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Applichem (A) (Abridged)

> The Gary [Indiana] plant had had obvious problems for years. It was an ineffective operation. It had a fiefdom type of management. The people had grown complacent and inefficient. They had lost their technical curiosity. And the state-of-the-art technology was in Frankfurt. In the late '70s, when I was business manager, I tried to get them to invite Ari (the Frankfurt manufacturing and technology expert) to Gary. After months of talking, they finally invited him to get me off their backs.
>
> In the fall of 1981, we [top management] had a meeting reviewing our 10 year plan. I said that I was going to shift production of Release-ease and another product from Gary to Frankfurt as fast as possible. I almost got punched in the mouth for that. We had been working on the Gary plant for years. But we hadn't accomplished anything!

J. S. (Joe) Spadaro, Vice President and Director of the Plastics Business, was discussing the conditions in Release-ease manufacturing that had led him to request a study of comparing productivity at Applichem's four Release-ease plants. He had requested the study in June 1982, and it had been finished in September 1982.

Spadaro had joined Applichem in 1956 when he was 27. His bachelor's degree was in mechanical engineering, and he had held several jobs prior to joining Applichem, including managing a machine shop, but not including anything related to the chemical industry. His first assignment had been in Italy where he spent 10 years; then he had spent 5 years in the U.K. before returning to work at corporate headquarters in Chicago.

Company Background

Applichem was a manufacturer of specialty chemicals founded in Chicago just before World War II. Most of its products were devised by Applichem's applications engineers as solutions to specific customer problems. Applichem's Research Department subsequently refined the product and process—in successful cases—to arrive at a product with broader application.

Data and names have been changed for purposes of confidentiality.

This case was abridged by Professors Jan Hammond and Gary Pisano from the Applichem (A) case, written by Professor Marie-Therese Flaherty. This case was written as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Applichem had a strong functional orientation, even though some matrixing had been introduced to the organization during the mid-1970s. There is evidence of matrixing in the June 1982 organization chart presented in **Exhibit 1**. Business Managers for two businesses reported to a Group Vice President and four Area Vice Presidents reported to the Chief Operating Officer. Each Business Manager led four business teams, one for each of the four Areas. Each Area business team was headed by one full-time manager. On each team were a financial manager, a marketing manager, an R&D manager (who usually focused on new product introductions) and an operations manager. The functional managers also held line jobs in their respective Area organizations. The operations and marketing managers, like employees in the manufacturing plants and sales and marketing organizations, reported up through the Area organizations. Finance and R&D reported up through the functional organizations. For example, John Benfield, Operations Manager for the Plastics North America Business Team in 1982, reported through two boxes on the organization chart in **Exhibit 1**: directly to Joe Spadaro and through several people to the Vice President of the North American area.

Business Background

Release-ease was a specialty chemical that Applichem had developed in 1952 in response to a customer's request. The customer had asked Applichem to formulate a plastic molding compound that would release easily from metal molds after compression molding. Release-ease was sold as a dry powder.

Making molded plastic parts is much like making molded jello. Both jello and the plastic molding compound are hot liquids when poured into the mold; both harden as they cool. Both tend to leave residue on the mold after they are unmolded. However, washing a jello mold is easy, and the mold is rarely needed again immediately. But molds for plastic parts are precision stainless steel; they can be difficult to clean; and they are used repeatedly, with unmolding and cleaning often the bottleneck in the molding process.

When a customer requested help in cleaning molds quickly, Applichem applications engineers came up with "Release-ease." It was a chemical to be added in low concentration to the plastic molding compound during its manufacture so that the molded parts would be easier to separate from the mold and would leave the mold cleaner. Release-ease was widely used in molding plastic parts.

Applichem had held the patent for Release-ease, and the product family had been a steady sales and profit generator for the company through 1982. Applichem had done little focused research on the Release-ease product or process after about 1953. What product and process changes had been made were instigated and implemented by manufacturing people in the plants. And most of those changes had been made by Aristotle (Ari) Pappas, Manager of Release-ease manufacturing at the Frankfurt plant.

The specifications of Release-ease varied slightly among regions. Over the years, as customers encountered problems in their molding processes, Applichem's applications engineers had worked with them to identify changes to Release-ease or to the customer's manufacturing process that could relieve the symptoms. The process was one of trial-and-error. Customers were also continually finding ways to reduce the concentration of Release-ease while achieving the same results. In 1982 Applichem's market research group expected little increase in worldwide demand for Release-ease during the next five years.

Market requirements for Release-ease varied by region. In Europe suspendability of the particles in liquid came to be an important property, and most promotional literature stressed this property. Competition was more fierce in Europe than in the U.S., and quality and product

specifications were more closely monitored there. Several managers were convinced that Release-ease made in the Frankfurt plant met specifications better than that made in other plants. There were two other important differences in customer use in Europe and the rest of the world. First, European customers made sure to consume Release-ease within one year of purchase, whereas some final customers in the U.S. would use it as long as three years after manufacture; customer use in other regions varied between the two extremes. Second, European customers purchased Release-ease in 50-kilo bags, but customers in the U.S. and Japan used packages in many sizes from 1/2-kilo on up.

Release-ease sold at an average price of $1.01 a pound. Applichem's Release-ease sales by region, production by each of the four plants, as well as exports and imports by region (all in millions of pounds) were as follows:

	Sales	Plants	Actual 1982 Production	Exports by Region	Imports by Region
North America	29	Gary	14.0	0	15.0
Western Europe (incl. Middle East and Africa)	20	Frankfurt	38.0	18.0	0
Latin America	12.3	Mexico	17.2	4.9	0
Pacific and Rest of World	11.9	Sunchem	4.0	0	7.9
Total	73.2		73.2	22.9	22.9

Applichem's strongest competitor was a large U.S.-based chemical company whose only plant for making a close substitute for Release-ease was located in Luxembourg. Its sales in Europe were strong and it made some export sales to the U.S. and Latin America. But Applichem had by far the largest market share and the mystique associated with having patented the earliest available form of the product. A third U.S.-based company provided some competition in the U.S. but J. (John) Benfield, Operations Manager for Applichem's Plastic North American Business Team, said that he thought that the latter company was not seriously committed to the business for the long run. He noted that the company had a plant with some excess capacity that it was using in 1982 to produce its version of Release-ease.

In Japan Applichem was the only company whose product had been approved by the Japanese regulators. Joe Spadaro expected that eventually there would be some other products sold in Japan, even if only exports from Europe.

Technology

Release-ease was manufactured using a 4-step process: reaction (particle formation), cleaning, drying, and packaging. In the reaction step the raw materials (several of which were hazardous, flammable, and therefore not transportable internationally) were combined in a precise sequence under pressure and heat to form the Release-ease. The Release-ease was then precipitated out to form a slurry. The timing of introducing materials into the pressurized vessel ("kettle")—as well as the temperature and pressure which prevailed, the feedrates, heat removal, and agitation—affected the size and composition of the forming Release-ease particles. The quality of the Release-ease, the amount of raw materials, and the characteristics of the process were unaffected by the source of energy used in the plant. So steam, natural gas, oil and electricity were combined differently at different plants to minimize local energy costs.

The second step was to clean and isolate the Release-ease particles from the slurry. This was done by moving the slurry on a conveyor belt made of mesh so that the liquid fell through the belt to

the trough below, leaving wet Release-ease particles on the belt. In the third step, Release-ease particles were dried; in the fourth step the Release-ease powder was packaged in bags on an automated filling and packaging line.

Laboratory samples were taken for analysis at the end of each of the reaction, cleaning and drying steps. It usually took four hours for operators to get laboratory results. Since waiting between the cleaning and drying steps impaired product properties, Release-ease particles moved continuously between cleaning and drying. The laboratory test information was used to classify the material after it was processed. Material that was off-spec was reworked in some plants; in other plants some of it was reclassified as QC-3 (QC-l was the category used for product which conformed to specs) and sold at a lower price.

Throughout the process there were possibilities for yield loss. For example, in the reaction step some raw materials were added in powder form; these could be lost as dust on the floor and in the air. In the cleaning step, particles might be filtered out with the liquid and impurities. Recapturing waste materials was an important source of yield increases; the manufacturing people typically improved recapture gradually over years of work. Waste levels could also be an important health and safety measure.

The average yield of Release-ease from raw material A was a key indicator of the overall performance of the Release-ease manufacturing processes at different plants. The yield was defined by dividing the actual number of pounds of active ingredient in the final product by the number of pounds of active ingredient which would be in the Release-ease if all the key raw material A were converted to active ingredient. Yields were usually expressed in percentages. Benfield explained,

> Plants designed for larger volumes of output generally have higher yields. Raw material A might not wind up in the final product for one or both of two reasons: (l) There might be physical losses (waste) during the process. For example, the percentage of residual raw material A per pound of Release-ease produced in a drum container (used in low volume processes) would be greater than that left in a railroad tank car (used in high volume processes). (2) The available raw material A might not be converted during the process. Larger scale processes have less waste than smaller scale processes. But the proportion of available raw material A converted to Release-ease is determined by how well the process is run, regardless of scale. A well-run, low-volume (around 5 million pounds a year) process would have an average yield on A of 91 or 92 percent; a well-run, medium volume plant would have an average yield on A of 94 to 95 percent; a well-run, high volume plant would have an average yield on A of 98 to 99 percent.

Usually, the manufacturing process was run 24 hours a day, 7 days a week, because shutting down the process required expensive cleaning of the reaction kettles and the dryers where Release-ease particles stuck. Similarly, changing the size of bag in the packaging line could require as long as a day.

One of the main quality measures for the final product performance was the percent of active ingredient in the powder, since high active ingredient correlated well with good application properties, especially for U.S. markets.

The Plastics North America Business Team estimated that in 1982 it would cost about $20-$25 million to build another plant like that in Gary, Indiana. And they expected that such a plant would have a useful technical life of about 20 years if properly maintained.

The Manufacturing Plants

The *Gary* plant was managed by the North American Area. The plant was located in Gary, Indiana, (just outside Chicago) in a neighborhood where immigrants from Eastern Europe had settled during the early twentieth century. The plant was founded in 1905 and purchased in 1951 by Applichem as the company's first large manufacturing facility. Many people who worked in the Gary plant in 1982 had followed 6 to 10 other members of their families who had worked there over the generations. They were loyal to the plant and to the plant manager, who had grown up in the neighborhood and called himself the "Gary kid."

Release-ease was the first product Applichem manufactured in Gary, and the process had changed incrementally as the market for Release-ease had changed. Most equipment for the process used in 1982 had been installed between 1959 and 1964. It was designed to run a wide range of product formulation and package types. In 1982 Gary ran 8 formulations of Release-ease and about 80 package sizes, whereas the Frankfurt plant, for example, ran only 2 formulations of Release-ease and one 50-kilo package.

The Gary plant manufactured 19 product families in addition to Release-ease. It had a total of 1,000 non-union employees, down from about 2,000 during the mid-1960s. It had a Release-ease design capacity of 26 million pounds a year, and around 60 people manufactured 14 million pounds of Release-ease in 1982.

The *Frankfurt* plant was managed by German nationals who reported through the European Area, and supplied customers located in Europe, the Middle East, and Africa as well as other Applichem plants. It made 12 product families in addition to Release-ease. The plant had 600 employees in 1982, and it made about 38 million pounds of Release-ease a year. Its design capacity was 47 million pounds a year. It had two processes for manufacturing Release-ease: one installed between 1971 and 1974 and one installed in about 1961, with later major modifications to increase capacity. The processes featured computer control of the first process step and extensive solids recovery and waste treatment. Frankfurt bulk-shipped Release-ease to other company plants which then packaged it and shipped it to customers.

Release-ease manufacturing in Frankfurt was managed by Ari Pappas. He was a Greek national who had headed Release-ease manufacturing at Frankfurt since the mid-1960s. He knew Joe Spadaro and several other members of Applichem's top management team from the 1960s, when they had worked in Europe. Pappas had a technical bent; and he had worked with customers, the Applichem Technical Center in Europe, and his own employees to improve the yields and reliability of the Release-ease he made.

The *Mexican* plant was part of a wholly owned subsidiary of Applichem. It was managed by Mexican nationals, who reported to the vice president of the Latin American Area. It supplied the Mexican market and in the early 1980s began to supply some markets in the Far East. The plant processed about 17.2 million pounds of Release-ease during 1982, and had a design capacity of 27 million pounds a year. All its Release-ease was packaged in 50-kilo bags. The process had been installed in 1968 with extra drying capacity introduced in 1978. It was similar in design to the Gary plant, and manufactured 6 product families in addition to Release-ease.

Although educational levels of the Mexican operators were generally lower than those of operators in the other plants, John Benfield explained that the Mexican operators had some technical depth and were able to maintain process improvements suggested by Ari.

Sunchem was Applichem's 50% Japanese joint venture which owned and operated a manufacturing plant in Japan for Release-ease and one other product for the plastics industry. It was managed by Japanese nationals and reported to Applichem's Pacific Area. It was founded in 1957 and

had supplied the Release-ease requirements of Japanese customers after that. Its manufacturing process had been redesigned in 1969, when some automation and waste recovery systems had been introduced. Its volume was constrained by its dryer capacity in 1982. The Japanese plant processed many 1/2-kilo and 1-kilo packages. The plant had a rated capacity of 5 million pounds a year, and it produced 4 million pounds in 1982. Within Applichem the Japanese plant was generally thought to be technically excellent. Employees there did more development work than in other plants: they had a product test laboratory, a plastics engineering lab and a workers' dormitory for single men. Japanese managers said that they required more environmental protection measures than the other plants. Their plant was, for example, the only Applichem plant with scrubbers for processing gaseous wastes.

There was no union at this plant although there generally were industry—as opposed to company—unions in the Japanese chemical industry. In 1979 the plant manager had written to U.S. management to explain why an unusually large number of employees was needed in Japan relative to similar Applichem plants elsewhere. He wrote:

> Work rules and regulations seem to be more severe than those in other countries. For example, the Japanese Fire Prevention Law prescribes that all work requiring the handling of flammable raw materials be performed by those having a license for doing such work. There are a wide variety of operations requiring similar licenses, including those in which we handle high pressure gas as in refrigerators, toxic substances, and organic solvents, as well as drying operations being performed where oxygen is not sufficient. A number of plant operators will have to attend training courses to acquire such licenses.
>
> Also, we know that one operator has been taking care of running several kettles at the Gary plant. One operator would not be enough to handle all kettles here because our workers do more work with the kettles.
>
> Finally, in accordance with a strong recommendation by the Shift Work Committee of the Japan Industrial Hygiene Institute, manufacturers are required to allow a temporary sleeping time of two hours a day to all who are engaged in mid-night work.

The Cross-Plant Productivity Study

John Benfield had managed the study comparing productivity at the different plants. He reflected on the study:

> The report got things on an even keel. It set the agenda. Until then our managers at one plant rarely encountered managers from sister plants. And they never gave much attention to improving their process on the basis of what other plants had done.
>
> Although the standard costs and volumes of Release-ease were easily available for each plant, the technical information needed for the study was not available. Allocating indirect labor over products was a major problem. The Japanese and Gary employees, for example, complained throughout that they simply had low volumes which caused their overhead allocations to be too high. Yield information was available, but only the technical people in the plants had it. The study was able to identify precise labor productivity differences among plants and to set an agenda for improvement.

> It was important to have financial and technical people in all the plants work together developing the numbers. We argued back and forth during the process, trying to ensure that everyone in the plants agreed with the numbers. For example, to satisfy some concerns at Gary, where a lot of time is spent packaging Release-ease in small packages, packaging was studied separately for all plants. And the Japanese over-estimated their material usage in their standards because they did not want to be caught short. So we took their usage numbers from their actual experience year-to-date.
>
> Over the four months that we worked on the report before it was published in September 1982, a lot of time went into it. The individual plants are not interested in repeating the comparison project. In fact, some said that they hoped it was never done again. It was a pain.

Exhibit 2 presents the breakdown and comparison of manufacturing costs for Release-ease at Applichem's four plants in 1982 as it appeared in the study. **Exhibits 3** through **5** present some of the data that Benfield's group used in defining and computing the cost figures presented in **Exhibit 2**. The costs in **Exhibit 2** are manufacturing, as opposed to delivered, costs. Annual volume of Release-ease was a plant's forecasted volume of Release-ease for 1982. Indirect costs were allocated over all the products in each plant; the standard cost of Release-ease included the allocated indirect costs. The operating costs were derived by dividing a plant's annual budget for the corresponding element of expense for all Release-ease production by the annual volume. Raw material prices and exchange rates were those used in the plants' 1982 business plans. Benfield said,

> Although exchange rate changes have a significant impact on comparative raw materials costs stated in dollars, the impact is lessened due to the fact that more than half of the raw materials are available in competitive international markets. We estimate that over the long haul only 30 to 40 per cent of the raw material cost is directly influenced by exchange rate changes. A variety of energy sources are used by the plants depending on local price and availability. The high local electricity costs at Sunchem reflect Japan's generally high energy costs.

Two employees from the Gary plant commented on the study. T. E. (Tom) Schultz was a project manager in development engineering at the Gary plant when John Benfield was assembling the productivity study. He had joined Applichem in 1978 just after completing his Bachelor's degree in Chemical Engineering. In the period before Applichem's U.S. Controller took over, Schultz and Gary's Production Manager for Release-ease began work to improve productivity in the Release-ease area. By the time John Benfield requested information for the Productivity Study, they had it nearly ready. The entire process of getting the data ready for the study took about two person-years. But Schultz had been enthusiastic about the study because he had believed that corporate managers were seeking to identify the best process ideas from all the plants and to implement them wherever they were relevant throughout the Applichem manufacturing network. Tom Schultz said:

> There were several difficulties in comparing cost, usage, and yield statistics across plants—even data assembled as carefully as Benfield did. For example, the Gary plant was designed to manufacture prototype samples for customers; most products in the Release-ease family had first been manufactured in Gary. Also, being an old product, Release-ease has folklore in Gary. There was also a body of opinion to the effect that older product [greater than two years] suffered some degradation in applications performance. As it was not unusual for product in the U.S. to be in the distribution channel for two years, Gary placed great emphasis on achieving a high level of active ingredient in the product at time of manufacture. We were also very leery about implementing some of the changes that the Frankfurt plant had made because we were afraid that our product shelf life might be adversely affected. As

> Frankfurt's product stayed in the distribution channel for at most one year, its emphasis on producing a high active ingredient product was less than ours and it was more adventuresome in adopting process changes.
>
> You know, when I joined the Gary plant it seemed that we had the lowest costs of any plant. But then the exchange rates changed a lot. And the productivity study came along just when we looked bad . . . I wonder when the exchange rates will swing back and make Gary look good again.

W. C. (Wanda) Tannenbaum was a financial analyst at the Gary plant during the productivity study. She had joined Applichem in 1981, after completing an undergraduate degree in Business from the University of Illinois. She noted that the study was very technically oriented, that she was involved only to "look it over". She explained:

> At Applichem we use fully allocated standard costs for operations management. For sourcing we used out-of-pocket costs. The data needed for the study were available, but not in accessible form. For example, we had many monthly reports, but no data was cumulative. And standard costs were redefined only once or twice a year, so it was just about impossible to get actual costs for Release-ease by month.
>
> The allocation of indirect costs was a big problem for the study—especially for a plant like Gary. It was not designed to be a real streamlined operation. It was designed to be a batch operation for research and specialty products. Its equipment is unique, and Release-ease manufacturing is spread out all over the place. You just can't compare it with plants that make commodities.

Exhibit 1 Organization Chart, June 1982

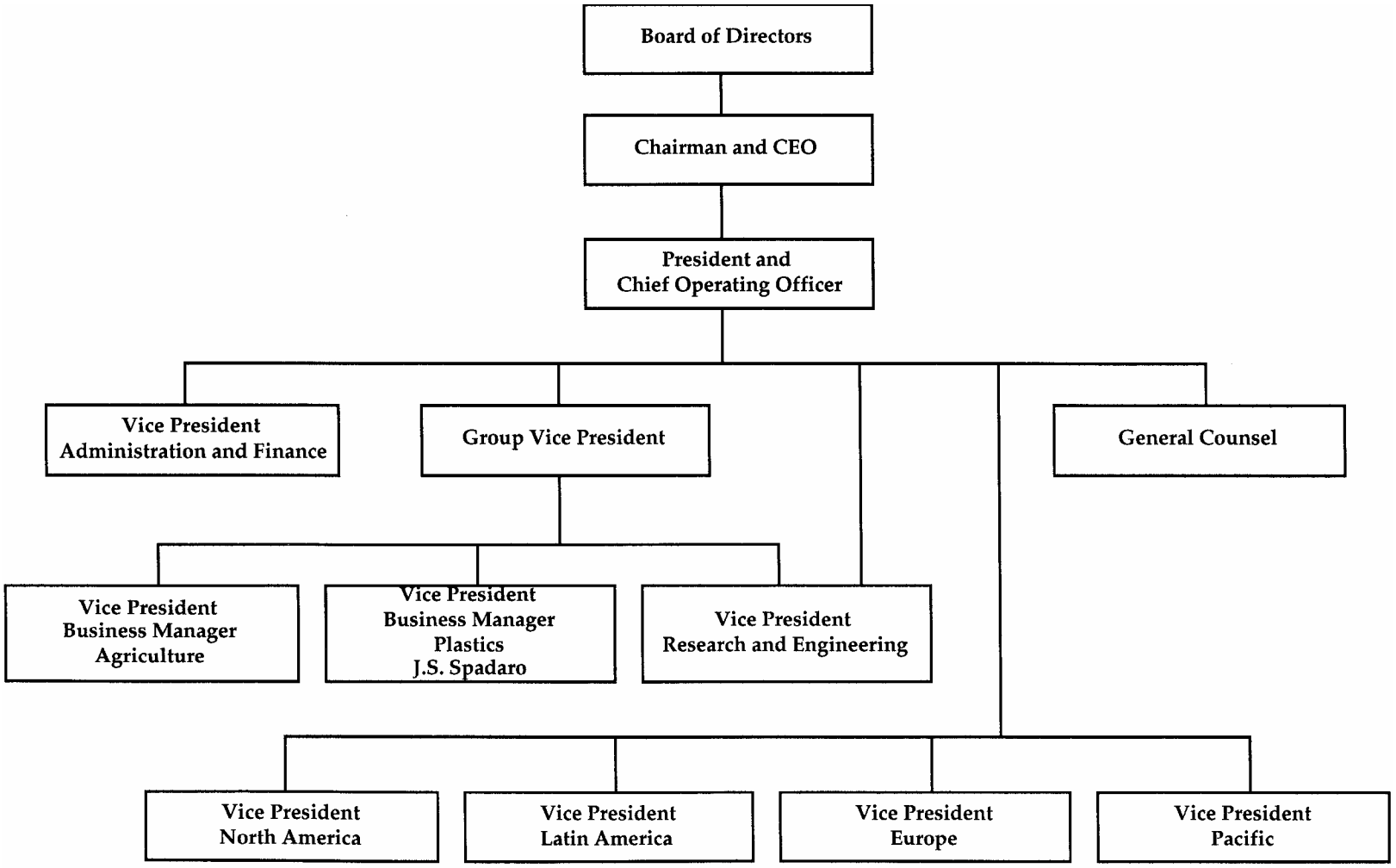

Exhibit 2 Comparison of Worldwide Release-ease Manufacturing Cost (U.S. dollars per hundred pounds of Release-ease)

		Plants		
Expense	**Mexico**	**Frankfurt**	**Gary**	**Sunchem**
Raw Materials				
A	27.00	24.02	27.96	29.62
B	14.57	11.69	13.52	20.41
C	16.39	9.03	6.92	24.68
D	5.89	3.75	6.48	5.50
Other	11.20	4.51	5.95	11.65
SUBTOTAL	75.05	53.00	60.83	91.86
Raw Material Overhead	—	—	2.65	—
Operating Costs				
Direct Labor, Salary & Fringes	2.38	5.78	8.46	12.82
Depreciation	.95	1.05	1.60	3.23
Utilities	1.20	1.11	1.94	3.67
Maintenance	1.60	1.34	3.71	3.77
Quality Control	.64	.57	1.54	2.77
Waste Treatment	1.37	.64	1.02	10.61
Plant Administration	1.11	2.91	1.22	4.07
Development	—	.38	.97	2.48
Supplies	2.25	—	.77	.56
Building Expense	—	1.12	.64	.36
Other	2.20	1.01	.29	6.22
SUBTOTAL	13.70	15.91	22.16	50.56
SUBTOTAL: COST BEFORE PACKAGING	88.75	68.91	85.64	142.42
PACKAGE, LOAD, & SHIP	2.38	3.35	13.78	4.56
TOTAL COST	91.13	72.26	99.42	146.98

Notes:

1. Operating costs include indirect labor and associated material costs other than raw materials.
2. Raw material overhead in the Gary plant includes incoming inspection, handling, and inventory carrying costs related to raw materials. For other plants those costs were included in Operating Costs.

Exhibit 3 Selected Productivity Comparisons for Release-ease Production

	Plants			
	Mexico	**Frankfurt**	**Gary**	**Sunchem**
Labor (Number of People)				
Direct	20	46	24	14
Indirect	25	40	34	17
Utility Usage (per million pounds product)				
Steam (metric ton)	2.09	3.18	2.74	NA
Natural Gas (cubic meter)	—	—	78.40	—
Oil (liter)	98.00	74.20	—	214.20
Electricity (kilowatt hours)	298.20	245.00	344.40	463.40
Utility Costs, ($ per unit purchased)				
Steam (metric ton)	$25.00	$20.56	$23.43	NA
Natural Gas (cubic meter)	—	—	$0.18	—
Oil (liter)	$0.32	$0.35	—	$0.31
Electricity (1000 kilowatt hours)	$40.00	$45.00	$56.00	$79.00
TOTAL UTILITY COSTS ($ PER MILLION POUNDS)	$12,012	$11,116	$19,365	$36,675
Raw Materials				
Pounds of Raw Material per hundred lbs of product produced				
A	20.4	18.9	20.75	19.14
B	51.21	47.82	53.8	48.23
C	55.97	50.28	53.6	49.49
D	26.40	24.21	28.77	25.07
%Active Ingredient in product	85.6%	84.4%	84.6%	85.4%
Average Yield on Raw Material A	94.7%	98.9%	90.4%	98.8%
Volume (million lbs)				
1982 Production Volume	17.2	38.0	14.0	4.0
Annual Design Capacity	27	47.0	26	5.0

Exhibit 4 Average Transportation Costs from Plants (¢/pound) to Regional Markets

	Regional Markets			
Plants	**North America**	**Western Europe**	**Latin America**	**Pacific & Rest of World**
Mexico	11.0	11.1	7.5	14.1
Frankfurt	10.5	2.0	12.9	13.3
Gary	5.0	10.1	11.5	12.6
Sunchem	14.0	14.3	13.3	2.0

Notes:

1) On average, it cost 12.9¢ to transport a pound of Release-ease from Frankfurt to Latin America and 11.1¢ to transport a pound of Release-ease from Mexico to Europe. The price of transport depended on distance, type of transport, and the volume transported. Where there were differences in transport costs between two locations, they were due to differences in the volumes Applichem had historically shipped in each direction between the locations and differences in import duties.

2) These costs include duty into various countries. In 1982 the duty into each country was the following percent of the value of Release-ease imported for the following sample countries:

Mexico	**Canada**	**Venezuela**	**Germany**	**U.S.**	**Japan**
60%	0%	50%	9.5%	4.5%	6%

Exhibit 5 History of Exchange, Inflation, and Wage Rates

	Mexico	Germany	U.S.	Japan
Average Annual Exchange Rates: (currency/$1US)	(Pesos)	(Deutsche Mark)	(Dollar)	(Yen)
1982	96.5	2.38	1.0	235.0
1981	26.2	2.25	1.0	219.9
1980	23.2	1.96	1.0	203.0
1979	22.8	1.73	1.0	239.7
1978	22.7	1.83	1.0	194.6
1977	22.7	2.10	1.0	240.0
Average Annual Price Indices (1980 = 100)[a]				
1982	194.2[c]	114.1[d]	113.7[d]	103.2[c]
1981	124.4	107.8	110.6	101.4
1980	100.0	100.0	100.0	100.0
1979	80.3	93.0	86.1	84.9
1978	67.9	88.7	76.3	79.1
1977	58.6	87.7	71.0	81.2
Average Gross Money Wages (Before Income Taxes, Social Security Contributions, and Benefits) (local currency per hour) [b]				
1982	99.42	14.64	8.50	1424.86
1981	63.46	13.92	7.99	1372.77
1980	48.11	13.18	7.27	1292.66
1979	39.91	12.36	6.69	1203.80
1978	34.17	11.73	6.17	1134.00
1977	29.70	11.14	5.68	1061.00

[a] Source: *International Financial Statistics*, International Monetary Fund.
[b] Source: Business International Corporation, *Worldwide Economic Indicators*, One Dag Hammarskjold Plaza, New York, NY.
[c] Wholesale prices
[d] Industrial prices