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PPG INDUSTRIES, INC.

CHEMICAL DIVISION - U.S.

LAKE CHARLES, LA

TRAINING MANUAL FOR THE POSITION OF "D" OPERATOR IN PLANT B-II VCM-II

Developed and compiled by:

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Operations Training

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3-22-92

Date

Approved by:

B. D. REYNOLDS, General Foreman

Operations Representative

Ben Reynolds

4/8/92

Date

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No. 91-1145

TASK DETAILING - A reference list of the subtasks necessary to perform the tasks in the module.

YOUR ON-THE-JOB TRAINER, LEAD OPERATOR AND SUPERVISOR WILL ASSIST YOU DURING YOUR TRAINING PERIOD. HOWEVER, YOU ARE THE PERSON MOST RESPONSIBLE FOR YOUR LEARNING.

Read the Objective and Rationale. If you have any questions about the task or why it is done, ask your on-the-job trainer or supervisor. Once the task and the reasons you perform it are clear to you, go on to the learning activities.

The first part of the Learning Activities will provide you with or refer you to information that must be learned in order to correctly and safely perform the task. Your on-the-job trainer will help you with the second part which is the practical application of the information to the job.

When you become confident that you can perform the task, ask your trainer for the Progress Check. The on-the-job trainer will assist you in completing the check, but it is your responsibility to know the material required to perform it. If the results are not satisfactory to you or the trainer, the Progress Check may be repeated after additional study. When the progress check is completed, the trainer or supervisor will sign the form. The signature means simply that the Progress Check has been completed. It should not be interpreted as an endorse-

ment of your performance. You will sign the Progress Check form as an indication that you have completed it.

Qualification Standards for this job are listed in the last section of the training manual. Your job performance will be measured using these standards as a guide. You must meet these standards to qualify for this job.

The final evaluation of your performance will include several items, the most important of which will be your performance on the test given at the completion of your training.

THIS MANUAL IS NOT INTENDED TO COVER EACH AND EVERY ASPECT OF THE JOB. IT CONTAINS THE BASICS OF THE JOB AND WILL BE MODIFIED AS NECESSARY.

Listed below is the suggested timetable for the completion of this manual. This schedule need not be strictly followed, but is furnished as a guide.

MODULE	COMPLETION TIME IN WORKING DAYS
#1	2
#2	1½
#3	2
#4	1/2
#5	1/2
#6	1

#7		1
#8		2
#9		1
#10		1
10	Modules	12½ Working Days

There is a reminder of the estimated completion time at the beginning of each module.

NOTE:

The generic pronoun "he" is used throughout this manual for the sake of convenience. There is no intent to discriminate by sex.

CONCERNS FOR YOUR FUTURE

The three important concerns for your future are Safety, Environmental Control and Energy Conservation.

SAFETY is the personal responsibility of each employee. He has a responsibility to his family, to his fellow workers, and to his employer by whom he is paid to work safely. In the performance of his duties, he will be expected to observe safe practice rules as well as instructions relating to the efficient handling of his work.

ENVIRONMENTAL CONTROL is both an important national consideration and a serious concern of PPG Industries. In order to maintain an environment that is healthy and in compliance with government requirements, all PPG employees must assume a personal responsibility for preventing spills, which would contaminate the environment.

ENERGY is not only an exhaustable natural resource, it is a major and ever-increasing expense to PPG. It increases in cost with consumption such that each unit of energy used increases the cost of all our energy. All employees are expected to recognize and take steps to eliminate waste and use efficiently that energy necessary to properly and efficiently complete his assigned task.

These concerns can be managed successfully with the full cooperation of every employee.

CONTENTS

PLANT HISTORY

The PPG Industries, Inc. Industrial Chemicals Division Plant in Lake Charles was constructed by the U.S. Government during World War II for the purpose of manufacturing magnesium. It was originally operated by Mathieson Alkali Works (Olin Chemical Corporation) for the Defense Plant Corporation.

In 1945 Southern Alkali Corporation, a jointly owned subsidiary of Pittsburgh Plate Glass Company and American Cyanamid Company, acquired the Lake Charles Plant for the purpose of converting the plant for the manufacture of chlorine and caustic soda. The first of four electrolytic chlorine cell circuits was put into operation on October 7, 1947. In 1951 PPG bought out the minority interest held by American Cyanamid and changed our name to Columbia-Southern Chemical Corporation. Columbia-Southern became the Chemical Division of Pittsburgh Plate Glass Company in 1961 and on April 1, 1968. the name was again changed, this time to PPG Industries, Inc., Chemical Division, U.S.

The Lake Charles Plant started with chlorine/caustic and has grown into a major producer of industrial chemicals. Vinyl chloride, ethyl chloride, chlorinated solvents and silica products are among these chemicals.

Two major chlorine/caustic/power expansions have taken place since the seventh diaphragm cell circuit was completed in 1955. PPG became the first company to market caustic in pellet form in 1968 with the start-up of the caustic prill unit (PELS). In 1969 a major expansion in chlorine and caustic production was made with the Mercury Cell Unit. This type unit was built to help utilize the surplus salt from the Diaphragm Cell area. The Mercury Cell area differs in that it produces a low salt, saleable strength caustic soda. There is no additional expense involved in processing the caustic soda. From time to time there have been modifications made in the original Diaphragm Cells to increase their capacity.

The products of Plant A are Chlorine, which is used as feedstock for other units, a bleach, and swimming pool water treatment to name a few and Caustic Soda, used in the paper industry and as a granular substance to uplug sink drains in homes. The third product of Plant A is hydrogen. This H_2 is compressed and sold to Gulf Oxygen and to Jupiter Chemicals. Some of the H_2 is used to fire the boilers at Powerhouse "C" in Plant C.

In 1968, the Silicas Products plant was started up. This was the first of its kind to be constructed in the South. The Silicas plant was the first unit to be built in Plant C, which in 1977-78 underwent an expansion with the construction of Chlorine, Caustic and Power units. This expansion was a 1500 ton per day Cl_2 expansion. A prototype of the Plant C cell was operated in Plant A before the Cl_2 area of Plant C was built. As a result of the Cl_2 expansion in Plant C, Liquefaction was

expanded. Another expansion of Plant C was started up in 1980. To help handle the increased Cl_2 production, North Liquefaction was built in Plant A.

With the purchase of the Alkali Plant from the government, PPG also purchased Power Plant A. The Riverside Power Plant was purchased from the government by Gulf States Utilities. Riverside Power Plant was expanded in 1950 to meet the growing demand for electrical energy on the Gulf Coast.

The 1955 Chlorine/Caustic expansion brought about the expansion of Power Plant A. Another boiler and turbine was added. In 1965, PPG purchased Riverside from G.S.U. This was in preparation for the Mercury Cell Unit that came on stream in 1969. Riverside was expanded from 85 megawatts to 165 megawatts. The name was changed to Power Plant "B".

Power Plant "C" was built in Plant C to help meet the energy demands there. This Power Plant incorporated the latest technology and design in modern power plants. It utilizes a gas turbine to generate electricity and the waste heat is used in a Heat Recovery Steam Generator. This steam in turn is used to generate electricity.

At the present, the energy capabilities are: Power Plant A is 96 megawatts and 1,575,000#/hour of steam, Power Plant B which has 165 megawatts and 1,570,000#/hour of steam and Power Plant C with 156 megawatts and 1,500,000#/hour of steam.

The expansion in Plant B is a complex, intertwined affair. The names of the process units and the chemicals used and produced are alien to the majority of new operators. Through related use, you will become familiar with the chemicals regardless of how strange the names may sound.

The Lake Charles Plant entered the organics market in 1960 with the construction of an Ethylene Dichloride Unit (EDC). This EDC unit was to prove to be a feedstock for several units to be built later. After the success of the EDC unit, Methyl Chloroform (MC) and Hydrogen Chloride (HCl) units were built. The MC is an electrical cleaner. This is also sold by other companies as a liquid to unplug kitchen sink drains. The HCl was sold to Continental Oil Company and also used as a feedstock in the MC unit.

Next in the growth of the organics units was the construction of Per-chloroethylene and Trichloroethylene unit (Per-Tri). The primary use is as a degreaser. Women use it to remove grease spots by spraying it on the clothes before washing them. Dry cleaners use Per because it is also a dry cleaning agent. Tri is used by the auto manufacturers and space industry as a degreaser.

After Per-Tri came on stream, Vinyl chloride (VC) and Ethyl Chloride (EC) units were built. VC is used in the manufacture of plastic pipe and furniture covering. EC is used as a refrigerant and in the manufacture of tetraethyl lead for gasoline. In the VC process, HCl is produced and sold as a feedstock and muriatic acid.

To help utilize the HCl produced by the VC unit, an Oxyhydrochlorination unit (OHC) was built. The OHC unit manufactures EDC which serves as a feedstock for the VC and Tetrachloroethane units. Modifications were made to the old MC unit to convert it to an EDC unit. A new MC unit was built. It was named TE-II after the registered trade name of Tri-ethane.

After the construction of the TE II unit, Plant B was divided into B-I and B-II. In B-I the units are Perchloroethylene-Trichloroethylene, Ethyl Chloride, Vinyl Chloride, Tetrachloroethane, Waste-Treatment, Hydorgen Chloride, and Oxyhydrochlorination. B-II is comprised of the Ethylene Dichloride, Methyl Chloroform, Oxyhydrochlorination and Vinyl II units.

As can be seen, there has been a tremendous amount of growth at the PPG Lake Charles complex. Most of these units produce saleable products. In order to move these products from the complex to the customer, the Shipping Department was created. This department has been expanded over the years to keep pace with the complex expansions. The Shipping Department started with a Chlorine and Caustic barge loading facility. Now there are Chlorine, Caustic, and Organics barge loading facilities. In addition to the barges, ships are loaded at the dock facilities. Now the Shipping Department loads barges, ships, drums, railcars, and trucks. The history of the Shipping Department is like the rest of the complex, one of growth.

Figure 1 is a map of the Lake Charles PPG complex.

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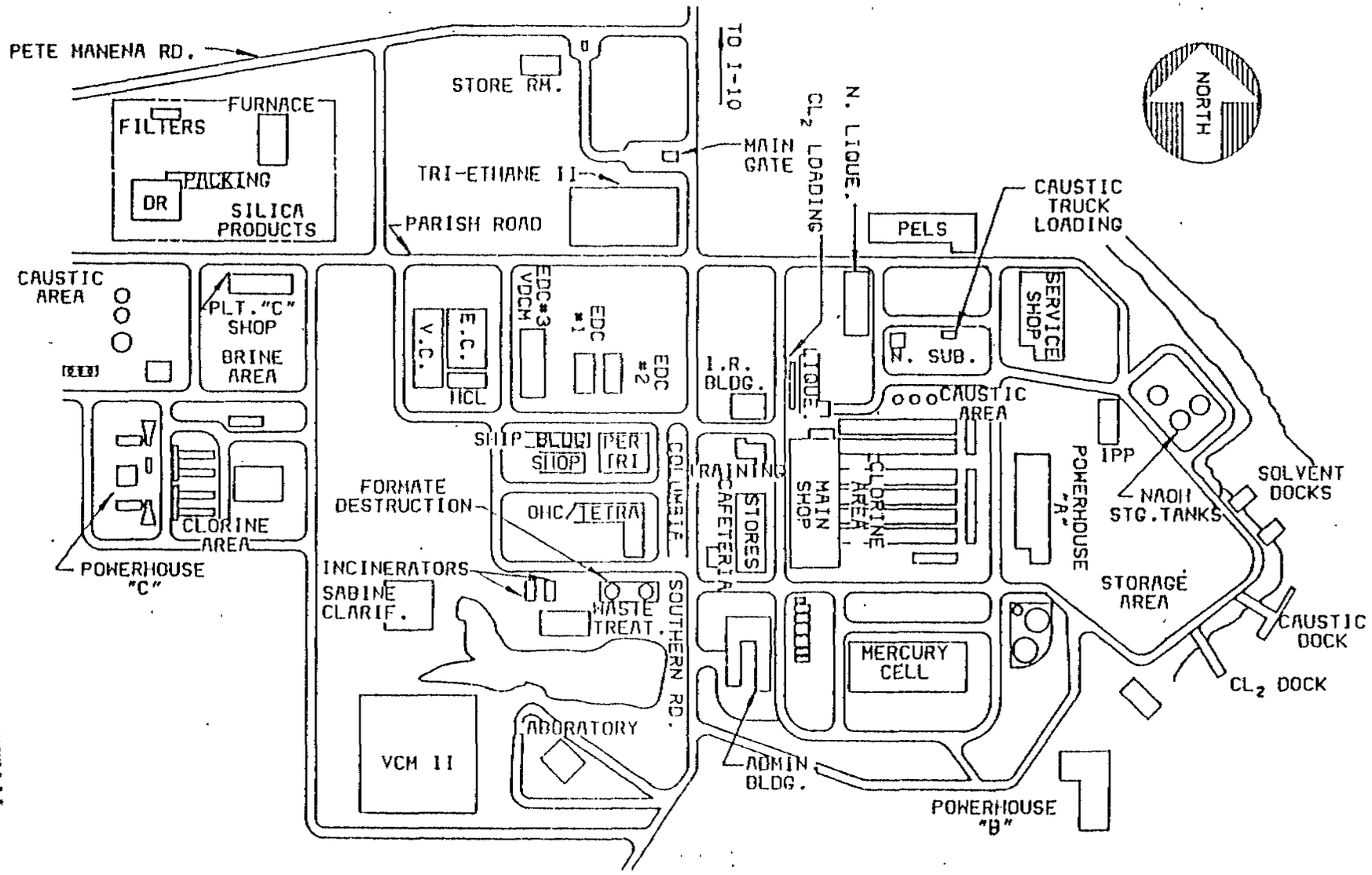

PLOT PLAN -- LAKE CHARLES PLANT

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WORKS MANAGERS

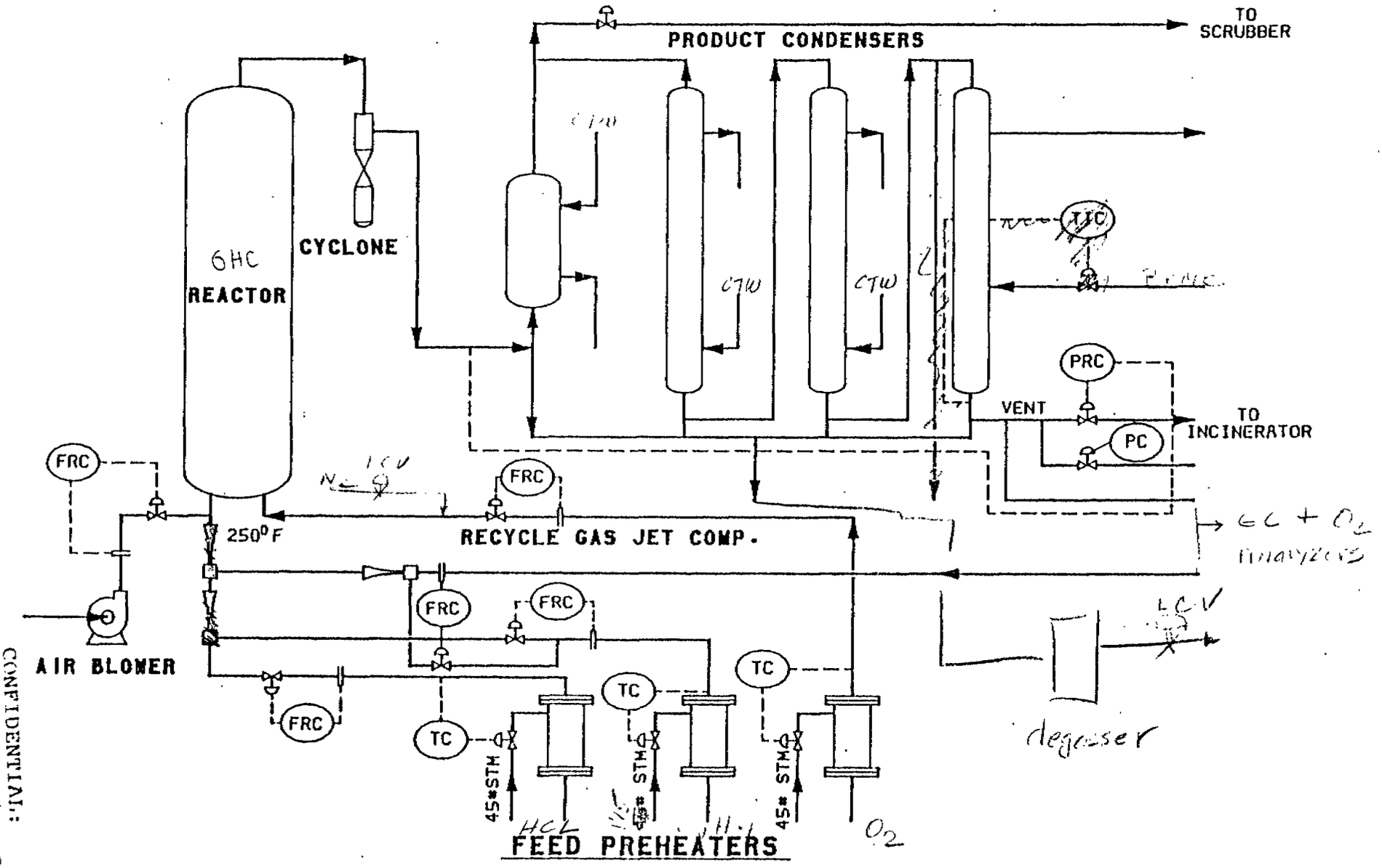
The Lake Charles Plant has had five Works Managers since it began operation. Our present Works Manager, G. C. Strickler, assumed leadership on January 1, 1981 from J. R. Farst, who had served as Works Manager of the Lake Charles Plant since January 1, 1978. A. T. Raetzsch became Works Manager in 1955, replacing C. K. Ballard, who became Works Manager in 1949. Stan Hultman was the original Works Manager until 1949.

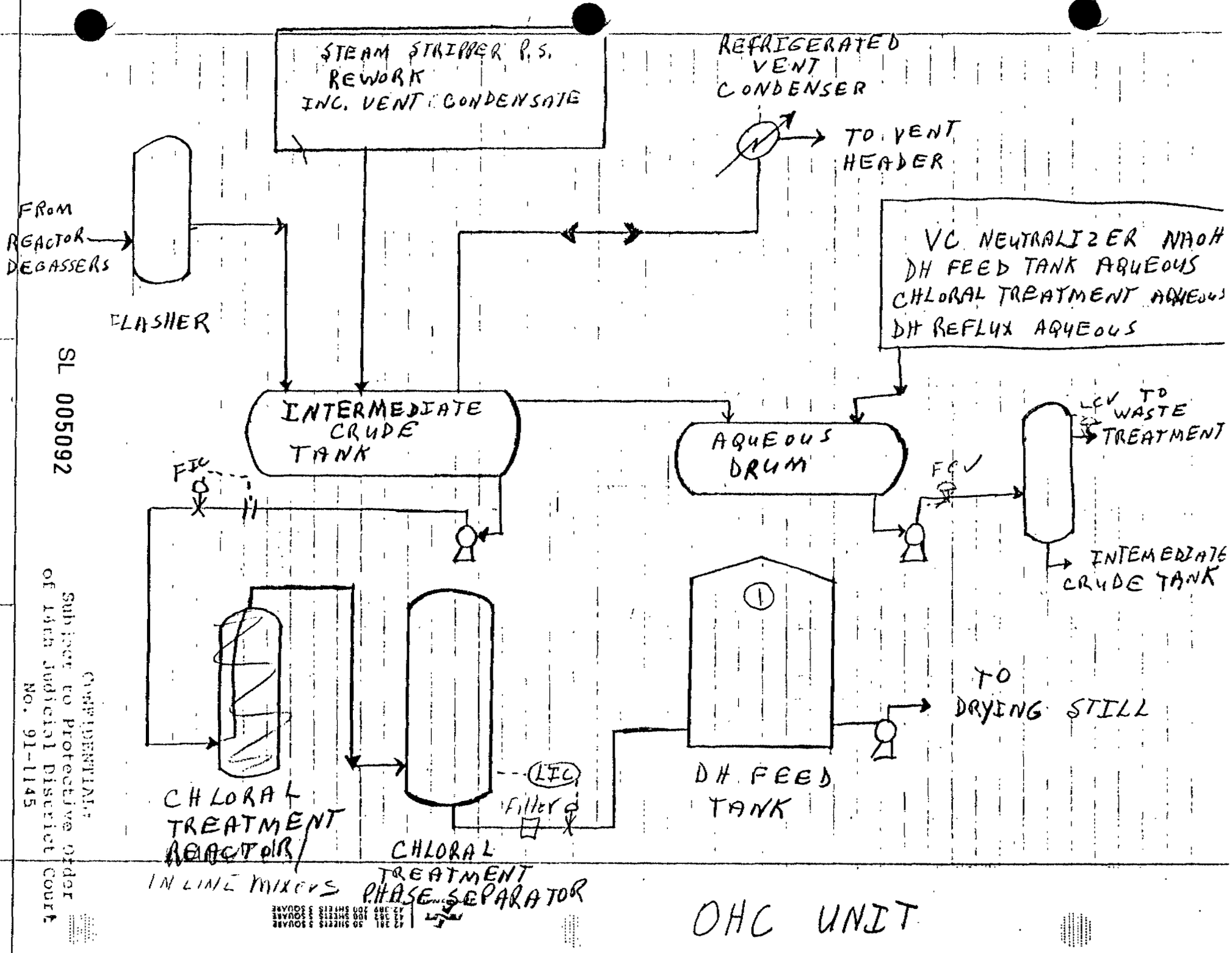
INTRODUCTION

What you will read in the following pages may sound complicated to you, but do not worry. After you complete your training, you will have a better understanding of your part. Basically what is happening; we put some chemicals into a vessel and mix them or heat them to form another chemical. This mixing does not turn out a pure product, so we then put the chemicals through a series of clean up steps. The end result is a saleable or usable product. You will be involved in this manufacturing of chemical products. Your areas of responsibility will be in the Oxyhydrochlorination unit (OHC) and the Liquid Phase-Ethylene Dichloride unit (LP-EDC).

The OHC unit utilizes HCl from the other units to produce EDC. Feeds to the OHC reactors are O_2, HCl, ethylene (C_2H_4) and recycle. Recycle is the reactor vent that is noncondensible and fed back into the reactors. These feeds are mixed in the presence of a catalyst containing cupric chloride and potassium chloride. The reaction of these feeds is exothermic (heat producing). Since the reactor produces heat, there must be a way to control the temperature in the reactor. Dowtherm is a fluid that is used to remove the heat from the OHC reactors.

Crude EDC is formed and exits out the top of the reactor in a gaseous form. These gases pass through a series of condensers. EDC and water are condensed out. This condensate is phase separated.





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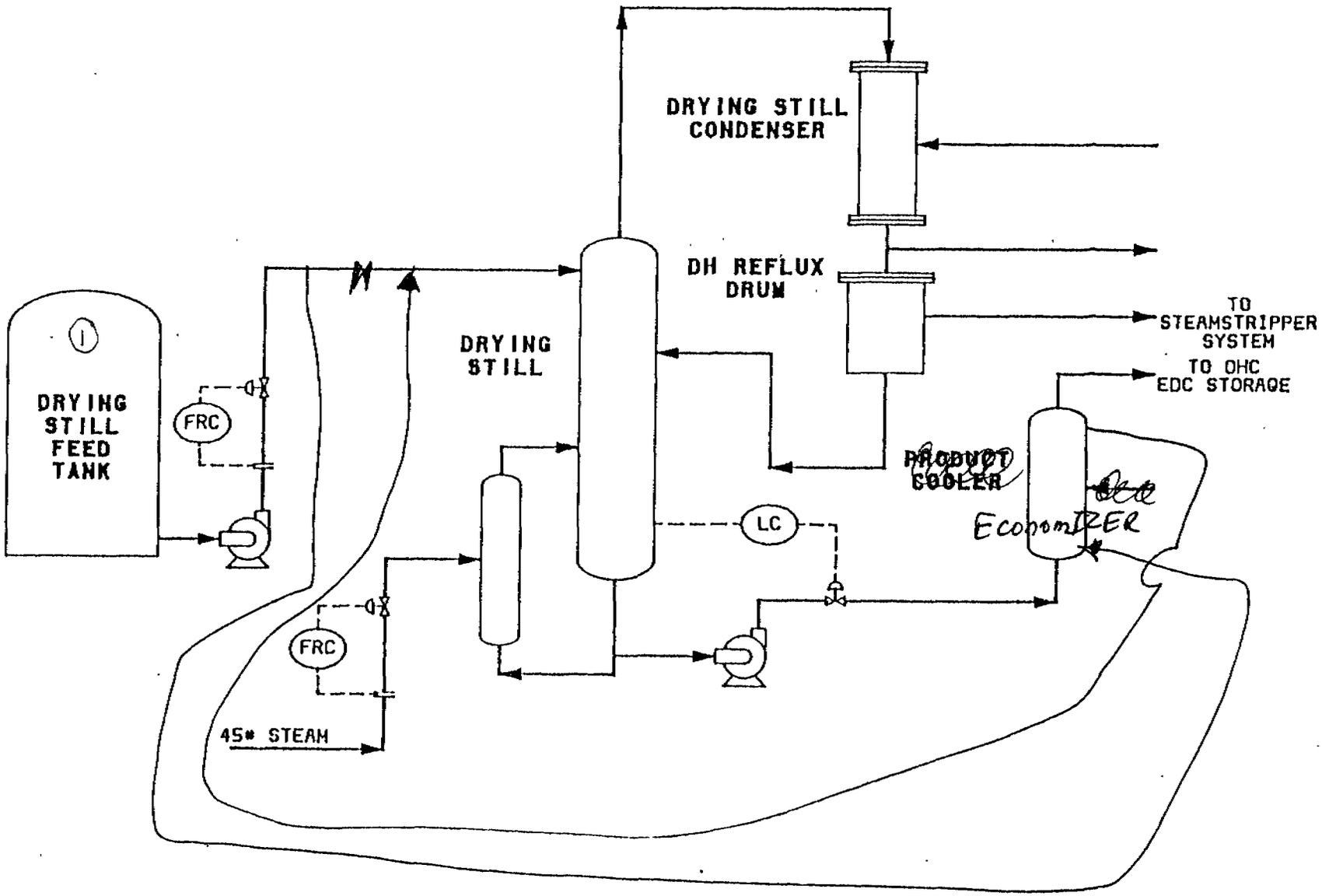

The crude EDC is not pure and contains lights and a compound called chloral. These impurities must be removed to prevent problems in the Vinyl (VC) furnaces in the event the EDC is used as VC feed. The lights are removed in the LP-EDC reactor by chlorination. Chloral is removed by washing the EDC crude with a wet caustic (NaOH) solution.

After the chloral is removed, the wet crude EDC is fed to the DH (dehydration) still for drying. From the DH still the EDC is stored until it is fed to the LP-EDC reactor.

The other area of responsibility is the Liquid Phase EDC unit (LP-EDC). Feed for the LP-EDC reactor are chlorine (Cl_2), ethylene (C_2H_4) and OHC crude. The Cl_2 and C_2H_4 react in the reactor to form EDC. OHC crude is fed to the LP-EDC reactor to chlorinate lights in the crude. This chlorination of lights enables their removal in the purification section.

The reaction between Cl_2 and C_2H_4 occur in a liquid bed of EDC. This liquid EDC provides a medium for more intimate contact between Cl_2 and C_2H_4. The reaction between Cl_2 and C_2H_4 is exothermic. If the liquid in the reactor were not cooled, it would boil dry. To cool the reactor, a side stream is taken from the reactor, cooled and returned to the reactor.

Vapors (mostly gaseous EDC) leave the reactor through the top and enter the reactor condenser. The vapors not condensed in the reactor condenser go to the reactor gas separator condenser. Any vapors not

condensed then go to the vent system. The condensate from the reactor condenser and reactor gas separator condenser go into the reactor gas separator. A stream of unreacted EDC from the VCM Unit also goes into the ~~reactor gas separator.~~ The liquid in the reactor gas separator goes to the reactor as reflux and forward as feed to the purification section.

Removal of light organics is the first step in purification of EDC crude. The lights still is used in this first step. The function of the lights still is to separate light (low boiling) compounds from the EDC crude. These lights, if not removed, would become impurities in the EDC product.

Lights-free EDC crude leaves the bottom of the lights still and is fed to the heavies still. Organics heavier than EDC go out the bottom of the heavies still and the EDC product goes out the top of the still to storage.

The OHC and LP-EDC Units are more complex than the description you read. You should have a general knowledge of the workings of the units. We will now discuss how you fit into the workings of the OHC and LP-EDC units.

The job of "D" Operator at OHC/LP-EDC is an entry level job but it is a very important one. Your duties vary from analyzing samples to doing housekeeping in the units. Because of your varied duties you will cover a great deal of the units. This makes you the eyes and ears

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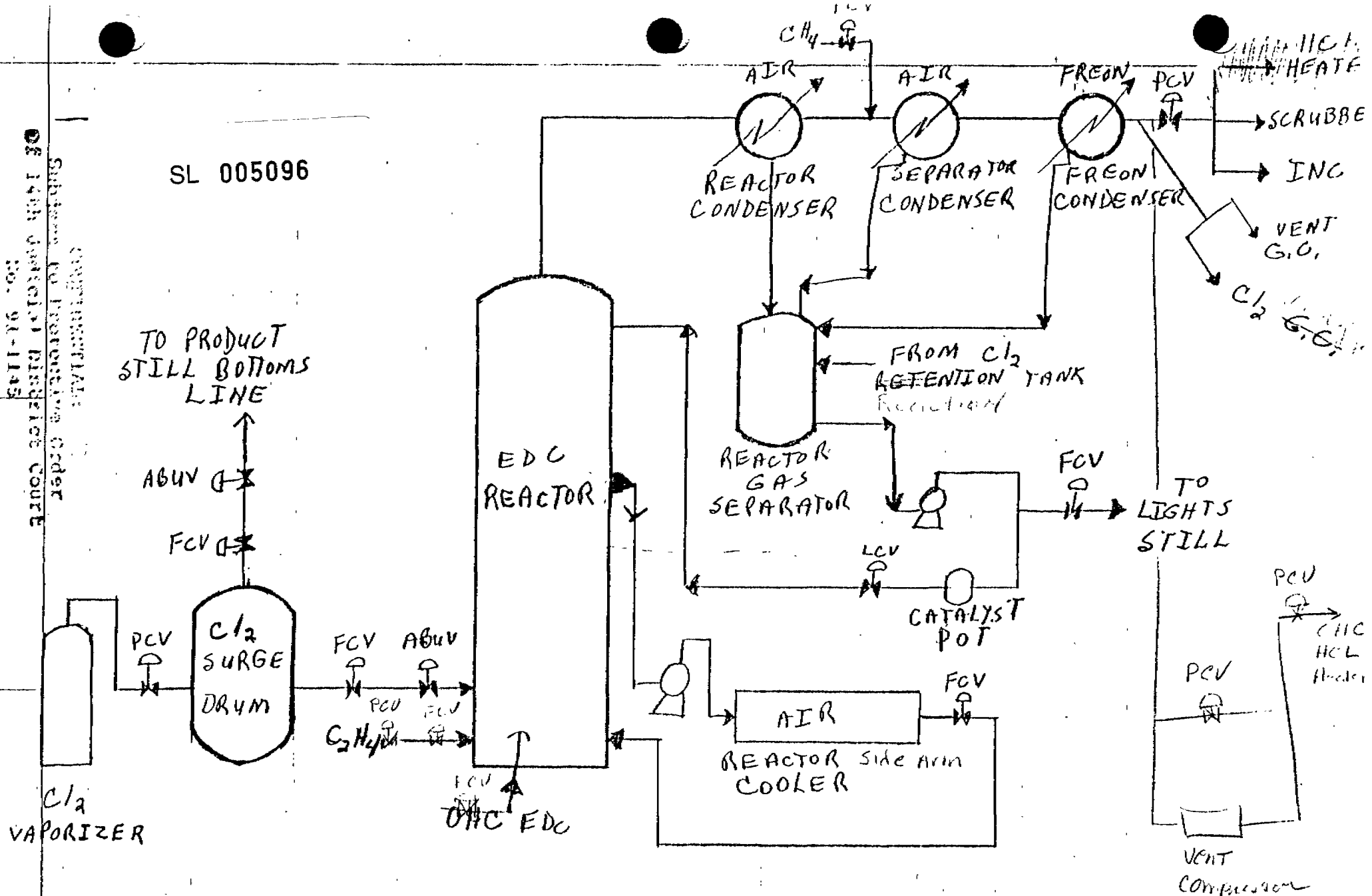
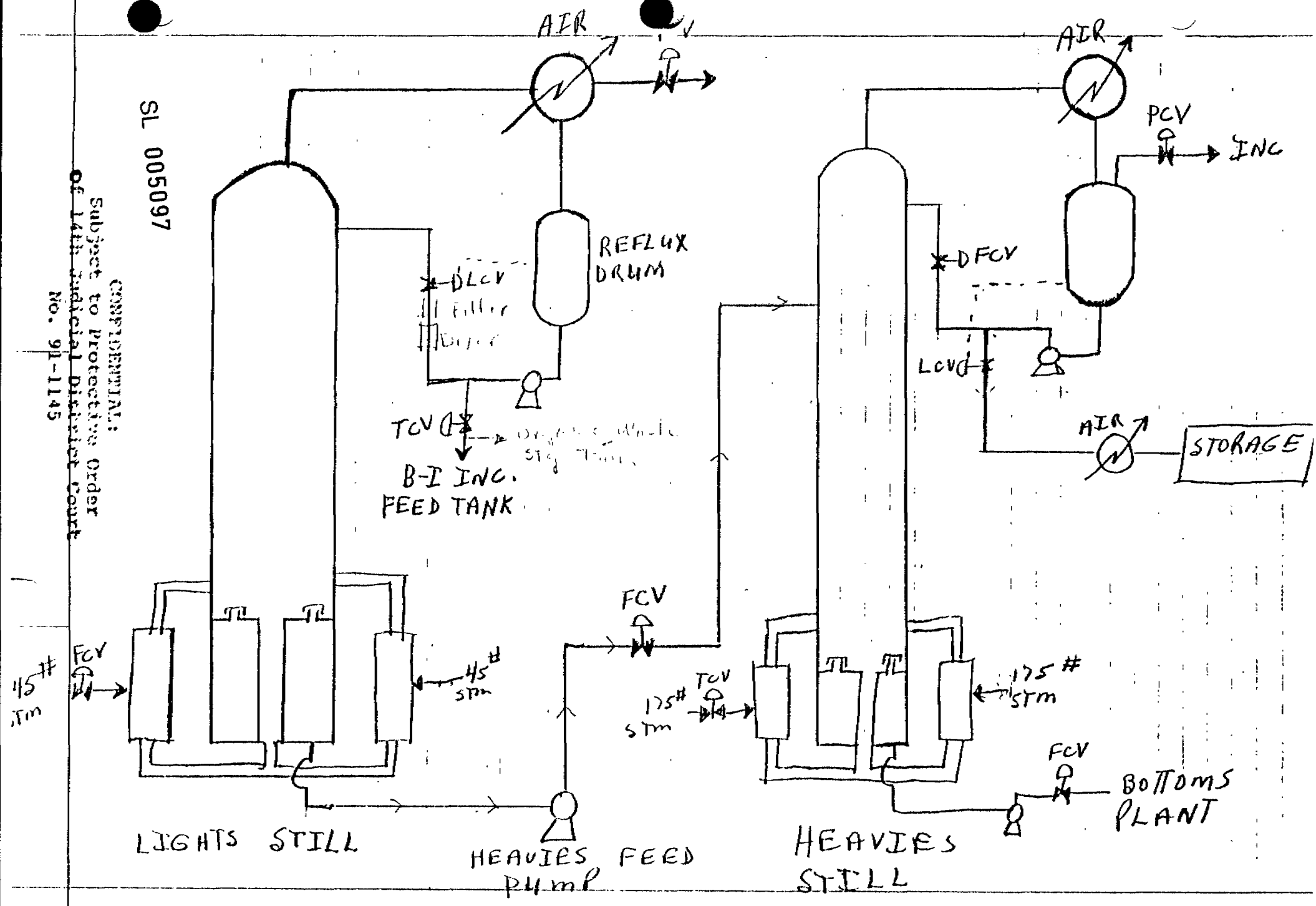


LP-EDC REACTOR SYSTEM



LP-EDC PURIFICATION

of the "A, B, and C" Operators. you will see leaks that may occur or hear pumps that are noisy. When you see or hear an abnormal condition you should report it to the Lead Operator or the operator in charge of the unit. The quicker these abnormal conditions are corrected, the less chance there is of damaging equipment or someone getting hurt.

SAMPLING

One of your major functions at OHC and LP-EDC Units will be catching and analyzing samples. This is a very important job. The operators make adjustments based on the results of your lab analysis. As you catch and analyze samples, care should be taken not to contaminate the sample. A contaminated sample could give a wrong analysis. This wrong analysis could result in the wrong adjustment being made by an operator. When you analyze a sample and get an out-of-spec result. You should notify the "Lead Operator or the operator in charge of the unit. An abnormal result can be an indication of trouble in the unit. The sooner corrective action can be taken, the less damage to the equipment. If the operator asks for a resample, you should get one to determine if an abnormal conditon exists. You are responsible to catch and analyze samples in the OHC and LP-EDC Units. Along with the catching and analyzing samples comes the responsibility of reporting abnormal sample results.

The OHC/LP-EDC Units have a vapor detector system in them. This consists of a mechanism that will detect combustible vapors. Care should be exercised while catching samples or blowing lines clear. The

vapors from a sample could activate the vapor detectors. These vapor detectors are tied into the sprinkler system and some to the unit shutdown systems. To avoid unnecessarily tripping the sprinklers or shutdown system, care should be taken while catching samples. It would be advisable to become aware of the vapor detector locations. Knowledge of the vapor detector locations and wind direction could avoid tripping the sprinklers or shutdown systems.

After you have performed the sample analyses you will be responsible for logging the results in the appropriate place. These lab sheets are used by the unit operator for reference to see if a trend is occurring or problems that may have occurred on the other shifts. This lab sheet will also be helpful to you to see if there have been any abnormal sample results.

CATALYST ADDITION

OHC reactors use a type of catalyst. Your responsibility will be to add the copper-potassium coated clay catalyst to the OHC reactor.

This catalyst is added to the reactor by the "D" operator at a rate of one or two drums per day or as posted in the log book. You will be responsible for reading the catalyst addition schedule that is posted and adding the catalyst. In the OHC reactor the catalyst is used as a heat removal agent and for better utilization of the HCl feed. This catalyst is corrosive to steel and should be cleaned up after the catalyst addition job.

You are responsible for the safe operation of the catalyst addition equipment. This means avoiding contact with the catalyst when posible, informing the "B" Operator that you are adding catalyst, and using any tools properly. After you finish adding catalyst you should perform good housekeeping in your addition areas.

NEUTRALIZING SOLUTIONS AND ACID DRYERS

Another area of responsibility lies in the changing of acid dryers and bicarb scrubber bottles on the OHC reactor vent analyzers. There is a bottle of bicarbonate (bicarb) solution and a bottle of sulfuric acid (H_2SO_4) on the O_2 analyzer and the reactor vent gas chromatograph (G.C.). These solutions remove the HCl from the vent stream with the bicarb solution and then dries it with the acid. These solutions must be changed daily. It will be your responsibility to safely change them. You must wear the proper protective equipment when handling the sulfuric acid dryers. Severe chemical burns could result if the acid was to come in contact with your body. Before you change the acid dryers and bicarb scrubber bottles, you must inform the OHC "B" operator of your intent. This will allow him time to bypass the OHC reactor shutdown system. The shutdown system is operated by the O_2 content shown on the O_2 analyzer. A high O_2 reading on the oxygen analyzer will automatically shutdown the OHC reactor. High O_2 readings will result because of the introduction of air into the acid dryer and bicarb scrubber bottles when they are open and also some air will enter when the sample lines are disconnected. To avoid a shutdown of the OHC reactor, it is very important that the shutdown system be by-passed before you you change these solutions. It will be

your responsibility to change the acid dryers and bicarb scrubber bottles and also to inform the OHC "B" Operator that you are changing the solutions.

ABNORMALITIES

These operating units are like all other pieces of equipment, they have failures. When a unit shuts down or has to be started up you will have to assist. You will be required to open and close valves or check levels in vessels by reading a sight glass. A sight glass is a glass tube that allows the reading of the level in a vessel. The start-up and shutdown is a good opportunity to learn the workings of equipment and the operating unit. During the start-up and shutdown, keep in mind that it must be done as safely as possible.

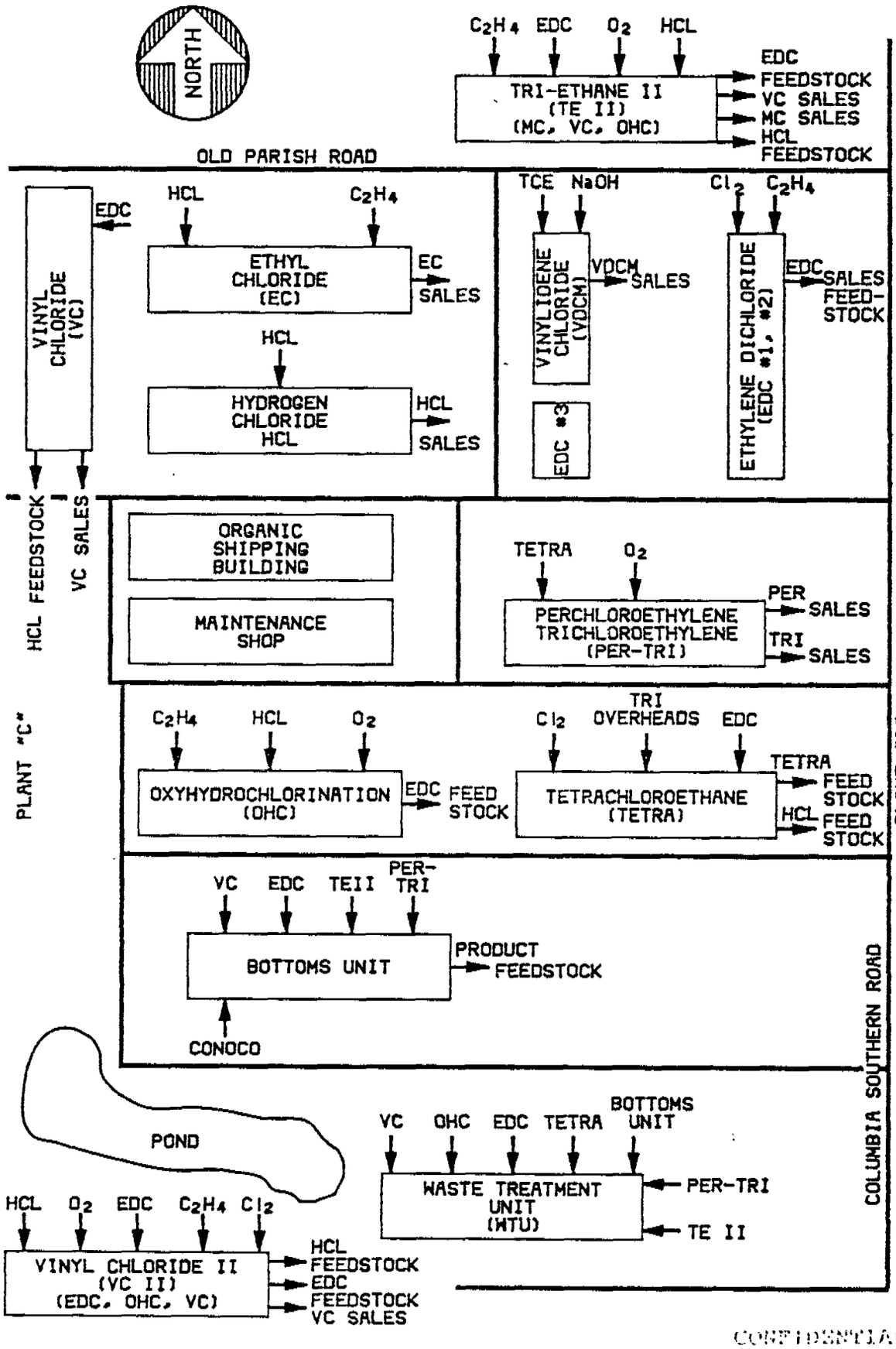
You are subordinate to the Lead Operator. He can give you a great deal of help and advice with problems that you might encounter on your job. The Lead Operator will sometimes assign jobs that are not a part of your regular job. These jobs are necessary for the safe and efficient operation of the operating units. He may also assign duties such as cleaning up the units. Keeping the units clean of trash and scattered hoses will make for a safer working area.

You should keep in mind that your job is important to the safe and efficient operation of the OHC and LP-EDC Units. It is imperative that you perform your duties well. Your responsibilities are not to be taken lightly. If you are confronted with problems or situations you are not familiar with, do not hesitate to consult the "Lead Operator".

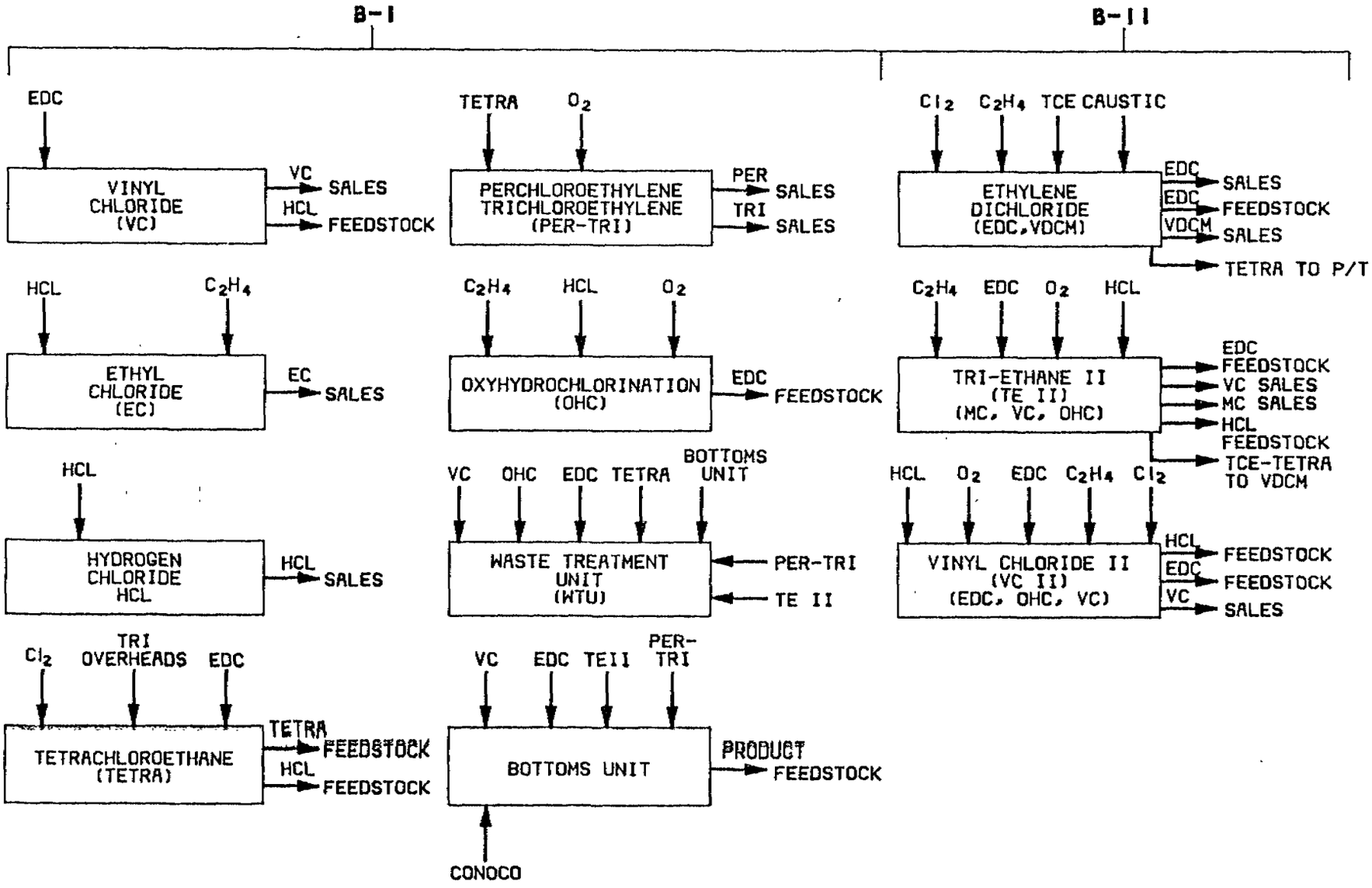
Remember, your major responsibility areas are sampling, catalyst addition, changing neutralizing solutions and acid dryers, and reporting abnormal conditions. How well you perform in these areas will help determine the efficiency of the operating unit. A good performance will also make your job more enjoyable and easier. If you encounter any problems on your job, please consult the Lead Operator, operator in charge of unit or one of the supervisors. Log abnormalities in the proper log book. These books will be the "Operational Log Books" or "Maintenance Log Book". A set of block diagrams for Plant B-I and B-II are on the following two pages.

TRAINING MODULES

The following pages are a series of modules designed to aid you in learning your job. These modules are arranged in a logical order to help you learn. There will be occasions when, because of varying operating conditions, you will want to change the sequence of the modules. In the event these conditions occur, it may be beneficial to go to the module that pertains to the situation. If this becomes the case, please do so.



PLANT "B" PLOT



PLANT "B" DISTRIBUTION

MODULE #1

EQUIPMENT LAYOUT

Time required to complete this module should be approximately two days.

OBJECTIVE

Upon completion of this module, you will be able to locate the major pieces of equipment in the OHC/LP-EDC Units.

RATIONALE

Now that you have been assigned to the OHC/LP-EDC Units, one of your responsibilities will be to become familiar with the area. Your primary duties will be in these areas. In order to function as an operations personnel in VCM-II, you will need to be able to locate most of the pieces of equipment.

A knowledge of the work area will be useful to make your job easier. It will be necessary that you learn the location of the equipment in order to perform. You will need to know the unit to catch samples, make rounds and operate the unit. In an emergency, a good knowledge of equipment location is vital. If you see or hear something unusual, such as a leak or noisy pump, you can tell the Lead Operator the location.

Much of the equipment will be alien to you when you first enter the OHC/LP-EDC Units. After working here for a short time the equipment will become familiar to you. Because of the size and shape of some of the equipment, you may be overwhelmed. Time will bring familiarity and you will be more at ease.

LEARNING ACTIVITIES

1. Study the flow diagrams in the introduction of this manual. Note the major pieces of equipment such as reactors, stills and tanks.

2. Make a list, from the flow diagrams, of the major equipment in OHC/LP-EDC Units.

3. Follow the on-the-job trainer on a sample round.

4. Ask the trainer to point out the major pieces of equipment such as the Heavies still, OHC Reactors, EDC Reactor, Lights and DH Still.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #1

Ask your trainer or supervisor to check your response to the following:

1. Identify to the trainer, the major pieces of equipment such as Heavies still, OHC reactors, EDC reactor, Lights still and DH still.

Florence Faulks has completed this Progress Check.
(Trainee's name)

COMMENTS:

1. _____

Supervisor or Trainer

Florence Faulks
Trainee

6/21/84
Date

SL 005108

MODULE #2

SAMPLING

Time required to complete this module, should be approximately 1½ days.

OBJECTIVE

Upon completion of this module, you will be able to catch representative samples in the OHC/LP-EDC Units.

RATIONALE

The bulk of your work will be concerned with samples and sampling of the different process streams in the OHC/LP-EDC Units. These samples are very important to the control of the different processes. From your sample analyses, data is gathered on which decisions are made in the control of the operating units. It is important that you use caution in catching your samples. A contaminated sample will give an incorrect indication of the process. This can lead to incorrect adjustments in the operating unit. These incorrect adjustments can lead to a great deal of expense in bad product or damaged equipment.

The sampling process is very simple. You catch some of your samples in bottles with screw caps. Some sample devices have a special apparatus called a "coil" to catch the sample. The coil is used to catch EDC. Exposure to EDC should be kept to a minimum. Coils allow for an enclosed sampling system with low to zero exposure.

The OHC/LP-EDC Units have a vapor detector system in them. This consists of a mechanism that will detect combustible vapors. Care should be exercised while catching samples or blowing lines clear. The vapors from a sample could activate the vapor detectors. These vapor detectors are tied into the sprinkler system and some to the unit shutdown systems. To avoid unnecessary tripping of the sprinklers or shutdown systems, care should be taken while catching samples. It would be advisable to become aware of the vapor detector locations. Knowledge of the vapor detector locations and wind direction could avoid tripping the sprinklers or shutdown system.

LEARNING ACTIVITIES

1. *Follow the trainer as he catches samples.*

2. Observe the procedure for catching samples.

3. Observe the location of the sample points.

4. Catch the samples with the on-the-job trainer observing. Ask the trainer to demonstrate the procedure for catching a representative sample.

5. Read the Task Detailing in this module for Coil Samples.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #2

Ask your trainer or supervisor to check your response to the following:

1. Explain to the trainer the procedure for catching samples.

2. Point out the sample points to the trainer.

3. Demonstrate to the trainer the procedure for catching a coil sample.

Florence Foulkes has completed this Progress Check.
(Trainee's name)

COMMENTS:

1. _____

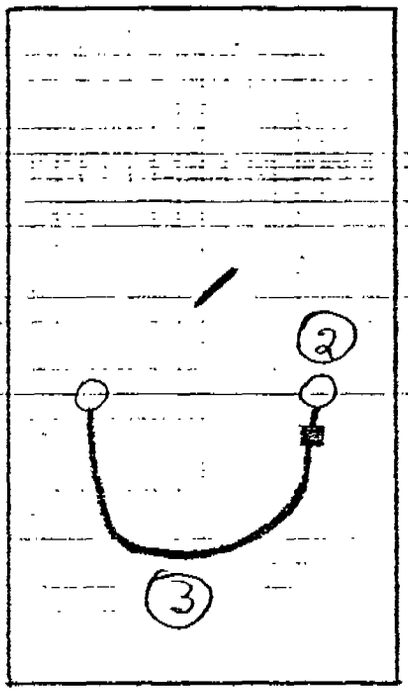
2. _____

3. N/A

Will Richard
Supervisor or Trainer

Florence Foulkes
Trainee

6/21/84
Date



VOID
M.G

COIL SAMPLE BOARD

SL 005112

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PPG INDUSTRIES

INDUSTRIAL CHEMICAL DIVISION
LAKE CHARLES LOUISIANA

TITLE	DRAWN BY	DATE	SCALE	DWG. NO.
	CHECKED BY	DATE	CHARGE	
	APPROVED BY	DATE	BILL OF MATERIAL	SHEET OF

59-443-0005

TASK DETAILING

Using a Sample Coil

1. Obtain a sample coil from the process lab and take it to the sample point you wish to sample.

2. Go to sample board. Verify good sample flow through rotameter.

3. Using the quick-connect fittings (2), disconnect the coil on board.

4. Using the quick-connect fitting on the sample coil, disconnect the flexible line on the new sample coil.

5. Connect the new sample coil to the flexible line (3) on the board.

6. Connect the flexible line on the coil to the quick-connect fitting (2) on the board.

7. Allow the sample to circulate for a minimum of fifteen (15) minutes.

8. After the sample has circulated and you are ready to remove the sample coil.

9. Remove the sample coil by disconnecting the quick-connect fittings.

10. Connect the flexible line (3) on the board to the quick-connect fitting (2).

11. If you have difficulty catching a coil sample, consult the Lead Operator or the EDC/VDCM "B" Operator.

MODULE #3

LAB ANALYSIS

Time required to complete this module should be approximately two days.

OBJECTIVE

Upon completion of this module, you will be able to safely and efficiently perform lab analyses such as G.C., pH, and moisture content in the OHC/LP-EDC lab.

RATIONALE

A large part of your job will be analyzing samples. This is also a critical part of your job. Error in analysis may result in wrong adjustments being made to the OHC/LP-EDC Units. An error in analyses may also result in your having to catch extra samples to see if a problem exists. You should be as careful and accurate as possible in your lab analyses.

While performing lab analyses, you should wear safety glasses or goggles. There is always the potential for eye injury from splashing chemicals. The number of cases of lab eye injury is small compared to the potential. There is also the hazard of cuts since most of the lab equipment is made of glass. Take care when handling the glassware.

Before performing lab analysis you should verify that your containers are clean by washing them with water or acetone. If a sample is to be checked for water, the apparatus should be cleaned with acetone. If a pH is to be checked, water will be sufficient as a washing agent. Contamination of lab equipment or samples can give a wrong result. Care should be taken to avoid contamination of the sample and lab equipment. While working in the lab, you should also keep safety in mind.

To assist you in performing lab duties, a lab procedure manual is provided. This procedure manual, combined with the on-the-job trainer will help you learn the sample procedures. Repeated running of samples will improve your techniques and abilities in the lab.

LEARNING ACTIVITIES

1. Observe the trainer performing lab analyses and note the procedures.

2. Become familiar with the Lab Procedure Manual. Make a notebook from the Lab Procedure Manual of the samples you must run.

3. Perform one each of the lab analyses with the trainer observing.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #3

Ask your trainer or supervisor to check your response to the following:

1. Explain to the trainer the procedure for performing your lab analyses.

2. Run some lab analyses and compare your result with the trainer to check the accuracy.

Florence Fowlkes has completed this Progress Check.
(Trainee's name)

COMMENTS:

1. Completed Satisfactory

2. "

Will Rudd
Supervisor or Trainer

Florence Fowlkes
Trainee

6/21/84
Date

SL 005117

MODULE #4

RUNNING SAMPLE ON A GAS CHROMATOGRAPH

Time required to complete this module should be approximately 1/2 day.

OBJECTIVE

Upon completion of this module, you will be able to perform Gas Chromatograph analyses by following the procedure on the front of the G.C.

RATIONALE

As the "D" Operator you will be required to analyze some samples with a Gas Chromatograph (G.C.). This is a machine that analyzes a gas or liquid as to components and records the analysis.

The G.C. appears to be a complex machine but the principle is fairly simple. A sample is injected through a rubber barrier called the septum. The septum is located on the injection port. Vaporization of the sample occurs in the injection port. After the sample is vaporized, it is moved by a carrier gas into the separating column. The principle behind a separating column is similar to allowing materials to separate by settling. Inside the separating column, which is a coil of tubing, the gases are separated as to molecular weights. The lighter or smaller molecules, the faster they will go through the separating column. Heavier or larger molecules go through the separating column at a slower speed. This would be similar to water going through a filter faster than oil. When the sample leaves the separating column it passes

over a detector. This detector analyzes the sample that passes it. Information of the anlaysis is picked up by the integrator which calculates and records the sample. The G.C. is useful in determining the composition of product and control streams. Using these results, the "B" and "C" Operators can determine the needed changes in their process unit. These G.C. analyses are also used to determine if a reactor or still has the proper feed ratio or temperature.

As with most machinery there are some do's and don'ts. The first to remember is DO NOT attempt to take short cuts. These could damage the G.C. or give the wrong analysis. Clean syringes help insure an accurate analysis. The syringe should be cleaned with acetone. Do not clean the syringe with a sample. There should not be a barb on the needle. This will damage the septum. Another item on the list will be the use of the proper amount of sample. This will be written on the front of the G.C. In the event a sample is injected into the wrong column, allow the sample to go through. If another sample is injected too soon you could get a composite of the two samples. The final basic rules are very common sense but sometimes overlooked. Simply put, they are to read the instructions and if you have problems to check the Troubleshooting Guide that is provided in this module.

LEARNING ACTIVITIES

1. Get your trainer to demonstrate the procedure for injecting a sample into the G.C.

2. Study the Troubleshooting Guide.

3. Read the Task Detailing for running a sample on a Gas Chromatograph.

4. Run a G.C. sample while your trainer observes.

5. Make a list of the things that will help guarantee a good representative sample.

SL 005120

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #4

Ask your trainer or supervisor to check your response to the following:

1. Explain to your trainer the procedure for running a sample on the G.C.

2. Run a sample on the G.C. and compare it to one run by your trainer.

Florence Fowlkes has completed this Progress Check.
(Trainee's name)

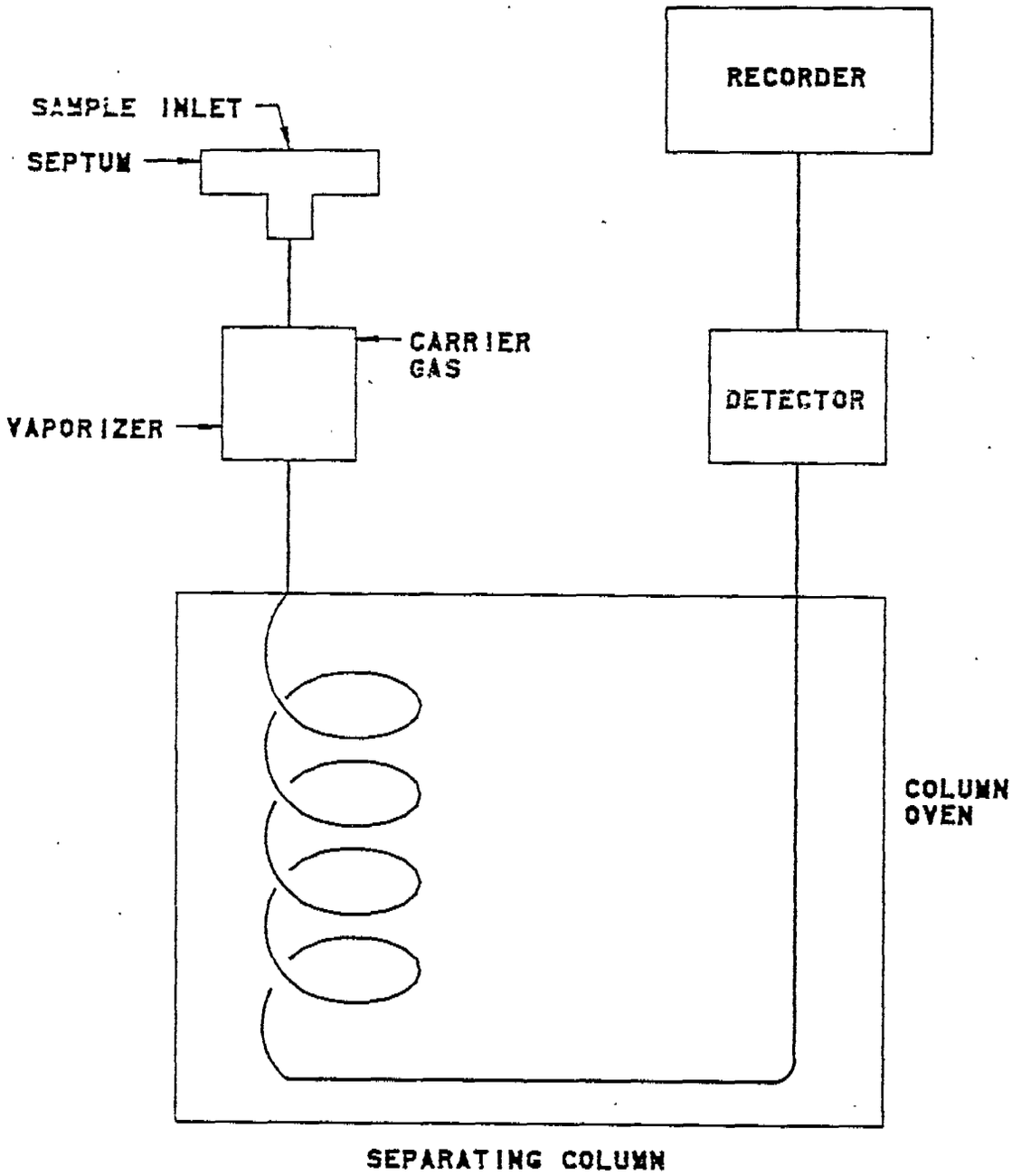
COMMENTS:

1. Completed Satisfactory
2. " "

Will Richard
Supervisor or Trainer

Florence Fowlkes
Trainee

6/21/84
Date



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No. 91-1145

SL 005122

DIAGRAM OF A BASIC GAS CHROMATOGRAPH

TASK DETAILING

RUNNING SAMPLE ON A GAS CHROMATOGRAPH

1. Read the card on front of the G.C. to determine the machine settings and proper sample.

2. Check box on side of G.C. for "ready" and "run" lights. Set numbers on box for respective sample.

3. From the card determine the proper column. This will be either "A" or "B" column.

4. Double check card and lights to verify machine is ready for your sample.

5. Remove syringe from the holder.

6. Open sample bottle and insert needle into the sample.

7. Pull the syringe plunger back and forth two or three times to clear the air from the syringe.

8. Use the prescribed amount of sample in the syringe.

9. Push the needle through the septum. Hold your finger on the end of the plunger to prevent pressure in the G.C. from blowing the plunger out.

10. Press the plunger into the syringe.

11. After the sample is injected into the G.C., remove the syringe from the septum.

12. Push the "START" button on the front of the G.C.

13. Write the name of the sample on the G.C. readout paper.

14. If problems develop, refer to the Troubleshooting Guide.

TROUBLESHOOTING GUIDE

PROBLEM		CAUSE		REMEDY
I. NO PRINT OUT	1.	No detector current	1.	Turn on detector power.
	2.	Helium Cylinder empty	2.	Replace with full cylinder.
	3.	Plugged or broken syringe	3.	Use new syringe
	4.	No sample-plugged injector (high column pressure)	4.	Call Lab instrument group.
	5.	Wrong detector polarity	5.	Select proper polarity and column.
	6.	No flame on FID	6.	Ignite flame
II. MIS IDENTIFICATION				
A. PEAKS LATE	1.	Leaking septum	1.	a)Ensure septum is snug b)Replace septum
	2.	Low Column pressure	2.	a)Helium cylinder empty b)Change septum c)Wait longer after septum change to run first sample. d)Call lab instrument group.
	3.	Very high column pressure	3.	Call lab instrument group.
	4.	Low starting temp.	4.	Call lab instrument group.
	5.	G.C. started before sample injected.	5.	Start system IMMEDIATELY after sample injected.
	6.	G.C. not "Ready" at system start.	6.	Wait for "Ready" light and try again.
	7.	G.C. not programming	7.	a)Start button not pressed. b)Start button pressed but G.C. not programming. 1. Upper limit hold button not pressed (3700 G.C. the hold button should not be pressed)
B. PEAKS EARLY	1.	Starting temp. too high	1.	a)G.C. cool downtime was interrupted and door closed before temp. was equilibrated. b)Call instrument group
	2.	System started late	2.	Start system immediately after sample inject.

C. UNEXPECTED PEAK

1.	Wrong file selected	1. Select proper file for sample.
2.	Dirty syringe	2. Clean syringe well and rinse with sample.
3.	Dirty sample bottle	3. Clean sample bottle or use new one.
4.	Wrong sample	4. Draw correct sample

III. NO SMALL PEAKS

1.	Very small sample injection	1. a)change septum b)use new syringe
2.	Baseline below zero	2. Set baseline before injection.

MODULE #5

CHANGING SEPTUMS

Time required to complete this module should be approximately 1/2 day.

OBJECTIVE

Upon completion of this module, you will be able to change septums in the G.C. without damaging the G.C.

RATIONALE

One of the instruments used in your sample analysis is a Gas Chromatograph (G.C.). This machine separates a sample into its components and analyzes the amount of each component. After performing this analysis, the G.C. then records the amounts on a piece of paper.

The G.C. depends on a gas flow to serve as a carrier for the sample. This carrier gas goes past the injection port. To prevent the carrier gas from escaping to the atmosphere while a sample is being injected, a septum is provided. A septum is a rubber disc that covers the injection port and is held in place by the septum holder. The sample is injected through the septum with a syringe. As samples are injected, the holes in the septum made by the syringe needle become bigger and more numerous, allowing the carrier gas to escape. Changing the septum at the beginning of each shift will prevent escaping carrier gas. This escaping gas will cause a reduction in the carrier gas flow rate. The flow rate of the carrier gas is critical to the separation of sample components. If the flow rate is altered, it could cause the G.C. to

misidentify. Another reason the septum should be changed is that you can lose your sample through a bad septum.

Excessive damage to a septum takes place when the needle point has a burr on it or is bent. Bad needles should be discarded and replaced.

Changing a septum is fairly simple but the proper procedure needs to be followed so that the G.C. will not be damaged and you will not be injured. Before you change a septum, you should turn the detector off. This is done by pressing the "off" switch on the front of the G.C. Pressing the "off" switch will prevent damage to the G.C. While you are changing the septum, there is little or no flow past the detector. If the detector is allowed to remain on, it will cause the detector to overheat and burn out. These detectors are expensive to replace, both for parts and personnel involved to change the parts.

Changing the septum is important in that it will aid in the proper operation of the G.C. and correct sample analysis. Changing the septums at the first of your shift eliminates the possibility of incorrect sample analyses. It takes about 5-10 minutes for the G.C. to be ready after a septum is changed. This is a short time to wait when you consider the improved quality of your sample analysis.

When changing a G.C. septum, you should be careful that you do not get burned. The septum holder and ceramic cover are HOT. These should be removed carefully to prevent burns. Included in this module is the procedure for changing the G.C. septum.

Proper care of the G.C. will lead to more reliability and longer operating life of the instrument. Also, following the proper procedures for changing the septum will help insure a more accurate sample analyses. The G.C.'s cost a great deal of money and the "B" and "C" Operators depend on your correct analyses. so give the proper required care to these machines.

LEARNING ACTIVITIES

1. Observe your trainer changing septums.

2. Read the Task Detailing for changing septums.

3. You change the septum on the G.C. explaining the steps to your trainer before doing them.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #5

Ask your trainer or supervisor to check your response to the following:

1. Demonstrate to your trainer the procedure for changing septums.

2. Explain to your trainer the importance of changing septums.

3. Explain to your trainer why the proper procedure should be followed while changing septums.

Florence Foulkes has completed this Progress Check.
(Trainee's name)

COMMENTS:

1. Completed Satisfactory
2. "
3. "

Will Richard
Supervisor or Trainer

Florence Foulkes
Trainee

6/21/84
Date

SL 005130

TASK DETAILING

CHANGING SEPTUMS IN G.C.

1. Verify the machine is not in use by checking the lights on the front of the machine. When there is only a yellow light, this means the machine is ready for a sample. A red light means the machine is in use. You should have a green light before changing septums.

2. On the front of the machine near the bottom is an "OFF" switch.

3. Press the "OFF" switch to shut off power to the detector.

4. CAUTION: The septum holder and ceramic cover are hot.

5. Use a paper towel or glove to remove ceramic cover from septum holder.

6. Unscrew septum holder.

7. Old septum is located inside the septum holder.

8. Take some type of rod and remove the old septum.

9. Place new septum into the septum holder.

10. Screw septum holder back onto the G.C.

11. Place the ceramic covers back in place.

12. The G.C. has an "ON" switch located beside the "OFF" switch.

13. Press the "ON" switch to restore power to the detector.

14. Check pressure gauge on front of the machine. Pressure should be up when machine is ready. It should take 5-10 minutes before machine is ready.

MODULE #6

SWITCHING CARRIER GAS CYLINDERS

Time required to complete this module should be approximately one day.

OBJECTIVE

Upon completion of this module, you will be able to switch carrier gas cylinders without losing flow to the chromatograph.

RATIONALE

The Gas Chromatograph (G.C.) depends on a gas to carry the sample through it. This gas is called the carrier gas. The carrier gas comes in cylinders with up to 2500 pounds of pressure in them. When this pressure gets low (around 500 pounds), the cylinders should be switched.

The G.C. has a part in it called the detector. If gas flow past the detector were interrupted, it could burn it out. A setup has been provided to allow switching of the carrier gas cylinders without interrupting the gas flow. Protection of the detector is one reason for switching gas cylinders about 500 psi. The other reason is to avoid contamination of the gas cylinder.

When handling gas cylinders, care should be taken. Do not beat on them or allow one to fall over. If the valve on the end of the cylinder

is broken off, the cylinder becomes an uncontrollable missile. There have been cases of cylinders going through brick walls when the valve was broken off. When a cylinder is being moved, the cap should be on. This will protect the valve in the event the cylinder falls.

Proper switching of the cylinders will help prolong the life of the G.C. Safe handling of the cylinders should be kept in mind.

LEARNING ACTIVITIES

1. Read the Task Detailing for Switching Carrier Gas Cylinders that is included in this module.

2. Go to the carrier gas cylinders and become familiar with the valving.

3. Ask your trainer to explain the procedure for switching carrier gas cylinders.

4. Switch carrier gas cylinders while the your trainer observes.

5. Observe the position of the valve handles when they are in the proper position.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #6

Ask your trainer or supervisor to check your response to the following:

1. Explain to your trainer the procedure for switching carrier gas cylinders.

2. Demonstrate the switching of the carrier gas cylinders while your trainer observes.

Florence Fowlkes has completed this Progress Check.
(Trainee's name)

COMMENTS:

1. Completed satisfactorily

2. _____

Will Richard
Supervisor or Trainer

Florence Fowlkes
Trainee

6-21-84
Date

SL 005135

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TASK DETAILING

Switching Carrier Gas Cylinders

1. Check pressure gauge on cylinder. If 500 to 400 psi, you will need to switch cylinders.

2. Close valve on top of empty cylinder.

3. Using a wrench, loosen connection on hose to the empty cylinder. This connection is screwed into the valve on top of the cylinder.

4. After the connection is loosened, shake the hose to allow pressure to bleed out the hose before disconnecting it.

5. Place cap on the empty cylinder.

6. Place the empty cylinder in the "EMPTY" rack.

7. Get a full cylinder from the "FULL" rack.

8. Place the full cylinder in the area vacated by the empty cylinder.

9. Remove the cap from the cylinder.

CAUTION: The cylinder should not be moved with the cap removed. If the cylinder were to fall, it could become a dangerous missile.

10. Connect the hose fitting to the valve on top of the cylinder.

11. Tighten the hose connection with the wrench.

12. Slowly open the valve on top of the cylinder.

13. Check for leaks. Tighten if there are leaks.

14. Check pressure to verify you have a full cylinder.

15. After checking for leaks and verifying, you have a full cylinder, close the valve on top of the cylinder.

16. You should have only one cylinder in service at a time. Opening to all three cylinders could result in G.C. damage if all three were allowed to become empty. By having only one cylinder in service at a time, you can switch. This allows for a ready supply of helium for the G.C.

17. Note in the log book that you changed a cylinder.

MODULE #7

COOLING TOWER DUTIES

Time required to complete this module should be approximately one day.

OBJECTIVE

Upon completion of this module, you will be able to monitor the cooling tower, adjust chemical feed and clean the screens.

RATIONALE

The cooling tower is an important piece of equipment to a process unit. Cooling towers provide cooling water for heat exchangers in the process unit. Your job is to assure a constant supply of treated water from the cooling tower. You must operate the cooling tower such that the water is properly treated to avoid damage to the heat exchangers.

LEARNING ACTIVITIES

1. Read the following on cooling towers.

COOLING TOWER

The VCM-II cooling tower cools water by evaporation. As water evaporates, the water left behind is cooled because liquids absorb heat when they evaporate. The tower aids in evaporation by providing a place for air to contact the water. This is called a closed circulation system.

The cooling water is pumped from the tower, through the cooling equipment in the field, then back to the tower. As the heated water returns, it covers the top of the tower and flows down through a network of slats. Because the water is dispersed as it falls, the surface area available for contact with air is increased. Exhaust fans on top of the tower pull air through the curtain of falling water on each side and out the top. This type of cooling tower is called a cross-flow type because the air flows horizontally across the water. The exhaust fans pull in a great volume of air with increased efficiency. The water that falls into the tower basin is cooled and is ready to be pumped back to the field.

As pure water evaporates, it leaves impurities behind. This evaporation causes impurities to concentrate in the cooling water. Impurities can cause deposits which hamper the heat transfer qualities of operating equipment or plug it. Impurities can also errode the cooling equipment. Blowdown of the cooling tower helps remove these impurities. Make up water is added to the tower to replace the loss from evaporation and blowdown. Makeup and blowdown must be balanced to prevent the tower from emptying or running over.

Proper operation of the VCM-II cooling tower is essential to better operations in the VCM-II complex.

2. Observe as the trainer collects and analyzes samples of the cooling tower.

3. The chemicals that are added to the cooling tower and the reason for the additions are listed below.

   a. The range for Cl_2 control is .1-.4 ppm free Cl_2. This range is maintained by adjusting a Cl_2 flow rotameter.

   b. Control the Betz 2020 in a range of 60-80 ppm.

   c. Betz 2040 is controlled in a range of 15-20 ppm.

   d. Sulfuric acid (H_2SO_4) is used to control the water pH. High pH causes fouling and low pH promotes corrosion.

   e. C-30 is added on a weekly basis. You add 6 gal/week. This is added only once per week.

4. Observe while the trainer makes sulfuric acid and C-30 adjustments to the cooling tower.

5. Ask the trainer to explain the procedure for cleaning the screens.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #7

Ask your trainer to check your response to the following:

1. Give a simple explanation of cooling tower operations to the trainer.

2. Explain how to clean the screens.

Florence Faulkes has completed this Progress Check.
(Trainee's name)

COMMENTS:

1. Explanation Satisfactory

2. Explanation Satisfactory

Will Rinland
Supervisor or Trainer

Florence Faulkes
Trainee

6-21-84
Date

SL 005141

MODULE #8

OHC REACTOR CATALYST ADDITION

Time required to complete this module should be approximately two days.

OBJECTIVE

Upon completion of this module, you will be able to safely add catalyst to an OHC Reactor through the catalyst addition pot.

RATIONALE

A catalyst is simply a substance that promotes or retards a chemical reaction. In the case of the OHC reactor, catalyst is used to promote the reaction to make EDC.

The catalyst consists of sand-like, clay particles that are coated with cupric chloride and potassium chloride. Cupric chloride and potassium chloride promote the reaction of the OHC reactor feeds to EDC. The catalyst also aids in heat transfer by distributing internal heat against the Dowtherm tubes which cool the reactor and prevent excessively high temperature within the reactor.

The reactor is filled above the Dowtherm tubes with catalyst before the startup of the reactor. During production, the catalyst level gradually lowers as "spent" catalyst or fines are carried out of the reactor in the

vapor streams. Although most of the catalyst remains in the reactor, the daily loss is significant. For the reactor to operate most efficiently the level must be maintained above the Dowtherm tubes.

Therefore, to promote optimum reaction and to aid in the heat transfer, you must add catalyst to the reactor on a regularly scheduled basis. This replacement catalyst is added to the reactor through the catalyst addition pot, located on the side of the reactor, while the reactor is on stream.

LEARNING ACTIVITIES

1. Go to the reactor with your trainer and locate the addition pot. Take the diagram with you, locate the valves and pressure gauge and identify each of your trainer.

2. Read the Task Detailing in this module for Catalyst Addition and discuss it with your trainer until you can list each step from memory.

3. Copy and take the procedure with you when your trainer adds catalyst per schedule. As you observe, ask your trainer to add the first pot and explain each step as he does it. DO NOT TAKE ANY SHORT-CUTS! Shortcuts may be unsafe.

4. Ask your trainer to allow you to add the second pot. Explain to your trainer each step before you do it, then do that step.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #8

Ask your trainer or supervisor to check your response to the following:

1. List, from memory, the steps used to add catalyst to an OHC Rx. Use the list supplied with the "Task Detailing" section of this module to check your list.

2. With your trainer checking the "Task Detailing" list, add catalyst to an OHC Rx.

Florence Fowlkes has completed this Progress Check.
(Trainee's Name)

COMMENTS:

1. Completed Satisfactory

2. "

Will Richard
Supervisor or Trainer

Florence Fowlkes
Trainee

6-21-84
Date

SL 005144

TASK DETAILING

Catalyst Addition

1. Check that the bleed valve (2) to the catalyst addition pot is open, with no pressure on the pot observe pressure gauge (4). If the catalyst pot pressure gauge (4) will not read zero, replace the gauge before proceeding.

2. Look for any reactor vapors leaking by from the catalyst pot through the bleed valve. This would indicate that the catalyst addition block valve (5) and ram valve (6) are leaking. If vapors are observed, notify the Lead Operator or OHC Operator.

3. If no vapors are observed, unbolt the catalyst pot lid (3) and open the catalyst addition pot.

4. Look into the catalyst addition pot and check for liquid (condensed EDC) or catalyst.

5. If there is liquid or catalyst in the pot, securely bolt the lid (3) closed.

   Notify the Lead Operator or OHC Operator of the condition you have found.

6. Close the bleed valve (2) on the pot (2) and open the N_2 (1) to the catalyst pot, and block valve (1).

7. Pressurize the pot to 50# (4). Observe the pressure gauge on top of the pot. Close the nitrogen block valve (1) to the catalyst addition pot.

8. Open the ram valve (6). Slowly open the catalyst addition block valve (5) beneath the catalyst pot.

9. Watch the pressure gauge on the catalyst pot (4) for a drop in pressure to indicate the pot has depressurized to reactor operating pressure.

10. When the catalyst pot pressure has decreased to about reactor pressure, begin opening the N_2 to catalyst pot block valve (1). Maintain slightly above reactor pressure on the pot for about 30 seconds. This will clear the remaining catalyst on liquid from the pot into the reactor.

11. Close the catalyst addition block valve (5) on the bottom of the pot. Then close the N_2 to catalyst pot block valve (1). Be careful not to exceed 150# of pressure on the catalyst addition pot or the safety relief valve on the catalyst pot will open. Bleed the pressure off of the catalyst pot through the bleed valve. (2)

12. Open the lid on the pot (3) and check for a liquid level.

13. If there is no liquid, fill the catalyst addition pot (maximum 75% full) with catalyst. If liquid is still in the pot, notify the Lead Operator.

14. Bolt the lid on the pot and close the bleed valve (2).

15. Pressurize the catalyst pot to 50# (4, valve 1). Then close the N_2 to catalyst pot block valve (1).

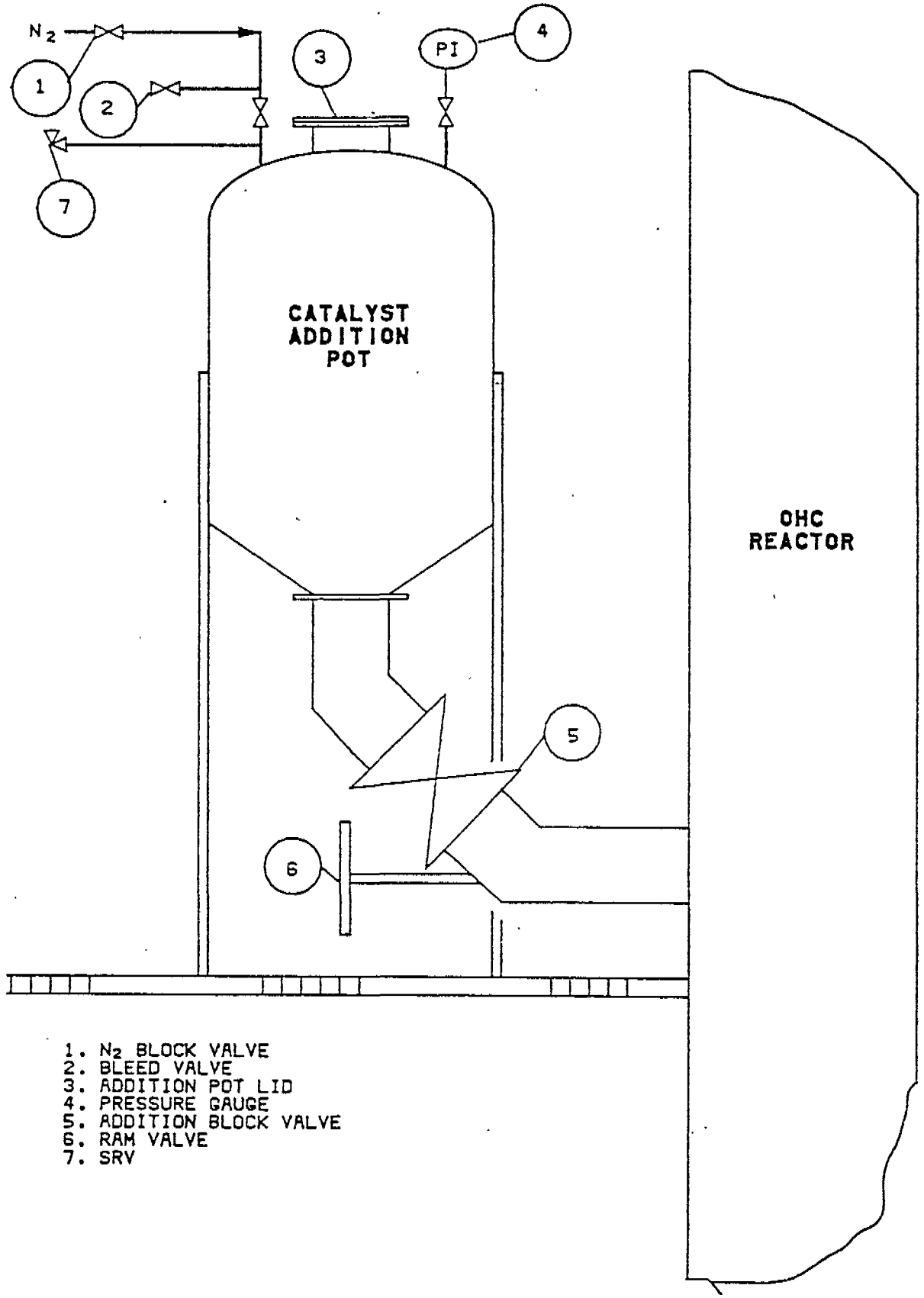
16. Open the block valve (5) beneath the pot and watch the pressure for a sudden drop in pressure. This indicates that the catalyst has blown into the reactor. Increase N_2 for 30 seconds to assure the pot is clear of catalyst. Repeat step 10.

17. Close the catalyst addition block valve (5) on the bottom of the pot. Then close the N_2 to catalyst pot block valve (1). Be careful not to exceed the 150# SRV setting for the catalyst pot. If no more catalyst is to be added, close the ram valve (6) and block valve (5).

18. Bleed the pressure off of the catalyst pot through the bleed valve (2) and open the catalyst pot lid (3). Be cautious of any reactor vapors which could leak from the catalyst pot, should the catalyst addition block valve (5) be leaking.

19. Check to see that all the catalyst has been blown into the reactor. If there is any remaining catalyst in the pot, securely close the lid (3) and repeat steps 15 through 18.

20. If more catalyst is to be added, repeat the process.



1. N_2 BLOCK VALVE
2. BLEED VALVE
3. ADDITION POT LID
4. PRESSURE GAUGE
5. ADDITION BLOCK VALVE
6. RAM VALVE
7. SRV

IG014A 21-0-OHC-7

OHC REACTOR CATALYST ADDITION SYSTEM

SL 005148

21. After all of the catalyst has been added, leave the catalyst addition pot in the following condition.

22. Close the bleed valve (2) and bolt the catalyst pot lid in place.

23. Open the N_2 valve (1) and pressurize the catalyst pot.

24. Open the block valve (5) beneath the pot and allow the N_2 to blow into the reactor.

25. While the N_2 is blowing into the reactor, close the ram valve (6) and the block valve. (5)

26. Block the N_2 (1) to the catalyst pot.

27. Check that the N_2 purge to the catalyst addition ram valve (6) is set and purging. Verify that the steam supply and condensate return for the ram valve steam jacket is in service and hot.

28. Open the bleed valve (2) and depressurize the pot.

MODULE #9

CHANGING ACID DRYERS AND BICARB BOTTLES

Time required to complete this module should be approximately one day.

OBJECTIVE

Upon completion of this module, you will be able to safely change bicarb bottles and acid dryers without tripping the OHC reactor shutdown system.

RATIONALE

The OHC Unit has three oxygen analyzers to check the O_2 content in the recycle stream and on the stream Gas Chromatograph (G.C.) to analyze the composition of the stream. Due to the large amount of Hydrogen Chloride (HCl) gas in the recycle stream, a neutralizing solution is used in the sample stream. If the HCl were allowed to get to the G.C. or O_2 analyzers, it would damage the analyzers. The neutralizing solution used is Sodium Bicarbonate ($NaHCO_3$), commonly known as bicarb. This bicarb is a water - $NaHCO_3$ solution and is therefore wet. Passing through the solution for neutralization of the HCl wets the sample. To dry the sample, Sulfuric (H_2SO_4) dryers are used. These are referred to as acid dryers.

The bicarb scrubbers and acid dryers are changed daily. These must be changed because the bicarb solution becomes depleted and the acid

dryers become wet. Once the bicarb is depleted it will not neutralize the HCl in the recycle stream. This can lead to G.C. damage. Failure to change the wet acid dryers can lead to water damage to the G.C. and O_2 analyzers.

The OHC Reactor has a shutdown system that can be activated by the O_2 analyzers. If the analyzers shows 5% O_2 in the reactor vent stream, the reactor shutdown system is tripped, causing a reactor shutdown. Before the bicarb bottles or acid dryers are changed, the OHC Operator must be notified. This will enable the OHC Operator to bypass the O_2 analyzer trip feature of the reactor shutdown system. You can cause a false high O_2 reading because of air that is in the dryers and bicarb bottles. Also the disconnecting and connecting of the lines to the bicarb bottles and acid dryers will allow the entrance of some air. The O_2 analyzer will read the air as a sample and show high O_2. Remember to notify the OHC Operator when you change bicarb bottles and acid dryers.

There are some hazards involved with handling the H_2SO_4. It will react with water. When this happens, a great deal of heat is generated. Enough heat is generated, that when H_2SO_4 gets on the body, tissue damage can result. A full face shield and slicker suit must be worn when handling Sulfuric Acid. This is to protect from splashing and spills of the acid. Handle the acid carefully to reduce the chance of acid burns or eye damage.

The procedure for changing bicarb bottles and acid dryers must be adhered to. Failure to change them properly can result in bodily harm or shutdown of the OHC reactor.

LEARNING ACTIVITIES

1. Read the Task Detailing in this module for Changing Bicarb Bottles and Acid Dryers.

2. Ask the trainer to explain the procedure for switching bicarb bottles and acid dryers.

3. Observe the trainer switching bicarb bottles and acid dryers.

4. With the trainer observing, switch bicarb bottles and acid dryers.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #9

Ask your trainer or supervisor to check your response to the following:

1. Explain the procedure for switching bicarb bottles and acid dryers.

2. Demonstrate the proper procedure for switching bicarb bottles and acid dryers.

Florence Fowlkes has completed this Progress Check.
(Trainee's Name)

COMMENTS:

1. Explanation Satisfactory "

2. "

Wilbert Rivers
Supervisor or Trainer

Florence Fowlkes
Trainee

6-21-84
Date

TASK DETAILING

Changing Acid Dryers and Bicarb Bottles

1. Inform OHC Operator that you are changing the acid dryers and bicarb bottles.

2. Put on full face shield and slicker suit.

3. Change dryers and bicarb bottles on O_2 analyzers, No. 1 and No. 2 first.

4. Turn valve on sample line to "OFF" position.

5. Check bottles for no flow by looking for bubbles. Absence of bubbles indicates no flow.

6. Open box that contains the bicarb bottles and acid dryers.

7. Unscrew cap on expended bottle.

8. Pull stopper out of bottle.

9. Remove bottle from box and empty into sewer.

10. Refill bottle with proper solution. Bicarb solution in bicarb scrubber bottles and H_2SO_4 into dryers. Fill about half full.

11. Rod out end of tubes that are inserted into bicarb scrubbers. Use a small piece of wire. Neutralization of HCl by the bicarb solution generates salt. This can plug the sample lines and restrict the sample flow to the oxygen analyzers and reactor vent G.C.

12. Replace the rubber hose in the bicarb bottles each time.

13. Place bottle back into box.

14. Replace hose and stopper into bottle.

15. Screw cap back on.

16. Turn vent valve back on.

17. Wait at least 30 minutes and do the same for the G.C. and No. 3 O_2 analyzer.

18. Procedure is same for bicarb bottles and acid dryers.

19. Inform OHC Operator when you have finished both the O_2 analyzers and G.C. bottles.

MODULE #10

TAR BUGGIES

Time required to complete this module should be approximately one day.

OBJECTIVE

Upon completion of this module, you will be able to safely pull the tar buggy to the prescribed area and safely empty the tar buggy into the Classifiers.

RATIONALE

The OHC/LP-EDC Units have waste products that are disposed of in a portable tank called a tar buggy. This means of disposal is used because of the nature of the waste material.

On evening and graveyards shifts, you may be required to pull these tar buggies to the Waste Treatment Unit for disposal of the waste material. This material is considered hazardous and must be handled safely.

LEARNING ACTIVITIES

1. Read the Task Detailing in this module for unloading the tar buggy into the Classifiers.

2. Ask the trainer to go to the field and explain the method for hooking up to the tar buggy and its destination.

3. After reading the Task Detailing, go to the field and explain to the trainer the procedure for unloading the LP/EDC tar buggy into the Classifiers.

PROGRESS CHECK

OHC/LP-EDC UNITS

"D" OPERATOR

MODULE #10

Ask your trainer to check your response to the following:

1. With the trainer observing, demonstrate your knowledge of how to pull the LP/EDC tar buggies and empty the LP/EDC tar buggy into the Classifiers.

N/A
(Trainee's Name) has completed this Progress Check.

COMMENTS:

1. N/A

Supervisor or Trainer

Trainee

Date

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TASK DETAILING

Unloading EDC Tar Buggy

1. Go to the OHC-WTU control room to get clearance for pulling the tar buggy to the Classifiers.

2. Connect a N_2 hose to the tar buggy and pressurize to 50 psig. After the tar buggy is pressurized to 50 psig, block the N_2 valve.

3. Connect the unloading hose to the discharge valve on the tar buggy.

4. Open the discharge valve on the tar buggy and allow the tar buggy to empty into the Classifiers.

5. When the tar buggy is empty, allow it to depressurize into the Classifiers.

6. After the tar buggy is depressurized, close the discharge valve on the tar buggy.

7. Depressurize the discharge hose and disconnect the hose and ground cable.

SL 005159

GLOSSARY

ABSORBER Equipment in which a gas is absorbed by contact with a liquid.

Tetra: Absorbs in EDC feed to the reactor, the HCl in the lights still vent.

VC: Vinyl chloride is absorbed in EDC and fed to the stripper. The overhead stream of the absorber is clean HCl.

HCl: HCl gas is absorbed in a weak muriatic acid solution to form a strong muriatic solution.

TE-II: Removes the DCE-MC from the HCl off of the MC reactor by contacting it with TCE/Tetra (Product still bottoms).

PER-TRI: Absorbs in well water, the HCl in the reactor vent after it passes through the primary and secondary condensers.

AMBIENT TEMPERATURE The temperature of the atmosphere.

ANALYZER An instrument that determines the composition of the material being fed to it.

ANTI-BACK UP VALVE A valve set up such that it will not permit a backwards flow.

AQUEOUS A solution of water with HCl gas absorbed in it.

BACK-PRESSURE CONTROL VALVE A valve that will open when the pressure in the line reaches a preset value. In the Tetra unit this valve relieves to the scrubber when the HCl pressure gets too high.

BALL VALVE A valve in which the flow is regulated by a ball that is turned by the handle on the valve.

BAYONET TUBE A dual-tube apparatus with heating fluid (steam) flowing into the inner tube and out of the annular space between the inner and outer tubes. Example: Chlorine vaporizer.

BICARB A solution used in the OHC units to neutralize HCl in the recycle stream. It is formed by caustic (NaOH) combining carbon dioxide (CO_2). The formula for bicarb is $NaHCO_3$.

BIG THREE A company that is one of the suppliers of N_2 and O_2 to PPG.

BLOWDOWN A purge taken off of the bottom of a vessel such as a kettle; the removing of catalyst from the centrifix or cyclone.

PER-TRI: Purge off of bottom of organic vaporizers and also removing of catalyst from the centrifixes.

OHC: Removing catalyst from the centrifixes or cyclones.

BOTTOMS The heavy chlorinated organics waste in a unit. In the Bottoms Unit, bottoms can refer to the kettle feed or the waste off the bottom of the kettle.

BRINE A liquid used in a refrigeration system, usually a solution of water and calcium chloride, which is cooled by contact with the evaporator surface and then goes to the vessel to be refrigerated. Also, brine is salt water.

BUBBLE CAP A metal cup covering a hole in a plate within a distillation tower; designed to permit vapors to rise from below the plate, pass through the cap, and make contact with liquid on the plate.

BURNING

OHC: Reacting O_2 with ethylene (C_2H_4) to form CO_2 and water without the C_2H_4 being utilized to form EDC.

PER-TRI: A desirable reaction in the Per-Tri reactors, when controlled, that is necessary for the formation of perchloroethylene and trichloroethylene.

BUTTERFLY VALVE A valve that utilizes a turnable disk element to regulate flow.

CATALYST A substance that promotes or retards a reaction.

CAUSTIC Sodium hydroxide; a basic (nonacid) substance composed of sodium hydroxide. It can exist as a liquid when dissolved in water or as a white, brittle substance when dry. It can cause chemical burns. Some of its uses are acid neutralization, bleach and chloral destruction

CELL LIQUOR A weak solution of caustic and water.

CENTRIFIX A piece of equipment used to remove the catalyst carry-over from the Per-Tri and OHC reactors.

CHECK VALVE A device for automatically limiting flow in a piping system to a single direction.

CHEST PRESSURE The pressure of the steam on a vessel needed to heat it to the desired temperature. Example; reboilers and heaters.

CHROMATOGRAPH An instrument used to determine the composition of a gas or liquid by separating the elements in the gas or liquid.

CHLORINATION Reacting with chlorine; an excess of unreacted chlorine.

COMPRESSOR A machine used for increasing the pressure of a gas.

CONCENTRATION The amount of a substance in a solute in proportion to the total amount.

CONDENSATE The liquid product of a condenser; the water from cooled steam.

CONDENSER A heat-transfer device that changes a gas to a liquid by cooling the gas.

CONVERSION To change from one isometric form to another.

VC: Percent EDC that is converted to vinyl in the crackers.

OHC: Percent of ethylene converted to EDC.

COUPLING An apparatus used to connect the motor and pump. It is designed to allow some flexing between the motor and pump shaft.

CRACKING To break up chemical compounds into different compounds by heat.

CTW Abbreviation for cooling tower water.

CYCLONE A piece of equipment that removes particles from a vapor or liquid by centrifugal action. Used in OHC to remove the catalyst from the reactor vapors.

DEFLUIDIZE To loose or cause the loss of fluidization.

DEGASSER A vessel in which dissolved gases are removed from a liquid.

DEMISTER A packing like material in a vessel whose purpose is to remove entrained liquid from a gas. Also called a mist eliminator.

DESUPERHEATER A device that is used to cool steam by water injection into the steam.

DEVIATE When a control instrument indication is not aligned with the set value.

DH Abbreviation for dehydration.

DIAPHRAGM VALVE A valve in which the open-close element is a flexible diaphragm.

DISTANCE PIECE An area in a positive displacement, reciprocating compressor where the drive rod is located.

DISTILLATION The process of producing a gas or vapor from a liquid by heat.

DISTRIBUTOR An apparatus usually in a packed column, such as a scrubber, that causes the liquid coming into the top to be distributed over the area of the packing.

DOUBLE BLOCK AND BLEED An arrangement of valves consisting of two block valves with a bleed valve located between them.

D.P. CELL Differential pressure cell; A transmitter that reads a pressure difference to determine a level or flow.

DUMPING A term used usually to indicate an uncontrollable emptying of a distillation column; a term meaning the emptying of a dopp kettle.

ECONOMIZER A forced-flow, once through heat exchanger that usually uses a process flow on the tube and shell side. It is used to heat up one stream while cooling another.

ENDOTHERMIC A reaction which absorbs heat.

END POINT That stage in the titration at which an effect, such as a color change occurs, indicating that a desired point in the titration has been reached.

ENTRAIN To have a fluid, in the form of a fog or mist, carried by a vapor.

ENTRAINMENT SEPARATOR A vessel whose function is to remove a mist from a vapor.

EXOTHERMIC A reaction that produces heat.

EXPANSION BOTTLE An apparatus used in a pipe line to allow for expansion of the fluid or gas, also used to take some of the surge out of a flow when it is not a smooth flow.

FCV Abbreviation for flow control valve.

FINES The spent catalyst, from a Per-Tri or OHC reactor, that is blown out of the centrifix or cyclone.

FLASH The rapid conversion of a liquid into a vapor.

FLASHER A vessel used for the rapid conversion of a liquid into a vapor.

FLOAT CHAMBER A vessel containing a float that indicates a liquid level.

FLOODED Distillation term meaning too high of a level in a reboiler or tray; to have too high of a level.

FLUIDIZED BED REACTOR A reactor in which the catalyst, such as Per-Tri or OHC, is suspended by the incoming gases. The catalyst has a boiling appearance.

FREE RADICAL INITIATOR The catalyst in the Tetra and TE-II unit that prevents unreacted Cl_2 from being excessive.

FREEZE PRECAUTION A water purge taken on water lines and showers to prevent freezing.

FURAN The trade name for a plastic-like material. There are pipe and vessels constructed of this at PPG.

FURNACE An apparatus in which heat is liberated and transferred directly or indirectly to a liquid for the purpose of effecting a physical change. These are used at VC to crack EDC and at Per-Tri and OHC to heat Dowtherm.

GATE VALVE A valve with a disc-shaped closing element that fits tightly over an opening through which a fluid passes.

GC-GAS CHROMATOGRAPH An instrument used to determine the composition of a gas or liquid by separating the elements in the gas or liquid.

GLOBE VALVE A device for regulating flow in a pipeline, consisting of a movable disc-type element and a stationary ring seat in a generally spherical body.

H.A.D. - HEAT ACTIVATED DEVICES A device used to trip the sprinkler system when there is a sudden increase in temperature.

HAVEG The trade name for a type of material that has the appearance of being epoxy and clay mixed. It is used to make piping and vessels.

HEADER A pipe or conduit which distributes fluid or gas from a series of smaller pipes or conduits.

HEAD TANK A tank that is elevated above a piping system. The function of the tank is to allow fluid to flow into the system to assure that the piping system is full at all times. Examples of these are in the brine system and Dowtherm system.

HEAVIES In the organic area, these are defined as material that is chlorinated too much for use in a unit. The particular unit may not have the facilities to clean up this material.

BOTTOMS PLANT: This term can be the feed to the Bottoms unit or can be the waste of the Bottoms unit.

INTERFACE The boundary between any two phases: generally a term used to define the separation between two liquids such as organics and water.

JACKETED Having an outer cover or casing through which steam or a coolant flows around a vessel.

KARBATE The brand name for an impervious graphite material used in heat exchangers. This is an acid resistant material.

KYNAR The brand name for a plastic like material from which valves and piping are made. This is an acid resistant material.

LCV: LEVEL CONTROL VALVE A device (valve) which is able to maintain, raise, or lower the level in a vessel or processing system as desired.

LIGHTS The lesser chlorinated organics in a unit. These are usually EDC or lighter, depending on the operating unit.

LIQUID AIR The name of one of the two companies that supply PPG with O_2 and N_2.

LIQUID BED REACTOR The process vessel in which the reaction of the reactants takes place in liquid.

MAKE-UP WATER Water feed needed to replace that which is lost by evaporation or leakage in a closed-circuit, recycle operation. Primarily used with cooling towers and steam generators.

MANIFOLD A piping arrangement through which a flow or flows can be diverted to several outlets.

MANUAL
1. Any processing operation performed by hand.
2. Controls arranged for their operation by hand.

MECHANICAL SEAL Mechanical assembly that forms a leakproof seal between flat, rotating surfaces to prevent high-pressure leakage.

MFH: MIXED FEED HEADER A pipe that allows a mixture of the organic feeds before they enter the reactor.

MIXED FEED NOZZLES The small openings through which the mixed organic feeds are fed to a reactor.

MLS: MANUAL LOADING STATION A valve that is operated by a signal sent to it by a human operator and not an automatic controller.

NEUTRALIZE To make a solution neutral (neither acidic or basic, pH of 7) by adding a base to an acidic solution, or an acid to a basic solution. Usually at PPG we use a neutralizer to remove acid from a stream by adding a basic solution.

OPTIMIZE Adjusting a unit or piece of equipment to run as efficiently as possible at a desired rate.

ORGANICS Of chemical compounds, based on carbon chains or carbon rings and also containing hydrogen with or without oxygen, nitrogen, or other elements.

ORIFICE PLATE A disk, with a measured hole, placed into a pipeline to measure flow.

ORIFICE RUN A piece of pipe containing an orifice to measure a flow.

O_2 RISER A piece of pipe on a reactor head through which the O_2 is fed into a reactor. The end rises above the head to insure the reaction does not take place at the reactor head.

PACKED COLUMN A column, usually a distillation column, designed to increase contact between liquid and phases.

PACKING A material (can be steel rings, gravel, ceramic saddles or rings, or Kynar rings or saddles) used to increase surface contact between a liquid and gas.

PAD SYSTEM An arrangement of piping and valves that allows a layer of inert gas, into a process vessel, to serve as a cushion or for protection.

PCV: PRESSURE CONTROL VALVE A device (valve) which is able to maintain, raise, or lower the pressure in a vessel or processing system as desired.

PHASE SEPARATOR A vessel used to separate liquids of different density by having a reduced flow rate that allow the heavier liquid to settle.

PLUG COCK VALVE A valve fitted with a plug that has a hole through which fluid flows and that is rotatable through 90° for operation in the open or closed position. Also known as a plug cock.

PLUGGING 1. The formation of a barrier (plug) of solid material in a process flow system, such as a pipe or reactor. 2. A term used in P/T and OHC to refer to the restriction of feed through the reactor heads.

PNEUMATIC Pertaining to or operated by air or other gas.

POSITIVE DISPLACEMENT A term used in reference to pumps and compressors. In the pump or compressor a piston displaces the material in the cylinder.

PSIG: POUNDS PER SQUARE INCH GUAGE The guage pressure, measured by the number of pounds-force exerted on an area of 1 square inch. The guage has been calibrated to take atmospheric pressure into consideration.

PSIA: POUNDS PER SQUARE INCH ABSOLUTE The absolute, thermodynamic pressure, measured by the number of pounds-force exerted on an area of 1 square inch. This means that an adjustment for atmospheric pressure has not been made.

QUICK CONNECT A hose fitting that has two handles to latch it to another fitting.

RAM VALVE A special valve that has a sliding plug to clear valve when it is opened.

RATIO The relationship in quantity, amount or size between two or more things.

REACTION The action of molecules that act upon one another to produce a new set of molecules (products).

REACTOR A device or process vessel in which chemical reaction (catalyzed or noncatalyzed) take place during a chemical conversion type of process.

REACTOR HOT SPOT The level at which the major reactions occur in the reactor.

REBOILER A heating unit for a distillation column designed to supply heat to the lower portion of the column.

RECIRCULATION Taking stream from a vessel and returning it. The purpose of this stream is usually for cooling, drying or mixing of the vessel contents.

RECYCLE That portion of a product stream that has passed thru a processing unit and is recirculated (recycled) back through the process. The purpose of recycle is usually to recover some usable material in the stream.

REFLUX In a chemical process, that part of the product stream that may be returned to the process to assist in giving increased conversion or recovery, as in distillation. Taking part of the product stream and returning it to the process vessel for the purpose of cooling and or purification of a product.

REWORK To send an out-of-spec stream back through the process in order to get it in spec.

ROTAMETER A rate-of-flow volume meter in which the fluid or gas flows upward through a tapered tube, lifting a shaped weight to a position where upward fluid or gas force just balances its weight.

R/D: RUPTURE DISK A disk designed to burst at a predetermined pressure differential; sometimes used as a safety valve. Protects a process vessel or line from over-pressurization.

SADDLES A term for U-shaped material used for packing in process equipment. They are commonly made of ceramic, PVC, or Kynar.

SATURATED STEAM: DESUPERHEATED STEAM Steam that has had condensate added so that the steam temperature equals the temperature of boiling at the pressure existing on it.

SCFH: STANDARD CUBIC FOOT PER HOUR A flow measurement of gases or steam.

SCRUBBER A device for the removal, or washing out, of entrained liquid droplets, or for the removal of an undesired gas component from process gas streams.

SEAL LOOP A loop in a line that will relieve pressure. These are used at home as sink traps. They also stop the escape of vapors.

SEAL POT A container on a line or tank to act as a relief point. These are low pressure applications. Usually they are filled with a liquid. The liquid blows out to avoid over-pressurization.

SEPARATOR A process vessel used for separating liquids of different specific gravity; phase separator separates and organics.

SET POINT The value selected to be maintained by an controller.

SIDE-ARM COOLER A heat exchanger (cooler) that the side of a process vessel for cooling th vessel.

TETRA: Reactor side-arm cooler; used to cool the reactor liquor.

SIGHTGLASS A glass tube or a glass-faced section on a process line or vessel; used for visual reading of liquid levels or of manometer pressures.

SNUFFING STEAM The steam used to avoid or to put out fires on the vent stacks. Also, the steam that could be turned on into the VC and Dowtherm furnaces if a tube rupture occurs causing a fire.

SOP: STANDARD OPERATIONS PROCEDURES A reference that is used to list the specifications for an operating unit that the operators use in producing a product.

SPARGER: PERFORATED-PIPE DISTRIBUTOR A device that distributes liquid or gas in a vessel. It usually consists of a length of pipe or tubing with holes at spaced intervals along the length; used in the liquid-bed reactors and scrubbers.

SPEC Abbreviation of specification.

SPIRAL EXCHANGER: SPIRAL-TUBE HEAT EXCHANGER A counter-current heat exchange device made of a group of concentric spirally wound coils.

SRV: SAFETY RELIEF VALVE A spring-loaded, pressure-actuated valve that allows a gas or liquid to escape from a vessel at a pressure slightly above the safe working pressure of the vessel.

STABILIZER An ingredient added to a product so that it can be handled or stored with less change in composition.

STEAM TRAP A device which drains and removes condensate automatically from steam lines or reboilers.

STILL: DISTILLATION COLUMN A vessel used in the process of producing a gas or vapor from a liquid by heating the liquid in the column and collecting and condensing the vapors into liquids.

STRAP A procedure in which storage tanks are measured thru their top with steel measuring tapes to calculate the volumetric capacity of the tank for increments of height.

STRIPPER An evaporative device for the removal of vapors from liquids; can be in a bubble-tray distillation tower, a vacuum vessel, or an evaporator; if it is a part of a distillation column below the feed tray, it is called the stripping section.

SUPER VALVE The inlet valve on a Quench Tower. Called this because of the difficulty to operate the valves.

TARS A viscous material composed of complex, high molecular weight compounds derived from the distillation of organics.

BOTTOMS PLANT: The heavy material that is burned in the incinerators.

TCV: TEMPERATURE CONTROL VALVE An automatic valve used to maintain the temperature of a process vessel within desired limits.

THERMOCOUPLE A device consisting basically of two dissimilar conductors joined together at their ends; the thermoelectric voltage developed between the two junctions is porportional to the temperature difference between the junctions, so the device can be used to measure the temperature of one of the junctions when the other is held at a fixed, known temperature, or to convert radiant energy into electric energy.

THERMOSYPHON REBOILER A liquid reheater (as for distillation tower bottoms) in which natural circulation of the boiling liquid is obtained by maintaining a sufficient liquid head. The circulation is from the bottom to the top of the reboiler.

THERMOWELL A receptacle for holding thermocouples or thermometers. Another function of the thermowell is to enable the reading of a liquid or gas temperature while it is contained in a pipe or vessel. It also protects the thermocouple or thermometer from the process.

TI: TEMPERATURE INDICATOR Thermometer.

TRAY A metal sheet in a distillation column that provides intimate contact between the falling liquid and rising vapor.

TUBES A long cylindrical body with a hollow center used especially to convey fluid.

TUBESHEET A mounting plate for elements of a larger item of equipment; for example tubes for heat exchangers or coolers.

VAPORIZER A process vessel in which a liquid is indirectly heated with steam until it vaporizes.

Cl_2 VAPORIZER: Liquid Cl_2 is heated until it vaporizes.

PER-TRI ORGANIC VAPORIZER: Organics are heated until they are vaporized.

VAPOR SPACE The area within a vessel that does not contain liquid.

VELOCITY The speed at which the gas flows through a Per-Tri or OHC reactor.

VENT An opening provided for the discharge of pressure or the release of pressure from tanks, vessels, reactors, processing equipment, etc. The gases that are discharged from the processing equipment are called the vent.

WATER HAMMER A pressure rise in a pipeline caused by a sudden change in the rate of flow or stoppage of flow in the line. At times, a very loud noise is caused by this pressure rise when opening into a steam line too fast.

WEIR A device over which a fluid flows that serves to regulate fluid level or measure flow.

W.W. Abbreviation for well water.

ZERO ADJUSTMENT Setting the pointer position of an instrument or meter to read zero when the measured quantity is zero.

OHC/LP-EDC "D" OPERATOR
MAJOR TASK LIST

LAB RELATED DUTIES

1. Catch samples in the OHC/LP-EDC Units as part of routine work.
2. Analyze samples from LP-EDC and OHC Units.
3. Notify "B" Operator of abnormal sample results.
4. Record sample analysis on lab sheet in their proper place.
5. Prepare sample bottles for first (graveyard) shift on third (evening) shift.
6. Catch samples for main lab per schedule.
7. Change septum on G.C. every shift.
8. Fill out lab supply list when more supplies are needed.
9. Fill the reagent bottles in lab at the end of shift.
10. Change G.C. carrier gas cylinders when the pressure approaches 500#.

CATALYST RELATED DUTIES

11. Operate air hoist to take catalyst to top of OHC reactor.

OHC/LP-EDC "D" OPERATOR
MAJOR TASK LIST

12. Add catalyst to the OHC reactor per schedule.

13. Clean up catalyst addition area of OHC reactor.

MISCELLANEOUS

14. Change acid and bicarb solution for the process G.C. and O_2 analyzers without tripping the shutdown system on the OHC reactor.

15. Clean lab and truck as part of routine duties.

16. Report equipment and operational abnormalities to the Lead Operator.

17. Record operations difficulties in logbook.

18. Assist the Lead Operator and B Operators during start-up and shutdown.

19. Perform general housekeeping in the LP-EDC and OHC Units.

SL 005184

QUALIFICATION STANDARDS

1. Wears proper safety and personal protection equipment and follows safety rules at all times.

2. Accurately runs and records necessary laboratory analysis.

3. Obtains current knowledge of unit by reading logs and talking with others in the unit.

4. Keeps others informed of the condition of the operations of the area by making necessary entries in logs and talking with the Lead Operator and other operators.

5. Protects the environment.

6. Reports all spills immediately to the Lead Operator.

7. Follows written and oral instructions of Lead Operator and Supervisors.

8. Maintain area in a safe, efficient and orderly condition by performing housekeeping duties.

9. Safely changes carrier gas cylinders without interrupting the gas flow to the chromatographs.

10. Safely pulls the tar buggy to the Classifiers at WTU and safely unloads the tar buggy into the Classifiers.

11. Safely switches bicarb solution and acid bottles without tripping the OHC Reactor shutdown system.

12. Safely adds catalyst to the OHC Reactor per schedule and cleans the area afterwards.

13. Assists during start-up and shutdown.