What is claimed is:

1. A process for producing acetic acid, comprising:

separating a reaction medium in a flash vessel into a liquid recycle stream and a vapor product stream comprising from 45 to 75 wt.% acetic acid, from 24 to less than 36 wt.% methyl iodide, up to 9 wt.% methyl acetate, up to 15 wt.% water, from 0.005 to 1 wt.% acetaldehyde, and up to 1 wt.% hydrogen iodide; and

distilling at least a portion of the vapor product stream in a first column to obtain an acetic acid product stream comprising acetic acid and up to 300 wppm hydrogen iodide and an overhead stream comprising methyl iodide, water and methyl acetate.

2. The process of claim 1, wherein the vapor product stream comprises from 55 to 75 wt.% acetic acid, from 24 to 35 wt.% methyl iodide, from 0.5 to 8 wt.% methyl acetate, from 0.5 to 14 wt.% water, from 0.01 to 0.8 wt.% acetaldehyde, and up to 0.5 wt.% hydrogen iodide.

3. The process of claim 1, wherein the vapor product stream comprises from 60 to 70 wt.% acetic acid, from 25 to 35 wt.% methyl iodide, from 0.5 to 6.5 wt.% methyl acetate, from 1 to 8 wt.% water, from 0.01 to 0.7 wt.% acetaldehyde, and up to 0.1 wt.% hydrogen iodide.

4. The process of claim 1, wherein the acetic acid product stream comprises up to 50 wppm hydrogen iodide.

5. The process of claim 1, wherein the acetic acid product stream comprises from 0.1 to 6 wt.% methyl iodide.

6. The process of claim 1, wherein the acetic acid product stream comprises from 0.1 to 6 wt.% methyl acetate.

7. The process of claim 1, wherein the water concentration is maintained in the acetic acid product stream from 1 to 9 wt.%.

8. The process of claim 1, wherein the net production of water in the distilling step increases by up to 0.5% over the water concentration in the vapor product stream fed to the distilling step.

9. The process of claim 1, wherein the liquid recycle stream comprises from 0.01 to 0.5 wt.% metal catalyst; from 5 to 20 wt.% lithium iodide; from 10 to 2500 wppm corrosion metals; from 60 to 90 wt.% acetic acid; from 0.5 to 5 wt.% methyl iodide; from 0.1 to 5 wt.% methyl acetate; from 0.1 to 8 wt.% water; from 0.0001 to 1 wt.% acetaldehyde; and from 0.0001 to 0.5 wt.% hydrogen iodide.

10. The process of claim 1, wherein the overhead stream is phase separated to form a light liquid phase and a heavy liquid phase.

11. The process of claim 10, wherein the light liquid phase comprises from 1 to 40 wt.% acetic acid, up to 10 wt.% methyl iodide, from 1 to 50 wt.% methyl acetate, from 40 to 80 wt.% water, up to 5 wt.% acetaldehyde, and up to 2 wt.% hydrogen iodide.

12. The process of claim 10, wherein the light liquid phase comprises from 15 to 25 wt.% acetic acid, from 1 to 5 wt.% methyl iodide, from 1 to 10 wt.% methyl acetate, from 60 to 75 wt.% water, from 0.1 to 0.7 wt.% acetaldehyde, and from 0.001 to 0.5 wt.% hydrogen iodide.

13. A process for producing acetic acid comprising:

separating a reaction medium in a flash vessel into a liquid recycle stream and a vapor product stream comprising from 45 to 75 wt.% acetic acid, from 24 to less than 36 wt.% methyl iodide, up to 9 wt.% methyl acetate, up to 15 wt.% water, from 0.005 to 1 wt.% acetaldehyde, and up to 1 wt.% hydrogen iodide; and

distilling at least a portion of the vapor product stream in a first column to obtain an acetic acid product stream comprising acetic acid and from 0.1 to 6 wt.% methyl iodide and an overhead stream comprising methyl iodide, water and methyl acetate.

14. The process of claim 13, wherein the vapor product stream comprises from 55 to 75 wt.% acetic acid, from 24 to 35 wt.% methyl iodide, from 0.5 to 8 wt.% methyl acetate, from 0.5 to 14 wt.% water, from 0.01 to 0.8 wt.% acetaldehyde, and up to 0.5 wt.% hydrogen iodide.

15. The process of claim 13, wherein the acetic acid product stream comprises up to 300 wppm hydrogen iodide.

16. The process of claim 13, wherein the acetic acid product stream comprises from 0.1 to 6 wt.% methyl acetate.

17. The process of claim 13, wherein the water concentration is maintained in the acetic acid product stream from 1 to 9 wt.%.

18. The process of claim 13, wherein the liquid recycle stream comprises from 0.01 to 0.5 wt.% metal catalyst; from 5 to 20 wt.% lithium iodide; from 10 to 2500 wppm corrosion metals; from 60 to 90 wt.% acetic acid; from 0.5 to 5 wt.% methyl iodide; from 0.1 to 5 wt.% methyl acetate; from 0.1 to 8 wt.% water; from 0.0001 to 1 wt.% acetaldehyde; and from 0.0001 to 0.5 wt.% hydrogen iodide.

19. A process for producing acetic acid comprising:

distilling a mixture comprising from 45 to 75 wt.% acetic acid, from 24 to less than 36 wt.% methyl iodide, up to 9 wt.% methyl acetate, up to 15 wt.% water, from 0.005 to 1 wt.% acetaldehyde and up to 1 wt.% hydrogen iodide to form an overhead stream comprising methyl iodide and sidedraw stream comprising acetic acid; and

condensing the overhead stream to form separate liquid phases.

20. The process of claim 19, wherein the water concentration in the sidedraw stream is maintained from 1 to 3 wt.% water and up to 300 wppm hydrogen iodide.