## CLAIMS

What is claimed is:

1. A method of equipment decontamination comprising:

(A) introducing a cleaning stream comprising hydrogen and a solvent composition comprising a hydrocarbon solvent and a refinery cutting fluid into the equipment; and

(B) introducing a stream comprising nitrogen into the equipment, wherein the equipment comprises deposits.

2. The method of claim 1, further comprising introducing a solvent-free hydrogen stream before step (A), wherein the solvent-free hydrogen stream is at a temperature of 150 °C to 300 °C.

3. The method of claim 1, wherein step (A) comprises:

injecting the solvent composition into a hydrogen stream;

vaporizing the solvent composition with the hydrogen stream; and

dispersing the solvent composition with the hydrogen stream.

4. The method of claim 1, wherein the hydrocarbon solvent is a bicyclic hydrocarbon compound comprising two fused benzene rings.

5. The method of claim 4, wherein the two fused benzene rings comprise one aromatic ring and on saturated ring.

6. The method of claim 1, wherein the hydrocarbon solvent comprises a Kb value between 120 Kb and 150 Kb.

7. The method of claim 1, wherein the hydrocarbon solvent comprises naphthalene, tetralin, decalin, or any combinations thereof.

8. The method of claim 1, wherein the hydrocarbon solvent is present in an amount ranging between 60% to 100% by volume of the solvent composition.

9. The method of claim 1, wherein the refinery cutting fluid is any material capable of being naturally distilled from crude oil.

10. The method of claim 1, wherein the refinery cutting fluid comprises diesel, kerosene, naphtha, or any combinations thereof.

11. The method of claim 1 further comprising:

absorbing the deposits, disaggregating the deposits, or any combinations thereof; and

generating a bottoms stream comprising the hydrogen, the solvent composition, and the absorbed and/or disaggregated deposits.

12. The method of claim 11 further comprising removing at least a portion of the solvent composition and the absorbed and/or disaggregated deposits.

13. The method of claim 1, wherein the equipment is a reactor comprising a catalyst and wherein the method further comprises removing at least a portion of the catalyst after step (B).

14. A method comprising:

(A) introducing a stream comprising hydrogen into a reactor, wherein the reactor comprises a catalyst, deposits on the catalyst, and other contaminants;

(B) introducing into the stream comprising hydrogen a solvent composition stream comprising a hydrocarbon solvent and a refinery cutting fluid;

(C) vaporizing the solvent composition stream into the stream comprising hydrogen to produce a cleaning stream in the reactor;

(D) contacting the deposits with the cleaning stream and removing at least a portion of the deposits and/or other contaminants with the cleaning stream; and

(E introducing a nitrogen stream into the reactor.

15. The method of claim 14, wherein the hydrogen stream is at a temperature of 150 °C to 300 °C.

16. The method of claim 14, wherein the deposits comprise at least one of an unsaturated hydrocarbon, an aromatic hydrocarbon, a hydrocarbon based gum, a hydrocarbon based resin, a heavy oil, or oligomers.

17. The method of claim 14, wherein the other contaminants are comprised of, but not limited to, hydrogen sulfide, benzene, dispersed combustible materials, or combinations thereof.

18. The method of claim 14, wherein the hydrocarbon solvent comprises naphthalene, tetralin, decalin, or any combinations thereof.

19. The method of claim 14, wherein the refinery cutting fluid comprises diesel, kerosene, naphtha, or any combinations thereof.

20. The method of claim 13 or 14 further comprising:

generating a bottoms stream from the reactor comprising the cleaning stream and the removed portion of the deposits; and

removing the deposits and at least a portion of the solvent from the bottoms stream to produce a hydrogen waste stream.