CLAIMS:

1. A method of operating a polyolefin manufacturing system, comprising:

   producing a first polyolefin in a first loop slurry polymerization reactor, wherein producing the first polyolefin comprises polymerizing olefin at a first temperature;

   discharging from the first loop slurry polymerization reactor a transfer slurry comprising solid particles of the first polyolefin and a diluent;

   cooling the transfer slurry by transferring heat from the transfer slurry to a cooling medium to produce a second reactor transfer feed slurry having a second temperature, wherein the first temperature is greater than the second temperature;

   introducing the second reactor transfer feed slurry into a second loop slurry polymerization reactor;

   producing a second polyolefin in the second loop slurry polymerization reactor, wherein producing the second polyolefin comprises polymerizing olefin at the second temperature; and

   discharging from the second loop slurry polymerization reactor a second reactor discharge slurry comprising solid particles of the first polyolefin and the second polyolefin,

   wherein the transfer slurry and the second reactor transfer feed slurry have a temperature difference of at least 3° F.,

   wherein the transfer slurry is not recycled into the transfer slurry or the first loop slurry polymerization reactor, and

   wherein the second reactor discharge slurry is not recycled into the transfer slurry, the second reactor transfer feed, the first loop slurry polymerization reactor, or the second loop slurry polymerization reactor.

2. The method of claim 1, wherein cooling the transfer slurry comprises receiving the cooling medium to cool the transfer slurry.

3. The method of claim 1, comprising receiving the cooling medium at a heat exchanger, and wherein cooling the transfer slurry comprises subjecting the transfer slurry to the heat exchanger.

4. The method of claim 1, comprising routing the transfer slurry through a first portion of a transfer line to a heat exchanger comprising the cooling medium, and wherein cooling the transfer slurry comprises removing heat from the transfer slurry via the heat exchanger.

5. The method of claim 1, wherein cooling the transfer slurry comprises evaporation cooling of the transfer slurry.

6. The method of claim 5, wherein the evaporation cooling comprises flashing the diluent in the transfer slurry.

7. The method of claim 1, wherein the slurry discharged from the second loop slurry polymerization reactor comprises a product polyolefin comprising the first polyolefin and the second polyolefin.

8. The method of claim 7, wherein the product polyolefin comprises a bimodal polyolefin.

9. The method of claim 1, wherein the first polyolefin comprises a high density polyethylene, and the second polyolefin comprises a low density polyethylene.

10. The method of claim 1, comprising cooling a feed stream to the second loop slurry polymerization reactor.

11. The method of claim 1, wherein the first loop slurry polymerization reactor and the second loop slurry polymerization reactor are substantially the same size in volume.

12. The method of claim 1, wherein the first loop slurry polymerization reactor and the second loop slurry polymerization reactor differ in size by volume.

13. The method of claim 1, wherein the first loop slurry polymerization reactor is 50% to 90% in size by volume of the second loop slurry polymerization reactor.

14. A method of manufacturing polyolefin, comprising:

    polymerizing olefin at a first temperature in a first loop slurry reactor into a first polyolefin;

    discharging from the first loop slurry reactor a first slurry comprising solid particles of the first polyolefin and a diluent;

    cooling the first slurry to a second temperature by transferring heat from the first slurry to a cooling medium to form a transfer slurry;

    cooling a feed stream;

    combining the feed stream with at least a portion of the transfer slurry;

    feeding the combined feed stream and transfer slurry to a second loop slurry reactor; and

    polymerizing olefin at the second temperature in the second loop slurry reactor into a second polyolefin, wherein the first temperature is greater than the second temperature,

    wherein the transfer slurry is not recycled into the first slurry or the first loop slurry reactor, and

    wherein the second polyolefin is not recycled into the transfer slurry, the first loop slurry reactor, or the second loop slurry reactor.

15. The method of claim 14, wherein the first slurry and the transfer slurry have a temperature difference of at least 3° F.