SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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DEPARTMENT OF MECHANICAL ENGINEERING

19MEZ405- CASTING DESIGN AND PERFORMANCE

IV YEAR / VIII SEM

UNIT – 1

CASTING PROCESS

1. Minimize the Number of Cores
Combine Internal Cavities:
Merge adjacent cavities into a single core where possible, reducing the need for multiple cores.
Coreless Design:
Where feasible, redesign parts to eliminate cores by modifying the geometry to use open mould sections instead.

2. Simplify Core Geometry
Simple Shapes:
Use simple, regular shapes (e.g., cylindrical, rectangular) for cores to reduce production time and complexity.
Straight Core Prints:
Avoid curved or complex core prints (sections of the core that fit into the mould) to simplify core placement.
Split Cores:
For intricate cavities, use split cores (two or more simple cores assembled together) instead of a single complex core.

3. Optimize Core Placement
Accessible Core Locations:
Design castings such that cores can be easily positioned and secured without requiring advanced handling tools.
Reduce Core Size:
Minimize the size of cores to save material and simplify handling, ensuring they are just large enough to create the required cavity.

4. Reduce Core Material Waste

Hollow Cores:
For large cores, use hollow designs or core inserts to minimize sand usage without compromising strength.

Reusable Core Boxes:
Invest in reusable core boxes to produce cores consistently and reduce tooling costs over time.

Core Sand Recycling:
Use sand that can be reclaimed and reused in subsequent cores to reduce material costs.

5. Optimize Core Assembly

Integrated Cores:
For designs requiring multiple cores, consider combining smaller cores into an integrated assembly to reduce manual assembly time.

Self-Locating Cores:
Design cores with features that naturally align and position themselves in the mould, reducing errors during assembly.

6. Consider Core Strength and Binder Usage

Adequate Core Strength:
Use just enough binder to provide the required strength for the core, avoiding excess binder that adds cost and complicates removal after casting.

Lightweight Materials:
For non-load-bearing sections, consider lightweight materials for cores to reduce sand consumption.

7. Design for Easy Core Removal
Simplify Core Removal:
Avoid narrow, inaccessible cavities that make core removal difficult after solidification. Use core designs that collapse or disintegrate easily.
Core Venting:
Incorporate proper venting to prevent gas entrapment and ease core breakdown during casting.

8. Optimize Core Orientation
Vertical Orientation:
Where possible, orient cores vertically to reduce the number of supports and simplify the pouring process.
Support Features:
Add core prints or features to the casting design that securely hold the core in position during mould filling.

9. Use Advanced Core-Making Techniques
3D-Printed Cores:
For complex geometries or low-volume production, consider 3D-printed cores. These reduce tooling costs and allow for intricate designs without additional machining.
Pre-Assembled Cores:
Use pre-assembled cores for complex castings to save on assembly time.

10. Leverage Core Simulation and Software
Simulation Tools:
Use casting simulation software to optimize core design, analyze gas flow, and predict potential defects such as core shift or gas entrapment.
Thermal Analysis:
Ensure that cores are designed to provide uniform cooling and directional solidification, reducing hot spots and minimizing defects.

Benefits of Economical Sand Molding Design
Lower Production Costs: By minimizing material usage, reducing machining, and optimizing mould design.
Increased Efficiency: Faster mould preparation and reduced cycle times.
Improved Quality: Fewer defects mean less rework and waste.
Scalability: Simplified designs and reusable patterns support high-volume production.
By adhering to these principles, sand casting can remain a cost-effective.

Example: Economical Coring Design
Inefficient Core Design:
Multiple small cores with irregular shapes requiring complex handling and assembly.
Excessively large core prints that increase sand usage.
Deep, inaccessible cavities making core removal difficult.
Optimized Core Design:
A single integrated core with a simple geometry (e.g., cylindrical or box-shaped).
Minimal core print size, designed for easy placement and alignment.
Accessible cavity layout for easy removal of core residues.

Benefits of Economical Coring
Lower Material Costs: Reduced sand and binder usage.
Faster Production: Simplified core manufacturing, placement, and removal.
Fewer Defects: Improved design reduces risks of core shift, gas entrapment, and shrinkage defects.
Reduced Labor and Tooling Costs: Standardized and modular core designs streamline production.