CLAIMS:

1. A polyolefin production system comprising:

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

a second reactor configured to produce a second reactor discharge comprising a second polyolefin; and

a reactor transfer zone configured to receive the first reactor discharge and transfer at least a portion of the first reactor discharge to the second reactor as a second reactor transfer feed, wherein the first reactor discharge and the second reactor transfer feed have a temperature difference of at least 3 ºF.

2. The polyolefin production system of claim 1, wherein the reactor transfer zone comprises a heat exchanger.

3. The polyolefin production system of claim 1, wherein the reactor transfer zone comprises a slurry transfer line for the second reactor transfer feed, the slurry transfer line having a jacket for a cooling medium.

4. The polyolefin production system of claim 1, wherein the reactor transfer zone is configured to receive a cooling medium to remove heat from the second reactor transfer feed, and wherein the temperature difference is at least 10ºF.

5. The polyolefin production system of claim 1, wherein the reactor transfer zone comprises a vessel configured for evaporative cooling to lower a temperature of the second reactor transfer feed.

6. The polyolefin production system of claim 1, wherein the first polyolefin has a different average molecular weight than the second polyolefin, and wherein the first polyolefin has a different density than the second polyolefin.

7. The polyolefin production system of claim 1, wherein the first polyolefin is a low molecular weight – high density polyolefin, and the second polyolefin is a high molecular weight – low density polyolefin.

8. A polyolefin production system comprising:

~~a first reactor configured to produce a transfer slurry comprising a first polyolefin polymerized in the first reactor;~~

~~a heat exchanger configured to remove heat from the transfer slurry; and~~

~~a second reactor configured to receive the transfer slurry cooled by the heat exchanger, and to produce a product slurry comprising a product polyolefin having the first polyolefin and a second polyolefin polymerized in the second reactor.~~

~~9. The polyolefin production system of claim 8, wherein the heat exchanger is configured to receive a cooling medium, and wherein the heat exchanger comprises a jacketed pipe heat exchanger, a shell-and-tube heat exchanger, a plate-and-frame heat exchanger, or any combination thereof.~~

~~10. The polyolefin production system of claim 8, comprising a transfer line to route the transfer slurry to the second reactor, wherein the heat exchanger is disposed along the transfer line.~~

~~11. The polyolefin production system of claim 8, wherein the first polyolefin has a different molecular weight than the second polyolefin, and wherein the first polyolefin has a different density than the second polyolefin .~~

~~12. The polyolefin production system of claim 8, comprising an additional heat exchanger configured to remove heat from a feed stream other than the transfer slurry to the second reactor.~~

~~13. The polyolefin production system of claim 12, wherein the feed stream is a diluent feed stream.~~

~~14. The polyolefin production system of claim 12, wherein the feed stream comprises monomer or comonomer, or both.~~

~~15.~~

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

producing a first polyolefin in a first loop slurry polymerization reactor~~;~~

~~cooling a transfer slurry comprising the first polyolefin from the first polymerization reactor;~~

~~introducing the transfer slurry into a second polymerization reactor;~~

~~, wherein~~ producing ~~a second~~the first polyolefin ~~in the second polymerization reactor; and~~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~~.~~,

~~16.~~

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 15~~1, wherein cooling the transfer slurry comprises receiving ~~a~~the cooling medium to cool the transfer slurry.

~~17.~~

3. The method of ~~claim 15~~1, comprising receiving ~~a~~the cooling medium at a heat exchanger, and wherein cooling the transfer slurry comprises subjecting the transfer slurry to the heat exchanger.

~~18.~~

4. The method of ~~claim 15~~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.

~~19.~~

5. The method of ~~claim 15~~1, wherein cooling the transfer slurry comprises evaporation cooling of the transfer slurry.

~~20.~~

6. The method of ~~claim 19~~5, wherein the evaporation cooling comprises flashing the diluent in the transfer slurry.

~~21.~~

The method of ~~claim 15, wherein producing the first polyolefin comprises polymerizing olefin at a first temperature in the first polymerization reactor, and producing the second polyolefin~~

~~comprises polymerizing olefin at a second temperature in the second polymerization reactor, wherein the first temperature is greater than the second temperature.~~

7. ~~22. The method of claim 15~~1, wherein the slurry discharged from the second loop slurry polymerization reactor comprises a product polyolefin ~~having~~comprising the first polyolefin and the second polyolefin.

~~23.~~

8. The method of~~-~~ claim ~~20~~7, wherein the product polyolefin comprises a bimodal polyolefin.

~~24.~~

9. The method of~~-~~ claim ~~15~~1, wherein the first polyolefin comprises a high density polyethylene, and the second polyolefin comprises a low density polyethylene.

~~25.~~

10. The method of~~–~~ claim ~~15~~1, comprising cooling a feed stream to the second loop slurry polymerization reactor.

~~26.~~

11. The method of~~-~~ claim ~~15~~1, wherein the first loop slurry polymerization reactor and the second loop slurry polymerization reactor are substantially the same size in volume.

~~27.~~

12. The method of~~-~~ claim ~~15~~1, wherein the first loop slurry polymerization reactor and the second loop slurry polymerization reactor differ in size by volume.

~~28.~~

13. The method of~~-~~ claim ~~15~~1, wherein the first loop slurry polymerization reactor is 50% to 90% in size by volume of the second loop slurry polymerization reactor.

~~29.~~

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 ~~first slurry to form a transfer slurry;~~

~~feeding the~~ transfer slurry;

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

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

~~30.~~

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 ~~29~~14, wherein the first slurry and the transfer slurry have a temperature difference of at least ~~3°F.~~3° F.