CLAIMS:

1. A water-cooled heat rejection heat exchanger, comprising:

a housing having first and second opposing end plates and sidewalls extending between the end plates to form an enclosure, at least the first end plate including first and second inlet/outlet pairs for first and second fluids, respectively;

a plurality of plates disposed within the enclosure between the first and second end plates to define a first fluid pathway disposed in fluid communication with the first inlet/outlet pair and a second fluid pathway disposed in fluid communication with the second inlet/outlet pair; and

a plurality of brazed formations disposed between adjacent ones of the first end plate, the plurality of plates and the second end plate to isolate the first fluid pathway from the second fluid pathway.

2. The water-cooled heat rejection heat exchanger according to claim 1, wherein the inlet/outlet pairs for the first and second fluids and the pathways provide different cross-sectional areas for the first fluid and the second fluid.

3. The water-cooled heat rejection heat exchanger according to claim 1, wherein the plurality of plates are fabricated from stainless steel.

4. The water-cooled heat rejection heat exchanger according to claim 1, wherein the first fluid and the second fluid thermally communicate.

5. The water-cooled heat rejection heat exchanger according to claim 1, wherein the first fluid comprises water and the second fluid comprises carbon dioxide.

6. The water-cooled heat rejection heat exchanger according to claim 5, at least partially operable as a gas cooler.

7. The water-cooled heat rejection heat exchanger according to claim 1, wherein the inlet/outlet pair for the first fluid is located on a same end plate as the inlet/outlet pair for the second fluid.

8. The water-cooled heat rejection heat exchanger according to claim 1, wherein the inlet and outlet for at least one of the first fluid and the second fluid are located on opposite end plates.

9. A water-cooled heat rejection heat exchanger, comprising:

a housing having first and second opposing end plates and sidewalls extending between the end plates to form an enclosure, at least the first end plate including high and low temperature inlet/outlet pairs for high and low temperature fluids, respectively;

a plurality of plates disposed within the enclosure between the first and second end plates to define a high temperature fluid pathway disposed in fluid communication with the high temperature inlet/outlet pair and a low temperature fluid pathway disposed in fluid communication with the low temperature inlet/outlet pair; and

a plurality of brazed formations disposed between adjacent ones of the first end plate, the plurality of plates and the second end plate to isolate the high temperature fluid pathway from the low temperature fluid pathway.

10. The water-cooled heat rejection heat exchanger according to claim 9, wherein the inlet/outlet pairs for the high and low temperature fluids and the pathways are providing different cross-sectional areas for the first fluid and the second fluid.

11. The water-cooled heat rejection heat exchanger according to claim 9, wherein the plurality of plates are fabricated from stainless steel.

12. The water-cooled heat rejection heat exchanger according to claim 9, wherein the high temperature fluid comprises carbon dioxide and the low temperature fluid comprises water.

13. The water-cooled heat rejection heat exchanger according to claim 12, at least partially operable as a gas cooler.

14. The water-cooled heat rejection heat exchanger according to claim 9, wherein the inlet/outlet pair for the high temperature fluid is located on a same end plate as the inlet/outlet pair for the low temperature fluid.

15. The water-cooled heat rejection heat exchanger according to claim 9, wherein the inlet and outlet for at least one of the high temperature fluid and the low temperature fluid are located on opposite end plates.

16. A refrigeration unit, comprising:

a vapor compression cycle unit including an evaporator, an air-cooled heat rejection heat exchanger and a compressor operably disposed between the evaporator and the condenser; and

a water-cooled brazed plate heat rejection heat exchanger operably disposed between the compressor and the evaporator receiving high temperature fluid from the compressor and low temperature fluid from an external source, whereby the high temperature fluid is cooled via thermal communication with the low temperature fluid and is flown from the compressor to the evaporator,

the water-cooled brazed plate heat rejection heat exchanger being formed to define high and low temperature fluid pathways and including a plurality of brazed formations to isolate the high temperature fluid pathway from the low temperature fluid pathway.

17. The refrigeration unit according to claim 16, wherein the water-cooled brazed plate heat rejection heat exchanger is positioned between the compressor and the air-cooled heat rejection heat exchanger.

18. The refrigeration unit according to claim 16, wherein the water-cooled heat rejection heat exchanger is positioned between the air-cooled heat rejection heat exchanger and the evaporator.

19. The refrigeration unit according to claim 16, wherein the water-cooled heat rejection heat exchanger and the air-cooled heat rejection heat exchanger are at least partially simultaneously engaged in operation.

20. The refrigeration unit according to claim 16, wherein the water-cooled heat rejection heat exchanger and the air-cooled heat rejection heat exchanger are at least partially operationally interchangeable.

21. The refrigeration unit according to claim 16, wherein the high and low temperature pathways provide different cross-sectional areas for the high and low temperature fluids.

22. The refrigeration unit according to claim 16, wherein the high temperature fluid comprises carbon dioxide and the low temperature fluid comprises water.

23. The refrigeration unit according to claim 16, wherein the water-cooled brazed plate heat rejection heat exchanger is at least partially operable as a gas cooler.

24. The refrigeration unit according to claim 16, wherein the compressor comprises at least first and second compression stage compressors, and the air-cooled heat rejection heat exchanger comprises an air-cooled gas cooler/condenser operably disposed downstream from the second stage compressor and an air-cooled intercooler operably disposed downstream from the first stage compressor.

25. The refrigeration unit according to claim 24, wherein the water-cooled brazed plate heat rejection heat exchanger is positioned between the second stage compressor and the gas cooler/condenser.

26. The refrigeration unit according to claim 24, wherein the water-cooled brazed plate heat rejection heat exchanger is positioned between the air-cooled gas cooler/condenser and the evaporator.

27. The refrigeration unit according to claim 24, wherein the water-cooled braze plate heat rejection heat exchanger comprises two separate units, one positioned downstream from the first stage compressor and one positioned downstream from the second stage compressor.

28. The refrigeration unit according to claim 27, wherein one unit is positioned between the first stage compressor and the intercooler or between the intercooler and the second stage compressor and the other unit is positioned between the second stage compressor and the gas cooler/condenser or between the gas cooler/condenser and the evaporator.

29. The refrigeration unit according to claim 27, wherein the units comprise a single unit with four inlet/outlet pairs, two for the high temperature fluid and two for the low temperature fluid.

30. The refrigeration unit according to claim 24, wherein the water-cooled braze plate heat rejection heat exchanger is positioned between the second stage compressor and the air-cooled gas cooler/condenser or between the air-cooled gas cooler/condenser and the evaporator.

31. The refrigeration unit according to claim 16, further comprising:

a flash tank;

a high pressure regulating valve operably interposed between the water-cooled brazed plate heat rejection heat exchanger and the flash tank; and

an evaporator expansion valve operably interposed between the flash tank and the evaporator.

32. The refrigeration unit according to claim 31, wherein the flash tank separates cooled gaseous high temperature fluid from liquid high temperature fluid, delivers the gaseous high temperature fluid to the compressor and delivers the liquid high temperature fluid toward the evaporator via the evaporator expansion valve.

33. The refrigeration unit according to claim 16, wherein the vapor compression cycle unit comprises:

a motor to drive the compressor; and

a variable frequency drive to actuate the motor to drive the compressor at varying speeds, the variable frequency drive being disposed at one or more of multiple positions.

CLAIMS:

1. A water-cooled heat rejection heat exchanger, comprising:

a housing having first and second opposing end plates and sidewalls extending between the end plates to form an enclosure, at least the first end plate including first and second inlet/outlet pairs for first and second fluids, respectively;

a plurality of plates disposed within the enclosure between the first and second end plates to define a first fluid pathway disposed in fluid communication with the first inlet/outlet pair and a second fluid pathway disposed in fluid communication with the second inlet/outlet pair; and

a plurality of brazed formations disposed between adjacent ones of the first end plate, the plurality of plates and the second end plate to isolate the first fluid pathway from the second fluid pathway.

2. The water-cooled heat rejection heat exchanger according to claim 1, wherein the inlet/outlet pairs for the first and second fluids and the pathways provide different cross-sectional areas for the first fluid and the second fluid.

3. The water-cooled heat rejection heat exchanger according to claim 1, wherein the plurality of plates are fabricated from stainless steel.

4. The water-cooled heat rejection heat exchanger according to claim 1, wherein the first fluid and the second fluid thermally communicate.

5. The water-cooled heat rejection heat exchanger according to claim 1, wherein the first fluid comprises water and the second fluid comprises carbon dioxide.

6. The water-cooled heat rejection heat exchanger according to claim 5, at least partially operable as a gas cooler.

7. The water-cooled heat rejection heat exchanger according to claim 1, wherein the inlet/outlet pair for the first fluid is located on a same end plate as the inlet/outlet pair for the second fluid.

8. The water-cooled heat rejection heat exchanger according to claim 1, wherein the inlet and outlet for at least one of the first fluid and the second fluid are located on opposite end plates.

9. A water-cooled heat rejection heat exchanger, comprising:

a housing having first and second opposing end plates and sidewalls extending between the end plates to form an enclosure, at least the first end plate including high and low temperature inlet/outlet pairs for high and low temperature fluids, respectively;

a plurality of plates disposed within the enclosure between the first and second end plates to define a high temperature fluid pathway disposed in fluid communication with the high temperature inlet/outlet pair and a low temperature fluid pathway disposed in fluid communication with the low temperature inlet/outlet pair; and

a plurality of brazed formations disposed between adjacent ones of the first end plate, the plurality of plates and the second end plate to isolate the high temperature fluid pathway from the low temperature fluid pathway.

10. The water-cooled heat rejection heat exchanger according to claim 9, wherein the inlet/outlet pairs for the high and low temperature fluids and the pathways are providing different cross-sectional areas for the first fluid and the second fluid.

11. The water-cooled heat rejection heat exchanger according to claim 9, wherein the plurality of plates are fabricated from stainless steel.

12. The water-cooled heat rejection heat exchanger according to claim 9, wherein the high temperature fluid comprises carbon dioxide and the low temperature fluid comprises water.

13. The water-cooled heat rejection heat exchanger according to claim 12, at least partially operable as a gas cooler.

14. The water-cooled heat rejection heat exchanger according to claim 9, wherein the inlet/outlet pair for the high temperature fluid is located on a same end plate as the inlet/outlet pair for the low temperature fluid.

15. The water-cooled heat rejection heat exchanger according to claim 9, wherein the inlet and outlet for at least one of the high temperature fluid and the low temperature fluid are located on opposite end plates.

16. A refrigeration unit (10), comprising:

a vapor compression cycle unit including an evaporator (20), an air-cooled heat rejection heat exchanger (30) and a compressor (40) operably disposed between the evaporator (20) and the condenser (31);

characterized in that

a water-cooled brazed plate heat rejection heat exchanger (50) is operably disposed between the compressor (40) and the evaporator (20) receiving high temperature fluid from the compressor (40) and low temperature fluid from an external source, whereby the high temperature fluid is cooled via thermal communication with the low temperature fluid and is flown from the compressor (40) to the evaporator (20), the water-cooled brazed plate heat rejection heat exchanger (50) being formed to define high and low temperature fluid pathways and including a plurality of brazed formations to isolate the high temperature fluid pathway from the low temperature fluid pathway,

wherein the compressor (40) comprises at least first and second compression stage compressors (41, 42), and the air-cooled heat rejection heat exchanger (30) comprises an air-cooled gas cooler/condenser operably disposed downstream from the second stage compressor and an air-cooled intercooler operably disposed downstream from the first stage compressor, and

wherein the water-cooled brazed plate heat rejection heat exchanger (50) comprises two separate units, one positioned downstream from the first stage compressor and one positioned downstream from the second stage compressor.

17. The refrigeration unit (10) according to claim 16, wherein the water-cooled brazed plate heat rejection heat exchanger (50) is positioned between the compressor (40) and the air-cooled heat rejection heat exchanger (30).

18. The refrigeration unit (10) according to claim 16, wherein the water-cooled heat rejection heat exchanger (50) is positioned between the air-cooled heat rejection heat exchanger (30) and the evaporator (20).

19. The refrigeration unit (10) according to claim 16, wherein the water-cooled heat rejection heat exchanger (50) and the air-cooled heat rejection heat exchanger (30) are at least partially simultaneously engaged in operation.

20. The refrigeration unit (10) according to claim 16, wherein the water-cooled heat rejection heat exchanger (50) and the air-cooled heat rejection heat exchanger (30) are at least partially operationally interchangeable.

21. The refrigeration unit (10) according to claim 16, wherein the high and low temperature pathways provide different cross- sectional areas for the high and low temperature fluids.

22. The refrigeration unit (10) according to claim 16, wherein the high temperature fluid comprises carbon dioxide and the low temperature fluid comprises water.

23. The refrigeration unit (10) according to claim 16, wherein the water-cooled brazed plate heat rejection heat exchanger (50) is at least partially operable as a gas cooler.

24. The refrigeration unit (10) according to claim 16, wherein the water-cooled brazed plate heat rejection heat exchanger (50) is positioned between the second stage compressor (42) and the gas cooler/condenser (31).

25. The refrigeration unit (10) according to claim 16, wherein the water-cooled brazed plate heat rejection heat exchanger (50) is positioned between the air-cooled gas cooler/condenser (31) and the evaporator (20).

26. The refrigeration unit (10) according to claim 16, wherein one unit is positioned between the first stage compressor (41) and the intercooler (32) or between the intercooler (32) and the second stage compressor (42) and the other unit is positioned between the second stage compressor (42) and the gas cooler/condenser (31) or between the gas cooler/condenser (31) and the evaporator (20).

27. The refrigeration unit (10) according to claim 16, wherein the units comprise a single unit with four inlet/outlet pairs, two for the high temperature fluid and two for the low temperature fluid, and wherein the water-cooled brazed plate heat rejection heat exchanger (50) is positioned between the second stage compressor (42) and the air-cooled gas cooler/condenser (31) or between the air-cooled gas cooler/condenser (31) and the evaporator (20).

28. The refrigeration unit (10) according to claim 16, further comprising:
a flash tank (70);
a high pressure regulating valve (80) operably interposed between the water-cooled brazed plate heat rejection heat exchanger (50) and the flash tank(70); and
an evaporator expansion valve (90) operably interposed between the flash tank (70) and the evaporator (20).

29. The refrigeration unit (10) according to claim 28, wherein the flash tank (70) separates cooled gaseous high temperature fluid from liquid high temperature fluid, delivers the gaseous high temperature fluid to the compressor and delivers the liquid high temperature fluid toward the evaporator (20) via the evaporator expansion valve (90).

30. The refrigeration unit (10) according to claim 16, wherein the vapour compression cycle unit comprises:
a motor (110) to d rive the compressor (40); and
a variable frequency drive (120) to actuate the motor (110) to drive the compressor (40) at varying speeds, the variable frequency drive being disposed at one or more of multiple positions.