

pany became ripe for a takeover.

The attempt came in the fall of 1985. GAF, in the person of Samuel Heyman, a financier and Chief Executive Officer of GAF, made a hostile tender offer for the shares of Union Carbide. GAF, which at one time in the distant past had been General Aniline and Film, was only about one-tenth the size of Union Carbide, but it had the backing of Drexel Burnham, an investment banker with sufficient resources to make a leveraged buyout. Heyman's strategy was to take over Union Carbide, break it up, and sell the pieces at a substantial profit. With Carbide's low stock valuation, the pieces were far more valuable than the whole, even with the Bhopal liability, and the overfunded pension reserve would be icing on the cake.

The Company mounted a defense to the takeover attempt to preserve stock holder values, and a bidding war ensued. GAF made a final offer on Christmas day of 1985, but the Company topped it on January 2, 1986. The Company's offer to the stockholders included stock and a cash dividend of \$33 a share, close to the mid-1985 market value of the stock. (The exchange mechanism consisted of making a three for one stock split and then buying back one of those three shares for \$33.) The stockholders accepted this offer and the Company prevailed.

An immediate consequence of the huge cash dividend offer was that, in addition to taking on debt, parts of the Company had to be sold to pay the bill. The Consumer and Electronics businesses were selected for divestiture, because they had the highest growth and earnings quality, would be easiest to sell, would yield the most money, and would least impair the stockholders' remaining equity. Employees were advised of the situation and managers were brought in to participate in selling their units. A condition of each sale was that the purchaser had to commit to offering a position to every current employee at a salary and with benefits equal to what they were getting at Union Carbide.

Under these conditions, the Company, in 1986, divested Home and Automotive Products for \$800 million to First Brands, Inc., Battery Products for \$1.4 billion to Ralston Purina Corporation, and the Films Packaging Division for \$215 million to Envirodyne. The Agricultural Products business was sold to Rhone-Poulenc, a French company, for \$575 million. The remainder of the Metals Division, The Carbon Specialties group, and Kemet all went to leveraged buyouts, mostly by former employees. The cash generated by these divestitures exceeded the market value of the entire Corporation prior to the takeover attempt.

Not all the movement was downward. In 1988, the Company acquired a

half interest in UOP (formerly Universal Oil Products) from the Allied-Signal Corporation in exchange, largely, for Union Carbide's molecular sieve business. UOP is a process and licensing business serving the process industries (chemicals and petroleum). Union Carbide's molecular sieve businesses of manufacturing and selling catalysts, adsorbants, and process systems was complementary to the UOP operations. UOP is thriving in the 1990s with sales of about one billion dollars per year.

Union Carbide was realigned as a holding company in 1989, forty years after being converted to an operating company, as a prelude to final restructuring. The companies under the holding company umbrella were Union Carbide Chemicals and Plastics, Union Carbide Industrial Gases (Linde), and UCAR Carbons (Carbon Products). Union Carbide Industrial Gases was spun off as Praxair in mid-1992 in a tax-free exchange for stockholders. (The name Praxair was adopted because the name Linde was usable only in the United States under terms of the original agreement with Professor von Linde. Praxair, which is the largest industrial gases company in the Western Hemisphere, could use its new name in pursuit of broadening its markets in the rest of the world.) Half of UCAR Carbons was sold to Mitsubishi Corporation in 1991, and then both Mitsubishi and Union Carbide sold out completely in 1995. The Organosilicones Division, which was not regarded as part of Union Carbide's core businesses, was sold in 1993 to OSI Specialties, Inc. With these divestitures, the last major steps in the restructuring of Union Carbide were complete. The Company had an entirely new identity, no longer a conglomerate, but instead a basic, intermediates, and specialty chemicals company. The focus now was on being the best in its field. Its strategy was to be "a uniquely advantaged global chemical company recognized as the low-cost, preferred supplier in its core businesses."

The two men who led Union Carbide through these extremely difficult years were Warren M. Anderson and Robert D. Kennedy. Anderson served as chairman of the board from 1981 to 1985. Kennedy was chairman of the board from 1986 to 1995. Anderson had to cope with the Bhopal crisis. He acted constructively, ethically, humanely, and with grace while under great pressure and sometimes in the face of hostility. Kennedy guided the restructuring of the Company. He did it in a clear headed fashion that was effective and as fair as possible to both the employees affected and the shareholders involved. Kennedy also was one of the leaders in the implementation of the industry-wide "Responsible Care" program—a code of

mandatory management practice to ensure safeguards for employees, users, transporters, and the public throughout the life cycle of a company's products.

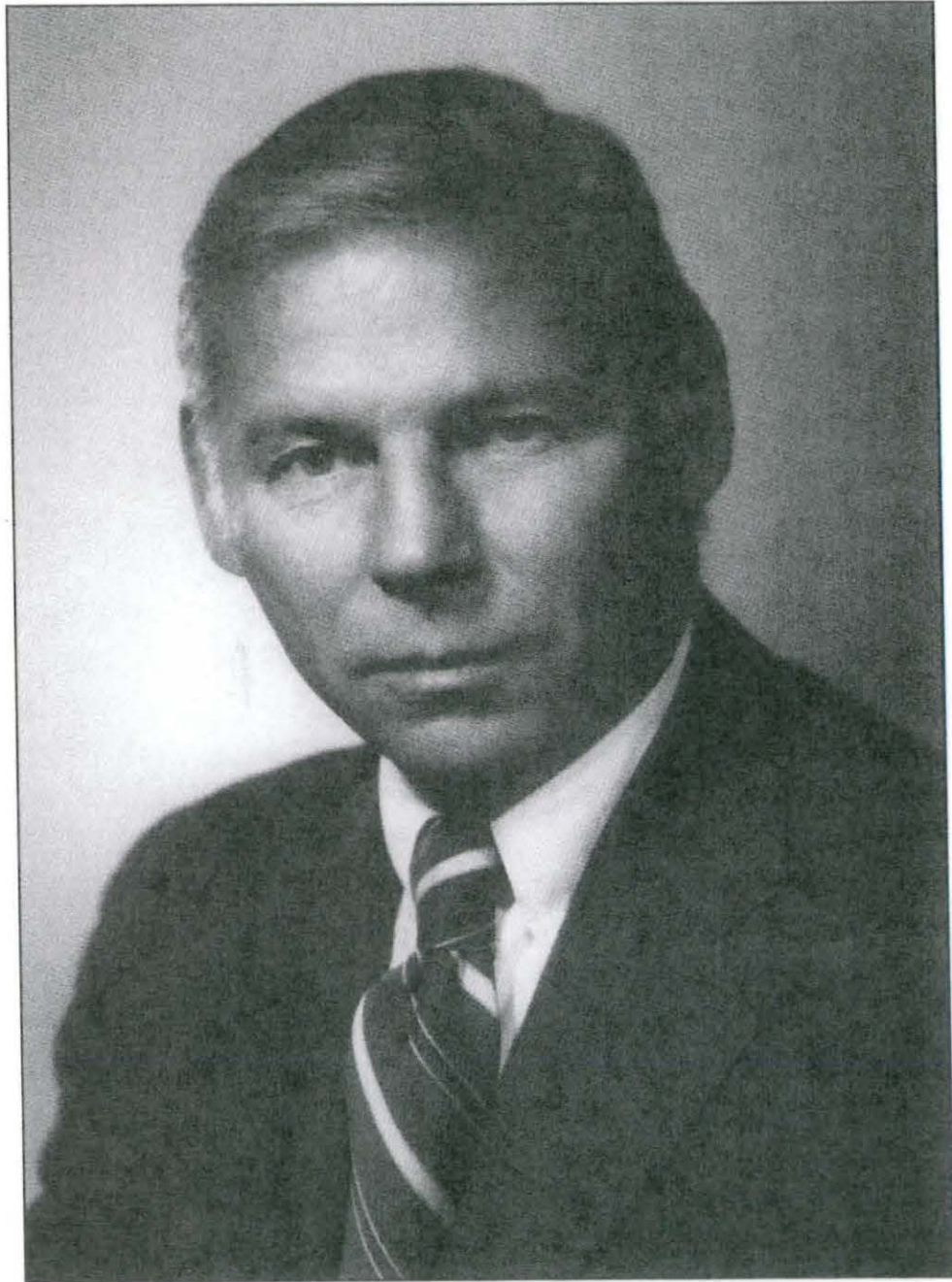


Figure XXIX
Warren M. Anderson

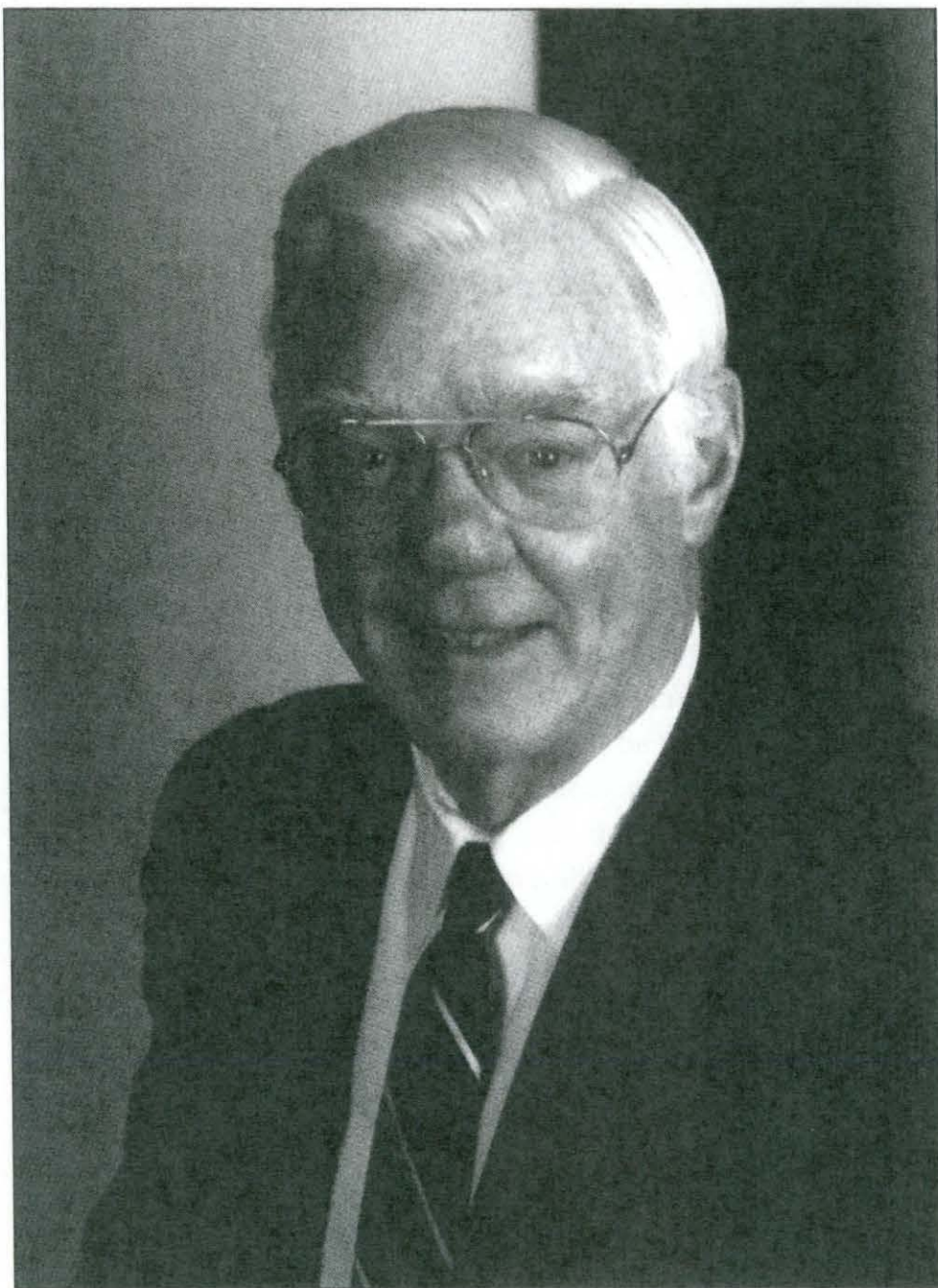


Figure XXX
Robert D. Kennedy

A HISTORY OF UNION CARBIDE CORPORATION

Epilog

Over the years, Union Carbide and its people made substantial contributions to technology, business, and society. The Company was a very special place for those associated with it: the mood was civil, the corporate character was ethical, there were many capable people, and things were happening. There was a strong sense of belonging—of being a “Carbider”—which existed pretty much at all levels and across the entire Organization.

Success sometimes seems to be measured by size, the bigger the better. Union Carbide ended up by being smaller, and some have viewed the Company negatively from that standpoint. (Net Corporate sales in 1990 were \$7.6 billion—including Industrial Gases (Linde)—and \$6.1 billion in 1996 without Industrial Gases and Osi (Silicones)—compared to peak Corporate sales of \$10.2 billion in 1981). However, the situation must be considered more broadly. The Company today is stronger, more focused, and growing. Most of the parts divested are also stronger and thriving, and in the process, value was created. In that light, despite the pains of passage, the aggregate outcome must be regarded as positive.

Another chapter of Union Carbide’s history remains to be written—that of the 1990s with the story of “re-engineering” and the outcomes of the new business focus and the new technologies. We’ll leave that for someone else to do in the future.

RDS

January 1998

A HISTORY OF UNION CARBIDE CORPORATION

About the Author



The author, Robert D. Stief, came to chronicle the history of Union Carbide Corporation in a roundabout way. He had suggested in 1993 to Union Carbide that it participate in the Chemical Heritage Foundation's recording of the history of the chemical industry in America. In turn, he was asked if he would do it himself under the aegis of the Carbide Retiree Corps—to which he agreed. The timing was probably propitious. If the work had been done any later, much of the earlier history would have been lost in the mists of time. If the work had been done very much earlier, the outcome of the transformation of the Company would not have been known. There turned out to be considerably more work than expected. It took five years to do instead of the two or three anticipated, and several hundred people participated in one way or another.

The author is a former director of engineering of the Chemicals and Plastics division of Union Carbide. He started work with the Company in 1952 at South Charleston, West Virginia, and was associated with the Engineering Department for his entire career with the Company except for a two-year stint as an employee relations manager. Prior to joining Union Carbide, he was in the U.S. Army Air Force (1944 - 1945) and at Los Alamos Scientific Laboratory (1951 - 1952). He has bachelor's and master's degrees in Chemical Engineering from the University of New Mexico and Syracuse University, respectively, and is a Fellow in the American Institute of Chemical Engineers. His avocation is anthropology. He retired from Union Carbide in 1983 and now lives at Seabrook Island, near Charleston, South Carolina.

A HISTORY OF UNION CARBIDE CORPORATION

APPENDIX

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A HISTORY OF UNION CARBIDE CORPORATION

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A HISTORY OF UNION CARBIDE CORPORATION

PRODUCTS AND SERVICES

1940

Annual Report
of
UNION CARBIDE AND CARBON CORPORATION
1940



Principal Units

ACHESON GRAPHITE CORPORATION	
AKTIESELSKABET MERAKER SMELTEVERK	
AKTIESELSKABET SAUDEFALDENE	
AMERICAN CARBOLITE COMPANY, INC.	
BAKELITE CORPORATION	
CANADIAN NATIONAL CARBON COMPANY, LIMITED	
CARBIDE AND CARBON CHEMICALS CORPORATION	
CARBIDE AND CARBON CHEMICALS LIMITED	
CARBIDE AND CARBON REALTY COMPANY, INC.	
DOMINION OXYGEN COMPANY, LIMITED	
ELECTRIC FURNACE PRODUCTS COMPANY, LIMITED	
ELECTRO METALLURGICAL COMPANY	
ELECTRO METALLURGICAL COMPANY OF CANADA, LIMITED	
ELECTRO METALLURGICAL SALES CORPORATION	
HAYNES STELLITE COMPANY	
KEMET LABORATORIES COMPANY, INC.	
THE LINDE AIR PRODUCTS COMPANY	
MICHIGAN NORTHERN POWER COMPANY	
NATIONAL CARBON COMPANY, INC.	
OXWELD ACETYLENE COMPANY	
THE OXWELD RAILROAD SERVICE COMPANY	
THE PREST-O-LITE COMPANY, INC.	
PREST-O-LITE COMPANY OF CANADA, LIMITED	
UNION CARBIDE COMPANY	
UNION CARBIDE COMPANY OF CANADA, LIMITED	
UNION CARBIDE AND CARBON RESEARCH LABORATORIES, INC.	
UNITED STATES VANADIUM CORPORATION	

Condensed Summary of Products

The products and processes of the Corporation, summarized in the following pages, may be grouped into four divisions:



ALLOYS AND METALS

FERRO-ALLOYS AND REFINED ALLOYING METALS
METALS AND ALLOYS FOR ABRASION-RESISTANCE AND
FOR CORROSION-RESISTANCE

•
CALCIUM CARBIDE AND GASES

CALCIUM CARBIDE
OXYGEN, NITROGEN, RARE GASES OF THE ATMOSPHERE
ACETYLENE AND HYDROGEN
WELDING AND CUTTING APPARATUS AND SUPPLIES
STEEL-CONDITIONING MACHINES AND PROCESSES
"UNIONMELT" WELDING PROCESS AND EQUIPMENT

•
ELECTRODES, CARBONS, AND BATTERIES

CARBON AND GRAPHITE FURNACE ELECTRODES
GRAPHITE ANODES FOR ELECTROCHEMICAL PROCESSES
CARBON, GRAPHITE, AND METAL-GRAPHITE BRUSHES
CARBON, GRAPHITE, AND "KARBATE" STRUCTURAL MATERIALS
PROJECTOR AND PHOTOGRAPHIC CARBONS
FLASHLIGHTS AND BATTERIES
DRY CELLS AND RADIO BATTERIES
ANTI-FREEZES AND INSECT-REPELLENT LOTIONS

•
SYNTHETIC ORGANIC CHEMICALS
AND PLASTICS

ALCOHOLS, GLYCOLS, AND ALCOHOL-ETHERS
ALDEHYDES, KETONES, ACIDS, ANHYDRIDES, AND AMINES
ETHERS, OXIDES, ESTERS, AND CHLORINATED COMPOUNDS
ANTI-FREEZES, HYDROCARBON GASES
PLASTICS, RESINS, AND WAXES

Alloys and Metals Division

Alloys of chromium, manganese, silicon, vanadium, columbium, and tungsten impart properties to steel which have made possible revolutionary changes in many industries. In every form of transportation, lighter weight construction with greater speed and safety is the result of the use of alloy steels. Resistance to corrosion and oxidation of special metals such as stainless steel has brought numerous improvements and economies in the oil, food, chemical, paper, and textile industries. In mining, machinery and parts made of alloy steels give greater life because of their resistance to corrosion and abrasion. The ALLOYS AND METALS division of the Corporation manufactures and sells these alloys in different forms, and promotes the use of stainless steel and other alloy steels in industry.

The ALLOYS AND METALS division of the Corporation includes Electro Metallurgical Company; Electro Metallurgical Company of Canada, Limited; Electro Metallurgical Sales Corporation; Haynes Stellite Company; Kemet Laboratories Company, Inc.; United States Vanadium Corporation; Aktieselskabet Saudefaldene; Aktieselskabet Meraker Smelteverk; and Electric Furnace Products Company, Limited.

FERRO-ALLOYS AND METALS—*Brand name is "Electromet."*

CALCIUM—*Calcium-Aluminum-Silicon, Calcium-Manganese-Silicon, Calcium Metal, and Calcium-Silicon.*

Combination alloys of calcium and silicon are extremely efficient deoxidizers and purifiers in the manufacture of steel and high-strength cast iron.

CHROMIUM—*Chromium Briquets, Chromium-Copper, Chromium Metal, CMSZ Alloy, and Ferrochromium (Ferrochrome).—Brand name for briquets is "EM."*

Chromium is the principal alloying element in stainless steels. Ferrochromium imparts strength, hardness, and resistance to

TRADE-MARKED PRODUCTS INCLUDE

Electromet
Ferro-Alloys & Metals

corrosion and oxidation. High-nitrogen ferrochromium is particularly effective in reducing grain size and improving the physical properties of steels containing 20 per cent or more chromium. Chromium prevents growth, and increases the strength and hardness of cast iron.

COLUMBIUM—*Ferrocolumbium.*

Columbium is used in the manufacture of stainless steels. It imparts improved welding characteristics to these steels and makes them particularly suitable for high-temperature applications.

MANGANESE—*Standard Ferromanganese, Low- and Medium-Carbon Ferromanganese, Ferromanganese-Silicon, Manganese Briquets, Manganese-Copper, Manganese Metal, and Silico-Manganese.—Brand name for briquets is "EM."*

Manganese is an essential element in the manufacture of nearly all grades of steel. It improves hot-rolling properties, adds strength and toughness, and is generally used as a deoxidizer. Low-carbon ferromanganese is used in stainless steel to impart better hot ductility and to improve weldability. Medium-carbon ferromanganese is used in low-carbon sheet steel to prevent age-hardening. Silico-manganese alloys hasten the refining of quality steels, reduce impurities and surface defects, and improve rolling properties.

SILICON—*Ferrosilicon, Silicon Briquets, Silicon Metal, and SMZ Alloy.—Brand name for briquets is "EM."*

Silicon is extensively used for degasifying and deoxidizing steel and cast iron. It imparts special electrical properties to steel, and is also used for the generation of hydrogen. SMZ alloy is a combination of silicon, manganese, and zirconium effectively used for softening cast iron. Silicon, manganese, and chromium are alloyed in non-ferrous metals, such as aluminum, nickel, and copper, to increase strength and improve other physical properties.

TRADE-MARKED PRODUCTS INCLUDE



CHROMIUM BRIQUETS



MANGANESE BRIQUETS



SILICON BRIQUETS

CONDENSED SUMMARY OF PRODUCTS

TUNGSTEN—*Ferrotungsten, and other Tungsten Alloys.*

Tungsten adds hardness and strength to steels and is used in the manufacture of high-speed tool steels, tungsten magnet steels, and in "Haynes Stellite" and "Haystellite" alloys.

VANADIUM—*Ammonium Meta-Vanadate, Ferrovandium, and Vanadium Oxide.*

Vanadium in alloy steels increases their strength and resistance to fatigue.

ZIRCONIUM—*Aluminum-Zirconium, Nickel-Zirconium, 35-40% Zirconium Alloy, 12-15% Zirconium Alloy.*

Zirconium alloys are active deoxidizers used in the manufacture of ferrous and non-ferrous metals. Zirconium combines with nitrogen and is used effectively in straight-chromium steels. It inhibits age-hardening in low-carbon sheet steel.

SPECIAL ALLOYS

ABRASION- AND CORROSION-RESISTANT ALLOYS—*Brand names are "Haynes Stellite," "Haystellite," "Hascrome," "Hastelloy," and "Stellite."*

"Haynes Stellite" non-ferrous alloys of cobalt, chromium, and tungsten are used for metal-cutting tools, and in the form of welding rod for hard-facing metal parts subject to abrasive wear, such as automotive and steam valves, agricultural implements, and cement and steel mill equipment. The outstanding characteristic of these "Haynes Stellite" alloys is that they will remain hard when red hot. This is known as "red hardness"; it makes "Haynes Stellite" alloys particularly adaptable for high-speed metal-cutting tools and for resistance to abrasion.

"Haynes Stellite" "93" alloy is an iron-base alloy containing cobalt, chromium, molybdenum, and vanadium, used in the form of welding rod for hard-facing metal parts subjected to severe abrasion with only a moderate amount of impact. This alloy is also made as special wear-resistant castings.

TRADE-MARKED PRODUCTS INCLUDE



CORROSION-RESISTANT ALLOYS



ABRASION-RESISTANT ALLOYS



IMPACT-RESISTANT ALLOY



CALCIUM CARBIDE AND GASES DIVISION

"Haystellite" cast tungsten carbide is an extremely hard material used in the form of inserts, composite rod, and tube rod for increasing the life and efficiency of oil well drilling and coring tools, and other metal parts subjected to severe abrasion.

"Hascrome" high-iron hard-facing rod, containing chromium and manganese, is used for surfacing wearing parts subjected to heavy shock or impact.

"Hastelloy" ferrous and non-ferrous alloys are used in the form of castings and fabricated equipment to handle acids and severely corrosive chemicals.

BARIUM GETTERS—*Brand name is "Kemet."*

These are used for the removal of gas from radio tubes.

Calcium Carbide and Gases Division

The products of this division are used principally for the welding and cutting of metals. These products include oxygen, calcium carbide, dissolved acetylene, and many types of automatic and hand-operated equipment.

The oxy-acetylene process is used in practically every manufacturing industry—particularly in the steel producing, metal fabricating, and metal consuming industries. Typical uses are the welding of various metals, including special steels and alloys, in production and repair; welding of pipe joints for oil, gas, water, and steam lines; building-up of worn rail ends; production cutting of steel shapes; cutting of scrap metal; conditioning of steel during its manufacture; and the flame-hardening and flame-softening of metals.

The CALCIUM CARBIDE AND GASES division of the Corporation includes The Linde Air Products Company; Dominion Oxygen Company, Limited; Michigan Northern Power Company; Oxweld Acetylene Company; The Oxweld Railroad Service Company; The Prest-O-Lite Company, Inc.; Prest-O-Lite Company of Canada, Limited; Union Carbide Company; and Union Carbide Company of Canada, Limited.

TRADE-MARKED PRODUCTS INCLUDE

UNION CARBIDE
CALCIUM CARBIDE

LINDE
U.S.P.
OXYGEN

Prest-O-Lite
DISSOLVED ACETYLENE

ACETYLENE—Brand name is "Prest-O-Lite."

The basic materials for the oxy-acetylene process of welding and cutting metals are oxygen and acetylene. "Prest-O-Lite" dissolved acetylene is furnished through numerous plants and warehouses in large cylinders for welding and cutting, and in small tanks for motor truck lighting, soldering, brazing, and heating.

CALCIUM CARBIDE—Brand names are "Union" (packed in the well-known blue and gray drums), "Cameo," "Carbic," "Carbolite," "Imperial," and "Amazon."

Calcium carbide is an electric furnace product from which is derived acetylene gas, used in the oxy-acetylene process of welding and cutting; in the production of dissolved acetylene; for farm and mine lighting; and as a basic material in the manufacture of various chemicals by chemical synthesis.

Calcium carbide in briquetted form is sold under the trademark "Carbic" for use chiefly in flood lights, and in portable acetylene generators for oxy-acetylene welding and cutting. "Carbic" flood lights are used on highways and railroads in night construction and repair work, in routine and emergency work throughout industry, and by municipal street and fire departments.

OXYGEN—Brand names are "Linde," "Driox," and "Dominion" (in Canada).

Oxygen is produced for use in the oxy-acetylene process of welding and cutting, for oxygen therapy, and for numerous other purposes. "Linde" oxygen plants and warehouses are located in all important industrial centers. Linde "Driox" liquid oxygen is supplied to large industrial users.

STEEL-CONDITIONING MACHINES AND PROCESSES—Brand names are "Lin-de-Surfac" and "Linde."

Processes and machines developed for the mechanized oxy-acetylene conditioning of steel have greatly improved certain phases of steel mill practice. The "Lin-de-Surfac" Conditioning

TRADE-MARKED PRODUCTS INCLUDE

DRIOX
LIQUID OXYGEN

LINDE-SURFACER
STEEL-CONDITIONING MACHINE

LINDE
RARE GASES

Machine removes defective surfaces from hot steel as a part of the continuous rolling process. The "Linde" Surface Remover conditions semi-finished steel where it is impracticable to perform this operation during the rolling process.

"UNIONMELT" WELDING PROCESS—Brand name is "Unionmelt."

The "Unionmelt" welding process, together with the necessary equipment and supplies, provides an automatic electric welding method which permits steel of commercially used thickness to be welded in one pass at remarkably high speeds. It produces welds of high strength and exceptional uniformity at lower costs than by former methods. Important applications are in the manufacture of ships, barges, railway cars and locomotives, large pipe, tanks, pressure vessels, and structural shapes.

WELDING AND CUTTING APPARATUS—Brand names include "Oxweld," "Prest-O-Weld," "Purox," and "Carbic."

A complete line of oxy-acetylene equipment, including welding and cutting machines, as well as blowpipes, regulators, acetylene generators, welding rods and supplies, is manufactured for use in the application of the oxy-acetylene process of welding and cutting. Flood lights and air-acetylene lighting and heating apparatus also are produced.

HYDROGEN—Brand names are "Linde," and "Dominion" (in Canada).

Hydrogen is used for the hydrogenation of oils and fats, for the production of metals from metallic oxides, and to furnish a non-oxidizing atmosphere for the heat-treatment of metals.

NITROGEN—Brand names are "Linde," and "Dominion" (in Canada).

Nitrogen, obtained from the atmosphere, is used in the incandescent lamp industry and wherever an inert atmosphere free of oxygen is desired.

RARE GASES—Argon, Helium, Krypton, Neon, and Xenon.—Brand name is "Linde."

Rare gases are extracted from air by the "Linde" Liquefaction

TRADE-MARKED PRODUCTS INCLUDE

UNIONMELT
ELECTRIC WELDING EQUIPMENT

Oxweld **PREST-O-WELD** **PUROX**
OXY-ACETYLENE WELDING AND CUTTING APPARATUS

CONDENSED SUMMARY OF PRODUCTS

Process. They are used in the manufacture of luminous tube signs of all colors, and for scientific purposes.

VALVES, CYLINDERS, AND SPECIAL DEVICES

Cylinder Valves—*Brand name "McKay."*
Cylinders for refrigerant gases—*Brand name "Polco."*
All-metal containers for liquefied gases—*Brand name "Purox."*
Halide Leak Detector—*Brand name "Prest-O-Lite."*

Electrodes, Carbons, and Batteries Division

The operations of this division include the manufacture and sale of products made partly or entirely from carbon, and the merchandising of many consumer products made by other divisions.

Sales to industry include carbon and graphite electrodes, used in large quantities in electric furnaces for the production of steel, ferroalloys, calcium carbide, phosphorus, and non-ferrous metals; and graphite anodes, used extensively for the production of chlorine and other electrochemical products. Other products sold to various industries include carbons for motion picture projection and photography; carbons for electric welding; carbon brushes for electric motors and generators; and an increasingly wide range of carbon specialties, particularly for anti-corrosion applications.

Products purchased by the consuming public include "Eveready" flashlights, flashlight batteries, radio batteries, "Air Cell" batteries, 6-inch dry cells, "Prestone" anti-freeze, "Trek" anti-freeze, and "Sta-Way" insect repellent lotion.

The ELECTRODES, CARBONS, AND BATTERIES division of the Corporation includes Acheson Graphite Corporation; Canadian National Carbon Company, Limited; and National Carbon Company, Inc.

ACTIVATED CARBON—*Brand name is "Columbia."*

Activated carbon is used for solvent recovery in industrial processes, and in gas masks for military and industrial purposes. It is marketed by Carbide and Carbon Chemicals Corporation.

TRADE-MARKED PRODUCTS INCLUDE

PRESTONE
ANTI-FREEZE

EVEREADY
BATTERIES, DRY CELLS, AND FLASHLIGHTS

Trek
ANTI-FREEZE

ELECTRODES, CARBONS, AND BATTERIES DIVISION

ANTI-FREEZES AND CORROSION PREVENTIVE—*Brand names are "Eveready," "Prestone," "Trek," and "Rustone."*

"Prestone" anti-freeze, "Trek" anti-freeze, and "Rustone" corrosion preventive, described with the products of the SYNTHETIC ORGANIC CHEMICALS AND PLASTICS division, are marketed with other "Eveready" products by National Carbon Company, Inc.

"Prestone" anti-freeze is the leading brand. Used according to directions, "one shot" of "Prestone" anti-freeze is guaranteed to protect the cooling system of a car against freezing, and against clogging from rust formation, for an entire winter.

BATTERIES AND DRY CELLS—*Telephone and Ignition Dry Cells, Signal Cells, Flashlight Batteries, and Radio "A," "B," and "C" Batteries.—Brand names include "Eveready," "Air Cell," "Columbia," "Hot Shot," "Ignitor," "Layer-Bilt," "Super-Layer-Bilt," and "Mini-Max."*

Various kinds of primary batteries are manufactured. The original and basic product is the 6-inch dry cell, used for ignition, telephones, signal bells and buzzers, animated displays, and for numerous other purposes. Flashlight batteries are another familiar form of the dry cell.


"B" and "C" radio batteries, and some "A" radio batteries, use assemblies of miniature dry cells, packed and connected together. In "Layer-Bilt" batteries, the traditional cylindrical form of the dry cell has been changed to a flat layer, packed layer on layer to eliminate waste space and much internal wiring. The latest form is the new "Mini-Max" "B" battery for portable sets which gives approximately twice the service life of other batteries of equal size and is an important contribution to the development of smaller and lighter radios.

The "Air Cell" battery is a "wet" battery designed to supply "A" power for battery-operated radio sets.

TRADE-MARKED PRODUCTS INCLUDE

COLUMBIA
DRY CELLS

LAYER-BILT
RADIO BATTERIES


NATIONAL
CARBON BRUSHES

MINI-MAX
"B" BATTERY

AIR CELL
"A" BATTERY

CONDENSED SUMMARY OF PRODUCTS

BRUSHES AND ELECTRICAL SPECIALTIES—*Brushes for Electric Motors and Generators, Welding Carbon Products, and Contacts.*—Brand names include "Columbia," "National," "Pyramid," and "Corliss."

Carbon, graphite, and metal-graphite brushes play an important part in the generation and use of electric power. They are manufactured in a wide range of sizes. Carbon specialties are used in welding and in numerous electrical applications.

ELECTRODES—*Carbon and Graphite.*—Brand names are "National" and "Acheson."

Electrodes are essential in arc-type electric furnaces used for the production of calcium carbide, ferro-alloys, phosphorus, alloy steels, non-ferrous metals, and gray iron. Carbon electrodes are made in sizes ranging from tiny battery carbons only 1/16 inch in diameter to huge 40-inch diameter furnace electrodes weighing several tons each. Graphite electrodes are also made in a wide range of sizes.

FLASHLIGHTS—Brand name is "Eveready."

Flashlights include a wide variety of types and sizes, ranging from small pocket lights to large powerful focusing searchlights and special types for industrial applications.

GRAPHITE PRODUCTS—*Anodes, Powders, Plates, Rods, and Tubes.*—Brand names are "Acheson" and "National."

Graphite anodes are used in electrolytic cells for the production of chlorine, caustic soda, and many other products. Graphite powder is used in the manufacture of dry batteries, brake linings, and lubricants.

INDUSTRIAL AND SOLARIUM ARC LAMPS—Brand name is "National."

Industrial arc lamps are used by industries requiring sources of light with special characteristics, and for the irradiation of milk and other foodstuffs. Large solarium arc lamps are used in hospitals for light therapy.

TRADE-MARKED PRODUCTS INCLUDE



KARBATE
STRUCTURAL MATERIALS

STAWAY
INSECT REPELLENT

National
LIGHTING CARBONS



SYNTHETIC ORGANIC CHEMICALS AND PLASTICS DIVISION

INSECT REPELLENT LOTION—Brand name is "Sta-Way."

"Sta-Way" insect repellent lotion effectively repels mosquitoes, flies, and other winged insects. It is harmless to the skin and has a pleasant odor.

LIGHTING CARBONS—*for Carbon Arc Lights, Industrial and Medical Irradiation, and Motion Picture Projection and Photography.*—Brand name is "National."

The carbon arc is the most powerful artificial light source. Carbon arc searchlights are used by the Army and Navy. Modern motion picture photography and projection are made possible through carbon arc light.

MAZDA MINIATURE LAMPS—Brand name is "Eveready."

Mazda miniature lamps include a complete line for automobiles, toys, flashlights, and other uses.

STRUCTURAL SPECIALTIES—*for Corrosion-Resistant Plant Structures and Equipment.*—Brand names are "Karbate," "Kempruf," "Carbocell," and "Graphicell."

Carbon and graphite in the form of large beams, bricks, and pipe are used in constructing such equipment as electrostatic precipitators, heat exchangers, and fractionating columns. Where imperviousness to passage of gases or liquids is required, the graphite or carbon base material is rendered impervious through special treatment. Very porous types of material are used for filtering.

Synthetic Organic Chemicals and Plastics Division

In recent years, processes and reactions have been developed through research—sponsored largely by Units of the Corporation—which permit the building-up of desired organic compounds from chemical elements or from simpler compounds. This is called synthesis—and the products are known as synthetic organic chemicals.

TRADE-MARKED PRODUCTS INCLUDE

SYNASOL
PROPRIETARY SOLVENT

CELLOSOLVE
SOLVENT

CARBITOL
SOLVENT

These products are utilized by widely diversified industries, sometimes to replace chemicals with less desirable characteristics, but more frequently in connection with new processes based upon distinctive properties of the new compounds. They are used in the textile (including rayon), surface coatings, automotive, chemical, pharmaceutical, paper, petroleum, photographic, printing, rubber, explosives, plastics, and many other industries.

In addition to the industries for which they are essential raw materials, synthetic organic chemicals are also utilized as emulsifying agents in cosmetic creams, polishes, and shampoos; as wetting agents for speeding aqueous processes; as plasticizers for resins, gelatin glue, and adhesives; as anti-freeze compounds for cooling systems; as heat-transfer mediums for aircraft engines; and as synthetic resins used for high-test safety glass, plastic articles, adhesives, and synthetic fibers.

The SYNTHETIC ORGANIC CHEMICALS AND PLASTICS division of the Corporation includes Bakelite Corporation; Carbide and Carbon Chemicals Corporation; and Carbide and Carbon Chemicals Limited.

ACIDS AND ANHYDRIDES—*Acetic, Propionic, Butyric, Maleic, and "Carbic" Anhydrides; Butyric, Ethylbutyric, Caproic, and Ethylhexoic Acids.*
—Brand name is "Carbic."

Organic acids and anhydrides are important raw materials in the manufacture of cellulose esters for rayon, safety photographic film, and plastics, and of certain perfume and flavoring essences. Acetic Anhydride is used also in making aspirin and other pharmaceuticals.

ACTIVATED CARBON—Brand name is "Columbia."

"Columbia" activated carbon, a product of the ELECTRODES, CARBONS, AND BATTERIES division, is marketed by Carbide and Carbon Chemicals Corporation. This material, which is available in several types and grades, is now universally used in both military and industrial gas masks, and is widely used in many commercial operations, such as the recovery of solvents vaporized into the air in industrial processes, and the removal of

odors and other impurities from air and other gases. Complete plants for solvent recovery by the "Columbia" activated carbon system also are designed and supplied.

ALCOHOLS—*Methyl, Ethyl, Isopropyl, Butyl, Methyl Amyl, Ethylbutyl, Hexyl, Ethylhexyl, and higher Alcohols.*—Brand name for a proprietary solvent is "Synasol."

Alcohols are used in anti-freeze compounds and as solvents in the manufacture of lacquers, dyestuffs, artificial leather, and shellac solutions. They are components of drugs, food preparations, extracts, cosmetics and toilet preparations, antiseptics, and disinfectants. They are also converted into synthetic resins, rubber chemicals, and textile dyeing compounds.

ALCOHOL-ETHERS—*Methyl "Cellosolve," "Cellosolve," Butyl "Cellosolve," Phenyl "Cellosolve"; Methyl "Carbitol," "Carbitol," Butyl "Carbitol."*—Brand names are "Carbitol" and "Cellosolve."

"Cellosolve" and "Carbitol" solvents are used in lacquers, wood stains, hydraulic brake fluids, printing and dyeing of textiles, and in the manufacture of non-shatterable glass, and cosmetics.

ALDEHYDES—*Butyl, Croton, Ethylbutyl, Hexyl, and Ethylhexyl Aldehydes.*

Aldehydes are important in the manufacture of plastics and compounds used to accelerate the vulcanization of rubber.

AMINES—*Acetoacetanilides, Ethanolamines, Ethylene Amines, Isopropanolamines, Morpholine, Ethylhexyl Amines, Phenyl Ethanolamines.*

Most of the amines form soaps used as emulsifying agents in polishes, insecticides, cosmetics, and cutting oils, as well as in textile and leather treating compounds. They are also used in making dyestuffs, pigments, pharmaceuticals, and cement and rubber chemicals. Certain amines are used to remove or concentrate carbon dioxide and other acid gases.

TRADE-MARKED PRODUCTS INCLUDE

SOLVATONE
SOLVENT

CARBIC
ANHYDRIDES

COLUMBIA
ACTIVATED CARBON

TRADE-MARKED PRODUCTS INCLUDE

PRESTONE WINTER-FLO BLUE-FLO Trek
ANTI-FREEZES FOR WINTER PROTECTION

ANTI-FREEZES AND CORROSION PREVENTIVE—Brand names for anti-freezes are "Eveready," "Prestone," "Blue-Flo," "Trek," and "Winter-Flo," and for corrosion preventive, "Rustone."

"Prestone" anti-freeze is the leading all-winter brand, and like "Trek" anti-freeze, it is marketed by National Carbon Company, Inc. "Trek" and "Winter-Flo" anti-freezes are concentrated methanol, effectively inhibited to retard corrosion. "Blue-Flo" anti-freeze is an ethyl alcohol base proprietary anti-freeze. Anti-freeze compounds also are manufactured for a number of national distributors who sell the materials under their own brand names.

"Rustone" corrosion preventive, added to the water in a clean cooling system, will retard the formation of rust.

CARBON DIOXIDE

Carbon dioxide is produced for the manufacture of "Dry Ice."

CHLORINATED COMPOUNDS—Ethylene and Propylene Chlorhydrins; Ethylene, Propylene, and Triglycol Dichlorides; Trichlorethylene.

The chlorinated hydrocarbons are characterized by high solvent power and are used in dry cleaning machines; in textile scouring; in the degreasing of metal parts; and for the extraction of oils, fats, and waxes. Ethylene Dichloride is one of the solvents for tetraethyl lead used to increase the octane rating of gasoline. When mixed with carbon tetrachloride, it is also widely used as a fumigant for insect pests.

ESTERS—Methyl, Ethyl, Isopropyl, Butyl, Methyl Amyl, and Ethylhexyl Acetates; "Carbitol" and "Cellosolve" Acetates; Dimethyl and Dibutyl Phthalates; Diethyl Sulfate; Methyl and Ethyl Acetoacetates; Glycol Diacetate; Glycol Diformate; Ethyl Silicate; "Flexol" Plasticizers; and "Tergitol" Penetrants.—Brand names are "Carbitol," "Cellosolve," "Flexol," and "Tergitol."

Esters are important solvents and plasticizers for cellulose esters, gums, and resins. They are used in lacquers and in the manufacture of pyroxylin plastics, photographic films, artificial leather, safety glass, dyes, and medicinals. "Tergitol" penetrants

TRADE-MARKED PRODUCTS INCLUDE

TERGITOL
PENETRANTS

FLEXOL
PLASTICIZERS

CHLOREX
SOLVENT

are wetting agents that speed aqueous processes, and increase the spreading power of metal cleaning compounds, insecticide sprays, and dust-laying solutions.

ETHERS AND OXIDES—Ethyl, Isopropyl, Butyl, Hexyl, and Dichlorethyl Ethers; Diethyl "Cellosolve" and Diethyl "Carbitol"; Dimethoxytetraglycol; Ethylene and Propylene Oxides; Dioxane.—Brand names are "Carbitol," "Carboxide," "Cellosolve," and "Chlorex."

Ethers are extractants for fats, oils, and alkaloids, and are utilized to recover organic acids from aqueous solutions, an important process in the manufacture of cellulose acetate rayon. Some are used in the manufacture of insecticides, guncotton, pyroxylin plastics, and collodion. The petroleum industry employs "Chlorex" solvent in the preparation of the new "solvent extracted" type of lubricating oils. "Carboxide" fumigant is particularly adapted for fumigating foodstuffs, grain, clothing, furs, tobacco, and dwellings.

GASOLINE

Gasoline is derived from natural gas and from oil cracking, and is sold in bulk to various oil companies.

GLYCOLS—Ethylene, Diethylene, Triethylene, Tetraethylene, Propylene, and Dipropylene Glycols.—Brand name for a glycol-base "anti-leak" liquid for gas main use is "Carboseal."

Glycols are liquids used in making hydraulic brake fluids, electrolytic condensers, synthetic resins, lacquer plasticizers, emulsifying agents, and low-freezing dynamites. Some find application as moistening and softening agents for tobacco, composition cork, glue, and paper products, and as fiber lubricants. "Carboseal" anti-leak is used in gas mains to prevent losses through dried-out joint packings.

HYDROCARBON GASES—Butane, Ethane, Ethylene, Isobutane, Methane, Propane, and Propylene.—Brand name for propane for domestic use is "Pyrofax."

These gases are used as fuels where high calorific value is required, as refrigerants in domestic and industrial installations,

TRADE-MARKED PRODUCTS INCLUDE

CARBOXIDE
FUMIGANT

Pyrofax
GAS

CARBOSSEAL
ANTI-LEAK FOR GAS MAINS

and as basic materials for the synthesis of many chemical compounds. Ethylene is widely used for accelerating the coloring of matured fruits and vegetables, principally citrus fruits, tomatoes, and bananas.

"Pyrofax" gas brings the convenience of gas fuel to homes, institutions, restaurants, and industrial plants located beyond the city gas mains. The gas is delivered in steel cylinders through a chain of over 350 distributing stations and is used with standard gas ranges, water heaters, gas refrigerators, and other gas burning appliances. "Pyrofax" gas is also used with oxygen for cutting steel; for carburizing or casehardening; and in many industrial applications where a fuel of uniform composition is required.

KETONES—*Acetone; Diacetone Alcohol; Mesityl Oxide; Methyl Amyl, Methyl Isobutyl, and Diisobutyl Ketones; Isophorone.*

Ketones are solvents for cellulose esters, oils, "Vinylite" and other resins, and many organic compounds. They are used in the manufacture of lacquers, rayon, artificial leather, photographic films, pyroxylin plastics, smokeless powder, and as alcohol denaturants. Acetone is used in acetylene cylinders as a solvent for the gas.

PLASTICS, RESINS, AND WAXES—*Brand names are "Bakelite," "Carbowax," "Halowax," "Vinylite," "Vinylseal," and "Vinyon."*

"Bakelite" plastics include two general types of products: thermosetting phenol-formaldehyde and urea-formaldehyde materials, and thermoplastic cellulose acetate and polystyrene. These products can be classified generally as: materials for molding and extrusion; cast resinoids in many colors and of various textures; liquid resinous products for the impregnation of brake linings and electrical equipment; cements, adhesives, and bonds for lamp bulb bases, plywood, and abrasive wheels; resinoid varnishes for the production of laminated materials, such as wall

paneling, silent automotive and industrial gears, table or desk tops, and instrument panels; synthetic resins for the production of all types of highest quality paint and varnish products, both for baking and air-drying finishes; heat-hardening lacquers and varnishes for coating chemical processing equipment, metal hardware, and other metallic surfaces; calendering materials for coating electrical insulation, metals, and fabrics.

"Vinylite" resins comprise another important group of synthetic resins and plastic materials. They are available in several forms: as powder; as granules for molding; and as sheets, film, permanently flexible sheeting, resin-coated paper, and extruded rods and tubes. Some are fabricated into colorful combs and toothbrush handles, or into records for electrical transcriptions, while others have become important insulating materials for various types of wires and cables. In another form they serve as the interlayer for high-test safety glass. When used as surface coatings, these resins are extremely resistant to the action of alcohols, acids, and alkalis. The flexible sheeting is finding wide application as shoe uppers, belts, and suspenders; in a thinner form it is used for shower curtains, raincoats, and other wearing apparel.

"Vinyon" synthetic fiber yarn, made by rayon manufacturers from "Vinylite" resin, is being used for industrial filter cloths, marine twine, and other applications where high tensile strength, elasticity, and chemical resistance are required.

The "Halowax" products are chlorinated hydrocarbons, synthetic resins, and various combinations of these products. They are used in industry as dielectrics, flameproofing agents, lubrication additives, and as plasticizers.

"Carbowax" compounds are non-volatile, water-soluble solids which resemble paraffin and petrolatum in appearance and texture, and are used as water-soluble textile lubricants; as paper and leather plasticizers; and as bases for water paint, shoe polish, sizing, and art crayons.

TRADE-MARKED PRODUCTS INCLUDE

BAKELITE
PLASTICS

VINYON
SYNTHETIC FIBER YARNS

Vinylite
RESINS

TRADE-MARKED PRODUCTS INCLUDE

VINYLSEAL
ADHESIVES

HALOWAX
SYNTHETIC WAXES

CARBOWAX
COMPOUNDS

A HISTORY OF UNION CARBIDE CORPORATION

PRODUCTS AND SERVICES

CURRENT

PRINCIPAL PRODUCTS AND SERVICES – CURRENT

Specialties and Intermediates

Industrial Performance Chemicals

Union Carbide manufactures a broad range of ethylene oxide derivatives and formulated glycol products. These include CARBOWAX polyethylene glycols with a wide range of applications in pharmaceutical, personal care, household and industrial markets; ethanolamines for detergents, personal care products and in natural gas conditioning and refining; ethyleneamines for many industrial uses; TERGITOL and TRITON specialty and commodity surfactants for institutional and household cleaning products and for other applications; UCON fluids and lubricants; and alkyl alkanol amines. Formulated glycol products include UCAR and ULTRA deicing and anti-icing fluids for the aviation industry, UCARTHERRM and NORKOOL heat transfer fluids, and gas treating products, including UCARSOL and SELEXOL solvents.

Manufacturing Sites – Taft, LA; Seadrift and Texas City, TX; Institute and South Charleston, WV; and Wilton, UK.

Specialty Polyolefins

Specialty Polyolefins manufactures and markets worldwide a variety of performance polyolefin products. Chief among these are polyolefin-based compounds for sophisticated insulation, semiconductives and jacketing systems for power distribution, telecommunications and flame-retardant wire and cable applications. Other specialty polyolefins products are used in adhesives, flexible tubing, and beer-can and soda-can six-pack carriers.

Manufacturing Sites – Bound Brook and Somerset, NJ; Seadrift, TX; Antwerp, Belgium; Cubatao, Brazil; and joint ventures in Gonfreville, France, and Kawasaki, Japan.

UNIPOL Systems

UNIPOL Systems licenses UNIPOL Process technology, the most cost-efficient and versatile method of manufacturing polyethylene, to producers of these products worldwide. It also develops new process technology for the manufacture of other olefins-based polymers, such as ethylene-propylene rubber, and sells catalysts to UNIPOL Process licensees world wide.

Manufacturing Sites – Norco, LA; Bound Brook, NJ; Houston and Seadrift, TX; and South Charleston, WV.

Solvents and Intermediates

Solvents and Intermediates supplies one of the industry's broadest product line of solvents and intermediates. Among its products are aldehydes, acids, alcohols, including high-quality synthetic and fermentation ethanol; esters; glycol ethers (CARBITOL and CELLOSOLVE solvents); ketones; and monomers (vinyl acetate and acrylics for polymers and waterborne coatings). Its principal customers are the paint and coatings industries, and many of its products are also widely used in cosmetics and personal care preparations, adhesives, household and institutional products, drugs and pharmaceuticals, fuel and lubricating oil additives, and agricultural products. The Company's UNICARB SYSTEM is a pollution-reducing, supercritical fluid technology for spray-applied coatings that can cut costs and reduce volatile organic compounds by 80 percent.

Manufacturing Sites – Taft, LA; Seadrift and Texas City, TX; Institute, WV; and Wilton, UK.

Specialty Polymers and Products & UCAR Emulsion Systems

Specialty Industrial Products produces acrolein derivatives, glutaraldehyde, vinyl methyl ether, ethlidene norbornene (ENB), specialty ketones, and biocides used to control microorganisms in applications such as sterilants, water treatment, papermaking, metalworking, oilfield operations, and industrial preservatives.

Performance Polymers include POLYOX water-soluble resins used in personal care products, pharmaceuticals, inks, and thermoplastics; and polyvinyl acetate resins used in chewing-gum resins, low-profile additives, Neulon polyester modifiers, fast-cure additives, and pigmentable systems.

Coating Materials products include CELLOSIZE hydroxyethyl cellulose (HEC); UCAR solution vinyl resins, TONE caprolactone-based materials, and cycloaliphatic epoxides, including CYRACURE ultraviolet-curing products, and FLEXOL plasticizers. Markets include paints, coatings, inks, substrates and other materials for magnetic tapes, food and beverage packaging, plastics, and orthopedic materials.

Manufacturing Sites – Taft and Greensburg, LA; Edison, NJ; Mamaroneck, NY; Texas City, TX; Institute and South Charleston, WV; Antwerp and Vilvoorde, Belgium; and Aratu, Brazil.

UCAR Emulsion Systems products, used in interior and exterior house paints, include UCAR latex products (acrylics and vinyl-acrylics that impart enhanced staining, weather, and scrub resistance to paints) and POLYPHOBE thickeners.

Manufacturing Sites – Torrance, CA; Tucker, GA; Alsip, IL; Somerset, NJ; Bayamon, PR; Garland, TX; Guayaquil, Ecuador; Jakarta, Indonesia; Seremabam, Malaysia; Guangdong, PRC; Batangs, Philippines; Ekala, Sri Lanka; Nonthaburi, Thailand; Jebel Ali Free Trade Zone, Dubai, United Arab Emirates.

Basic Chemicals and Polymers

Olefins

Union Carbide manufactures about three-quarters of its ethylene requirements and more than one-half of its propylene requirements. Ethylene and propylene are the key raw materials for Union Carbides olefin-chain businesses.

Manufacturing Sites – Taft, LA; Seadrift and Texas City, TX; a joint venture at Montreal, Quebec.

Ethylene Oxide and Glycol

Union Carbide is the world's leading producer of ethylene oxide and glycol. Ethylene oxide is a chemical intermediate primarily used in the manufacture of ethylene glycol, polyethylene glycol, glycol ethers, ethanalamines, surfactants, and other performance chemicals and polymers. Ethylene glycol is used extensively in the production of polyester fiber, resin, and film; automotive antifreeze, and engine coolants. Other ethylene oxide-based products include diethylene glycol, triethylene glycol, and tetraethylene glycol used as chemical intermediates and in dehydrating natural gas.

Manufacturing Sites – Taft, LA; Seadrift and Texas City, TX; Institute, WV; Prentiss, Alberta; Wilton, UK; a joint venture at Prentiss, Alberta.

UNIPOL Polymers

Union Carbide is a leading manufacturer of polyethylene, the world's most widely used plastic. UNIPOL Polymers produces and markets low-density, linear low-density, medium density, and high-density polyethylenes used in high-volume applications such as housewares, milk and water bottles, grocery sacks, trash bags, packaging, and water and gas pipes. FLEXOMER very-low density resins are used as a polymer modifier in other polyolefins and to produce flexible hose and tubing, frozen-food bags, and stretch wrap.

Manufacturing Sites – Taft, LA (Star Plant); Bound Brook, NJ; Seadrift, TX; Boucherville, Quebec.