

Autodesk Product Design and Manufacturing Collection | Vault Professional

Optimize Multidisciplinary Workflows

Markus Koechl

Solutions Engineer PDM|PLM – Autodesk Central Europe





About the speaker

Markus Koechl

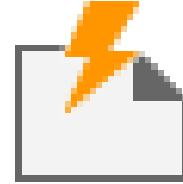
Markus is a Solution Engineer for Vault Products. He is driven by customer needs, practical workflows and always eager to overcome barriers by extensions or automation. That's the simple reason that he started programming Inventor, Inventor iLogic, and Vault APIs with the background of a Mechanical Engineer.

Learning Objectives



PDMC & VAULT OVERVIEW

- Get an overview of major capabilities and workflows covered by the Product Design & Manufacturing Collection toolset
- Learn how Vault Professional captures all relevant engineering data using built-in functionalities
- Learn how iLogic Automation extends workflows beyond design automation



WORKFLOW CHALLENGES

- Get insights on challenges encountered when consolidating data for different disciplines, like sharing models for procurement or machining



WHERE TO START WITH AUTOMATION

- Learn how to access available configuration and automation samples that might help to eliminate unproductive steps in daily work

Agenda



Capturing Engineering Data

Inventor Nesting - Vault

The diagram shows the Inventor Nesting - Vault workflow. It starts with a 'Model' (a 3D part), followed by 'Nest' (a 2D layout), and 'Cut' (a 3D model of a red machine part). A circular callout lists the following features:

- Automated true-shape nesting
- Nesting Reports
- DXF/DWG Import
- Integration with CAM

Machine & Factory Layout Design

Managing Asset Libraries, Assets, and Layouts in Vault

The diagram shows a 3D model of a factory floor with a person walking. A circular callout lists the following features:

- Process Modelling
- Planning Layouts
- Detailed Design
- Design Review
- Communication

Integrating Manufacturing

Managing Tolerance Analysis Data in Vault

The diagram shows a 3D model of a machine part with a tolerance analysis overlay. A circular callout lists the following features:

- Stackup
- Advanced Statistical results
- Report Generation

Beyond Engineering

Managing Inventor BIM Exchange Data

The diagram shows a 3D model of a building structure with a BIM exchange overlay. A circular callout lists the following features:

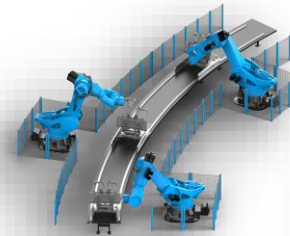
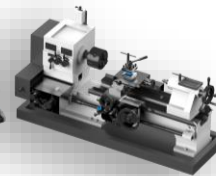
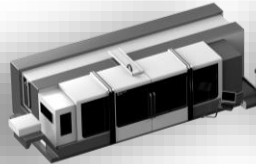
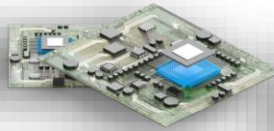
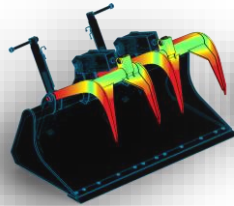
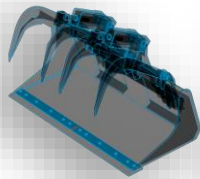
- BIM Model Authoring
- BIM Model Simplification
- BIM Connectors
- BIM Metadata
- Export Formats
 - Revit Family
 - ADSK Package
 - IFC

Valuable Links & Downloads

The diagram shows a large blue arrow pointing down, indicating a download or link.



AUTODESK® PRODUCT DESIGN & MANUFACTURING COLLECTION



Product Design

Engineering

Production Engineering

Distribution

Use

Generative
Design

Conceptual
Definition

Mechanical
Engineering

Simulation

Documentation

Factory
Planning

Machining

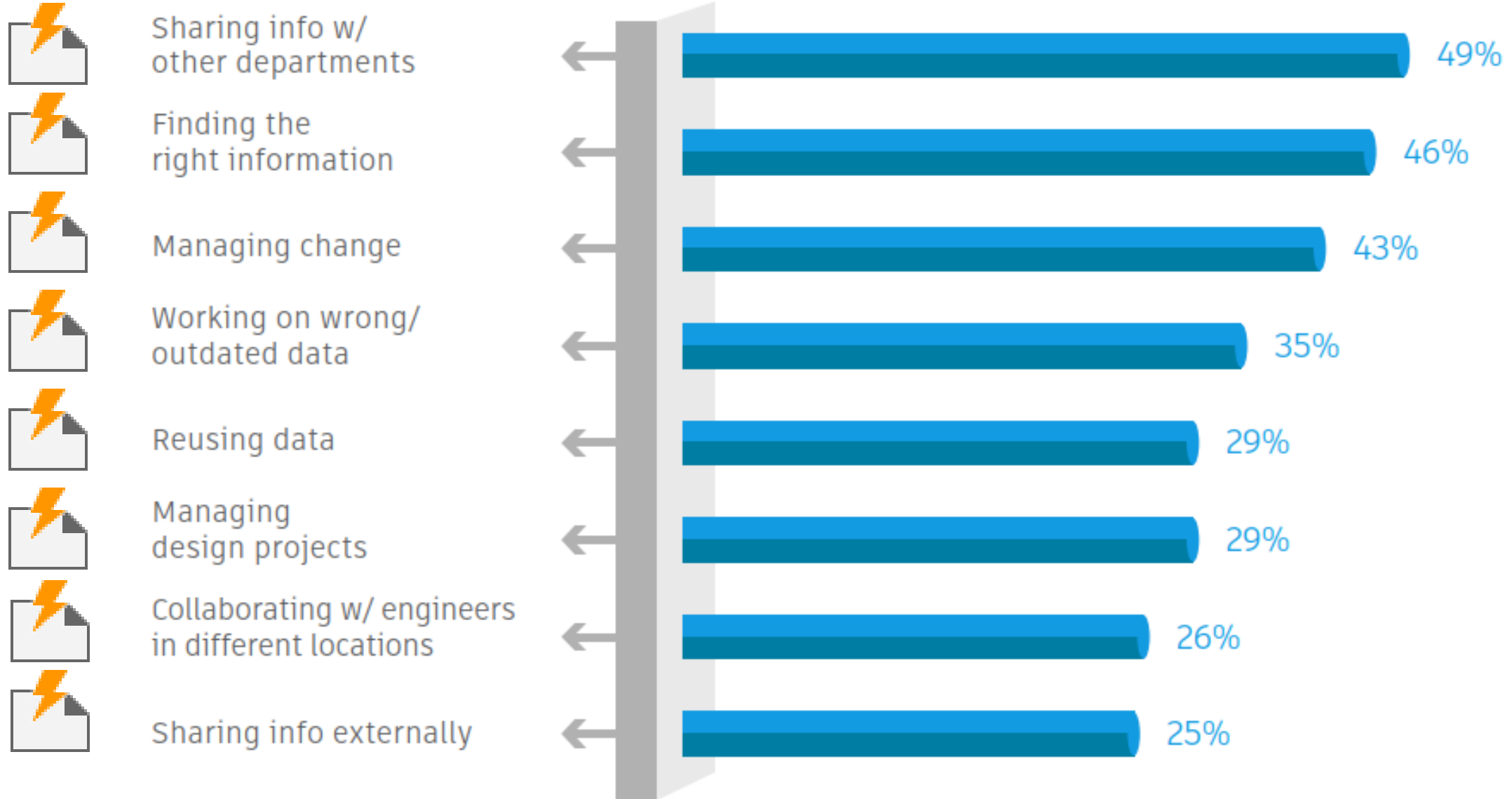
Additive
Manufacture

Mold Tool
and Die

Production
Management

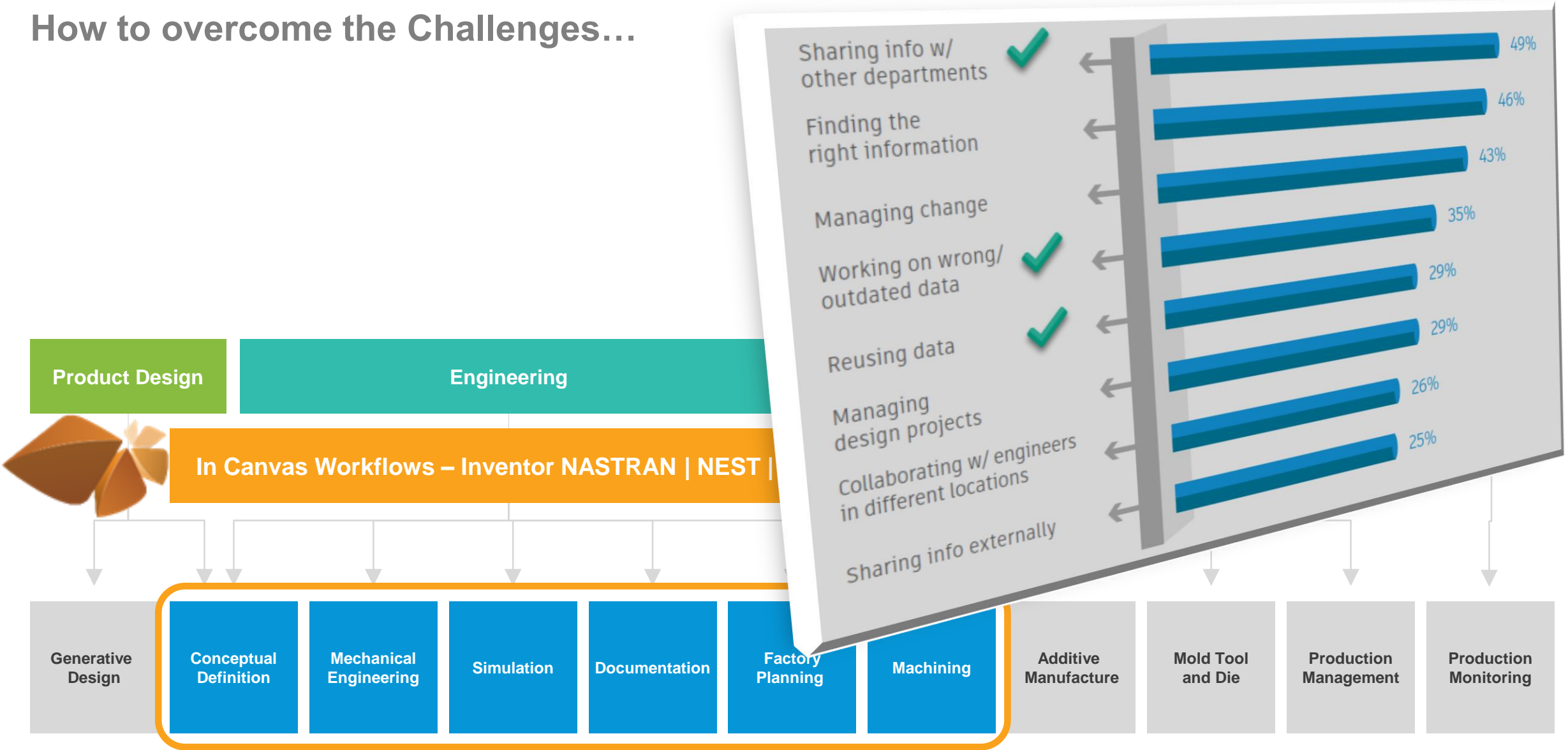
Production
Monitoring

Top Design Challenges Related to Data Management



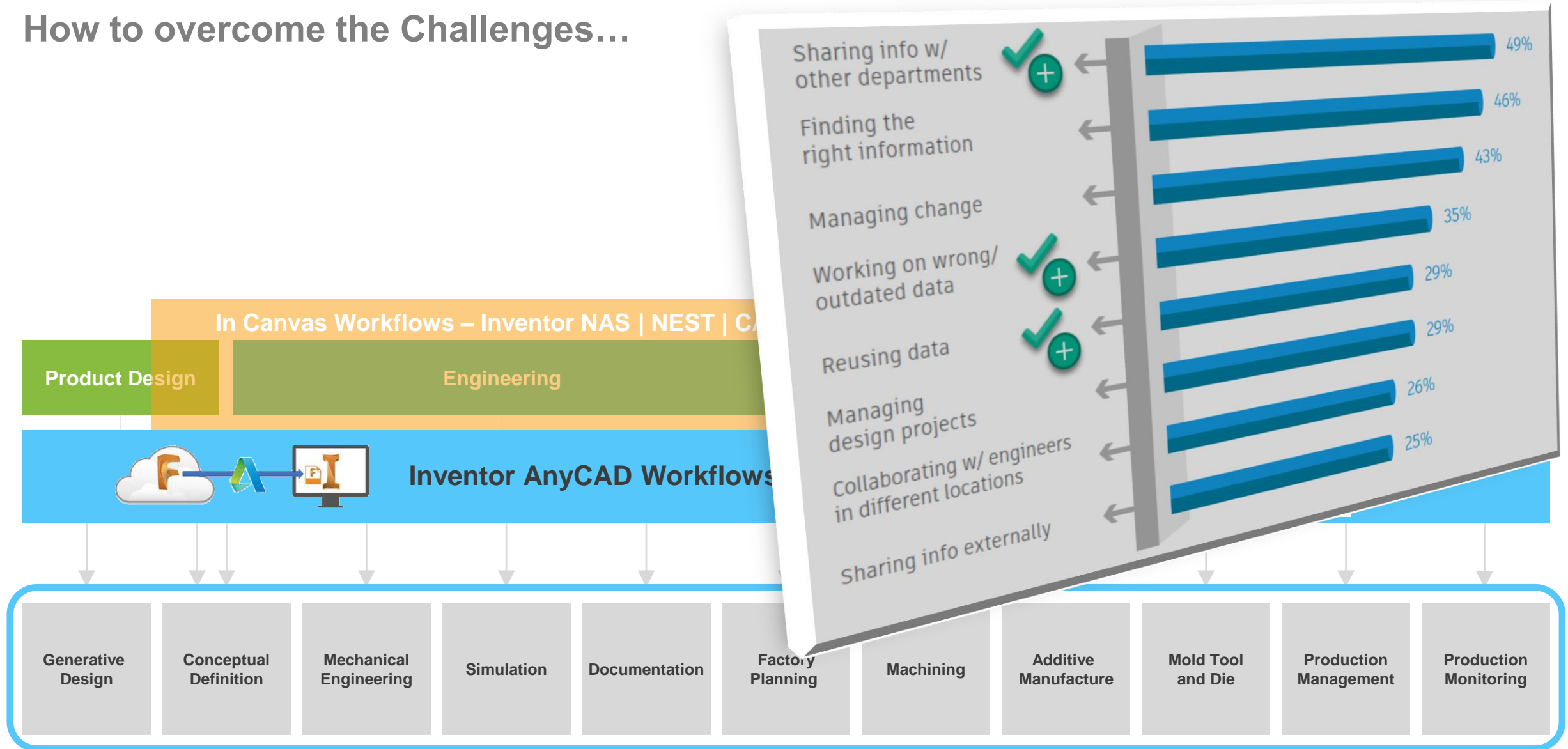
Common Data Model

How to overcome the Challenges...



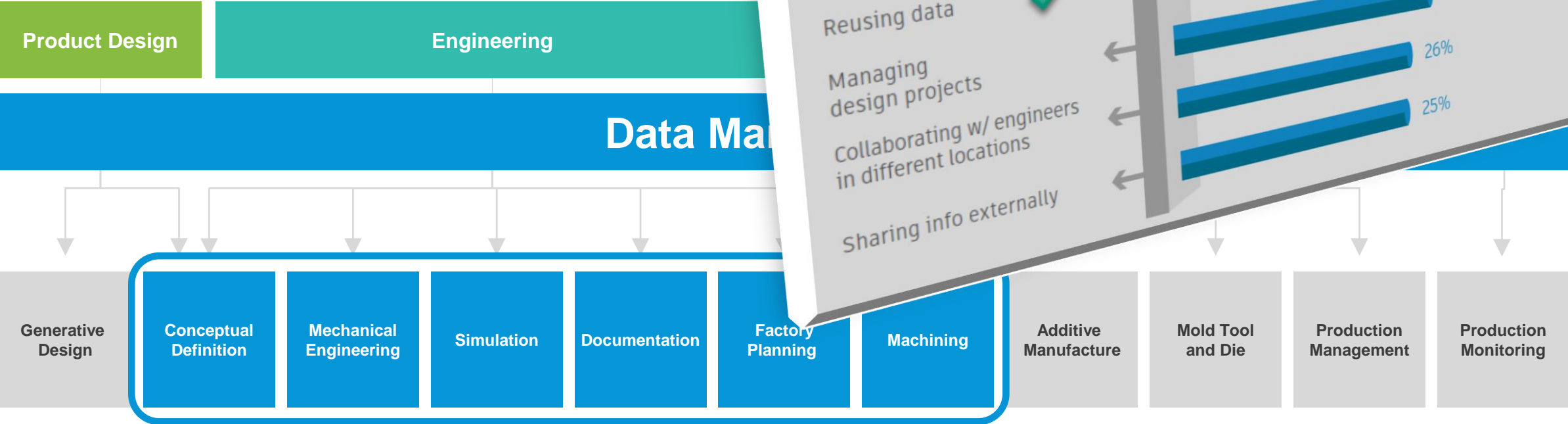
Associative Interoperability - AnyCAD

How to overcome the Challenges...



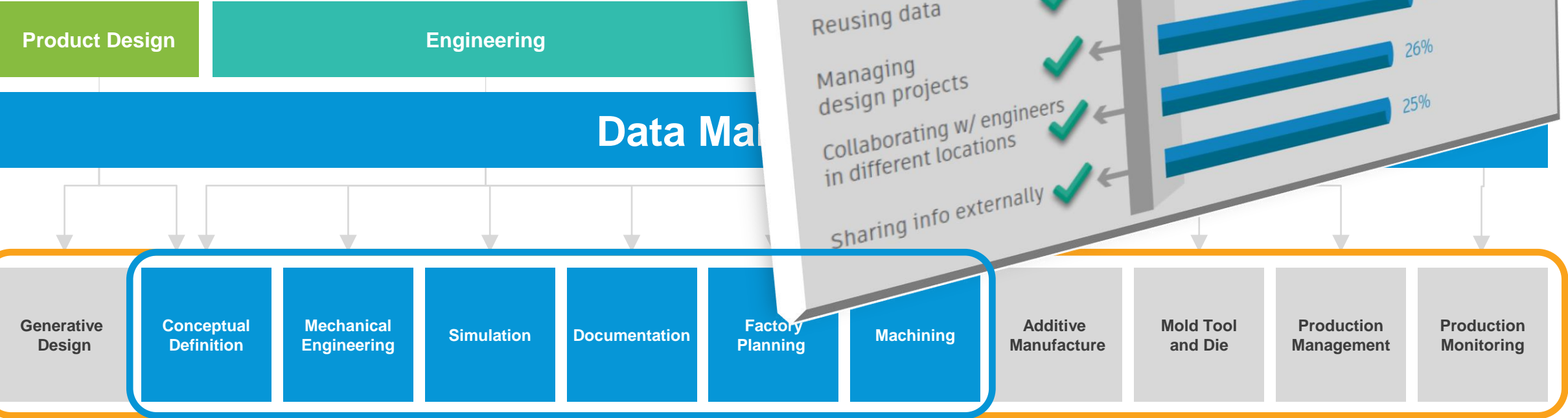
Data Management

How to overcome the Challenges...



Data Management

How to overcome the Challenges...



DEMO

Autodesk Inventor Professional 2020 01-0712.iam

Search Help & Commands... Markus.Koechl

File Factory Assemble Design Annotate 3D Model Sketch Inspect Tools CAM Manage View Environments Data Standard Get Started Electromechanical Vault Collaborate

Place from Create Free Move Free Rotate Joint Constrain Show Show Sick Pattern Mirror Bill of Parameters Ground and Plane Axis Point Shrinkwrap Shrinkwrap

Select File From Vault

Folder View Advanced

My Saved Searches

Look in: Classified Components

Name	Title	Revision	State	Stand...	Power...	Checked In	Comment
TEFC NEMA ...	3 Phase Motor	A	Work in Pro...	IEC	(Custom)		
TEFC NEMA ...	3 Phase Motor	A	Work in Pro...	JIC	16 kW	09/04/2019 13:46	Change Category
GST07-3-100...	Getriebemotor	A	Work in Pro...	IEC	12,5 kW	05/02/2019 00:18	Change Category
GST07-3-100...	Getriebemotor	A	Work in Pro...	IEC	7,5 kW	05/02/2019 00:18	Change Category
GST07-3-100...	Getriebemotor	A	Work in Pro...	IEC	10 kW	05/02/2019 00:18	Change Category
GST07-3-100...	Getriebemotor	A	Work in Pro...	IEC	15 kW	05/02/2019 00:18	Change Category

File name: TEFC NEMA Motor 16kW.ipt

Files of type: Component Files (*.ipt; *.iam)

Revision: Latest Work in Progress

Open Cancel Help

Vault

Designs.ipj

01-0712.iam

01-0711.ipt

01-0713.iam

01-0714.ipt

01-0715.ipt

01-0716.ipt

01-0717.ipt

01-0718.ipt

001504.iam 01-0712.iam

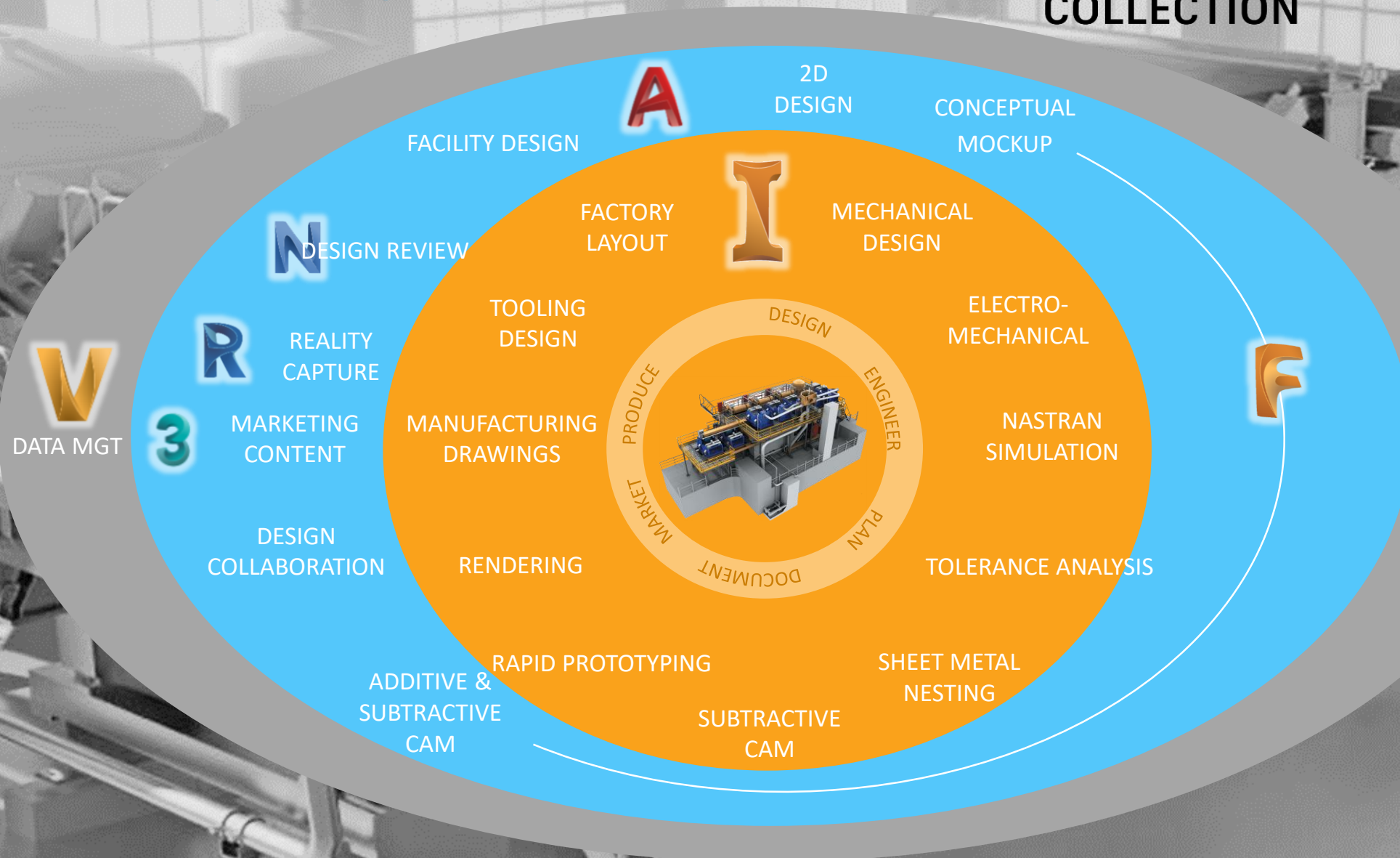
Ready

9 86

Vault Family Integration

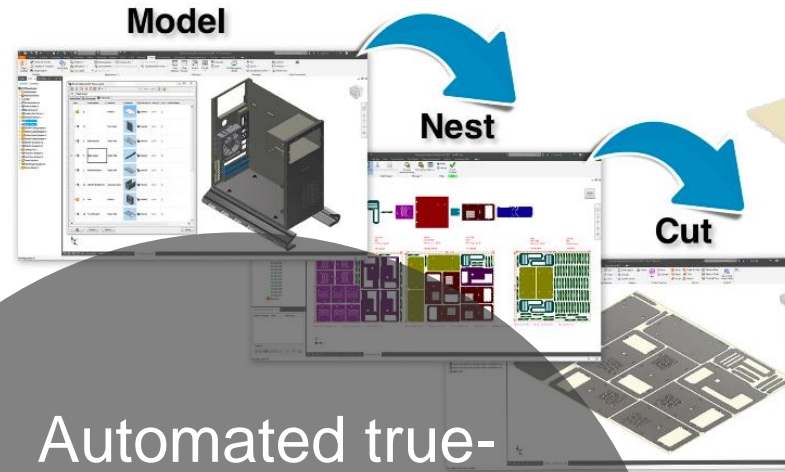


AUTODESK® PRODUCT
DESIGN & MANUFACTURING
COLLECTION

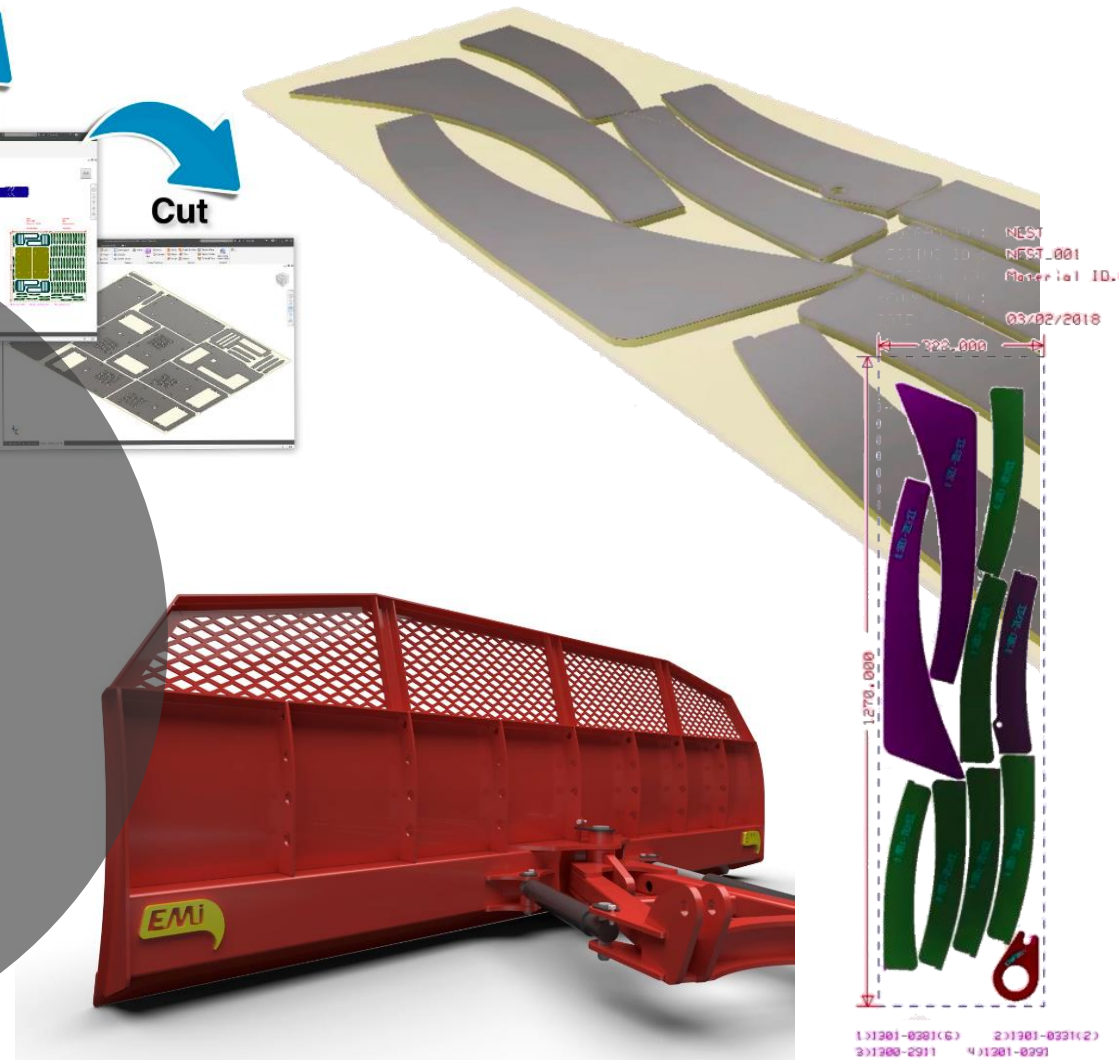


Capturing Engineering Data

Inventor Nesting - Vault



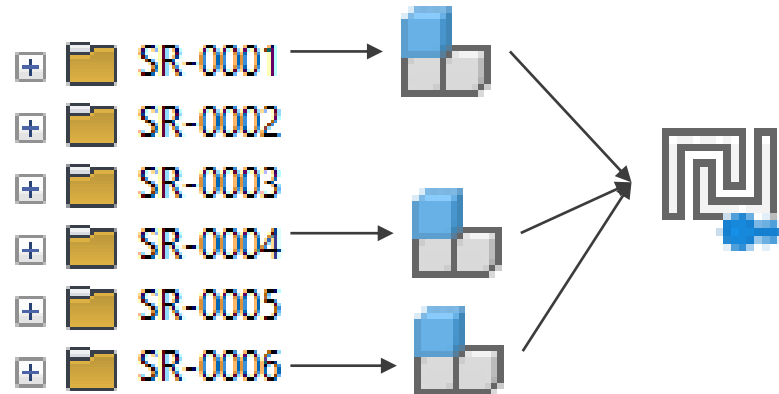
- Automated true-shape nesting
- Nesting Reports
- DXF/DWG Import
- Integration with CAM



Nesting

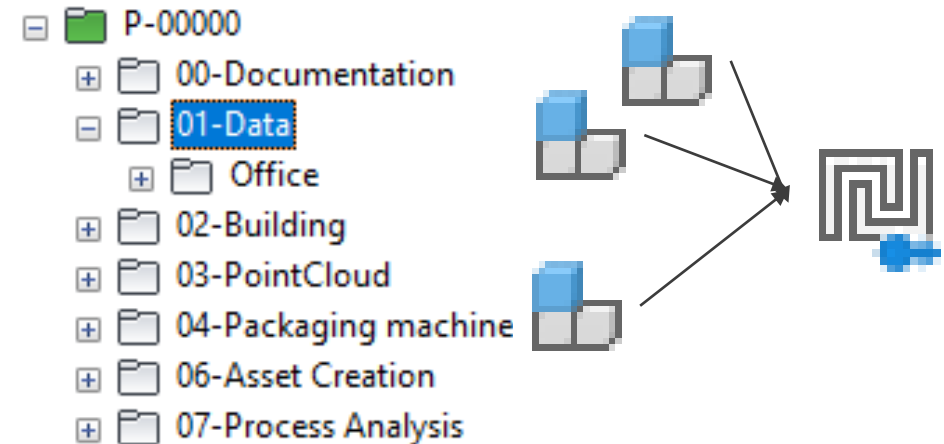
General Purpose and Implications on PDM

- Mass manufacturing
 - Optimize utilization of stock and machines across range of products being manufactured at a point of time



- ⇒ Multiple sources link to one nesting
- ⇒ CAD BOMs don't reflect nesting BOM
- ⇒ **Long-term** value of managed nesting file for recurring production

- Project driven manufacturing
 - Optimize utilization of stock and machines for running project manufactured parts



- ⇒ Multiple sources link to one nesting
- ⇒ CAD BOMs don't reflect nesting BOM
- ⇒ **Mid-term** value of managed nesting file due to one-time manufacturing

DEMO

Autodesk Inventor Professional 2020 - Nesting1

Search Help & Commands... Markus.Koechl

File Nesting Tools View Vault

Sources Nesting Properties Create Edit Calculate Automatic Update All Shaded Default Object Visibility 2D Auto-zoom Export Create 3D Model Process Material Library Options iProperties Add Rule iLogic Browser Free iLogic Memory Event Triggers Help About

Nesting X Calculate Nest +

Nesting Root

- Geometry Sources
 - Source Assembly.1 (1700-0561.iam)
 - Source File.1 (1300-3691.ipt) 1300-3691
 - Source File.5 (1300-2911.ipt) 1300-2911
 - Source File.7 (1300-2921.ipt) 1300-2921
 - Source File.10 (1301-0301.ipt) 1301-0301
 - Source File.11 (1301-0311.ipt) 1301-0311
 - Source File.12 (1301-0321.ipt) 1301-0321
 - Source File.13 (1301-0331.ipt) 1301-0331
 - Source File.15 (1301-0381.ipt) 1301-0381
 - Source File.16 (1301-0391.ipt) 1301-0391
 - Source File.17 (1301-0401.ipt) 1301-0401
 - Source File.18 (1301-0411.ipt) 1301-0411
 - Source File.19 (1301-0421.ipt) 1301-0421
 - Source File.20 (1301-0431.ipt) 1301-0431
 - Source File.21 (1301-0421_MIR.ipt) 1301-0421_MIR
 - Source File.23 (1301-034-01.ipt) 1301-034-01
 - Source File.24 (1301-034-02.ipt) 1301-034-02
 - Source File.25 (1301-034-03.ipt) 1301-034-03
 - Source File.26 (1301-034-04.ipt) 1301-034-04
 - Source File.27 (1301-0441.ipt) 1301-0441
 - Source File.29 (1301-0451.ipt)

Sources

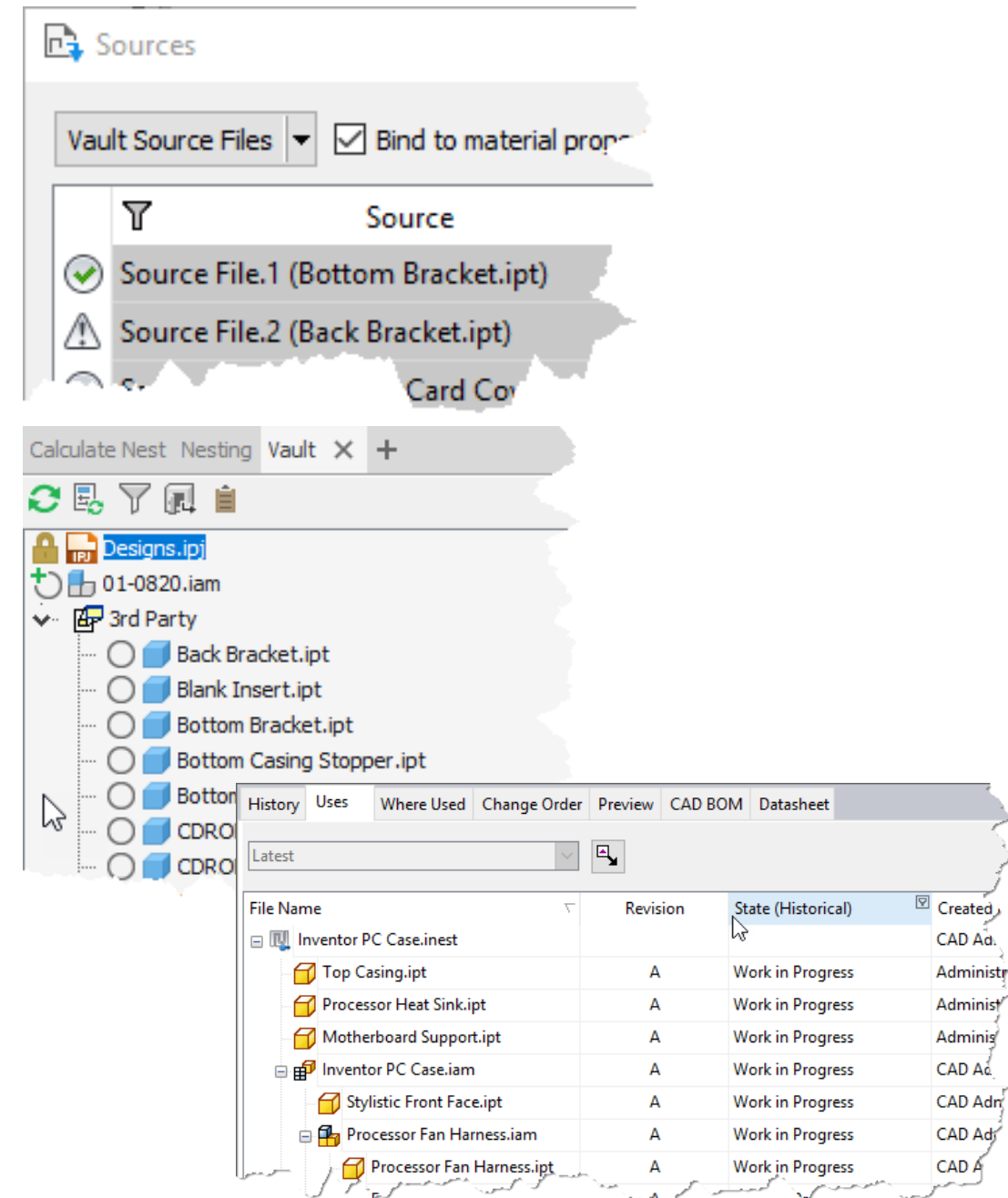
Vault Source Files Bind to material properties Number of sources: 26

Source	Unit Rule	Unit	Source Location	Source Pr
Source File.1 (1300-3691.ipt)	From source document	mm	C:\PDMC-Sample\Designs\Inventor Sample Data\Trial Sample Data\Snow Shovel\1300-3691.ipt	Inventor Sheet
Source File.5 (1300-2911.ipt)				
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Nesting – Vault

Applies to Nesting 2019.2 and later

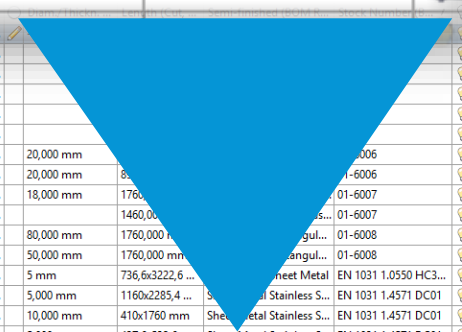
- Add *Sources* from Vault
- Check-in of Nesting is blocked if source files are not vaulted
- Uses View displays correct source file links
 - Direct links and source's children
 - Multiple sources across
 - Multiple projects or products



Nesting – Vault Item BOM

Applies to BOM Reporting and ERP Export

- Filter Sheet Metal components from item BOM if
 - CAD BOM is base for manufacturing
 - SM components are nested.



01-0823 - Work in Progress - Item									
File Edit View Actions Help									
Save Exit Edit Mode									
General History Bill of Materials Where Used Change Order View									
Latest Work in Progress Today 5									
Number	Ro...	Posi...	Item ...	Quantity	Unit	Description	Material	Quantity	Dimensions (B...
01-0823	-	-	-	-	-	-	-	-	-
01-0832	5	6	1	1 Each	1 Each	Cooler	--	A	Work in...
01-0836	7	8	1	1 Each	1 Each	Evaporator	--	A	Work in...
01-0834	9	10	1	1 Each	1 Each	Aggregate	--	A	Work in...
01-0843	19	22	1	1 Each	1 Each	Light	--	A	Work in...
01-0841	20	23	1	1 Each	1 Each	Light	--	A	Work in...
01-0824	11	12	1	1 Each	1 Each	Glass Side	Glass	A	Work in...
01-0833	16	19	1	1 Each	1 Each	Glass Side Left	Glass	A	Work in...
01-0830	1	2	1	1 Each	1 Each	Top Cover Pane	Glass Sa...	A	Work in...
01-0842	2	3	1	1 Each	1 Each	Pane	Glass Sa...	A	Work in...
01-0835	8	9	1	1 Each	1 Each	Frame Bottom	1.4571 X...	A	Work in...
01-0844	14	17	1	1 Each	1 Each	Frame Top	1.4571 X...	A	Work in...
01-0827	21	24	1	1 Each	1 Each	01-0827.ipt	1.0550 ...	A	Work in...
01-0839	3	4	1	1 Each	1 Each	Cooler Basin	1.4571 X...	A	Work in...
01-0826	4	5	1	1 Each	1 Each	Lower Shelf	1.4571 X...	A	Work in...
01-0838	10	11	1	1 Each	1 Each	Evaporator Basin	1.4571 X...	A	Work in...
01-0828	12	15	1	1 Each	1 Each	Support Short	1.4571 X...	A	Work in...
01-0829	13	16	1	1 Each	1 Each	Support Long Left	1.4571 X...	A	Work in...
01-0831	17	20	1	1 Each	1 Each	Support Long Left	1.4571 X...	A	Work in...
01-0837	6	7	1	1 Each	1 Each	Pane Mount	1.4571 X...	A	Work in...
01-0845	15	18	1	1 Each	1 Each	Frame Side LH	1.4571 X...	A	Work in...
01-0840	18	21	1	1 Each	1 Each	Frame Side LH	1.4571 X...	A	Work in...

Takeaways

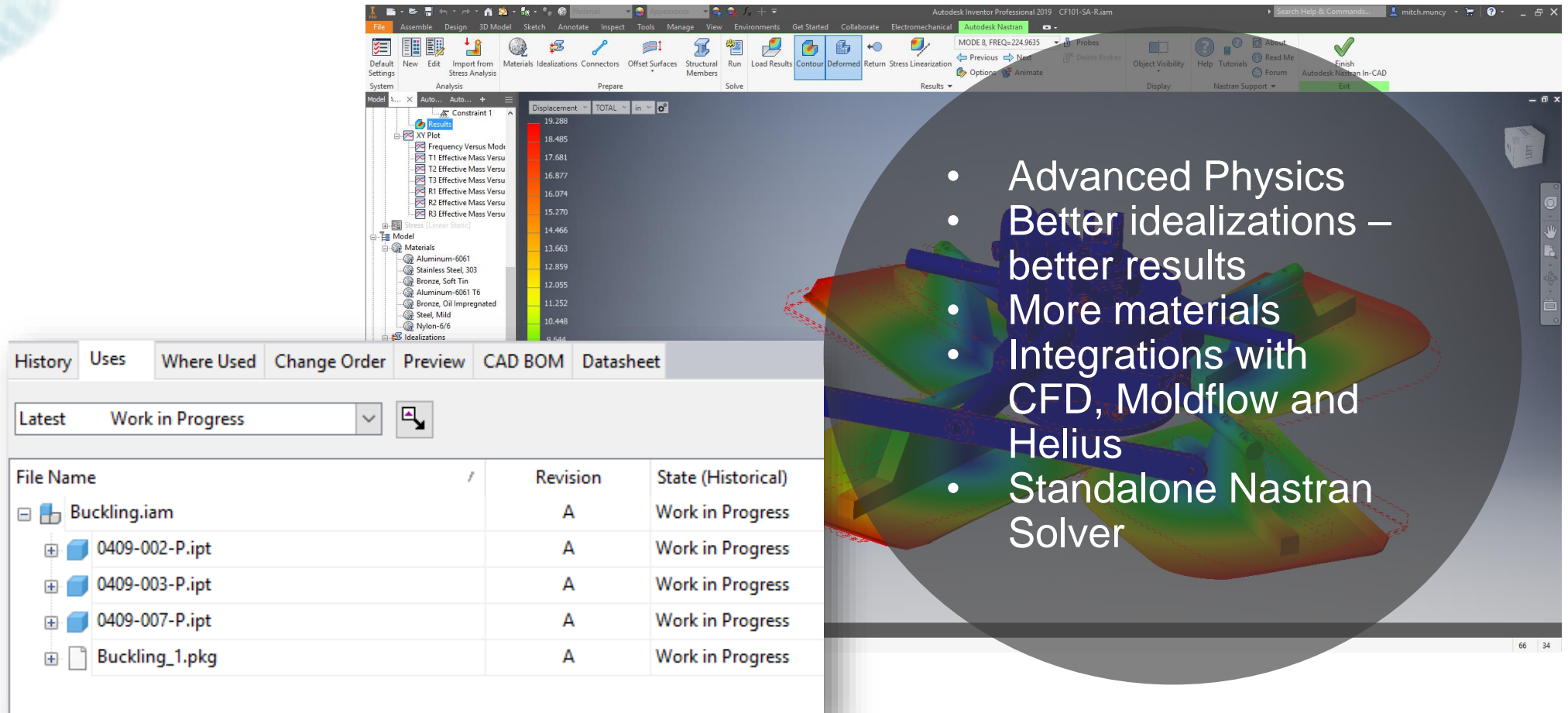
Managing Nesting Assemblies

- Identify Scope
 - Recurring Nesting Production
 - One-Time Manufacturing/Nesting
- ✓ Vault Optimizes
 - ✓ Managing Nesting Source Relationships
 - ✓ Manufacturing Release Process
 - ✓ NC Code Association
- Avoid BOM Redundancy
 - Disable SM Items in Manufacturing BOM
 - Enable SM Items in Engineering BOM



Capturing Engineering Data

Inventor Nastran - Vault



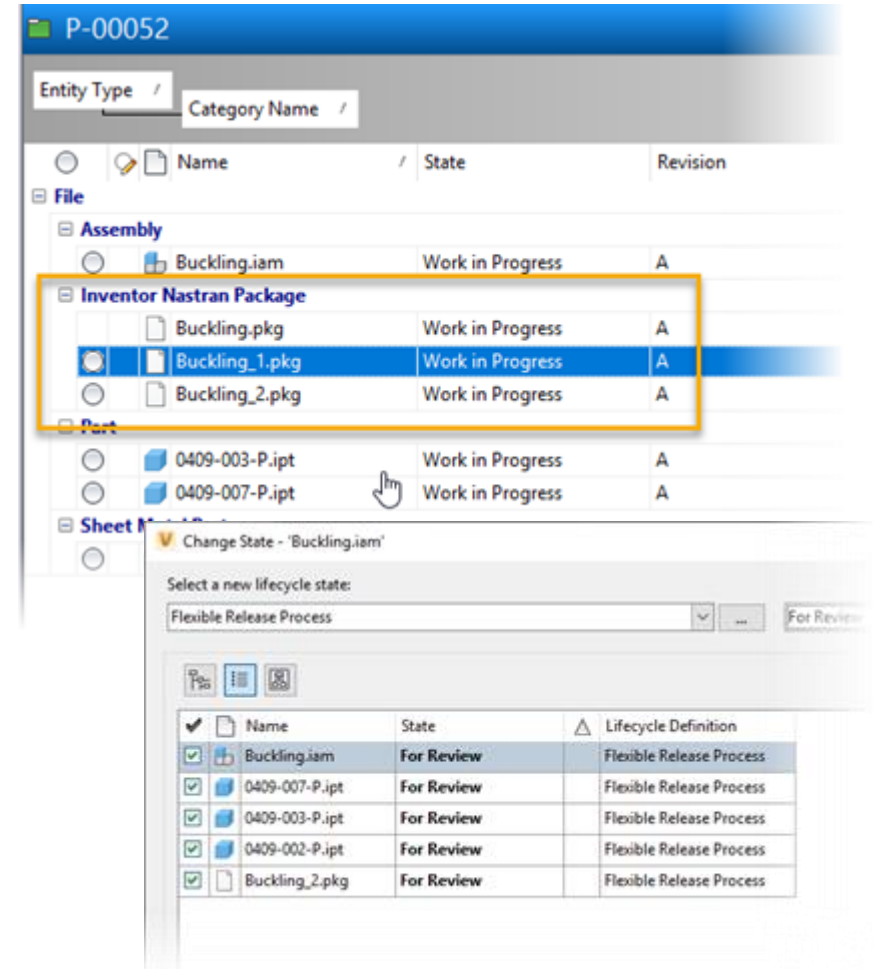
- Advanced Physics
- Better idealizations – better results
- More materials
- Integrations with CFD, Moldflow and Helius
- Standalone Nastran Solver

File Name	Revision	State (Historical)
Buckling.iam	A	Work in Progress
0409-002-P.ipt	A	Work in Progress
0409-003-P.ipt	A	Work in Progress
0409-007-P.ipt	A	Work in Progress
Buckling_1.pkg	A	Work in Progress

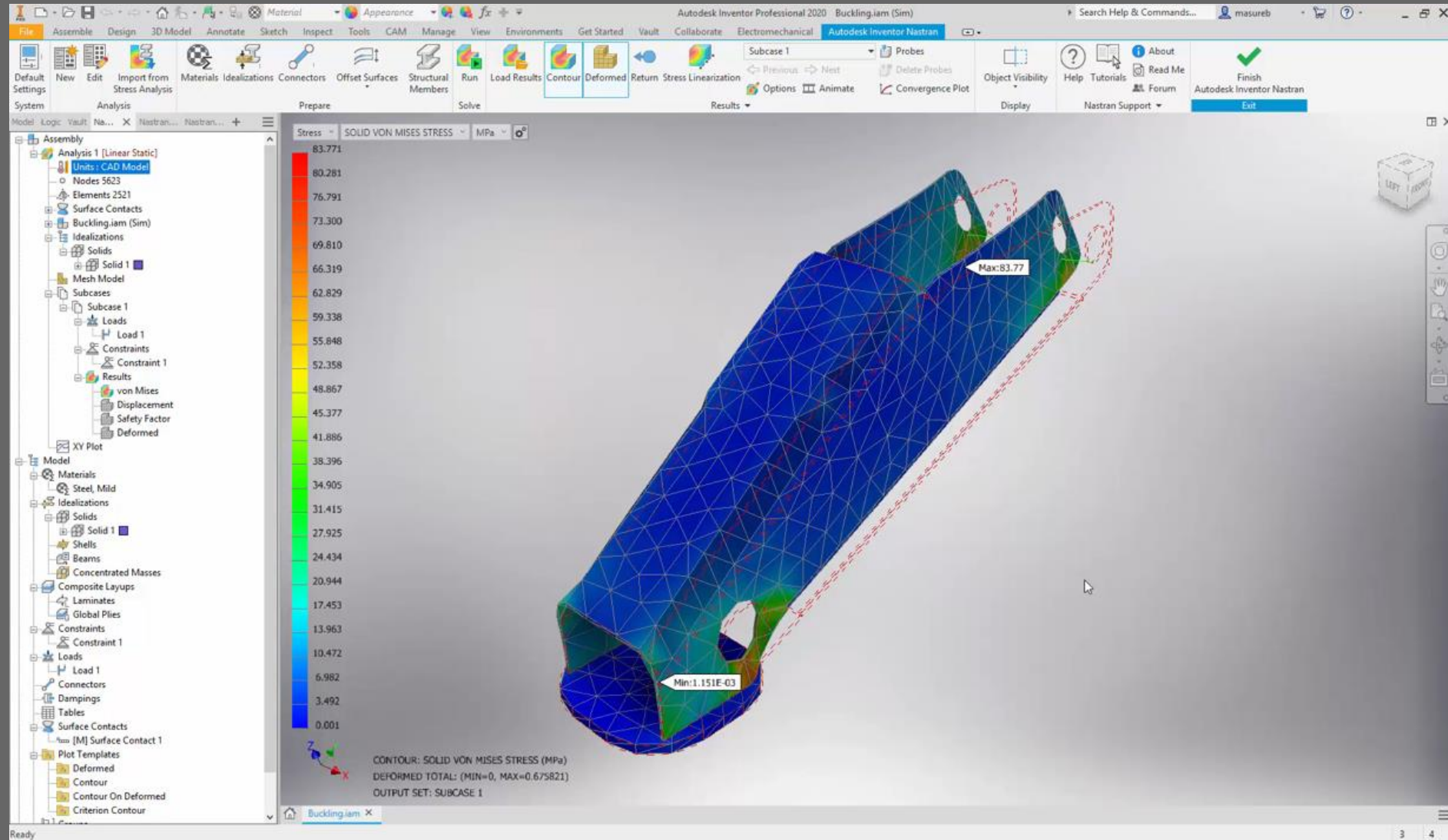
Inventor Nastran

General Purpose and Implications on PDM

- In CAD tools aimed at the design engineer.
 - Associative FEM setup and solving
 - Include FEM data in design release process
- Validate design suitability before the product is built.
 - Complete virtual prototype/product
- Reduce over engineering.
- Prove and generate reports to backup design changes.
 - Revise design and validation data



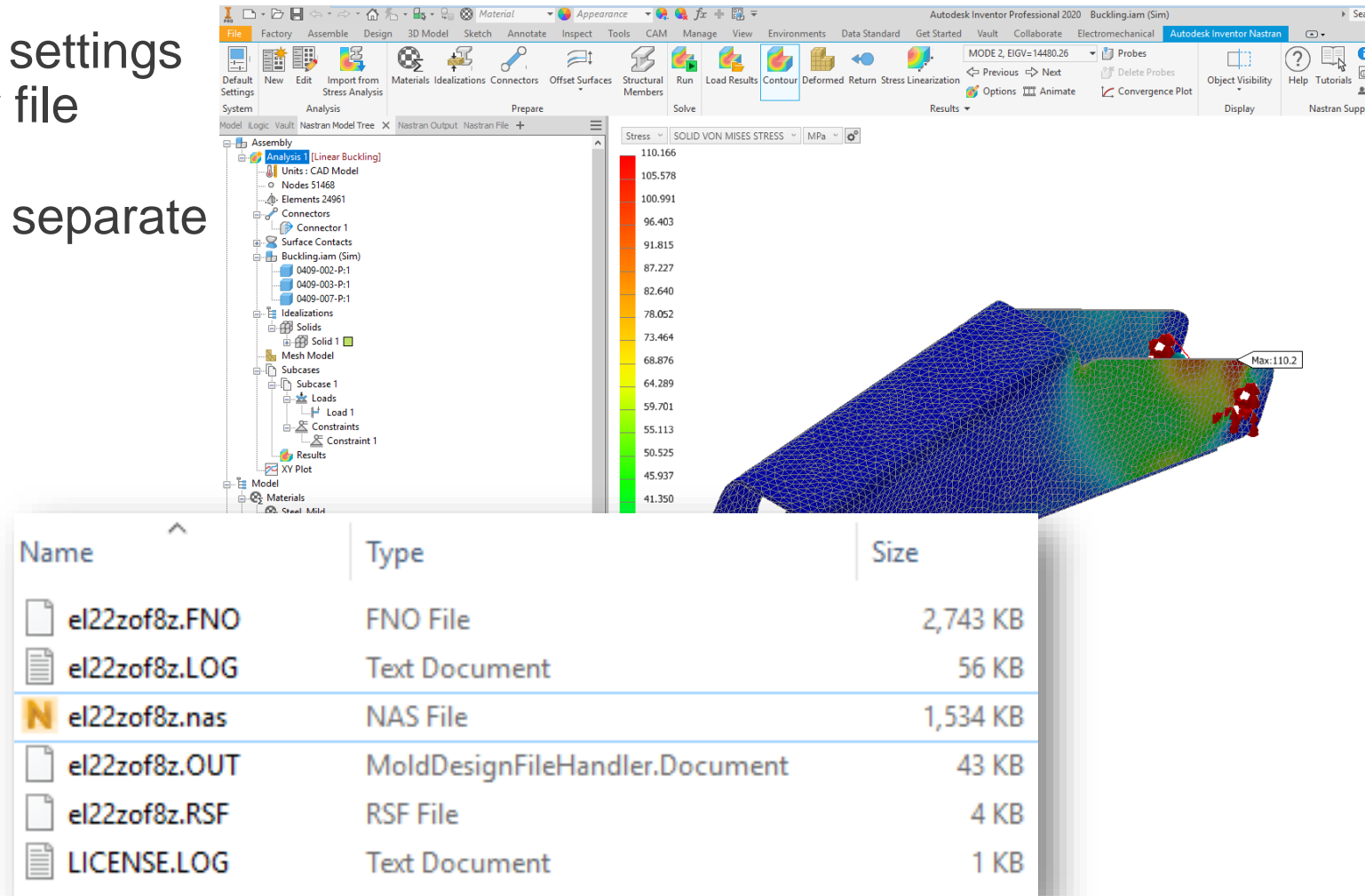
DEMO



Inventor Nastran with Autodesk Vault

Manage simulation files inside Vault

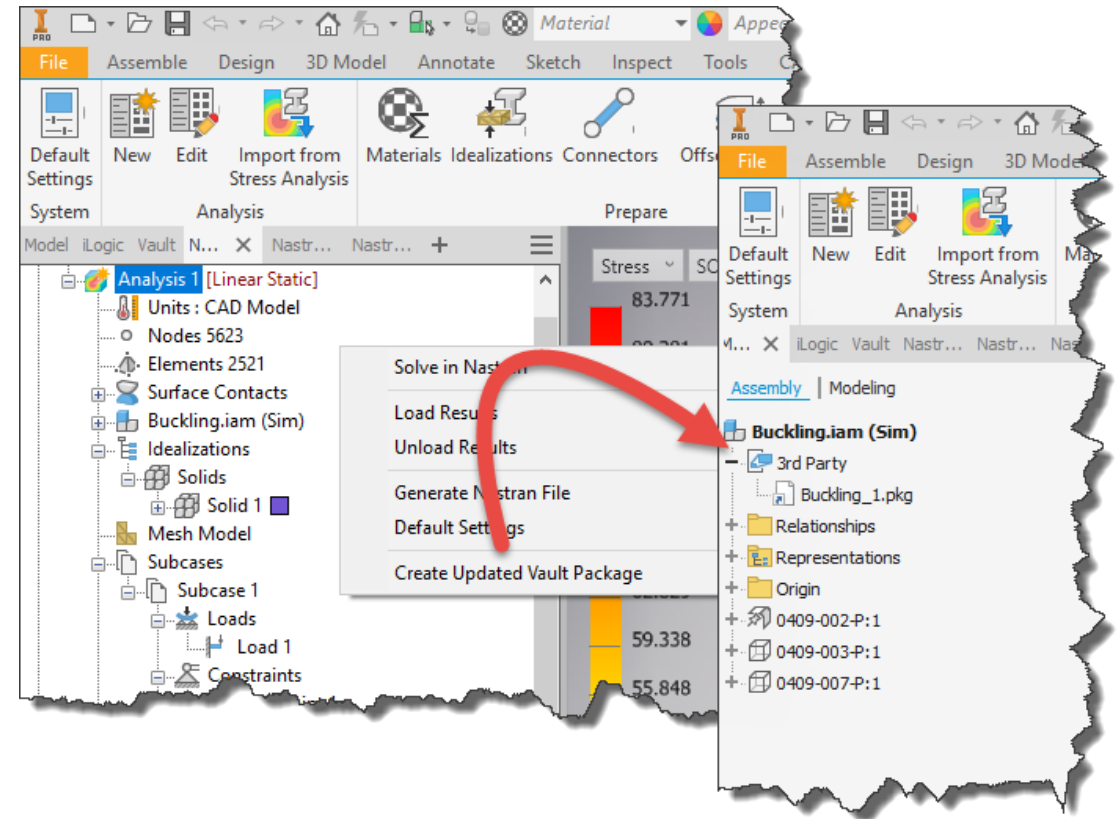
- Inventor Nastran analysis related settings are saved along with the Inventor file
- Result files however are saved in separate files
- Primary files
 - **NAS** – Nastran Bulk Data File
 - Raw simulation data
 - **FNO** – Binary Results Files
 - Usually heavy data
- Support Files
 - **LOG** – analysis data
 - **OUT** – ASCII results file
 - **RSF** – results summary



Inventor Nastran with Autodesk Vault

Inventor Nastran 2020 introduces new capabilities

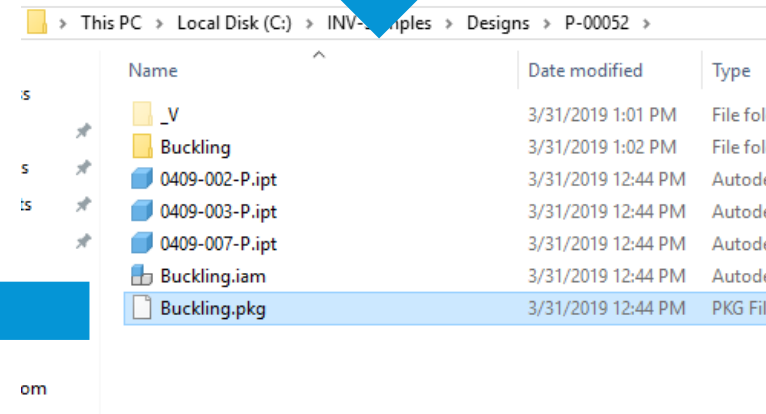
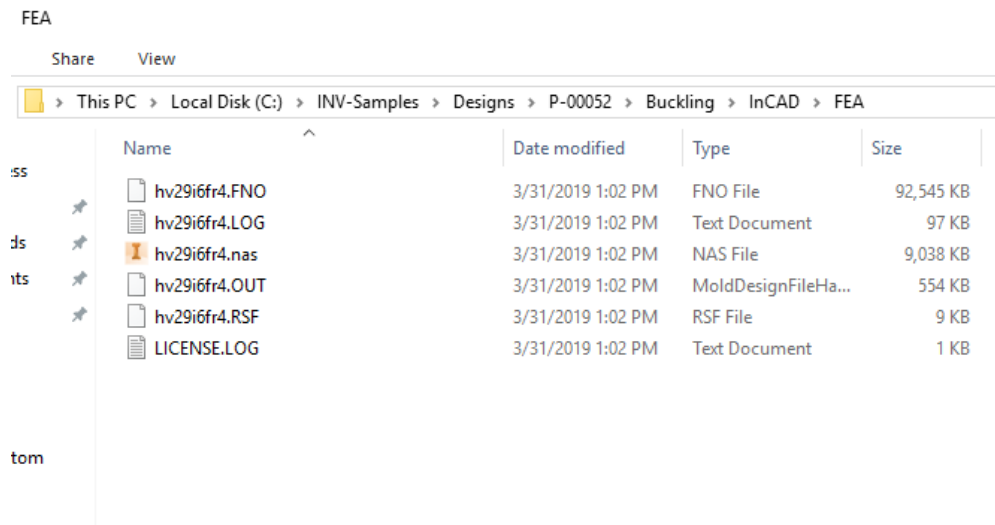
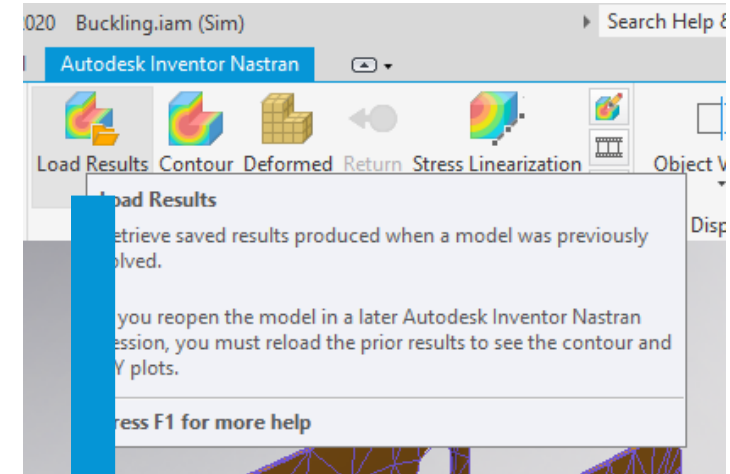
- *Create Updated Vault Package* automates existing workflow and goes beyond
 - Creates archive from result files
 - adopts component file name
 - PKG is a zip of the subfolder \InCAD\FEA\
 - Links package as a 3rd party file to design file
- Treated during check-in and check-out as a reference



Inventor Nastran with Autodesk Vault

Simulation study files package handling

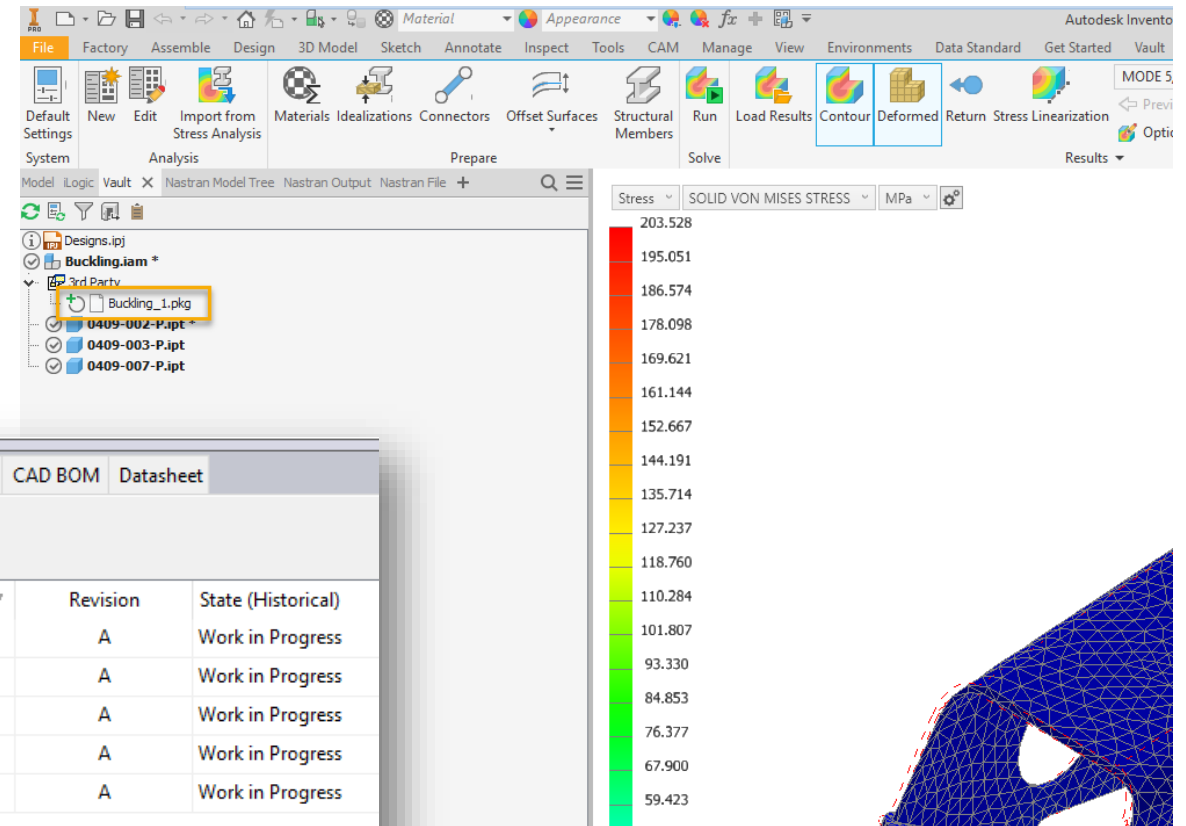
- During GET/Check-out PKG file is downloaded automatically, not extracted
- Extraction is initiated as soon as Load Results command is used
- Easy to open existing results when needed



Inventor Nastran with Autodesk Vault

Updating simulation package workflow

- Updated simulation results require to update also Vault Package again
- New Package is generated with _1 suffix
- 3rd party link updated to replace previous package

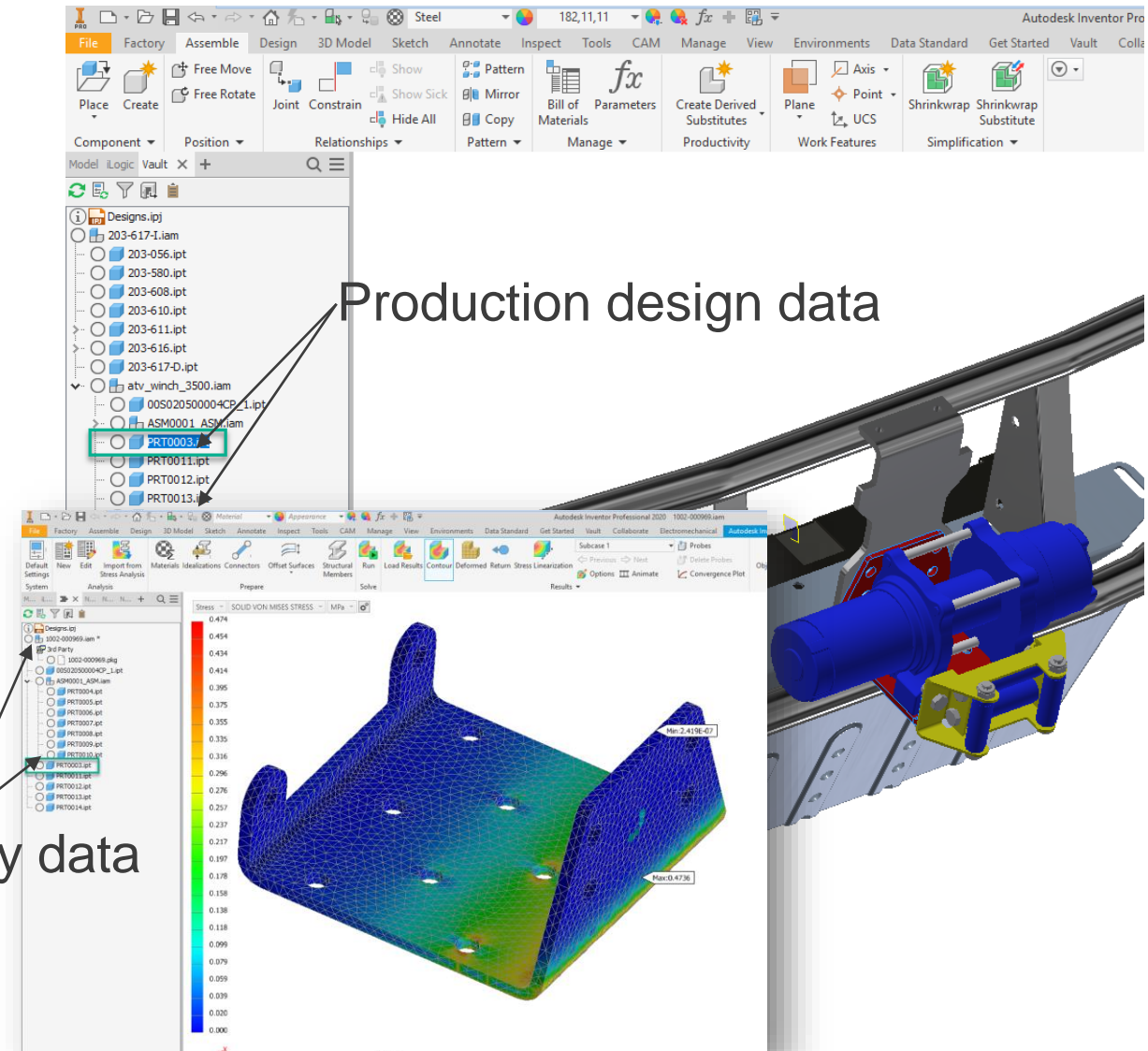


Inventor Nastran with Autodesk Vault

Recommended use case

- FEA models usually differ from CAD model
 - Simplifications, Idealization, ...
- Use new parent as container
 - Reference design data incl. design context components
- ✓ Separates simulation and engineering assembly
 - ✓ Auto assign different category and lifecycle





Simulation study data



Inventor Nastran with Autodesk Vault

General recommendations

- Clean up simulation results before creating package, be sure to have the relevant simulation files only
- Managing pkg with specific category allows better filtering where needed and differentiation from other files
- Use lifecycle definitions of parent file to simplify release process

	0409-007-P.ipt	3/31/2019 12:44 PM	Autodesk I...	105 KB
	Buckling.iam	3/31/2019 1:39 PM	Autodesk I...	88,744 KB
	Buckling_1.pkg	3/31/2019 1:15 PM	PKG File	80,976 KB
	Buckling_2.pkg	3/31/2019 1:40 PM	PKG File	94,185 KB

P-00052

Entity Type / Category Name /

	Name	State	Revision
File			
Assembly			
	Buckling.iam	Work in Progress	A
Inventor Nastran Package			
	Buckling.pkg	Work in Progress	A
	Buckling_1.pkg	Work in Progress	A
	Buckling_2.pkg	Work in Progress	A
Part			
	0409-003-P.ipt	Work in Progress	A
	0409-007-P.ipt	Work in Progress	A
Sheet Metal Part			
	0409-002-P.ipt	Work in Progress	A

Change State - 'Buckling.iam'

Select a new lifecycle state:
Flexible Release Process

Name	State	Lifecycle Definition
Buckling.iam	For Review	Flexible Release Process
0409-007-P.ipt	For Review	Flexible Release Process
0409-003-P.ipt	For Review	Flexible Release Process
0409-002-P.ipt	For Review	Flexible Release Process
Buckling_2.pkg	For Review	Flexible Release Process

Takeaways

Managing Nastran Settings & Results

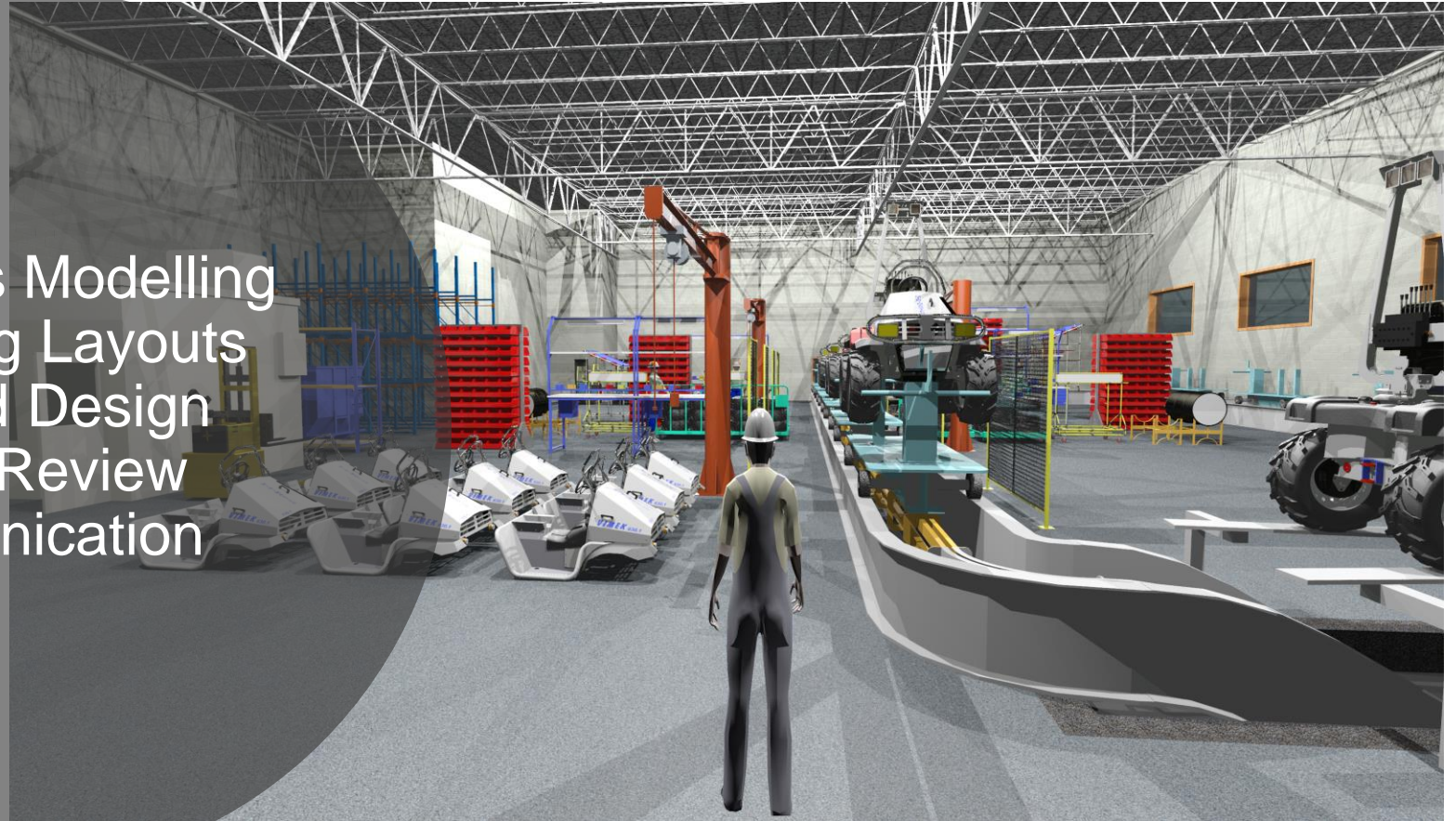
- In CAD FEM makes file handling easy
- ✓ Vault Optimizes
 - ✓ Single Package File
 - ✓ FEM Setup Assembly – CAD Model Association
 - ✓ Integrating FEM in Lifecycle/Revision Management
- Secure Clean Packages
 - Empty local FEM Folder
 - Establish Vault Workspace Sync



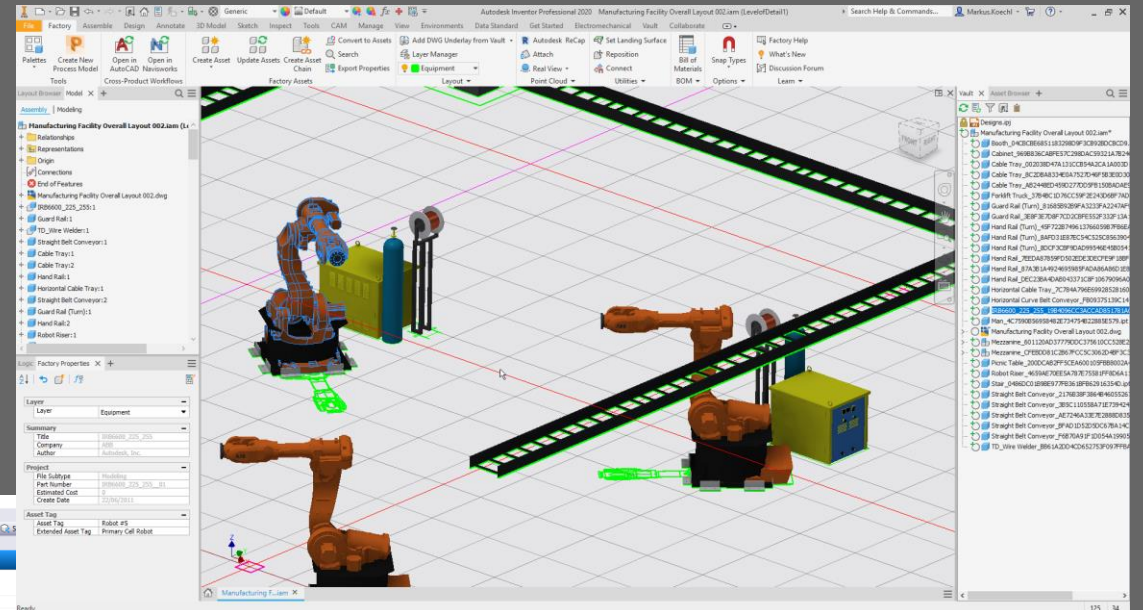
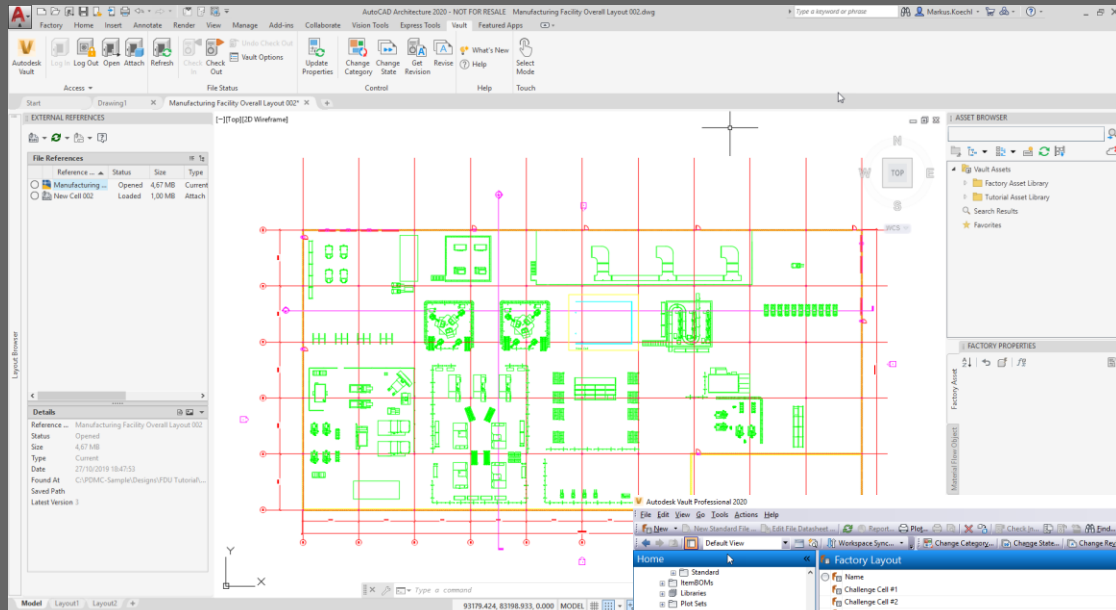
Machine & Factory Layout Design

Managing Asset Libraries, Assets, and Layouts in Vault

- Process Modelling
- Planning Layouts
- Detailed Design
- Design Review
- Communication



DEMO



Home

Factory Layout

Contents Where Used Factory Layout Info

Name	Quantity	Instance Properties	Asset Tag	Key Parameters
IB6600_225_255	8			
IB6600_225_255	1	None	None	None
IB6600_225_255	1	None	None	None
IB6600_225_255	1	None	None	None
IB6600_225_255	1	None	None	None
IB6600_225_255	1	None	None	None
IB6600_225_255	1	None	None	None
IB6600_225_255	1	Service Interval: weekly	Robot #1	None
IB6600_225_255	1	Service Interval: weekly	Robot #2	None
Man	3			
Man	1	None	None	None
Man	1	None	None	None
Man	1	None	None	None
Mezzanine	2			
Mezzanine	1	None	None	Angle30 deg: FenceGap:1000.0 mm; Gate3:False; Gate2:True; Gate3:False; Gate4:None
Mezzanine	1	None	None	Angle30 deg: FenceGap:1000.0 mm; Gate3:False; Gate2:True; Gate3:False; Gate4:None
Mezzanine	1	None	None	Angle45 deg: FenceGap:1000.0 mm; Gate3:False; Gate2:True; Gate3:False; Gate4:None
Picnic Table	1			
Picnic Table	1	Height:800 mm; Length:1830 mm; Width:1475 mm	None	Height:800 mm; Length:1830 mm; Width:1475 mm
Robot Riser	8			
Robot Riser	1	None	None	Height:500 mm; MountingBrackets:True; SupportBrackets:True; Width:1000 mm
Robot Riser	1	None	None	Height:500 mm; MountingBrackets:True; SupportBrackets:True; Width:1000 mm
Robot Riser	1	None	None	Height:500 mm; MountingBrackets:True; SupportBrackets:True; Width:1000 mm
Robot Riser	1	None	None	Height:500 mm; MountingBrackets:True; SupportBrackets:True; Width:1000 mm
Robot Riser	1	None	None	Height:500 mm; MountingBrackets:True; SupportBrackets:True; Width:1000 mm
Robot Riser	1	None	None	Height:500 mm; MountingBrackets:True; SupportBrackets:True; Width:1000 mm
Robot Riser	1	None	None	Height:500 mm; MountingBrackets:True; SupportBrackets:True; Width:1000 mm

Created By: CAD Admin

Current Owner: Munich Site (WHS-9948PVL)

Custom Object Name: Factory Layout

Leased Unit: 10/06/2019 18:18

Lifecycle Definition

Name: Manufacturing Facility Overall Layout 002.dwg

State: False

Property Compliance: Compliant

Use Defined

Type Tag: 11

Operation: Service Interval: weekly

Summary: Author: Autodesk, Inc. Title: IB6600_225_255 Company: ABB

Project: File Subtype: Modeling Part Number: IB6600_225_255 Estimated Cost: 0 Create Date: 06/02/2011

Asset Tag: Asset Tag: Robot #2 Extended Asset Tag: Secondary Cell Robot

Shared View Properties

162,168,85,128 - PDMC Sample - CAD Admin

Factory Design Utilities

General Purpose and Implications on PDM

- Create Machine and Factory Layouts
 - Drag Assets from 2D/3D Library
 - Draft in 2D -> Auto-Open 3D/4D
- Asset Library
 - ✓ Vault – Revision Management
 - ✓ Vault – Where Used Information
- Layouts
 - ✓ Vault – Insight Content
 - ✓ Vault – Managing 2D – 3D – 4D
 - ✓ Vault – Extended Uses View
 - ✓ Assets
 - ✓ Asset Configuration
 - ✓ Asset Instance Information

01	Process modelling	
02	Planning layout	
03	Detailed design	
04	Design review	
05	Communication	
06	File Versioning	

Vault PDM

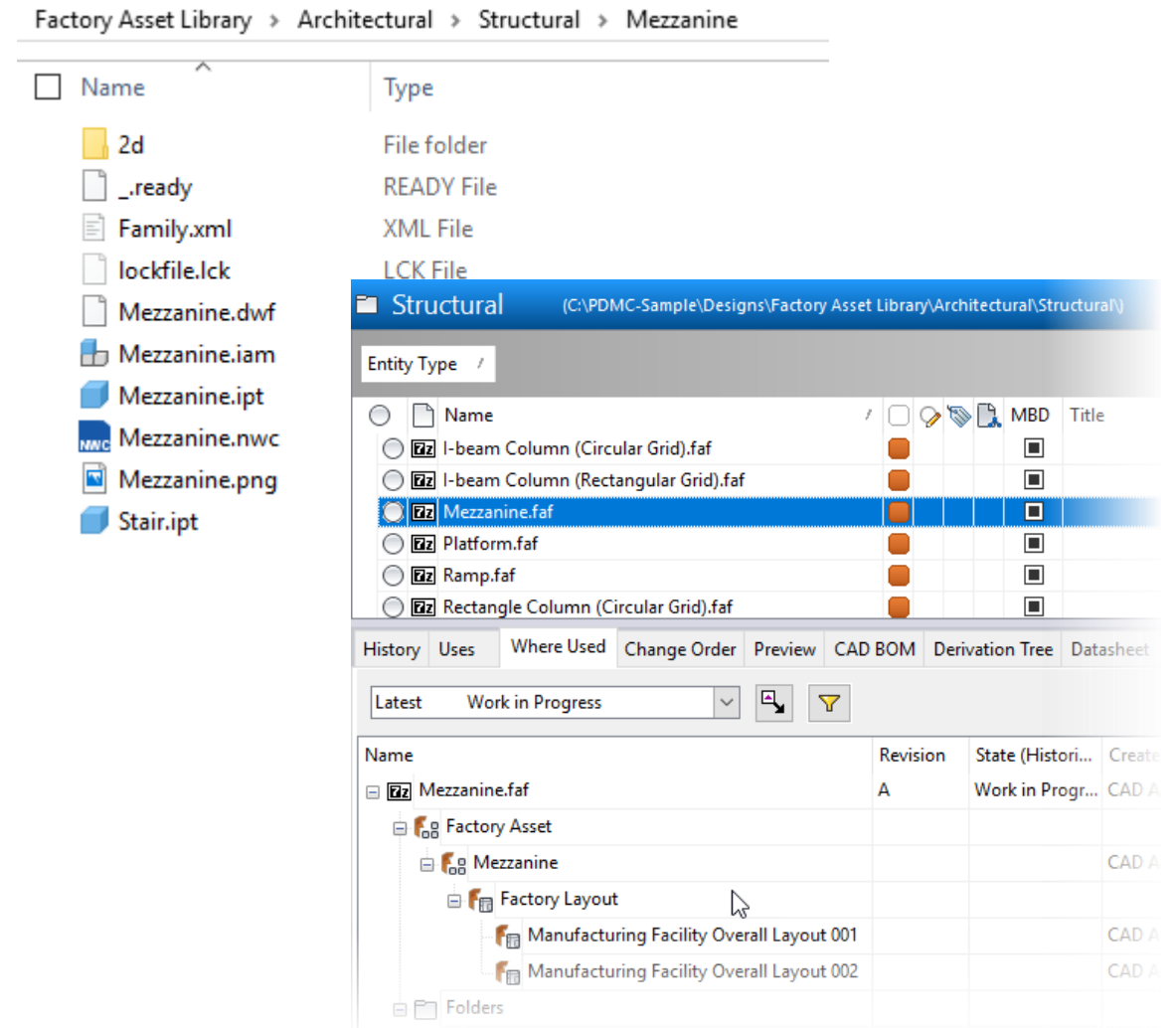


- ▶ Assets Management
- ▶ 2D - 3D - 4D Sync
- ▶ Revision Management
- ▶ Lifecycle
- ▶ Layout Management
- ▶ Project BOM
- ▶ Layout BOM
- ▶ Project Tracking

Asset Library

Managing Tasks and Benefits of PDM

- Library Asset – Set of files
 - Asset Publisher
 - Save to Vault
 - Edit from Vault
 - Save Connector Class to Vault
- ✓ Vault Library Asset – Package file
 - ✓ Simplified management
 - ✓ Where Used – 2D/3D/4D independent



Factory Assets

Managing Tasks and Benefits of PDM

- Asset – Consumed Library Asset
 - Variants
 - Single File per Size/Variant
 - New Files on edits/library revision
- ✓ Vault Assets – Factory Asset Object
 - ✓ Uses – Library Asset, any version, or revision
 - ✓ Where Used – Layouts, detail levels
 - ✓ Asset
 - ✓ Asset Configuration
 - ✓ Asset Instance

Mezzanine_601120AD37779DDC375610CC528E2E64.iam
Mezzanine_DF##F_601120AD37779DDC375610CC528E2E64.ipt
Stair_DF##F_601120AD37779DDC375610CC528E2E64.ipt

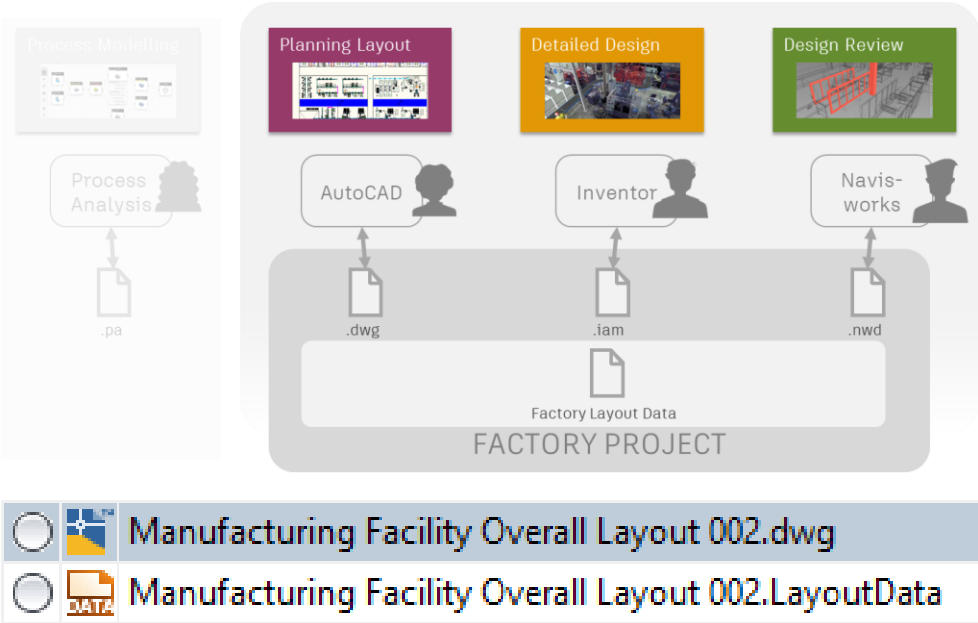
Factory Asset				
<div><div></div> Name</div> <div><div></div> Lift Table</div> <div><div></div> Man</div> <div><div></div> Mezzanine</div> <div><div></div> Oval Pit</div> <div><div></div> Pallet</div> <div><div></div> Picnic Table</div>				
ContentsWhere UsedFactory Asset Info				
Asset Instance				
Name	Q...	Instance Properties	Asset ... /	Key Paramet
Mezzanine	4			
Mezzanine	2			Angle:45 deg
Mezzanine	1	None	None	Angle:45 deg
Manufacturing Facility Overall Layout 001	1			
Mezzanine	1	None	None	Angle:45 deg
Manufacturing Facility Overall Layout 002	1			
Mezzanine	2			Angle:30 deg
Mezzanine	1	None	None	Angle:30 deg
Manufacturing Facility Overall Layout 001	1			
Mezzanine	1	None	None	Angle:30 deg
Manufacturing Facility Overall Layout 002	1			

Factory Layouts

Managing Tasks and Benefits of PDM

- Layout – Project File
 - Opens in AutoCAD, Inventor, Navisworks
 - Consumes 2D 3D or 4D Format (Library)
 - References Building Model

- ✓ Vault Assets – Factory Asset Object
 - ✓ Uses – Library Asset, any Revision
 - ✓ Where Used – Layouts, Detail Levels
 - ✓ Asset
 - ✓ Asset Configuration
 - ✓ Asset Instance



Factory Layout				
Name	Challenge Cell #1			
	Challenge Cell #2			
	Manufacturing Facility Overall Layout 001			
	Manufacturing Facility Overall Layout 002			
	Material Flow Analysis_Complete			
	Material Flow Analysis_Start			
Contents Where Used Factory Layout Info				
Asset Instance				
Name	Quant	Asset Tag	Instance Properties	Key Parameters
Horizontal Curve Belt Conveyor	1	None	None	Angle:90 deg; Heig
Horizontal Curve Belt Conveyor	1	None	None	Angle:90 deg; Heig
IRB6600_225_255	8			None
IRB6600_225_255	8			None
IRB6600_225_255	1	Robot #1	Service Interval:weekly;	None
IRB6600_225_255	1	Robot #2	Service Interval:weekly;	None
IRB6600_225_255	1	Robot #3	None	None
IRB6600_225_255	1	Robot #4	None	None
IRB6600_225_255	1	Robot #5	None	None
IRB6600_225_255	1	Robot #6	None	None
IRB6600_225_255	1	Robot #7	None	None

DEMO

Digitization in Custom Plant Design

When developing complete plants and systems the planning – that is, the creation of a factory layout – and design, ... , must be optimally coordinated and combined.



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TECHNOLOGY FOR CLEAN AIR



Takeaways

Managing Factory Design Assets and Layouts

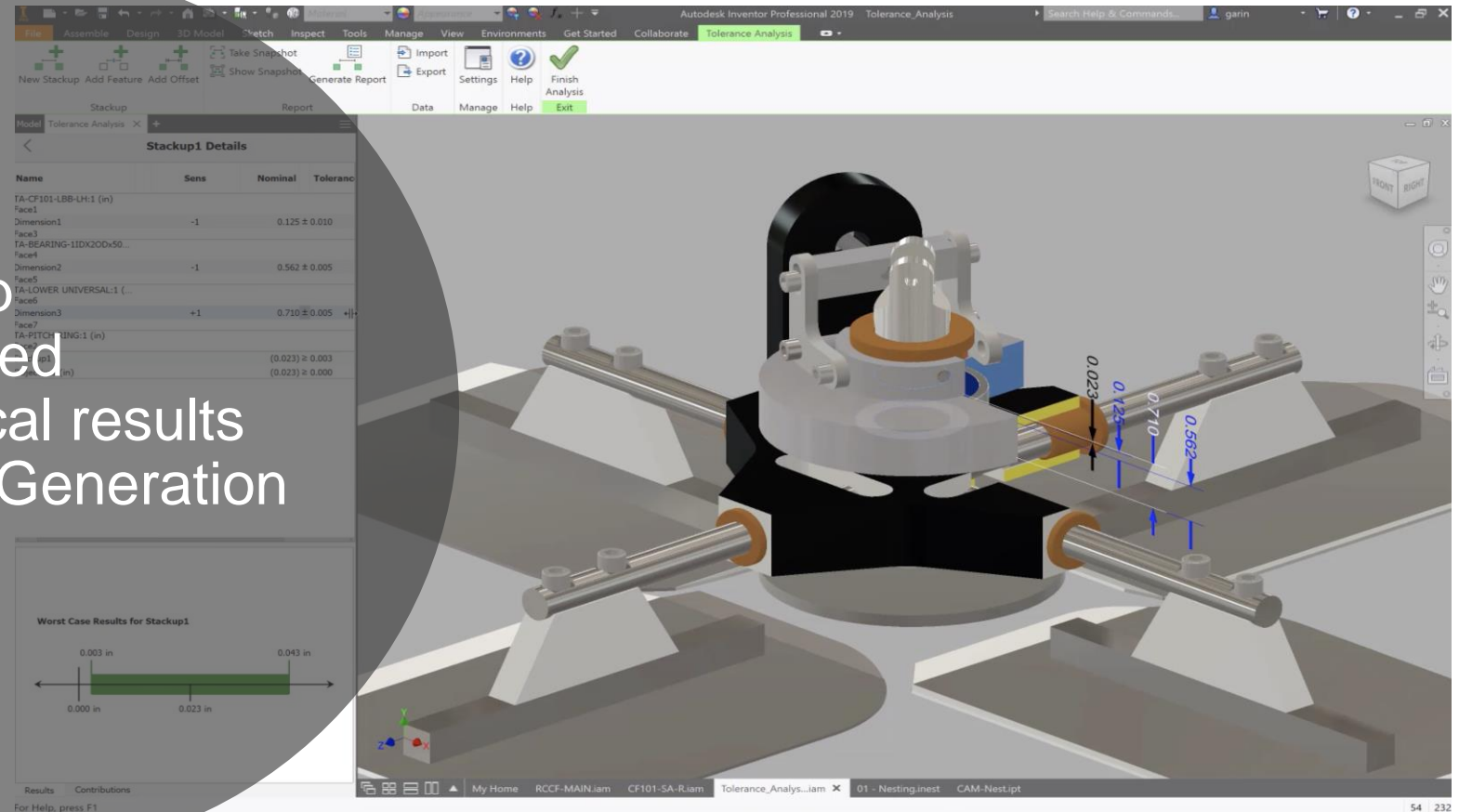
- Power of Factory Design Utilities depends on Asset Library
 - Completeness and consistency
 - Access control
 - Revision control management
- ✓ Vault Optimizes
 - ✓ Consistency of Asset Library
 - ✓ Asset release management
 - ✓ Layout content insights
 - ✓ Layout release management



Integrating Manufacturing

Managing Tolerance Analysis Data in Vault

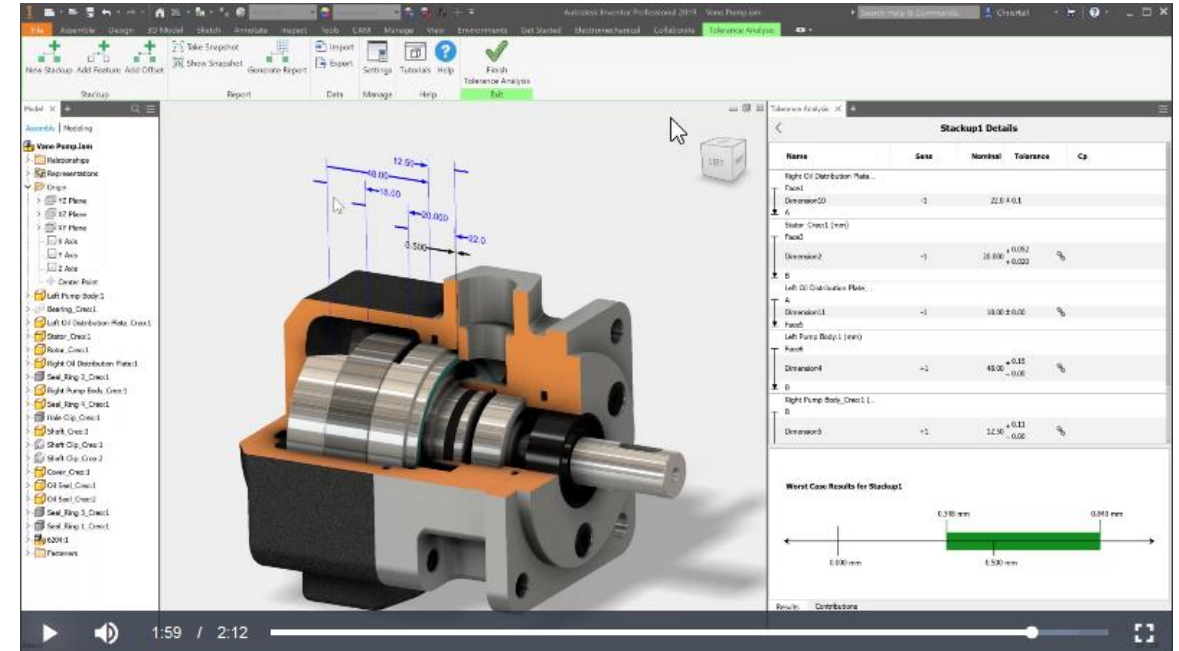
- Stackup
- Advanced Statistical results
- Report Generation



Inventor Tolerance Analysis – PDM|PLM Workflows

Considerations and Options Leveraging Autodesk Vault Professional

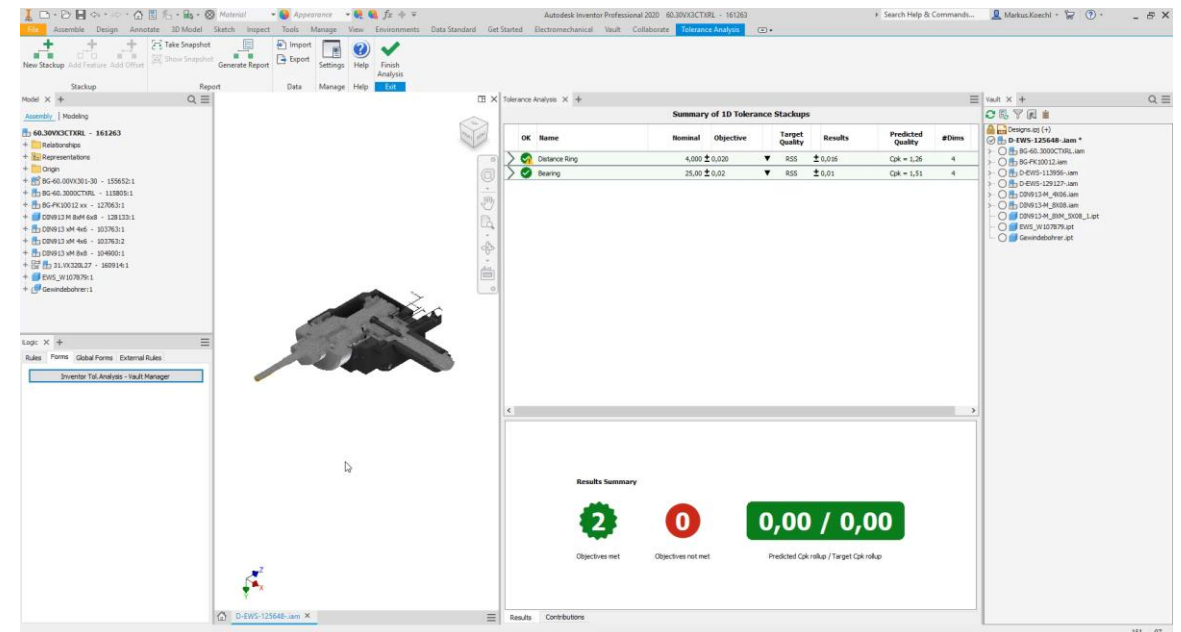
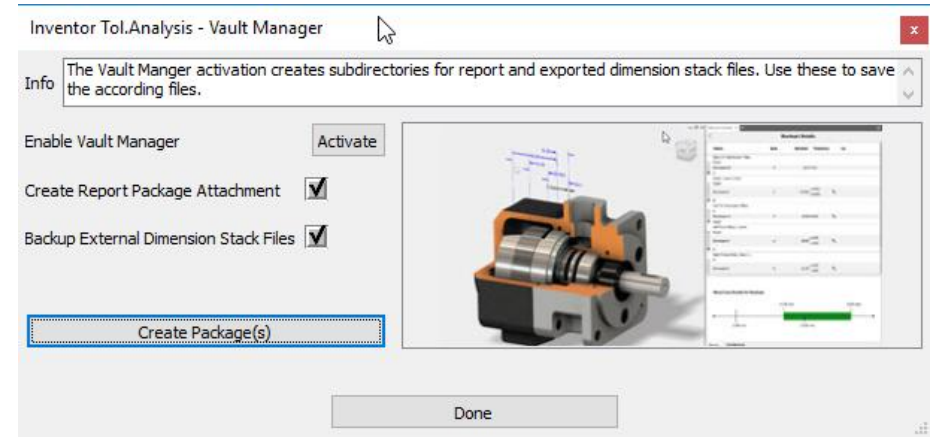
- Inventor Tolerance Analysis manages
 - Product requirements
 - Common dimensions and tolerances for multiple stackups.
 - Calculation of geometric tolerances.
 - Calculation of statistical results.
- Objectives for PDM|PLM workflows
 - Backup external stack-up data
 - Capture statistical results sheets
 - Communicate findings and required actions



Inventor Tolerance Analysis – Vault Concept

Managing Tolerance Stack-up Data and Reports

- Inventor iLogic – Package Manager
 - Backup external stack up data
 - Capture statistical results sheets
- Autodesk Vault
 - Include Report Package in design release process
 - Communicate findings and required actions via ECO notification



Takeaways

Managing Tolerance Analysis Data

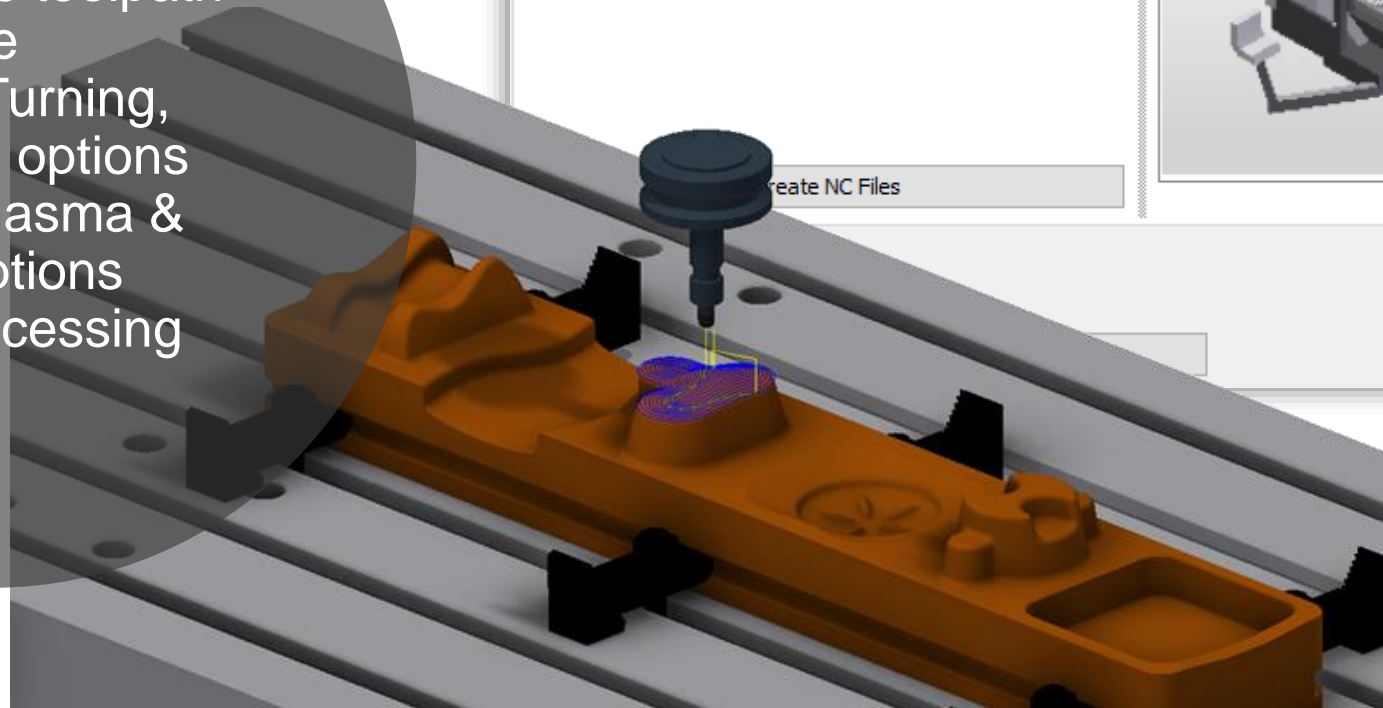
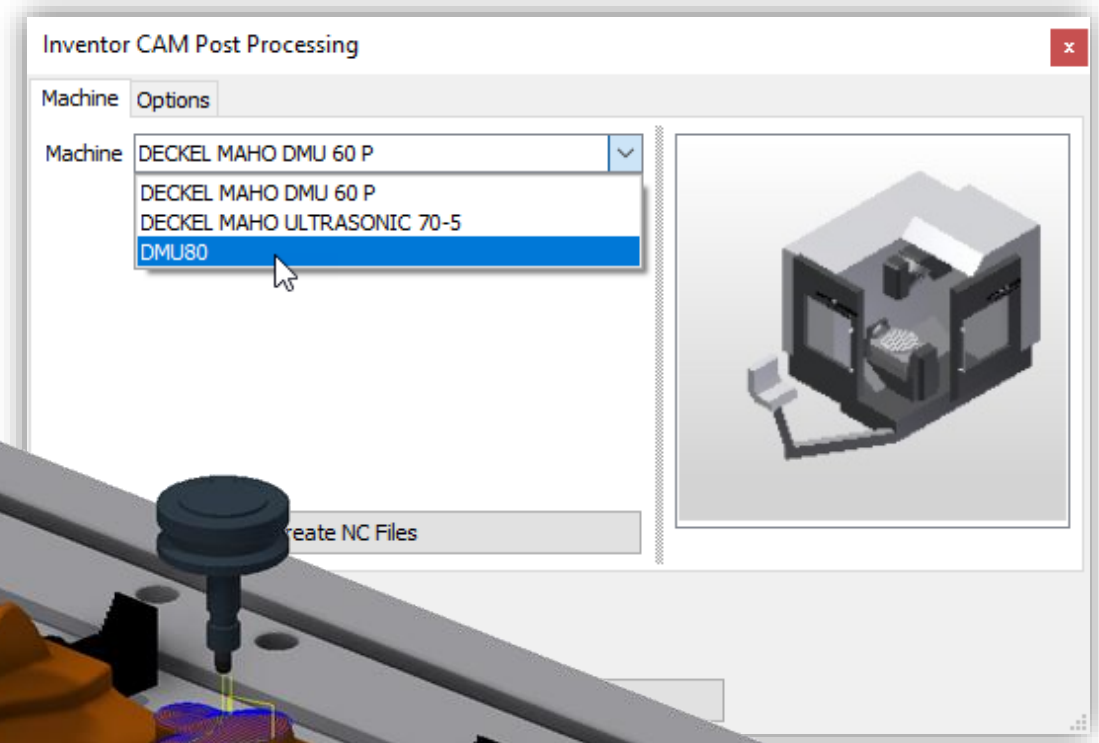
- Enhanced Collaboration
 - Manufacturing and Quality Engineering
- Improved Quality and Reputation
- Reduced Cost
- Vault Optimizes
 - Report to Model Association
 - Archiving Stack Definitions/Variants
 - Downstream Sharing of Results and Reports



Integrating Manufacturing

Automating and Managing Inventor CAM & NC Data

- Generate toolpath from face
- Milling, Turning, Mill-Turn options
- Laser, Plasma & Water options
- Post Processing



Workflow Challenges & Benefits

Inventor CAM – Associative CAM and Post Processing

- Integrated CAM tightens source geometry and toolpath associatively
 - Saving NC setup and toolpath definition
 - Updating according design changes
- Toolpath definition might edit the work piece
 - Suppressing features
 - Activating median tolerances
 - ...
 - ...



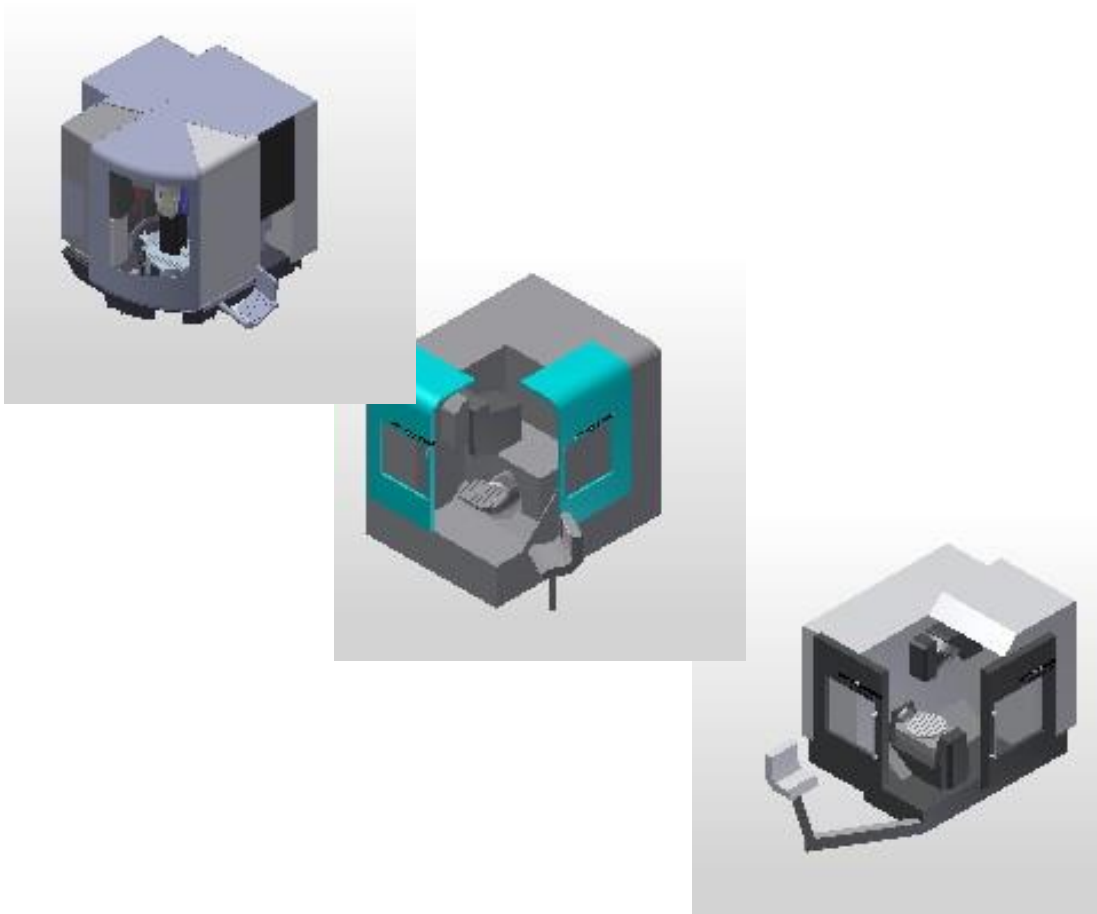
Released to manufacturing

- How to integrate it in PDM based design workflows?

Workflow Challenges & Benefits

Inventor CAM – Associative CAM and Post Processing

- Components might get manufactured on different machines based on availability



001375.ipt

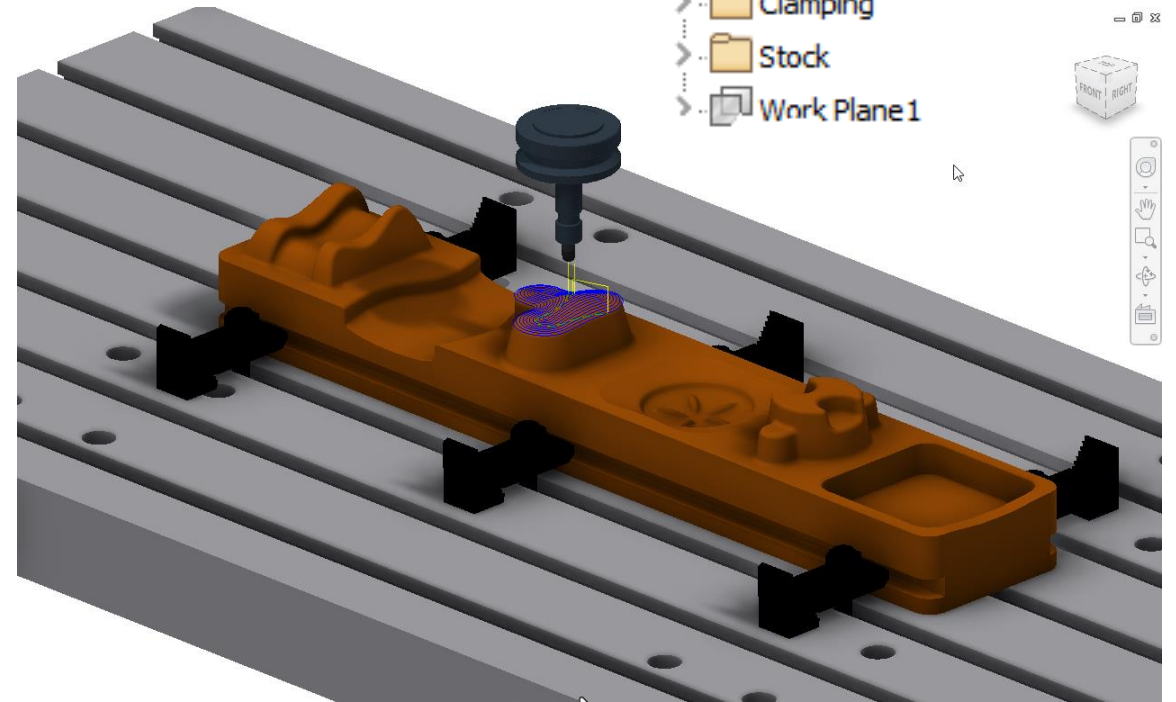
Released to manufacturing

- How to manage related links for ?
 - Post Processor – Machine
 - NC Code – Workpiece
 - Setup Sheet – NC Code
 - ...

Inventor CAM – Vault | Concept

Inventor CAM - Assembly Template

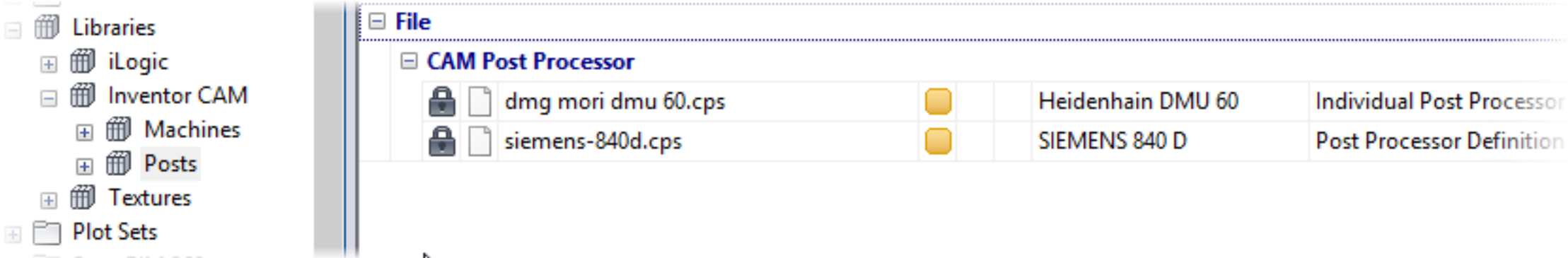
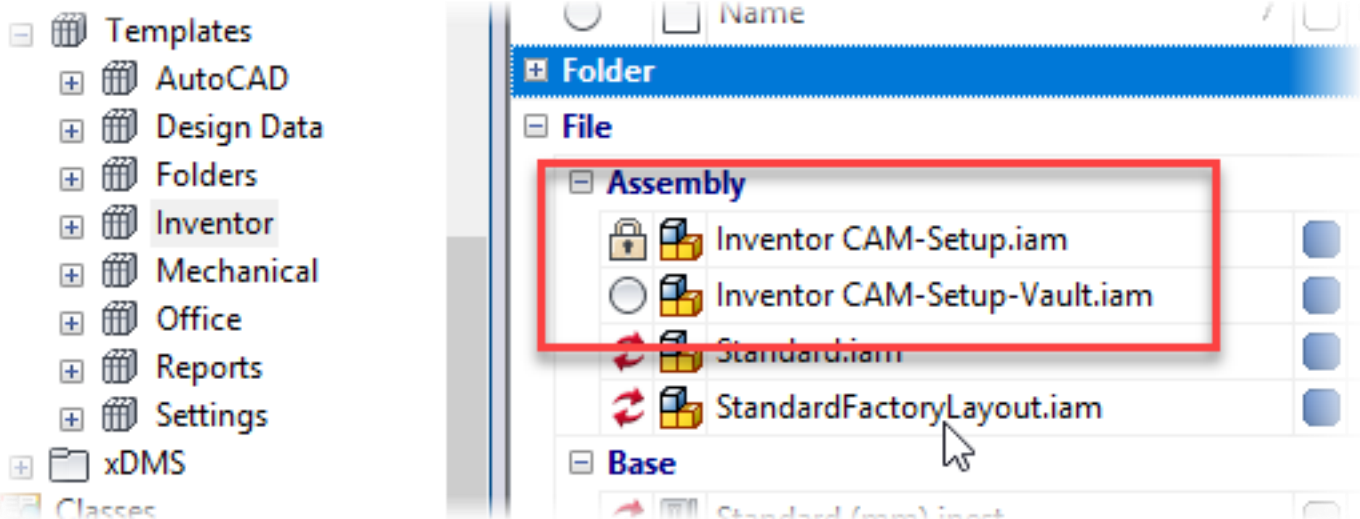
- Run Inventor CAM in assembly context saving
 - Setup and toolpath
 - Linked NC code and Setup Sheet files
 - Clamping and machine context
- Temporarily activate component changes, e.g., Median Tolerance
 - Inventor allows edits on read-only files



Inventor CAM – Vault | Concept

Vault – View

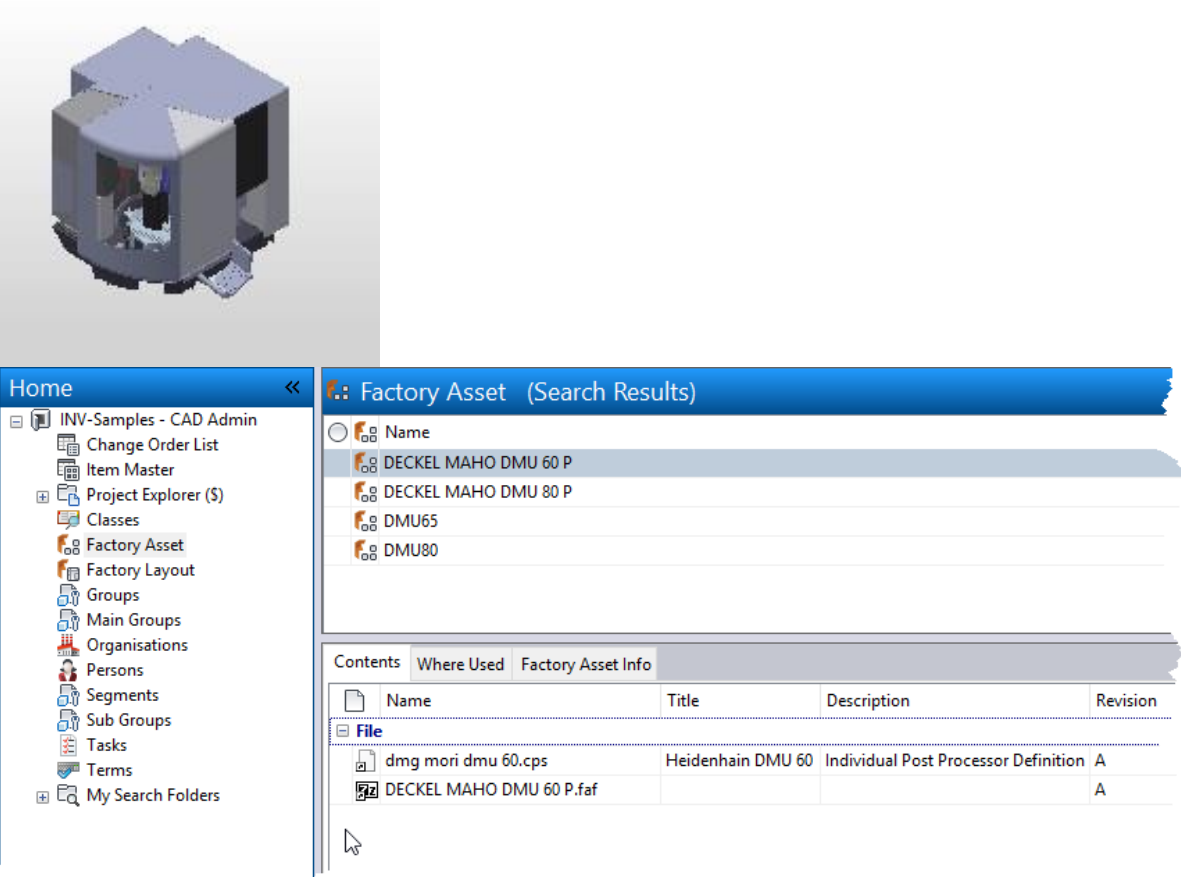
- Managing Templates and Posts



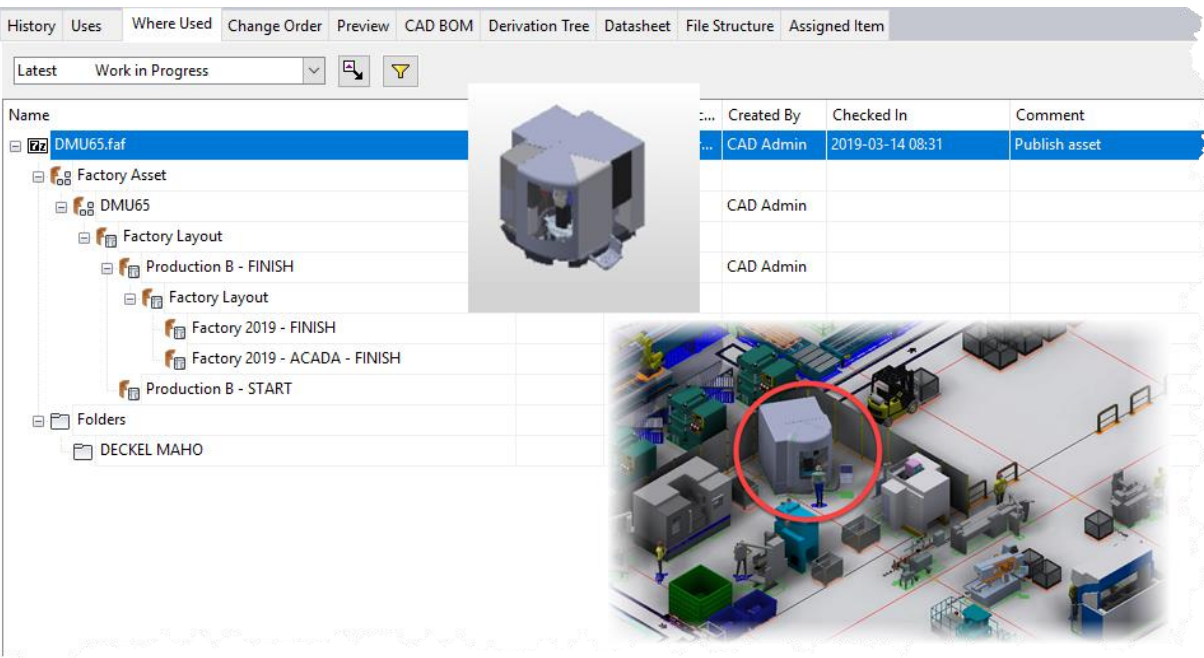
Inventor CAM – Vault | Concept FDU Extended

Vault, Factory Design Utility – View

- Managing Machine Assets
 - Link Templates, Posts, Service Docs



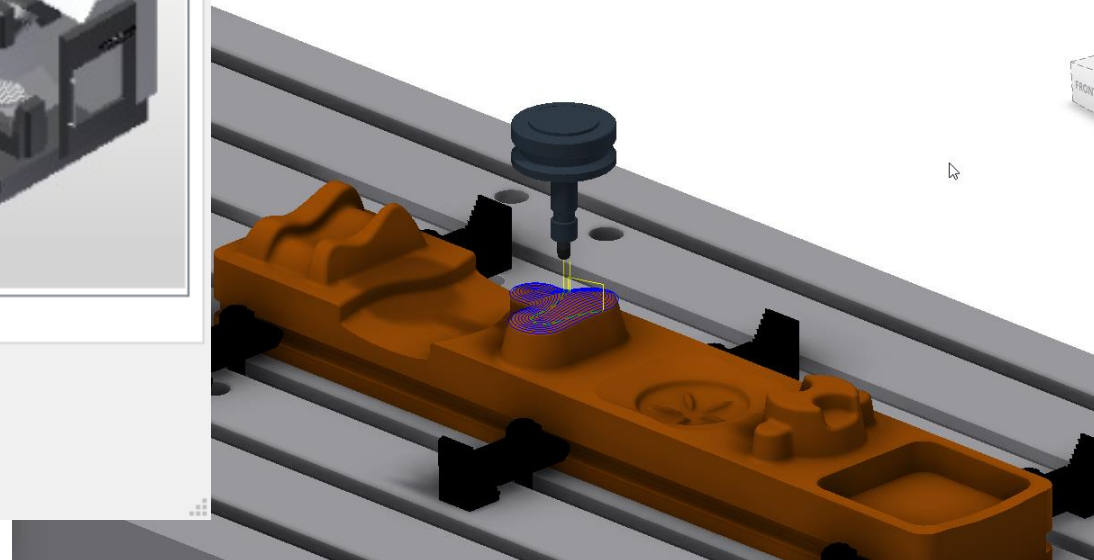
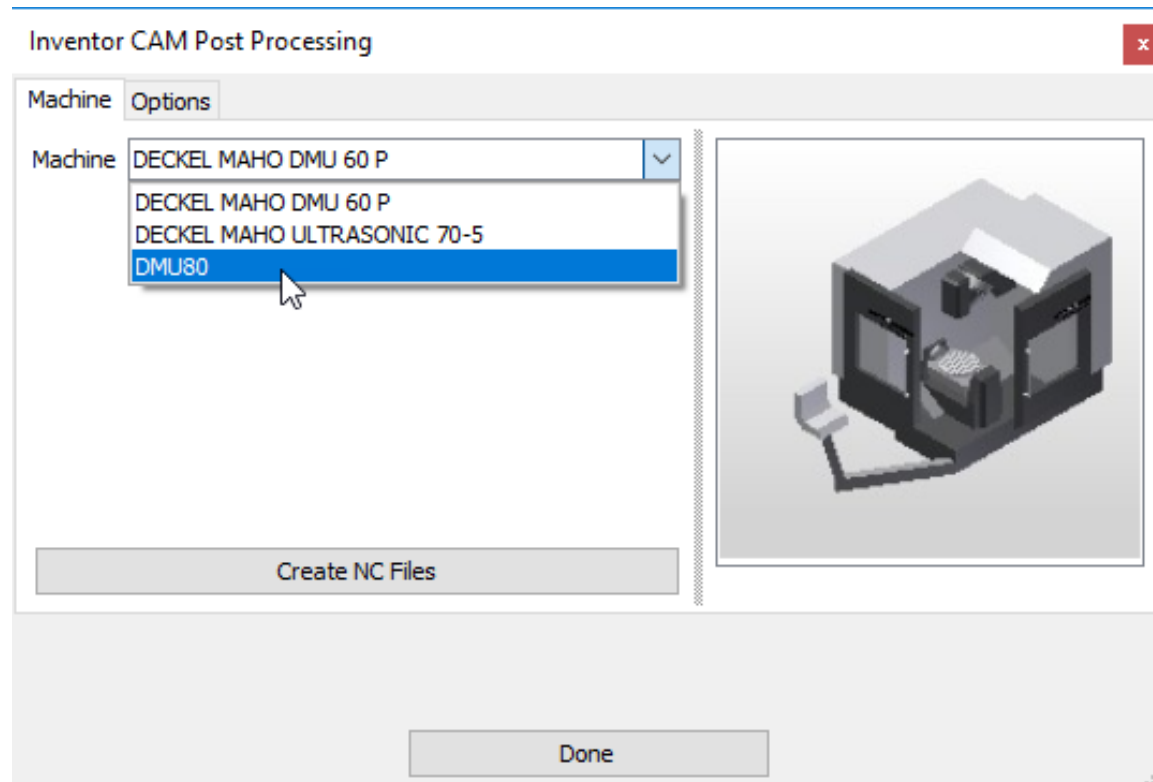
- Managing Factory Digital Twins



Inventor CAM – Vault – iLogic Design Automation

Automate NC Code Output and Vault File Management

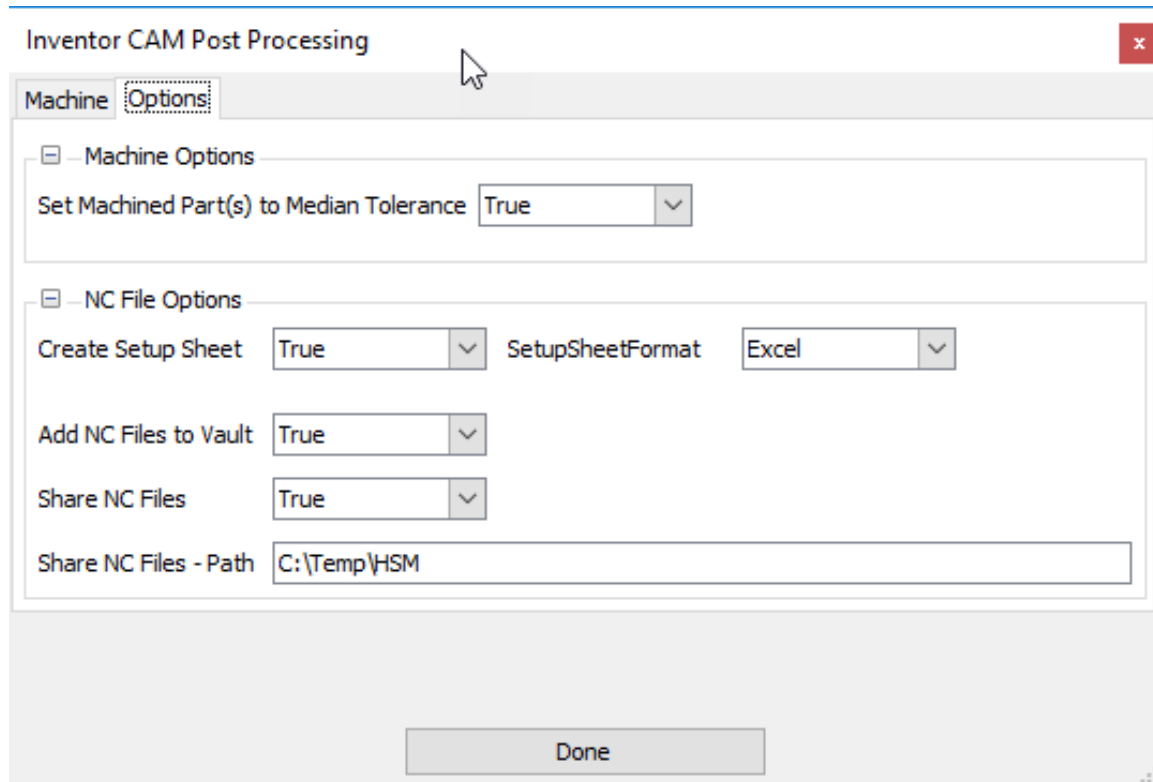
- Activate Inventor CAM-Setup Assembly
 - Select Machine
- Automation
 - Reads available Machines from Vault
 - Download post processor definition



Inventor CAM – Vault – iLogic Design Automation

Automate NC Code Output and Vault File Management

- Activate Inventor CAM-Setup Assembly
 - Select Options



Create NC Files

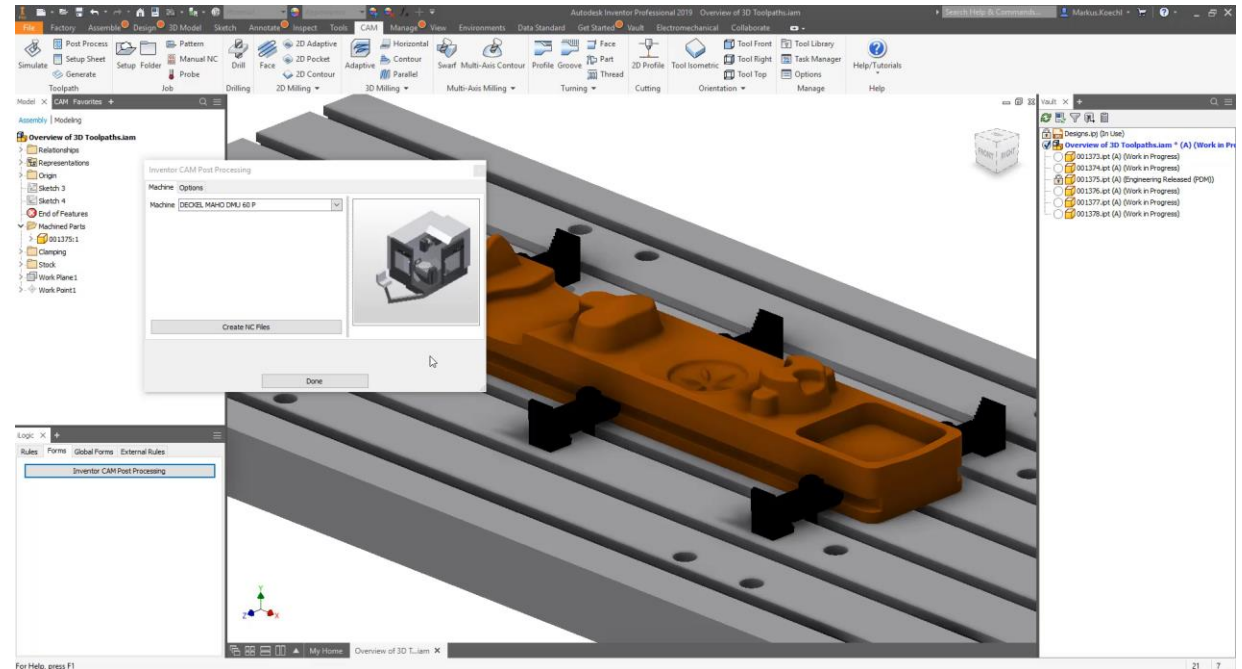


- Automation Machining - Tolerance
 - Iterates one to many work pieces activating median tolerance
- Automation NC-File
 - Create NC file for selected machine
 - Create Setup Sheet
 - Add Machine/NC Code to Vault
 - Copy NC Code/Setup to external share

Inventor CAM – Vault – iLogic Design Automation

Automate NC Code Output and Vault File Management

- Video
 - Select Machine(s)
 - Activate Tolerances
 - Create NC output for 1 to n machines
 - Check-in to Vault
 - Include output into Manufacturing Release process



Takeaways

Automating and Managing CAM & NC Data

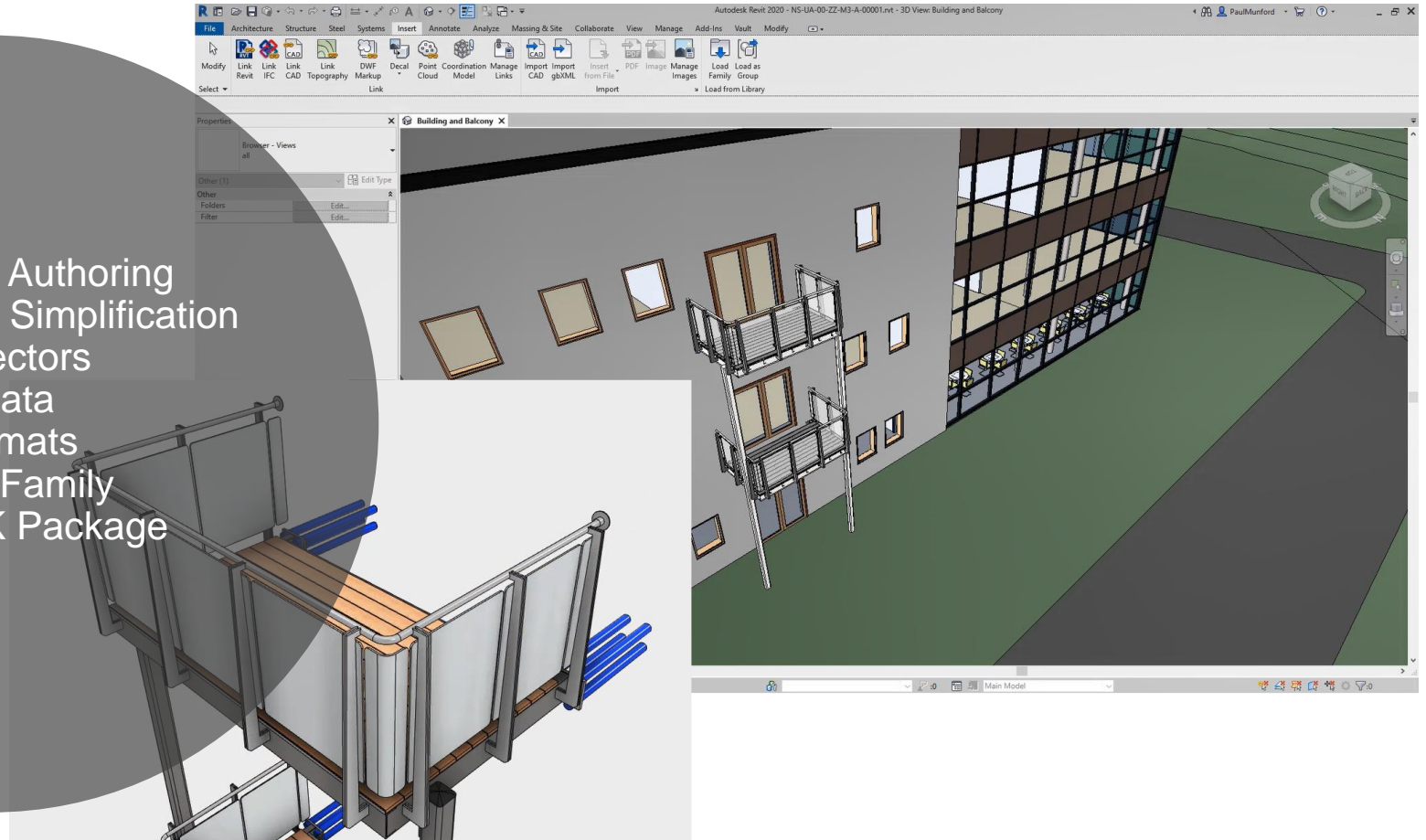
- Released CAD Model Files
 - Avoid Copying for CAM
- NC Setup and Postprocessing
 - Recurring Effort on Update
- ✓ iLogic-Vault Optimizes
 - ✓ NC Code Generation & Export
- ✓ Vault Optimizes
 - ✓ CAM Setup and CAD Model Association
 - ✓ Managing Post Processor Definition
 - ✓ NC Code Association and Release Management
 - ✓ FDU Library Option: Managing CNC Machine Assets



Beyond Engineering

Managing Inventor BIM Exchange Data

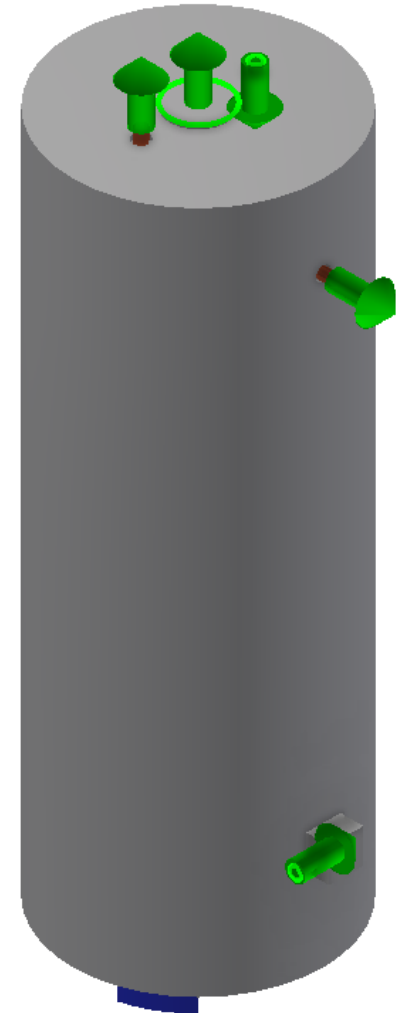
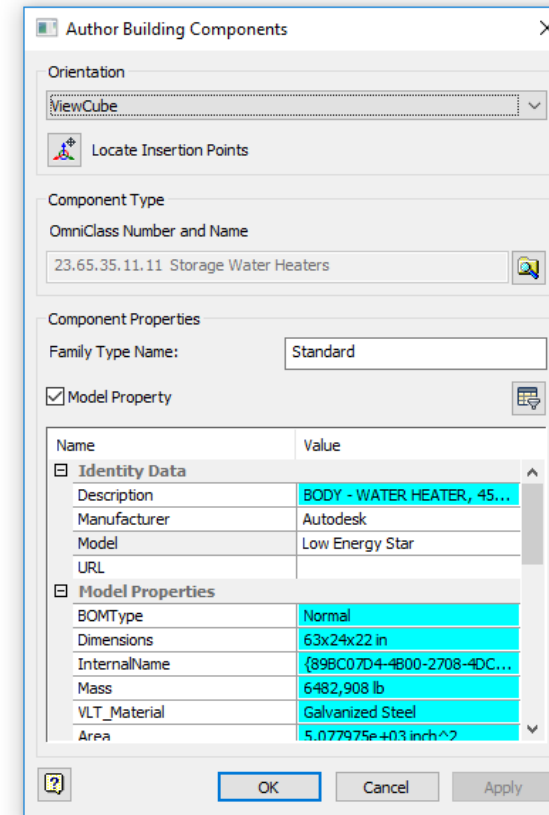
- BIM Model Authoring
- BIM Model Simplification
- BIM Connectors
- BIM Metadata
- Export Formats
 - Revit Family
 - ADSK Package
 - IFC



Inventor BIM Exchange – PDM Workflow

Considerations and Options Leveraging Autodesk Vault Professional

- Inventor BIM Exchange formats
 - Revit Family (*.rfa)
 - Autodesk Exchange (*.adsk)
 - IFC
- Exchange objectives may target
 - Output for libraries
 - Enable Search
 - Include exchange in release process



Inventor BIM Exchange – PDM Workflow

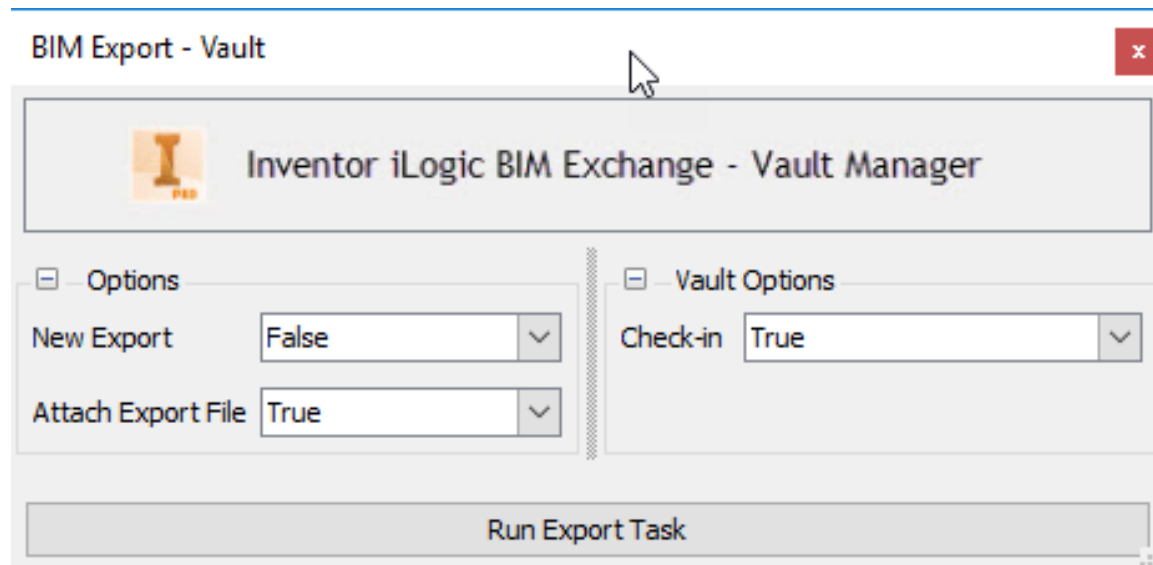
Considerations and Options Leveraging Autodesk Vault Professional

- Inventor BIM Exchange formats
 - Revit Family (*.rfa)
 - Autodesk Exchange (*.adsk)
 - IFC
- Exchange objectives may target
 - Output for libraries
 - Enable Search
 - Include exchange in release process
- Autodesk Vault Implications
 - Vault manages Revit families
 - Vault manages ADSK and IFC as standard file format
 -
- Vault Workflow Implications
 - Notify library manager
 - Enable search for ADSK or IFC

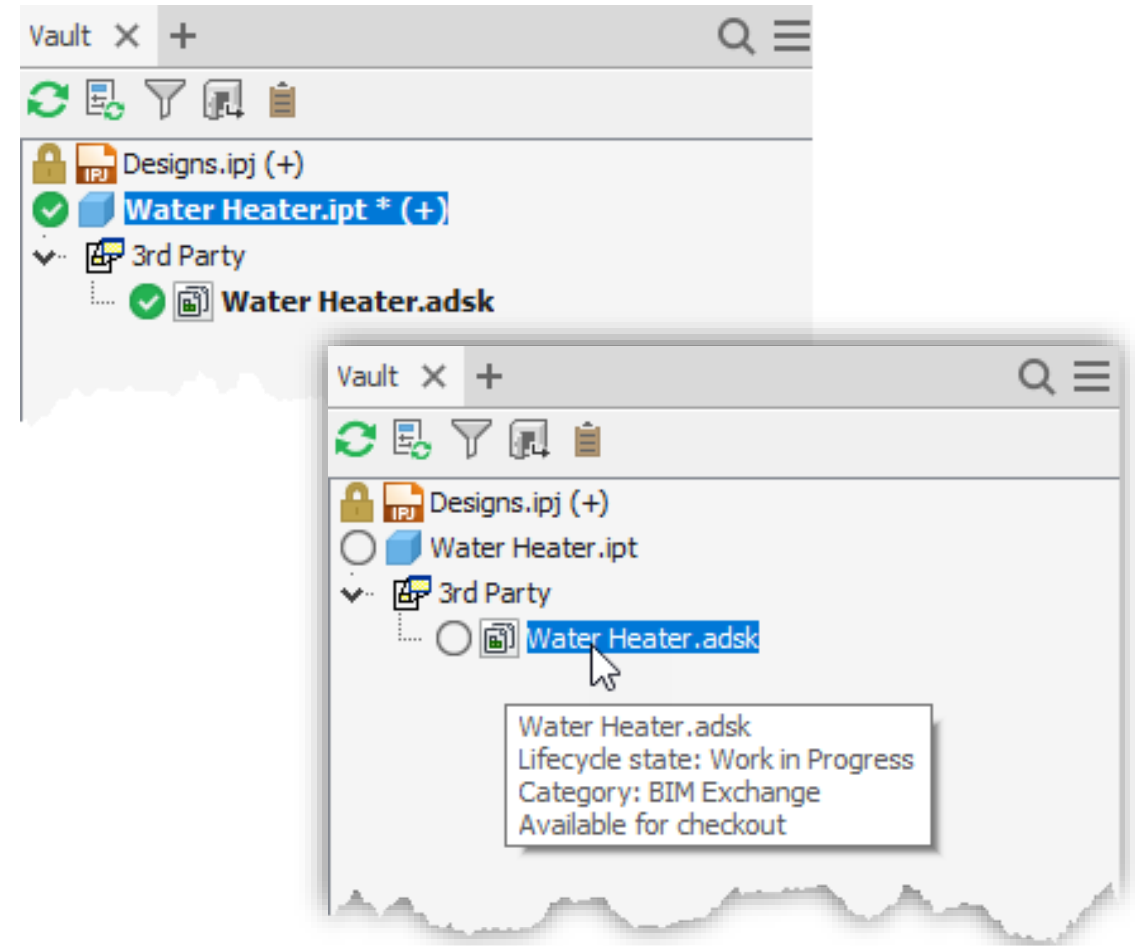
Inventor BIM Exchange – Vault Options

Semi-Automation or Workflow Automation

- User Interactive Approach – iLogic
 - Automate save and attach
 - Check-in on finish
- Extendable to full BIM Exchange Setup



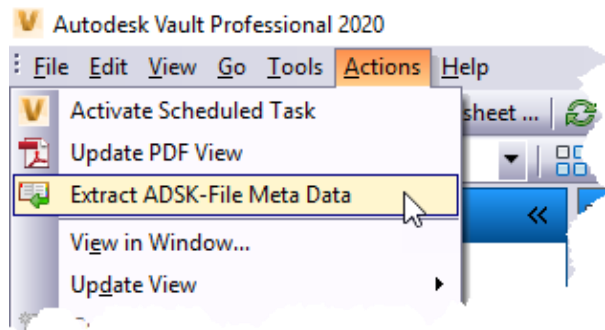
- Vault Result



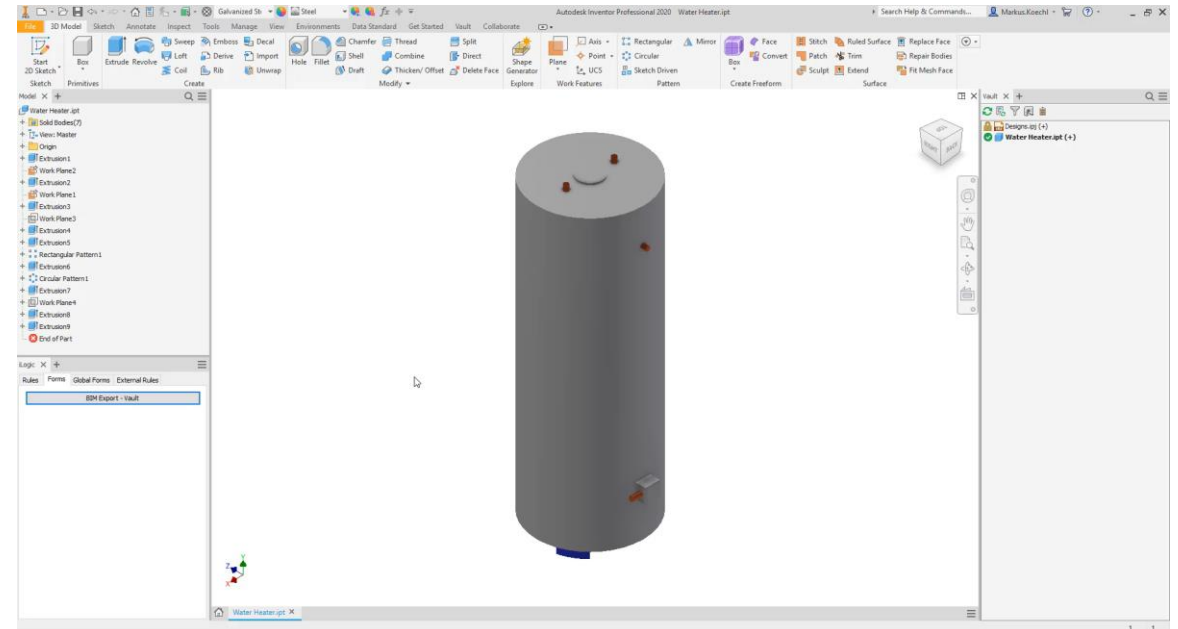
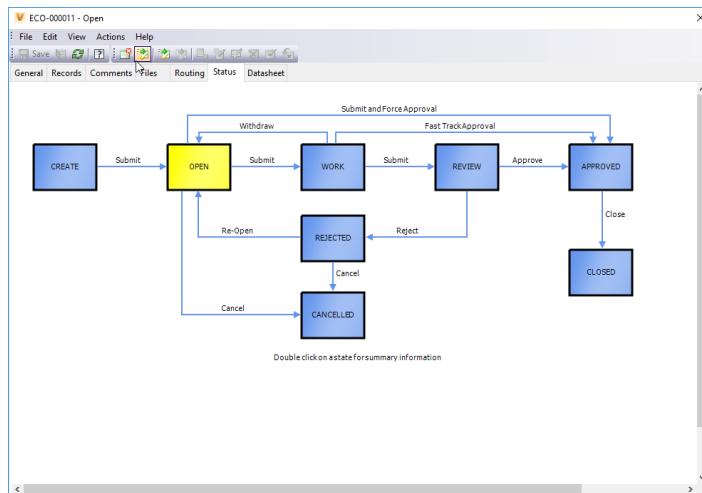
Inventor BIM Exchange – Vault Options

Semi-Automation or Workflow Automation by Job Processor

- User Interactive Approach – Vault
 - Enable Search / Index



- Notify BIM Library Manager



Takeaways

Managing BIM Exchange Data

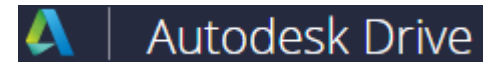
- BIM Exchange Data are non-associative Export file formats
- Time and efforts of BIM Export
- ✓ Vault Optimizes
 - ✓ Mech. Model – BIM model association
 - ✓ BIM Export automation (Job Processor)



Valuable Links & Downloads



Download



- Sample Vault including several Models, Rules, Configurations
 - Vault Professional 2020 – Full Backup
- Vault Automation – Custom Jobs
 - STEP Export
- iLogic-Vault Rule Samples
 - iLogic-Vault Quickstart Library
 - Tolerance Analysis – Vault Manager
 - Inventor CAM Post Processing
 - BIM Exchange Export – Vault

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Image courtesy of Balzer Pacific Equipment Co.

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Jaw Stand

Jaw Crusher

Main Hopper

Jaw Hopper

Transfer Chute

Apron Feeder

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