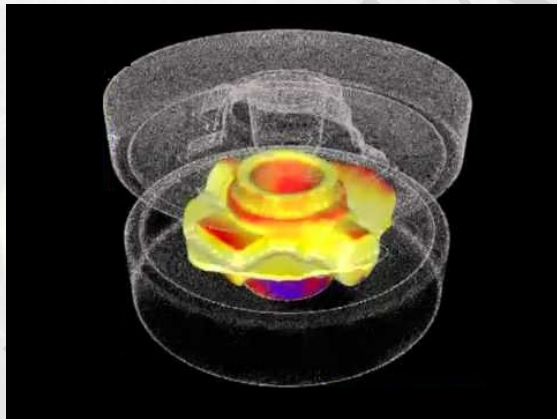


CLOSED DIE FORGING

**Close die forging** is a plastic deformation process where, unlike in the open die forging process, the material is forced to flow in a closed shape called die. Compared to the open die forging, the close die forging (said also hot drop forging) can achieve more complex geometries, very much close to the dimensions of the finished component.

The plastic deformation is given rapidly through some shots which force the material to fill the shape of the die. The process is performed at the plastic temperature of the material in use without intermediate re-heatings.

A key step in close die forging is the design and the production of the dies, process which is part of the know-how of the manufacturer. Unlike the open die forging, suitable to manufacture also individual parts, the close die forging is used to manufacture series production as this is particularly convenient to absorb the costs the dies. The close die forged product shows several advantages like the typical flow lines of the material along the profile of the component, beneficial particularly on mechanical components put in service under cyclic fatigue. This process allows furthermore to use reduced over-dimensions, feature which allows cost savings on input weights as well as on final machining due to less material to remove. The close die forging process is typically used for critical components, in our case on railway, petrochemical, electrical, lifting and safety system, industrial and agricultural machinery sectors.



## OPEN DIE-FORGING

**Open-die forging** is the deformation, in hot condition, between hammer and anvil, of a metal using a press or hammer. The result obtained depends on the skill of the forgemaster. Open-die forging is an ancestral activity, traditionally associated with blacksmithing, horseshoeing, etc. It does not require precise tooling and is used to produce blanks and shaped parts. The process is called "open-die" because, during forging, the metal can deform in different directions, differently from the close die forging. In close die forging, the metal is deformed inside a closed volume called die. The process works at a relatively low temperature, at a colour ranging from cherry red (fairly dark) to orange-yellow. Open-die forging is used for small series or single pieces.

