CLAIMS

What is claimed is:

1. A process of thermal fluid reclamation comprising:

combining at least two recovered thermal fluids comprising a first refrigerant compound and a second refrigerant compound to form a consolidated thermal fluid, wherein the consolidated thermal fluid is a blend including the first refrigerant compound and the second refrigerant compound with a consolidated composition;

testing the consolidated thermal fluid and validating that the consolidated thermal fluid has greater than about 95 wt%, preferably greater than about 99 wt%, most preferably greater than about 99.5 wt% organic purity;

distilling the consolidated thermal fluid to form at least one distillate comprising the first refrigerant compound and the second refrigerant compound as a reclaimed thermal fluid, wherein the reclaimed thermal fluid has a reclaimed composition different from the consolidated composition and the reclaimed thermal fluid is azeotropic, azeotrope-like, or close-boiling; and

supplying the reclaimed thermal fluid for formation of a thermal fluid product.

2. A process of thermal fluid reclamation comprising:

combining at least two recovered thermal fluids comprising a first refrigerant compound and a second refrigerant compound to form a consolidated thermal fluid, wherein the consolidated thermal fluid is a blend including the first refrigerant compound and the second refrigerant compound with a consolidated composition;

treating the consolidated thermal fluid to form a reclaimed thermal fluid comprising the first refrigerant compound and the second refrigerant compound, wherein the reclaimed thermal fluid has a reclaimed composition different from the consolidated composition, wherein the reclaimed thermal fluid is azeotropic, azeotrope-like, or close-boiling, and wherein the reclaimed thermal fluid has greater than about 95 wt%, preferably greater than about 99 wt%, most preferably greater than about 99.5 wt% organic purity; and

supplying the reclaimed thermal fluid for formation of a thermal fluid product.

3. The process of claim 1 or claim 2, wherein the supplying comprises packaging the reclaimed thermal fluid for commercial sale.

4. The process of any one of claims 1 to 3, wherein the first refrigerant compound and the second refrigerant compound are a pair selected from the group consisting of R-134a and R-1234yf; R-1234ze(E) and R-227ea; R-152a and R-134a; R-1234yf and R-152a; R-125 and R-143a; R-32 and R-1132(E); R-1234yf and R-1132(Z); R-1234ze(E) and R-1132(Z); R-152a and R-1234ze(E); R-125 and R-32; R-1234ze(E) and R-134; R-1234yf and R-1252zc; R-1234ze(E) and R-1252zc; R-1234ze(E) and R-134a; R-1234ze(Z) and R-1336mzz(E); R-1234ze(Z) and R-1233zd(E); R-245fa and R-1234ze(Z); R-245fa and R-1233zd(E); R-1336mzz(Z) and trans-dichloroethylene; R-152a and R-1252zc; R-1132(Z) and R-152a; CO_2 and R-1132a; R-1233zd(E) and R-1336mzz(E); and R-32 and R-290.

5. The process of any one of claims 1 to 4, wherein the at least two recovered thermal fluids and the reclaimed thermal fluid further comprise a third refrigerant compound.

6. The process of claim 5, wherein the first refrigerant compound, the second refrigerant compound, and the third refrigerant compound are R-1234yf, R-152a, and R-134a.

7. The process of any one of claims 1 to 4, wherein the supplying comprises adjusting a ratio of the first refrigerant compound to the second refrigerant compound of the reclaimed composition by adding an additional amount of at least one of the first refrigerant compound and the second refrigerant compound to the reclaimed thermal fluid to form the thermal fluid product.

8. The process of claim 7, wherein the first refrigerant compound and the second refrigerant compound are selected from the group consisting of R-134a and R-1234yf; R-1234ze(E) and R-227ea; R-152a and R-134a; R-1234yf and R-152a; R-125 and R-143a; R-32 and R-1132(E); R-1234yf and R-1132(Z); R-1234ze(E) and R-1132(Z); R-152a and R-1234ze(E); R-125 and R-32; and R-1234ze(E) and R-134a.

9. The process of claim 7 or claim 8,

wherein the first refrigerant compound and the second refrigerant compound are R-125 and R-32 and the thermal fluid product is selected from the group consisting of R-410A and R-410B; or

wherein the first refrigerant compound is R-134a, the second refrigerant compound is R-1234yf, and the thermal fluid product is selected from the group consisting of R-513A and R-513B; or

wherein the first refrigerant compound is R-1234ze, the second refrigerant compound is R-227ea, and the thermal fluid product is selected from the group consisting of R-515A and R-515B; or

wherein the first refrigerant compound is R-152a, the second refrigerant compound is R-134a, and the thermal fluid product is selected from the group consisting of R-512A and R-516A; or

wherein the first refrigerant compound is R-125, the second refrigerant compound is R-143a, and the thermal fluid product is selected from the group consisting of R-404A, R-462A, and R-507A.

10. The process of any one of claims 1 to 4 and 7 to 9, wherein the supplying comprises blending the reclaimed composition with at least one blending thermal fluid comprising a third refrigerant compound to form the thermal fluid product, optionally wherein at least one refrigerant compound of the reclaimed composition is an HFC.

11. The process of claim 10,

wherein the first refrigerant compound and the second refrigerant compound are R-134a and R-1234yf; R-1234ze(E) and R-227ea; R-152a and R-134a; R-1234yf and R-152a; R-125 and R-143a; R-32 and R-1132(E); R-1234yf and R-1132(Z); R-1234ze(E) and R-1132(Z); R-152a and R-1234ze(E); R-125 and R-32; and R-1234ze(E) and R-134a;

wherein the first refrigerant compound is R-134a, the second refrigerant compound is R-1234yf, and the thermal fluid product is selected from the group consisting of R-448A, R-448B, R-449A, R-449B, R-449C, R-475A, R-513A and R-516A;

wherein the first refrigerant compound is R-1234ze, the second refrigerant compound is R-227ea, and the thermal fluid product is selected from the group consisting of R-464A, R-470A, R-470B, and R-471A;

wherein the first refrigerant compound is R-1234yf, the second refrigerant compound is R-152a, and the third refrigerant compound is R-32, and the thermal fluid product is selected from the group consisting of R-457A, R-457B, R-457C and R-457D;

wherein the first refrigerant compound is R-125, the second refrigerant compound is R-32, the third refrigerant compound is R-134a, and the thermal fluid product is selected from the group consisting of R-407A, R-407B, R-407C, R-407D, R-407E, R-407F, R-407G, R-407H, and R-407I; or

wherein the first refrigerant compound is R-1234ze(E), the second refrigerant compound is R-152a, the third refrigerant compound is R-32, and the thermal fluid product is selected from the group consisting of R-444A, R-444B and R-478A, and is preferably R-444A.

12. The process of any one of claims 1 to 11, wherein the validating comprises removing one or more impurities from the consolidated thermal fluid such that the consolidated thermal fluid has greater than about 95 wt%, preferably greater than about 99 wt%, most preferably greater than about 99.5 wt% organic purity.

13. The process of claim 12, wherein the one or more impurities comprises an oil.

14. The process of any one of claims 1 to 13, further comprising adding a stabilizer package to the reclaimed thermal fluid.

15. The process of claim 1 or claim 2, wherein the reclaimed thermal fluid is azeotropic.

16. The process of any one of claims 1 and 3 to 13, wherein the at least one distillate comprises a first distillate comprising the first refrigerant compound and the second refrigerant compound as a first reclaimed thermal fluid and a second distillate as a second reclaimed thermal fluid, wherein the first

reclaimed thermal fluid and the second reclaimed thermal fluid are azeotropic, azeotrope-like, or close-boiling.

17. The process of any one of claims 1 to 4, wherein the consolidated thermal fluid comprises one of:

R-134a as the first refrigerant compound, R-1234yf as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1225ye, HFO-1243zf, E-HFO-1234ze, HFC-236ea, HCFC-244bb, HFC-245fa, HFC-245eb, HFC-245cb, 3,3,3-trifluoropropyne, HFC-152a, FO-1114, CFO-1123, HCFO-1131a, trans-HCFO-1131, HCO- 1140, HCFO-1214ya, HFO-1216, HCFO-1224yd, HFO-1252 isomers, HFC-143a, HCFC-225, HFC-254eb, HFC-263fb, HFC-236fa, HCFC-142b, HCFC-244cc, HCFO-1223, HFO-1132a, HCC-40, HFO-1225zc, HFC-134, HFC-161, HCFC-22, CHFC-124, CHFO-1122, HCFC-31, CFC-114, and CFC-114a; or

R-1234ze(E) as the first refrigerant compound, R-227ea as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1234yf, HFC-245cb, HFO-1225yf(E), HFO-1225yf(Z), HFO-1225zc, HFC-236fa, HFC-152a, HFC-143a, HFC-125, HFC-134a, HFO-1234zc, HFO-1233xf, HFO-1233zd, CFC-114, HCFC-124, 2223, HFO-1234ze(Z), HFC-245fa, HFC-227ea, HFO-1243zf, HFC-263fb, HFC-134, HFC-23, FC-1216, HCFC-22, and FC-218; or

R-152a as the first refrigerant compound, R-134a as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFC-161, HCC-40, isobutane, HCO-1140, HCC-160, CFC-114a, HFC-143a, HFO-1225zc, HFC-245cb, HFC-134, HFC-152a, HFO-1225ye, E-HFO-1234ze, HCFC-22, HFO-1243zf, CHFC-124, CHFO-1122, HCFC-31, and CFC-114; or

R-1234yf as the first refrigerant compound, R-152a as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1225ye, HFO-1243zf, E-HFO-1234ze, HFC-236ea, HCFC-244bb, HFC-245fa, HFC-245eb, HFC-245cb, 3,3,3-trifluoropropyne, HFC-152a, FO-1114, CFO-1123, HCFO-1131a,

trans-HCFO-1131, HCO- 1140, HCFO-1214ya, HFO-1216, HCFO-1224yd, HFO-1252 isomers, HFC-143a, HCFC-225, HFC-254eb, HFC-263fb, HFC-236fa, HCFC-142b, HCFC-244cc, HCFO-1223, HFO-1132a, HCC-40, HFC-161, isobutane, HCO-1140, HCC-160, and CFC-114a; or

R-125 as the first refrigerant compound, R-143a as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFC-23, HFC-32, HFC-143a, HFC-134a, CFC-115, CFCO-1113, HCC-40, HFC-152a, HCFC-22, CFC-12, HCFC-124, CFC-114a, and HCFC-133a; or

R-32 as the first refrigerant compound, R-1132(E) as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFC-143a, HFC-41, HFC-134a, HCFC-22, CFC-12, HCC-40, HFC-32, HFC-125, HCFO-E-1122a, HCFO-Z-1122a, HFO-1123, HFO-1141, HCFC-133, HCFC-133b, HCFC-123, HFC-152, HFC-143, ethylene, HCFC-142a, HFO-1132a, HCFO-1131a, HCFO-E-1131, HCFO-Z-1131, HCFO-1122, acetylene, and HCO-1140; or

R-1234yf as the first refrigerant compound, R-1132(Z) as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1225ye, HFO-1243zf, E-HFO-1234ze, HFC-236ea, HCFC-244bb, HFC-245fa, HFC-245eb, HFC-245cb, 3,3,3-trifluoropropyne, HFC-152a, FO-1114, CFO-1123, HCFO-1131a, trans-HCFO-1131, HCO- 1140, HCFO-1214ya, HFO-1216, HCFO-1224yd, HFO-1252 isomers, HFC-143a, HCFC-225, HFC-254eb, HFC-263fb, HFC-236fa, HCFC-142b, HCFC-244cc, HCFO-1223, HFO-1132a, HCC-40, difluoromethane (HFC-32), 1,1,1,2,2 pentafluoroethane (HFC-125), E-1-chloro-1,2-difluoroethylene (HCFO-E-1122a), Z-1-chloro-1,2-difluoroethylene (HCFO-Z-1122a), 1,1,2-trifluoroethylene (HFO-1123), fluoroethylene (HFO-1141), 1-chloro-1,2,2-trifluoroethane (HCFC-133), 1-chloro-1,1,2-trifluoroethane (HCFC-133b), 1,1-dichloro-2,2,2-trifluoroethane (HCFC-123), 1,2-difluoroethane (HFC-152), 1,1,2-trifluoroethane (HFC-143), fluoromethane (HFC-41), chlorodifluoromethane (HCFC-22), ethylene,1-chloro-1,2-difluoroethane (HCFC-142a), Z-1-chloro-1-fluoroethene (HCFO-Z-1131), 1-

chloro-2,2-difluoroethylene (HCFO-1122), HFO-E-1132, vinyl chloride (HCO-1140), acetylene and fluoroacetylene; or

R-1234ze(E) as the first refrigerant compound, R-1132(Z) as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1234yf, HFC-245cb, HFO-1225yf(E), HFO-1225yf(Z), HFO-1225zc, HFC-236fa, HFC-152a, HFC-143a, HFC-125, HFC-134a, HFO-1234zc, HFO-1233xf, HFO-1233zd, CFC-114, HCFC-124, 2223, HFO-1234ze(Z), HFC-245fa, HFC-227ea, HFO-1243zf, HFC-263fb, HFC-134, difluoromethane (HFC-32), E-1-chloro-1,2-difluoroethylene (HCFO-E-1122a), Z-1-chloro-1,2-difluoroethylene (HCFO-Z-1122a), 1,1,2-trifluoroethylene (HFO-1123), fluoroethylene (HFO-1141), 1-chloro-1,2,2-trifluoroethane (HCFC-133), 1-chloro-1,1,2-trifluoroethane (HCFC-133b), 1,1-dichloro-2,2,2-trifluoroethane (HCFC-123), 1,2-difluoroethane (HFC-152), 1,1,2-trifluoroethane (HFC-143), fluoromethane (HFC-41), chlorodifluoromethane (HCFC-22), ethylene,1-chloro-1,2-difluoroethane (HCFC-142a), 1,1-difluoroethylene (HFO-1132a), 1-chloro-1-fluoroethene (HCFO-1131a), E-1-chloro-2-fluoroethene (HCFO-E-1131), Z-1-chloro-1-fluoroethene (HCFO-Z-1131), 1-chloro-2,2-difluoroethylene (HCFO-1122), HFO-E-1132, vinyl chloride (HCO-1140), acetylene and fluoroacetylene; or

R-1234ze(E) as the first refrigerant compound, R-152a as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1234yf, HFC-245cb, HFO-1225yf(E), HFO-1225yf(Z), HFO-1225zc, HFC-236fa, HFC-152a, HFC-143a, HFC-125, HFC-134a, HFO-1234zc, HFO-1233xf, HFO-1233zd, CFC-114, HCFC-124, 2223, HFO-1234ze(Z), HFC-245fa, HFC-227ea, HFO-1243zf, HFC-263fb, HFC-134, HFC-161, HCC-40, isobutane, HCO-1140, HCC-160 and CFC-114a; or

R-125 as the first refrigerant compound, R-32 as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFC-23, HFC-32, HFC-143a, HFC-134a, CFC-115, CFCO-1113, HCC-40, HFC-41, HFC-134a, HCFC-22, and CFC-12; or

R-1234ze(E) as the first refrigerant compound, R-134 as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1234yf, HFC-245cb, HFO-1225yf(E), HFO-1225yf(Z), HFO-1225zc, HFC-236fa, HFC-152a, HFC-143a, HFC-125, HFC-134a, HFO-1234zc, HFO-1233xf, HFO-1233zd, CFC-114, HCFC-124, 2223, HFO-1234ze(Z), HFC-245fa, HFC-227ea, HFO-1243zf, HFC-263fb, HFC-134, HFC-134a, HCFC-124a, HCFO-1122, HCFC-31, HFC-32, CFC-114a, FCO-1114, FCO-1318my, FC-C318, and HFC-161; or

R-1234yf as the first refrigerant compound, R-1252zc as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1225ye, HFO-1243zf, E-HFO-1234ze, HFC-236ea, HCFC-244bb, HFC-245fa, HFC-245eb, HFC-245cb, 3,3,3-trifluoropropyne, HFC-152a, FO-1114, CFO-1123, HCFO-1131a, trans-HCFO-1131, HCO- 1140, HCFO-1214ya, HFO-1216, HCFO-1224yd, HFO-1252 isomers, HFC-143a, HCFC-225, HFC-254eb, HFC-263fb, HFC-236fa, HCFC-142b, HCFC-244cc, HCFO-1223, HFO-1132a, HCC-40, methane, ethylene, dichloromethane (HCC-30), fluoroethane (HFC-1141), propane (HC-290), propylene (HC-1270), 2,3,3,3-tetrafluoropropene (HFO-1234yf), allene, 3-fluoro-1-propene (HFO-1261), 1,1,1-trifluoropropane (HFC-263b), 3-fluoro-1-propene (HFO-1261), 2-butene, cyclobutene, 2-methyl-1-propene, 1,1-difluoropropane (HFC-272fb), 2-chloro-3,3,3-trifluoropropene (HCFO-1233xf), 3-chloropropene (HCO-1260zf), and C_3H_4FCl (HCFO-1251); or

R-1234ze(E) as the first refrigerant compound, R-1252zc as the second refrigerant compound, and further comprises one or more additional compounds selected from the group consisting of HFO-1234yf, HFC-245cb, HFO-1225yf(E), HFO-1225yf(Z), HFO-1225zc, HFC-236fa, HFC-152a, HFC-143a, HFC-125, HFC-134a, HFO-1234zc, HFO-1233xf, HFO-1233zd, CFC-114, HCFC-124, 2223, HFO-1234ze(Z), HFC-245fa, HFC-227ea, HFO-1243zf, HFC-263fb, HFC-134, methane, ethylene, dichloromethane (HCC-30), fluoroethane (HFC-1141), propane (HC-290), propylene (HC-1270), allene, 3-fluoro-1-propene (HFO-1261), 1,1,1-trifluoropropane (HFC-263b), 3-fluoro-1-propene (HFO-1261), 2-butene, cyclobutene, 2-methyl-1-propene, 1,1-

difluoropropane (HFC-272fb), 2-chloro-3,3,3-trifluoropropene (HCFO-1233xf), 3-chloropropene (HCO-1260zf), and C_3H_4FCl (HCFO-1251).

18. The process of claim 6, wherein the consolidated thermal fluid further comprises one or more additional compounds selected from the group consisting of HFO-1225ye, HFO-1243zf, E-HFO-1234ze, HFC-236ea, HCFC-244bb, HFC-245fa, HFC-245eb, HFC-245cb, 3,3,3-trifluoropropyne, HFC-152a, FO-1114, CFO-1123, HCFO-1131a, trans-HCFO-1131, HCO- 1140, HCFO-1214ya, HFO-1216, HCFO-1224yd, HFO-1252 isomers, HFC-143a, HCFC-225, HFC-254eb, HFC-263fb, HFC- 236fa, HCFC-142b, HCFC-244cc, HCFO-1223, HFO-1132a, HCC-40, HFC-161, isobutane, HCC-160, CFC-114a, HFO-1225zc, HFC-134, HCFC-22, CHFC-124, CHFO-1122, HCFC-31, and CFC-114.

19. The process of any one of claims 1 to 18, wherein the recovered thermal fluid(s), the consolidated thermal fluid and/or the reclaimed thermal fluid comprises at least one acid scavenger and/or at least one inhibitor selected from the group consisting of hydrocarbons including at least cyclic monoterpene; lipophilic organic compounds; phenols, aromatic organic compounds having at least one chemical moiety $-C_6H_4(OH)$, preferably at least one member selected from the group consisting of D-limonene, pinene, α-pinene, β-pinene, α-terpinene, α-tocopherol, butylated hydroxytoluene, 4-methoxyphenol, benzene-1,4-diol, and mixtures thereof.