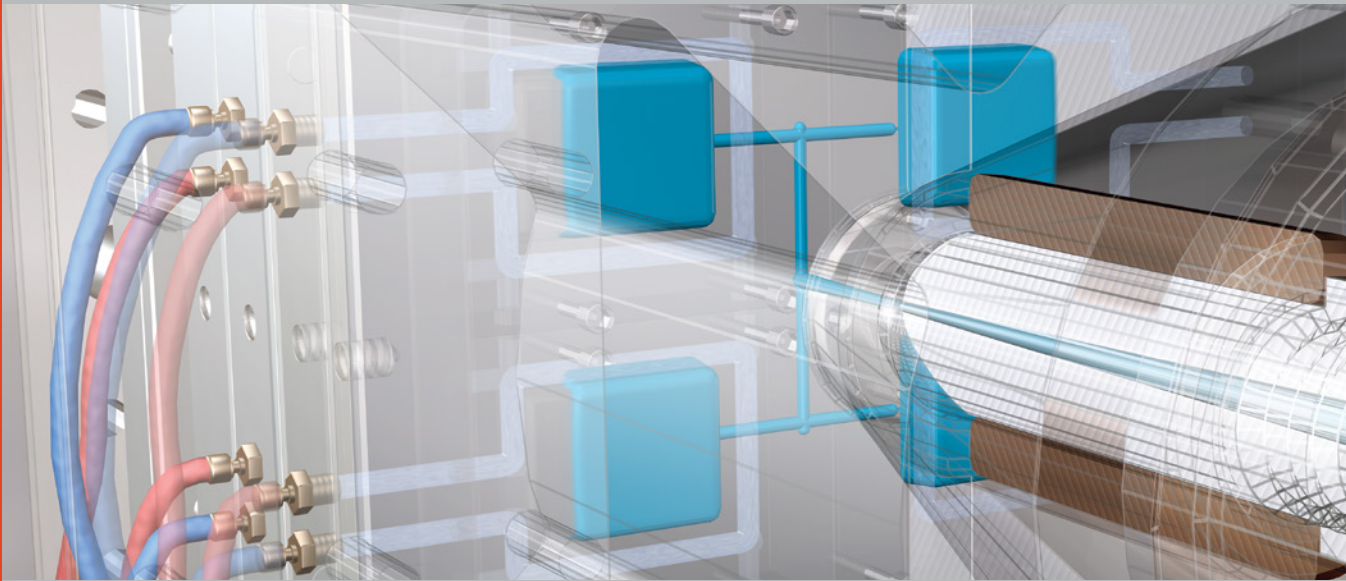


Scientific Troubleshooting: Splay, Bubbles & Blisters



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 SPLAY, BUBBLES & BLISTERS

Splay appears on the part surface as streaking in the direction of flow.

Bubbles are small pockets of gas within the part and can occur in both thin and thick sections. Bubbles are similar to voids in appearance and are easy to detect in translucent parts. To ensure the defect is a gas bubble and not a void, you can mold parts at different speeds. If the defect moves from shot to shot, it is most likely a gas bubble.

Blisters are gas bubbles that appear as bumps on the surface of the part.

Splay, bubbles, and blisters are all caused by either moisture, air, gases or volatiles being present in the resin or on the mold surface. These are typically caused by one of three major factors:

- Material Handling
- Material Temperature
- Machine Setup



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Material Handling

Splay, bubbles, and blisters can result from the improper drying of hygroscopic materials, improper removal of surface moisture, or contamination.

Hygroscopicity

Splay, Bubbles, and Blisters most commonly occur with hygroscopic materials; such as Nylon, Polycarbonate, and Acetal. These moisture-absorbing polymers require drying to prevent the water molecules from escaping or damaging the polymer during injection.

Although many materials are dried before they are shipped, an improper seal or a ripped bag will allow water to become re-absorbed by the polymer. Additionally, if a dried material is removed from the dryer and is not used immediately, it can re-absorb moisture from the air. Some materials, such as acrylics, can re-absorb moisture within only a few seconds.

All materials, both hygroscopic and non-hygroscopic, can attract surface moisture if they have been shipped overseas, kept outdoors, and stored in a humid area. If this moisture is not removed, Splay, Bubbles, and Blisters will often occur.

Drying

Non-hygroscopic materials, such as polypropylene and polystyrene, which have been contaminated with surface moisture should be dried using hot air dryers or circulated air ovens. In most cases, the temperatures used to remove surface moisture are higher than the boiling point of water, which is 100°C (212°F).

Moisture removing dryers (desiccant, vacuum, compressed air) should be used for drying hygroscopic polymers.

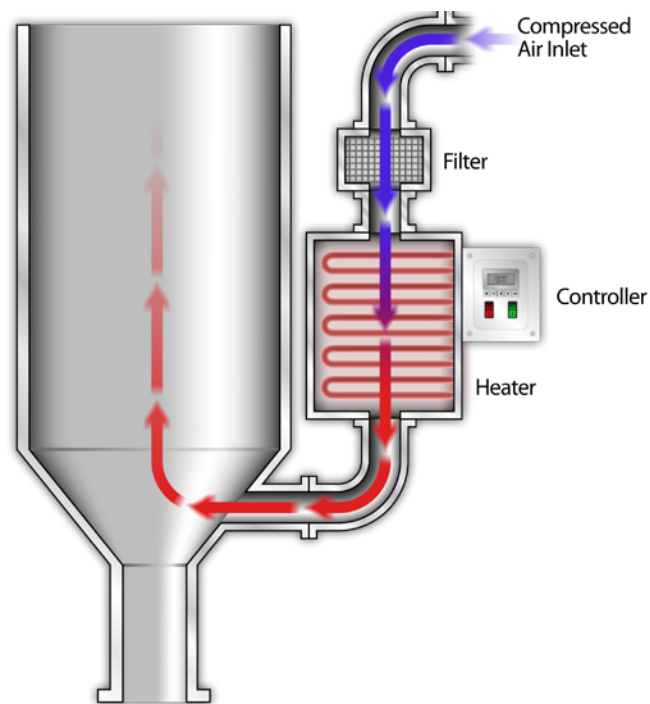


Diagram of a Compressed Air Dryer



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Hygroscopic materials should be dried using temperature settings recommended by the material supplier. If you are using regrind, you may need to dry the regrind for a longer period of time to ensure it is properly dried.

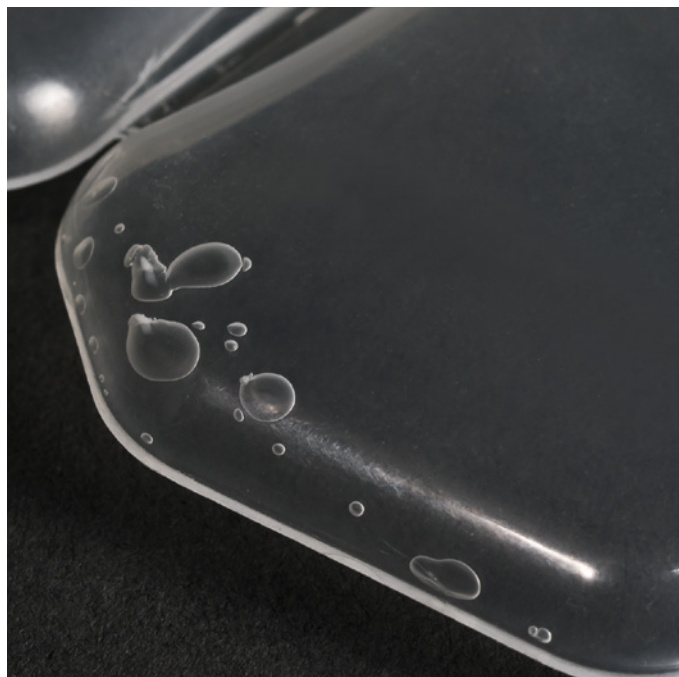
If you are using a non-hygroscopic material, you may need to contact the material supplier to obtain recommended drying temperatures and times.

Verify the effectiveness of your drying equipment by using a dewpoint meter at the bottom of the hopper near the feedthroat. If the material is properly dried, this measurement should correspond with the dewpoint recommended by the supplier.

Contamination

Contaminants such as fluids, grease, and oils can vaporize in the barrel — resulting in splay, bubbles, and blisters when injected into the mold.

To prevent contamination, it is critical that all storage containers and hoppers remain covered at all times. You must also clean all material containers, hoppers, filters, and lines each time a change in material is made.



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Material Temperature

Splay, Bubbles, and Blisters can be the result of **Material Degradation**, caused by high Material Temperature. Excessive Melt Temperature and Back Pressure can break down the polymer and additives — resulting in material degradation. This releases volatiles from the polymer.

Verify that the **Melt Temperature** and the **Back Pressure** variables are still correct and in accordance with the documented standard.

Machine Setup

With respect to machine setup, splay, bubbles, or blisters can result from the use of Sprue Break or excessive Screw Decompression.

Sprue Break separates the nozzle from the sprue bushing between cycles and is intended to prevent the material from freezing off at the nozzle. Unfortunately, sprue break allows air and water to flow in front of the nozzle which can cause splay, bubbles, and blisters.

Whenever possible, remove sprue break from the cycle to prevent the introduction of gases and moisture at the nozzle.

Screw Decompression is used to pull the screw back to properly position the check ring after Screw Recovery. If excessive screw decompression is used, air can be drawn into the nozzle and barrel which can cause splay, bubbles, or blisters.

The amount of decompression used should be limited to the amount of check ring movement to minimize the introduction of gases into the barrel.



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