

Ingenia Extrusion Brief

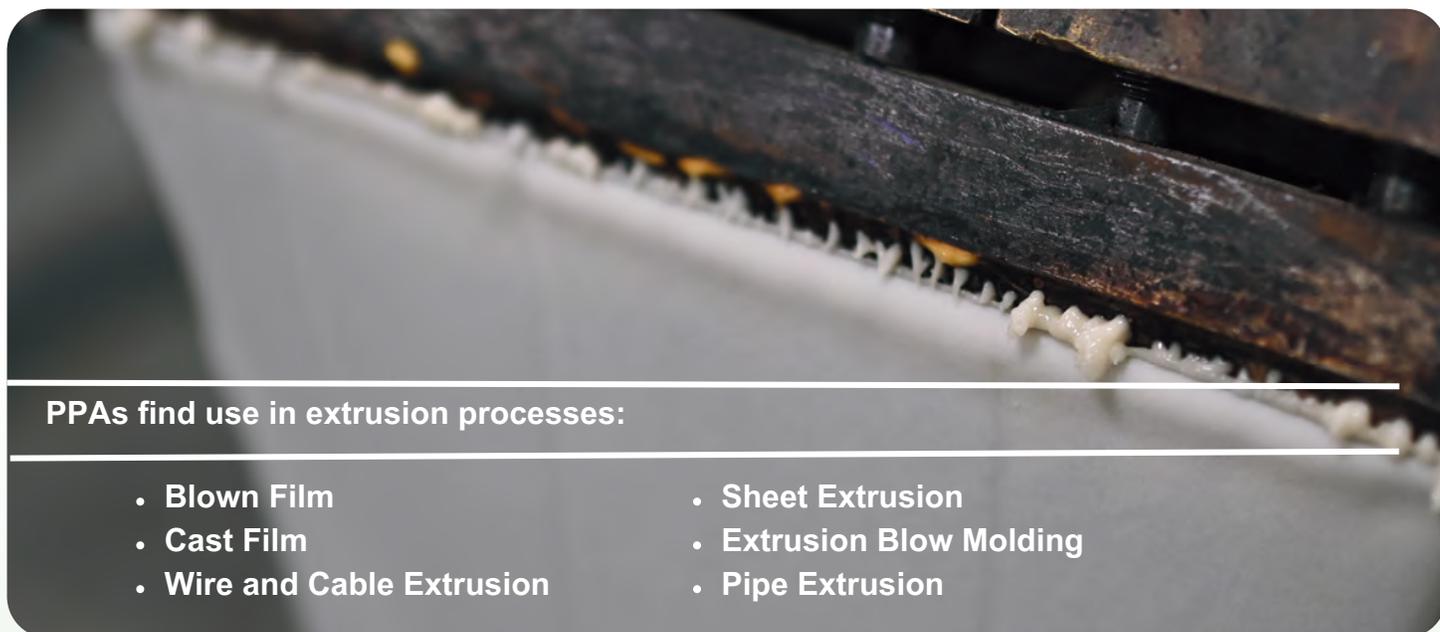
Polymer Process Aids

Polymer process aids are additives that are used to improve the processability of polymers, primarily in the extrusion process. The use of polymer process aids helps to alleviate melt fracture in blown film extrusion and die lip buildup. In industry, melt fracture is also known as ‘sharkskin’, ‘orange peel’ and ‘apple sauce’. Die lip buildup is also known as plate out.



Melt fracture in blown film noted in picture on the left, while picture on the right has no melt fracture

EXAMPLE OF DIE LIP BUILDUP IN EXTRUSION:



PPAs find use in extrusion processes:

- Blown Film
- Cast Film
- Wire and Cable Extrusion
- Sheet Extrusion
- Extrusion Blow Molding
- Pipe Extrusion

Contact your Ingenia Polymer Sales or Technical Service Representative to learn more

Mike Medlar – Sales Manager
Mike.Medlar@ingeniapolymers.com
Office: 519-758-8941 x1012
Cell: +1-403-804-0942

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Polymer Process Aids

Historically, fluoropolymers were the most popular and widely used class of PPA. In recent years legislative pressure has limited the use of polyfluoroalkyl substances (PFAS), a class of chemicals of which fluoropolymers fall under. Non-PFAS PPAs are replacing the previously used fluoropolymers. In both fluoropolymer PPAs and non-PFAS PPAs synergistic additives are often used to enhance PPA activity. The polymer process aid is incorporated into the molten polymer through the melt extrusion process. Polymer process aids are introduced into the host matrix using masterbatches and the amount of PPA required in the melt varies from 100 ppm (parts per million) for die lip buildup to 1000 ppm for melt fracture depending on the resin type, additives incorporated, processing conditions, and die type. For maximum efficiency, the dispersion of the PPA, including the PPA droplet size and their distribution in the masterbatch, has to be optimized. Optimum dispersion depends on the type of polymer process aid used. The PPA coats the metal surface in the extrusion equipment thereby lowering friction between the polymer melt and the metal. Thus, it promotes slippage at the polymer and die interface. This reduces the large elongational stresses at the exit of the die, which is the root cause of melt fracture. Also, this leads to a production rate increase which is another benefit of using PPAs.



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PPA efficiency can be impacted by other polymers in the melt including antiblocks, UV stabilizers, minerals and pigments. Selection of the type of polymer process aid is important to reduce negative interactions. As PPAs are an expensive component of the film blend on a unit basis, it is imperative that dosage levels be optimized to use the least possible amount and reduce total film cost. Further, excessive use of PPAs can lead to other issues such as PPA buildup on the die or on downstream equipment. Also, excessive use of certain PPAs causes difficulties in sealability and printability of the film. Therefore, careful selection of the type of polymer process aid is important.

Use of polymer process aids can eliminate die lip buildup in pipe extrusion, some colorants can be especially problematic.



PPAs provide several benefits to the processor. These include:

- Elimination of melt fracture
- Reduction of die lip buildup
- Improve extrusion of high viscosity, low melt index resins
- Reduction in back pressure
- Reduction/elimination of interfacial melt instability
- Facilitate use of lower die gaps
- Elimination of gels, black specs
- Increase productivity
- Reduction in change over times
- Improvement in the optical properties of high clarity films

To learn how the correct PPA can help solve your processing challenges, contact your Ingenia Sales and Technical Service team. With a leading industry position and a variety of stock and specialty products, the solution to your melt fracture or die lip buildup problem is available at Ingenia.