PTC® Live Global

PTC 109 - Best Practices for Managing Your Product Configurations

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Solutions Management

June 8th, 2015

Managing your Product Configurations

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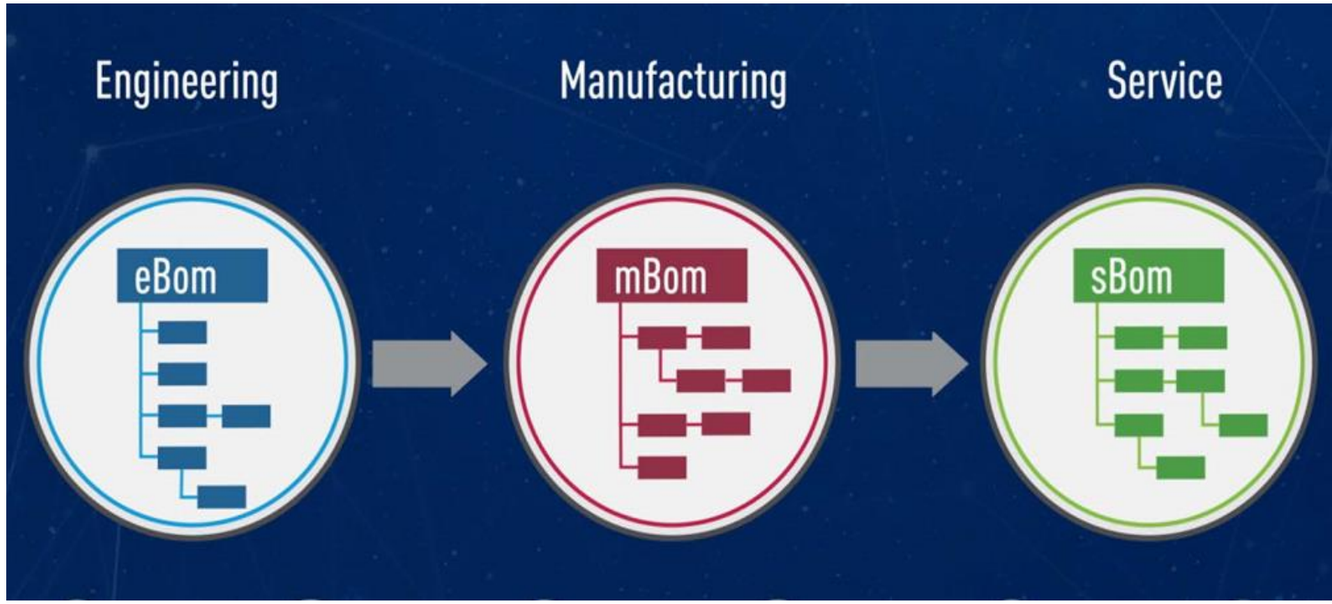
- Goal
  - Sharing approaches to help companies adopt more Part-centric Configuration Management Practices

- Agenda
  - Configuration Management Practices & Strategies
  - Common Challenges with Drawings
  - Moving to Part-centric Configuration Management PTC Windchill Highlights
    - Windchill 10.2 M030 & X26
  - Questions



Learn More: Look for these to find other sessions on managing Product Configurations!

PTC Live 2015 - eBOM & mBOM Sessions

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PTC Topic	Date	Time	Room	Customer Session	Date	Time	Room
PTC109: Best Practices for Managing Your Product Configurations	6/8/2015	2:15PM	Lincoln DE	**Cust124: Linked Data in Real Life: How "Owner Links" Change Everything, Solar Turbines**	6/8/15	5:00PM	Cheekwood ABC
PTC114: Part Types in PTC Windchill	6/8/2015	4:00PM	Lincoln DE	**Part113: Part-Centric PLM in a Drawing-Centric World: How we Manage Complete Part Specs**	6/8/15	1:15PM	Lincoln A
PTC201:Managing Configurable Product Platforms	6/9/2015	10:00AM	Presidential Boardroom A	**Cust321: Whether Bottoms Up or Top Down Design: Let PTC Windchill do the Heavy Lifting, TE Connectivity**	6/10/15	11:30AM	Heritage E
PTC214:Managing the SKU Development Process for Consumer Products	6/9/2015	2:15PM	Lincoln DE	**Part201: Ninja MCAD/ECAD BOM Creation**	6/9/15	1:15PM	Hermitage AB
PTC238: Driving Part Re-Use: ROI and Best Practices for Maximize Design Reuse	6/9/2015	5:00PM	Jackson AB	**Cust238: GE Aviation Systems PLM Journey to Effective Global Concurrent Engineering**	6/9/15	5:00PM	Washington B
PTC310: Moving to MBOM (Unifying Engineering and MFG Planning) with PTC Windchill MPMLink	6/10/2015	10:30AM	Jackson AB	**CUST305 Demo of Alcon Change Management Process Using CAD Driven Product Structure**	6/10/15	8:15AM	Heritage E
PTC300: Moving from PDM to PLM: The Value of Associative BOM	6/10/2015	8:15AM	Hermitage D	**CUST308 Moving Day: Moving Information from Drawings into the 3D Model**	6/10/15	9:15AM	Presidential Boardroom A

Vertical Market Needs Drive Configuration Mgt Strategies

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High Traceability | **Product Variation**

Configuration Control | **Design Flexibility/Reuse** | **Speed to Market**

Aerospace/ Defense

Raytheon
AIRBUS
THALES
National Aeronautics and Space Administration
BOEING
LOCKHEED MARTIN
United Defense
U.S.ARMY

Life Sciences

ABBOTT LABORATORIES
Canadian Pharmacists Association / Association des Pharmaciens du Canada
WelchAllyn
BECKMAN COULTER
BD
gsk GlaxoSmithKline
Medtronic When Life Depends on Medical Technology
Aventis
GUIDANT
AstraZeneca
American Red Cross
Pfizer

Automotive

TOYOTA
Audi
TRW
MOTOR HARLEY-DAVIDSON COMPANY
POLARIS
HARMAN/BECKER AUTOMOTIVE SYSTEMS

Industrial Equipment

ITT Industries Engineered for life
ABB
YORK Leading the World in Heating.
Rexroth Bosch Group
MITSUBISHI HEAVY INDUSTRIES, LTD.
BABCOCK BORSIG POWER
IR
CATERPILLAR®
Manitowoc

Consumer Products

XYRON
Reebok Product Lifecycle Management
HermanMiller
LIZ claiborne
Sara Lee
MOEN Buy it for looks. Buy it for life.®
patagonia
LANDS' END DIRECT MERCHANTS
Whirlpool
Limitedbrands
ROLEX

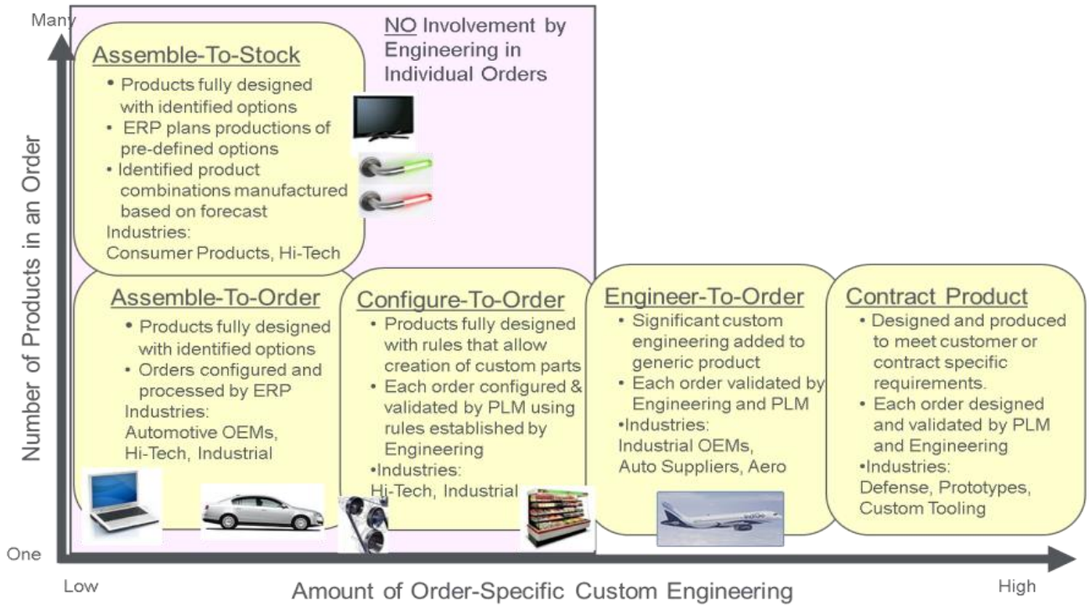
High Tech/ Electronics

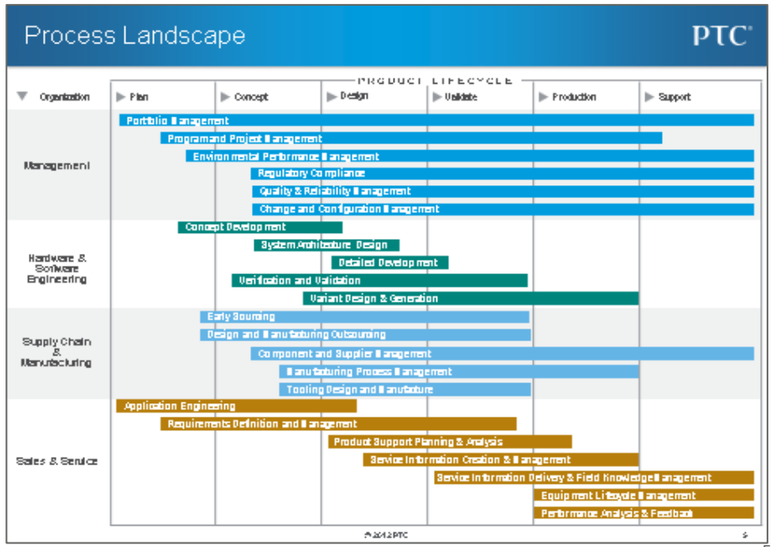
HITACHI
intel
hp invent
SIEMENS
SAMSUNG
DELL
Lam RESEARCH Changing the Value Equation™
TOSHIBA
software ag

Industry Strategies for eBOM Management

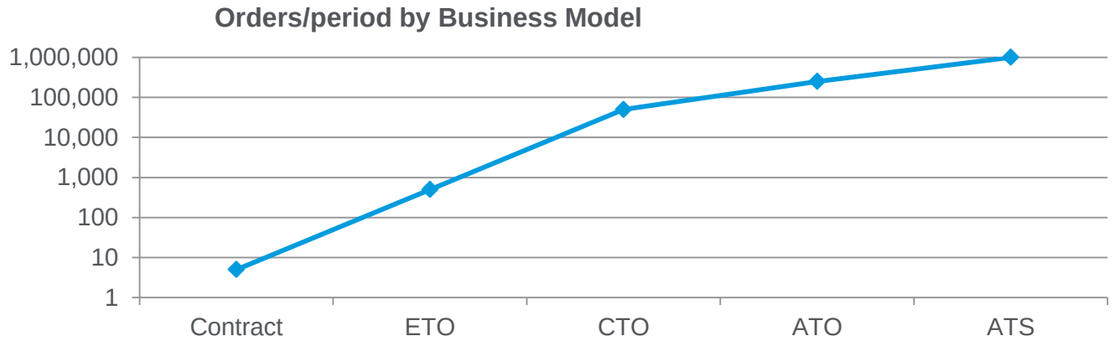
- Key Strategy Drivers
  - Product Variety
    - Markets
    - Brands
    - Features
    - Customer-unique
  - Selling Strategies
    - xTO
  - Velocity - Speed to Market
  - Manufacturing Approaches
    - Internal
    - External

- Affects
  - Enterprise & Product Development Processes
  - Primary Product Descriptions
    - EBOM
    - MBOM
    - SBOM
  - Virtual variety – CAD Modeling Practices





Describing Variety in the Enterprise

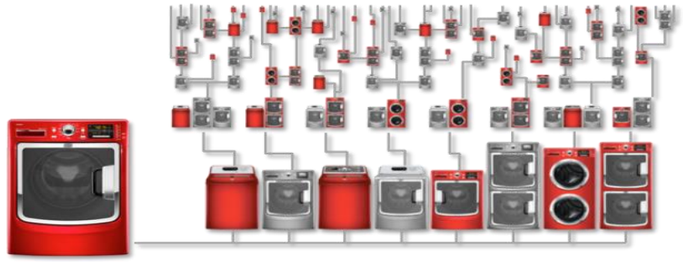


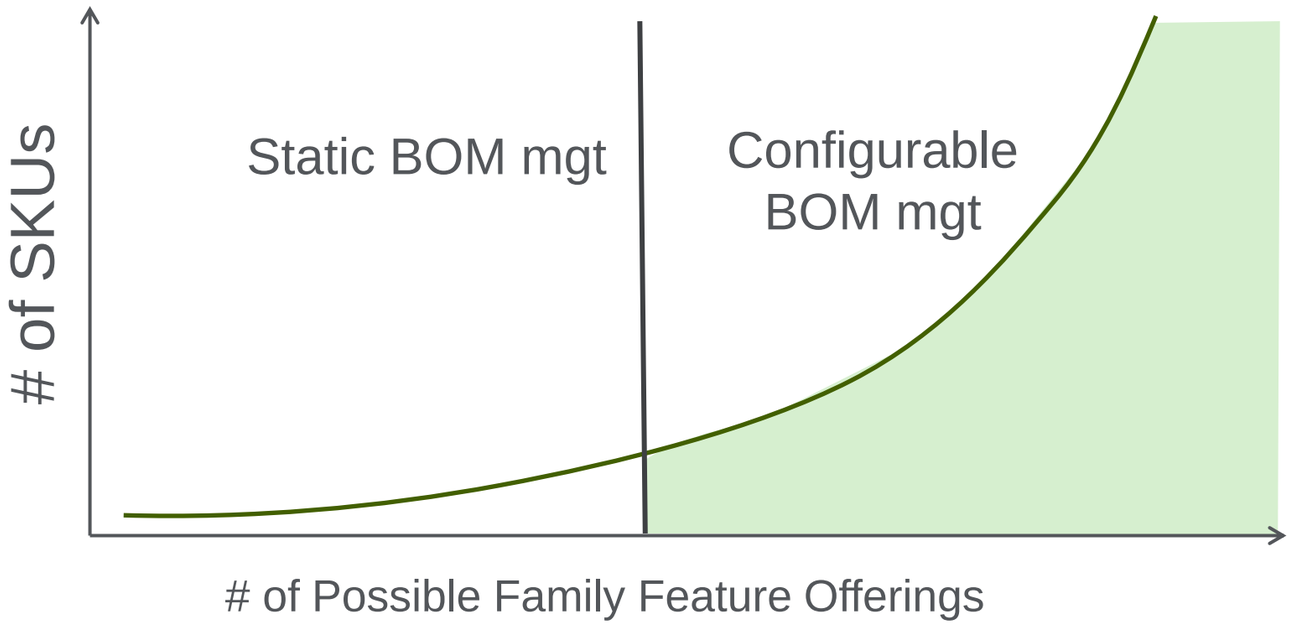
- Product Variation Types
  - Features, Sizes, Brands, Customer environments, etc.
  - Paints, colors, finishes

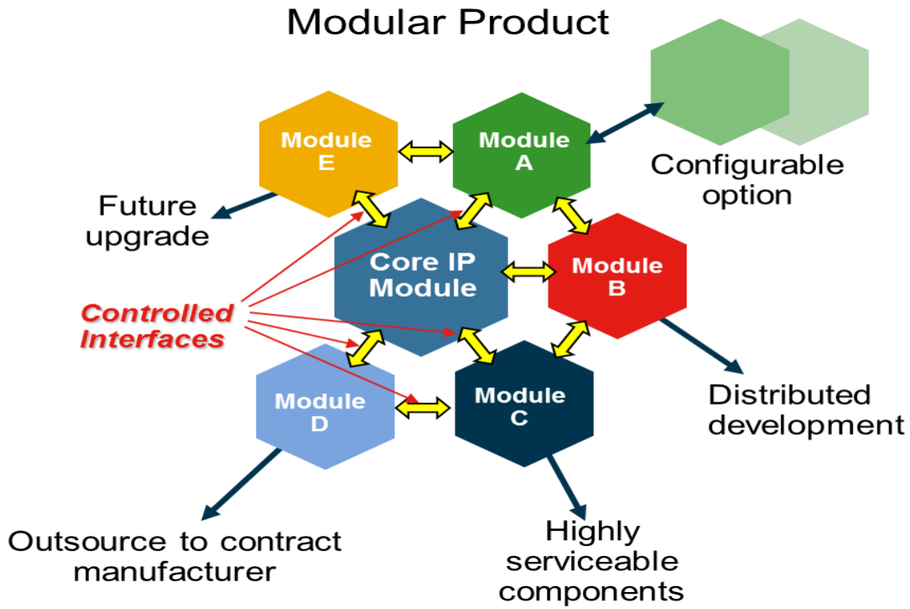
- Points of variation
  - Hardware
  - Electrical
  - Software

- Considerations for Documenting and Describing Variety
  - Product Definition
    - Efficiency in definition of variety
    - Efficiency in communication, change mgt to the organization
  - Product Validation
    - How do we ensure the variation will work in all domains?
    - Ex: Hardware, Electronics, Software
  - Mfg Planning
    - How will we plan for and build each product variation with high quality and within cost targets?
  - Service
    - How will we plan to service each product
  - Operate – Digital Twin
    - How do we ensure we can learn from our products in the field

Considerations for BOM Management Strategies







Common Question
How Closely to Relate Parts with CAD Models for eBOM?

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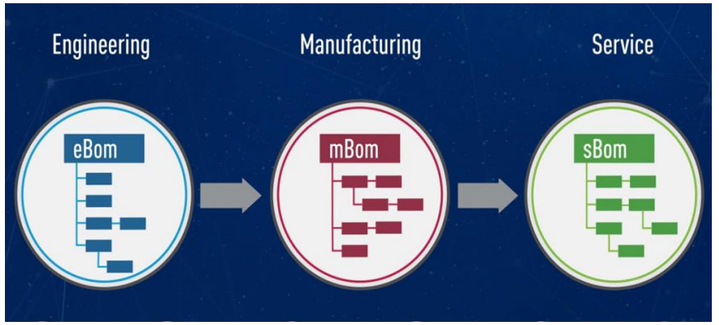
- Common eBOM Needs - Increased focus on Part-Centric
  - Robust Lifecycle management of key deliverables
    - Revision Control, Flexible identification
    - Ability to link related information
  - Rich Configuration Management & Change Management
    - Navigate configurations by lifecycle, date and baselines
  - Capabilities to easily create and maintain the eBOM and share in Mfg and Service
  - Enable collaborative Multi-discipline Approach– (Mechanical-Electrical-Software)



- High Volume Products (ATS, ATO)
  - **Who:** Computers, Telecom, some industrial, EHT, Consumer products, med devices
    - Products with low virtual variety & high volume of configurations
    - One more mfg sites
  - **High Priority:** Enterprise needs high quantity & high quality BOMs
  - **Virtual validation**: For representative configurations
  - **Critical Needs**
    - Loosely coupled Part to CAD relationships to identify “typical”
    - Validate typical virtual representations for design
    - Effectively create and maintain BOMs manually or automated

- Order-Specific Products (ATO, CTO/ETO/Contract)
  - **Who:** Heavy equipment, automotive, some industrial products
    - High configuration variety – more virtual validation, mfg planning
    - Tightly connected Design & Mfg and internal mfg orgs
  - **High Priority**: Representative and order-specific BOMs
  - **Virtual Validation:** For most/each configuration
  - **Critical Needs**
    - Tightly coupled Part to CAD relationships for each variation
    - Validate many product permutations virtually
    - Share documentation of order differences in Mfg & Service

Learn More: Part113: Part-Centric PLM : Panel

Learn More: Cust124: Solar Turbines

Typical Manufacturer eBOM

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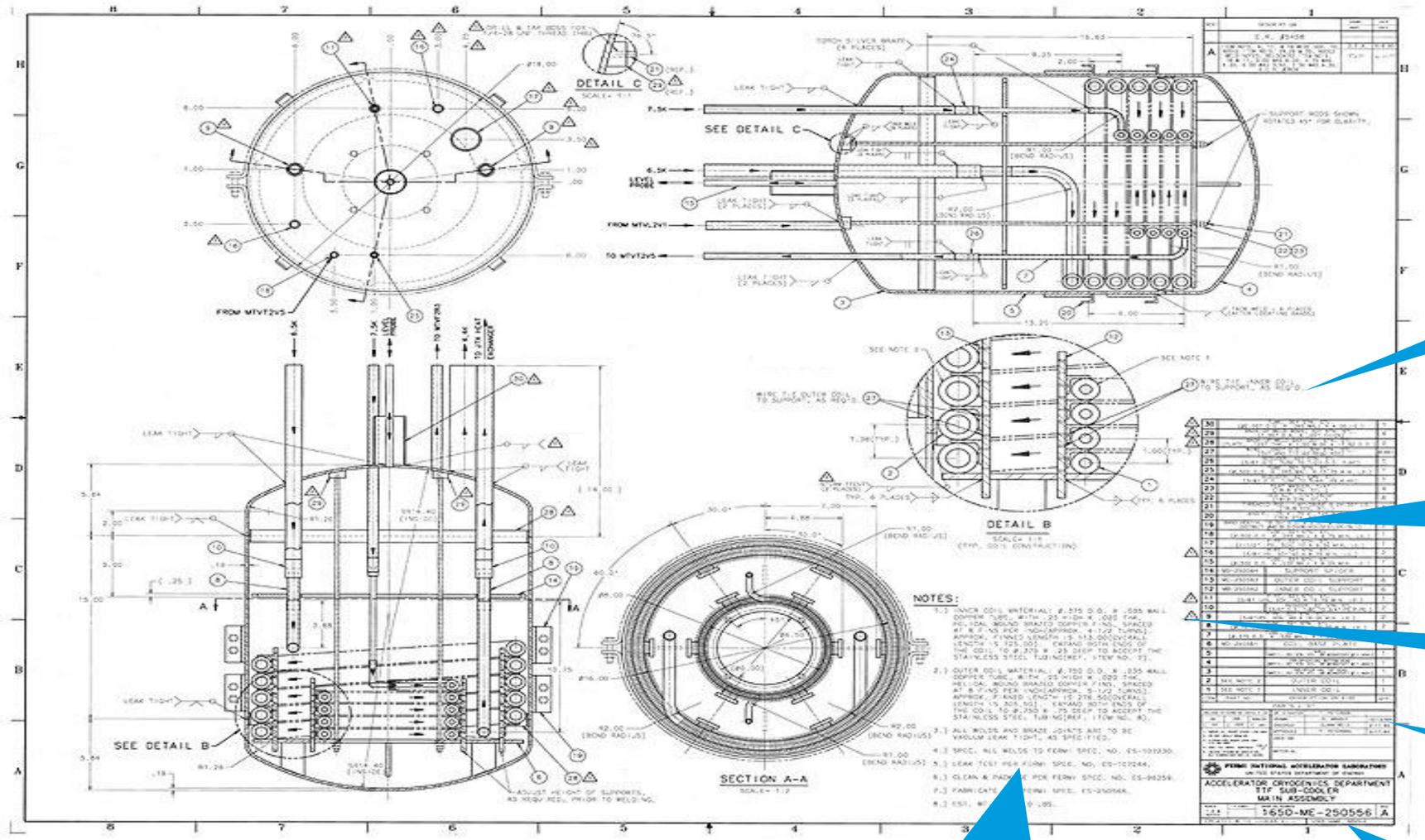

BOM

Part # + Part Name

Find Numbers

Quantity

Process Reqts

Part Name + Rev

The Waiting Game

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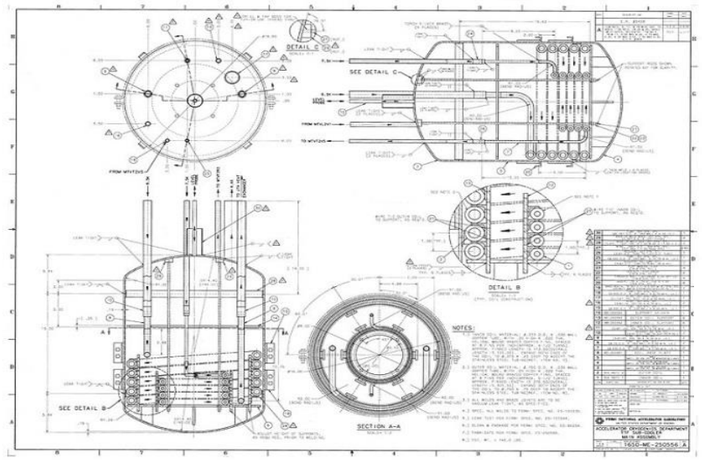
Composition Process

Reviewers

Consumers

De-Composition Process

All must be ready before the drawing can be “Released”



BOM

Parts

Critical Dimensions

CAD Models

Material Spec

Suppliers

CAD Models

BOM

Parts

Critical Dimensions

Material Spec

Drawings

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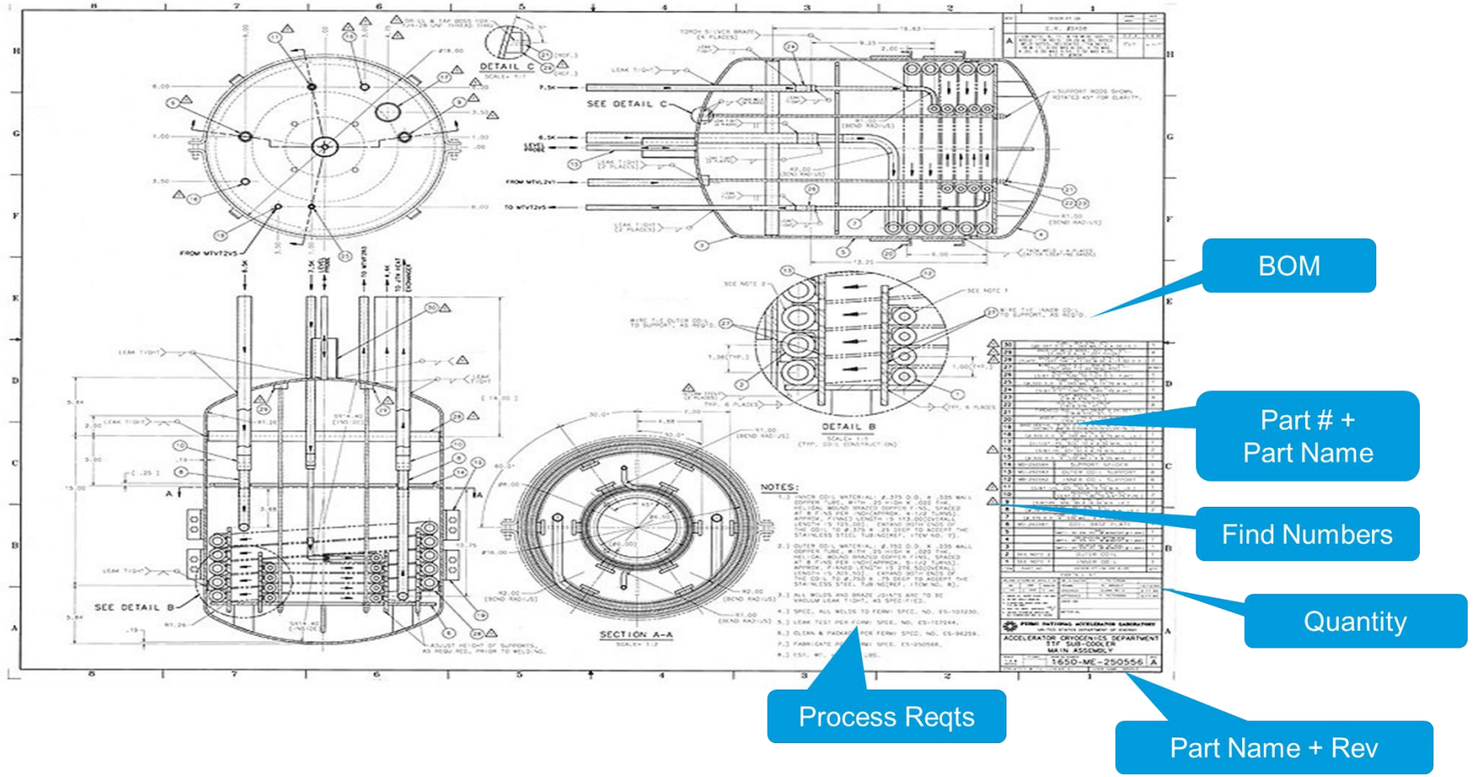
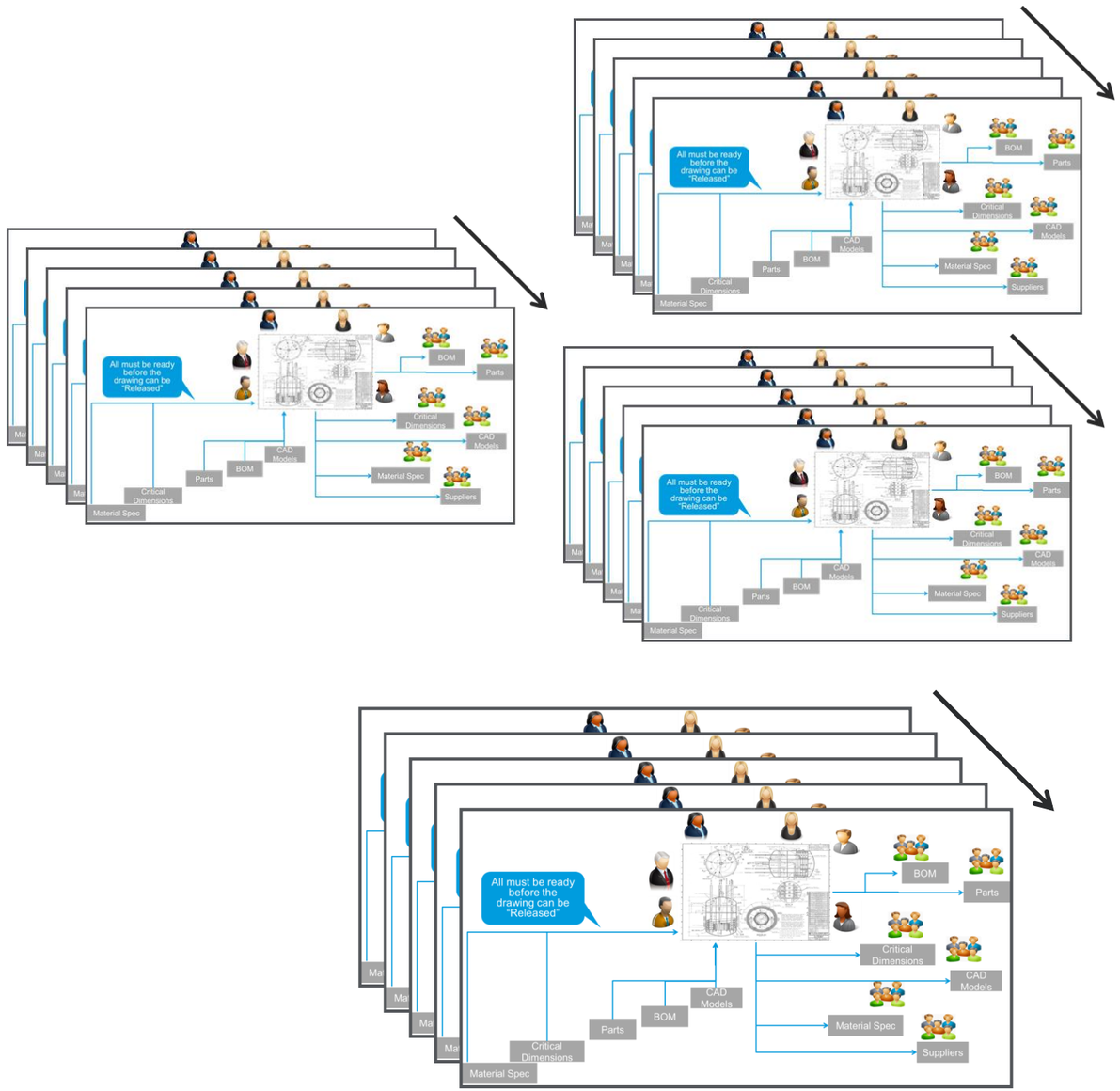
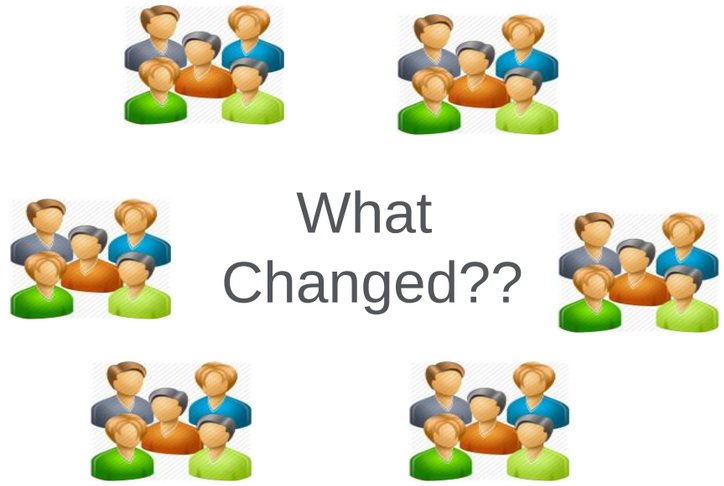
- Drawing Centered World
  - Product Content
    - Part Drawings
    - Assy Drawings
    - Table Drawings
    - Mfg/assy
  - Suppliers
    - Spec Control Drawing
  - Governance
    - Design Review of Drawings
    - Change Control of Drawings



The Waiting Game Gets more Expensive



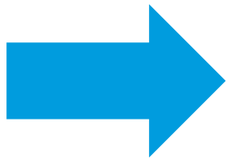
- Tracking Changes
  - Quantity changes => Drawing Change
  - Process changes => Drawing Change
  - Part Number => Drawing Change
  - Part Name changes => Drawing Change
  - New Assy BOM => Drawing Change
  - Replace a Part => Drawing Change
  - Change a Find Number => Drawing Change



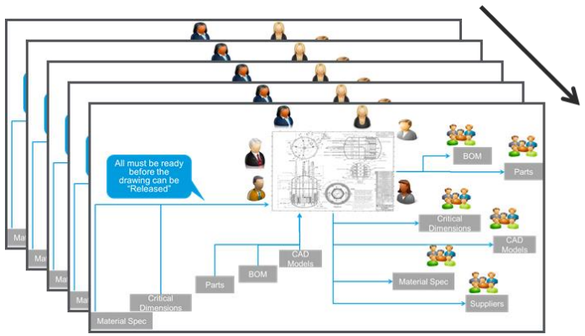
1 Change on a Drawing may affect 10x downstream activities & deliverables

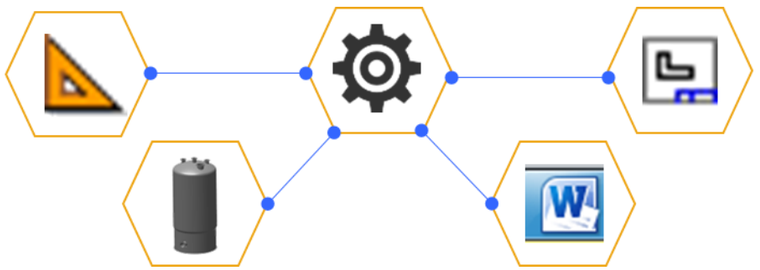
Moving to Part-centric Configuration Management

- Drawing Centered World
  - Product Content
    - Part Drawing
    - Assembly Drawings
    - Table Drawings
    - Mfg/assy Drawing
  - Suppliers
  - Governance of Product Definition



- Part Centered World
  - Product Content
    - Parts
      - BOM
      - Related information
    - Configurable Designs
    - Manufacturing, Supplier and Service information
  - Governance of Product Definition





Part Drawing

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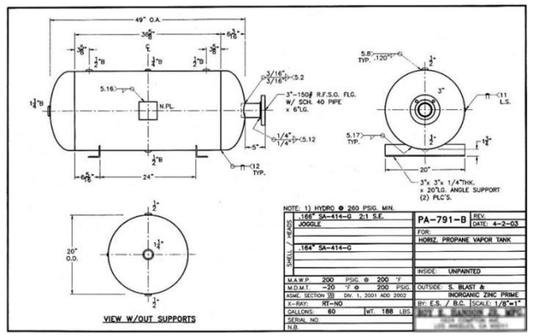
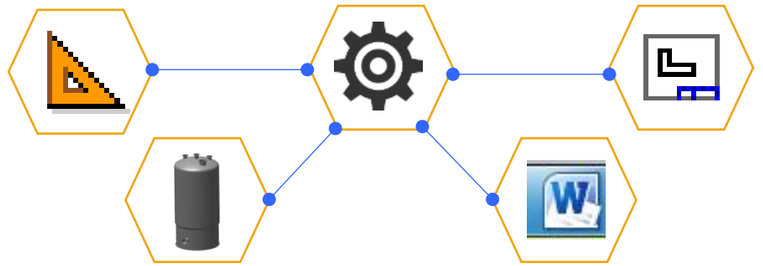
- Typical Needs
  - Document the Part Geometry
  - Identify Critical Attributes
  - Reference Information





- Part Definition in Windchill
  - Associate CAD Model to Part
    - Owner Relationship
  - Associate Drawing to Part
  - Share important attributes
  - Define Alternates
  - Design specification
    - Describes by - Linked to a specific Document Revision
    - Referenced by - Linked to the latest or by Config Spec Supplier specification
    - Reference link to Parts

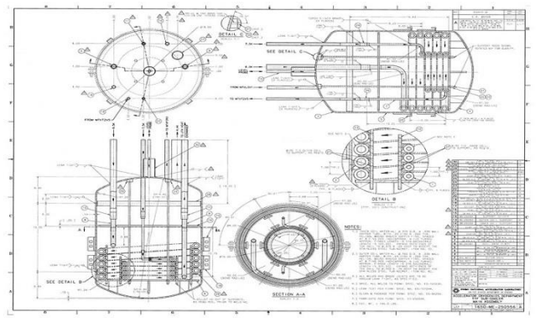
Association Type	Builds Structure	Attribute	Reps	Contributes to Structure	Usage
Owner	☑	☑	☑	☑	Associate primary CAD document responsible for driving structure creation
Contributing Image	☐	☑	☑	☑	Multi-CAD secondary association, flexible components
Image	☐	☐	☑	☑	Multi-CAD secondary association, flexible components
Contributing Content	☐	☑	☐	☐	Multi-CAD where secondary attributes critical to BOM
Content	☐	☐	☐	☐	Inclusion of additional descriptive CAD content, ex. Model's Drawing to Part

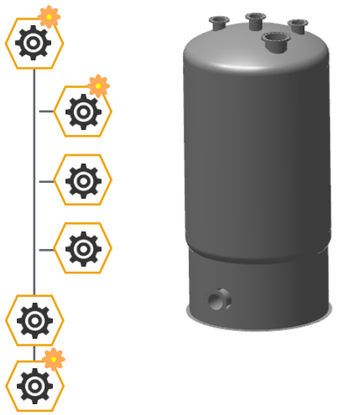
- Review Processes
  - WIP - Promotion Process
  - Release – Change Process

Learn More: PTC114: Part Types in WC
Monday– 4:00pm

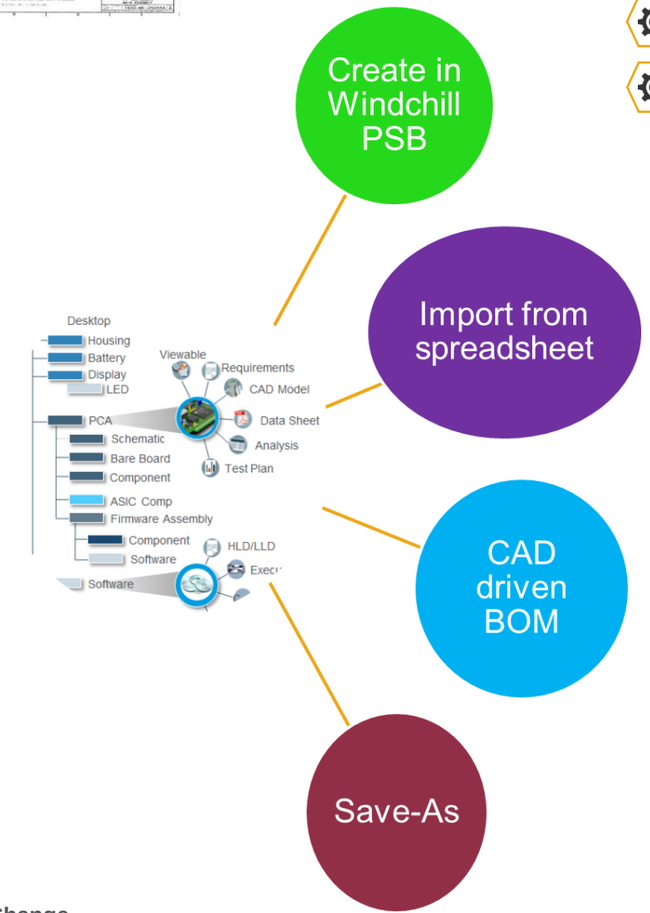
Assembly Drawing

- Typical Needs
  - Document the Assy Geometry
  - Identify BOM
  - Identify Reference Information





- Assy Definition in PTC Windchill
  - Create BOMs
    - In PTC Windchill
    - Excel Import/export
    - With CAD – Top Down/Bottom Up
  - Define BOM information
    - Qty, Unit of Measure, Line Number, Find Number, Reference Designator
  - Assembly Visualization
  - Define Substitutes
  - Share important attributes



- Review Processes
  - WIP - Promotion Process
  - Release – Change Process

Assembly Drawing to Part-centric BOM

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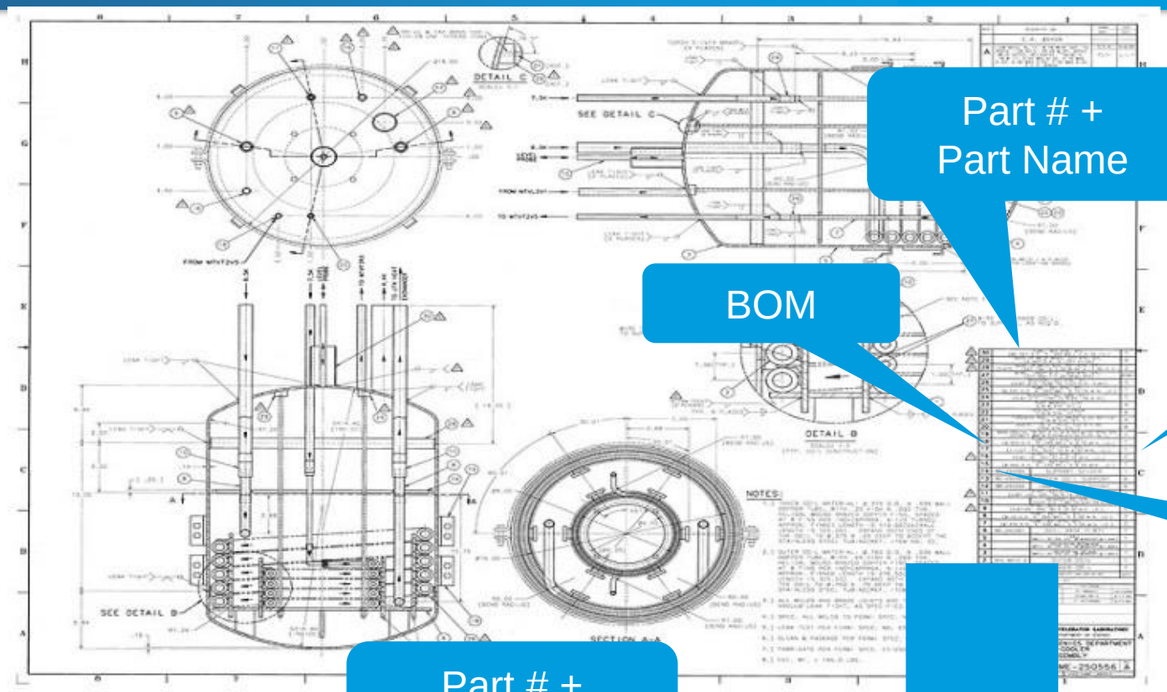


Part # + Part Name

BOM

Quantity

Find Numbers

Part # + Part Name

BOM

Quantity

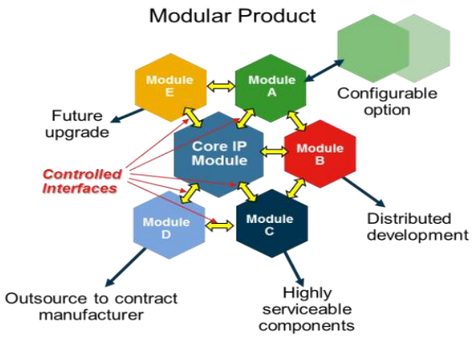
Find Numbers

Attributes | Occurrences | Visualization

Number	Name	Version	End Item	Line Number	Quantity	Unit	Trace Code	Reference Designator	Find Number
070009	CAPACITOR, 10uF, 16V, SMD	A.1 (Design)	No	10	1	each	Untraced	C4	30
070021	DIODE, SCHOTTKY, 30V, 200mA	A.1 (Design)	No	20	4	each	Untraced	D1-D4	190
070023	JUMPER, CONN HEADER, 2POS, ...	A.1 (Design)	No	30	7	each	Untraced	JP1,JP7,JP10-JP12,TP1-TP2	210
070024	JUMPER, CONN HEADER, 3POS, ...	A.1 (Design)	No	40	7	each	Untraced	JP2-JP6,JP8-JP9	220
070028	LED, RED, CLEAR, SMD	A.1 (Design)	No	50	7	each	Untraced	LED1-LED7	290
070036	RESISTOR NETWORK, COMMON ...	A.1 (Design)	No	60	6	each	Untraced	RP3-RP8	390
070066	CAPACITOR, 100nF, 50V, 10%, SMD	A.1 (Design)	No	70	40	each	Untraced	C1-C3,C5-C6,C9,C11,C13...	20

Assembly Drawing – Considerations for Creating BOMs

- As Companies move to PTC Windchill Part Management
  - Some Existing CAD Modeling Practices optimized for **Drawing** definition
  - Organizational Change Management is **Needed**

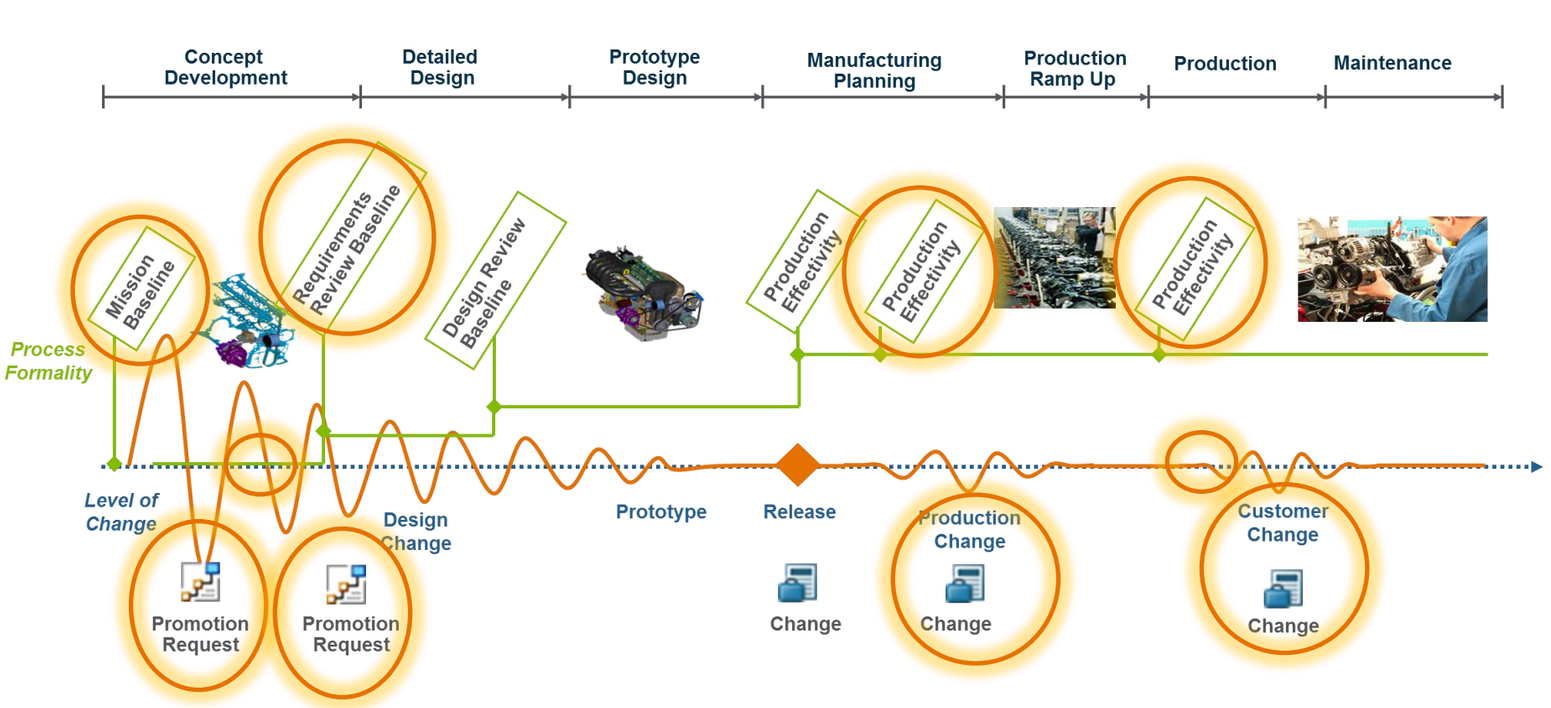


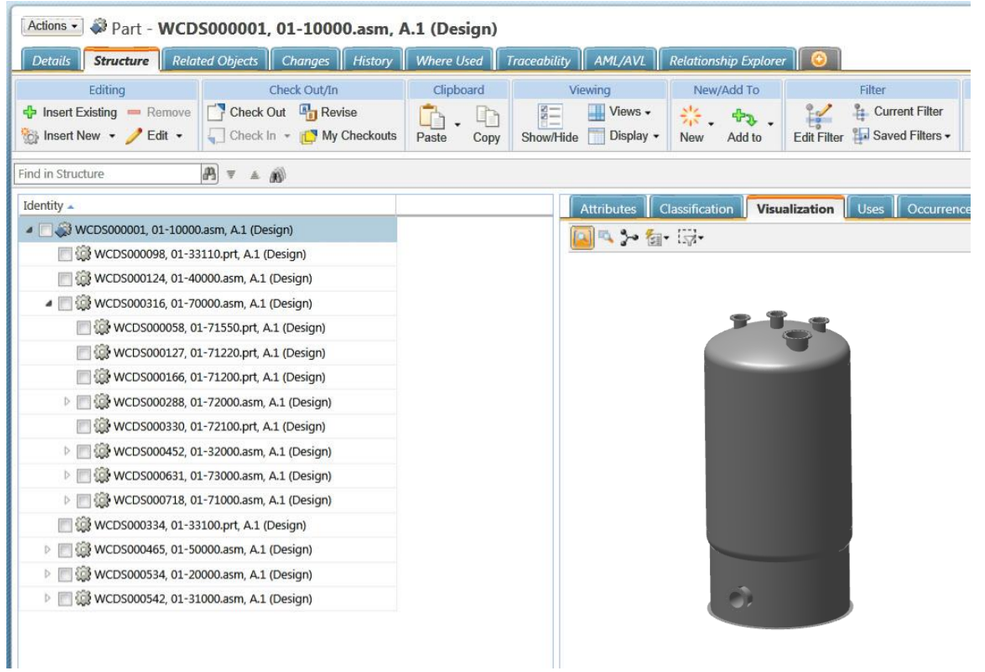
- Drawing Centric PTC Creo Practices
  - Product Layout
    - Product Level (Integral) Skeletons
  - Product Configurations in PTC Creo
    - Creo Assy Family tables
      - Unable to identify configuration changes
    - Simplified Representations
      - These do not drive product structure
  - Part Definition
    - Part Family Tables
    - Model to Model relationships

Retire!

- PTC Windchill Part-Centric Creo Practices to Adopt
  - Product Layout
    - Distributed (Modular) Skeletons
  - Product Configurations in PTC Creo
    - Creo Assy by Module Locators
    - External Simplified Reps
      - Independent
      - Dependent
  - Part Definition
    - Discrete Part Models
    - Model to Interface relationships

Assembly Drawings – Managing Product Structure Configurations over time





Purpose	Configuration Specification
Develop concepts & update configurations	Latest
Review concepts and prototypes	Promotion Request
Capture significant program milestones	Baseline
Plan Production Configuration	Unit or Date Effectivity

Table Drawings

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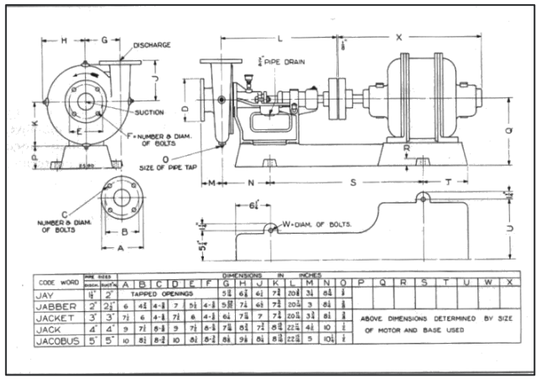
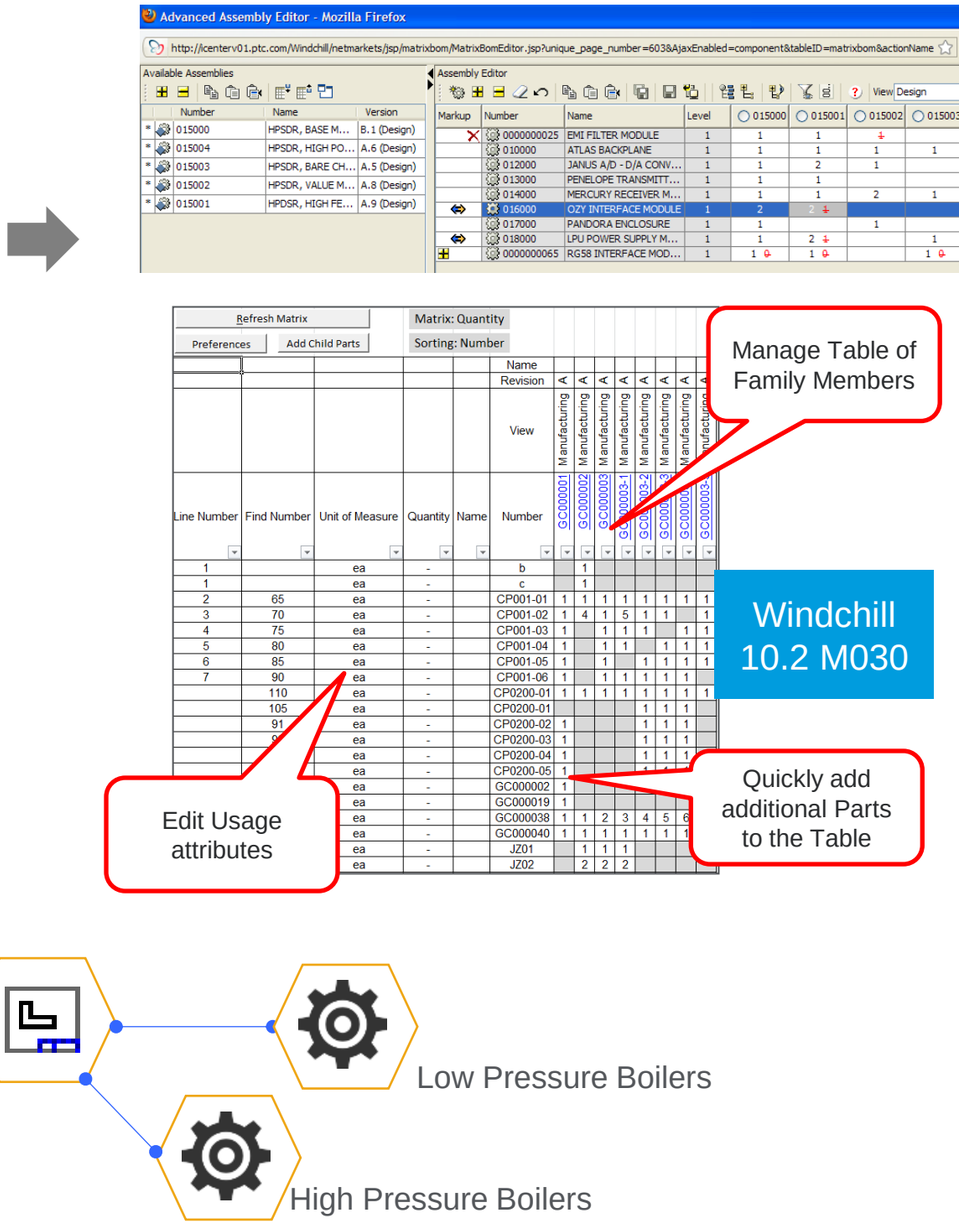
- Typical Needs
  - Define a related set of parts or assemblies with varying dimensions or attributes



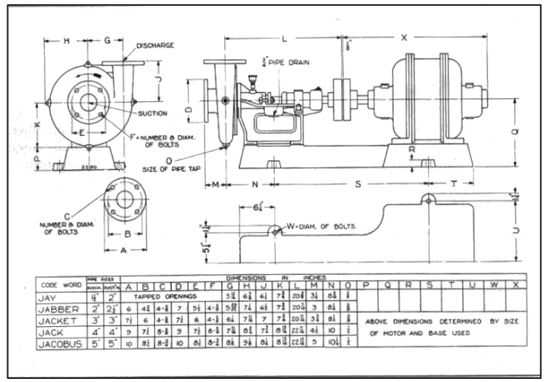
- Family Definition in PTC Windchill
  - Create/Manage BOMs
    - Save-As Part Structures
    - Assembly Table Editor – Edit multiple family members
  - Manage related Drawings
    - Relate Drawings to Multiple Parts
  - Platform Structures Module
    - Excel Product Family

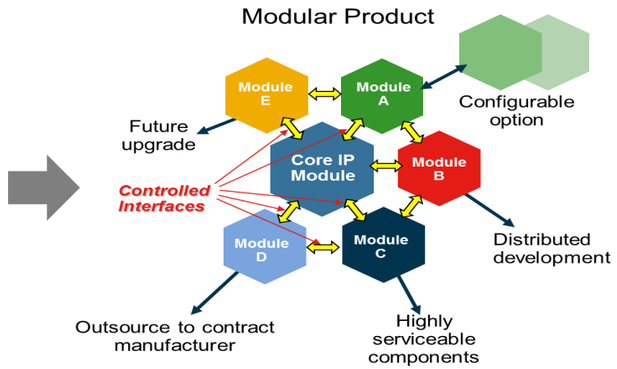


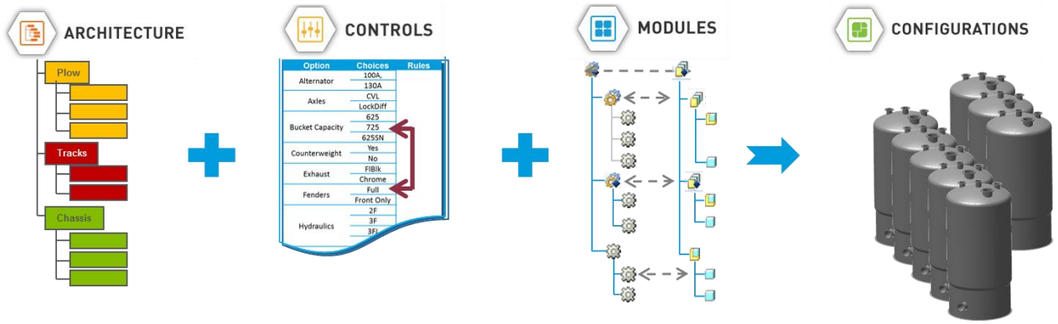
- Review Processes
  - WIP - Promotion Process with Baselines
  - Release – Change Process

Table Drawings – Moving to Configurable Products

- Typical Needs
  - Define a related set of parts or assemblies with varying dimensions or attributes
- Instead of Tables - Platforms in PTC Windchill
  - Create Configurable BOMs with Global Platforms
    - Requirements -> Option & Choices, Rules
    - Define Family Models & Configurations
    - Design Module Variants
  - Create and Update Product BOMs
    - Generate BOMs for each needed configuration
    - Update BOMs as rules & designs change
- Review Processes
  - WIP - Promotion Process
  - Learn More: PTC201: Product Platforms Tuesday – 10:00

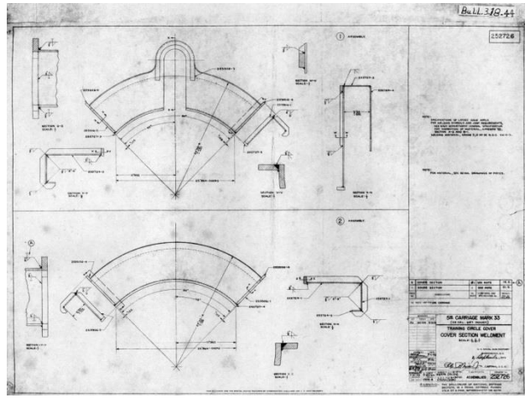


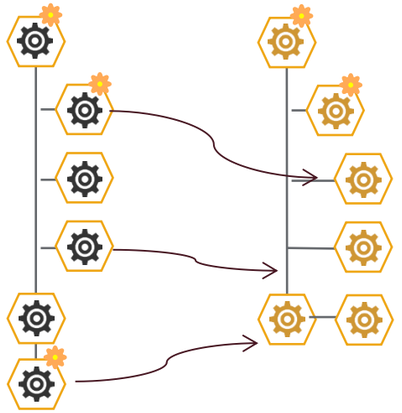




Manufacturing / Assembly Instruction Drawings

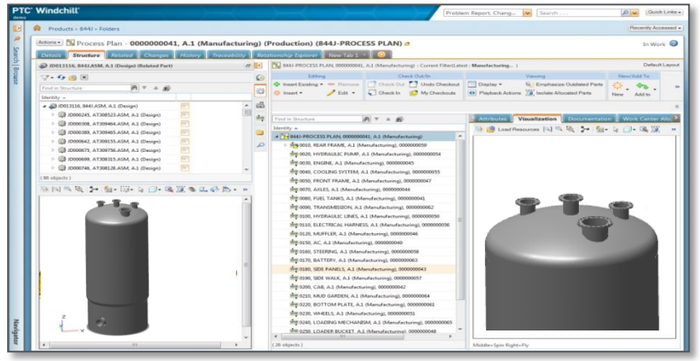
- Typical Needs
  - Recreate geometry for mfg drawing views
  - Define requirements for manufacturing such as welds, torque, lubricants, etc.
  - Show assembly steps





eBOM mBOM

- Manufacturing Definition in PTC Windchill
  - BOM Notes in Product Structure
    - Define manufacturing process needs such as torque values or lubricant application.
  - PTC Windchill Manufacturing Planning Solution
    - Associative views – one or more MBOMs
    - Define Process Plan
      - Define plant specific process definition
      - Dynamically generated work instructions
    - Engineering to manufacturing change propagation

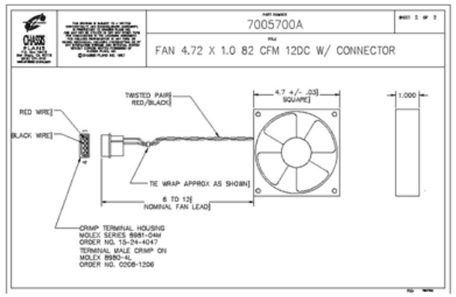


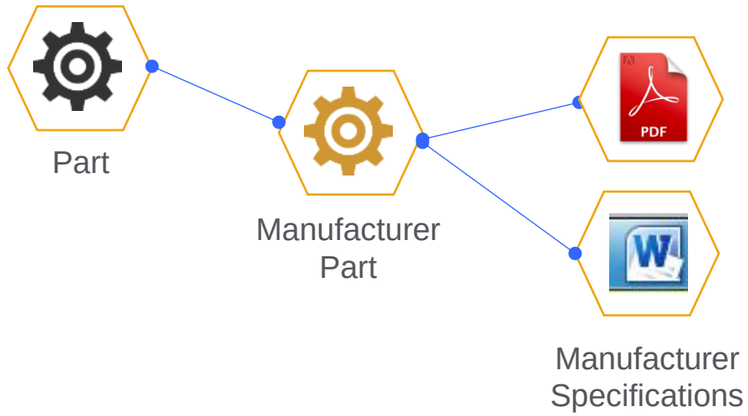
- Review Processes
  - WIP - Promotion Process
  - Release – Change Process

Learn More: PTC310: Moving to MBOM with Windchill MPMLink
Wednesday – 10:30am

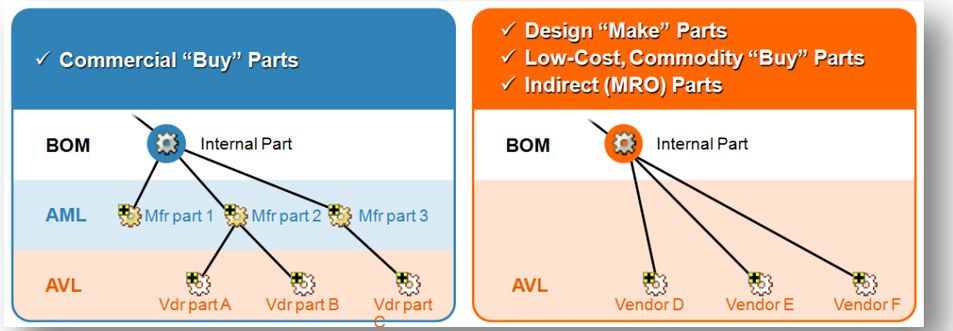
Supplier Drawings – Spec Control Drawings

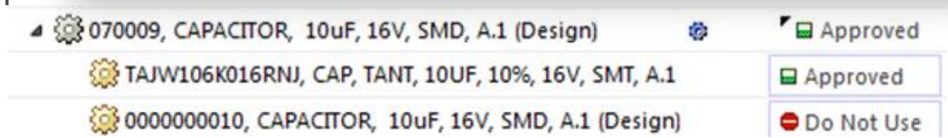
- Typical Needs
  - Drawing to call out supplier specific parts
    - Can be duplicated for multiple suppliers
  - Define requirements for purchased parts





- Supplier Definition in PTC Windchill
  - Supplier and Manufacturer Parts related to BOM Part
    - View in the BOM
    - Define applicability by Sourcing contexts
  - Supplier and Manufacturer Parts have related specifications
    - Describes by - Linked to a specific Document Revision
    - Referenced by - Linked to the latest or by Config Spec Supplier specification
  - Define Suppliers and Manufacturers to view and manage their parts





- Review Processes
  - WIP - Promotion Process
  - Release – Change Process

Learn More: PTC238: Driving Part Re-Use: ROI
Wednesday – 10:30am

Review Processes - Change Management and Promotion Requests

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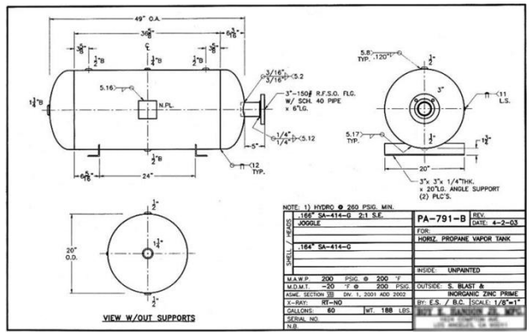
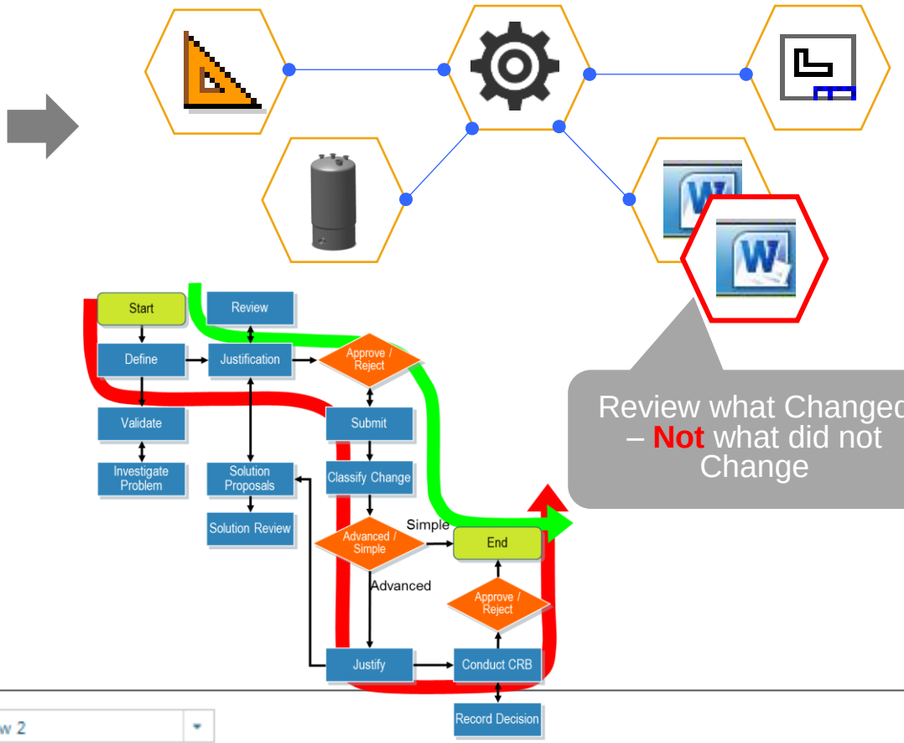
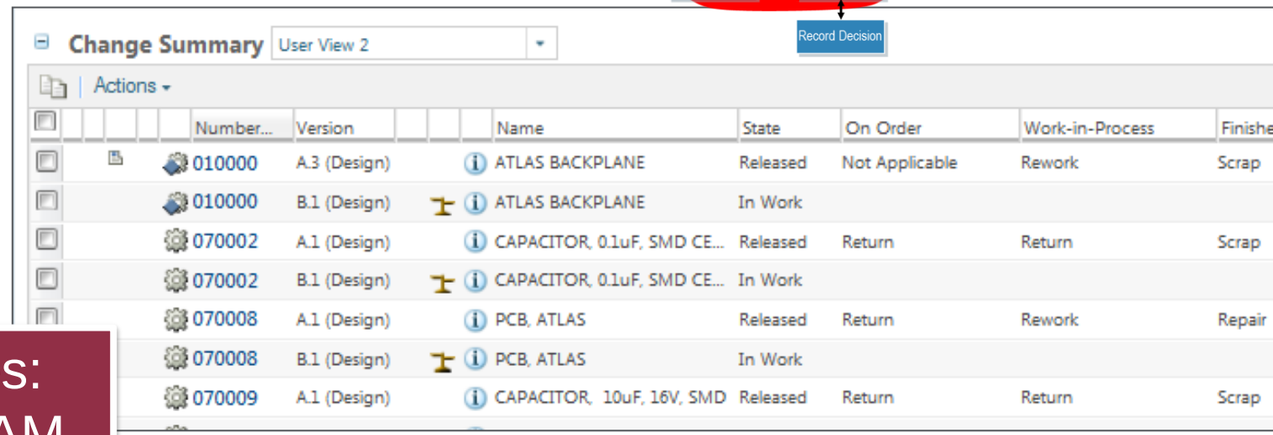
- Typical Needs
  - Drawing Review and Release
  - Revise Drawings, Review and Release
  - Identify other affected drawings and change them



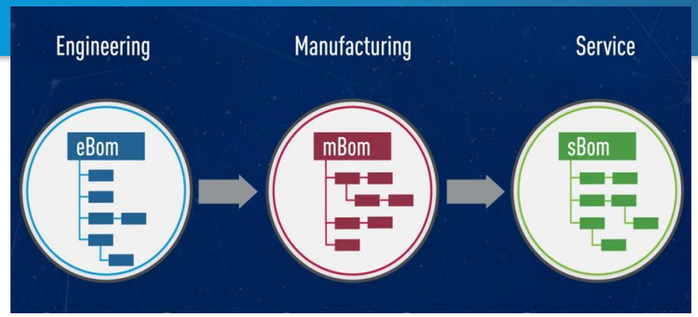


- Review Processes in PTC Windchill
  - Change Management
    - Review and Govern each important deliverable
    - Better understanding of what deliverable changed
    - Highly scalable from simple changes to robust enterprise changes
    - Easily gather related data including Parts, CAD, Documents, Supplier Parts, Option Logic and more.
  - Promotion Request
    - Light weight process to mange WIP data state changes



Learn More: Change Management Best Practices: Executing the Change Process Tuesday – 11:00 AM

Benefits of managing your Product Configurations



Millennium Power Manufacturing (Shanghai) Corp. (MPMC) is a high-tech enterprise which integrates the research, development, assembly, production, sales and service of energy-saving and environment-friendly Diesel Generator Sets Trailer Lighting Towers and Movable New-energy Lighting Towers..

- Product development productivity improved by 50%
- Parts reuse improvement of 80%
- Design changes were reduced by 60%

Learn More: Moving from PDM to PLM: The Value of Associative BOM - Wednesday – 8:15AM

See Customers in Action with PTC Windchill

PTC® Live Global

> Anyone in the Company has the luxury of grabbing a bill of materials at any point in time and having confidence that what they're looking at is the correct and up-to-date information.
>
> Kar Dehal

PTC® PRODUCT & SERVICE ADVANTAGE

Live Webinar: March 25, 2015 at 11AM (ET)

Learn How an Engineering BOM in PTC® Windchill® can Accelerate Product Development

▶ REGISTER NOW

Watch a Demonstration to learn how iRobot accelerates their product development processes by using engineering BOMs within PTC Windchill.

Learn how to:

- Manage a bill of materials that accurately reflects all the items in a product – mechanical, electrical, artwork, packaging, and documentation
- Easily find information related to specific components and assemblies, such as inspection documents, assembly instructions, datasheets, and analysis files
- Leverage existing PTC Windchill features such as "where used" and "BOM compare"

Join Steve Shaw from PTC and Kar Dehal from iRobot and learn how using an Engineering BOM in PTC Windchill can accelerate product development

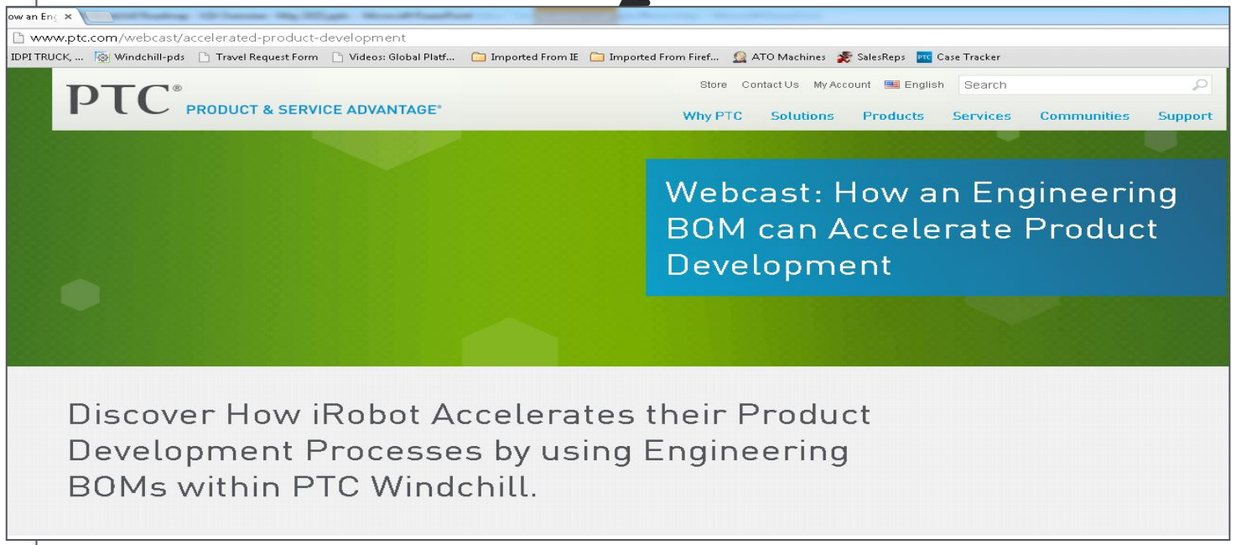
Steve Shaw, Global Product Development Solutions Director, PTC

Steve has over 16 years of industry experience in product design and development and has worked with companies worldwide to help them better manage product data.

Kar Dehal, PTC Windchill Business Lead, iRobot

Kar is a mechanical engineer and a PTC Windchill administrator with over 10 years of experience designing products, implementing PLM systems, and managing engineering data. For the last 3 years, Kar has focused on administering PTC Windchill which has included the integration of ECAD data into PTC Windchill and, overhauling the Change Management Process.

Watch It Today at www.ptc.com



Learn More: Moving from PDM to PLM: The Value of Associative BOM
Wednesday – 8:15AM

PTC Live 2015 - eBOM & mBOM Sessions

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PTC Topic	Date	Time	Room	Customer Session	Date	Time	Room
PTC109: Best Practices for Managing Your Product Configurations	6/8/2015	2:15PM	Lincoln DE	**Cust124: Linked Data in Real Life: How "Owner Links" Change Everything, Solar Turbines**	6/8/15	5:00PM	Cheekwood ABC
PTC114: Part Types in PTC Windchill	6/8/2015	4:00PM	Lincoln DE	**Part113: Part-Centric PLM in a Drawing-Centric World: How we Manage Complete Part Specs**	6/8/15	1:15PM	Lincoln A
PTC201:Managing Configurable Product Platforms	6/9/2015	10:00AM	Presidential Boardroom A	**Cust321: Whether Bottoms Up or Top Down Design: Let PTC Windchill do the Heavy Lifting, TE Connectivity**	6/10/15	11:30AM	Heritage E
PTC214:Managing the SKU Development Process for Consumer Products	6/9/2015	2:15PM	Lincoln DE	**Part201: Ninja MCAD/ECAD BOM Creation**	6/9/15	1:15PM	Hermitage AB
PTC238: Driving Part Re-Use: ROI and Best Practices for Maximize Design Reuse	6/9/2015	5:00PM	Jackson AB	**Cust238: GE Aviation Systems PLM Journey to Effective Global Concurrent Engineering**	6/9/15	5:00PM	Washington B
PTC310: Moving to MBOM (Unifying Engineering and MFG Planning) with PTC Windchill MPMLink	6/10/2015	10:30AM	Jackson AB	**CUST305 Demo of Alcon Change Management Process Using CAD Driven Product Structure**	6/10/15	8:15AM	Heritage E
PTC300: Moving from PDM to PLM: The Value of Associative BOM	6/10/2015	8:15AM	Hermitage D	**CUST308 Moving Day: Moving Information from Drawings into the 3D Model**	6/10/15	9:15AM	Presidential Boardroom A

PTC Windchill Configuration Mgmt Highlights 10.2 M030

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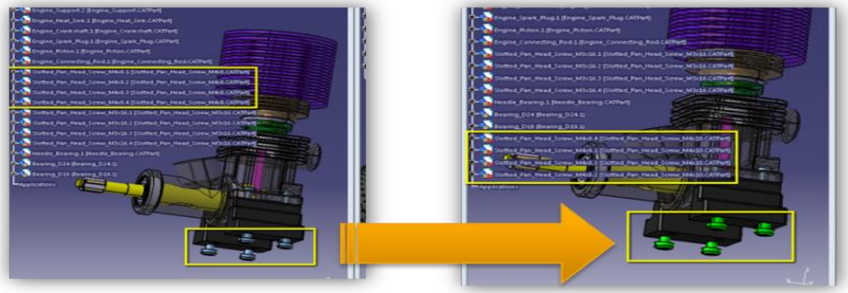
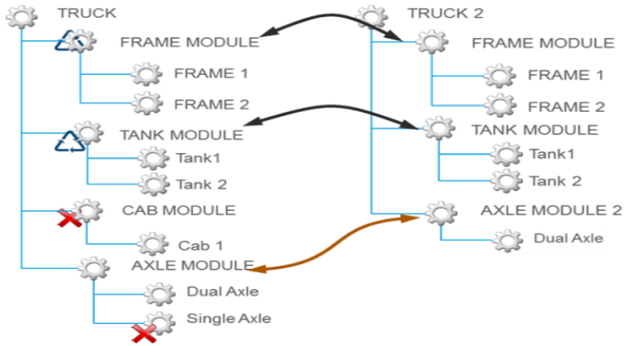
- Mass Change
  - Enable users to update BOMs with Owner linked CAD
    - Update the Part and CAD structure
      - Supported for PTC Creo and CATIA
    - Preserve occurrence location of the Part
    - Usability improvement for Mass Change

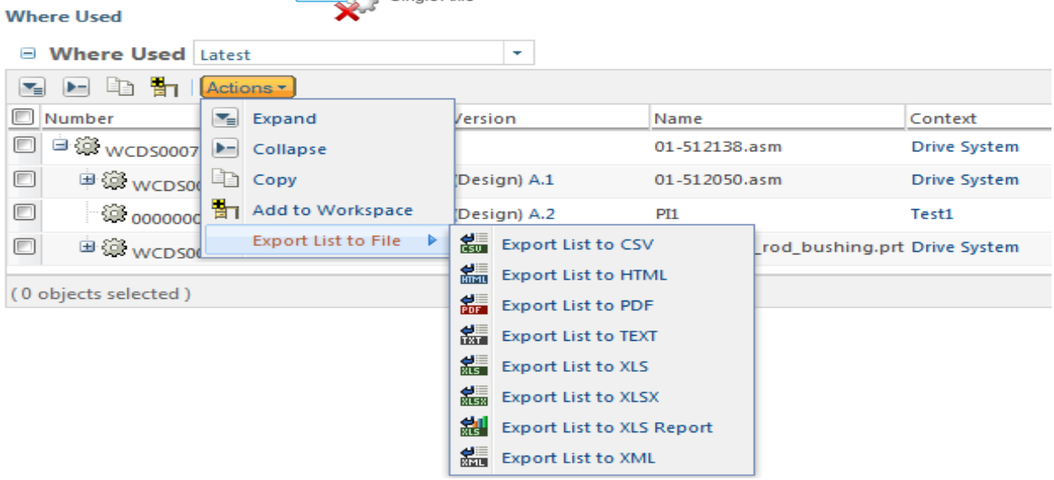


- Save-As
  - Let users Prune Parts from the BOM during the Save-As operation

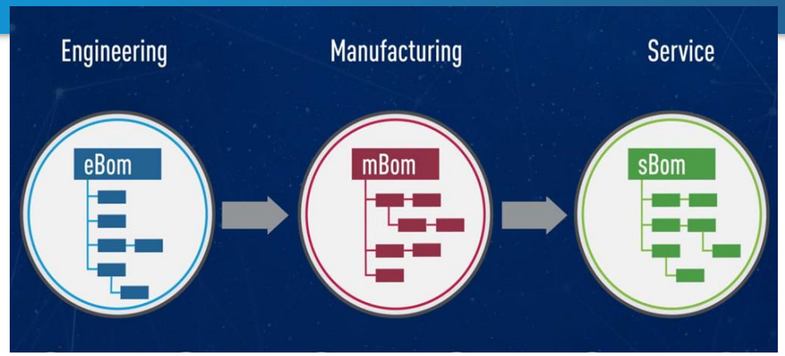


- Configuration Context
  - Refresh 1st level nodes
  - Improved rule grouping and order
  - Identify unoccurrenced Parts in the Context

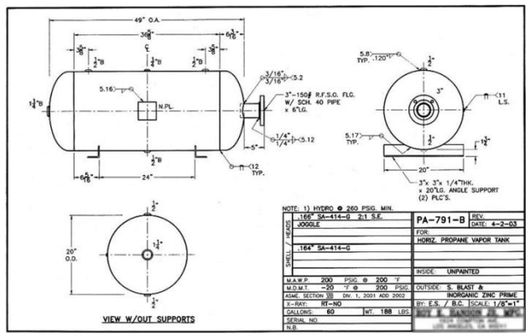
- Where-Used
  - Provide Export List to File action on the Part Where-Used Table

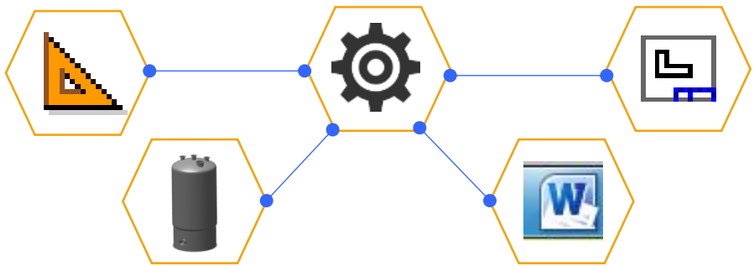


Best Practices for Managing your Product Configurations



- Many companies are on the journey from moving from a Drawing-centric to a Part-centric Practice
- Highlighted Practices to translate from Drawing-centric to Part-centric Configuration Management
- There are significant benefits to adopt a Part-centric Practice
  - Significant productivity benefits to Engineering
  - Even more significant cost, productivity and quality benefits downstream of Engineering
  - Organizational Change Management is key to making the transition





- Your feedback is valuable
- Don’t miss out on the chance to provide your feedback
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- Complete your session evaluation now

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Assembly Drawing – Managing Assembly Information over time

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User wants	Configuration Specification	Manage WIP Data	View Production	Description
To find latest designs	Latest	✓	✓	Expand the structure using the most recently created versions of a selected View and Life Cycle State. Available for most structure types.
To get the design from a specific event in time	Baseline	✓	✓	Expand the structure using versions captured in a previously created baseline. Available for part and CAD document structures.
To see the configuration of a product based upon serial number or lot	Unit Effectivity		✓	Expand the part structure using part versions assigned a specified serial number, lot number, or lot/serial number effectivity. Available for part structures only.
To see the configuration of a product based upon date	Date Effectivity		✓	Expand the part structure using part versions assigned a specified date, or date and time effectivity. Available for part structures only.
To Get the data related to a promotion request	Promotion Request	✓		Expand the structure using versions referenced by a specified promotion request. Available for part and CAD document structures.
To get back the CAD data that the user had succesfully regenerated and checked in	As Stored	✓		Expand a CAD document structure according to a baseline automatically created when the CAD model is stored. Available for CAD document structures only.