~~WHAT IS CLAIMED IS~~CLAIMS:

1. A method of making a polyisobutylene polymer in a recirculating loop reactor with one or more reaction tubes in contact with a heat transfer medium comprising:

(a) providing a feed mixture consisting essentially of polymerizable monomer and catalyst to a residual reactor stream at a feed rate to form a reaction mixture, the reaction mixture containing less than 5% by weight diluent components;

(b) recirculating the reaction mixture in the one or more reaction tubes of the loop reactor at a recirculation rate greater than the feed rate utilizing a recirculating pump operating at a pressure differential, delta P, corresponding to a recirculating flow;

(c) polymerizing the reaction mixture in the one or more tubes of the loop reactor to convert the feed mixture to polyisobutylene polymer while cooling the one or more tubes of the loop reactor with the heat transfer medium; and

(e) withdrawing polyisobutylene polymer from the loop reactor,

with the further proviso that either (i) delta P and polymerization reaction are controlled to provide a linear velocity of the reaction mixture of at least 3 m/s (10 ft/sec) in the one or more reaction tubes of the loop reactor or (ii) the recirculating pump operating at a pressure differential, delta P, of from 241 kPa to 552 kPa (35 psi to 80 psi) and controlling the pressure delta and polymerization reaction of steps (b) and (c) to provide a recirculation ratio of the recirculation rate to the feed rate of at least 30:1.

~~2. The method according to Claim 1, wherein the feed mixture and the reaction mixture contain 3% by weight or less diluent components.~~

~~3~~2. The method according to Claim 1, wherein the feed mixture and the reaction mixture contain 1.5% by weight or less diluent components.

~~4~~3. The method according to Claim 1, wherein the feed mixture and the reaction mixture contain 1% by weight or less diluent components.

~~5. The method according to Claim 1, wherein the feed mixture and the reaction mixture contain 0.5% by weight or less diluent components.~~

~~6~~4. The method according to Claim 1, wherein the delta P and polymerization reaction are controlled to provide a linear velocity of the reaction mixture of at least 3 m/s (10 ft/sec) in the one or more reaction tubes of the loop reactor.

~~7. The method according to Claim 6, wherein the delta P delta and polymerization reaction are controlled to provide a linear velocity of the reaction mixture of at least 11 ft/sec in the one or more reaction tubes of the loop reactor.~~

~~8~~5. The method according to Claim ~~7~~4, wherein the delta P and polymerization reaction are controlled to provide a linear velocity of the reaction mixture of at least 3.7 m/s (12 ft/sec) in the one or more reaction tubes of the loop reactor.

~~9. The method according to Claim 8, wherein the delta P and polymerization reaction are controlled to provide a linear velocity of the reaction mixture of at least 13 ft/sec in the one or more reaction tubes of the loop reactor.~~

~~10. The method according to Claim 9, wherein the delta P and polymerization reaction are controlled to provide a linear velocity of the reaction mixture of at least 14 ft/sec in the one or more reaction tubes of the loop reactor.~~

~~11. The method according to Claim 1, wherein the delta P and polymerization reaction are controlled to provide a linear velocity of the reaction mixture of from 10 ft/sec to 20 ft/sec in the one or more reaction tubes of the loop reactor.~~

~~12~~6. The method according to Claim 1, wherein the polyisobutylene withdrawn from the loop reactor is a highly reactive polyisobutylene with a number average molecular weight of from 500 to 4000 Daltons.

~~13. The method according to Claim 12, wherein the loop reactor is operated with a catalyst turnover number of from 650 to 1350 lbs. polymer/lbs. catalyst when the polyisobutylene withdrawn from the loop reactor is a highly reactive polyisobutylene with a number average molecular weight of from 1500 to 4000 Daltons.~~

~~14. The method according to Claim 13, wherein the loop reactor is operated with a catalyst turnover number of at least 750 lbs. polymer/lbs. catalyst.~~

~~15. The method according to Claim 12, wherein the loop reactor is operated with a catalyst turnover number of from 800 to 1500 lbs. polymer/lbs. catalyst when the polyisobutylene withdrawn from the loop reactor is a highly reactive polyisobutylene with a number average molecular weight of from 500 to 1500 Daltons.~~

~~16. The method according to Claim 15, wherein the loop reactor is operated with a catalyst turnover number of at least 900 lbs. polymer/lbs. catalyst.~~

~~17~~7. The method according to Claim 1, wherein the polymer withdrawn from the loop reactor is a mid-range vinylidene polyisobutylene polymer with a number average molecular weight of from 500 Daltons to 4000 Daltons.

~~18~~8. The method according to Claim ~~1~~7, wherein the loop reactor is operated with a catalyst turnover number of from 1600 kg polymer/kg catalyst (lbs. polymer/lbs. catalyst) to 3000 kg polymer/kg catalyst (lbs. polymer/lbs. catalyst).

~~19. The method according to Claim 17, wherein the loop reactor is operated with a catalyst turnover number of at least 1700 lbs. polymer/lbs. catalyst.~~

~~20. The method according to Claim 17, wherein the loop reactor is operated with a catalyst turnover number of at least 1800 lbs. polymer/lbs. catalyst.~~

~~21. The method according to Claim 1, wherein the loop reactor has a plurality of reaction tubes.~~

~~22. The method according to Claim 21, wherein the loop reactor is a two-pass loop reactor.~~

~~23~~9. ~~A~~The method according to Claim 1 ~~of making a polyisobutylene polymer in a recirculating loop reactor with one or more reaction tubes in contact with a heat transfer medium~~ comprising:

~~(a) providing a feed mixture consisting essentially of polymerizable monomer and catalyst to a residual reactor stream at a feed rate~~

~~to form a reaction mixture, the reaction mixture containing less than 5% by weight diluent components;~~

~~(b)~~ recirculating the reaction mixture in the one or more reaction tubes of the loop reactor at a recirculation rate utilizing a recirculating pump operating at a pressure differential, delta P, of from 241 kPa to 552 kPa (35 psi to 80 psi);

~~(c) polymerizing the reaction mixture in the one or more tubes of the loop reactor to convert the feed mixture to polyisobutylene polymer while cooling the one or more tubes of the loop reactor with the heat transfer medium;~~

~~(d)~~ controlling the pressure delta and polymerization reaction of steps (b) and (c) to provide a recirculation ratio of the recirculation rate to the feed rate of at least 30:1~~; and~~

~~(e) withdrawing polyisobutylene polymer from the loop reactor~~.

~~24. The method according to Claim 23, wherein the feed mixture and the reaction mixture contain 3% by weight or less diluent components.~~

~~25. The method according to Claim 23, wherein the feed mixture and the reaction mixture contain 1.5% by weight or less diluent components.~~

~~26. The method according to Claim 23, wherein the feed mixture and the reaction mixture contain 1% by weight or less diluent components.~~

~~27. The method according to Claim 23, wherein the feed mixture and the reaction mixture contain 0.5% by weight or less diluent components.~~

~~28~~10. The method according to Claim ~~23~~9, wherein the conversion of isobutylene monomer to polymer is from 50% to 80%.

~~29. The method according to Claim 23, wherein the conversion of isobutylene monomer to polymer is at least 55%.~~

~~30. The method according to Claim 23, wherein the delta P of the recirculating pump is at least 40 psi.~~

~~31. The method according to Claim 23, wherein the delta P of the recirculating pump is at least 45 psi.~~

~~32~~11. The method according to Claim ~~31~~9, wherein the ~~wherein the~~ delta P of the recirculating pump is at least 345 kPa (50 psi).

~~33. The method according to Claim 28, wherein the wherein the delta P of the recirculating pump is at least 55 psi.~~

~~34~~12. The method according to Claim ~~27~~11, wherein the ~~wherein the~~ delta P of the recirculating pump is at least 414 kPa (60 psi).

~~35~~13. The method according to Claim ~~23~~9, operated at a recirculation ratio of from 30:1 to 50:1.

~~36~~14. The method according to Claim ~~35~~13, operated at a recirculation ratio of at least 35:1.

~~37. The method according to Claim 35, operated at a recirculation ratio of at least 37.5:1.~~

~~38. The method according to Claim 35, operated at a recirculation ratio of at least 40:1.~~

~~39. The method according to Claim 35, operated at a recirculation ratio of at least 45:1.~~

~~40. The method according to any of the proceeding Claims, operated continuously at a residence time of from 1 to 10 minutes.~~

~~41. The method according to any one of Claims 1 through 39, operated continuously at a residence time of from 2 to 8 minutes.~~

~~42~~15. The method according to any of Claims 1 through ~~39~~14, operated continuously at a residence time of from 3 to 6 minutes.