

Product and Manufacturing Information (PMI)

3D Model Documentation

Benefits

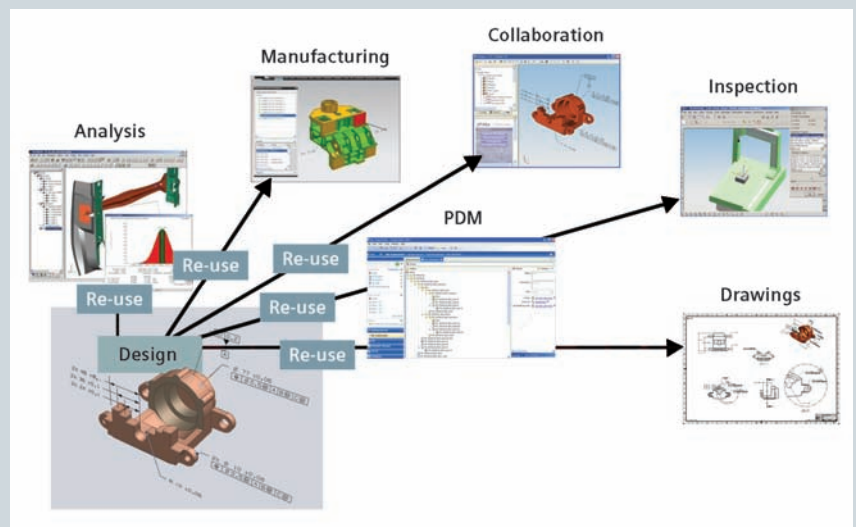
- *Enhances and shortens the design cycle* by enabling product teams to incorporate product and process information during the design phase, thereby facilitating better communications, fewer errors, streamlined design/manufacturing processes and faster change management
- *Accelerates decision making* by enabling product teams to remove drawings from the supplier communication chain and replacing that information with persistent, associated 3D product data that can be deployed across multiple lifecycle processes and used anywhere

Summary

Siemens' PMI solution facilitates a comprehensive 3D annotation environment that allows product teams to capture and associate a component's manufacturing requirements directly to the 3D model, as well as convey this information to downstream manufacturing applications. By associating PMI with a "living" part, the environment facilitates information re-use throughout the product lifecycle. In addition, since PMI complies with industry standards for 3D product definition, product teams now have the ability to use 3D models as a sanctioned and legitimate method for fully documenting product and manufacturing information.

Capturing and conveying manufacturing requirements for 3D digital product development

Product and manufacturing information (PMI) is used in 3D CAD and/or collaborative product development systems to convey information about the design of a product's components for manufacturing. More specifically, PMI conveys information such as geometric dimensioning and tolerancing (GD&T), 3D annotation (text), surface finish and material specifications.



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Results

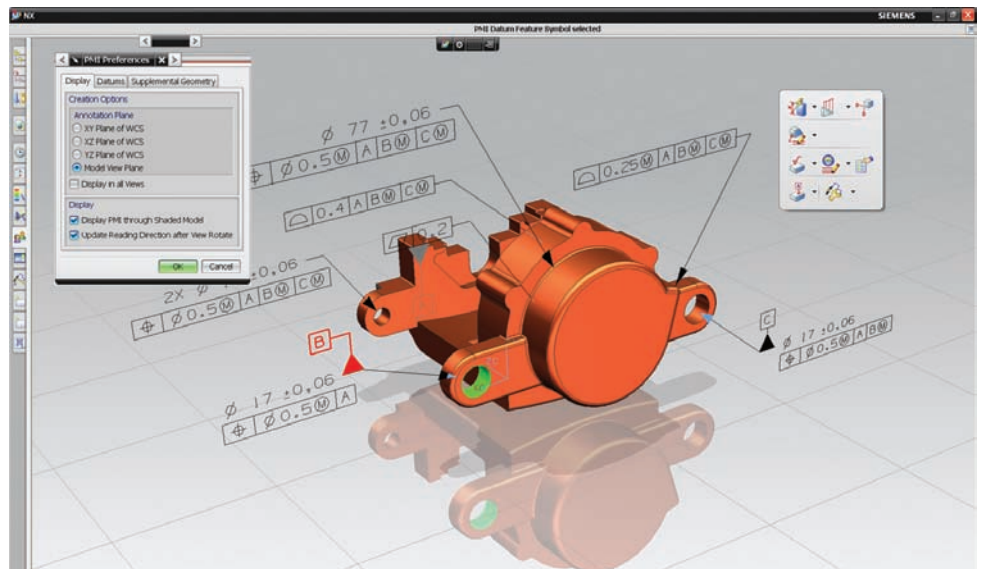
“Through the use of 3D documentation methods (i.e., PMI), the time and cost of documenting a part can be reduced by 50 percent and make early involvement of manufacturing easier with state of the art online 3D collaboration and visualization tools. Limiting redundant annotation and views – normally created on drawings in an attempt to clarify part design requirements – leads to better communications with fewer interruption errors, improved first time quality and increased productivity.”

Norm Crawford

*GD&T Instructor/Mentor
Applied Geometrics Inc.*

Features

- Comprehensive set of 3D annotation tools for capturing dimension, tolerance and product definition and manufacturing information
- The same highly productive user interface as all other NX modules, including Drafting – requires no significant learning curve to begin using the application
- Fully re-usable in NX Drafting; viewable in JT data format-enabled viewers and integrated with Siemens' validation tools
- Full API coverage provided for all PMI features via JT, PLMXML and the NX Open APIs



Siemens provides a comprehensive 3D annotation environment that not only captures and associates manufacturing requirements to the 3D model, but also allows the digital data to be re-used by downstream applications because the data lives with – and is driven by – the product's parts.

Moreover, because PMI complies with the standards for 3D part definition (ASME Y14.41, ISO 16792 and JEITA), 3D models can legitimately join 2D drawing as a fully sanctioned means of conveying product and manufacturing information.

Use cases

Replacing the universal 2D drawing

People are familiar with 2D drawings and use them as a means of legally defining a finished product. 2D drawings contain standard symbology that is universally understood and interpreted.

However, in some cases, the existence of multiple, redundant data required to define a manufactured part can lead to deviations in the final 3D form.

Interpretation errors, duplication errors or revision inconsistencies can contribute to costly mistakes that quickly translate into lower quality and productivity. As a result, while 2D drawings contain the “recipe” for manufacturing a part, the true manufac-

turing process requires both the 3D form and 2D information to produce a correct part the first time.

The use of 2D drawings for the purpose of communicating downstream production requirements can also add an unnecessary burden to the product development cycle. A simple change in the product definition not only requires updated 3D digital data, but also necessitates numerous engineering changes to all 2D documentation associated with the product. Since it takes time to maintain this documentation, the lifecycle for implementing a product change grows with the extent of its associated 2D data.

By using the NX™ PMI solution to embed 2D information directly within the 3D model, product teams have no need to create multiple, redundant data sets to define a given part. Instead, PMI allows product teams to capture and share engineering requirements within the 3D model – thereby permitting full utilization of the design intent, eliminating the need for 2D drawings and ensuring that the final product complies with its engineering specifications.

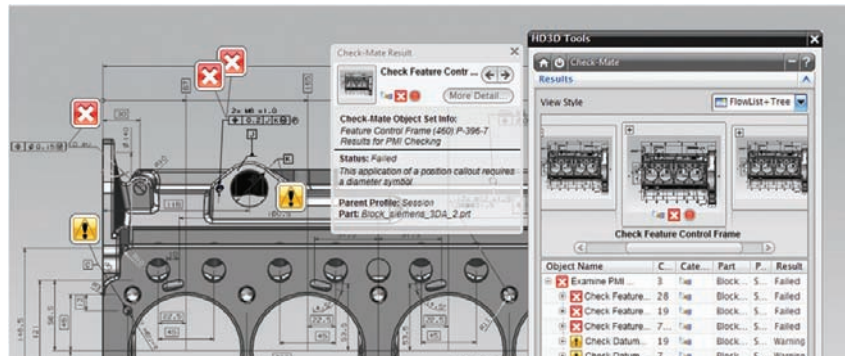
Improved productivity through 3D product definition When created in a 3D CAD model and directly associated with objects in the part, PMI provides the following benefits:

- Reduces cost by ensuring that design intent is completely captured and associated to the model. Deducing and interpreting design intent from 2D information is no longer necessary.
- Reduces rework associated with inaccurate or incomplete manufacturing information.
- Reduces manufacturing errors encountered as a result of manual translations and enforces “characteristic accountability” for the final product definition.
- Increases productivity and quality by documenting the information once and reusing it everywhere (redundant data is no longer required for downstream applications).
- Supports concurrent engineering by facilitating the documentation of models earlier in the design process. Design collaboration teams no longer need to wait for the production of the drawing to communicate design requirements.

Digitally stored information can be easily re-used by numerous downstream processes – from the automated creation of 2D drawings to final inspection of the produced part.

In addition, because PMI is supported and published in the lightweight JT™ format, product teams can take advantage of the preferred method for visualizing data:

- Directly from a CAD/CAM system
- In a standalone 3D product visualization tool
- In the portal viewer of a product data management (PDM) system



NX PMI not only reduces the need to generate 2D drawings; it also enables downstream applications to directly access this information for automating tasks such as CNC programming, tolerance stack up analysis and CMM analysis using other Siemens PLM products as well as third-party applications. NX PMI also enables “PMI Driven Machining”, which automatically selects the correct machining process and tools. As a result, product teams have enterprise-wide access to the right data at the right time with the right amount of detail and with reduced errors and greater speed because there is no need to re-enter data from a drawing.

By understanding and communicating the values of 3D PMI throughout an enterprise – from engineering departments to the manufacturing floor and out to the supplier base – manufacturers are able to realize productivity, quality and efficiency gains throughout their upstream and downstream processes.

PMI can contain GD&T, weld symbols, text and dimensions, as well as the product definition and process notes. In addition,

NX PMI gives you the ability to automatically check your GD&T for standards compliance. PMI can exist in 3D models in the same way that information exists on 2D drawings – using leader lines that connect the data to specific parts in the product design. As a result, PMI provides an intuitive environment for users familiar with a 2D system.

Once PMI is created, it can be re-used throughout the product lifecycle – from the engineering drawing to validation analysis, from visualization tools that facilitate collaboration and markup to manufacturing and quality planning processes. PMI, including Lightweight Section Views, can also be inherited onto a 2D drawing. The essential value of PMI remains the same: Create it once, use it anywhere.

Packaging and availability

PMI tools are included with many NX Mach Series solution packages, and available as an add-on module for earlier NX installations.



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