

People have been casting metals for several thousand years. Casting, however, is one of the last industrial processes to come out into the light of day. Why is this? Casting is a difficult process to visualize. It seems easy enough: melt some metal in a fire and pour it into a hole. It turns solid. What is so difficult about that, and why has it been a black art so long if it is so old? The answer is easy.

Casting is a four dimensional problem. It contains the standard three that we walk about in every day, and of course time. Simply put, the designer of castings has to be able to visualize metal flowing into a mold and simultaneously imagine the energy transfers during solidification. This is complicated by boundary conditions where the energy moves from the casting into the mold and from the mold into the environment. Include issues such as solidification and shrinkage, metal freezing properties, mold geometry limitations and you begin to see the scope of the problem that a designer faces.

That is not all. You are trying to make money with these castings, so you need the tools done quick and correct. Unfortunately it is very difficult to wrap ones mind around such a problem, and decades of experience do not guarantee success on every design. Design simulation can help in the following ways:

1. Allow the part designer to look for trouble spots in a complicated casting.
2. Help the mold designer to test the locations and style of gates and risers attached to the part.
3. Observe the mold filling to look for trapped air pockets, turbulent filling, re-entrant fluid streams, etc.
4. Shorten the acceptance cycle for a new part.
5. Design tooling that produces good parts on the first shot.
6. Gain insight about what is really happening inside a casting.
7. Solve problem tools.
8. Reduce scrap rates.
9. Increase yields.
10. Increase the value added to a part.
11. Shorten the overall cycle time from concept to production.

Casting simulation cannot replace capable, experienced designers; that is not its mission. Simulation is a tool which when placed in the hands of well trained designers most likely will significantly increase their insight into the parts, processes, and tools which will yield substantial increases in the value of your product.

