

NX Progressive Die Design

What's New in NX 4

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Tooling Industry Challenges...

All else being equal, TIME is today's competitive measure



Time

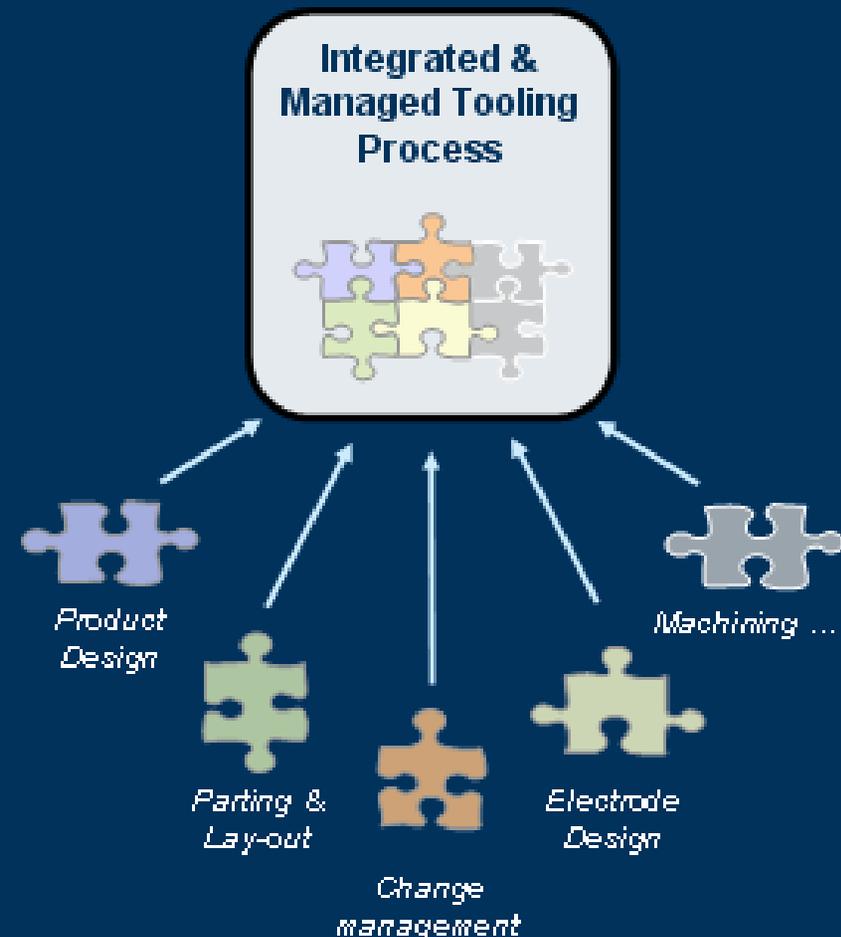
- ▶ Reduce design lead time
- ▶ Reduce cycle times
- ▶ Increase production volume
- ▶ Reduce manufacturing / machining time

Cost

- ▶ Manage and reduce costs
- ▶ Eliminate errors (human and design)

Quality

- ▶ Achieve first time quality on increasingly complex parts
- ▶ Achieve customer requirements
- ▶ Maintain tool design quality
- ▶ Maintain product quality

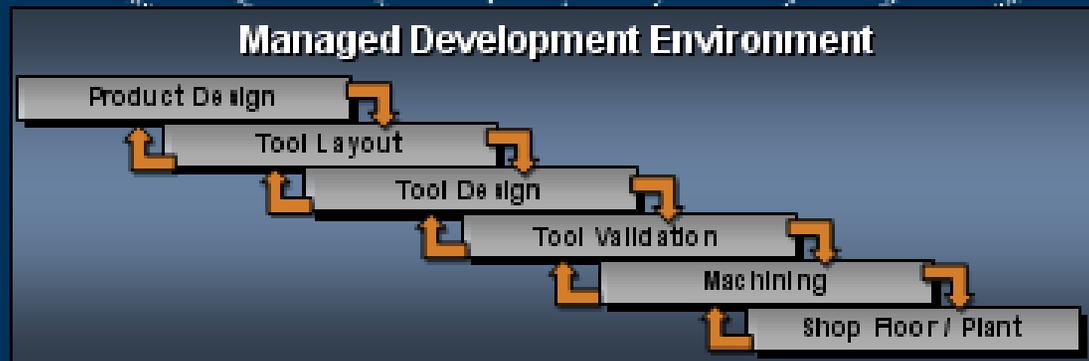


Sources of market challenges:

- AMBA white paper, "Know the True Cost of Molds US vs. Offshore"
- AMBA white paper, "What can US Mold Builders Do To Compete?"
- Market engagements



Deliver the most complete and fastest tooling process 'from design to production' through intelligent automation and process integration



Directions

- ▶ Usability & productivity
- ▶ Data preparation
- ▶ Bend definition / forming analysis
- ▶ Parting / patching
- ▶ Knowledge reuse templates
- ▶ Accurate DFM validation
- ▶ Managed Development Environment integration
 - ▶ Concurrent design
 - ▶ Design change management & propagation
 - ▶ Process and product data management
- ▶ Automatic machining operation selection
- ▶ Shop floor integration
- ▶ Quick Start Documentation



NX Progressive Die Design Process



Managed Development Environment

Product Design

Tool Layout

Tool Design

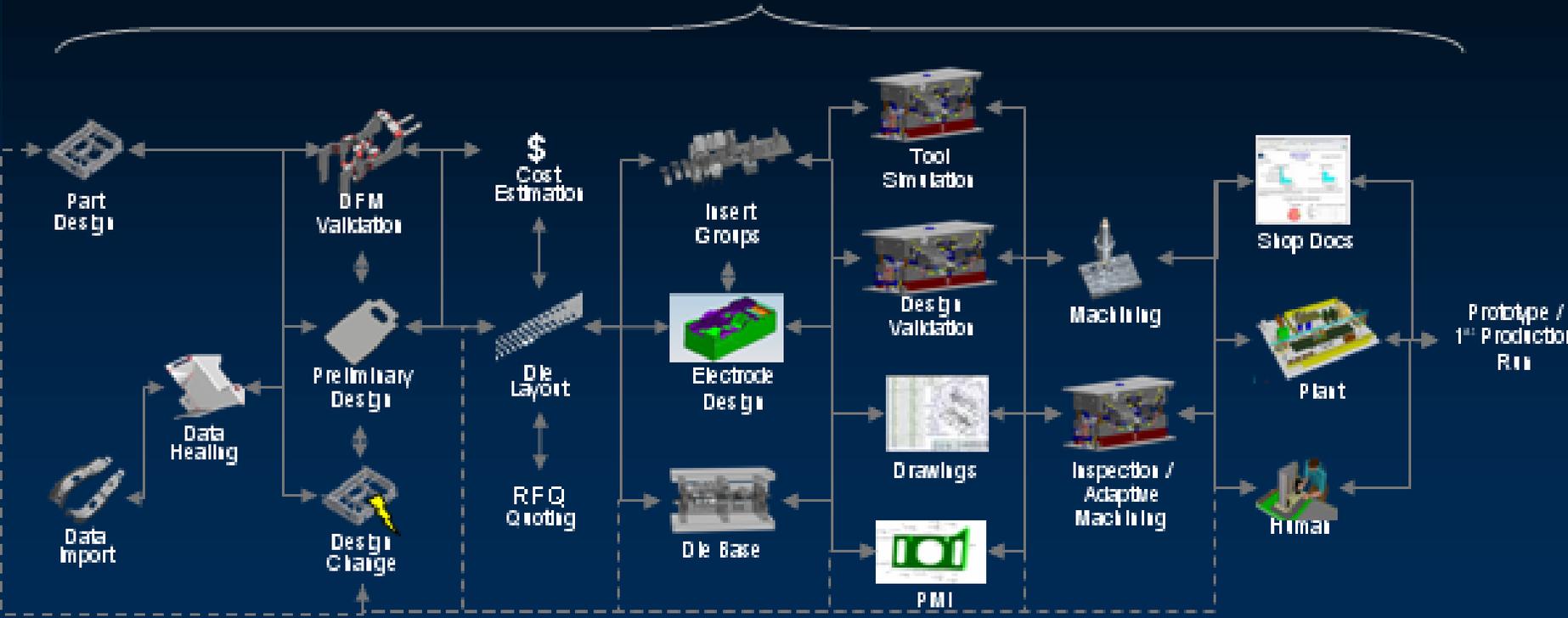
Tool Validation

Machining

Shop Floor / Plant



Suppliers
Partners
OEMs





Progressive Die Wizard

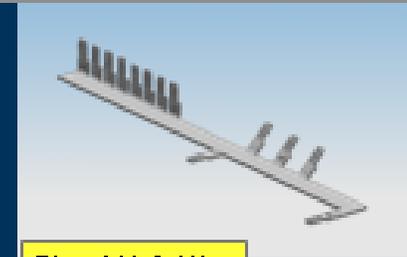


Directions

- ▶ Improved integration within Managed Development Environment, and concurrent team design
- ▶ Streamlined design process and ease of use
- ▶ Validation for manufacturability

NX 4 projects

- ▶ Direct unfolding (NX 4 / NX 4.0.1)
- ▶ Design associativity
- ▶ Pilot scrap
- ▶ Fine blanking
- ▶ New design / modeling tools
- ▶ Pocket / Thread hole improvement
- ▶ Drawings - hole report
- ▶ Extended standard part libraries
- ▶ Instance array & point pattern positioning
- ▶ Improved defaults & preferences
- ▶ Teamcenter Engineering integration
 - ▶ Library integration
 - ▶ Concurrent design
- ▶ **Electrode design – new add-on module



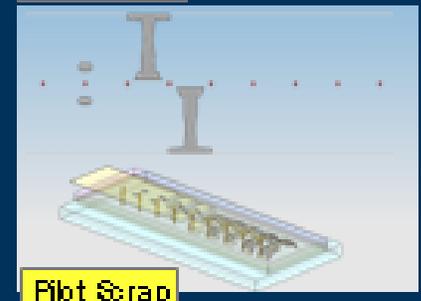
Direct Unfolding



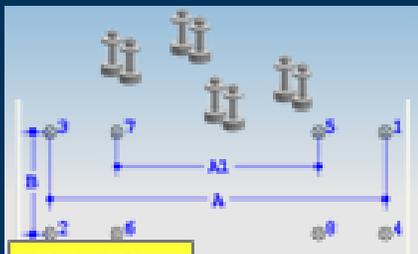
Hole Report



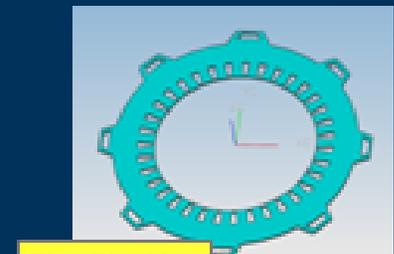
Instance Array



Pilot Scrap



Point Pattern



Fine Blanking



New Design Tools

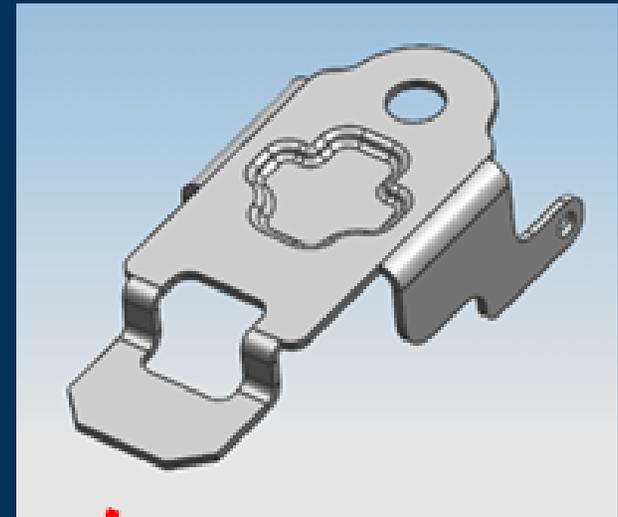


Electrode Design



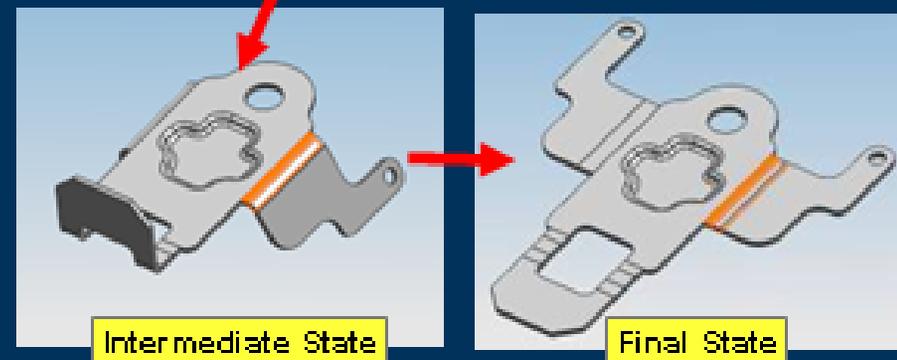
Capabilities

- ▶ Directly unfold unparameterized solid bodies to generate blanks
- ▶ Direct unfolding of individual geometric features to generate intermediate stages
- ▶ Easily define multiple-step bending (with constant bend radius)
- ▶ Unbend complicated side-face conditions (not formally possible with sheet metal feature recognition)



Why is this important to you?

- ▶ Eliminate the complex process of converting imported "dumb" models to feature-based models
- ▶ Easily handle sheet metal parts originated from other CAD systems
- ▶ Shorten progressive die delivery time



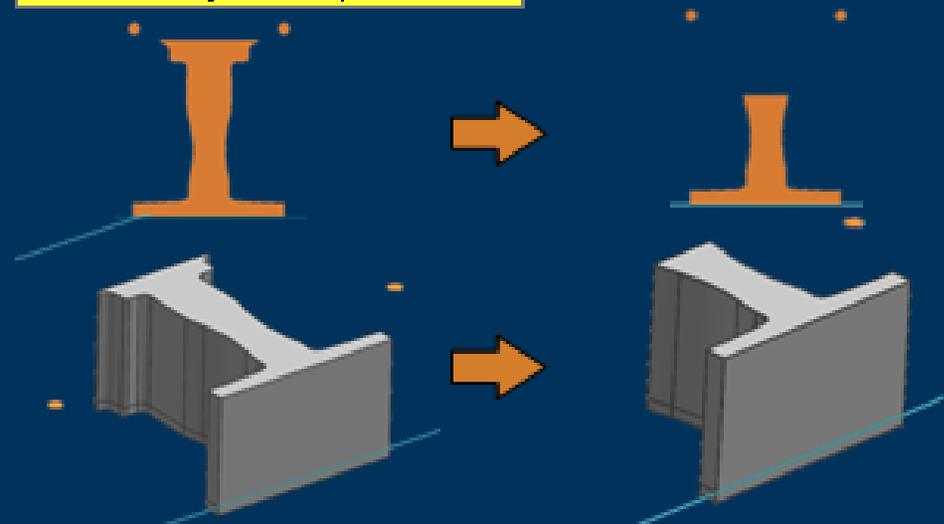
Intermediate States
available in NX 4.0.X



Capabilities

- ▶ Re-parent piercing insert with scrap, scrap change, piercing insert changes accordingly
- ▶ Original part or intermediate stage change, related form insert change accordingly
- ▶ Automatically check the unwanted inserts

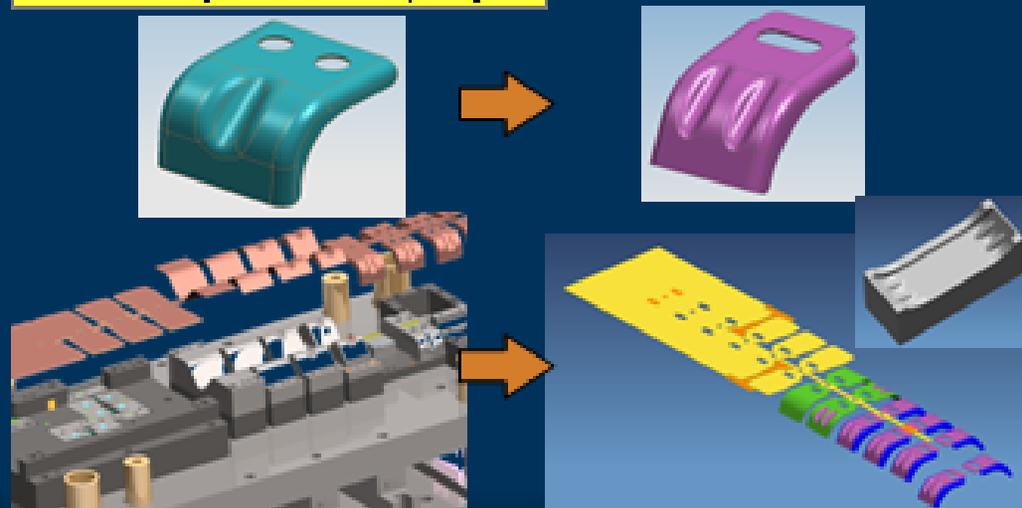
Associativity to Scrap Definition



Associativity to Part / Strip Layout

Why is this important to you?

- ▶ Easily make die design change once new version of sheet metal part come in
- ▶ Easily reuse existed finished project for similar sheet metal part





Pilot Scrap / Strip Definition

Progressive Die Design

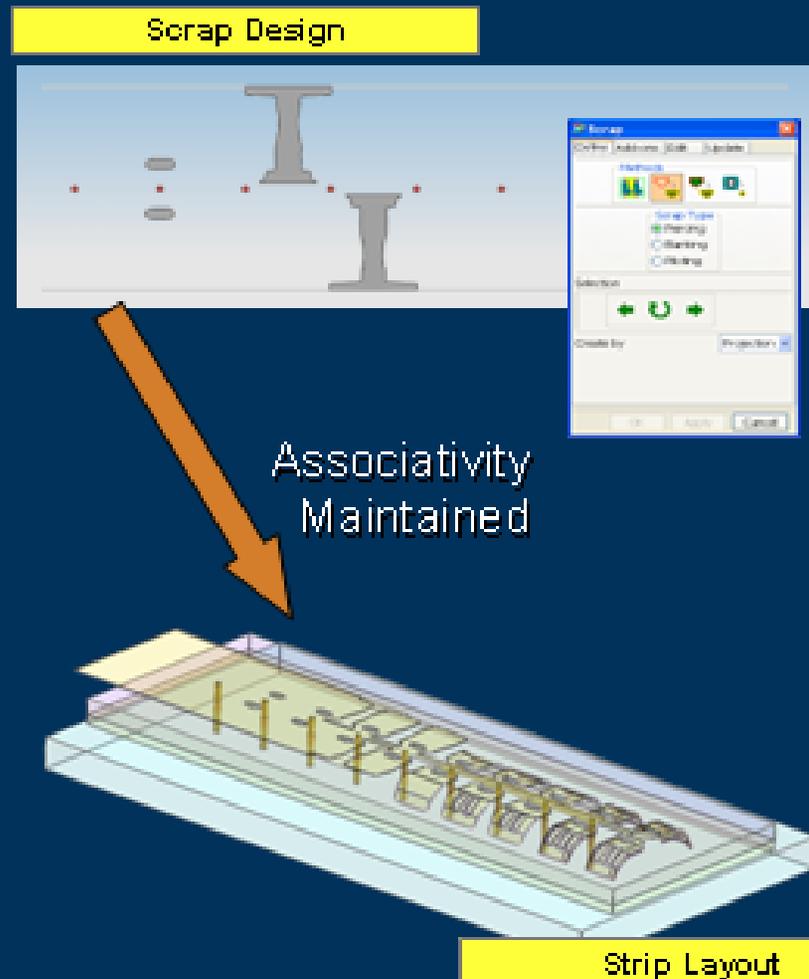


Capabilities

- ▶ Provide pilot scrap type in scrap design
- ▶ Strip Layout: automatically copy pilot scrap to all of stations
- ▶ Insert Group: automatically change pilot punch diameter according to pilot scrap

Why is this important to you?

- ▶ In metal stamping, pilot clearance is a crucial element required for all progressive dies, this capability ensures pilot clearance is properly accounted for in design





Strip Layout Simulation

Progressive Die Design

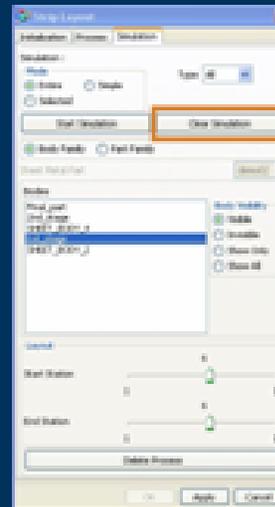


Function Location

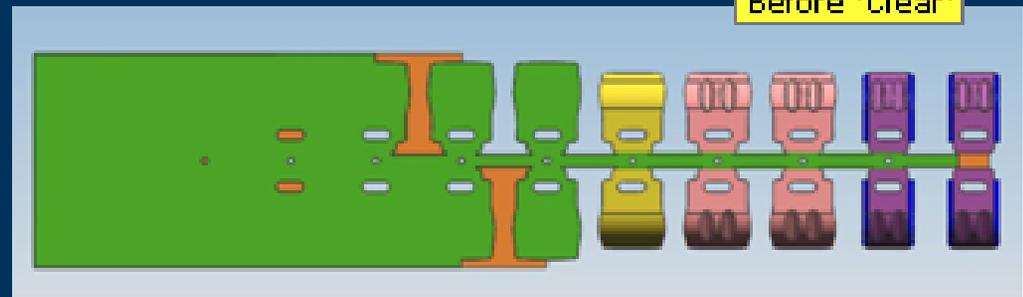
- ▶ Strip Layout

Enhancement Description

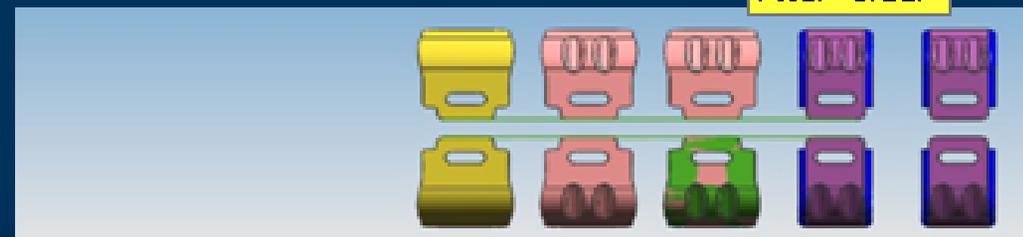
- ▶ 'Clear Simulation' has been enhanced to remove all objects excluding sheet and solid bodies from the body family or part family layout
- ▶ This provides the ability to easily edit the scrap design while maintaining the intermediate body layout
- ▶ Enhanced flexibility to conduct strip simulation and layout in any sequence
 - ▶ i.e. no order dependence of operations



Before 'Clear'



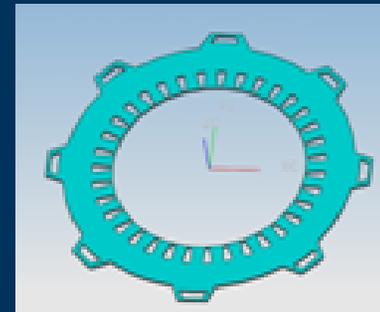
After 'Clear'





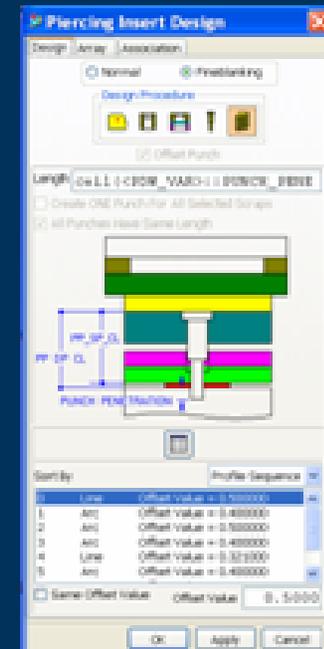
Capabilities

- ▶ Apply piercing punch-die clearance to die side or punch side
- ▶ Apply variable offset to piercing/blanking profile
- ▶ Integrate offset table into punch/die cavity design



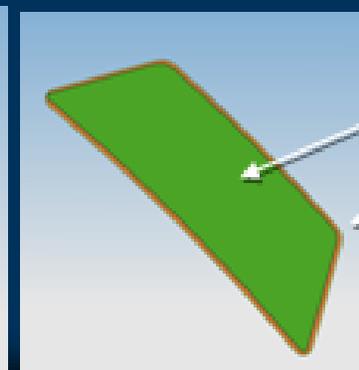
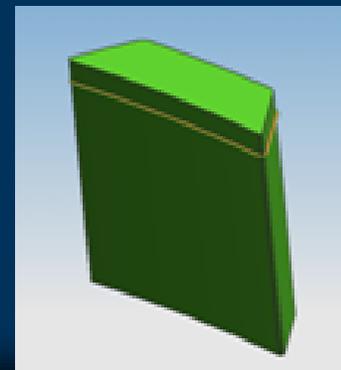
Fine Blanking Parameter Table

#	Material Thickness	Constant Offset	Non Arc Offset	Arc Offset
PARAMETERS				
	t	const_offset	line_offset	var_offset(r=t)
	0.5	0.005%	0.005%	0.012%
	1	0.005%	0.005%	0.012%
	2	0.005%	0.005%	0.012%
	3	0.005%	0.005%	0.001%
	4	0.005%	0.005%	0.008%
	6	0.008%	0.008%	0.0025%
	10	0.007%	0.007%	0.0025%
	15	0.005%	0.005%	0.0025%
	END			



Why is this important to you?

- ▶ Meet fine blanking die industry needs
- ▶ Improve final part quality
- ▶ Increase the productivity
- ▶ Reduce cost



blank

scrap



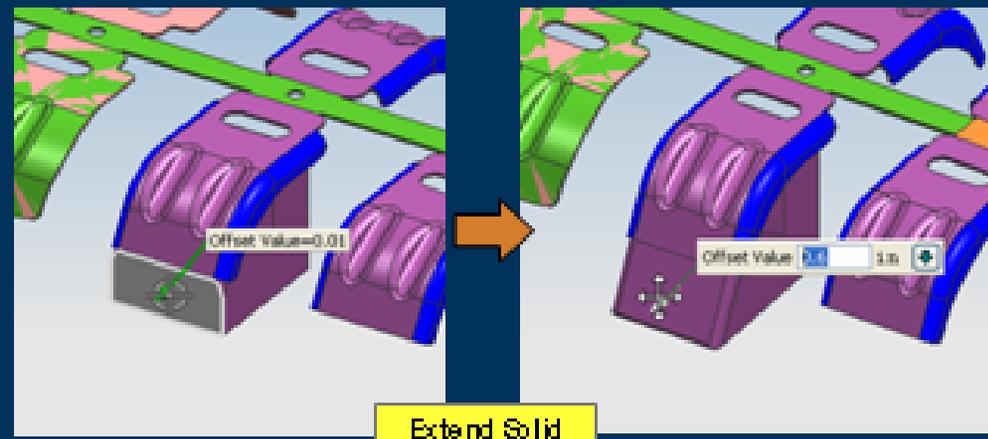
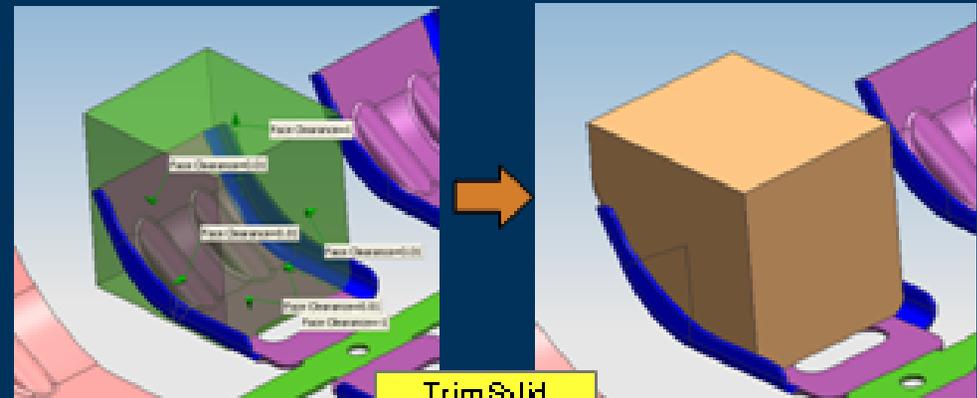
New Design / Modeling Tools

Progressive Die Design



Capabilities

- ▶ Create Box
 - ▶ Quickly generate a box of appropriate size for forming punches
- ▶ Trim Solid
 - ▶ After box is defined and trimmed the box size can be dragged to fill desired space while maintained it's trimmed shape
- ▶ Replace Solid
 - ▶ Define a box based selecting boundary faces
- ▶ Extend Solid
 - ▶ Extend the size of a box by dragging its faces to the appropriate size
- ▶ Reference Blend
 - ▶ Add blends to boxes by referencing blend on the part



Benefits

- ▶ Speed the design of complex insert shapes



Pocket / Threaded Hole Improvement

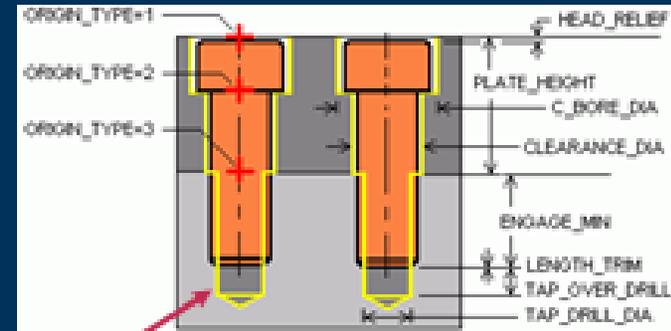
Progressive Die Design



Capabilities

- ▶ Automatically specify and add correct symbolic thread to pockets
 - ▶ Rules-based spreadsheet search tap drill diameter
 - ▶ Symbolic thread applied to corresponding pocket faces based on attributes
- ▶ Enhanced ability to define thread information in thread spreadsheet
- ▶ Enhanced ability to leverage both English and Metric thread units in the same NX session
 - ▶ Merged thread spreadsheets into single file: thread_standard_dat.xls

Screw template & data file
[var.prt](#) & [var.xls](#)



Setting of FALSE body
 Face attribute:

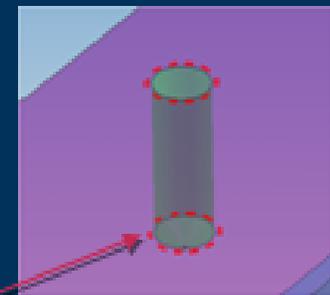
MW_HOLE_THREAD

Expression of drill diameter:

TAP_DRILL_DIA

TAP DRILL DIA
<UM VAR>::SCREW TAP DRILL DIA 4
<UM VAR>::SCREW TAP DRILL DIA 5
<UM VAR>::SCREW TAP DRILL DIA 6
<UM VAR>::SCREW TAP DRILL DIA 8
<UM VAR>::SCREW TAP DRILL DIA 10
<UM VAR>::SCREW TAP DRILL DIA 12
<UM VAR>::SCREW TAP DRILL DIA 16
<UM VAR>::SCREW TAP DRILL DIA 20

When the pocket is cut, the TAP_DRILL_DIA value is read from the screw and the appropriate thread parameter is applied to the symbolic thread (based on predefined / configurable spreadsheet values)



thread_standard_dat.xls

Why is it important to you?

- ▶ Accelerate workflows for designing the mold base and components

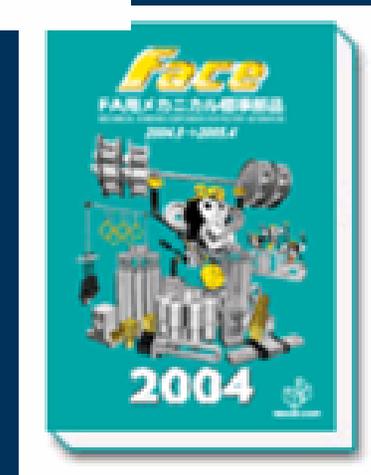


Capabilities

- ▶ FIBRO catalog – popular in Europe
 - ▶ Automotive sheet metal parts
 - ▶ Gas springs / flex CAM
 - ▶ Punches
 - ▶ Springs
 - ▶ Guide pins
- ▶ Added new MISUMI standard parts
 - ▶ Bars, guides, pins, clamps, punches, dowels, springs, screws, cams, power units, etc

Why is this important to you?

- ▶ Improve die design efficiency
- ▶ Shorten project delivery time





Hole Report / Drawing Workflow

Progressive Die Design



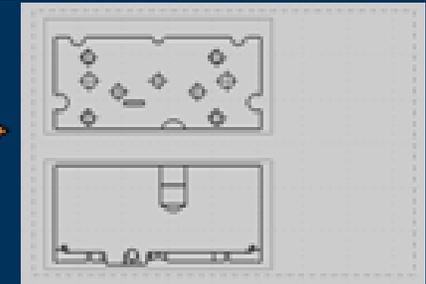
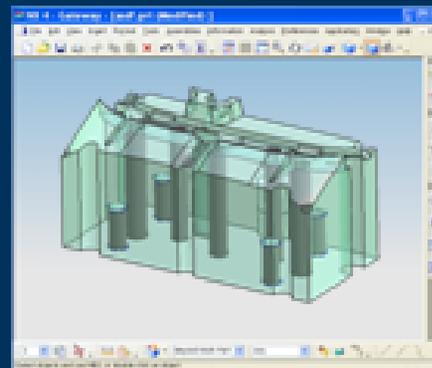
Capabilities

- ▶ Recognize holes in unparameterized models
- ▶ Recognizes
 - ▶ threaded holes
 - ▶ blind holes
- ▶ Customizable hole report content
- ▶ Ordinate origin definition
- ▶ 4 quadrant dimensioning

Why is this important to you?

- ▶ Generate hole report completely and easily

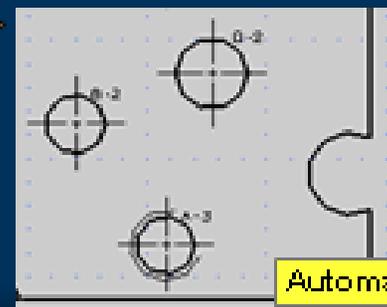
Drawing Creation Automation



Hole Table on Drawing



HOLE REPORT	
HOLE NO.	Ø
A 4	Ø 2.450 0.001 THREAD DP0.000 0.001
1	Ø 2.451
2	Ø 2.451
3	Ø 2.451
4	Ø 2.451
B 2	Ø 2.500 0.001 HOLE DP16.751 0.001
1	Ø 2.500
2	Ø 2.500
C 1	Ø 2.500 0.001 HOLE DP16.280 0.001
1	Ø 2.500
D 2	Ø 3.000 0.001 HOLE DP16.751 0.001
1	Ø 3.000
2	Ø 3.000



Automated Labeling



Hole Report Enhancements



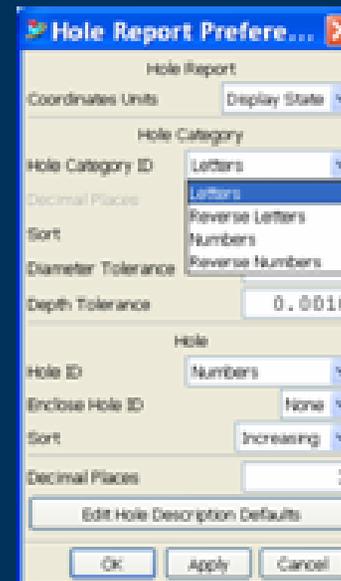
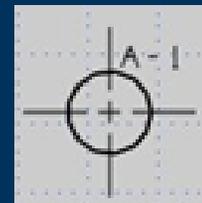
Hole Label Positioning

Function Location

- ▶ Available with Drafting and Hole Report

Enhancement Description

- ▶ Position of hole label is determined based on size of hole
→ results in better looking drawings
- ▶ Changed default of Hole Category ID from number to letter
→ improved alignment with typical customer design practices



Labeling Defaults



Instance Array

Mold and Progressive Die Design

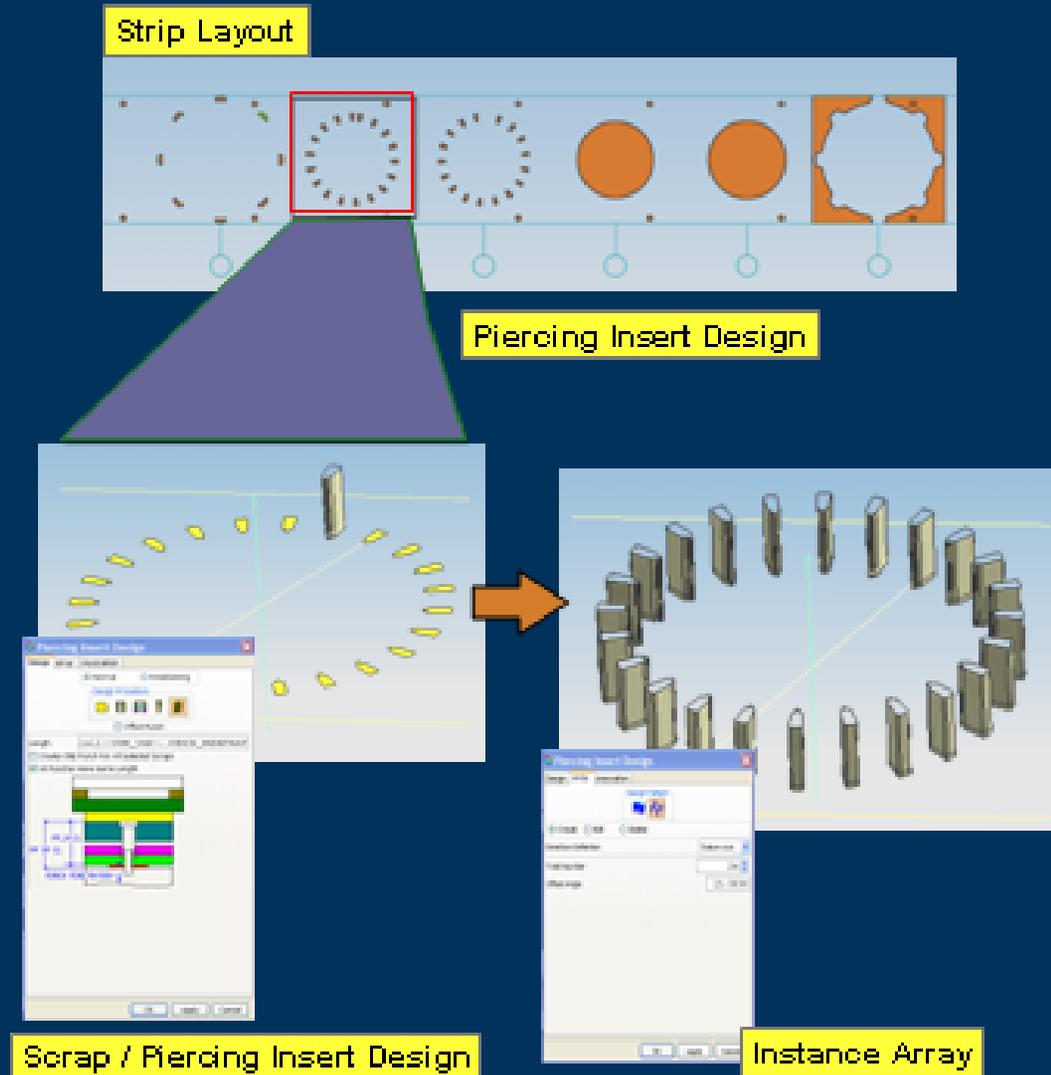


Capabilities

- ▶ Design insert according to circular array or rectangular array
- ▶ Edit insert array
- ▶ Delete array or individual insert

Why is this important to you?

- ▶ Only need to design one insert for an array of scraps
- ▶ Improve design efficiency
- ▶ Easy to make changes
- ▶ Lighter weight of assembly

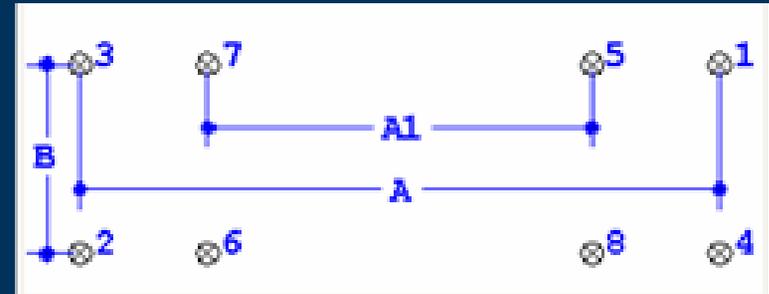




Capabilities

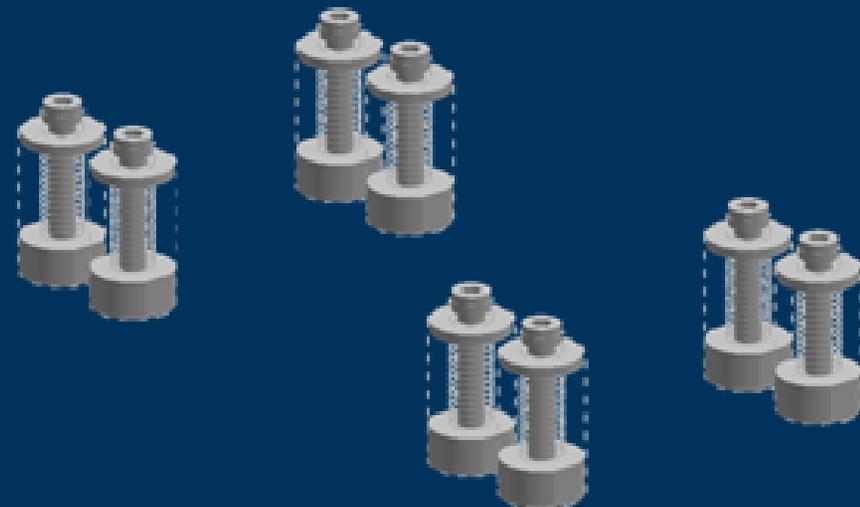
- ▶ Provides 15 commonly utilized OTB point pattern layouts
- ▶ Insert any standard part according to above pattern
- ▶ Customizable point patterns and catalog storage

Point Patterns for Insert Positioning



Why is this important to you?

- ▶ Easily add a group of standard parts to a pattern
- ▶ Speed up design
- ▶ Provides lighter weight of assemblies (create instance vs. multiple components)





Defaults and Preferences

Mold and Progressive Die Design

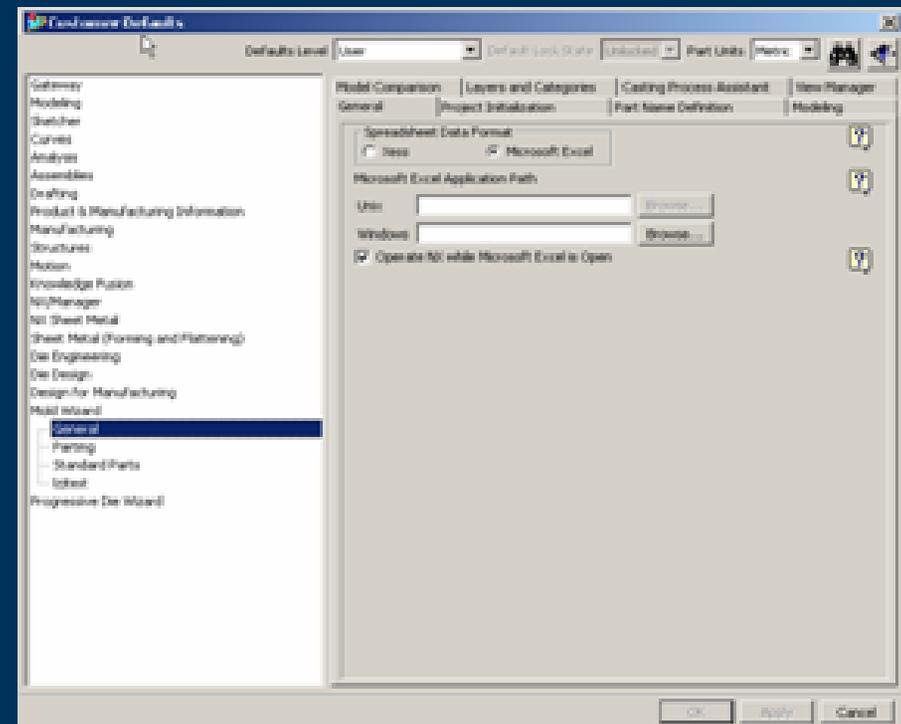


Capabilities

- ▶ Now manages Mold Wizard and Progressive Die Wizard defaults and preferences
 - ▶ Previous .def files converted into .dpx files
- ▶ More control for implementing site-wide standards and preferences
- ▶ Three levels of settings (site, workgroup, user)
- ▶ Searching capabilities
- ▶ Help provided for settings

Why is it important to you?

- ▶ Improved version-up, searching, and privilege management capabilities
- ▶ Improved help





MDE: Tooling Database Integration

Mold and Progressive Die Design

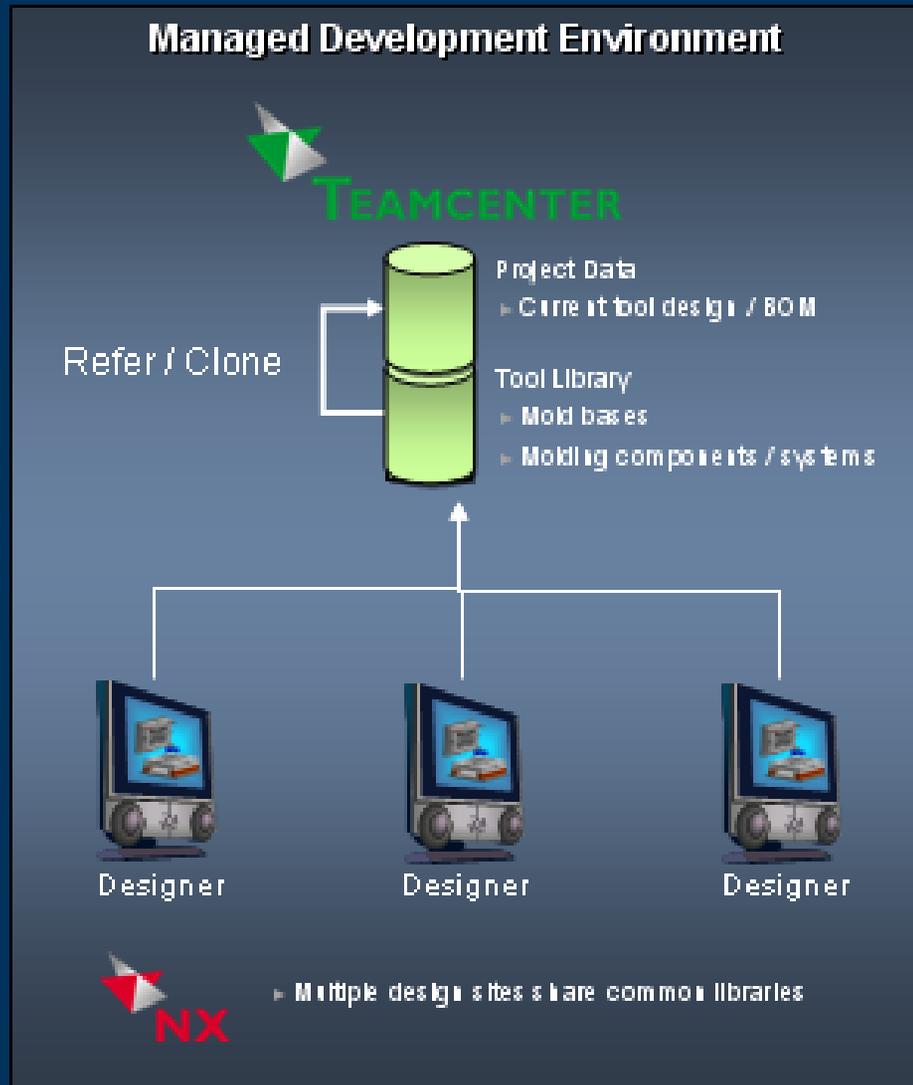


Capabilities

- ▶ NX tooling database now supported within Teamcenter library
 - ▶ Mold and die bases
 - ▶ Standard mold and die components / systems
- ▶ New workflows:
 - ▶ Refer to:
 - ▶ Tool project references Teamcenter library component (no new part number for project BOM)
 - ▶ Clone:
 - ▶ Teamcenter library component copied into tool project (unique part number created within tool project BOM)

Why is it important to you?

- ▶ Provides ability to tool project follow corporate part numbering standards
- ▶ Enables distributed sharing of common tooling components and systems within the Teamcenter Engineering environment





MDE: Part Family Support

Mold and Progressive Die Design

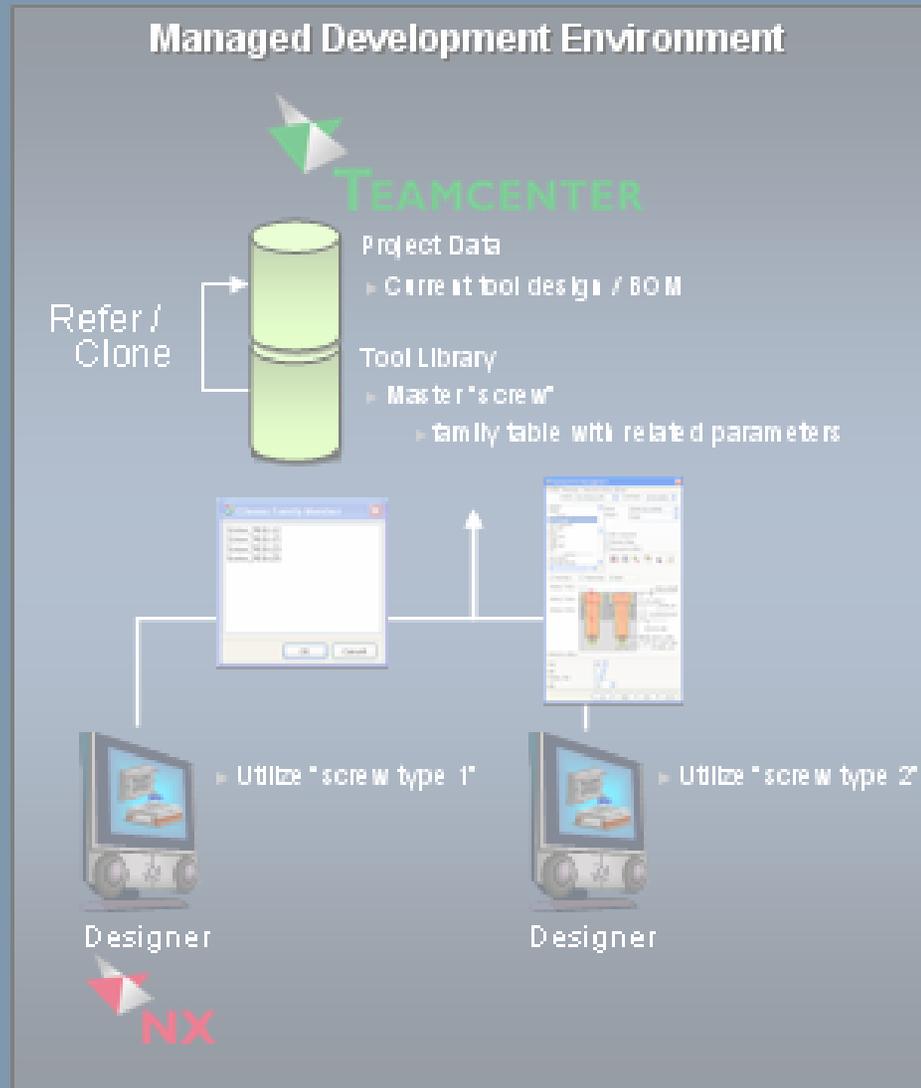


Capabilities

- ▶ Tooling database / part families now supported within Teamcenter library
 - ▶ "Master" component (parameter table embedded within component file) stored within Teamcenter Engineering library
 - ▶ User can refer or clone family member into project
- ▶ Standard

Why is it important to you?

- ▶ Enables ability to manage libraries of similar components / systems





MDE: Concurrent Tool Design

Progressive Die Design Best Practice Example

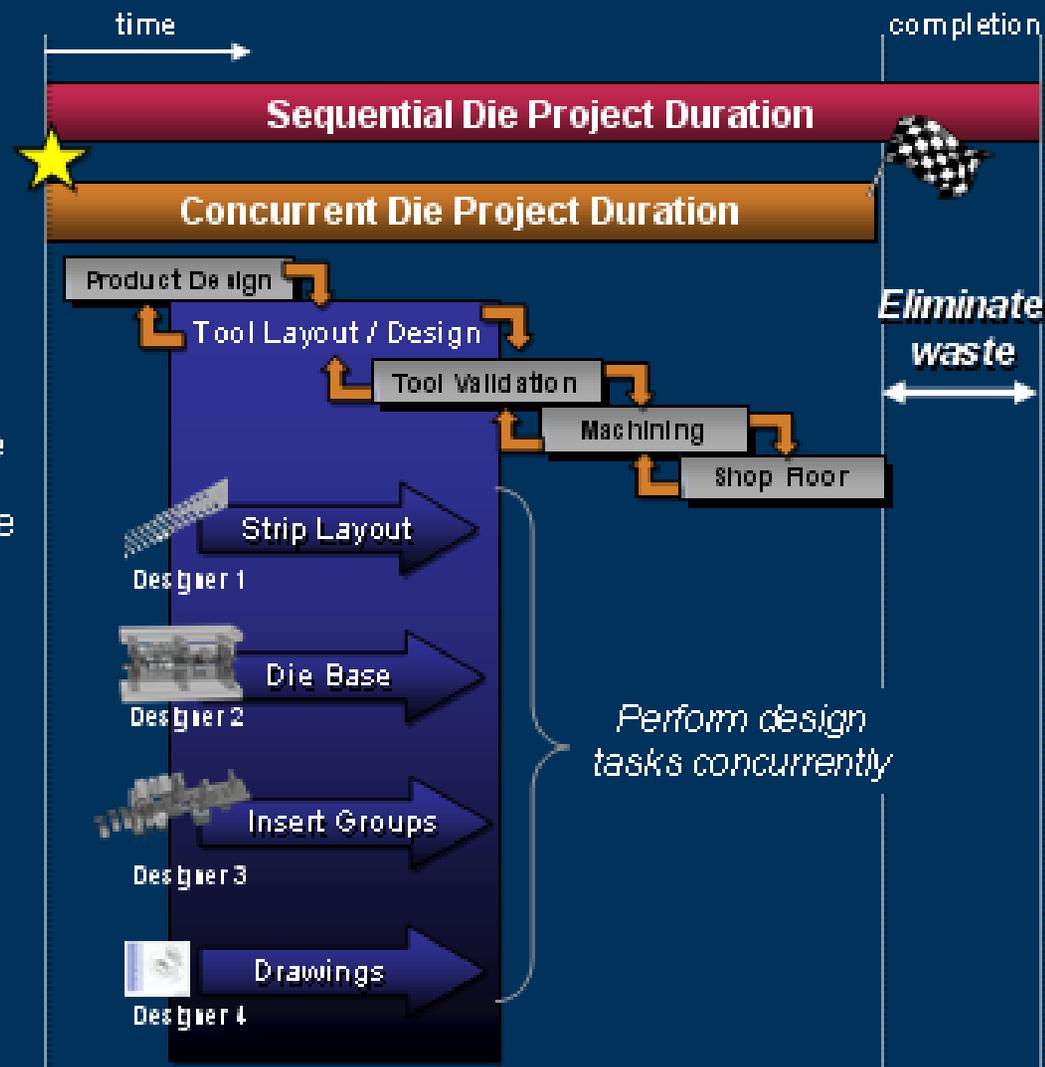


Capabilities

- ▶ Team of several designers can simultaneously work on the same progressive die assembly
- ▶ Sub-assemblies representing different aspects of the mold tool can be distributed using WAVE
- ▶ Teamcenter Engineering integration
 - ▶ Locking mechanisms that prevent more than one user from making modifications to the same part file at the same time
 - ▶ Check who holds locks on part files
 - ▶ Track revisions / related information
 - ▶ Leverage workflow for design release approval, process and data access control

Why is this important to you?

- ▶ Provide new capability to enable mold designers to implement concurrent design in order to shorten project delivery time





Electrode Design

Mold and Progressive Die Design



Capabilities

- ▶ Electrode Design Module
 - ▶ Project and process support
 - ▶ Blank design
 - ▶ Automation of assembly, drawing, BOM
 - ▶ Interference / clearance checking
- ▶ New design tools that support electrode sparking head / working area modeling

Why is this important to you?

- ▶ Optimized electrode design process
- ▶ Enables quick establishment of reference points, body, direction for electrode design
- ▶ Quickly create electrode blank

“The new NX 4 electrode design capabilities provide the breadth of integrated tools necessary for the electrode design process.”

Takahiro Maruyama, Chief Tool Design and Manufacturing Engineer, Shonan Design Co., Ltd



- Bill of Materials
- Electrode Checking
- Electrode Drafting
- Blank Design
- Manufacturing Geometry
- Initialize Project



- Reference Blend
- Extend Solid
- Replace Solid
- Trim Solid
- Create Box



 Thank you.