

RADIAN CORPORATION

Radian Contract No. 200-045-51

VOLUME II
FINAL REPORT FOR
CONTRACT NO. 68-02-1319
TASK NUMBER 51

ORGANIC CHEMICAL PRODUCERS'
DATA BASE PROGRAM

Submitted to:
ENVIRONMENTAL PROTECTION AGENCY
5555 Ridge Ave.
Cincinnati, Ohio 45268
Attention: Mr. David Becker

5 August 1976

Prepared by:

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CONTENTS
VOLUME II

Volume II presents the actual data contained in the Organic Chemical Producers' Data Base developed by Radian Corporation under the sponsorship of the Environmental Protection Agency, Contract Number 68-02-1319, Task 51.

The data presentation is accomplished in two parts. The information with respect to each chemical is listed first, alphabetically by chemical, and is approximately the first two-thirds of Volume II. Chemical information includes all production/capacity information, costs, Wiswesser Line Notation, Process Numbers from the Environmental Catalog of Industrial Processes toxicity and production sites. The final one-third of Volume II is a rearrangement of the production site information such that the product slate for each production site is given, and the production sites are listed alphabetically. These two listings are commands 5006 and 0005 as seen in Appendix I of Volume I.

One chemical can be produced by two or more process routes at a single site. An asterisk is given after the chemical process route number to identify each process route that is one of several used at a single site.

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ABSTRACT

This report describes the Organic Chemical Producers' Data Base (OCPDB) Program developed by Radian Corporation under the sponsorship of the Environmental Protection Agency, Contract Number 68-02-1319, Task 51.

The purpose of the OCPDB Program is to provide a method by which data on organic chemicals may be readily accessed and by which analyses and assessments of the organic chemical industry may be facilitated. The basic data matrix consists of approximately 400 organic chemicals and their production sites. Specific information on the chemicals and their production sites are available along with several searching/sorting routines.

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1.0

INTRODUCTION

The organic chemical industry is a complex, interdependent network that consists of many different products, processes, and producers. As a result, projects dealing with organic chemicals are complicated by the many possible variations that occur in the industry. To create an aid for analyzing this segment of the chemical industry the Environmental Protection Agency retained Radian Corporation to develop a computer data base specifically for organic chemicals and their production sites.

The purpose of this project was, therefore, to establish a computer program that would provide easy access to data on organic chemicals with a format that would facilitate comparisons of various aspects of the industry. The product of this effort is the Organic Chemical Producers' Data Base (OCPDB) Program. This data base program consists of a data matrix of organic chemicals and their production sites, specific information on chemicals and sites, and several searching/sorting routines. Due to the project scope of work Radian did not attempt to develop new information but rather incorporated existing data sources into the program data matrix.

This report describes the OCPDB Program, which is summarized in Section 2.0. Section 3.0 describes the basic data matrix while the various information categories for chemicals and production sites are discussed in Section 4.0. The searches possible with the OCPDB Program are described in Section 5.0 and detailed in Appendix I.

2.0

SUMMARY

The objective of this project was to develop a data base program to serve as an information retrieval system for study of the environmental impacts of the organic chemical industry and to provide a mechanism by which various searches and comparisons of this industry might be conducted. This study was therefore directed toward establishing a vehicle for accessing and analyzing existing and/or future information, not on developing new data. Information for the program was gathered from existing sources, and then assembled in a program format conducive to data retrieval and comparison.

The result of this contract is the Organic Chemical Producers' Data Base Program. The data base itself contains fundamental information necessary for a study of the U.S. chemical industry. The information categories are:

- A matrix of approximately 400 industrial organic chemicals and their 610 production sites.
- Information, when available, about each chemical, i.e.
 - Toxicity
 - Production Volumes
 - Costs
 - Emission Factors
 - Cross-indexed Chemical Tree
 - Wiswesser Line Notation
- Information about each site - a classification based on three factors

- Original feedstock source (coal, wood, or petroleum)
- Refinery Association
- Product Slate
- Information about chemicals at a specific site
 - Site-specific production capacities
 - Site-specific production routes

Toxicity, production volumes, costs and emissions factors are all obviously important in analyzing the environmental effects of chemical production. The cross-index to a chemical tree shows the user the primary chemical feedstocks necessary for chemical production and also the products that are made from each chemical. The Wiswesser Line Notation (WLN) is utilized to access and/or list chemicals with specific functional groups or structures. The Organic Chemical Producers' Data Base Program can print out all or parts of these information categories.

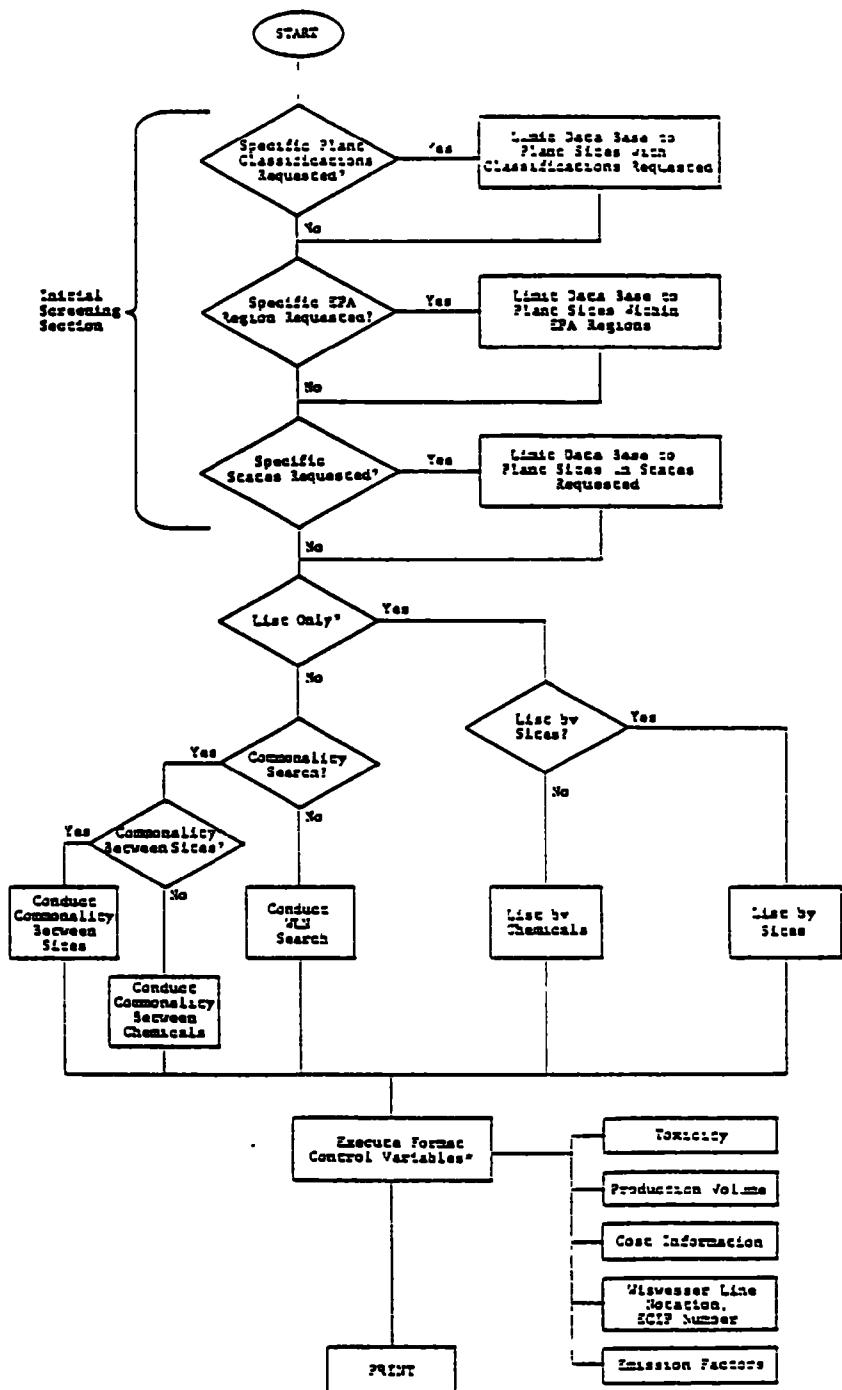
A valuable feature of the program is the ability to conduct searches within the stored data. Possible searches include identifying all the chemicals with a certain desired chemical structure, identifying all the sites that produce a specified product slate, or conducting any of the possible commands or searches within only selected combinations of states or EPA regions.

Possible program outputs are as follows:

Lists of chemicals with their production sites, or production sites with their product slates.

- Plant sites and their product slates may be limited for any execution by plant categorization or by geographic location - state or EPA region - if desired.
- Chemicals may be designated arbitrarily, or by using the Wiswesser Line Notation searches for any specific functional or structural group may be accomplished.
- Lists providing any or all of the information categories for designated chemicals.
- Identification of common production sites for any specific group of chemicals.

The basic program commands may be cascaded to give a variety of outputs and search possibilities. An example request could be to search all the non-refinery associated plant sites in EPA regions IV and V for the plant sites that produce acetone, phenol and cumene, and then group the identified sites by state and EPA region in the print out. Figure 2-1 is a simplified flow sheet showing how the OCPDB Program functions.



*Chemical information listed is available to be printed with chemical name. All combinations of one of these data may be obtained according to the format control designated.

FIGURE 2-1
FLOW SHEET FOR OCPDB PROGRAM

3.0 DATA BASE MATRIX

The foundation of the Organic Chemical Producers' Data Base is a matrix consisting of approximately 400 industrial organic chemicals and their 610 production sites. The matrix storage format is suited for printouts which either 1) list the chemicals in order and for each chemical give its production sites, or 2) list the organic chemical product slate for each production site. Examples of these basic listings are illustrated in Tables 3-1 and 3-2. The Organic Chemical Producers' Data Base does not contain the complete product slate for every plant; only those chemicals included in the data base matrix are available for listing. The purpose of this project was to establish a convenient information base specifically for analyses of the organic chemical industry. Inorganic chemicals, end-use chemicals and very small volume or specialty chemicals were not addressed in this study.

Chemicals

The chemical list compiled for the Organic Chemical Producers' Data Base Program started with the list generated by Monsanto Research Corporation under the EPA Contract No. 68-02-1320, Task 17. New chemical entries had only to meet the criteria of being an industrial organic chemical and not an end product, or a chemical that does not undergo further transformation before use. First the basic petrochemical feedstocks were added (benzene, toluene, xylene, ethylene, propylene, C₂ - C₄ hydrocarbons), followed by chemicals that have production volumes equal to or greater than the chemicals already included in the data base. This was approximately ten million pounds of production per year. The U. S. International Trade Commission reports on Synthetic Organic Chemicals were used to compare production volumes. Next, prioritized lists of toxic chemicals supplied by EPA were examined

TABLE 3-1
CHEMICALS AND THEIR PRODUCTION SITES

300 ANILINE					
300 AMERICAN CYANAMID CO.	4	BOUNDBROOK		NJ	
340 AMERICAN CYANAMID CO.	5	WILLOW ISLAND		WV	
1730 EI DU PONT DE NEMOURS & CO	5	BEAUMONT		TX	
1780 EI DU PONT DE NEMOJRS & CO	5	GIBBSTOWN		NJ	
2150 FIRST MISSISSIPPI CORP.	5	PASCAGOULA		MS	
3220 MOBAY CHEMICAL CO.	5	NEW MARTINSVILLE		WV	
4511 RUBICON CHEMICALS INC.	5	GEISMAR		LA	
310 ANILINE HYDROCHLORIDE					
300 AMERICAN CYANAMID CO.	4	BOUNDBRUNK		NJ	
320 ANISIDINE					
130 ALDRICH CHEMICAL CO.	5	MILWAUKEE		WI	
290 AMERICAN COLOR AND CHEMICAL CORP.	6	LOCK HAVEN		PA	
1760 EI DU PONT DE NEMOURS & CO	5	DEEPWATER POINT		NJ	
1990 EASTMAN KODAK CO.	5	ROCHESTER		NY	
3380 MONSANTO CO.	5	ST. LOUIS		MO	
4540 SALISBURY LABS	5	WILMINGTON		NC	
330 ANISOLE					
1110 CHEMICAL FORMULATORS INC.	6	NITRO		WV	
1370 CONTINENTAL OIL COMPANY	1	NEWARK		NJ	
2410 GIVAUDAN CORP.	6	CLIFTON		NJ	
3000 ELI LILLY AND CO.	6	LAFAYETTE		IN	
3750 ORBIS PRODUCTS CORP.	6	NEWARK		NJ	

TABLE 3-2
PRODUCTION SITES AND THEIR PRODUCT SLATES

1600 DIXIE CHEMICAL CO 90 ACETONE 1300 DIETHYLENE GLYCOL 1830 ETHYLENE GLYCOL 2640 METHYL ETHYL KETONE 3460 TRIETHYLENE GLYCOL	5	BAYPORT	TX
1605 DOW CHEMICAL CO, 2090 GLYCEROL (NATURAL & SYNTHETIC)	6	ANCHORAGE	AK
1610 DOW BADISCHE CO, 160 ACRYLIC ACID 630 N-BUTYLACRYLATE 640 N-BUTYL ALCOHOL 750 N-BUTYRALDEHYDE 785 CAPROLACTAM 1130 CYCLOHEXANOL 1140 CYCLOHEXANONE 1690 ETHYL ACRYLATE 2000 2-ETHYL HEXANOL 2250 ISOBUTANOL	5	FREEPORT	TX
1630 DOW CHEMICAL CO, 380 BENZENE 550 BIPHENYL 590 BUTADIENE 592 1-BUTENE 720 BUTYLENES 1770 ETHYLENE 3090 PROPYLENE	4	BAY CITY	MI

and chemicals not in the data base were added. Lastly, the organic chemicals in the Source Assessment study compiled by Monsanto Research Corporation (EPA Contract No. 68-02-1874) were checked against the OCPDB to see if any chemicals meeting the specified criteria were omitted. At this time approximately 400 organic chemicals are included in the data matrix. The chemicals currently in the data base are listed in Appendix II.

Production Sites

Production sites for all chemicals in the program were obtained from the 1976 Directory of Chemical Producers (ST-203). Approximately 610 different production sites are entered in the computer data base.

4.0

COMPLEMENTARY ENTRIES

Another dimension to the OCPDB is provided by the inclusion of information specific to each chemical and each production site. Toxicity, production volumes, costs, emission factors and a cross index to a chemical tree showing feedstocks and products are included for the chemical entries. The Wiswesser Line Notation, a method for depicting the molecular structure of a chemical compound, is also included for the chemicals in the data base.

Data base production sites are categorized to aid in output analysis and provide a method for limiting the data base for searches. Plant sites are classified with respect to feedstock source, products and refinery association. Chemical production capacities at specific production sites are included when available. Site specific production routes are identified for chemicals that have more than one commercially used processing route.

It should be noted that each complementary entry is not available for every chemical. The present percentage completion depended on the amount of information contained in published literature, and varies from 99% of all chemicals for the Wiswesser Line Notation to 10% for site specific process routes. Brief discussions are presented here describing the categories of information included and their sources.

4.1

Chemical Specific Entries

4.1.1

Toxicity

Toxicity is an area where a great deal of effort is presently being directed by both governmental agencies and industry.

Readily available toxicity data was compiled and put into the program, and the capability exists of including much more new information when available. Toxicity data categories that are currently in the program are as follows:

- Threshold Limit Values obtained from the Federal Register.
- Toxicity Hazard Rating as given in Sax (SA-175).
- The LD₅₀'s for chemicals administered orally to rats.
- If no other information was available, a classification of low, medium or high toxicity as reported in the Condensed Chemical Dictionary (HA-264) or Sax (SA-175).
- Suspected Carcinogens as published by NIOSH (CH-262).

The Threshold Limit Values (TLV's) are reported for each chemical where they are available in units of both parts per million and milligrams per cubic meter. The list was published first in the Federal Register (Vol. 36, No. 105, May 29, 1971) and has been reprinted in many reports, including Sax (SA-175). TLV's are a useful form of toxicity data obtained from both experiments and experience.

The bulk of the toxicity information contained in the Chemical Producers' Data Base Program consists of the Toxicity Hazard Ratings obtained from Sax (SA-175) and is presented in a concise manner for use by an informed layman.

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The categories used for the toxicity hazard rating are: 1) Acute local, 2) Acute systemic, 3) Chronic local, and 4) Chronic systemic. These categories have sufficient breadth so as to include all types of exposure and effects. Acute and chronic describe the relative exposure pattern but the absolute duration of exposure cannot be inferred. Acute means a single exposure which could occur for seconds or hours, while chronic exposure can be continuous or repetitive but lasts for several days or longer. Local effects concern only the skin or mucous membranes where contact occurs, with systemic effects being more generalized as to the entire body.

Under each of these categories several entries exist which contain the specific information. These entries describe the route of absorption a chemical would follow (i.e., ingestion, inhalation and skin absorption), or if the chemical is an irritant or allergen. For each entry where information is available a number, zero to three, is assigned to describe the severity of the effect. Zero means the chemical has been found non-toxic with that specific type exposure, and a one means the effects are slight and will disappear after exposure ends. Two is a broad class where the effects are "moderate" but not enough "to cause death or permanent injury." When death or permanent injury can occur with a small exposure, the number three is given. Where no entry is given the effects are unknown or are of questionable validity.

LD₅₀'s (the lethal dose to kill 50% of a test population) are a measure of toxicity that takes knowledge and experience to accurately interpret. The numbers could be valuable, though, as a relative indication of toxicity when compared with an LD₅₀ of a chemical with known toxicity that was obtained from the type of same animal by the same method. The LD₅₀ administered orally to rats has been included with the toxicity data in the OCPDB. All the values included were obtained from Sax (SA-175)

If no other information were available, the description of low, medium or high toxicity is reported as obtained from Sax (SA-175) or Hawley (HA-264).

The final entry for toxicity information in the Chemical Producers' Data Base Program is noting which chemicals are suspected carcinogens. This was obtained from the list published by NIOSH (CH-262) which does not distinguish between proven and suspected carcinogens.

An example of the toxicity information output is shown for ethyl acetate in Table 4-1. A visual inspection of the toxicity data as illustrated in this table may therefore provide information about relative toxicity or a general indication of toxicity in the following manner:

- A TLV provides allowable air concentration limits.
- The more entries of higher numbers given in the Toxicity Hazard Rating, the more toxic the chemical. Each three entry represents the possibility of death or permanent injury upon exposure, while the number of three's is the number of routes from which exposure could be fatal.
- Suspected carcinogens are noted for special attention.

An examination of Table 4-1 reveals that ethyl acetate is not on the NIOSH list of carcinogens, or else "carcinogen" would appear next to the toxicity title. The toxicity hazard rating does not appear severe. Acute local irritant 1 means on a single exposure to ethyl acetate the exposed area will suffer

TABLE 4-1
TOXICITY INFORMATION

1670 ETHYL ACETATE

TOXICITY

ACUTE LOCAL .

IRRITANT 1

ACUTE SYSTEMIC

INGESTION 2 INHALATION 2 SKIN ABSORPTION 2

CHRONIC LOCAL

IRRITANT 1

CHRONIC SYSTEMIC

INGESTION 1 INHALATION 1 SKIN ABSORPTION 1

TLV = 400.00 PPM 1400.00 MG/M³

LD50 = 5640 MG/KG

mild irritation which should disappear after exposure is stopped. A single exposure through ingestion, inhalation or skin absorption (all 2's) would have a more pronounced effect on a person's bodily functions and could cause discomfort but not death. It should be noted that dose size has not been considered, but would of course be important. The remaining numbers show smaller exposure over longer periods of time would have a mild irritant effect, as well as a mild effect on the body overall. The TLV is given in both vapor concentration and particulate levels as 400ppm and 1400 mg/m³, respectively. The oral rat LD₅₀ is 5600 mg/kg, a relatively large dosage.

4.1.2 Production Volumes and Chemical Prices

Overall industry chemical production volumes are given along with the chemical prices. Economic analyses should not be undertaken with this information, but the relative magnitude of each section of the chemical processing industry and its dollar value can be seen. Chemical prices generally range from five cents to two dollars per pound.

An illustration of a production volume and chemical price printout is shown for ethyl acetate in Table 4-2. Ethyl acetate had a production volume of 196.5 million pounds in the year 1974. This was the most recent year for which production information was available for this chemical. The sales price for ethyl acetate in 1976 was \$0.22 per pound. Multiplying these two numbers together gives an approximate dollar value for ethyl acetate production of \$43 million.

TABLE 4-2
PRODUCTION VOLUME AND COST INFORMATION

- 1670 ETHYL ACETATE
 - PROD. VOL.: 196,510 MYLBS (1974)
 - UNIT COST: \$ 0.222 PER LB
 - SALES: 43,232 MYS/YR

- ALL ENTRIES HAVE PRODUCTION RATES
 > 1,000,000 LBS/YR

4.1.3 Specific Chemical Relation to Chemical Tree

The chemicals in the OCPDB are cross-indexed to the chemical tree process numbers developed by Monsanto Research Corporation for Chapter Six of the Environmental Catalog of Industrial Processes (ECIP) under EPA Contract No. 68-02-1320, Task 17. This chemical tree was used as the initial list of organic chemicals in the OCPDB, so all the chemicals added later do not have ECIP process numbers. For the great majority of chemicals, though, the chemical tree helps to visualize the complexity of the organic chemical industry. Using the chemical tree to determine the feedstocks required for and products made from a chemical, and using the OCPDB to show production sites, the interdependency of the chemical industry is delineated clearly. This chemical tree is shown in Appendix IV.

4.1.4 Emission Factors

Emission factors are taken directly from the Source Assessment Program compiled by Monsanto Research Corporation (DE-203). These factors are readily retrievable in conjunction with the other chemical-specific information contained in the OCPDB (see Appendix I).

An example of emission factor output is shown in Table 4-3 for ethyl acetate and acrylonitrile. Ethyl acetate production from acetic acid and ethanol (ECIP process 92, see chemical tree in Appendix IV) has measured emissions of both ethyl acetate and ethanol. A more complete characterization of emissions is presented for the production and subsequent purification of acrylonitrile by the ammoxidation of propylene route. This process is number 258 on the ECIP chemical tree.

TABLE 4-3
EMISSION FACTORS

1670 ETHYL ACETATE

EMISSION FACTORS

ETHANOL	5.00	LB/TON
ETHYL ACETATE	5.00	LB/TON

170 ACRYLONITRILE

EMISSION FACTORS

SULFUR DIOXIDE	0.03	LB/TON
NITROGEN DIOXIDE	1.10	LB/TON
CARBON MONOXIDE	158.60	LB/TON
METHANE	1.34	LB/TON
ETHANE	3.86	LB/TON
ETHYLENE	5.14	LB/TON
PROPANE & PROPYLENE	110.00	LB/TON
BUTENE	0.80	LB/TON
BUTANES	0.06	LB/TON
METHANOL	0.17	LB/TON
PENTANES	0.04	LB/TON
ACETALDEHYDE	0.06	LB/TON
HEXANES	0.04	LB/TON
ETHANOL	0.10	LB/TON
BENZENE	0.60	LB/TON
TOLUENE	0.15	LB/TON
ACRYLONITRILE	1.77	LB/TON
ACETONITRILE	1.37	LB/TON
HYDROGEN CYANIDE	1.32	LB/TON
FUMARONITRILE	0.04	LB/TON
PYRIDINE	5.16	LB/TON
PROPIONALDEHYDE	0.01	LB/TON
FURAN	0.93	LB/TON
AMMONIA	2.00	LB/TON
ALLYL CHLORIDE	0.05	LB/TON

4.1.5 Wiswesser Line Notation

The Wiswesser Line Notation (WLN) is a line formula chemical notation which describes the structural formula of a chemical compound. The primary purpose of including the WLN in this program is to allow machine retrieval of chemicals by structure and to provide functional group search capabilities. This search capability is discussed and an example given in Section 5.1.

4.2 Site Specific Data

The specific information about plant sites was condensed into one number per site, the plant site classification, and is given each time the plant name is listed. The classification was included to aid in an understanding of the organic chemical industry and the types of production sites.

The basic factors taken into account for the categorization of chemical production sites were:

- Original Feedstock Source (coal, wood, or petroleum)
- Refinery Association, and
- Product Slate

Considering these factors, the specific company-sites were segregated into the following classifications:

Class One represents company-sites utilizing coal, coal tars or wood as a feedstock.

Class Two represents refinery associated company-sites producing basic petrochemical feedstocks only.

Class Three represents refinery associated company-sites which produce both basic petrochemical feedstocks and industrial organic chemicals.

Class Four represents nonrefinery associated chemical production sites which produce both basic petrochemical feedstocks and industrial organic chemicals.

Class Five represents nonrefinery associated company-sites producing industrial organic chemicals only. No basic petrochemical feedstocks are produced at these sites.

Class Six represents nonrefinery associated company-sites that either produce chemicals as an aside to a major area of interest in finished products (dyes, soaps, fertilizers, etc.) or produce speciality chemicals for laboratory or analytical work.

Class One company-sites were determined from feedstock information contained in the 1975 and 1976 Directory of Chemical Producers (ST-351) (ST-285). Site specific feedstock information on chemicals known to be produced from coal and coal tar were compiled to obtain the listings of Class One. This category primarily consists of chemical production sites operated in conjunction with steel manufacturing facilities.

A chemical production facility is considered to be refinery associated only if the refinery operating company or company division produces the chemicals. If a chemical production division of a major company is situated next to a refinery

owned by the same parent company, the chemical site is considered nonrefinery associated. The locations of the chemical companies were obtained from the 1975 and 1976 Directory of Chemical Producers, and the various refinery sites from "The Oil and Gas Journal", April 7, 1975. Natural gas liquid production plants were considered equivalent to refineries.

A rather arbitrary division of petrochemicals was defined to make a distinction between basic petrochemical feedstocks and industrial organic chemicals. The basis petrochemical feedstocks, as listed in the task description, are:

benzene
butylenes
cresols and cresylic acid
ethylene
naphthalene
propylene
toluene
xylene

All other organic chemicals are considered industrial organic or end-use chemicals.

4.3 Chemical and Site Related Entries

When the separate entries of site and chemical are brought together, certain "site-specific" information is also given in the OCPDB. Specific chemical production routes and plant capacities then have more meaning. Many chemicals are produced by more than one route, and these are defined where the information is available. Each specific route is designated by a process number. The key that details the process routes for each chemical is presented in Appendix II. The great bulk of

this information was obtained from the Directory of Chemical Producers and the Chemical Economics Handbook, both published by the Stanford Research Institute. Site specific process information on a few selected chemicals was obtained from the Monsanto Source Assessment Program and by the contacting of individual plants by Radian personnel.

An example printout of processing route information is shown in Table 4-4. Using Appendix II and Table 4-4, the process routes used for the production of n-butanol are delineated. Celanese at Bishop, Texas reacts crotonaldehyde to form n-butanol while Dow Badische at Freeport, Texas, Eastman Kodak at Longview, Texas, Oxochem at Penuelas, Puerto Rico, Shell at Deer Park, Texas, Union Carbide at Penuelas, Puerto Rico, and Union Carbide at Seadrift, Texas, all use the Oxo process involving hydrogenation of butyraldehyde. Continental Oil at Westlake, Louisiana uses a Zeigler catalyst process and Publicker Industries at Philadelphia, Pennsylvania uses a fermentation process to produce n-butanol. Celanese at Bay City, Texas, Ethyl at Pasadena, Texas, and W. R. Grace at Fords, New Jersey, all produce n-butanol, but the exact process route is not known.

It is important to know site-specific chemical production capacity along with the site-specific processing routes. Actual production volumes of a chemical at any production site is almost always proprietary information, but nameplate capacities are more readily available and are contained in the program where possible. An economic analysis is often important when process modifications are being considered, and with the site production capacity known a gross economic factor can be given. This factor should be an indication of the economic importance of a particular process to a plant, which would be a consideration in an industries' assessment of process additions or modifications. The approximate

TABLE 4-4
SITE-SPECIFIC PROCESS ROUTE INFORMATION

640 V-BUTYL ALCOHOL

PROCESS 1	ECIP NUMBER: [086]				
920 CELANESE CHEMICAL CO.		5	BISHOP		TX
PROCESS 2	ECIP NUMBER: [264]				
1610 DOW BADISCHE CO.		5	FREEPORT		TX
1970 EASTMAN KODAK CO.		4	LONGVIEW		TX
3770 UXOCHEM ENTERPRISE		4	PENUELAS		PR
4580 SHELL OIL CO.		4	DEER PARK		TX
5320 UNION CARBIDE CORP.		4	PENUELAS		PR
5330 UNION CARBIDE CORP.		4	SEADRIFT		TX
PROCESS 3	ECIP NUMBER: [000]				
1380 CONTINENTAL OIL COMPANY		4	WESTLAKE		LA
PROCESS 4	ECIP NUMBER: [000]				
4232 PUBLICKER INDUSTRIES INC.		5	PHILADELPHIA		PA
OTHER					
910 CELANESE CHEMICAL CO.		5	BAY CITY		TX
2070 ETHYL CORP.		5	PASADENA		TX
2470 W. R. GRACE AND CO.		6	FORDS		N.J.

1976 prices for the chemicals were obtained from the Chemical Marketing Reporter and assuming production equal to 90% of capacity a rough dollar sales figure was calculated and is available through the Organic Chemical Producers' Data Program (see Appendix I) as shown in Tables 4-5 and 4-6.

4.4 Combined Data Output

Although program commands allow a wide variety of data outputs, all data entries may be obtained on a single printout. An example of the total data base output is shown in Table 4-7.

TABLE 4-5
COST INFORMATION BY CHEMICAL

		PROD VOL MMIHS	COST \$/LB	SALES MM\$/YR	PLANT CAP MMLBS	SALES MM\$/YR
1670 ETHYL ACETATE		100,510	0.22	43,232		
625 RECKMAN INSTRUMENTS, INC.	6	PAID ALTO			CA	N/A
920 CELANESE CHEMICAL CO.	5	BISHOP			TX	50,000
970 CELANESE CHEMICAL CO.	5	PAMPA			TX	31,000
1950 EASTMAN KODAK CO.	5	KINGSPORT			TN	20,000
1970 EASTMAN KODAK CO.	4	LONGVIEW			TX	21,000
3410 MONSANTO CO.	6	SPRINGFIELD			MA	21,000
3420 MONSANTO CO.	6	TRENTON			MI	15,000
4232 PUBLICER INDUSTRIES INC.	5	PHILADELPHIA			PA	20,000
5280 UNION CARBIDE CORP.	5	BROWNSVILLE			TX	34,000
5290 UNION CARBIDE CORP.	5	INSTITUTE AND SOUTH CHARLESTON WV			WV	34,000
5360 UNION CARBIDE CORP.	4	TEXAS CITY			TX	34,000
					TOTAL	257,000
						50,886
125-						
1690 ETHYL ACRYLATE		307,230	0.30	92,169		
930 CELANESE CHEMICAL CO.	5	CLEAR LAKE			TX	N/A
970 CELANESE CHEMICAL CO.	5	PAMPA			TX	80,000
1610 DOW BADISCHE CO.	5	FREEPORT			TX	40,000
4480 ROHM & HAAS CO.	5	DEER PARK			TX	400,000
5350 UNION CARBIDE CORP.	4	TAFT			LA	200,000
					TOTAL	720,000
						194,400

TABLE 4-6
COST INFORMATION BY SITE

PROD. CAP.	PRICE	SALES
(MMLRHS/YR)	(\$/LB)	(MM\$ /YR)

189 ALLIED CHEMICAL CORP. 114 ACETONE 124 ACETOPHENONE 187A CUMENE HYDROPEROXIDE 269A 4-METHYLSTYRENE 291B PHENOL	5 FRANKFORD [433,211,212,231,257,279] [432,434,433,446] [278] [297] [437,433,279,314]	PA	534.00 4.00 4.00 15.00 550.00	0.15 0.40 0.00 0.00 1.05	44.6 0.0 0.0 0.0 519.7
				TOTAL	564.3
181 ALLIED CHEMICAL CORP. 177B ETHYLENE 35.12 UREA	4 GEISMAN [434] [175]	LA	750.00 245.00	0.12 0.09	77.8 19.8
				TOTAL	97.5
191 ALLIED CHEMICAL CORP. 184 ADIPIC ACID 785 CAPROLACTAM 113B CYCLOHEXANOL 114B CYCLOHEXANONE	5 KOPENHILL [411] [444] [442,289] [442,290]	VA	34.00 400.00 4.00 345.00	0.40 0.55 0.37 0.37	10.0 198.0 0.0 114.9
				TOTAL	323.7
191 ALLIED CHEMICAL CORP. 314B SODIUM ACETATE 324A SUCCINIC ACID	6 MARCUS HOOK [495] [435]	PA	0.00 0.00	0.35 0.67	0.0 0.0
				TOTAL	0.0
200 ALLIED CHEMICAL CORP. 81A CARBON TETRACHLORIDE 93A CHLOROFORM 243B MALEIC ANHYDRIDE 244B MALIC ACID 255B METHYL CHLORIDE 262B METHYLENE CHLORIDE 263B METHYLENE DIANILINE 277B NITROBENZENE 295B PHOSGENE 3355 TOLUENE DIISOCYANATES(MIXTURE)	5 MOUNDSVILLE [131,158,218] [160] [434,457,204] [438] [150,184] [153] [195] [431] [150] [400]	WV	8.00 34.00 60.00 0.00 25.00 54.00 0.00 55.00 98.00 0.00	0.15 0.22 0.40 0.57 0.15 0.19 0.00 0.23 0.25 0.00	1.1 5.9 21.6 0.0 3.3 8.5 0.0 11.4 22.1 0.0
				TOTAL	73.9

TABLE 4-7
ALL CHEMICAL-SPECIFIC INFORMATION

1670 ETHYL ACETATE

PROD. VOL.: 196,511 MM³LBS (1974)
UNIT COST: \$ 0,220 PER LB
SALES: 43,232 MM³/YR

ECIP NUMBER: {092,211} WLN: 20V1

EMISSION FACTORS

ETHANOL	5,00 LB/TON
ETHYL ACETATE	5,00 LB/TON

TOXICITY

-27-

ACUTE LOCAL

IRRITANT 1

ACUTE SYSTEMIC

INGESTION 2 INHALATION 2 SKIN ABSORPTION 2

CHRONIC LOCAL

IRRITANT 1

CHRONIC SYSTEMIC

INGESTION 1 INHALATION 1 SKIN ABSORPTION 1

TLV = 400,00 PPM 1400,00 MG/M³

LD50 = 5600 MG/KG

TABLE 4-7 (Continued)
ALL CHEMICAL-SPECIFIC INFORMATION

PRODUCTION SITES

625 BECKMAN INSTRUMENTS, INC.	6	PALO ALTO	CA
920 CELANESE CHEMICAL CO.	5	BISHOP	TX
970 CELANESE CHEMICAL CO.	5	PAMPA	TX
1960 EASTMAN KODAK CO.	5	KINGSPORT	TN
1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
3400 MONSANTO CO.	6	SPRINGFIELD	IL
3420 MONSANTO CO.	6	TRENTON	NJ
4232 PUBLICKER INDUSTRIES INC.	5	PHILADELPHIA	PA
5280 UNION CARBIDE CORP.	5	BROWNSVILLE	TX
5290 UNION CARBIDE CORP.	5	INSTITUTE AND SOUTH CHARLESTON	WV
5360 UNION CARBIDE CORP.	4	TEXAS CITY	TX

5.0 SEARCHES

The most useful and unique feature of the OCPDB program is the ability to conduct searches of the information which it contains. The possible searches include identifying all the chemicals with a certain desired chemical structure, identifying all the sites that produce a specified product slate, conducting any of the possible commands or searches within only selected combinations of states or EPA regions. These searches were set up to answer quickly and efficiently any questions that the EPA might request.

The possible searches are discussed in the following sections.

5.1 Chemical Structure

The searches with respect to structure are conducted using the Wiswesser Line Notation (WLN). The WLN is a method for writing and describing the structure of a chemical molecule on one line using normal typewriter characters. Thus a search for any desired chemical structure is possible by searching the WLN's for the appropriate combination of characters. This capability allows searches of all the chemicals in the data base for carboxylic acid groups, amine groups, ether linkages, or any other functional group or structure of interest. The sites that produce these chemicals can then also be identified. The chemical specific entries as discussed in Section 4 (toxicity, production volume, emission factors) are easily included on the OCPDB Program print-out of identified chemicals. It is also possible to cascade commands so that only the plant sites in a desired EPA region are listed. This will be further discussed in Section 5.3.

An example of the chemical structure search is illustrated in Table 5-1 which lists all chemicals in the data base that contain carboxylic acid groups. The carboxylic acid structure can be represented by either QV or VQ, therefore both structures must be requested and the output is as shown.

5.2 Commonality

A group of searches are possible under the general heading of "commonality". The two main approaches are as follows:

- Have the OCPDB Program identify all the sites which have "in common" the production of specified chemicals, or
- Specify a group of plants and have the program search for commonality between the product slates of these plants.

The first option listed is most useful when chemicals have been identified or are known and specific sites need to be pinpointed. Even more useful information can be obtained from the program when this option is taken. For the sites that have been identified, the program can continue to list all other chemicals produced in common at those sites and further list the five "next most commonly" produced chemicals. This command was executed for ethylene oxide and ethylene glycol and is shown in Table 5-2. Of all the sites that produce ethylene glycol 78.9% also produce ethylene oxide. Of all sites that produce ethylene oxide 93.7% also produce ethylene glycol. No other chemical is produced at all of the fifteen sites listed, but diethylene glycol is the next most common chemical and is produced at 14 of these sites.

TABLE 5-1
WISWESSER LINE NOTATION SEARCH FOR CARBOXYLIC ACID GROUPS; QV, VQ

CHEMICALS WITH WISWESSER LINE NOTATION & QV

70 ACETIC ACID	WLNS: QV1
160 ACRYLIC ACID AND ACRYLATE ESTERS	WLNS: QV1U1QV1V1
180 ADIPIC ACID	WLNS: QV4VQ
430 BENZOIC ACID	WLNS: QVR
700 P-TERT-BUTYLBENZOIC ACID	WLNS: QVR BX
760 N-BUTYRIC ACID	WLNS: QV3
840 CHLOROACETIC ACID	WLNS: QV1G
900 CHLOROBENZOIC ACID	WLNS: QVR XG
1050 CROTONIC ACID	WLNS: QV1U2 -T
1080 CYANODACETIC ACID	WLNS: QV1CN
2070 FUMARIC ACID	WLNS: QV1U1VQ-T
2210 P-HYDROXYBENZOIC ACID	WLNS: QVR DU
2280 ISOBUTYRIC ACID	WLNS: QVY
2340 ISOPHTHALIC ACID	WLNS: QVR CVD
2420 MALEIC ACID	WLNS: QV1U1VQ -C
2440 MALIC ACID	WLNS: QVYU1VQ -L
2460 METHACRYLIC ACID	WLNS: QVYU1

TABLE 5-1 (Continued)
WISWESSER LINE NOTATION SEARCH FOR CARBOXYLIC ACID GROUPS; QV, VQ

2750 NEOPENTANOIC ACID	WLNS: QVX
2930 PHENYL ANTHRANILIC ACID	WLNS: QVR BMR
3060 PROPIONIC ACID	WLNS: QV2
3160 RESORCYLIC ACID	WLNS: QVR BQ DQ
3170 SALICYLIC ACID	WLNS: QVR BQ
3220 SORBIC ACID	WLNS: QV1U2U2
3240 SUCCINIC ACID	WLNS: QV2V0
3280 TEREPHTHALIC ACID	WLNS: QVR DQ

TABLE 5-1 (Continued)
WISWESSER LINE NOTATION SEARCH FOR CARBOXYLIC ACID GROUPS; QV, VQ

CHEMICALS WITH WISWESSER LINE NOTATION : VQ

180 ADIPIC ACID	WLNS: QV4VQ
220 AMINOBENZOIC ACID (M,P)	WLNS: ZR CVQ;ZR DVO
340 ANTHRANILIC ACID	WLNS: ZR UVQ
420 BENZILIC ACID	WLNS: QXR&R&VQ
1200 DIAMINOBENZOIC ACID	WLNS: ZR XZ XVQ
1540 3,5-DINITROBENZOIC ACID	WLNS: WNR CVO ENW
2070 FUMARIC ACID	WLNS: QVIUUVQ-T
2110 GLYCINE	WLNS: ZIVQ
2340 ISOPHTHALIC ACID	WLNS: QVR CVO
2420 MALEIC ACID	WLNS: QVIUUVQ -C
2440 MALIC ACID	WLNS: QVYQIVQ -L
2780 NITROBENZOIC ACID (M,N,P)	WLNS: WNR XVQ
3240 SUCCINIC ACID	WLNS: DV2VQ
3280 TEREPHTHALIC ACID	WLNS: QVR DVO

TABLE 5-2
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE

PLANTS PRODUCING THE FOLLOWING PRODUCT SLATE :
 NUMBER NAME % OF TOTAL PRODUCING THIS CHEMICAL

1830	ETHYLENE GLYCOL	78.9	
1980	ETHYLENE OXIDE	93.7	
590	BASF WYANDOTTE CORP.	4	LA
870	CALCASIEU CHEMICAL CORP.	5	LA
930	CELANESE CHEMICAL CO.	5	TX
1640	DOW CHEMICAL CO.	4	TX
1690	DOW CHEMICAL CO.	4	LA
1970	EASTMAN KODAK CO.	4	TX
2810	JEFFERSON CHEMICAL CO., INC.	4	TX
3590	NORTHERN NATURAL GAS CO.	4	IL
3720	OLIN CORP.	4	KY
4050	PPG INDUSTRIES, INC.	5	TX
4160	PPG INDUSTRIES, INC.	5	PR
4600	SHELL OIL CO.	5	LA
5320	UNION CARBIDE CORP.	4	PR
5330	UNION CARBIDE CORP.	4	TX
5350	UNION CARBIDE CORP.	4	LA
	GEISMAR		
	LAKE CHARLES		
	CLEAR LAKE		
	FREEPORT		
	PLAQUEMINE		
	LONGVIEW		
	PORT NECHES		
	MORRIS		
	BRANDENBURG		
	BEAUMONT		
	GUAYANILLA		
	GEISMAR		
	PENUELAS		
	SEADRIFT		
	TAFT		

COMMON CHEMICALS

1830 ETHYLENE GLYCOL

1980 ETHYLENE OXIDE

NEXT FIVE MOST COMMON CHEMICALS

1330 DIETHYLENE GLYCOL

TABLE 5-2 (Continued)
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE

590	BASF WYANDOTTE CORP.	4	GEISMAR	LA
930	CELANESE CHEMICAL CO.	5	CLEAR LAKE	TX
1640	DOW CHEMICAL CO.	4	FREEPORT	TX
1690	DOW CHEMICAL CO.	4	PLAQUEMINE	LA
1970	EASTMAN KODAK CO.	4	LONGVIEW	TX
2810	JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
3590	NORTHERN NATURAL GAS CO.	4	MORRIS	TL
3720	OLIN CORP.	4	BRANDENBURG	KY
4050	PPG INDUSTRIES, INC.	5	BEAUMONT	TX
4060	PPG INDUSTRIES, INC.	5	GUAYANILLA	PR
4600	SHELL OIL CO.	5	GEISMAR	LA
5320	UNION CARBIDE CORP.	4	PENUELAS	PR
5330	UNION CARBIDE CORP.	4	SEADRIFT	TX
5350	UNION CARBIDE CORP.	4	TAFT	LA

3460 TRIETHYLENE GLYCOL

930	CELANESE CHEMICAL CO.	5	CLEAR LAKE	TX
1640	DOW CHEMICAL CO.	4	FREEPORT	TX
1690	DOW CHEMICAL CO.	4	PLAQUEMINE	LA
1970	EASTMAN KODAK CO.	4	LONGVIEW	TX
2810	JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
3720	OLIN CORP.	4	BRANDENBURG	KY
4050	PPG INDUSTRIES, INC.	5	BEAUMONT	TX
4060	PPG INDUSTRIES, INC.	5	GUAYANILLA	PR
4600	SHELL OIL CO.	5	GEISMAR	LA
5320	UNION CARBIDE CORP.	4	PENUELAS	PR
5330	UNION CARBIDE CORP.	4	SEADRIFT	TX
5350	UNION CARBIDE CORP.	4	TAFT	LA

TABLE 5-2 (Continued)
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE

1770 ETHYLENE

1640 DOW CHEMICAL CO.	4	FREEPORT	TX
1690 DOW CHEMICAL CO.	4	PLAQUEMINE	LA
1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
3590 NORTHERN NATURAL GAS CO.	4	MORRIS	IL
3720 OLIN CORP.	4	BRANDENBURG	KY
5320 UNION CARBIDE CORP.	4	PENUELAS	PR
5330 UNION CARBIDE CORP.	4	SEADRIFT	TX
5350 UNION CARBIDE CORP.	4	TAFT	LA

3090 PROPYLENE

1640 BASF WYANDOTTE CORP.	4	GEISMAR	LA
1640 DOW CHEMICAL CO.	4	FREEPORT	TX
1690 DOW CHEMICAL CO.	4	PLAQUEMINE	LA
1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
3590 NORTHERN NATURAL GAS CO.	4	MORRIS	IL
5320 UNION CARBIDE CORP.	4	PENUELAS	PR
5330 UNION CARBIDE CORP.	4	SEADRIFT	TX
5350 UNION CARBIDE CORP.	4	TAFT	LA

1360 DIETHYLENE GLYCOL MONOMETHYL ETHER

1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
3720 OLIN CORP.	4	BRANDENBURG	KY
4250 PPG INDUSTRIES, INC.	5	BEAUMONT	TX
4600 SHELL OIL CO.	5	GEISMAR	LA
5350 UNION CARBIDE CORP.	4	TAFT	LA

The four next most common chemicals are also given in Table 5-2, down to diethylene glycol monomethyl ether which has six production sites in common with both ethylene oxide and ethylene glycol.

A preliminary search to identify chemicals that are commonly produced together has been initiated with the OCPDB Program. This task is discussed in Appendix III, where the degrees of commonality between chemical pairs are listed.

A command with one more degree of sophistication is also available through the user's file. It effectively reforms the organic chemical production site matrix to only those sites producing chemicals on a list supplied by the user. Commonality searches can then be executed using only this abbreviated matrix.

5.3 Screening

The screening procedure is a method whereby all commands can be executed using only certain segments of the entire data base. The data base can be limited to production sites with specific site classifications (Section 4.2), specific states and/or EPA Administrative Regions.

Thus, any state or group of states, or any EPA region or group of regions, can be specified at the onset of a run. The commands will then be executed with only the plant sites in the specified geographic region being available from the data base. The geographic screening is possible for all commands, both listings and searchings. When the geographic options are taken but no state or EPA region is to be deleted from the data base, the OCPDB Program then structures the output to be state-by-state within each of the ten EPA regions.

The same procedure is used for any specified group of plant classifications. If for example, listings or searches are desired considering only petroleum or petrochemical feedstock plants and not coal and wood processors, this can be easily accomplished.

The screening procedures are all additive. It is possible to cascade a plant site classification requirement, an EPA region and state requirement, and a commonality search into one execution. An example of the cascading of commands is shown in Table 5-3. Commonality of ethylene glycol and ethylene oxide, the same two chemicals as shown in Table 5-2, is given state-by-state in EPA region VI. The output for each state represents a new commonality search within the denoted area, and the percentages given are for that area only.

TABLE 5-3
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE
WITHIN EPA REGION VI, BY STATE

EPA REGION VI - ARKANSAS

PLANTS PRODUCING THE FOLLOWING PRODUCT SLATE :
 NUMBER NAME % OF TOTAL PRODUCING THIS CHEMICAL

1830 ETHYLENE GLYCOL	-	0,0
1980 ETHYLENE OXIDE		0,0

NONE

EPA REGION VI - LOUISIANA

PLANTS PRODUCING THE FOLLOWING PRODUCT SLATE :
 NUMBER NAME % OF TOTAL PRODUCING THIS CHEMICAL

1830 ETHYLENE GLYCOL	83,3
1980 ETHYLENE OXIDE	100,0

590 BASF WYANDOTTE CORP.	4	GEISMAR	LA
870 CALCASIEU CHEMICAL CORP.	5	LAKE CHARLES	LA
1690 DON CHEMICAL CO.	4	PLAQUEMINES	LA
4600 SHELL OIL CO.	5	GFISMAR	LA
5350 UNION CARBIDE CORP.	4	TAFT	LA

TABLE 5-3 (Continued)
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE
WITHIN EPA REGION VI, BY STATE

COMMON CHEMICALS

1830 ETHYLENE GLYCOL

1980 ETHYLENE OXIDE

NEXT FIVE MOST COMMON CHEMICALS

1300 DIETHYLENE GLYCOL

590 BASF WYANDOTTE CORP.	4	GEISMAR	LA
1690 DOW CHEMICAL CO.	4	PLAQUEMINE	LA
4600 SHELL OIL CO.	5	GEISMAR	LA
5350 UNION CARBIDE CORP.	4	TAFT	LA

3090 PROPYLENE

590 BASF WYANDOTTE CORP.	4	GEISMAR	LA
--------------------------	---	---------	----

1690 DOW CHEMICAL CO.	4	PLAQUEMINE	LA
5350 UNION CARBIDE CORP.	4	TAFT	LA

3460 TRIETHYLENE GLYCOL

1690 DOW CHEMICAL CO.	4	PLAQUEMINE	LA
4600 SHELL OIL CO.	5	GEISMAR	LA
5350 UNION CARBIDE CORP.	4	TAFT	LA

TABLE 5-3 (Continued)
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE
WITHIN EPA REGION VI, BY STATE

1230 1,2-DICHLOROETHANE

1690 DOW CHEMICAL CO.	4	PLAQUEMINE	LA
5350 UNION CARBIDE CORP.	4	TAFT	LA

1360 DIETHYLENE GLYCOL MONOMETHYL ETHER

4600 SHELL OIL CO.	5	GEISMAR	LA
5350 UNION CARBIDE CORP.	4	TAFT	LA

EPA REGION VI - NEW MEXICO

PLANTS PRODUCING THE FOLLOWING PRODUCT STATE :		
NUMBER	NAME	% OF TOTAL PRODUCING THIS CHEMICAL
1830	ETHYLENE GLYCOL	0.0
1980	ETHYLENE OXIDE	0.0

NONE

TABLE 5-3 (Continued)
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE
WITHIN EPA REGION VI, BY STATE

EPA REGION VI - OKLAHOMA

PLANTS PRODUCING THE FOLLOWING PRODUCT SLATE :		
NUMBER	NAME	% OF TOTAL PRODUCING THIS CHEMICAL
1830	ETHYLENE GLYCOL	0,0
1980	ETHYLENE OXIDE	0,0

NONE

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EPA REGION VI - TEXAS

PLANTS PRODUCING THE FOLLOWING PRODUCT SLATE :		
NUMBER	NAME	% OF TOTAL PRODUCING THIS CHEMICAL
1830	ETHYLENE GLYCOL	75,0
1980	ETHYLENE OXIDE	100,0

930 CELANESE CHEMICAL CO.	5	CLEAR LAKE	TX
1640 DOW CHEMICAL CO.	4	FREEPORT	TX
1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
4150 PPG INDUSTRIES, INC.	5	BEAUMONT	TX
5330 UNION CARBIDE CORP.	4	SEADRIFT	TX

TABLE 5-3 (Continued)
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE
WITHIN EPA REGION VI, BY STATE

COMMON CHEMICALS

1300 DIETHYLENE GLYCOL

1830 ETHYLENE GLYCOL

1980 ETHYLENE OXIDE

3460 TRIETHYLENE GLYCOL

NEXT FIVE MOST COMMON CHEMICALS

1770 ETHYLENE

1640 DOW CHEMICAL CO.	4	FREEPORT	TX
1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
5330 UNION CARBIDE CORP.	4	SEADRIFT	TX

3490 PROPYLENE

1640 DOW CHEMICAL CO.	4	FREEPORT	TX
1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
5330 UNION CARBIDE CORP.	4	SEADRIFT	TX

TABLE 5-3 (Continued)
COMMONALITY OF ETHYLENE GLYCOL AND ETHYLENE OXIDE
WITHIN EPA REGION VI, BY STATE

1360 DIETHYLENE GLYCOL MONOMETHYL ETHER

1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
4050 PPG INDUSTRIES, INC.	5	BEAUMONT	TX

1661 ETHANOLAMINE

1640 DOW CHEMICAL CO.	4	FREEPOR	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
5330 UNION CARBIDE CORP.	4	SEADRIIFT	TX

1930 ETHYLENE GLYCOL MONOMETHYL ETHER

1970 EASTMAN KODAK CO.	4	LONGVIEW	TX
2810 JEFFERSON CHEMICAL CO., INC.	4	PORT NECHES	TX
4050 PPG INDUSTRIES, INC.	5	BEAUMONT	TX

APPENDIX I
COMMANDS AVAILABLE TO
ORGANIC CHEMICAL DATA BASE

Commands Available to Access the Organic Chemical
Producers Data Base Program

Four digit commands have been developed to sort, search and list the data contained in the Chemical Producers Data Base Program. The first two digits are format control variables, listed below as X and Y, and will be explained after the command listings. The third and fourth digits in the command prescribe which of the various searches or sorts of the data is to be conducted, as described below. Realizing that the X's and Y's will be digits in an actual command, the possible commands are:

Listings

X001 - List all plants and all chemicals

X002 - List product slate for all plants

XY03 - List all chemicals along with the plants where they are produced

X004 - Same as X001 except chemical list includes specific chemical production routes

X005 - Same as X002 except chemical list includes specific chemical production routes

XY06 - Same as XY03 except chemical list includes specific chemical production routes

X007 - List all plants by classification

- X008 - List all chemicals according to their plant production site classification
- X009 - List the chemicals including the specific chemical production routes by plant classification
- X011 - List the chemicals specified
- XY12 - (1) List the production site for each specified chemical, then, (2) regroup this information and list by site the product slate from the chemicals listed.
- XY13 - Same as XY12, and then (3) list the entire product slate for each identified plant
- X022 - List for the requested sites chemical specific production capacity, chemical price and a dollars sales figure assuming production is 90% of capacity
- X033 - List as much of the following information as is available: (1) chemical price, (2) total production volume and sales and (3) for chemicals with known site specific capacities, list sales breakdown by sites.

Any of the chemical and site listing commands can be followed by 0001 on the command card and only the sites will be listed, or followed by 0002 and only the chemicals will be listed.

Searches

X010 - List the plants that produce a specified product slate

X020 - Same as X010, but continue to list all other chemicals produced in common at the listed plants and the next five most common chemicals

X030 - List the chemicals produced in common by specified plants

X040 - Same as X010, except the chemical list includes specific chemical production routes

X050 - Same as X020, except the chemical list includes specific chemical production routes

X060 - Same as X030, except the chemical list includes specific chemical production routes

X070 - List the chemicals that contain any desired structure, as identified by the Wiswesser Line Notation

XY80 - List all the chemicals identified in the X070 search, along with the plants that produce each

X090 - List the plants, along with the chemicals themselves, that produce the chemicals identified in the X070 search

Screenings

9999 Specify plant site classifications

9997 Specify EPA Administrative Regions

9996 Specify States

Format Control Variables

The command variables X and Y will now be explained.

Each chemical has associated with it certain information independent of production sites. This includes toxicity, production volume, emission factors (for each process), and EPA's Environmental Catalog of Industrial Processes (ECIP) process number. Depending on the digit, all, none, or combinations of this information will be printed each time the chemical name is printed, as shown:

Let A = ECIP process number and Wiswesser Line Notation

B = production volume

C = toxicity

D = emission factors

E = Cost information

So that when

Print Out

X = 1 + A

X = 2 + B

X = 3 →	C
X = 4 →	D
X = 5 →	A,B,C,D,E
X = 6 →	A,B
X = 7 →	A,C
X = 8 →	B,C
X = 9 →	E
X = 0 →	none

The X = 9 command for cost information is presently available only on the X001, X022 and X033 commands.

The Y command can only be used when production sites are listed for each chemical. The options available are:

- for Y=0 simply the plants are listed,
- for Y=1 site specific production capacities are printed,
- for Y=2 the chemicals with more than one production route have their plants grouped according to their processing routes, and
- for Y=3 groupings are made identical to Y=2 but site capacities and emission factors are also listed.

Future Y commands could include information on reaction characteristics and waste streams.

APPENDIX II
CHEMICALS IN ORGANIC CHEMICAL DATA BASE
AND PRODUCTION PROCESS ROUTES

ORGANIC CHEMICALS AND
PRODUCTION PROCESS ROUTES

The chemicals contained in the Organic Chemical Producers' Data Base are presented in this appendix. The derivation of the list is discussed in Section 3.0 of the report. The different process production routes are listed only for the chemicals where it is known how each site produces that chemical. Certain plant sites use more than one process to produce the same chemical. Asterisks are used to identify all processes that are one of several processes that produce a specific chemical at any one site. The process route key is given following this chemical listing. The OCPDB chemical numbers are on the far right after the name. The numbers in parentheses refer to processes as shown on the chemical tree contained in the draft copy of EPA's Environmental Catalog of Industrial Processes which is reproduced in Appendix IV.

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE

20 ACETAL

30 ACETALDEHYDE

PROCESS 1

PROCESS 2

PROCESS 3

40 ACETALDOL

50 ACETAMIDE

60 ACETANILIDE

70 ACETIC ACID

PROCESS 1

PROCESS 3

80 ACETIC ANHYDRIDE

90 ACETONE

PROCESS 1

PROCESS 2

PROCESS 5

PROCESS 7

PROCESS 8

PROCESS 9

100 ACETONE CYANOHYDRIN

110 ACETONITRILE

120 ACETOPHENONE

125 ACETYL CHLORIDE

130 ACETYLENE

PROCESS 1 *

PROCESS 3 *

PROCESS 4 *

PROCESS 5

PROCESS 6

140 ACROLEIN

150 ACRYLAMIDE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

160 ACRYLIC ACID AND ACRYLATE ESTERS
 PROCESS 1
 PROCESS 2
 PROCESS 3
170 ACRYLONITRILE
180 ADIPIC ACID
185 ADIPONITRILE
190 ALKYLNAPHTHALENES (METHYL)
200 ALLYL ALCOHOL
210 ALLYL CHLORIDE
220 AMINOBENZOIC ACID (M,P)
230 AMINOETHYLETHANOLAMINE
235 P-AMINOPHENOL
240 AMYL ACETATES
250 AMYL ALCOHOLS (8 ISOMERS)
260 AMYLAMINE
270 AMYL CHLORIDE
280 AMYL MERCAPTANS
290 AMYL PHENOL
300 ANILINE
310 ANILINE HYDROCHLORIDE
320 ANISIDINE
330 ANISOLE
340 ANTHRANILIC ACID
350 ANTHRAQUINONE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

360 BENZALDEHYDE

370 BENZAMIDE

380 BENZENE

PROCESS 1 *

PROCESS 2 *

PROCESS 3 *

PROCESS 4 *

PROCESS 5 *

390 BENZENEDISULFONIC ACID

400 BENZENESULFONIC ACID

410 BENZIL

420 BENZILIC ACID

430 BENZOIC ACID

440 BENZOIN

450 BENZONITRILE

460 BENZOPHENONE

480 BENZOTRICHLORIDE

490 BENZOYL CHLORIDE

500 BENZYL ALCOHOL

510 BENZYLAMINE

520 BENZYL BENZOATE

530 BENZYL CHLORIDE

540 BENZYL DICHLORIDE

550 BIPHENYL

560 BISPHENOL A

570 BROMOBENZENE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

580 BROMONAPHTHALENE

590 BUTADIENE
PROCESS 1 *
PROCESS 3 *
PROCESS 4

592 1-BUTENE

600 V-BUTYLACETATE

630 V-BUTYLACRYLATE

640 V-BUTYL ALCOHOL
PROCESS 1
PROCESS 2
PROCESS 3
PROCESS 4

650 SEC-BUTYL ALCOHOL

660 TERT-BUTYL ALCOHOL

670 V-BUTYLAMINE

680 SEC-BUTYLAMINE

690 TERT-BUTYLAMINE

700 P-TERT-BUTYLBENZOIC ACID

710 1,3 BUTYLENE GLYCOL

720 BUTYLENES

730 TERT-BUTYLPHENOL

750 V-BUTYRALDEHYDE

760 V-BUTYRIC ACID

770 V-BUTYRIC ANHYDRIDE

780 V-BUTYRONITRILE

785 CAPROLACTAM

790 CARBON DISULFIDE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

800 CARBON TETRABROMIDE
810 CARBON TETRACHLORIDE
 PROCESS 4 *
 PROCESS 5 *
 PROCESS 6 *
820 CELLULOSE ACETATE
840 CHLOROACETIC ACID
850 4-CHLORODANILINE
860 O-CHLORODANILINE
870 P-CHLORODANILINE
880 CHLOROBENZALDEHYDE
890 CHLOROBENZENE
 PROCESS 1
 PROCESS 2
900 CHLOROBENZOIC ACID
905 CHLOROBENZOTRICHLORIDE (O,P)
910 CHLOROBENZOYL CHLORIDE
920 CHLORODIFLUOROETHANE
921 CHLORODIFLUOROMETHANE
930 CHLOROFORM
940 CHLORONAPHTHALENE
950 O-CHLORONITROBENZENE
951 P-CHLORONITROBENZENE
960 CHLOROPHENOLS
965 CHLOROSULFONIC ACID
970 4-CHLOROTOLUENE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

980 O-CHLOROTOLUENE
990 P-CHLOROTOLUENE
995 CHLOROTRIFLUOROMETHANE
1000 4-CRESOL
1010 O-CRESOL
1020 P-CRESOL
1021 CRESOLS, MIXED
1030 CRESYLIC ACID
1040 CROTONALDEHYDE
1050 CROTONIC ACID
1060 CUMENE
1070 CUMENE HYDROPEROXIDE
1080 CYANOACETIC ACID
1090 CYANOGEN CHLORIDE
1100 CYANURIC ACID
1110 CYANURIC CHLORIDE
1120 CYCLOHEXANE
 PROCESS 1
 PROCESS 2
1130 CYCLOHEXANOL
 PROCESS 1
 PROCESS 2
1140 CYCLOHEXANONE
 PROCESS 1
 PROCESS 2
1150 CYCLOHEXENE
1160 CYCLOHEXYLAMINE
1170 CYCLOOCTADIENE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

- 1180 DECANOL
1190 DIACETONE ALCOHOL
1200 DIAMINOBENZOIC ACID
1210 DICHLOROANILINE
1215 4-DICHLOROBENZENE
1216 3-DICHLOROBENZENE
1220 P-DICHLOROBENZENE
1221 DICHLORODIFLUOROMETHANE
1230 1,2-DICHLOROETHANE
1240 DICHLOROETHYL ETHER
1250 DICHLOROHYDRIN
1270 DICHLOROPROPENE
1280 DICYCLOHEXYLAMINE
1290 DIETHYLAMINE
1300 DIETHYLENE GLYCOL
1324 DIETHYLENE GLYCOL DIETHYL ETHER
1325 DIETHYLENE GLYCOL DIMETHYL ETHER
1310 DIETHYLENE GLYCOL MONOBUTYL ETHER
1320 DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
1330 DIETHYLENE GLYCOL MONOETHYL ETHER
1340 DIETHYLENE GLYCOL MONOETHYL ETHER ACETATE
1360 DIETHYLENE GLYCOL MONOMETHYL ETHER
1420 DIETHYL SULFATE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

- 1430 DIFLUOROETHANE
1440 DIISOBUTYLENE
1450 DIKETENE
1460 DIMETHYLAMINE
1470 N,N-DIMETHYLANILINE
1480 DIMETHYL ETHER
1490 N,N-DIMETHYLFORMAMIDE
1495 DIMETHYL HYDRAZINE
1500 DIMETHYL SULFATE
1510 DIMETHYL SULFIDE
1520 DIMETHYL SULFOXIDE
1530 DIMETHYL TEREPHTHALATE
1540 3,5-DINITROBENZOIC ACID
1545 2,4-DINITROPHENOL
1550 DINITROTOLUENE
1560 DIOXANE
1570 DIOXOLANE
1580 DIPHENYLAMINE
1590 DIPHENYL OXIDE
1600 DIPHENYLTHIUREA
1610 DIPROPYLENE GLYCOL
1620 DODECENE
1630 DODECYLANILINE
1640 DODECYLPHENOL

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE - (Continued)

- 1650 EPICHLOROHYDRIN
1660 ETHANOL
1661 ETHANOLAMINE
1670 ETHYL ACETATE
1680 ETHYL ACETOACETATE
1690 ETHYL ACRYLATE
1700 ETHYLAMINE
1710 ETHYLBENZENE
 PROCESS 1 *
 PROCESS 2 *
1720 ETHYL BROMIDE
1730 ETHYL CELLULOSE
1740 ETHYL CHLORIDE
1750 ETHYL CHLOROACETATE
1760 ETHYLCYANOACETATE
1770 ETHYLENE
1780 ETHYLENE CARBONATE
1790 ETHYLENE CHLOROHYDRIN
1810 ETHYLENE DIAMINE
1810 ETHYLENE DIBROMIDE
1830 ETHYLENE GLYCOL
 PROCESS 1
 PROCESS 2
1840 ETHYLENE GLYCOL DIACETATE
1870 ETHYLENE GLYCOL DIMETHYL ETHER
1890 ETHYLENE GLYCOL MONOBUTYL ETHER

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

1900 ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
1910 ETHYLENE GLYCOL MONOETHYL ETHER
1920 ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
1930 ETHYLENE GLYCOL MONOMETHYL ETHER
1940 ETHYLENE GLYCOL MONOMETHYL ETHER ACETATE
1950 ETHYLENE GLYCOL MONOPHENYL ETHER
1970 ETHYLENE GLYCOL MONOPROPYL ETHER
1980 ETHYLENE OXIDE
1990 ETHYL ETHER -
2000 2-ETHYL-HEXANOL
2010 ETHYL ORTHOFORMATE
2020 ETHYL OXALATE
2030 ETHYL SODIUM OXALACETATE
2040 FORMALDEHYDE
 PROCESS 1
 PROCESS 2
2050 FORMAMIDE
2060 FORMIC ACID
2070 FUMARIC ACID
2090 GLYCEROL (NATURAL & SYNTHETIC)
 PROCESS 1
 PROCESS 2
 PROCESS 3
 PROCESS 5
 PROCESS 6
2091 GLYCEROL DICHLOROHYDRIN
2100 GLYCEROL TRI(POLYOXYPROPYLENE) ETHER
2110 GLYCINE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

2120 GLYOXAL
2140 HEPTENE
2145 HEXACHLOROBENZENE
2150 HEXACHLOROETHANE
2160 HEXADECYL ALCOHOL
2165 HEXAMETHYLENEDIAMINE
2170 HEXAMETHYLENE GLYCOL
2180 HEXAMETHYLENE TETRAMINE
2190 HYDROGEN CYANIDE
2200 HYDROQUINONE
2210 P-HYDROXYBENZOIC ACID
2240 ISOAMYLENE
2250 ISOBUTANOL
2260 ISOBUTYL ACETATE
2261 ISOBUTYLENE
2270 ISOBUTYLALDEHYDE
2280 ISOBUTYRIC ACID
2300 ISODECANOL
2320 ISOCTYL ALCOHOL
2321 ISOPENTANE
2330 ISOPHORONE
2340 ISOPHTHALIC ACID

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

2350 ISOPRENE
 PROCESS 1
 PROCESS 2
 PROCESS 3
2360 ISOPROPANOL

2370 ISOPROPYL ACETATE

2380 ISOPROPYLAMINE(MONO)

2390 ISOPROPYL CHLORIDE

2400 ISOPROPYLPHENOL

2410 ETENE

2420 MALEIC ACID

2430 MALEIC ANHYDRIDE

2440 MALIC ACID

2450 MESITYL OXIDE

2455 METANILIC ACID

2460 METHACRYLIC ACID

2490 METHALLYL CHLORIDE

2500 METHANOL
 PROCESS 1
 PROCESS 2
2510 METHYL ACETATE

2520 METHYL ACETOACETATE

2530 METHYLAMINE

2540 4-METHYLANILINE

2550 METHYL BUTYNOL

2560 METHYL CHLORIDE
 PROCESS 1 *
 PROCESS 2 *

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

2570 METHYLCYCLOHEXANE
2591 METHYLCYCLOHEXANONE
2620 METHYLENE CHLORIDE
2632 METHYLENE DIANILINE
2640 METHYL ETHYL KETONE
 PROCESS 1
 PROCESS 2
 PROCESS 3
2645 METHYL FORMATE
2650 METHYLISOBUTYL CARBINOL
2660 METHYLISOBUTYL KETONE
2665 METHYL METHACRYLATE
 PROCESS 1
 PROCESS 2
2670 METHYLPENTYNOL
2690 α -METHYLSTYRENE
2700 MORPHOLINE
2701 NAPHTHALENE
 PROCESS 1
 PROCESS 2
2710 α -NAPHTHALENE SULFONIC ACID
2720 3-NAPHTHALENE SULFONIC ACID
2730 α -NAPHTHOL
2740 3-NAPHTHOL
2750 NEOPENTANOIC ACID
2756 O-NITROANILINE
2757 P-NITROANILINE
2760 O-NITROANISOLE
2762 P-NITROANISOLE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

2770 NITROBENZENE
2780 NITROBENZOIC ACID (M,O,P)
2790 NITROETHANE
2791 NITROMETHANE
2792 NITROPHENOL
2793 NITROPROPANE
2800 NITROTOLUENE
2810 NONENE
2820 VINYLPHENOL
2830 OCTYLPHENOL
2840 PARALDEHYDE
2850 PENTAERYTHRITOL
2851 N-PENTANE
2855 1-PENTENE
2860 PERCHLOROETHYLENE
 PROCESS 1
 PROCESS 4
 PROCESS 5
2882 PERCHLOROMETHYL MERCAPTAN
2890 O-PHENETIDINE
2900 P-PHENETIDINE
2910 PHENOL
 PROCESS 1
 PROCESS 2
 PROCESS 3
 PROCESS 4 *
 PROCESS 5 *
 PROCESS 6 *

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

2920 PHENOLSULFONIC ACIDS
2930 PHENYL ANTHRANILIC ACID
2940 PHENYLENEDIAMINE
2950 PHOSGENE
2960 PHTHALIC ANHYDRIDE
 PROCESS 1
 PROCESS 2
 PROCESS 3
2970 PHTHALIMIDE
2981 3-PICOLINE
2990 PIPERAZINE
3000 POLYBUTENES
3010 POLYETHYLENE GLYCOL
3030 POLYPROPYLENE GLYCOL
3050 PROPIONALDEHYDE
3060 PROPIONIC ACID
 PROCESS 1
 PROCESS 2
 PROCESS 3
3061 N-PROPYL ALCOHOL
3070 PROPYLAMINE
3080 PROPYL CHLORIDE
3090 PROPYLENE
 PROCESS 1 *
 PROCESS 2 *
 PROCESS 3
3100 PROPYLENE CHLOROHYDRIN
3110 PROPYLENE DICHLORIDE
3111 PROPYLENE GLYCOL
3120 PROPYLENE OXIDE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

3130 PYRIDINE (NATURAL & SYNTHETIC)
3140 QUINONE
3150 RESORCINOL
3160 RESORCYLIC ACID
3170 SALICYLIC ACID
3180 SODIUM ACETATE
3181 SODIUM BENZOATE
3190 SODIUM CARBOXYMETHYL CELLULOSE
3191 SODIUM CHLOROACETATE
3200 SODIUM FORMATE
3210 SODIUM PHENATE
3220 SORBIC ACID
3230 STYRENE
3240 SUCCINIC ACID
3250 SUCCINONITRILE
3251 SULFANILIC ACID
3260 SULFOLANE
3270 TANNIC ACID
3280 TEREPHTHALIC ACID
3290 TETRACHLOROETHANE
3300 TETRACHLOROPHTHALIC ANHYDRIDE
3310 TETRAETHYL LEAD
PROCESS 1
PROCESS 2

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

- 3320 TETRAHYDRONAPHTHALENE
3330 TETRAHYDROPHthalic ANHYDRIDE
3340 TETRAMETHYLENEDIAMINE
3341 TETRAMETHYLETHYLENEDIAMINE
3349 TOLUENE
 PROCESS 1 *
 PROCESS 2 *
 PROCESS 3 *
 PROCESS 4 *
 PROCESS 5 *
3350 TOLUENE-2,4-DIAMINE
3354 2,4-TOLUENE DIISOCYANATE
3355 TOLUENE DIISOCYANATES(MIXTURE)
3360 TOLUENESULFONAMIDE
3370 TOLUENESULFONIC ACIDS
3380 TOLUENESULFONYL CHLORIDE
3381 TOLUIDINES
3390 TRICHLOROBENZENE
3395 1,1,1-TRICHLOROETHANE
3400 1,1,2-TRICHLOROETHANE
3410 TRICHLOROETHYLENE
 PROCESS 1
 PROCESS 2
3411 TRICHLOROFUOROMETHANE
3420 1,2,3-TRICHLOROPROPANE
3430 1,1,2-TRICHLORO-1,2,2-TRIFLUORETHANE
3450 TRIETHYLAMINE

CHEMICALS IN ORGANIC CHEMICAL
PRODUCERS' DATA BASE (Continued)

3460 TRIETHYLENE GLYCOL
3470 TRIETHYLENE GLYCOL DIMETHYL ETHER
3480 TRIISOBUTYLENE
3490 TRIMETHYLAMINE
3500 JREA
3510 VINYL ACETATE
 PROCESS 1
 PROCESS 2
3520 VINYL CHLORIDE
 PROCESS 1
 PROCESS 2
 PROCESS 3
3530 VINYLIDENE CHLORIDE
3540 VINYL TOLUENE
3541 XYLEMES, MIXED
 PROCESS 1 *
 PROCESS 2
 PROCESS 3 *
 PROCESS 4 *
 PROCESS 5
 PROCESS 5 *
3560 O-XYLENE
3570 P-XYLENE
3580 XYLENOL
3590 XYLIDINE

KEY TO CHEMICAL PRODUCTION PROCESS ROUTES

Acetaldehyde 0030

- Process 1 - (73) oxidation of ethylene
- Process 2 - (114) oxidation of ethanol
- Process 3 - (212) oxidation of propane, butane

Acetic Acid 0070

- Process 1 - synthetic
- Process 3 - caprolactone by-product

Acetone 0090

- Process 1 - (33) (279) cumene peroxidation to phenol
- Process 2 - dehydrogenation of butanes
- Process 5 - (257) dehydrogenation of isopropanol
- Process 7 - from diisopropyl benzene
- Process 8 - fermentation
- Process 9 - oxidation of propylene

Acetylene 0130

- Process 1 - (167) BASF, partial oxidation of methane
- Process 3 - from calcium carbide
- Process 4 - by-product of ethylene
- Process 5 - Wulff process, from ethane
- Process 6 - (167) Societe Belge de L'Azoto, similar to Process 1

Acrylic Acid 0160

- Process 1 - Ketene process, reacting acetone or acetic acid
- Process 2 - Modified Reppe process, reacting acetylene and carbon monoxide
- Process 3 - (248) oxidation of propylene

Benzene	0380
Process 1 - hydrodealkylation of toluene	
Process 2 - Processes 3 & 5	
Process 3 - from catalytic reforming of petroleum	
Process 4 - fractional distillation of coal tar	
Process 5 - from pyrolysis gasoline	
Butadiene	0590
Process 1 - (55) (223) dehydrogenation of n-butenes	
Process 2 - Processes 1 & 3	
Process 3 - (224) dehydrogenation of n-butane	
Process 4 - by-product of ethylene	
Process 5 - fluid coking	
n-Butanol	0640
Process 1 - (86) from crotonaldehyde	
Process 2 - (264) hydrogenation of n-butyraldehyde, Oxo process	
Process 3 - Ziegler	
Process 4 - fermentation of corn molasses	
Carbon Tetrachloride	0810
Process 4 - (158) chlorination of methane	
Process 5 - (218) hydrocarbon chlorinolysis & pyrolysis	
Process 6 - from carbon disulfide	
Chlorobenzene	0890
Process 1 - (4) direct substitution on benzene	
Process 2 - oxychlorination (only as intermediate to pheonol)	
Cyclohexane	1120
Process 1 - extraction from petroleum naphthas	
Process 2 - (40) hydrogenation of benzene	

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Cyclohexanol	1130
Process 1 - (42) from cyclohexane	
Process 2 - (289) from phenol	
Cyclohexanone	1140
Process 1 - (42) oxidation of cyclohexane	
Process 2 - (290) hydrogenation of phenol	
Ethylbenzene	1710
Process 1 - (1) benzene alkylation	
Process 2 - (349) separation from mixed xylene stream of a gasoline fraction	
Ethylene Glycol	1830
Process 1 - (136) from ethylene oxide	
Process 2 - hydrogenation and hydrogenolysis of molasses	
Formaldehyde	2040
Process 1 - (193) oxidation of methanol	
Process 2 - (212) oxidation of LPG	
Glycerol	2090
Process 1 - (300) from epichlorohydrin	
Process 2 - from acrolein-allyl alcohol	
Process 3 - (275) from allyl alcohol and peracetic acid	
Process 5 - by-product of fatty acid; crude glycerin	
Process 6 - refined natural glycerin from crude glycerin	
Isoprene	2350
Process 1 - (231) from isoamylanes	
Process 2 - from cracked petroleum fraction	
Process 3 - propylene dimerization & acetonitrile extraction	

Methanol	2500
Process 1 - (182) high pressure synthesis from natural gas	
Process 2 - (182) low pressure synthesis from natural gas	
Methyl Chloride	2560
Process 1 - (150) from methane	
Process 2 - (184) from methanol	
Methyl Ethyl Ketone	2640
Process 1 - (52) from sec-butyl alcohol	
Process 2 - (211) by-product of n-butane oxidation to acetic acid	
Process 3 - butadiene by-product	
Methyl Methacrylate	2665
Process 1 - reacting acetone and hydrogen cyanide	
Process 2 - purification of crude monomer	
Naphthalene	2701
Process 1 - coal derived	
Process 2 - petroleum derived	
Perchloroethylene	2860
Process 1 - (131) coproduct, chlorination and dehydrochlorina- tion of ethylene dichloride	
Process 4 - (173) coproduct from tetrachloroethane	
Process 5 - (218) coproduct with carbon tetrachloride from hydrocarbon chloronolysis	

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Phenol	2910
Process 1 - (7) from chlorobenzene	
Process 2 - (33) (279) from cumene	
Process 3 - by toluene oxidation	
Process 4 - separated from coal tar	
Process 5 - from benzene sulfonate	
Process 6 - separation from petroleum fraction	
Phthalic Anhydride	2960
Process 1 - (204) from petro-naphthalene	
Process 2 - (350) from o-xylene	
Process 3 - (204) from desulfurized naphthalene	
Propionic Acid	3060
Process 1 - (116) from ethanol & CO	
Process 2 - (211) by-product from oxidation of n-butane to acetic acid	
Process 3 - nitroparaffin by-product	
Propylene	3090
Process 1 - from refining operations	
Process 2 - from ethylene manufacturing operations	
Process 3 - butadiene by-product	
Tetraethyl Lead	3310
Process 1 - (207) production via lead amalgam	
Process 2 - (207) production via electrolysis	
Toluene	3349
Process 1 - catalytic reforming of petroleum	
Process 2 - fractional distillation of coal tar light oil	
Process 3 - by-product of ethylene manufacture	
Process 4 - by-product of styrene manufacture	
Process 5 - from pyrolysis gasoline	

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Trichloroethylene	3410
Process 1 - from ethylene	
Process 2 - from acetylene	
Vinyl Acetate	3510
Process 1 - (84) vapor phase reaction with ethylene	
Process 2 - reaction of acetylene	
Vinyl Chloride	3520
Process 1 - Ethylene oxychlorination	
Process 2 - (125) from ethylene	
Process 3 - from acetylene	
Xylenes	3541
Process 1 - (337) from toluene transalkylation	
Process 2 - (349) from fractional distillation of petroleum	
Process 3 - from catalytic reformate	
Process 4 - from coke oven light oil	
Process 5 - from olefin production	
Process 6 - from pyrolysis gasoline	

APPENDIX III
CHEMICAL COMMONALITY

CHEMICAL COMMONALITY

The scope of work as outlined in the Task Specification Request for EPA Contract No. 68-02-1319, Task No. 51 described the need to identify products that are normally produced together at a specific location. The commonality search capability in the OCPDB Program, or the ability to search for sites that "commonly" produce any desired group of chemicals, was developed to approach this problem.

The definition of this commonality study was clarified by initial efforts toward finding groups of chemicals whose production occurs together in industry, and it was seen that only a major project would yield satisfactory results. Thus, exhaustive efforts in the direction of finding all chemicals groups that exist together and their degree of association was de-emphasized with increased emphasis placed on information catagories or entries concerning all the chemicals. In effect a first pass at the commonality of all the chemicals contained in the data base on a one-to-one basis was achieved. The results of this effort are presented in Table III-1. Only when commonality is greater than or equal to 50% is the pair listed.

Commonality, or the percentage of chemical A production sites that also produce chemical B, is a "one-way" fraction. Chemical A may be produced at 6 sites, 5 of which are common with (or also produce) chemical B. If chemical B has 11 production sites, the commonality of chemical A with chemical B is 5 out of 6 or 83%, while the commonality of chemical B with A is only 5 out of 11 or 45%. The commonalities listed on Table III-1 are in the direction of the first chemical listed toward the indented chemicals listed below. Thus, for the first entry, acetaldehyde is produced at 8 sites of which 75% or 6 of those sites also

produce acetic acid. (The chemical numbers as assigned in the Organic Chemical Producers' Data Base are also given.) Commonality in the other direction can be found by looking at the acetic acid entry and observing a 50% commonality with acetaldehyde or common production at 6 out of 12 sites. The commonality of any chemical pair not listed is less than 50%.

Other tables are also necessary to report the initial data. Table III-2 lists all the chemicals with only one production site. These chemicals must be considered separately since they have 100% commonality with all the other chemicals produced at that site. Chemicals with two production sites should also be considered separately since the results can be misleading if compared to chemicals with several production sites. At least fifty percent commonality is achieved with every chemical produced at the two sites, and 100% commonality is seen if both sites produce the chemicals. Therefore the chemical pairs with 100% commonality at two sites are reported separately on Table III-3. Chemicals having less than 50% commonality with all other chemicals are listed in Table III-4.

The main results of the commonality study are given in Table III-5. This table reports only the information contained in Table III-1 by listing chemical pairs in order of decreasing commonality. For each chemical pair commonality exists in two directions. The highest commonality direction is given priority and the chemical pairs are ranked first by this fraction. Further ordering is achieved by ranking the commonality of the reverse direction in each pair. Thus, chemical pairs are first grouped according to the highest commonality percentages and then these groups are ranked in decreasing order of the reciprocal commonality. As an example, the eleven 83% commonality pairs are then further ranked by the reciprocal commonality from 83% to <50%.

The commonality results are encouraging, but show that a great deal of work is necessary before useful results are obtained. It would be necessary for future endeavors to specify arbitrary degrees of association where commonality would and would not exist, to decide the weighting of reciprocal commonality (especially in groups of more than two chemicals) and to plan a methodology so that no chemical associations would be missed.

TABLE III-1
CHEMICALS WITH >50% COMMONALITY

0030	Acetaldehyde	8 sites	
	Acetic Acid 75%		0070
	Ethyl Acetate 50%		1670
0050	Acetamide	2 sites	
0070	Acetic Acid	12 sites	
	Acetaldehyde 50%		0030
	Ethyl Acetate 50%		1670
0080	Acetic Anhydride	7 sites	
	Acetic Acid 57%		0070
	Cellulose Acetate 57%		0820
	Ethyl Acetate 57%		1672
0100	Acetone Cyanohydrin	2 sites	
	Hydrogen Cyanide 100%		2190
	Methyl Methacrylate 100%		2665
0110	Acetonitrile	2 sites	
	Propylene 100%		3090
0120	Acetophenone	7 sites	
	Acetone 71%		0090
	a-Methylstyrene 57%		2690
	Phenol 71%		2910
0125	Acetyl Chloride	2 sites	
0140	Acrolein	2 sites	
	Butadiene 100%		0590
	1,2-Dichloroethylene 100%		1230
	Ethylene 100%		1770
	Ethylene Dichloride 100%		1820
	Propylene 100%		3090
0160	Acrylic Acid	6 sites	
	Acetic Acid 50%		0070
	N-Butylacrylate 83%		0630
	Ethyl Acrylate 83%		1690
0170	Acrylonitrile	5 sites	2190
	Hydrogen Cyanide 100%		

Table III-1
Chemicals With >50% Commonality (Cont.)

0180	Adipic Acid	7 sites	
	Adiponitrile 71%		185
	Cyclohexanol 71%		1130
	Cyclohexanone 57%		1140
	Hexamethylenediamine 71%		2165
0185	Adiponitrile	7 sites	
	Adipic Acid 71%		180
	Hexamethylenediamine 71%		2165
0200	Allyl Alcohol	2 sites	
	Glycerol 100%		2090
0210	Allyl Chloride	3 sites	
	Acetone 67%		0090
	Benzene 67%		0380
	Bisphenol-A 67%		0560
	Butadiene 100%		0590
	sec-Butyl Alcohol 67%		0650
	1,2-Dichloroethylene 100%		1230
	Epichlorohydrin 100%		1650
	Ethyl Chloride 67%		1740
	Ethylene 100%		1770
	Ethylene dichloride 100%		1820
	Glycerol 100%		2090
	Methyl Ethyl Ketone 67%		2640
	Propylene 100%		3090
	1,2,3-Trichloropropone 67%		3420
	Vinyl Chloride 100%		3520
0230	Aminoethyl ethanolamine	4 sites	
	Acetylene 50%		0130
	Butadiene 50%		0590
	1,2-Dichloroethylene 50%		1230
	Diethylene Glycol 50%		1300
	Ethylene 50%		1770
	Ethyleneamine 50%		1800
	Ethylene Dichloride 50%		1820
	Piperazine 50%		2990
	Polyethylene Glycol 50%		3015
	Polypropylene Glycol 75%		3030
	Propylene 50%		3090
	1,1,2-Trichloroethane 50%		3400

Table III-1
Chemicals With >50% Commonality (Cont.)

0240	Amyl Acetates	3 sites	
	Acetic Acid 67%		0070
	Acetone 67%		0090
	Butyl Acetate 67%		0600
	Ethanol 100%		1660
	Ethyl Acetate 67%		1670
	Ethyl Ether 67%		1990
	Methyl Butanol 67%		2550
0250	Amyl Alcohols	4 sites	
	Ethanol 50%		1660
	Methyl Butanol 100%		2550
0260	Amylamine	3 sites	
	n-Butylamine 67%		0670
	sec-Butylamine 67%		0680
	Diethylamine 67%		1290
	Ethylamine 67%		1700
	Isopropylamine 67%		2380
	Propylamine 67%		3070
	Triethylamine 67%		3450
0290	Amyl Phenol	2 sites	
0300	Aniline	7 sites	
	Nitrobenzene 100%		2770
0340	Anthranilic Acid	2 sites	
0360	Benzaldehyde	6 sites	
	Benzoic Acid 50%		0430
	Benzyl Alcohol 67%		0500
0370	Benzamide	2 sites	
0380	Benzene	55 sites	
	Propylene 51%		3090
	Toluene 82%		3349
	Xylenes, Mixed 60%		3541
0400	Benzenesulfonic Acid	3 sites	
	Toluenesulfonic Acid 67%		3370
0410	Benzil	2 sites	
0420	Benzilic Acid	2 sites	

Table III-1
Chemicals with >50% Commonality (Cont.)

0430	Benzolic Acid Benzaldehyde 60%	5 sites	0360
0470	Benzoquinone Quinone 100%	2 sites	3140
0480	Benzotrichloride Benzoyl Chloride 67% Chlorobenzaldehyde 67% Chlorobenzoic Acid 67% Chlorobenzoyl Chloride 67% o-Chlorotoluene 67% p-Chlorotoluene 67%	3 sites	0490 0880 0900 0910 0980 0990
0490	Benzoyl Chloride Benzaldehyde 67% Benzotrichloride 67% Benzyl Alcohol 67%	3 sites	0360 0480 0500
0500	Benzyl Alcohol Benzaldehyde 67%	6 sites	0360
0560	Bisphenol-A Butadiene 60% Ethylene 60% Propylene 60%	5 sites	0590 1770 3090
0580	Bromonaphthalene Chlorophenols 67% m-Chlorobenzene 67% Propylene Chlorohydrin 67% Succinonitrile 67%	3 sites	0960 1215 3100 3250
0590	Butadiene Ethylene 70% Propylene 70%	23 sites	1770 3090
0592	1-Butene Benzene 50% Biphenyl 50% Butadiene 75% Butylenes 100% Ethylene 75% Propylene 75%	4 sites	0380 0550 0590 0720 1770 3090

Table III-1
Chemicals with >50% Commonality (Cont.)

0600	n-Butyl acetate	5 sites	
	Acetic Acid 80%		0070
	Acetone 80%		0090
	Ethanol 60%		1660
	Ethyl Acetate 100%		1670
	Ethyl Ether 60%		1990
	Isobutyl Acetate 60%		2260
	Isopropyl Acetate 60%		2370
	n-Propyl Alcohol 60%		3061
0630	n-ButylAcrylate	5 sites	
	Acetic Acid 60%		0070
	Acrylic Acid 100%		0160
	Ethyl Acrylate 100%		1690
0640	n-Butyl Alcohol	12 sites	
	n-Butyraldehyde 58%		0750
	2-Ethyl Hexanol 58%		2000
	Isobutanol 50%		2250
0650	sec-Butyl Alcohol	4 sites	
	Acetone 75%		0090
	Allyl Chloride 50%		0210
	Butadiene 75%		0590
	1,2-Dichloroethylene 50%		1230
	Epichlorohydrin 50%		1650
	Ethylene 50%		1770
	Ethylene Dichloride 50%		1820
	Glycerol 50%		2090
	Isopropanol 50%		2360
	Mesityl Oxide 50%		2450
	Methyl Ethyl Ketone 100%		2640
	Methyl Isobutyl Ketone 50%		2660
	Propylene 100%		3090
	Vinyl Chloride 50%		3520
0660	tert-Butyl Alcohol	2 sites	
0670	n-Butylamine	3 sites	
	Amylamine 67%		0260
	sec-Butylamine 67%		0680
	Diethylamine 100%		1290
	Ethylamine 100%		1700
	Isopropylamine 100%		2380
	Propylamine 67%		3070
	Triethylamine 100%		3450

Table III-1
Chemicals with >50% Commonality (Cont.)

0680	sec-Butylamine	2 sites	
	Amylamine 100%		0260
	N-Butylamine 100%		0670
	Diethylamine 100%		1290
	Ethylamine 100%		1700
	Isopropylamine 100%		2380
	Propylamine 100%		3090
	Triethylamine 100%		3450
0680	tert-Butylamine	2 sites	
	Hydrogen Cyanide 100%		2190
	Methanol 100%		2500
0720	Butylenes	4 sites	
	Benzene 50%		0380
	Biphenyl 50%		0550
	Butadiene 75%		0590
	1-Butene 100%		0592
	Ethylene 75%		1770
	Propylene 75%		3090
0730	tert-Butylphenol	5 sites	
	Phenol 60%		2910
0750	N-Butyraldehyde	7 sites	
	n-Butyl Alcohol 100%		0640
	Ethylene 57%		1770
	2-Ethyl Hexanol 86%		2000
	Isobutanol 71%		2250
	Isobutyraldehyde 57%		2270
	Propylene 57%		3090
0760	n-Butyric Acid	3 sites	
	Acetaldehyde 67%		0030
	Acetic Acid 100%		0070
	Acetic Anhydride 67%		0080
	Acetone 67%		0090
	Butyl Acetate 67%		0600
	Ethyl Acetate 100%		1670
	Ethylene Glycol Diacetate 67%		1840
	Ethylene Glycol Monomethyl Ether Acetate 67%		1840
	Isobutyl Acetate 67%		2260
	Isopropyl Acetate 67%		2370
	Methylisobutyl Ketone 67%		2660
	Propionic Acid 67%		3060

Table III-1
Chemicals with >50% Commonality (Cont.)

0785	Caprolactam	3 sites	
	Cyclohexanol 100%		1130
	Cyclohexanone 100%		1140
0800	Carbon Tetrabromide	2 sites	
0810	Carbon Tetrachloride	12 sites	
	Chloroform 50%		0930
	Methylene Chloride 50%		2620
	Perchloroethylene 58%		2860
0820	Cellulose Acetate	6 sites	
	Acetic Anhydride 67%		0080
0840	Chloroacetic Acid	3 sites	
	Sodium Carboxymethyl Cellulose 67%		3190
0860	o-Chloroaniline	2 sites	
	p-Chloroaniline 100%		0870
	Dichloroaniline 100%		1210
0870	p-Chloroaniline	2 sites	
	Dichloroaniline 100%		1210
0880	Chlorobenzaldehyde	2 sites	
	Benzotrichloride 100%		0480
	Chlorobenzoic Acid 100%		0900
	Chlorobenzoyl Chloride 100%		0910
	o-Chlorotoluene 100%		0980
	p-Chlorotoluene 100%		0990
0890	Chlorobenzene	10 sites	
	o-Dichlorobenzene 80%		1216
	p-Dichlorobenzene 80%		1220
	Trichlorobenzene 60%		3390
0900	Chlorobenzoil Acid	3 sites	
	Benzotrichloride 67%		0480
	Chlorobenzaldehyde 67%		0880
	Chlorobenzoyl Chloride 67%		0910
	o-Chlorotoluene 67%		0980
	p-Chlorotoluene 67%		0990
0910	Chlorobenzoyl Chloride	2 sites	
	Benzotrichloride 100%		0480
	Chlorobenzaldehyde 100%		0880
	Chlorobenzoic Acid 100%		0900
	o-Chlorotoluene 100%		0980
	p-Chlorotoluene 100%		0990

Table III-1
Chemicals with >50% Commonality (Cont.)

0920	Chlorodifluoroethane 6 sites Chlorodifluoromethane 100% Chlorotrifluoromethane 83% Dichlorodifluoromethane 100% Trichlorofluoromethane 100% 1,1,2-Trichloro - 1,2,2-Trifluoroethane 83%	0921 0995 1221 3411 3430
0921	Chlorodifluoromethane 10 sites Chlorodifluoroethane 60% Chlorotrifluoromethane 60% Dichlorodifluoromethane 100% Trichlorofluoromethane 90% 1,1,2-Trichloro - 1,2,2-Trifluoroethane 60%	0920 0995 1221 3411 3430
0930	Chloroform 7 sites Carbon Tetrachloride 86% Methyl Chloride 57% Methylene Chloride 100% Perchloroethylene 71%	0810 2560 2620 2860
0950	o-Chloronitrobenzene 2 sites p-Chloronitrobenzene 100% Nitrophenol 100%	0951 2792
0951	p-Chloronitrobenzene 2 sites o-Chloronitrobenzene 100% Nitrophenol 100%	0950 2792
0980	o-Chlorotoluene 2 sites Benzotrichloride 100% Chlorobenzaldehyde 100% Chlorobenzoic Acid 100% Chlorobenzoyl Chloride 100% p-Chlorotoluene 100%	0480 0880 0900 0910 0990
0990	p-Chlorotoluene 2 sites Benzotrichloride 100% Chlorobenzaldehyde 100% Chlorobenzoic Acid 100% Chlorobenzoyl Chloride 100% o-Chlorotoluene 100%	0480 0880 0900 0910 0980
0995	Chlorotrifluoromethane 7 sites Chlorodifluoroethane 71% Chlorodifluoromethane 86% Dichlorodifluoromethane 100% Trichlorofluoromethane 100% 1,1,2-Trichloro - 1,2,2-Trifluoromethane 86%	0920 0921 1221 3411 3430

Table III-1
Chemicals with >50% Commonality (Cont.)

1010	o-Cresol	5 sites	
	Cresols, mixed 100%		1021
	Cresylic Acid 100%		1030
	Phenol 80%		2910
	Xylenol 80%		3580
1020	P-Cresol	2 sites	
1021	Cresols, mixed	5 sites	
	o-Cresol 100%		1010
	Cresylic Acid 100%		1030
	Phenol 80%		2910
	Xylenol 80%		3580
1030	Cresylic Acid	8 sites	
	o-Cresol 63%		1010
	Cresols, mixed 63%		1021
	Phenol 63%		2910
	Xylenol 50%		3580
1060	Cumene	14 sites	
	Benzene 79%		0380
	Propylene 93%		3090
	Toluene 86%		3349
1100	Cyanuric Acid	2 sites	
1120	Cyclohexane	10 sites	
	Benzene 90%		0380
	Propylene 60%		3090
	Toluene 80%		3349
	Xylenes, mixed 50%		3541
1130	Cyclohexanol	8 sites	
	Adipic Acid 63%		0180
	Cyclohexanone 88%		1140
1140	Cyclohexanone	8 sites	
	Adipic Acid 50%		0180
	Cyclohexanol 88%		1130
1150	Cyclohexene	2 sites	
1160	Cyclohexylamine	3 sites	
	Dicyclohexylamine 67%		1280

Table III-1
Chemicals with >50% Commonality (Cont.)

1180	Decanol	4 sites	
	Dodecene 50%		1620
	Ethylene 50%		1770
	Hexadecyl Alcohol 50%		2160
	Isodecanol 50%		2300
	Isooctyl Alcohol 50%		2320
	Propylene 50%		3090
1190	Diacetone Alcohol	4 sites	
	Acetone 75%		0090
	n-Butylacetate 50%		0600
	n-Butyl Alcohol 50%		0640
	n-Butyraldehyde 50%		0750
	Ethanol 50%		1660
	Ethyl Acetate 50%		1670
	2-Ethyl Hexanol 50%		2000
	Isobutanol 50%		2250
	Isopropanol 50%		2360
	Mesityl Oxide 75%		2450
	Methylisobutyl Carbinol 75%		2650
	Methylisobutyl Ketone 75%		2660
	n-Propyl Alcohol 50%		3061
	Propylene 50%		3090
1200	Diaminobenzoic Acid	2 sites	
	Aminobenzoic Acid (m,p) 100%		0220
1210	Dichloroaniline	3 sites	
	o-Chloroaniline 67%		0860
	p-Chloroaniline 67%		0870
1215	m-Dichlorobenzene	3 sites	
	Bromonaphthalene 67%		0580
1216	o-Dichlorobenzene	11 sites	
	Chlorobenzene 73%		0890
	p-Dichlorobenzene 91%		1220
	Trichlorobenzene 55%		3390
1220	P-Dichlorobenzene	10 sites	
	Chlorobenzene 80%		0890
	o-Dichlorobenzene 100%		3390
	Trichlorobenzene 60%		

Table III-1
Chemicals with >50% Commonality (Cont.)

1221	Dichlorodifluoromethane	12 sites	
	Chlorodifluoroethane	50%	0920
	Chlorodifluoromethane	83%	0921
	Chlorotrifluoromethane	58%	0995
	Trichlorofluoromethane	92%	3411
	1,1,2-Trichloro - 1,2,2-Trifluoroethane	50%	3430
1230	1,2-Dichloroethylene	18 sites	
	Ethylene	50%	1770
	Propylene	50%	3090
	Vinyl Chloride	72%	3520
1240	Dichloroethyl Ether	2 sites	
	Tetramethylethylenediamine	100%	3341
1280	Dicyclohexylamine	2 sites	
	Cyclohexylamine	100%	1160
1290	Diethylamine	4 sites	
	Amylamine	50%	0260
	n-Butylamine	75%	0670
	sec-Butylamine	50%	0680
	Ethylamine	100%	1700
	Isopropylamine	100%	2380
	Propylamine	50%	3570
	Triethylamine	100%	3450
1300	Diethylene Glycol	18 sites	
	Ethylene	56%	1770
	Ethylene Glycol	94%	1830
	Ethylene Oxide	78%	1980
	Propylene	56%	3090
	Triethylene Glycol	78%	3460
1305	Diethylene Glycol Diethyl Ether	2 sites	
1310	Diethylene Glycol Monobutyl Ether	5 sites	
	Diethylene Glycol	80%	1300
	Diethylene Glycol Monoethyl Ether	80%	1330
	Diethylene Glycol Monomethyl Ether	80%	1360
	Ethanolamines	60%	1661
	Ethylene	60%	1770
	Ethylene Glycol	80%	1830
	Ethylene Glycol Monobutyl Ether	100%	1890
	Ethylene Glycol Monoethyl Ether	100%	1910
	Ethylene Glycol Monomethyl Ether	100%	1930
	Ethylene Oxide	80%	1980
	Triethylene Glycol	80%	3460

Table III-1
Chemicals with >50% Commonality (Cont.)

1320	Diethylene Glycol Monobutyl Ether Acetate 2 sites	
	Acetaldehyde 100%	0030
	Ethanol 100%	1660
	Ethyl Acetate 100%	1670
	Ethylene Glycol Monoethyl Ether 100%	
	2-Ethyl Hexanol 100%	2000
	Isobutanol 100%	2250
	n-Propyl Alcohol 100%	3061
	Triethylene Glycol 100%	3460
1330	Diethylene Glycol Monoethyl Ether 5 sites	
	Diethylene Glycol 80%	1300
	Diethylene Glycol Monobutyl Ether 80%	1310
	Diethylene Glycol Monomethyl Ether 100%	1360
	Ethylene 60%	1770
	Ethylene Glycol 80%	1830
	Ethylene Glycol Monobutyl Ether 80%	1890
	Ethylene Glycol Monoethyl Ether 80%	1910
	Ethylene Glycol Monomethyl Ether 80%	1930
	Ethylene Oxide 80%	1980
	Triethylene Glycol 80%	3460
1360	Diethylene Glycol Monomethyl Ether 7 sites	
	Diethylene Glycol 86%	1300
	Diethylene Glycol Monobutyl Ether 57%	1310
	Diethylene Glycol Monoethyl Ether 71%	1330
	Ethylene 57%	1770
	Ethylene Glycol 86%	1830
	Ethylene Glycol Monobutyl Ether 57%	1890
	Ethylene Glycol Monoethyl Ether 57%	1910
	Ethylene Glycol Monomethyl Ether 86%	1930
	Ethylene Oxide 86%	1980
	Triethylene Glycol 86%	
1430	Difluoroethane 2 sites	
	Chlorodifluoromethane 100%	0921
	Chlorotrifluoromethane 100%	0995
	Dichlorodifluoromethane 100%	1221
	Trichlorofluoromethane 100%	3411
	1,1,2-Trichloro - 1,2,2-Trifluoroethane 100%	3430
1440	Diisobutylene 4 sites	
	Triisobutylene 75%	3480

Table III-1
Chemicals with >50% Commonality (Cont.)

1450	Diketene	2 sites	
	Acetic Anhydride	100%	0080
	Cellulose Acetate	100%	0820
	Ketene	100%	2410
1460	Dimethylamine	4 sites	
	n,n-Dimethylformamide	50%	1490
	Formaldehyde	50%	2040
	Methylamine	100%	2530
	Trimethylamine	100%	3490
1470	n,n-Dimethylaniline	4 sites	
	n-Methylaniline	50%	2540
	Toluene - 2,4 - Diamine	50%	3350
1490	N,N-Dimethylformamide	3 sites	
	Dimethylamine	67%	1460
	Methylamine	67%	2530
	Trimethylamine	67%	3490
1495	Dimethyl Hydrazine	2 sites	
	Phosgene	100%	2950
1500	Dimethyl Sulfate	2 sites	
1520	Dimethyl Sulfoxide	2 sites	
	Dimethyl Sulfate	50%	1500
1540	3,5-Dinitrobenzoic Acid	3 sites	
	Aminobenzoic Acid (m,p)	67%	0220
	Nitrobenzoic Acid (o,m,p)	67%	2780
1550	Dinitrotoluene	5 sites	
	Phosgene	80%	2950
	2,4-Toluene Diisocyanate	60%	3354
	Toluene Diisocyanates, mixture	60%	3355
1560	Dioxane	4 sites	
	Polyethylene Glycol	50%	3010
	Polypropylene Glycol	50%	3030
	Propylene Glycol	50%	3111
	Toluene Diisocyanates, mixture	50%	3355
	Triethylene Glycol	50%	3460
1580	Diphenylamine	3 sites	
	Aniline	100%	0300
	Nitrobenzene	100%	2770
	Toluene - 2,4-Diamine	67%	3350

Table III-1
Chemicals with >50% Commonality (Cont.)

1590	Diphenyl Oxide	2 sites	
	Cumene 100%		1060
	Ethylbenzene 100%		1710
	Phenol 100%		2910
	Toluene 100%		3349
1610	Dipropylene Glycol	5 sites.	
	1,2-Dichloroethylene 60%		1230
	Diethylene Glycol 80%		1300
	Ethenol Amines 60%		1661
	Ethylene 80%		1770
	Ethylene Dichloride 60%		1820
	Ethylene Glycol 80%		1830
	Ethylene Oxide 80%		1980
	Polyethylene Glycol 60%		3010
	Propylene 60%		3090
	Propylene Dichloride 80%		3110
	Propylene Glycol 100%		3111
	Propylene Oxide 100%		3120
	Triethylene Glycol 80%		3460
1620	Dodecene	11 sites	
	Propylene 91%		3090
1640	Dodecylphenol	3 sites	
	Nonylphenol 100%		2820
1650	Epichlorohydrin	3 sites	
	Acetone 67%		0090
	Allyl Chloride 100%		0210
	Benzene 67%		0380
	Bisphenol-A 67%		0560
	Butadiene 100%		0590
	sec-Butyl Alcohol 67%		0650
	1,2-Dichloroethylene 100%		1230
	Ethyl Chloride 67%		1740
	Ethylene 100%		1770
	Ethylene Dichloride 100%		1820
	Glycerol (Natural & Synthetic) 100%		2090
	Methyl Ethyl Ketone 67%		2640
	Propylene 100%		3090
	1,2,3-Trichloropropane 67%		3420
	Vinyl Chloride 100%		3520
1661	Ethanolamines	6 sites	
	Diethylene Glycol 83%		1300
	Diethylene Glycol Monobutyl Ether 50%		1310
	Dipropylene Glycol 50%		1610

Table III-1
Chemicals with >50% Commonality (Cont.)

1661	Ethanolamines (Cont.)		
	Ethylbenzene 50%	1710	
	Ethylene 67%	1710	
	Ethylene Glycol 83%	1830	
	Ethylene Glycol Monobutyl Ether 50%	1890	
	Ethylene Glycol, Monoethyl Ether 50%	1910	
	Ethylene Glycol Monomethyl Ether 50%	1930	
	Ethylene Oxide 67%	1960	
	Polyethylene Glycol 50%	3010	
	Polypropylene Glycol 50%	3030	
	Propylene 50%	3090	
	Propylene Dichloride 50%	3110	
	Propylene Glycol 50%	3111	
	Propylene Oxide 50%	3120	
	Styrene 50%	3230	
	Triethylene Glycol 83%	3460	
1670	Ethyl Acetate	11 sites	
	Acetic Acid 55%	0070	
1680	Ethyl Acetoacetate	2 sites	
	Methyl Acetoacetate 100%	2520	
1690	Ethyl Acrylate	5 sites	
	Acetic Acid 60%	0070	
	Acrylic Acid 100%	0160	
	n-Butylacrylate 100%	0630	
1700	Ethylamine	4 sites	
	Amylamine 50%	0260	
	n-Butylamine 75%	0670	
	sec-Butylamine 50%	0680	
	Diethylamine 100%	1290	
	Isopropylamine 100%	2380	
	Propylamine 50%	3070	
	Triethylamine 100%	3450	
1710	Ethylbenzene	19 sites	
	Styrene 63%	3230	
	Toluene 68%	3349	
1720	Ethyl Bromide	3 sites	
	Ethylene Dibromide 67%	1810	
1730	Cellulose Acetate	2 sites	

Table III-1
Chemicals With >50% Commonality (Cont.)

1740	Ethyl Chloride	7 sites	
	1,2-Dichloroethylene	86%	1230
	Ethylene Dichloride	86%	1820
	Vinyl Chloride	86%	3520
1750	Ethyl Chloroacetate	3 sites	
	Salicylic Acid	67%	3170
1760	Ethylcyanoacetate	2 sites	
1770	Ethylene	36 sites	
	Propylene	86%	3090
1800	Ethylene Diamine	3 sites	
	Acetic Acid	67%	0070
	Acetylene	100%	0130
	Aminoethylethanolamine	67%	0230
	Benzene	67%	0380
	Butadiene	100%	0590
	1,2-Dichloroethylene	100%	1230
	Diethylene Glycol	100%	1300
	Ethylene	100%	1770
	Ethylene Dichloride	100%	1820
	Ethylene Glycol	67%	1830
	Ethylene Oxide	67%	1980
	Piperazine	67%	2990
	Propylene	100%	3090
	1,1,2-Trichloroethane	67%	3400
	Triethylene Glycol	67%	3460
1820	Ethylene Dichloride	18 sites	
	1,2-Dichloroethylene	100%	1230
	Ethylene	50%	1770
	Propylene	50%	3090
	Vinyl Chloride	72%	3520
1830	Ethylene Glycol	19 sites	
	Diethylene Glycol	89%	1300
	Ethylene Oxide	79%	1980
	Triethylene Glycol	74%	3460
1840	Ethylene Glycol Diacetate	2 sites	
	Acetic Acid	100%	0070
	Acetone	100%	0090
	n-Butyl Acetate	100%	0600
	n-Butyric Acid	100%	0760
	Ethyl Acetate	100%	1670

Table III-1
Chemicals With >50% Commonality (Cont.)

1840	Ethylene Glycol Diacetate (Cont.)	
	Ethylene Glycol Monoethyl Ether Acetate 100%	1940
	Isobutyl Acetate 100%	2260
	Isopropyl Acetate 100%	2370
	Methyl Isobutyl Ketone 100%	2660
1890	Ethylene Glycol Monobutyl Ether 5 sites	
	Diethylene Glycol 80%	1300
	Diethylene Glycol Monobutyl Ether 100%	1310
	Diethylene Glycol Monoethyl Ether 80%	1330
	Diethylene Glycol Monomethyl Ether 80%	1360
	Ethanolamines 60%	1661
	Ethylene 60%	1770
	Ethylene Glycol 80%	1830
	Ethylene Glycol Monoethyl Ether 100%	1910
	Ethylene Glycol Monomethyl Ether 100%	1930
	Ethylene Oxide 80%	1980
	Triethylene Glycol 80%	3460
1910	Ethylene Glycol Monoethyl Ether 6 sites	
	Diethylene Glycol 67%	1300
	Diethylene Glycol Monobutyl Ether 83%	1310
	Diethylene Glycol Monoether Ether 67%	1330
	Diethylene Glycol Monomethyl Ether 67%	1360
	Ethanolamines 50%	1661
	Ethylene 50%	1770
	Ethylene Glycol 67%	1830
	Ethylene Glycol Monobutyl Ether 83%	1890
	Ethylene Glycol Monomethyl Ether 83%	1930
	Ethylene Oxide 67%	1980
	Polyethylene Glycol 50%	3010
	Polypropylene Glycol 50%	3030
	Propylene Glycol 50%	3111
	Triethylene Glycol 83%	3460
1920	Ethylene Glycol Monoethyl Ether Acetate 2 sites	
	Diethylene Glycol 100%	1300
	Diethylene Glycol Monobutyl Ether 100%	1310
	Diethylene Glycol Monobutyl Ether Acetate 100%	1320
	Diethylene Glycol Monoethyl Ether 100%	1330
	Diethylene Glycol Monomethyl Ether 100%	1360
	Ethylene 100%	1770
	Ethylene Glycol 100%	1830
	Ethylene Glycol Monobutyl Ether 100%	1890
	Ethylene Glycol Monoethyl Ether 100%	1910
	Ethylene Glycol Monomethyl Ether 100%	1930
	Ethylene Oxide 100%	1980
	Triethylene Glycol 100%	3460

Table III-1
Chemicals With >50% Commonality (Cont.)

1930	Ethylene Glycol Monomethyl Ether 8 sites	
	Diethylene Glycol 75%	1300
	Diethylene Glycol Monobutyl Ether 63%	1310
	Diethylene Glycol Monoethyl Ether 50%	1330
	Diethylene Glycol Monomethyl Ether 75%	1360
	Ethylene 50%	1770
	Ethylene Glycol 75%	1830
	Ethylene Glycol Monobutyl Ether 63%	1890
	Ethylene Glycol Monoethyl Ether 63%	1910
	Ethylene Oxide 75%	1980
	Triethylene Glycol 75%	3460
1940	Ethylene Glycol Monomethyl Ether Acetate 2 sites	
	Acetic Acid 100%	0070
	Acetone 100%	0090
	n-Butylacetate 100%	0600
	n-Butyric Acid 100%	0760
	Ethyl Acetate 100%	1670
	Ethylene Glycol Diacetate 100%	1840
	Isobutyl Acetate 100%	2260
	Isopropyl Acetate 100%	2370
	Methyl Isobutyl Ketone 100%	2660
1980	Ethylene Oxide 16 sites	
	Diethylene Glycol 88%	1300
	Ethylene 63%	1770
	Ethylene Glycol 94%	1830
	Propylene 56%	3090
	Triethylene Glycol 75%	3460
1990	Ethyl Ether 7 sites	
	Ethanol 57%	1660
2000	2-Ethyl Hexanol 8 sites	
	n-Butyl Alcohol 88%	0640
	n-Butyraldehyde 75%	0750
	Ethylene 50%	1770
	Isobutanol 88%	2250
	Propylene 50%	3090
	Triethylene Glycol 50%	3460
2060	Formic Acid 4 sites	
	Acetic Acid 50%	0070
	Acetic Anhydride 50%	0080
	Ethyl Acetate 50%	1670
	Methyl Ethyl Ketone 50%	2640

Table III-1
Chemicals With >50% Commonality (Cont.)

2070	Fumaric Acid Maleic Anhydride 50% Sodium Benzoate 50%	6 sites	
			2430
			3181
2100	Glycerol Tri(Polyoxypropylene) Ether Ethylene Glycol 50% Polypropylene Glycol 100%	4 sites	
			1830
			3030
2120	Glyoxal	2 sites	
2140	Heptene None 50%	4 sites	
			2810
2145	Hexachlorobenzene Hexachloroethane 50%	2 sites	
			2150
2160	Hexadecyl Alcohol Glycerol 60%	5 sites	
			2090
2165	Hexamethylenediamine Adipic Acid 83% Adiponitrile 83% Cyclohexanol 50% Cyclohexanone 50%	6 sites	
			0180
			0185
			1130
			1140
2180	Hexamethylene Tetramine Formaldehyde 75%	8 sites	
			2040
2200	Hydroquinone Acetone 67%	3 sites	
			0070
2210	p-Hydroxybenzoic Acid Sodium Benzoate 100%	2 sites	
			3181
2240	Isoamylene	2 sites	
2250	Isobutanol Acetone 50% n-Butyl Alcohol 75% n-Butyraldehyde 63% Ethanol 50% Ethylene 50% 2-Ethyl Hexanol 88% Isobutyraldehyde 50% Propylene 50%	8 sites	
			0090
			0640
			0750
			1660
			1770
			2000
			2270
			3090

Table III-1
Chemicals With >50% Commonality (Cont.)

2260	Isobutyl Acetate	4 sites	
	Acetic Acid 75%		0070
	Acetic Anhydride 50%		0080
	Acetone 75%		0090
	n-Butylacetate 75%		0600
	n-Butyric Acid 50%		0760
	Ethanol 50%		1660
	Ethyl Acetate 75%		1670
	Ethylene Glycol Diacetate 50%		1840
	Ethylene Glycol Monomethyl Ether Acetate 50%		1940
	Ethyl Ether 50%		1990
	Isobutanol		2250
	Isopropyl Acetate 75%		2370
	Methylisobutyl Ketone 50%		2660
	Propionic Acid 50%		3060
	n-Propyl Alcohol 50%		3061
2261	Isobutylene	5 sites	
	Butadiene 60%		0590
	Propylene 60%		3090
2270	Isobutyraldehyde	5 sites	
	n-Butyl Alcohol 80%		0640
	n-Butyraldehyde 80%		0750
	Diethylene Glycol 60%		1300
	Ethyl Acetate 60%		1670
	Ethylene 60%		1770
	2-Ethyl Hexanol 60%		2000
	Isobutanol 80%		2250
	n-Propyl Alcohol 60%		3061
	Propylene 60%		3090
2300	Isodecanol	2 sites	
	Decanol 100%		1180
	Isooctyl Alcohol 100%		2320
2320	Isooctyl Alcohol	2 sites	
	Decanol 100%		1180
	Isodecanol 100%		2300
2321	Isopentane	3 sites	
	Benzene 67%		0380
	n-Pentane 67%		2851
2330	Isophorone	2 sites	
	Acetone 100%		0090
	Mesityl Oxide 100%		2450
	Methyl Isobutyl Ketone 100%		2660

Table III-1
Chemicals With >50% Commonality (Cont.)

2350	Isoprene	6 sites	
	Benzene 50%		0380
	Butadiene 50%		0590
2360	Isopropanol	5 sites	
	Acetone 60%		0090
	Butadiene 80%		0590
	Ethylene 60%		1770
	Propylene 100%		3090
2370	Isopropyl Acetate	3 sites	
	Acetic Acid 100%		0070
	Acetic Anhydride 67%		0080
	Acetone 100%		0090
	n-Butyl Acetate 100%		0600
	n-Butyric Acid 67%		0760
	Ethanol 67%		1660
	Ethyl Acetate 100%		1670
	Ethylene Glycol Diacetate 67%		1840
	Ethylene Glycol Monomethyl Ether Acetate 67%		1940
	Ethyl Ether 67%		1990
	Isobutanol 67%		2250
	Isobutyl Acetate 100%		2260
	Methyl Isobutyl Ketone 67%		2660
	Propionic Acid 67%		3060
	n-Propyl Alcohol 67%		3061
2380	Isopropylamine (mono)	4 sites	
	Amylamine 50%		0260
	n-Butylamine 75%		0670
	sec-Butylamine 50%		0680
	Diethylamine 100%		1290
	Ethylamine 100%		1700
	Propylamine 50%		3070
	Triethylamine 100%		3450
2400	Isopropylphenol	2 sites	
	tert-Butylphenol 100%		0730
2410	Ketene	2 sites	
	Acetic Anhydride 100%		0080
	Cellulose Acetate 100%		0820
	Diketene 100%		1450
2450	Mesityl Oxide	4 sites	
	Acetone 100%		0090
	sec-Butyl Alcohol 50%		0650

Table III-1
Chemicals With >50% Commonality (Cont.)

2450	Mesityl Oxide (Cont.)		
	Diacetone Alcohol 75%	1190	
	Ethanol 50%	1660	
	2-Ethyl Hexanol 50%	2000	
	Isobutanol 50%	2250	
	Isophorone 50%	2330	
	Isopropanol 50%	2360	
	Methyl Ethyl Ketone 50%	2640	
	Methyl Isobutyl Carbinol 75%	2650	
	Methyl Isobutyl Ketone 100%	2660	
	Propylene 75%	3090	
2455	Metanilic Acid	2 sites	
2460	Methacrylic Acid	3 sites	
	Methyl Methacrylate 100%		
2490	Methallyl Chloride	2 sites	
2520	Methyl Acetoacetate	2 sites	
	Ethyl Acetoacetate 100%	1680	
2530	Methylamine	5 sites	
	Dimethylamine 80%	1460	
	Formaldehyde 60%	2040	
	Trimethylamine 80%	3490	
2540	n-Methylaniline	2 sites	
	n,n-Dimethylaniline 100%	1470	
2550	Methyl Butanol	5 sites	
	Amyl Alcohols 80%	0250	
	Ethanol 60%	1660	
2620	Methylene Chloride	8 sites	
	Carbon Tetrachloride 75%	0810	
	Chloroform 88%	0930	
	Methyl Chloride 63%	2560	
	Perchloroethylene 63%	2860	
2630	Methylene Dianiline	3 sites	
	Nitrobenzene 67%	2770	
	Phosgene 67%	2950	
	Toluene Diisocyanates (mixture) 67%	3355	
2645	Methyl Formate	2 sites	

Table III-1
Chemicals With >50% Commonality (Cont.)

2650	Methylisobutyl Carbinol	3 sites	
	Acetone 100%		0090
	Diacetone Alcohol 100%		1190
	Ethanol 67%		1660
	2-Ethyl Hexanol 67%		2000
	Isobutanol 67%		2250
	Isopropanol 67%		2360
	Mesityl Oxide 100%		2450
	Methylisobutyl Ketone 100%		2660
	Propylene 67%		3090
2660	Methylisobutyl Ketone	5 sites	
	Acetone 100%		0090
	Diacetone Alcohol 100%		1190
	Mesityl Oxide 80%		2450
	Methylisobutyl Carbinol 60%		2650
	Propylene 60%		3090
2690	<i>a</i> -Methylstyrene	7 sites	
	Acetone 86%		0090
	Acetophenone 57%		0120
	Phenol 100%		2910
2750	Neopentanoic Acid	2 sites	
2760	Nitroanisole	2 sites	
	Anisidine 100%		0320
2770	Nitrobenzene	9 sites	
	Aniline 78%		0300
2780	Nitrobenzoic Acid (m,o,p)	4 sites	
	Aminobenzoic Acid (m,p) 50%		0220
	3,5 - Dinitrobenzoic Acid 50%		1540
2800	Nitrotoluene	2 sites	
	Toluidines 100%		3381
2810	Nonene	7 sites	
	Benzene 57%		0380
	Dodecene 71%		1620
	Propylene 86%		3090
2830	Octylphenol	5 sites	
	Nonylphenol 100%		2820

Table III-1
Chemicals With >50% Commonality (Cont.)

2840	Paraldehyde	2 sites	
2850	Pentaerythritol	4 sites	
	Formaldehyde 75%		2040
	Sodium Formate 75%		3200
2851	n-Pentane	3 sites	
	Isopentane 67%		2321
2860	Perchloroethylene	11 sites	
	Carbon Tetrachloride 64%		0810
	1,2-Dichloroethylene 55%		1230
	Ethylene Dichloride 55%		1820
2900	p-Phenetidine	3 sites	
	Anisidine 67%		0320
2910	Phenol	18 sites	
	Acetone 56%		0090
2981	β -Picoline	2 sites	
	Pyridine 100%		3130
2990	Piperazine	4 sites	
	Acetic Acid 50%		0070
	Acetylene 50%		0130
	Aminoethylethanolamine 50%		0230
	Butadiene 50%		0590
	1,2-Dichloroethylene 50%		1230
	Diethylene Glycol 50%		1300
	Ethylene 50%		1770
	Ethylene Diamine 50%		1800
	Ethylene Dichloride 50%		1820
	Propylene 50%		3010
3000	Polybutenes	6 sites	
	Propylene 83%		3090
3010	Polyethylene Glycol	7 sites	
	Polypropylene Glycol 71%		3030
	Propylene Dichloride 57%		3110
	Propylene Glycol 57%		3111
	Propylene Oxide 57%		3120
	Triethylene Glycol 57%		3460

Table III-1
Chemicals With >50% Commonality (Cont.)

3050	Propionaldehyde	3 sites	
	Acetylene 67%		0130
	Butadiene 67%		0590
	n-Butyl Alcohol 67%		0640
	n-Butyraldehyde 67%		0750
	Diethylene Glycol 100%		1300
	Ethanol 67%		1660
	Ethyl Acetate 67%		1670
	Ethylene 100%		1770
	Ethylene Glycol 67%		1830
	Ethylene Oxide 67%		1980
	2-Ethyl Hexanol 67%		2000
	Isobutanol 67%		2250
	Isobutyraldehyde 67%		2270
	n-Propyl Alcohol 67%		3061
	Propylene 100%		3090
	Triethylene Glycol 67%		3460
3060	Propionic Acid	4 sites	
	Acetic Acid 75%		0070
	Acetic Anhydride 75%		0080
	Acetone 50%		0090
	n-Butylacetate 50%		0600
	n-Butyric Acid 50%		0760
	Ethyl Acetate 75%		1670
	Isobutyl Acetate 50%		2260
	Isopropyl Acetate 50%		2370
3061	n-Propyl Alcohol	4 sites	
	Acetaldehyde 50%		0030
	Acetic Acid 50%		0070
	Acetone 50%		0090
	n-Butylacetate 75%		0600
	n-Butyl Alcohol 50%		0640
	n-Butyraldehyde 50%		0750
	Diacetone Alcohol 50%		1190
	Diethylene Glycol 50%		1300
	Diethylene Glycol Monobutyl Ether Acetate 50%		1320
	Ethanol 75%		1660
	Ethyl Acetate 100%		1670
	Ethylene 50%		1770
	Ethylene Glycol Monoethyl Ether 50%		1910
	Ethyl Ether 50%		1990
	2-Ethyl Hexanol 50%		2000
	Isobutanol 75%		2250
	Isobutyl Acetate 50%		2260

Table III-1
Chemicals With >50% Commonality (Cont.)

3061	n-Propyl Alcohol (Cont.)		
	Isobutyraldehyde 75%		2270
	Isopropylacetate 50%		2370
	Propionaldehyde 50%		3050
	Propylene 50%		3090
	Triethylene Glycol 50%		3460
3070	Propylamine	2 sites	
	Amylamine 100%		0260
	n-Butylamine 100%		0670
	sec-Butylamine 100%		0680
	Diethylamine 100%		1290
	Ethylamine 100%		1700
	Isopropylamine 100%		2380
	Triethylamine 100%		3450
3090	Propylene	62 sites	
	Ethylene 50%		1770
3100	Propylene Chlorohydrin	2 sites	
	Bromonaphthalene 100%		0580
	Chlorophenols 100%		0960
3110	Propylene Dichloride	5 sites	
	1,2-Dichloroethylene 60%		1230
	Diethylene Glycol 80%		1300
	Dipropylene Glycol 80%		1610
	Ethanolamines 60%		1661
	Ethylene 80%		1770
	Ethylene Dichloride 60%		1820
	Ethylene Glycol 80%		1830
	Ethylene Oxide 80%		1980
	Polyethylene Glycol 80%		3010
	Polypropylene Glycol 60%		3030
	Propylene 60%		3090
	Propylene Glycol 80%		3111
	Propylene Oxide 100%		3120
	Triethylene Glycol 80%		3460
3111	Propylene Glycol	6 sites	
	1,2-Dichloroethylene 50%		1230
	Diethylene Glycol 67%		1300
	Dipropylene Glycol 83%		1610
	Ethanolamines 50%		1661
	Ethylene 67%		1770
	Ethylene Dichloride 50%		1820
	Ethylene Glycol 67%		1830

Table III-1
Chemicals With >50% Commonality (Cont.)

3111	Propylene Glycol (Cont.)		
	Ethylene Glycol Monoethyl Ether 50%	1910	
	Ethylene Oxide 67%	1980	
	Polyethylene Glycol 67%	3010	
	Polypropylene Glycol 50%	3030	
	Propylene 50%	3090	
	Propylene Dichloride 67%	3110	
	Propylene Oxide 83%	3120	
	Triethylene Glycol 83%	3400	
3120	Propylene Oxide 6 sites		
	1,2-Dichloroethylene 50%	1230	
	Diethylene Glycol 67%	1300	
	Dipropylene Glycol 83%	1610	
	Ethanolamine 50%	1661	
	Ethylene 67%	1770	
	Ethylene Dichloride 50%	1820	
	Ethylene Glycol 67%	1830	
	Ethylene Oxide 67%	1980	
	Polyethylene Glycol 67%	3010	
	Polypropylene Glycol 50%	3030	
	Propylene 50%	3090	
	Propylene Dichloride 83%	3110	
	Propylene Glycol 83%	3111	
	Triethylene Glycol 67%	3460	
3140	Quinone 2 sites		
	Benzoquinone 100%	0470	
3160	Resorcylic Acid 2 sites		
3170	Salicylic Acid 4 sites		
	Ethyl Chloroacetate 50%	1750	
	Fumaric Acid 50%	2070	
	Sodium Benzoate 50%	3181	
3181	Sodium Benzoate 5 sites		
	Fumaric Acid 60%	2070	
3200	Sodium Formate 4 sites		
	Formaldehyde 75%	2040	
	Pentaerythritol 75%	2850	
3230	Styrene 13 sites		
	Ethylbenzene 92%	1710	
	Propylene 54%	3090	
	Toluene 62%	3349	

Table III-1
Chemicals With >50% Commonality (Cont.)

3240	Succinic Acid	2 sites	
3250	Succinonitrile Bromonaphthalene 100%	2 sites	0580
3260	Sulfolane Butadiene 100%	2 sites	0590
3280	Terephthalic Acid Dimethyl Terephthalate 100%	3 sites	1530
3310	Tetraethyl Lead Ethyl Chloride 50%	6 sites	1740
3341	Tetramethylethylenediamine Dichloroethyl Ether 50%	4 sites	1240
3349	Toluene Benzene 90% Xylenes, mixed 62%	50 sites	0380 3541
3354	2,4-Toluene Diisocyanate Dinitrotoluene 50% Phosgene 83% Toluene Diisocyanates, mixture 50%	6 sites	1550 2950 3355
3355	Toluene Diisocyanates, mixture Phosgene 75%	8 sites	2950
3381	Toluidines Nitrotoluene 67%	3 sites	2800
3390	Trichlorobenzene Chlorobenzene 86% o-Dichlorobenzene 36% p-Dichlorobenzene 86%	7 sites	0890 1216 1220
3395	1,1,1-Trichloroethane Carbon Tetrachloride 67% Chloroform 67% 1,2-Dichloroethylene 100% Ethyl Chloride 67% Ethylene Dichloride 100% Methylene Chloride 67% Perchloroethylene 100% Trichloroethylene 67% Vinyl Chloride 67% Vinylidene Chloride 67%	3 sites	0810 0930 1230 1740 1820 2620 2860 3410 3520 3530

Table III-1
Chemicals With >50% Commonality (Cont.)

3400	1,1,2-Trichloroethane 3 sites	
	Acetylene 67%	0130
	Aminoethyllethanolamine 67%	0230
	Butadiene 67%	0590
	1,2-Dichloroethylene 67%	1230
	Diethylene Glycol 67%	1300
	Ethylene 67%	1770
	Ethylene Diamine 67%	1800
	Ethylene Dichloride 67%	1820
	Propylene 67%	3090
3401	Trichloroethylene 5 sites	
	1,2-Dichloroethylene 80%	1230
	Ethyl Chloride 60%	1740
	Ethylene Dichloride 80%	1820
	Perchloroethylene 1-0%	2860
	Vinyl Chloride 60%	3520
3411	Trichlorofluoromethane 11 sites	
	Chlorodifluoroethane 55%	0920
	Chlorodifluoromethane 82%	9021
	Chlorotrifluoromethane 64%	0995
	Dichlorodifluoromethane 100%	1221
	1,1,2-Trichloro - 1,2,2-Trifluoroethane 55%	3430
3420	1,2,3-Trichloropropane 2 sites	
	Allyl Chloride 100%	0210
	Benzene 100%	0380
	Bisphenol-A 100%	0560
	Butadiene 100%	0590
	1,2-Dichloroethylene 100%	1230
	Epichlorohydrin 100%	1650
	Ethyl Chloride 100%	1740
	Ethylene 100%	1770
	Ethylene Dichloride 100%	1820
	Glycerol (natural & synthetic) 100%	2090
	Propylene 100%	3090
	Vinyl Chloride 100%	3520
3430	1,1,2-Trichloro - 1,2,2-Trifluoroethene 6 sites	
	Chlorodifluoroethane 83%	0920
	Chlorodifluoromethane 100%	0921
	Chlorotrifluoromethane 100%	0995
	Dichlorodifluoromethane 100%	1221
	Trichlorofluoromethane 100%	3411

Table III-1
Chemicals With >50% Commonality (Cont.)

3450	Triethylamine	4 sites	
	Amylamine 50%		0260
	n-Butylamine 75%		0670
	sec-Butylamine 50%		0680
	Diethylamine 100%		1290
	Ethylamine 100%		1700
	Isopropylamine 100%		2380
	Propylamine 50%		3070
3460	Triethylene Glycol	15 sites	
	Diethylene Glycol 93%		1300
	Ethylene 53%		1770
	Ethylene Glycol 93%		1830
	Ethylene Oxide 80%		1980
3480	Triisobutylene	3 sites	
	Diisobutylene 100%		1440
3490	-Trimethylamine	4 sites	
	Dimethylamine 100%		1460
	n,n-Dimethylformamide 50%		1490
	Formaldehyde 50%		2090
	Methylamine 100%		2530
3510	Vinyl Acetate	7 sites	
	Acetic Acid 57%		0070
3520	Vinyl Chloride	15 sites	
	1,2-Dichloroethylene 87%		1230
	Ethylene Dichloride 87%		1820
3530	Vinylidene Chloride	3 sites	
	Carbon Tetrachloride 67%		0810
	Chloroform 67%		0930
	1,2-Dichloroethylene 100%		1230
	Diethylene Glycol 67%		1300
	Dipropylene Glycol 67%		1610
	Ethyl Chloride 67%		1740
	Ethylene 67%		1770
	Ethylene Dichloride 100%		1820
	Ethylene Glycol 67%		1830
	Ethylene Oxide 67%		1980
	Methylene Chloride 67%		2620
	Perchloroethylene 100%		2680
	Propylene 67%		3090
	Propylene Dichloride 67%		3110
	Propylene Glycol 67%		3111

Table III-1
Chemicals With >50% Commonality (Cont.)

3530	Vinylidene Chloride (Cont.)		
	Propylene Oxide 67%	3120	
	1,1,2-Trichloroethane 67%	3395	
	Trichloroethylene 67%	3410	
	Triethylene Glycol 67%	3460	
	Vinyl Chloride 100%	3520	
3540	Vinyl Toluene	2 sites	
	Ethylbenzene 100%	1710	
	Styrene 100%	3230	
	Toluene 100%	3349	
3541	Xylenes, mixed	36 sites	
	Benzene 92%	0380	
	Toluene 86%	3349	
3560	o-Xylene	12 sites	
	Benzene 92%	0380	
	Ethylbenzene 50%	1710	
	Propylene 67%	3090	
	Toluene 83%	3349	
	Xylenes, mixed 75%	3541	
	p-Xylene 67%	3570	
3570	p-Xylene	14 sites	
	Benzene 64%	0380	
	Propylene 57%	3090	
	Toluene 57%	3349	
	Xylenes, mixed 57%	3541	
	o-Xylene 57%	3560	
3580	Xylenol	7 sites	
	o-Cresol 57%	1010	
	Cresols, mixed 57%	1021	
	Cresylic Acid 57%	1030	

TABLE III-2
CHEMICAL WITH ONE PRODUCTION SITE

<u>NUMBER</u>	<u>NAME</u>
0020	Acetal
0040	Acetaldol
0270	Amyl Chloride
0280	Amyl Mercaptens
0310	Aniline hydrochloride
0390	Benzenedisulfonic Acid
0440	Benzoin
0450	Benzonitrile
0540	Benzyl dichloride
0570	Bromobenzene
0700	p-tert-Butylbenzoic Acid
0710	1,3-Butylene glycol
0770	n-Butyric Anhydride
0780	n-Butyronitrile
0850	m-Chloroaniline
0940	Chloronaphthalene
0970	m-Chlorotoluene
1000	m-Cresol
1040	Crotonaldehyde
1050	Crotonic Acid
1080	Cyanoacetic Acid
1090	Cyanogen Chloride
1170	Cyclooctadiene
1250	Dichlorohydrin
1270	Dichloropropene
1304	Diethylene glycol diethylether
1340	Diethylene Glycol Monoethyl Ether Acetate

TABLE III-2 (Continued)

<u>NUMBER</u>	<u>NAME</u>
1420	Diethyl Sulfate
1480	Dimethyl Ether
1545	2,4-Dinitrophenol
1570	Dioxolane
1630	Dodecylaniline
1780	Ethylene Carbonate
1790	Ethylene Chlorohydrin
1870	Ethylene Glycol Dimethyl Ether
1900	Ethylene Glycol Monophenyl Ether Acetate
1960	Ethylene Glycol Monophenyl Ether
1970	Ethylene Glycol Monoproyl Ether
2010	Ethyl Orthoformate
2020	Ethyl Oxalate
2030	Ethyl Sodium Oxalacetate
2050	Formamide
2091	Glycerol Dichlorohydrin
2110	Glycine
2150	Hexachlorobenzene
2170	Hexamethylene Glycol
2280	Isobutyric Acid
2340	Isophthalic Acid
2390	Isopropyl Chloride
2420	Maleic Acid
2570	Methylcyclohexane
2590	Methylcyclohexanone
2670	Methylpentynel
2700	Morpholine
2720	β -Naphthalene Sulfuric Acid
2730	α -Naphthol

TABLE III-2 (Continued)

<u>NUMBER</u>	<u>NAME</u>
2740	β -Naphthol
2756	α -nitroaniline
2790	Nitroethane
2791	Nitromethane
2793	Nitropropane
2855	i-Pentene
2882	Perchloromethyl Mercaptan
2890	α -Phenetidine
2930	Phenyl Anthranilic Acid
2970	Phthalimide
3080	Propyl Chloride
3150	Resorcinol
3191	Sodium Chlonacetate
3251	Sulfanilic Acid
3290	Tetrachloroethane
3300	Tetrachlorophthalic Anhydride
3320	Tetrahydronaphthalene
3330	Tetrahydropthalic Anhydride
3340	Tetramethylenediamine
3360	Toluenesulfonamide
3470	Triethylene Glycol Dimethyl Ether

TABLE III-3
COMMONALITY OF CHEMICALS WITH TWO PRODUCTION SITES

CHEMICAL NUMBER	CHEMICAL	COMMONALITY WITH INITIAL CHEMICAL	CHEMICAL AND NUMBER	RECIPROCAL COMMONALITY
0680	sec-Butylamine	100%	Propylamine 3070	(100%)
0880	Chlorobenzaldehyde	100%	o-chlorotoluene 0980	(100%)
0880	Chlorobenzaldehyde	100%	p-Chlorotoluene 0990	(100%)
0910	Chlorobenzoyl chloride	100%	o-Chlorotoluene 0980	(100%)
0910	Chlorobenzoyl chloride	100%	p-Chlorotoluene 0990	(100%)
0950	o-Chloronitrobenzene	100%	p-Chloronitrobenzene 0951	(100%)
0980	o-Chlorotoluene	100%	p-Chlorotoluene 0990	(100%)
1450	Diketene	100%	Ketene 2410	(100%)
1680	Ethyl Acetate	100%	Methyl Acetoacetate 2520	(100%)
1840	Ethylene Glycol Diacetate	100%	Ethylene Glycol Monomethyl Ether Acetate 1940	(100%)
2300	Isodecanol	100%	Isooctyl Alcohol 2320	(100%)
0680	sec-Butylamine	100%	Amylamine 0260	(67%)
0680	sec-Butylamine	100%	n-Butylamine 0670	(67%)
0860	o-Chloroaniline	100%	Dichloroaniline 1210	(67%)
0870	p-Chloroaniline	100%	Dichloroaniline 1210	(67%)
0880	Chlorobenzaldehyde	100%	Benzotrichloride 0480	(67%)
0880	Chlorobenzaldehyde	100%	Chlorobenzoic Acid 0900	(67%)
0910	Chlorobenzoyl Chloride	100%	Benzotrichloride 0480	(67%)
0910	Chlorobenzoyl Chloride	100%	Chlorobenzoic Acid 0900	(67%)
0980	o-Chlorotoluene	100%	Benzotrichloride 0480	(67%)
0980	o-Chlorotoluene	100%	Chlorobenzoic Acid 0900	(67%)
0990	p-Chlorotoluene	100%	Benzotrichloride 0480	(67%)
0990	p-Chlorotoluene	100%	Chlorobenzoic Acid 0900	(67%)

TABLE III-3
COMMONALITY OF CHEMICALS WITH TWO PRODUCTION SITES
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>
1280	Dicyclohexylamine	100%	Cyclohexylamine 1160	(67%)
1840	Ethylene Glycol Diacetate	100%	n-Butyric Acid 0760	(67%)
1840	Ethylene Glycol Diacetate	100%	Isopropyl Acetate	(67%)
1940	Ethylene Glycol Monomethyl Ether Acetate	100%	n-Butyric Acid 0760	(67%)
1940	Ethylene Glycol Monomethyl Ether Acetate	100%	Isopropyl Acetate 2370	(67%)
2800	Nitrotoluene	100%	Toluidines 3381	(67%)
3070	Propylamine	100%	Amylamine 0260	(67%)
3070	Propylamine	100%	n-Butylamine 0670	(67%)
3100	Propylene Chlorohydrin	100%	Bromonaphthalene 0580	(67%)
3430	1,2,3-Trichloropropane	100%	Allyl chloride 0210	(67%)
3420	1,2,3-Trichloropropane	100%	Epichlorohydrin 1650	(67%)
0680	sec-Butylamine	100%	Diethylamine 1290	(50%)
0680	sec-Butylamine	100%	Ethylamine 1700	(50%)
0680	sec-Butylamine	100%	Isopropylamine 2380	(50%)
0680	sec-Butylamine	100%	Triethylamine 3450	(50%)
1240	Dichloroethyl Ether	100%	Tetramethylethylenediamine 3341	(50%)
1320	Diethylene Glycol Monobutyl Ether Acetate	100%	n-Propyl Alcohol 3061	(50%)
1940	Ethylene Glycol Monomethyl Ether Acetate	100%	Isobutyl Acetate 2260	(50%)
2300	Isodecanol	100%	Decanol 1180	(50%)
2320	Isooctyl Alcohol	100%	Decanol 1180	(50%)
2330	Isophorone	100%	Mesityl Oxide 2450	(50%)

TABLE III-3
COMMONALITY OF CHEMICALS WITH TWO PRODUCTION SITES
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>
2540	n-Methylaniline	100%	Dimethylaniline 1470	(50%)
3070	Propylamine	100%	Diethylamine 1270	(50%)
3070	Propylamine	100%	Ethylamine 1700	(.50%)
3070	Propylamine	100%	Isopropylamine 2380	(50%)
3070	Propylamine	100%	Triethylamine 3450	(50%)
0100	Acetone Cyanohydrin	100%	Hydrogen Cyanide 2190	(<50%)
0100	Acetone Cyanohydrin	100%	Methyl Methacrylate 2665	(<50%)
0110	Acetonitrile	100%	Propylene 3090	(<50%)
0140	Acrolein	100%	Butadiene 0590	(<50%)
0140	Acrolein	100%	1,2-Dichloroethylene 1230	(<50%)
0140	Acrolein	100%	Ethylene 1770	(<50%)
0140	Acrolein	100%	Propylene 3090	(<50%)
0200	Allyl Alcohol	100%	Glycerol 2090	(<50%)
0690	tert-Butylamine	100%	Hydrogen Cyanide 2190	(<50%)
0690	tert-Butylamine	100%	Methanol 2500	(<50%)
0860	o-Chloroaniline	100%	p-Chloroaniline 0870	(<50%)
0950	o-Chloronitrobenzene	100%	Nitrophenol 2792	(<50%)
0951	p-Chloronitrobenzene	100%	Nitrophenol 2792	(<50%)
1200	Diaminobenzoic Acid	100%	Aminobenzoic Acid (m,p) 0220	(<50%)
J320	Diethylene Glycol Monobutyl Ether Acetate	100%	Acetaldehyde 0030	(<50%)

TABLE III-3

COMMONALITY OF CHEMICALS WITH TWO PRODUCTION SITES
Continued

CHEMICAL NUMBER	CHEMICAL	COMMONALITY WITH INITIAL CHEMICAL	CHEMICAL AND NUMBER	RECIPROCAL COMMONALITY
1320	Diethylene Glycol Monobutyl Ether Acetate	100%	Acetaldehyde 0030	(<50%)
1320	Diethylene Glycol Monobutyl Ether Acetate	100%	Ethyl Acetate 1670	(<50%)
1320	Diethylene Glycol Monobutyl Ether Acetate	100%	Ethylene Glycol Monoethyl Ether 1910	(<50%)
1320	Diethylene Glycol Monobutyl Ether Acetate	100%	2-Ethyl Hexanol 2000	(<50%)
1320	Diethylene Glycol Monobutyl Ether Acetate	100%	Isobutanol 2250	(<50%)
1320	Diethylene Glycol Monobutyl Ether Acetate	100%	Triethylene Glycol 3460	(<50%)
1430	Difluoroethane	100%	Chlorodifluoromethane 0921	(<50%)
1430	Difluoroethane	100%	Chlorotrifluoromethane 0995	(<50%)
1430	Difluoroethane	100%	Dichlorodifluoromethane 1221	(<50%)
1430	Difluoroethane	100%	Trichlorofluoromethane 3411	(<50%)
1430	Difluoroethane	100%	1,1,2-Trichloro-1,2,2-Trifluoroethane 3430	(<50%)
1450	Diketene	100%	Acetic Anhydride 0080	(<50%)
1450	Diketene	100%	Cellulose Acetate 0820	(<50%)
1495	Dimethyl Hydrazine	100%	Phosgene 2950	(<50%)
1590	Diphenyl Oxide	100%	Cumene 1060	(<50%)
1590	Diphenyl Oxide	100%	Ethylbenzene 1710	(<50%)
1590	Diphenyl Oxide	100%	Phenol 2910	(<50%)
1590	Diphenyl Oxide	100%	Toluene 3349	(<50%)
1840	Ethylene Glycol Diacetate	100%	Acetic Acid 0070	(<50%)

TABLE III-3

COMMONALITY OF CHEMICALS WITH TWO PRODUCTION SITES
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>
1840	Ethylene Glycol Diacetate	100%	Acetone 0090	(<50%)
1840	Ethylene Glycol Diacetate	100%	Ethyl Acetate 1670	(<50%)
1840	Ethylene Glycol Diacetate	100%	Isobutyl Acetate 226	(<50%)
1840	Ethylene Glycol Diacetate	100%	Methyl Isobutyl Ketone 2660	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Diethylene Glycol 1300	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Diethylene Glycol Monobutyl Ether 1310	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Diethylene Glycol Monobutyl Ether Acetate 1320	(<50%)
1920	Ethylene Glycol Monoethyl Ether Ether Acetate	100%	Diethylene Glycol Monoethyl Ether 1330	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Diethylene Glycol Monomethyl Ether 1360	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Ethylene 1770	(<50%)
1920	Ethylene Glycol Monoethyl Ether Ether Acetate	100%	Ethylene Glycol 1830	(<50%)
1920	Ethylene Glycol Monoethyl Ether Ether Acetate	100%	Ethylene Glycol Monobutyl Ether 1890	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Ethylene Glycol Monoethyl Ether 1910	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Ethylene Glycol Monomethyl Ether	(<50%)
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Ethylene Oxide 1980	(<50%)

TABLE III-3

COMMONALITY OF CHEMICALS WITH TWO PRODUCTION SITES

Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>
1920	Ethylene Glycol Monoethyl Ether Acetate	100%	Triethylene Glycol 3460	(<50%)
1940	Ethylene Glycol Monoethyl Ether Acetate	100%	Acetic Acid 0070	(<50%)
1940	Ethylene Glycol Monomethyl Ether Acetate	100%	Acetone 0090	(<50%)
1940	Ethylene Glycol Monomethyl Ether Acetate	100%	n-butylacetate 0600	(<50%)
1940	Ethylene Glycol Monomethyl Ether Acetate	100%	Ethyl Acetate 1670	(<50%)
1940	Ethylene Glycol Monomethyl Ether Acetate	100%	Methyl Isobutyl Ketone 2660	(<50%)
2210	p-hydroxybenzoic Acid	100%	Sodium Benzoate 3181	(<50%)
2330	Isophorone	100%	Acetone 0090	(<50%)
2330	Isophorone	100%	Methyl Isobutyl Ketone 2660	(<50%)
2400	Isopropylphenol	100%	tert-Butylphenol 0730	(<50%)
2410	Ketene	100%	Acetic Anhydride 0080	(<50%)
2410	Ketene	100%	Cellulose Acetate 0820	(<50%)
2760	Nitroanisole	100%	Anisidine 0320	(<50%)
2981	B-Picoline	100%	Pyridine 3130	(<50%)
3100	Propylene Chlorohydrin	100%	Chlorophenols 0960	(<50%)
3250	Succinonitrile	100%	Bromonaphthanene 0580	(<50%)
3260	Sulfolane	100%	Butadine 0590	(<50%)
3420	1,2,3-Trichloropropane	100%	Benzene 0380	(<50%)

TAB 11
COMMONALITY CHEMICALS WITH TWO PRODUCTION SITES
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>
3420	1,2,3-Trichloropropane	100%	Bisphenol-A 0560	(<50%)
3420	1,2,3-Trichloropropane	100%	Butadiene 0590	(<50%)
3420	1,2,3-Trichloropropane	100%	1,2-Dichloroethylene 1230	(<50%)
3420	1,2,3-Trichloropropane	100%	Ethyl Chloride 1740	(<50%)
3420	1,2,3-Trichloropropane	100%	Ethylene 1770	(<50%)
3420	1,2,3-Trichloropropane	100%	Glycerol (natural and synthetic) 2090	(<50%)
3420	1,2,3-Trichloropropane	100%	Propylene 3090	(<50%)
3420	1,2,3-Trichloropropane	100%	Vinyl Chloride 3520	(<50%)
3540	Vinyl Toluene	100%	Ethylbenzene 1710	(<50%)
3540	Vinyl Toluene	100%	Styrene 3230	(<50%)
3540	Vinyl Toluene	100%	Toluene 3349	(<50%)

TABLE III-4
CHEMICALS WITH <50% COMMONALITY

<u>NUMBER</u>	<u>NAME</u>
0060	Acetanilide
0090	Acetone
0130	Acetylene
0150	Acrylamide
0190	Alkylnaphthalenes (methyl)
0220	Aminobenzoic Acid (m,p)
0320	Anisidine
0330	Anisole
0460	Benzophenone
0510	Benzylamine
0520	Benzyl Benzoate
0530	Benzyl Chloride
0550	Biphenyl
0790	Carbon Disulfide
0960	Chlorophenols
0965	Chlorosulfonic Acid
1070	Cumene Hydroperoxide
1110	Cyanuric Acid
1510	Dimethyl Sulfide
1530	Dimethyl Terephthalate
1600	Diphenyl Thiourea
1660.	Ethanol
1810	Ethylene Dibromide
2040	Formaldehyde
2190	Hydrogen Cyanide
2430	Maleic Anhydride
2440	Malic Acid

TABLE III-4
CHEMICALS WITH < 50% COMMONALITY (Continued)

<u>NUMBER</u>	<u>NAME</u>
2500	Methanol
2510	Methyl Acetate
2560	Methyl Chloride
2640	Methyl Formate
2665	Methyl Methacrylate
2701	Naphthalene
2710	a-Naphthalene Sulfonic Acid
2757	p-Nitroaniline
2792	Nitrophenol
2820	Nonylphenol
2920	Phenolsulfonic acids
2940	Phenylenediamine
2950	Phosgene
2960	Phthalic Anhydride
3030	Polypropylene Glycol
3130	Pyridine Cnatl. & synthetic)
3180	Sodium Acetate
3190	Sodium Carboxymethylcellulose
3210	Sodium Phenate
3220	Sorbic Acid
3350	Toluene-2,4-Diamine
3500	Urea

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
0210	Allyl chloride	100%	Epichlorohydrin 1650	(100%)	3
0592	1-Butene	100%	Butylenes 0720	(100%)	4
0630	n-Butyl Acrylate	100%	Ethyl Acrylate 1690	(100%)	5
1010	o-Cresol	100%	Cresols, mixed 1021	(100%)	5
1290	Diethylamine	100%	Ethylamine 1700	(100%)	4
1290	Diethylamine	100%	Isopropylamine 2380	(100%)	4
1290	Diethylamine	100%	Triethylamine 3450	(100%)	4
1310	Diethylene Glycol Monobutyl Ether	100%	Ethylene Glycol Monobutyl Ether 1890	(100%)	5
1310	Diethylene Glycol Monobutyl Ether	100%	Ethylene Glycol Monoethyl Ether 1910	(100%)	5
1460	Dimethylamine	100%	Trimethylamine 3490	(100%)	4
1700	Ethylamine	100%	Isopropylamine 2380	(100%)	4
1700	Ethylamine	100%	Triethylamine 3450	(100%)	5
2380	Isopropylamine (mono)	100%	Triethylamine 3450	(100%)	4
3411	Trichlorofluoromethane	100%	Dichlorodifluoromethane 1221	(92%)	11
1220	p-Dichlorobenzene	100%	o-Dichlorobenzene 1216	(91%)	10
0930	Chloroform	100%	Methylene chloride 2620	(88%)	7
3430	1,1,2-Trichloro-1,2,2-Trifluoroethane	100%	Chlorotrifluoromethane 0995	(86%)	6
0630	n-Butyl Acrylate	100%	Acrylic Acid 0160	(83%)	5
0921	Chlorodifluoromethane	100%	Dichlorodifluoromethane 1221	(83%)	10

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

CHEMICAL NUMBER	CHEMICAL	COMMONALITY WITH INITIAL CHEMICAL	CHEMICAL AND NUMBER	RECIPROCAL COMMONALITY	NUMBER OF INITIAL CHEMICAL PRODUCTION SITES
1610	Dipropylene Glycol	100%	Propylene Glycol 3111	(83%)	5
1610	Dipropylene Glycol	100%	Propylene Oxide 3120	(83%)	5
1690	Ethyl Acrylate	100%	Acrylic Acid 0160	(83%)	5
1890	Ethylene Glycol Monobutyl Ether	100%	Ethylene Glycol Monoethyl Ether 1910	(83%)	5
3110	Propylene Dichloride	100%	Propylene Oxide 3120	(83%)	5
0250	Amyl Alcohols	100%	Methyl Butanol 2550	(80%)	4
1460	Dimethylamine	100%	Methylamine 2530	(80%)	4
3490	Trimethylamine	100%	Methylamine 2530	(80%)	4
0300	Aniline	100%	Nitrobenzene 2770	(78%)	7
0670	n-Butylamine	100%	Diethylamine 1290	(75%)	3
0670	n-Butylamine	100%	Ethylamine 1700	(75%)	3
0670	n-Butylamine	100%	Isopropylamine 2380	(75%)	3
0670	n-Butylamine	100%	Triethylamine 3450	(75%)	3
2370	Isopropyl Acetate	100%	Isobutyl Acetate 2260	(75%)	3
2650	Methylisobutyl Carbinol	100%	Diacetone Alcohol 1190	(75%)	3
2650	Methylisobutyle Carbinol	100%	Mesityl Oxide 2450	(75%)	3
3480	Triisobutylene	100%	Diisobutylene 1440	(75%)	3
1330	Diethylene Glycol Monoethyl Ether	100%	Diethylene Glycol Monomethyl Ether 1360	(71%)	5
0995	Chlorotrifluoromethane	100%	Trichlorofluoromethane 3411	(64%)	7
1010	o-Cresol	100%	Cresylic Acid 1030	(63%)	5

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
 Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
1021	Cresols, mixed	100%	Cresylic Acid 1030	(63%)	5
1310	Diethylene Glycol Monobutyl Ether	100%	Ethylene Glycol Monomethyl Ether 1930	(63%)	5
1890	Ethylene Glycol Monobutyl Ether	100%	Ethylene Glycol Monomethyl Ether 1930	(63%)	5
0920	Chlorodifluoroethane	100%	Chlorodifluoromethane 0921	(60%)	6
2370	Isopropyl Acetate	100%	n-Butyl Acetate 0600	(60%)	3
2450	Mesityl Oxide	100%	Methyl Isobutyl Ketone 2660	(60%)	4
2650	Methylisobutyl Carbinol	100%	Methylisobutyl Ketone 2660	(60%)	3
3430	1,1,2-Trichloro -1,2,2-Trifluoroethane	100%	Chlorodifluoromethane 0921	(60%)	7
0750	n-Butyraldehyde	100%	n-Butyl Alcohol 0640	(58%)	7
0995	Chlorotrifluoromethane	100%	Dichlorodifluoromethane 1221	(58%)	7
127-0920	Chlorodifluoroethane	100%	Trichlorofluoromethane 3411	(55%)	6
3430	1,1,2-Trichloro -1,2,2-Trifluoroethane	100%	Trichlorofluoromethane 3411	(55%)	6
0920	Chlorodifluoroethane	100%	Dichlorodifluoromethane 1221	(50%)	6
3430	1,1,2-Trichloro -1,2,3-Trifluoroethane	100%	Dichlorodefluoromethane 1221	(50%)	6
0170	Acrylonitrile	100%	Hydrogen Cyanide 2190	(<50%)	5
0210	Allyl Chloride	100%	Butadiene 0590	(<50%)	3
0210	Allyl Chloride	100%	1,2-Dichloroethane 1230	(<50%)	3
0210	Allyl Chloride	100%	Ethylene 1770	(<50%)	3
0210	Allyl Chloride	100%	Ethylene Dichloride 1820	(<50%)	3

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
0210	Allyl Chloride	100%	Glycerol 2090	(<50%)	3
0210	Allyl Chloride	100%	Propylene 3090	(<50%)	3
0210	Allyl Chloride	100%	Vinyl Chloride 3520	(<50%)	3
0240	Amyl Acetates	100%	Ethanol 1660	(<50%)	3
0600	n-Butyl Acetate	100%	Ethyl Acetate 1670	(<50%)	5
0650	sec-Butyl Alcohol	100%	Methyl Ethyl Ketone 2660	(<50%)	4
0650	sec-Butyl Alcohol	100%	Propylene 3090	(<50%)	4
0760	n-Butyric Acid	100%	Acetic Acid 0070	(<50%)	3
0760	n-Butyric Acid	100%	Ethyl Acetate 1670	(<50%)	3
0785	Caprolactam	100%	Cyclohexanol 1130	(<50%)	3
0785	Caprolactam	100%	Cyclohexanone 1140	(<50%)	3
1580	Diphenylamine	100%	Nitrobenzene 2770	(<50%)	3
1580	Diphenylamine	100%	Aniline 0330	(<50%)	3
1640	Dodecylphenol	100%	Nonylphenol 2820	(<50%)	3
1650	Epichlorohydrin	100%	Buitadiene 0590	(<50%)	3
1650	Epichlorohydrin	100%	1,2-Dichloroethylene 1230	(<50%)	3
1650	Epichlorohydrin	100%	Ethylene 1770	(<50%)	3
1650	Epichlorohydrin	100%	Ethylene Dichloride 1820	(<50%)	3
1650	Epichlorohydrin	100%	Glycerol (natl & syn) 2090	(<50%)	3
1650	Epichlorohydrin	100%	Propylene 3090	(<50%)	3
1650	Epichlorohydrin	100%	Vinyl Chloride 3520	(<50%)	3
1800	Ethylene Diamine	100%	Acetylene 0130	(<50%)	3

TABLE 14-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
1800	Ethylene Diamine	100%	Butadiene 0590	(<50%)	3
1800	Ethylene Diamine	100%	1,2-Dichloroethylene	(<50%)	3
1800	Ethylene Diamine	100%	Diethylene Glycol 1300	(<50%)	3
1800	Ethylene Diamine	100%	Ethylene 1770	(<50%)	3
1800	Ethylene Diamine	100%	Ethylene Dichloride 1820	(<50%)	3
1800	Ethylene Diamine	100%	Propylene 3090	(<50%)	3
1820	Ethylene Dichloride	100%	1,2-Dichloroethylene 1230	(<50%)	18
2100	Glycerol Tri (Polyoxy-propylene) Ether	100%	Polypropylene Glycol 3030	(<50%)	4
2360	Isopropanol	100%	Propylene 3090	(<50%)	5
2370	Isopropyl Acetate	100%	Acetic Acid 0070	(<50%)	3
2370	Isopropyl Acetate	100%	Acetone 0090	(<50%)	3
2370	Isopropyl Acetate	100%	Ethyl Acetate 1670	(<50%)	3
2450	Mesityl Oxide	100%	Acetone 0090	(<50%)	4
2650	Methylisobutyl Carbinol	100%	Acetone 0090	(<50%)	3
2660	Methylisobutyl Ketone	100%	Acetone 0090	(<50%)	5
2690	α -Methylstyrene	100%	Phenol 2910	(<50%)	7
2830	Octylphenol	100%	Nonylphenol 2820	(<50%)	5
3050	Propionaldehyde	100%	Diethylene Glycol 1300	(<50%)	3
3050	Propionaldehyde	100%	Ethylene 1770	(<50%)	3

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
3050	Propionaldehyde	100%	Propylene 3090	(<50%)	3
3061	n-Propyl Alcohol	100%	Ethyl Acetate 1670	(<50%)	4
3280	Terephthalic Acid	100%	Dimethyl Terephthalate 1530	(<50%)	3
3395	1,1,1-Trichloroethane	100%	Dichloroethylene 1230	(<50%)	3
3395	1,1,1-Trichloroethane	100%	Ethylene Dichloride 1820	(<50%)	3
3395	1,1,1-Trichloroethane	100%	Perchlorethylene 2860	(<50%)	3
3401	Trichloroethylene	100%	Perchloroethylene 2860	(<50%)	5
3490	Trimethylamine	100%	Dimethylamine 1460	(<50%)	4
3530	Vinylidene Chloride	100%	1,2-Dichloroethylene 1230	(<50%)	3
3530	Vinylidene Chloride	100%	Ethylene Dichloride 1820	(<50%)	3
3530	Vinylidene Chloride	100%	Perchloroethylene 2680	(<50%)	3
3530	Vinylidene Chloride	100%	Vinyl Chloride 3520	(<50%)	3
1300	Diethylene Glycol	94%	Ethylene Glycol 1830	(89%)	18
1980	Ethylene Oxide	94%	Ethylene Glycol 1830	(79%)	16
3460	Triethylene Glycol	93%	Diethylene Glycol 1300	(78%)	15
3460	Triethylene Glycol	93%	Ethylene Glycol 1830	(74%)	15
1060	Cumene	93%	Propylene 3090	(<50%)	14
3460	Triethylene Glycol	93%	Ethylene Glycol 1830	(<50%)	6
3230	Styrene	92%	Ethylbenzene 1710	(63%)	13
3541	Xylenes mixed	92%	Benzene 0380	(60%)	36
3560	o-Xylene	92%	Benzene 0380	(<50%)	12

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
1620	Dodecene	91%	Propylene 3090	(<50%)	11
0921	Chlorodifluoromethane	90%	Trichlorofluoromethane 3411	(82%)	10
3349	Toluene	90%	Benzene 0380	(82%)	50
1120	Cyclohexane	90%	Benzene 0380	(<50%)	10
1130	Cyclohexanol	88%	Cyclohexanone 1140	(88%)	8
2000	2-Ethyl Hexanol	88%	Isobutanol 2250	(88%)	8
1980	Ethylene Oxide	88%	Diethylene Glycol 1300	(78%)	16
2000	2-Ethyl Hexanol	88%	n-Butyl Alcohol 0640	(58%)	8
3520	Vinyl Chloride	87%	1,2-Dichloroethylene 1230	(72%)	15
0750	n-Butyraldehyde	86%	2-Ethyl Hexanol 2000	(75%)	7
1360	Diethylene Glycol Monomethyl Ether	86%	Ethylene Glycol Monomethyl Ether 1930	(75%)	7
3541	Xylenes, mixed	86%	Toluene 3349	(62%)	36
1360	Diethylene Glycol Monomethyl Ether	86%	Ethylene Glycol Monomethyl Ether 1930	(75%)	7
0995	Chlorodifluoromethane	86%	Chlorodifluoromethane 0921	(60%)	7
3390	Trichlorobenzene	86%	Chlorobenzene 0890	(60%)	7
3390	Trichlorobenzene	86%	p-Dichlorobenzene 1220	(60%)	7
3390	Trichlorobenzene	86%	o-Dichlorobenzene 1216	(55%)	7
0930	Chloroform	86%	Carbon Tetrachloride 0810	(50%)	7
1770	Ethylene	86%	Propylene 3090	(50%)	36

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
1060	Cumene	86%	Toluene 3349	(<50%)	14
1360	Diethylene Glycol Monomethyl Ether	86%	Diethylene Glycol 1300	(<50%)	7
1360	Diethylene Glycol Monomethyl Ether	86%	Ethylene Glycol 1830	(<50%)	7
1360	Diethylene Glycol Monomethyl Ether	86%	Ethylene Oxide 1980	(<50%)	7
1360	Diethylene Glycol Monomethyl Ether	86%	Triethylene Glycol 3460	(<50%)	7
1740	Ethyl Chloride	86%	1,2-Dichloroethylene 1230	(<50%)	7
1740	Ethyl Chloride	86%	Ethylene Dichloride 1820	(<50%)	7
1740	Ethyl Chloride	86%	Vinyl Chloride 3520	(<50%)	7
2690	α -Methylstyrene	86%	Acetone 0090	(<50%)	7
2810	Nonene	86%	Propylene 3090	(<50%)	7
1320920	Chlorodifluoroethane	83%	1,1,2-Trichloro -1,2,2-Trifluoroethane 3430	(83%)	6
3111	Propylene Glycol	83%	Propylene Oxide 3120	(83%)	6
0920	Chlorodifluoroethane	83%	Chlorotrifluoromethane 0995	(71%)	6
2165	Hexamethylenediamine	83%	Adipic Acid 0180	(71%)	6
2165	Hexamethylenediamine	83%	Adiponitrile 0185	(71%)	6
1910	Ethylene Glycol Monoethyl Ether	83%	Ethylene Glycol Monomethyl Ether 1930	(63%)	6
1661	Ethanolamines	83%	Diethylene Glycol 1300	(<50%)	6
1661	Ethanolamines	83%	Ethylene Glycol 1830	(<50%)	6
1661	Ethanolamines	83%	Triethylene Glycol 3460	(<50%)	6

TABLE I-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
1910	Ethylene Glycol Monoethyl Ether	83%	Triethylene Glycol 3460	(<50%)	6
3000	Polybutenes	83%	Propylene 3090	(<50%)	6
3111	Propylene Glycol	83%	Dipropylene Glycol 1610	(<50%)	6
3111	Propylene Glycol	83%	Triethylene Glycol 3400	(<50%)	6
3120	Propylene Oxide	83%	Dipropylene Glycol 1610	(<50%)	6
3354	2,4-Toluene Diisocyanate	83%	Phosgene	(<50%)	6
3560	o-Xylene	83%	Toluene 3349	(<50%)	12
0890	Chlorobenzene	80%	p-Dichlorobenzene 1220	(80%)	10
1310	Diethylene Glycol Monobutyl Ether	80%	Diethylene Glycol Monoether Ether 1330	(80%)	5
1330	Diethylene Glycol Monoethyl Ether	80%	Ethylene Glycol Monobutyl Ether 1890	(80%)	5
1610	Dipropylene Glycol	80%	Propylene Dichloride 3110	(80%)	5
3460	Triethylene Glycol	80%	Ethylene Oxide 1980	(75%)	15
0890	Chlorobenzene	80%	o-Dichlorobenzene 1216	(73%)	10
1330	Diethylene Glycol Monoethyl Ether	80%	Ethylene Glycol Monoethyl Ether 1910	(67%)	5
3110	Propylene Dichloride	80%	Propylene Glycol 3111	(67%)	5
1010	o-Cresol	80%	Xylenol 3580	(57%)	5
1021	Cresols, mixed	80%	Xylenol 3580	(57%)	5

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

CHEMICAL NUMBER	CHEMICAL	COMMONALITY WITH INITIAL CHEMICAL	CHEMICAL AND NUMBER	RECIPROCAL COMMONALITY	NUMBER OF INITIAL CHEMICAL PRODUCTION SITES
1310	Diethylene Glycol Monobutyl Ether	80%	Diethylene Glycol Monomethyl Ether 1360	(57%)	5
1890	Ethylene Glycol Monobutyl Ether	80%	Diethylene Glycol Monomethyl Ether 1360	(57%)	6
2270	Isobutyraldehyde	80%	n-Butyraldehyde 0750	(57%)	5
3110	Propylene Dichloride	80%	Polyethylene Glycol 3010	(57%)	.5
1330	Diethylene Glycol Monoethyl Ether	80%	Ethylene Glycol Monomethyl Ether 1930	(50%)	5
2270	Isobutyraldehyde	80%	Isobutanol 2250	(50%)	5
0600	n-Butyl Acetate	80%	Acetic Acid 0070	(<50%)	5
0600	n-Butyl Acetate	80%	Acetone 0090	(<50%)	5
1010	o-Cresol	80%	Phenol 2910	(<50%)	5
1021	Cresols, mixed	80%	Phenol 2910	(<50%)	5
1120	Cyclohexane	80%	Toluene 3349	(<50%)	10
1310	Diethylene Glycol Monobutyl Ether	80%	Diethylene Glycol 1300	(<50%)	5
1310	Diethylene Glycol Monobutyl Ether	80%	Ethylene Glycol 1830	(<50%)	5
1310	Diethylene Glycol Monobutyl Ether	80%	Ethylene Oxide 1980	(<50%)	5
1310	Diethylene Glycol Monobutyl Ether	80%	Triethylene Glycol 3460	(<50%)	5
1330	Diethylene Glycol Monobutyl Ether	80%	Diethylene Glycol 1300	(<50%)	5
1330	Diethylene Glycol Monoethyl Ether	80%	Ethylene Glycol 1830	(<50%)	5
1330	Diethylene Glycol Monoethyl Ether	80%	Ethylene Oxide 1980	(<50%)	5

TABLE 11-5
COMMONALITY OF CHEMICAL PAIRS
Continued

CHEMICAL NUMBER	CHEMICAL	COMMONALITY WITH INITIAL CHEMICAL	CHEMICAL AND NUMBER	RECIPROCAL COMMONALITY	NUMBER OF INITIAL CHEMICAL PRODUCTION SITES
1330	Diethylene Glycol Monoethyl Ether	80%	Triethylene Glycol 3460	(<50%)	5
1550	Dinitrotoluene	80%	Phosgene 2950	(<50%)	5
1610	Dipropylene Glycol	80%	Diethylene Glycol 1300	(<50%)	5
1610	Dipropylene Glycol	80%	Ethylene 1770	(<50%)	5
1610	Dipropylene Glycol	80%	Ethylene Glycol 1830	(<50%)	5
1610	Dipropylene Glycol	80%	Ethylene Oxide 1980	(<50%)	5
1610	Dipropylene Glycol	80%	Triethylene Glycol 3460	(<50%)	5
1890	Ethylene Glycol Monobutyl Ether	80%	Diethylene Glycol 1300	(<50%)	5
1890	Ethylene Glycol Monobutyl Ether	80%	Ethylene Glycol 1830	(<50%)	5
1890	Ethylene Glycol Monobutyl Ether	80%	Diethylene Glycol Monoethyl Ether 1330	(<50%)	5
1890	Ethylene Glycol Monobutyl Ether	80%	Ethylene Oxide 1980	(<50%)	5
1890	Ethylene Glycol Monobutyl Ether	80%	Triethylene Glycol 3460	(<50%)	5
2270	Isobutyraldehyde	80%	n-Butyl Alcohol 0640	(<50%)	5
2360	Isopropanol	80%	Butadiene 0590	(<50%)	5
2530	Methylamine	80%	Dimethylamine 1460	(<50%)	5
3110	Propylene Dichloride	80%	Diethylene Glycol 1300	(<50%)	5
3110	Propylene Dichloride	80%	Ethylene 1770	(<50%)	5
3110	Propylene Dichloride	80%	Ethylene Glycol 1830	(<50%)	5
3110	Propylene Dichloride	80%	Ethylene Oxide 1980	(<50%)	5
3110	Propylene Dichloride	80%	Triethylene Glycol 3460	(<50%)	5

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
3401	Trichloroethylene	80%	1,2-Dichloroethylene 1230	(<50%)	5
3401	Trichloroethylene	80%	Ethylene Dichloride 1820	(<50%)	5
1060	Cumene	79%	Benzene 0380	(<50%)	14
1190	Diacetone Alcohol	75%	Mesityl Oxide 2450	(75%)	4
2850	Pentaerythritol	75%	Sodium Formate 3200	(75%)	4
1190	Diacetone Alcohol	75%	Methylisobutyl Ketone 2660	(60%)	4
2260	Isobutyl Acetate	75%	n-Butyl Acetate 0600	(60%)	4
3061	n-Propyl Alcohol	75%	n-Butyl Acetate 0600	(60%)	4
3061	n-Propyl Alcohol	75%	Isobutyraldehyde 2270	(60%)	4
0030	Acetaldehyde	75%	Acetic Acid 0070	(50%)	8
2250	Isobutanol	75%	n-Butyl Alcohol 0640	(50%)	8
10230	Aminoethyl ethanolamine	75%	Polypropylene Glycol 3030	(<50%)	4
10592	1-Butene	75%	Butadiene 0590	(<50%)	4
10592	1-Butene	75%	Ethylene 1770	(<50%)	4
0592	1-Butene	75%	Propylene 3090	(<50%)	4
0650	sec-Butyl Alcohol	75%	Acetone 0090	(<50%)	4
0650	sec-Butyl Alcohol	75%	Butadiene 0590	(<50%)	4
0720	Butylenes	75%	Butadiene 0590	(<50%)	4
0720	Butylenes	75%	Ethylene 1770	(<50%)	4

TAB. II-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
0720	Butylenes	75%	Propylene 3090	(<50%)	4
1190	Diacetone Alcohol	75%	Acetone 0090	(<50%)	4
1930	Ethylene Glycol Monomethyl Ether	75%	Diethylene Glycol 1300	(<50%)	8
1930	Ethylene Glycol Monomethyl Ether	75%	Ethylene Glycol 1830	(<50%)	8
1930	Ethylene Glycol Monomethyl Ether	75%	Ethylene Oxide 1980	(<50%)	8
1930	Ethylene Glycol Monomethyl Ether	75%	Triethylene Glycol 3460	(<50%)	8
2180	Hexamethylene Tetramine	75%	Formaldehyde 2040	(<50%)	8
2260	Isobutyl Acetate	75%	Acetic Acid 0070	(<50%)	4
2260	Isobutyl Acetate	75%	Acetone 0090	(<50%)	4
2260	Isobutyl Acetate	75%	Ethyl Acetate 1670	(<50%)	4
2450	Mesityl Oxide	75%	Diacetone Alcohol 1190	(<50%)	4
2450	Mesityl Oxide	75%	Propylene 3090	(<50%)	4
2620	Methylene Chloride	75%	Carbon Tetrachloride 0810	(<50%)	8
2850	Pentaerythritol	75%	Formaldehyde 2040	(<50%)	4
3060	Propionic Acid	75%	Acetic Acid 0070	(<50%)	4
3060	Propionic Acid	75%	Acetic Anhydride 0080	(<50%)	4
3060	Propionic Acid	75%	Ethyl Acetate 1670	(<50%)	4
3061	n-Propyl Alcohol	75%	Ethanol 1660	(<50%)	4
3061	n-Propyl Alcohol	75%	Isobutanol 2250	(<50%)	4

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
3200	Sodium Formate	75%	Formaldehyde 2040	(<50%)	4
3355	Toluene Diisocyanates, mixture	75%	Phosgene 2950	(<50%)	8
3560	<i>o</i> -Xylene	75%	Xylenes, mixed 3541	(<50%)	12
1820	Ethylene Dichloride	72%	Vinyl Chloride 3520	(<50%)	18
1360	Diethylene Glycol Monomethyl Ether	71%	Diethylene Glycol Monomethyl Ether 1330	(100%)	
0180	Adipic Acid	71%	Adiponitrile 0185	(71%)	7
0180	Adipic Acid	71%	Cyclohexanol 1140	(63%)	7
0750	<i>n</i> -Butyraldehyde	71%	Isobutanol 2250	(63%)	7
0120	Acetophenone	71%	Acetone 0090	(<50%)	7
0120	Acetophenone	71%	Phenol 2910	(<50%)	7
0930	Chloroform	71%	Perchloroethylene 2860	(<50%)	7
3010	Polyethylene Glycol	71%	Polypropylene Glycol 3030	(<50%)	7
0590	Butadiene	70%	Ethylene 1770	(<50%)	23
0590	Butadiene	70%	Propylene 3090	(<50%)	23
1710	Ethylbenzene	68%	Toluene 3349	(<50%)	19
0260	Amylamines	67%	<i>n</i> -Butylamine 0670	(67%)	3
0360	Benzaldehyde	67%	Benzyl Alcohol 0500	(67%)	6
0480	Benzotrichloride	67%	Benzoyl Chloride 0490	(67%)	3
0480	Benzotrichloride	67%	Chlorobenzoic Acid 0900	(67%)	3
0580	Bromonaphthalene	67%	<i>m</i> -Dichlorobenzene 1215	(67%)	3
0760	<i>n</i> -Butyric Acid	67%	Isopropyl Acetate 2370	(67%)	3

TABLE II-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
1800	Ethylene Diamine	67%	1,1,2-Trichloroethane 3400	(67%)	3
2321	Isopentane	67%	n-Pentane 2851	(67%)	3
3395	1,1,1-Trichloroethane	67%	Vinylidene Chloride 3530	(67%)	3
0820	Cellulose Acetate	67%	Acetic Anhydride 0080	(57%)	6
1910	Ethylene Glycol Monoethyl Ether	67%	Diethylene Glycol Monomethyl Ether 1360	(57%)	6
3111	Propylene Glycol	67%	Polyethylene Glycol 3010	(57%)	6
3120	Propylene Oxide	67%	Polyethylene Glycol 3010	(57%)	6
3560	o-Xylene	67%	p-Xylene 3570	(57%)	12
0210	Allyl Chloride	67%	sec-Butyl Alcohol 0650	(50%)	3
0260	Amyl amines	67%	Diethylamine 1290	(50%)	3
0260	Amyl amines	67%	Ethylamine 1700	(50%)	3
0260	Amyl amines	67%	Isopropylamine 2380	(50%)	3
0260	Amyl amines	67%	Trimethylamine 3450	(50%)	3
0760	n-Butyric Acid	67%	Isobutyl Acetate 2260	(50%)	3
0760	n-Butyric Acid	67%	Propionic Acid 3060	(50%)	3
1490	n,n-Dimethylformamide	67%	Dimethylamine 1460	(50%)	3
1490	n,n-Dimethylformamide	67%	Trimethylamine 3490	(50%)	3
1540	3,5-Dinitrobenzoic Acid	67%	Nitrobenzoic Acid (o,m,p) 2780	(50%)	3
1650	Epichlorohydrin	67%	sec-Butyl Alcohol 0650	(50%)	3
1750	Ethyl Chloroacetate	67%	Salicylic Acid 3170	(50%)	3
1800	Ethylene Diamine	67%	Aminoethyl ethanolamine 0230	(50%)	3
1800	Ethylene Diamine	67%	Piperazine 2990	(50%)	3
2370	Isopropyl Acetate	67%	Propionic Acid 3060	(50%)	3

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
2370	Isopropyl Acetate	67%	n-Propyl Alcohol 3061	(50%)	3
3050	Propionaldehyde	67%	n-Propyl Alcohol 3061	(50%)	3
3400	1,1,2-Trichloroethane	67%	Aminoethyl ethanolamine 0230	(50%)	3
0210	Allyl Chloride	67%	Acetone 0090	(<50%)	3
0210	Allyl Chloride	67%	Benzene 0380	(<50%)	3
0210	Allyl Chloride	67%	Bisphenol-A 0560	(<50%)	3
0210	Allyl Chloride	67%	Ethyl Chloride 1740	(<50%)	3
0210	Allyl Chloride	67%	Methyl Ethyl Ketone 2640	(<50%)	3
0240	Amyl Acetates	67%	Acetic Acid 0070	(<50%)	3
0240	Amyl Acetates	67%	Acetone 0090	(<50%)	3
0240	Amyl Acetates	67%	n-Butyl Acetate 0600	(<50%)	3
0240	Amyl Acetates	67%	Ethyl Acetate 1670	(<50%)	3
0240	Amyl Acetates	67%	Ethyl Ether 1990	(<50%)	3
0240	Amyl Acetates	67%	Methyl Butynol 2550	(<50%)	3
0400	Benzenesulfonic Acid	67%	Toluenesulfonic Acid 3370	(<50%)	3
0490	Benzoyl Chloride	67%	Benzaldehyde 0360	(<50%)	3
0490	Benzoyl Chloride	67%	Benzyl Alcohol 0500	(<50%)	3
0580	Bromonaphthalene	67%	Chlorophenol 0960	(<50%)	3
0580	Bromonaphthalene	67%	Succinonitrile 3250	(<50%)	3
0760	n-Butyric Acid	67%	Acetaldehyde 0030	(<50%)	3
0760	n-Butyric Acid	67%	Acetic Anhydride 0080	(<50%)	3
0760	n-Butyric Acid	67%	Acetone 0090	(<50%)	3
0760	n-Butyric Acid	67%	n-Butyl Acetate 0600	(<50%)	3

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
0760	n-Butyric Acid	67%	Methylisobutyl Ketone 2660	(<50%)	3
0840	Chloroacetic Acid	67%	Sodium Carboxymethyl Cellulose 3190 (<50%)	(<50%)	3
1490	n,n-Dimethylformamide	67%	Methylamine 2530	(<50%)	3
1540	3,5-Dinitrobenzoic Acid	67%	Aminobenzoic Acid (m,p) 0220	(<50%)	3
1580	Diphenylamine	67%	Toluene-2,4-Diamine 3350	(<50%)	3
1650	Epichlorohydrin	67%	Acetone 0090	(<50%)	3
1650	Epichlorohydrin	67%	Benzene 0380	(<50%)	3
1650	Epichlorohydrin	67%	Bisphenol A 0560	(<50%)	3
1650	Epichlorohydrin	67%	Ethyl Chloride 1740	(<50%)	3
1650	Epichlorohydrin	67%	Methyl Ethyl Ketone 2640	(<50%)	3
1661	Ethanolamine	67%	Ethylene 1710	(<50%)	6
1661	Ethanolamine	67%	Ethylene Oxide 1960	(<50%)	6
1720	Ethyl Bromide	67%	Ethylene Dibromide 1810	(<50%)	3
1800	Ethylene Diamine	67%	Acetic Acid 0070	(<50%)	3
1800	Ethylene Diamine	67%	Benzene 0380	(<50%)	3
1800	Ethylene Diamine	67%	Ethylene Glycol 1830	(<50%)	3
1800	Ethylene Diamine	67%	Ethylene Oxide 1980	(<50%)	3
1800	Ethylene Diamine	67%	Triethylene Glycol 3460	(<50%)	3
1910	Ethylene Glycol Monoethyl Ether	67%	Diethylene Glycol 1300	(<50%)	6
1910	Ethylene Glycol Monoethyl Ether	67%	Ethylene Glycol 1830	(<50%)	6
1910	Ethylene Glycol Monoethyl Ether	67%	Ethylene Oxide 1980	(<50%)	6

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
2200	Hydroquinone	67%	Acetone 0070	(<50%)	3
2321	Isopentane	67%	Benzene 0380	(<50%)	3
2370	Isopropyl Acetate	67%	Acetic Anhydride 0080	(<50%)	3
2370	Isopropyl Acetate	67%	Ethanol 1660	(<50%)	3
2370	Isopropyl Acetate	67%	Ethyl Ether 1990	(<50%)	3
2370	Isopropyl Acetate	67%	Isobutanol 2250	(<50%)	3
2370	Isopropyl Acetate	67%	Methyl Isobutyl Ketone 2660	(<50%)	3
2630	Methylene Dianiline	67%	Nitrobenzene 2770	(<50%)	3
2630	Methylene Dianiline	67%	Phosgene 2950	(<50%)	3
2630	Methylene Dianiline	67%	Toluene Diisocyanates, mixture 3355	(<50%)	3
2650	Methylisobutyl Carbinol	67%	Ethanol 1660	(<50%)	3
-142-	Methylisobutyl Carbinol	67%	2-Ethyl Hexanol 2000	(<50%)	3
2650	Methylisobutyl Carbinol	67%	Isobutanol 2250	(<50%)	3
2650	Methylisobutyl Carbinol	67%	Isopropanol 2360	(<50%)	3
2650	Methylisobutyl Carbinol	67%	Propylene 3090	(<50%)	3
2900	p-Phenetidine	67%	Anisidine 0320	(<50%)	3
3050	Propionaldehyde	67%	Acetylene 0130	(<50%)	3
3050	Propionaldehyde	67%	Butadiene 0590	(<50%)	3
3050	Propionaldehyde	67%	n-Butyl Alcohol 0640	(<50%)	3
3050	Propionaldehyde	67%	n-Butyraldehyde 0750	(<50%)	3

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
3050	Propionaldehyde	67%	Ethanol 1660	(<50%)	3
3050	Propionaldehyde	67%	Ethyl Acetate 1670	(<50%)	3
3050	Propionaldehyde	67%	Ethylene Glycol 1830	(<50%)	3
3050	Propionaldehyde	67%	Ethylene Oxide 1980	(<50%)	3
3050	Propionaldehyde	67%	2-Ethyl Hexanol 2000	(<50%)	3
3050	Propionaldehyde	67%	Isobutanol 2250	(<50%)	3
3050	Propionaldehyde	67%	Isobutyraldehyde 2270	(<50%)	3
3050	Propionaldehyde	67%	Triethylene Glycol 3460	(<50%)	3
3111	Propylene Glycol	67%	Diethylene Glycol 1300	(<50%)	6
3111	Propylene Glycol	67%	Ethylene 1770	(<50%)	6
3111	Propylene Glycol	67%	Ethylene Glycol 1830	(<50%)	6
3111	Propylene Glycol	67%	Ethylene Oxide 1980	(<50%)	6
3120	Propylene Oxide	67%	Diethylene Glycol 1300	(<50%)	6
3120	Propylene Oxide	67%	Ethylene 1770	(<50%)	6
3120	Propylene Oxide	67%	Ethylene Glycol 1830	(<50%)	6
3120	Propylene Oxide	67%	Ethylene Oxide 1980	(<50%)	6
3120	Propylene Oxide	67%	Triethylene Glycol 3460	(<50%)	6
3395	1,1,1-Trichloroethane	67%	Carbon Tetrachloride 0810	(<50%)	3
3395	1,1,1-Trichloroethane	67%	Chloroform 0910	(<50%)	3
3395	1,1,1-Trichloroethane	67%	Ethyl Chloride 1740	(<50%)	3
3395	1,1,1-Trichloroethane	67%	Methylene Chloride 2620	(<50%)	3
3395	1,1,1-Trichloroethane	67%	Trichloroethylene 3410	(<50%)	3

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
3395	1,1,1-Trichloroethane	67%	Vinyl Chloride 3520	(<50%)	3
3400	1,1,2-Trichloroethane	67%	Acetylene 0130	(<50%)	3
3400	1,1,2-Trichloroethane	67%	Butadiene 0590	(<50%)	3
3400	1,1,2-Trichloroethane	67%	1,2-Dichloroethylene 1230	(<50%)	3
3400	1,1,2-Trichloroethane	67%	Diethylene Glycol 1300	(<50%)	3
3400	1,1,2-Trichloroethane	67%	Ethylene 1770	(<50%)	3
3400	1,1,2-Trichloroethane	67%	Ethylene Dichloride 1820	(<50%)	3
3400	1,1,2-Trichloroethane	67%	Propylene 3090	(<50%)	3
3530	Vinylidene Chloride	67%	Carbon Tetrachloride 0810	(<50%)	3
3530	Vinylidene Chloride	67%	Chloroform 0930	(<50%)	3
3530	Vinylidene Chloride	67%	Diethylene Glycol 1300	(<50%)	3
3530	Vinylidene Chloride	67%	Dipropylene Glycol 1610	(<50%)	3
3530	Vinylidene Chloride	67%	Ethyl Chloride 1740	(<50%)	3
3530	Vinylidene Chloride	67%	Ethylene 1770	(<50%)	3
3530	Vinylidene Chloride	67%	Ethylene Glycol 1830	(<50%)	3
3530	Vinylidene Chloride	67%	Ethylene Oxide 1980	(<50%)	3
3530	Vinylidene Chloride	67%	Methylene Chloride 2620	(<50%)	3
3530	Vinylidene Chloride	67%	Propylene 3090	(<50%)	3
3530	Vinylidene Chloride	67%	Propylene Dichloride 3110	(<50%)	3
3530	Vinylidene Chloride	67%	Propylene Glycol 3111	(<50%)	3
3530	Vinylidene Chloride	67%	Propylene Oxide 3120	(<50%)	3

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
3530	Vinylidene Chloride	67%	Trichloroethylene 3410	(<50%)	3
3530	Vinylidene Chloride	67%	Triethylene Glycol 3460	(<50%)	3
3560	<i>o</i> -Xylene	67%	Propylene 3090	(<50%)	12
2860	Perchloroethylene	64%	Carbon Tetrachloride 0810	(58%)	11
3570	<i>p</i> -Xylene	64%	Benzene 0380	(<50%)	14
1030	Cresylic Acid	63%	Phenol 2910	(<50%)	8
1980	Ethylene Oxide	63%	Ethylene 1770	(<50%)	16
2620	Methylene Chloride	63%	Methyl Chloride 2560	(<50%)	8
2620	Methylene Chloride	63%	Perchloroethylene 2860	(<50%)	8
3230	Styrene	62%	Toluene 3349	(<50%)	13
0430	Benzoic Acid	60%	Benzaldehyde 1360	(50%)	5
1310	Diethylene Glycol Monobutyl Ether	60%	Ethanolamines 1661	(50%)	5
1610	Dipropylene Glycol	60%	Ethanolamines 1661	(50%)	5
1890	Ethylene Glycol Monobutyl Ether	60%	Ethanolamines 1661	(50%)	5
3110	Propylene Dichloride	60%	Ethanolamines 1661	(50%)	5
0560	Bisphenol-A	60%	Butadiene 0590	(<50%)	5
0560	Bisphenol-A	60%	Ethylene 1770	(<50%)	5
0560	Bisphenol-A	60%	Propylene 3090	(<50%)	5
0600	<i>n</i> -Butyl Acetate	60%	Ethanol 1660	(<50%)	5
0600	<i>n</i> -Butyl Acetate	60%	Ethyl Ether 1990	(<50%)	5

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
0630	n-Butyl Acrylate	60%	Acetic Acid 0070	(<50%)	5
0730	tert-Butylphenol	60%	Phenol 2910	(<50%)	5
1120	Cyclohexane	60%	Propylene 3090	(<50%)	10
1310	Diethylene Glycol Monobutyl Ether	60%	Ethylene 1770	(<50%)	5
1330	Diethylene Glycol Monoethyl Ether	60%	Ethylene 1770	(<50%)	5
1550	Dinitrotoluene	60%	Toluene Diisocyanate, mixture 3355	(<50%)	5
1610	Dipropylene Glycol	60%	1,2-Dichloroethylene 1230	(<50%)	5
1610	Dipropylene Glycol	60%	Ethanolamines 1661	(<50%)	5
1610	Dipropylene Glycol	60%	Ethylene Dichloride 1820	(<50%)	5
1610	Dipropylene Glycol	60%	Polyethylene Glycol 3010	(<50%)	5
1610	Dipropylene Glycol	60%	Propylene 3090	(<50%)	5
1690	Ethyl Acrylate	60%	Acetic Acid 0070	(<50%)	5
1890	Ethylene Glycol Monobutyl Ether	60%	Ethylene 1770	(<50%)	5
2160	Hexadecyl Alcohol	60%	Glycerol 2090	(<50%)	5
2261	Isobutylene	60%	Butadiene 0590	(<50%)	5
2261	Isobutylene	60%	Propylene 3090	(<50%)	5
2270	Isobutyraldehyde	60%	Diethylene Glycol 1300	(<50%)	5
2270	Isobutyraldehyde	60%	Ethyl Acetate 1670	(<50%)	5
2270	Isobutyraldehyde	60%	Ethylene 1770	(<50%)	5
2270	Isobutyraldehyde	60%	2-Ethyl Hexanol 2000	(<50%)	5

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
2270	Isobutyraldehyde	60%	Propylene 3090	(<50%)	5
2360	Isopropanol	60%	Acetone 0090	(<50%)	5
2360	Isopropanol	60%	Ethylene 1770	(<50%)	5
2530	Methylamine	60%	Formaldehyde 2040	(<50%)	5
2550	Methyl Butanol	60%	Ethanol 1660	(<50%)	5
2660	Methylisobutyl Ketone	60%	Diacetone Alcohol 1190	(<50%)	5
2660	Methylisobutyl Ketone	60%	Propylene 3090	(<50%)	5
3110	Propylene Dichloride	60%	1,2-Dichlorethylene 1230	(<50%)	5
3110	Propylene Dichloride	60%	Ethylene Dichloride 1820	(<50%)	5
3110	Propylene Dichloride	60%	Polypropylene Glycol 3030	(<50%)	5
3110	Propylene Dichloride	60%	Propylene 3090	(<50%)	5
3181	Sodium Benzoate	60%	Fumaric Acid 2070	(<50%)	5
3401	Trichloroethylene	60%	Ethyl Chloride 1740	(<50%)	5
3401	Trichloroethylene	60%	Vinyl Chloride 3520	(<50%)	5
0120	Acetophenone	57%	A-Methylstyrene 2690	(57%)	7
0180	Adipic Acid	57%	Cyclohexanone 1140	(50%)	7
3580	Xylenol	57%	Cresylic Acid 1030	(50%)	7
0080	Acetic Anhydride	57%	Acetic Acid 0070	(<50%)	7
0080	Acetic Anhydride	57%	Ethyl Acetate 1670	(<50%)	7
0750	n-Butyraldehyde	57%	Ethylene 1770	(<50%)	7

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

CHEMICAL NUMBER	CHEMICAL	COMMONALITY WITH INITIAL CHEMICAL	CHEMICAL AND NUMBER	RECIPROCAL COMMONALITY	NUMBER OF INITIAL CHEMICAL PRODUCTION SITES
0750	n-Butyraldehyde	57%	Propylene 3090	(<50%)	7
0930	Chloroform	57%	Methyl Chloride 2560	(<50%)	7
1360	Diethylene Glycol Monomethyl Ether	57%	Ethylene 1770	(<50%)	7
1990	Ethyl Ether	57%	Ethanol 1660	(<50%)	7
2810	Nonene	57%	Benzene 0380	(<50%)	7
3010	Polyethylene Glycol	57%	Triethylene Glycol 3460	(<50%)	7
3510	Vinyl Acetate	57%	Acetic Acid 0070	(<50%)	7
3570	p-Xylene	57%	Propylene 3090	(<50%)	14
3570	p-Xylene	57%	Toluene 3349	(<50%)	14
3570	p-Xylene	57%	Xlenes, mixed 3541	(<50%)	14
3570	p-Xylene	57%	o-Xylene 3560	(<50%)	14
1300	Diethylene Glycol	56%	Ethylene 1770	(<50%)	18
1300	Diethylene Glycol	56%	Propylene 3090	(<50%)	18
1980	Ethylene Oxide	56%	Propylene 3090	(<50%)	16
2910	Phenol	56%	Acetone 0090	(<50%)	18
1670	Ethyl Acetate	55%	Acetic Acid 0070	(<50%)	11
2860	Perchloroethylene	55%	1,2-Dichlorethylene 1230	(<50%)	11
2860	Perchloroethylene	55%	Ethylene Dichloride 1820	(<50%)	11
3230	Styrene	54%	Propylene 3090	(<50%)	13
3460	Triethylene Glycol	53%	Ethylene	(<50%)	15

TABLE III-5
COMMONALITY OF CHEMICAL PAIRS
Continued

<u>CHEMICAL NUMBER</u>	<u>CHEMICAL</u>	<u>COMMONALITY WITH INITIAL CHEMICAL</u>	<u>CHEMICAL AND NUMBER</u>	<u>RECIPROCAL COMMONALITY</u>	<u>NUMBER OF INITIAL CHEMICAL PRODUCTION SITES</u>
0380	Benzene	51%	Propylene 3090	(<50%)	55
0030	Acetaldehyde	50%	Ethyl Acetate 1670	(50%)	8
0230	Aminoethyl ethanolamine	50%	Piperazine 2990	(50%)	4
0650	sec-Butyl Alcohol	50%	Mesityl Oxide 2450	(50%)	4
1190	Diacetone Alcohol	50%	n-Propyl Alcohol 3061	(50%)	4
1661	Ethanolamine	50%	Ethylene Glycol Monoethyl Ether 1910	(50%)	6
1661	Ethanolamines	50%	Propylene Glycol 3111	(50%)	6
1661	Ethanolamines	50%	Propylene Oxide 3120	(50%)	6
1910	Ethylene Glycol Monoethyl Ether	50%	Propylene Glycol 3111	(50%)	6
2260	Isobutyl Acetate	50%	Propionic Acid 3060	(50%)	4
2260	Isobutyl Acetate	50%	n-Propyl Alcohol 3061	(50%)	4

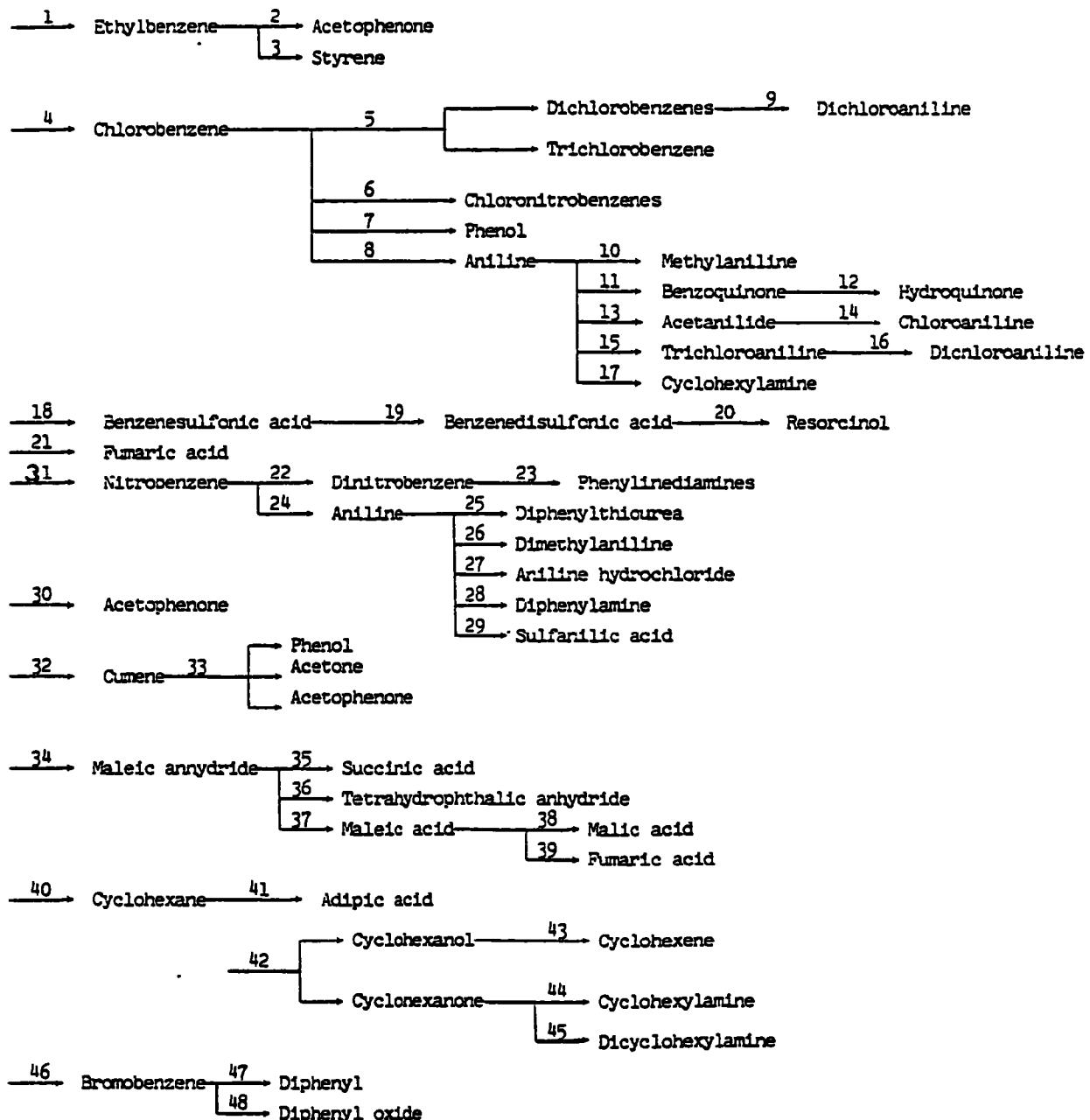
**RADIAN
CORPORATION**

**APPENDIX IV
CHEMICAL TREE**

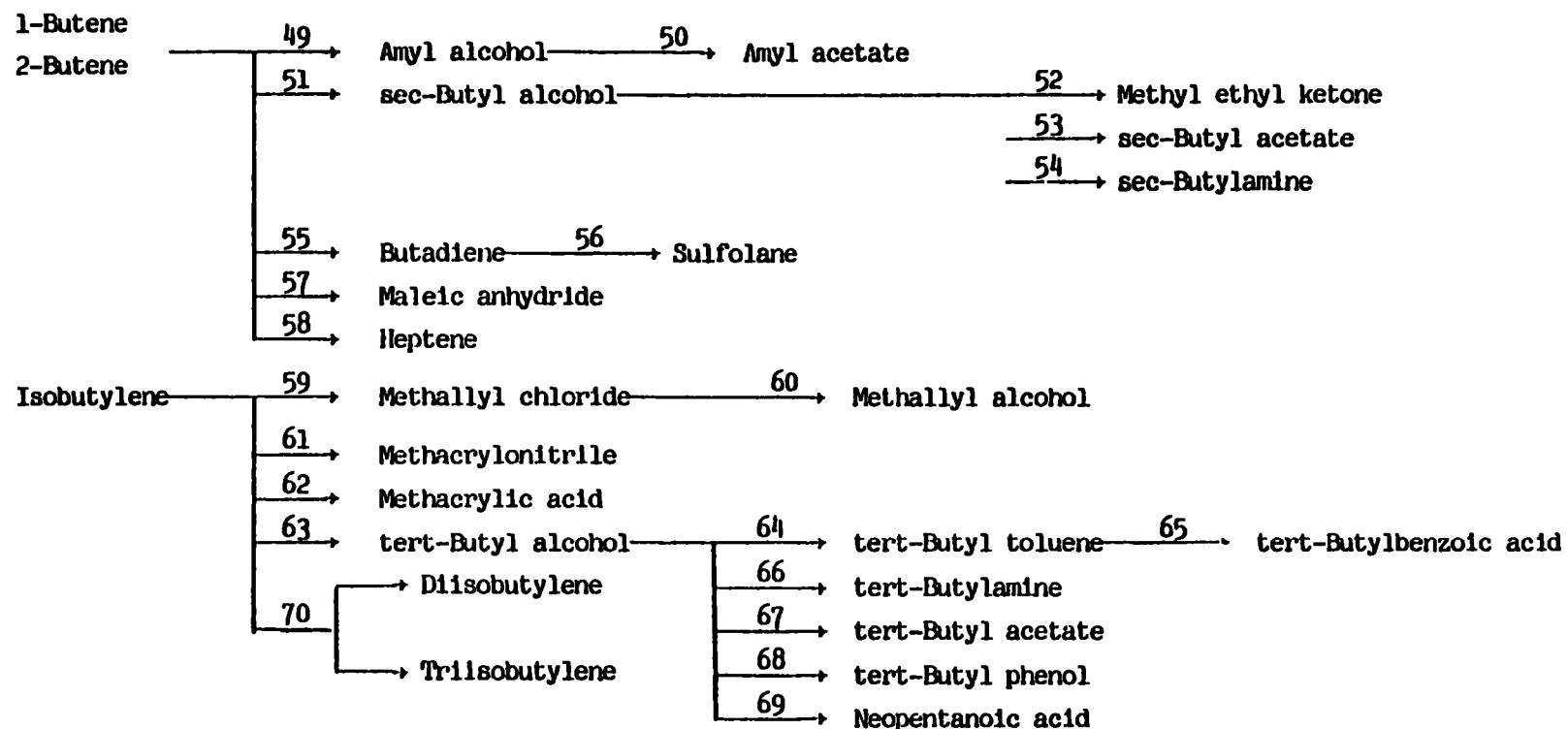
CHEMICAL TREE

The chemical tree developed by Monsanto Research Corporation for the draft copy of the Environmental Catalog of Industrial Processes, Chapter 6, is included in this appendix. The work was completed under EPA Contract No. 68-02-1320, Task 17.

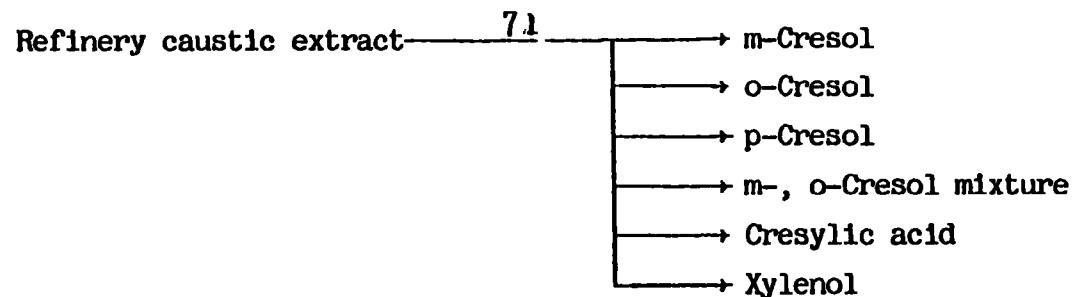
BENZENE

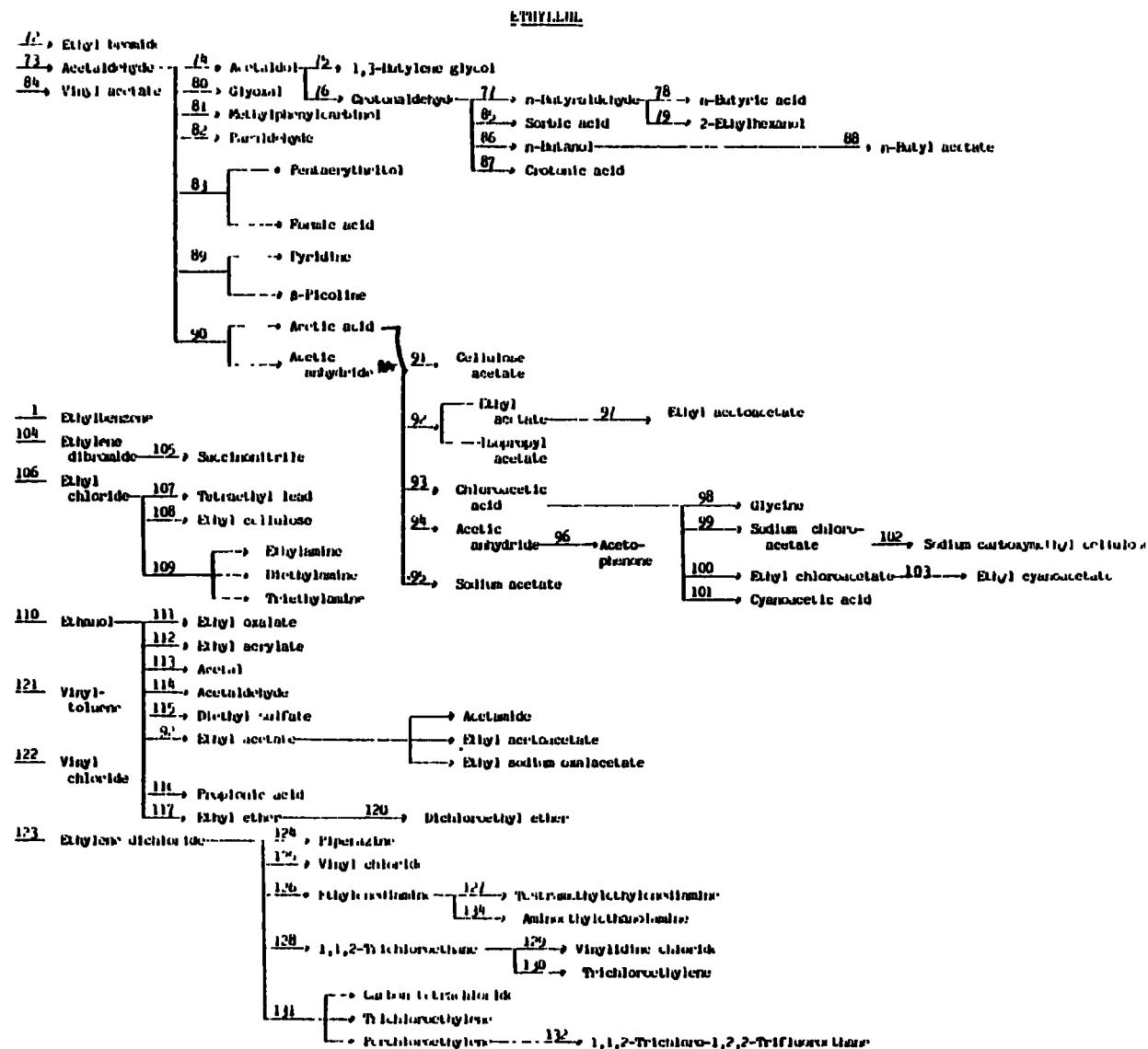


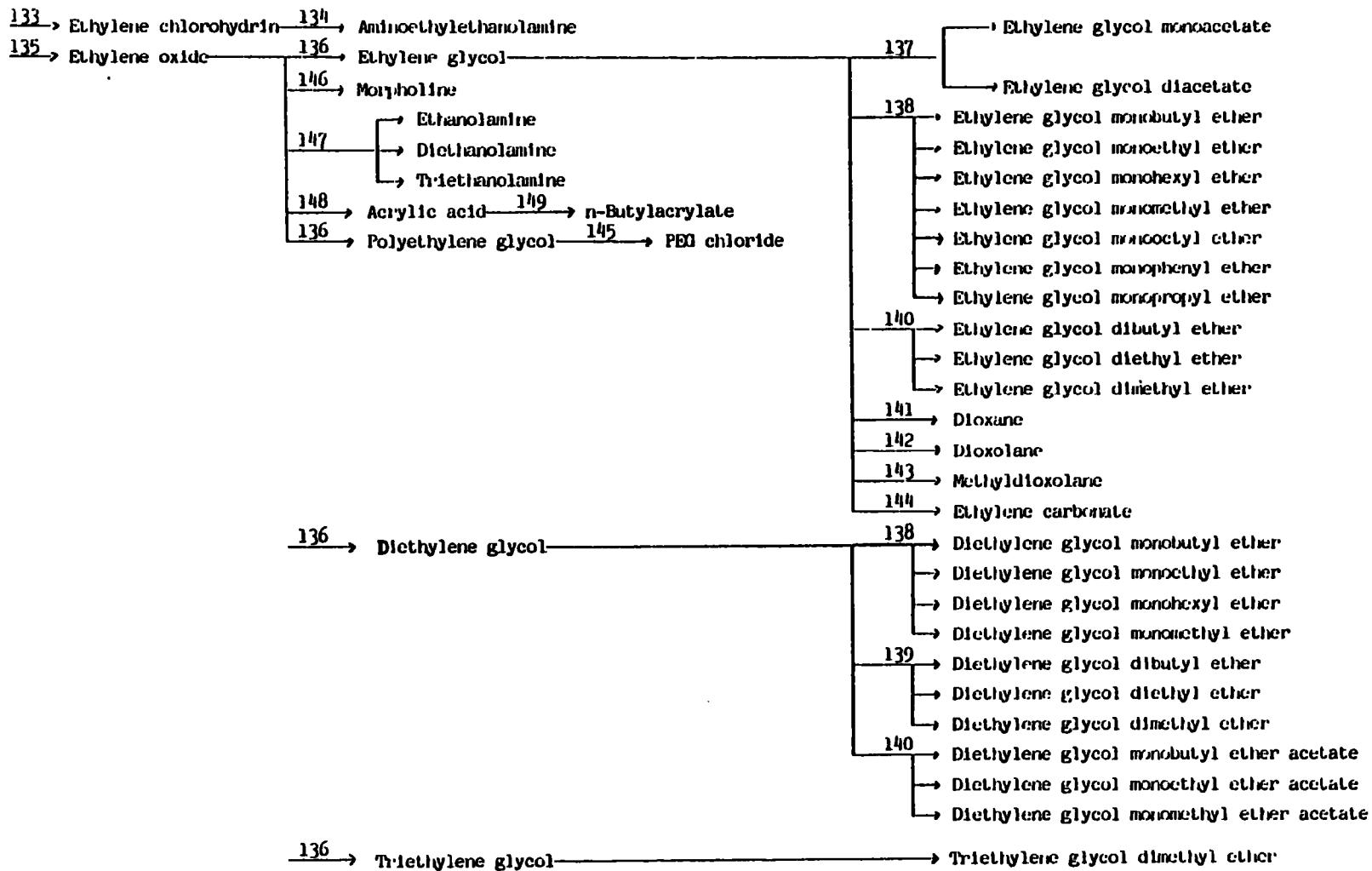
BUTYLENES

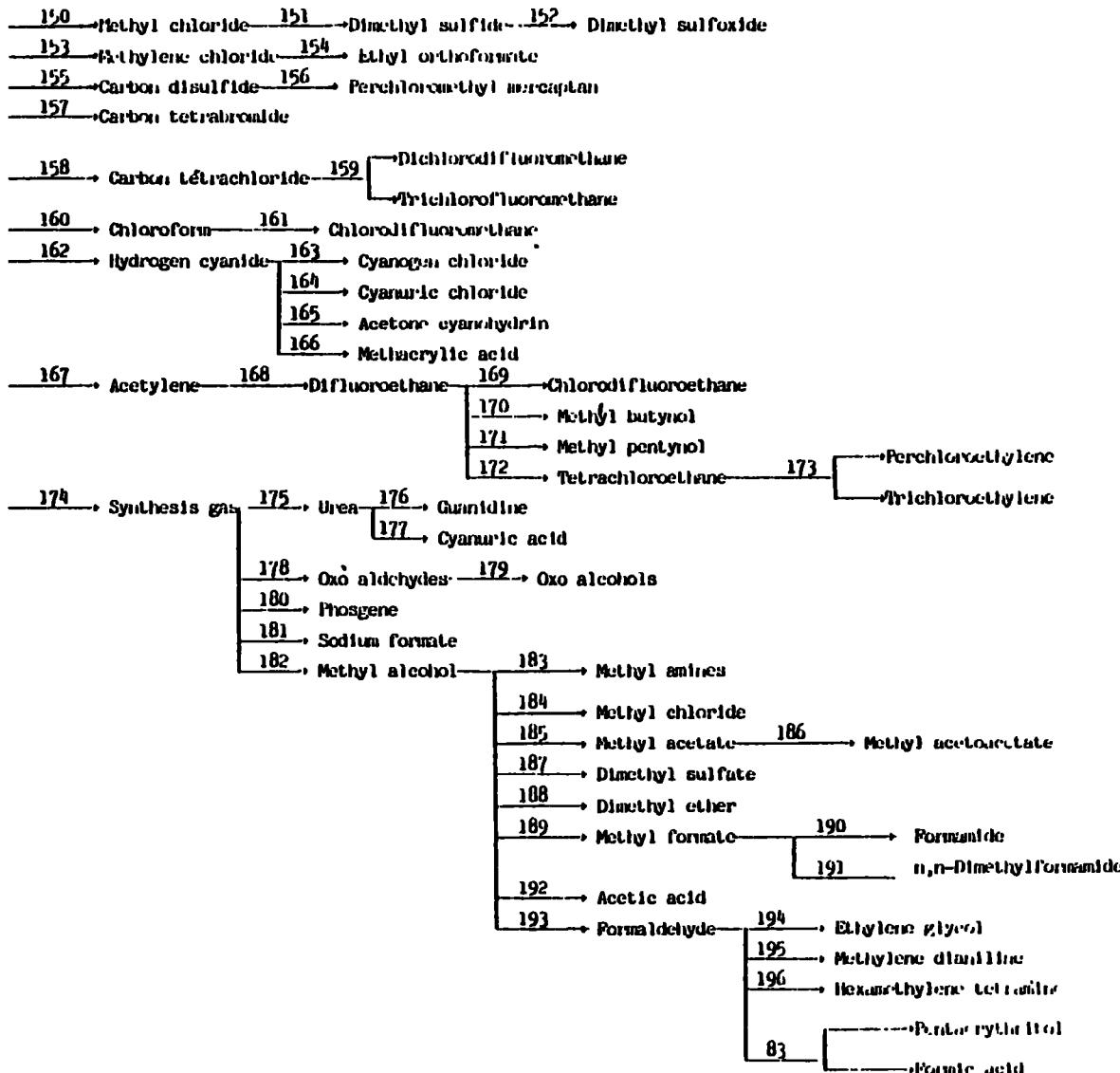


CRESOLS AND CRESYLIC ACID

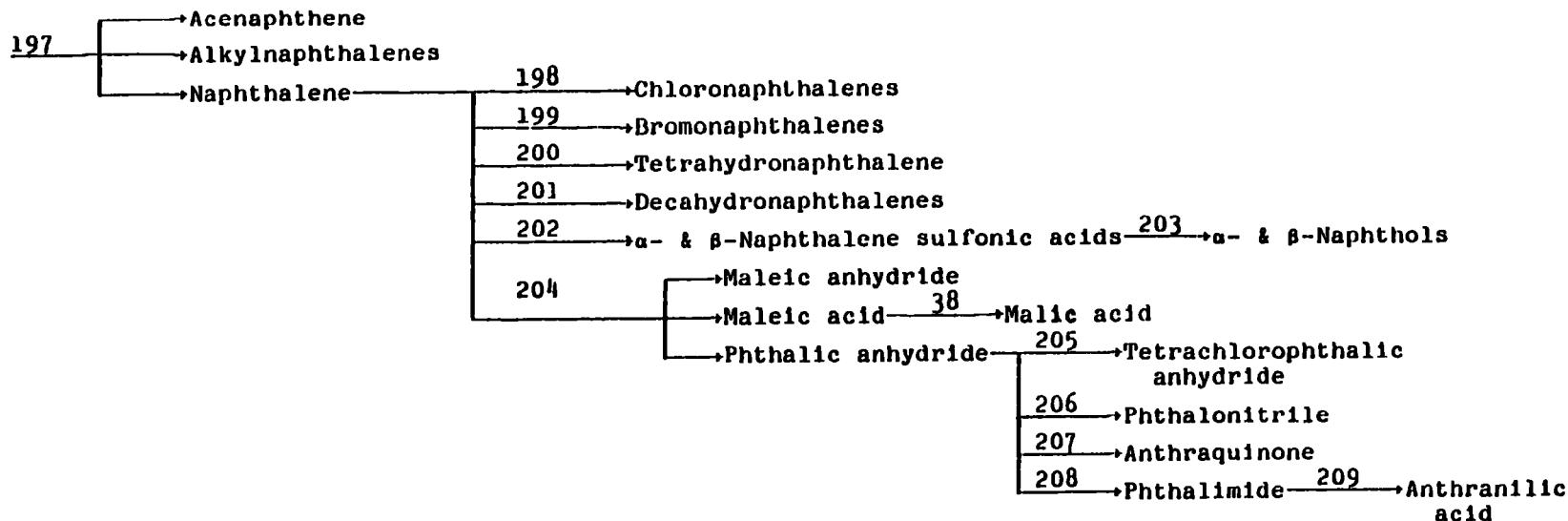


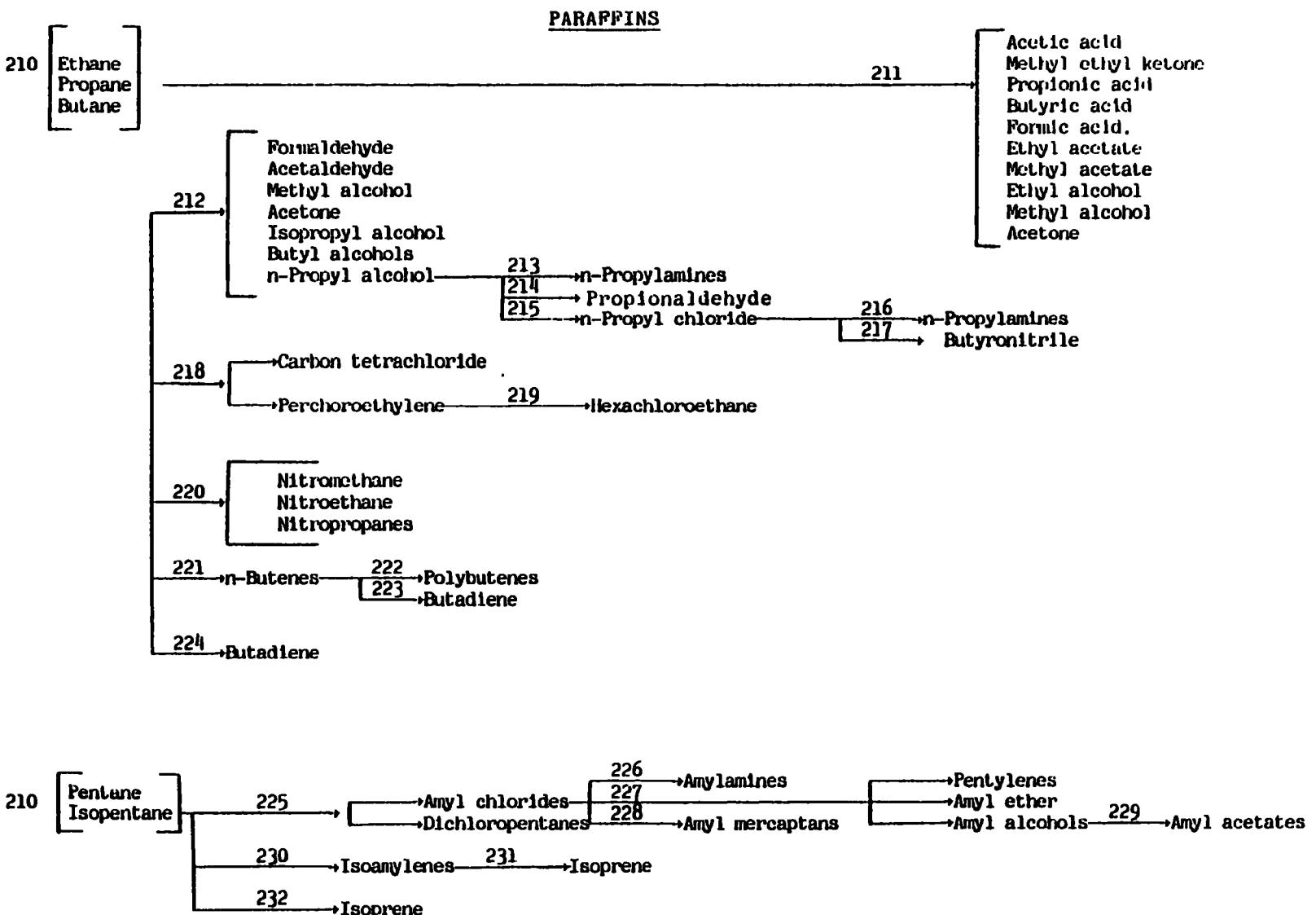


ETHYLENE (CONTINUED)

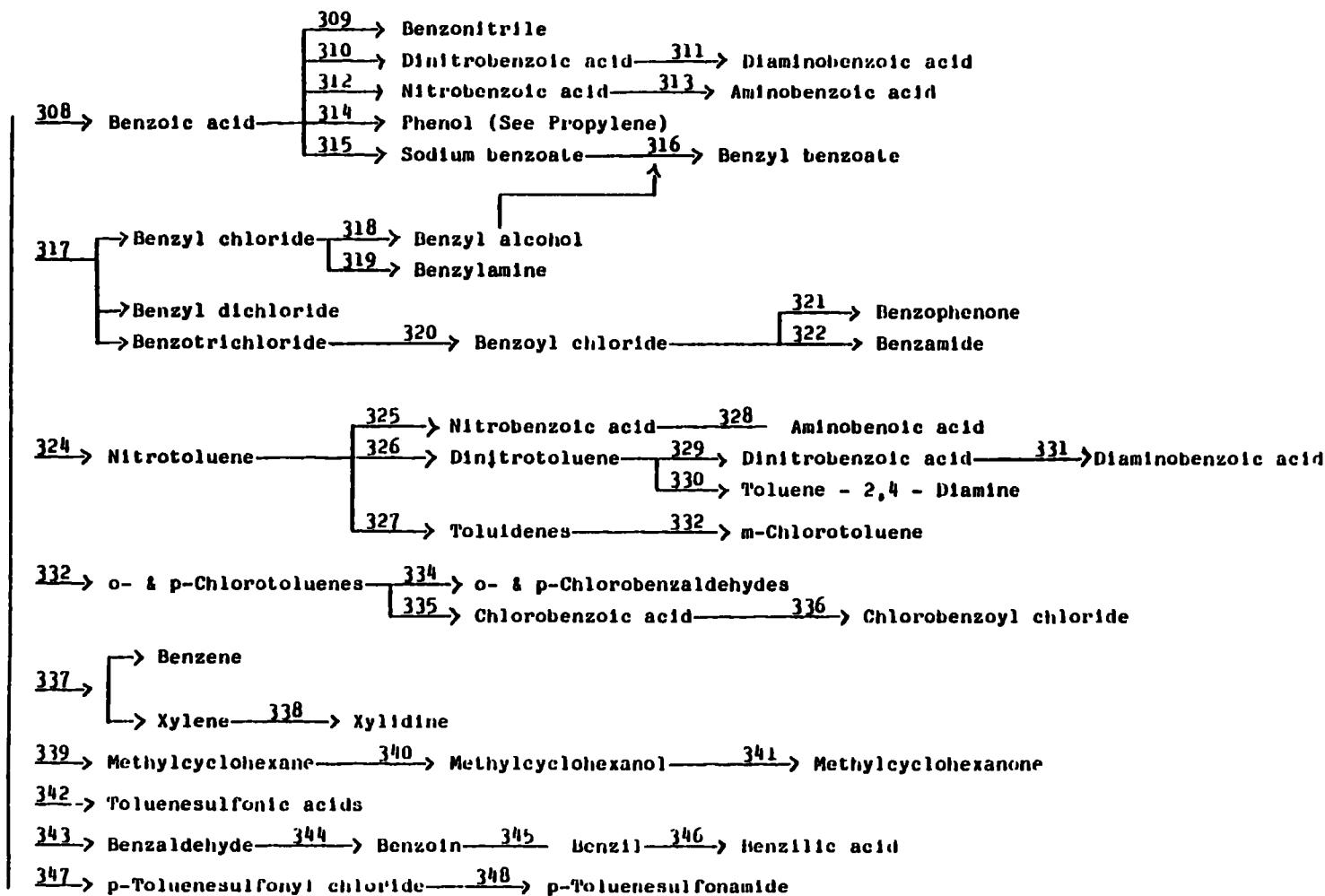
METHANE

NAPHTHALENES

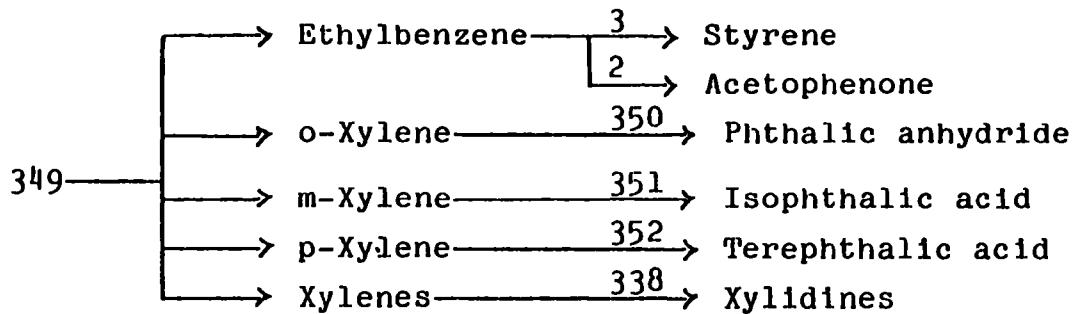






TOLUENE**TOLUENE**

XYLEMES



**APPENDIX V
BIBLIOGRAPHY**

BIBLIOGRAPHY

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