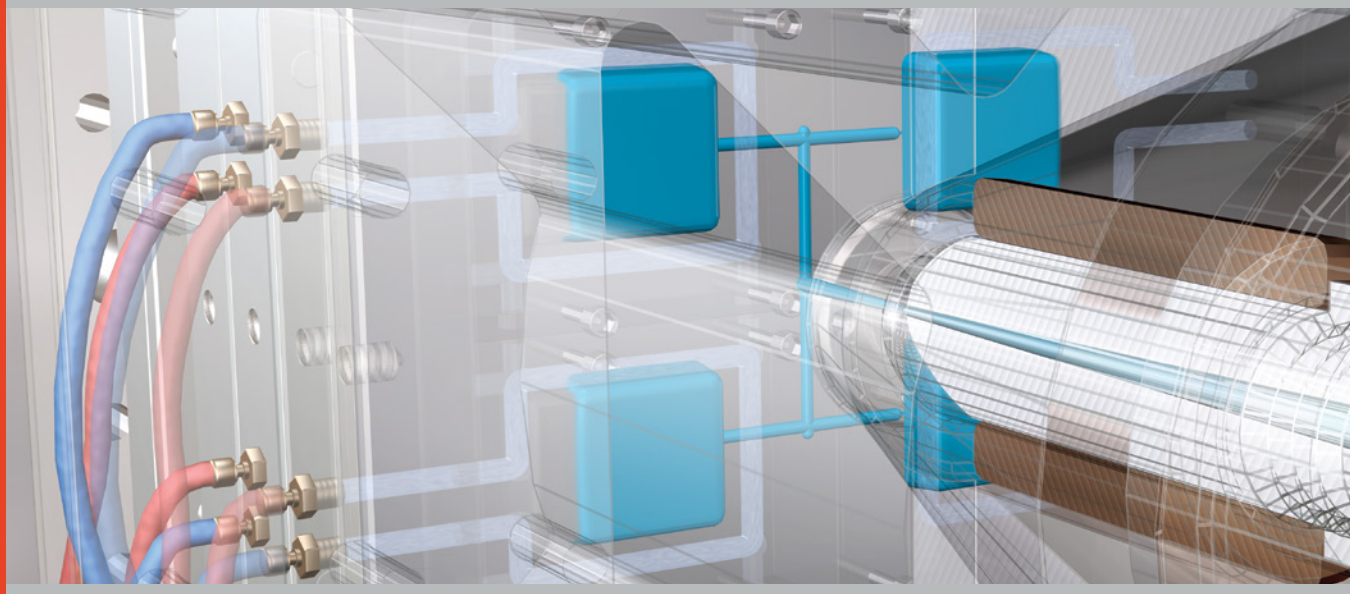
REFERENCE SERIES: PROCESSING

Scientific Troubleshooting: Weld & Meld Lines



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 WELD & MELD LINES

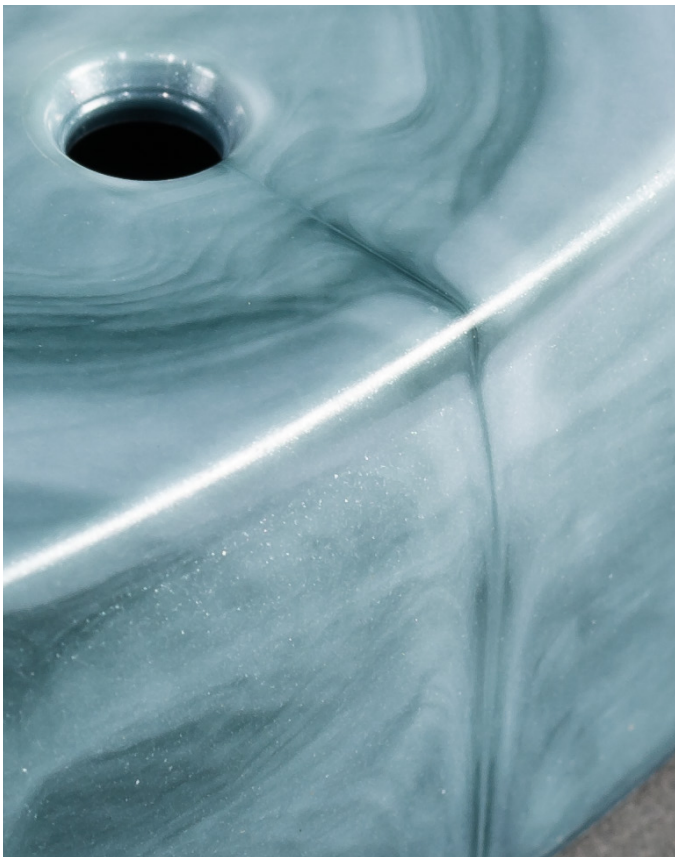
Both Weld Lines and Meld Lines are very similar in appearance because they both result from the joining of two polymer flow fronts. The difference between a weld line and a meld line is how they are formed.

Weld lines are created when two flow fronts meet and stop. This is considered a static interaction.

Meld lines occur when two flow fronts meet, but continue flowing afterwards – this is considered to be a dynamic interaction. The dynamic nature of meld lines allows the polymer chains to better interact and entangle. As a result, weld lines are generally weaker when compared to meld lines

Weld and Meld Lines can be caused by one of seven major factors:

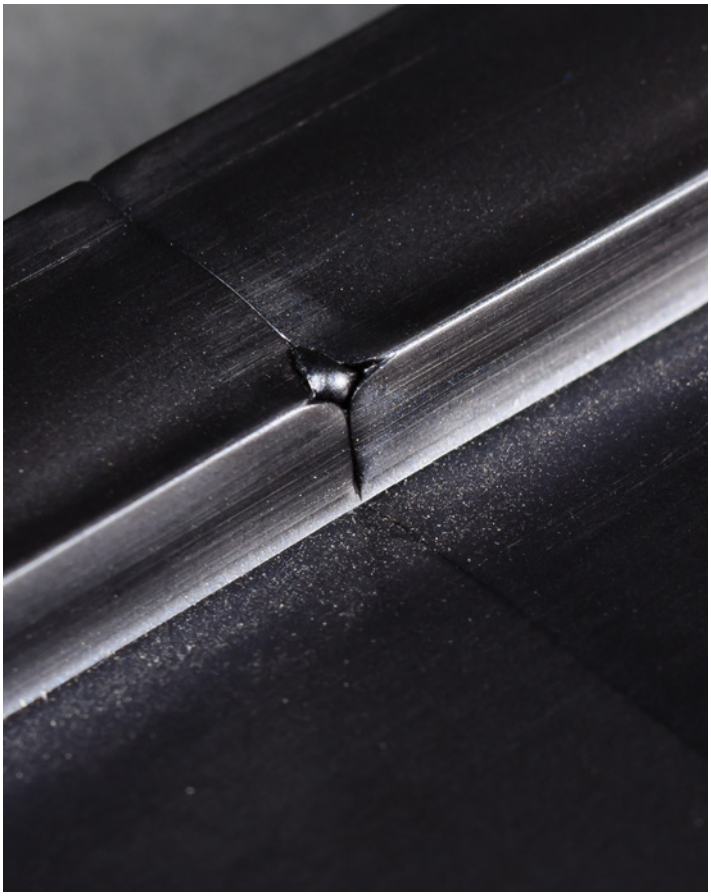
- Material Temperature
- 1st Stage Injection
- 2nd Stage Packing
- Mold Temperature
- Clamp Tonnage
- Mold Damage
- Mold Design



Material Temperature

With respect to Material Temperature, poor Weld and Meld Lines can result from a **Low Melt Temperature** or **Material Degradation**.

Polymers having a low Melt Temperature can cause higher pressure losses during injection. This pressure loss reduces the amount of injection and packing pressure present where the two flow fronts meet.



Cooler materials also have lower polymer chain mobility — which significantly reduces the molecular chain entanglement where the two flow fronts meet.

Excessively high **Melt Temperatures** and **Back Pressures** often cause the material additives to burn and degrade. This degradation creates gases and volatiles, which can interfere with the molecular entanglement at the meld or weld line location.

It is critical to ensure that both the Melt Temperature and Back Pressure are at the documented setpoint when troubleshooting weld and meld line strength and appearance.

1st Stage Injection

1st Stage Injection issues that may contribute to Weld and Meld Lines include: Low Injection Velocity, High Injection Velocity, Insufficient Material Injection, and Gas Entrapment.

If a low **Plastic Flow Rate** is being used during injection, the polymer viscosity increases which can reduce the strength and appearance of meld and weld lines.

If an excessively high **Injection Velocity** is used, the rate at which material enters the mold may exceed the mold's ability to vent trapped gas. Since trapped gas can interfere with molecular chain entanglement at the flow front intersection, high injection speeds may decrease both weld and meld line appearance.

If too little material is injected during 1st Stage, the 2nd Stage Packing Pressure may not be high enough to both fill the mold and create a proper weld or meld line.

Gases trapped in the mold during injection due to blocked vents can interfere with both weld and meld line formation.

It is always important that all mold vents are properly cleaned when troubleshooting the appearance or strength of weld and meld lines.

Turn off 2nd Stage Packing and ensure that the 1st Stage Fill-only Part Weight and 1st Stage Injection time match the documented standard.

2nd Stage Packing

A low 2nd Stage Packing Pressure results in insufficient material to compensate for polymer shrinkage. This reduces pressure at the weld or meld line location.

Verify that 2nd Stage Packing Pressure matches the documented standard.

Mold Temperature

Weld and Meld Lines can also be the result of a Low Mold Temperature.

A low Mold Temperature can reduce the temperature of the polymer at the weld line location, thus reducing the amount of polymer chain entanglement.

Verify the coolant temperatures entering and leaving the mold when troubleshooting Weld and Meld Line strength and appearance.

Clamp Tonnage

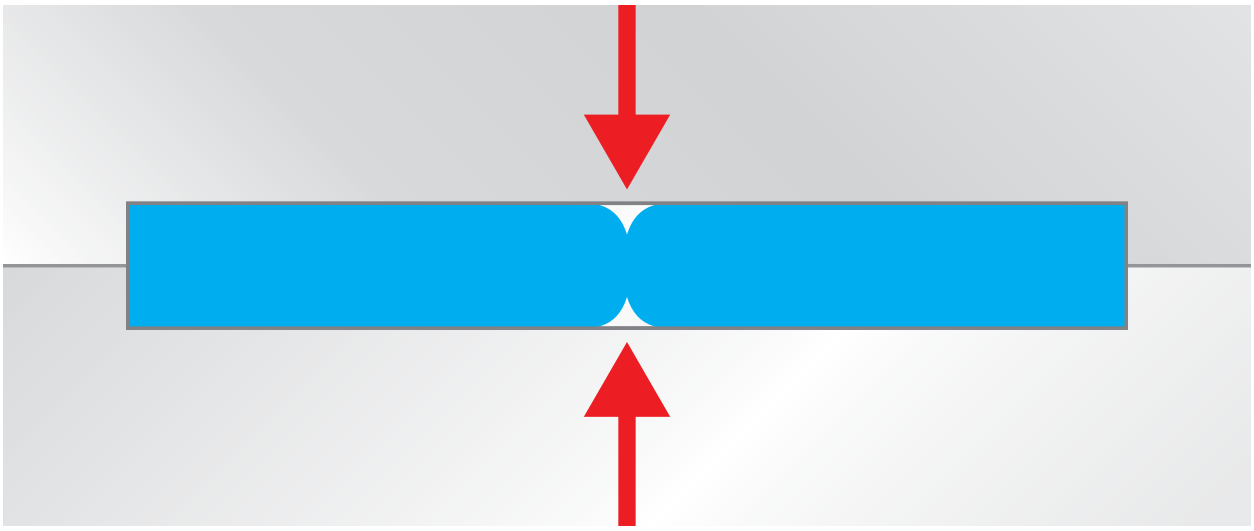
Excessive Clamp Tonnage compresses the mold vents — causing gas entrapment, which will interfere with proper weld and meld line formation.

Verify the Clamp Tonnage settings to 'standard' and re-establish Clamp Tonnage for toggle machines.

Mold Damage

Vent damage is another possible factor in poor weld and meld lines. Over time, wear and damage will reduce the effectiveness of mold vents and affect the strength and appearance of both weld and meld lines.

An experienced technician or mold maker should inspect and measure the vents to determine whether mold repairs are necessary.



Mold Design

Inadequate venting interferes with weld and meld line formation — which will always affect their appearance and reduce their strength.

Adding vents at the locations of weld and meld lines will always improve the strength and appearance. Static vents, dynamic vents and porous steel will also help improve weld and meld line appearance and strength.