CLAIMS

What is claimed is:

1. A method for purifying a crude liquid vinyl acetate feed stream comprising:

a) feeding the crude liquid vinyl acetate feed stream from a vinyl acetate monomer reactor into a first distillation tower, wherein the crude liquid vinyl acetate feed stream comprises vinyl acetate monomer, acetic acid, water, and ethyl acetate, and wherein the first distillation tower comprises a top of the first distillation tower and a bottom of the first distillation tower;

b) distilling the crude liquid vinyl acetate feed stream;

c) removing a first vapor product from the top of the first distillation tower, wherein the first vapor product is predominantly a water and vinyl acetate monomer azeotrope mixture;

d) removing a first liquid product from the bottom of the first distillation tower, wherein the first liquid product comprises water and acetic acid;

e) removing a first vapor side stream from the first distillation tower, wherein the first vapor side stream comprises acetic acid, water, vinyl acetate monomer and ethyl acetate,

f) feeding the first vapor side stream from the first distillation tower into a second distillation tower;

g) distilling the first vapor side stream in the second distillation tower, wherein the second distillation tower comprises a top of the second distillation tower and a bottom of the second distillation tower;

h) removing a second liquid product comprising acetic acid and water from the bottom of the second distillation tower,

i) removing a second vapor product comprising vinyl acetate monomer, ethyl acetate and the remaining water from the top of the second distillation tower;

j) condensing the second vapor product; and

k) separating the condensed second vapor product into a third vapor stream, a first aqueous stream and an optional organic stream, wherein a first portion of the first aqueous stream is returned to the second distillation tower as reflux and a second portion of the first aqueous stream is sent to a water treatment plant or a reaction area of the vinyl acetate monomer reactor.

2. The method of claim 1, further comprising the steps of:

l) condensing and separating the first vapor product to form a second aqueous stream and a first vapor phase,

m) purging the first vapor phase, and

n) feeding the second aqueous stream to either a water treatment plant or the reaction area of the vinyl acetate monomer reactor.

3. The method of claim 1, wherein the liquid product removed from the bottom of the first distillation tower has a constant water concentration of ~~about~~ 4 to 15 wt. %.

4. The method of claim 1, wherein the first distillation tower contains 50 to 90 trays and is operated under 1 to 5 bars of absolute pressure.

5. The method of claim 1, wherein a feed inlet tray of the first distillation tower is located between a middle section of the first distillation tower and the top of the first distillation tower.

6. The method of claim 1, wherein the condensing of the second vapor product stream is in a temperature range of ~~about~~ 35 to ~~about~~ 105°C.

7. The method of claim 1, wherein the optional organic stream from the condensed second vapor product is present when the condensing occurs in a temperature range of ~~about~~ 35 to ~~about~~ 78°C.