MAY

Biphenyl flowed at an improved pace throughout May.

Two Aroclor 1016 runs were made mid-month utilizing "high" Methyl biphenyl content biphenyl as feedstock. The 1016, as well as the Aroclor 1254 produced using the subsequent column bottoms, was in specification and saleable.

A 1400 gallon test blend of Aroclor 1489 (90% 1016, 10% MCS-1302) is being prepared at month's end. Experiencing some difficulties in meeting suggested electrical specifications.

JUNE

There was a Cl_2 shortage most of the month. Lost 98 hours of chlorinator production.

No shipments were missed but department and warehouse inventories are very low on both Aroclor and Pyranol.

A safety platform was installed on the back of the montar trailer. Montar was dropped one time in 15 drums while the trailer was out of service.

The top of #1 Intermediate storage tank was repaired after 5 nozzles corroded off. Started air sweep on #1 and #2 Intermediate storages on 6/14.

A 15 drum shipment of Aroclor 1489 was made to Electric Utilities Company.

JULY

Department and Warehouse inventories of Aroclor and Pyranols were near zero, except for 1016.

The column condenser was tested for leakage but test of 150# static pressure did not show leak. The last 6 column runs averaged ~55 ppm on H_2O.

Made 153 drums of Capacitor 21.

Lost 119 hours chlorination due to departments 213 and 217 being down.

Ran 6 days at reduced rate due to chlorine shortage.

A new demister housing was installed on the blow Brink tank.

Stacy

DEPARTMENT 246/259 1974 OPERATIONS REPORT (Cont'd)

AUGUST

Department operated at reduced rates throughout month due to chlorine allocation and biphenyl flow. Both areas had improved at month's end. TCB continued in short supply.

A new top was installed on #3 batch chlorinator and put into service 8/20. Biphenyl was used sparingly as 1254 feed stock due to refined residue shortage.

SEPTEMBER

An experimental Dow Monochlorobiphenyl run was performed 9/19 through 9/28. The 53M lbs. of product met all specifications. The production proceeded with minor difficulties, however, anticipated rates on the chlorinators and column were not fully realized.

Virgil Brawley left the department 9/23, having been promoted to Department 276 Production Supervisor. Tom Carrico returned to the department 9/9 after recovering from minor surgery.

The chlorinators were down 24 hours 9/18 for plant steam repairs, and the week of 9/22 for the Acid Division turnaround. The chlorinators remain down at month's end due to Acid Unit repairs estimated to last 2-4 weeks. Department inventories are becoming critically low.

Biphenyl yield was somewhat low for the month. This is due in part to holding the intermediate fraction of the Mono run for future disposition. Further recoveries will occur as the residues are converted to 1254.

OCTOBER

Department 246 started up 10/3 and ran 22 days drowning the HCl off-gas to the sewer due to continued Acid Division repairs. Average daily departmental PCB losses during this period were at or below normal levels. Operations have again been locked-in to the Acid Division since 10/26.

All material from the first Aroclor 1016 run since Monochlorobiphenyl production was in specification. 1016 Penta/Hexa content has been higher than normal since mid-October. Visual inspection of the column 11/1 revealed some damage to the top two trays, doubtlessly contributing to this increase. Column operations have been modified slightly to alleviate this condition.

Bill Crabtree became Department 246/259 Production Foreman effective 10/21. Tom Carrico participated in a customer relations visit to Heavy Duty, Goldsboro, N.C., 10/23-10/24.

Higher biphenyl yields for the month reflect the anticipated return on conversion of "Mono" residue to Aroclor 1254.

NOVEMBER

While Pyranol sales continue at an increased pace, Aroclor inventories are at a two year high. Specification 1016 continues to be produced under slightly modified column operations. Elimination of the "boildown" step has reduced the size of a column run by approximately 5%.

One customer complaint was received during the month. A tank car of Inerteen 54201-CM (1242 PPO) to Westinghouse, South Boston, reportedly had a high power factor. Analysis of the reserve sample verified this.

The 1016 column operated under a natural gas curtailment for most of the month. Improvements were made to the back-up fuel oil system to assure smooth operation throughout the coming months. The department had two visitors from the National Institute of Occupational Safety and Health (NIOSH) on 11/22. Biphenyl yields continued high as "Mono" residue is reworked to Aroclor 1254.

DECEMBER

1016 sales fell off drastically this month. The 1 M lbs. production represents a three year low. At the same time, the 1.8M lbs. of Aroclor 1242/1254 produced was a record high since going to a 5-day rate in May, 1972. Pyranols continued at a high pace.

The south department settling basin and trenches were cleaned 12/26. 54,200 lbs. of Monochlorobiphenyl from the September/October demonstration run was shipped to Dow 12/26.

Monsanto

FROM (NAME & LOCATION) K. E. Boucher, WGK

January 31, 1974 Dale J. Schillinger

SUBJECT STATUS OF 246/259
PROCESS SAFETY AUDIT

REFERENCE

TO : Virgil Brawley
Bob Eden
bill Engman
Gary Johnson

On 12/12/73 we reviewed the Aroclor Process Safety Audit job list. We completed four of twelve high priority jobs in 1973 and plan to complete the remaining high priority jobs in 1974. Here is the job list including status and group assigned responsibility for action.

GENERAL RECOMMENDATIONS:

1. Pressure alarm for N_2 blanketing.

   Status: W.O. issued Oct. 11, 1973

   Responsibility: Instrument Shop/Production

2. Give men additional protection when working on lean-to roof.

   Responsibility: Maintenance

3. Check aluminum storage tank thickness on tops.

   Status - Done (SIAM program)

SAFETY JOBS

1. Replace air unloading of Biphenyl with pump.

   Priority: High

   Status: One of the unloading systems will be replaced.

   Responsibility: TSD will provide estimate and design.

2. Equip West Biphenyl Feed Tank (1-702) with Flame Arrestor

   Priority: Medium

   Status/Responsibility: Will be handled by Maintenance.

MONS 055815

IN-13 REV. 1-72

SAFETY JOBS (Continued)

3. Install dip pipe on Biphenyl head tank (1-103)

   Priority: Medium

   Status: Remains to be done

   Responsibility: Maintenance/Production

4. Cool biphenyl in catalyst mix tank (1-403)

   Priority: High

   Status: Production will look into putting socks on line tracers to prevent overheating.

5. Provide non-metallic funnel on 1-403.

   Priority: High

   Responsibility: Maintenance/Production

6. Vent catalyst mix tank to West biphenyl storage tank.

   Priority: High

   Status - Maintenance will estiamte

   Responsibility: Maintenance

7. Move catalyst mix tank pump to ground level.

   Priority: High

   Status: Design and estimate needed.

   Responsibility: TSD will handle.

8. Provide alterations to the chlorine vaporizer vent system.

   Priority: High

   Status - Need specification for chlorine relief valve and project estimate.

   Responsibility: TSD will handle.

9. Install relief valve in steam line after pressure regulator to protect against high chlorine temperature.

   Status: Done.

MONS 055816

SAFETY JOBS (Cont'd)

10. Drains for process pump - Items 121,122,123,124,125,127,525, 306,313

    Priority: Medium

    Status: This is in progress.

    Responsibility: Maintenance/Production

11. Reduce high temperature alarm in chlorinator off-gas header from 190°C to 150°C.

    Priority: High

    Status: Done

12. Check #2 intermediate tank top thickness, provide access platform.

    Priority: High

    Status: Thickness check, needs platform

    Responsibility: TSD

13. Turn vent discharge on #3 Still Receiver

    Priority: High

    Status: Done

14. Move start-stop button away from column pot circulating pump.

    Priority: High

    Status: W.O. 70766 issued to Electrical Shop
    Responsibility: Production/Maintenance E&I Shop

15. Reduce Montar Drum Handling

    Priority: High

    Status: Trailer purchased for handling Montars

    Responsibility: TSD/Production

SAFETY JOBS (Cont'd)

16. Provide furnace controls on #2 Still

Priority: High

Status: Project package issued 1/30/74

Responsibility: TSD/Maintenance

Kenneth E. Boucher
Technical Services Department

/tm

COMPANY CONFIDENTIAL

1975

MANUFACTURING IMPROVEMENT PLAN

FOR

AROCLORS AND PYRANOLS

DEPARTMENTS 246 AND 259

PREPARED BY:

R. E. Boucher
R. E. BOUCHER

B. C. Bosse
B. C. BOSSE

ISSUE DATE:
3/5/75

APPROVED:

A. E. LEISY

W. C. ENGMAN

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J. R. SAVAGE

MONS 055819

DISTRIBUTION

B. C. Bosse
K. E. Boucher
W. P. Conant
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R. Flint
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R. L. Heider
H. J. Horner
G. L. Johnson
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W. A. Kuhn - B3NA
A. E. Leisy
D. K. Lynch
R. H. Munch - T1B
C. Paton - B2SC
E. M. Potter - B2NK
W. R. Richard - T3A
J. R. Savage - B2SL
G. W. Watson

MONS 055820

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SUMMARY

Based on the sales and use forecast of 12-31-74, the department will have adequate capacity in 1975. As in 1974 there remains the potential problem of excess volume of residue from MCS 1016 production versus sales needs for Aroclor 1254 which is produced from this residue.

Forecast for 1976 indicates a major reduction in the capacitor (MCS 1016) market. Some equipment time will be available. Monochlorobiphenyl is the prime candidate to utilize the equipment as MCS 1016 production requirements decrease. Monochlorobiphenyl is a new product not used in the capacitor field.

There will be a tight capacity situation in 1976 if MCS 1016 sales remain at the 1975 forecast level and Monochlorobiphenyl sales approach 8M pounds annual rate in 1976.

Major technical effort in 1975 will be directed towards:

1. Completion of the Monochlorobiphenyl project.
2. Continued reduction of PCB losses to the environment.
3. Technical assistance to customers for PCB pollution control.

Total technical effort for 1975 is estimated at 28 man months of which 13 man months will be process engineering. Capital for defined projects comes to $408,000.

WORK PLAN FOR 1975

Item	Potential Benefits	Capital (Rough)	Priority*	TSD Manpower (Man Months) Process	Other	Responsible
I. COST IMPROVEMENT						
Replace steel demister tank with polyester	Reduce down-time & maintenance	$13,700	Installation in 1975	0	1	Prod, TSD, Maint
II. POLLUTION CONTROL						
A. Continue study of PCB removal	Environmental control of PCB's		Continued Evaluation	3	0	TSD, AR&D, Research
B. Visit customers' plants to provide assistance	Environmental control of PCB's			1	0	TSD
C. Install interlocks on column vent condenser	Environmental control of PCB's	$5,000	Design Complete	0	0	Maint
	Total	$5,000		4	0	

*Priority 1 - Design will be completed in 1975
Priority 2 - Design will be completed in 1975 manpower permitting
Priority 3 - Backlog

MONS 055823

WORK PLAN FOR 1975

Item	Potential Benefits	Capital (Rough)	Priority*	TSD Manpower (Man Months) Process	Other	Responsible
III. NEW PRODUCTS						
A. Demonstrate isomerization and prepare project for Monochlorobiphenyl	New sales, reduce fixed and budgeted costs from MCS 1016	$350,000	1	3	9	TSD, Prod, Research, Maint
B. Install absorber for new MCS 1489 blend	New sales	$ 20,000	Undetermined	1	2	TSD, Maint
C. Investigate selling MCS 1016 distilled residue	Reduce production costs, make product more acceptable to customer		Investigate	1	0	Prod, Marketing
	Total	$370,000		5	11	

*Priority 1 - Design will be completed in 1975
Priority 2 - Design will be completed in 1975 manpower permitting
Priority 3 - Backlog

MONS 055824

WORK PLAN FOR 1975

Item	Potential Benefits	Capital (Rough)	Priority*	TSD Manpower (Man Months) Process	Other	Responsible
IV. PROCESS CONTROL						
A. Investigate changing Cl_2 distribution to continuous chlorinators	Decrease hi-boiler in crude	Investigation		1	0	TSD
B. Find cause of fluorescence change in Aroclor 1016	Maintain customer	Undetermined		Undetermined	0	Prod, AR&D, TSD
C. Evaluate hydrodechlorination	Eliminate MCS 1016 column residue if Aroclor 1242/1254 sales are lost	Undetermined		1	0	TSD, Research
D. Upgrade fuel oil control system	Allow Aroclor column to run on oil at various rates	$2,000		0	1	TSD, Maint
	Total	$2,000		2	1	

*Priority 1 - Design will be completed in 1975
Priority 2 - Design will be completed in 1975 manpower permitting
Priority 3 - Backlog

MONS 055825

WORK PLAN FOR 1975

Item	Potential Benefits	Capital (Rough)	Priority*	TSD Manpower (Man Months) Process	Other	Responsible
V. PLANT IMPROVEMENT						
A. Simplify lime handling	Work simplification	$7,000	3	0	1	TSD, Maint
B. Pave area between R.R. and department	Housekeeping	$4,500	3	0	1	TSD, Maint
	Total	$11,500		0	2	
VI. SAFETY						
A. Biphenyl unloading pump	Potential Safety Hazard	$10,000	1	½	½	TSD, Maint
B. Alter Chlorine vaporizer vent system	Safety	$ 1,000	2	0	0	Maint
C. Provide automatic Cl_2 shut off at main header	Safety		Undetermined	Undetermined		TSD
D. Replace top of #2 intermediate storage tank and provide platform	Safety	$ 3,400 - $ 4,000 Expense	Installation in 1975	0	0	Prod, Maint
	Total	$11,000		½	½	

*Priority 1 - Design will be completed in 1975
Priority 2 - Design will be completed in 1975 manpower permitting
Priority 3 - Backlog

MONS 055826

WORK PLAN FOR 1975

Item	Potential Benefits	Capital (Rough)	Priority*	TSD Manpower (Man Months) Process	Other	Responsible
VII. ENERGY CONSERVATION						
A. Improve furnace efficiency	Reduce energy consumption			½	0	Prod, Maint
B. Reduce steam usage	Reduce energy consumption			1	0	Prod, Maint
	Total			1½	0	
	Total Work Plan			12 3/4	15½	

*Priority 1 - Design will be completed in 1975
Priority 2 - Design will be completed in 1975 manpower permitting
Priority 3 - Backlog

MONS 055827

A. CAPACITY REQUIREMENTS

Forecasted sales of Aroclors and Aroclor blends, through 1984, are shown below. The figures were obtained from the MICC Production Plan dated 12-31-74. The forecast for Aroclors includes the Aroclor needed to make the various blends.

Sales and Use Forecast for Aroclor Department (Mlb/yr)

Product	1975	1976	1977	1979	1984
1) 1016	28.20	23.00	19.06	14.35	14.30
2) 1221	0.15	0	0	0	0
3) 1242	7.53	6.58	6.68	6.16	4.14
4) 1254	10.00	8.83	7.89	7.76	6.39
5) Monochlorobiphenyl	0	8.00	9.00	15.00	20.00

Sales and Use Forecast for Aroclor Blend (Mlb/yr)

Aroclor Blend	Aroclor Used	1975	1976	1977	1979	1984
1) Inerteen 54201 CM	1242	7.46	6.52	6.61	6.10	4.10
2) Pyranol A-13B3B-3	1254	0.95	0.76	0.67	0.70	0.70
3) Inerteen 70/30	1254	5.65	5.01	4.67	4.51	3.64
4) Aroclor 1489	1016	0.09	0.45	0.45	0	0

The following lists the present production capacity of the department.

Product	Capacity
1016	50.4 Mlb/yr
1221 1242 1254	21.6 Mlb/yr
Aroclor blends	20.3 Mlb/yr

A. (Cont'd)

Based on the Sales and Use Forecast of 12-31-74, the department will have adequate capacity to meet expected demands for 1975. In 1976 the department will likely begin the production of 8M lb/yr of Monochlorobiphenyl. To achieve this production the Monochlorobiphenyl project will:

1. Increase the continuous chlorinator capacity by providing larger Cl_2 control valves.

2. Debottleneck the Aroclor column by removal of the blanking strips.

3. Activate the #1 still to provide isomerization facilities for converting Mono column residue into Aroclor 1242.

4. Revamp the existing blow tanks to provide hold tanks for lime treatment of the Aroclor 1242.

5. Provide new central instrumentation for the Aroclor column to automate Monochlorobiphenyl distillation.

In specification Monochlorobiphenyl was produced in the September, 1974, department demonstration. Also, column still bottoms were collected to be used early in 1975 for a department demonstration of the manufacture of Aroclor 1242 from Mono residue. During the demonstration, only 80% of the column design capacity could be achieved due to severe vibration in the still pot as boil-up was increased. Causes of the vibration are being investigated as the plant scope is being prepared.

The same equipment will be used for MCS 1016 and Monochlorobiphenyl production. Equipment occupancy in 1976 is given below:

Product	Capacity	Annual Month Occupancy in 1976
MCS 1016	5.4 M lbs/mo.	4.3 mo. @ 23M lb/yr
Monochlorobiphenyl	1.4 M lbs/mo.	5.7 mo. @ 8M lb/yr
	Total Occupancy	10.0 months

A. (Cont'd)

The 12-31-74 forecast for 1976 is considered conservative in that 1016 sales could continue at the 1975 level of 28.2 M lb/yr. In this case equipment occupancy would be 11.2 months. This would leave little time for product changeovers.

Another problem associated with making Monochlorobiphenyl is the residue disposal route. When making Mono, only Aroclor 1242 is made using the column residue. Likewise, when MCS 1016 is made, only Aroclor 1254 is produced from the column residue. There will be few exceptions, otherwise an imbalance may be produced causing additional production delays.

Analysis of equipment occupancy shows additional facilities for Monochlorobiphenyl may be needed in 1978.

Equipment Occupancy thru 1984 (Months)

Product	Rate	1976	1977	1979	1984
1016	5.4M #/Mo.	4.3	3.5	2.6	2.6
Monochlorobiphenyl	1.4M #/Mo.	5.7	6.4	10.1	14.3
Total Months		10.0	9.9	12.7	16.9

B. COST

The following is the budget total bulk production cost for 1975 as of 8-26-74:

MCS 1016	21.73¢/lb.
Aroclors	21.17¢/lb.
Pyranols	26.53¢/lb.

C. COST IMPROVEMENT

The existing steel demister blow tank will be replaced with polyester material to reduce maintenance cost and downtime.

1975 COST IMPROVEMENT

PROJECT	GROSS ANNUAL SAVINGS RATE	1st Q.	2nd Q.	3rd Q.	4th Q.	UNBUDGETED CURRENT YEAR EXPENSE	ESTIMATED CAPITAL REQUIREMENT	EDC	ODDS OF SUCCESS
Replace Blow Tank Demister	$ 9,300	0	$2,500	$ 800	$ 3,100	0	$13,700	9/1/75	95%

MONS 055831

D. POLLUTION CONTROL

Monitoring and control of PCB losses to the sewer will continue. Current losses from the Aroclor department and the incinerator are below the target of 1 #/day. Federal regulations have not been promulgated as yet, but may be 0.54#/day excluding background. Technical effort may be required to develop means to reach this level on a consistent basis if 0.54 #/day becomes law.

TSD and Research will continue to evaluate various adsorption media for PCB removal from the department effluent. Such a study may prove useful in also finding ways to remove PCB's in effluent discharges from our Aroclor customers' plants.

At the request of the EIA (Electronic Industries Association), TSD is visiting each capacitor customer and obtaining the following samples for PCB content.

1. Samples of each plant's effluent.

2. Samples of the water used by each plant.

3. Samples of the body of water into which each plant discharges its waste streams.

Installation of a newly-designed temperature interlock for the Aroclor 1016 column vent condenser will be installed to further reduce the chance of discharging vapors containing PCB's to the atmosphere.

E. NEW PRODUCTS

In 1976, the department is expected to begin Monochlorobiphenyl production. The production of 8M lb/yr of Monochlorobiphenyl should result in a cost divisor savings of $125,000/yr in the production of Aroclor 1016 by spreading the base for fixed and budgeted costs.

New capital may be needed to make MCS 1489 in the department. MCS 1489 is a blend consisting of 10% by weight Tolylxylsulfone mixed into Aroclor 1016.

F. PROCESS CONTROL

Work may be needed in 1975 on altering the chlorine distribution among the four continuous chlorinators to reduce the amount of high boilers.

F. PROCESS CONTROL (Cont'd)

A cooperative effort between production and AR & D is needed to identify the cause of the change in the fluorescence color of Aroclor 1016. The General Electric Company of Hudson Falls noticed this change.

Hydrodechloriantion process now under study by Research is the dechlorination of Aroclor by catalytic hydrogenation to recover the Biphenyl value of the residue. Hydrodechlorination appears to be the most promising use of the MCS 1016 distilled residue should loss of the 1242/1254 market occur. Major drawbacks to the hydrodechlorination route is the high capital ($1M +), and the generation of dissolved solids (NaCl). Further studies will be conducted by Research.

The column still fuel oil control system will be revised in 1975 to be capable of operating at various rates.

To reduce corrosion of the crude storage tanks, air blowing of the crude Aroclor 1142 has been resumed. Technical effort may be needed if increased PCB losses are caused by air blowing.

G. PLANT IMPROVEMENT

Two carryover projects are included:

1. A project is needed to simplify the handling of bagged lime.

2. The area between the department and the railroad tracks should be paved.

H. SAFETY

Two safety items from the safety audit remain to be completed. In addition, two additional items have been added. They are:

1. Provide Biphenyl unloading pump.

2. Replace rupture disc on the chlorine vaporizer with a relief valve.

3. Install automatic Cl_2 shut off on the chlorine header in case of an electrical failure.

4. Replace top of #2 intermediate storage tank and provide a platform.

1. ENERGY CONSERVATION

To conserve energy, effort will be directed towards two items:

1. Improving the efficiency of the furnaces in the department by changing the air throughput to obtain maximum flame temperature.

2. Reducing steam usage--an item which is being done on a plantwide basis.

Master

STANDARD MANUFACTURING PROCESS

PYRANOLS & INERTEENS

DEPARTMENT 259

Do not Scan

MONS 055734

MONSANTO COMPANY

SPECIALTY PRODUCTS DIVISION

STANDARD MANUFACTURING PROCESS

FOR

PYRANOLS, DEPARTMENT 259

INERTEENS, DEPARTMENT 259

SUPERSEDES: STANDARD MANUFACTURING PROCESS FOR THE MANUFACTURE OF PYRANOLS AND INERTEENS IN DEPARTMENT 259, DATED DECEMBER, 1970, AND ALL AMENDMENTS.

PREPARED BY: G. L. JOHNSON

APPROVED BY:

A.E. LEISY, GENERAL SUPERINTENDENT

W.R. RICHARD, RESEARCH

J.R. SAVAGE, MANUFACTURING MANAGER

ISSUED: SEPTEMBER, 1974

COPY 9 OF 15

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MONS 055736

AMENDING RECORD SHEET

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MONS 055738

SECTION I

SYNOPSIS OF PROCESS

Pyranol and Inerteen are trade names used to designate mixtures of Aroclor and Trichlorobenzene (TCB). A chloride scavenger, phenyl glycidyl ether or Unox Epoxide 221, (EPON 4221) is also added.

Pyranols are used as a dielectric in electrical equipment (transformers), and particularly as a transformer cooling medium. The addition of TCB to the Aroclor increases fluidity of the blend at only a slight expense to its electrical properties. Extreme care is used in the production of Pyranol blends because the customer specifications are very stringent.

At the present time, three electrical grade blends are made. They are:

	Common Name	Other Names
1.	Inerteen 54201 CM	Inerteen 100-42, 1242 PPO
2.	Inerteen 70/30	Inerteen 54201 KA, 1254 PPO
3.	Pyranol A13B3B-3	----

The proportion of components blended to manufacture the various blends are listed below:

Wt. % Product	Inerteen 54201 CM	Inerteen 70/30	Pyranol A13B3B-3
TCB	---	30	40
Aroclor 1242	100	--	--
Aroclor 1254	---	70	60
Unox Epoxide	---	--	0.125
Glycidyl Phenyl Ether	0.20	0.20	--

Primary chemical reactions are absent in the production of these blends. The manufacturing steps are blending, earth treatment and filtration, and packaging.

Blending is a simple mixing operation. Small adjustments are necessary until proper specific gravity and refractive index are obtained. To improve electrical properties, a small amount of attapulgus earth may be added to the blend and subsequently filtered out. The electrical grade products are sold in tank cars, tank trailers, or in drums of 55 gallon and 5 gallon.

SECTION I - SYNOPSIS OF PROCESS (Continued)

The Pyranol trade name is used by the General Electric Corporation and Inerteen by the Westinghouse Electric Corporation.

SECTION II

FLOW SHEETS

Flow sheets for the blending operations are highlighted on the following department drawings. (Flow diagrams will follow when they become available.)

SECTION III

PROCESS IN DETAIL

A. BLEND CALCULATION

The first step in making a blend is to determine the batch size desired and the weight of each major component based on the percentages listed in Section 1. Using these weights, and the known specific gravity and refractive index of both the Aroclor and Chlorobenzene, the theoretical S.G. and index of the blend is calculated. This is done simply by weighted averages. By trial and error, the ratio of the major components is shifted slightly, if necessary, so that both specific gravity and refractive index will be as near as possible to the middle of their respective specification ranges.

B. BLENDING

The major raw materials are pumped to the mix tank (#2, #3, or #4), the Chlorobenzene first. This is to avoid the more viscous Aroclor from clinging to the walls and bottom of the tank. The mix tank contents are agitated for at least four hours after the major components have been added. The blend is heated to 90-100°C during this time. A 16 ounce control sample is taken for S.G. and index. If adjustments are needed, they are calculated in the same way as the original batch. Once S.G. and index are in spec., the chloride scavenger (glycidyl phenyl ether or unox epoxide) is added based on the total batch weight.

C. EARTH TREATMENT AND FILTRATION

After agitating for another 4 hours, a final sample of three 4-pint bottles is taken. If all analyses are in specification, and the power factor at 60 cycles is under 1.5% and the resistivity is at least 1500×10^9, then the product is ready for packaging. (These quality levels have been set within the department.) If this quality is not met, then 20-25 lbs. of attapulgus earth may be added to the blend, agitated for 4 hours, and circulated through a filter for 1-2 hours. Samples are taken and re-analyzed for electrical properties. This earth treatment step can be repeated as often as necessary. The 1.5% power factor and 1500×10^9 resistivity levels were set for efficiency of operation only (See C1 in "Comments on Process" section.) The critical analysis is the tank car analysis.

SECTION III - PROCESS IN DETAIL (Continued)

D. PACKAGING

As an environmental preventive measure, heavier gauge drums with special labeling were put into all Pyranol/ Aroclor service in early 1973. The drums are of 16 gauge, double chime construction with an all yellow exterior. A silk screen, seven language logo is printed on each drum. This warns the customer of the relative hazards of PCB's and instructs them on proper handling and use. In addition, each product label indicates proper disposal method through incineration at the Monsanto W.G.K. facility. See Appendix F for container sizes and product weights.

When shipping product via tank cars or trailer, product samples are taken from the car or trailer and an analysis run. If a certificate of analysis is requested, this is the one used. Drum samples are not taken, but merely identified by lot numbers which correlates to a mix tank analysis. As a further step to reduce the potential of PCB's reaching the environment, bulk shipping via trailers is discouraged. The preferred method is by tank cars or drums.

During the drumming operation, a 4 pint grab sample is taken for appearance, moisture, and electrical properties only, and the drums identified by lot numbers which correlates to a mix tank analysis.

SECTION IV - COMMENTS ON PROCESS

A. RAW MATERIAL YIELDS

In calculating yields, the Aroclor yield is assumed to be 100% and the Chlorobenzene yield calculated on that basis. Therefore, minor losses will show up as Chlorobenzene yields less than 100%. Actual material losses are very small, an estimated 0.04%. Very small losses occur at the mix tank vents, leaking pumps, and in discarded filter cartridges. The only significant loss occurs when a tank car is overfilled. A collection system and settling basin prevent this material from reaching the sewers and environment. A yield loss (but not a material loss) occurs when drums are filled to more than the indicated net weight.

Chlorobenzene yields do not necessarily reflect only the above mentioned losses. The yields also reflect the specific gravities and refractive indices of the Chlorobenzenes and the Aroclors. This is because the finished product is made to meet certain specification ranges, not a certain weight ratio. Therefore, it is possible to have below 100% Chlorobenzene yields even with no material losses. Likewise, yields over 100% can be legitimate and do occur.

Prior to 1974, tri-tetrachlorobenzene (TTCB) was used as a raw material in A13B3B blends rather than TCB. The use of TTCB in Pyranol blends was discontinued in late 1973 when the existing A13B3B-3 blend was developed.

B. CAPACITY

The rated monthly capacity of Dept. 259 for producing Pyranols is 1.69M lbs. The record level of production to date was in January, 1974, when 2.30M lbs. were produced. A more "normal" level is 1.0-1.3M lbs/mo. Past difficulties in obtaining an adequate supply of chlorobenzene have occasionally hampered production. Three mix tanks are available for making the three Pyranol blends. These tanks are also the only storage capacity, although the No. 10 storage tank has been used to provide temporary surge capacity for Inerteen 70/30 on occasion. The present uses are: #2 mix tank - A13B3B-3; #3 mix tank - 70/30; #4 mix tank - 54201 CM.

SECTION IV - COMMENTS ON PROCESS

B. CAPACITY (Cont'd)

A few minor points:

1. The mix tanks should be agitated and circulated while charging as well as afterwards to reduce actual blending time. If this is done, it was decided after evaluation that an in-line stationary mixer was not needed.

2. There are no problems in making a batch on top of a heel. At times this can be done advantageously in order to get to the next batch more quickly.

C. QUALITY

Quality is singularly the most important consideration in the production of electrical grade blends. The production of off-grade blends has resulted in much controversy, extended correspondence, and chemical research. No attempt will be made to cover the entire scope of the quality problem. Some of the factors related to quality are discussed briefly:

1. Electrical Properties - A rather arbitrary "mix tank specification" has been observed by the department for power factor @ 60 cycles and resistivity. This is a maximum of 1.5% power factor and a minimum of 1500 x 10^9 resistivity. This is more stringent than the formal plant specification because these two analyses must be in specification in the tank car. Normally these electrical properties drop when pumping from tank to tank, or tank to car. The reason for this is unknown, but the suspicion is always contamination. It is also recognized that proper sampling is extremely important.

2. Moisture - The moisture content of Pyranol and Inerteen batches can be reduced to 10-15 ppm by blowing the batches with N_2 supplied by Dept. 246. In the blowing operation, the batch should not be heated above 100°C for prolonged periods to prevent TCB vaporization losses. The vaporization loss of sufficient TCB may throw the blend out of specification on specific gravity and refractive index and require a TCB adjustment.

   Pyranols and Inerteens have an affinity for moisture. Tanks and containers should be kept closed when possible.

SECTION IV - COMMENTS ON PROCESS

C. QUALITY (Cont'd)

2. (Cont'd)

When a low moisture content has been achieved and the material is to be drummed, a high temperature (120°C-140°C) is better for maintaining the low H_2O level than is continued blowing with N_2. It should be noted, however, that if the drums or cans are quite full at normal temperatures, at the higher temperatures the required net weights may be difficult to obtain.

3. Attapulgus earth tends to remove a small amount of scavenger in a batch. If a batch is extensively earth treated after the scavenger has been added there should be a final re-analysis for the glycidyl phenyl ether. The only known way of removing excess scavenger is by earth treatment or by lowering percentage by compositing a larger batch.

4. Chloride Scavenger - Many of the inorganic chloride troubles of the past have been traced to the chloride scavenger. Tin tetraphenyl is no longer used as a chloride scavenger because the mixes would not pass the 0.1 ppm inorganic chloride specification in many instances. Unstable glycidyl phenyl ether has been responsible for off-grade Inerteen in the past. Inerteen batches with chloride concentrations as high as 0.30 ppm have been successfully treated to reduce the chloride concentration to 0.1 ppm by the addition of 10-20 pounds of Attapulgus earth to the mix tank and circulating the batch through the filter.

5. Raw Material Stability - During 1947, considerable difficulty was encountered producing Pyranols that would pass the 0.1 ppm specification on inorganic chlorides. After extensive research work, the difficulty was traced to the instability of the raw material trichlorobenzene.

6. Since mid-1973, the number 5 Porocel absorber has been used to upgrade TCB prior to blending. An evaluation is presently underway to determine if this practice has significantly improved the properties of the final blends. There is some evidence that the frequency of earth treating batches has decreased since Porocel treatment of the TCB had begun.

SECTION IV - COMMENTS ON PROCESS

C. QUALITY (Cont'd)

At the present time, so many variations in the final analysis are experienced that it is virtually impossible to track down where the electrical properties degrade. The variations are probably due to sampling variances, bottle contamination, atmospheric contamination in plant and laboratory, and personal analytical techniques.

MONS 055747

APPENDIX A EQUIPMENT LIST

APPENDIX B SPECIFICATIONS

C PHSYICAL CONSTANTS

D UTILITIES

E WORK SCHEDULE

F DRUM STOCK

G MATERIAL BALANCE

H PRODUCT LOSSES

I PROCESS CONTROL

J SAFETY AND TOXICITY

K BACKGROUND INFORMATION

L TIME CYCLE

M QUALITY CONSIDERATIONS

N MISCELLANEOUS

MONS 055748

DEPARTMENT 259

PYRANOLS AND INERTEENS

APPENDIX A - EQUIPMENT LIST

ITEM NO.	EQUIPMENT NAME	EQUIPMENT NUMBER	DESCRIPTION
142	#1 Blend Tank Motor	21-0779 52-56134	Tank made by Graver. Dwg. E-862. Welded steel tank, 7' dia. x 7'high, dished heads 1/2", shell 3/8". All surfaces sprayed with .005" zinc, then .003" tin. 2" xHy pipe coil. Cast bronze stirrer and bronze shaft. Test pressure of tank is 60# hydo., coil is 300 hydro. pressure. Capacity 2,000 gals.
143	#2 Blend Tank Motor	21-1399 52-56134	Same as Item 142.
144	Blend Tank Pump Motor	52-02680 52-56409	Durco Mark II, Group II, as casing and impeller (10-1/2"), Crane 9 mechanical seal. Lincoln 10 HP motor, 1800 rpm.
145	Blend Tank Filter	-	Alsop filter Model No. PAK 125-4, 316 ss, 6000 in ^{2} filtration area, 840 in ^{3} volume.
152	#5 TCB Stg. Tank	21-1310	Tank made by Leader Iron Works. C-609. 10' O.D. x 26' long on Str. side, dished heads, shell 1/2" head 9/16". Test of tank is 60# and coil is 300# hydro pressure. All coils, supports, and inside surface sprayed with .005" zinc and .003 tin.
153	#5 TCB Stg. Tank Pump Motor	19-0929 66-0856	Taber submerged, vertical, centrifugal pump, model C-3, size 228. Pump is 2-1/2 x 2 x 9, length is 138 inches. Base 3000 bronze casing and suction cover, bronze impeller, and nickel/steel shaft. Capacity is 50 ppm @ 40' static head. Lincoln motor is 5 HP, 1445 rpm.
154	#3 Mix Tank Speed Reducer Motor	21-03526 52-87054 52-56409	Alpha tank, 12'0" dia. x 22'0" high. Capacity is 20,000 gallons. Mode of aluminum, see Dwg. TS-D-3011. Lighting agitator, Louis Allis 10 HP motor.
155	#1 Mix Tank Pump Motor	19-3172 66-2651	Durco, Model WHD2, 2 x 1-1/2 x 9.4/8; casing, cover and impeller are alloy 20; capacity of 160 gpm @ 55' head. Motor is 1800 rpm.
159	#1 Mix Tank	21-01321 52-82562 52-56209	Tank (Nooter), Dwg. D-6455, 14' O.D. x 10' high, 3/8" steel shell. Capacity is 13,000 gallons. Agitator motor is 7.5 HP, 1750 rpm.

MONS 055749

DEPARTMENT 259 - PYRANOLS AND INERTEENS

APPENDIX A - EQUIPMENT LIST

ITEM NO.	EQUIPMENT NAME	EQUIPMENT NUMBER	DESCRIPTION
160	#2 Mix Tank Pump Motor	52-02875 52-56409	Durco 3 x 1-1/2 x 13/9.5, alloy 20 with external mechanical seal, motor is an Allis-Chalmers, 10HP, 1750 rpm.
162	#6 TCB Stg. Tank	21-0848	Made by Graver, Dwg. E-4413, 8' ID x 25'6" long, horizontal and underground, internal steam coil, capacity is 9500 gallons.
163	#6 TCB Stg. Tank Pump and Motor	52-76527 52-56286	Vertical centrifugal pump, 2 x 1-1/2 x 9.0/9.0, length is 118 inches, cast iron casing, suction cover and impeller, steel shaft. Lincoln motor is 7.5 HP, 1740 rpm.
164	#2 Mix Tank Speed Reducer Motor	21-2621 23-4109 52-56259	Steel tank, zinc/tin lined, 10'6" I.D. x 23'0" high, capacity is 14,800 gallons. Lightning mixer, 450 rpm, 3 bladed - 18" impeller. Motor is 7.5 hp, 1800 rpm.
165	#3 Mix Tank Pump Motor	52-02875 52-56409	Same as Item 160.
166	#2 Mix Tank Filter	15-0657	Sparkler, 18" diameter, 23 leaves, Model 18-S-23, all 304 ss construction.
173	#4 Mix Tank Filter	65-0769	Same as Item 166.
174	TCB and TTCB Unloading Pump Motor	52-77781	Blackmer, Model 3202, 2 x 2, all cast iron construction, 5 HP motor.
178	#4 Mix Tank Speed Reducer Motor	21-3456	Made by Missouri Boiler Co., 304 ss, 13'0" diameter, capacity of 20,000 gallons. Steam coil has 45 turns of 1-1/2" pipe. Lightning agitator is 18" in diameter and has 3 blades, 420 rpm. Motor is 10 HP, 1160 rpm.
179	#4 Mix Tank Pump Motor	52-69960 52-56409	Durco, 3 x 1-1/2, 13/9.5, Model A20J, ductile iron casing and impeller, jacketed rear cover plate. Allis Chalmers motor is 10 HP, 1750 rpm.
180	Filter at loading dock #3, Track 10A	-	Same as Item 145
187	#3 Mix Tank Filter	15-03338	Same as Item 166.

APPENDIX B

SPECIFICATIONS

The following is a list of the raw materials used for the manufacture of Pyranols and Inerteens. Specification sheets that are available are included for the materials.

MATERIAL CODE	RAW MATERIAL
60200	Trichlorobenzene
81103	Aroclor 1254
61325	Unox Epoxide 221
81101	Aroclor 1242
36100	Glycidyl Phenyl Ether
19400	Attapulgus Earth
43101	Nitrogen

The following is a list of the finished products manufactured in Department 259. Specification sheets are included.

PRODUCT CODE	PRODUCT
81110	Inerteen 54201CM
81093	Pyranol A13B3B-3
81098	Inerteen 70/30

ORGANIC CHEMICALS DIVISION Krummrich & Anniston RAW MATERIAL SPECIFICATION	MATERIAL CODE 61525	MATERIAL EP-221
	PLANT WGK & Ann.	SUPERSEDES A-246 WGK 27 Apr.
	DATE EFFECTIVE 8/13/69	SUPPLIER Union Carbide

APPROVALS

PRODUCTION J. Molloy	RESEARCH J. W. Baker
PROCUREMENT J. Jaworski	QUALITY CONTROL (Chief Chemist) R. Blowers G.W.Miller

GENERAL DESCRIPTION

CHEMICAL FORMULA

SUPERSEDES SPEC OF 7/21/66	SAMPLE FOR ANALYSIS 1 - 16 oz. W M Bottle	ISSUED BY Biggerson/Stiles

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Appearance	Clear liq., free from dirt fibers, or other contamination	13019
(R) Assay	88%, min.	13017
Color	150 APHA, max.	10084
Total Free Chlorides	10 ppm, max.	13021
Refractive Index @25°C.	Report	13020
Moisture	0.1%, max.	10620
Acidity	0.2 mg KOH/gm, max.	10087
Sp. Gr. @90/15.5°C.	Report	13018

Supplier's certificate of analysis to be sent on day of shipment to:
Chief Chemist, Monsanto Co., Monsanto, Ill.

OR Chief Chemist, Monsanto Co., Anniston, Ala.

MONS 055752

(R) Routine Analysis. All others Analyzed by request only.

ORGANIC CHEMICALS DIVISION

RAW MATERIAL SPECIFICATION

MATERIAL CODE	MATERIAL
60200	Trichlorobenzene
PLANT	USING DEPT.
York	259
DATE EFFECTIVE	SUPPLIER
11/13/70	Hooker

APPROVALS

PRODUCTION	RESEARCH
B. W. Corlew/R. McCutchan	W. R. Richard
PURCHASING	QUALITY CONTROL (Chief Chemist)
J. D. Leverle	R. M. Blowers

GENERAL DESCRIPTION: TCB

CHEMICAL FORMULA: $C_6H_3Cl_3$

SUPERSEDES SPEC'S OF	SAMPLE FOR ANALYSIS	ISSUED BY
11/20/68	3 x 5 ot amber bottles	S. Shaulter/C. Stitz

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
Color	APHA 15, max.	10105
(R) Condition	Clear	10105
(R) Sp. Gr. @15.5/15.5°C	1.460 - 1.477	10106
Acidity (mg. KOH/g.)	0.014, max.	10109
Moisture (H_2O)	75 ppm., max.	10620
(R) Refractive Index @25°C	1.5680 - 1.5715	10125
Free Chlorides	0.10 ppm., max.	10118
Crystallizing Point	10°C, max.	10107
Dielectric Strength @25°C	30 KV, min.	11605
Distillation Range (ASTM D-850, Modified) (corrected for Stem and Barometric Pressure)		10108
First Drop	205°C, min.	
5% by volume	210°C, min.	
50% by volume	213°C, min.	
90% by volume	215°C, min.	
Corrosion Test, 6 hrs at 210°C with bright aluminum foil		10126
Change in weight of Al	0.0%	
Color	APHA 200, max.	
Condition	Clear	
Acidity (mg. KOH/g.)	0.014, max.	
Free Chlorides	0.10 ppm., max.	
Monsanto Stability Test	0.5 ppm., max.*	11503
Hydrolysis Stability Test	0.5 ppm., max.	12672
Fire Point	None to boiling point	10123
Fixed Chlorine	58.5%, min.	10088

*Every other car can be over 0.5 ppm but never over 1.0 ppm. Values over 0.5 ppm to be cleared in advance.

Certificate of Analysis required on the above properties - To be sent to the Chief Chemist, W. G. Krummrich Plant to arrive on or before receipt of shipment.

MONS 055753

(R) - Routine Analysis. All others Analyzed by request only.

ORGANIC CHEMICALS DIVISION RAW MATERIAL SPECIFICATION	MATERIAL CODE 43101	MATERIAL Nitrogen, Gas
	DIVISION WGK	USING GROUP See Below (3)
	DATE EFFECTIVE 3/29/68	SUPPLIER Air Reduction Sales Co.

APPROVALS

PRODUCTION J. W. M. T. W. D. O. D. D. E. D. M. J. M. C.	RESEARCH R. H. Mills ODeG. E. L. M. J. A. S.
PROCUREMENT H. Lanuser	QUALITY CONTROL (Chief Chemist) W. J. Gresham

MATERIAL DESCRIPTION — CHEMICAL FORMULA

Grade - O. P. Special Nitrogen

SUPERSEDES SPEC'S OF	SAMPLE FOR ANALYSIS	ISSUED BY
2/18/65	----	L. E. Hornback

CHARACTERISTIC	LIMITS	METHOD
Assay (1)	99.9%, min.	(2)
Oxygen	0.1%, max.	
Hydrogen	0%	
Dew Point	-76°F.	

	Typical Analysis
Nitrogen	99.78%
Argon	0.12%
Oxygen	0.1%
Carbon Dioxide	.00005%
Acetylene	.00005%

(1) Nitrogen plus inert rare gases
(2) Any analyses to be obtained from supplier on request.
(3) 213, 244, 246, 247, A-255, A-256, 259, 267, 270, B-270 & 281.

MONS 055754

(R) Routine Analysis. All others Analyzed by request only.

ORGANIC CHEMICALS DIVISION RAW MATERIAL SPECIFICATION	MATERIAL CODE 36100	MATERIAL Glycidyl Phenyl Ether (Phenoxypropene Oxide)
	PLANT WGK	USING DEPTS. A-246
	DATE EFFECTIVE 7/10/69	SUPPLIER Shell Chemical Co.

APPROVALS

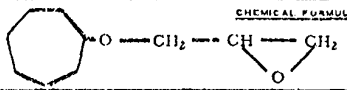
PRODUCTION J. E. Molloy	RESEARCH M. E. Gibbs
PROCUREMENT J. Loyerle	QUALITY CONTROL (Chief Chemist) R. Blowers

GENERAL DESCRIPTION

$C_9H_{10}O_2$

mol wt. 150.17

CHEMICAL FORMULA



SUPERSEDES SPECS OF 5/26/66	SAMPLE FOR ANALYSIS 1 x 16 oz. W.M. Bottle	ISSUED BY Higgerson/Stites

CHARACTERISTIC	LIMITS	METHOD
UNCLASSIFIED INFORMATION		
(R) Sp. Gr. @20/20°C.	1.105 - 1.115	11,864
(R) Total Chlorine (as Cl^-)	40 ppm, max.	12,510

GENERAL INFORMATION

At the present time the material being supplied to WGK for use in the manufacturing of Westinghouse Inerteen PPO, is a commercial Grade of Glycidyl Phenyl Ether. In addition to the 2 tests shown above, the supplier's specification lists:

Purity		--------
(Based on Epoxide Content, per cent by weight	98%, max.	---------
Color	30 APHA, max.	---------

The supplier's Technical Bulletin shows the following Physical Properties for the Refined Grade.

Boiling Point @ 760 mm.	245°C.	11,862
Melting Point	3.5°C.	11,861
Flash Point	175°F.	-----
Refractive Index @20°C.	1.5314	11,863
Viscosity @20°C.	7.05 cs.	------
30°C.	4.88 cs.	------

Supplier's certificate of analysis to be sent on day of shipment to:

Chief Chemist, Monsanto Co., Monsanto, Ill.

MONS 055755

(R) Routine Analysis. All others Analysed by request only.

ORGANIC CHEMICALS DIVISION W. G. Krumbrich Plant RAW MATERIAL SPECIFICATION	MATERIAL CODE 1940	MATERIAL Attapulgus Earth 200/U
	PLANT WGK	USING DEPTS. 246
	DATE EFFECTIVE 2/3/69	SUPPLIER Mineral & Chemical Phillips Corp.

APPROVALS

PRODUCTION J. W. Holley	RESEARCH Marvin E. Gibbs
PROCUREMENT J. Leverle	QUALITY CONTROL (Chief Chemist) R. Blowers

GENERAL DESCRIPTION

Clay

CHEMICAL FORMULA

SUPERSEDES SPECS OF	SAMPLE FOR ANALYSIS	ISSUED BY
1/21/66	2 x 16 oz. W.M. Bottles	Higgerson/[illegible]

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Volatile Matter (at 950°C.)	6 - 8%	
(R) Mesh Test:		
Through USS 325	90%, min.	

This material is not accepted without the supplier's analysis of the above properties.

MONS 055756

(R) Routine Analysis, All others Analyzed by request only.

Monsanto
ORGANIC CHEMICALS DIVISION
W. G. Krummrich Plant
FINISHED PRODUCT SPECIFICATION

PRODUCT	DEPT.
Aroclor 1254 Electrical Grade	246

PLANT	PRODUCT CODE	USE
W. G. K.	811.03	Sales to 810.00

DATE EFFECTIVE	SALES CODE
9/8/72	1040-281-16-03

APPROVALS

PRODUCTION	RESEARCH
A. E. Leisy	W. R. Richard
SALES	QUALITY CONTROL (Chief Chemist)
C. Paton	H. J. Horner
GENERAL DESCRIPTION	CHEMICAL FORMULA

Also called Pyranol 1476.

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
11/4/68	3 x 4 Pt. Amber Bottles	R. McCutchan/S.Shaulter

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Color, APHA	50, Max.	10,084
(R) Condition	Clear	10,084
(R) Sp. Gr. @ 65/15.5°C.	1.495 - 1.505	10,114
(R) Acidity (mg. KOH/gm.)	0.010, Max.	10,087
(R) Moisture (H_2O)	35 ppm., Max.	10,620
(R) Refractive Index @ 25°C.	1.6375 - 1.6415	10,125
(R) Inorganic (Free) Chlorides	0.05 ppm., Max.	12,741
(R) Pour Point	7 - 12°C.	10,115
(R) Dielectric Constant (60 cycles @ 100°C.)	4.25 - 4.55	T-2273
(R) Hydrolysis Stability Test (As Chlorides)	1.0 ppm., Max.	12,672
(R) Monsanto Stability Test (As Chlorides)	0.5 ppm., Max.	11,503
(R) Distillation Range (ASTM D-20, Corrected)		10,117
10% Distilled b y Wt.	366 - 378°C.	
50% Distilled by Wt.	371 - 383°C.	
90% Distilled by Wt.	379 - 394°C.	
Sulfates	None	12,169
Dielectric Strength @ 25°C.	35 KV, Min.	11,605
Flash Point	None	10,123
Fire Point	None	10,123
Visc. @ 210°F.	44 - 48	10,086
Corrosion Test (6 hrs. @ 210°C. with bright Aluminum Foil.)		10,126
Change in wt. of Al (%)	0.0	
A.C. Color, APHA	60, Max.	10,084
A.C. Condition	Clear	10,084
A.C. Acidity (mg. KOH/g.)	0.010, Max.	10,087
A.C. Inorganic (Free) Chlorides	0.05 ppm., Max.	10,118

		Internal	Customer	
(R) Power Factor @ 100°C., 60 cycles, Max.	Bulk	0.5%	1.0%	T-2273
	Drums	2.0%	4.0%	

(R) Routine Analysis. All others Analyzed by request Only

CONTINUED PAGE 2

Characteristics	Limits	Methods
GENERAL INFORMATION		
Specific Heat @ 25°C.	0.27	
Coefficient of Expansion (25 - 65°C.)	0.00066 cc/°C	
Fixed Chlorine	54.5 - 55.5%	

Monsanto
ORGANIC CHEMICALS DIVISION

W. G. Krummrich Plant
FINISHED PRODUCT
SPECIFICATION

PRODUCT		DEPT.
Aroclor 1242, Electrical Grade		246
PLANT	PRODUCT CODE	USE
W.G.K.	811.01	Sales, to 810.
DATE EFFECTIVE	SALES CODE	
9/8/72	1040-241-16-03	

APPROVALS

PRODUCTION	RESEARCH
A. E. Leisy	W. F. Richard
SALES	QUALITY CONTROL (Christ Chemist)
C. Paton	H. J. Horner

GENERAL DESCRIPTION — CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
10/22/69	3 x 4 Pt. Amber Bottles	R.McCutchan/S.Shaulter

CHARACTERISTIC	LIMITS	METHOD
UNRESTRICTED INFORMATION		
(R) Color (APHA	40, Max.	10,084
(R) Condition	Clear	10,084
(R) Sp. Gr. @ 25/15.5°C.	1.381 - 1.392	10,114
(R) Acidity (mg. KOH/g.)	0.010, Max.	10,087
(R) Moisture (H_2O)	35 ppm., Max.	10,620
(R) Refractive Index @ 25°C.	1.6240 - 1.6260	10,125
(R) Inorganic (Free) Chlorides	0.05 ppm., Max.	12,741
(R) Pour Point	-14°C. or lower	10,115
(R) Dielectric Constant (60 cycles @ 100°C.)	4.75 - 4.95	T-2273
(R) Hydrolysis Stability Test (As Chlorides)	0.5 ppm., Max.	12,672
(R) Monsanto Stability Test (As Chlorides)	0.4 ppm., Max.	11,503
(R) Distillation Range (ASTM D-20, Corrected)		10,117
10% Distilled by Wt.	325°C., Min.	
90% Distilled by Wg.	360°C., Max.	
Sulfates	None	12,169
Dielectric Strength @ 25°C.	35 KV, Min.	11,605
Flash Point (°F)	338 - 392	10,123
Fire Point	None	10,123
Corrosion Test (16 hours @ 210°C. with bright Aluminum Foil.) Change in wt. of Al %	0.0	
A.C. Color (APHA)	60, Max.	10,084
A.C. Condition	Clear	10,084
A.C. Acidity (mg. KOH/g.)	0.010, Max.	10,087
A.C. Inorganic (Free) Chlorides	0.05 ppm., Max.	12,741
Visc. @ 100°F. (SUS)	82 - 92	10,086

		Internal	Customer	
(R) Power Factor @ 100°C., 60 cyclos, Max.	Bulk	0.5%	1.0	T-2273
	Drums	2.0	4.0	

(R) Routine Analysis, All others Analyzed by request Only

MONS 055759

Characteristics	Limits	Methods
GENERAL INFORMATION		
Specific Heat @ 25°C.	0.30	
Coefficient of Expansion (25-65°C.)	0.00068 cc/°C.	
Fixed Chlorine	42.5 - 43.5%	
SPECIAL CUSTOMER REQUIREMENTS		
General Electric		
Thermal Chemical Chlorides	0.65 ppm., Max.	12,722
Westinghouse		
Hydrolizable Chlorine (Westinghouse Stability Test)	1.0 ppm., Max.	T-2219

Monsanto
ORGANIC CHEMICALS DIVISION
W. G. Krummrich Plant
FINISHED PRODUCT SPECIFICATION

PRODUCT			DEPT.
Inerteen 70-30 Transformer Fluid			259
PLANT	PRODUCT CODE	USE	
W. G. K.	810.98	Sales	
DATE EFFECTIVE	SALES CODE		
5/17/72	1050-210-16-03		

APPROVALS

PRODUCTION: A. E. Leisy	RESEARCH: W. R. Richard
SALES: C. Paton	QUALITY CONTROL (Chief Chemist): R. M. Blowers

GENERAL DESCRIPTION: Mixture — 70% Aroclor 1254, 30% Trichlorobenzene, Plus 0.20% Gylcidyl Phenyl Ether

CHEMICAL FORMULA:

MOL WT.:

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
7/10/69	3 x 4 Pt. Amber Bottles	R.McCutchan/S.Shaulter

CHARACTERISTIC — LIMITS — METHOD

UNRESTRICTED INFORMATION

(R)	Color	50 APHA, Max.	10,084
(R)	Condition	Clear	10,084
(R)	Sp. Gr. @ 15.5/15.5°C.	1.518 - 1.528	10,114
(R)	Acidity (mg. KOH/g.)	0.014, Max.	10,087
(R)	inorganic Chloride	0.05 ppm., Max.	12,741
(R)	Viscosity @ 100°F.	58 - 62 SUS	10,086
(R)	Dielectric Strength @ 25°C.	35 KV, Min.	11,605
(R)	Refractive Index @ 25°C.	1.6163 - 1.6193	10,125
(R)	Distillation		10,117
	1st Drop	200°C., Min.	
	Below 270°C.	35%, Max.	
	90% by Wt.	379 - 394°C.	
(R)	Pour Point	-30°C., Max.	10,115
(R)	Moisture (H_2O)	30 ppm., Max.	10,620
(R)	Fire Point	None to boiling point.	10,123
(R)	Glycidyl Phenyl Ether	0.18 - 0.22%	11,865
(R)	Corrosion Test 6 hrs. @ 210°C. with bright Al foil Change in wt. of Al.	0.0%	10,126
	A.C. Color	200 APHA, Max.	10,084
	A.C. Condition	Clear	10,084
	A.C. Acidity (mg. KOH/g.)	0.014, Max.	10,087
	A.C. Inorganic Chloride	2.0 ppm., Max.	12,741
(R)	Dielectric Constant, 60 cycles, 100°C.	4.3 - 4.6	T-2273

			Internal	Customer	
(R)	Power Factor @ 100°C., 60 Cycles, Max.	Bulk	1.5%	2.0%	T-2273
		Drums	2.0%	4.0%	

(R) Routine Analysis, All others Available on Request Only

Monsanto
ORGANIC CHEMICALS DIVISION
W. G. Krummrich Plant
FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Inerteen 54201-CM		259
PLANT	PRODUCT CODE	USE
W. G. K.	811.10	Sales
DATE EFFECTIVE	SALES CODE	
5/17/72	1050-216-16-03	

APPROVALS

PRODUCTION	RESEARCH
A. E. Leisy	W. R. Richard
SALES	QUALITY CONTROL (Chief Chemist)
C. Paton	R. M. Blowers

GENERAL DESCRIPTION

99.8% Aroclor 1242
0.2% Glycidyl Phenyl Ether

CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPEC'S. OF	SAMPLE FOR ANALYSIS	ISSUED BY
10/21/71	3 x 4 Pt. Amber Bottles	R. McCutchan/S.Shaulter

	CHARACTERISTIC	LIMITS	METHOD
(R)	Color, APHA	60, Max.	10,084
(R)	Condition	Clear	10,084
(R)	Sp. Gr. @ 25°/15.5°C.	1.381 - 1.392	10,114
(R)	Acidity (Mg KOH/g.)	0.010, Max.	10,087
(R)	Moisture, ppm.	35, Max.	10,620
(R)	Refractive Index @ 25°C.	1.6240 - 1.6260	10,125
(R)	Inorganic (Free) Chlorides, ppm.	0.05, Max.	12,741
(R)	Pour Point, °C.	-17 or lower	10,115
(R)	Distillation Range (ASTM D-20, corrected)		12,169
	10% Distilled by weight.	325°C., Min.	
	90% Distilled by weight.	360°C., Max.	
(R)	Dielectric Constant, 60 cycles, 100°C.	4.75 - 4.95	T-2273
(R)	Dielectric Strength @ 25°C.	35 KV, Min.	11,605
(R)	Fire Point	None to Boiling	10,123
(R)	Viscosity @ 100°F., SUS	82 - 92	10,086
(R)	Glycidyl Phenyl Ether, %	0.18 - 0.22	11,865
(R)	Corrosion Test - 6 hrs. @ 210°C. with Bright Al Foil		
	Change in wt. of Al foil, %	0.0	
	Color, APHA	100, Max.	10,084
	Condition	Clear	10,084
	Acidity (Mg KOH/g.)	0.010, Max.	10,087
	Inorganic (Free Chlorides, ppm.	0.05, Max.	12,741

			Internal	Customer	
(R)	Power Factor @ 60 cycles, 100°C.	Bulk	1.5%	2.0%	T-2273
	Min.	Drums	2.0%	4.0%	

R - Routine Analysis. All others Analyzed by request Only

MONS 055762

MONSANTO INDUSTRIAL CHEMICALS COMPANY

Wm.G.Krummrich Plant

TENTATIVE

FINISHED PRODUCT SPECIFICATIONS

PRODUCT CODE: 810.93	DEPT. OR JOB: 259	PAGE 1 OF 1	
SALES CODE: 1050-302-16-003		APPROVALS — DATE	
ISSUE DATE: 4/24/74	SUPERCEDES SPECS. DATED: NEW	CHIEF CHEMIST: H.J.Horner	
PRODUCT (Trade Name): Transformer Pyranol A13B3B3	GRADE	MANUFACTURING DEPT.: A.E.Leisy	
PRODUCT (Chemical Name)		MGR., MANUFACTURING: J.R.Savage	
CHEMICAL FORMULA: Mixture 60% Aroclor 1254, 40% TCB, EP-221		RESEARCH GROUP LEADER: R.H.Munch	
		MARKETING OR DEVELOPMENT PRODUCT MANAGER: C.Paton	
SAMPLE FOR ANALYSIS: 2 x 4 pint amber bottles		MANAGER, PRODUCT ACCEPTABILITY: W.G.Papageorge	

Characteristics	LIMITS: Reject	LIMITS: Manufacturing	Unrestricted Sales	Method Number
(R) Color, APHA			150,max.	10,084
(R) Condition			Clear	10,084
(R) Specific Gravity 25/15.5°C			1.495-1.510	10,114
(R) Acidity (mg KOH/gm)			0.014,max.	10,087
(R) Moisture (H_2O)			30 ppm,max.	10,620
(R) Refractive Index 25°C			1.6110-1.6120	10,125
(R) Dielectric Strength 25°C			35 KV,min.	11,605
(R) Viscosity 37.8°C			44-48 SUS	10,086
(R) Pour Point			-38°C or lower	10,115
(R) Active EP-221			0.115-0.135%	13,014
(R) Inorganic Chlorides			0.10 ppm max.	12,741
(R) Power Factor 60 cycles,100°C		3.0%, max. (Bulk) 3.0%,max. (Drums)	5%, max. 5%, max.	T-2273
(R) Corrosion Test				10,126
After heating with aluminum for 6 hrs. at 210°C, the aluminum must not be corroded either on visual or weight inspection and the Pyranol should meet the following specifications:				
Color, APHA			200 max.	10,084
Acidity, mg KOH/g			0.014 max.	10,087
Inorg.Chlorides, ppm			0.15 max. tentative	12,741
Condition			Clear	10,084

(R) Routine Analysis, all other analyzed by request only.

NOTE: This specification is the property of the Monsanto Company and is for internal use only. It may not be released without written approval by Division Product Acceptability.

MONS 055763

General Properties Not Included in the Specification Tests

Dielectric Constant, 100°C,60 Hz (ASTM D924)	4.2-4.6 None to boiling point	T-2273 10,123
Burn Point (ASTM D92)	55.6 ± 0.5	10,088
Fixed Chlorine		
Coefficient of Thermal Expansion (ASTMD1903)	0.0007 cc./cc./°C	
Distillation Range (ASTM D20) Corrected for stem and barometric pressure		
First Drop	208°C,min.	
35%	247°C,min.	
55%	360°C,min.	
65%	365°C,min.	
95%	380°C,min.	

MONS 055764

Monsanto
ORGANIC CHEMICALS DIVISION

Anniston and Krummrich
FINISHED PRODUCT
SPECIFICATION

PRODUCT: INERTEEN 70-30 TRANSFORMER FLUID

Dept. 27 -Ann
A-246 WGK

PLANT	PRODUCT CODE	USE
Anniston WGK	81098 - WGK Ann.	SALES
DATE EFFECTIVE	SALES CODE	
7/10/69	1050-210-16-03/09	

APPROVALS

PRODUCTION	RESEARCH
J. W. Molloy	J. W. Baker
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault	G. W. Miller R. Blowers

GENERAL DESCRIPTION

Mixture 70% Aroclor 1254
30% Trichlorobenzene
Plus 0.20% Phenoxypropene Oxide

CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
4/10/66	3 x 5 pt. Amber Bottles	Higgerson/Stites

CHARACTERISTIC		LIMITS	METHOD
UNRESTRICTED INFORMATION			
(R)	Color	50 APHA, max.	10,084
(R)	Condition	Clear	10,084
(R)	Sp. Gr. @ 15.5/15.5°C.	1.518 - 1.528	10,114
(R)	Acidity (mg. KOH/g.)	0.014 max.	10,087
(R)	Inorganic Chloride	0.05 ppm., max.	12,741
(R)	Viscosity @ 100°F.	58 - 62 SUS	10,086
(R)	Resistivity @ 100°C. ohm/cm	500×10^9 min.	11,607
(R)	Dielectric Strength @ 25°C.	35 KV, min.	11,605
(R)	Refractive Index @ 25°C.	1.6153 - 1.6173	10,125
(R)	Distillation		10,117
	1st Drop	200°C., min.	
	Below 270°C.	35%, max.	
	90% by wt.	379 - 394°C.	
(R)	Pour Point	-30°C., max.	10,115
(R)	Moisture (H_2O)	30 ppm., max.	10,620
(R)	Fire Point	None to boiling pt.	10,123
(R)	Phenoxypropene Oxide	0.18 - 0.22%	11,865
(R)	Corrosion Test 6 hrs. @ 210°C. with bright Al foil Change in wt. of Al	0.0%	10,126
	AC Color	200 APHA, max.	10,084
	AC Condition	Clear	10,084
	AC Acidity (mg KOH/g.)	0.014, max.	10,087
	AC Inorganic Chloride	2.0 ppm., max.	12,741
RESTRICTED INFORMATION			
(R)	Power Factor @ 60 cycles and 100°C.	5.0%, max.	11,608

Monsanto
ORGANIC CHEMICALS DIVISION
W. G. Krummrich Plant
FINISHED PRODUCT SPECIFICATION

PRODUCT		DEPT.
Inerteen 4201-CM		259
PLANT	PRODUCT CODE	USE
W.G.K.	811.10	Sales
DATE EFFECTIVE	SALES CODE	
10/21/71	1050-216-16-03	

APPROVALS

PRODUCTION	RESEARCH
A. E. Leisy	W. R. Richard
SALES	QUALITY CONTROL (Chief Chemist)
W. E. Ault	R. M. Blowers

GENERAL DESCRIPTION — CHEMICAL FORMULA

99.8% Aroclor 1242
0.2% Phenoxypropene Oxide

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
NEW	3 x 5 Pt. Amber Bottles	S. M. Shaulter/G. Stites

	CHARACTERISTIC	LIMITS	METHOD
(R)	Color, APHA	60 Maximum	10,084
(R)	Condition	Clear	10,084
(R)	Specific Gravity @ 25°/15.5°C.	1.381-1.392	10,114
(R)	Acidity (Mg KOH/g)	0.010 Maximum	10,087
(R)	Moisture, ppm	35 Maximum	10,620
(R)	Refractive Index @ 25°C.	1.6240 - 1.6260	10,125
(R)	Inorganic (Free) Chlorides, ppm	0.05 Maximum	12,741
(R)	Pour Point, °C.	-17 or lower	10,115
(R)	Resistivity, ohm-cm 500 VDC @ 100°C. 0.1" Cap	100 x 10^9 Minimum	11,607
(R)	Distillation Range (ASTM D-20, corrected)		12,169
	10% Distilled by weight	325°C., Minimum	
	90% Distilled by weight	360°C., Maximum	
(R)	Dielectric Strength @ 25°C.	35 KV, Minimum	11,605
(R)	Fire Point	None to Boiling	10,123
(R)	Viscosity @ 100°F., SUS	82 - 92	10,086
(R)	Phenoxypropene Oxide, %	0.18 - 0.22	11,865
(R)	Corrosion Test-6 hrs. @ 210°C. with Bright Al Foil		10,126
	Change in wt. of Al foil, %	0.0	
	Color, APHA	100 Maximum	10,084
	Condition	Clear	10,084
	Acidity (Mg KOH/g)	0.010 Maximum	10,087
	Inorganic (Free) Chlorides, ppm	0.05 Maximum	12,741

MONS 055766

(R) Routine Analysis. All others Analyzed by request Only

APPENDIX C

PHYSICAL CONSTANTS DATA SHEETS

This section contains physical and chemical data of the raw materials and finished products.

DEGRADATION OF TCB

	Inorganic Chlorides	
Time	Dark	Sunlight
0	.000004%	.000004%
3 days	.000004%	.0005%
7 days	.000004%	.001%

VAPOR PRESSURE OF PYRANOL 1481 (obsolete)
(75% Aroclor 1254, 25% TCB)

Temperature	Partial Pressure TCB	Partial Pressure Aroclor 1254	Total Pressure Pyranol 1481
112°C	13.12 mm	0.039 mm	13.16 mm
50	0.76	0.00051	0.76
40	0.34	0.00022	0.34
30	0.23	0.000086	0.23
20	0.111	0.000032	0.114
10	0.057	0.000011	0.057
0	0.027	0.0000036	0.027

60200

PHYSICAL CONSTANTS DATA

SUBSTANCE: TRICHLOROBENZENE

(Mixture of 1, 2, 3 & 1, 2, 4 T. C. B.)

STRUCTURAL FORMULA

COMPILED BY: Hooker Electrochemical Company

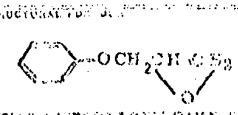
DATE: 7-25-57

NAME		SOURCE & DATE
Formula	$C_6H_3Cl_3$	Ref. 1
Molecular Weight	181.5	Ref. 1
Appearance	Clear colorless	Ref. 1
Boiling Point at 760 mm		
Boiling Point at mm		
Boiling Point at mm 50 psig	280°C	Ref. 2
Boiling Point at mm		
Crystallizing Point		
Melting Point	10°C, Max.	Ref. 3
Solution Point		
Specific Gravity @ 15.5°C/15.5°C	1.460-1.475	Ref. 3
Specific Gravity @		
Pounds per Gal. @ 15.5 °C	12.2	Ref. 2
Coefficient of Expansion Cubical	.00086	Ref. 2
Refractive Index @ 20 n D	1.570	
Infra Red Spectrum (Reference)		
Ultra Violet Spectrum (Reference)		
Viscosity @ 100° F	1.100 Centistokes	Ref. 2
Viscosity @ 210° F	0.549 Centistokes	Ref. 2
Surface Tension @25°C	38.9 dynes/cm	Ref. 2
Solubility in Water		
Solubility in water @ 25°C	.0025 grams/100 grams	Ref. 2
Solubility in		
Flash Point °F (Method) Cleveland open cup	None	Ref. 2
Fire Point °C " " "	None up to boiling pt.	Ref. 2
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./gr/min.)		
Latent Heat of Fusion		
Latent Heat of Vap.	54 cal/gram	
Specific Heat @ 25°C	0.20	Ref. 2
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Other Constants: Moisture content	.05%, Max.	Ref. 3
Distillation range	5°C, Max. incl 216°C	Ref. 3
Decomposition temperature	300 + °C	Ref. 2
Density correction factor	.00124 per 1°C	Ref. 2
Isomer distribution	Mixture 1, 2, 3 & 1, 2, 4	Ref. 2
References (1) Langes Handbook		
References (2) Hooker Data Sheet		
References (3) Hooker Specification		
Toxicity (Give Reference)		

MONS 055768

Shell 36100 PHYSICAL CONSTANTS DATA

Material: GLYCIDYL PHENYL ETHER

Structural Formula: 

Synonyms: (Phenoxymethyl)oxirane; 1,2-Epoxy-3-phenoxypropane; Phenyl glycidyl ether

Issue: 7/1/57

Basis: A.I.P. 60 Compound

Formula	$C_9H_{10}O_2$	
Molecular Weight	150	Ref. 1
Freezing Point		
Boiling Point, 760 mm	245°C	Ref. 1
Boiling Point, 100 mm		
Boiling Point, 50 mm		
Boiling Point, 10 mm		
Boiling Point, 5 mm		
Specific Gravity		
Density	8.65°C	Ref. 1
Specific Gravity 20/4°C	1.1092	Ref. 1
Specific Gravity 25/25°C		
Refractive Index 20°C	1.530	Ref. 1
Coefficient of Expansion	0.00081 cc/cc/°C	Ref. 1
Refractive Index 20°C D Line	1.5314	Ref. 1
Ultra Red Absorption (Wave Length)		
Ultra Violet Absorption (Wave Length)		
Viscosity 100°C	2.05 cs	Ref. 1
Viscosity 50°C	4.88 cs	Ref. 1
Surface Tension 20°C	41.7 dynes/cm	Ref. 1
Solubility in H2O 20°C	2.3% by wt.	Ref. 1
Solubility in Gasoline @ 20°C	12.8%	Ref. 1
Solubility in Acetone	∞	Ref. 1
Flash Point (Cleveland Open Cup)	175°F	Ref. 1
Fire Point		
Autoignition Temperature		
Viscosity, SUV @ 100°F		
Carbon, wt %		
Hydrogen, wt %		
Sulfur, wt %		
Combining Weight		
Chlorine, wt %		
Other Properties		
Other Constants	Ref. (1) Shell Chemical Product Data Sheet	
Toxicity (Rat Oral LD 50 g/kg)	1.2 g/kg	Ref. 1
	Highly toxic by skin absorption	Ref. 1

NOTE: These data should not be released outside of Shell Chemical Company. Non-confidential sheets if necessary.

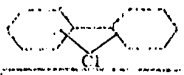
MONS 055769

Form 610

PHYSICAL CONSTANTS DATA

SUBSTANCE: AROCLOR 1242

STRUCTURAL FORMULA:



COMPILED BY: A. M. Eichburg

DATE: 4-25-57

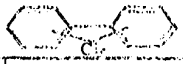
NAME		SOURCE & DATE
Formula	$C_{12}H_5Cl_5$	
Molecular Weight	257 av.	
Appearance	Colorless Mobile Oil	Monsanto Bull. OP-1.5, 9/56
Boiling Point at 760 mm. Range	325 - 360 C.	"
Boiling Point at 3 mm. "	155-195 C.	
Boiling Point at ___ mm.		
Boiling Point at ___ mm.		
Crystallizing Point	Non-crystallizable	
Melting Point		
Solution Point		
Specific Gravity @ 25/25 C.	1.380	"
Specific Gravity @ 25/15.5 C.	1.381 - 1.392	Specifications 2-14-55
Pounds per Gal. @ 25 °C	11.50	M. B. OP-1.5
Coefficient of Expansion 25-65 C.	0.00068 cc/cc/C.	"
Refractive Index @ 25 C. n_D	1.6245 - 1.6265	Specifications 2-14-55
Infra Red Spectrum *(Reference)*		
Ultra Violet Spectrum *(Reference)*		
Viscosity @ 210 F.	34-35 SUS	M. B. OP-1.5
Viscosity @ 100 F.	82-92 SUS	"
Surface Tension Dynes/cm @ 20 C.	45.3	J. Coll. Sci., 10A, 1952
Solubility in Water	Insoluble	M. B. OP-1.5
Solubility in 3A Alcohol @ 29 C.	23.1 g./100 cc	"
Solubility in Pyridine @ 30 °C.	132.5 g./100 cc	"
Flash Point °C (Method) c.o.c.	180 C.	"
Fire Point °C c.o.c.	None	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./Ag/min.)		
Latent Heat of Fusion		
Latent Heat of Vap. cal/gm.	61	Calculated
Specific Heat @ 25 C.	0.293	M. B. OP-1.5
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Specific Heat @ 100 C.	0.350	"
Pour Point	-14 C. or lower	
Thermal Conductivity, cal/cm/C/sec.	24.0 @ 25 C.	To be published
Dielectric Constant 100 C.		
60 cy.	4.2 - 4.9	M. B. OP-1.5
Other Constants: Thermal Conductivity (BTU/hr./ft²/°F/ft		0.0674 0.0288
Viscosity, SUS		1300 93
Viscosity, cp.		400 7
Toxicity *(See Reference)*	Contact Medical Dept.	M. B. OP-1.5

NOTE: These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.

MONS 055770

PHYSICAL CONSTANTS DATA

SUBSTANCE: AROCLOR 1254

STRUCTURAL FORMULA: 

COMPILED BY: A. M. Ellenberg

DATE: 4-25-4[illegible]

NAME		SOURCE & DATE
Formula	$C_{12}H_{6}Cl_{4}$	
Molecular Weight	326 (Avg.)	
Appearance	Pale Yellow Viscous oil	Monsanto Bull. OP-115/19[illegible]
Boiling Point at 760 mm Range	365-40[illegible]°C	"
Boiling Point at 3 mm "	180-220°C	"
Boiling Point at mm		
Boiling Point at mm		
Crystallizing Point	Non-crystallizing	"
Melting Point		
Solution Point		
Specific Gravity @ 25/25°C	1.538	"
Specific Gravity @ 65/15.5°C	1.495-1.505	Specifications 2/14/[illegible]
Pounds per Gal. @ 25°C	12.82	MB OP-115
Coefficient of Expansion 25-65°C	0.00066 cc/cc/°C	"
Refractive Index @ 25°C/m δ	1.6370-1.6390	Specification 2/14/[illegible]
Infra Red Spectrum (Reference)		
Ultra Violet Spectrum (Reference)		
Viscosity @ 210°F	44-48 SUS	MB OP-115
Viscosity @		
Surface Tension Dynes/cm	50.3 @25°C, 42.0 @100°C	"
Solubility in Water	Insoluble	"
Solubility in 3A Alcohol @ 25°C	10 g./100 cc	"
Solubility in Pyridine @ 31°C	114 g./100 cc	"
Flash Point °F (Method) c.o.c.	None	"
Fire Point °C c.o.c.	None	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap. cal/gm.	50	Calculated
Specific Heat @ 25°C	0.261	MB OP-115
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Specific Heat @ 300°C	0.335	"
Other Constants: Pour Point	5-12°C	"
Other Constants: Thermal Conductivity, Cal/cm/°C/Sec.	22.9 @ 28°C	To be published
Other Constants: Dielectric Constant, 100°C, 60 cy.	4.15-4.35	MB-OP-115
Toxicity (Give Reference)	Contact Medical Dept.	MB-OP-115

NOTE: *These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.*

MONS 055771

PHYSICAL CONSTANTS DATA

SUBSTANCE	STRUCTURAL FORMULA
PYRANOL 1481 (Aroclor)	Mixture 75% Aroclor 1254 25% Trichlorobenzene

COMPILED BY	DATE
A. M. Ellenburg	7/9/57

NAME		SOURCE & DATE
Formula		
Molecular Weight		
Appearance	yellow tinted mobile oil	Specs. Jan 28, 1955
Boiling Point at 760 mm		
Boiling Point at ... mm		
Boiling Point at ... mm		
Boiling Point at ... mm		
Crystallizing Point		
Melting Point		
Solution Point		
Specific Gravity @ 15.5/15.5°C	1.525-1.535	"
Specific Gravity @		
Pounds per Gal. @ 15.5°C	12.75	"
Coefficient of Expansion (20 - 100°C)	0.0007 cc/cc/°C	Monsanto Chemical Ltd.
Refractive Index @ 25°C n δ	1.6205-1.6215	Specs. Jan 28, 1955
Infra Red Spectrum (Reference)		
Ultra Violet Spectrum (Reference)		
Viscosity @ 100°F	70-82 SUS	"
Viscosity @		
Surface Tension		
Solubility in Water		
Solubility in		
Solubility in		
Flash Point °F (Method)		
Fire Point °C C.O.C.	None to boiling	"
Heat of Combustion		
Heat of Formation		
Thermal Stability (cal./kg/min.)		
Latent Heat of Fusion		
Latent Heat of Vap.		
Specific Heat		
Critical Temperature		
Critical Pressure		
Dissociation Constant		
Pour Point	-15°C or lower	"
Other Constants: Dielectric Constant, 100°C,	60 cy. 4.1 - 4.6	"
Toxicity (Give Reference)	Contact Medical Dept.	

NOTE: *These data should not be released outside of Monsanto Chemical Company. Use additional sheets if necessary.*

MONS 055772

DEPT. 259 - STANDARD MANUFACTURING PROCESS

PYRANOLS AND INERTEENS

APPENDIX D - UTILITIES

The utility calculations are based on 1973 actual usages. 1973 monthly production averaged 1.1M lbs.

The breakdown of utility usage by individual equipment is only an estimate. The estimates are based on the total monthly usage of each utility as taken from the cost report, and the relative period of time that each is operated.

1. ELECTRICITY - 440v, 3 phase, 60 cycle

ITEM NO.	EQUIPMENT MOTOR	MOTOR HP	PEAK LOAD KW	MONTHLY USAGE KWH
178	#4 Mix Tank	10.0	8.8	2000
179	#4 Mix Tank Pump	10.0	8.8	2000
153	TCB Pump	3.0	2.6	250
154	#3 Mix Tank	7.5	6.6	3000
160	#3 Mix Tank Pump	10.0	8.8	2000
163	TCB Pump	7.5	6.6	250
164	#2 Mix Tank	7.5	6.6	3000
165	#2 Mix Tank Pump	10.0	8.8	2000
174	TCB Tank Car Pump	5.0	4.4	500
	TOTALS	70.5	62.0	15,000

In addition, 110V power is used for lighting and small miscellaneous equipment.

2. NITROGEN (Bulk) -- Because this cost is negligible, all N_2 costs are charged to Aroclors.

ITEM NO.	USING EQUIPMENT	NORMAL USE SCFH	PEAK USE SCFH	MONTHLY USAGE, SCF
178	#4 Mix Tank	4	5	2000
154	#3 Mix Tank	4	5	2000
164	#2 Mix Tank	4	5	2000
	TOTALS	12	15	6000

3. STEAM (80 psig @ 325°F)

ITEM NO.	USING EQUIPMENT	NORMAL USE M BTU/HR.	PEAK USE M BTU/HR.	MONTHLY USAGE, M BTU
178	#4 Mix Tank	500	750	200
154	#3 Mix Tank	500	750	200
164	#2 Mix Tank	500	750	200
---	Drum Heater & Misc.	50	100	40
	TOTALS	1550	2350	640

APPENDIX E

WORK SCHEDULE

SCHEDULE #	NAME		S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	REPAIRMAN	D		1	1	1	1	1			1	1	1	1	1			1	1	1	1	1			1	1	1	1	1			1	1	1	1	1	
2	PREMIUM OPERATORS	D	5	5	5	2	2	2	2	2	3	3	3	3	3		4	4	4	4	4	5	5	5	5	5	2	2	2	2	2	3	3	3	3	3		4	4	4	4	4	5	5
		M	2	3	3	3	3	3		4	4	4	4	4	5	5	5	5	5	2	2	2	2	2	3	3	3	3	3		4	4	4	4	4	5	5	5	5	2	2	2
		L	4	4	4	4	4	5	5	5	5	5	2	2	2	2	2	3	3	3	3	3		4	4	4	4	4	5	5	5	5	5	2	2	2	2	3	3	3	3	3
3	COLUMN OPERATORS	D		6	6	6	6	6			7	7	7	7	7			8	8	8	8	8			6	6	6	6	6			7	7	7	7	7			8	8	8	8	8
		M		7	7	7	7	7			8	8	8	8	8			6	6	6	6	6			7	7	7	7	7			8	8	8	8	8			6	6	6	6	6
		L		8	8	8	8	8			6	6	6	6	6			7	7	7	7	7			8	8	8	8	8			6	6	6	6	6			7	7	7	7	7
4																																										
5	STILL OPERATORS	D		9	9	9	9	9			10	10	10	10	10			9	9	9	9	9			10	10	10	10	10			9	9	9	9	9			10	10	10	10	10
		M		10	10	10	10	10			9	9	9	9	9			10	10	10	10	10			9	9	9	9	9			10	10	10	10	10			9	9	9	9	9
6		L																																								
7	SECOND OPERATORS	D		11	11	11	11	11			12	12	12	12	12			13	13	13	13	13			11	11	11	11	11			12	12	12	12	12			13	13	13	13	13
		M		12	12	12	12	12			13	13	13	13	13			11	11	11	11	11			12	12	12	12	12			13	13	13	13	13			11	11	11	11	11
		L		13	13	13	13	13			11	11	11	11	11			12	12	12	12	12			13	13	13	13	13			11	11	11	11	11			12	12	12	12	12
8																																										
9	STANDARD OPERATOR	D		14	14	14	14	14										14	14	14	14	14										14	14	14	14	14							
		M									14	14	14	14	14										14	14	14	14	14										14	14	14	14	14
10																																										
11	1974		S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
	JAN		27	28	29	30	31												1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
12	FEB							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28							
	MARCH			10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31											1	2	3	4	5	6	7	8	9
13	APRIL			21	22	23	24	25	26	27	28	29	30													1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	MAY							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
14	JUNE		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30											1
	JULY		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31												1	2	3	4	5	6	7	8	9	10	11	12	13
	AUGUST		25	26	27	28	29	30	31												1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	SEPT.									1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
	OCT.		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31										1	2	3	4	5
	NOV.		17	18	19	20	21	22	23	24	25	26	27	28	29	30													1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	DEC.		29	30	31												1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	1975																																									
	JAN.						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
	FEB.		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28																1	2	3	4	5	6	7	8

MONS 05574

APPENDIX F

DEPT. 246 - AROCLORS
DRUM STOCK
AROCLOR

DATE .....

PRODUCT	GRADE					
Capacitor 21x520	225					
1242 EGX600	241					
1242 With Earth X600	243					
1254 EGX600	281					
1254 With Earth X600	283					
54201 CF X600	028					
Difenilo Clorado (1016) X600	027					
1016 X600	016					
Total Aroclors						

	PYRANOLS					
A13B3B-3 X675	302					
A13B3B-3 X60	302					
70-30 X674	210					
70-30 X60	210					
54201 KA X674	217					
54201 CM X600	216					
54201 CM X55	216					
100-42 X600	215					
Difenilo Clorado (1242 PPO) X600	214					
Inerteen 54201 KJ X550	218					
Total Pyranols						

Total Aroclors & Pyranols _____

MONS 055775

DEPARTMENT 259 - STANDARD MANUFACTURING PROCESS

PYRANOLS AND INERTEENS

APPENDIX G -- MATERIAL BALANCE

A detailed material balance on Dept. 259 was not made because losses in the process are negligible in terms of yield. Minor losses are discussed in Appendix H.

TCB yields on individual batches can be less than standard or over theory. This is due to the fact that blends are made and adjusted to a specific gravity range rather than by percent composition. (See "Yield" section of Comments on Process.)

The attapulgus earth and nitrogen is used to upgrade the electrical properties. They do not become a part of the finished goods.

SECTION 1

SYNOPSIS OF PROCESS

Pyranol and Inerteen are trade names used to designate mixtures of Aroclor and Trichlorobenzene (TCB). A chloride scavenger, glycidyl phenyl ether or unox epoxide 221, is also added.

Pyranols are used as a dielectric in electrical equipment (transformers), and particularly as a transformer cooling medium. The addition of TCB to the Aroclor increases fluidity of the blend at only a slight expense to its electrical properties. Extreme care is used in the production of Pyranol blends because the customer specifications are very stringent.

At the present time, three electrical grade blends are made. They are:

	Common Name	Other Names
1.	Inerteen 54201 CM	Inerteen 100-42, 1242 PPO
2.	Inerteen 70/30	Inerteen 54201 KA, 1254 PPO
3.	Pyranol A13B3B-3	----

The proportion of components blended to manufacture the various blends are listed below:

Wt. % Product	Inerteen 54201 CM	Inerteen 70/30	Pyranol A13B3B-3
TCB	---	30	40
Aroclor 1242	100	--	--
Aroclor 1254	---	70	60
Unox Epoxide	---	--	0.125
Glycidyl Phenyl Ether	0.20	0.20	--

Primary chemical reactions are absent in the production of these blends. The manufacturing steps are blending, earth treatment and filtration, and packaging.

Blending is a simple mixing operation. Small adjustments are necessary until proper specific gravity and refractive index are obtained. To improve electrical properties, a small amount of attapulgus earth may be added to the blend and subsequently filtered out. The electrical grade products are sold in tank cars, tank trailers, or in drums of 55 gallon and 5 gallon.

DEPARTMENT 259 - STANDARD MANUFACTURING PROCESS

PYRANOLS AND INERTEENS

APPENDIX H -- PRODUCT LOSSES

Estimated product losses in terms of source are shown below:

Source	Typical 12,000 Gal. Batch (Gal.)	% of Total Produced	#/Yr. Based on 15M # Pyranols
1. Samples & Rinses	4.0	0.033%	5,000 lbs.
2. Filter Waste	0.5	0.004	600
3. Pump Leakage	0.25	0.002	300
4. Spills	0.25	0.002	300
5. Fumes	0.25	0.002	300
TOTALS	5.25 gals.	0.043%	6,500lbs.

Discharge to Atmosphere

Based on the above estimate, Pyranol production losses to the atmosphere amount to about 300 lbs. of material per year (source #5). This loss is predominantly TCB, whose vapor pressure is many, many times greater than the Aroclors it is blended with. The estimate is based on a minimal amount of mix tank vent sampling data.

Discharge to Sewers

Materials from sources #1 and #3 are currently collected in drums for incineration. Product from source #2 is placed in drums and goes to an approved landfill. Spills are collected on a curbed concrete pad and directed to the northern departmental settling basin. Here the heavier Pyranols are contained, preventing any Aroclors from reaching the sewers.

DEPARTMENT 259 - STANDARD MANUFACTURING PROCESS

PYRANOLS AND INERTEENS

APPENDIX I -- PROCESS CONTROL

Three forms are included in this section:

1. A table of process control variables.
2. A Pyranol batch sheet.

3. A daily transfer sheet (for all transfers made by Second Operator.)

KEY VARIABLES

1. TCB Quality -- The certificate of analysis should be noted before the material is used. If poor quality chlorobenzenes are used, poor blends result. In some cases the low quality blend can be upgraded, but in others it cannot.

2. Mix Tank Temperature -- In most cases the temperature should be 90-100°C. At lower temperatures high moisture content is possible. At high temperatures (130°C. and above) loss of the chlorobenzene may be great enough to throw the specific gravity or refractive index out of specification.

3. Use of Batch Sheets -- In a batch blending operation the only operating data available is that which the operator records. Therefore, these records must be maintained properly. If the batch is in specification on the first analysis, the transfer data will be little used. When problems occur the raw data is indispensible.

MONS 055779

PYRANOLS 70/30, A13838-3, and 54201 CM

Process Area or Step	Variable or Parameter	Description of Parameter As It Affects Safety, Quality, Yield, Rate, or Other	Range for Best Known Process Performance	Supervision Frequency of Monitoring	Measurement of Variable			Interaction With Other Variables	How Control Variables	Comments
					Frequency	Method	Accuracy			
1. Raw Material Analysis	(a) Aroclor 1242 and 1254 analysis	Quality	In specification	At least gravity is checked before each use	Each finished lot of Aroclor	(See finished goods specifications sheets).		Directly affects all finished goods analyses.	Make adjustments when necessary	The reliability of Aroclor quality is very high. Therefore a specific gravity and refractive index check is the only required analysis prior to its use in a Pyranol (Inerteen) blend.
	(b) TCB	Quality	In specification	S.G. & Index are checked on each shipment.	Each shipment	10114 10125	± 0.001 ± 0.0002	Directly affects all finished goods	Accept or reject shipment.	TCB is supplied by Hooker. A certificate of analysis is received with each shipment.
2. Raw Material Addition	(a) Contents of tank before charging raw mat'ls.	Quality	For different products, the mix tank should be empty before charging identical products can be built on a heel.	Each batch	Each batch	Level indicator	± 1"	Each Pyranol has different chemical and physical properties	Drum out mix tank before making new batch.	Normally a new mix is not made on an existing heel. This is done only when drumming a tank empty would unduly delay the production of another identical mix (or other similar circumstances.)
	(b) Proportions of Major Components	Quality	The ratios should be near those specified in the Standard Manufacturing Process - but not necessarily exactly.	Each batch	Each batch	Level gauges or meter	± 50 gal.	The most critical analyses are specific gravity and refractive index. When these are correct, usually all other physical analyses are correct.	Manual valves are used in charging a mix tank. Specific gravities can be averaged. Refractive indices can be averaged but with less accuracy & reliability.	In relationship to the old specifications (prior to 4/1/70) for Inerteen PPO & A13838, the specific gravity had to be near the lower limit for these two products, & the refractive index near the upper limit. This meant specs. were difficult to achieve and TCB standard yields were often not met.

MONS 055780

PYRANOLS 70/30, A13838-3, and S4201-CN

Process Area or Step	Variable or Parameter	Description of Parameter As It Affects Safety, Quality, Yield, Rate, or Other	Range for Best Known Process Performance	Supervision Frequency of Monitoring	Measurement of Variable: Frequency	Measurement of Variable: Method	Measurement of Variable: Accuracy	Interaction With Other Variables	How Control Variables	Comments
2 (Continued)	(c) Order of Addition	Rate	Add TCB first, then Aroclor.	Each batch	Each batch	By instruction.	--	A constant gravity blend analysis will be achieved more quickly if the lighter, less viscous is added first.	By instruction.	After gravity and index has been achieved, the small percentage additives are added.
	(d) Temperature of raw materials	Rate	100°C. in raw material storage tanks.	Once/month	Continuous	TI	± 2°C.	Affects pumping time and initial temperature of mix.	Steam pressure reducer	
	(e) Agitation & Circulation during RM addition	Rate	There should be agitation & circulation during raw material addition.	Spot check only	Each batch	By physical check.	--	Will affect the total batch cycle time.	By operator training	
3. Mixing #2, #3 & #4 Mix Tanks	(a) Temperature	Rate	90-100°C.	Once/week	Continuous	TIC	± 2°C.	At lower temperatures, the mix time will be longer.	TIC set point at 95°C.	
	(b) Agitation	Rate - Quality	Agitator on, as well as circulating pump.	Daily	Each batch	Visual check	--	Without agitation, thorough mixing is not accomplished.	By instruction	

MONS 055781

Process Area or Step	Variable or Parameter	Description of Parameter As It Affects Safety, Quality, Yield, Rate, or Other	Range for Best Known Process Performance	Supervision Frequency of Monitoring	Measurement of Variable: Frequency	Measurement of Variable: Method	Measurement of Variable: Accuracy	Interaction With Other Variables	How Control Variables	Comments
3. (Continued)	(c) Mixing Time	Rate - Quality	4 hours after components are added.	Spot check	Time of RM charging & time of sample taking is noted on log sheet	—	—	Large batches may take longer before complete mixing is accomplished.	Samples for gravity and index are taken every 4 hrs. until the results are constant.	
4. Finished Goods Adjustments (when necessary)	The following analyses are the ones more likely to be out of specifications:									
	(a) Specific Gravity and Refractive Index	Quality	Specification	Each batch	Each batch	10114 10125	± 0.001 ± 0.0002	Gravity and index increase or decrease together.	For low gravity and index, add Aroclor. For high gravity or index add TCB. In most circumstances add more of a normal component only. If conditions are such that the addition of a different Aroclor would be beneficial, these may be added in small amounts with supervisory permission.	
	(b) Electrical properties (Power Factor Resistivity)	Quality	Specification	Each batch	Each batch	11608 11607	Unknown	Related to free chlorides	If in the mix tank a blend has a power factor higher than 1.5% (spec is 5.0% max.) the batch is earth treated. One or more buckets of attapulgus earth are added manually, the batch agitated for 2 hours and then circulated through a filter. After 1 hour the mix is analyzed and filtration continued. The procedure is repeated if necessary.	
	(c) % Chloride Scavenger (Glycidal phenyl ether or unox epoxide.)	Quality	Specification	Each batch	Each batch	11,865 13,014	± 0.002%	There is some evidence that earth treatment may remove some chloride scavenger.	If not enough scavenger is present, add more. If too much is present, earth treatment may lower the percentage. A second alternative is to build a larger batch using less scavenger.	

MONS 055782

PYRANOLS 70/30, A1383B-3, and 54201.CH

Process Area or Step	Variable or Parameter	Description of Parameter As It Affects Safety, Quality, Yield, Rate, or Other	Range for Best Known Process Performance	Supervision Frequency of Monitoring	Measurement of Variable			Interaction With Other Variables	How Control Variables	Comments
					Frequency	Method	Accuracy			
4. (Continued)	(d) H_2O	Quality	Specification	Each batch	Each batch	10.620	± 2.5 ppm	Too much water may lower electrical properties.	If water content is high, sparge with air or nitrogen.	

MONS 055783

DEPARTMENT 2[illegible]
BYRANCH BLENDING
NO._____ MIX TANK

Blend_____ Lot No._____ Date_____

Keep all drip pans under pump seals and packing glands emptied
Keep all drums under stirers at a level that prevents spillage
Put nothing but product in waste and sample drums for incinerator

Material	From Tank Number	Measurement Before Transfer	Measurement After Transfer	Mix Tk. Measurement Before Transfer	Mix Tk. Measurement After Transfer	Operator

Original blend control sample time:_____

Results		
Sp.Gr.	Ref.Ind.	Vis

Material	From Tank Number	[illegible]TS Measurement Before Transfer	[illegible]TS Measurement After Transfer	Mix Tank Before Transfer	Mix Tank After Transfer	Results Sp.Gr.	Results Ref.Ind.	Results Visc

Final Samples taken by _____time_____results:

COMMENTS.

MONS 055784

DEPT. 246

SECOND OPERATOR

DATE _____

DAILY TRANSFER SHEET

PRODUCT	LOT NUMBER	FROM TANK	MEASURE B.P.	MEASURE A. P.	OPERATOR	TO TANK	MEASURE B.P.	MEASURE A.P.	OPERATOR	COMMENTS

MONS 055785

DEPTS. 246/259

Department Hazardous Chemical Information

name	characteristics	hazard	symptoms	first aid	handling instructions
CHLORINE	GREENISH-YELLOW GAS WITH PUNGENT, IRRITATING ODOR, IN EITHER LIQUID OR GASEOUS STATE, IT IS NON-FLAMMABLE AND NON-EXPLOSIVE.	SKIN IRRITANT EYE IRRITANT RESPIRATORY CONGESTION. SEVERE EXPOSURE WILL CAUSE DEATH. CONCENTRATIONS OF 1000 PPM FOR 1/2 HOUR TO 1 HOUR CAN BE FATAL.	1. INHALATION - CAUSES COUGHING, DISCOMFORT IN THE CHEST, HOARSE COUGH, NAUSEA, AND VOMITING. 2. EYE CONTACT - CAUSES SMARTING AND IRRITATION. 3. SKIN CONTACT - CAUSES LOCAL IRRITATION AND/OR MINOR BURNS.	1. INHALATION - REMOVE MAN QUICKLY FROM AREA. APPLY BREATHING AIR OR ARTIFICIAL RESPIRATION IF NOT BREATHING OR HAVING DIFFICULTY IN BREATHING. KEEP WARM AND LYING DOWN IF POSSIBLE. GIVE MAN 1-2 GLASSES OF MILK TO SETTLE STOMACH. BRONCHIAL DILATOR PILLS WILL ASSIST BREATHING. 2. EYE CONTACT - RINSE WITH WATER (LIDS OPEN) FOR 15 MINUTES. 3. SKIN CONTACT - FLUSH WITH WATER.	WHEN CHANGING CHLORINE TANK CARS USE GAS MASK AND GLOVES.
BIPHENYL	WHITE FLAKES OR SOLID OFF-WHITE MASS AT ROOM TEMPERATURE; WATER-WHITE TO STRAW-COLORED LIQUID WHEN ABOVE 69°C.; MEDICINAL SWEET ODOR.	EYE IRRITANT AND RESPIRATORY IRRITANT, ESPECIALLY VAPORS FROM MOLTEN FORM. NORMAL LEVEL IN WORKING AREA SHOULD NOT BE ABOVE 1 mg. m^3 AIR (ABOUT 0.2 PPM). CAN ABSORB THROUGH SKIN. WILL CAUSE THERMAL BURN WHEN MOLTEN.	1. EYE CONTACT - CAUSES SMARTING & IRRITATION. 2. INHALATION - CAUSES COUGHING, CHOKING. 3. SKIN CONTACT - CAUSES IRRITATION AND/OR BURNS.	1. EYE CONTACT - RINSE WITH WATER FOR 15 MINUTES. REPORT TO DISPENSARY. 2. REMOVE PERSON FROM AREA OF VAPORS. USUALLY THIS IS ADEQUATE. GIVE ADDITIONAL BREATHING AIR IF NEEDED. 3. SKIN - FLUSH WITH WATER.	BIPHENYL IS HANDLED MOLTEN IN DEPT. 246. WEAR GLOVES AND GOGGLES WHEN UNLOADING TANK CAR. AVOID BREATHING FUMES.
FERRIC CHLORIDE	BLACK, FINE GRANULAR SOLID	DUST IS EYE IRRITANT AND RESPIRATORY IRRITANT; VERY LOW PROBABILITY OF BECOMING A HAZARD.	IRRITATION, COUGHING	FLUSH EYES WITH WATER, GET OUT OF DUST.	STORE IN CLOSED CONTAINERS BECAUSE IT ABSORBS WATER AND RELEASES HEAT. WET FERRIC CHLORIDE WILL NOT CATALYZE BIPHENYL CHLORINATION.
LIME	WHITE ALKALINE POWDER, DENERATES HEAT IN CONTACT WITH WATER (SLAKING).	CHEMICAL BURNS; EYE DAMAGE; INHALATION IRRITANT.	CHEMICAL BURNS TO SKIN EITHER IN SOLID FORM OR SOLUTION. EYE DAMAGE - DUST OR SOLUTION CAN CAUSE IRRITATION OF THE EYES. INHALATION IRRITATES THE MUCOUS MEMBRANES.	SPEED IN REMOVING FROM BODY IS MOST IMPORTANT. FLUSH WITH LARGE QUANTITIES OF WATER. REMOVE CLOTHING INCLUDING SHOES IF NECESSARY. IF EYES ARE AFFECTED, FLUSH WITH WATER FOR 15 MINUTES. IF LARGE QUANTITIES ARE INHALED, DRINK LARGE QUANTITIES OF WATER. CALL DOCTOR IF IRRITATION PERSISTS OR EYES ARE AFFECTED.	WEAR RUBBER GLOVES AND GOGGLES.
FUROGEL	LIGHT-WEIGHT, BROWN, POROUS, INERT GRANULAR SOLID.	EYE IRRITANT (PHYSICAL, NOT CHEMICAL)	EYE IRRITATION AS FROM DUST	FLUSH EYES WITH WATER.	WEAR EYE PROTECTION
ATTAPULGUS EARTH	INERT, TAN-COLORED POWDER.	EYE IRRITANT (PHYSICAL, NOT CHEMICAL)	EYE IRRITATION AS FROM DUST.	FLUSH EYES WITH WATER.	WEAR EYE PROTECTION
NITROGEN GAS (N_2)	COLORLESS GAS	NON-TOXIC, NITROGEN IS AN INERT GAS. BREATHING ONLY NITROGEN WILL CAUSE ASPHYXIATION DEATH.	DIZZINESS, HEADACHES, LOSS OF CONSCIOUSNESS, FINALLY DEATH.	REMOVE TO FRESH AIR. ADMINISTER OXYGEN OR BREATHING AIR IF NECESSARY.	AVOID BREATHING GAS, PROVIDE GOOD VENTILATION.
TRICHLORO-BENZENE (TCB)	WATER-WHITE LIQUID; STRONG ORGANIC CHEMICAL ODOR.	SKIN IRRITANT, INHALATION IRRITANT.	SKIN IRRITATION, CAUSES LOSS OF HAIR ON EXPERIMENTAL ANIMALS. BURNING SENSATION WHEN FUMES ARE BREATHED.	WASH SKIN WITH SOAP AND WATER; CHANGE CLOTHES IF CONTAMINATED. GET OUT OF VAPORS.	WEAR GLOVES AND EYE PROTECTION.
TRI-PETHA CHLOROBENZENE (TPCB)	WATER-WHITE LIQUID; STRONG ORGANIC CHEMICAL ODOR.	SKIN IRRITANT. INHALATION IRRITANT.	SKIN IRRITATION CAUSES LOSS OF HAIR ON EXPERIMENTAL ANIMALS. BURNING SENSATION WHEN FUMES ARE BREATHED.	WASH SKIN WITH SOAP AND WATER; CHANGE CLOTHES IF CONTAMINATED. GET OUT OF VAPORS.	WEAR GLOVES AND EYE PROTECTION.
GLYCIDYL PHENYL ETHER	VISCOUS LIQUID	SKIN IRRITANT; CAN CAUSE SEVERE RASH.	REDNESS, SWELLING OF CONTACTED AREA IF NOT REMOVED FROM SKIN.	WASH THOROUGHLY WITH SOAP AND WATER, REMOVE CONTAMINATED CLOTHING. IF SYMPTOMS ARE ALREADY PRESENT, REPORT TO DISPENSARY.	WEAR RUBBER GLOVES, EYE PROTECTION
UNOX EPOXIDE	VISCOUS LIQUID	SKIN IRRITANT; CAN CAUSE SEVERE RASH.	REDNESS, SWELLING OF CONTACTED AREA IF NOT REMOVED FROM SKIN.	WASH THOROUGHLY WITH SOAP AND WATER, REMOVE CONTAMINATED CLOTHING. IF SYMPTOMS ARE ALREADY PRESENT, REPORT TO DISPENSARY.	WEAR RUBBER GLOVES, EYE PROTECTION

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DEPTS. 246/250 (CONT'D)

Department Hazardous Chemical Information

PAGE 2.

name	characteristics	hazard	symptoms	first aid	handling instructions
INTERMEDIATES & BY-PRODUCTS:					
CRUDE AROCLORS	PURPLISH TO BLACK OILY LIQUID, PETROLEUM-LIKE ODOR, USUALLY HANDLED HOT; CONTAINS LESS THAN 0.05% UNDISSOLVED FERRIC CHLORIDE.	INHALATION IRRITANT (HOT VAPORS). THERMAL BURNS.	COUGHING, IRRITATING TO BREATHE. REDNESS AS FOR ANY OTHER THERMAL BURN.	GET OUT OF VAPORS. WASH AREA TO REMOVE AROCLOR AND TREAT AS ANY OTHER BURN.	WEAR RUBBER GLOVES, EYE PROTECTIC
HYDROGEN CHLORIDE (HCL)	COLORLESS GAS; HIGHLY CORROSIVE; NON-FLAMMABLE. READILY DISSOLVES IN WATER TO FORM AN ACID.	IRRITANT TO EYES AND RESPIRATORY TRACT. CHEMICAL BURNS TO SKIN. THE ACID COMBINES WITH MANY METALS AND RELEASES EXPLOSIVE HYDROGEN GAS.	IRRITATION TO EYES, SKIN AND THROAT.	FLUSH EYES WITH WATER FOR 15 MINUTES. FLUSH CONTACTED AREA WITH WATER. REPORT TO DISPENSARY.	AVOID BREATHING HCl VAPORS OR CONTACT WITH SKIN. USE SCOTT AIR PAK WHEN IN CONTAMINATED AREA.
FINISHED GOODS:					
MCS-1100 CAPACITOR 21 AROCLOR 1232	WATER-WHITE OILY LIQUIDS; CHLORINATED BIPHENYLS AND SOME UNREACTED BIPHENYL. FLASH POINT LOWER THAN THOSE PRODUCTS THAT ARE CHLORINATED BIPHENYLS ONLY.	INHALATION IRRITANT (HOT VAPORS). THERMAL BURNS.	COUGHING, IRRITATING TO BREATHE. REDNESS AS FOR ANY OTHER THERMAL BURN.	GET OUT OF VAPORS. WASH AREA TO REMOVE AROCLOR AND TREAT AS ANY OTHER BURN.	WEAR RUBBER GLOVES, EYE PROTECTI
AROCLORS (#15) 1016 1242 1248 1254 1260 1262	WATER-WHITE OILY LIQUIDS; CHLORINATED BIPHENYLS; VISCOSITY INCREASES WITH DEGREE OF CHLORINATION.	INHALATION IRRITANT (HOT VAPORS) THERMAL BURNS.	COUGHING, IRRITATING TO BREATHE. REDNESS AS FOR ANY OTHER THERMAL BURN.	GET OUT OF VAPORS. WASH AREA TO REMOVE AROCLOR AND TREAT AS ANY OTHER BURN.	WEAR RUBBER GLOVES, EYE PROTECTI
THERMINOL FR-O FR-LOW TEMP., INERTEEN 54201KJ (#16)	WATER-WHITE OILY LIQUID; BLENDS OF AROCLORS AND CHLOROBENZENES	INHALATION IRRITANT (HOT VAPORS) THERMAL BURNS. SOMEWHAT MORE IRRITATING THAN AROCLORS BECAUSE CHLOROBENZENES ARE PRESENT.	COUGHING, IRRITATING TO BREATHE. REDNESS AS FOR ANY OTHER THERMAL BURN.	GET OUT OF VAPORS. WASH AREA TO REMOVE AROCLOR AND TREAT AS ANY OTHER BURN.	WEAR RUBBER GLOVES, EYE PROTECTI
PYRANOL A1232D PYRANOL A1232D INERTEEN FPO INERTEEN 70/30	WATER-WHITE OILY LIQUID; BLENDS OF AROCLORS, CHLOROBENZENES, AND EITHER GLYCIDYL PHENYL ETHER OR UNOX EPOXIDE.	INHALATION IRRITANT (HOT VAPORS) THERMAL BURNS. SOMEWHAT MORE IRRITATING THAN #15 OR #16 (ABOVE) BECAUSE THE CHLORIDE SCAVENGER IS PRESENT.	COUGHING, IRRITATING TO BREATHE. REDNESS AS FOR ANY OTHER THERMAL BURN.	GET OUT OF VAPORS. WASH AREA TO REMOVE AROCLOR AND TREAT AS ANY OTHER BURN.	WEAR RUBBER GLOVES, EYE PROTECTI
INERTEEN 54201 CM	WATER-WHITE OILY LIQUID; BLEND OF AROCLOR AND GLYCIDYL PHENYL ETHER.	INHALATION IRRITANT (HOT VAPORS) THERMAL BURNS. SOMEWHAT MORE IRRITATING THAN AROCLORS BECAUSE THE CHLORIDE SCAVENGER IS PRESENT.	COUGHING, IRRITATING TO BREATHE. REDNESS AS FOR ANY OTHER THERMAL BURN.	GET OUT OF VAPORS. WASH AREA TO REMOVE AROCLOR AND TREAT AS ANY OTHER BURN.	WEAR RUBBER GLOVES, EYE PROTECTI
MONTAN	BROWN TO BLACK VISCOUS LIQUID; HANDLED AT TEMPERATURES UP TO 300°C. A SOLID AT AMBIENT TEMPERATURES.	VAPORS ARE A RESPIRATORY IRRITANT; THERMAL BURN HAZARD.	COUGHING, IRRITATION; THERMAL BURN.	GET OUT OF VAPORS; TREAT AS ANY OTHER BURN.	USE RESPIRATOR WHEN AROUND VAPORS; USE GLOVES, EYE PROTECTI & HANDLE WITH EXTREME CARE WHEN MOLTEN.

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DEPARTMENT 259 - STANDARD MANUFACTURING PROCESS

PYRANOLS AND INERTEENS

APPENDIX J

SAFETY AND TOXICITY DATA

(Sections I & II of Appendix J refer to all of Dept. 246/259, only part of which is used to produce Pyranols/Inerteens.)

I. SAFETY EQUIPMENT

A. Fire Extinguishers

1. Carbon dioxide - 1st floor, NE of lean-to
2. Dry chemical - 1st floor, SE of lean-to
3. Dry chemical - 2nd floor, west wall
4. Dry chemical - 2nd floor, west wall

B. Gas Masks

1. 1st floor, on sprinkler house
2. 1st floor, outside west wall of repair room
3. 2nd floor, on west wall
4. Control room, east wa-l
5. 4th floor, on handrail by #1 chlorinator
6. 4th platform, Aroclor column (2)

C. Scott Air Pak

1. Outside west wall of lean-to

D. Emergency Clothing

1. Box on 2nd floor, west wall

E. Safety Showers with Eye Wash

1. Batch department, 1st floor
2. Batch department, 2nd floor
3. Batch department, 4th floor
4. Continuous department, 1st floor
5. Continuous department, 2nd floor
6. Continuous department, 3rd floor
7. West side of tank farm (alarm in control room)
8. Control room (eye bath only).

DEPARTMENT 259 - STANDARD MANUFACTURING PROCESS

PYRANOLS AND INERTEENS

APPENDIX J

SAFETY AND TOXICITY DATA

II. SAFETY PRECAUTIONS AND DATA

A. Personal Safety Equipment:

Mandatory	Recommended
1. Hard hat	1. Rubber or canvas gloves
2. Safety glasses	2. Goggles
3. Safety shoes	3. Rubber overshoes

B. Fire

None of the raw materials or finished products are fire hazards. Fire extinguishers are available in many areas throughout the department.

C. Toxicity (see next section).

D. Miscellaneous

There are many accidents that can occur which may be classified as health and safety hazards. These accidents can result from steam leaks, product leaks, and other minor hazards normally present to some degree in a chemical plant.

E. Safety Record (Depts. 246/259)

1. Lost Time Accidents - last occurred on January 28, 1948.

2. Serious Injuries - the last two serious injuries were:

   a. April 12, 1973 - Broken finger from dropped T/C lid.

   b. February 15, 1972 - Finger laceration while working on T/C.

3. Minor Injuries - for the year 1973, there were two minor injuries, for an indices of 0.10 minor injuries/man/year in Departments 246/259.

DEPARTMENT 259 - STANDARD MANUFACTURING PROCESS

PYRANOLS AND INERTEENS

APPENDIX J

SAFETY AND TOXICITY DATA

III. TOXICITY

AROCLORS

1. Recommended Threshold Limit Value (T.V.L.)

   a. Aroclor 1242 - 1.0 mg per cubic meter of air. (0.50 action level)

   b. Aroclor 1254 - 0.5 mg per cubic meter of air. (0.25 action level)

2. Hazards and Control

   a. Inhalation: Absorption is chiefly by inhalation. Concentrations in the workroom atmosphere should be maintained below the recommended levels. Where the chlorinated diphenyls are used at room temperatures, the hazard of inhalation is considered slight or absent. When these materials are subjected to elevated temperatures, the process either should be completely enclosed or other adequate mechanical exhaust ventilation must be provided to reduce concentrations to safe levels.

   b. Skin contact: Operations and handling procedures should be such as to avoid the possibility of prolonged or repeated skin contact. Contaminated clothing must be laundered before reuse.

   c. Eye contact: Goggles or face shield should be used where there is a possibility of liquid splashes.

3. Emergency Treatment: Skin surfaces exposed to chlorodiphenyls should be thoroughly washed with soap and water at once. If clothing has been contaminated, it should be removed promptly.

   If exposure to a high vapor concentration occurs, as in the case of spills at elevated temperatures, the patient should be moved from exposure and kept at rest until seen by a physician. Oxygen should be administered if breathing is difficult.

   Eyes contaminated with chlorodiphenyl should be irrigated with water for at least 15 minutes and the patient should be seen by a physician.

III. TOXICITY (Cont'd)

Special procedures: Persons who are regularly or repeatedly exposed to chlorodiphenyls should be examined periodically to detect early evidence of skin irritation and/or liver damage. Persons with known liver disease should not be exposed to repeated contact with the chlorodiphenyls.

* The information in this section is from the Hygienic Guide Series published by the American Industrial Hygiene Association. The particular pamphlet is "Chlorodiphenyls", Jan.-Feb., 1965.

III. TOXICITY (Continued)

The following toxic rating code will be used in describing the toxicity of these materials:

0 - none
1 - slight
2 - moderate
3 - high
U - unknown

A. Biphenyl (Code 82601)

Threshold Limit Value (TLV for 8 hours) = 0.2 ppm or 1.0 Mg/M^2. Action Level = 0.1 ppm or 0.5 Mg/M^2.

1. Synonyms: Diphenyl

2. Description: White flakes or solid off-white mass somewhat pleasant odor.

3. Constants: Mol. Wt. 154.2; M.P. 69°C; B.P. 255°C; Density: .9910@ 75°/4°C.

4. Flash Point: 235°F (C.C.)

5. Auto Ignition Temperature: 1004°F.

6. Toxic Hazard Rating: Acute Local: U
Acute Systematic: Ingestion 3, Inhalation 3
Chronic Local: U

7. Fire Hazard: Definitely when exposed to heat or flame; can react with oxidizing materials.

8. Fire Fighting: CO_2 or dry chemical.

9. Formula: $C_6H_5C_6H_5$

10. Biphenyl vapors are irritating to the upper respiratory tract. Workers should not be exposed to vapor levels throughout their shift in excess of the threshold limit value of 1 milligram per cubic meter of air (or about 0.2 ppm). The compound, or organic solutions of the compound can absorb through the intact skin; therefore, repeated skin contact should be avoided.

11. See Hygienic Guide Series on "Diphenyl".

111. TOXICITY (Cont'd)

B. Chlorine (Code 81059).

1. Description: Greenish yellow gas

2. Formula: Cl_2

3. Constants: Mol. Wt. 70.914; M.P. = 101°C; B.P. 34.5°C; Density 1.47 @ 0°C.

4. Toxic Hazard Rating: Acute Local: Irritant 3; Inhalation 3; Acute Systemic: 0
Chronic Local: U
Chronic Systemic: U
T.L.V. - 1 ppm in air per 8 hour day.
0.5 ppm action level.

5. Toxicology: Chlorine is extremely irritating to the mucous membranes of the eyes and respiratory tract. It combines with moisture to liberate nascent oxygen and from hydrochloric acid.

Both these substances, if present in quantity, cause inflammation of the tissues with which they come in contact. If the lung tissues are attacked, pulmonary edema may result. A concentration of 3.5 ppm produces a detectable odor; 15 PPM causes immediate irritation of the throat. Concentrations of 50 ppm are dangerous for even short exposures. 1000 ppm may be fatal even when the exposure is brief.

Because of its intensely irritating properties, severe industrial exposure seldom occurs as the workman is forced to leave the area before he can be seriously affected. In cases where this is impossible, the initial irritation of the eyes and mucous membranes of the nose and throat is followed by cough, a feeling of suffocation and later pain and a feeling of constriction in the chest. If exposure has been severe, pulmonary edema may follow with rales being heard over the chest.

6. Fire Hazard: Moderate -- can react to cause fire or explosion upon contact with turpentine, ether, ammonia gas, illuminating gas, hydrocarbons, hydrogen and powdered metals.

III. TOXICITY (Cont'd)

B. 7. Explosion Hazard: Present by reaction with reducing agents.

8. Disaster Control: Dangerous; emits highly toxic fumes; will react with water to form toxic and corrosive fumes of HCl; is heavier than air -- gas will hug the ground. People without adequate protection should go across wind until out of the affected area.

C. HCl Off-Gas (Code 828.51)

1. Synonyms: Muriatic Acid, Chlorophydric Acid, Hydrogen Chloride

2. Description: Colorless gas.

3. Formula: HCl

4. Toxic Hazard Rating:
Acute Local: Irritant 3, Ingestion 3, Inhalation 3
Acute Systemic: U
Chronic Local: Irritant 2
Chronic Systemic: U

5. TLV: 5 ppm in air for 8 hour day.
Action Level = 2.5 ppm

6. Toxicology: Hydrogen chloride is an irritant to the mucous membranes of the eyes and respiratory tract. Concentration of 35 ppm causes irritation of the throat after short exposure. Concentrations of 50 to 100 ppm are tolerable for one hour. More serious exposures result in pulmonary edema and often laryngeal spasm. Concentrations of 1000 to 2000 ppm are dangerous even for brief exposures. Mists of HCl are considered less harmful than the anhydrous form since the droplets have no dehydrating effect.

7. See Hygienic Guide Series on "Hydrogen Chloride."

111. TOXICITY (Cont'd)

D. Ferric Chloride (Code 33500)

T.L.V. of 1.0 Mg/M^3
Action Level = 0.5 Mg/M^3

1. Description: Granular solid

2. Formula: $FeCl_3$ (Anhydrous)

3. Constants: Mol. Wt. = 166.22, Melting Pt = sublimes, solubility in H_2O = very soluble with heat rise.

4. Toxic Hazard Rating:

Acute Local: Irritant 1: Ingestion 1
Acute Systemic: U
Chronic Local: Irritant 1
Chronic Systemic: U

5. Fire Hazard: There is no fire hazard under normal conditions, but it will emit toxic fumes at high temperatures.

6. Handling: Protect the skin with approved protective clothing, avoid the breathing of $FeCl_3$ dust, wear approved respirator with adequate cartridge, and protect the eyes with approved goggles. There are no storage regulations; however, it should be stored in a dry place as heat is released upon solution in water and dry ferric chloride will not catalyze the chlorination reaction.

E. Lime (Code 38800)(Calcium Oxide)

T.L.V. = 10 Mg/M^3 Nuisance Dust

1. Description: Fine white or slightly gray powder.

2. Formula: CaO

3. Toxic Hazard Rating:

Acute Local: Irritant 3; Ingestion 1, Inhalation 3
Acute Systemic: Ingestion 2; Inhalation 3; Skin Absorption 0.
Chronic Local: Irritant 3; Inhalation 3
Chronic Systemic: Ingestion 2; Inhalation 2; Skin Absorption 0.

III. TOXICITY

E. Lime (Continued)

4. Toxicology: Has a caustic reaction and, therefore, is irritating to the skin. As a dust it can cause dermatitis and irritation of the eyes and mucous membranes. It is a general nuisance type of dust.

5. Fire Hazard: None

6. Explosion Hazard: Virtually none.

7. Handling: Dust respirator, adequate protective clothing, including rubber coated gloves, optional rubber full cover apron and full cover plastic goggles should be used when handling lime (dust). Adequate ventilation and dust removal equipment should be used in the handling area.

   Lime is added to the stills to neutralize any liberated HCl and prevent sublimation of the $FeCl_3$ catalyst. It is handled in 50# bags.

F. Nitrogen (Code 43101)

TLV = Simple asphyxiants. Oxygen content of air must be 18% or higher (equivalent to a partial pressure of 135 mm Hg.)

1. Description: Colorless gas.

2. Formula: N_2

3. Constants: Mol. Wt. 28.02; M.P. - 210°C; B.P. - 195.8°C; Density 1.2506 gr/liter at 0°C.

4. Toxicity: None. In high concentrations, it is an asphyxiant.

APPENDIX K

BACKGROUND INFORMATION

Monsanto began producing Aroclors in 1929 and has been using the same process in principle ever since. Specifications on Aroclor became more stringent with time. The General Electric Company mixed some of the different Aroclors to form products with intermediate physical properties, and named the mixtures Pyranols. Later, Aroclor was mixed with Trichlorobenzene, tri-tetrachlorobenzene, toluene, butyl acetate and cresyl diphenyl to form pyranols with special properties. As products with lower allowable free organic chlorides were required, chloride scavengers such as tin tetra-phenyl, glycidyl phenyl ether and Unox Epoxide's were added to the mix.

Pyranols at the present time, are formed by mixing Aroclor and Trichlorobenzene. Glycidyl phenyl ether and Unox Epoxide 221 are the best chloride scavengers now known and are the only chloride scavengers used.

Monsanto's Aroclors, especially the chlorinated biphenyls including types 1242 and 1254, used alone or in combination with chlorinated benzenes, are commonly used dielectric materials of the ASKAREL class.

Askarel is a generic name referring to liquid dielectrics derived from halogenated aromatic compounds possessing excellent chemical and dielectric stability and fire resistance over the temperature ranges and operating conditions of transformers and capacitors in the electrical industry. The electrical industry's use of these fluids have been in accordance with the General Electric Company's patents and developments.

Resulting from the wide use of these materials in the electrical industry, trade names have been established to identify them by different manufacturers of electrical equipment. Listed alpha-betically, the trade names include "Chloroextol," Allis Chalmers; "Diaclor," Sangamo Electric; "Dykanol," Cornell Dubilier; "Elemex," Line Materials; "Hyvol," Aerovox; "Inerteen," Westinghouse Electric; "Noflamol," Wagner Electric; and "Pyranol," General Electric Company.

The electrical and fire-resistant properties of Askarel type fluids have enabled them to capture a share of the market from the lower-cost transformer oils.

PYRANOLS AND INERTEENS

APPENDIX L

TIME CYCLE

The cost standard capacity (1973 and 1974) of Dept. 259 for Pyranol is 1.7 M pounds per month, or approximately 20 M pounds per year. The production for 1973 was about 15.0 M pounds. Aside from raw material availability, storage facilities are the limiting factor in Pyranol production. There are no finished goods storage tanks. Tank cars are loaded and drums filled directly from #2, #3, or #4 Mix Tank.

Efficient use of equipment, manpower, and laboratory analysis would indicate that large batches should always be made. The pressure of time may dictate, however, that only a small batch be made, large enough for only one specific order.

The following table shows an approximate time cycle for a 12,000 gallon batch of Inerteen 70/30, or Pyranol A13B3B-3. A batch of Inerteen 54201 CM would take less time because it does not contain trichlorobenzene.

TIME CYCLE

Step		70/30 or A13B3B-3	54201 CM
1.	Charge Aroclor and Chlorobenzene	4 hrs.	2 hrs.
2.	Blend major components	4	-
3.	Sample for control and analysis	2	-
4.	Adjust and re-analyze (if necessary)	0-6	-
5.	Charge chloride scavenger	1	1
6.	Blend total batch	3	3
7.	Sample and final analysis	10	10
8.	Earth treat and re-analysis of electrical properties (if necessary)	0-6	0-6
	TOTALS	24-36 hrs.	16-22 hrs.

From this point on, the batch cycle is dependent upon how the product is packaged. Bulk shipments can be loaded at a rate of 35-50 GPM depending on filter condition. Drums (55 gallon) can be filled at a rate of 40-44 per man per shift.

If for any reason a tank car analysis is out of specification, the product may have to be unloaded to the mix tank, reworked, analyzed, and reloaded.

PYRANOLS AND INERTEENS

APPENDIX M

QUALITY CONSIDERATIONS

Pyranols and Inerteens are functional chemicals. Pyranols and Inerteens are used mainly as transformer fluids in the electrical industry. Qualities exhibited by Pyranols and Inerteens include excellent chemical and dielectric stability and fire resistance over the temperature ranges required of transformers and capacitors.

Pyranols and Inerteens are manufactured under very carefully controlled conditions in order to meet the strict and exacting electrical requirements and properties. Good quality Aroclor is essential for producing high grade Pyranols. Any contemplated process change must be carefully evaluated before the actual change is made. Changes in product properties or off-grade products can extensively damage electrical equipment.

APPENDIX N

MISCELLANEOUS

This section contains the following data:

1. Additional raw material information
2. References
3. 1974 Pyranol Cost Standard
4. 1973 Operations Report
5. Status Report of Department 246 Safety Audit
6. 1974 Aroclor Manufacturing Improvement Plan

APPENDIX N (Cont'd)

Raw Materials

1. TCB

   TCB is received in tank car quantities from Hooker Chemical Company. The tank cars are sampled and analyzed for specific gravity and index. The other properties are determined from the suppliers Certificate of Analysis. Cars are unloaded into a storage tank. Tank trucks are used to supply TCB during times of shortage of material.

2. Aroclor 1242, 1254

   Received by pipeline from Department 246.

3. Glycidyl Phenyl Ether

   Purchased from Shell Chemical Company in 55 gallon drums, 475 lbs. each.

4. Unox Epoxide (EP-221)

   Purchased from Union Carbide in 55 gallon drums. Also known as ERL-4221.

5. Attapulgus Earth

   Purchased in 50 pound bags.

REFERENCES:

1. St. Louis Report No. 2072, Job No. 2-02-750.01 - 3428, May 4, 1958.

   Title: Final Report on Aroclor Process Studies

   Summary: Purity of raw materials, catalyst concentration, reaction temperature, and rate of chlorination were the variables studied with respect to their influences on the stability of the finished product.

2. St. Louis Report No. 2420, Job No. 2-02-750.01 - 2681, January 8, 1960.

   Title: Assistance to Sales and Development Departments on Aroclors, Biphenyl and related products.

   Summary: Studies were made to measure physical properties and other data on the Aroclor series of compounds.

3. St. Louis Report No. 2540, Job No. 171-616, December 28, 1958.

   Title: The Effect of Prolonged Heat on the Electrical Properties of Aroclors.

   Summary: Aroclors 1232, 1242, 2148 and 1254 were held at 130°C. The power factor was periodically measured.

4. E. E. Martin, Process Description for the Manufacture of Pyranols and Inerteens, W. G. Krummrich Plant, June, 1962.

5. P. G. Benignus, The Proper Handling of Aroclors and Their Mixtures in the Electrical Industry, St. Louis, Jan., 1960.

PRODUCTION COST STANDARD

PLANT W. Chic
BUS GRP: SOCIETY EMPLOYEES MFG GRP NO SY
PRODUCT CODE: 81090

Page 1 of 4
Effective 1-1-75

PRODUCT: BINDING

MO.	DAY	TH	DIV.	LOC.	DIV	LOC	C.C.T.H	PRODUCT	P.F
	4*	5	6-7	8-11	12-13	14-17	18-20	21-25	1-3
		1	03	0003	03	0003	559	21810	

CITY: 1,693,500
BLK. INV. STD.
CRS

COST UNIT: CWT

4-25

DUPL. COLS. 4-25 INTO ALL CARDS

TYP	NO	UNIT COST	EQUIPMENT USED Dept. No.	Percent
27	38-40	41-48	21810	100.00
3	030	SEE		
3	034	FOLLOWING		
3	045	DETAIL		

DUPLICATE COLS. 4-25 INTO ALL CARDS

TYPE	UNIT
27	34
4	1

BRACKET 1 INV.STD. UNIT COST

DAYS	UNIT STD
36-38	39-46
301	

BRACKET 2

DAYS	QUANITY
47-49	50-57
301	1,693,500

BRACKET 3

DAYS	QUANITY
58-60	61-68

BRACKET 4

DAYS	QUANITY
69-71	72-79
220	240,000

PRODUCT COST	EX CL	AMT	CRD	YFB	BRACKET 1 AMOUNT	CR	BRACKET 2 UNIT COST	BRACKET 2 AMOUNT	CR	BRACKET 3 UNIT COST	BRACKET 3 AMOUNT	CR	BRACKET 4 UNIT COST	BRACKET 4 AMOUNT	CR
Material Cost				V											
Steam	530			F	253		089	1515					122	1515	
Electricity	533			F	19		015	254					020	254	
Comp. Air	536														
Water-Purch.	539														
Water-Plt.	542														
Fuel-Gas	545														
Fuel-Oil	546														
DUPL. COLS. 4-25	26-28	36	37	38	48-55	CR 54		56-63	CR 62		64-71	CR 70		72-79	CR 78
Labor-Mfg.	570	2	1	F	2202		228	3834					178	2202	
Salaries	575	2	1	B	2385		141	2385					193	2385	
Payroll OH	578	2	1	F	1084		092	1566					094	1167	
Factory Supplies	590	2	1	F	100		006	100					008	100	
Packing Labor	601	2	1	F	618		065	1109					286	976	
Packing OH	603	2	1	F	55		004	75					004	55	
Factory	610	2	1	F	—		134	2079					140	1735	
Cloth & Laundry	614	2	1	F	44		003	44					003	33	
Tech. Service	621	2	1	B											
Plt. Proc. Res. & Del.	657	2	1	B											
Waste Disposal	661	3	1	—											
Tank Car Storage	687	2	1	—											
Mechanical Exp.	694	2	1	B	2765		143	2765					223	2765	
Plt. Borns & Improv	693	2	1	B	250		015	250					020	250	
Prod. Proc. Res.	651	2	1	B											
CONTAINER SHIP	613	2	1	F	—		005	80					001	57	
		2	1												
		2	1												
Total Direct Conv.					7773		1956	16086					750	13513	
Depreciation	608	2	1	B	482		053	884					041	812	
Factory Indr. Exp.	760	2	1	B	2676		158	2676					318	2426	
Total Indr. Exp.					3558		210	3558					359	3238	
Total Product Cost					13331		1160	19644					1109	17751	
Total P & B Cost					13331		1160	19644					1109	17751	
Total Variable Cost															

LABOR UTILITY SERVICE	UNIT	EXP CL	QTY	CRD	VFB	STANDARD UTL PRICE	BRACKET 1	CR 55	BRACKET 2	CR 63	BRACKET 3	CR 71	BRACKET 4	CR 79
DUPL. COLS. 4-25		26-28	36	37	38	39-47	48-55		56-63		64-71		72-79	
Labor	Hrs	576	1	1	F		301		526				301	
Laboratory	LBOT Mfg.	610	1	1	F				1749				1446	
	MBTU	530	1	1	F	2 55000	100		600				600	
Utility	CKWH	533	1	1	F	1 69200	10		150				150	
Compair	MCFT	536	1	1										
Water-Purch.	MGAL	539	1	1										
Water-Plt.	MGAL	542	1	1										
Fuel-Gas	MBTU	545	1	1										
Fuel-Oil	MBTU	546	1	1										

MONS 055803

PRODUCTION COST STANDARD

PLANT W.G.K

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MO.	DAY	TR	DIV.	LOC	DIV.	LOC	CCTR	PRODUCT
	4	5	6-7	8-11	12-13	14-17	18-20	21-25
		1	02	0003	02	0003	259	81070

PRODUCT BYRANOLS
PRODUCTION CODE 81070
BULK INV. STD. COST —

EFFECTIVE 1-1-75
CAPACITY 1693,500
COST UNIT CWT

MATERIALS: DUPLICATE COLS.-4-25 INTO ALLCARDS	EXP CL	PRODUCT	LOC	FORM PKG.	S&U	CODE	SUBSTITUTABLE MAT'L STD. YIELD %		STANDARD QTY. PER UNIT		CR	RAW MAT'L STD UNIT PRICE / HANDLING STD. UNIT PRICE		UNIT COST
4-25	26-28	29-33	34-37	38-40	44	45	46-51	52-53	54-57	58-60	60	61-64	65-69	
ATTAPULGUS EARTH	505	19400		999	0					.015			07000	.001
POROCEL	505	40289		999	0					.040			06450	.003
					0									
					0									
					0									
					0									
					0									
					0									
					0									
55 GAL DRUM	505	93320		030	0					.150		18	68780	
5 GAL CAN	505	94146		034	0				1	.683		2	35350	
					0									
					0									
					0									
CONTAINER HANDLING	527												02500	.025
H/M Whsg. & Handling	526												02000	.020
Gross Total Mat'ls.														
By-Products	523					0								
						0								
						0								
						0								
						0								
						0								
Total By-Products														
Net Total Materials														

DO NOT KEY PUNCH DATA BELOW THIS LINE

MAT'L. USAGE DATA	CODE	MATERIAL	THEO. USAGE	THEO. TO STD. ON	STD LBS	THEO LBS	% THEO/STD
	60200	TCB	SEE DETAIL SHEET				

BRACKETS	1	2	3	4	5	6	7	8	TYPE PKG.	NET LB./PKG.	Gross Lb./Pkg.	Net Lb./Pallet	Gross Lbs./Pallet
Operating Period: DAYS	30	30	-	22					93320	600	665	2400	2660
SHIFTS	3	3	-	3					93320	674	739	2696	2956
									93320	675	740	2700	2960
PRODUCTION CONTROL DATA — CLASSIFICATION	AMOUNT												
Cost/Shut Down													
Cost/Start-Up													
Cost/Changeover									94146	60	66	960	1056
Pkg. Changeover Cost									94146	55	61	880	976
Pkg. Rate Lbs./Mo.													

CONTAINERS:	USAGE/UNIT	PRICE PER CONT.	CONT. COST/UNIT	PKG UNIT STD.
93320 55 gal. DRUM	.150	18.68780	2 80317	
94146 5 gal. CAN	1.683	2.35350	3 96094	

OTHER INFORMATION

6 1:	2.2 MEN
BK 2:	3.7 "
BK 4:	2.4 "

APPROVAL	SIGNATURE	DATE
	[illegible]	[illegible]
	[illegible]	

DOWNTIME SUMMARY	DT	RL	TOTAL
Repair	1.0 %	%	1.0 %
Process	1.0		1.0
Other	—		—
Inventory	—		—
Total	2.0		2.0
On-Stream	98.0 %	%	98.0 %
On Stream Rate	2400 #/Hr.		1,693,500

MONS 055804

ODUCTION COST STANDARD | PLANT W.G. KRUMMRICH | Page 3 of 4

DIV	TR	DIV	LOC	DIV.	LOC	CCTR	PRODUCT	PRODUCT	EFFECTIVE
4	5	6-7	8-11	12-15	14-17	18-20	21-25	PRODUCTION CODE 81090	CAPACITY 1,673,500
		02	0003	02	0003	259	81090	BULK INV. STD COST SEE DETAIL	COST UNIT CWT

MATERIALS DUPLICATE COLS.-4-25 INTO ALLCARDS	EXP CL	PRODUCT	LOC	FORM PKG.	S & U	CODE	SUBSTITUTABLE MAT'L. STD. YIELD %		STANDARD QTY. PER UNIT		CR	RAW MAT'L. STD. UNIT PRICE HANDLING STD. UNIT PRICE		UNIT COST
4-25	26-28	29-33	34-37	38-40	44	45	46-51	52-53	54-57	58-60	60	61-64	65-69	
13-B-3-B-3 81093					0		THEORY		STANDARD					
TCB	505	60700		999	0		40	000	40	500			36520	14 811
ROXIDE	505	61325		999	0					150			89480	134
AROCLOR 1254	520	81103		999	0		60	000	61	100			18953	11 580
ATTAPULGUS EARTH	505	19400		999	0					015			07000	001
PORCEL	505	48289		999	0					040			06450	003
526					0								02000	020
527					0								02500	025
					0							TOTAL		26 594
					0									
					0									
					0									
					0									
					0									
THERMEEN 70130 81098					0									
GLYPHEN - ETHER	505	36100		999	0					220		2	12500	1168
TCB	505	60700		999	0		30	000	30	612			36520	11 195
AROCLOR 1254	520	81103	0003	999	0		70	000	70	707			18953	13 401
ATTAPULGUS EARTH	505	19400		999	0					015			07000	001
PORCEL	505	48289		999	0					040			06450	003
526					0								02000	020
527					0								02500	025
					0							TOTAL		38 113
					0									
					0									
					0									
					0									
					0									
5200 SOL 81110					0									
GLYPHEN - ETHER	505	36100		999	0					220		2	12500	1168
AROCLOR 1242	520	81101	0003	999	0		100	000	101	010			19497	19 695
ATTAPULGUS EARTH	505	19400		999	0					015			07000	001
PORCEL	505	48289		999	0					040			06450	003
526					0								02000	020
527					0								02500	025
					0							TOTAL		20 211
					0									
					0									
AROCLOR 1489 - 81095					0									
AROCLOR 1016	520	81104	0003	999	0		90	00	90	900			18344	16 675
MCS 1302	505	80752	0001	000	0		10	00	10	200			74740	17 622
PORCEL	505	48289		999	0					040			06450	003
526					0								02000	[illegible]
527					0								02500	[illegible]
					0							TOTAL		24 [illegible]
					0									
					0									
					0									
					0									
					0									

MONS 055805

RODUCTION COST STANDARD

PLANT W.G. Krumm Rich

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DAY	TR	DIV.	LOC	DIV.	LOC	CCTR.	PRODUCT
4	5	6-7	8-11	12-15	16-17	18-20	21-25
	1	02	0003	02	0003	257	81090

PRODUCT Pyranol

PRODUCTION CODE 81090

BULK INV. STD. COST SEE DETAIL

EFFECTIVE 1-1-75

CAPACITY 1,693,500

COST UNIT CWT

MATERIALS						SUBSTITUTABLE MAT'L.		STANDARD QTY. PER UNIT			RAW MAT'L. STD. UNIT PRICE		UNIT COST
DUPLICATE COLS. 4-25 INTO ALL CARDS	EXP CL	PRODUCT	LOC	FORM PKG.	S & U	CODE	STD. YIELD %			CR	HANDLING STD. UNIT PRICE		
4-25	26-28	29-33	34-37	38-40	44	45	46-51	52-55	54-57	58-60	60	61-64	65-69
RODUCT CODE	MAT	RIAL	+	CH	EPS	0	BULK	STD.	55900	0700		55PL	CAN
81093	26	594	1	160	0		27	734	30	537		31	694
81098	25	113	1	160	0		26	272	29	076		30	233
81095	24	346	1	160	0		25	506	28	309		29	467
81110	20	211	1	160	0		21	371	24	174		25	331

MONS 055806

DEPT. 246 - 1974 OPERATIONS REPORT

AROCLORS - 811.00, 811.04

PRODUCTION - TOTAL AROCLORS (42.18M# in 1973) (38.99M# in 1972) (43.5M# in 1971) (49.7M# in 1970)

MONTH	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
ACTUAL	3628710	3682932	3756763	2612205	3,698,998	3,041,791	3,640,444	3,817,150	2,394,731	3,699,322	3,367,415	2,832,27
SCHEDULED	3628710	3682932	3756763	2612205	3,698,998	3,041,791	3,640,444	3,817,150	2,394,731	3,699,322	3,367,415	2,832,27
ACTUAL YTD	3628710	7311642	11068405	13680610	17,379,608	28,421,399	24,061,843	27,878,993	30,273,724	33,973,046	37,340,461	40,172,7

PRODUCTION - AROCLORS BY KIND

1016	2421337	2397283	2761015	1787832	2,438,164	2,092,247	2,266,013	2446062	1,303,777	2,299,688	1,845,930	1,025,77
1242	600417	528325	304722	324730	681,044	442,404	670,333	648,125	235,676	790,619	728,519	969,80
1254	606956	757324	691026	499643	579,079	507,140	624,538	722,953	802,282	609,015	792,966	835,22
Mono									52,996			1,474

PER CENT YIELD ON BIPHENYL Std. 98.0% (1973 98.98%) (1972 99.96%) (1971 100.75%) (1970 100.41%)

MONTH	97.99	101.55	99.51	97.23	96.79	97.42	98.19	99.25	92.88	101.96	100.84	97.29
YTD	97.99	99.74	99.66	99.19	98.67	98.37	98.43	98.55	98.08	98.48	98.69	98.59

AVERAGE QUALITY OF 1242 EG LOTS (1973 Avg. on 18 Lots: 0.18 ppm; 166,989 x 10^9; 0.209%)

ACC	0.20	-	0.38	0.33	0.27	0.33	0.40	0.32	0.26	0.21	0.22	0.13
RESISTIVITY	136460	-	123400	130540	101,693	122,335	32,705	49,825	188,550	113,350	114,250	184,275
POWER FACTOR	0.27	-	0.26	0.13	0.309	0.489	0.474	0.500	0.276	0.186	0.22	0.237
NO. OF LOTS	2	0	2	2	2	2	1	2	1	1	2	2

MONS 055807

VERAGE QUA TY OF MCS - 1016 LOTS (1973 Aves. on 123 Lots: 0.14 ppm: 187.027 x 10^9;0.22%; 0.27

ONTH	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
CC	0.12	0.136	0.152	0.17	0.15	0.176	0.16	0.186	0.13	0.12	0.12	0.11
ESISTIVITY	117507	242222	210223	110587	170,742	150,015	224,067	223,842	141,500	176,810	214,970	233,670
OWER FACTOR	0.29	0.20	0.21	0.25	0.19	0.22	0.24	0.217	0.19	0.21	0.18	0.22
ENT/HEXA	0.189	0.170	0.128	0.196	0.26	0.206	0.25	0.256	0.28	0.34	0.20	0.12
O. OF LOTS	11	12	13	8	12	8	11	10	8	12	12	6

(13 Minor injuries and 0 serious injuries in 1971)
(5 minor injuries and 1 serious injury in 1972)
(1 minor injury and 1 serious injury in 1973)

AFETY												
INOR	0	0	1	1	0	0	0	1	1	1	1	0
ERIOUS	0	0	0	0	0	0	0	0	0	0	0	0

UALITY COMPLAINTS (Formal and Informal) (4 in 1973) (16 in 1972)

UMBER	0	0	0	0	0	2	0	0	0	0	1	0

ERSONNEL (1973: O.T. 11.1%; E.H. 4.0%; ABS. 5.6%) (1972: O.T. 8.2%, E.H. 2.4%; ABS 6.3%)

VERTIME	14.2	14.0	5.9	5.2	8.0	6.4	14.2	18.9	13.1	13.2	11.9	14.5
.T. YTD	14.2	14.1	11.1	9.7	9.4	8.9	9.7	10.8	11.0	11.2	11.3	11.5
XTRA HRS.	2.2	6.2	12.4	3.8	0.0	0.0	0.0	6.1	0.0	10.2	5.3	1.5
.H. YTD	2.2	4.2	7.1	6.3	5.1	4.4	3.7	4.0	3.6	4.3	4.4	4.2
BS. HRS.	7.5	3.4	0.4	3.8	5.9	1.9	5.1	8.3	6.1	8.1	7.4	9.1
BS.HRS.YTD	7.5	5.5	3.7	3.7	4.1	3.8	4.0	4.5	4.7	5.0	5.2	5.5

AROCLOR
NVENTORY(1973 Average: Whse. 589M#, Dept. 1,195M#)(1972 Average: Whse. 701M#, Dept. 1358M#)

HSE.	382885	525280	534080	411080	567,600	418.800	631,040	698,670	989,040	789,240	594,480	1,384,382
EPT.	719262	1012290	1292333	794658	912,490	669,088	1,146,274	970,444	376,272	1,294,122	1,661,942	536,480
OTAL	1102147	1537570	1826413	1205738	1,480,090	1,087,888	1,777,314	1,669,114	1,365,312	2,083,362	2,256,422	1,920,862

MONS 055808

DEPT. 1674 OPERATIONS REPORT

PYRANOLS (810.90)

PRODUCTION - TOTAL PYRANOLS (13.37M# in 1973) (14.9M# in 1972) (19.0M# in 1971) (15.2M # in 1970)

MONTH	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
ACTUAL	2301823	1318913	1042667	739973	1,224,338	971,580	844,146	1,850,264	942,432	1,265,914	1,124,700	2,071,15
SCHEDULED	2301823	1318913	1042667	739973	1,224,338	971,580	844,146	1,850,264	942,432	1,265,914	1,124,700	2,071,15
ACTUAL YTD	2301823	3620736	4663403	5403376	6,627,714	7,599,294	8,443,440	10,293,704	11236,136	12,502,050	13,626,750	15,697,9

PRODUCTION - PYRANOLS BY KIND

242 PPO	686760	466140	381320	292040	657,340	314,900	540,660	884,980	376,890	648,180	579,540	940,320
30-30	1087786	726026	419708	448172	568,212	492,288	270,550	800,464	332,746	542,420	306,354	781,664
13-B-3B-3	527277	126747	241639	(1139)	(1,214)	150,963	32,936	164,820	232,796	75,314	238,806	348,972
1489						13,429						

YIELDS (TCB Std. 98.0% (1973 Actual 96.58%)

TCB MO.	97.88	102.37	97.10	98.08	98.68	96.00	100.43	96.36	97.32	100.93	97.40	98.32
TCB YTD	97.88	99.33	98.84	98.75	98.75	98.37	98.48	98.14	98.07	98.29	98.23	98.24

PYRANOL INVENTORY (1974 Average: Whse. 325M#, Dept. 217M#)

WHSE.	292575	311746	787981	503136	443,991	235,709	52,388	265,471	283,470	127,451	96,698	494,644
DEPT.	438686	486729	432568	424524	238,860	293,360	117,308	454,848	198,890	369,914	123,060	225,720
TOTAL	731261	798475	1220549	927660	682,851	529,069	169,696	720,319	482,360	497,365	219,758	720,364

MONS 055809

DEPARTMENT 246/259 1974 OPERATIONS REPORT

JANUARY

Department 246 suffered nearly 20% downtime in January due to poor quality chlorine. This resulted in some minor shipping delays and necessitated delaying the Aroclor scrubber installation until the week of February 18. At month's end, chlorine quality had returned to near normal.

The chlorinators were down 30 hours 1/17 - 1/18 to clean a portion of the HCl off-gas transfer line. A slight improvement was noted in the chlorinator HCl back pressure afterwards.

Department 259 set an all time monthly Pyranol production record. The January production was 10.6% greater than the previous high of October 1970.

Problems at the repair track necessitated draining and cleaning two 1242 PPO tank cars in the department for 1016 service. All properties were within specification on these cars.

Overtime ran higher during the month to keep pace with the increased product demand. Total Aroclor/Pyranol inventory at month's end is at a four-year low.

FEBRUARY

The HCl scrubber column(project 8020) installation was completed this month and started-up with only minor problems. The installation and start-up accounted for approximately 5 days of chlorinator downtime. The scrubber's efficiency will be determined next month.

Biphenyl availability was tight in February and expected to worsen in March, possibly resulting in Aroclor allocation. Minor shipping delays were suffered in February due to tank car inavailabilities.

At month's end, instrument problems associated with the Densitrol were resulting in some chlorinator downtime.

MARCH

Biphenyl was again short in March. The department operated at reduced rates throughout the month, but did not suffer any production outages as a result. Aroclor sales are on allocation and some tank car shipments are being short loaded.

MARCH

Aroclor 1254 quality problems(thermal chemical chlorides and Monsanto stability)developed mid-month. The condition still exists, to a lesser extent, at month's end. A program was developed with plant AR&D to attempt to locate the source of the instability problem.

Densitrol instrument troubles cleared up the first week in March when the temperature compensater was "fine-tuned". The department was down 24 hrs. 3/20 while the HCl line between Dept. 236 and Dept. 217 was Dowell cleaned. #8 chlorinator air exchanger was changed out 3/18 with a slight improvement noted in temperature control.

Tests were made throughout March to demonstrate the HCl off-gas scrubber(project 8020). The scrubber is performing as designed, however, this still does not permit Dept. 246 to operate when Dept. 217 is off-line. Project 4438 to eliminate air blowing of crude Aroclor and reduce the water flow to the sewer will be installed and started-up the first week in April.

The first tank trailer shipment of Pyranol 70/30 was made to Heavy Duty on 3/20. Modifications for their trailer are necessary before another shipment is made. The new Montar trailer was put into service 3/20.

APRIL

The Aroclor 1254 stability problems cleared up by April's end. The program to locate a cause eliminated many potential sources, but failed to define a specific cause.

Project 4438 to eliminate air blowing and reduce sewer flows was started-up early April. Thus far the project is a success, although the total scoped water reduction was not realized. Corrosion to the intermediate storage tanks is being closely monitored.

The Acid Division turnaround 4/13-4/24 resulted in over 20% downtime for the month. Biphenyl continued in short supply, however the situation is expected to ease somewhat in May.