What is claimed is:

1. A process for producing acetic acid comprising:
introducing a product gas comprising carbon monoxide, hydrogen, and carbon dioxide and at least one reactant selected from the group consisting of methanol, methyl acetate, methyl formate, dimethyl ether and mixtures thereof to a reactor comprising a reaction medium comprising a catalyst, methyl acetate, promoter, and catalyst stabilizer under carbonylation conditions effective to produce acetic acid, wherein hydrogen partial pressure in the reactor is from 3 atm to 40 atm;
withdrawing a vent gas from the reactor, provided that the carbon monoxide partial pressure in the reactor is less than 15 atm to maintain a carbon monoxide content in the vent gas of less than 40 mol. %;
withdrawing a reaction solution from the reactor; and recovering acetic acid from the reaction solution.

2. The process of claim 1, wherein the product gas has a hydrogen to carbon monoxide molar ratio of 0.2:1 to 6:1.

3. The process of claim 1, wherein the product gas has a carbon dioxide to carbon monoxide molar ratio from 1:0.5 to 1:80.

4. The process of claim 1, wherein the product gas comprises from 9 mol. % to 80 mol. % hydrogen, from 3 mol. % to 90 mol. % carbon monoxide, and from 0.5 mol. % to 25 mol. % carbon dioxide.

5. The process of claim 1, wherein carbon monoxide partial pressure in the reactor is from 0.3 atm to 15 atm.

6. The process of claim 1, wherein hydrogen partial pressure in the reactor is from 5 atm to 25 atm.

7. The process of claim 1, wherein carbon monoxide partial pressure in the reactor is less than hydrogen partial pressure in the reactor.

8. The process of claim 1, wherein the vent gas comprises from 5 mol. % to 95 mol. % hydrogen, and from 4 mol. % to 70 mol. % carbon dioxide, and from 0.2 mol. % to 40 mol. % carbon monoxide.