

CHEMIFACTS

Federal Republic of Germany

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SECTION I

CHEMICAL PRODUCT PROFILES

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FOREWORD

This volume, the second edition of Chemfacts: Federal Republic of Germany is the ninth in our series Chemfacts, designed to present current and accurate information on major industrial chemicals and chemical producers on a national scale. The success of the first edition in 1976, now virtually out of print, has assured us of the need to update and re-edit this volume which reflects a rapid period of growth and change in the Federal Republic of Germany.

The information is presented in two sections. Section 1 contains 79 chemical product profiles on 50 organic chemicals, 15 inorganic chemicals, 8 fertilizers and 6 polymers listed alphabetically in this volume. Each profile includes a basic product description, market trends on production and trade spanning ten years from 1978 where these have been released by official government sources. Trade breakdowns, with percentages for the volume of trade are provided for 1977 and 1978. This section also includes a table on plant data, listing the major national manufacturers of the product, the plant locations, present and planned capacities, feedstocks, process, licensor and contractor where available. This information has been largely obtained by direct contact and surveys with every company featured in this book, and we have been greatly assisted by the generous measure of positive response from most of the chemical manufacturers in the Federal Republic. The term 'v' in the plant data section denotes that the information has been directly verified by the company concerned. In instances where it was not possible to obtain verified information on plant data, but where there was good evidence for it, the term 'p.s.' has been used to mean published sources. These consist of several leading chemical industrial journals and newspapers printed in English, French and German which are scanned regularly in our department and can be quoted on request. Section 1 also contains a map pinpointing plant locations for every product, in conjunction with the major neighbouring cities. Thus Section 1 offers an overview of the present and planned manufacturing potential of the product and its growth and fluctuation in production and trade.

Section 11 provides information on 73 chemical companies listed in Section 1 and thereby relates the information on a particular product to the context of a producer's overall interests and engagements. The data in this section varies in length depending on the stature and structural complexity of the company and on the replies to our survey, but aims to include details of the directorate, finance, number of employees, overall manufacturing activities, subsidiaries and details of ownership, wherever information is available along these lines. Readers of the 1976 edition will note that fewer companies have been featured in the 1980 edition, due to first hand information of closures and mergers which have taken place over the last five years.

We extend our thanks to the many companies who have co-operated so liberally with us by providing the most recent information on their company structure and manufacturing programme. While every effort has been made to achieve strict accuracy in this survey under no circumstances can the publishers be liable in respect of any inadvertent error or omission from this survey.

Finally, we would welcome comments from our readers as we are constantly engaged in monitoring chemical data to make it a source of reliable and accurate reference for a world-wide readership.

Chemical Data Services
IPC Industrial Press Limited
Dorset House
Stamford Street
London SE1 9LU

March 1980

Sources of Reference

Subject

Statistics on Production:

Industrielle Produktion Reihe 3.
Statistisches Bundesamt, Wiesbaden.

Statistics on Trade:

Aussenhandel Reihe 2.
Statistisches Bundesamt, Wiesbaden.

Plant Data:

Primary Source

Survey of the major chemical producers
in the Federal Republic of Germany.

Secondary Sources*

Leading chemical industry journals and newspapers published in the Federal Republic of Germany, France, Japan, United Kingdom and the United States of America.

*Names of journals can be quoted on request.

Company Information:

1. Companies' replies to survey.
2. Companies' annual reports.

Cartographic Reference:

The Times Atlas of the World 1977 Edition.

TABLE OF ABBREVIATIONS

v. = verified by company

p.s. = published sources

m. = million

DM = Deutsche Mark

P. = process

F. = feedstock

L. = licensor

C. = contractor

(T) = total capacity

(A) = additional capacity

Note

Because of rounding, the figures shown in the tables of Market Trends and Trade Breakdowns may not conform exactly to the figures issued by government sources.

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	<p>These consist of 50 organic chemicals, 15 inorganic chemicals, 8 fertilizers, and 6 polymers listed alphabetically under product headings, with relevant page numbers on Divider Card 1.</p> <p>Information comprises a product description, with the product term in French, German Italian and Spanish; market trends in production, imports and exports; trade breakdowns for imports and exports for 1977 and 1978; plant data stating manufacturers, plant locations and where available, actual and planned capacities of the product, its process, feedstocks, licensor and contractor. A map indicating plant locations and major neighbouring cities is provided for every product.</p>	
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	<p>73 Chemical Companies named in Section 1 are listed alphabetically with relevant page numbers on Divider Card 11.</p> <p>Information comprises company address, and where available details of directorate, profile and present day structure of the company, number of employees, financial data, subsidiaries and associate companies, details of ownership and overall manufacturing activities.</p>	
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Acetaldehyde

Empirical formula: CH₃CHO

Synonyms: Acetic aldehyde, Ethyl aldehyde, Ethanal

Translation: French — Acétaldéhyde; German — Acetaldehyd;
Italian — Acetaldeide; Spanish — Acetaldehido.

Description: Colourless liquid, with pungent fruity odour. Soluble in water and in most organic solvents. Melting point: -123.5°C. Boiling point: 20.2°C. Specific gravity: 0.7834.

Derivation: a) air oxidation of ethylene (e.g. Wacker process)
b) oxidation of ethanol. c) hydration of acetylene with sulphuric acid and mercuric sulphate catalyst (the original route).

Grades: Various technical grades.

Uses: Main use is as chemical intermediate in the manufacture of acetic acid and of acetic anhydride, but also used in many other chemical processes, e.g. production of n-butyl alcohol, 2-ethyl hexanol and pentaerythritol.

Hazards: Fire: Highly inflammable, flash point -38°C. Stability: Very reactive, can form explosive peroxides under atmospheric pressure and reacts vigorously with oxidising materials. Personnel: Vapour toxic, exposure to more than 10,000 ppm for 1-2 hours can prove fatal.

MARKET TRENDS

Figures in Metric Tons

Year	Production	Imports	Exports
1969	293 843	224	3 684
1970	321 691	2 715	2 296
1971	300 575	2 518	1 323
1972	293 843	1 796	9 494
1973	372 688	655	24 172
1974	431 547	520	38 766
1975	272 536	5 176	7 443
1976	352 636	2 178	16 945
1977	346 220	1	32 583
1978	367 038	1 773	23 301



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric tons/yr.		Remarks
		Present	Planned	
Bayer AG	Leverkusen	60 000		P—oxidation of n-butene. p.s.
Chemische Werke Hüls AG	Herne	80 000		P—own; F—ethanol. v.
Hoechst AG	Frankfurt-Hoechst	170 000		F—ethylene; P—Hoechst/Wacker; L—Hoechst; C—Uhde
	Knapsack	133 000		F—ethylene; P—Hoechst/Wacker; L—Hoechst; C—Uhde. p.s.
Wacker Chemie GmbH	Cologne	60 000		F—aldehyde, ethylene. v.
	Burghausen	60 000		F—aldehyde, ethylene. v.

TRADE BREAKDOWN

Imports Country of Origin	1977		1978		Exports Country of Destination	1977		1978	
	Metric Tons	%	Metric Tons	%		Metric Tons	%	Metric Tons	%
France			1 750	99	Belgium	13 489	41	11 003	47
Others			23	1	France	7 541	23	3 721	16
					Netherlands	1 373	4	2 120	9
					Italy			456	2
					Sweden	2 865	9	3 081	13
					Switzerland	6 837	21	2 918	13
					Others	478	1		

Acetic Acid

Empirical formula: CH₃COOH

Synonyms: Ethanoic acid, Methane carboxylic acid

Translation: French — Acide acétique; German — Essigsäure; Italian — Acido acetico; Spanish — Acido acético.

Description: Clear colourless liquid with a very pungent odour. Miscible with water, alcohol, glycerine and ether. Melting point: 16.1°C. Boiling point: 118.1°C. Specific gravity: 1.04.

Derivation: From oxidation of acetaldehyde in air at 70-80°C in presence of manganous acetate. There are several modifications of this process. The acetaldehyde is obtained industrially from acetylene, oxidation of ethanol or, increasingly, from ethylene oxidation (e.g. Wacker process). Other processes for the preparation of acetic acid are (a) by catalytic combination of methanol and carbon monoxide and (b) oxidation of butane, using catalysts.

Grades: The pure acid (minimum 99.8%) is often referred to as glacial acetic acid. There are also many commercial and technical grades with lower acetic acid contents.

Uses: In the manufacture of acetic anhydride and of acetate esters, e.g. vinyl acetate, also ethyl and butyl acetates. Much of the acetic anhydride is used in the production of cellulose acetate.

Hazards: Fire: Combustible liquid, flash point 43.3°C. Stability: Reacts vigorously with oxidising materials and violently with caustic potash and caustic soda. Compatibility: Highly corrosive to metals. Personnel: Vapour causes irritation of eyes and respiratory system. Liquid causes severe burning of skin.

MARKET TRENDS

Figures in Metric Tons

Year	Production	Imports	Exports
1969	222 002	1 126	12 844
1970	237 649	412	18 486
1971	234 494	391	17 357
1972	247 795	202	20 367
1973	279 658	360	20 751
1974	311 827	147	41 298
1975	223 957	232	15 091
1976	266 177	438	20 239
1977	249 586	6 994	24 080
1978	266 196	5 886	24 845



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric tons/yr.		Remarks
		Present	Planned	
BASF AG	Ludwigshafen	40 000		F—methanol and carbon monoxide. v.
Bayer AG	Leverkusen	60 000		P—own; F—butene. p.s.
Chemische Werke Hüls AG	Marl	41 000		P—own; F—acetaldehyde. v.
Hoechst AG	Knapsack	80 000		P—oxidation of acetaldehyde. p.s.
Lonza Werke GmbH	Waldshut			production confirmed, other details not disclosed.
Degussa AG	Bodenfelde			production confirmed, capacity not disclosed.
				P—wood distillation; F—wood. v.

TRADE BREAKDOWN

Imports Country of Origin	1977		1978		Exports Country of Destination	1977		1978	
	Metric Tons	%	Metric Tons	%		Metric Tons	%	Metric Tons	%
Netherlands	6 118	87	4 799	82	Austria			1 213	5
France			960	16	Belgium	8 418	35	7 530	30
Others	876	13	127	2	France	4 197	17	1 920	8
					Hungary	3 534	15	1 805	7
					Italy	1 025	4	1 570	6
					Netherlands	1 127	5	1 484	6
					Romania			3 662	15
					Others	5 779	24	5 661	23

Acetic Anhydride

Empirical formula: $(CH_3CO)_2O$

Synonyms: Ethanoic anhydride.

Translation: French — Anhydride acetique; German — Essig-säure anhydrid, Azetanhydrid; Italian — Anidride acetica; Spanish — Anhidrido acetico.

Description: Colourless liquid with a pungent odour. Miscible with water and many organic solvents. Melting point: 73.1°C; Boiling point: 140°C.; Specific gravity: 1.082.

Derivation: a) from methyl alcohol and carbon monoxide; b) from direct oxidation of acetaldehyde, using catalysts such as manganous or cobalt acetates; c) by reaction of acetylene and glacial acetic acid in presence of mercuric sulphate; d) from glacial acetic acid and ketene, obtained by pyrolysis of acetone.

Uses: As an intermediate in the preparation of cellulose acetate and in other chemical processes such as the production of vinyl acetate. Used as a dehydrating agent. Also used as an acetylating agent in the production of pharmaceuticals, dyestuffs and explosives.

Hazards: Fire. Combustible liquid, flash point 65°C. Stability: reacts with water to form acetic acid, producing considerable heat. Reacts violently with caustic potash and caustic soda. Personnel: vapour toxic; liquid causes severe burns.

MARKET TRENDS

Figures in Metric Tons

Year	Production	Imports	Exports
1969	49 458	1 273	9 405
1970	47 382	1 442	8 168
1971	47 267	3 767	5 975
1972	55 936	3 627	8 098
1973	65 222	4 143	11 517
1974	73 868	2 035	15 314
1975	54 136	2 354	10 302
1976	66 298	4 382	17 439
1977	71 951	5 430	17 517
1978	75 488	5 426	19 910



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric tons/yr.		Remarks
		Present	Planned	
Hoechst AG	Knapsack			further details not disclosed. production confirmed; other details not disclosed. v.
Lonza Werke GmbH	Waldshut			
Wacker Chemie GmbH	Burghausen	10 000		

TRADE BREAKDOWN

Imports Country of Origin	1977		1978		Exports Country of Destination	1977		1978	
	Metric Tons	%	Metric Tons	%		Metric Tons	%	Metric Tons	%
Belgium	84	2							
Canada	549	10							
France	2 473	46	2 422	45					
Italy	2 298	42	2 897	53					
Others	26	—	107	2					

Export breakdowns not disclosed.

Acetone

Empirical formula: CH_3COCH_3

Synonyms: Dimethyl ketone, 2-propanone

Translation: French — Acétone; German — Aceton; Italian — Acetone; Spanish — Acetona.

Description: Colourless volatile and highly inflammable liquid with a characteristic odour. Miscible with water and most organic solvents. Melting point: -95°C . Boiling point: 56.5°C . Specific gravity: 0.792.

Derivation: From a) catalytic oxidation of isopropyl alcohol, b) oxidation of cumene, c) vapour-phase oxidation of butane.

Grades: Pure and various commercial and technical grades.

Uses: As an intermediate for many chemical processes, e.g. in the manufacture of methyl isobutyl ketone, methyl methacrylate, Bisphenol A and other chemicals. Also as a solvent for lacquers, cellulose acetate, vinyl resins, acetylene, gums, chlorophyll etc. Much used as a solvent in the plastics and paint industries.

Hazards: Fire: Highly inflammable liquid, flash point -9.4°C . If water is used in fire-fighting, large quantities must be applied to prevent re-ignition; a 4% acetone/96% water solution has a flash point as low as 54°C . Compatibility: Will dissolve rubber and many plastics. Personnel: Vapour toxic.

MARKET TRENDS

Figures in Metric Tons

Year	Production	Imports	Exports
1975		51 365	
1976		48 375	
1977		51 074	
1978		52 127	

Production and export figures not published. Imports: to 1975 product not sufficiently defined.



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric Tons/yr.		Remarks
		Present	Planned	
Deutsche Texaco AG	Moers-Meerbeck	36 000		C—Edeleanu, v.
Hoechst AG	Knapsack	10 000		p.s.
Phenolchemie GmbH	Gladbeck, Westfalen	250 000		P—oxidation; F—cumene; date of completion: 1977 v.

TRADE BREAKDOWN

Imports Country of Origin		1977		1978		Exports Country of Destination		1977		1978	
		Metric Tons	%	Metric Tons	%			Metric Tons	%	Metric Tons	%
Belgium		3 461	7	4 198	8						
France		3 057	6	2 177	4						
Czechoslovakia				404	1						
Italy		17 469	34	17 024	33						
Netherlands		20 102	39	21 963	42						
Romania		1 889	4								
United Kingdom		3 414	7	3 907	7						
Poland				827	2						
Switzerland				300	1						
U.S.A.				1 077	2						
Others		1 682	3	250	—						

No export trade details have been disclosed.

Acetylene

Empirical formula: $\text{CH}\equiv\text{CH}$

Synonyms: Ethyne, Ethine

Translation: French — Acétylène; German — Acetylen; Italian — Acetilene; Spanish — Acetileno.

Description: Colourless, highly inflammable gas, with garlic odour. Soluble in water and organic solvents. Melting point: -81.8°C (890 mm). Boiling point: -84°C .

Derivation: a) By the action of water on calcium carbide, b) by the cracking of petroleum hydrocarbons with steam (Wulff process), c) by the partial oxidation of natural gas (BASF process).

Grades: Technical grades, about 98% acetylene. Much acetylene is compressed in steel cylinders.

Uses: As a feedstock and intermediate in many chemical processes, e.g. in the manufacture of acrylonitrile, vinyl chloride, vinyl acetate, etc. There is an increasing tendency for ethylene to replace acetylene as a raw material for the production of vinyl compounds. Acetylene also has important uses in welding technology and as a source of various grades of carbon black.

Hazards: Fire: Highly inflammable; very explosive when compressed or mixed with air in certain proportions. Stability: Forms explosive compounds with copper and silver. Personnel: Toxic when inhaled.

MARKET TRENDS

Figures in Metric tons

Year	Production	Imports	Exports
1969	309 719	3 110	773
1970	311 262		
1971	335 065		
1972	352 128		
1973	374 033		
1974	345 969		
1975	260 249		
1976	251 496		
1977	203 906		
1978	209 097		

Trade: not stated after 1969.



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric Tons/yr.		Remarks
		Present	Planned	
BASF AG	Ludwigshafen	90 000		F—liquified petroleum gas, LPG. v.
Chemische Werke Hüls AG	Marl	120 000		P—own; F—LPG, natural gas, refinery gas. v.
Hoechst AG	Frankfurt Hoechst	145 000		p.s.
Wacker Chemie GmbH	Burghausen			further details not disclosed.

TRADE BREAKDOWN

Imports Country of Origin	1977 Metric Tons		%	1978 Metric Tons		%	Exports Country of Destination	1977 Metric Tons		%	1978 Metric Tons		%

No details available.

Acrylic Acid

Empirical formula: $\text{CH}_2=\text{CHCOOH}$

Synonyms: Acroleic acid, Propenoic acid, Ethylene carboxylic acid.

Translation: French — Acide acrylique; German — Akrylsäure; Italian — Acido acrilico; Spanish — Acido acrilico.

Description: Colourless, corrosive liquid, with an acid smell. Miscible with water, alcohol and ether. Readily polymerizes. Melting point: 12.3°C . Boiling point: 140.9°C . Specific gravity: 1.052.

Derivation: a) By hydrolysis of ethylene cyanohydrin with sulphuric acid. b) From acetylene, carbon monoxide and water. c) By oxidation of propylene, either directly, or via acrolein.

Grades: Technical, esterification and polymerisation grades.

Uses: Used as monomer for making polyacrylic acid, and also in making acrylic acid esters.

Hazards: Fire: Combustible liquid, flash point 54.4°C . Stability: Polymerizes readily. Compatibility: Severely corrodes iron and steel. Personnel: Vapour causes skin, eye and nasal irritation.

MARKET TRENDS

Figures in Metric Tons

Year	Production	Imports	Exports
1969		1 333	2 563
1970		2 378	3 051
1971		2 095	3 131
1972		468	5 066
1973		346	6 502
1974		2 864	5 823
1975		3 732	3 993
1976		1 387	7 152
1977		4 654	7 016
1978		3 358	8 608

Production figures not published. Trade: sorbic acid and acrylic acid.



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric Tons/yr.		Remarks
		Present	Planned	
BASF AG	Ludwigshafen	190 000		v.
E. Merck	Darmstadt			further details not disclosed.
Resart-IHM AG	Mainz			p.s.

TRADE BREAKDOWN

Imports Country of Origin	1977 Metric Tons		1978 Metric Tons		Exports Country of Destination	1977 Metric Tons		1978 Metric Tons	
		%		%			%		%
Belgium	126	3	47	1	Austria			107	1
France			86	3	Belgium	387	6	557	6
Japan	236	5	184	5	Brazil			434	5
United Kingdom	4 142	89	2 820	84	France	2 113	30	2 887	34
U.S.A.	126	3	187	6	Italy	849	12	1 125	13
Others	24	1	34	1	Netherlands	873	12	754	9
					Spain	235	3	383	4
					United Kingdom	1 672	24	1 752	20
					Others	887	13	607	7

Acrylonitrile

Empirical formula: $\text{CH}_2=\text{CHCN}$

Synonyms: Propene nitrile, Vinyl cyanide

Translation: French — Nitrile acrylique, Acrylonitrile; German — Acrylnitril, Akrylnitril; Italian — Acrilonitrile; Spanish — Acrilonitril.

Description: Colourless liquid with a mild odour. Miscible with water and most organic solvents. Melting point: -82°C . Boiling point: $77.3-77.4^\circ\text{C}$. Specific gravity: 0.8004.

Derivation: a) From dehydration of ethylene cyanohydrin (obtained from ethylene oxide and hydrogen cyanide). b) From acetylene and hydrogen cyanide. c) By ammoxidation of propylene (Sohio process).

Grades: Pure (over 99%) and technical grade.

Uses: As a monomer for polymerising to polyacrylonitrile, used in the production of synthetic fibres and in the production of oil resistant nitrile rubbers (butadiene — acrylonitrile copolymers), and ABS resins.

Hazards: Fire: Inflammable liquid, flash point 0°C . Stability: Sensitive to light; very reactive: may polymerise explosively in the presence of strong bases. Personnel: Vapour and liquid toxic. When heated this material may evolve toxic cyanide gas, or explode, or both.

MARKET TRENDS

Figures in Metric Tons

Year	Production	Imports	Exports
1969		30 547	7 945
1970		37 701	423
1971		63 007	1 597
1972		61 208	9 205
1973		12 973	35 812
1974		9 107	70 343
1975		3 721	24 378
1976		1 206	49 179
1977		12 126	24 191
1978		19 777	58 460

Production figures not published.



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric Tons/yr.		Remarks
		Present	Planned	
Erdölchemie GmbH	Köln-Worringen	280 000		P—Bayer and Sohio; F—ammonia and propylene; L—Bayer/Sohio; C—Bayer/Badger.
Hoechst AG	Knapsack	20 000		v.
Süddeutsche	Münchsmünster	90 000		p.s.
Kalkstickstoffwerke AG				L—Sohio; C—Badger. p.s.

TRADE BREAKDOWN

Imports Country of Origin	1977 Metric Tons	%	1978 Metric Tons	%	Exports Country of Destination	1977 Metric Tons	%	1978 Metric Tons	%
Austria			9 654	49	Austria	10 193	42	5 149	9
Belgium	108	1	94	—	Belgium	910	4	4 876	8
France	126	1	1 094	6	Czechoslovakia			376	1
Italy	898	7	508	3	France	1 772	7	518	1
Netherlands	2 575	21	4 278	22	Hungary			2 001	3
Romania	158	1			Italy	1 568	6	6 934	12
Switzerland			112	1	Netherlands	8 659	36	36 764	63
United Kingdom	8 237	68	4 026	20	Sweden	393	2	349	1
Others	24	—	11	—	Switzerland	552	2	1 406	2
					Others	144	1	87	—

Adipic Acid

Empirical formula: $\text{HOOC}(\text{CH}_2)_4\text{COOH}$.

Synonyms: Hexanedioic acid, 1,4-butanedicarboxylic acid.

Translation: French — Acide adipique; German — Adipinsäure; Italian — Acido adipico; Spanish — Acido adipico.

Description: White, crystalline solid. Slightly soluble in water, soluble in alcohol and acetone. Melting point: 152°C. Specific gravity: 1.360.

Derivation: Obtained by oxidation of cyclohexanone, which is derived from oxidation of cyclohexane.

Uses: Major raw material in the production of nylon 66. Also used in the production of esters, e.g. dicyclohexyl adipate; for plasticiser purposes; in the production of resins by condensation of the acid with polyhydric alcohols; as an ingredient of foods as an acidulant; in insecticides and adhesives.

MARKET TRENDS

Figures in Metric Tons

Year	Production	Imports	Exports
1969		351	16 968
1970		5 123	17 995
1971		7 632	15 089
1972		7 974	18 455
1973		18 299	15 084
1974	155 202	13 990	15 431
1975	118 701	9 857	8 701
1976	146 571	17 107	14 003
1977	136 678	20 416	16 361
1978	143 601	25 286	23 034

Production: adipic acid and salts, not stated before 1974.

Trade: to 1972 malonic and adipic acid, salts and esters, from 1973 adipic acid and its salts.



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric tons/yr.		Remarks
		Present	Planned	
BASF AG	Ludwigshafen	200 000		P—oxidation; F—cyclohexane. v.
Bayer AG	Uerdingen	42 000		P—oxidation; F—cyclohexane p.s.
Chemische Werke Hüls	Herne	20 000		P—own; F—phenol, cyclohexanol. v.

TRADE BREAKDOWN

Imports Country of Origin		1977 Metric Tons	%	1978 Metric Tons	%	Exports Country of Destination		1977 Metric Tons	%	1978 Metric Tons	%
Belgium		4 390	22	1 177	5	Austria		1 401	9		
France		14 503	71	23 681	94	Belgium		588	4	741	3
Italy		157	1	164	1	France		1 273	8	1 149	5
Netherlands		299	1	184	1	Italy		4 410	27	6 081	26
United Kingdom		1 024	5	80	—	Japan				5 235	23
Other		43	—			Netherlands		1 419	9	1 610	7
						Poland				694	3
						Spain		590	4	835	4
						Switzerland		551	3	909	4
						United Kingdom		477	3		
						U.S.S.R.		500	3	900	4
						Others		5 152	31	4 880	21

Ammonia

Empirical formula: NH_3

Translation: French — Ammoniac; German — Ammoniak; Italian — Ammoniaca; Spanish — Ammoniaco.

Description: Colourless gas, with characteristic pungent odour; lighter than air. Easily liquefied by pressure. Very soluble in water. Freezing point (of liquid): -77.7°C . Boiling point: -33.5°C . Specific gravity: 0.77 (at 0°C).

Derivation: Obtained on commercial scale by direct combination of nitrogen and hydrogen at high temperature and pressure in presence of catalyst (Haber process; with various modifications).

Grades: Commercial grades contain about 99.5% ammonia. Available in compressed liquid form in steel cylinders. The term "ammonia" is also used for ammonium hydroxide, i.e. solutions of ammonia in water.

Uses: Much of the ammonia produced industrially is used in the manufacture of fertilizers, either directly as liquid ammonia or in solutions, or in derived products such as ammonium salts and urea. Other chemical uses of ammonia are in the production of nitric acid, hydrazine, acrylonitrile and other nitrogenous organic compounds. Liquid ammonia is also used as a refrigerant and solvent.

Hazards: Personnel: Gas extremely irritating; liquid causes burns.

MARKET TRENDS

Figures in Metric Tons

Year	Production(a)	Imports	Exports
1969	1 940 469	242 157	77 200
1970	1 821 148	310 191	12 593
1971	1 787 555	200 491	25 435
1972	1 923 310	197 142	73 494
1973	2 064 320	220 014	28 699
1974	2 170 084	156 674	71 386
1975	1 981 020	156 998	277 053
1976	1 862 507	155 455	207 197
1977	1 988 858	127 898	314 799
1978	1 955 439	104 428	195 822

Production: synthetic ammonia expressed as N.

Trade: anhydrous ammonia.



CHEMICAL PLANT DATA

Company	Plant Location	Capacity Metric tons/yr.		Remarks
		Present	Planned	
BASF AG	Ludwigshafen	800 000		capacity as nitrogen content. v. P—ICI, Shell, own; F—LPG, natural gas, heavy fuel oil. The capacity is expressed as nitrogen content and includes those of subsidiaries in proportion to holding. v. F—natural gas; L—ICI/Kellogg; C—Kellogg/Bayer. v. P—ICI steam reforming; F—natural gas; L—ICI; C—Uhde. p.s. P—ICI; F—naphtha. p.s. production confirmed, other details not disclosed. P—Shell/Lurgi/Topsoe; F—residue; C—Lurgi Start-up date 1972/73. v. production confirmed, capacity not disclosed.
Chemische Werke Hüls AG	Herne	1 050 000		
	Botrop			
	Brunsbüttel			
Erdölchemie GmbH	Köln-Worringen	300 000		
Gewerkschaft Victor Chemische Werke	Castrop Rauxel	240 000		
Hoechst AG	Frankfurt-Hoechst	115 000		
Ruhr-Stickstoff AG	Bochum			
Veba Oel AG	Gelsenkirchen-Scholven	400 000		
Wintershall AG	Kassel			

Continued —

TRADE BREAKDOWN

Imports Country of Origin	1977		1978		Exports Country of Destination	1977		1978	
	Metric Tons	%	Metric Tons	%		Metric Tons	%	Metric Tons	%
Austria	36 286	28	45 781	44	Algeria	7 741	2		
Denmark			313	—	Angola			177	—
France	87 236	68	39 183	38	Belgium	61 221	19	32 080	16
Hungary	496	—	2 968	3	Denmark	164 911	52	89 653	46
Italy	160	—			France	31 171	10	38 233	20
Netherlands	3 556	3	16 132	15	Italy	9 910	3	2 005	1
Others	164	—	51	—	Netherlands			2 269	1
					Spain			9 030	5
					Sweden	26 802	9	3 810	2
					United Kingdom	8 182	3	17 998	9
					U.S.A.	4 410	1		
					Others	451	—	567	—