How to Reduce Sink Marks in Injection Molding

Sink marks are one of the most common defects found in plastic injection-molded components. This standard operating procedure explains how to identify sink marks, understand their root causes, and apply corrective actions to reduce sink marks in injection molding. It also covers how to troubleshoot sink marks that appear suddenly in components that normally run without defects.

Purpose

This procedure provides a structured approach for recognizing sink mark defects, understanding why they occur, and taking corrective action to reduce sink marks in injection molding. It also provides a troubleshooting sequence to follow when sink marks appear unexpectedly during otherwise stable production runs.

Scope

This procedure applies to plastic injection molding production processes where sink mark defects are observed on component surfaces, whether during initial process setup or during ongoing regular production.

Required equipment and tools

- Mold with functioning cooling channels
- Standard cooling system (cooling tower or chiller)
- Water temperature monitoring equipment
- Mold maintenance and inspection tools for checking cooling pipelines

Step 1: Identify the sink mark defect

A sink mark appears as a small depression or hole on the surface of a plastic component. This defect is most commonly observed in thick areas of the part, where material takes longer to cool and solidify evenly.

Cross-section diagram of a plastic component with the "Sink" area circled in red, showing where the sink mark defect typically forms.

Step 2: Determine the common causes of sink marks

Before adjusting the process, confirm which of the following factors may be contributing to the defect:

- Insufficient cooling time during the molding cycle
- Overpacking, meaning too much material is injected into the mold
- Inadequate holding speed, pressure, or time during the holding phase
- Insufficient cooling water supplied to the mold

Step 3: Review correct rib design to reduce sink marks

Compare the rib design of the component against correct design standards. An incorrect rib design, with improper thickness, produces a visible sink mark. A correct rib design uses proper rib thickness, rounded edges, and appropriate rib height to avoid sink marks.

Side-by-side diagram comparing an incorrect rib design that causes a sink mark with a correct rib design that uses proper thickness and rounded edges.

Step 4: Apply corrective actions to reduce sink marks in injection molding

Once the cause has been identified, apply the following adjustments as needed:

- Reduce the packing of the part to avoid overfilling the mold with material
- Increase holding pressure, holding speed, and holding time so material is properly packed and cooled
- Increase cooling time to allow the part more time to cool before ejection
- Ensure sufficient cooling water is supplied to the mold

Step 5: Troubleshoot sudden sink mark defects during regular production

If a component that normally runs without sink marks suddenly develops the defect during a regular production run, follow this troubleshooting sequence.

1. Confirm that the issue is inconsistent with the component's usual performance. Inconsistent appearance of the defect typically points to a process or equipment issue rather than a design or material issue.
2. Check whether the mold has been left on the machine for many days without maintenance, since prolonged use without maintenance can lead to blockages in the cooling channels.
3. Inspect the cooling pipelines for blockages. A blocked cooling channel prevents proper water circulation in that area of the mold, causing uneven cooling and increasing the likelihood of sink marks. If a sink mark appears suddenly in a component that usually runs fine, inspect the cooling pipelines first.
4. If no blockage is found, check the temperature of the cooling water. Confirm that the water temperature matches the regular, recommended value for the process. If the temperature is within the normal range, continue monitoring for other potential issues.
5. If the water temperature is outside the recommended range, adjust it to the correct value immediately using your standard cooling system, whether a cooling tower or a chiller. Ensure there is no variation in water temperature during production, since a stable water temperature prevents sink mark problems from occurring.
6. If sink marks persist even after the water temperature has been stabilized, treat this as an indication that the affected area of the component is experiencing uneven cooling. Direct further troubleshooting toward identifying and correcting the source of uneven cooling in the mold or cooling system.

Verification and summary

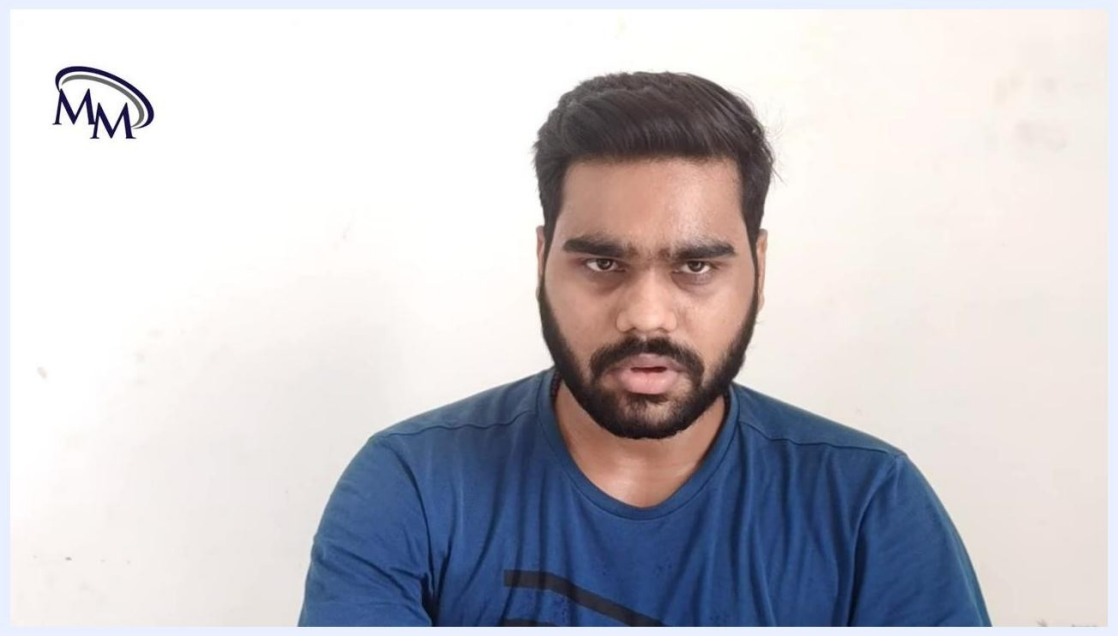
To confirm that sink marks have been successfully reduced or eliminated, verify the following:

- The component surface no longer shows depressions or holes in thick areas
- Cooling channels are free of blockages and water circulates properly through the mold
- Cooling water temperature remains stable at the recommended value throughout the production run

- Holding pressure, holding speed, holding time, and cooling time are set according to the corrective adjustments applied

When troubleshooting sink marks in a component that normally runs without defects, always check the mold's cooling system and water temperature first, as these are the most common sources of unexpected sink mark issues in otherwise stable production processes.

Presenter introducing the topic of shrinkage in plastic components. Plain background, logo "MM" in the top left, presenter in a blue shirt.



Presenter explaining the occurrence of unexpected shrinkage in regular components. Plain background, "MM" logo in the top left, presenter in a blue shirt, direct eye contact with the camera.

Presenter emphasizing the importance of checking cooling channels for blockages. Plain background, "MM" logo in the top left, presenter in a blue shirt, explaining with a focused expression.

Presenter instructing to check the temperature of the cooling water if no blockage is found. Plain background, "MM" logo in the top left, presenter in a blue shirt, calm and informative demeanor.

Presenter explaining the importance of stable water temperature for preventing shrinkage. Plain background, "MM" logo in the top left, presenter in a blue shirt, direct eye contact with the camera.

Presenter emphasizing that persistent shrinkage indicates uneven cooling in a specific area. Plain background, "MM" logo in the top left, presenter in a blue shirt, explaining with a focused expression.

Presenter summarizing the causes and solutions for shrinkage problems. Plain background, "MM" logo in the top left, presenter in a blue shirt, calm and informative demeanor.

Presenter concluding the video, with a large red "YouTube LIKE & SHARE" graphic and "MM" logo in the top left. Plain background, presenter in a blue shirt, inviting viewers to engage.