

Gels

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1. What is a gel?
2. Can Gels be formed in the die or are they inherently in the resin?
3. Can screen pecks be used to eliminate gels? Do screens filter, break up or provide more receptive temp. for melting?
4. Can sand packs be applied to polyethylene extrusion?

The answers to these questions were submitted by Paul Limbach of Mecha Design, Honeybrook, Pa. _

Gels, gel formation and gel elimination is a subject where regardless of what you say you are probably wrong, but not without reason. First of all, for definition — a gel is a visual effect caused by differences in refractive index of a portion or point in a material with respect to material adjacent to it.

Due to flow patterns, they generally end up as elongated ellipses called fish eyes.

They may come from several sources; high molecular weight materials, cross-linking, degradation, dissimilar materials, dirt, etc. Most of the time they can be categorized as follows:

1. High molecular weight material dispersed in a low molecular weight material. Flow patterns generally form elongated ellipses. Not dot in center of fish eye.
2. Cross-linked particles which behave as a high molecular weight material.
3. Dirt and foreign matter such as silicas used in catalyst, or inorganic material or additives or regrind. This source most generally forms a gel with a dot in it that can be found under a magnifying glass or microscope. These appear most like fish eyes.

Elimination is more difficult, but there are several possibilities for improvement. Firstly, the energy to molecularly break down a gel is high. Higher than we would normally want to expend. A gel as we see it is not just one molecule, but many molecules; some of which are more loosely tied than others.

Shear stresses as applied by sand packs, porous metals, etc., if sufficiently high can dislodge and disrupt the agglomeration so that it is more evenly dispersed.

Screen packs are fine for taking out large agglomerations, dirt, etc., if they too are fine enough. They generally cannot diffuse fish eyes or gels to the degree that a bad resin can become a good one. I suggest trying a couple of 150 or 250 mesh if your machine can take the back pressure. The fine pack, however, may also produce problems. Depending upon the type of gel and its tendency, it may merely be filtered and pile up until back pressure increases and forces them through at once, so an intermittent condition may develop. Each case is specific and unfortunately, trial and error is one route to solution.

Temperature, here also, plays a part. High temperature assists in the softening of the high molecular weight materials so that it can be dispersed to the point that it is not' objectionable.

Smear heads and high shear mixing heads have been used again with the idea to disperse the high molecular weight material.

The best advice is, first to clean up any operation, screws, handling, methods, dies with bad stagnation areas, hot

spots, etc. Second, try to identify the type of fish eye or gel and its frequency and resin source. Start experimenting, using a scientific method.

See also:

- Mixing myths
- On-line quality analysis
- Polymer filtration
- PVC gels
- Sources of gels

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