Mold Design

MoldDesign automates mold die design.

- Functionality covering both from small to large mold parts.
- Hybrid design of 2D and 3D design method.
- Various standard parts featuring information useful for manufacturing and procurement.
- Automatic creation of parts list enables association with BOM.
- CAM automation achieved by attribute association with 2.5D/3D CAM.

V5 prerequisites: MD2 (or HD2)
## Mold Design command list

<table>
<thead>
<tr>
<th>Category</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic design</td>
<td>Guide pin, Guide bush, Return pin, Locate ring, Ejector guide pin, Ejector guide bush, Support pillar, Stop pin, Spacer ring, Parting lock, Support pin, Stop bolt, Puller bolt, Loose core, Guide rail, Loose core stop block, Angular pin, Mold base, Collective hole creation, Min/Max Box.</td>
</tr>
<tr>
<td>Insert design</td>
<td>Flat head bolt with hexagonal hole, Screw plug, Dowel pin, Eye bolt, Spring, Insert stopper, Bolt with hexagonal hole (head base), Bolt with hexagonal hole (tap base), Insert split, Delete insert split, Casting design (Rib, Rib through, Inner rib, Gap block, Fill gap)</td>
</tr>
<tr>
<td>Flow design</td>
<td>Sprue bush, Sprue bush guide, Runner lock pin, Pin point gate bush, Runner, Gate</td>
</tr>
<tr>
<td>Cooling design</td>
<td>Hose nipple, Taper screw plug, Cooling joint, Cooling pipe, Cooling pipe list, Cooling pipe check</td>
</tr>
<tr>
<td>Ejector design</td>
<td>Stepped ejector pin, Square ejector pin, Shoulder bolt, Ejector rod, Ejector pin (standard), Ejector pin (user defined), Loose core placement, Slide placement, Under cut list</td>
</tr>
<tr>
<td>Modeling</td>
<td>PL, PL surface, Divide plate</td>
</tr>
<tr>
<td>3D-CAM</td>
<td>Addition of surface machining attribute, Boundary addition</td>
</tr>
<tr>
<td>2.5D-CAM</td>
<td>Hole machining attribute setting/editing, Pocket machining attribute setting/editing, Delete machining attribute, Color set machining attribute, Round hole, Hole list</td>
</tr>
<tr>
<td>Evaluation/Design support</td>
<td>Spec Table, Layer list (Layer group), Distance map, Projection area, Thickness check</td>
</tr>
<tr>
<td>Design info.</td>
<td>Layer list, Type ON/OFF, Current selection set</td>
</tr>
<tr>
<td>Standard part.</td>
<td>(Round hole)</td>
</tr>
<tr>
<td>BOM</td>
<td>Part attribute setting/editing, Delete part attribute, Part attribute list, Parts list</td>
</tr>
<tr>
<td>Drawing</td>
<td>3D note, External name definition/change, Height dimension, Change view, Erase temporary figure</td>
</tr>
</tbody>
</table>
Mold base

- Futaba and Nikkata bases are supported.
- Improvement such as base point position, etc.
- User bases are supported in the same manner.

<table>
<thead>
<tr>
<th>Maker</th>
<th>Series</th>
<th>MTD</th>
<th>Dynavista</th>
</tr>
</thead>
<tbody>
<tr>
<td>Futaba</td>
<td>S</td>
<td>SC</td>
<td>SA, SB, SG, SD, SE, SF</td>
</tr>
<tr>
<td></td>
<td>D,E</td>
<td>-</td>
<td>DA, DB, DC, DD, DD, DE, DF, EA, EB, EG</td>
</tr>
<tr>
<td></td>
<td>F,G</td>
<td>GA</td>
<td>FA, FG, FE, FF</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>-</td>
<td>HA, HB, HG, HD</td>
</tr>
<tr>
<td>Nikkata</td>
<td>S</td>
<td>-</td>
<td>SA, SAX, SB, SBX, SG, SGX</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>-</td>
<td>PA, PAX, PAY, PAXY, PB, PBX, PBY, PBXY</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>-</td>
<td>KAY, KBY</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>-</td>
<td>HAY, HBXY, HBY, HBXY</td>
</tr>
</tbody>
</table>
- Standard parts from major Japanese makers such as Misumi, Futaba, etc. are prepared. They include not only part solids and hole solids but symbols for supporting 2D like design. Part attributes and machining attributes are already defined. User defined parts can be handled as the same manner.

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<table>
<thead>
<tr>
<th>Basic design</th>
<th>Guide pin, Guide bush, Return pin, Locate ring, Ejector guide pin, Ejector guide bush, Support pillar, Stop pin, Spacer ring, Parting lock, Support pin, Stop bolt, Puller bolt, Loose core, Guide rail, Loose core stop lock, Angular pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert design</td>
<td>Bolt with hexagonal hole, Flat head bolt with hexagonal hole, Screw plug, Dowel pin, Eye bolt, Spring, Insert stopper</td>
</tr>
<tr>
<td>Flow design</td>
<td>Sprue bush, Sprue bush guide, Runner lock pin, Pin point gate bush</td>
</tr>
<tr>
<td>Cooling design</td>
<td>Hose nipple, Taper screw plug, Cooling joint</td>
</tr>
<tr>
<td>Ejector design</td>
<td>Ejector pin, Stepped ejector pin, Square ejector pin, Shoulder bolt, Ejector rod</td>
</tr>
</tbody>
</table>
A list of Slide core (User defined) and Loose core (User defined) placed under the top product is shown.

Length of them are collectively re-calculated.

Display status of them can be changed.

By the use of simulation, collision can be visually checked,

* The slide core and loose core shall be created on specific rules in order to be handled by this command.
Die standard axis system

A coordinate system is defined including die opening direction by varying the angle in real time manner.

Coordinate definition by checking back draft and depth

Rotation information can be checked by switching coordinate
**Parting scenario of Dynavista**

1. **PL creation**
   - Cut the product by the PL.
   - Surfaces both cavity and core sides.

2. **PL surface creation**
   - PLs are automatically searched by giving the start and the end boundary curve.
   - There are three types of surfaces: Hit, adjustment, and relief.
   - Draft angle along the dismount direction.
   - Two guide swept surface creation
   - Trimming by parallel swept surface

3. **Divide plate**
   - The surface is automatically created by giving the start and end boundary curves and the direction.
   - The divide plate cuts the product by the PL.
   - Surfaces both cavity and core sides.
Round hole

- Steps can be set up to 5.
- Two or more holes can be created by one command.
- Machining attribute can be added at the creation.
**Insert core**

- Both insert core and insert pocket features can be created and edited.
- Executed in the target part
- Machining attributes are added.
- Draft, evade and flange shapes are defined at this time.

**Insert splitting**

- A core part is created and placed.
- The hole is created on the target part.
- A part attribute is added.
Head based
(1) Automatic definition of bolt length

Tap based
(1) Automatic definition of overlap amount by the type of material
(2) Bolt length is defined by specifying placement plane or the length under neck
(3) Prepared hole shapes can be correctly defined also.
(4) They can freely be customized by the users.
Runner and Gate

**Runner**
- 4 types – circle, semi-circle, barrel and trapezoid
- 2 types of placements – actual shape and cross section shape only

**Gate**
- 4 types – side, under, submarine (flat and ball)
A surface and tool tip path are created by cross section of sweeping circle, semi-circle or trapezoid shape along runner base curve.
Placing of 10 types of cooling pipes and related parts, and adjustment of its position and length. The command for cooling pipe circuit check is prepared.

**Cooling pipe placement**
- Select a part among 10 types of cooling pipes and related parts.
- Cooling pipe length can be automatically adjusted.

**Adjustment of position**

**Cooling pipe list**

**Length Adjustment**
- 1. Length (L parameter)
- 2. Direction and length
- 3. Surface (Product surf.)
- 4. Cooling pipe (connected)
The use of sphere is newly available in addition to the use of Z direction height for the calculation of cooling pipe length.

Definition of the center of sphere which is consistent with cooling pipe shape of Dynavista.

User customization is possible for the sphere center.

Rounding of cooling pipe height

Accurate distance can be calculated including side walls for cooling pipes (fountain type).
Cooling pipe check

Circuit validity is checked (displaying the circuit temporarily) by the input of cooling pipes, start point and end point.

Available cooling types:
- Hole only, with screw
- With taper screw plug
- With O-ring
- Baffle type

Forced connection:
Connection of outer piping, shifted cooling pipes is possible.

Incorrect circuit:
Red point and line display for error position.

Multiple circuits (warning):
Purple display for the shortest path, red for other valid portions

Single circuit:
Blue display

Circuit validity is checked only specifying IN, OUT. It largely improves the efficiency of cooling pipe design.
Ejector pin

Standard

The best fit ejector pin will be selected and placed by the distance from a placement point to CoreSurface.

The dimension values are automatically calculated from the top surface height of the placement point, CoreSurface and spacer block.

(1) Start point and placement position will be defined by starting Ejector pin (Standard) placement command.

(2) Open the catalog browser and select a part. Calculate a evade hole and the best fit ejector pin will be selected at the last chapter of the catalog browser.

User defined

The best fit ejector pin will be selected and placed by the distance from a placement point to CoreSurface.

In the user definition, a part can be placed together with a screw plug and offset constraint can be defined.

Dimension values are automatically calculated at the placement.

Offset constraint is featured, which capability is not implemented for Ejector pin (standard).

Specification of stopper is available

D cut  Both cut  Pin

Length adjustment
Calculation of exact distance or rounding control can be selected for calculating ejector pin distance. This enables design of sleeve and center pin.

**<Distance calculation>**

- **Simple**
- **Exact**

**<Plane check mode>**

- **Extension + round**
- **Accordance + round**
- **Accordance**

Sleep pins and core pins can be designed.

This enables boss related parts (sleeve, center pin or core pin) design.
Each part has
- Part (PartBody)
- Hole solid (Drill Hole, Tap Hole)
- Part symbol (2 kind of)
- Symbol for hole
Whose layers are classified to cavity, core and common parts.
From a layer number table, each
- line
- raw
- item
Display can be switched to on/off.
Visibility of elements in the layer is changed by specifying layer number by key in.

**Characteristics**
User operation can be reduced since no mouse is used different from Layer table command.
More layer operations are possible by fewer input by the use of “?” and “-” for layer input.

1. **Layer number**

   ![Layer Table](image)

2. **Multiple layer numbers (separating with “,”)**

   ![Layer Table](image)

3. **Range (connecting with “-”)**

   ![Layer Table](image)

4. **Undefined number (“?” = all from 0 to 9)**

   ![Layer Table](image)
SpecTable

- Collective management of parameters such as dimensions or measurement values, or information such as checks and rules in one table.

<table>
<thead>
<tr>
<th>Case</th>
<th>Distance</th>
<th>Length_1</th>
<th>Gap</th>
<th>Check_1</th>
<th>Publish</th>
<th>Rule_1</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case1</td>
<td>50.0</td>
<td>10.0</td>
<td>1.0</td>
<td>OK</td>
<td>Design sf, A</td>
<td>Effective</td>
<td>Must be XX</td>
</tr>
<tr>
<td>Case2</td>
<td>60.0</td>
<td>15.0</td>
<td>1.2</td>
<td>NG</td>
<td>Design sf, A</td>
<td>Effective</td>
<td></td>
</tr>
<tr>
<td>Case3</td>
<td>70.0</td>
<td>20.0</td>
<td>1.4</td>
<td>OK</td>
<td>Design sf, B</td>
<td>Effective</td>
<td>Must be YY</td>
</tr>
<tr>
<td>Case4</td>
<td>80.0</td>
<td>25.0</td>
<td>1.6</td>
<td>-</td>
<td>Design sf, B</td>
<td>Effective</td>
<td></td>
</tr>
<tr>
<td>Case5</td>
<td>90.0</td>
<td>30.0</td>
<td>1.8</td>
<td>OK</td>
<td>Design sf, B</td>
<td>Ineffective</td>
<td></td>
</tr>
<tr>
<td>Case6</td>
<td>100.0</td>
<td>35.0</td>
<td>2.0</td>
<td>-</td>
<td>Design sf, C</td>
<td>Ineffective</td>
<td></td>
</tr>
</tbody>
</table>

Distance a Length_1: Gap Check_1 Publish Rule_1 Comment

- Collective management of parameters such as dimensions or measurement values, or information such as checks and rules in one table.

Check sheet
External reference
Rule control

File input/output in Excel format
Distance map

Distance from one target shape to another is measured and displayed in gradation.

- Distance check is possible between two groups of multiple features (body, surface, curve and cloud). (cannot be performed by CATIA.)
- The result can be saved. It can be seen at any time.
- Detailed condition (Approximation tolerance, measurement point pitch) can be specified.
- Direction of “+” and “-” can be distinguished and displayed.

The distance check is available in various design cases such as products and cooling pipes, a cooling pipe and another, cooling pipes and parts, EJ pins and products, and a product and another (design change)
Projection area

The projection area is calculated by specifying a solid (or a composite surface) and direction of projection.

Area surrounded by outermost boundary and outermost edge curves along with the specified direction.

The projected outermost curve and calculated area are temporarily displayed.

- High robustness (the result can be taken without failure)
  (Although similar operation is possible by projecting a reflect line in CATIA V5., the result can be taken without fail by Dynavista since it projects polygons and in-out is judged by lattice point.)

It can be used for strength calculation by the use of injection pressure (plate bending, size on slide core and number of pins), etc.
**Thickness check**

**Maximum and/or minimum thickness are specified.**
- Check result can be saved (as a feature) and be seen at any time.
- Detailed conditions (Approximation tolerance, measurement point pitch) can be specified.
Release resistance

 Portions where die and product cannot be easily separated by a friction resistance (release resistance) can be detected.

<Characteristic>
Release resistance areas are temporarily displayed. Points are output for the ease of pin placement. Gravity center of resistance area <yellow point> (one point in one area). For high resistance areas, gravity center of all areas <red> (one point for one execution).

Portions less than test angle and no less than specified area are displayed.
Heat spot areas can be detected in the die by specifying die splitting surface.

<Characteristic>
Since heat spots are output for each section, display and output are controlled for each section.
Since points are output, they are used for following commands such as cooling pipe.
Min/Max Box

A box is created based on a specified coordinate system so that it contains specified elements.

Layer, transparency, round value and machining stock can be defined.
- As for part attribute, part identifier, material, order information, heat treatment and comment can be defined. The BOM is created by the use of part attribute. Part attribute can be customized.

**<Part attribute>**

**<Part attribute list>**

**<BOM>**

Attribute setting to each part

Editing by the use of Excel

Part check in an assembly

Display On/Off

Output of selected items by customization
A rib is created by sweeping a top surface to specified sweeping direction, where the surface is created by offsetting specified curves to both sides with the direction determined by the curve direction and sweeping direction.

Ribs are created inside of the mold die structure (inside rib) Lattice shaped ribs are collectively created.

Casting holes are created for the reduction of weight

Surface edge or any curve is used for the rib through curve (no rectangle shape is available)

• Dynavista common direction input
  Dynavista is used.
• A curve not on a surface can be specified.
Casting modeling support

**Fill gap**
Gaps created by standard part placement are filled.

**Correct gap**
Connection shape is created between casting structure and flat surface.
A boundary curve is added to a face in a surface by specifying a boundary curve to be added (constant parameter curve/curve on a surface) and a surface. The divided faces where an edge is added inherit attributes attached to the original face.

In case that a dividing curve is short and face is not divided into two or more areas.

Edge is added after extending the curve tangentially.

Used for separating a portion as another component surface.
Input of two or more curves

Two or more curves can be specified in one operation.

Range where boundary curves and added curves are lapping.

No curves are added at lapping range of the boundary and added curved. (The boundary is prioritized.) If an end point of the lapping range and the added curve are separated, the end point and a non-lapping range of the added curve will be connected by a line.
Final hole generation and Machining attribute

- Machining attribute is copied to a hole shape by adding the attribute to a cut solid and by executing Collective hole generation command.

Consideration of association with 2.5D CAM. Items can be customized such as addition of items and non display of an item.

*Direct setting to a hole shape is also possible

Direct setting of hole machining attribute

Pre setting

Placement

Collective hole generation

- Color display of the machining attribute
  - Color display by following class
  - drill
  - tap
  - planar surface (fine1)
  - planar surface (fine2)
  - planar surface (fine3)
  - Reaming (fine1)
  - Reaming (fine2)
  - Reaming (fine3)
  - Cooling pipe
If surface machining attributes are added during surface operations, color can be changed for faces of product surfaces, PL surfaces and PL evade surface after solid division.

(1) Definition of surface machining attributes for product surfaces, PL surfaces and evade surfaces.

(2) Joining of each unit for solid division

(3) Solid division

(4) Definition of machining attribute/color
Machining attribute – Finish mark and Coarseness

Display improvement by finish type (symbol, coarseness) (V8.1 -)

- If “Finish Type” is “Finish Mark”, “Finish Mark”: the value and “Coarse”: “-” is displayed.

- If “Finish Type” is Ra/Ry/Rz, “Finish Mark”: “-”, and “Coarse”: “Finish Type + Coarse” is displayed.
Hole list

Hole list is exported to an Excel file by specifying a plate from a mold die model after the hole creation.

Output can be made by specifying machining direction, machining base point (base position + movement) for the plate.
3D drawing

3D Note
An annotation is created by key-in at any pick location.

External name definition
Create a leader line with an external name.

Height dimension
A height dimension is created as a temporary text figure from the base height.
It will be erased by “Erase temporary figures” command or Dynavista termination.

Change of external name
Change the external name or the annotation created by “External name” command.
It can be changed to any feature name or any text string.

Change of view
Restore current view to the view of leader line with text at its creation time.

Removal of temporary figures
Erase the temporary figures created by “Height dimension” command, etc.

3D Balloon
Part number of part attribute is created as 3D note.
Dynavista common convenient tools

**Type ON/OFF**

Display control for each element type. Can be returned to the original display because of a temporary display.

**Component face selection**

Reduction of face input for machining attribute or color change.

Face Selection
- Operation:
  - Append
  - Except
- Selection method:
  - Selection
  - Rectangle
  - Polygon
  - Stroke
- Whole Inside
- Get Upper Faces
- Complement Perimeter Faces
- None
  - Once
  - Complete
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