METHODS FOR GEL REDUCTION IN POLYOLEFINS

FIELD

[0001] This disclosure generally relates to gel reduction in polyolefins. In particular, this disclosure relates to methods for extrusion of polyolefins that control specific energy input to the extruder for gel reduction.

BACKGROUND

[0002] Films extruded from high density polyolefins, especially high density polyethylene, have become an important product worldwide. Even more particularly, the use of multimodal or bimodal polyethylene in films has gained market share over traditional unimodal polyethylene. In order to make such films, complex reaction processes such as the use of multi-site catalysts and/or multi-stage reactors are necessary. This can often lead to problems in the quality of the film, such as the presence of gels. Gels are highly localized imperfections in the film that are visually distinct from the surrounding film. There are typically several different causes of gels, including unblended polymer, unreacted catalyst and activator, localized areas of varying molecular weight, localized areas of crosslinked material, and contamination (e.g., inorganics, sand, carbon black, etc.) that can reflect and transmit light differently from the surrounding polymer. The presence of gels can lower the value of these films and, in some cases, makes the films unmarketable.

[0003] A number of different techniques may be used to reduce gel formation in polyolefins. Careful control of upstream systems and extrusion temperatures can prevent contaminants such as fibers and degraded polymer or black specks that cause gels. While these techniques may be suitable for reducing certain types of gels, improved techniques for reduction of gels in polyolefins are needed, especially those techniques that can reduce gels due to localized areas of varying molecular weight which can be hard to remove.

SUMMARY

[0004] Disclosed herein is an example method for forming plastic products with reduced gels, comprising: melting a polyolefin resin in extruder to form a melt, adjusting specific energy input in the extruder to reduce gels in the melt, and forming the melt into a polyolefin product.

[0004a] In one aspect, there is provided a method for forming plastic products with reduced gels, comprising:

melting a polyolefin resin in extruder to form a melt;

adjusting specific energy input in the extruder to reduce gels in the melt; and

forming the melt into a polyolefin product,

the method further comprising passing the melt through a screen pack, wherein the screen pack comprises an inlet screen having a size from 20 mesh to 80 mesh, one or more intermediate screens having a size of 100 mesh or greater, and an outlet screen having a size from 20 mesh to 80 mesh, and

wherein the one or more intermediate screens comprise a screen having a size from 20 mesh 80 mesh sandwiched between screens of 100 mesh or larger.

[0005] Disclosed herein is an example method for forming plastic products with reduced gels, comprising: melting a polyolefin resin in extruder to form a melt; selecting a throttle valve position for gel reduction; setting the throttle valve at the selected throttle valve position to restrict flow of the melt out of the extruder; and forming the melt into a polyolefin product.

[0005a] In another aspect, there is provided a method for forming plastic products with reduced gels, comprising:

melting a polyolefin resin in extruder to form a melt;

selecting a throttle valve position for gel reduction;

setting the throttle valve at the selected throttle valve position to restrict flow of the melt out of the extruder; and

forming the melt into a polyolefin product,further comprising passing the melt through a screen pack, wherein the screen comprise an inlet screen having a size from 20 mesh to 80 mesh, one or more intermediate screens having a size of 100 mesh or greater, and an outlet screen having a size from 20 mesh to 80 mesh.

CLAIMS

What is claimed is:

1. A method for forming plastic products with reduced gels, comprising:

melting a polyolefin resin in extruder to form a melt;

adjusting specific energy input in the extruder to reduce gels in the melt; and

forming the melt into a polyolefin product,

the method further comprising passing the melt through a screen pack, wherein the screen pack comprises an inlet screen having a size from 20 mesh to 80 mesh, one or more intermediate screens having a size of 100 mesh or greater, and an outlet screen having a size from 20 mesh to 80 mesh, and

wherein the one or more intermediate screens comprise a screen having a size from 20 mesh 80 mesh sandwiched between screens of 100 mesh or larger.

2. The method of claim 1, wherein the step of adjusting the specific energy input comprises adjusting a throttle valve at an exit of the extruder to increase the specific energy input in the extruder.

3. The method of claim 1, wherein the step of adjusting the specific energy input comprises restricting flow of the melt out of the extruder.

4. The method of claim 1, wherein the step of adjusting the specific energy input comprises increasing suction pressure on a melt pump.

5. The method of claim 1, wherein the one or more intermediate screens comprise at least one screen having a size from 200 mesh to 250 mesh.

6. The method of any one of claims 1 to 5, further comprising passing the melt through a pelletizer configured to form the melt into pellets.

7. The method of any one of claims 1 to 5, further comprising passing the melt through a die configured to form the first melt and/or the second melt into a polyolefin film.

8. The method of any one of claims 1 to 7, wherein the polyolefin resin comprises a polyolefin made from ethylene monomers or branched higher alpha-olefin monomers containing from 3 to 20 carbon atoms.

9. The method of any one of claims 1 to 8, wherein the polyolefin resin comprises a polyolefin having a density of from 0.910 g/cm^3 to 0.975 g/cm^3.

10. The method of any one of claims 1 to 9, wherein the polyolefin resin comprises a polyolefin having a melt index ranging from 0.1 g/10 min to about 1000 g/10 min.

11. The method of any one of claims 1 to 10, wherein the polyolefin product comprises pellets, pipe, sheet, or a film.

12. A method for forming plastic products with reduced gels, comprising:

melting a polyolefin resin in extruder to form a melt;

selecting a throttle valve position for gel reduction;

setting the throttle valve at the selected throttle valve position to restrict flow of the melt out of the extruder; and

forming the melt into a polyolefin product, further comprising passing the melt through a screen pack, wherein the screen comprise an inlet screen having a size from 20 mesh to 80 mesh, one or more intermediate screens having a size of 100 mesh or greater, and an outlet screen having a size from 20 mesh to 80 mesh.

13. The method of claim 12, further comprising passing the melt through a pelletizer configured to form the melt into pellets.

14. The method of claim 12, further comprising passing the melt through a die configured to form the first melt and/or the second melt into a polyolefin film.

15. The method of any one of claims 12 to 14, wherein the polyolefin resin comprises a polyolefin made from ethylene monomers or branched higher alpha-olefin monomers containing from 3 to 20 carbon atoms.

16. The method of any one of claims 12 to 15, wherein the polyolefin resin comprises a polyolefin having a density of from 0.910 g/cm^3 to 0.975 g/cm^3.

17. The method of any one of claims 12 to 16, wherein the polyolefin resin comprises a polyolefin having a melt index range from 0.1 g/10 min to about 1000 g/10 min.