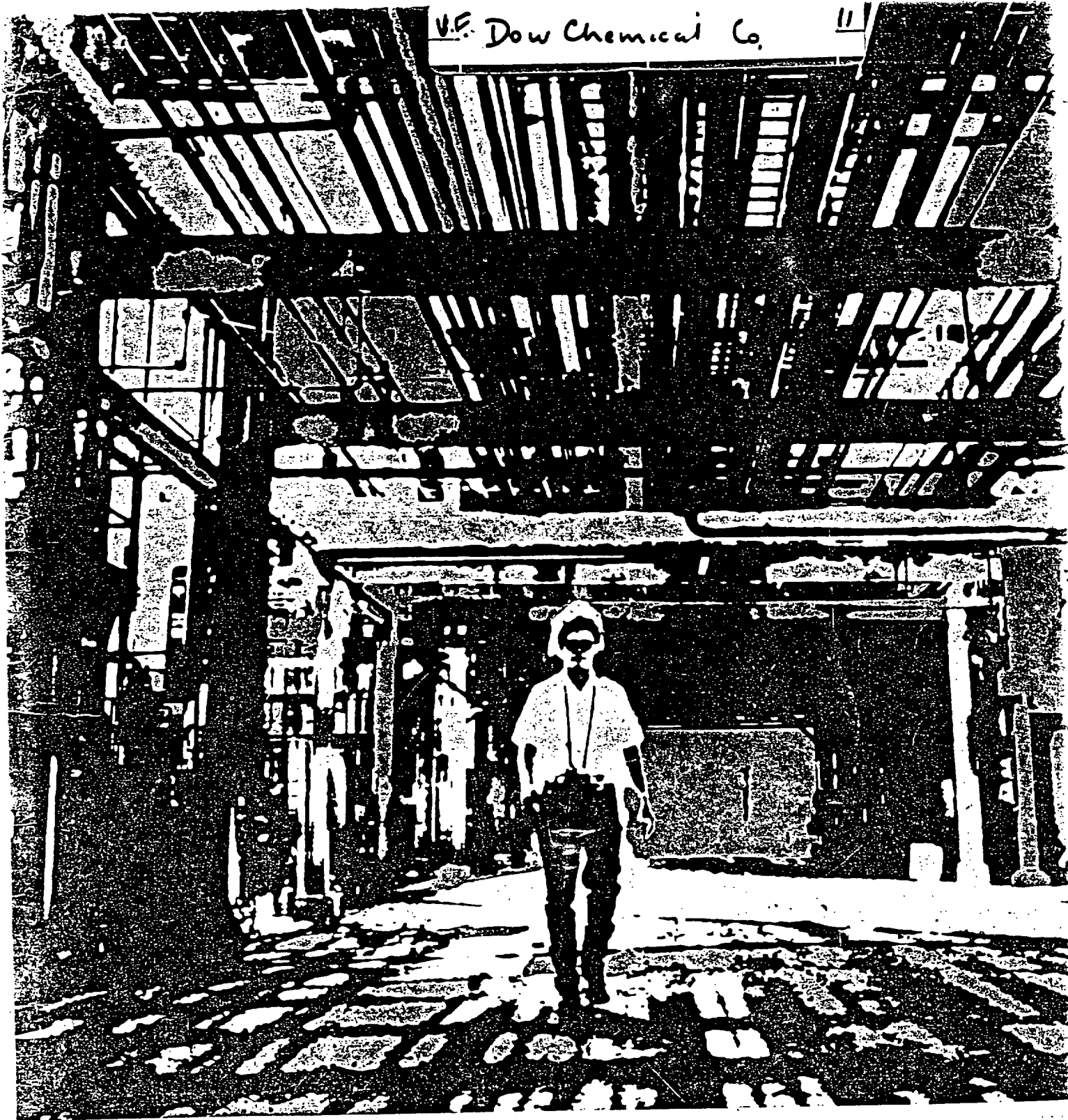


U.F. Dow Chemical Co.



1970 Annual Report



ST0004547

Covers

A chemical engineer in Oyster Creek, Texas, and a secretary in Midland, Michigan, symbolize the 47,400 people around the world who daily give substance and meaning to The Dow Chemical Company.

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Annual Meeting

The 1971 annual meeting of stockholders will be held at 2 p.m. Wednesday, May 5, at Midland, Michigan. A formal notice of the meeting, with a proxy statement and form of proxy, will be mailed to each stockholder separately from this report.

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The Dow Chemical Company

Annual Report for 1970

Highlights

OPERATIONS SUMMARY IN MILLIONS

	1970	1969	% Change
Net Sales	\$ 1,911.1	\$ 1,797.1	+ 6.3
Depreciation	207.7	177.9	+ 16.8
U.S. and Foreign Income Taxes	88.1	81.5	+ 8.1
Income before Extraordinary Items	132.3	148.7	- 11.0
Net Income after Extraordinary Items	103.4	148.7	- 30.5
Earnings per Share before Extraordinary Items (in dollars)	4.38	4.91 ³	- 10.8
Earnings per Share after Extraordinary Items (in dollars)	3.42	4.91 ³	- 30.3
Cash Dividends Declared	78.5	77.3	+ 1.6
Common Stockholders' Equity	1,102.6	1,080.2	+ 2.1
Book Value per Share of Common Stock at December 31 (in dollars)	36.50	35.75	+ 2.1
Average Common Shares Outstanding	30,191,648	30,296,994	- 0.3
Common Stockholders	90.975	90.500	+ 0.5
Employees	47,400	47,400	

QUARTERLY RESULTS IN MILLIONS (except per-share amounts)

Quarter Ended	Sales		Earnings per Share ¹ Before Extraordinary Items		Products and Services Operating Income	
	1970	1969	1970 ²	1969 ³	1970	1969
3/31	\$ 456.6	\$ 413.0	\$1.03	\$1.13	\$ 59.4	\$ 55.9
6/30	493.4	464.3	1.26	1.50	76.1	69.6
9/30	480.4	455.5	1.10	1.23	68.3	66.4
12/31	480.7	464.3	.99	1.05	55.8	47.8
TOTAL	\$1,911.1	\$1,797.1	\$4.38	\$4.91	\$259.6	\$239.7

¹ Based on average shares outstanding

² Restated from published quarterly earnings reports to exclude extraordinary items

³ Including special credits, equivalent to \$.21 per share

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President's Letter



Herbert D. Doan
President until February 1971



C. B. Branch
Dow's new president

The Business Year

For the first time in 10 years, Dow's earnings declined in 1970—to \$4.38 per share (before extraordinary items) from \$4.91 in the previous year, or a decrease of 11%. If special credits of \$.21 per share are excluded from reported 1969 income for comparative purposes, the decline in 1970 earnings was 7%.

Net return on the average of the common stockholders' equity (before extraordinary items) was 12.1%, compared to 14.2% in 1969.

The earnings reduction was due to sluggish business conditions in the United States and also to non-operating items such as higher interest costs and lower miscellaneous income. Although a decline in earnings is unpleasant news, I am convinced that Dow people performed exceptionally under recession conditions.

Dow's world-wide consolidated sales rose 6% to a record \$1.911 billion. Substantial increases in the European, Latin American and Pacific Areas and our global Life Sciences operations more than offset a 1% decline in our U.S. sales. Substantial earnings increases in these segments of our business, however, only partially compensated for declines elsewhere.

The extraordinary items included a charge of \$31.1 million after taxes, equivalent to \$1.03 per share, resulting from the write-off of our total \$43.3 million investment in Phrix-Werke A.G., the German fiber company in which we own a half interest. (A further discussion of Phrix-Werke will be found on page 32 and in the Notes to Financial Statements.) This charge was partially offset by special credits of \$2.1 million after taxes, or \$.07 per share, from the disposition of interests in two partly owned companies. Net income after these extraordinary items was \$3.42 per share.

A promising development of 1970 was the turnaround in chemical prices. For the first time in 13 years, the weighted index of U.S. selling prices for Dow products rose slightly instead of slipping, and prices elsewhere in the world generally were firmer. As the only major American industry whose wholesale price index in 1969 was below the 1957-59 average, the chemical industry obviously needs this. Productivity gains are still fundamental to our technologically based business, but without price increases we can't absorb the type of inflation we have had world-wide in recent years.

Capital Spending Continues at High Rate

Capital expenditures, at \$348 million, were down 6% from 1969's record high of \$371 million, and we expect a further reduction of about 7% in the current year, with an increased proportion spent outside the United States. Despite these declines, our outlays for new facilities continue at high levels, reflecting the abundance of good growth opportunities available to us. Better than half of our physical plant world-wide is new within the past five years and is in excellent competitive condition.

During 1970, we went twice to the U.S. money markets, selling a total of \$300 million of 30-year debentures. A 110-million Eurodollar, five-year revolving credit facility was arranged with a consortium of 16 international banks and is available to provide short- and medium-term financing for expansion, particularly in Europe. As a result of these borrowings, the Company is in a very strong liquidity position. Good evidence of this is seen in Standard & Poor's recent assignment of an A-1 rating to our commercial paper.

No additional long-term debt issues in the United States are planned for the current year. Several small overseas bond issues are contemplated, primarily to refinance short-term debt.

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Changes in Board of Directors

At the January 1971 board meeting, Dr. A. P. Beutel retired as a director and vice president of the Company. Dr. Beutel was in his 55th year of Dow service. His contributions to Dow's growth are incalculable, but any listing (and it would be a long one) would be headed by the Texas Division, which he pioneered in the 1940s. The Louisiana, Dowell and Brazos Divisions and the Government Affairs Department are among the many other enduring monuments to his energetic leadership.

Elected to the board were J. M. Leathers, vice president and operations director of the U.S. Area, and Paul F. Oreffice, who had been named financial vice president in November. Their elections increased the board's membership from 17 to 18.

Dow and the Environment

Dow continued to make real progress in the urgent matter of environmental improvement. We are in relatively good shape in this area and believe our efforts not only will meet any reasonable requirements but also will, in total, be profitable. In short, we intend to surprise both those environmentalists who doubt we'll do enough and those members of the financial community who fear it will cost too much.

Continuing Commitment to Technology

Dow's long suit is the breadth and depth of its technology and the tremendous product diversification that this produces. We are constantly adding to our technological storehouse by supporting research and development at high expenditure levels. The bulk of this work—process development and improvement of existing products—generates little glamor but considerable profit. Occasionally, lightning strikes in the form of a barnburner of a product, of which Dow research has produced many. A recent example is rifampicin antibiotic, a product of Lepetit for the treatment of tuberculosis and other diseases and winner of the Prix Gallien, France's top pharmaceutical award, in 1970. All of which adds to our conviction that through technological progress—both the unglamorous and the spectacular—Dow will better serve the world and assure its own success.

* * *

At the February board meeting, the directors accepted my retirement as president, chief executive officer and chairman of the Executive Committee and elected C. B. Branch, executive vice president since 1962, to these positions.

My decision to retire is based on my belief that, as between change and continuity, the emphasis should favor change in all phases of our business. I have attempted to keep the scales tipped in that direction during eight years as your president. I long ago decided the dynamics of change should include me personally.

I feel a real pleasure in turning over my duties to Ben Branch, who in my opinion is one of the world's finest managers.

Although I will continue to serve as a director of the Company, this is the last President's Letter I will write to Dow stockholders. As my parting thought, I would like to express my conviction that Dow, in terms of both people and physical facilities, is in excellent condition for substantial profit growth and that, in Dow, you have a good investment.

Herbert D. Doan

February 4, 1971

Herbert D. Doan

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After being immunized with LIRUGEN one-shot measles vaccine, West African girl proudly displays her vaccination certificate.

Products

(dollars in millions)	SALES				PRODUCTS AND SERVICES OPERATING INCOME				CAPITAL EXPENDITURES			
	1970	1969	% Change	1970 % of Total Company	1970	1969	% Change	1970 % of Total Company	1970	1969	% Change	1970 % of Total Company
Chemicals/Metals	\$ 917.5	\$ 878.5	+ 4.4	48.0	\$108.7	\$112.2	- 3.1	41.9	\$257.5	\$281.8	- 8.6	74.0
Plastics/Packaging	638.2	611.3	+ 4.4	33.4	101.0	89.6	+12.7	38.9	59.6	74.4	- 19.9	17.1
Bioproducts/Consumer Products	355.4	307.3	+15.7	18.6	49.9	37.9	+31.7	19.2	31.0	14.4	+115.3	8.9
TOTAL	\$1,911.1	\$1,797.1	+ 6.3	100.0	\$259.6	\$239.7	+ 8.3	100.0	\$348.1	\$370.6	- 6.1	100.0

CHEMICALS/METALS Inorganic Chemicals and Solvents

A tight world-wide supply-demand balance for caustic soda helped our inorganic chemicals business to increase its operating income substantially. The tighter global supply situation was due in some areas to a slowing of growth rates for chlorine-derivative products while those for industries consuming caustic (a co-product of chlorine production) slowed less or not at all. Caustic continued in strong demand for the conversion of bauxite to alumina and for pulp and paper production. We discontinued our production of soda ash and caustic potash.

Caustic soda beads, a new free-flowing form of the product added to the line in 1969, gained headway in the U. S. and marketing was extended to Canada.

Ethylene dibromide, used principally in anti-knock additives in leaded gasoline, experienced a good year but, of course, is a question mark for the future. We anticipate, however, that the shift to non-leaded gasoline will be gradual, rather than abrupt, and that in the meantime promising new growth areas can be found for the bromine released by the cutback in leaded gasoline consumption.

One of these areas of growth potential is fire retardants for synthetic fabrics, construction materials and carpeting. Although our SA-1138 fire retardant for polyester plastics was withdrawn because of disappointing sales, Dow's flame retardants and fire-control agents as a group grew 15% in 1970.

Sales of our magnesium chemical products were up 20% from the previous year. Demand for magnesium oxide, whose uses include additives for lubricating oils and the manufacture of refractory brick for steel furnaces, was brisk and is expected to continue at a high level. With the closing of a magnesium oxide neighbor plant in Midland, Michigan, Dow lost a magnesium hydroxide customer, but sales to other magnesium hydroxide users are expected to grow.

Chlorinated solvents, one of our major businesses, registered satisfactory growth. Adverse price trends for several products were successfully countered. *Chlorothene* VG solvent, which we are promoting on the basis of safety and superior performance, continued to penetrate the vapor degreasing market in the United States and Europe and was introduced in Canada and Japan. We expect chlorinated solvents will benefit materially with even a moderate upturn in the U. S. economy in 1971.

Organic Chemicals

A "Super" line of products was introduced to the U. S. automotive aftermarket with good initial results. It includes Super Coolant Antifreeze, Carb Cleaner, Carb & Choke Cleaner, Chrome & Vinyl Cleaner, Starting Fluid, Brake Fluids, Windshield De-Icer, and Stop-Leak Pellets. Additional products scheduled for test market and possible national introduction in 1971 could give us the most complete line of branded automotive products on the market.

Softness in the economy hit some organic chemicals hard. Sales to the auto industry and its suppliers were significantly affected by the General Motors strike in the second half. Sales of phenol, used extensively in plywood glues, followed the dip in housing starts. A sharp decline in the industry growth rate for urethane products adversely affected our sales of *Voranol* polyols; nevertheless, the long-range outlook for urethanes continues very favorable, and we are endeavoring to be the first to produce urethane polyols in several developing countries.

Our continuing switch from the chlorohydrin to the direct-oxidation route to ethylene oxide is releasing additional chlorohydrin facilities for production of the more profitable propylene oxide. Meanwhile, we are taking steps to deploy more of our ethylene oxide toward higher-return derivatives.

Functional and Designed Chemicals

Results for *Methocel* cellulose ether products were strong as the result of firmer prices in the U. S. and increased volume in Europe. These products thicken paints, improve the properties of plasters and mortars, and assist in polymerizing vinyl chloride to PVC. The latter uses are especially pertinent to Europe, which is the largest PVC producer and makes heavy use of concrete in building construction.

A new catalyst, Type S, for producing butadiene from butylenes was launched and is expected to make obsolete the Type B catalyst that has long been the major product of its kind in the world. The new product's improved performance offers increased earnings potential for both Dow and the customer.

Sales of *Separan* flocculants increased in 1970, reversing a three-year trend. The new growth was due primarily to uses in the paper and mining industries. Dow mining chemicals as a whole, including frothers and collectors, enjoyed an excellent year.

Sales of antimicrobials were off 10% because of the slow economy and the discontinuation of two products. A new antimicrobial for preserving cosmetics and another for latex paints were introduced. Ecological concerns increased the appeal of our preservatives, which are non-mercury-based.

Despite the economic slowdown, sales of Dow Industrial Service continued to grow. DIS increased its capabilities for serving the nuclear power industry with cleaning and other services.

Secondary-oil-recovery floods employing *Pusher* mobility control chemicals were in progress in seven states and five foreign countries in 1970. A second Dow-developed oil-field process, using *Channelblock* chemicals, was introduced in the fourth quarter on a developmental basis; based on polymers of exceptionally high viscosity, it corrects gross bypassing of injection fluids in secondary-recovery projects.

Metals

Consumption of primary magnesium exceeded production capacity for the fifth consecutive year. Dow purchased 6,000 tons from the U. S. Government stockpile in first-half 1970, but by mid-year, our new 24,000-ton-per-year facility in Freeport, Texas, was brought up to its full production rate, rendering stockpile purchases unnecessary for the rest of the year.

A description of functional-chemical applications in environmental control will be found in the Human and Environmental Relations section of the report

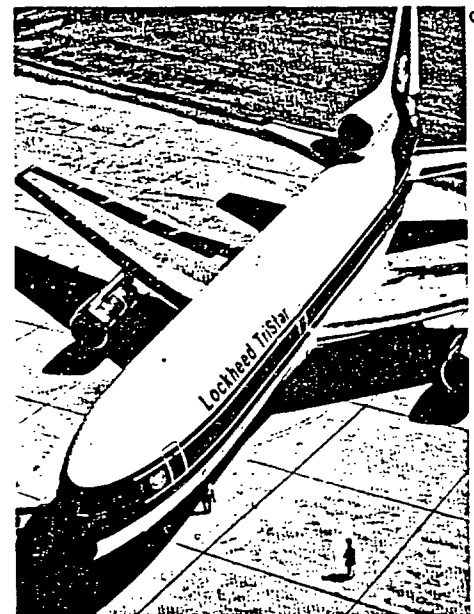


Knit fabrics, enjoying a popularity boom, require special cleaning care to preserve fresh-from-the-dressbox look. Dow supplies a line of drycleaning solvents with gentle, effective cleaning power and supplements it with technical advice to drycleaners and computerized analysis of their solvent systems.

Plastic panels extruded from Dow ABS resins provide durable, lightweight siding for recreational vehicles, as the "Apache" camping trailer.



Dow made a major appeal to automotive aftermarket with "Super" line of car maintenance and cleaning products.



Lockheed "Tri-Star" is second jumbo jet utilizing large extruded aluminum wing spars from Dow.

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Alloying with aluminum continued as the major market for magnesium, with automotive die casting as a strong second. The latter is due mainly to requirements for the German Volkswagen, which also is produced in Brazil and, since 1970, in Mexico. A new magnesium diecasting alloy, AS41, developed by Dow research in less than a year, provides improved high-temperature properties to match the operating characteristics of new, higher horsepower engines.

Magnesium extruded battery stock was sold at record levels as magnesium became the standard energy source for military back packs, replacing zinc. Dow continued to produce large aluminum landing-mat extrusions for the Government and wing spars for the Boeing 747 Stratojet. We also are furnishing wing structures for the Lockheed Tri-Star, so that two of the three jumbo jets now use Dow aluminum extrusions.

Dowetch Deadline magnesium photoengraving sheet became available in a new form with the photo resist coating (PRC) already applied, thus saving additional time for the photoengraver.

PLASTICS/PACKAGING Molding and Extrusion Materials

Global sales of Dow plastic resins for molding and extrusion were up moderately and operating income up substantially despite generally softer business conditions and prolonged strikes at some key customer industries.

The improvement in operating income was due mainly to higher sales volume and better pricing for low-density polyethylene, combined with operating economies made possible by process improvements and a reduction in our line of LDPE resins. Excess industry capacity caused high-density-polyethylene prices to weaken, but we continued to operate our HDPE business profitably with manufacturing improvements and increased sales.

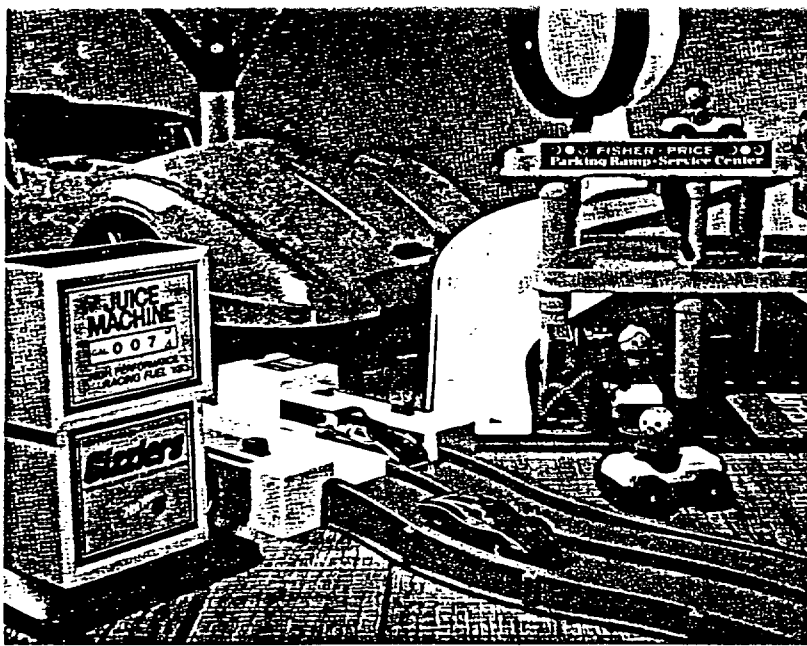
Results for our major plastic material, *Styron* polystyrene, were down slightly from 1969. Operating income was up substantially in Europe and to a lesser degree in Latin America and the Pacific. In the United States and Europe, we sacrificed a share of market in an effort to hold the line on prices but met with only partial success. *Styron 470*, a new high-performance impact resin, was introduced in the U. S.—the first of a new series of products designed to reinforce our world polystyrene leadership.

Dow introduced new medium-impact ABS (acrylonitrile-butadiene-styrene) resins in 1970 and high-impact formulations are planned for 1971. This broader line enables us to pursue a significantly larger portion of the ABS market.

Manufacture of *Pelaspán* expandable polystyrene beads, used in molded cushion packaging and other lightweight items, was terminated in the U. S. but continues in Canada for the Canadian market. *Pelaspán-Pac* polystyrene foam strands for loose-fill packaging as well as the *Styrofoam* and *Dorvon* brands of rigid polystyrene foam are unaffected by this move.

Functional and Designed Plastics

Styrofoam brand plastic foam experienced another great year. In Canada, for example, sales increased over 1969 despite a 15% drop in over-all construction spending. *Styrofoam* HI was installed as insulation under taxiways of Anchorage Airport, the second major Alaskan airport to utilize the product, and under runway extensions of the airport at Vaasa, Finland. In the U. S. *Styrofoam* FR was used in



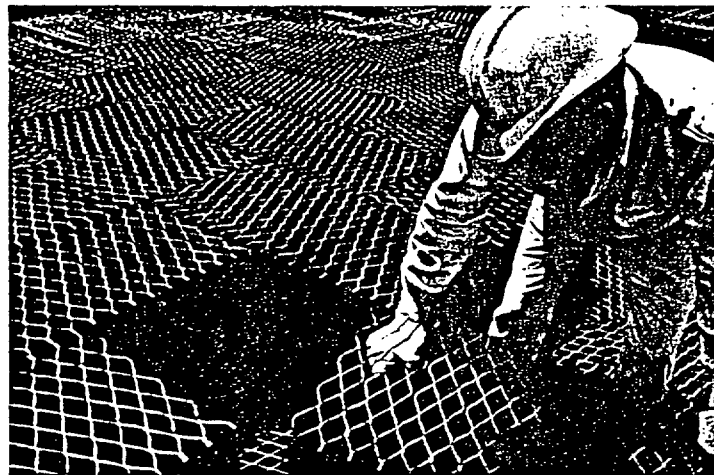
STYRON polystyrene was specified increasingly for components of high-quality toys. Shown are "Hot Wheels Sizzlers" racing set, "Poweride X-70" car, "AstroScope" color-screen viewer, and a parking ramp-service center.



Chlorinated polyethylene from Dow is incorporated in Celotex Corporation's single-ply roof membrane for West Palm Beach Auditorium.

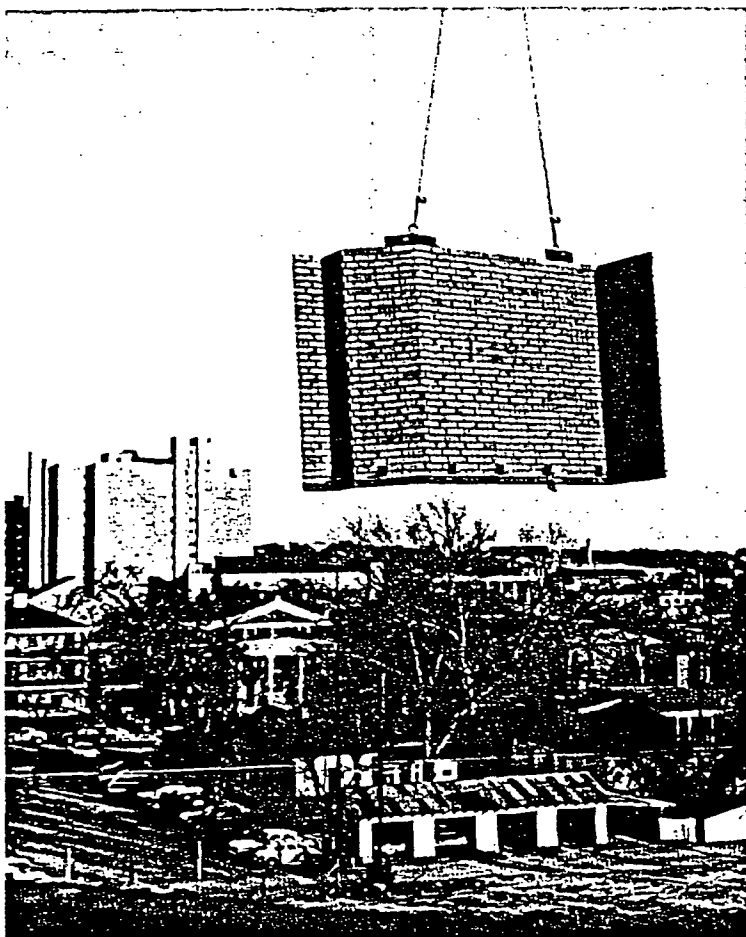


Eye makeup and other cosmetics retain freshness longer with new, specially tailored preservative, DOWICIL 200.

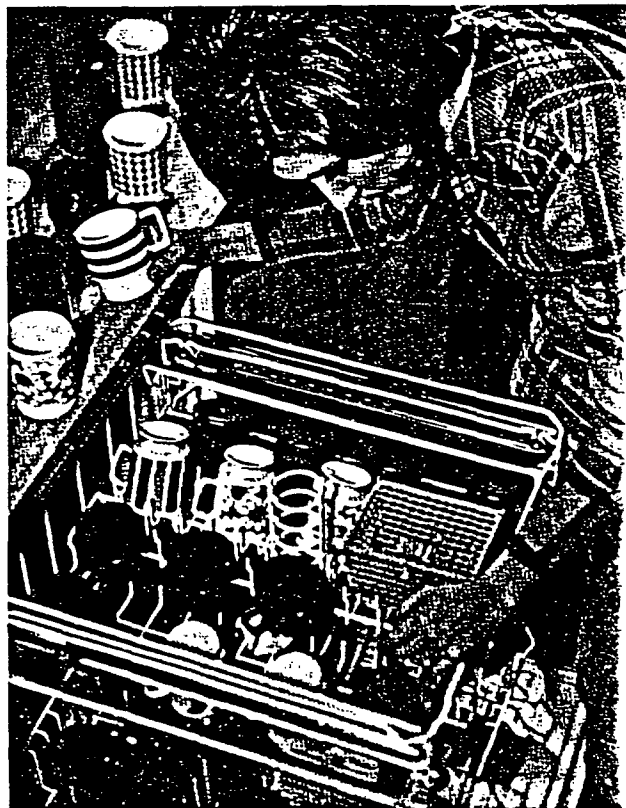


Plastic honeycombs of SURFPAC biological oxidation media, installed at Sacramento treatment plant, provide home for sewage-loving bacteria.

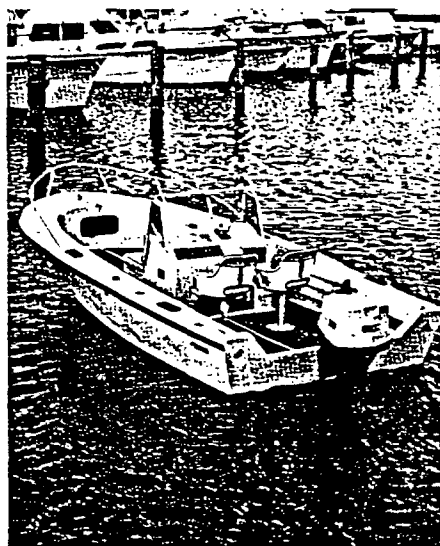
Prefabricated brick curtain walls make the scene, thanks to super-strong mortar joints produced by SARABOND mortar additive. This scene is the 29-story University Center in Austin, Texas.



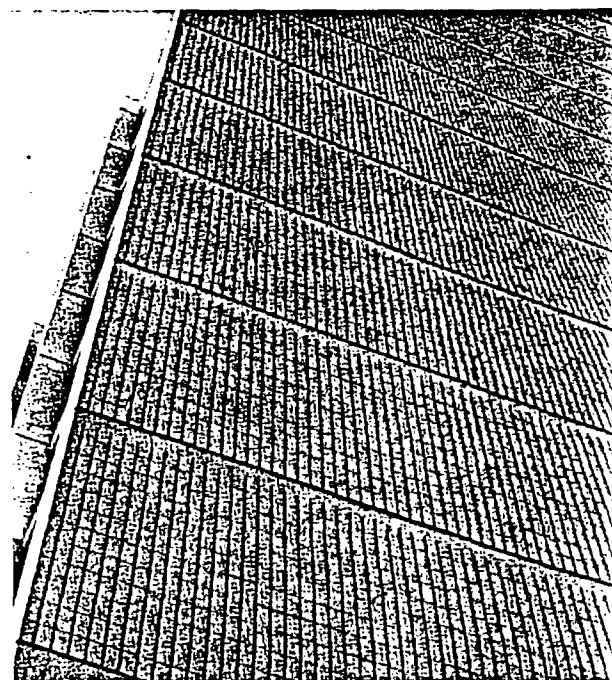
Housewares made from new line of TYRIL styrene-acrylonitrile resins offer added protection against heat distortion.



Dow epoxy resins function as an adhesive binder in molded fiber glass skis by K-2.



SARAN microspheres are blended with polyester resin and sprayed with fiber glass to produce unusually lightweight boat hulls and deck parts, as in this "Mako 19" powerboat.



Concrete block reaches new high in load-bearing walls in 14-story Alexander Arms, Honolulu. THREADLINE brand adhesive mortar is a key material in "shell block" construction concept on which building is based.

panel cores by 46 manufacturers of camper and house trailers and truck campers. *Styrofoam* TG, a tongue and groove sheathing material for houses and farm buildings, was introduced. IRMA (Insulated Roof Membrane Assembly), a new system that employs *Styrofoam* or *Roofmate* brand plastic foam in an entirely new concept, was introduced on a developmental basis.

In Malmö, Sweden, a bank building was constructed with prefabricated panels incorporating *Sarabond* brand mortar additive—the first use of the product in Europe.

The Dow paving system based on latex-modified cement and a new automated paver was used to restore approximately 50 bridge decks on Middle West and New England highways, including portions of the interstate system.

World-wide sales of Dow plastic-lined piping products rose 15%, and the number of products in the line was increased 13%. A shortage of nickel (resulting from a strike in Canada early in 1970) gave plastic-lined piping products the opportunity to prove their utility in many new applications.

Sales of Dow coatings were off by a fraction of a percentage point even though the drop in housing starts depressed carpet installation and with it our various latex products for the carpet industry. A new latex binder that meets government fire-retardancy standards for carpet backing was introduced late in 1970.

Sales of latex to the paper and paint industries were about level with 1969. We terminated our relatively small production of acrylic latex and henceforth will concentrate in styrene-butadiene latex, whose development we pioneered in the 1940s.

Our over-all coatings business was buoyed by a boost in sales of electroconductive resins for office-copier paper. Markets for ECR resins underwent a rapid development in Europe and Japan, and our production plant in Midland, Michigan, twice expanded its capacity to meet the demand.

Epoxy resin sales were off as a result of reduced activity in the television, aerospace, reinforced plastics and industrial coatings markets. The 1971 outlook is much brighter, based on new products and marketing approaches. During the year, Eagle I, which is fabricated from Dow epoxy resins and other high-strength materials, by Windecker Research, Inc., became the first plastic aircraft to receive type certification by the Federal Aviation Administration.

Packaging Products

Dow's packaging products business, 80% of which is concentrated in the U.S., achieved a marked improvement in profitability, with every major product line contributing to earnings. Manufacturing economies, the continued culling of unprofitable products and success in selectively raising prices were major factors.

The world-wide polyethylene-film market again experienced healthy growth and the prices of various products either steadied or increased.

Refinements in our family of films opened new opportunities. *Saran Wrap* brand plastic film with heat-sealable coatings was chosen by a leading food-products manufacturer as the wrapping for a line of prepared cookie doughs. Two new formulations of *Saranex* coextruded two-ply films were introduced with encouraging results. *Trycite* polystyrene film with a more sealable surface performed satisfactorily in bacon-package windows and is being evaluated for window envelopes.

Our plastic-container business was supplemented by a new ABS line that opened new markets for us in the packaging of margarine and butter.

A description of functional- and designed-plastic applications in environmental control and low-cost housing will be found in the Human and Environmental Relations section of the report.

**BIOPRODUCTS/
CONSUMER PRODUCTS**

Life Sciences

Sales of Dow's human health business grew 19% in 1970. Prospects are excellent for expanded contributions in pharmaceuticals and biologicals, diagnostic services and products, instrumentation, and biomedical devices.

Gruppo Lepetit, the Italy-based multinational pharmaceutical producer in which Dow holds the majority interest, was a major contributor to Life Sciences' 1970 performance. A key factor was the heavy demand abroad for *Rifadin* (rifampicin) antibiotic for tuberculosis and other disease. Applications to market rifampicin in the United States for treatment of tuberculosis and the carrier state of meningitis are pending. Researchers are studying the effect of rifampicin derivatives on viral diseases and leukemia.

Lepetit in 1970 acquired extensive fermentation facilities in Brindisi, Italy, and expanded its chemical plant in Garesio. A new pharmaceutical plant is under construction in Spain and another is planned for central Italy. A Lepetit plant under construction in São Paulo, Brazil, will extract L-Dopa, used in the treatment of Parkinson's disease, from a natural source.

Bio-Science Laboratories, a wholly-owned subsidiary based in Van Nuys, California, developed a new urine screening test to detect drug abuse. The nation's leading clinical-chemistry reference laboratory, BSL provides more than 600 tests for patient care and medical research. In West Germany, a medical diagnostic referral laboratory being built by BSL and a German partner neared completion.

In the United States, Dow's human-health operations were organized as the Indianapolis Division of Life Sciences. The principal unit is Rx Pharmaceuticals, best known for *Lirugen* one-shot measles vaccine and *Novahistine* decongestants. A second unit, Generic Pharmaceuticals, introduced 10 products in 1970 from facilities in St. Croix, U. S. Virgin Islands; Hanover, New Jersey; and Indianapolis, Indiana. A third unit, Diagnostics, introduced four new *Diagnostest* reagents sets, bringing to 14 the number of such tests designed for use in physicians' offices.

Coordinated research efforts by the various segments of our global Life Sciences organization produced promising leads to treatments for certain types of cardiovascular diseases, inflammatory diseases (such as arthritis) and disorders of the nervous system. Significant progress was recorded in the development of rubella (German measles) and mumps vaccines. Efforts are being made to combine one or both with *Lirugen* measles vaccine for greater convenience to patients and physicians. Broad clinical trials began on a new agent for lowering blood cholesterol, with introduction abroad a possibility in 1971.

Agricultural Products

Substantially improved performance characterized our world-wide agricultural products business in 1970, with sales and earnings well above the previous year.

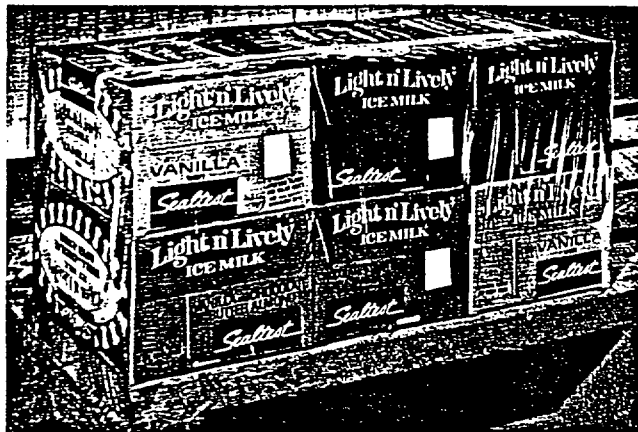
Our herbicide business, soft in 1969, executed a turnaround on the strength of better prices and a larger share of market. Dollar sales of phenoxy herbicides (2,4-D, 2,4,5-T) increased sharply. Sales of *Tordon* herbicide for rangeland brush control gained substantially in Latin America and Australia and were launched in the United States with a state registration in Texas; meanwhile, use of this herbicide for controlling brush on utility rights of way continued to grow, mainly in the U. S.

Dowpon grass killer was a significant contributor to our improved U. S. business, with higher pricing and sales increases in the face of pressure from imported materials. *Premerge* herbicide gained federal clearance for an additional crop use (soybeans) and was used increasingly in combination with other herbicides. *Tavron* herbicide for weed control in irrigated rice was introduced in The Philippines.

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Notes to Financial Statements

New POLYFILM 303 shrink-bundling film protects dairy products and wide variety of other items in shipment and storage.



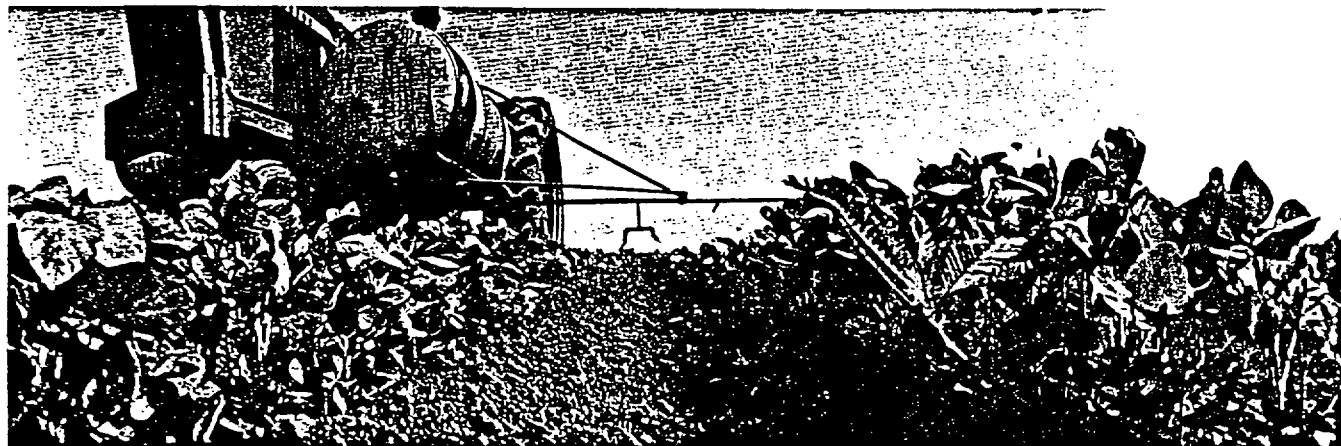
A Swedish beauty gives the nod to TOUCH OF SWEDEN hand lotion. Product won good acceptance from women in large U.S. regional market.



Now it's "plastic hay."
RUFF-TABS polyethylene roughage replacer mixed with feed stimulates digestive juices in rumen (first stomach) of bovines, performs function normally requiring large quantities of hay.



New sight in Hong Kong—iceberg lettuce from U.S. with freshness preserved by TRYCITE polystyrene film.



PREMERGE dinitro weed killer was approved for an additional use—control of weeds at base of soybean plants. The herbicide is applied with precision directed-spray equipment.

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Efforts to advance in the world ranching market began to show results as sales of our vaccines and insecticides for livestock increased and additional products were added. *Kedlor* feed-grade biuret, a nonprotein nitrogen source for cattle, moved to U. S. customers in substantial amounts for the 1970-71 winter feeding season. The product sold very well in its first year on the market in Australia. The growing cost of natural feeds indicates a good future for *Kedlor*.

Coyden coccidiostat for the control of poultry disease was successfully introduced in Japan. In its second year on the U. S. market, the product achieved sales nearly equal to those of our older *Zoamix* coccidiostat. Between them, the two continued to hold a major share of both the U. S. and overseas markets.

Our insecticides business, based largely on increased use of the relatively new *Dursban* insecticide, will be supplemented in 1971 by the return to market of *Zectran* insecticide. Planned uses are control of spruce budworm in forest management, general insect control in nurseries, greenhouses and home gardening and control of fly larvae in poultry houses.

Consumer Products

Our established national-brand consumer products—*Saran Wrap*, *Handi-Wrap*, *Dow Oven Cleaner*, *Dow Bathroom Cleaner*—and five products in regional market aggregated a 22% sales increase in 1970.

Saran Wrap brand plastic film continued as the top-selling quality film food wrap on the market. *Handi-Wrap* brand plastic film again outsold all other polyethylene wraps combined.

Products in various stages of regional marketing were:

- *Ziploc* brand plastic food storage bags, which moved to 50% of national distribution early in 1971.
- *Handi-Wrap* brand sandwich, storage and trash bags, our newest entries in the burgeoning bag market.
- *Dow Bathroom Disinfectant Spray*, a product combining disinfection with an ability to destroy odors chemically.
- *Aztec* suntan products, our first entry in the personal-care market.
- *Touch of Sweden* hand lotion, an outstanding skin moisturizer, our second personal-care product.

In Argentina, locally produced Dow-brand household cleaners sold well. In Europe, arrangements were made to market *Aztec* suntan products through Gruppo Lepetit.

DOWELL DIVISION

Environmental considerations on Alaska's North Slope and elsewhere, the reduction in the depletion allowance, and the high cost of money combined to curtail drilling-rig activity in the North American petroleum industry in 1970. As a result, Dowell Division's business servicing oil and gas wells declined in the last three quarters, and sales for the year were down.

Although appreciable improvement in the industry is not anticipated until the second half, Dowell forecasts a better business year in 1971. Revenues from environmental services are expected to grow substantially. These include chemical sealing of settling ponds, small reservoirs and lakes; water clarification and dust control in the mining industry; and backfilling of abandoned coal mines.

ST0004562

Consolidated Statement of Income

THE DOW CHEMICAL COMPANY AND SUBSIDIARY COMPANIES

	Year Ended December 31	
	1970	1969
Products and Services		
Net sales.....	\$1,911,105,081	\$1,797,057,283
Operating costs and expenses:		
Cost of sales	1,193,300,411	1,155,954,658
Depreciation	207,744,199	177,882,468
Selling and administrative	250,436,657	223,532,962
	<u>1,651,481,267</u>	<u>1,557,370,088</u>
Products and services operating income.....	<u>259,623,814</u>	<u>239,687,195</u>
Non-Products and Services		
Investment and financial (Note I):		
Profit on investment turnover	10,658,493	11,117,707
Income from sundry investments	3,912,369	2,572,591
Equity in earnings of Swiss banking subsidiary	2,331,584	2,112,725
Administrative expenses	(1,974,248)	(1,286,113)
Investment and financial income	<u>14,928,198</u>	<u>14,516,910</u>
Other:		
Dividends from associated companies	7,451,640	9,278,203
Sundry income—net (Note J).....	15,890,983	26,213,026
Interest expense—net.....	(73,521,590)	(54,315,243)
Non-products and services income (loss)	<u>(35,250,769)</u>	<u>(4,307,104)</u>
Income Before Provision for Taxes on Income	224,373,045	235,380,091
Provision for Taxes on Income (Note L).....	<u>88,100,000</u>	<u>81,500,000</u>
Income Before Minority Interests	136,273,045	153,880,091
Minority Interests' Share in Income	<u>3,977,670</u>	<u>5,157,778</u>
Income Before Extraordinary Items (Note J).....	132,295,375	148,722,313
Extraordinary Items—net of tax (Note B).....	<u>(28,908,208)</u>	<u>—</u>
Net Income	<u>\$ 103,387,167</u>	<u>\$ 148,722,313</u>
Earnings per Share:		
Income Before Extraordinary Items.....	\$4.38	\$4.91
Extraordinary Items—net of tax (Note B).....	<u>(.96)</u>	<u>—</u>
Net Income.....	<u>\$3.42</u>	<u>\$4.91</u>

See Notes to Financial Statements

ST0004563

Consolidated Balance Sheet

THE DOW CHEMICAL COMPANY AND SUBSIDIARY COMPANIES

		December 31	
		1970	1969
ASSETS	Current Assets		
	Cash.....	\$ 30,280,740	\$ 42,516,851
	Marketable securities and interest-bearing deposits (at cost—approximately market).....	48,362,673	90,895,715
	Accounts and notes receivable:		
	Trade, less allowance for doubtful accounts (1970, \$11,470,611; 1969, \$9,371,070).....	349,640,162	316,425,596
	Miscellaneous.....	95,329,549	113,570,252
	Inventories—at lower of cost or market:		
	Finished and in process.....	256,734,955	202,701,375
	Materials and supplies	111,504,818	86,368,200
		<u>891,852,897</u>	<u>852,477,989</u>
	Investments and Non-Current Receivables		
	Carried at equity in net assets—		
	Wholly owned Swiss bank (Note A).....	31,819,987	29,488,403
	Carried at cost (less reserves—1970, \$7,885,004; 1969, \$4,517,619):		
	Non-consolidated subsidiaries	654,191	562,104
	Associated companies (Note C).....	176,981,484	200,650,490
	Notes, securities and other assets held for investment	101,094,000	106,201,737
	Sundry.....	31,361,573	41,214,032
		<u>341,911,235</u>	<u>378,116,766</u>
	Plant Properties (Note E)		
	Cost.....	2,524,312,720	2,305,128,787
	Less—Accumulated depreciation.....	1,086,124,485	1,010,128,768
		<u>1,438,188,235</u>	<u>1,295,000,019</u>
	Goodwill (Note D).....	<u>72,195,649</u>	<u>62,739,806</u>
	Deferred Charges and Other Assets.....	<u>35,653,499</u>	<u>31,441,036</u>
	TOTAL.....	\$2,779,801,515	\$2,619,775,616

See Notes to Financial Statements

LIABILITIES		December 31	
		1970	1969
	Current Liabilities		
	Notes payable.....	\$ 229,255,553	\$ 337,752,058
	Long-term debt due within one year.....	61,980,998	16,615,938
	Accounts payable.....	150,566,715	140,544,515
	United States and foreign taxes on income.....	56,770,254	51,603,401
	Accrued and other current liabilities.....	144,732,366	133,967,646
		<u>643,305,886</u>	<u>680,483,558</u>
	 Long-Term Debt (Note F).....	 <u>969,844,553</u>	 <u>797,992,233</u>
	 Minority Interests in Subsidiary Companies.....	 <u>39,932,009</u>	 <u>39,615,622</u>
	 Reserves		
	Deferred employee benefits (Note G).....	19,168,418	16,435,768
	Loss on foreign investments.....	5,000,000	5,000,000
		<u>24,168,418</u>	<u>21,435,768</u>
	 Stockholders' Equity (Note H)		
	Common stock (1970—issued, 31,617,824 shares)...	158,089,120	157,152,870
	Capital surplus.....	585,046,077	574,699,429
	Earned surplus.....	454,802,305	430,696,301
		<u>1,197,937,502</u>	<u>1,162,548,600</u>
	 Less—Treasury stock at cost		
	(1970—1,413,829 shares).....	95,386,853	82,300,165
		<u>1,102,550,649</u>	<u>1,080,248,435</u>
	 TOTAL.....	 <u>\$2,779,801,515</u>	 <u>\$2,619,775,616</u>

See Notes to Financial Statements

ST0004565

Consolidated Statements of Surplus

		Year Ended December 31	
		1970	1969
Capital Surplus	Balance at Beginning of the Year	\$574,699,429	\$562,171,177
	Add:		
	Excess of selling or market price over par value of common stock issued to employees	10,671,487	12,284,061
	Excess of face value of debentures over par value of common stock issued on conversion	86,145	244,191
		<u>\$585,457,061</u>	<u>\$574,699,429</u>
	Deduct—Retirement of treasury shares and transactions related to acquisition of subsidiaries	410,984	
	Balance at End of the Year	<u>\$585,046,077</u>	<u>\$574,699,429</u>
Earned Surplus	Balance at Beginning of the Year	\$430,696,301	\$358,830,020
	Add:		
	Net income for the year	103,387,167	148,722,313
	Adjustments related to consolidation of subsidiaries	188,308	401,252
		<u>\$534,271,776</u>	<u>\$507,953,585</u>
	Deduct:		
	Cash dividends	78,499,230	77,257,284
	Retirement of treasury shares	970,241	
	Balance at End of the Year	<u>\$454,802,305</u>	<u>\$430,696,301</u>

Consolidated Source and Application of Funds

		Year Ended December 31	
		1970	1969
Source of Funds (in thousands)	Net income	\$103,387	\$148,722
	Non-cash charges (credits) to income:		
	Depreciation	207,744	177,882
	Write-off investment in associated company	43,367	
	Minority interests' share in income	3,978	5,158
	Equity in earnings of Swiss banking subsidiary	(2,332)	(2,113)
	Other—net	9,316	5,560
	Proceeds from sale of investments, less gains reflected in net income	13,094	7,436
	Funds provided from operations	<u>378,554</u>	<u>342,645</u>
	Issuance of debentures	274,000	100,000
	Sale of common stock to employees	10,258	11,996
	Reserve transferred from current liabilities		12,081
	Disposal of plant property and sundry	<u>3,858</u>	<u>17,851</u>
		<u>\$666,670</u>	<u>\$484,573</u>
Application of Funds (in thousands)	New plant and equipment	\$348,099	\$370,579
	Cash dividends	78,499	77,257
	Purchase of treasury stock	15,969	14,769
	Decrease (increase) in revolving credit and other long-term debt	108,074	(13,680)
	Noncurrent investments	19,484	38,813
	Increase in deferred charges and other outlays	4,660	8,706
	Acquisitions of subsidiaries and purchase of minority interests:		
	Working capital	2,178	
	Goodwill	9,456	17,877
	Other—net	3,699	2,721
		<u>590,118</u>	<u>517,042</u>
	Increase (decrease) in working capital	<u>\$ 76,552</u>	<u>\$ (32,469)</u>

ST0004566

Notes to Financial Statements

A. Principles of Consolidation The financial statements include all significant subsidiaries on a full consolidation basis, except for a wholly owned Swiss banking company which is accounted for on the equity basis. Accordingly, if the bank were consolidated, there would be no effect on consolidated net income and stockholders' equity as reported.

During 1970, several minor subsidiaries were acquired. One acquisition was accounted for as a pooling of interests; the others were accounted for as purchases. The effect of these acquisitions on the results of operations was not material.

Foreign currency items have been translated into U. S. dollars at appropriate rates of exchange. Financial information regarding foreign operations is presented on page 23.

B. Extraordinary Items During 1970, Phrix-Werke A. G., a 50%-owned German fiber producer, experienced financial difficulties which resulted in a decision to begin significant curtailment of its activities. While all factors regarding the future of Phrix were not determinable at December 31, 1970, Dow management considered its investment therein to be worthless. Accordingly, income was charged with \$31,073,000, or \$1.03 a share, representing the cost of the investment in Phrix, after income tax reduction of \$12,294,000.

Investments in two additional 50%-owned companies were disposed of during 1970 at a profit of \$2,165,000, or \$.07 a share, after income tax of \$710,000.

The foregoing resulted in an extraordinary charge of \$28,908,000, or \$.96 a share.

C. Associated Companies Investments in associated companies represent a 50% interest in several domestic and foreign companies. The Company's equity in the combined net income of these companies, as shown by their unaudited financial statements, was \$8,700,000 in 1970 and \$2,200,000 in 1969. The equity in the undistributed net earnings of these companies since acquisition was approximately \$25,000,000 at December 31, 1970. The associated companies referred to in Note B were excluded from the equity determinations.

D. Goodwill The excess of the cost of investments in consolidated subsidiaries over their net assets at dates of acquisition is carried as goodwill.

Recently promulgated accounting rules provide for compulsory amortization of goodwill arising after October 31, 1970. All goodwill in the accompanying balance sheet relates to investments acquired prior to November 1, 1970. In the opinion of management, these investments have appreciated in value since acquisition, and no amortization of goodwill was required in 1970.

E. Plant Properties Properties and accumulated depreciation at December 31, 1970 were:

Classifications	Cost	(000 omitted)
		Accumulated Depreciation
Land.....	\$ 52,080	
Land and waterway improvements.....	50,870	\$ 21,936
Buildings.....	286,666	120,020
Machinery and other equipment.....	1,816,035	893,369
Wells and brine systems.....	39,346	22,909
Furniture and fixtures.....	27,514	14,554
Other.....	21,378	10,985
Construction in progress.....	230,424	2,351
Total.....	<u>\$2,524,313</u>	<u>\$1,086,124</u>

Depreciation in the United States and Canada is computed primarily under the declining-balance method, whereas in other countries the straight-line method is generally used.

F. Long-Term Debt & Available Credit Facilities

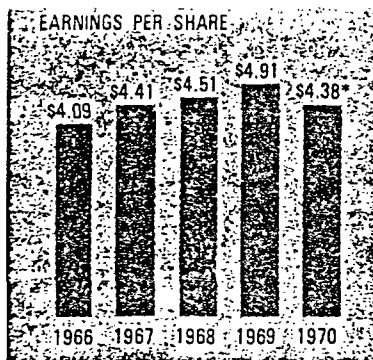
(a) Details of long-term debt were:

	(000 omitted) December 31	
	1970	1969
Promissory notes:		
4.5%, final maturity 1990.....	\$115,000	\$120,000
5.0%, final maturity 1991.....	96,000	100,000
Debentures:		
4.35%, final maturity 1988.....	79,010	84,134
6.70%, final maturity 1998.....	100,000	100,000
7.75%, final maturity 1999.....	100,000	100,000
8.875%, final maturity 2000.....	142,000	
8.90%, final maturity 2000.....	132,000	
Debentures, subordinate convertible,		
3% due 1982 (1970-22,184 common shares reserved).....	1,085	1,181
Notes payable under revolving credit agreements:		
Due 1973 (total available facility \$225,000,000).....		125,000
Due 1975 (total available facility \$110,000,000).....	40,000	
Other (various rates and maturities):		
Foreign currency loans.....	117,769	112,985
Dollar loans.....	46,981	54,692
Total.....	<u>\$969,845</u>	<u>\$797,992</u>

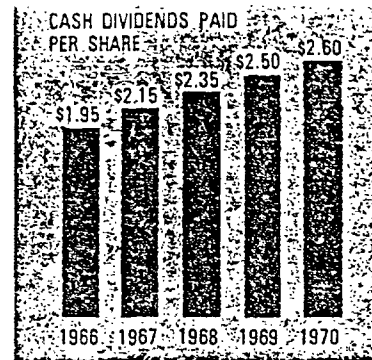
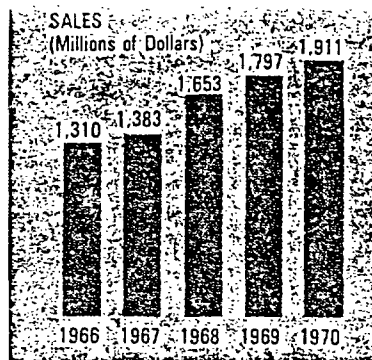
The promissory notes and debentures are payable generally in annual installments beginning at various dates.

Agreements relating to the issuance of the 8.875% and the 8.90% debentures provide for delivery of \$8,000,000 and \$18,000,000 principal amounts, respectively, subsequent to December 31, 1970. The debentures are recorded as debt when proceeds are received.

ST0004567



* Before extraordinary items



Installments (stated in millions) due on long-term debt in the five years after 1970 are: 1971, \$62.0; 1972, \$31.6; 1973, \$46.2; 1974, \$39.5; 1975, \$83.6.

(b) Available credit facilities at year-end:

In addition to the revolving credit agreements referenced above, the company had a 1.0 billion Deutsche mark agreement with a group of major German banks exercisable through 1974. Of the German credit facility, 30.0 million Deutsche marks were in use at December 31, 1970.

G. Deferred Employee Benefits Certain foreign subsidiaries provide termination benefits to employees in amounts stipulated by law. It is the companies' policy to accrue for these benefits as earned.

H. Stockholders' Equity At December 31, 1970 authorized capital stock consisted of 100,000,000 common shares and 25,000,000 preferred shares of \$5 par and \$1 par per share, respectively.

The changes in the number and amount of issued shares of common stock during 1970 were:

	Shares	Amount
Issued January 1.....	31,430,574	\$157,152,870
Sold to employees	166,583	832,915
Awarded as restricted stock ..	18,705	93,525
Conversion of debentures	1,962	9,810
Issued December 31.....	<u>31,617,824</u>	<u>\$158,089,120</u>

At December 31, 1970, there were 30,203,995 shares of common stock outstanding, after deducting 1,413,829 shares of treasury stock. None of the preferred shares have been issued.

In May 1970, the Company made an offering of common stock to its employees at \$57.75 a share, payable generally through payroll deductions. At December 31, 1970, there were unfilled subscriptions for 151,541 shares which may be cancelled at the option of the employee. Partial payments on these subscriptions aggregating \$5,814,000 are included in current liabilities.

The stockholders authorized in 1969 an Award Plan providing for the granting, during the ensuing ten-year period, of 350,000 shares of Restricted or Deferred Stock, or a combination thereof, to selected employees in lieu of cash for services. During 1970, 18,705 shares of Restricted Stock were issued and 745 shares of Deferred Stock were awarded. At Decem-

ber 31, 1970, there were 312,635 shares available for grant. The Plan also extended to May 1979 the previous authority for granting dividend units.

The stockholders previously authorized plans for granting options to purchase common stock at the fair market value at the date of grant to officers and key employees. The options must be exercised within five years from the date of issuance. Changes during 1970 in the number of shares under option were:

	1967 Option Plan	1964 Incentive Plan	Dividend Units*
Options:			
Outstanding January 1....	300,247	82,350	61,420
Granted	30,000		
Expired or terminated.....	1,500	15,600	
Outstanding December 31	328,747	66,750	61,420
Not optioned December 31	71,253		188,580
Price range on outstanding options at December 31	\$61.44 to 87.00	\$60.00 to 76.25	

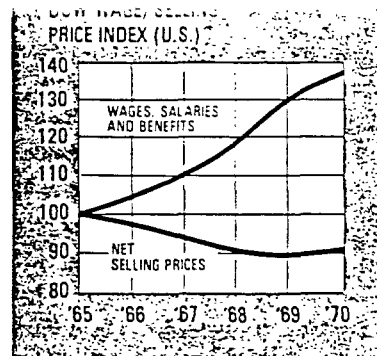
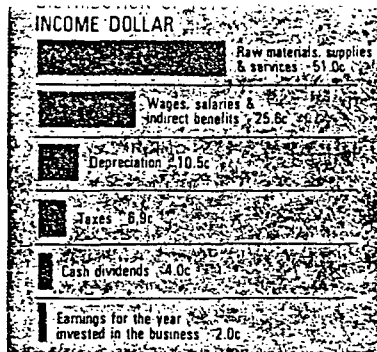
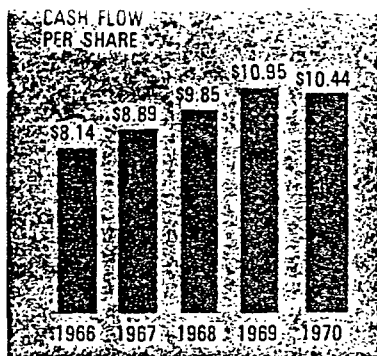
* A dividend unit is the right to receive for a specified period cash payments equivalent in value to cash dividends paid during such period on one share of common stock

In computing earnings per share, no adjustment was made for common shares issuable under stock purchase and option plans or upon conversion of 3% debentures because there would be no material dilutive effect.

I. Investment and Financial Income Except for the earnings of the Swiss banking subsidiary, investment and financial income relates generally to the companies' investment activities. The assets held for investment appreciation, excluding working capital, are shown in the balance sheet caption—Notes, securities and other assets held for investment. Profit on investment turnover represents gain on disposition of these investments. Income from sundry investment includes dividends and lease income.

J. Special Credits—1969 Sundry income for 1969 included \$7,928,000 representing profit on discontinuance of several small product lines, which after income tax contributed \$6,305,000 to net income, equivalent to \$.21 a share.

ST0004568



K. Retirement Plans The Company and certain subsidiaries have plans to provide retirement benefits for eligible employees. The Company's plan was amended effective January 1, 1970 to extend coverage to substantially all full-time employees and to provide additional benefits. The cost of the plan was \$14,398,000 in 1970 and \$13,634,000 in 1969. The Company's policy is to accrue and fund pension cost as computed by its actuary. Pension fund assets exceed the actuarially computed value of vested benefits.

The total cost of pension plans for all companies in the consolidated group in 1970 and 1969 was \$17,177,000 and \$14,987,000, respectively.

These plans exclude the deferred employee benefits referenced in Note G.

L. Taxes on Income and Investment Credits

The companies compute and record income taxes currently payable based upon their determination of taxable income which may be different from pretax accounting income. These differences may arise from recording in pretax accounting income, transactions which enter into the determination of taxable income in another period. The tax effect of these timing differences is recognized by adjustment currently to the provision for taxes. Accordingly, the 1970 and 1969 tax provisions were reduced by \$73,000 and \$3,817,000, respectively.

No provision has been made for income taxes on the unremitted earnings of subsidiary companies, except as required under United States income tax laws. Untaxed earnings are considered to be either permanently invested or the tax applicable thereto would not be material.

Laws governing the determination of United States and certain foreign income taxes provide for investment credits or allowances which are deductible generally upon completion of qualified facilities. The provision for taxes on income in 1970 and 1969 was reduced \$9,100,000 and \$18,100,000, respectively, for such credits claimed in those years.

In addition to investment tax credits, certain foreign countries provide investment incentives in the form of tax free grants. These grants were utilized in 1970 to the extent of \$200,000 to offset development and construction expenses of new facilities to which they relate. The excess of the grants earned over ex-

penses incurred was deferred to cover similar expenses in the future at those facilities.

Agreement was reached in 1970 with the Internal Revenue Service on all contested tax assessments for 1956 through 1964.

M. Contingent Liabilities and Commitments

The Company's position on mercury pollution litigation is discussed on page 36. Other suits have been started against the Company and certain subsidiaries because of alleged product damage and other claims. All suits are being contested and the amount of uninsured liability thereunder, if any, is considered to be immaterial.

Lease rental payments (stated in millions) due in each of the five years after 1970 are: 1971, \$36.3; 1972, \$31.9; 1973, \$30.5; 1974, \$28.1; 1975, \$25.9.

Opinion of Independent Public Accountants

HASKINS & SELLS
CERTIFIED PUBLIC ACCOUNTANTS

1200 GUARDIAN BUILDING
DETROIT 48226

February 19, 1971

THE DOW CHEMICAL COMPANY

We have examined the consolidated balance sheet of The Dow Chemical Company and its subsidiary companies as of December 31, 1970 and the related consolidated statements of income, surplus, and source and application of funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, such financial statements present fairly the financial position of the companies at December 31, 1970 and the results of their operations and the source and application of their funds for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Haskins & Sells

ST00004569

Condensed Comparative Statements

THE DOW CHEMICAL COMPANY AND SUBSIDIARY COMPANIES

	1970	1969	1968	1967	1966	1960	1950
Financial Condition (in millions)							
Current Assets:							
Cash and marketable securities.....	\$ 78.6	\$ 133.4	\$ 141.7	\$ 104.5	\$ 127.2	\$ 50.8	\$ 43.3
Receivables (less reserves).....	445.1	430.0	357.9	307.0	254.9	114.9	30.1
Inventories.....	368.2	289.1	276.3	216.6	195.2	162.9	34.0
Total current assets.....	891.9	852.5	775.9	628.1	577.3	328.6	107.4
Current Liabilities:							
Notes payable.....	229.3	337.8	246.5	175.5	58.8	96.4	
Accounts payable and accruals.....	357.2	291.1	272.4	199.0	176.5	74.5	24.8
Taxes on income.....	56.8	51.6	52.5	45.7	53.1	28.2	19.2
Total current liabilities.....	643.3	680.5	571.4	420.2	288.4	199.1	44.0
Working Capital.....(A)	248.6	172.0	204.5	207.9	288.9	129.5	63.4
Property (at cost).....	2,524.3	2,305.1	2,060.4	1,756.0	1,673.5	1,228.1	299.6
Depreciation.....	1,086.1	1,010.1	933.4	859.9	823.8	633.8	87.5
Net property.....(B)	1,438.2	1,295.0	1,127.0	896.1	849.7	594.3	212.1
Other Assets.....(C)	449.7	472.2	409.3	389.0	279.2	52.6	7.8
Investment (A) plus (B) plus (C).....(D)	2,136.5	1,939.2	1,740.8	1,493.0	1,417.8	776.4	283.3
Long-term indebtedness.....	969.8	798.0	684.6	551.6	552.3	140.9	62.6
Preferred Stock.....							46.4
Minority Interest.....	39.9	39.6	41.6	.8	.8	1.6	.9
Reserves.....	24.2	21.4	5.0	5.0	5.0		.8
Total.....(E)	1,033.9	859.0	731.2	557.4	558.1	142.5	110.7
Common Stockholders' Equity (D) minus (E).....	\$1,102.6	\$1,080.2	\$1,009.6	\$ 935.6	\$ 859.7	\$ 633.9	\$172.6
Income (in millions)							
Net sales of products and services.....	\$1,911.1	\$1,797.1	\$1,652.5	\$1,382.7	\$1,309.7	\$ 819.8	\$220.8
Cost of sales.....	1,193.4	1,156.0	1,053.3	883.2	842.4	519.2	133.5
Depreciation.....	207.7	177.9	157.2	136.0	122.6	81.9	20.3
Selling and administrative expenses.....	250.4	223.5	213.5	148.6	142.8	103.8	16.0
Products and services operating income ..	259.6	239.7	228.5	214.9	201.9	114.9	51.0
Investment and sundry income—net.....	38.3	50.0	37.4	26.1	19.7	12.9	3.8
Interest income (expense).....	(73.5)	(54.3)	(33.9)	(21.0)	(17.6)	(6.3)	(1.5)
Non-products and services income (loss) ..	(35.2)	(4.3)	3.5	5.1	2.1	6.6	2.3
Taxes on income.....	88.1	81.5	92.0	87.7	81.3	50.8	19.5
Minority interests' share in income.....	4.0	5.2	4.0			(.1)	
Net income before extraordinary items.....	\$ 132.3	\$ 148.7	\$ 136.0	\$ 132.3	\$ 122.7	\$ 70.8	\$ 33.8
Net income after extraordinary items.....	\$ 103.4	\$ 148.7	\$ 136.0	\$ 132.3	\$ 122.7	\$ 70.8	\$ 33.8
Other Statistics (in millions)							
Additions to property.....	\$ 348.1	\$ 370.6	\$ 306.3	\$ 192.3	\$ 241.5	\$ 129.0	\$ 29.0
Research and development expenses.....	91.5	87.3	83.8	76.8	71.3	47.3	11.0
Taxes (major).....	136.5	140.7	144.5	125.9	116.5	75.7	26.7
Wages and salaries paid.....	440.6	415.5	389.3	325.6	302.1	209.8	55.2
Cost of employee benefits.....	67.8	59.1	50.8	36.2	32.9	22.1	5.5
Number of employees at year-end (thousands)....	47.4	47.4	47.4	36.4	35.0	30.5	14.5
Cash dividends declared on Common Stock.....	78.5	77.3	72.5	66.1	59.9	39.6	10.1
Per share of Common Stock (in dollars) (*):							
Earnings before extraordinary items.....	4.38	4.91	4.51	4.41	4.09	2.34	1.44
Earnings after extraordinary items.....	3.42	4.91	4.51	4.41	4.09	2.34	1.44
Cash dividends paid.....	2.60	2.50	2.35	2.15	1.95	1.32	.46
Market closing price on December 31.....	73.63	68.63	78.00	87.13	61.63	74.63	78.88

(*) Adjusted for stock splits and stock dividends.

ST0004570

World Operations

(dollars in millions)	SALES				PRODUCTS AND SERVICES OPERATING INCOME			
	1970	1969	% Change	1970 % of Total Company	1970	1969	% Change	1970 % of Total Company
United States	\$1,139.8	\$1,154.6	- 1.3	59.6	\$144.1	\$144.8	- 0.5	55.5
Europe/Africa	430.8	351.1	+22.7	22.5	79.0	61.1	+29.3	30.4
Canada	126.2	119.9	+ 5.3	6.6	10.6	17.9	-40.8	4.1
Latin America	132.8	107.5	+23.5	7.0	14.7	7.5	+96.0	5.7
Pacific	81.5	64.0	+27.3	4.3	11.2	8.4	+33.3	4.3
TOTAL	\$1,911.1	\$1,797.1	+ 6.3	100.0	\$259.6	\$239.7	+ 8.3	100.0

(dollars in millions)	GROSS PLANT PROPERTIES			CAPITAL EXPENDITURES			EMPLOYEES (thousands)		
	1970	1969	1970 % of Total Company	1970	1969	1970 % of Total Company	1970	1969	1970 % of Total Company
United States	\$1,777.1	\$1,711.1	70.4	\$192.8	\$243.6	55.4	28.9	30.3	60.9
Europe/Africa	469.3	356.4	18.6	109.9	81.6	31.6	10.8	9.7	22.8
Canada	190.7	171.8	7.6	24.3	24.2	7.0	2.4	2.3	5.1
Latin America	67.5	48.8	2.6	18.8	18.5	5.4	4.2	4.2	8.9
Pacific	19.7	17.0	0.8	2.3	2.7	0.6	1.1	0.9	2.3
TOTAL	\$2,524.3	\$2,305.1	100.0	\$348.1	\$370.6	100.0	47.4	47.4	100.0

UNITED STATES



Hourly worker—Michigan

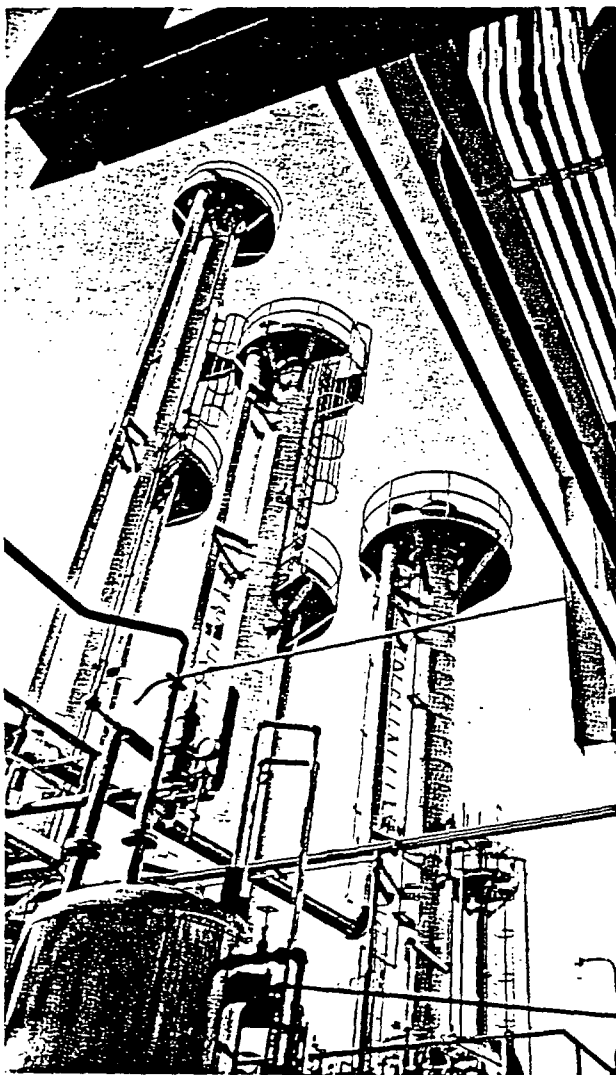
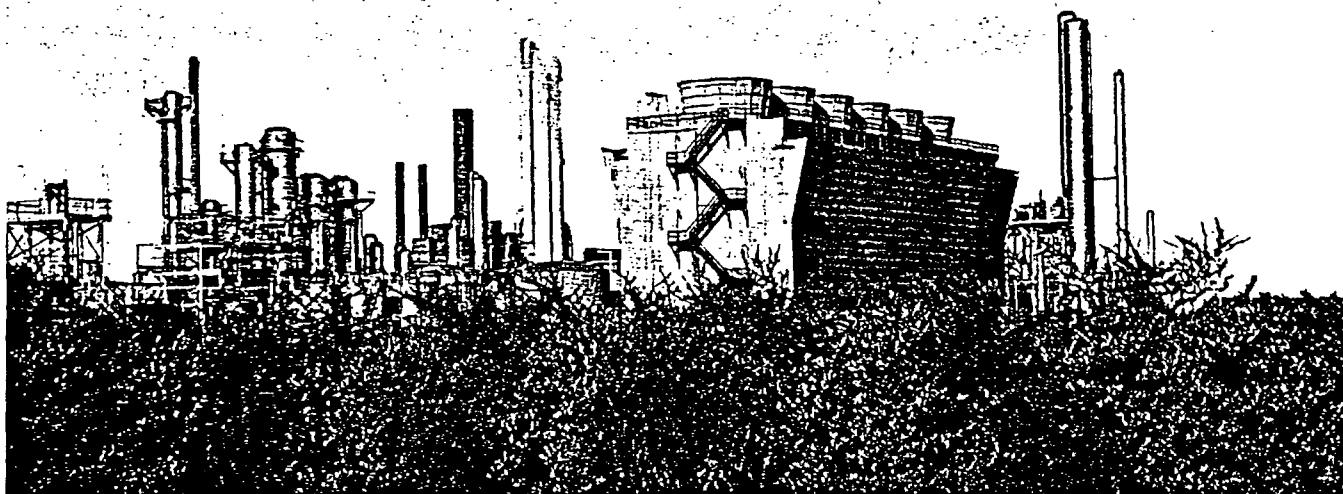
Dow's weighted index of U. S. selling prices gained 0.7% in 1970. This was the first increase since 1957. But higher costs (including the cost of money) and softness in the economy combined to depress our income from U. S. operations.

Agricultural Products paced all others in earnings improvement, followed by the Inorganic Chemicals and Solvents Department, Metals, and Packaging. Plastic resins achieved a moderate earnings gain despite lower sales.

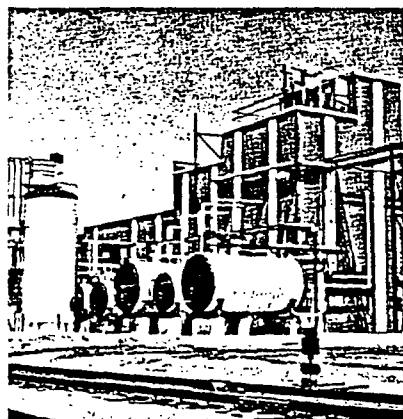
U. S. operating earnings in the current year are expected to continue at the 1970 level, with slightly higher prices for Dow products being offset by continued cost escalation and little growth in demand.

New plant start-ups in the U. S. again were at a record level as more than \$240 million worth of new facilities came on stream. The largest concentration was in the Louisiana Division and featured a new ethylene oxide and glycol facility costing in excess of \$25 million. Multi-million dollar caustic-finishing plants were completed and brought on stream in the Louisiana Division and the Oyster Creek Division in

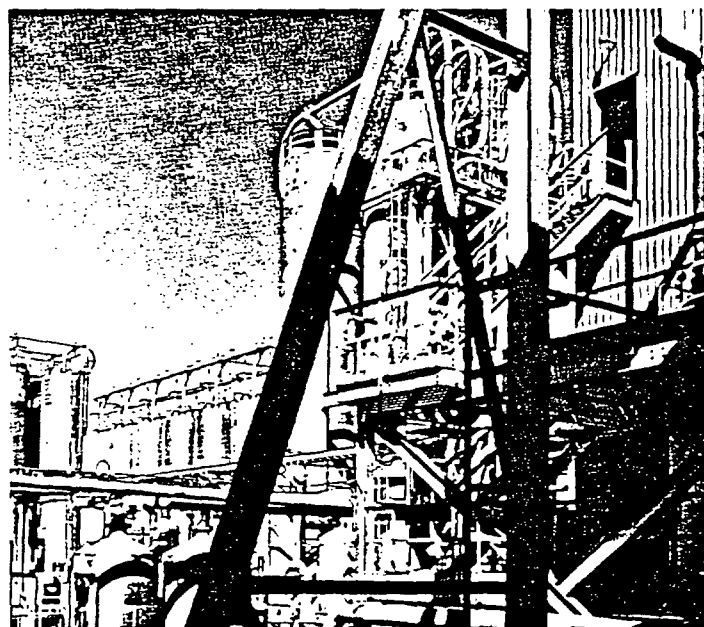
Biggest Dow capital project completed in 1970 was ethylene oxide and glycol plant, world's largest, in Louisiana Division. Cooling tower in foreground minimizes discharge of heated water to Mississippi River.



Largest solvents plant in western U.S. came on stream at Dow's Western Division plant in Pittsburg, California.



New Midland Division plant for DURSBAN insecticide makes this biodegradable, selective pesticide available in full commercial quantities for present and prospective volume use.



New low-density polyethylene plant in the Texas Division is based on a technologically advanced process for producing resins for high-clarity film.

ST0004572



Plant operators — Michigan

Texas. No unusual start-up problems were encountered in any of our projects. Existing facilities operated at 81.5% of capacity, a slight decline from 1969's 83%.

As a result of relatively heavy capital spending, nearly 50% of our present U. S. capacity is new within the past five years. For this reason and because of high construction costs and slowness in the economy, Dow's U. S. capital spending in 1971 will be significantly lower. The rate of new authorizations has been reduced, and several previously authorized projects have been "stretched out" where such delays will not penalize us in the market place. Start-up costs, which are burdensome no matter how smooth the start-up, thus will be better spaced, and more personnel will be available to extract operating economies from existing plants.

Dow's Engineering and Construction Services provided design engineering and construction administration for 102 major projects at 16 operating locations.

During 1970, Dow became a partner in Promix, a joint operating company formed in the 1960s by three petroleum companies. We now own one-fourth of the assets of Promix, which owns pipelines and separation facilities for natural-gas liquids in southern Louisiana. In addition to sharing in the earnings of this profitable enterprise, Dow has entered into an extended-term agreement with Promix to supply hydrocarbon feedstocks for Dow's Gulf Coast operations, thus assuring a continuing supply of these vital materials.

Government Business

Direct sales of products and services to the United States Government declined moderately to 1% of our total consolidated sales. Our business decreased with the Department of Defense and the Space Agency but improved with non-defense agencies.

Reflecting the shift of emphasis in government spending, Dow activity increased in federal, state and local programs dedicated to enhancing the quality of life. These included environmental improvement, transportation, health and education, and housing. Dow broadened its contract research and development programs with government agencies, and gained acceptance of additional products and services, in these newer areas. Liaison was provided by our Government Affairs Department.

The Catalytic-Dow joint venture, which provided engineering services at Kennedy Space Center, Florida, was completed and terminated at mid-year. A number of key Dow personnel from this effort were assigned to other positions in the Company.

EUROPE/AFRICA

Dow's operations in Europe experienced a fine year, with a strong sales gain and a major increase in the area's contribution to total operating income.

Although the European economy was somewhat less vigorous than in 1969, generally good business conditions prevailed. This included further strengthening of chemical prices.

European plant completions in 1970 totaled \$131 million. At Terneuzen, the 400,000 metric ton naphtha cracker completed in late 1969 was brought on stream and produced ethylene, propylene, butadiene and benzene in planned quantities.

ST0004573



Plant manager—Greece

Construction of a second naphtha cracker at Terneuzen was started. Work also was started on the chlorine-caustic-solvents complex at Stade, West Germany, with the first production units due on stream in late 1971 or early 1972. Our investment at Stade is expected to total \$250 million by 1975.

With the permission of the Spanish government, Dow successfully made a public offer to purchase class A shares of Dow-Unquinesa of Spain from shareholders. Aim of the offer was to increase Dow's ownership from the present 54% to about 80%—the level deemed necessary for Dow to commit the resources necessary to assure a profitable future for the Spanish company—and 85% ownership actually was achieved.

CANADA



Traffic manager—Sarnia

Sales of Dow Chemical of Canada, Limited increased to a new record high. Operating income was again caught in the squeeze between price attrition and further increases in the costs of employment, raw materials and energy.

The best marketing gains were seen in inorganic chemicals and human and animal health products. Consumer brands and all major plastics also performed well. Sales of some products were curtailed by lengthy strikes in the construction and automotive industries and by the effects of tight money and relative flatness in the economy.

The sharp gain in inorganic chemical sales reflected Dow Canada's strong position in the pulp and paper industry, whose production levels continued to run high. Distribution services to customers in this industry were further strengthened with the addition of a liquid caustic soda bulk storage depot at Botwood, Newfoundland.

Sales to export markets again accounted for about 10% of Dow Canada's output. The main export products were glycols, solvents, styrene, polystyrene and benzoic acid.

Capital expenditures of \$25 million again were concentrated at the major works in Sarnia, Ontario. A new manufacturing location at Varennes, Quebec, started operations with a plant for *Styrofoam* and *Roofmate* brand plastic foams.

Negotiations were begun for the purchase of land in the deep-water Canso Strait area of Nova Scotia as the possible site of a future Dow Canada production complex.

LATIN AMERICA

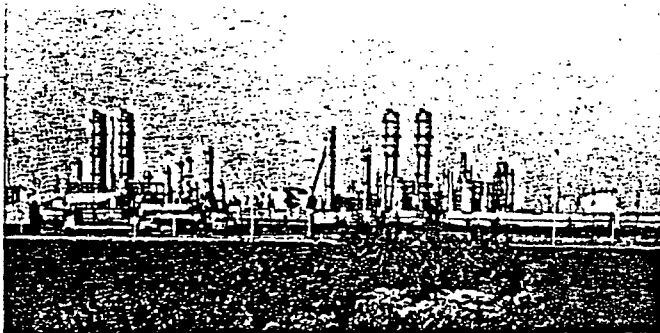
Growth amid change was the keynote for Dow's Latin American operations in 1970. Seven republics acquired new administrations, and a wide variety of political and economic conditions prevailed.

For most of the area's regional offices, 1970 saw results not only above 1969 levels but also above their goals for the year. Among the major regions, plant expansions and local production acquisitions, coupled with a robust increase in sales of U.S. Area-produced products, contributed to outstanding gains in Brazil, Colombia, and Mexico.

The smaller sales regions also prospered. Peru and Central America based their substantial sales increases on U.S. Area exports, but the year also saw the beginnings of intra-area sales of products produced in Dow plants in the regions.

ST0004574

ST0004575



At the Terneuzen complex in The Netherlands, a second styrene facility (right in photo) was major plant completion.

Dow's giant naphtha cracker at Terneuzen was started up successfully and work on a second cracker was started.



Dow extended its plastic-foam production to eastern provinces with new plant in Varennes, Quebec.



Dow's research and development capability in Canada was expanded with completion of \$3 million center at Sarnia, Ontario.



Secretary—Coral Gables

Since 1966, when the Latin American Area was established, Dow's sales in the area have grown annually at an average rate in excess of 20%.

A large portion of the plant construction program begun in 1968 was completed. Biggest unit is the petrochemical complex at Concepción, Chile; built with Chilean government participation, it will produce polyethylene, vinyl chloride monomer and polyvinyl chloride resins.

Progress on future investments assuring additional local production was substantial. Dow received approval from the government of Argentina to proceed with planning for a petrochemical complex at Bahía Blanca, and both Argentine private capital and a government corporation signified an interest in joining the venture.

PACIFIC

Dow's growth in the Pacific continued in 1970 despite mixed business conditions throughout the area in the second half of the year.

Reduced demand in the United States for the products of Pacific countries dampened economic growth in Japan and the South Asia and East Asia regions. Labor disputes and an extended drought were added factors slowing the economies of Australia and New Zealand.

As a result, many products manufactured by Dow were in excess supply and prices were under considerable pressure. However, we were able to exceed our sales and profit goals on the strength of continuing firm over-all demand for Dow products, selective price increases, a broadened product base and the availability of product from three new production plants in the area.

In Japan/Korea, our largest volume region, sales were up 36%. The loss of some plastics business (the result of severe price competition from Japanese producers) was offset by commodity and specialty chemicals, especially *Chlorothene* solvents and *Coyden* coccidiostat, the latter newly introduced to the Japanese poultry feed-additive market. Australia/New Zealand posted a 27% sales increase. The prolonged Australian drought prompted the introduction of *Kedlor* feed-grade biuret, a non-protein nitrogen source for cattle and sheep, six months ahead of schedule. South and East Asia sales were up 9%.



Sales Manager—Hong Kong

ST00004576

INDUSTRIAL RELATIONS

The number of people employed by Dow and its consolidated subsidiaries at the end of 1970 was 47,400, unchanged from the previous year. However, employment within the United States declined by about 1,400 while increasing by the same number abroad.

A nine-week work stoppage by hourly employees occurred during wage negotiations at the Rocky Flats Division, but the plant continued in operation with salaried employees. Six other hourly labor contracts were concluded without incident. The strike at the Indianapolis Division, longest (18 months) in the Company's history, was ended by a decision of the employees to dissociate from union representation.

Despite the softer economy in the U.S., increased sales per employee were achieved.

The world-wide cumulative accident frequency rate among Dow employees in 1970 was the lowest since the Company began keeping records and was one of the best in all industry.

Improved yields in Philippine rice cultivation are expected from use of TAVRON herbicide to control weeds in irrigated fields.



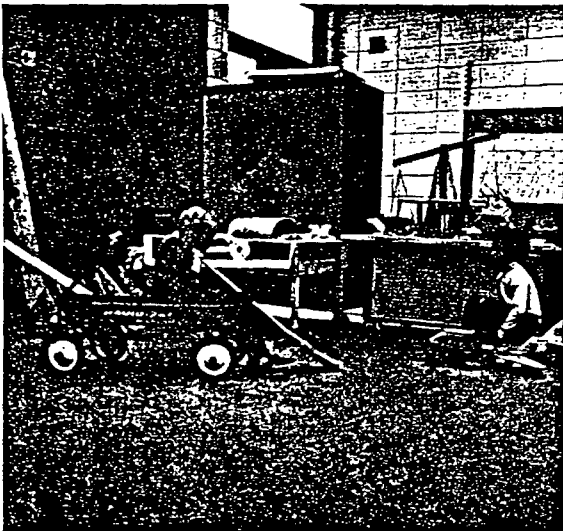
Latin American phenomenon—retail stores selling only plastic articles. This Bogotá outlet is supplied by local industry using Dow's made-in-Colombia polystyrene and polyethylene resins.



Dow Corning introduced RUST PATROL, a paste-like rust dissolver. Packaged in eight-ounce plastic squeeze bottle, the product is being test-marketed in selected hardware stores.



ST00004577



Carpet of ZEFKROME yarn by Dow Badische provides durable floor covering for schoolers. Yarn contains 3% ZEFSTAT yarn to keep static electricity below noticeable levels.



New workboat puts Dowell Division in position to gain larger share of expanding market for cementing and acidizing services to offshore wells on Gulf Coast.

INVESTMENT & FINANCIAL

In its second year of formal organization, the *Ventures, Investment and Finance Company Division* contributed \$.25 per share to Dow's earnings. This division handles business acquisition and disposition activities, invests in venture-capital businesses and manages an investment portfolio. Its resources exceed \$100 million (at cost) and include loans and land as well as equity investments. Its objective is capital appreciation from its investments.

Some examples will demonstrate the diversity of the Ventures Division's interests. Through an equity-capital investment, the division in 1970 acquired a majority position in a manufacturer of X-ray generating equipment for medical therapy, science and industry. Minority positions were acquired in firms making medical X-ray and diagnostic equipment. The division invested in an Alaskan housing venture, and a joint company was formed to develop land in the south-west for housing and other uses. The division plans its investments by its own investment criteria, not by any resultant sale of Dow products.

Earnings of *Dow Banking Corporation*, a wholly owned subsidiary, increased by 11% as the Eurodollar market continued its vigorous growth.

DBC, which is incorporated in Switzerland and has its head office in Zurich, opened a full-service branch in the City of London and a representative office in New York in 1970. The Amsterdam branch, established in 1969, became a fully authorized Dutch bank, serving corporate customers and financial institutions in the Benelux countries. In Luxembourg, DBC acquired 50% of Eurocapital S.A., which will begin operations as a multinational underwriter of securities in 1971.

Bank Mendes Gans, Amsterdam, The Netherlands, continues to perform an excellent function as Dow's European money collection center, as it has since we obtained a substantial minority position in 1962.

Dow in 1970 further expanded its large minority position in Banco Cidade de Sao Paulo S.A., a rapidly growing commercial bank, headquartered in Sao Paulo, Brazil.

RESEARCH & DEVELOPMENT



Chemist—United States

Dow's support of Research and Development, although not keeping pace with cost inflation, increased \$4 million to a total of \$91 million in 1970. This included funding for pilot-plant operations and technical service.

An increased proportion of research and development effort was devoted to the broad field of environmental improvement. Involved were:

- Development of products and techniques for controlling solid, liquid and gaseous wastes, which eventually are utilized in our own plant operations and/or marketed to others through our Environmental Control Systems business. Included was research on new strains of bacteria to degrade chemical wastes not previously biodegradable.
- Development of new categories of toxicological data for Dow products—a further extension of the broad program started by our Toxicology Laboratory, which was founded in the early 1930s.
- Intensified studies of the effect of agricultural chemicals on the ecosystem. New testing requirements have increased to eight or 10 years and \$10 million the time and cost of taking a new pesticide from discovery to market.

A number of important new products and processes commercialized in 1970 are described in the World Operations, Products, and Environmental Relations sections of this report. Other significant developments included:

In designed chemicals — a flocculant for the paper industry that reduces the loss of paper-fiber fines and pigments and speeds water drainage on the papermaking machine, thus saving raw materials and reducing pollution; vinyl ester resins with wood-like properties.

In organic chemicals — polyglycols for improved flexible and rigid urethane foams for automobile seating and furniture.

In plastics — high-density polyethylene resin and a special surface treatment for automotive gasoline tanks offering lower hydrocarbon vapor loss, easier installation and greater puncture resistance.

A new laboratory was established in Greenville, South Carolina, to develop chlorinated-solvent dyeing processes for the textile industry.

Dow was issued 421 new U. S. patents in 1970. At year's end, the Company's portfolio of active patents included 5,962 U. S. and 8,508 from other countries. More than a third of all Dow patents are in actual use by the Company or its licensees.

SIGNIFICANT PLANT COMPLETIONS IN 1970

PRODUCT	PLANT LOCATION	DESCRIPTION
Antibiotics	Brindisi, Italy	NL
Chlorine	Midland, Michigan	ME
Chlorine/Caustic Soda	Plaquemine, Louisiana	ME
Caustic Beads	Midland, Michigan	ND
Caustic Soda	Oyster Creek, Texas	NL
<i>Dursban</i> insecticide	Midland, Michigan	ME
<i>Dowflake</i> calcium chloride	Midland, Michigan	NP
Epoxy resins	Altona, Australia	NA
Epoxy resins	Sao Paulo, Brazil	NA
Epoxy resins	Torrance, California	NL
Ethylene/propylene	Plaquemine, Louisiana	ME
Ethylene dibromide	Magnolia, Arkansas	NL
Ethylene oxide/glycol	Plaquemine, Louisiana	ME
Laminating/coating facility	Cleveland, Ohio	ME
Light-metal extrusions	Denver, Colorado	NL
Light-metal extrusions	Russellville, Arkansas	NL
Polyethylene	Concepcion, Chile	NA
Polyethylene	Freeport, Texas	ME
<i>Polyfilm</i> polyethylene film	Honolulu, Hawaii	ME
Polyvinyl chloride	Concepcion, Chile	NA
<i>Separan</i> flocculants	Tlalneplantla, Mexico	NA
Styrene	Terneuzen, The Netherlands	ME
Styrene-butadiene latex	Altona, Australia	NA
Styrene-butadiene latex	Livorno, Italy	NL
Styrene-butadiene latex	San Lorenzo, Argentina	NA
<i>Styrofoam</i> plastic foam	Drusenheim, France	NL
<i>Styrofoam</i> plastic foam	Varennnes, Quebec	NL
<i>Thurane</i> plastic foam	Ironton, Ohio	NL
Vinyl chloride	Concepcion, Chile	NA
Vinyl chloride	Sarnia, Ontario	ME
<i>Ziploc</i> plastic bags	Bay City, Michigan	ND

NL = New to this location.
ME = Major expansion at this location
ND = New to Dow.

NA = New to this Dow Area.
NP = Replacement plant with new process technology.

ST0004579

PARTLY OWNED
COMPANIES

Dividends from 50%-owned companies, whose operating results are not consolidated in Dow's financial statements, totaled \$7.5 million, compared to \$9.3 million in 1969. Excluding operating losses of Phrix-Werke A.G., Dow's equity in the net income of the companies as a group improved markedly, rising to \$8.7 million from \$2.2 million in the previous year as a principal U.S. company began to overcome its operational difficulties.

We elected to write off our entire investment of \$43.3 million in Phrix-Werke, a German fiber producer whose business was heavily concentrated in rayon fibers. A combination of circumstances forced Phrix into financial difficulties in 1970. Devaluation of the French franc, revaluation of the German mark and a wage increase in excess of 20% in late 1969 all came at a time when German fiber prices were dropping sharply. Although some Phrix plants continue to operate, our appraisal indicated a write-off of the investment as the conservative course.

Highlights of the 50%-owned companies in 1970 were as follows, with individual companies listed in order of sales volume:

Dow Corning Corporation, Midland, Michigan — In common with many other industrial-material suppliers, Dow Corning felt the pressures of the declining U.S. economy but experienced continued growth abroad. The company is aggressively developing new materials technology and, through ongoing improvement in basic production techniques, leading to more attractive prices, is opening up new and broader applications for silicones.

Asahi-Dow Limited, Tokyo, Japan — Our oldest foreign joint venture enjoyed record sales and profits. Design work was completed for a plant to produce *Chloro-thene* solvents, representing the company's first move into non-plastic products.

Dow Badische Company, Williamsburg, Virginia — Sales reached substantial new highs despite the downturn in the U.S. economy. Sales of chemical products were at record levels for the fourth consecutive year. Fiber sales gained 30% over 1969. Since 1966, Dow Badische has oriented its fibers marketing effort toward the knit apparel and carpet industries, both substantial growth markets. In 1970, the company made significant progress toward overcoming its start-up and developmental difficulties. The Anderson, South Carolina, plant for *Anavor* polyester and *Vivana* nylon ran essentially at capacity in 1970. A 40% capacity expansion was completed early in 1971. Dow Badische recently acquired full ownership of Universal Textured Yarns Inc., engaged in texturizing several types of yarns, and announced its 90% ownership of Bentex Mills Inc., engaged in commission knitting, dyeing and finishing of fabrics.

Dowell Schlumberger, London, England, and Paris, France — Revenues of Dowell Schlumberger, which performs the same oil-industry services in the rest of the free world as our Dowell Division in North America, increased 6%. The internal situation in Libya caused a major sales decline in that country as well as a slight reduction in over-all earnings.

A company in which we hold a minority interest, *Austral-Pacific Fertilizers*, Brisbane, Australia, experienced financial difficulties, primarily because of strained conditions in the fertilizer market. Dow and Swift & Company, the principal stockholders, have agreed in principle with I.C.I. of Australia and New Zealand to merge their fertilizer interests in eastern Australia in a new company, Consolidated Fertilizers, Limited. The merger should improve the performance of all facilities involved.

ST0004580

The Dow Chemical Company

CORPORATE HEADQUARTERS: MIDLAND, MICHIGAN



UNITED STATES AREA/ Earle B. Barnes, General Manager

Headquarters: Midland, Michigan

SALES OFFICES IN 24 CITIES • 29 MANUFACTURING LOCATIONS IN 18 STATES: *Arizona* Tucson • *Arkansas* Russellville • *California* Fresno, Pittsburg, Torrance • *Colorado* Denver, Golden • *Connecticut* Gales Ferry • *Georgia* Dalton • *Hawaii* Honolulu • *Louisiana* Plaquemine • *Michigan* Bay City, Ludington, Midland • *Minnesota* Biwabik • *Missouri* Cape Girardeau, Pevely • *New Jersey* Carteret • *Ohio* Cleveland, Findlay, Ironton, Newark • *Oklahoma* Tulsa • *Pennsylvania* Royersford • *Texas* Freeport, Oyster Creek • *Utah* Ogden (under construction) • *Washington* Dallesport (under construction) • PRINCIPAL PARTLY OWNED COMPANIES*: Dolco Packaging Corp., Los Angeles, California • Dow Badische Company, Williamsburg, Virginia • Dow Corning Corporation, Midland, Michigan • The Kartridg Pak Co., Davenport, Iowa.

DOW CHEMICAL EUROPE S.A./ Zoltan Merszei, President

Headquarters: Zurich, Switzerland

OFFICES IN 18 CITIES • 14 MANUFACTURING LOCATIONS IN 8 COUNTRIES: *France* Drusenheim • *Germany* Greffern; Stade (under construction) • *Greece* Lavrion • *Italy* Livorno • *The Netherlands* Rotterdam, Terneuzen • *Spain* Barcelona, Bilbao, Santander, Tarragona • *Sweden* Norrköping (under construction) • *United Kingdom* King's Lynn, England; Barry, Wales • PRINCIPAL PARTLY OWNED COMPANIES*: Compagnie des Services Dowell Schlumberger, Paris, France • Dowell Schlumberger Corporation, London England • Lurex N.V., Amsterdam, The Netherlands • Phrix-Werke A.G., Hamburg, Germany.

DOW CHEMICAL OF CANADA, LIMITED/ LeRoy D. Smithers, President

Headquarters: Sarnia, Ontario

SALES OFFICES IN 6 CITIES • 10 MANUFACTURING LOCATIONS IN 4 PROVINCES: *Alberta* Edmonton, Fort Saskatchewan • *British Columbia* Ladner • *Ontario* Don Mills, Thunder Bay, Sarnia, Toronto, Weston • *Quebec* Montreal, Varennes.

DOW CHEMICAL LATIN AMERICA S.A./ Dave W. Schornstein, President

Headquarters: Coral Gables, Florida

OFFICES IN 11 CITIES • 10 MANUFACTURING LOCATIONS IN 5 COUNTRIES: *Argentina* Buenos Aires, San Lorenzo • *Brazil* Santos (under construction), São Paulo (two locations) • *Chile* Concepción, Santiago • *Colombia* Bogotá, Cartagena • *Mexico* Mexico City • PRINCIPAL PARTLY OWNED COMPANIES*: Atanor S.A.M., Buenos Aires, Argentina • Poliolefinas Colombianas S.A., Bogotá, Colombia.

DOW CHEMICAL PACIFIC LIMITED/ Robert W. Lundeen, Managing Director

Headquarters: Hong Kong

OFFICES IN 14 CITIES • MANUFACTURING OPERATIONS IN *Australia* Altona, Rhodes, Smithfield • PRINCIPAL PARTLY OWNED COMPANIES*: Asahi-Dow Limited, Tokyo, Japan • Austral-Pacific Fertilizers, Brisbane, Australia • Ivon Watkins-Dow Limited, New Plymouth, New Zealand • Korea Pacific Chemical Corporation, Ulsan, Korea • Pacific Chemicals Berhad, Kuala Lumpur, Malaysia • Polychem Limited, Bombay, India.

LIFE SCIENCES DEPARTMENT/ William R. Dixon, General Manager

Headquarters: Midland, Michigan

INDIANAPOLIS DIVISION (*Rx Pharmaceuticals, Generic Pharmaceuticals, Diagnostics, Environmental Bio-Engineering*), Indianapolis, Indiana • Gruppo Lepetit, S.p.A., Milan, Italy • Bio-Science Laboratories, Van Nuys, California • Laboratorios Industriales Farmaceuticos Ecuatorianos, S.A., Quito, Ecuador • Photovolt Corporation, New York, New York • PRINCIPAL PARTLY OWNED COMPANIES*: Bioscientia Klinisch-Diagnostisches Institut GmbH, Ingelheim am Rhein, Germany • Cordis Dow Corp., Miami, Florida • Medical Laboratory Automation, Inc., Mt. Vernon, New York • Nova Quest, Los Altos, California.

* Companies in which Dow's interest is substantial but less than a majority and whose results are not consolidated in Dow's financial statements

ST0004581

Human & Environmental Relations

Recognizing the broader implications of environmental preservation, Dow management in 1970 established a corporate Ecology Council to set objectives, provide guidelines and spur action throughout the Company. By year's end, ecology sub-councils had been formed in all of our U. S. manufacturing divisions and product departments and in our area managements outside the U. S. The broad purpose of the councils is to assess the impact of existing and proposed Dow operations and products on the ecology and to take appropriate action in the light of this knowledge.

Water and Air Quality

By the end of 1970, Dow's phosphorous-removal technology had been used in more than 40 municipal waste-treatment plants in the Great Lakes watershed. The goal of 80% phosphorous removal was exceeded in all full-scale operations as well as plant trials.

Detergent manufacturers have reacted to the public debate over phosphates by attempting to remove these nutrients from their products. Dow's view, shared by many scientists and at least one major detergent producer, is that enough phosphorous from other sources reaches our lakes and rivers to assure continued growth of algae, the cause of eutrophication, and that the only real solution is to take out the phosphates at the sewage-disposal plant. The Dow process accomplishes just that.

The first of four huge (200-foot-diameter) Dow Domes was completed at the municipal waste-treatment plant in Winston-Salem, North Carolina. Dow Domes prevent odor emissions from sewage-disposal facilities and enhance their appearance and operating efficiency. More than 100, constructed by our spiral-generation technique, have been installed in the U. S.

Some 243,000 cubic feet of *Surfpac* biological oxidation media were installed in two trickling-filter towers in Sacramento, California. Installations incorporating these plastic honeycombs for aerobic bacteria, which destroy sewage, are now operating in 19 states, Canada and Mexico.

During 1971, a multimillion dollar incineration system designed by Dow engineers will be completed at 3M Company's plant near St. Paul. It will burn a variety of wastes, mainly liquids, while operating well within Minnesota's strict emission standards.

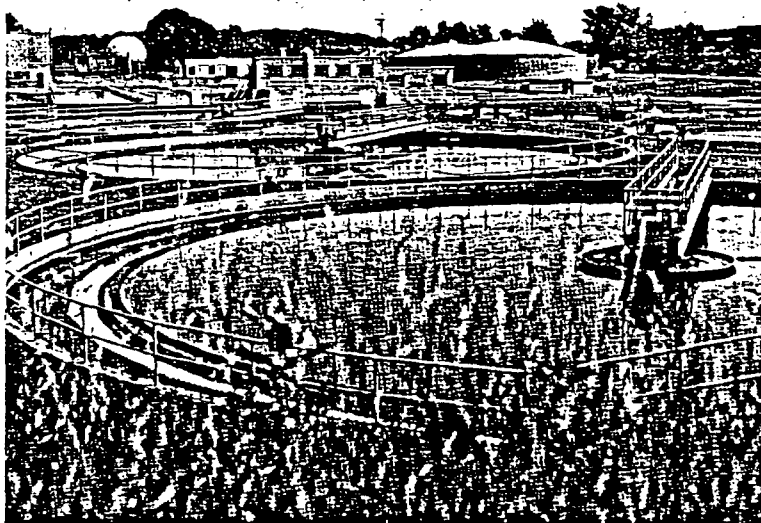
Dow Plant Operations

Dow in 1970 spent \$20.7 million in capital and operating funds for waste control in the United States, up from \$14.7 million the previous year. These figures do not include the cost of process improvements that reduce or eliminate wastes. The thrust of our efforts is toward waste *prevention*, since process materials that are not wasted can contribute to more profitable plant operations and conserve resources.

Attractive 261-unit Village West project for low-income families in Louisville, Kentucky, has 26 brick-veneered buildings. Load-bearing concrete-block walls were prefabricated with THREADLINE brand adhesive mortar and trucked to site.



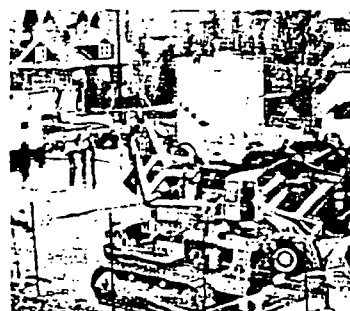
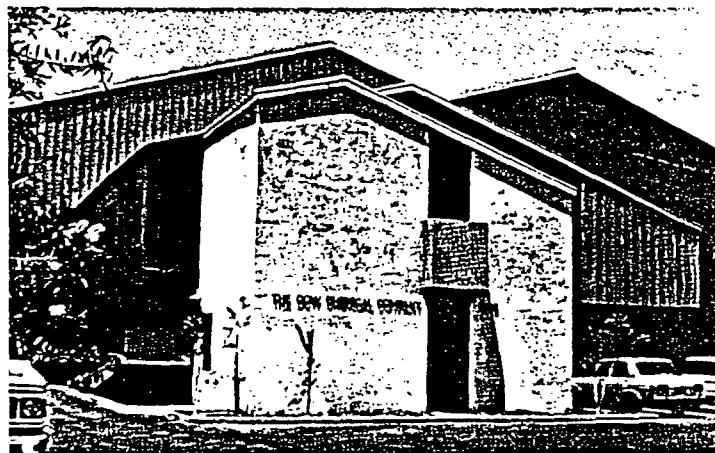
Municipal wastewater treatment plant at Grand Rapids, Michigan, is site of 12-month national demonstration of Dow phosphate-removal process with fully automated equipment.



ST0004583



Used polyethylene milk bottles returned by customers of Golden Arrow Dairy, San Diego, are converted to agricultural drainage tile. Dow, supplier of the polyethylene, provided technical assistance.



New polyethylene film plant in Honolulu contributes to aesthetics of its neighborhood.

Dowell Division backfilled abandoned coal mines under Rock Springs, Wyoming, to stop settling of homes and commercial buildings.

The Mercury Problem

In August 1969, following discussions with Ontario Water Resources Commission personnel, Dow Chemical of Canada, Limited initiated action to make improvements in its mercury cell chlor-alkali plants at Sarnia to reduce losses of mercury into the St. Clair River. In February 1970, when commission personnel reported finding mercury residues in fish, Dow Canada launched a crash program to complete the work already under way, and the job was completed and the plant "buttoned up" on March 27.

Until recently it was generally considered that metallic mercury and inorganic mercurial compounds were inert in water and were not converted to forms that could be concentrated in fish. This was the assumption under which Dow Canada's mercury-cell plants and some 200 others throughout the world had always operated. Less than 5% of the chlorine produced by Dow and its subsidiaries comes from mercury cells. All of the rest is made in Dow diaphragm cells, in which no mercury is used.

Several damage suits related to mercury have been lodged against Dow and Dow Canada. Dow and Dow Canada feel they are not legally liable and, therefore, are contesting these suits.

Following an offer to make methods available, Dow has received some 3,000 requests for its mercury analytical methods, which it has now perfected to detect the element to 0.2 part per billion. Dow also has received nearly 200 requests for its comprehensive index/bibliography of literature on mercury in the environment, which was compiled in the spring of 1970.

Dow Stands by 2,4,5-T

During 1970, the registration of 2,4,5-T herbicide for certain uses was cancelled by the U. S. Department of Agriculture. The department acted after a laboratory under contract to the National Cancer Institute, using an unrepresentative sample of 2,4,5-T obtained in 1964, reported birth deformities following doses given to mice and rats. The sample contained 27 parts per million of a dioxin impurity. Our own tests with Dow production-grade 2,4,5-T, which contains less than 1 ppm of the impurity, produced no birth defects. The tests conformed to government-approved procedures. Because of our firm belief that Dow 2,4,5-T is and always has been safe when used as recommended, we have appealed the ruling.

Rocky Flats Plant and Area Are Safe

During 1970, numerous allegations were made regarding plutonium contamination from the Rocky Flats facility near Golden, Colorado, which we operate for the Atomic Energy Commission. These allegations were investigated by the Colorado Department of Health, which concluded that no hazard exists in the Denver area or in the area surrounding the plant itself.

Equal Employment Opportunity

During a year of reduced hiring activity, the number of employees from minority groups increased from 1,714 to 1,781 or from 5% to 5.2% of our total U. S. employment. Of total additions to payrolls, 30% were minority persons, defined by the federal government as Negroes, Orientals, American Indians and Spanish Americans.

As a result of hiring and promotions, the number of minority persons in technical and professional positions increased by 62% from the previous year. Additional counselors were appointed to encourage participation by minority employees in the Company's training and self-improvement programs.

ST 00 014581

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(Effective February 4, 1971)

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University of California—Berkeley
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Firmin A. Paulus
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Assistant Treasurer
Dale A. Bywater
Auditor

Transfer Agents

The Cleveland Trust Company
Morgan Guaranty Trust
Company of New York

Registrars

The National City Bank of Cleveland
Chemical Bank New York
Trust Company

Certified Public Accountants

Haskins & Sells

ST0004585

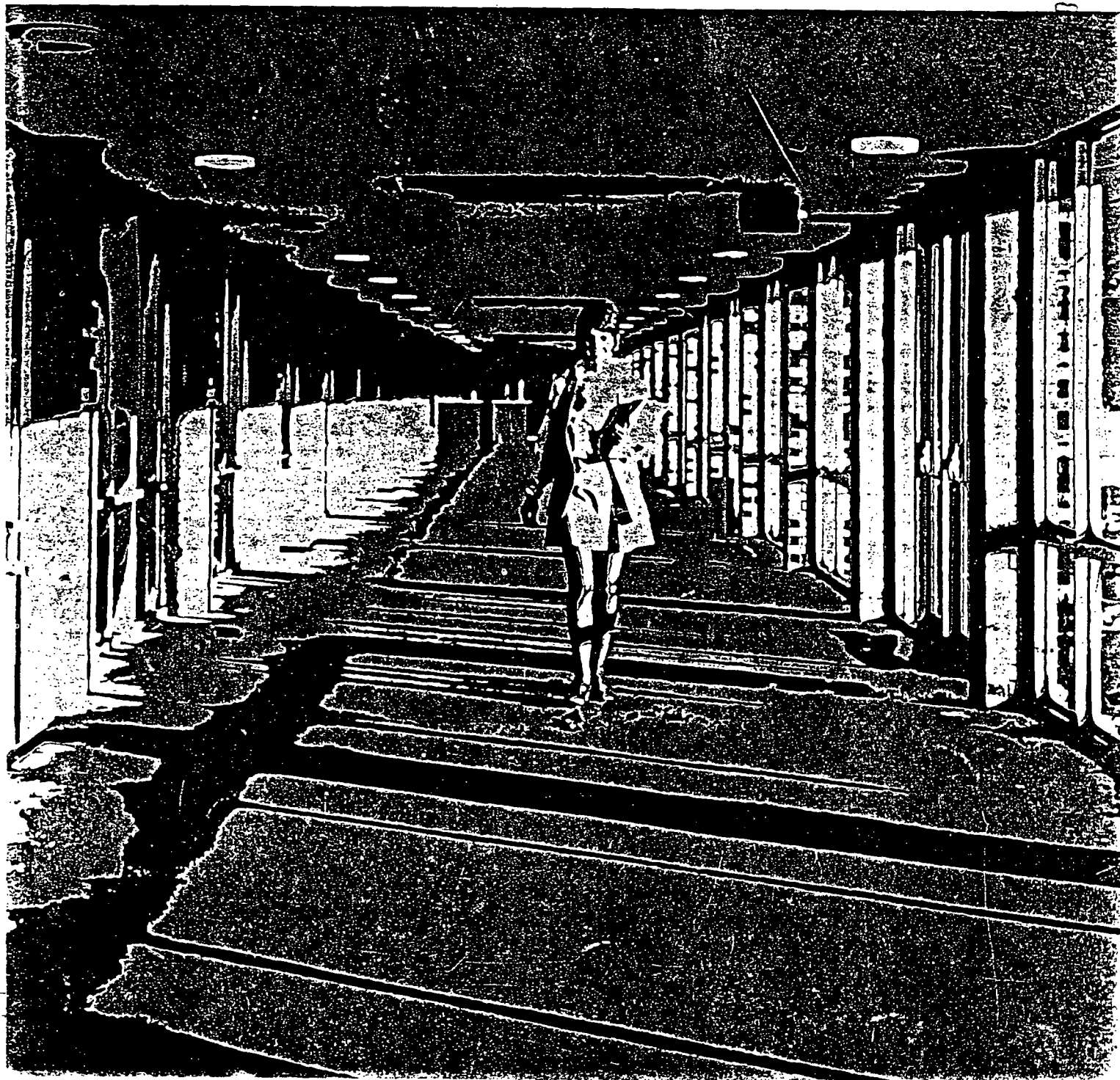
THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN 48640



3rd CLASS BULK RATE
U. S. POSTAGE
PAID
Permit No. 2582
Detroit, Michigan

CITY OF MIDLAND
MIDLAND MICH 48640

SI000458





DOW CHEMICAL U.S.A.

MICHIGAN DIVISION
March 13, 1981

Dick Rogers
OCPD Maintenance
327 Building

cc: OCPD Maintenance Supervisors
Safety Engineers
Matt Baltusis, 887 Bldg.
Fred Sabel, 322 Bldg.
Jeannie Hammond, 47 Bldg.

*This is info developed
by Cal Schneider of OCPD.
I think it should be
reviewed with our lawyers.
Thel*

DUST USED ON PIPE COVERING WEATHERPROOFING

The new "dusted" covering weatherproofing, ALPHA HV-AL TGH-1500 with vapor barrier, is being supplied through DVS Stock. The dusting is being applied to keep the material from sticking on the roll and to make installation easier when sliding the covering at the seams.

The dusting material originally used was talc, but recent shipments have been dusted with mica. Also, the dusting has been reduced to the minimum amount.

Hazards of Talc or Mica

Both talc and mica are a mineral dust. Talc is also known as magnesium silicate. The hazard of these materials would be in breathing large quantities of the dust. While they are not nearly as hazardous as asbestos or silica, continuous, long-term breathing of large quantities of the dust can cause a chronic fibrosis of the lungs. This is typical of most dusts when breathed in large quantities over extended periods.

Summary of Toxic Properties

<u>Type of Contact</u>	<u>Consequences of Exposure</u>	<u>Control Measure</u>
Eye	Foreign body irritation	None required
Skin	None	None required
Ingestion	None	None required
Inhalation	Initial response: throat and nose irritation Continuous: can cause fibrosis of the lungs	None required for incidental exposure Where work must be performed in dusty atmosphere, a dust mask must be worn



ST0005254

Dick Rogers
March 13, 1981
page 2

I do not feel there is a problem with the way we are presently doing the pipe covering. The only way that hazardous quantities of the dust could be inhaled would be if the coverer's work bench were blown off with an air hose and a concentrated dust cloud were formed on a routine basis. This would definitely be a poor practice since all other covering dusts would also be blown into the air. All coverer's benches should be swept off occasionally and the dust disposed of in the trash.

With this basic knowledge and by following normal practices, the "dusting" material should not present a hazard to you in the normal course of your job.


E. C. Schneider
OCPD - Safety
172 Building

jjz

ST0005255



DOW CHEMICAL U.S.A.

February 14, 1978

MIDLAND, MICHIGAN 48640

Dale J. Ducommun, M.D.
MI Division Medical Department
607 Building

cc: D. B. Johns, M.D., 607 Building

PIPECOVERERS

As we discussed previously, there seems to be omissions in the list of names of those persons who are or have been pipecoverers over the years.

Fortunately, M. G. Ott identified from the personnel census lists such employees through 1970. Since that time, employees with that job class can be printed out from 690's computer services. However, a program needs to be written for combining these two lists with an on-going system for updating, including duration as pipecoverer (i.e., date began and date left). This system should also maintain current status (left, retired, etc.) to enhance our medical follow-through.

I discussed with Stu Gudmundsen the feasibility of my idea; he suggests that much programming would be necessary on his end but that 690 is possibly already equipped. I plan to talk with G. Story at 690 to obtain his feedback. As you probably are aware, Data Processing (690) encourages autonomy in departments when possible. (I will pursue this area and let you know.)

I urge you to work with X-ray personnel and anyone else involved in the medical surveillance of pipecoverers in organizing a systematic and comprehensive program of identifying all coverers, whether or not they need to be screened.

Your **medical program** seems to be excellent; I will be happy to assist in coordinating some of the above areas if you wish.

Thank you for sharing in my learning of the asbestos subject matter. I am finding our experiences very meaningful - including our evening tennis games!

Jean C. Townsend
Epidemiologist
MI Division Medical Department
607 Building

SRM

AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY



EST0005256

10

1/16 covers Educational Series 4-81

(thurs. Tuesday)

D

a) asbestos aspects

DTD

Schiff's recommendations

Key Teaching File

ECO classification

How our films are read

Value of screening

value of film function tests

b) vs Fiberglas data

c) any digestive ca aspects of asbestos etc

Good section on Ma x-ray / Zorseu on
asbestos

1969
Group of people
disc. want
T.H. & DTD
series of these

EST0005257

8-26-81

Discussed E & J D

Reviewed list of pipe coverers

- 1) The list of coverers who were offered job A (1978)
(319 seniority list)
was negotiated to joint bargaining committee --- would
have to be pursued there, including adding workers who
have left covering.
- 2) Screening for workers who have left covering -- currently are
dropped from coverers list, but advised to have annual H&F.
- 3) Regarding the question on chronic effects of ~~asbestos~~ (Fiberglas,
asbestos etc) --- would need to develop an educational film. incl. GI
effects. write to Seligson
- 4) Teaching film about X-rays --- I will discuss E & R C K

EST0005258

Richard
Cafare
64241

7-9-81

- Request
(1) → moving people to the list of men who were offered opportunity to chg job & are of pay status,

see prior agreement → 319 security list
most men on the ^{old} list have gone.

- (2) ? making the list more complete - people who don't work currently with asbestos, to include in screening and ? offer them opportunity also to achieve job change.

currently 68-9 covers

This was prompted by request from an employee who has health problems & wished to change jobs.

- (3) ? asks whether asbestos can cause chronic problems
fibrosis
etc

- (4) X ray teaching file of abnormal films for 1st covers
review - or consider a TV tape.
or present to group. (X rays)
VC

EST00005259

- Concern over retired coverers who are ill
 & have died - 5/6 died in the past yr
 incl Paul Terenzi
- also digestive problems,

pg B

J. Holycross

3/15/79

These people have been identified by Cliff Ingle as working with Asbestos in the Chloro-Alkali Department.

Foreman:

C. D. Ingle, 025302

Shift Foreman:

J. E. Snider, 53813

Crew Leader:

L. A. Dziurka, 5609

T. L. Foy, 53702

Utility Man Class 2:

R. J. Bowen, 73474

M. E. Clark, Jr. 20130

L. R. Mitchell, 11010

G. A. Onweller, 52705

D. L. Owens, 66618

R. E. Szczepanski, 54863

Spare:

W. O. Burch, 22247

R. Schultz, 69545

E. Greenacre, 69303

N. C. Johnson, 63128

L. Hansen, 63251

Overhead Crane Operator:

D. S. Warner, 64893

G. W. Ketchum, 69678

J. F. Prybyski, 3336

R. E. Woodruff, 75396

DOW CONFIDENTIAL

ST00006373

CHAPTER II--AIR CONTAMINANTS AND PHYSICAL AGENTS

PART II--SPECIAL SUBSTANCES

e 2205 ASBESTOS [1910.93a - entire rule]

(1) Definitions.

For the purpose of this rule.

(a) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite. [1910.93a(a)(1)]

(b) "Asbestos fibers" means asbestos fibers longer than 5 micrometers. [1910.93a(a)(2)]

(2) Permissible exposure to airborne concentrations of asbestos fibers. [1910.93a(b)]

(a) The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in subsection (5) of this rule. [1910.93a(b)(1)]

(b) Standard effective July 1, 1976. The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in subsection (5) of this rule. [1910.93a(b)(2)]

(c) Ceiling concentration. No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in subsection (5) of this rule. [1910.93a(b)(3)]

(3) Methods of compliance.

(a) Engineering methods.

(i) Engineering controls. Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in subsection (2) of this rule. [1910.93a(c)(1)(i)]

(ii) Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1971, which is incorporated by reference herein. [1910.93a(c)(1)(ii)(a)]

(iii) Particular tools. All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in subsection (2) of this rule, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with subdivision (ii) of this paragraph. [1910.93a(c)(1)(iii)]

ST00006374

(b) Work practices.

(i) Wet methods. Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in subsection (2) of this section, unless the usefulness of the product would be diminished thereby. [1910.93a(c)(2)(i)]

(ii) Particular products and operations. No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in subsection (2) of this rule. [1910.93a(c)(2)(ii)]

(iii) Spraying, demolition, or removal. Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with subdivision (4)(b)(iii) of this rule and with special clothing in accordance with paragraph (4)(c) of this rule. [1910.93a(c)(2)(iii)]

(4) Personal protective equipment.

(a) Compliance with the exposure limits prescribed by subsection (2) of this rule may not be achieved by the use of respirators or shift rotation of employees, except: [1910.93a(d)(1)]

(i) During the time period necessary to install the engineering controls and to institute the work practices required by subsection (3) of this rule. [1910.93a(d)(1)(i)]

(ii) In work situations in which the methods prescribed in subsection (3) of this rule are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by subsection (2) of this rule; or [1910.93a(d)(1)(ii)]

(iii) In emergencies.

(iv) Where both respirators and personnel rotation are allowed by subdivisions (i), (ii), or (iii) of this paragraph, and both are practicable, personnel rotation shall be preferred and used. [1910.93a(d)(1)(iv)]

(b) Where a respirator is permitted by paragraph (a) of this subsection it shall be selected from among those approved by the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, under the provisions of 30 CFR Part 11 (37 F.R.6244, Mar.25, 1972), and shall be used in accordance with subdivisions (i), (ii), (iii), and (iv) of this paragraph. [1910.93a(d)(2)]

(i) Air purifying respirators. A reusable or single use air purifying respirator, or a respirator described in subdivision (ii) or (iii) of this paragraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in subsection

(2) of this rule, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits. [1910.93a(d)(2)(i)]

(ii) Powered air purifying respirators. A full facepiece powered air purifying respirator, or a powered air purifying respirator, or a respirator described in subdivision (iii) of this paragraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in subsection (2) of this rule, when the ceiling or the 8-hour time-weighted average concentrations of asbestos fibers are reasonably expected to exceed 10 times, but not 100 times, those limits. [1910.93a(d)(2)(ii)]

(iii) Type "C" supplied-air respirators, continuous flow or pressure-demand class. A type "C" continuous flow or pressure-demand, supplied-air respirator shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in subsection (2) of this rule, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed 100 times those limits. [1910.93a(d)(2)(iii)]

(iv) Establishment of a respirator program.

(A) The employer shall establish a respirator program in accordance with the requirements of the American National Standard Practices for Respiratory Protection, ANSI Z88.2-1969, which is incorporated by reference herein. (See Rule 3502). [1910.93a(d)(2)(iv)(a)]

(B) No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his use of a respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he had just prior to such transfer, if such a different position is available. [1910.93a(d)(2)(iv)(c)]

(c) Special clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in subsection (2) of this rule. [1910.93a(d)(3)]

(d) Change rooms:

(i) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in subsection (2) of this rule, the employer shall provide change rooms for employees working regularly at the place. [1910.93a(d)(4)(i)]

(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes. [1910.93a(d)(4)(ii)]

(iii) Laundering:

(A) Laundering of asbestos contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in subsection (2) of this rule. [1910.93a(d)(4)(iii)(a)]

(B) Any employer who gives asbestos contaminated clothing to another person for laundering shall inform such person of the requirement in (A) of this subdivision to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in subsection (2) of this rule. [1910.93a(d)(4)(iii)(b)]

(C) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with subsection (7) of this rule. [1910.93a(d)(4)(iii)(c)]

(5) Method of measurement.

All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at 400-450 x (magnification) (4 millimeter objective) with phase contrast illumination. [1910.93a(e)]

(6) Monitoring.

(a) Initial determinations. Every employer shall cause every place of employment where asbestos fibers are released to be monitored in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in subsection (2) of this rule. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with subsection (3) of this rule. [1910.93a(f)(1)]

(b) Personal monitoring.

(i) Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers. [1910.93a(f)(2)(i)]

(ii) Sampling frequency and patterns. After the initial determinations required by paragraph (a) of this subsection, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees. In no case shall the sampling be done at intervals greater than 6 months for employees whose exposure to asbestos may reasonably be foreseen to exceed the limits prescribed by subsection (2) of this rule. [1910.93a(f)(2)(ii)]

(c) Environmental monitoring.

(i) Samples shall be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted

in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers. [1910.93a(f)(3)(i)]

(ii) Sampling frequency and patterns. After the initial determinations required by paragraph (a) of this subsection, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than 6 months for employees whose exposures to asbestos may reasonably be foreseen to exceed the exposure limits prescribed in subsection (2) of this rule. [1910.93a(f)(3)(ii)]

(d) Employee observation of monitoring. Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof. [1910.93a(f)(4)]

(7) Caution signs and labels.

(a) Caution signs.

(i) Posting. Caution signs shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in subsection (2) of this rule. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers. [1910.93a(g)(1)(i)]

(ii) Sign specifications. The warning signs required by subdivision (i) of this paragraph shall conform to the requirements of 20" x 14" vertical format signs specified in Rule 4501, and to this subdivision. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this subdivision. [1910.93a(g)(1)(ii)]

Legend	Notation
Asbestos-----	1" Sans Serif, Gothic or Block.
Dust Hazard -----	3/4" Sans Serif, Gothic or Block.
Avoid Breathing Dust -----	1/4" Gothic
Wear Assigned Protective Equipment -----	1/4" Gothic.
Do Not Remain In Area Unless Your Work Requires It.	1/4" Gothic
Breathing Asbestos Dust May Be Hazardous To Your Health.	14 point Gothic
Spacing between lines shall be at least equal to the height of the upper of any two lines.	

(b) Caution Labels.

(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in subsection (2) of this rule will be released. [1910.93a(g)(2)(i)]

(ii) Label specifications. The caution labels required by subdivision (i) of this paragraph shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state: [1910.93a(g)(2)(ii)]

CAUTION

Contains Asbestos Fibers
Avoid Creating Dust
Breathing Asbestos Dust May Cause
Serious Bodily Harm

(8) Housekeeping.

(a) Cleaning. All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration. [1910.93a(h)(1)]

(b) Waste disposal. Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce in any reasonably foreseeable use, handling, storage, processing, disposal, or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in subsection (2) of this rule shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers. [1910.93a(h)(2)]

(9) Recordkeeping.

(a) Exposure records. Every employer shall maintain records of any personal or environmental monitoring required by this subsection. Records shall be maintained for a period of at least 3 years and shall be made available upon request to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National Institute for Occupational Safety and Health and to the Director of the Department of Public Health and to authorized representatives of either. [1910.93a(i)(1)]

(b) Employee access. Every employee and former employee shall have reasonable access to any record required to be maintained by paragraph (a) of this subsection, which indicates the employee's own exposure to asbestos fibers. [1910.93a(i)(2)]

(c) Employee notification. Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in subsection (2) of this rule shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken. [1910.93a(i)(3)]

(10) Medical examinations.

(a) General. The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this subsection. [1910.93a(j)(1)]

(b) Preplacement. The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}). [1910.93a(j)(2)]

(c) Annual examinations. On or before January 31, 1973, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}). [1910.93a(j)(3)]

(d) Termination of employment. The employer shall provide, or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}). [1910.93a(j)(4)]

(e) Recent examinations. No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this subsection within the past 1-year period. [1910.93a(j)(5)]

(f) Medical records.

(i) Maintenance. Employers of employees examined pursuant to this subsection shall cause to be maintained complete and accurate records of all such medical examinations. Records shall be retained by employers for at least 20 years. [1910.93a(j)(6)(i)]

(ii) Access. The contents of the records of the medical examinations required by this subsection shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of NIOSH, the Director of the Department of Public Health, to authorized physicians and medical consultants of any of them, and, upon the request of an employee or former employee, to his physician. Any physician who conducts a medical examination required by this subsection shall furnish to the employer of the examined employee all the information specifically required by this subsection, and any other medical information related to occupational exposure to asbestos fibers. [1910.93a(j)(6)(ii)]

OSHA PROGRAM DIRECTIVE #300-16
October 11, 1978

TO: REGIONAL ADMINISTRATORS/OSHA

Subject: 29 CFR 1910.1001(j)(2) or (3) or (4), Minimum Airborne Fiber Concentration for Initiating and Continuing Asbestos Medical Examinations.

1. *Purpose*

The purpose of this directive is to provide uniform inspection and compliance procedures for the medical examination requirement in the asbestos standard, 29 CFR 1910.1001(j)(2), or (3) or (4).

2. *Documentation Affected*

This directive supplements and provides reference for the OSHA Industrial Hygiene Field Operations Manual (IHFOM) and the OSHA Field Operations Manual (FOM).

3. *Background*

In 29 CFR 1910.1001(j)(2), or (3) or (4), Medical examinations, the term "... exposed to airborne concentrations of asbestos fibers. ..." has been the subject of considerable discussion and debate as to the meaning or interpretation of "airborne concentrations."

4. *Action*

a. *Definition.*

In 29 CFR 1910.1001(j)(2), or (3) or (4), Medical examinations, the term "... exposed to airborne concentrations of asbestos fibers. ..." is administratively interpreted to mean exposed to a minimum of 0.1 asbestos fibers longer than 5 micrometers per cubic centimeter of air, as determined by the sampling method prescribed in section 4.c. of this directive. The phrase "fibers longer than 5 micrometers per cubic centimeter of air" shall hereafter be abbreviated as "fibers/cc."

b. *Scope and applicability.*

Medical examinations as per 29 CFR 1910.1001(j)(2), or (3) or (4) will be required for any 7- to 8-hour time-weighted average concentration of 0.1 fibers/cc, or for a greater concentration.

c. *Sampling information.*

(1) Sampling procedures will follow Chapter X of the IHFOM., with the additional guidance of 4.c.(2) and (3) of this directive.

(2) Exposure to asbestos dust with low levels of contamination (e.g., mixed with other minerals).

(a) For exposures to dust that is mostly asbestos and is expected to be below the permissible exposure limit, the same filter should be used for the entire shift, but no longer than 8 hours.

(b) For exposures expected to be at or above the permissible exposure limit, several samples may be re-

quired during the shift to avoid overloading the filters.

(3) Exposures to asbestos dust with high levels of contamination.

(a) Several samples may be required during the shift to avoid overloading the filter.

(b) Filters should be changed only after a minimum of 1 hour of sampling time for exposures expected to be close to 0.1 fibers/cc. Seven or eight 1-hour samples can be collected during the day.

d. *Examples of types of violations.*

(1) Where an employer does not provide the required medical examinations, and an employee is exposed to 0.1 or more fibers/cc, it would be considered a "serious" violation of 29 CFR 1910.1001(j)(2), or (3) or (4).

(2) For definitions and guidance on "repeated," "willful," or a "failure to correct" violation, see the FOM, Chapter VIII.

5. *Effective Date*

This directive is effective immediately and will remain in effect until further notice.

Occupational Safety & Health Reporter

SI0006381

PEOPLE WHO WORK IN CHLORO-ALKALI WHO WORK WITH ASBESTOS 1979

Bill Birch
✓Roger Bowen 73474
✓Merle Clark 20130
✓Koius Dzureka
Cliff Engle
✓Larry Hansen
✓Bob Glesner 3941 Thomas Foy
✓Ray Guthrie
Mel Johnson
Tom Ketchum
Lloyd Mitchell
✓Terry Oliver
Glen Onweller
✓Del Owens 24286
Joe Prybyski
✓Robt Szczepanski 50805
✓Jim Snider 53813
Robert Woodruff
✓How Schultz 69375
✓Everett Greenacre 69303
✓Douglas Warner 64893

*Maple to 1. Ray
L. E.
Mansley*

*Cliff Engle
John White*

ST0006382

ICPD
J. Miller

J. Holycross

3/15/79

These people have been identified by Cliff Ingle as working with Asbestos in the Chloro-Alkali Department.

Foreman:

C. D. Ingle, 025302 ^{HI'S} 3/12/79

Shift Foreman:

J. E. Snider, 53813 2/28/79

Crew Leader:

L. A. Dziurka, 5609 3/9/79

T. L. Foy, 53702 3/2/79

Utility Man Class 2:

R. J. Bowen, 73474 3/13/79

M. E. Clark, Jr. 20130 3/13/79

L. R. Mitchell, 11010 3/9/79

G. A. Onweller, 52705 *refused*

D. L. Owens, 66618 3/13/79

R. E. Szczepanski, 54863 2/27/79

Spare:

W. O. Burch, 22247 *refused*

N. C. Johnson, 63128 3/6/79

R. Schultz, ³⁻¹³⁻⁷⁹ 69545
²⁻²²⁻⁷⁹ L. Hansen, 63251

E. Greenacre, ³⁻¹³⁻⁷⁹ 69303

Overhead Crane Operator:

D. S. Warner, 64893 3/13/79

G. W. Ketchum, 69678 3/9/79

J. F. Prybyski, 3336 *refused*

R. E. Woodruff, 75396 3/12/79

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J. Holycross

3/15/79

These people have been identified by Cliff Ingle as working with Asbestos in the Chloro-Alkali Department.

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Shift Foreman:

J. E. Snider, 53813

Crew Leader:

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D. L. Owens, 66618

R. E. Szczepanski, 54863

Spare:

W. G. Burch, 22247

N. C. Johnson, 63128

R. Schultz, 69545

L. Hansen, 63251

E. Greenacre, 69303

Overhead Crane Operator:

D. S. Warner, 64893

G. W. Ketchum, 69678

J. F. Prybski, 3336

R. E. Woodruff, 75396

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*copies to: x-ray, RCK
DGE
RUB-NI
MD response ICPD=DC*

*did not
for pipe cover
only -*

ST00006384

pm 5

PEOPLE WHO WORK IN CHLORO-ALKALI WHO WORK WITH ASBESTOS 1979

Bill Barch
✓ Roger Bowen 73474
✓ Merle Clark 20130
✓ Louis Dzureka
Cliff Engle
✓ Larry Hansen 63251 spare
✓ Bob Glesner 65941 Thomas Foy
✓ Ray Guthrie
✓ ^{real} Mel Johnson
Tom Ketchum
Lloyd Mitchell
✓ Terry Oliver
Glen Onweller
✓ Del Owens 24286
Joe Prybyski
✓ Robt Szczepanski 50856
✓ Jim Snider 53813
Robert Woodruff
✓ How Schultz 69875 spare
✓ Everett Greengard 69303 spare
✓ Douglas Warner 64893

These people
identified by
Cliff Engle as working
with asbestos

ST0006385

Report to: R. Ray
L. E.
M. W.

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Cliff Engle
John White

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ST0006386

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10 MICHIGAN DIV
05 ICPD
03 CHLOR-ALKALI
02 CELL SERVICES

B G CALDWELL
J R MIER
H V WAIT
J SELEVICIUS

EMPLOYEE NAME MASTER LG STAT CR-SVC BIRTH PESREP PRO-D ACCO

***** 04090 MACHINE SHOP *****

I SR APR MILLWRT
R T ERABON 65106 9 11-10-66 09-23-43 111111 10-72 8

***** 03950 CONSTRUCTION-DEPARTMENT *****

I SR APR CARPTR
J J EUREL 64620 12 09-07-66 03-05-37 2111110 01-76 8

***** 03822 CCP CONSTRUCTION *****

I SR APR CARPTR								
M HOVEY	62785	14		11-02-65	12-19-46	1111110	12-75	8
J T KAMINSKI	64442	12		08-22-66	03-23-46	2111210	03-76	8
R T LUPTOWSKI	60324	14		08-24-64	06-07-37	2111210	07-75	8
R H WILLIAMS	63090	12		01-26-66	09-23-37	1111110	12-75	8

***** 09102 DPMF CONSTRUCTION *****

I SR APR CARPTR
J P LAFRAMBOISE 65021 13 11-07-67 09-25-48 2111110 03-76 8

***** 09512 SPM-CONSTRUCTION *****

I SR APP CARPTR								
G P KOSY	60060	14		04-12-64	09-13-38	1112110	10-74	31
P K NAUGLE	64795	13		09-27-66	12-05-47	1111110	03-76	81

***** 05612 CELL MANUFACTURING *****

FOREMAN								
G C GRANGER	9914	EX		09-08-41	06-25-16			81
C D INGLE	25302	EX		08-16-50	08-27-31			81

SHIFT FOREMAN								
J E SMIDER	53813	EX		06-07-56	02-05-37			81

CREW LEADER								
L A OZIURKA	5609	14		11-08-50	07-31-17	2111113	10-72	81
X T L FOY	53702	14		05-28-58	07-17-31	2111110	10-77	81

UTL MN CL2								
R J SOREN	73474	6 T		10-13-75	01-05-55	1111110	06-78	81
X M E CLARK JR	20130	6		03-30-50	03-06-29	2111110	03-75	81
L R MITCHELL	11010	6		04-30-42	10-27-22	2111211	11-72	81
G A UNWELLER	52705	6		09-28-56	10-28-31	2111110	02-74	81
D L OWENS	66618	6		10-02-67	05-12-44	1111110	10-74	81
R E SCZEPANSKI	54863	6		01-04-62	12-08-32	2121111	11-72	81

JRNY CEL SH MEC								
R J APPOLD	54078	17		06-25-58	01-19-24	1111111	10-72	81
O B INNAM	12641	17		07-16-42	09-08-22	2111112	10-72	81
J F SIMLIK	61751	17		09-03-55	07-21-28	2111110	12-73	81
V E TOBER	8497	17		02-27-41	03-03-21	2111111	11-72	81
R A VANCAMP	66609	17		09-18-67	10-28-48	3111110	11-76	81

SR CEL SHP MC								
J F BIS	67130	14		01-08-71	05-03-46	1111110	06-73	81
M L DAWSON	67011	14		11-20-70	06-27-25	2111110	07-73	81
G M GILLESPIE	67547	14		04-08-71	07-13-40	1111210	07-74	81
R D SHELTON	69250	14		12-08-73	06-05-47	1111110	12-74	81
E J WOLLSCHIED	60460	14		08-28-67	07-23-43	2111110	10-47	81



10 MICHIGAN DIV
05 ICPD
03 CHLOR-ALKALI
02 CELL SERVICES

B G CALDWELL
J R MIER
H V WAIT
J SELEVICIUS

EMPLOYEE NAME MASTER LG STAT CR-SVC BIRTH PESREP PRO-D ACCOUNT

***** 05612 CELL MANUFACTURING *****

SPARE

W D BURCH	22247	6		10-24-50	08-20-22	1111110	03-78	817
N C JOHNSON	63128	6		02-14-66	01-05-39	2111110	09-76	817

DVHD CRN D

J F FRYBYSKI	3336	7		12-10-36	01-12-17	2111110	03-58	817
R E WOODRUFF	75396	7	T	04-11-77	02-22-54	1111110	03-77	817

X

***** 05614 CHLOR/ALKALI PRODUCTION *****

X DVHD CRN D

D S WARNER	64893	9	T	10-13-66	03-23-48	3111110	01-76	817
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***** 05616 HYDROGEN RECOVERY *****

DVHD CRN D

G W KETCHUM	69678	7		10-08-73	05-13-49	1111110	12-77	817
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***** 09032 FSU=12 CONSTRUCTION *****

I SR APR CARPTR

H HOLLENBECK	64939	12		10-24-66	04-01-42	2111110	05-78	817
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***** 09012 FSU = 1 CONSTRUCTION *****

I SR APR CARPTR

L R RIGG	64986	12		10-25-66	05-25-47	1111110	09-76	81
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PS-TOTALS	02	OVERALL	EXEMPT		NON-EXEMPT		HOURLY	
		TOTAL	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE

ACTIVE PEOPLE	38		3				35	
LEAVE OF ABS								

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1038-125-03

MICHIGAN DIVISION PERSONNEL REPORT AS OF 02-28-79

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10 MICHIGAN DIV
05 ICPD
03 CHLOR-ALKALI
03 CHLOR-AL PRODB G CALDWELL
J R MIER
H V WAIT
E M SEIDEL

EMPLOYEE NAME MASTER LG STAT CR-SVC BIRTH PESREP PRO-D ACCOU

***** 05614 CHLOR/ALKALI PRODUCTION *****

CHLR ALK L								
K J EHLE	63978	7		09-15-70	09-04-47	1111110	06-73	81
G L LILLY	66608	7		09-18-67	11-23-41	2111112	11-72	81
X C.A. ANALY								
R W GIESNER	69401	6		08-06-73	03-21-48	1111110	10-74	81
R J GUTHRIE	53106	6		01-16-58	09-02-28	3112110	12-74	81
T L OLIVER	69373	6	STEW	01-26-73	09-01-51	2111110	01-76	81

***** 09531 ICPM-BOILER *****

MULTI-CRAFTSMAN								
G A VAILLANCOURT	21468	26		03-25-43	01-07-25			81
JRNY BOILERMKR								
W F FOX	23957	20		05-18-50	02-22-24	3111113	02-73	81

***** 09532 ICPM-CONSTRUCTION *****

JRNY CARPTR								
W A FRADENBURGH	63332	20		03-21-67	11-17-38	2111110	06-75	81

***** 09534 ICPM-PIPE *****

MULTI-CRAFTSMAN								
H W KADE	24004	29		06-01-48	02-09-29	2112210	02-76	81
E L YOUNANS	16151	23		04-22-43	06-10-24	2111110	11-72	81
I JR PPE FT/WDR								
L W CRON	53133	24		03-21-66	12-21-31	2211110	06-78	81
I JRY PIPE FTR								
M S MIKOLS	59663	22		09-11-63	02-07-41	2111111	11-72	81
J R PETRIMOUX	28077	22		03-19-52	11-24-28	2111110	01-76	81
R D SHERMAN	27629	22		09-24-51	08-25-30	2111110	11-72	81
R C SPAULDING	58506	22		08-13-63	01-20-40	1211111	11-72	81
L J STRONG	52308	22		08-03-55	03-03-37	2111111	11-72	81
R N VESTERFELT	54814	22		09-28-58	05-25-34	2111110	08-76	81
I JRNY PIPECOVERER								
L M HALEY JR	63113	18		02-10-66	02-20-33	2111110	09-73	81
J L HITCHCOCK	62742	18		10-15-65	08-05-41	2111112	10-72	81
I SR APR PIPECOVERER								
R E HOLZHAUSEN	66540	9		09-11-67	03-06-37	1111110	12-75	81
L T NAGLE	53501	18		04-26-59	05-23-36	2111210	05-73	81
JRNY PIPECOVERER								
R L SHERWOOD	5773	18		09-25-42	03-26-18	3112110	06-77	81

***** 09535 ICPM-ELECTRIC *****

I JRNY ELECT								
G L BINDER	56706	23		12-21-60	08-26-37	2111110	07-73	81
W BLENKHORN	50475	23		07-27-55	06-09-30	2111110	10-75	81
J L CHAPMAN	50599	23		07-03-53	04-25-35	2111110	11-75	81
R L SALISBURY	54645	23		09-12-56	06-21-38	2111110	07-73	81
I SR APR ELECT								
A M PRICE	60332	19		08-24-64	05-22-45	2111110	12-75	81

ASBESTOS FILE

THE FOLLOWING PEOPLE WORK WITH ASBESTOS IN THE AREA. THESE
PEOPLE SHOULD HAVE A P/A CHEST X-RAY ON A YEARLY BASIS
REGARDLESS OF THEIR AGE.

CELL MANUFACTURING - INDEX 05612, ACCOUNT 347; CONTACT
FOR THIS GROUP IS CLIFF INGLE ON 6-3651.

J. SELEVICIUS, JR	69859
C. D. INGLE	25302
J. E. SNIDER	53813
L. S. TOWNSEND	63514
R. J. ROWEN	73474
W. D. BURCH	22247
B. D. GENAW	72528
L. R. MITCHELL	11010
G. A. ONWEILER	52705
R. E. SCZEPANSKI	54863
R. E. THAYER	69076
R. J. APPOLD	54078
G. M. GILLESPIE	67547
V. E. TOBER	8497
R. A. VANCAMP	66609
E. J. WOHLSCHEID	60460
J. F. BIS	67130
M. L. DAWSON	67011
N. C. JOHNSON	63128
D. L. OWENS	66618
G. J. BENDELE	66805
T. L. FOY	53702
M. H. BELL	65732

TOTAL OF 23 (3 MALE EXEMPT; 20 MALE HOURLY)
RESPONSIBLE MD FOR AREA IS R. C. KOLFAR, M.D.
RESPONSIBLE SAFETY PERSON: D. J. LAVIOLETTE
RESPONSIBLE IND. HYGIENE PERSON: FRED SABEL
RESPONSIBLE IND. HYGIENE MAJOR: G. ROUSH

SJS - This group will have chest x-rays done
when trailer goes thru Zone #4 starting
April 6th. - jwh 3/3/81

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PEOPLE WHO WORK IN CHLORO-ALKALI WHO WORK WITH ASBESTOS 1979

Bill Birch
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Cliff Engle
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Ray Guthrie
Mel Johnson
Tom Ketchum
Lloyd Mitchell
Terry Oliver
Glen Onweller
Del Owens
Joe Prybyski
Robt Szczepanski
Jim Snider
Robert Woodruff

ST0006390

*Added to 1. Ray
List
Marley*

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