|  |  |  |
| --- | --- | --- |
| **Porosity**: This defect appears as small voids or holes in the casting caused by entrapped gases during solidification. It can weaken the casting and reduce its mechanical properties.  **Shrinkage**: Shrinkage defects occur when the metal contracts during solidification, leading to voids or cavities in the casting. This defect is often found in thicker sections or areas where the metal cools rapidly.  **Inclusions**: Inclusions are non-metallic particles or foreign materials trapped in the casting. They can result from contaminants in the molten metal or from the mold material.  **Cold shuts**: Cold shuts occur when the molten metal does not fuse completely during solidification, leaving a line or crack in the casting. This defect typically happens at the intersection of two or more metal streams.  **Misruns**: Misruns happen when the molten metal fails to completely fill the mold cavity, resulting in incomplete castings.  **Surface defects**: Surface defects include various irregularities or blemishes on the surface of the casting, such as roughness, cracks, or tears. These defects can be caused by mold erosion, improper gating, or inadequate pouring techniques.  **Warping**: Warping refers to the deformation or distortion of the casting due to internal stresses during cooling. It can result in dimensional inaccuracies and poor part quality.  **Hot tears**: Hot tears occur when the casting undergoes tensile stresses during solidification, leading to cracks or fractures in the metal. | 1: Green sand, also known as clay-bonded sand, is perhaps the most widely used casting sand. It consists of silica sand mixed with clay and water. Green sand molds are relatively inexpensive and easy to produce. They offer good collapsibility, which means they can be easily removed from the casting without causing damage. However, green sand molds typically have lower dimensional accuracy compared to other types of molds.  2.: Resin-bonded sand molds are made by mixing silica sand with a resin binder (commonly phenolic resin) and a catalyst. This mixture is then cured to harden the sand. Resin-bonded sand molds offer higher dimensional accuracy and better surface finish compared to green sand molds. They are often used for producing complex castings with fine details.  3: Shell molding sand, also known as precoated sand, is made by applying a thin layer of resin-coated sand onto a heated metal pattern. The resin coating creates a shell-like mold around the pattern when it cures. Shell molds provide excellent dimensional accuracy, surface finish, and high strength. They are commonly used for producing high-precision castings with intricate details.  4: Investment casting, also known as lost-wax casting, uses a ceramic shell made from a mixture of fine ceramic powders and binders. The ceramic shell is created by repeatedly dipping a wax pattern into a ceramic slurry and then coating it with a refractory material. Once the shell is built up to the desired thickness, the wax is melted out, leaving behind a hollow mold cavity. Investment casting provides exceptional surface finish and dimensional accuracy and is suitable for producing complex castings with thin walls and intricate details.  5.: No-bake sand, also known as air-set sand or cold-box sand, uses a chemical binder (such as urethane) instead of clay to bond the sand grains together. This type of sand does not require baking to harden the mold; instead, the binder is activated by a catalyst or gas. No-bake sand molds offer good dimensional accuracy, surface finish, and high strength. They are often used for producing large and heavy castings. | 1. : Shrinkage allowance is added to the casting pattern or mold to compensate for the reduction in size that occurs as the molten metal solidifies and cools. Different metals have different shrinkage rates, so the amount of shrinkage allowance varies depending on the material being cast.  2: Draft allowance is the taper provided on vertical surfaces of the pattern or mold to facilitate easy removal of the pattern from the mold cavity and the casting from the mold. It prevents the casting from getting stuck in the mold and reduces the risk of damage during demolding.  3. Machining allowance is the additional material provided on the casting to account for the material that will be removed during machining operations such as milling, turning, drilling, and grinding. The amount of machining allowance depends on the required dimensional accuracy and surface finish of the final casting.   1. Fillet and corner allowance are provided to round off sharp corners and edges on the pattern or mold to reduce stress concentrations and improve the flow of molten metal during casting. This helps prevent defects such as hot tearing and ensures better quality castings.   5: Pattern maker's shrink allowance is the additional dimensions added to the pattern to compensate for the shrinkage of the casting and any additional shrinkage that may occur during cooling and solidification. It ensures that the final casting matches the dimensions of the desired part.  6.: Riser and feeder allowance is the extra material provided in the form of risers (also known as feeders) to supply molten metal to the casting and compensate for shrinkage as the casting solidifies. The riser solidifies last and feeds additional metal to the casting to prevent shrinkage defects such as porosity and shrinkage cavities. |