WHAT IS CLAIMED IS:

1. A method of purifying a linear alpha olefin product, comprising:

(a) feeding a linear alpha olefin feed stream comprising the linear alpha olefin product and ethylene into a feed stage of a distillation column, the distillation column having a plurality of stacked stages positioned between an overhead outlet and a bottoms reboiler including a stripping section of the distillation column between the feed stage and the bottoms reboiler and a rectifying section between the feed stage and the overhead outlet;

(b) feeding an aliphatic paraffin hydrocarbon solvent to the rectifying section of the distillation column to absorb linear alpha olefin;

(c) adding heat to at least one of said plurality of stacked stages in the stripping section of the distillation column between the feed stage and the bottoms reboiler;

(d) withdrawing an overhead stream comprising ethylene from the overhead outlet; and

(e) withdrawing a bottoms stream from the distillation column comprising the linear alpha olefin product.

2. The method of claim 1, comprising adding heat to a plurality of stacked stages in the stripping section of the distillation column, such as adding heat to at least 2 and up to 6 stages.

3. The method of claim 1 or claim 2, wherein said adding heat comprises adding heat through a heat exchanger positioned either within the distillation column or external to the distillation column, and optionally wherein the amount of heat added to the stripping section above the reboiler is 50 to 75% of the total heat duty added to the stripping section of the distillation column.

4. The method of claim 1 or claim 2, wherein adding heat comprises:

i) withdrawing a liquid side stream from at least one of said plurality of stacked stages in the stripping section of the distillation column;

ii) feeding the side stream into a side reboiler adapted to at least partially vaporize the side stream to produce a vapor-containing effluent; and

iii) returning the vapor-containing effluent from the side reboiler to a stage of the stripping section of the distillation column.

5. The method of claim 4, further comprising conducting the (i) withdrawing, (ii) feeding, and (iii) returning steps at a plurality of stages in the stripping section of the distillation column using a plurality of side reboilers.

6. The method of claim 1 or claim 2, wherein the stages of the distillation column have a first diameter in the rectifying section and a second diameter in the stripping section of the distillation column, wherein the second diameter is larger than the first diameter, such as wherein the second diameter is no more than five times the first diameter.

7. The method of claim 1 or claim 2, wherein the average stage-to-stage change in vapor flow rate in the bottom five stages of the stripping section of the distillation column is no more than 12% and/or the average stage-to-stage change in liquid flow rate in the bottom five stages of the stripping section of the distillation column is no more than 20%.

8. The method of claim 1 or claim 2, wherein the overhead stream comprises 90% by weight ethylene or greater, such as 95% by weight ethylene or greater, and/or wherein a mass ratio of aliphatic paraffin hydrocarbon solvent added to the distillation column to ethylene in the overhead stream is 0.15 to 0.5, and/or wherein the overhead stream passes through a compressor.

9. The method of claim 1 or claim 2, wherein the linear alpha olefin feed stream comprises the aliphatic paraffin hydrocarbon solvent, such as n-heptane, and 1-hexene.

10. The method of claim 9, wherein the linear alpha olefin feed stream comprises 3% by weight or less of C5 or smaller hydrocarbons other than ethylene.

11. A system for preparing and purifying a linear alpha olefin product, comprising:
    (a) an ethylene oligomerization reactor, the reactor producing an effluent comprising the linear alpha olefin product and ethylene;
    (b) a distillation column in fluid communication with the effluent of the ethylene oligomerization reactor at a feed stage, the distillation column having a plurality of stacked stages positioned between an overhead outlet and a bottoms reboiler including a stripping section of the distillation column between the feed stage and the bottoms reboiler and a rectifying section between the feed stage and the overhead outlet;
    (c) an aliphatic paraffin hydrocarbon solvent source in fluid communication with the rectifying section of the distillation column; and

(d) at least one heating device positioned to add heat to at least one stage in the stripping section of the distillation column between the feed stage and the bottoms reboiler.

12. The system of claim 11, wherein the heating device comprises one or more side reboilers, each reboiler operatively positioned to receive and at least partially vaporize a liquid side stream from a different stage of the stripping section of the distillation column and return a vapor-containing effluent to the stripping section of the distillation column.

13. The system of claim 12, wherein the number of side reboilers is between 2 and 6.

14. The system of claim 11, wherein the stages of the distillation column have a first diameter in the rectifying section and a second diameter in the stripping section of the distillation column, wherein the second diameter is larger than the first diameter, such as wherein the second diameter is no more than five times the first diameter.

15. The system of claim 11, wherein an overhead stream from the distillation column comprises 90% by weight ethylene or greater, such as 95% by weight ethylene or greater; and/or the effluent from the ethylene oligomerization reactor comprises the aliphatic paraffin hydrocarbon solvent and 1-hexene; and/or the effluent from the ethylene oligomerization reactor comprises 3% by weight or less of C5 or smaller hydrocarbons other than ethylene.