CLAIMS

1. A polyolefin reactor system comprising:

a first reactor configured to produce a first reactor discharge comprising a diluent and a first polyolefin;

a diluent separator configured to receive at least a portion of the first reactor discharge and to form a diluent recycle stream comprising diluent and a separator product stream comprising diluent and the first polyolefin;

a second reactor configured to receive the diluent separator product stream and to produce a second reactor discharge comprising a second polyolefin; and

a diluent feed stream configured to introduce fresh diluent to at least one of the diluent separator, the diluent separator product stream, or

the second reactor, such that the second reactor has a lower hydrogen content than the first reactor.

2. The polyolefin reactor system of claim 1, wherein at least a portion of the diluent recycle stream is recycled to the first reactor.

3. The polyolefin reactor system of claims 1 through 2, wherein the diluent recycle stream is sent to a suction of a circulation pump of the first reactor.

4. The polyolefin reactor system of claims 1 through 3, wherein the first reactor discharge comprises hydrogen, and the diluent recycle stream comprises hydrogen.

5. The polyolefin reactor system of claims 1 through 4, wherein the diluent separator is a hydrocyclone.

6. The polyolefin reactor system of claims 1 through 5, wherein the diluent separator comprises a wash column.

7. The polyolefin reactor system of claims 1 through 6, wherein the diluent separator comprises a decanter.

8. The polyolefin reactor system of claims 1 through 7, wherein the diluent recycle stream consists essentially of diluent.

9. The polyolefin reactor system of claims 1 through 8, wherein the second polyolefin has a higher average molecular weight than the first polyolefin.

10. The polyolefin reactor system of claims 1 through 9, wherein the second polyolefin has a lower average molecular weight than the first polyolefin.

11. The polyolefin reactor system of claims 1 through 10, wherein the first polyolefin is polyethylene.

12. The polyolefin reactor system of claims 1 through 11, wherein the diluent recycle stream is not modulated with a control valve, and is introduced directly into the first reactor.

CLAIMS

What is claimed is:

1. A polyolefin reactor system comprising:

a first reactor configured to produce a first reactor discharge comprising a diluent and a first polyolefin;

a diluent separator configured to receive at least a portion of the first reactor discharge and to form a diluent recycle stream comprising diluent and a separator product stream comprising diluent and the first polyolefin, wherein the diluent separator is selected from a hydrocyclone, a wash column and a decanter;

a second reactor configured to receive the diluent separator product stream and to produce a second reactor discharge comprising a second polyolefin; and

a diluent feed stream configured to introduce fresh diluent to at least one of the diluent separator, the diluent separator product stream, or the second reactor, such that the second reactor has a lower hydrogen content than the first reactor.

2. The polyolefin reactor system of claim 1, wherein at least a portion of the diluent recycle stream is recycled to the first reactor.

3. The polyolefin reactor system of claim 1, wherein the diluent recycle stream. is sent to a suction of a circulation pump of the first reactor.

4. The polyolefin reactor system of claim 1, wherein the first reactor discharge comprises hydrogen, and the diluent recycle stream comprises hydrogen.

5. The polyolefin reactor system of claim 1, wherein the diluent recycle stream consists essentially of diluent.

6. The polyolefin reactor system of claim 1, wherein the second polyolefin has a higher average molecular weight than the first polyolefin.

7. The polyolefin reactor system of claim 1, wherein the second polyolefin has a lower average molecular weight than the first polyolefin.

8. The polyolefin reactor system of claim 1, wherein the first polyolefin is polyethylene.

9. The polyolefin reactor system of claim 1, wherein the diluent recycle stream is not modulated with a control valve, and is introduced directly into the first reactor.

10. A polymerization reactor system comprising:

a first loop reactor configured to polymerize olefin monomer in the presence of a chain transfer agent to produce a first polyolefin, and to discharge a transfer slurry comprising the first polyolefin and the chain transfer agent;

a separation system configured to remove the chain transfer agent from the transfer slurry, and to discharge a fluffy slurry comprising the first polyolefin to a second loop reactor, and

the second loop reactor configured to polymerize olefin monomer to produce a second polyolefin and to discharge a product slurry comprising a product polyolefin comprising the first polyolefin and the second polyolefin, wherein the polymerization reactor system is capable to discharge the transfer slurry from the first loop reactor to the second loop reactor, bypassing the separation system.

11. The polymerization reactor system of claim 10, wherein the product polyolefin comprises a bimodal polyolefin.

12. The polymerization reactor system of claim 10, wherein the first polyolefin comprises a linear low-density polyethylene (LLDPE), and the second polyolefin comprises a high density polyethylene (HDPE).

13. The polymerization reactor system of claim 10, wherein the first polyolefin comprises a high density polyethylene (HDPE), and the second polyolefin comprises a linear low-density polyethylene (LLDPE).

14. The polymerization reactor system of claim 10, wherein the chain transfer agent comprises hydrogen.

15. The polymerization reactor system of claim 10, wherein polymerization reactor system is configured to add hydrogenation catalyst to the transfer slurry.

16. The polymerization reactor system of claim 10, wherein the second polyolefin has a higher average molecular weight than the first polyolefin.

17. The polymerization reactor system of claim 10, wherein the second polyolefin has a lower average molecular weight than the first polyolefin.

18. The polymerization reactor system of claim 10, wherein the first loop reactor is configured to discharge continuously the transfer slurry.

19. The polymerization reactor system of claim 10, wherein the first loop reactor is configured to discharge intermittently the transfer slurry.

20. The polymerization reactor system of claim 10, wherein the first loop reactor is configured to discharge the transfer slurry via a settling leg.

21. The polymerization reactor system of claim 10, comprising a heater configured to heat the transfer slurry.

22. A method of operating a polyolefin reactor system comprising:

polymerizing olefin in the presence of a chain transfer agent in a first reactor to form an intermediate polyolefin;

discharging from the first reactor a transfer slurry comprising the intermediate polyolefin and the chain transfer agent:

processing the transfer slurry to remove chain transfer agent and to provide a fluff slurry comprising the intermediate polyolefin and a lower content of chain transfer agent than in the transfer slurry;

feeding the fluff slurry to a second reactor;

polymerizing olefin in the second reactor to form a product polyolefin; and

discharging, from the second reactor a product slurry comprising the product polyolefin, wherein the intermediate polyolefin comprises a linear low-density polyethylene (LLDPE), and the product polyolefin comprises the intermediate polyolefin and a high density polyethylene (HDPE).

23. The method of claim 22, wherein the product polyolefin is a bimodal polyolefin.

24. The method of claim 22, wherein the chain transfer agent comprises hydrogen.

25. The method of claim 22, wherein processing the transfer slurry comprises adding hydrogenation catalyst to the transfer slurry.

26. The method of claim 22, wherein processing the transfer slurry comprises reducing pressure of the transfer slurry to flash diluent and the chain transfer agent in the transfer slurry.

27. The method of claim 22, wherein discharging the transfer slurry from the first reactor comprises discharging continuously the transfer slurry from the first reactor.

28. The method of claim 22, wherein discharging the transfer slurry from the first reactor comprises discharging the transfer slurry from the first reactor through a settling leg.

29. The method of claim 22, comprising heating the transfer slurry.

30. A method of operating a polyolefin reactor system, comprising:

polymerizing olefin in the presence of a chain transfer agent in a first reactor to form an intermediate polyolefin;

discharging from the first reactor a transfer slurry comprising the intermediate polyolefin and the chain transfer agent;

processing the transfer slurry to remove chain transfer agent and to provide a fluff slurry comprising the intermediate polyolefin and a lower content of chain transfer agent than in the transfer slurry;

feeding the fluff slurry to a second reactor;

polymerizing olefin in the second reactor to form a product polyolefin; and

discharging from the second reactor a product slurry comprising the product polyolefin, wherein the intermediate polyolefin comprises a high density polyethylene (HDPE), and the product polyolefin comprises the intermediate polyolefin and a linear low-density polyethylene (LLDPE).

31. A method of operating a polyolefin reactor system, comprising:

polymerizing olefin in the presence of a chain transfer agent in a first reactor to form an intermediate polyolefin;

discharging from the first reactor a transfer slurry comprising the intermediate polyolefin and the chain transfer agent;

processing the transfer slurry to remove chain transfer agent and to provide a fluff slurry comprising the intermediate polyolefin and a lower content of chain transfer agent than in the transfer slurry;

feeding the fluff slurry to a second reactor;

polymerizing olefin in the second reactor to form a product polyolefin; and

discharging from the second reactor a product slurry comprising the product polyolefin, wherein processing the transfer slurry comprises feeding the transfer slurry to a hydrocyclone that removes the chain transfer agent and discharges the fluff slurry.

32. A method of operating a polyolefin reactor system comprising:

polymerizing olefin in the presence of a chain transfer agent in a first reactor to form an intermediate polyolefin;

discharging from the first reactor a transfer slurry comprising the intermediate polyolefin and the chain transfer agent;

processing the transfer slurry to remove chain transfer agent and to provide a fluffy slurry comprising the intermediate polyolefin and a lower content of chain transfer agent than in the transfer slurry;

feeding the fluff slurry to a second reactor;

polymerizing olefin in the second reactor to form a product polyolefin; and

discharging from the second reactor a product slurry comprising the product polyolefin, wherein processing the transfer slurry comprises feeding the transfer slurry to a decanter.