CLAIMS:

What is claimed is:

1. A process comprising:

(i) obtaining an exhaust steam stream having an absolute pressure from 200 kPa to 1,050 kPa and shaft power from one or more extraction turbines and/or back-pressure turbines located in an olefins production plant, wherein the shaft power drives a device located in the olefins production plant; and at least one of the one or more extraction turbines and/or back-pressure turbines comprises one or more extraction turbines;

(ii) providing a gas mixture stream comprising CO_2;

(iii) feeding the gas mixture stream and a lean-amine stream comprising an amine into an absorption column;

(iv) obtaining a CO_2-rich amine stream and a CO_2-depleted residual gas stream from the absorption column;

(v) feeding at least a portion of the CO_2-rich amine stream into a separation column;

(vi) heating the at least a portion of the CO_2-rich amine stream in the separation column using the exhaust steam stream to produce a stream rich in CO_2 and a bottoms stream rich in the amine; and

(vii) recycling at least a portion of the bottoms stream to the absorption column as at least a portion of the lean-amine stream.

2. The process of any of the preceding claims, wherein the exhaust steam stream has an absolute pressure no higher than 450 kPa.

3. The process of any of the preceding claims, wherein the gas mixture stream comprises H_2, CO, and CO_2.

4. The process of any of the preceding claims, wherein the one or more extraction turbines and/or back-pressure turbines drives a compressor located in the olefins production plant.

5. The process of any of the preceding claims, wherein at least one of the one or more extraction turbines and/or back-pressure turbines comprises a back-pressure turbine.

6. The process of claim 5, wherein all of the one or more extraction turbines and/or back-pressure turbines are back-pressure turbines.

7. The process of claim 5 or claim 6, wherein:

the exhaust steam stream provides a quantity of energy to the at least a portion of the CO_2-rich amine stream in step (vi); and

at least 30% of the quantity of energy would have been lost to the atmosphere in a comparative process identical with the process except the back-pressure turbine is substituted by an extraction/condensing turbine with the identical power rating.

8. The process of claim 7, wherein at least 50% of the quantity of energy would have been lost to the atmosphere in the comparative process.

9. The process of claim 8, wherein at least 70% of the quantity of energy would have been lost to the atmosphere in the comparative process.

10. The process of any of the preceding claims, wherein the gas mixture stream is produced by a syngas producing process comprising:

(A) supplying a hydrocarbon feed and a steam feed into a syngas producing unit comprising a reforming reactor under syngas producing conditions to produce a reformed stream exiting the reforming reactor, wherein the syngas producing conditions include the presence of a reforming catalyst, and the reformed stream comprises H_2, CO, and steam;

(B) cooling the reformed stream by using a waste heat boiler ("WHB") to produce a cooled reformed stream and to generate a high-pressure steam ("HPS") stream;

(C) contacting the cooled reformed stream with a first shifting catalyst in a first shift reactor under a first set of shifting conditions to produce a first shifted stream exiting the first shift reactor, wherein the first shifted stream has a lower CO concentration and a higher CO_2 concentration than the first cooled reforming reactor effluent stream; and

(D) obtaining the gas mixture stream from the first shifted stream.

11. The process of claim 10, wherein step (D) comprises:

(D1) cooling the first shifted stream to obtain a cooled first shifted stream;

(D2) contacting the cooled first shifted stream with a second shifting catalyst in a second shift reactor under a second set of shifting conditions to produce a second shifted stream

exiting the second shift reactor, wherein the second shifted stream has a lower CO concentration and a higher CO_2 concentration than the cooled first shifted stream;

(D3) reducing an amount of steam present in the second shifted stream to produce the gas mixture stream comprising CO_2 and H_2.

12. The process of claim 11, wherein the syngas producing unit comprises a steam-methane-reformer ("SMR"), and/or an autothermal reformer ("ATR").

13. The process of claim 12, wherein:

the reforming reactor comprises a SMR; and

the SMR comprises: a plurality of SMR burners where a SMR fuel combusts to supply thermal energy to SMR; a radiant section heated by the thermal energy in which the hydrocarbon feed and steam reacts under the syngas producing conditions; a convection section heated by the thermal energy in which the hydrocarbon feed and steam are preheated before entering the radiant section.

14. The process of claim 13, wherein the reformed stream has a temperature from 750 to 900 °C.

15. The process of claim 13 or claim 14, wherein the syngas producing process further comprises:

(E) heating the HPS stream generated in step (B) in the convection section of the SMR and/or an auxiliary furnace to obtain a super-heated HPS ("SH-HPS") stream having at least one of the following: a temperature from 350 °C to 550 °C, and a pressure from 4,000 kPa to 14,000 kPa.

16. The process of any of claims 12 to 15, wherein:

the reforming reactor comprises an ATR;

an O_2 stream is fed into the ATR;

the ATR comprises a reaction vessel into which the hydrocarbon feed, the steam feed, and the O_2 stream are supplied;

the reforming conditions comprises the presence of an ATR catalyst in the reaction vessel; and

the reformed stream has at least one of the following: a temperature from 800 °C to 1,100 °C; and an absolute pressure from 2,000 kPa to 5,000 kPa.

17. The process of claim 16, further comprising:

(E') heating the HPS stream generated in step (B) in an auxiliary furnace to obtain a super-heated HPS ("SH-HPS") stream having at least one of the following: a temperature from 350 °C to 550 °C, and a pressure from 4,000 kPa to 14,000 kPa.

18. The process of any of claims 15 to 17, wherein a portion of the SH-HPS stream generated in step (E) is supplied to the one or more extraction turbines and/or back-pressure turbines in step (i).

19. The process of any of claims 10 to 18, further comprising:

(F1) expanding the at least a portion of the SH-HPS stream produced in step (E) and/or step (E') in a first stage steam turbine to produce shaft power and an intermediate steam stream; and

(F2) expanding at least a portion of the intermediate steam stream in a second stage turbine to produce the exhaust steam stream, wherein the second stage turbine is an extraction turbine and/or a back-pressure turbine.

20. The process of claim 19, wherein the first stage turbine and/or the second stage turbine is selected from: (i) one or more turbines driving one or more process-gas compressors located on the olefins production plant; (ii) one or more turbines driving one or more propylene refrigeration compressors located on the olefins production plant; and (iii) one or more turbines driving one or more ethylene refrigeration compressors located on the olefins production plant.

21. The process of claim 19 or claim 20, wherein a portion of the SH-HPS stream generated in step (E) and/or step (E') is supplied to a turbine driving a pump located on the olefins production plant.

22. A process comprising:

(i) obtaining an exhaust steam stream having an absolute pressure from 200 kPa to 1,050 kPa exhausted from one or more extraction turbines and/or back-pressure turbines located in an olefins production plant, wherein the extraction turbines and/or back-pressure

turbines drives one or more of the following: a process-gas compressor; a refrigeration compressor; and combinations thereof;

(ii) providing a gas mixture stream comprising CO_2;

(iii) feeding the gas mixture stream and a lean-amine stream comprising an amine into an absorption column;

(iv) obtaining a CO_2-rich amine stream and a CO_2-depleted residual gas stream from the absorption column;

(v) feeding at least a portion of the CO_2-rich amine stream into a separation column;

(vi) heating the at least a portion of the CO_2-rich amine stream in the separation column using the exhaust steam stream to produce an overhead stream rich in CO_2 and a bottoms stream rich in the amine; and

(vii) recycling at least a portion of the bottoms stream to the absorption column as at least a portion of the lean-amine stream.

23. The process of claim 22, wherein step (i) comprises:

(ia) providing a super-heated high-pressure steam (SH-HPS) stream;

(ib) expanding at least a portion of the SH-HPS stream in the at least one extraction turbines and/or back-pressure turbines to obtain the exhaust steam stream.

24. The process of claim 22 or claim 23, wherein step (i) comprises:

(ia') providing a super-heated high-pressure steam (SH-HPS) stream;

(ib') expanding at least a portion of the SH-HPS stream in a first stage steam turbine to an intermediate steam stream; and

(ic') expanding the intermediate steam stream in a second stage turbine to obtain the exhaust steam stream, wherein the second stage turbine is an extraction turbine or a back-pressure turbine.

25. The process of claim 23 or claim 24, wherein the gas mixture stream is produced by a syngas producing process comprising:

(A) supplying a hydrocarbon feed and a steam feed into a syngas producing unit comprising a reforming reactor under syngas producing conditions to produce a reformed stream exiting the reforming reactor, wherein the syngas producing conditions include the presence of a reforming catalyst, and the reformed stream comprises H_2, CO, and steam;

(B) cooling the reformed stream by using a waste heat boiler ("WHB") to produce a cooled reformed stream and to generate a high-pressure steam ("HPS") stream;

(C) contacting the cooled reformed stream with a first shifting catalyst in a first shift reactor under a first set of shifting conditions to produce a first shifted stream exiting the first shift reactor, wherein the first shifted stream has a lower CO concentration and a higher CO_2 concentration than the first cooled reforming reactor effluent stream;

(D) obtaining the gas mixture stream from the first shifted stream;

(E) cooling the first shifted stream to obtain a cooled first shifted stream;

(F) contacting the cooled first shifted stream with a second shifting catalyst in a second shift reactor under a second set of shifting conditions to produce a second shifted stream exiting the second shift reactor, wherein the second shifted stream has a lower CO concentration and a higher CO_2 concentration than the cooled first shifted stream;

(G) abating the steam present in the second shifted stream to produce the gas mixture stream comprising CO_2 and H_2; the process further comprises:

(viii) heating the HPS stream generated in step (B) to obtain the SH-HPS stream, wherein the SH-HPS stream has at least one of the following: a temperature from 350 °C to 550 °C, and a pressure from 4,000 kPa to 14,000 kPa.