

3M™ Boron Nitride Cooling Fillers

Injection Molding Processing Guide

3M™ Boron Nitride Cooling Fillers (BNCF) are engineered to help improve thermal conductivity in polymers while helping maintain or improve electrical insulation. Their unique properties make these additives suitable for many thermoplastic, elastomer and thermoset resins used in a wide variety of 5G, electrical, electronic, and automotive applications. This processing guide will help you optimize the outcome of your final product.



Process equipment

When injection molding thermally conductive polymers, the pelletized compound granulates are melted, injected in a mold and cooled. Finding the optimum combination of melt, nozzle and mold temperature and injection speed, injection pressure, dwell pressure along with post pressure is crucial for complete filling of the mold.



How to choose the right melt temperature?

3M Boron Nitride Cooling Fillers will increase the viscosity of the compound, and therefore higher melt temperatures will be necessary compared to a pure polymer (such as HDPE, TPE, PP, PA and PC). Typically, the melt temperature of thermally conductive polymers needs to be increased by 30 – 50° C.



How to choose the right mold temperature?

3M Boron Nitride Cooling Fillers are enhancing thermal conductivities, and therefore cools faster compared to the pure polymer. To avoid incomplete tool filling, the mold temperature of a thermally conductive polymer typically needs to be increased by 20 – 90° C.



How does Boron Nitride effect the injection parameters?

An increase in 3M Boron Nitride Cooling Fillers within the compound, increases the viscosity and thermal conductivities of the melt, exponentially. The melt temperature is increased slightly, and mold temperature is drastically increased with filler content. Compared to pure polymers, 3M BNCF melt and mold temperatures are much higher. Melt 200° C – 300° C, mold 100° C – 160° C.



How is in-plane and through-plane thermal conductivity influenced?

In-plane is typically greater at higher melt and mold temperatures as friction towards the mold orients BN platelets and flakes in-plane. Medium melt and medium mold temperatures combined with low injection speed keep the random orientation and favor high through-plane thermal conductivity of the boron nitride.



Safety

3M BNCF are powders which can be safely handled with gloves, safety glasses and a dust mask. Always wear PPE recommended by your equipment manufacturer. Refer to the Safety Data Sheet (SDS) for more information.

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