Claims

1. An in-line blending process for polymers comprising:

(a) providing two or more reactor-low pressure separator units (1,7) in parallel configuration, each reactor-low pressure separator unit comprising one reactor (2,8) fluidly connected to one low pressure separator (3,9) downstream and further a recycling line (5,11) connecting the low pressure separator (3,9) back to the corresponding reactor (2,8);

(b) contacting in the two or more reactors (2,8) of each reactor-low pressure separator unit (1,7)

1) olefin monomers having two or more carbon atoms,

2) one or more catalyst systems,

3) optionally one or more comonomers,

4) optionally one or more chain transfer agents, and

5) optionally one or more diluents or solvents,

wherein the reactors (2,8) are operated under operating conditions which ensure that the reactor contents form a single homogeneous phase, the reactor contents comprising the olefin monomers, any comonomer present, any diluent or solvent present, any chain transfer agent present, and the polymer product;

whereby the catalyst system for each reactor comprises one or more catalyst precursors, one or more activators, and optionally, one or more catalyst supports;

(c) forming an unreduced reactor effluents stream including a homogeneous fluid phase polymer-monomer-solvent mixture in each of the reactors (2,8);

(d) passing the unreduced reactor effluents streams from each of the reactors (2,8) through the corresponding low pressure separators (3,9),

whereby the temperature and pressure of the low pressure separators (3,9) is adjusted such that a liquid phase and a vapour phase are obtained, thereby yielding a polymer-enriched liquid phase and a polymer-lean vapour phase;

(e) separating the polymer-lean vapour phase from the polymer-enriched liquid phase in each of the low-pressure separators (3,9)

to form separated polymer-lean vapour streams and separated polymer-enriched liquid streams;

(f) combining the polymer-enriched liquid streams from step (e) in a further low-pressure separator and/or a mixer (13) to produce a combined polymer-enriched liquid stream (16);

(g) reintroducing the polymer-lean vapour streams from step (e) via recycling lines (5,11) into the corresponding reactors (2,8).

2. The process of claim 1, comprising a step of heating the unreduced reactor effluents stream of (c).

3. The process of claim 2, comprising a step of heating the unreduced reactor effluents stream of (c) in two stages including a pre-heating stage and a final-heating stage.

4. The process of claim 3, wherein the pre-heating is effected by a heat exchanger transferring heat from the separation of (d) on the unreduced reactor effluents from the two or more reactors.

5. The process of claim 3, wherein the final-heating stage includes heating of the unreduced reactor effluents stream at least 180 °C.

6. The process of claim 5, wherein the final-heating stage includes heating of the unreduced reactor effluents stream at least 200 °C.

7. The process of claim 6, wherein the final-heating stage includes heating of the unreduced reactor effluents stream at least 210 °C.

8. The process of claim 1, wherein at least one of the reactors includes a solvent mixture of hydrocarbons with major components having a number of carbon atoms between 4 and 9, i.e. C4-C9.

9. The process of claim 1, wherein the optional one or more comonomers of (b) comprise one or more of ethylene, propylene, butenes, pentenes, hexenes, heptenes, oct enes, decenes, or dodecenes.

10. The process of claim 1, wherein one of the two or more reactors polymerizes a homopolymer or a random co-polymer and wherein one of the at least two or more reactors polymerizes a copolymer.

11. The process of claim 10, wherein the homopolymer is chosen from isotactic polypropylene, syndiotactic polypropylene, atactic polypropylene, polyethylene, polybutene, polybutadiene, polypentene, polyhexene, polyheptene, polyoctene, polydecene, and polystyrene.

12. The process of claim 10, wherein the copolymer is chosen from ethylenepropylene, propylene-butene-1, propylene-pentene-1, propylene-hexene-1, propyleneheptene-1, propylene-octene-1, ptopylene-decene-1, ethylene-butene-1, ethylenepentene-1, ethylene-hexene-1, ethylene-heptene-1, and ethylene-octene-1 copolymers.

13. The process of claim 1, further comprising separating low molecular weight oligomers, low molecular weight polymers, solvents/diluents, or combinations thereof from the separated polymer-lean vapour phases of step (d).

14. The process of claim 1, wherein combining the polymer-enriched liquid streams in step (f) is effected by a mixer and by a subsequently arranged further low pressure separator.

15. The process of claim 1, whereby the polymer-enriched liquid streams of step (e) are heated before, during, or after combination.

16. The process of claim 1, wherein the low pressure separators are operated at a pressure of less than 1.5 MPa and at a temperature of less than 240 °C.

17. The process of claim 16, wherein the low pressure separators are operated at a pressure of less than 1.2 MPa and at a temperature of less than 220 °C.

18. The process of claim 17, wherein the low pressure separators are operated at a pressure of less than 1.0 MPa and at a temperature of less than 200 °C.

19. The process of claim 1, wherein the polymer content in the separated polymer-enriched liquid phase from step (e) is from 40 to 90 % by weight, based on the total weight content of the separated polymer-enriched liquid phase.