

THUMBNAIL SKETCH

Texas City, Texas

Hydrocarbons Division

PRODUCTS

Styrene monomer for use in the plastics, synthetic rubber and surface coating industries.
Vinyl chloride and vinyl acetate monomer for use in plastics industry as transparent sheeting for rainwear, etc., or rigid for tile or hoses.
Acrylonitrile monomer for use in the plastics industry and in the synthetic fiber industry for miracle fabrics.
Polyethylene polymer for use in the plastics and wire coating industries; used solid in molding and in flexible film for coverings.
Methanol for use in production of radiator anti-freeze and formaldehyde.
Lactic acid for use in food preparation and in manufacture of cloth.

PLANT IN BRIEF

Acquired in 1946 by purchase from U. S. Government. Started operation in 1943 by Monsanto for U. S. Government's rubber program.

No. of employees: Approximately 1,900 (1,150 hourly - 750 salaried)

Best safety record: Without lost-time accident:

6,814,618 man-hours
Date record ended - January 26, 1962

Unions: Texas City, Texas, Metal Trades Council, AFL-CIO
Associated Guards of the United States
International Union of Operating Engineers Local 347

Geographical description: 201 acres. 13 miles north of Galveston; 40 miles south of Houston; located directly on Galveston Bay on Highway 146 leading in south from Highway 75. Highway 75 connects Houston and Galveston.

Texas City Disaster - April 16, 1947 - caused by the explosion of French liner "Grandcamp" loaded with 2300 tons of ammonium nitrate at adjacent public dock.

604 employed by Monsanto
451 (approx.) on duty at time of disaster
145 killed
over 200 hospitalized
123 employees of outside construction contractors on duty in the plant
227 total dead at plant

\$500,000 emergency relief fund appropriated by Monsanto

WAR 000001

RSV0032990

PLANT HISTORY

Monsanto Company

Texas City, Texas

Hydrocarbons & Polymers Division

Monsanto located its plant in Texas City, Texas, to take advantage of the supply of petroleum raw materials, fuel, adequate shipping facilities, and the temperate year-round climate that affords setting up chemical units without protection from extreme weather conditions.

The Texas City plant is located directly on Galveston Bay, within the city limits, on the southeast corner of the city. Other industry in the city extends back from Monsanto for several miles and includes three other chemical companies, three oil refineries, and a tin alloy plant. The population of Texas City is now about 35,000 people -- having grown consistently with the industry of the Gulf Coast. Adjacent to the city is the residential town of La Marque. Texas City is 13 miles north of Galveston, which is directly across the bay from the Monsanto plant, and is 40 miles south of Houston.

In November of 1941, Monsanto purchased a 30-acre tract of land in Texas City from the Texas Sugar Refining Company. The tract was located on the Galveston Bay shore adjacent to the dock facilities of the Texas City Terminal Railway. Much of the land had been filled in from the bay. The site contained miscellaneous office buildings, a boiler house, machinery storage, a machine shop, warehouse and other buildings, all in a questionable state of repair.

Plans were started immediately for the construction of styrene production facilities under the auspices of the Defense Plant Corporation for the synthetic rubber program. The plant design utilized a process developed by Monsanto and actual construction of a 20,000 ton a year plant was started on March 17, 1942.

In September of 1942 the government asked for expanded production facilities to produce 50,000 tons of styrene a year. In December of that year some units were completed and start-up operations were begun. On March 13, 1943, four days less than a year after the start of construction, the first tank car of styrene left the plant.

In August, 1944, additional modification work was done to the units to produce the equivalent of 60,000 ton a year -- 10,000 tons above that requested by Rubber Reserve.

Until 1946 all of the styrene produced was earmarked for the government's synthetic rubber program. However, with the passing of VE Day and VJ Day, war requirements declined rapidly and by late 1945 the plant was operating at a reduced capacity. In mid-1946, Monsanto requested and obtained permission from the government to utilize some of the surplus capacities of the plant to provide styrene for the expanded domestic plastics market. Throughout the rest of 1946 Monsanto was engaged in negotiating with the government on the purchase of the plant and the beginning of a styrene polymerization unit at Texas City.

On October 5, 1946, Monsanto purchased the plant from the government for approximately \$10 million. However, the company was still committed to supply some styrene to Rubber Reserve on a reduced schedule. Additional units were placed in operation and modifications were made on existing units, effecting a major increase in monthly styrene production.

WAR 000002

RSV0032991

On January 1, 1947, the Texas Division was established as a separate operating unit of Monsanto. The division included 550 employees on 45 acres of land. At the same time, plans were formulated to increase styrene production through a program to extend over several years.

These plans received a material setback on April 16, 1947, at 9:12 a.m. when the French liner, "S. S. Grandcamp," loaded with 2,300 tons of ammonium nitrate, exploded at the Texas City Terminal Railway dock adjacent to the plant. The explosion resulted in the total destruction of the plant with an extremely heavy toll of dead and injured.

The impact of the explosion was equivalent to 250 five-ton blockbusters; in the immediate area the detonation was almost equal to that of an atomic bomb. A large warehouse -- a steel and brick structure -- was flattened; not a splinter remained upright. The main power plant was similarly crushed. As the blast fanned out, walls of manufacturing buildings fell, windows of the offices and laboratories were shattered, and pipe lines carrying inflammable liquids were torn apart. The explosion's heat ignited the benzol, propane and ethylbenzene pouring out of ruptured pipes and storage tanks.

At the time of the explosion, the plant employed 604 people; approximately 451 of them were then on duty. Of this number, 145 were killed with over 200 being hospitalized with serious injuries. In addition to company casualties, 123 employees of outside contractors were working in the plant; 82 were killed, bringing the death total at the plant to 227 people -- more than one-half of the whole area's total dead.

To provide for payments which were beyond the company's legal liabilities, the Board of Directors immediately appropriated a \$500,000 relief fund. This was in addition to many other benefits, financial settlements and assistances given to victims of the disaster. Two days after the explosion, the company president was asked about the future of the plant. He replied -- "We will rebuild the plant; a better plant than was destroyed."

True to its word, Monsanto did rebuild. The plant was again on stream and producing ethylene in March of 1948 and the first styrene was shipped out in August. Changes and modifications in the design made possible the production of styrene well above the original pre-blast figures.

In September of 1950 a major expansion program for Texas City was announced. The expansion included new additions to the styrene plant and the construction of units for the production of vinyl chloride and acrylonitrile. Construction was actually begun in early 1951 and completed during the latter part of 1952.

On October 14, 1952, the first tank car of vinyl chloride monomer was shipped to the company's plant at Springfield, Massachusetts. On December 30, 1952, the first tank car of acrylonitrile monomer was shipped to the Decatur, Alabama, plant of the Chemstrand Corporation where it was used in the manufacture of Acrilan, a new synthetic fiber.

These events marked the beginning of the plant's quantity production of all three of the most important monomers in industry -- styrene, vinyl chloride and acrylonitrile -- making Texas City the "Monomer Headquarters of America." Styrene production capacity, now doubled in size, made the plant one of the world's largest producers of the basic plastic.

WAR 000003

RSV0032992

On January 1, 1954, Monsanto reorganized its division along product lines. As a result of this reorganization, the Texas Division was made a part of the Plastics Division.

Construction started in 1954 on a major addition to the research laboratories at Texas City. The new building was completed that year and housed 16 additional laboratories plus a wing for offices and an auditorium. The Research Department also uses a three-story structure, a part of the original plant.

Further major additions to the plant were announced in 1954 with the construction of a high purity ethylene plant, a polyethylene plant, a ship dock and a methanol plant.

The high purity ethylene facilities were completed late in 1954. The methanol unit also went on stream in November of 1954. The plant was a joint venture with Heyden Chemical Corporation and was based at Texas City because of the large acetylene operation there for acrylonitrile production.

Monsanto's first polyethylene plant went on stream in January of 1955. The new product represented the first polymer at Texas City that was being shipped directly to our customers. The polyethylene plant used existing ethylene units for its basic raw material.

The ship dock, originally justified on the basis of methanol shipments by Heyden, also permitted tanker shipments of styrene monomer and receipts of benzene. The dock is used by the "U. S. Chemical Transporter" for these shipments.

Construction of boiler water demineralizer facilities was begun in mid-1955. This facility for expanded power needs at Texas City was placed in service in December of 1955.

Another major expansion was announced in 1956 with the construction of a multi-million dollar ethylene plant to supplement existing ethylene units. The new units were completed and went on stream in April of 1957. Ethylene is a basic chemical at Texas City for the production of styrene, vinyl chloride and polyethylene.

The Research Department began work in 1956 on the addition of a two-story wing to the structure finished in 1954. The new building houses laboratories, testing facilities and offices and was completed during the summer of 1957.

An expansion for the divisional Engineering Department was completed in 1956 with the finishing of new office quarters in an existing structure that had been used as a warehouse. The new quarters include offices and conference rooms for the Engineering Department.

Since 1956, styrene, vinyl chloride, acrylonitrile and polyethylene have undergone major capacity expansions. Texas City's styrene plant is now the world's largest single facility for the production of that product.

In the spring of 1961, ground was broken for a huge complex at Chocolate Bayou for the production of hydrocarbons. Multiple pipelines connect that plant with Texas City.

Texas City, along with Chocolate Bayou and Lion Oil, became a part of the Hydrocarbons Division in October of 1961, when the company combined the operations of petroleum-based chemicals into one division. The division was reorganized in 1965 to include several manufacturing locations of the former Plastics Division and was renamed Hydrocarbons and Polymers Division.

Construction began in 1962 on a multi-million dollar unit that added a new product to Texas City's line. The plant makes vinyl acetate monomer.

Monsanto now owns 280 acres of land at Texas City. This is broken up into 201 acres which is the plant site and 79 acres about three-quarters of a mile north of town which is used to obtain fill for construction and to dispose of sludge from water treating facilities. The plant has 120 buildings with a total floor space of approximately 538,267 square feet. Most of the production operations are of semi-open construction.

Besides the manufacturing units and their service departments, Texas City also has large research and engineering departments. The plant currently employs around 1,900 people - 1,150 are hourly employees and 750 are salaried employees. Monsanto is the second largest employer in industrialized Galveston County.

Texas City is served by railway freight, deep water anchorage for sea-going vessels and the intra-coastal canal for barges. Other chemical industries in Texas City include Union Carbide Chemicals Company, Smith-Douglass Company and AMOCO Chemicals Corporation. The refineries are American Oil Company, Marathon Oil Company and Texas City Refining, Inc. Wah Chang Corporation, manufactures of tin alloy products, are also located in Texas City (previously the Tin Processing Corporation).

Production at Monsanto's Texas City plant is concerned primarily with the plastics and synthetics industry. The plant takes such raw materials as natural gas, petroleum by-products, air, chlorine and ammonia and processes them into colorless liquids or opaque solids. The liquids are "monomer" and include styrene, vinyl chloride and acrylonitrile. The solid, a "polymer", is polyethylene that is shipped as tiny pellets to customers.

Styrene is to the plastics industry what steel is to the auto industry. It is found in synthetic rubber, paints, waxes, polishes and tires. It turns up as a high-impact plastic in dishes, toys and boats. Styrene also goes into wall tiles, fishing rods and automobile bodies. The end uses are limitless.

The end use of vinyl chloride monomer is also extremely varied. Vinyl chloride can be either a rigid or flexible plastic. It goes into transparent sheeting for rainwear, shower curtains and as upholstery fabrics. It is also used in garden hose, floor tile and adhesives. Vinyl acetate is also produced at the Texas City plant. Vinyl acetate is used to make vinyl plastics and emulsions.

Acrylonitrile monomer is primarily used in the synthetic fiber industry. From acrylonitrile is spun Acrilan by the Chemstrand Corporation, a wholly owned subsidiary. Acrilan is a soft, wooly fiber that finds its way into dresses, sweaters, blankets, suits, work clothes and rugs. The miracle fiber is resistant to wrinkles, stains, mildew, rot and acids, and is completely washable.

WAR 000005

RSV0032994

Polyethylene plastic, both high and low density, is manufactured at Texas City. Polyethylene is used widely as a wire coating and in squeeze bottles for cosmetics, etc. The soft, pliable plastic also makes safe toys and molded tableware. Used in a transparent sheet or film, it packages frozen foods and protects products.

One of the "non-plastic" products at Texas City is methanol. It is used principally as an automobile radiator anti-freeze and in the manufacture of formaldehyde by other plants.

Our newest plant at Texas City makes synthetic lactic acid -- both food and technical grade. Food grade lactic acid is used as an acidulant in green olives, dairy products, carbonated beverages and other food products, and as an ingredient in emulsifiers for bakery products. Technical grade lactic acid is used in tanning of hides and textile finishing and as a chemical intermediate.

Texas City is a highly-automated plant. The manufacturing units are run by a few operators and engineers who operate production from control houses that are a maze of control panels, dials and instruments. An idea of the degree of automation is seen with the fact that out of the 1,140 hourly employees, approximately 440 of them are maintenance personnel who work only one shift. The other 700 hourly employees consist mainly of production personnel who work three shifts round-the-clock. This automation makes mass production of chemicals and plastics possible at low market prices.

Another "record" for Texas City has been its safety performance over the years. For four different years the plant won the President's Safety Trophy for having the best record in the entire company, retiring it permanently at Texas City. The best record without a lost-time accident is 6,814,618 safe man-hours worked. Monsanto is a safety leader in the Galveston County area.

6-15-67

WAR 000006

RSV0032995

GENERAL INFORMATION

PLANT LOCATION

The plant is located at the southeast corner of Texas City. Total plant area is 358 acres of which 243 are in use for manufacturing. This total acreage includes 80 acres northeast of Texas City in the Amburn Tract, 18 acres south of the plant at Swan Lake, and 18 acres of peripheral property adjacent to the plant. The Amburn Tract property is the site of our fire training area and a lagoon used to decant river mud from the plant water treating clarifier. The Swan Lake property is used for non-hazardous waste disposal.

ORGANIZATION

Manufacturing operations at Texas City are administered by the Fibers and Intermediates Company, which operates the acrylonitrile and acetone cyanohydrin units, site utilities, and environmental control operations. The Polymer Products Company is a guest operator of six manufacturing units - ethylbenzene, styrene, oxo alcohol, phthalic anhydride, phthalate esters, and tertiary butylamine. The Industrial Chemicals Company is a guest operator of the acetic acid and methanol manufacturing units. The Agriculture and Nutritional Products Company is a guest operator of the lactonitrile, lactic acid, and iminodiacetic acid manufacturing units (IDA is currently mothballed).

Other Manufacturing functions at Texas City include MISD, Accounting, Personnel, Plant Engineering and Distribution. The Personnel department includes the medical dispensary, industrial hygiene laboratory, plant security, and cafeteria. Plant Engineering includes instrument, electrical and mechanical maintenance, project construction groups with a large central shop facility, purchasing, stores, an engineering design group for plant projects and a material/mechanical technology group. The Distribution department includes material handling, production planning and scheduling, and the quality assurance laboratory.

The Technical Center at Texas City includes a process engineering group which supports capital project development, research and development laboratories and a CEO project support group.

The Texas City plant has historically used contractors to supplement Monsanto craftsmen and to execute capital project work. For the last few years, the number of contractor supplement to maintenance has gone down significantly. Monsanto Maintenance now works in our Plant Capital Projects group which in the past has been total contract manpower. We have provided an average of 40 Monsanto craftsmen per day to Capital Project work. Overall the contractor headcount has been down during 1983 and 1984 except for turnarounds that have occurred.

WAR 000007

RSV0032996

TEXAS City Plant History

Page 2.

EMPLOYMENT

The plant employs 1364 people in the following classifications:

Wage	855
Salaried:	
Manufacturing, Exempt	263
Non-exempt	101
Process Technology, Exempt	81
Non-exempt	47
Corporate Engineering, Exempt	12
Non-exempt	2
MPP Distribution, Exempt	<u>3</u>
Total	1364

Plant operating and craft wage personnel are represented by the Texas City, Texas, Metal Trades Council, an association of thirteen craft and operating unions. Cafeteria workers are represented by Local 347, International Union of Operating Engineers, AFL-CIO. Security guards are represented by the Associated Guards of the United States.

MAJOR PRODUCTS

The major finished products of the plant are as follows:

Acrylonitrile used for fibers, nylon and structural plastics.

Acetic Acid used in making cellulose acetate and vinyl acetate monomer, and for fiber and agricultural production.

Acetone Cyanohydrin used for manufacturing polymethyl methacrylate plastic.

Iminodiacetic Acid used as a raw material for Roundup.

Synthetic Lactic Acid used in the food industry as a preservative.

Methanol used in the production of anti-freeze, formaldehyde and acetic acid.

Oxo Alcohol used in manufacture of phthalate esters.

Phthalic Anhydride used in plasticizers, polyesters, alkyd resins, dyes and pharmaceuticals.

WAR 000008

RSV0032997

Phthalate Esters used in food-grade plastics, floor tile, film, fabrics and adhesives.

Styrene Monomer used for plastics, synthetic rubber, and surface coating materials.

Tertiary Butylamine (TBA) used as intermediate for the rubber and tire industry.

TEXAS CITY PLANT HISTORY

- 1941 ... Thirty-acre tract purchased under auspices of Defense Plant Corporation.
- 1942 ... Construction started on Styrene monomer unit and supporting Ethylene units.
- 1946 ... Plant purchased by Monsanto from United States Government.
- 1947 ... Ship explosions in harbor completely destroyed plant; reconstruction of Styrene and Ethylene units started immediately.
- 1951 ... Construction begun on Acrylonitrile, Hydrogen Cyanide, and Vinyl Chloride monomer units plus supporting Oxygen and Acetylene units; major expansion in Styrene.
- 1952 ... Started up Oxygen, Acetylene, Hydrogen Cyanide, Acrylonitrile and Vinyl Chloride monomer units.
- 1954 ... Construction begun on Methanol and low density Polyethylene units plus high-purity Ethylene units.
- 1955 ... Started up TBA unit and low density Polyethylene.
- 1956 ... Construction begun on new Ethylene units.
- 1957 ... Started up new Ethylene unit.
- 1959 ... Tract of 68 acres adjacent to plant acquired and filled by dredging for future plant expansion.
- 1962 ... Construction begun on high density Polyethylene unit.
- 1963 ... Started up Lactic Acid unit.
- 1969 ... 22 acres adjacent to south side of plant acquired for new deep water docking facility and product storage area.
Construction started on new Methanol and Acetic Acid units.
Construction begun on Phthalic Anhydride and Esters units.

1970 ... Started up new Methanol, Acetic Acid and Esters units.

Acetylene, Acrylonitrile, Vinyl Acetate and old Methanol units shut down and dismantled.

Construction begun on Oxo Alcohol and new Styrene units.

1971 ... Started up EVCL unit.

Started up Phthalic Anhydride and Oxo Alcohol units.

1972 ... Part of low density Polyethylene shut down.

Started up new Styrene unit.

Started up new primary waste water treatment.

1973 ... Signed contract for secondary waste water treatment at Gulf Coast Waste Disposal Authority (GCWDA) regional treatment facility.

1974 ... Started up new Ethylbenzene unit.

Construction begun on new Acrylonitrile unit.

EVCL unit shut down.

1975 ... Construction started on Acetone Cyanohydrin unit.

Low density Polyethylene unit shut down and dismantling started.

Started up GCWDA secondary treatment facility.

1976 ... Acetone Cyanohydrin started up.

Low density Polyethylene dismantling complete.

1977 ... Started up new Acrylonitrile unit.

-Hydrogen Cyanide unit shut down.

1978 ... Chrome-Zinc removal project completed.

Storm water diversion project completed.

1979 ... Major energy conservation project completed.

Boiler fuel conversion project completed.

1980 ... Acrylonitrile Exposure Reduction project completed.

Ethylene plant shut down, dismantling.

Started up GCWDA regional disposal facility for hazardous solid waste.

1981 ... Evaluation of coal utilization.

Benzene Exposure Reduction project completed.

Benzene pipeline from Shell and Exxon put on line.

8.7 acres south of plant leased.

CO₂ line from Air Products to Methanol completed.

1982 ... AN conversion to Nitro catalyst.

Demonstration of Phthalic Anhydride energy conservation project.

Startup and shutdown of IDA II.

High density Polyethylene shutdown.

1983 ... Install packing in EB/SM splitter column.

Texas City site study.

1984 MAJOR PROJECTS

Cogeneration evaluation.

Acetic Acid debottlenecking.

Methanol reformer rehabilitation.

Complete cooling tower consolidation.

1986 - 8/31/86 SOLD TEXAS CITY P.L.U. TO
STRENGTHS MEMBERS

WAR 000011

RSV0033000

TEXAS City

PLANT WORK CODE

001 Ethylene

100

START-UP 1947
DESIGN 1947
RE-THINK 1949

002 & 003 Alkylation

Feed: Propane

Products: Hydrogen, Methane, Acetylene,

Ethylene, Propylene, Cracked Oil

Solvents: Dimethylformamide, Freon 11 (CCl₃F)

Feedstocks: Ethylene, Benzene, HCl, Ethyl Chloride, Aluminum Chloride, Aluminum Powder, Caustic (50%)

Products: Benzene, Ethylbenzene, Polyethylene, Flux Oil (Heavy ends)

004 & 005 Ethylbenzene & Distillation

Feed: Alkylate

Products: Benzene, Ethylbenzene, Polyethylene, Flux Oil (Heavy ends)

Heat Transfer Fluid: Dowtherm A (Diphenyloxide, Diphenyl)

006 Lead Pot Cracking
(Unit #6 was dehydro at one time)

Feeds: Propane, Lead

Products: Hydrogen, Methane, Ethylene, Acetylene, Propylene, Cracked Oil

007 & 008 Dehydro Mixture & Distillation

Feed: Dehydrogenation Mixture (DM)

Products: Benzene, Toluene, Ethylbenzene, Styrene, Flux Oil (Alkylation Tars), Styrene Tar, Sulfur, tert-Butylcatechol

010 Ethylene

START-UP 1957
106 (1955) 1952

RE-DESIGN 1956
(1955) 1952

THIS LIST SAYS
EYE-SHOT-DOWN 1950
In (area) 1950

Feed: Field Condensate

Pyrolysis Products: Hydrogen, Methane, Ethane, Acetylene, Ethylene, Allene, Methylacetylene, Propane, Propylene, Butane, Butenes, Butadiene, Pentane, Pentenes, Isoprene, Pentadienes, Cyclopentadiene, Hexenes, Benzene, Toluene, Xylenes, Styrene, Dicyclopentadiene, Methylstyrenes, Indenes, C₉ Aromatics, Napthalene, Methylnapthalenes, Pyrolysis Pitch

Product Cuts: BTX, Resin Oil, Napthalene

Concentrate, Resin PR

Processing Solvents: Dimethylformamide

Refrigerant: Freon 11 (CCl₃F)

Cooling Tower Chemicals: Cl₂, H₂SO₄, NaNO₃, Na₂Cr₂O₇, Na₂SO₃, Na₃PO₄, 3nCrO₄

011 NSI

Feeds: 2,4-Dinitrophenol, HCl, NaOH

Products: 2-Amino-4-Nitrophenol, Sodium 2,4-Dinitrophenoxide (NSI Salt)

013 & 014 Ethylbenzene

Feeds: Ethylene, Benzene, Aluminum Powder, HCl, Ethyl Chloride, NaOH, Anhydrous AlCl₃

Products: Benzene, Ethylbenzene, Polyethylbenzenes, Flux Oil (Heavy Ends), Aqueous AlCl₃ Muriatic Acid (HCl)

Cooling Tower Chemicals: Chlorine, Na₂SO₃, 3nCrO₄

WAR 000012

RSV0033001

015 & 016	Styrene	<u>Feeds:</u> Ethylbenzene, Dehydrogenated Mixture, Shell 105 Iron Oxide Catalyst ($\text{Fe}_2\text{O}_3 + \text{K}_2\text{CO}_3 + \text{Cr}_2\text{O}_3$) Flux Oil (Alkylation Heavy Ends), Tert-Butylcatechol, 2,4-Dinitrophenol, NaOH, HCl <u>Products:</u> Benzene, Toluene, Ethylbenzene, Styrene, Sodium 2,4-Dinitrophenoxide, 2 Amino-4-Nitrophenol, Styrene Tar (Polymer & Flux Oil), Hydrogen, CO, CO_2 , Ethylene
017	Oxygen	<u>Solvents:</u> Tricresylphosphate, Methylene Chloride, Freon 12, Santocell, Vermiculite
018	Acetylene	<u>Feed:</u> Methane <u>Products:</u> H_2 , CO, Acetylene, Higher Acetylenes, Soot <u>Solvents:</u> Butyrolactone, N-Methylpyrrolidone, Toluene, Diesel Oil
019	HCN (Hydrogen Cyanide)	<u>Feed:</u> NH_3 , CH_4 , H_2SO_4 , Platinum-Rhodium Gause <u>Cooling Tower Chemicals:</u> SO_2 , 3nCrO_4 , Na_2SO_3
020	Acrylonitrile (AN-1)	<u>Feeds:</u> HCN, Acetylene, HCl <u>Catalyst:</u> Cu_2Cl_2 , KCl, NH_4Cl <u>Products:</u> Acrylonitrile, NH, HCN, Acetonitrile, Crotonitrile, Croton Aldehyde, Acrolein, Methyl Acrolein, Monovinyl Acetylene, Divinylacetylene, Cyanobutadiene, Lactonitrile, Methylvinylketone, Crotonic Acid, Acetaldehyde <u>Inhibitors:</u> p-Nitrosodiphenylamine, p-Aminophenol, p-Methoxyphenol, Hydroquinone
021	VCM (Vinyl Chloride Monomer)	<u>Feeds:</u> Acetylene, Cl_2 , Ethylene, HCl, Styrene Oxide <u>Catalyst:</u> HgCl_2 , Silica, CuCl_2 , Alumina, H_3PO_4 <u>Products:</u> Vinyl Chloride, Ethylene Dichloride, Trichloroethane, Ethyl Chloride, Ethylene Dichloride, Trichloroethanes, 2 Chlorobutadiene, Chlorinated Tars (Heavy Ends), bis(chloroethyl) ether (small), Chloral
024	Waste Treatment	<u>Liquids:</u> Acetic Acid Sump Sludge, Chlorinator Sump Sludge, MeOH Heavy Ends, Oxo Alcohols Recycle, Acetic Acid Bottoms, HCN, Dock Collections, Vacuum Truck Skimmings, TBA Wax, Flare Sump Cleanouts, Paint Waste Solvents, Recycle Styrene, Pilot Plant EMA Waste, Lube Oil, Mobiltherm

12/20/52 1st TANK FOR SAMPLE
 AN-1 SHUT DOWN 7/70
 NEW UNIT STARTED-UP 1977

10/14/52 1st TANK FOR SAMPLE
 12/69 UNIT SHUT DOWN

025	Tert-Butyl Amine (TBA)	<u>Feed:</u> HCN, Isobutylene, H ₂ SO ₄ , 50% NaOH, Lime, <u>Products:</u> T.-Butylalcohol, TBA, Sodium Formate, Poly Isobutylenes (TBA Wax).
027	Lactonitrile (LN)	<u>Feeds:</u> HCN, Acetaldehyde, NaOH, H ₃ PO ₄ <u>Products:</u> Lactonitrile
029	Acetone Cyanohydrin (ACY)	<u>Feeds:</u> Acetone, HCN, NaOH, H ₂ SO ₄ <u>Product:</u> Acetone Cyanohydrin
031	Methanol	<u>Feeds:</u> 3n Chromite Catalyst, KMnO ₄ , H ₂ SO ₄ , Pd - Al ₂ O ₃ Catalyst, Co, Co ₂ , H ₂ <u>Products:</u> Dimethylether, Methanol, higher alcohols (heavy ends)
033	Lactic Acid (LA)	<u>Feeds:</u> Lactonitrile, Methanol, HCl, Methylchloride <u>Products:</u> Acetaldehyde, NH ₃ , NH ₄ Cl, Methyl acetate Lactic Acid, Methyl lactate <u>Catalyst:</u> Ion Exchange Resin (Strong Base)
034	Vinyl Acetate	<u>Feeds:</u> Acetylene, Acetic Acid, Methanol, Styrene Oxide, NaOH, H ₂ SO ₄ <u>Catalyst:</u> Zn Acetate, H ₂ SO ₄ <u>Products:</u> Acetaldehyde, Propenyl Acetate, Vinyl Acetate, Acetic Anhydride <u>Inhibitors:</u> Diphenylamine, Hydroquinone <u>Heat Transfer Oil:</u> Mobil Therm
035F	High Density Polyethylene Finishing	<u>Feeds:</u> Ethylene, Ca(OH) ₂ , Dilaurylthiodipropionate (DLTDP); N, N-bis[2-hydroxyethyl]-C ₁₂ -C ₁₆ Alkylamine (Armostat-340), Polyethylene Glycol, glycerolmonostearate, Zinc Stearate, Diphenyl phosphite, Tetrakis [Methylene 3-(3', 5 di-t-butyl-4 hydroxyphenyl) propionate]Methane (Irganox 110); NN-bis [hydroxyethyl]laurylamide (MASA); Oxylate Ester (OAE 4,4'-thiobis-(6-t-butyl-m-Cresol) (Santonox); 2, 6-Dit-Butyl-p-Cresol (Ionol); Distearylpentaerythrit phosphite (Weston 618); 2-Hydroxy-4-N-Octoxyl benzophenone (Cyansorb UV-5311); 2,4-Di=5-butylphenol 3,5-di-t-butyl-4-hydroxyl benzoate (AM340) <u>Product:</u> Polyethylene
035P	High Density Polyethylene Powder	<u>Feeds:</u> Ethylene, Hydrogen, Acetylene, Methanol, Butanol, Hexane, Ethylene Oxide, Hydroxylamine, Lime, Butene-1 <u>Catalyst:</u> Diisobutyl aluminum hydride, TiCl ₄ <u>Product:</u> Polyethylene

041 & 042 Low Density
Polyethylene

Feeds: Ethylene, Acetylene, propargyl aldehyde, Vinyl Acetate, Propane, Isobutylene, Propylene, Erucyl Amide, 2, 6-Di-*t*-butyl-*p*-Cresol (Ionol); 4-4'-thiobis- (6-*tert*-butyl-*m*-cresol (Santonox); 1, 3, 5 tri Methyl-2,4,6-tris [3,5 di-*t*-butyl-4-hydroxy benzyl] benzene (Ionol)
Catalyst: Oxygen, Di-*tert*-butyl peroxide, Lauryl peroxide, Benzoyl Peroxide, Diatomaceous earth (celite 219)
Product: Polyethylene

044,045,046 Methanol

Feeds: Methane, H₂, CO, CO₂, Hydrazine, NaOH, HCl, Feron 12, NaOH, Na₃PO₃, Na₃PO₄, Ethylenediamine, tetra acetic acid, (EDTA), nitrilotriacetic acid (NTA)
Product: Methanol, Ethane, C₃-C₆ higher alcohols
Catalyst: ZnO, CuO, Al₂O₃

048 Oxo-Alcohol

Feeds: CO, (C₆, C₈, C₁₀, 2-Olefins); H₂
Products: C₇, C₉, C₁₁, Aldehydes; C₇, C₉, C₁₁ Formates; C₇, C₉, C₁₁, Alcohols, C₆, C₈, C₁₀ Hydrocarbons; Heavyends
Catalyst: Cr₂O₃, CoO

050 Acetic Acid

Feeds: CO, Methanol
Catalyst: RhI₃, HI
Products: Acetic Acid, Methyl iodide, Propionic Acid, Methyl Acetate, Heavy Ends, I₂

051 AN-5

Feed: NH₃, Propylene
Catalyst 41: CoMoO₄, NiMoO₄, BiMoO₄, K₃PO₃, Fe₂O₃
Products: HCN, Acrylonitrile, Acrylic Acid, Acrolein, Crotonitrile, Acetic Acid, Succinonitrile, Fumaronitrile, Oxazole, 3-Cyano-pyridine, poly HCN
Boiler Chemicals: ZnCrO₄, Aqueous AlCl₃, Na₂SO₃
NaOH, SO₂, Na₃PO₄, Sodium Hexameta phosphate
Inhibitor: H₂SO₄, Hydroquinone, *p*-Methoxyphenol (MQ), Mercaptobenzothiozole

053 Phthalic Anhydride
-(PA) -

Feed: Orthoxylene
Catalyst: V₂O₅ on Silica, SO₂
Products: Maleic Anhydride, Citraconic Anhydride, *O*-Toluic Aldehyde, Benzoic Acid, Phthalic Anhydride
Tars
Boiler Chemicals: NaOH, H₂SO₄, Na₂SO₃

060 Ethylene Vinyl
Chloride

Feeds: Vinyl Chloride, Ethylene, Acrylamide
Inhibitor: Methoxyphenol, Butyrate Hydroxy Toluene, Fe(NH₄)₃ (SO₄)₂, (NH₄)₂S₂O₃, NaOH, Sodium Lauryl Sulfate, Tetra Hydrofuran, Ethylenediamine
Acetic acid, Sodium formaldehyde sulfoxylate
Product: Ethylene-Vinyl Chloride Polymer

DPO Power 1&2

Na₃PO₄, Sodium Hexameta Phosphate, Cl₂, NaCr₂O₇, Na₂SO₃, NaOH, Muriatic Acid, ZnCrO₄, Lime, H₂SO₄, FeSO₄, Aqueous AlCl₃

P6	Material Handling	Acetic Acid, Acrylonitrile, Ammonia, Acetaldehyde, Acetone Cyanohydrin, Acetone, $AlCl_3$ (Anhydrous), Aluminum Powder (Scrap), C7, Ca, C11, Alcohols, Butyrolactone, Benzene, Butanol, Butenes, Chloro-Condensate, Di Undearylphthalate, Decane, Diesel Oil, Ethyl Chloride, Ethylbenzene, C7-C11 Phthalic Esters, Hydroquinone, HCN, H_2SO_4 , Hexane, Flux Oil, Light Ends (oxo alcohols), Lactic Acid, Lactonitrile, Anhydrous HCl, Isobutylene, N-Methyl Pyrrolidone, Diphenylamine, p-Methoxyphenol (mq), Methanol, Mineral Oil, Naphthalene, Naphthalene Concentrate, NaOH, Phenol, Propargylaldehyde, Phthalic Anhydride, Propane, Propylene, Polyethylene, SAB, Sunbyporn, Sulfur, Styrene, Tert-Butylamine, TBC, Vinylchloride, Vinylacetate, o-Xylene, Toluene, C6, C8-C10 Olefins
L1	Petrochemicals Lab	<u>Solvents:</u> CH_2Cl_2 , $CHCl_3$, CCl_4 , Trichloroethylene, Acetonitrile, Pyridine, Dimethylformamide, Acetone, Tetrahydrofuran, Dioxane, Ethyl Ether, Benzene, Toluene, Ethanol <u>Acids:</u> $HClO_4$, HCl, HI, H_2SO_4 , H_3PO_4 , HNO_3 , Acetic Acid <u>Bases:</u> NH_4OH , NaOH, KOH, Na_2CO_3 , $NaHCO_3$ <u>Reagent Chemicals:</u> Numerous but in small amounts with little contact. <u>Products & Raw Materials:</u> All that have been used in the Plant
L2	Polymers Lab	<u>Solvents:</u> $CHCl_3$, Hexane, Xylene <u>Product:</u> Polyethylene
L3	Research & Process Technology Lab	<u>Solvents:</u> CH_2Cl_2 , $CHCl_3$, CCl_4 , Trichloroethylene, Acetonitrile, Pyridine, Dimethylformamide, Acetone, Tetrahydrofuran, Dioxane, Ethyl Ether, Ethanol, Butanol, Methanol, Benzene, Toluene, Xylenes, Ethylbenzene <u>Acids:</u> HCl, HI, HNO_3 , H_2SO_4 , H_3PO_4 , Acetic Acid <u>Bases:</u> NH_4OH , NaOH, KOH, Na_2CO_3 , $NaHCO_3$ <u>Reagent Chemicals:</u> Numerous <u>Products & Raw Materials:</u> All that have been used in plant
W1	Main Warehouse	<u>Solvents:</u> MC-9, Vinyl thinner, Epoxy thinner, Kerosene, Lacquer thinner, Vacuum pump oil, Insecticide, CCl_4 , Cutting Oil, Mobiltherm, Lub Oil
W2	P. E. Warehouse	<u>Raw Material Additives:</u> Dilaurylthiodipropionate (OLTDP) N N-Bis(2-hydroxyethyl)-alkylamine (Armote 340) Polyethylene Glycol, glycerolmonostearate, Zinc Stearate, Tetrakis (Methylene 3-(3', 5 di-tert-butyl-4-hydroxyphenyl) Propionate) methane (Irgac 110), Diphenyl phosphite, N N-bis (hydroxyethyl laurylamide) (MASA), Oxylate ester (OABH), 4,4'-thiobis-(6-5-butyl-m-cresol) (Santonox), 2,6-Di-tert-butyl-p-cresol (Ionol), Distearylpentaerythrityl phosphite (Weston 618), 2-Hydroxy-4-N-octyloxybenzophenone (Cyansorb UV-S3a), 2,4-Di-tert-butyl phenyl

WAR 000016

RSV0033005

3, 5-di-t-butyl-4-hydroxybenzoate (AM 340),
Butanol, Erucylamide

E1	Technical-Office	General Plant Vapors
E2	Technical-Plant	Unit Vaport & Liquids
E3	Non-Technical-Office	General Plant Vapors
E4	Non-Technical-Plant	Unit Vapors & Liquids
N-1	Non-Exempt-Office	General Plant Vapors
N-2	Non-Exempt-Plant	Unit Vapors & Liquids
M01	Abestos Workers	Abestos, Fiberglass
M02	Boilermakers	Welding, MC-9 Cleaning Solvent
M03	Carpenters	Butane, Trichloroethylene, Contact Cement, Acetone
M04	Electrical Workers	MC-9, CCl ₄ , Methylene Chloride, Polychlorinated ^e , Phenyls (PCB's), Mineral oil
M05	Instrument Men	MC-9, CCl ₄ , Mehtylene Chloride, Ethanol, Benzene
M06	Ironworkers	Welding, MC-9 Cleaning Solvent
M07	Laborers	NSI, Used Carbon, Shell 105 Iron Oxide Catalyst, Cu-Cr ₂ O ₃ Oxo Catalyst, CoO/NiO Oxo Catalyst, Zinc Oxide, Dept. 24 Ash & Slag, Dept. 24 Chloronator Sludge, Ion Exchange Resins, Diatomaceous Earth, Sand, Naphthalene Waste, Styrene Polymer, Barrier Resin Scrap, EMA Waste, Acetylene Esters AN } Filter Cakes Cooling Tower Sump Sludge, Dept. 19-25 Sump Sludge Dept. 513 Filter Screening, Flare sumps
M08	Machinist	Cutting Oil, Kerosene, MC-9, CCl ₄ , Welding
M09	Painters-	Silica from Sandblasting, Vinyl Thinner, Epoxy Thinner, Lacquer Thinner, Kerosene, <u>Paint</u>
M11	Pipefitters	Welding, Seal Lead, Epoxy Glue, MC-9
M12	Truck Drivers/ Helpers	Gasoline

WAR 000017

RSV0033006

Additional Plant Work Code

56 Esters

Feed: Phthalic Anhydride, C₇-C₁₁ Alcohols

Catalyst: Oxalic Acid, Stannous Oxalate,
Diatomaceous Earth

Products: C₇-C₁₁ Phthalic Esters

M-13 Janitors

Ammonia Water, Waxes, Household Cleaners,
Research and Petrochemical Laboratory
Trash, Commode Cleaner (HCl, H₃ PO₄,
n-Alkyl (C₁₂ - C₁₈) Dimethyl Benzyl Ammonium
Chloride).

CAF Cafeteria

Fantastik Cleaner; Floor Disinfectant (contains
Isopropyl Alcohol, Pine oil, Soap, Potassium O-benzyl
P-chlorophenate), Clorox (NaOCl), Potassium
Hydroxide, Dranio (NaOH), Commode Cleaner
(HCl, H₃PO₄, n-Alkyl (C₁₂-C₁₈)Dimethyl Benzyl
Ammonium Chloride), Dip-It Oxygen Bleaching Agent.

(13)

WAR 000018

RSV0033007