ASCEND PERFORMANCE MATERIALS

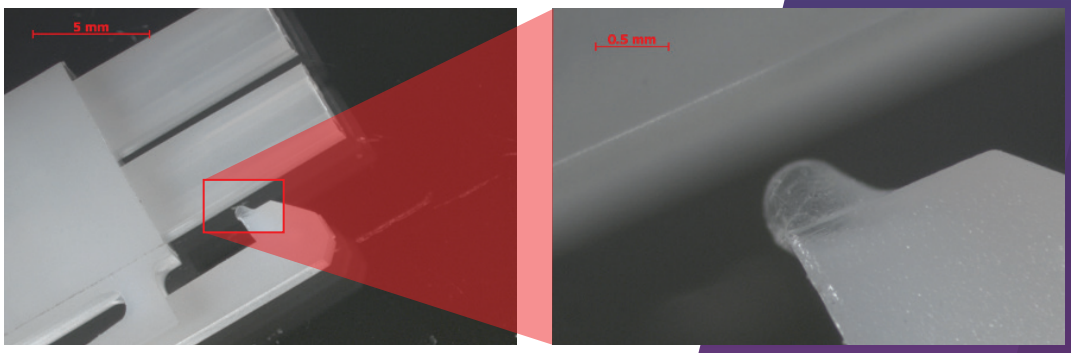
Problem:

Blisters

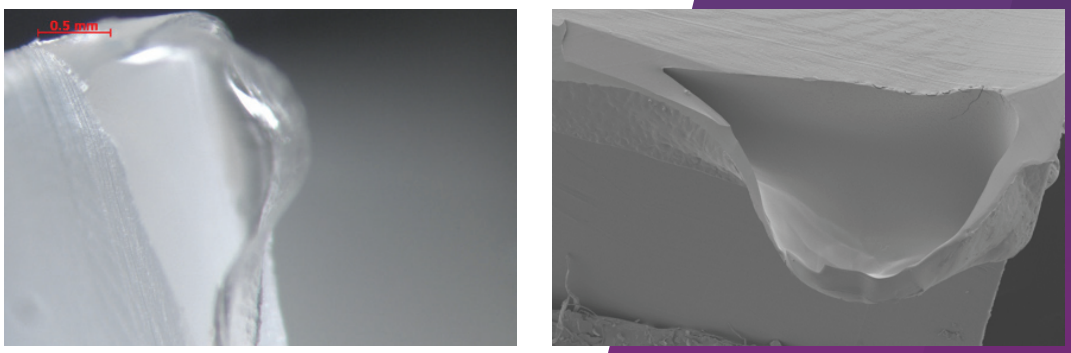
Blisters are pockets of trapped air that accumulate on or near the surface of a molded part. Air can be trapped in the melt prior to injection or during the pack-and-fill phase. Blisters are aesthetically unappealing, and they can cause defects in a given application.

TECH TIPS

Your Vydyne® technical services team offers step-by-step troubleshooting tips to help locate and solve problems that may occur during injection molding in order for you to get production back up and running.



Left: Top-light stereomicroscopy of blister
Right: Detail view



Cross-sectional view through bubble/blister
Left: Top-light stereomicroscopy
Right: Scanning electron microscopy

Problem:

Blisters

Root causes

Several factors can lead to blisters:

- High injection speed
- Excessive melt decompression
- Excessive melt temperature
- High mold temperature
- Excessive residence time
- Too small of gate
- Insufficient tool venting
- Improper screw design
- Wet resin
- Contaminated resin
- Trapped gas in a rib or other part geometry
- Weld lines

How to troubleshoot

Evaluate the molding process

- *Injection speed:* High injection rates can cause a thin polymer skin to form as the resin flows through the tool cavity. Lower the injection speed to reduce the likelihood of trapped air accumulating in this susceptible area.
- *Melt decompression:* A high melt decompression setting can pull air into the nozzle. Set melt decompression levels low enough to eliminate the blistering defect, but high enough to control nozzle drool.
- *Melt temperature:* Excessive barrel/hot manifold temperatures can degrade the resin and/or additives. Degraded polymers and additives emit volatile gasses that can become trapped as the melt front flows to end of fill. Follow the manufacturer's recommended guidelines for optimal part molding.
- *Mold temperature near gate:* Excessive tool temperatures near the gate can create turbulent flow fronts and trapped gas on the surface of the molded part. If other remedies are not effective in reducing the appearance of blistering, consider incorporating a separate means of controlled cooling near the gate.
- *Residence time:* Resin can degrade when it is exposed to prolonged periods within the barrel prior to molding. The optimal residence time for Vydyne materials would be three to five minutes. For a typical process, set barrel temperatures to produce a melt temperature in the recommended range listed on the Vydyne technical data sheet.
- *Clamp tonnage:* Excessive clamp tonnage can seal vents needed during the injection phase. Consider lower clamp tonnage to aid in venting. Improving venting if necessary.
- *Trapped gas in a rib:* Melt flowing over a large rib may "pull" trapped air from the rib and deposit it onto the part surface. A short shot study or placing a cut rib from a previous shot back into the suspected rib may prove the origin of the gas and adjusting the injection speed during the filling phase may eliminate the problem.

Evaluate the machine and mold design

- *Tool venting:* Proper ventilation lessens the risk of trapped air. Add vents to the mold at the appropriate points, including end-of-fill, core pins and/or increase number of vents and the depth of any existing vents. Recommended depth dimensions for PA66 are 0.0005 to 0.0015 in. Polishing the vents may prevent residue from easily sticking to the surface.
- *Screw design:* A purge shot may reveal the presence of any bubbles contributing to blisters. If so, the screw design may be insufficient for the process. General purpose screws with L/D ratios of 18:1 or lower may not properly plasticize the resin. Use of L/D ratios of 20:1 or higher are recommended. Screw compression ratio is another important consideration when choosing a screw. For Vydyne resins, a screw with a compression ratio of 3.5 to 4.0 is recommended.
- *Mold cooling:* Hot spots in the mold can cause blisters creating trapped gases at the molded part surface. If other remedies are not effective in reducing the appearance of blistering, adding additional cooling near these spots may help eliminate them by setting a solid skin layer. The use of a thermal-imaging camera on the plastic part can aid in finding mold hot spots.
- *Gate size:* Check gate size for excessive shear or jetting. A gate that is too small will cause excessive shear and melt temperature. A poor gate design or location may cause jetting or splay.

Evaluate the material

- *Wet resin:* Resin that is not properly dried can result in the formation of moisture vapor and contribute to blisters. The moisture content of the resin can be measured using a moisture analyzer. A moisture level range of 0.10% to 0.20% is recommended when molding Vydyne resins.
- *Contamination:* Keep all Vydyne material contamination free as most other polymers decompose at Vydyne molding temperatures. Culprits of contamination include material handling, improperly prepared regrind, dirty drier filters and improper cleaning of the screw and barrel. These foreign particulates can lead to degradation and the generation of volatiles which will cause blistering.

About Ascend

Ascend Performance Materials is the world's largest fully integrated producer of nylon 6,6 resin. We manufacture and reliably supply world-class plastics, fibers and chemicals that are used in thousands of everyday applications such as car parts, electronics and cable ties.

North America

1010 Travis Street, Suite 900
Houston, TX 77002
United States

+1 713 315 5700

Europe

Watson & Crick Hill Park
Rue Granbonpré 11 – Bâtiment H
B-1435 Mont-Saint-Guibert
Belgium

+32 10 608 600

Asia

Unit 3602,
Raffles City Office Towers
268 Xi Zang Road (M)
Shanghai 200001
China

+86 21 2315 0888

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For more information, contact our expert applications specialists or visit **ascendmaterials.com.**

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