## CLAIMS

What is claimed is –

1. A process for separating an olefin-containing stream to form one or more product streams, wherein said process comprises:

(a) introducing a column feed stream to in an ethylene fractionator, wherein said column feed stream comprises a recycle content ethylene composition obtained by cracking r-pyoil (r-ethylene);

(b) separating said column feed stream comprising ethane and ethylene in said ethylene fractionator into an overhead stream enriched in ethylene and a bottoms stream enriched in ethane,

wherein the mole ratio of ethylene to ethane in said column feed stream is at least 0.1% higher than if said column feed stream did not include said r-ethylene but had the same mass flow rate.

2. The process of claim 1, further comprising prior to the introducing, cracking a cracker feed stream comprising a recycle content pyrolysis oil (r-pyoil) in a cracker furnace to provide an olefin-containing effluent, wherein said column feed comprises at least a portion of said olefin-containing effluent.

3. A process for separating an olefin-containing stream to form one or more product streams, wherein said process comprises:

(a) introducing a column feed stream to an ethylene fractionator column, wherein said column feed stream comprises a recycle content ethylene composition obtained by cracking r-pyoil (r-ethylene);

(b) separating said column feed stream comprising ethane and ethylene in said ethylene fractionator into an overhead stream enriched in ethylene and a bottoms stream enriched in ethane,

wherein the mass flow rate of ethane in said overhead stream is at least 0.1% lower than if said column feed stream did not include said r-ethylene but had the same mass flow rate.

4. The process of claim 4, further comprising prior to the introducing, cracking a cracker feed stream comprising a recycle content pyrolysis oil (r-pyoil) in a cracker furnace to provide an olefin-containing effluent, wherein said column feed comprises at least a portion of said olefin-containing effluent.

5. A process for separating an olefin-containing stream to form one or more product streams, wherein said process comprises:

(a) introducing a column feed stream to an ethylene fractionator, wherein said column feed stream comprises a recycle content ethylene composition obtained by cracking r-pyoil (r-ethylene);

(b) separating said column feed stream comprising ethane and ethylene in said ethylene fractionator into an overhead stream enriched in ethylene and a bottoms stream enriched in ethane, and

(c) refluxing at least a portion of the column overhead stream back into the ethylene fractionator,

wherein the reflux ratio used during said separating is at least 0.1% lower than the reflux ratio used if said column feed stream did not include said r-ethylene but had the same mass flow rate.

6. The process of claim 6, further comprising prior to the introducing, cracking a cracker feed stream comprising a recycle content pyrolysis oil (r-pyoil) in a cracker furnace to provide an olefin-containing effluent, wherein said column feed comprises at least a portion of said olefin-containing effluent.

7. A process for separating an olefin-containing stream to form one or more product streams, wherein said process comprises:

(a) introducing a column feed stream to an ethylene fractionator, wherein said column feed stream comprises a recycle content ethylene composition obtained by cracking r-pyoil (r-ethylene); and

(b) separating said column feed stream said ethylene fractionator to form an overhead stream enriched in ethylene and a bottoms stream depleted in ethylene, wherein the differential pressure across said ethylene fractionator is at least 0.1% lower than the reflux ratio used if said column feed stream did not include said r-ethylene but had the same mass flow rate.

8. The process of claim 8, further comprising prior to the introducing, cracking a cracker feed stream comprising a recycle content pyrolysis oil (r-pyoil) in a cracker furnace to provide an olefin-containing effluent, wherein said column feed comprises at least a portion of said olefin-containing effluent.

9. A process for making olefins, said process comprising:

(a) cracking a cracker feed stream comprising a recycle content pyrolysis oil composition (r-pyoil) and a stream comprising non-recycle content ethane in a cracker furnace to provide an olefin-containing effluent;

(b) introducing a column feed stream comprising at least a portion of said olefin-containing effluent into an ethylene fractionator; and

(c) separating said column feed stream into an ethylene-enriched overhead and an ethylene-depleted bottoms stream,

wherein the mole ratio of ethylene to ethane in said column feed stream is higher than if said cracker feed stream did not include said r-pyoil but had the same mass flow rate.

10. The process of claim 10, prior to said cracking, introducing a first feed stream comprising a C2 to C4 hydrocarbon composition and a second feed stream comprising said r-pyoil separately into the cracking furnace, wherein said introducing includes feeding a stream comprising said C2 to C4 hydrocarbon

composition into a first coil in said cracker furnace and feeding a stream comprising said r-pyoil into a second coil in said cracker furnace separate from said first coil.

11. A process for making olefins, said process comprising:

(a) cracking a cracker feed stream comprising a recycle content pyrolysis oil composition (r-pyoil) and a stream comprising non-recycle content ethane in a cracker furnace to provide an olefin-containing effluent;

(b) introducing a column feed stream comprising at least a portion of said olefin-containing effluent into an ethylene fractionator; and

(c) separating said column feed stream into an ethylene-enriched overhead and an ethylene-depleted bottoms stream,

wherein the mole ratio of ethylene in said ethylene-enriched overhead stream to ethane in said cracker feed stream is higher than if said cracker feed stream did not include said r-pyoil but had the same mass flow rate.

12. The process of claim 13, prior to said cracking, introducing a first feed stream comprising a C2 to C4 hydrocarbon composition and a second feed stream comprising said r-pyoil separately into the cracking furnace, wherein said introducing includes feeding a stream comprising said C2 to C4 hydrocarbon composition into a first coil in said cracker furnace and feeding a stream comprising said r-pyoil into a second coil in said cracker furnace separate from said first coil.

13. A process for making olefins, said process comprising:

(a) cracking a cracker feed stream comprising a recycle content pyrolysis oil composition (r-pyoil) and a stream comprising non-recycle content ethane in a cracker furnace to provide an olefin-containing effluent;

(b) separating at least a portion of the olefin-containing effluent in an ethylene fractionator into an ethylene-enriched overhead stream and an ethane-enriched bottoms stream; and

(c) recycling at least a portion of said ethane-enriched bottoms stream to said cracker furnace, wherein said cracker feed stream comprises at least a portion of said ethane-enriched bottoms stream,
wherein the ratio of the weight of non-recycle content ethane in said cracker feed stream to the weight of ethane in said ethane-enriched stream is at least 0.1% lower than if said cracker feed stream did not include said r-pyoil but had the same mass flow rate.

14. The process of claim 15, prior to said cracking, introducing a first feed stream comprising a C2 to C4 hydrocarbon composition and a second feed stream comprising said r-pyoil separately into the cracking furnace, wherein said introducing includes feeding a stream comprising said C2 to C4 hydrocarbon composition into a first coil in said cracker furnace and feeding a stream comprising said r-pyoil into a second coil in said cracker furnace separate from said first coil.

15. A process for making olefins, said process comprising:
cracking a cracker feed stream comprising a recycle content pyrolysis oil composition (r-pyoil) and a stream comprising non-recycle content ethane in a cracker furnace to provide an olefin-containing effluent,
wherein the amount of ethylene in said olefin-containing effluent is at least 0.1% higher than if said cracker feed stream did not include said r-pyoil but had the same mass flow rate.

16. The process of claim 17, prior to said cracking, introducing a first feed stream comprising a C2 to C4 hydrocarbon composition and a second feed stream comprising said r-pyoil separately into the cracking furnace, wherein said introducing includes feeding a stream comprising said C2 to C4 hydrocarbon composition into a first coil in said cracker furnace and feeding a stream comprising said r-pyoil into a second coil in said cracker furnace separate from said first coil.

17. A process for separating an olefin-containing stream to form one or more product streams, wherein said process comprises:

(a) introducing a column feed stream to an ethylene fractionator column, wherein said column feed stream comprises a recycle content ethylene composition obtained by cracking r-pyoil (r-ethylene);

(b) separating said column feed stream comprising ethane and ethylene in said ethylene fractionator into an overhead stream enriched in ethylene and a bottoms stream enriched in ethane,

wherein the volumetric or mass flow rate of liquid within the ethylene fractionator is at least 0.1% lower than the liquid or mass flow rate in the ethylene fractionator if said cracker stream did not include said r-pyoil but had the same mass flow rate.

18. The process of claims 19, prior to said cracking, introducing a first feed stream comprising a C2 to C4 hydrocarbon composition and a second feed stream comprising said r-pyoil separately into the cracking furnace, wherein said introducing includes feeding a stream comprising said C2 to C4 hydrocarbon composition into a first coil in said cracker furnace and feeding a stream comprising said r-pyoil into a second coil in said cracker furnace separate from said first coil.