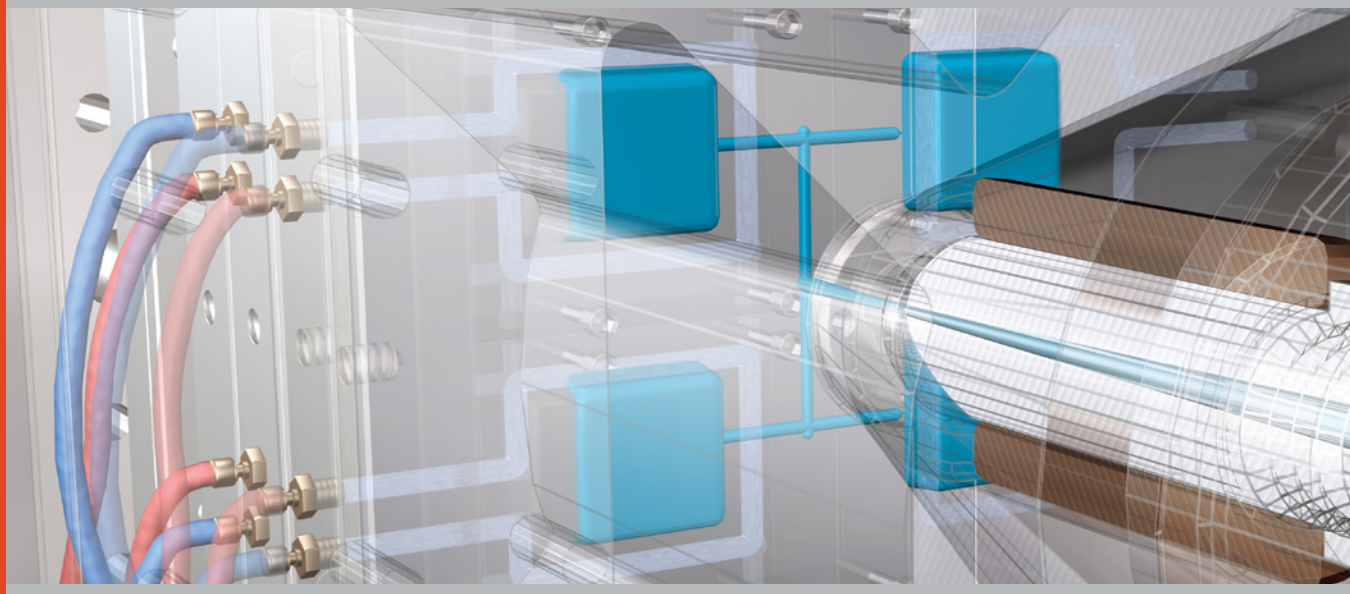
REFERENCE SERIES: PROCESSING

Scientific Troubleshooting: Poor Surface Finish



nexeo plastics

Created exclusively for **Nexeo Plastics** by Routsis Training, this free guide contains excerpts from Routsis's ***Scientific Molding Courses***.

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TROUBLESHOOTING POOR SURFACE FINISH

When the appearance of the part surface looks poor, and has inconsistent gloss, it is often deemed unacceptable to the customer. This condition is generally the result of non-uniform adherence between the polymer and the mold surface.

Poor Surface Finish can be caused by one of seven major factors:

- Material Temperature
- 1st Stage Injection
- 2nd Stage Packing
- Mold Temperature
- Clamp Tonnage
- Mold Damage
- Mold Design

Material Temperature

With respect to Material Temperature, Poor Surface Finish can result from both Low Melt Temperature and Material Degradation.

A low Melt Temperature will cause higher pressure losses in the mold cavity during injection. This pressure loss reduces the quality of the surface finish due to the reduced amount of pressure forcing the polymer melt against the mold surface.

Excessive Melt Temperature and Back Pressure may cause material degradation. When the polymer degrades it gives off volatiles, which can become deposited on the mold surface during injection.

Verify that the **Plastic Temperature** variables, **Melt Temperature**, and **Back Pressure** are still correct – according to the documented standard.

1st Stage Injection

Poor Surface Finish can result from Low Injection Velocity, Insufficient Material Injection, and Gas Entrapment during 1st Stage Injection.

If a low plastic flow rate is being used during injection, the polymer cools and the viscosity increases as it fills the mold. This may cause inconsistent adherence of the melted polymer to the mold surface.

If too little material is injected during 1st Stage, the 2nd Stage Packing pressure must fill a significant portion of the mold using a lower velocity. Since too much 2nd Stage Pressure is used to fill the mold in this case, a poor part surface finish will often result near the end of fill.

If the vents are blocked, gas can become trapped between the polymer melt and the mold surface during injection. This trapped gas can prevent the polymer from directly contacting the mold, resulting in a poor surface finish.

When poor surface finish occurs, you should clean both the vents and the mold surface to help prevent the buildup and blockages.

Turn off 2nd Stage Packing and ensure that the fill only part weight and 1st Stage Injection time match the documented standard.

2nd Stage Packing

Poor Surface Finish can also be the result from using a Low Packing Pressure during 2nd Stage.

A low 2nd Stage Packing Pressure provides insufficient material, and cannot properly compensate for polymer shrinkage. This causes a poor surface finish due to the limited pressure forcing the polymer against the mold cavity.

When troubleshooting surface finish issues, you should always verify the 2nd Stage Packing Pressure to ensure it matches the documented standard.

Mold Temperature

Poor Surface Finish may be the result of a Low Mold Temperature.

A low Mold Temperature will reduce the temperature of the polymer causing the viscosity of the polymer contacting the surface to rise. This prevents the material from properly acquiring the detail of the mold surface, thus affecting the part appearance.

It is important to verify the coolant temperatures entering and leaving the mold when troubleshooting part surface appearance.

Clamp Tonnage

Poor Surface Finish can also result from excessive Clamp Tonnage. This pressure can compress the mold vents — causing gas entrapment between the mold and the polymer melt.

Verify the Clamp Tonnage settings match the standard and re-establish Clamp Tonnage if you are using a toggle machine.

Mold Damage

Poor Surface Finish can result from Corrosion, Surface Erosion, or Vent Damage.

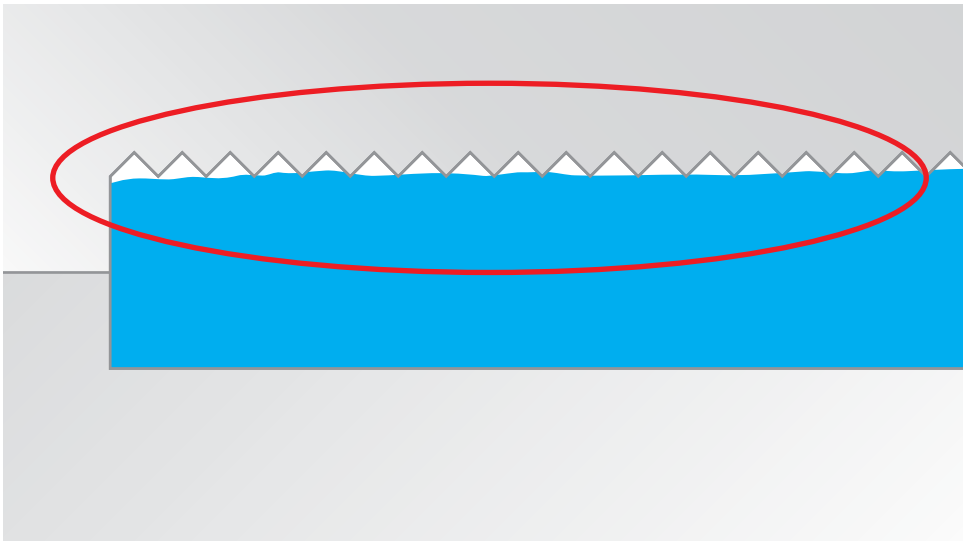
The mold surface can become easily corroded or damaged if it is not kept clean and properly treated. Even corrosion-resistant materials, such as stainless steel, can become corroded or damaged if they are not properly maintained. Some highly polished surface finishes can actually be damaged by the simple touch of a finger.

Over time, repeated injection of the polymer melt will actually erode away portions of the mold surface. This will significantly affect the appearance of the molded part surface, especially if the mold cavity has been treated with a surface coating such as chrome plating or nitriding.

Materials that are either fiber-reinforced or mineral-filled will cause significantly more erosion than unfilled materials. With any material, the most erosion occurs in areas of the mold cavity such as the gate where the shear rate is highest.

Over time, wear and damage will reduce the effectiveness of mold vents, therefore affecting the appearance of the part surface. Always keep the mold surface clean and spray the mold surface with the appropriate surface protectant whenever the mold is being stored.

If it is suspected that the vents or mold cavity surface is worn or damaged, it is best to have the tooling personnel measure or inspects the mold to help determine the best course of action.



Mold Design

Inadequate Venting can also contribute to Poor Surface Finish. Inadequate venting will always contribute to gas entrapment and can be the cause of poor surface finish. Adding parting line vents to the mold will often improve the overall part appearance when gas entrapment occurs.