

Sources of Gels

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Vol. 22 #2, September 1995

Gels appear in extruded products, particularly sheet and film, as small, local imperfections of many different forms. Since their appearance is often similar, regardless of source, they are often mistakenly treated as a single problem. In fact, they have many sources and several solutions.

Poorly homogenized melt can permit some feed pellets to maintain their integrity through the process and appear as imperfections in the final product. This is the one situation in which process adjustment is likely to solve the problem. Moves toward more severe processing, higher heats, higher shear, finer screens, etc., should bring a positive response.

Gels can, and do sometimes, come in the door with the resin. Resin particles sintered in the polymerization and/or compounding steps, as well as impurities within the resin, will float within the melt, without losing their identity, and appear in the product as gels. Process changes will rarely help to correct this situation.

The extrusion process itself can create gels by allowing some material to stay on the hot side of the process for too long. Material that reaches zero or close to zero forward velocity anywhere in the extrusion system can partially degrade, become incompatible with the resin flowing around it, break loose and appear as gels. To correct this, one must look at system streamlining, compound lubricity and elasticity, and metal temperatures as they relate to stock temperatures.

Contaminants introduced in the extrusion plant can turn up as gels. These include:

1. Dirt from improper materials handling, particularly in regrind,
2. other resins than the one being run, that are chemically and/or thermally incompatible with the base resin, and
3. stiffer grades of the same base resin. For example, a low fractional melt index in a higher melt index will not fully melt and assimilate in the softer main melt stream.

The solution here lies in correcting materials handling problems and clean up procedures. As in all extrusion problems, it is essential to clearly identify the source before the right correction can be found. Chasing gels with process conditions is rarely the answer.

- David R. Hopkins, Complex, Inc.

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