DEPARTMENT 246

TENTATIVE OPERATING INSTRUCTIONS

HCl SCRUBBER SYSTEM

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HCl Scrubber System

A. Synopsis

The purpose of the HCl off-gas scrubber system is to reduce the amount of PCB's in the off-gas to an acceptable level to protect the environment. The chlorinators can continue to run for short periods of time or at a reduced rate when the HCl using department is down.

B. Equipment

1. Scrubber colum(item 439)
2. Scrubber liquor tank(item 441)
3. Scrubber liquor heat exchanger(item 440)
4. Scrubber liquor circulating pump(item 442)
5. Entrainment separator

C. Equipment Function

1. The function of the scrubber column is to remove the Aroclor and Biphenyl from the HCl off-gas by passing the gas up through the cool liquor that is being circulated downward through the column.
2. The function of the scrubber liquor tank is to hold liquor while it is being circulated through the heat exchanger and column scrubber.
3. The function of the scrubber liquor circulating pump is to circulate the liquor from the liquor tank through the heat exchanger and scrubber column.
4. The function of the scrubber liquor heat exchanger is to cool the circulating liquor to the desired temperature.
5. The function of the separator is to remove droplets of liquids that may carry-over with the off-gas as it leaves the HCl storage tank.

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D. Control Loops, Interlocks and Alarms

1. Control loops. There are 4 in this system.

(a) Scrubber liquor tank temperature control-TIC-441
The function of this loop is to prevent the material in the liquor tank from going below 35°C. Set point is 35°C. This temperature controller is field mounted.

(b) Scrubber liquor tank level indicator - L-441
The function of loop is to provide an indication of the scrubber liquor level in the tank. The level indicator is located on the tank, on the ground floor. Normal level is about 60%(1,260 gal).

(c) Scrubber liquor heat exchanger temperature controller - TIC-440
The function of this loop is to control the temperature of the liquor to the scrubber column, and to sound an alarm on a high liquor temperature of 50°C. Normal set point is 40°C. This temperature controller is panel mounted.

(d) Scrubber column liquor flow controller - FIC-439
The function of this loop is to control the flow of scrubber liquor to the column. The controller is in the field. Normal set point is 80 GPM.

2. Interlocks

There are no interlocks on this system.

3. Alarms

There are two alarms:

(a) If the temperature of the scrubber liquid on the top tray in the column reaches 50°C the alarm will sound and the window marked "Hi temp off-gas scrubber" will light.

(b) If the motor on the liquor circulating pump stops the alarm will sound and the window marked "scrubber liquor circ pump" will light. Both alarms use the same telalarm window.

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HCl Scrubber System

E. Start-Up Instructions

1. Close the bottom outlet valve on the scrubber liquor tank.

2. Have distilled 1016 residue pumped from #2 receiver into the scrubber liquor tank to 60% on the level indicator.

3. Start cooling water through the scrubber liquor heat exchanger and set the temperature controller on 40°C. (Controller is on panel board in control room).

4. Set the liquor flow controller on 50 GPM, on manual control.

5. Line up all valves in the liquor circulating line from the pump, through the heat exchanger, into the top of the column, out of the bottom of the column and into the top of the liquor tank.

6. Open the bottom outlet valve on the scrubber liquor tank to allow liquor to flow to the circulating pump, then turn the circulating pump on.

7. Set the liquor flow controller on automatic and raise the set point to 80 GPM.

   Note: Normal conditions at this point should be:

   (a) liquor temperature 40°C.
   (b) liquor flow - 80 GPM
   (c) the telalarm window light should be out for the circulating pump and hi temp off-gas scrubber.
   (d) the level in the scrubber tank should be about 60%
   (e) the temperature on the liquor tank should be 40°C.

8. Open the HCl sewering valve to the drowning jet. (Lower the set point on the controller on the 3rd floor).

9. Start up a batch chlorinator in the normal manner.

10. When the batch chlorinator is running, check the back pressure on it. It should not be over 6 pounds.

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E. Start-Up Instructions(Cont'd.)

11. If the HCl scrubber system functions properly with the batch chlorinator, start up the continous chlorinators at 40% biphenyl rate.(The back pressure on the HCl storage tank should not be above 6 pounds).

12. Allow time for the sp.gr. on the chlorinators to line out, and if the back pressure is no problem, increase the biphenyl feed rate to 50% and allow it to line out.

13. Increase the biphenyl feed rate to 60%, then to 70% in the same manner as above in 11 and 12.

14. If all operations look normal, call Dept. 217 and send the HCl to them.

15. To change out the liquor in the liquor tank use the pump under the HCl storage tank and transfer the material through the head tank and out to #7 storage tank. Keep the liquor circulating pump running and don't let the level go below 10%. Recharge from #2 receiver.

F. Shut Down Instructions

1. Emergency

a. Shut down all chlorinators.
b. Shut off the liquor circulating pump.

2. Normal

a. Shut down all chlorinators.
b. Keep the liquor circulating pump running and the liquor temperature in control.

G. Electrical Power Failure

Electrical power failure will:

1. Shut off the liquor circulating pump.
2. Close the water valve to the liquor heat exchanger.

When power is restored, start the circulating pump.

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HCl Scrubber System

H. General Information

1. The back pressure on the chlorinators should not exceed 8 pounds due to the scrubber system.

2. The pressure drop across the column should be about 3 pounds. A higher pressure drop may indicate flooding in the column(too much liquor).

3. When making 1142 in the continuous chlorinators, the scrubber liquor is expected to last about 7 days before requiring a change out.

4. The scrubber liquor must be changed when the biphenyl content reaches 5.0% or the monochlorobiphenyl(MCB)content reaches 1.3%, as reported by the lab. If the biphenyl level exceeds 5.5%, the biphenyl will solidify on the HCl transfer line walls.

5. To by-pass the scrubber system it is necessary to:
   a) Shut the chlorinators down.
   b) Remove the 6 inch slip blank.
   c) Put in two 6 inch slip blanks.

6. There are 7 thermo(steam) panels on the liquor tank. Two have steam applied to them automatically. The other five require opening manual block valves if more heat is needed.

7. The scrubber liquor can freeze at temperatures below 30°C. If there is a steam failure and the temperature of the scrubber liquor falls below 30°C manually turn on the other 5 thermo panels until the liquor exceeds 30°C. If the circulating pump is off, do not turn it on until the circulating tank temperature exceeds 30°C.

I. Pre-Conditioning Inspection

Item 429 - off-gas storage tank

Visual inspection of tank _____

Is dip pipe(1) installed for the entrainment separator?_____

Item 430 - Brink Mist Eliminator

Visual inspection of tank _____

Fill the dish with 50 gallons of distilled 1016 residue bottoms _____

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HCl Scrubber System

I. Pre-Conditioning Inspection(Cont'd.)

Item 441 - Scrubber Circulating Tank

Visual inspection of tank _____

Are dip pipes(2) installed?_____

Are corrosion coupons and the corometer installed?_____

Item 439 - Off gas scrubber

Visual inspection of column and demister pad _____

Are corrosion coupons and the corometer installed (top tray)?_____

Is the thermowell properly installed(top tray)?_____

Item 442 - Scrubber circulating pump

Check rotation of pump _____

Check pump failure alarm _____

Instrumentation

A. Scrubber liquor heat exchanger

Check manual operation of water valve _____

Check temperature indicator against amibient temperature _____

B. Circulating tank temperature controller

Check manual operation of steam valve _____

Check temperature indicator against ambient temperature _____

C. Column liquor flow controller

Check manual operation of flow control valve _____

D. HCl gas temperature indicators, scrubber column inlet and outlet

Check temperature indicators against ambient temperature _____

E. Circulating tank level indicator

Check zero point _____

F. Brink differential pressure manometer

Check piping connections for manometer _____

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HCl Scrubber System

J. Equipment Conditioning Plans

1. I above should be completed. _____.

2. Open all drains possible to remove any water that may be in the system._____.

3. Pressurize the system with air to 90 - 100" H_2O (3.5 psig)and check for leaks.

_____

_____

If necessary HCl can be used to pressurize the system to check for leaks, using NH_3 bottles.

_____

4. When the system is tight, pump 1016 residue from #2 receiver to a level of 10% in the liquor tank._____.

5. Line up valves for circulating liquor through the heat exchanger, column and back to the liquor tank. _____.

(Set the FIC on 50 gpm in the manual position).

6. Circulate the liquor for one hour and take 1-16 oz. sample to lab for H_2O analysis.

Time_____, Analysis _____.

7. If the H_2O analysis is below 150 ppm the liquor can probably be left in the tank for further use. If the H_2O analysis is above 150 ppm it may be necessary to remove the water or pump the liquor to #7 storage, or both.

8. Turn cooling water on the heat exchanger with the controller set point on 40°C.

9. Set the liquor flow controller(FIC) on automatic and increase the flow to 80 gpm_____.

Take the following readings:

a. Circulating pump pressure
inlet _____ lbs.
oultet _____ lbs.

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J. Equipment Conditioning Plans (Cont'd.)

Take the following readings:

b. Shut off the circulating pump to check telalarm. _____.
Then start pump again.

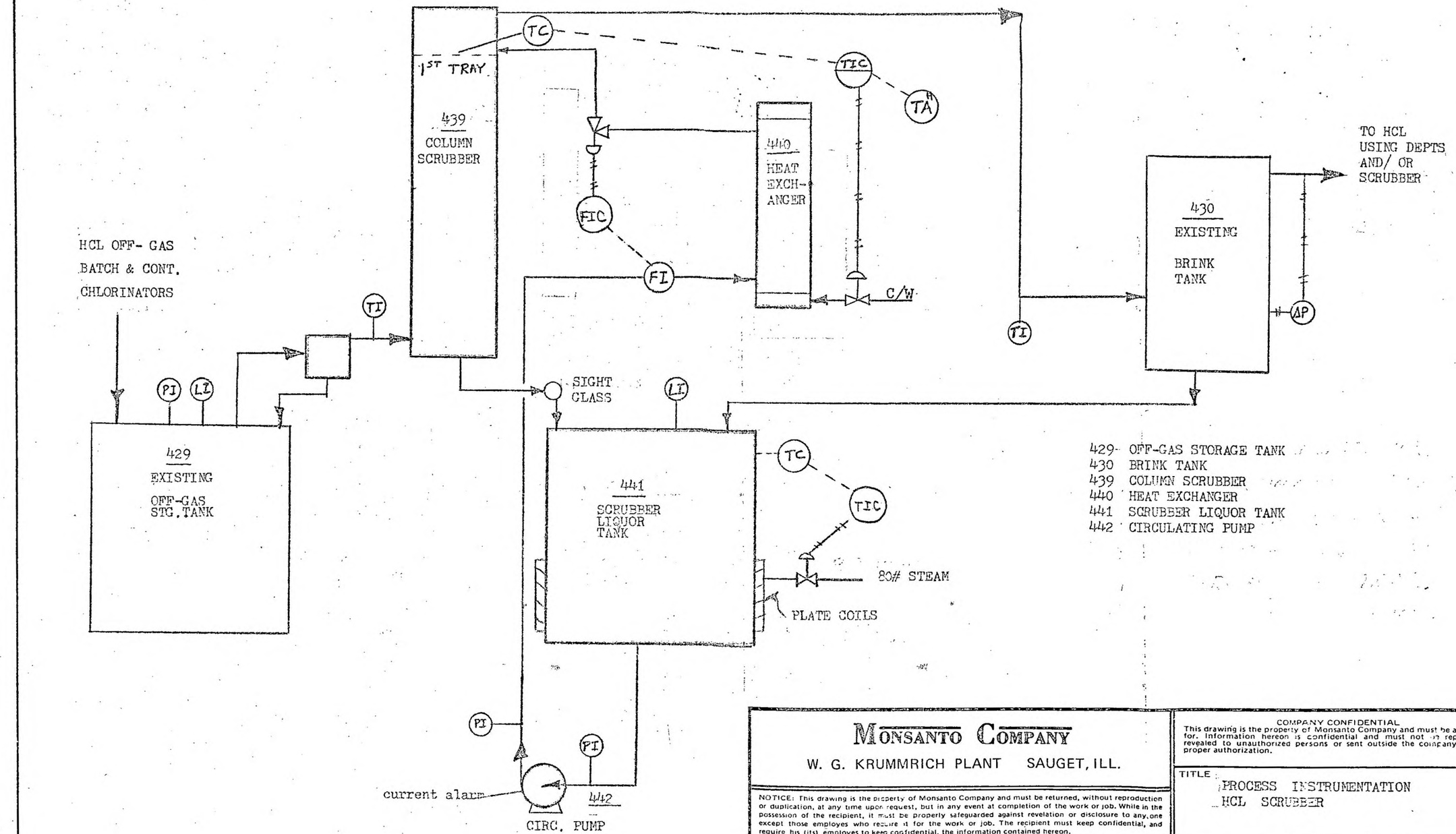
c. Check the sight glass in the return line on top of the liquor tank.
How full is the glass? _____.
Color of liquor _____.

d. Cool the liquor to 35°C to check the temperature control. _____.

e. Shut off the H_2O to the heat exchanger and heat liquor to 50°C. Use the panels on the liquor tank.
Did the telalarm come in on high temp? _____.

f. Turn the steam off the liquor tank panels and turn water back on the heat exchanger to cool the liquor down to 40°C.

PCB-ARCH-EXT0374543



429- OFF-GAS STORAGE TANK
430 BRINK TANK
439 COLUMN SCRUBBER
440 HEAT EXCHANGER
441 SCRUBBER LIQUOR TANK
442 CIRCULATING PUMP

MONSANTO COMPANY

W. G. KRUMMRICH PLANT SAUGET, ILL.

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