WHAT IS CLAIMED IS:

1. A process for optimizing syngas carbon utilisation, syngas purity and subsequent syngas conversion into a downstream syngas conversion unit from a scrubbed syngas source comprising the steps of:

a) feeding a scrubbed syngas into a purification unit comprising at least one absorption unit to partially remove CO_2 from said scrubbed syngas, producing a clean syngas stream adjusted to optimal target carbon content and a CO_2 rich stream, wherein the purification unit is an acid gas removal unit (AGR), wherein in said AGR,

- CO_2 and sulfur species are absorbed from the scrubbed syngas in a absorption unit using said selective solvent, producing a loaded solvent and a clean syngas stream;

- the loaded solvent is withdrawn through at least one recirculation loop;

- the loaded solvent is pre-flashed at an intermediate pressure to recover absorbed H_2 and CO, producing the CO_2 rich stream rich in H_2 and CO and a flashed solvent stream;

- the flashed solvent is flashed at lower pressure to recover CO_2, generating a non-flammable CO_2 rich stream and a second flashed solvent; and

- the second flashed solvent is stripped in a first stripping unit to remove the sulfur species, producing a rich sulfur species stream and a clean solvent which is recycled back into the absorption unit;

b) mixing the clean syngas stream with hydrogen producing a balanced syngas stream, wherein the balanced syngas stream meet the stoichiometric ratio requirement of the syngas conversion unit; and

c) feeding said balanced syngas stream in said syngas conversion unit.

2. The process of claim 1, wherein the at least one absorption unit further removes sulfur species and produces an additional sulfur species rich stream.

3. The process of claim 2, wherein the sulfur species is H_2S, COS, CS_2, or a combination thereof.

4. The process claim 1, wherein the at least one absorption unit further removes nitrogen contaminant species and produces an additional nitrogen contaminant rich stream.

5. The process of claim 1, wherein the scrubbed syngas source comprises between 25 to 45 mol% of H_2, 30 to 65 mol% of CO and 6 to 40 mol% of CO_2 and/or wherein the clean syngas stream composition comprises 30% to 50 mol% H_2, 40 to 68 mol% CO and 0 to 25 mol% CO_2.

6. The process of claim 1, further comprising a step of recycling the CO_2 rich stream for use as inerting gas, exporting said CO_2 rich stream for Carbon Capture and Storage (CCS), and/or producing saleable merchant CO_2 from said CO_2 rich stream.

7. The process of claim 1, wherein a first portion of the loaded solvent is withdrawn through a first recirculation loop and a second portion of the loaded solvent is withdrawn through a second recirculation loop, and where,

-the first portion of the loaded solvent is pre-flashed at an intermediate pressure recovering the H_2 and CO contained in the loaded solvent, producing a first CO_2 stream rich in H_2 and CO and a first flashed solvent, and the second portion of the loaded solvent is pre-flashed at an intermediate pressure recovering H_2 and CO contained in the loaded solvent, producing a second CO_2 stream rich in H_2 and CO and a second flashed solvent;

-the first flashed solvent is flashed at lower pressure generating a non-flammable CO_2 rich stream and a clean solvent which is recycled back into the absorption unit;

-the first and second CO_2 streams rich in H_2 and CO are recycled in the scrubbed syngas stream upstream of the absorption unit; and

-the second solvent is stripped in a first stripping unit to remove sulfur species, producing a rich sulfur species stream and a clean solvent which is recycled back into the absorption unit.

8. The process of claim 1, wherein the selective solvent of the purification unit further removes the sulfur species, and nitrogen species, producing a rich sulfur and nitrogen species stream.

9. The process of claim 8, wherein a first portion of the loaded solvent is withdrawn through a first recirculation loop, a second portion of loaded solvent is withdrawn through a second recirculation loop, and a third portion of loaded solvent is withdrawn through a third recirculation loop where;

the first portion of the loaded solvent is pre-flashed at an intermediate pressure recovering the H_2 and CO contained in the loaded solvent, producing a first CO_2 stream rich in H_2 and CO and a first flashed solvent; and the second portion of the loaded solvent is pre-flashed at an intermediate pressure recovering H_2 and CO contained in the loaded solvent, producing a second CO_2 stream rich in H_2 and CO and a second flashed solvent; and, optionally, the third portion of the loaded solvent is pre-flashed at an intermediate pressure recovering the H_2 and CO contained in the loaded solvent, producing a third CO_2 stream rich in H_2 and CO and a third flashed solvent;

the first flashed solvent is flashed at lower pressure generating a non-flammable CO_2 rich stream and a clean solvent which is recycled back into the absorption unit;

the first, second and optional third CO_2 streams rich in H_2 and CO are recycled in the scrubbed syngas stream upstream of the absorption unit; and

the second flashed and third flashed solvents, or unflashed solvents are stripped in a stripping unit to remove the sulfur species, and nitrogen species, producing a rich sulfur and nitrogen species stream and a clean solvent which is recycled back into the absorption unit.

10. The process of claim 1, wherein the non-flammable CO_2 rich stream is further used as inerting gas, recovered for Carbon Capture and Storage (CCS) and/or to produce saleable merchant CO_2.

11. The process of claim 1, further comprising treating the clean syngas stream with at least one solid adsorbent bed before or after mixing the clean syngas stream with hydrogen.

12. The process of claim 1, wherein H_2S concentration in the clean syngas stream is adjusted to achieves a specific desired concentration, to meet the requirement of the downstream syngas conversion unit; while achieving low level of HCN and/or NH_3 concentration.

13. The process of claim 1, wherein the hydrogen is imported from an external source.

14. The process of claim 1, wherein the purification unit comprises chilled methanol as a solvent.

15. The process of claim 1, wherein the balanced syngas stream meet the stoichiometric ratio requirement of the syngas conversion unit to produce fuel, a chemical, or a Fischer Tropsch product.

16. The process of claim 1, wherein the scrubbed syngas is from a gasification and/or reforming of a carbonaceous material.

17. The process of claim 13, further comprising admixing an external source of CO_2 or CO_2 input from another process effluent into the clean syngas stream along with the external source of hydrogen to produce a balanced syngas further boosted in carbon that meet the stoichiometric ratio of the desired end product, thus further increasing the production of the desired end product.

18. The process of claim 1, further comprising a reverse water gas shift (RWGS) unit to convert a portion of the recovered CO_2 along with a portion of the imported H_2 to generate additional carbon monoxide prior to the syngas conversion unit.

19. The process of claims 1, wherein the recovered CO_2 is recycled back to a carbonaceous feedstock gasification and/or reforming unit to reduce the scrubbed syngas H_2/CO ratio, increasing the total CO yield and production, and generating a boosted CO scrubbed syngas and a boosted CO clean syngas.

20. The process of claim 1, wherein the purification unit comprises a stripping unit including a split loading stripper column with at least a top and bottom mass transfer zone sections, where nitrogen species loaded methanol is fed at the top of the stripper column and above the top mass transfer zone, while the sulfur species loaded methanol is fed in the middle of the stripper column in between the top and bottom mass transfer zone sections.