

DiEdifice

for Pressure Die-Casting Die Design

A solution by Neilsoft

DiEdifice

DiEdifice is a useful tool for creating gates, runners and overflows for high pressure die casting. Besides its gate-making capabilities, DiEdifice also helps in the design of the ejection system and if used, the vacuum venting system. It has built-in calculations and automatically generates the 3D geometry of the gating system after the designer has interactively finished his design specifications. The tool designer can easily take the output to any CAM system and proceed to cut the gating on the dies.

An additional advantage of DiEdifice is that it can be used as a pre-processor to simulation software. The entire gating system can be created in just *a couple of hours* and the STL output can be easily fed to simulation software. Its design methodology keeps the design within a reasonable confidence level and hence convergence can be achieved more quickly. Iterations are also easy, and as one of DiEdifice's customers put it, "you simply change a few numbers and the entire gate & runner geometry gets updated".

DiEdifice Design Methodology

DiEdifice starts with the casting as the input. The casting may be in the form of a solid model or an STL file. DiEdifice computes its volume, surface area, average thickness and projected area. User can select the casting material, grade and application (pressure tight, commercial or technical) from the interface provided. It has a built-in material database for mostly used Aluminum, Zinc and Magnesium alloys.

DiEdifice determines cavity filling time (as a function of casting thickness, casting metal properties, die temperature, etc.), gate velocity (as a function of casting thickness and casting material) and cavity pressure (depending on casting material and application).

DiEdifice creates gates (edge/ overlap type, whole / comb type) and fan / tangential type gate-runners at user specified locations. It calculates all the section dimensions with the appropriate area corrections for different values of flow and/or skew angles.

DiEdifice creates rectangular and wedge overflows at locations specified by the user and calculates all dimensions based on the overflow gate length selected.

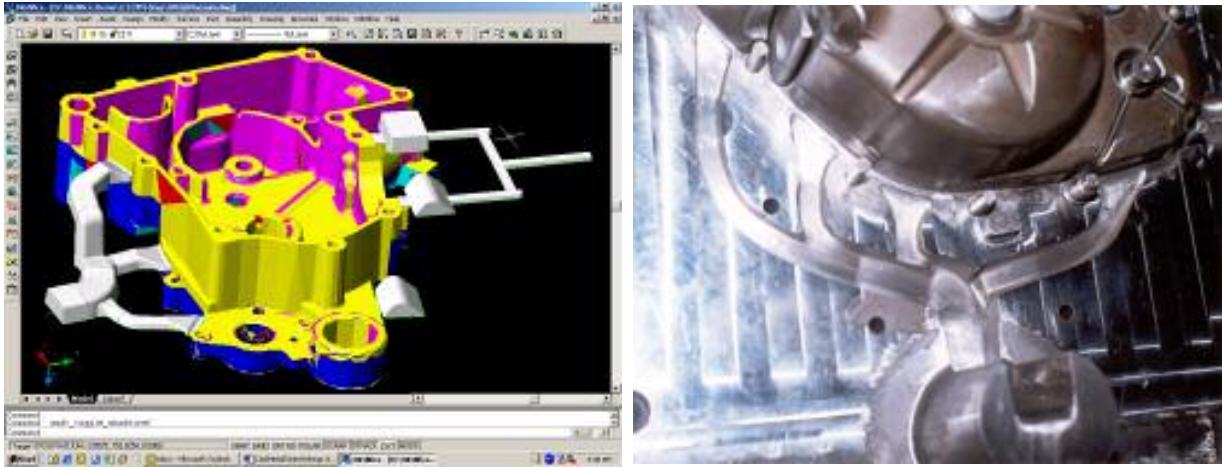
For designing runners, the user draws the runner flow path layout in the form of simple curves. DiEdifice then automatically designs the runners ensuring proper increase in area and tangency between branches to reduce eddies and flow separation.

DiEdifice gives the flexibility to create the gates, overflows and runners on different halves of the die – fixed (cover) or moving (ejector). It creates the appropriate transitions taking care that the cross sectional areas are maintained for flow and smoothness of the transition from one half of the die to the other.

DiEdifice determines the required venting area, validating the exit air velocity. It also creates the specified vacuum venting runner system.

DiEdifice generates a 2D preview of all designed gating elements, which can be edited for iterative improvement in design. Finally, it creates 3D solid features of the gating system ready for machining or simulation.

The pictures below show the complete 3D gating system created using DiEdifice for a casting, and a photo of the gating system cut on a die for another casting.



In addition to its gate making capabilities, DiEdifice also computes total ejection load by knowing shrinkage of casting material, catching area on moving side, casting thickness, etc. It divides the casting into sections and determines the number of ejection pins required for each section, to achieve balanced ejection and to avoid ejection pin marks on casting. It performs interference check with the existing ejection pins and cooling lines on moving side.

DiEdifice also incorporates a simple cooling calculator, which determines total effective cooling length required to maintain thermal equilibrium in the die. It also performs collision check with casting and ejection pins (if added).

DiEdifice performs a PQ^2 check by determining the total pressure drop across the gating system, and thus the dynamic injection pressure required for filling the casting and compares it with the PQ^2 characteristics of the machine. It computes 1st phase and 2nd phase plunger velocities, critical point, pressure to set in shot cylinder and final fill ratio.

It also computes effectiveness of venting based on total venting required and the corresponding venting provided. For ordinary venting, that depends on the number of overflows added, assuming vents to be placed on overflows. For vacuum venting, it computes the effectiveness of the vacuum venting system added by user.

Benefits

- Reduces your design time and increases your productivity.
- Reduces the number of simulation iterations required to achieve a satisfactory design. Helps you easily make changes to your design after viewing simulation results.
- Helps obtain higher yields due to a more efficient gating design.

Conclusion

DiEdifice is a robust, flexible and easy to use application, which helps die designers to reduce overall die design time, and is a useful tool for preparing the design for simulation. It thus aids the designer in optimizing his resource requirements and create more accurate designs.