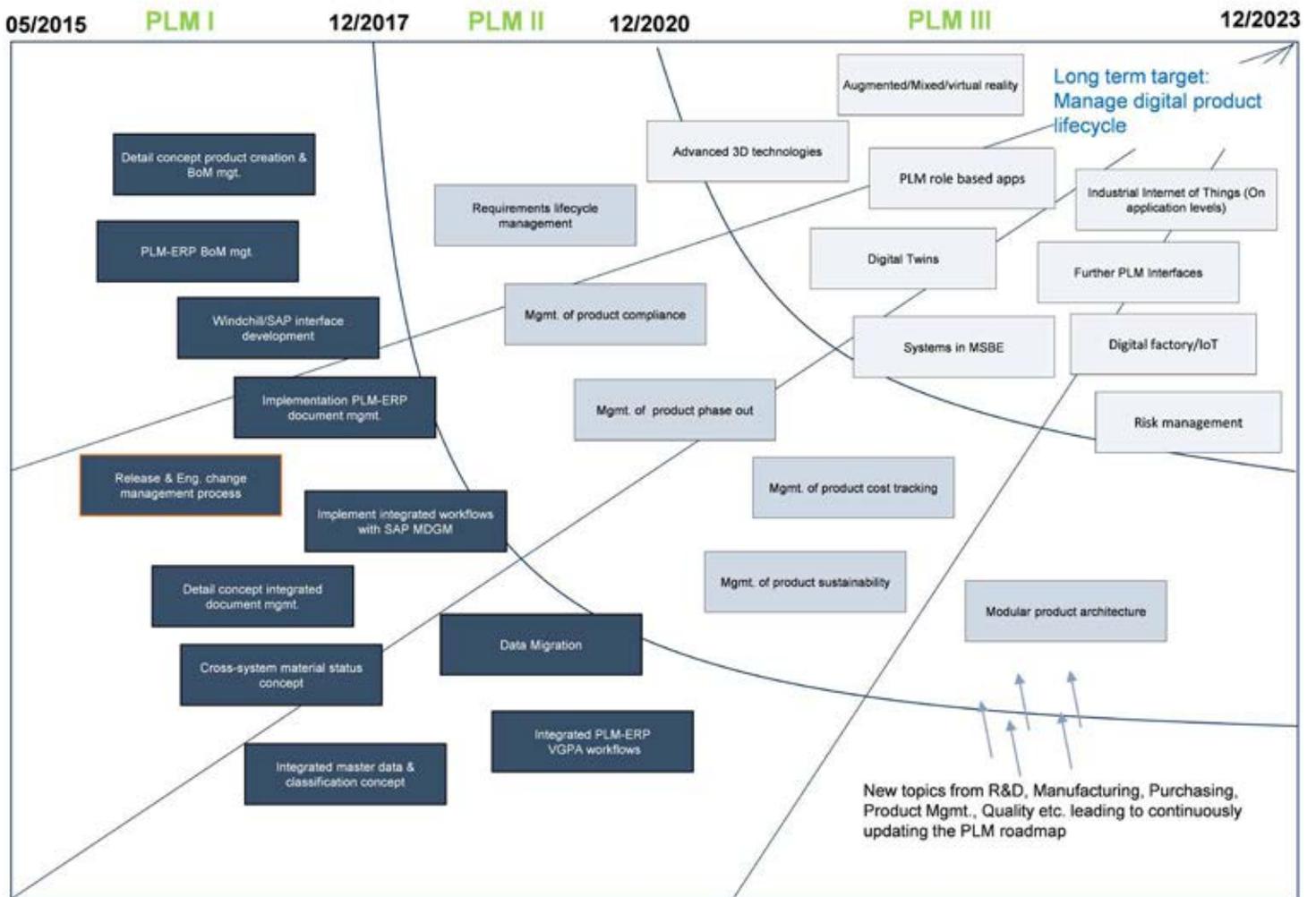

Figure 1: PLM & Digital Transformation Roadmap for Vaillant Group 2015–2023

Change Process Improvement

Products today are growing ever more complex. Changes occur daily during the product development process. Stakeholders up and down the value chain need to keep up with these changes; as well as, optimize their processes to implement them. Many assets can change all at once such as 3D CAD models and drawings, specifications, documentation, BOMs, and more. Furthermore, any number of changes from the outside can occur, directly affecting every aspect of the product development lifecycle. For example, changes such as part replacements because of cancellations, product quality issues, and new compliance regulations can wreak havoc as a company tries to get their NPIs (New Product Introductions) off the ground, with a relative quick time-to-market.

This already complicated process is made even more difficult when managed by inefficient and archaic means such as spreadsheets.

The time to implement changes, the ECN process, is their key success metric. This process has a direct impact on time-to-market. For NPIs, this part starts after creating the product data (e.g. CAD, BOMs, documents, etc.). In the case of product modification, the ECN starts after an analysis phase where an engineering change request (ECR) is investigated and approved.

ECN Before PLM

For Vaillant, managing ECNs before the implementation of a PLM solution was fraught with process issues and inefficiencies. They faced a multitude of key challenges: high-setup times (involving manual data collection of changes);

non-transparent change statuses; long process execution times; time-consuming manual tracking of actions; parallel and conflicting changes (due to poor communication and lack of ubiquitous documentation); and too much reliance on phone conversations, voicemails, and emails.

ECN After PLM

When Windchill's highly-configurable out-of-the-box PLM capabilities with an interface to SAP/MDG-M are applied to this process, a holistic change management solution takes place, and provides the following immediate benefits:

- Lists such as parts, products, documents, etc., are automatically generated
- Critical functions such as pre-defined rules are automatically generated
- Automatic transfer of changed product data to ERP SAP (via MPM-Link)
- Enhanced and efficient workflow-controlled approval processes
- Workflow functionalities provided by Windchill and SAP MDG-M.
- Automatic and transparent status tracking of changes
- Reminder functions
- And more...

The following chart illustrates Vaillant's ECN release process layers, providing a clearer picture of the connection between Windchill and SAP from organization to system to process.
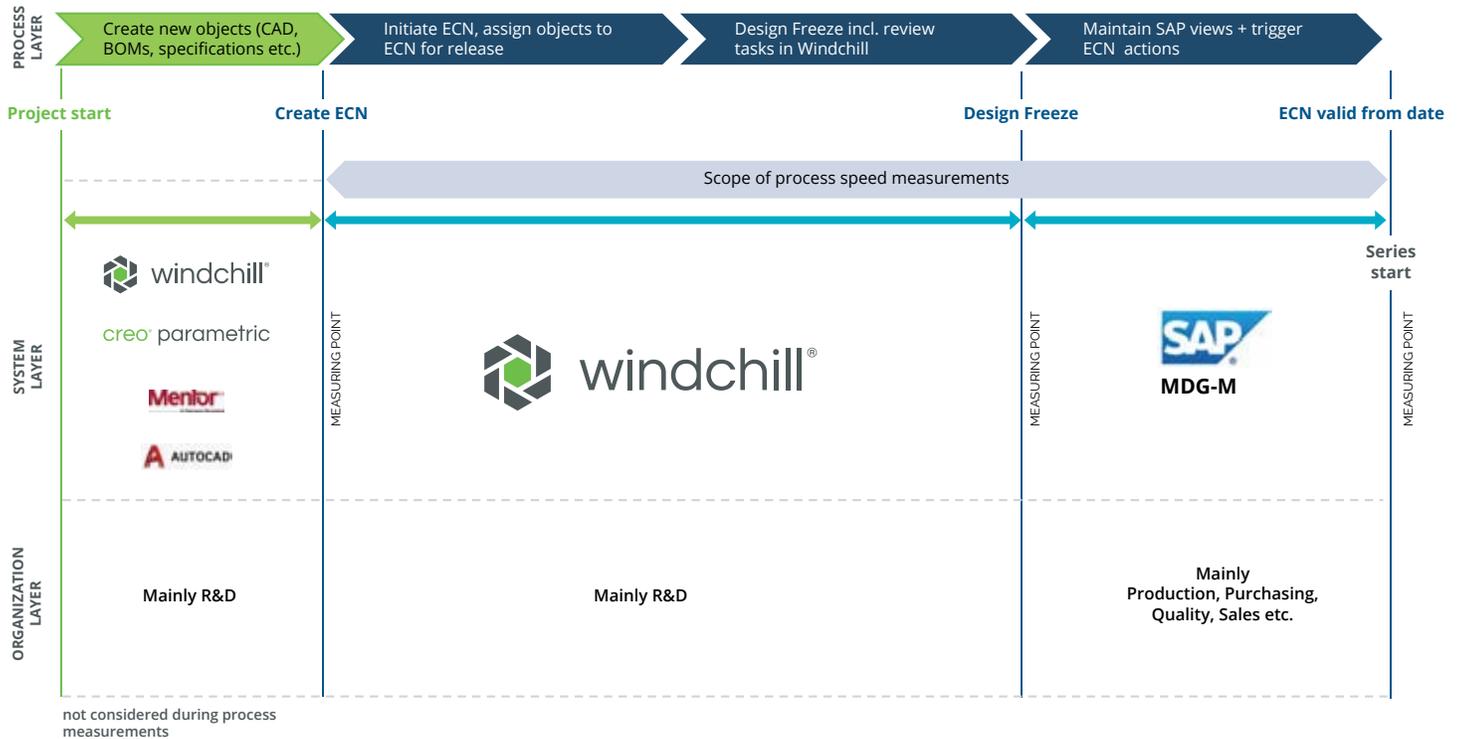

Figure 2: Release Process Layers for Organizational ECNs

As you can see from a system standpoint, Windchill is employed to manage ECNs and other data (such as CAD from Creo & AutoCAD from project start to Design Freeze (PLM status 30)). After that, SAP MDG-M manages the process steps to follow.

In the next section, we will look directly at the Workflow Management Improvements, the metrics used to test them, and the actual results.

Workflow Management Improvements

Vaillant defined the following three concrete measuring points in the process both before and after PLM.

1. Creation date of ECNs in Windchill with integration to SAP versus the manual process (before PLM)

2. Date of Design Freeze in Windchill versus manual process (before PLM)

3. Effectivity dates of engineering changes (ECNs) before and after PLM

The key metric here is the reduction in processing time to implement a change owing to the benefit of PLM. From 2011–2017, Vaillant was measuring the average time to process engineering changes. When that same metric was tested after they implemented PLM from 2018–2019, *the average process run time reduction was ~42%*.

Besides PLM workflow benefits, there is another aspect which could be noticed before and after PLM. While big ECNs containing a lot of BOMs, drawings, and other documents have been often used before PLM to release new products, the situation after PLM has changed. Now people use smaller ECNs, starting the process on schedule, and leading to shorter process runtimes.

	Baseline (Before PLM)	With PLM
Time windows of measurements	2011 – 2017	02/2018 – 05/2019
Number of evaluated ECOs/ECNs	771	550
Number of projects where ECOs/ECNs were created	28	15

Figure 3: KPI PLM Efficiency – Evaluated Data

The Numbers Speak for Themselves

From the baseline perspective (meaning before Vaillant implemented their PLM solution), from 2011–2017, they analyzed 771 engineering change orders from 28 development projects. All these engineering change orders ran according to the manual process (Excel, email, etc.).

After they implemented their ECN process as a key element of their End-to-End PLM solution (starting in 2015), they analyzed about 550 ECNs from 15 projects. All these change orders started and closed using their new PLM solution strategy (i.e. Windchill & SAP MDG-M).

In terms of percentage points gained, the expected PLM efficiency was estimated at 10% before launching the PLM project in 2015. However, the process run time from starting a change note ECN until design freeze (i.e. Status 30), where Windchill is the active part of the PLM software, *increased overall to a whopping 51% efficiency* (on average from January 2018–May 2019, and since 2011) compared to the situation before PLM! At the same time, the average process efficiency where SAP MDG-M is the active part of the PLM software was about 40%.

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We saw a reduction of nearly half the time it took to implement changes thanks to our End-to-End PLM solution."

— **Dr. Gamal Lashin, Strategy & Performance Manager, Vaillant Group**

DIGITAL THREAD

What is a Digital Thread, in basic terms? It is a connection of related upstream and downstream product and process information, which:

- Creates continuity and accessibility to product data across an enterprise
- Enables the execution of processes across organizations through these connections

The key benefit for Vaillant is that Digital Thread helps the manufacturer make better change decisions by combining data across their PLM and ERP systems in context for all stakeholders throughout the enterprise.

Digital Thread is a market-disrupting technology that gives companies a competitive advantage by facilitating innovation in any given industry, such as HVAC.

For more information about the industrial power of Digital Thread and other market-disrupting technologies, visit **www.ptc.com/plm**.

The following chart sums up the development of the measured ECN process efficiency with Windchill and SAP/MDG-M in the time window of January 2018–May 2019.
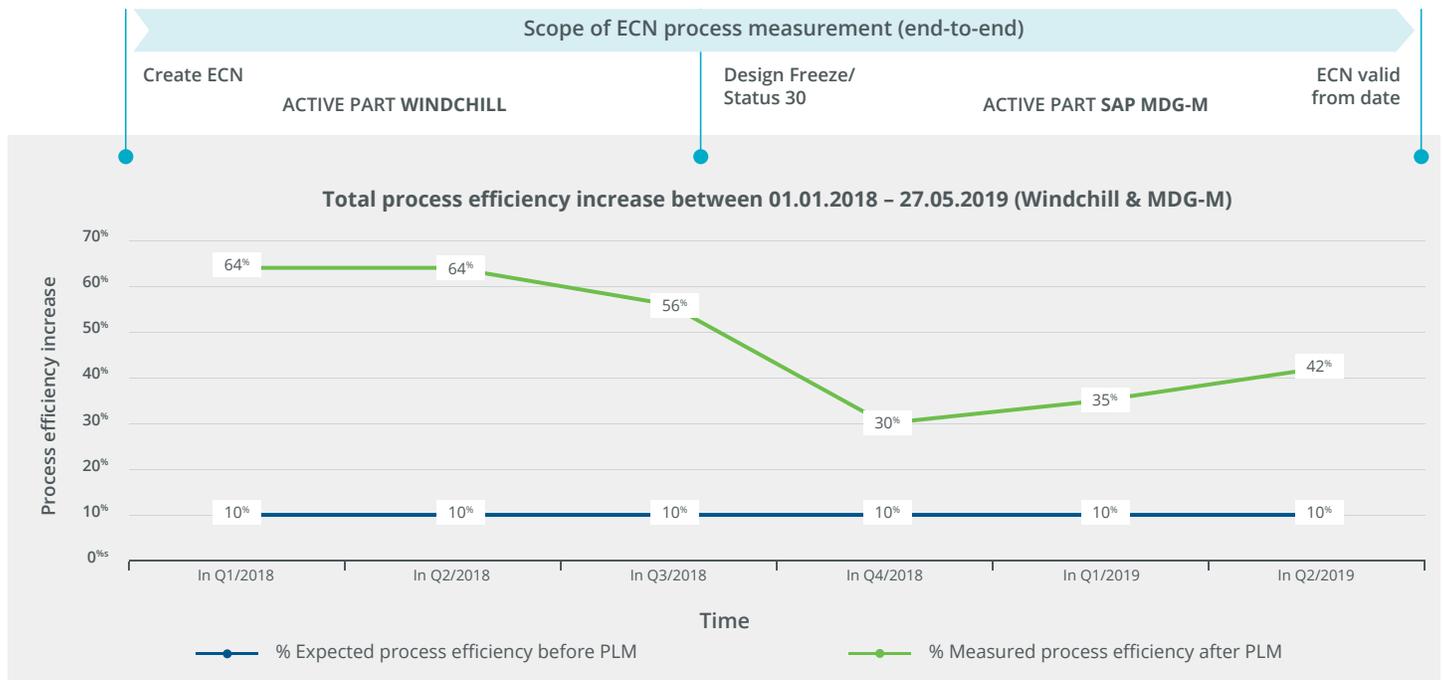

Figure 4: KPI PLM Efficiency in Windchill

In the Fourth Quarter of 2018, the total efficiency dropped down a little bit because of various reasons: parallel data migration activities and the introduction of some new approval steps in SAP MDG-M, resulting in additional waiting times in the process. However, recent measurements show increasing improvements with these two factors.

Dr. Lashin also commented directly on this overall improvement. "The workflow functionalities in the End-to-End PLM solution made up of Windchill and SAP MDG-M makes communication faster, transparency much better and reduces manual work to a minimum. Windchill and SAP MDG-M have all the assets for the groups to view. Essentially, the way we are working and creating Engineering Change Notices (ECNs) has vastly improved with our End-to-End PLM solution. PLM has changed the way the people at Vaillant work, our workflows, and transfer of our most valued objects."

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   Strategy & Performance Manager, Vaillant Group

Digital Transformation

While Vaillant Group is still in the process of getting their Digital House in Order, they have already come a long way by tapping into the engineering change management process benefits that PLM inherently provides. Their short-term goal of improving efficiency from 2015 has been a real success story for Vaillant. More importantly, they took the time to measure and quantify the results of their efforts to bring Product Lifecycle Management into their organization.

Armed with these new metrics and results—clearly illustrating the value of PLM—the stage is set for the next level buy-in from the Vaillant Group C-Suite. What this means is that they have a great business case to continue pursuing their Phase II & Phase III plans of Digital Transformation, including adopting and implementing technologies such as IoT and AR.

In conclusion, closely tracking how your PLM solution is working is just as important as implementing it in the first place.

PLM is not something that you just "set and forget."

For more information on PLM Change Management, visit PTC's [Change Management solutions webpage](#).

PLM is a dynamic resource that provides the backbone for any organization seeking their own Digital Transformation.

Vaillant certainly looks to the future as they strengthen their Digital Thread with new technologies to deliver even more value back to the business.

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Our partnership with PTC has helped us discover and set up new manufacturing possibilities using the most advanced technologies on the market from 3D CAD, PLM, IoT to AR. With these coming online in the future, Vaillant Group is sure to prosper in Europe and abroad for decades to come."

— **Dr. Gamal Lashin,**
   Strategy & Performance Manager, Vaillant Group