INITIAL DECISION BY

MONTGOMERY K. HYUN, ADMINISTRATIVE LAW JUDGE

DECEMBER 17, 1987

INTRODUCTION

On July 18, 1985, the Federal Trade Commission issued an administrative complaint challenging the acquisition by Olin Corporation ("Olin") of the swimming pool chemicals assets and business of FMC Corporation ("FMC") as a violation of Section 7 of the Clayton Act, as amended, 15 U.S.C. 18, and Section 5 of the Federal Trade Commission Act, as amended, 15 U.S.C. 45. The complaint charged that the acquisition may substantially lessen competition in two markets: (1) the "manufacture and sale of chlorinated isocyanurate and calcium hypochlorite dry swimming pool sanitizers" in the United States and (2) the "manufacture and sale of chlorinated isocyanurate dry swimming pool sanitizers" in the United States. (Complaint ¶¶ 13-14) Olin filed its answer to the complaint on August 28, 1985, admitting in part, and denying in part, the various allegations of the complaint.

After extensive discovery conducted in this country and abroad and completion of other pretrial steps, evidentiary hearings began on January 20, 1987 and concluded on April 28, 1987, with some 52 hearing days. Testimony was heard from a total of 41 witnesses (complaint counsel called 14 witnesses and respondent called 27 witnesses). The record, encompassing some 9,945 pages of hearing transcripts and over 755 exhibits, was closed on June 2, 1987. Subsequently, the parties filed Proposed Findings, Conclusions and Order, with Briefs and Replies. The Commission extended the due date of an initial decision until December 17, 1987.

This initial decision sustains the essential allegations of the complaint, finds a violation of Section 7 of the amended Clayton Act and Section 5 of the amended Federal Trade Commission Act and recommends a partial divestiture order.

With respect to the product market issue, it is determined that the production and sale of isocyanurates for residential pool use is a valid Section 7 market and that the production and sale of isocyanurates and/or calcium hypochlorite for residential pool use (the so-called dry pool chemicals) also constitutes a valid Section 7 market for the purposes of this case. Pool bleach (sodium hypochlorite) is excluded for the reason that it still remains what it has been for decades, namely an essentially local or regional product and that it does not compete with isocyanurates or calcium hypochlorite on a national basis.

With respect to the geographic market issue, it is determined that the United States is a valid Section 7 market. Respondent's suggestion of a world-wide market is rejected. **[2]** However, in view of the historically substantial imports of isocyanurates and calcium hypochlorite for pool use, import competition was fully taken into account in assessing the competitive effects of the challenged acquisition.

The market shares and concentration data in the relevant markets show that the challenged acquisition left only two domestic firms in the isocyanurates market, with a combined capacity (including that of Olin's waterbatched plant) approaching 86%. In the isocyanurates-calcium hypochlorite market, the acquisition left three domestic firms, with a combined capacity (including that of Olin's waterbatched plant) in excess of 91%, with the two top firms accounting for almost 76%. If we were to exclude Olin's waterbatched isocyanurate plant, the top two and three firms would account for about # # and # #, respectively. Thus, on the basis of any accepted measure of market concentration, the challenged acquisition has such a high probability of substantial anticompetitive effects that it does not pass muster under Section 7, unless relevant qualitative or non-market share factor or factors demonstrate that the market share and concentration data substantially overstate or misrepresent the true present and future competitive significance of the merging firms or that qualitative or non-market share factors can reasonably be expected to operate as sufficient constraints upon the market power of the dominant firms including Olin.

On that score, the evidence is clear that entry barriers are high with respect to the isocyanurate market and remain substantial with respect to the dry pool chemicals market. Furthermore, price competition appears limited and the relevant markets are characterized by a number of significant collusion-facilitating features. On balance, the relevant non-market share factors tend to confirm, and reenforce, the strong presumption of substantial lessening of competition flowing from the market share and concentration analysis.

Finally, respondent's "efficiencies" defense and "exiting asset" defense are both rejected for the reason that (1) there is no substantial evidence establishing that substantial economies or efficiency gains resulted from the acquisition or that the alleged efficiencies are unique to this acquisition and (2) the record as a whole shows that alternatives to the challenged acquisition were available to Olin and FMC at the time of the acquisition.

As for relief, it is determined that the customary divestiture of the acquired assets and business is appropriate. The administrative law judge is of the view that full restoration of competition in the relevant markets and the need to insure the **[3]** viability of the divested business require that the divestiture include the acquired assets related to the production of cyanuric acid so as to enable the purchaser to enter the market with cyanuric acid production capacity. However, respondent should be allowed to retain the Sulfolane process technology for the manufacture of cyanuric acid inasmuch as the divestiture package will include the dry pyrolysis process technology acquired from FMC.

Having considered the entire record evidence and having observed the demeanor of the witnesses who appeared and testified in this case, the administrative law judge makes the following Findings on the basis of the record evidence as a whole.[1] **[4]**

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[1] Certain abbreviations were used by way of reference to the record. The testimonial and documentary evidence also contain a number of abbreviations, acronyms and terms used in the trade. They are as follows:

CB — Complaint counsel's supporting brief.

CPF — Complaint counsel's Proposed Findings.

CRB — Complaint counsel's reply brief.

CX — Complaint counsel's exhibit.

RB — Respondent's supporting brief.

RPF — Respondent's Proposed Findings.

RRB — Respondents' reply brief.

RX — Respondent's exhibit.

In camera information in the textual material is indicated by # at the beginning and at the end. Record citations referring to *in camera* testimony and exhibits are similarly indicated by # following each such reference.

ACL—The acronym by which Monsanto refers to its isos business.

The Acquisition—Olin's acquisition of the swim pool sanitizer business (and assets) of FMC Corporation.

Ad Hoc Committee—the Isocyanurate Industry Ad Hoc Toxicity Committee; an organization of chlorinated isocyanurate producers and marketers.

Annual Nameplate Capacity—For pool sanitizer plants, the annual output that a plant is designed to produce.

Annual Practical Capacity—For pool sanitizer plants, the annual output that a plant is capable of producing, giving consideration to planned outages, maintenance and repairs.

APC—Azote et Produits Chemiques.

(footnote cont'd)

AvCl—Available chlorine.
Baleco—Baleco International, Inc.
BASF—BASF Wyandotte Corporation.
Bay State—Bay State Pool Supplies.
Benson Pump—Benson Pump Company.
Bio-Lab—Bio-Lab Incorporated.
Bleach—sodium hypochlorite; may also be referred to as "sodium," "liquid bleach," "pool bleach," or "soda bleach."
Bromine—Bromochlorodimethylhydantoin; may also be referred to as "BCDMH."
CA—Cyanuric acid; may also be referred to as "CYA," "ICA," "ICYA," "isocyanuric acid," or "acid."
CAR—Capital Appropriations Request.
Cal Hypo—Calcium hypochlorite; may also be referred to as "CH."
CDB—Chlorinated Dry Bleach; the acronym by which FMC referred to its isos business; may also be referred to as "CDB/Sun."
CdF Chimie—CdF Chimie, S.A.
Chem Lab—Chem Lab Products.
ChemQuip—ChemQuip, Inc.
Chem Systems—Chem Systems, Inc.
China National—China National Chemical.
Chlor-Chem—Chlor-Chem Limited.
Chlorinated isocyanurates—Trichloroisocyanuric acid and sodium dichloroisocyanurate, collectively; may also be referred to as "isocyanurates," "iso" or "isos."
CIF—Carrier Insured Freight.
Coastal-Coastal Industries, Inc.
CPR—Competitive price request.
D&R—D&R Sales.
Delsa—Derivados Electroquimicos Levante, S.A.
Dichlor—Sodium dichloroisocyanurate; may also be referred to as "dichloro," "di," "SDCC," "sodium dichlor," or "NaDCC."
DOC—The United States Department of Commerce.
EPA—The United States Environmental Protection Agency.
E-Z Clor—E-Z Clor Systems; may also be referred to as "Heldor/E-Z Clor."
Fertilizers & Chemicals—Fertilizers & Chemicals Ltd.
FMC—FMC Corporation.
FOB—Freight on Board.
FTC—The United States Federal Trade Commission.
Granular CA—Refined cyanuric acid that has been granulated for pool use as a commercial stabilizing agent.
Great Lakes—Great Lakes Chemical Corporation.
Hasa—Hasa Chemical Company, Inc.
Horner—Horner Equipment of Florida, Inc.
HTH—Olin's brand name for calcium hypochlorite.
Hydrotech—Hydrotech Chemical Corporation.
ICD—ICD Group, Inc.
ICI America—ICI America, Inc.; may also be referred to as "ICIA."
Inquidesa—Inquidesa, S.A.
ITA—The International Trade Administration, a division of the Department of Commerce; may also be referred to as "ITA (DOC)."
ITC—The United States International Trade Commission; may also be referred to as "USITC."
Jones Chemical—Jones Chemical Company.
Lithium—Lithium hypochlorite.
Midstate—Midstate Chemical and Supply Corporation.
Mitsubishi—Mitsubishi group of companies of Japan.
Mitsubishi International—Mitsubishi International Corporation.
Monsanto—Monsanto Company.
NCP—N-cyclohexylpyrolidone; a solvent used in the production of cyanuric acid.
Netback—The total revenue realized from the sale of all sizes of a product, less commission, freight, discounts and early buy allowances; may also be referred to as "nets."

(footnote cont'd)

I. THE FIRMS INVOLVED IN THE CHALLENGED ACQUISITION

A. *Respondent Olin Corporation and Its Business*

1. Olin Corporation ("Olin") is a corporation organized under the laws of the State of Virginia with its **[5]** principal place of business at 120 Long Ridge Road, Stamford, Connecticut. Olin has plants and offices in a number of states, including Alabama, Arizona, California, Connecticut, Florida, **[6]** Illinois, Louisiana, Michigan, Missouri, New York, Pennsylvania, Rhode Island, Tennessee, Washington, and West Virginia. Olin also has plants and offices in several foreign countries. **[7]** (Complaint ¶ 2; Answer ¶ 2; CX 678-D, E, F, G, T, U, V, W, Z14; CX 679-D, E, F, O, P, Q, R, Z9)

2. Olin manufactures and sells chemicals, metals, ammunition, and defense-related products. Chemical products include commodity and specialty industrial chemicals and water treatment products, services,

Nippon Soda—Nippon Soda Ltd.
Nissan—Nissan Chemical Industries, Ltd.
N. Jonas—N. Jonas Co., Inc.
NuClear—NuClear Pools.
Olin—Olin Corporation.
PACE—Olin's brand name for isocyanurate.
Powdered Ca—Refined cyanuric acid in powder form that is used as a basic raw material in the manufacture of chlorinated isocyanurates. Unless otherwise indicated, all references to merchant CA pertain to CA in powder form.
PPG—PPG Industries, Inc.
Private Label—The label and consumer-sized package developed for a distributor or retailer by a producer or repacker using that distributor's or retailer's own brand name; after the package and label are developed, the producer or repacker fills the package for resale by the distributor or retailer.
Quimica ROT—Quimica ROT de Mexico.
Repacker—Repackager.
Saskatoon—Saskatoon Chemical Co.
Shasta—Shasta Industries.
Shikoku—Shikoku Chemicals Corporation.
Shikoku International—Shikoku International Corporation.
Sigma—Sigma Prodotti Chimichi, SpA.
South Charleston—FMC's CA, dichlor and trichlor plant in South Charleston, West Virginia; may also be referred to as "South Charleston plant."
Sparkling—Sparkling Pools.
Steelcrete—Steelcrete Company.
Suffolk—Suffolk Chemical Company.
Sumitomo (Japan)—Sumitomo Corporation of Japan.
Sumitomo—Sumitomo Corporation of America.
SUN—FMC's brand name for isocyanurate acquired by Olin.
Surpass—Surpass Chemical Co., Inc.
3-V—3-V Chemical Corporation.
Toyomenka—Toyomenka America, Inc.
Toyomenka (Japan)—Toyo Menka Kaisha, Ltd.
Toyo Soda—Toyo Soda Manufacturing Co., Ltd.
Trichlor—Trichloroisocyanuric acid; may also be referred to as "trichloro," "tri," "TCCA," or "TICA."
TVA—Temporary voluntary allowance.
York—York Chemical Corporation.

and equipment. Metal products include copper alloy, sheet, strip, tube and fabricated parts, nickel alloys, and stainless steel strip. Ammunition includes both sporting and defense ammunition. (Complaint ¶ 3; Answer ¶ 3; CX 678-T, U, V, W; CX 679-O, P, Q, R, S; Henske, Tr. 7091-92)

3. In 1984, the last full fiscal year prior to the acquisition, Olin had $2.1 billion in net sales and $1.6 billion in assets. Olin's 1984 after tax profits were $88.7 million. (Answer ¶¶ 2, 3, 4; CX 678-Z2, Z10) Because of a major corporate restructuring and substantial asset write-offs, Olin had losses in 1985 of $165.3 million. (CX 679-X)

4. Olin's Chemicals Group develops, manufactures and markets industrial chemicals, specialty chemicals and water treatment chemicals. (Henske, Tr. 7091-92) In 1985, the Chemicals Group had $1.1 billion in sales and reported an operating profit of $46.2 million. (CX 679-W; Henske, Tr. 7092-93)

5. Within Olin's Chemicals Group is the Water Products and Services Division, which includes Olin's swimming pool chemicals business. Olin's Water Products and Services Division was known as Olin's Consumer Products Group until May of 1985, when Olin's water services business was added to the group and the current name was adopted. (CX 474-D#) Among the industrial chemicals that Olin produces are three chemicals which are important in the manufacture of pool chemicals: (1) chlorine, (2) caustic soda and (3) urea. (Turnipseed, Tr. 7868#)

6. Olin's pool chemicals business consists of the manufacture, packaging, distribution, marketing and sale of the dry sanitizers, calcium hypochlorite ("cal hypo") and chlorinated isocyanurates ("isocyanurates" or "isos"). (CX 439#) Annually, Olin's swimming pool chemical sales amount to $100-$150 million. (Henske, Tr. 7092-93)

7. Olin markets its calcium hypochlorite and isocyanurate products to the swimming pool trade through a common sales force. (CX 9-Q; CX 653-H#; Turnipseed, Tr. 7732) # # (CX 660#) Olin's 1984 Annual Report stated results for the company's [8] "pool chemicals business." (CX 678-D, U) In full awareness of its # # (CX 394-D#) An Olin company profile, being prepared at the time of acquisition, asserted that # # (CX 481-E#) Olin primarily markets calcium hypochlorite under the HTH brand and isocyanurates under the PACE and, subsequent to the acquisition, SUN brand. (CX 439-A-B#)

8. For the purposes of this proceeding, Olin's relevant production

facilities are its manufacturing plants located at Lake Charles, Louisiana, South Charleston, West Virginia, and Charleston, Tennessee. In addition, relevant Olin nonmanufacturing facilities are its packaging plant at Livonia, Michigan and the corporate headquarters at Stamford, Connecticut, which also headquarters personnel responsible for Olin's swimming pool sanitizer business. (Kosche, Tr. 9031-34#; Johnstone, Tr. 6389#; RX 32-C#; Kennedy, Tr. 433; Fortuna, Tr. 7945#; Kosche, Tr. 8290-91; Swartley, Tr. 6875-77; CX 441-A, B, C#; CX 450-G#; CX 678-U; CX 679-Q; CX 700-A#)

9. Olin has been a producer of calcium hypochlorite since 1928. (CX 377-F#) Olin began manufacturing cal hypo at a plant in Niagara Falls, New York around 1927. (Turnipseed, Tr. 7462-63) # # (CX 473-H; RX 32-C#; Kosche, Tr. 9031-34#;)

10. Olin currently operates a calcium hypochlorite production facility in Charleston, Tennessee, which is the largest such facility in the world. (CX 548-A, E; CX 652-E#) Olin's competitive assessment studies conclude # # (Henske, Tr. 7243#) Olin also owns 50% of Aquachlor, a calcium hypochlorite facility in the Republic of South Africa. (CX 441-D#)

11. In 1984, Olin produced # # pounds of calcium hypochlorite at its Charleston plant, which amounted to almost # #% of the calcium hypochlorite manufactured in the United States. (CX 441-I#; CX 652-K, L#) In 1985, Olin's annual cal hypo production capacity at Charleston was approximately # # pounds, which constituted about # # of domestic cal hypo capacity. (CX 441-J#; CX 652-B, E#) Including its interest in Aquachlor, Olin possessed approximately # #% of world cal hypo capacity in 1985. (CX 652-B, E#) **[9]**

12. Olin sells cal hypo in both branded and bulk form. The branded cal hypo is sold to repackers, distributors and retailers under several Olin brand names, including HTH, Pulsar and CCH. Olin also sells private label cal hypo to certain repackers, distributors and retailers. (CX 377-P#) Branded cal hypo is sold in numerous consumer-sized containers up to 100-pound drums. Olin also sells cal hypo to repackers in bulk form.

13. Olin is well-recognized as the leading firm in the calcium hypochlorite pool chemical business. (CX 119-L; CX 549-C; CX 613-A#; Marshall, Tr. 1156, 1158; Jonas, Tr. 2269; Castagnolli, Tr. 2454-56; Hughes, Tr. 5250, 5353; Hammersmith, Tr. 6144-45; Henske, Tr. 7156, 7168#) Olin's HTH is the only brand of calcium hypochlorite to command a premium price in the pool chemicals market. (CX 660-C#; Hughes, Tr. 5304)

14. In 1979, Olin entered the production of isocyanurates as a natural outgrowth of its calcium hypochlorite swimming pool sanitizer business. (RX 35-P-Q#; Kosche, Tr. 8315) The isocyanurate facility, located in Lake Charles, Louisiana, is considered by Olin # # (CX 472-R-T#; CX 473-L; Swartley, Tr. 7059-61#; Henske, Tr. 7199#) And Olin's isocyanurate business was considered to be a # # (CX 394-B#)

15. Olin constructed CA, dichlor and trichlor manufacturing plants and a packaging plant at Lake Charles, Louisiana in the 1977-1980 time period. Originally, the Lake Charles facility was designed to manufacture CA, dichlor, and trichlor and to package all three products. (Johnstone, Tr. 6261-62; Kosche, Tr. 8295, 8309-11) Olin closed its CA plant in 1980, and ceased its dichlor operation in 1982 and its trichlor operation in August, 1984. Olin reopened that plant after its acquisition of FMC's pool chemicals business in November, 1985. (Kosche, Tr. 8498-99#, 9021-24#; CX 330-A, B, I; CX 402; CX 679-Q) Currently, the # #. (Fortuna, Tr. 8084#; Kosche, Tr. 9042#; CX 450-G#) Olin's South Charleston plant was acquired from FMC in 1985 as part of the acquisition. Olin manufactures CA and dichlor at that plant. Olin also acquired the Livonia isocyanurate packaging facility as part of the acquisition. Olin packages branded isos at that plant. (RX 341#; CX 450-G#; CX 679-Q)

16. On July 1, 1984, Olin and Monsanto Company concluded a tolling agreement ("Monsanto Toll"), whereby Monsanto was to produce isocyanurates for Olin using Olin's raw materials with Olin paying a fee for the conversion. (CX 469#) Then, on **[10]** or about July 7, 1984, Olin announced that, effective August 1, 1984, it will suspend PACE production at its Lake Charles trichlor plant "until further notice." (CX 402) The announcement indicated that, until it resumed isos production, Olin would market isos obtained from an unnamed manufacturer under a raw materials tolling arrangement. (CX 402) The announcement explained that "this action was taken for economic reasons since current conditions favor contract tolling the product for an interim period instead of manufacturing it." (CX 402) During the interim period, Olin stated that the Lake Charles trichlor facility would "be kept in stand-by condition." (CX 402)

17. Olin kept its Lake Charles trichlor plant out of operation from on or about August 1, 1984, until after it had consummated the challenged acquisition. (Kosche, Tr. 8953#) However, Olin maintained the facility in a "waterbatched" condition to assure that the facility

could resume production within sixty to ninety days. (Johnstone, Tr. 6295-96#) Waterbatching (which has been defined as maintaining a plant in a higher state of readiness than mothballing) involves incurring additional expense to circulate water through key operating systems to prevent deterioration. (CX 474-Z2#)

18. Olin sells trichlor and dichlor in both branded and bulk form. Branded isos are sold in consumer-sized packages. Olin's branded isos are sold primarily under the PACE and SUN brand names to distributors and retailers. (CX 267-F#) The SUN brand name was acquired by Olin from FMC in the acquisition. Olin also sells private label isos to certain distributors and retailers. Olin also sells isos to repackers in bulk form. During the period in which Olin's trichlor plant was shut down, Olin only sold branded isos that it purchased from Monsanto pursuant to the Monsanto Tolling Agreement. (Johnstone, Tr. 6294#; Kosche, Tr. 8497#)

19. In the seven-month period that it operated in 1984, Olin's Lake Charles plant produced # # million pounds of trichlor, which constituted approximately # # of total domestic isocyanurate production. (CX 441-I#; CX 652-K#) However, Olin # # (CX 440-A#; Kosche, Tr. 9011-13#)

20. In 1985, Olin's annual trichlor production capacity was approximately # # pounds. (CX 441-J#) This represented approximately # # of domestic isocyanurate capacity and # # of world-wide isocyanurate capacity. (CX 652-A, B#) **[11]**

21. Olin's sales of PACE in 1984 were estimated to be approximately # #% of total domestic sales of isos, making PACE the second largest national brand of isocyanurate pool chemicals next to FMC's SUN brand. (CX 127-H, J#)

22. During the period from 1980 to 1984, Olin produced and sold the following amounts of isos:

		Production (MM's lbs.)					
		1980	1981	1982	1983	1984	
Trichlor	#						#
Dichlor	#						#
Total	#						#

(CX 441-E, F, G, H, I#) Olin's trichlor plant was shut down in July, 1984.

23. During the period from 1980 to 1984, Olin produced and sold the following amounts of cal hypo:

	Production (MM's lbs.)				
	1980	1981	1982	1983	1984
#					#

(CX 441-E, F, G, H, I#)

24. Olin is engaged in the sale and shipment of isos and cal hypo throughout the United States and the world. Olin is engaged in commerce, and its acts and practices are in or affecting commerce, within the meaning of the Clayton Act, as amended (15 U.S.C. 12), and the Federal Trade Commission Act, as amended (15 U.S.C. 44).

B. *Olin's Management Structure*

25. John M. Henske, who testified for Olin in this case, was Chairman of Olin's Board of Directors and its Chief Executive Officer at the time the acquisition was consummated. Mr. Henske had held the CEO position since April, 1978, and had been the Chairman of the Olin Board since September, 1981. (CX 657-C#; Henske, Tr. 7090-91) Mr. Henske's direct involvement with Olin's pool chemicals business in various management positions dated back to 1969. (Henske, Tr. 7103) **[12]**

26. At the time of the acquisition, reporting to Mr. Henske were two executive vice presidents, John Johnstone and Richard Barry, who together with Mr. Henske, comprised Olin's Office of the Chief Executive, also called the CEO Office. (CX 653-K#; Johnstone, Tr. 6249; Henske, Tr. 7095-97) The three members of the CEO Office were also referred to as Olin's corporate management. (CX 653-K#) Each of Olin's operating groups was managed by a group president who reported either to Johnstone or Barry. (Henske, Tr. 7095-96)

27. Mr. Johnstone, who testified for Olin in this case, was elected an executive vice president in June, 1983. (Johnstone, Tr. 6249) One of the operating groups that reported to him was the Consumer Products Group which included Olin's pool chemicals business. (Johnstone, Tr. 6250-51) Prior to becoming executive vice president, Mr. Johnstone had no direct involvement with Olin's pool chemicals business. (Johnstone, Tr. 6250) Olin's swimming pool chemicals business was part of Consumer Products from the early 1970's until assigned to the Chemicals Group during the 1985 reorganization. (Johnstone, Tr. 6251, 6253; Kosche, Tr. 8291)

28. John S. Swartley, who testified for Olin in this case, was President of the Consumer Products Group from November, 1982

until May, 1985, when the group was reorganized. Thereafter, Mr. Swartley continued to manage Olin's pool chemicals business as President of the Water Products and Services Division. (Swartley, Tr. 6876-77) Mr. Swartley first became involved with Olin's pool chemicals business upon joining the company in July, 1982, as Executive Vice President of the Consumer Products Group. Mr. Swartley's predecessor as the President of the Consumer Products Group was Ben Foster. (Swartley, Tr. 6876, 6883) The Consumer Products Group was one of four Olin business operations for which Mr. Johnstone had general management responsibility, businesses with annual sales totalling over a billion dollars. (Johnstone, Tr. 6250, 6263-64) The senior managers of Olin's manufacturing organization and its technology organization both reported to Mr. Johnstone. (Johnstone, Tr. 6250, 6263)

29. Olin's technology organization had responsibility for all research and development activities involving the company's chemicals business. (CX 472-D#) From about 1980 and until he left the company in the summer of 1984, Dr. Kevin O'Leary was the senior manager of Olin's technology organization. (CX 472-D#; Johnstone, Tr. 6267; Kosche, Tr. 8331) Dr. O'Leary was succeeded by Dr. John Marano, who had been working within the technology organization since April, 1982, as Director of Process Technology. (CX 472-D#) **[13]**

30. Olin's manufacturing organization had direct responsibility for the operation of all of Olin's production facilities, including Olin's Lake Charles Plant. William Oppold was the senior manager of manufacturing from the late 1970's until sometime prior to June, 1983, when he was succeeded by Frank Eakin. (Johnstone, Tr. 6266-67; Kosche, Tr. 8626-28#; Swartley, Tr. 7067-70#)

31. Peter C. Kosche, who testified for Olin, has held several important management positions within Olin's pool chemicals business beginning in 1973. (Kosche, Tr. 8291) Mr. Kosche started in calcium hypochlorite product development, and later managed the HTH sales organization. (Kosche, Tr. 8291-92) Beginning in 1975, Mr. Kosche assumed overall responsibility for planning and implementing the commercial development of Olin's isocyanurate entry. (Kosche, Tr. 8293-94) When Olin formally approved the funding of plant construction in mid-1977, Mr. Kosche became PACE Business Manager. (Kosche, Tr. 8310) In December, 1980, Mr. Kosche was named Director of Marketing and Sales for the Pool Chemicals Business. (Kosche, Tr. 8387#) Sometime in 1983, Mr. Kosche returned to

product development as Director of Commercial Development for Pool Chemicals. (CX 475-E#) From late 1984 to May, 1985, Mr. Kosche was Director of Commercial Development for the Consumer Products Group. (CX 475-D#) With the May, 1985 reorganization, his title changed to Director of Commercial Development for the Water Products and Services Division. (CX 475-D#) Mr. Kosche supervised Olin's due diligence review of the FMC pool chemicals business prior to the consummation of the acquisition. (Kosche, Tr. 8503-04#) After the acquisition, he was named General Manager of Pool Chemicals. (Kosche, Tr. 8516-17#)

32. B. George Turnipseed, who testified for Olin, held a number of marketing positions in Olin's pool chemicals business, from mid-1973 until early 1981. (Turnipseed, Tr. 7459-60) Mr. Turnipseed succeeded Mr. Kosche as PACE Business Manager at the beginning of 1981, and in early 1983 followed Mr. Kosche as Director of Marketing and Sales for Pool Chemicals. (Turnipseed, Tr. 7457-59) After the acquisition, Mr. Turnipseed assumed the position of Director of Marketing for Pool Chemicals. (Turnipseed, Tr. 7456)

33. As the CEO, Mr. Henske received monthly highlight reports from the group presidents. (Henske, Tr. 7097) # # (CX 656-K#; Swartley, Tr. 7416#) Mr. Henske was closely involved in Olin's formal strategic planning process. (Henske, Tr. 7093, 7098) That process required that # # **[14]** (Henske, Tr. 7097; Kosche, Tr. 8445-46#)

34. Within the operating group, the annual planning cycle began with a planning exercise in March or April. (Swartley, Tr. 6882-83) # # (CX 656-P#) Mr. Turnipseed had # # (CX 474-G#; CX 656-D#)

35. Generally, in the middle of the year the group strategic plans were forwarded to the Vice President of Corporate Planning. (CX 656-S-T#; Henske, Tr. 7099) # # (CX 653-P-Q#; Henske, Tr. 7192-93#) # # (CX 653-Q-R#; Henske, Tr. 7193#) # # (Henske, Tr. 7193#)

36. Mr. Henske would # # (Henske, Tr. 7193#) In reviewing a group's plan, Mr. Henske was most concerned about the validity of the first two years of the plan. (Henske, Tr. 7099-7100) Mr. Johnstone # # (CX 653-N-V#)

37. Whenever appropriate, those in the CEO Office communicated to the particular group president their critique of his strategic plan and typically such corporate feedback would be directed at the first two or three years of the plan. (CX 653-N, Q-R#; Henske, Tr. 7099-7100) # # (CX 653-R#) However, Olin's corporate management # # (Swartley, Tr. 7011-13#) **[15]**

C. *FMC Corporation and Its Business*

38. FMC Corporation ("FMC") is a corporation organized under the laws of the State of Delaware, with its principal place of business located at 200 East Randolph Drive, Chicago, Illinois. (Complaint ¶ 7; Answer ¶ 7) FMC operates 112 manufacturing facilities and mines in 27 states and 15 foreign countries. (CX 702-B) FMC manufactures and markets a broad range of industrial chemicals, agricultural chemicals, food machinery, specialized machinery, defense equipment, and petroleum equipment. These various businesses comprise twenty-five business units within the corporation. (CX 702-A-B; Furrer, Tr. 3345-46) In 1984, FMC had total sales of about $3.3 billion, net income of about $38 million, and assets of about $2.4 billion. (Answer ¶ 9; CX 702-A, B)

39. Prior to the acquisition, FMC produced and marketed a number of pool chemicals, including trichlor, dichlor and CA. FMC manufactured CA and isos at its plant at South Charleston, West Virginia and owned a packaging plant at Livonia, Michigan. FMC also owned 50% of the outstanding voting securities of Chlor-Chem Limited ("Chlor-Chem"), a manufacturer of isos located in Widnes, United Kingdom. The remaining 50% of Chlor-Chem's voting securities were owned by FBC (formerly Fisons) Limited, a subsidiary of Schering AG. (Furrer, Tr. 3525; Collins, Tr. 3555-56, 3562-63, 3570; Kosche, Tr. 8732-33#; RX 132-E; H, M, O; CX 700-A, C#; CX 709)

40. The business unit at FMC that was responsible for the production and sale of isos and CA prior to the acquisition was the CDB/SUN business unit of the Specialty Chemicals Division at FMC. The Specialty Chemicals Division, in turn, was one of three operating divisions of FMC's Industrial Chemicals Group. The chain of decisional authority with respect to FMC's swimming pool sanitizer business ran from the CDB/SUN business to the Specialty Chemicals Division to the Industrial Chemicals Group to senior corporate management. (Collins, Tr. 3550-51) FMC began the construction of its isos facility in 1958. (CX 450-B#) It began actual production and sale of isos in the late 1950's or early 1960's.

41. FMC originally sold isos for use as a pool sanitizer in bulk form to repackers, who in turn packaged the isos in consumer-sized units. FMC sold the bulk isos as a powder in 300 pound drums or 2200 pound bins. (Collins, Tr. 3568-69)

42. In 1978, FMC acquired the repackaging operations of Sun Cleanser Company and began to repackage and sell isos under the

SUN brand name in competition with the repackers who had been FMC's bulk pool chemical customers. FMC also obtained the **[16]** repackaging plant at Livonia, Michigan, together with all other tangible and intangible assets of that company. (CX 54; Collins, Tr. 3570)

43. During the period from 1980 to 1984, FMC produced and sold the following amounts of isos:

Sales (MM's lbs.)

	1980	1981	1982	1983	1984
Swim Pool	#				#
Industrial	#				#
Total Isos	#				#

Sales Revenues ($MM's)

	1980	1981	1982	1983	1984
Total Isos	#				#

(CX 707-I, Z19, Z22#)

44. In 1984, FMC's South Charleston plant produced about # # million pounds of isocyanurates, which constituted about # # of domestic iso production. (CX 64-Z37; CX 652-K#) It has been estimated that FMC's 1984 sales of SUN brand isocyanurate pool sanitizers constituted approximately # #% of total domestic isocyanurate pool sanitizer sales, making SUN the largest national brand of such pool sanitizers. (CX 127-J#)

45. In 1985, isocyanurate production capacity at South Charleston was an estimated # # million pounds or about # # of domestic iso capacity. (CX 64-Z33, Z34; CX 652-A#) Including its Chlor-Chem interest, FMC's share of world isocyanurate capacity was about # # in 1985. (CX 652-B#)

D. *FMC's Management Structure*

46. From at least 1980 to the time of the acquisition, R.H. Malott was FMC's Chairman and Chief Executive Officer and R.C. Tower was its President and Chief Operating Officer. (Furrer, Tr. 3364-65) John R. Furrer, who testified for Olin, was FMC's Vice President for Corporate Development and had held that position since 1977. (Furrer, Tr. 3343) Mr. Furrer's responsibilities included corporate planning, business unit planning, and acquisitions and divestitures.

(Furrer, Tr. 3343) Mr. Furrer reported directly to the CEO. (Furrer, Tr. 3343). **[17]**

47. At the time of the acquisition, FMC's isos business was designated the "CDB business" (for chlorinated dry bleach) and was also identified as "CDB" or "CDB/SUN." (Collins, Tr. 3554, 3713) The CDB business was part of the Specialty Chemicals Division which, in turn, was part of FMC's Industrial Chemicals Group. (Collins, Tr. 3550-51) In FMC business records, the two organizations are identified by their initials, "SCD" and "ICG," respectively. (CX 664-C)

48. William A. McMinn was the ICG Group Manager at least since 1980. (Furrer, Tr. 3358, 3364) From 1980 until late 1983, John J. Randolph was the SCD Division Manager. His successor was Robert Harries. (Furrer, Tr. 3364; Collins, Tr. 3556)

49. James R. Collins, who testified for Olin, was the SUN general manager from 1981 until late 1983. (Collins, Tr. 3554) In that position, Mr. Collins was responsible for the marketing of SUN pool chemicals throughout North America. (Collins, Tr. 3555) In late 1983, Mr. Collins was named the CDB Business Director and given responsibility for the marketing of all FMC's isos. (Collins, Tr. 3555, 3713)

50. At the time of the acquisition, John M. Polkowski was the marketing manager for industrial and international CDB's, which position he had held since 1983. (CX 478-E) Mr. Polkowski also served on the Chlor-Chem Operating Committee. (CX 478-S-T) Mr. Polkowski was hired by Olin after the acquisition. (CX 478-C)

51. The South Charleston isocyanurates facility was the operational responsibility of Norm Marsh, FMC's Director of Manufacturing. The South Charleston plant manager reported to Mr. Marsh, and not to Mr. Collins. (Collins, Tr. 3558)

52. FMC employed a formal planning procedure that required each division to prepare a strategic plan every two years, which was forwarded to Mr. Furrer's office for critical review. When his office had completed its analysis, the plan was formally presented to corporate management, including the CEO, the chief operating officer, and the chief financial officer. (Furrer, Tr. 3352-53)

53. After the formal presentation of the strategic plan to corporate management, the planning process was finalized with the execution of a "master contract" between corporate management and the business unit, confirming the operating guidelines of the business for the two-year plan period. (Furrer, Tr. 3367) **[18]**

54. Prior to the acquisition, FMC was engaged in the sale and shipment of isos throughout the United States and the world. For purposes of this proceeding, FMC was engaged in commerce throughout the relevant time period, and FMC's acts and practices were in or affecting commerce, within the meaning of the Clayton Act, as amended (15 U.S.C. 12), and the Federal Trade Commission Act, as amended (15 U.S.C. 44).

II. OLIN'S ACQUISITION OF FMC'S ASSETS AND BUSINESS RELATED TO THE MANUFACTURE AND SALE OF CHLORINATED ISOCYANURATES

A. *Acquisition Negotiations*

55. On February 7, 1985, Olin and FMC signed a letter of intent, which set forth the parties' mutual intent for Olin to buy FMC's pool chemicals business and related assets for approximately $49.5 million, less adjustments (the "Letter of Intent"). (Complaint ¶ 12; Answer ¶ 12; CX 700#) The proposed transaction was announced on March 4, 1985. (CX 764) Pursuant to the Letter of Intent, Olin agreed to buy, and FMC agreed to sell, FMC's CA, trichlor, and dichlor production facilities at the South Charleston plant (the "South Charleston plant" or "South Charleston"), the repackaging facilities in Livonia, Michigan, the SUN brand name and other brand names used by FMC to identify CA, trichlor and dichlor, the Sulfolane technology for the production of CA, and the 50% interest in Chlor-Chem held by FMC. (Answer ¶ 12; CX 700-A#) Olin also agreed to buy FMC's chlorine and caustic business assets, but that portion of the proposed transaction was subsequently cancelled. (Furrer, Tr. 3414; Johnstone, Tr. 6458-61#; CX 405-C#; CX 700-A#; CX 753#) The acquisition was consummated on August 16, 1985. (Answer ¶ 12)

56. The discussions which led to the acquisition arose "probably early 1984," in a conversation between FMC's Chief Operating Officer, Raymond Tower, and either Olin's John Johnstone or John Henske. (Furrer, Tr. 3411) In that initial high-level Olin/FMC communication, "an understanding that there might be an interest in Olin purchasing [FMC's swimming pool] business was established." (Furrer, Tr. 3410) Also, Mr. Tower told the Olin corporate management official that John Furrer, FMC's Vice President of Corporate Development, would be responsible for any negotiations that developed. (Furrer, Tr. 3411)

57. In a telephone conversation sometime prior to June 28, 1984, FMC's William McMinn told Olin's William Schmitt **[19]** that FMC was

definitely interested in selling some of its chemical facilities, including possibly its South Charleston isocyanurate plant. (Johnstone, Tr. 6302-03, 6458#) On or before June 28, 1984, Olin's John Johnstone was told the details of the McMinn/Schmitt conversation (CX 537; Johnstone, Tr. 6457-58#) and discussed the matter with his CEO, John Henske. (Johnstone, Tr. 6311#) It also appears that before the direct communication from FMC's McMinn, Olin was aware of the possible FMC isocyanurate acquisition opportunity. In early October, 1983, in a slide presentation to CEO Henske, the acquisition of FMC's isocyanurate operation was mentioned as one of three Olin "business options" for achieving "market price improvement." (CX 396-D#; Swartley, Tr. 6984-85, 7420-21, 7427#)

58. When Mr. Henske learned of the McMinn phone call, he encouraged Mr. Johnstone to go forward with efforts to acquire the FMC isocyanurate facilities. (Johnstone, Tr. 6311#) Mr. Johnstone directed John Swartley, Olin's Consumer Products Group President, to contact FMC for further details. (Swartley, Tr. 7434-35#) Within a week or two of receiving the assignment from Mr. Johnstone, Mr. Swartley met with a subordinate of Mr. McMinn's and confirmed that, definitely, the South Charleston isocyanurate assets were for sale. (Johnstone, Tr. 6463#; Swartley, Tr. 7434-35#)

59. By July 26, 1984, an Olin pool chemicals market statistics specialist was preparing and circulating market concentration estimates for pool chemicals using the Herfindahl-Hirschmann Index ("HHI"). (CX 873#; CX 874-R#; Kosche, Tr. 9028, 9031#) By August 7, 1984, Mr. Swartley's financial staff had put together a preliminary assessment of the value of the assets being offered for sale by FMC, identified investment needs and plant change proposals and recommended a strategy for purchase price negotiation. (CX 538-A-C#; Johnstone, Tr. 6466#) In a letter to FMC, dated August 13, 1984, Mr. Swartley sought additional details concerning the FMC assets. (Swartley, Tr. 7435-36#) FMC sent Olin information regarding its pool chemicals business assets. Olin reviewed the material "for several weeks." (Furrer, Tr. 3412)

60. In September, 1984, Johnstone and Furrer held a negotiating session at Olin corporate headquarters. (Furrer, Tr. 3412-13; Johnstone, Tr. 6305) Mr. Furrer later testified, "At that time, [Johnstone] offered to buy the business from us at a price which seemed to be in the ballpark." (Furrer, Tr. 3413) There followed a second Johnstone/Furrer negotiating session to resolve details concerning which

FMC assets were to be included in the acquisition. (Furrer, Tr. 3413) **[20]**

61. Drafts of a letter of intent were prepared and exchanged in December, 1984. (Kosche, Tr. 8750-51#) Olin's Board of Directors was notified of the developing negotiations on December 13, 1984. (CX 263-A#; Kosche, Tr. 8750#) On February 8, 1985, Olin and FMC officials executed the Letter of Intent. It called for Olin to pay $49.5 million for the assets to be acquired, less certain adjustments for inventory and accounts receivable. In addition, the Letter of Intent allowed a downward adjustment of price in excess of $2 million should FMC be unable to obtain the consent of Schering AG to the transfer to Olin of FMC's interest in Chlor-Chem. (CX 700-C, D, E#) As part of the Letter of Intent, Olin also agreed to make royalty payments to FMC for five years should Olin begin commercial production of CA in the United States utilizing FMC's Sulfolane technology. The price paid by Olin was within the range of values that Olin placed upon the CDB/SUN business. By its own estimates, Olin valued the business at # #. The sum included an estimated # # in synergistic gains resulting from the unique benefit to Olin of finally obtaining the CA supply and technology that had eluded it for so many years. (CX 405-L#; CX 661-Q#; CX 700-C#)

62. Once the Letter of Intent was signed, Olin began to undertake its due diligence review of the assets it intended to purchase. Olin's due diligence efforts were led by Mr. Peter Kosche and Mr. Richard A. Campbell, Olin's plant manager at Lake Charles, who went to the South Charleston plant personally and supervised a team of technical personnel from Olin investigating the condition of the South Charleston plant. (Kosche, Tr. 8503-10#; CX 839-E#)

63. On March 4, 1985, Olin issued a public announcement that, pursuant to "an agreement in principle," Olin was buying FMC's pool chemicals business. (CX 764)

B. *Asset Maintenance Agreement*

64. On July 18, 1985, the FTC issued the Complaint challenging the acquisition. FMC was not named as a respondent. On July 20, 1985, Olin and the FTC signed an asset maintenance agreement pursuant to which the Commission agreed not to seek to enjoin consummation of the acquisition, thereby permitting Olin to acquire and operate FMC's swimming pool chemicals business pending resolution of the Commission's administrative complaint in this matter. In return, Olin agreed

to withdraw from the Monsanto Toll and to manage the acquired assets in accordance with certain requirements intended to preserve the Commission's ability to obtain effective divestiture. The asset maintenance agreement permitted Olin to consolidate FMC's business with its business and its then-closed **[21]** production facilities pending the outcome of the administrative proceeding, provided that Olin maintain FMC's business and assets in the condition existing at the time of the acquisition. The acquisition was consummated on August 16, 1985.

III. AN OVERVIEW OF THE SWIMMING POOL CHEMICALS INDUSTRY

A. *Swimming Pool Sanitization and Products—A Market History*

65. The purpose of pool sanitization is to kill bacteria and algae in the pool water. (RX 43-X; Kennedy, Tr. 453-54) Chlorine is a very effective sanitizer and is the principal active ingredient used most often to sanitize swimming pools. (Christensen, Tr. 1756) However, certain nonchlorine-based pool sanitizers, such as bromine, are also sold. (Marshall, Tr. 1112, 1142; Jonas, Tr. 2235-37; Pettoruto, Tr. 1491-92) Chlorine sanitizes a pool by reacting to and combining with organic materials in the pool water to form chloromenes. The United States Environmental Protection Agency ("EPA") recommends that the pool chlorine level be maintained at between one and three parts of chlorine per one million parts of pool water; the conventional recommended dosage of chlorine for daily maintenance of a pool varies from one to two parts of chlorine per each million parts of pool water. (CX 10-R; CX 257-G; CX 555-D; Kennedy, Tr. 454-55; Aston, Tr. 4573-75)

66. There are two phases of swimming pool sanitization: one phase referred to as primary, maintenance or routine sanitizing, and a second phase referred to as superchlorination or shocking. (Christensen, Tr. 1824; Jonas, Tr. 2213) Primary sanitization is the regular addition of sanitizer to the pool in order to maintain the pool in a condition considered safe for swimming. (Kennedy, Tr. 454; Jonas, Tr. 2213) In the case of chlorine sanitizing, this requires maintaining a chlorine level of 1 to 3 parts per million ("PPM"). (CX 257-G)

67. Shocking or superchlorination is the intermittent addition of sufficient sanitizer to the pool to eliminate accumulations of contaminants. (Kennedy, Tr. 454) Shocking a pool with a chlorine sanitizer requires the addition of enough sanitizer to temporarily raise the

chlorine level to 5-20 ppm (CX 258), a level too high for swimming. (Christensen, Tr. 1824) It is generally recommended that a pool receive shock treatment every two weeks. (CX 257-G; CX 283-D-E#) Under some conditions, such as heavy bather load or heavy rain, shocking could be advisable once a week. (CX 258; *see generally* CX 10; CX 257) **[22]**

68. Most pool sanitizer consumption is for the purpose of primary sanitization. (Hammersmith, Tr. 6026) Ancillary chemicals (such as algicides, pH adjustors, stabilizers, and conditioners) used to perform complementary functions are sold to consumers along with sanitizing chemicals. (CX 649-C; CX 650-E-F; CX 687-F-J; Christensen, Tr. 1767-68; Vonderlow, Tr. 4764-65; Wetzel, Tr. 5370)

69. Most pool sanitizers, including isos, bleach and cal hypo, alter the pH of the pool water. PH is the measure of the acid/alkali balance in the pool water. (CX 258) The pH level of pool water affects the level of free chlorine available to accomplish sanitization. The higher the pH level, the more chlorine is required to accomplish the sanitization. The recommended pH level for pool water is 7.2 to 7.6 or 7.8. (CX 555-D; CX 10-Z29; CX 258) If the pH in pool water is below 7.2, it is too acid and can "result in corrosive water which can etch or stain plaster, corrode metal, and cause eye, ear, nose or throat irritation. Too high a pH can cause cloudy water, scale formation, eye irritation and slow down the range of bacteria kill." (CX 555-D) Therefore, consumers must adjust the pH of their pool water. (Kennedy, Tr. 484-86, 598) The frequency of adjustment required to maintain the proper pH level is basically the same for all pool sanitizers. (Hughes, Tr. 5209)

70. Trichlor and chlorine gas decrease the pH level of pool water. Dichlor also decreases the pH level of swimming pool water, but less than does trichlor. Soda ash is the ancillary chemical generally used to raise the pH level. Cal hypo and liquid bleach increase the pH level of pool water. Muriatic acid or hypochloric acid are the ancillary chemicals used most frequently with cal hypo and bleach to adjust the pH level. (Kennedy, Tr. 485-86; Christensen, Tr. 1767; Hughes, Tr. 5209)

71. Cyanuric acid ("CA") which is a principal input material for the production of isos, is also sold as a "stabilizer." (Aston, Tr. 4537-38) It stabilizes the chlorine in the pool water by protecting the chlorine from being degraded and consumed by the sun's ultraviolet rays. Pools using isos need not be stabilized with CA, while pools using cal

hypo or bleach must be. (Kennedy, Tr. 588, 611-12; Schaub, Tr. 2181-82)

72. Products sold in the United States as pool sanitizers include isos, bleach, cal hypo, chlorine gas, lithium hypochlorite, certain bromine compounds, Baquacil, and various mechanical and electrical devices that produce and dispense chlorine or another sanitizing agent. Two principle types of isos are used as pool sanitizers: trichlor and dichlor. All of the above products have the same end use and perform the same **[23]** function: sanitization of swimming pool water. (Kennedy, Tr. 455-56; Bloom, Tr. 646, 773-74; Pettoruto, Tr. 1348#; Marcum, Tr. 3979-80) Vonderlow, Tr. 4807-08; Hughes, Tr. 5190-91); CX 677-J, Z41, Z42#)

73. Available chlorine ("AvCl") is a measure of the amount of chlorine contained in a product that is available to accomplish sanitization of pool water. Because pool sanitizers differ in the amount of available chlorine they contain, available chlorine provides a common denominator among the various pool sanitizers by which one can measure the relative disinfection potential per unit of different sanitizers in pool water. (Schaub, Tr. 2049-50; Marcum, Tr. 3981-82; Aston, Tr. 4451; Moran, Tr. 5595-96); Kosche, Tr. 8454-55#)

74. Originally, in the 1940's and 1950's, liquid bleach and chlorine gas were the predominant form of pool sanitizer. (Scott, Tr. 5745; Christensen, Tr. 1925) Subsequently, calcium hypochlorite was introduced as an alternative to liquid bleach and chlorine gas. (Christensen, Tr. 1925) Olin commercialized production of cal hypo in 1927 and began selling it shortly thereafter, but it was not until much later that cal hypo's application as a pool sanitizer was discovered. (Turnipseed, Tr. 7462-63) Bay State, a Northeastern distributor, started selling cal hypo as a pool sanitizer in 1955 or 1956 because "[n]ot everybody wanted sodium hypochlorite." (Arakelian, Tr. 5865-67) Cal hypo offered the convenience of having a higher available chlorine content (65 to 70%) and longer shelf life than bleach and an easier and safer method of application than both bleach or chlorine gas. Cal hypo soon achieved a substantial market penetration at the expense of both. (Kennedy, Tr. 599-600; Jonas, Tr. 2218; Christensen, Tr. 1925)

75. In the 1960's, isos were introduced as alternatives to both cal hypo and bleach. Isos offered a number of advantages over both cal hypo and bleach, including (1) a higher available chlorine content; (2) a more convenient form, when compressed in tablets or sticks, for

application than both cal hypo and bleach; and (3) built-in cyanuric acid stabilizer which slowed the release of available chlorine and reduced the frequency of applications needed to sanitize the pool. In the 1960's and 1970's, as a result, isos took sales volume from both cal hypo and bleach. (Christensen, Tr. 1925; Jones, Tr. 2218; Kennedy, Tr. 497-98)

76. Throughout this period, bleach has remained a popular pool sanitizer in certain regional areas, including portions of Florida, southern California, upstate New York and the Detroit-Chicago area. (Castagnoli, Tr. 2443-44) These areas have been "traditionally bleach markets, way back before even **[24]** calcium hypochlorite was being supplied" and have "remained as such." (Castagnoli, Tr. 2495) Indeed, "[s]ince . . . coming into this thing [*i.e.*, the swimming pool sanitizer business] in 1963, those pockets of sales of liquid bleach haven't changed dramatically . . . . They are still selling bleach in south Florida. They sold it 20 years ago, and they will sell it 20 years from now." (Castagnoli, Tr. 2443) Also, there is evidence indicating that, during the past few years, liquid bleach may have been gaining some new ground in some sections of the country. *E.g.*, Roberts, Tr. 5067-68; Moran, Tr. 5569-70#; Scott, Tr. 5795#; Kent, Tr. 6557-58#; RX 43-J; RX 52-S#.

1. Dry Pool Chemicals

a. *Isocyanurates*

77. Isocyanurates are white, crystalline solids with a chlorine content ranging from 56% to 90%. (Kennedy, Tr. 467; Christensen, Tr. 1777; Comm. Phy. Ex. 4-6) Isocyanurates were first introduced for pool sanitization in 1958 and have subsequently become a major swimming pool sanitizer, particularly popular among residential pool owners. (CX 256-J)

78. Most domestic isocyanurate consumption, approximately 70%, is used for sanitizing swimming pools. (CX 548-D) Isocyanurates are also used in a variety of industrial applications. (CX 256-L)

79. Isocyanurates are marketed in two chemical varieties which are generally referred to as "dichlor" and "trichlor." (Kennedy, Tr. 456) Dichlor is a shorthand expression for a family of three chemical compounds more accurately identified as dichloroisocyanurates. The dichlor compounds are also identified by other shortened designations, including "dichloro," "di," "SDCC" and "NaDCC." Dichlor compounds range in chlorine content from 56% to 62%. (CX 256-D, G;

Collins, Tr. 3567; Marcum, Tr. 4135-36#) Trichlor is a shorthand expression for the chemical compound trichloroisocyanuric acid. Trichlor is also referred to as "tri," "trichloro," "TCCA" and "TICA." Trichlor has a chlorine content of 90%. (CX 256-D; Marcum, Tr. 4135#)

80. The principal raw materials used in the manufacture of isocyanurates are chlorine, caustic soda and cyanuric acid ("CA"). Dichlor is produced by chlorinating cyanuric acid with two parts caustic soda to one part cyanuric acid, followed by chlorination to yield dichlor. Trichlor results from the combination of three parts caustic soda with one part cyanuric acid, followed by chlorination. (CX 179-Z14-15; CX 256-E-F) **[25]**

81. CA is generally produced by first pyrolyzing (*i.e.*, heating) urea in a vessel referred to as a kiln which generates crude CA, and that intermediate product is refined by acid hydrolysis. (CX 179-Z15; Kosche, Tr. 8301) CA is initially produced as a powder. It may also be compacted into granular form in the same production process stream. (CX 179-Z15; CX 256-E)

82. The chlorination process varies among the domestic producers of isos. Olin, for example, manufactures trichlor at its Lake Charles, Louisiana plant by # #. (CX 439#)

83. FMC produced dichlor at its South Charleston, West Virginia plant by chlorinating a slurry of disodium cyanuric acid to form dichlorcyanuric acid, which was then separated and mixed with 50% sodium hydroxide (caustic soda) to form sodium dichloroisocyanurate in slurry form. The slurry was then cooled and separated with the solid dichlor sent to be drummed and dried and the filtrate sent to acidification or waste treatment. (CX 19-B) FMC produced trichlor by chlorinating a trisodium cyanuric acid solution to form TCCA which was then separated and the solids sent through a flash dry and drummed. (CX 19-B)

84. Monsanto first produces # # (Marcum, Tr. 4053-55#; RX 355) Monsanto purchases the chlorine and caustic soda it uses to manufacture isos while Olin and FMC produced their own. (Henske, Tr. 7201#)

85. Nissan of Japan manufactures trichlor # #. (CX 676-Z28-Z34#) Shikoku of Japan manufactures trichlor in a two-stage chlorination process which results in a trichlor slurry that is then filtered and dried. The dichlor process is similar to FMC's and involves reacting dichlor wetcake with caustic soda, **[26]** centrifuging the reaction, and drying the granular matter. (CX 19-T, U)

86. Trichlor dissolves slowly in water and is generally sold in several sizes. (CX 649-C; CX 687-E; Schaub, Tr. 2029-30; Collins, Tr. 3566-67) Trichlor tablets are fed into the pool through skimmer baskets, floaters and in-line feeders, which allow the water to flow around the tablets, which slowly leach into the water. (Collins, Tr. 3566; Kosche, Tr. 8822-25#) Applied through a feeder, the large trichlor tablets, three (or more) inches in diameter, will thus continuously release chlorine as they dissolve in water over a period of a week (Marcum, Tr. 4139#), while small trichlor tablets are applied as often as once a day. (Schaub, Tr. 2030) Trichlor is often referred to as a long lasting sanitizer. (Schaub, Tr. 2173; Marcum, Tr. 4139#) Trichlor is strongly acidic with a pH of 3.0 in water solution, which must be adjusted to prevent corrosion of pool equipment. (Schaub, Tr. 2063-64, 2178-79)

87. While most domestic trichlor consumption is for sanitizing swimming pools, some trichlor is used in automatic dishwashing detergent, commercial laundry bleach and home laundry bleach. (CX 256-L)

88. Dichlor is generally sold for swimming pool use in granular form and is applied by manually broadcasting the granules into the pool. (Collins, Tr. 3566; Scott, Tr. 5847) Dichlor is a readily soluble chemical which dissolves rapidly in pool water, releasing its chlorine content much faster than trichlor tablets. (Christensen Tr. 1791-92; Schaub, Tr. 2173-74; Collins, Tr. 3566-67) The dichlor pool sanitizer must be reapplied with greater frequency than trichlor. (Marcum, Tr. 4139) Dichlor has a pH of 6.0 upon solution in water and requires comparatively little pH adjustment. (Schaub, Tr. 2064)

89. About half of dichlor consumption is as a swimming pool sanitizer. The other half is used in a variety of industrial applications, most importantly in automatic dishwashing detergents and scouring powders. (CX 179-Z18; CX 267-B#; CX 465-L)

90. Nationally, tablets account for approximately 70-75% of isocyanurate pool sanitizer consumption, with the remainder being granular. (CX 548-D; Kennedy, Tr. 456; Collins, Tr. 3643) However, in some areas of the country, granular isos are as much as 40% of iso sanitizer sales. (Castagnoli, Tr. 2426; Aston, Tr. 4456) In certain parts of the Midwest, the granular iso product is considered more popular than the tablet. (Scott, Tr. 5821) **[27]**

91. Most recent projections are for iso consumption to grow at a rate of 4-5% per year. (CX 261-D#; CX 451-D#; Marcum, Tr. 3976, 3998-99) Earlier projections for iso growth were in the 8-12% range.

(CX 876-A#) Isos' largest areas of growth are the South, Southwest and West Coast. (CX 291-A#)

b. *Calcium Hypochlorite*

92. Calcium hypochlorite, often referred to as "cal hypo" or "CH," is a white crystalline solid which is marketed for pool use in two chemical varieties, one containing 65% chlorine and one with 70% chlorine. (Pettoruto, Tr. 1408#; Christensen, Tr. 1778, 1780) The 65% and 70% cal hypo products have relatively low levels of impurities and are therefore suitable for use in swimming pool sanitization. (CX 377-H#) Other calcium hypochlorite products are manufactured containing high levels of impurities that make them unsuitable for swimming pool use.

93. Until 1983, Olin produced calcium hypochlorite through the # #. Olin currently uses the # #. (CX 439#) PPG manufactures cal hypo by reacting chlorine, sodium hydroxide and lime. (Hughes, Tr. 5166)

94. Cal hypo will decompose rapidly and release chlorine gas if exposed to high heat. Cal hypo will burn if water is poured into it or if it is contaminated with a large amount of organic material. Cal hypo also tends to intensify a fire and make it more difficult to extinguish. (Kennedy, Tr. 594; Bloom, Tr. 792#; Pettoruto, Tr. 1408-09#; Behnke, Tr. 1603, 1680-82; Aston, Tr. 4559-61; Hughes, Tr. 5323-24#)

95. The majority of cal hypo for pool use is sold in granular form with a smaller portion sold in tablet form or in a feeding device. Most retail dealers sell only granular cal hypo. (Kennedy, Tr. 458, 592-93; Schaub, Tr. 2162; Marshall, Tr. 1189-90; Behnke, Tr. 1607-08; Christensen, Tr. 1788; Tr. 2214; Turnipseed, Tr. 7728-29#; CX 484-W#)

96. Cal hypo can be broadcast into a pool, added to the pool's skimmer, or dissolved in water to form a slurry that is then applied to the pool. Because cal hypo, when broadcast, can **[28]** leave a residue and stain or bleach a vinyl-lined pool, many manufacturers and dealers recommend that cal hypo be first dissolved in water and the resulting slurry then poured into the pool. (RX 295; CX 724-G; Kennedy, Tr. 456-57, 466-67, 596, 607; Pettoruto, Tr. 1489-90#; Schaub, Tr. 2058, 2183-85; Castagnoli, Tr. 2516-18; Aston, Tr. 4561-63; Hughes, Tr. 5205) Cal hypo can also be introduced to pool water by means of floaters or in-line feeders. (Kennedy, Tr. 458; Kosche, Tr. 8851#, 8858#)

97. Cal hypo tends to contain particles that do not dissolve completely in the pool water. Insolubility can be a particular problem in areas that have hard water. For this reason, cal hypo manufacturers often recommend that it be slurried before being applied to the pool. If not properly applied, the undissolved particles in cal hypo can make pool water cloudy, clog filters, and leave residue on the bottom of the pool that can stain or bleach vinyl liners. (Kennedy, Tr. 607; Pettoruto, Tr. 1497#; Hughes, Tr. 2183)

98. Approximately 85% of the calcium hypochlorite pool sanitizer consumed in the United States is granular, with tablets accounting for 15%. (CX 546-B; CX 548-C) Among residential pool owners, it is estimated that as many as 20% of the calcium hypochlorite users treat their pools with tablets. (CX 4-O)

99. Calcium hypochlorite is used in swimming pool sanitization both as a primary or maintenance sanitizer and as a shock treatment chemical. (CX 257-F-G; CX 286) When used as a primary sanitizer, it must be applied to the pool daily or once every few days if the pool is stabilized with cyanuric acid. (Marcum, Tr. 4139#; Breving, Tr. 6171-72) The brand name or packaging sometimes indicates whether it is marketed as and intended to be used as a shock treatment or as a primary sanitizer. (CX 677-Z138#; Kennedy, Tr. 593-94; Bloom, Tr. 785-86#; Marshall, Tr. 1189-90; Christensen, Tr. 1769-70, 1784, 1928-29, 1931; Castagnoli, Tr. 2430-31, 2510-12; Aston, Tr. 4450-51; Hughes, Tr. 5173-74) Olin markets an HTH brand "Superchlorinator/Shock" product in one-pound bags, but PPG merely recommends adding up to twenty ounces of its Pittchlor brand cal hypo for shocking purposes. (CX 257-L; CX 555-F, G)

100. There is no chemical difference between the cal hypo sold for shock treatment and the cal hypo sold for primary sanitization. (Christensen, Tr. 1769-70, 1777-78; Castagnoli, Tr. 2510-11; Hughes, Tr. 5173-74) When cal hypo is sold or used as a shock treatment, it is a complementary rather than a substitute product to whatever primary swimming pool sanitizer is being used. (Christensen, Tr. 1935; Benson, Tr. 5000; Spiegel, Tr. 6780-81) **[29]**

101. The rate of growth in demand for calcium hypochlorite has declined. From the early 1970's to the early 1980's, the demand for calcium hypochlorite grew at an annual rate of about 8-9%. (CX 546-A) More recently, forecasts of cal hypo demand growth have been in the 4% per year range. (CX 548-D; Hughes, Tr. 5166) Cal hypo's greatest growth area is the Northeast, although its use is growing in the South and Southwest as well. (CX 291-B#)

c. *Bromine-based Pool Chemicals*

102. Bromine-based pool sanitizers have been available since the late 1950's. Bromine comes in two forms: a dry form known as "hydantoin" or "BCDMH" that is offered in sticks or tablets; and sodium bromide, which is a two-part system involving liquids. The hydantoin bromine is used to sanitize swimming pools and spas, while sodium bromide is used almost exclusively in spas. Because sodium bromide must be used with another chemical, monopotassium sulphate, and because it is difficult to balance and control, the substantial amounts of the two chemicals required to sanitize a pool, sodium bromide is considered impractical for that use. (Marshall, Tr. 1669; Jonas, Tr. 2234-35)

103. Brominated sanitizers such as BCDMH are much more expensive than isos and cal hypo (CX 100-B; CX 736-B; Marcum, Tr. 4143#; Vonderlow, Tr. 4824; Breving, Tr. 6183; Spiegel, Tr. 6795) and have not been widely used by pool owners. (Bloom, Tr. 719; Marshall, Tr. 1142, 1154, 1166; Christensen, Tr. 1833-34; Russ, Tr. 5694; Spiegel, Tr. 6817-18, 6866) However, BCDMH is widely used in spas and hot tubs because it maintains its sanitizing effect longer than chlorine in hot water (104 to 105 degree) present in spas and hot tubs. (CX 175-Z38; CX 471-Z20#; Schaub, Tr. 2100; Jonas, Tr. 2233-34; Castagnoli, Tr. 2437-38; Marcum, Tr. 4142#; Sossamon, Tr. 4586; Hughes, Tr. 5234#; Scott, Tr. 5790; Kent, Tr. 6497, 6523, 6527) BCDMH is also used in industrial water treatment. (Marshall, Tr. 1176)

104. BCDMH or hydantoin bromine is usually fed to the pool or spa through a "brominator," a device built into the pool's filtration system. BCDMH is sold in a granular, tablet and stick form. (CX 102-E; Kennedy, Tr. 459; Breving, Tr. 6172)

105. Bromine is a much less effective sanitizer of swimming pools than chlorine (CX 10-Z20; Marshall, Tr. 1142-43, 1154-55; Christensen, Tr. 1833; Jonas, Tr. 2232-33, 2236-37) and as much as thirty pounds of bromine may be required every two weeks in order to sanitize a residential pool. (Breving, Tr. 6226-27) BCDMH cannot be stabilized in a residential pool in a cost-effective manner. (Bloom, Tr. 719) BCDMH has also been **[30]** plagued by technical problems (CX 93-B#), including causing malodors (CX 10-Z20), turning pool water a greenish color (Vonderlow, Tr. 4825), and causing itching and skin irritation to bathers. (CX 89-A#; Jonas, Tr. 2233) Certain provinces in Canada have outlawed the use of brominated sanitizers because such

problems were considered a risk to public health. (CX 41; CX 97; CX 99; Jonas, Tr. 2233)

106. There is currently only one known producer of BCDMH of any significance, the Hydrotech Division of Great Lakes Chemicals Corporation (Kennedy, Tr. 516; Vonderlow, Tr. 4824), with a capacity of # # (CX 87#; CX 102-D; Marshall, Tr. 1174-75, 1220-21#) Patents held by Hydrotech expired in 1981 and 1985 (Marshall, Tr. 1144-45) and, although new competition has been anticipated since 1980, it has yet to materialize. (Marshall, Tr. 1145-47, 1151-52#)

107. Presently, BCDMH accounts for about 4.5 million pounds in sanitizer sales in the United States annually. (CX 2-I, Q; CX 102-F; CX 104-D, L-M, Z12) The evidence indicates that brominated pool sanitizers will remain insignificant for the foreseeable future. (Marshall, Tr. 1153-55#)

d. *Lithium Hypochlorite*

108. Lithium hypochlorite is a crystalline solid containing 35% chlorine (CX 10-Z22; CX 184-E-F#; Bloom, Tr. 718; Schaub, Tr. 2102; Jonas, Tr. 2214, 2223; Kosche, Tr. 8453#), and generally applied to pool water by broadcasting. (Kennedy, Tr. 459; Breving, Tr. 6188)

109. Lithium hypochlorite contains a relatively low level of insolubles and dissolves well in cold water. (Kennedy, Tr. 459; Christensen, Tr. 1830) It is more expensive than either calcium hypochlorite or isocyanurates. (Christensen, Tr. 1830; Schaub, Tr. 2102; Castagnoli, Tr. 2459; Marcum, Tr. 4141#; Vonderlow, Tr. 4826-27; Benson, Tr. 4919) Olin's George Turnipseed has estimated that, based on chlorine content, lithium hypochlorite is three times as expensive as isos. (CX 471-Z20#) There is also some concern in the swimming pool industry about possible health hazards associated with the use of lithium hypochlorite as a pool sanitizer (CX 10-Z22; Christensen, Tr. 1834-35; Schaub, Tr. 2102)

110. Lithium hypochlorite has a limited use as a pool sanitizer. (Schaub, Tr. 2100; Vonderlow, Tr. 4770) It is not generally available in significant quantities on a reliable basis. (Christensen, Tr. 1835; Schaub, Tr. 2100; Jonas, Tr. 2223-24) There is only one known producer of lithium hypochlorite, Lithium Corporation of America, with a capacity of **[31]** about # # pounds. (CX 184-C#; CX 414; Bloom, Tr. 718; Jonas, Tr. 2224; Castagnoli, Tr. 2435; Sossamon, Tr. 4616)

111. Lithium hypochlorite's use as pool chemicals is insignificant compared to the overall consumption of swimming pool sanitizers. (CX 412#; CX 686-C#; Bloom 627) Witnesses testifying at trial suggested it accounts for 1-3% of total sanitizer usage. (Schaub, Tr. 2100; Vonderlow, Tr. 4770) Presently, lithium hypochlorite accounts for less than # # pounds of sanitizer sales in the United States annually. (CX 184-D#) The suppliers who distribute lithium hypochlorite as a pool sanitizer generally market the product for shock treatment. (CX 414; Marshall, Tr. 1132; Jonas, Tr. 2223; Castagnoli, Tr. 2459) Lithium hypochlorite is also sold as laundry bleach and toilet bowl cleaner. (CX 184-D#)

2. Liquid Pool Chemicals

a. *Sodium Hypochlorite or Bleach*

112. Sodium hypochlorite is a liquid which is sold for swimming pool use with approximately 10-12% chlorine content. (Kennedy, Tr. 461-62; Castagnoli, Tr. 2503; Smith, Tr. 6668) It is generally applied by pouring it into the pool or a bleach feeder can be used. (RX 367; RX 368-C; RX 368-B)

113. Sodium hypochlorite or bleach is manufactured by reacting caustic soda with chlorine. It can be made in either a batch process, by mixing a predetermined quantity of bleach at one time, or a continuous process, by continuously reacting a flow of ingredients. The continuous process has lower labor cost and larger output than the batch process. (Smith, Tr. 6660-61; Wilson, Tr. 4293)

114. Bleach may be used as either a primary sanitizer or a shock treatment. (Kennedy, Tr. 460-61, 597; Marshall, Tr. 1222; Castagnoli, Tr. 2496-97) Bleach used as a shock treatment is chemically the same as bleach sold or used as a primary sanitizer. (Moran, Tr. 5560-61#)

115. Bleach is a less expensive product than isos or cal hypo (Breving, Tr. 6175) and is said to be popular among less affluent owners where it is available. However, it is a relatively inconvenient product to use as a swimming pool sanitizer because of its bulk, weight, liquid form and instability. (Pettoruto, Tr. 1349#; Behnke, Tr. 1600; Schaub, Tr. 2046; Wilson, Tr. 4338-39; Vonderlow, Tr. 4861-63; Hammersmith, Tr. 6109-12) **[32]**

116. Sodium hypochlorite is chemically unstable and loses its chlorine content rapidly, even in the best of circumstances, and the rate of decay is accelerated in warm weather. (Kennedy, Tr. 461; Behnke, Tr. 1602; Christensen, Tr. 1783; Castagnoli, Tr. 2508;

Wilson, Tr. 4378-79) Sodium hypochlorite also has a strong adverse effect on water pH. (CX 10-Z59; Schaub, Tr. 2046)

117. Liquid bleach is also used in home and commercial laundry applications, and industrial applications, such as waste water treatment. Bleach used for home laundry generally has about 5% chlorine. The machinery used to manufacture household bleach cannot be used to make pool bleach. (Wilson, Tr. 4385-86, 4504; Castagnoli, Tr. 2505) Commercial bleach, like that sold to commercial laundries, has the same level of available chlorine as bleach sold for swimming pool sanitization end-use, that is, it is labeled at 12%, but it is produced at approximately 14 to 16%. (Castagnoli, Tr. 2503-04)

118. Pool bleach is not used or sold in many areas of the country. Its use has been limited to certain "pockets" or regions. (Castagnoli, Tr. 2443) In those regions where it is popular, it is generally sold in gallon jugs, "4x1s" (four one-gallon containers sold together in a carrying case) or in "carboys" (two-and-one-half or five gallon containers).

119. A number of respondent's witnesses, who appeared to be bleach-enthusiasts, testified that sales of pool bleach have been increasing in many areas, including certain sections of the country where it had not been available or popular. *See* RPF 630. However, the distribution of pool bleach is generally limited to an area within a 250-to-300-mile radius of a pool bleach plant because of its bulk, weight and high transportation cost and low unit value. *See* F. 285-89, *infra.* The record as a whole indicates that at the present time pool bleach plants are to be found in or near those pockets or regions where pool bleach has traditionally been a factor in residential pools, such as portions of southern Florida, southern California and the Detroit metropolitan area.

b. *Baquacil*

120. "Baquacil" is the brand name of a liquid pool sanitizer produced by Imperial Chemical Industries Plc. in the United Kingdom and is marketed by ICI America in the United States. ICI America describes it as an alternative to chlorinated sanitizers which can be used to sanitize a pool in lieu of isos, cal hypo or liquid bleach. Baquacil is a liquid, non-chlorine-bearing sanitizer that is marketed in a three-part **[33]** system, involving the use of Baquacil in conjunction with two other liquid products. (CX 532-B; Jonas, Tr. 2235-36)

121. Baquacil is not compatible with chlorine systems (Pettoruto, Tr. 1350-51; Spiegel, Tr. 6820) and can cause stains on plaster or

concrete pools and problems with the filtration system. (Bloom, Tr. 725-26#; Pettoruto, Tr. 1350#; Spiegel, Tr. 6820) The operating cost for the residential pool owner using the Baquacil system is about twice that of comparable chlorine sanitizers. (CX 532-F; Spiegel, Tr. 6820)

122. Baquacil is available in limited areas in this country (CX 128-C#) and is largely unheard of by sellers of pool chemicals. (Christensen, Tr. 1836; Roberts, Tr. 5095; Scott, Tr. 5843) Those who are familiar with Baquacil do not consider it to be a viable product. (CX 532-D; Kennedy, Tr. 497; Jonas, Tr. 2235-36; Castagnoli, Tr. 2439)

123. Initial marketing efforts # # (CX 128-B#) Sales of Baquacil are in the # # million range and is insignificant. (Bloom, Tr. 723#)

3. Chlorine Gas

124. Chlorine gas is almost 100% chlorine, comes in pressurized cylinders and is used to sanitize commercial pools. The gas is fed into the pool by using relatively expensive, specialized metering equipment. (Kennedy, Tr. 464; Pettoruto, Tr. 1540#; Christensen, Tr. 1836-37; Kosche, Tr. 8454#) Chlorine gas is highly toxic and dangerous and its use required a skilled licensed operator. (Kennedy, Tr. 464; Christensen, Tr. 1837; Jonas, Tr. 2240; Wilson, Tr. 4380) It is also difficult to store and to transport long distances. (CX 255-A)

125. The use of chlorine gas as a pool sanitizer is limited almost exclusively to large, older commercial pools, and its use has been declining for many years. (CX 128-B#; CX 177-P; Kennedy, Tr. 501; Christensen, Tr. 1836-38; Jonas, Tr. 2240; Aston, Tr. 4505-06; Breving, Tr. 6224) Because of the toxic and corrosive properties of chlorine gas and the need to employ sophisticated metering equipment, chlorine gas is impractical and dangerous for use by residential pool owners. (CX 10-Z57-58; Kennedy, Tr. 463; Christensen, Tr. 1836-38) Consequently, chlorine gas is virtually never used as a pool sanitizer in residential pools. (CX 471-Z21#; Kennedy, Tr. 501; Pettoruto, Tr. 1540#; Christensen, Tr. 1840; Jonas, Tr. 2239-40; Marcum, Tr. 4142#; Smith, Tr. 6721-22) In the few instances in which gas is used to sanitize residential pools, it is applied by licensed, **[34]** pool service personnel. (Pettoruto, Tr. 1540#; Christensen, Tr. 1839-40; Marcum, Tr. 4142#)

4. Mechanical Pool Sanitizers

126. Chlorine generators, also called salt chlorinators and electrolytic converters, are pool sanitizing devices that use electricity to

derive chlorine from concentrated salt water. (Christensen, Tr. 1841-42; Jonas, Tr. 2238)

127. Chlorine generators retail anywhere from $600-$1800 (CX 82; CX 545-E; Christensen, Tr. 1842-43; Jonas, Tr. 2239; Vonderlow, Tr. 4827), and generally entail high electrical operating costs. (CX 10-Z21; Christensen, Tr. 1844) The active parts of these mechanical devices frequently corrode, requiring maintenance or replacement. (CX 10-Z20-Z21; CX 545-E; Christensen, Tr. 1842-43; Spiegel, Tr. 6821) Repair costs tend to be substantial. (CX 545-E; Christensen, Tr. 1843; Vonderlow, Tr. 4828; Russ, Tr. 5714-16) Chlorine generators also pose safety hazards such as chlorine gas leaks and hydrogen gas explosions. (CX 10-Z21)

128. Chlorine generators have been on the market for decades (CX 56-A-B; Christensen, Tr. 1842; Scott, Tr. 5841-42) and numerous companies have tried unsuccessfully to market them over the years. (Christensen, Tr. 1843-44; Russ, Tr. 5707-08; Scott, Tr. 5841-42) They are sold by professional pool dealers and pool builders, who build the pools and install and service chlorinators. (Vonderlow, Tr. 4807, 4827-30; Russ, Tr. 5656-57) A negligible number of swimming pools in the United States are sanitized with chlorine generators. (Jonas, Tr. 2239; Kent, Tr. 6620)

129. Ozonators are machines that sanitize pool water by generating ozone and have been on the market for several years. (Christensen, Tr. 1840; Kent, Tr. 6617) At retail, ozonators are priced in the $1,500-$3,000 range. (Jonas, Tr. 2238) A major drawback of ozonators is that they leave no detectable sanitizer residue in pool water, making it difficult to test whether the pool water is in fact in sanitary condition. (CX 415; Christensen, Tr. 1840-41) A second drawback is that, unless regularly and properly maintained, ozonators develop corrosion deposits which prevent them from operating properly. (Christensen, Tr. 1841) Ozonators also require use of ultraviolet lamps which are costly to replace. (CX 415)

130. Ozonators are used primarily in large, commercial pools and in conjunction with a chlorine sanitizer. (CX 415; Christensen, Tr. 1840-41; Jonas, Tr. 2237) **[35]**

B. *Pool Chemicals Consumers*

131. Users and consumers of pool chemicals are residential pool owners, commercial pool operators and pool service companies. (CX 259-I#; CX 264-D#; CX 267-C#; Kosche, Tr. 8786-87#)

1. Residential Pool Owners

132. At the end of 1984, there were about 3.9 million residential pools in the United States. (CX 4-C; CX 233-B) The majority of retail sales dollars spent on pool sanitizers are accounted for by residential pool owners. (Kosche, Tr. 8895#)

133. Residential pool owners are the focus of Olin's advertising, promotion and sales efforts for its HTH and PACE brand pool sanitizers. (Kosche, Tr. 8786, 8788, 8790#) And most of Olin's market studies have focused on the residential pool owner. (CX 276-W-Z3; CX 295#; Kosche, Tr. 8788-89#)

134. Other pool chemical producers compile and use market information about residential pools, residential pool owners and their pool chemicals usage. *E.g.*, CX 4-L-T; CX 53; CX 664-Z4; Christensen, Tr. 1889.

135. Residential pool owners who maintain their own pools are sometimes referred to as "do-it-yourselfers" or "self-maintainers." (Kosche, Tr. 8790#) Nationally, 90% or more of residential pool owners are self-maintainers. (CX 4-N; Kosche, Tr. 8790#) Aside from a few areas of the country where use of pool service is relatively popular, most of residential pool owners in this country maintain their own pools. (CX 288)

136. In studying pool sanitizer usage trends among residential pool owners, Olin # # (CX 284-E#); Kosche, Tr. 8640, 8791#) # # (Kosche, Tr. 8794#)

137. Since 1977 Olin annually has purchased residential pool owner primary usage data from a firm known as National Family Opinion ("NFO"). (CX 284-E#) # # (CX 259-I#; CX 276-I, T; CX 278-D#; CX 280-A-B#; CX 281-A#; CX 282-C#; CX 283-E#; CX 284-E#; CX 476-Z23#; CX 647#; Kosche, Tr. 8792-95, 8797-99#) Many industry participants **[36]** estimate pool sanitizer market shares in terms of the percent of pools treated with the sanitizer. (CX 4-M; Kennedy, Tr. 478; Pettoruto, Tr. 1540#; Scott, Tr. 5789-90, 5845-46)

138. The evidence shows that the self-maintainer's initial selection of pool chemicals is largely influenced by the recommendation of pool builder-installers or professional pool store dealers, who initiate the residential self-maintainer into the somewhat technical and arcane realm of pool maintenance and pool chemicals. (Castagnoli, Tr. 2513; Scott, Tr. 5798)

139. The evidence also strongly indicates that residential owners look for ease, simplicity and convenience of use in choosing pool

chemicals and that the price is usually not the primary consideration. (CX 276-Z1; CX 295-S#; Bloom, Tr. 661; Sossamon, Tr. 4647#; Hughes, Tr. 5052; Kosche, Tr. 8807-09#)

2. Commercial Pool Operators

140. Commercial pools range from municipal and community pools to pools operated by hotels and motels, apartment buildings and condominiums, clubs, schools, YMCA's and other institutions. (CX 430#; Christensen, Tr. 1880; Wilson, Tr. 4292; Breving, Tr. 6203) These pools are generally much larger than residential pools, containing 100,000 gallons or more of water, compared to an average of 20,000 to 30,000 gallons of water in residential pools. (Marcum, Tr. 3983) Operators of these pools are price sensitive in the purchase of supplies for their pools. (CX 259-I#)

141. At the end of 1984, there were about 400,000-500,000 commercial pools in the United States (CX 4-C; CX 430-A#; Bloom, Tr. 635) and about # # of them were located in the Pacific Southwest. (CX 430-O#)

142. Commercial pools are treated as a separate market in Olin planning documents (CX 255-A; CX 259-K#; CX 267-C#; CX 271-Q#) and Monsanto market research also looks at commercial pools separately from residential pools. (CX 4-L-T, U-Z3; Christensen, Tr. 1889)

3. Pool Service Companies

143. Pool service companies provide periodic (usually weekly or more) pool maintenance service to pool owners. Their service ranges from opening a pool at the beginning of the season (*i.e.,* add 20 to 25 gallons of bleach to pool water to kill off any bacteria, algae, etc. and make the pool "swimmable" (Roberts, Tr. 5090), providing weekly sanitization of the pool, performing repairs, vacuuming the pool, and closing the pool at the end of **[37]** the season. (Hammersmith, Tr. 6024-25; Breving, Tr. 6200; Smith, Tr. 6648)

144. Pool service companies are highly price sensitive with respect to the cost of supplies they use (CX 259-I#) and tend to use bleach where it is available, because it is the least expensive pool chemical. (CX 267-C#; Scott, Tr. 5830; Kosche, Tr. 8879#)

145. The average cost of the basic pool service in Westchester County, New York, and in southern California is $40-$42 a week. (Sossamon, Tr. 4728; Breving, Tr. 6191) Such service is generally

once a week and often must be supplemented by the addition of pool chemicals by the pool owner between visits by the serviceman. (Arakelian, Tr. 5982) The cost of these additional chemicals is not included in the regular service fee. (Sossamon, Tr. 4728) Full service requiring several trips a week by the serviceman would cost considerably more. (Sossamon, Tr. 4728-30; Roberts, Tr. 5138-39) The cost of basic pool service is over twice what a self-maintainer would spend to maintain his own pool with dry chemicals. (Sossamon, Tr. 4730)

146. It appears that those areas where pool service is relatively popular largely coincide with those areas where bleach has been a popular pool chemical.

147. The use of pool service companies is most prevalent in southern California, south Florida and metropolitan Detroit. (Bloom, Tr. 635-36; Marshall, Tr. 1134; Kent, Tr. 6529; Kosche, Tr. 8879#) In southern California, pool service is used by as many as 20-30% of residential pool owners. (CX 288; Kosche, Tr. 8790) Aside from these three areas, the proportion of residential pool owners using pool service is about 2-4%. (CX 288) On a national basis, it is about 7-10%. (CX 4-N; CX 284-Z18#; CX 288; Kosche, Tr. 8790#)

148. Most of the pools in south Florida that are sanitized with bleach are treated by pool service companies. (Kent, Tr. 6608) A Florida distributor who testified for Olin sells all his bleach to pool service companies. (Kent, Tr. 6599) A large percentage of bleach consumed on the West Coast is used by pool service companies. (Bloom, Tr. 647) A California bleach producer, Hasa, Inc., estimated that 40% of his bleach sales are to pool service companies. (Wilson, Tr. 4291)

149. An Olin marketing plan estimated that # # of the pool service companies in southern California used bleach and that # # of all bleach in southern California was consumed by pool service companies. (CX 486-F#) The owner of Steelcrete, a bleach distributor in Detroit, testified that most of his top **[38]** twenty bleach accounts are engaged in pool service operations that may consume 35-40% of the bleach they buy from Steelcrete. (Scott, Tr. 5831)

150. Olin's internal documents categorize pool service as a separate sanitizer market from residential self-maintainers. *E.g.*, CX 267-C#.

C. *Marketing and Distribution of Pool Chemicals*

151. In the pool chemicals industry the term "dry" sanitizers refers

to calcium hypochlorite and isocyanurate pool sanitizers. (CX 264-D#; Kennedy, Tr. 447, 528; Pettoruto, Tr. 1322; Christensen, Tr. 1827-28; Hughes, Tr. 5264#; Henske, Tr. 7168#; Kosche, Tr. 8642-43#)

152. Pool chemicals are marketed through several distribution channels. Producers can sell the product in bulk form to repackers, or in consumer-sized packaging under their own brand label to distributors or retailers, or in consumer-sized packaging to distributors or retailers under the latter's private brand labels. (Christensen, Tr. 1796; Vonderlow, Tr. 4786-89; Ishida, Tr. 921-22, 972#; Hughes, Tr. 5170-72) Trading companies and import merchants may also be involved in the marketing of imported pool chemicals. (CX 676-Z71, Z72, Z137 to Z139#; Ishida, Tr. 918; Pettoruto, Tr. 1311-12, 1330)

1. Isos and Cal Hypo

a. *Producers*

153. At the time of the acquisition, there were four domestic producers of dry sanitizers. (CX 264-D#; Christensen, Tr. 1796) PPG Industries, Inc. and Olin produced cal hypo. (Kennedy, Tr. 502; Christensen, Tr. 1796) FMC, Monsanto and Olin produced isos. (Kennedy, Tr. 513; Christensen, Tr. 1796) Dry sanitizers were also imported, primarily from Japan through Japanese trading companies. (CX 176-Z11; CX 179-Z21-23, Z55-56; CX 471-Z7#)

154. Olin and FMC packaged much of their own production under their own brand names for sale to distributors, mass merchandisers or, in some cases, larger pool dealers. (CX 179-Z20-21; CX 259-M, Q#; Castagnoli, Tr. 2486; Collins, Tr. 3572; Wilson, Tr. 4272; Hughes, Tr. 5171)

155. Olin's HTH brand cal hypo and PACE brand iso are sold to consumers through all types of retail outlets, while FMC's SUN brand of isos was sold to consumers primarily through **[39]** pool dealers. (CX 127-I#; CX 177-S; CX 545-D; CX 880-O-P#; Wilson, Tr. 4272) HTH, PACE and SUN, now all owned by Olin, are the most significant brands of dry sanitizers. (Marshall, Tr. 1156; Schaub, Tr. 2114; Jonas, Tr. 2260-61; Castagnoli, Tr. 2454-55; Hughes, Tr. 5353#; Henske, Tr. 7167, 7169#) HTH dominates the cal hypo segment, with HTH sales constituting over # # of cal hypo pool sanitizer sales. (CX 647-B#)

156. FMC's (now Olin's) SUN brand had and now has the largest share of any brand of the isos market. (CX 4-Q; CX 5-B) Olin's PACE

brand has the second largest share of any brand of isos. (CX 4-Q; CX 5-B)

157. The third U.S. manufacturer, Monsanto, sold its iso production exclusively in bulk to repackers. (CX 179-Z20; CX 256-K; Marcum, Tr. 3961-62)

158. The fourth U.S. producer, PPG, followed a "private label" strategy of packaging its product for sale to large distributors in consumer packaging bearing the distributors' respective proprietary brand labels. (CX 259-M#; CX 549-A; CX 677-Z160#; Christensen, Tr. 1890-91; Hughes, Tr. 5301#) PPG also sold small quantities of its own brand of cal hypo under the PITTCLOR label. (Hughes, Tr. 5170-73)

159. Dry sanitizers imported into the United States were sold in bulk to repackers, generally through trading companies and/or importers. (CX 677-Z15-17#; Ishida, Tr. 931; Pettoruto, Tr. 1376, 1521-24#)

b. *Repackers*

160. Repackers buy pool chemicals in bulk form (100-400 pound drums) and package them into consumer-sized packaging (1-100 pounds) under their own label or the private label of a distributor or retailer (Kennedy, Tr. 448-49; Bloom, Tr. 634; Pettoruto, Tr. 1335-36#; Christensen, Tr. 1796) Repackers buy from domestic producers or from trading companies or import houses. Many repackers also reformulate pool chemicals into tablets or sticks before packaging. (Kennedy, Tr. 448-49; Collin, Tr. 3569) Some repackers also perform contract packaging and tabletizing for producers. (CX 179-Z29)

161. Repackers sell pool chemicals to both levels of distribution below them, *i.e.*, distributors and retailers. Some repackers also operate their own retail stores. (CX 179-Z29) Repackers generally sell in regional marketing territories. Not even the largest of the repackers, such as Bio-Lab, E-Z Clor, Alden Leeds, Georgia Pacific, and Hydrotech, have a national distribution system. (Christensen, Tr. 1785, 1891) Compared **[40]** with the national brands SUN, PACE and HTH, repackers generally have relatively limited advertising and promotional programs. (Castagnoli, Tr. 2534) Repacker brands compete with the national brands by offering lower prices. (Scott, Tr. 5849; Kent, Tr. 6586-87, 6594#; Henske, Tr. 7128#)

162. During the late 1970's, there were over forty independent repackers in the United States. (CX 54-A; Marshall, Tr. 1124) A 1985

document prepared by one major repacker places the number of independent repackers at thirty-two. (CX 5-B) Some repackers believe that there are now no more than twenty repacker operations still in business. (Christensen, Tr. 1795-96; Schaub, Tr. 2110; Jonas, Tr. 2219-20)

c. *Distributors and Retailers*

163. Distributors are wholesalers who buy pool chemicals in consumer-sizes from producers or repackers, and sell to retail dealers. (Schaub, Tr. 2020; Sossamon, Tr. 4589; Vonderlow, Tr. 4768; Hughes, Tr. 5170; Kent, Tr. 6525) There are approximately 500 to 700 distributors in the United States. (CX 176-W)

164. Retailers are divided between pool dealers or "pool pros," who specialize in retail sales of a range of pool-related products and services to residential pool owners, and non-specialists, which include mass merchandisers, lawn, garden and building supply outlets and other retail outlets. (Schaub, Tr. 2020; Vonderlow, Tr. 4806; Hughes, Tr. 5170-71; Hammersmith, Tr. 6022; Smith, Tr. 6647#)

165. Mass merchandisers, also referred to in the pool industry as "the masses" or "the chains," generally provide little or no customer service to the residential pool owner. (Behnke, Tr. 1594) Olin estimates that approximately # # of all isos sales and # # of all cal hypo sales are made through mass merchandisers. (CX 310-A#) It is estimated that there are more than 17,000 retail outlets which sell pool chemicals in the United States. (CX 176-W)

2. Bleach

166. Liquid bleach is generally produced and sold within a two to three hundred mile radius of the bleach plant. (Schaub, Tr. 2110; Wilson, Tr. 4303; Marcum, Tr. 4134-35#; Benson, Tr. 4959; Scott, Tr. 5765, 5802-03; Hammersmith, Tr. 6029-30, 6089) In some instances, bleach may be shipped as far as 400 to 425 miles when other dry pool chemicals are being shipped on the same run. (Christensen, Tr. 1853-59) It may be sold directly to distributors, retailers or consumers either under the producer's label or the private label of the distributor or retailer. **[41]** (Spiegel, Tr. 6858-59; Roberts, Tr. 5080-81; Kent, Tr. 6532-33) In any event, it is not possible to get nationwide distribution out of any one bleach plant. (Turnipseed, Tr. 1858-59)

IV. THE RELEVANT PRODUCT MARKETS

A. *Introduction*

167. The complaint alleges, and the parties agree, that isos constitute a relevant product market in this case. (Complaint ¶ 13(b). *See* CPF 386-410; CB at 18-20; RPF 665-703; RB at 46-67). However, the parties sharply disagree as to whether isos and cal hypo together, the leading dry pool chemicals, also constitute a valid antitrust market for the purposes of this case. The record as a whole clearly and convincingly demonstrates that (1) isos and cal hypo together constitute a valid antitrust market in this case; (2) isos alone also constitutes an economically significant product market; and (3) bleach does not belong to the same product market with cal hypo and/or isos for the purposes of this proceeding.

168. To paraphrase *Brown Shoe*, a determination of the relevant market is a necessary predicate to a finding of liability under Section 7 because the threatened substantial lessening of competition or tendency to create a monopoly must be within the area of effective competition. *Brown Shoe Co. v. United States*, 370 U.S. 294, 324 (1962) (quoting *United States v. E.I. du Pont de Nemours & Co.*, 353 U.S. 586, 593).

169. *Brown Shoe* further made clear that the *outer* boundaries of a product market are determined by the reasonable interchangeability of use or the cross-elasticity of demand between the product and its practical substitutes and further that the product market boundaries must be drawn with sufficient breadth to recognize competition where it in fact exists. *Brown Shoe*, 370 U.S. at 325-26.

170. As a guide to these analyses, *Brown Shoe* pointed to a number of "practical indicia," including industry or public recognition as a separate economic activity, the product's peculiar characteristics and uses, unique production facilities, distinct customers, distinct prices, sensitivity to price changes and specialized vendors. *Brown Shoe*, 370 U.S. at 321. These indicia, however, are not to be applied in mechanical fashion, but are to be used to define product markets that are economically significant in terms of the alleged anticompetitive effect. *E.g.*, *IT&T Corp. v. GT&E Corp.*, 518 F.2d 913, 932 (9th Cir. 1975). **[42]**

171. In applying these principles to define a relevant product market in which the effects of a given merger is to be evaluated under Section 7, the 1984 *Department of Justice Merger Guidelines* ("*DOJ*

Guidelines"), Trade Reg. Rep. (CCH) No. 655 (June 14, 1984), seek to determine whether a hypothetical monopolist could profitably increase price by a "small but significant and nontransitory" amount without inducing enough buyers to shift to substitute products outside the postulated market so as to render such an attempt to increase price unprofitable. If such a price increase would result in substantial shifting, the DOJ would add the next-best substitute to the product market and ask the same question with respect to the broader market. The smallest group of products which would permit such a profitable price increase will constitute an appropriate relevant product market. *See DOJ Guidelines* § 2.11.

172. Industrial organization economists approach the question of product market definition from the standpoint of cross-elasticity of demand or supply (Kamerschen, Tr. 2660), which is defined as the percentage change in the quantity of one product over the percentage change in the price of another product. (Kamerschen, Tr. 2676; Ordover, Tr. 9411, F. Scherer, *Industrial Market Structure and Economic Performance* (2d ed. 1980) at 61 n. 57.)

173. To be sure, "cross-elasticity of supply and demand" is an attractive concept in defining an "economic market." It has the virtue of conceptual clearity and enables a rational delineation of markets within the framework of equilibrium price theory. However, the "real world" has seldom, if ever, been as accommodating as one might wish in terms of providing precise or reliable price-quantity data of sufficient scope or depth to enable us to define with any degree of precision an economic market with respect to any product or a group of products. *See, e.g.*, Scherer, *supra*, at 60; Glassman, *Market Definition As A Practical Matter*, 49 Antitrust J. 1155, 1156, 1161-65 (1981); Kamerschen, Tr. 2676. Although references to cross-elasticity abound in product market discussions in judicial decisions and antitrust law literature since *Brown Shoe*, we have yet to see a reported decision in which the court determined the appropriate product market based on a rigorous application of the cross-elasticity test.

174. Be that as it may, inasmuch as the purpose of the cross-elasticity analysis is to see whether consumers in the marketplace regard functional substitute products as realistically close-enough substitutes to require that they be placed in the same product market, limited or less than perfect data could be used as a surrogate to see if the available data **[43]** suggest that the products under discussion are

in fact close-enough substitutes and belong to the same product market.

175. In an attempt to apply these concepts to product market definition, the *DOJ Guidelines* suggest that a hypothetical price increase of 5% be used as a general benchmark, although the 5% test is not to be applied inflexibly and much smaller or much larger increases may be postulated depending upon the trade realities of each case. *DOJ Guidelines* § 2.1; Statement Accompanying Release of Revised Merger Guidelines (June 14, 1984) at S-14 (BNA, June 15, 1984). Thus, the *DOJ Guidelines* acknowledge that "it will usually be necessary for the Department to infer the likely effects of a price increase from various types of reliable, circumstantial evidence," including evidence of buyer and seller perceptions, movements in prices, and technical product characteristics. *DOJ Guidelines* § 2.12. Economists also recognize the importance of such common-sense devices as looking for a "qualitative gap in the chain of substitutes." (Kamerschen, Tr. 2662; Scherer, *op. cit.*, at 60) Such information may be useful, in conjunction with other confirmatory information about the products, in determining the appropriate product market in this case.

176. The FTC's approach in defining a product market in horizontal merger cases is similar. The central inquiry is whether different products serving the same end use compete significantly with each other. If a high cross-elasticity of demand or reasonable interchangeability of use exists as a practical matter, the products belong to a single antitrust market. Where such competition exists, the products will significantly constrain each other's prices, output, product quality, marketing and other business decisions. *See* Statement of the Federal Trade Commission Concerning Horizontal Mergers, Trade Reg. Rep. (CCH) No. 546 (June 14, 1982) ("FTC Statement") at 12.

177. In defining the relevant product market for the purposes of this case, we shall examine "the various types of reliable, circumstantial evidence," including the evidence of product substitutability, perceptions of buyers and sellers and technical product characteristics insofar as reliable quantitative evidence of sufficient scope regarding the likely effect of a "small but significant and nontransitory" price increase upon buyers, is not available.

178. It is also important to keep uppermost in our mind throughout the discussion of product market in this case that our task is to determine an <u>antitrust market</u> for this acquisition and that that

market may or may not coincide with an economic market for pool chemicals. *Cf.* Scheffman and Spiller, Geographic Market **[44]** Definition Under the DOJ Guidelines, Working Paper No. 129, FTC Bureau of Economics (August, 1985), at 2-6.

179. To put it another way, our central inquiry is whether the acquisition is likely to lead to the exercise of market power by Olin or by some larger group of pool chemicals producers. Therefore, the definition of a relevant antitrust market requires the determination of the smallest relevant group of producers that can attain or possess market power, with the parties to the acquisition as the focus.

180. Therefore, our inquiry will start with the pool chemicals produced and sold by the parties to this acquisition, namely, isos and cal hypo. And, if the preponderance of credible evidence in the record shows that the acquisition may bestow market power upon Olin, or a small group of producers which includes Olin, in the market consisting of isos and cal hypo, then complaint counsel will have discharged their burden of establishing that isos and cal hypo constitute a valid antitrust market in this case even though there may be some evidence arguably suggesting that an economic market in academic sense might be broader.

B. *Isos and Cal Hypo, the Two Leading Dry Pool Chemicals, Constitute a Valid Antitrust Market in this Case*

1. Product Characteristics and Uses

181. Isos and cal hypo are dry pool chemicals. And they are both marketed in granular form. (CX 649-A-B; CX 650-C) The predominant form in which cal hypo is sold and used as a pool sanitizer is granular. (Schaub, Tr. 2162; Hughes, Tr. 5167, 5256#) Both dichlor and, to a limited extent, trichlor are sold as granular products. (Castagnoli, Tr. 2426; Hughes, Tr. 5167) Cal hypo and isocyanurates are also sold in agglomerated form, primarily as large tablets or sticks, although cal hypo tablets are relatively new. (Schaub, Tr. 2035; Hughes, Tr. 5256#; Wetzel, Tr. 5457; Smith, Tr. 6713#; Kosche, Tr. 8807#)

182. Both cal hypo and isocyanurates in their granular forms are applied to swimming pools in the same manner: they are usually broadcast directly to pool water. (CX 484-W#; Kosche, Tr. 8826-27#) Some cal hypo package label instructions recommend that the product be premixed in a container of water before being applied to pool water. (Schaub, Tr. 2058) Premixing is intended to minimize cal hypo

residue in the pool water. (Schaub, Tr. 2184) However, such residue is considered relatively [45] insignificant (Smith, Tr. 6721#), and users of cal hypo seldom follow the premixing instructions. (Schaub, Tr. 2058)

183. Cal hypo tablets and iso tablets are both applied to pool water by means of feeding devices. (Wetzel, Tr. 5458; Smith, Tr. 6713#; Kosche, Tr. 8822, 8831#)

184. Both cal hypo and isocyanurates have a high chlorine content and can provide relatively long-lasting chlorination. (CX 304-B; Wetzel, Tr. 5453; Smith, Tr. 6718-20#; Kosche, Tr. 8845-48#) Isos and cal hypo are both strong oxidizing agents. (Castagnoli, Tr. 2521-22)

185. Both isos and cal hypo are relatively stable chemicals (Kennedy, Tr. 458-59) that, under proper storage conditions, can maintain their potency throughout a pool season and into the next. (Marcum, Tr. 4133-34#)

186. Because both isos and cal hypo are solids and highly concentrated, stable chemicals, residential pool owners are able, with relative ease and convenience, to purchase, transport and store sufficient quantities of either product to treat their pools over long periods of time. (Christensen, Tr. 1787, 1829; Smith, Tr. 6717-18#) A pool owner can buy and take home a full year's supply of either cal hypo or isos by a family car in a single trip and store it in the corner of the garage or utility shed. (Bloom, Tr. 660; Wetzel, Tr. 5461-62)

187. Isos and cal hypo are similar in terms of ease of operation and relative cost. (Jonas, Tr. 2220) A pool dealer testifying for respondent stated he would recommend isos to customers who have problems with cal hypo and cal hypo to customers who have problems with isos. (Wetzel, Tr. 5462-63)

188. Isos and cal hypo are both shipped and sold nationwide. (Jonas, Tr. 2258; Marcum, Tr. 4135#) They are widely available in all regions of the country, including hard water areas. (CX 471-Z3#; Christensen, Tr. 1826-27)

189. Many witnesses summarized the reasons for the popularity of isos and cal hypo as a convenience advantage over other pool sanitizers. *E.g.*, Kennedy, Tr. 480-81; Bloom, Tr. 661-62; Behnke, Tr. 1618-19; Christensen, Tr. 1829; Schaub, Tr. 2066; Hughes, Tr. 5290-91#. The evidence is clear that, apart from product efficacy, convenience of use is the most important product characteristic to a self-maintainer. Consumers who are use to the convenience of a dry

sanitizer are likely to choose another dry product when considering switching. (Christensen, Tr. 1827-28; Hughes, Tr. 5290-91#) **[46]**

190. Olin consumer surveys show that, while consumers favored a dry sanitizer over a liquid product for convenience, few consumers were aware of the differences between isos and cal hypo. (CX 454-P, T#)

191. Although there are some significant variances in the degree of convenience between isos and cal hypo (*see* F. 269-73, *infra*), convenience of use is a qualitative factor which can be used in defining an antitrust market. The common characteristics of isos and cal hypo reviewed herein above clearly make the two dry pool chemicals the more convenient sanitizer for the average residential pool owner to use, and this is a qualitative factor important to consumers and which supports inclusion of isos and cal hypo in the same product market in this case. (Kamerschen, Tr. 2663-67, 2961-63)

2. Product Pricing and Price Sensitivity

192. The evidence shows that iso prices and cal hypo prices are largely determined independently of each other at the producer, distributor and retailer levels. Although the producers and distributors of isos and/or cal hypo often monitor or look at the prices of both dry products and are aware of historical price/volume relationship existing between isos and cal hypo (F. 196-223, *infra*), their pricing decisions are primarily made on the basis of their own product costs and desired margins and the prices of competing sellers of the same sanitizer, be it isos or cal hypo. *E.g.*, Marshall, Tr. 1198-1200, 1204-05; Behnke, Tr. 1697-98; Marcum, Tr. 3985-86, 3992; Vonderlow, Tr. 4812-13; Benson, Tr. 4920-21; Hughes, Tr. 5195-96, 5200; Smith, Tr. 6680#. This is obviously due to the commonly recognized fact that isos have always commanded a substantially higher price than cal hypo, and buyers do not look for price parity between the two products.

193. The evidence also shows that residential pool owners tend to stay with the pool chemical they are comfortable or familiar with and generally do not switch to another sanitizer except when there is a significant price increase or some use-related problems develop with their current product. This tendency appears to be more prevalent among users of iso products. Industry witnesses variously attributed this consumer behavior to the greater convenience of use offered by current iso products and also to the relative affluence of iso-

accustomed pool owners. *E.g.,* Kennedy, Tr. 591-92; Behnke, Tr. 1613-15, 1623; Christensen, Tr. 1929-30; Jonas, Tr. 2222; Aston, Tr. 4462-63, 4501-02; Vonderlow, Tr. 4812, 4865-66; Hughes, Tr. 5346#; Scott, Tr. 5825; Smith, Tr. 6679#. **[47]**

194. There is testimony that residential pool owners who use isos are generally not particularly price sensitive. (Arakelian, Tr. 5977) A number of industry witnesses testified that residential pool owners who use isocyanurates are not likely to switch in significant numbers to other sanitizers in response to an iso price increase of 5-10%. *E.g.,* Behnke, Tr. 1622; Jonas, Tr. 2227; Sossamon, Tr. 4724, 4730-31; Arakelian, Tr. 5978; Kent, Tr. 6560-61#; Spiegel, Tr. 6824-25) Nathaniel Jonas, a repacker of dry pool chemicals, testified from long experience in pool chemicals marketing dating back to early 1960's that sometime in the mid-1970's a large, incremental increase in the price of isos caused a "small shift" of his customers to cal hypo, and that any iso price increase below 20% would be considered small and would not cause a substantial shift. (Jonas, Tr. 2230-33)

195. To put it another way, although there is direct and head-to-head competition between isos and cal hypo for the pool chemicals business of residential pool owners of this country, cal hypo, which has been on the market since the mid-1950's, has enjoyed a definite price advantage over isos, a relative newcomer which appeared on the scene during the mid-1960's. Thus, the price sensitivity between isos and cal hypo is not pronounced.

3. There Is Industry Recognition of Historical Price/Volume Relationship Between Isos and Cal Hypo

196. There is clear evidence that the industry, based on past observation and experience, generally recognizes that the movements in the relative prices of isos and cal hypo bring about changes in the relative consumption levels of the two products. Recognition of this price/volume relationship between isos and cal hypo pervades the marketing and strategy documents of producers and importers and is also reflected in the testimony of industry witnesses.

197. (For example, Olin's 1983 Pool Chemicals CEO Presentation (RX 52#) contains the following chart (RX 52-N#): **[48]** # #

198. # # (CX 259-I-J#; CX 260-J#; CX 287-D-K; CX 289#) One such Olin document involves a business review of the 1983 performance of Olin's pool chemicals operations and identifies # # (CX 260-A, J#) Another is Olin's 1983 Pool Chemicals Strategic Plan. (CX 259-E, I-J#)

199. In these high level company documents, Olin # # (CX 259-I-J#; CX 260-J#; RX 52-N#) **[49]**

200. Olin has also observed that the change in the ratio between iso repacker price and HTH distributor price was reflected in a similar change in retail prices. (CX 259-J#; CX 287-A) # # (CX 280#; CX 283-E#; Kosche, Tr. 8797-8801#) # # (Kosche, Tr. 8794-96#) Thus, the relationship demonstrated by # # reliably reflects the existence of a corresponding price/volume relationship between retail sales of cal hypo and isos.

201. Dr. David Kamerschen, Distinguished Professor of Economics at the University of Georgia, testifying as an economic expert on behalf of complaint counsel, testified that the data in the record were insufficient to permit a cross-elasticity analysis of cal hypo and isocyanurates. However, he considered the price/volume data in evidence as a surrogate for cross-elasticity analysis. (Kamerschen, Tr. 2676-79) Dr. Kamerschen attached sufficient importance to the clear and repeated recognition of such a relationship by Olin in its own internal business planning documents. (Kamerschen, Tr. 2680-82, 2691)

202. Dr. Kamerschen expressed an opinion that a correlation analysis he performed using Olin's price/primary share data confirmed that most of the movement in the relative shares of the two products is attributable to the movement in their relative prices. (Kamerschen, Tr. 2679-93) However, Dr. Kamerschen also testified that limitations on the price/volume data in evidence did not permit him to perform a rigorous statistical analysis of the competitive relationship between isos and cal hypo. (Kamerschen, Tr. 2680-82) Thus, Dr. Kamerschen's correlation analysis is based on limited and incomplete data and its validity, standing alone, is open to doubt.

203. On the other hand, respondent's expert witness, Dr. Ordover, expressed an opinion that the Stigler price correlation test he performed shows that there was no statistically significant relationship between the prices of isos and cal hypo and that, therefore, the two products did not belong to the same market. (Ordover, Tr. 9142-50) Dr. Ordover also testified that the "inferential" residual elasticity of demand test he performed shows that isos and cal hypo did not belong to the same antitrust market because cal hypo was not exerting sufficient constraining influence upon iso prices. (Ordover, Tr. 9142, 9198-9205) Respondent contends that Dr. Ordover's quantitative analyses, employing the Stigler price correlation **[50]** test

and the residual elasticity of demand test, establish that isos and cal hypo do not belong to the same product market. *See* RB at 52-57.

204. Dr. Ordover's tests and opinions founded thereon were excluded for the reason that respondent had not complied in good faith with applicable prehearing order requirements regarding timely notice and that complaint counsel were not afforded a reasonable opportunity to prepare for cross-examination of Dr. Ordover with respect thereto. Respondent contended that the exclusion order was in error because Dr. Ordover's data is of the type permissible under Rule 703 of the Federal Rules of Evidence. However, the data in question can hardly be characterized as being "of a type reasonably relied upon by experts in the particular field." In the final analysis, the data in question was largely mixed, incomplete, entirely unverified and incorporated information collected and prepared for the purposes of this litigation. Therefore, Dr. Ordover's opinion testimony based on the out-of-court data was properly excluded. *E.g., Barrel of Fun, Inc. v. State Farm Fire & Gas Co.,* 739 F.2d 1028, 1033 (5th Cir. 1984); *Soden v. Freightliner Corp..,* 714 F.2d 498, 502-05 (5th Cir. 1983); *Wilder Enterprises v. Allied Artists Pictures,* 632 F.2d 1135, 1143-44 (4th Cir. 1980); *In re Agent Orange Product Liability Litigation,* 611 F. Supp. 1223, 1246-47 (E.D.N.Y. 1985). In any event, although the theories Dr. Ordover invoked appear sound, the quantitative analyses he performed employed such seriously flawed and essentially unreliable data that his opinions based thereon are not persuasive and are of little value in determining the product market issue in this case. *Also see* CRB at 5-6, 11-18.

205. In any event, the evidence is clear that Olin not only quantified the price/volume relationship between cal hypo and isocyanurates, it took full account of this relationship in planning the business strategies for its pool chemicals operation. Such examples are legion.

206. Olin's 1982-1991 PACE Strategic Plan (CX 267#), initially notes that the # # (CX 267-A#) and identifies this risk as one that # # with the effect of # # (CX 267-J#; *see also* CX 266-M#) Olin's contingency plan for responding to the adverse impact of cal hypo prices on its iso business was to # # (CX 267-J#) **[51]**

207. Similar recognition of the competitive relationship between the two types of dry sanitizers is also found in the 1982 Strategic Plan for Olin's HTH (calcium hypochlorite) business (CX 271#). This HTH Plan lists as one of its "Strategies and Action Programs" the maintenance of # # and the # # (CX 271-O#)

208. During a March, 1983 negotiation with Nissan/Sumitomo involving Olin's cyanuric acid (CA) requirements for isocyanurates, Mr. Turnipseed, then Director of Marketing Sales for Olin's pool chemicals business, explained that Olin's projections for market demand for isos were somewhat pessimistic due to a recent decline in cal hypo prices. (CX 594-B; Kitagawa, Tr. 2364-65, 2368) According to a telex report of the meeting prepared by Sumitomo-New York, Olin's pessimism was based on the company's observations that (CX 594-B):

Once the price of Cal.Hypro. [sic] rose, while the price of Cl. ICA [isocyanurates] fell, raising the quantity of the sale of CL. ICA. But the price of Cal.Hypo. has been declining for five to six months, thus pushing the quantity of the sale of Cl. ICA down again . . . .

Also see CX 595-A,D (notes taken of the meeting by the Sumitomo representative); Kitagawa, Tr. 2376-83.

209. The competitive price/volume relationship between isocyanurates and calcium hypochlorite is confirmed in more recent Olin statements. In a 1984 HTH market strategy analysis document (CX 273#), reference is made to the displacement of cal hypo by isos and the concomitant reduction in the historic cal hypo price advantage (CX 273-B#), and to the fact that one element in reversing this displacement was the maintenance of the # # (CX 273-G#)

210. While developing the 1985 pool chemicals strategic plan, Mr. Turnipseed, then Olin's Director of Marketing and Sales for Swimming Pool Chemicals, circulated a short version of Olin's 1984 strategic plan and noted that the plan was # # and that it was # # (CX 275-A#) That document noted that, to obtain acceptable returns, Olin must # # by, among other things, # # and that any # # for calcium hypochlorite would # # (CX 275-Q1, T, Y#) During an investigational hearing in this matter, Mr. Turnipseed acknowledged that **[52]** # # (CX 471-Z5#)

211. Finally, during the recent calcium hypochlorite dumping proceeding before the International Trade Commission ("ITC"), Olin maintained the position that the price/volume relationship between cal hypo and isos was a real and significant factor affecting its sales of both products. (CX 386-I; for similar Olin submissions to ITC, *see* CX 175-X, Z11, Z31; CX 283-F#; CX 380-L; CX 383-E, F)

212. PPG, which is the second largest producer of cal hypo in the world next to Olin (but which does not produce isos) (CX 5-A; CX 548-

E; CX 652-E#), also recognizes the price/volume relationship between cal hypo and isos. For example, PPG's 1984 business strategy paper states (CX 548-D):

> Consumption of calcium hypochlorite as a swimming pool sanitizer can be affected by chlorinated isocyanurate consumption. Over the past 5 years, chlorinated isocyanurate consumption (trichloroisocyanuric acid, specifically) grew at a faster rate than calcium hypochlorite. We believe the future growth of chlorinated isocyanurates will not be significantly above that of calcium hypochlorite.
> . . . a favorable ruling from the FTC [sic] on dumping by the Japanese . . . is expected to increase the price of chlorinated isocyanurates by 25 Percent . . . .

213. In the same document, PPG expresses its obvious concern about the adverse impact that low iso prices could have upon cal hypo demand and concluded (CX 548-R):

> Olin's high stake in the marketplace with HTH calcium hypochlorite suggests that it will continue to stimulate calcium hypochlorite demand; and it is very unlikely that isocyanurates would be retailed at a low price over the period of time necessary to permanently undercut the product demand for calcium hypochlorite.

214. Similarly, FMC, which produced isos but not cal hypo, also recognized the price/volume relationship between the two products. For example, FMC's pool chemicals management observed an "equilibrium pricing" differential between cal hypo and isos which, if maintained, "means the products grow at the **[53]** same market share without shifting." (CX 66-D) The same observation is also reflected in handwritten notes of J.M. Polkowski, FMC's industrial and international iso marketing manager, who was subsequently hired by Olin but was unavailable to testify during trial because of temporary physical infirmity. (CX 32-C; Kosche, Tr. 8969-70, 9067-69#)

215. On his working copy of FMC's 1984 pool chemicals plan, James R. Collins, FMC's CDB Business Manager at the time of the acquisition, noted an equation between cal hypo and iso prices which he described as reflecting a "substitution" equation. (CX 30-E; Collins, Tr. 3887-88) Mr. Collins also noted that iso price improvement would be possible, at least in part, because of cal hypo price increases that were anticipated to follow the cal hypo dumping proceeding. (CX 30-E; Collins, Tr. 3888-89)

216. Mr. Collin's outline for a customer sales presentation in October 1984 indicates that he viewed the cal hypo dumping case as providing FMC (an iso producer) with a "great opportunity to grow

market share." (CX 24; Collins, Tr. 3883-84) Mr. Collin's testimony is corroborated by that of Wayne Vonderlow, marketing director for Poolquip-McNeme, a large Houston, Texas based distributor of pool products, who recalled Mr. Collin's sales presentation. (Vonderlow, Tr. 4851-52) Mr. Vonderlow also testified that his superior at Poolquip-McNeme, Mr. McNeme, shared the perception that there is a price/volume relationship between isos and cal hypo. (Vonderlow, Tr. 4852-53) Mr. Vonderlow agreed that there was "a general feeling through the years" by many in the industry of an isos/cal hypo relationship. (Vonderlow, Tr. 4853)

217. Shikoku, a Japanese producer that exports isos to the United States, is alert to the price/volume interaction of the two major dry sanitizers, isos and cal hypo, in the United States market. (CX 577-G#; Ishida, Tr. 943-44) Mr. Ishida, Shikoku's sole United States field representative, testified that he understood there to be an industry awareness of the pricing gap between cal hypo and isocyanurates. (Ishida, Tr. 942-43) It was also Mr. Ishida's understanding that fluctuations in the pricing gap influenced demand shifts between the two products. (Ishida, Tr. 943) In the fall of 1985, Mr. Ishida reported his concern to Shikoku-Japan that the cal hypo/iso price gap was widening, leading him to fear a shift to cal hypo by isocyanurate users in the United States. (CX 577-G#; Ishida, Tr. 946) At trial, although unaware of any actual shifting, Mr. Ishida continued to regard such a demand shift as a realistic concern. (Ishida, Tr. 946-47) **[54]**

218. ICI Americas ("ICI"), an importer of isocyanurates and cal hypo from Japan, expressed the company's view of the price/volume relationship between isos and cal hypo in ICI's 1985 water treatment chemicals marketing plan. (CX 127-K#)

219. Earlier in 1984, James Miller, an ICI official, told the ITC that # # (CX 174-Z194#) Nicholas Pettoruto, the ICI official in charge of ICI's sales of pool chemicals in the United States, testified in this case that he observed some actual shifting of sales away from isos toward cal hypo in recent years when iso prices have risen greater than cal hypo prices (Pettoruto, Tr. 1361-62, 1423#) and that, as the price gap between isos and cal hypo widens, cal hypo sales will likely increase at the expense of isos. (Pettoruto, Tr. 1361#)

220. General awareness in the industry of the existence of a price/volume relationship between isos and cal hypo (Bloom, Tr. 651; Christensen, Tr. 1854-55; Vonderlow, Tr. 4853) is also reflected in observations of repacker, dealer and distributor witnesses. For

example, Mike Marshall of Hydrotech, a repacker owned by Great Lakes Chemicals, expressed the opinion that a 5 to 10% increase in the price of trichlor might be sufficient to induce a consumer using that product to consider dichlor or cal hypo as an alternative. (Marshall, Tr. 1126) John Christensen of Chem Lab, a repacker of dry products and a manufacturer of liquid bleach, testified that a 10-15% increase in the price of cal hypo would cause switching to isos, but not to other sanitizers such as liquid bleach, in situations where a consumer had been using cal hypo as a primary sanitizer. (Christensen, Tr. 1993-96#)

221. Charles Schaub of Coastal, a repacker of both isos and cal hypo, has observed shifting between isos and cal hypo at Agway, one of his major accounts which he monitors on a regular basis. (Schaub, Tr. 2075, 2143-46) In 1982 or 1983, Mr. Schaub observed a 20% increase in iso purchases by Agway which he attributed to a 13% increase in the price of cal hypo, such price increase causing a shift away from cal hypo to isos. (Schaub, Tr. 2075, 2143) Mr. Schaub also recalled that a 10-15% increase in iso prices at Agway led to some switching to cal hypo during the 1980-1981 period. (Schaub, Tr. 2146) Mr. Schaub estimated that a 10% increase in cal hypo prices, assuming no increase in iso prices, would result in a 9 to 10% shift in relative sales volume away from cal hypo to isos. (Schaub, Tr. 2119)

222. Jesse Behnke of Home Depot, a mass merchandiser selling swimming pool chemicals in several southern states, testified that an increase in the price of either isos or cal **[55]** hypo would cause the consumer to consider shifting to the other dry product. (Behnke, Tr. 1623-24) Ronald Wetzel of D&R Sales, a pool dealer in Toledo, Ohio, testified that he noticed some switching from cal hypo to isos as the price gap between the two products narrowed some time before the ITC anti-dumping suit. (Wetzel, Tr. 5463-65)

223. Nathaniel Jonas of N. Jonas Company, another repacker of isos and cal hypo, testified that a 20 to 25% increase in the price of isos would, based on his experience, be likely to cause a substantial shift to cal hypo. (Jonas, Tr. 2222, 2231) Mr. Jonas recalled one instance of substantial shifting of customers away from isos to cal hypo at the retail level in the mid to late 1970's, when iso prices rose more rapidly than cal hypo prices. (Jonas, Tr. 2222, 2230)

4. Perceptions of Buyers and Sellers

224. The perceptions of manufacturers, purchasers and sellers of

pool chemicals strongly indicate that isos and cal hypo constitute a distinct market apart from other pool chemicals. Olin's planning and marketing documents reflect the same perception. Over the years, Olin planned and evaluated its pool chemicals performance largely in terms of cal hypo and isos.

225. For example, in Olin's 1975 analysis of the market risks associated with its planned isocyanurate entry, one of the # # identified was # # (RX 35-Q#) A 1980 Strategic Plan Overview of Olin's PACE [iso] pool chemicals business also notes the same concern, suggesting that Olin's consumer advertising should # # (CX 264-B#)

226. In a 47-page competitive study of FMC's isocyanurate business conducted in 1981, Olin noted that # # (CX 508-O#) As a result, the Olin study concluded # # (CX 508-P#)

227. In a strategic plan presentation to the CEO in 1982, it is noted that the three key issues in maximizing Olin's sales and profits of cal hypo are (1) # # (2)# # and (3) # # (CX 268-M#) This same CEO presentation document also notes that # # and that **[56]** # # (CX 268-R#)

228. In a marketing document concerning Olin's brand strategies, it is noted that (CX 278-L#): # #

229. In a section entitled "The Competition: Strategies," the same document denotes the "competition" as HTH (calcium hypochlorite), PACE (isocyanurate) and SUN (isocyanurate). (CX 278-T#) Among observations regarding Olin's cal hypo advertising strategies are that: # # (CX 278-X#) (emphasis in original), # # (CX 278-Z23#) and that # # (CX 278-Z4#)

230. Olin's 1983 Pool Chemicals Strategic Plan refers to a "dry sanitizer market" encompassing both isos and cal hypo but not liquid or gas sanitizers. (CX 259-G#; RX 32-D#) Peter Kosche, Olin's Director of Commercial Development, Water Products and Services Division, wrote about the 1980-1984 period: # # (CX 281-B#; CX 476-Z21-22#)

231. John Swartley, while President of Olin's Consumer Products Group, also underscored the direct competitive interrelationship between isos and cal hypo when he wrote (CX 262-C#): # # .

232. John M. Henske, Olin's Chairman and CEO, in discussing the company's strategic decisions in the pool chemicals business, referred to "the dry product," the isocyanurate and cal hypo part of the market, and the "sodium hypochlorite [bleach] market." (Henske, Tr. 7167-69#) **[57]**

233. Olin has also recognized the degree of competition between isos and cal hypo in presentations to the ITC in connection with anti-dumping proceedings. At a May 1984 ITC hearing, Olin acknowledged the degree of competition between the products (CX 173-M), with Olin's George Turnipseed stating that "the two products (isos and cal hypo) are very much competing products . . . when it comes to the subject of the swimming pool industry." (CX 173-Y) In February, 1985, Olin advised the ITC that iso prices had some effect on cal hypo demand (CX 175-Z11) and prices (CX 175-Z34) and that the two products were competitive. (CX 175-X-Y) Olin's written submissions to the ITC also acknowledge that isos and cal hypo compete. (CX 283-C, D, F#; CX 378-L#; CX 380-L; CX 381-F; 383-E-F; CX 386-I)

234. Other sellers, through their actions and words, perceive the existence of direct competition between isos and cal hypo. They include FMC, PPG, Monsanto, Nissan, Shikoku, and ICI.

235. FMC has long recognized the direct competition between cal hypo and isos. (CX 54-A-B; CX 880-O#) FMC saw its acquisition of the SUN repacker operation in 1978 as a means of positioning its isocyanurate business against Olin's HTH brand of cal hypo. (CX 54-A-B) An FMC official was quoted in a 1980 chemical industry periodical (and subsequently cited in an Olin competitive assessment of FMC) as saying # # (CX 880-O#)

236. In major national TV ad campaigns designed to establish SUN as a leading national pool sanitizer brand, FMC launched a major, national, consumer advertising campaign during the 1978-80 period. (CX 880-W-X#) Lloyd Bridges was featured in SUN ads to demonstrate the greater consumer ease of using SUN granular isocyanurates compared with cal hypo (CX 880-W, Z26#; Kosche, Tr. 8955-57#), and to tout SUN as a longer-lasting pool chemical than cal hypo (CX 880-W, Z27#), and as more effective than cal hypo. (CX 880-W, Z28#)

237. FMC tested its iso products against cal hypo. (CX 63; Collins, Tr. 3934)

238. PPG's planning documents for its cal hypo business are similarly replete with observations concerning competition with isos, although it does not produce or sell isos. (CX 545-A, C-F, I; CX 546-C, L-M; CX 548-D, L, V; CX 550-L) For example, in its 1983 Calcium Hypochlorite Business Strategy Paper, PPG noted that "[c]onsumption of calcium hypochlorite as a swimming pool **[58]** sanitizer can be affected by chlorinated isocyanurate consumption

. . . ." (CX 546-C) and identified isocyanurate suppliers, estimated the regional dispersion of isocyanurate users and planned "a comprehensive shelf life study and cost/benefit analysis [to] be conducted to establish quantitative competitive data on the various chlorinated isocyanurate and calcium hypochlorite products available today." (CX 546-C, L-M)

239. In its 1984 Calcium Hypochlorite Business Strategy Paper, PPG compared the growth rates of cal hypo and isocyanurates, observing that iso consumption grew faster than cal hypo consumption over the previous five years but predicting that isos would not grow significantly faster than cal hypo in the future. (CX 548-D) The 1984 paper also included PPG estimates of domestic isocyanurate demand, the capacity of each domestic isocyanurate producer and isocyanurate import and export levels. (CX 548-V)

240. Richard Hughes, the business manager for PPG's cal hypo business, testified that isos and cal hypo compete (Hughes, Tr. 5331), that PPG monitors iso supply and demand conditions (Hughes, Tr. 5276-77#) and that PPG subscribes to a clipping service which, at PPG's request, tracks retail prices of cal hypo and isos (but not any other pool chemicals). (Hughes, Tr. 5280)

241. Monsanto, an isocyanurate producer, monitors and responds to cal hypo marketplace activity. (CX 218-B#; Marcum, Tr. 3992-93, 4008-09, 4128-30, 4134) Monsanto keeps abreast of cal hypo capacity. (Marcum, Tr. 3993) Monsanto tracks calcium hypochlorite prices, in particular HTH prices, and the transaction prices of bulk sales to repackers (Marcum, Tr. 3991-92, 4009, 4134) and takes HTH prices into account in setting its isocyanurate prices. (Marcum, Tr. 4134)

242. In September, 1983, Monsanto's isocyanurate business manager recommended holding iso prices at current levels for the upcoming 1984 pool season in part to # # (CX 218-B#; Marcum, Tr. 4129-30#) Michael Marcum, Monsanto's isocyanurate business manager, testified that, of all non-isocyanurate pool chemicals, pricing developments involving cal hypo have the greatest significance for Monsanto's isocyanurate price decisions. (Marcum, Tr. 4128#)

243. As a service to its repacker customers, Monsanto prepares market data presentations concerning the United States pool chemicals business. (CX 4-A-Z4; Christensen, Tr. 1874) A typical Monsanto presentation contains a wide range of market data (*e.g.*, supply and demand figures, prices, market share estimates) for both isocyanu-

rates and cal hypo. **[59]** (CX 4-D-Q; Christensen, Tr. 1883-90) The Monsanto presentation has separate sections for residential and commercial pools (CX 4-L, U; Christensen, Tr. 1889) and isos and cal hypo dominate the residential pool section. Bleach, the only other product listed in the residential section, received a cursory treatment. (CX 4-L-T)

244. Nissan, a Japanese iso producer and exporter to the United States also recognizes the close competitive interaction between isos and cal hypo. In an April, 1982 letter, a Nissan official requested a meeting with Olin to exchange views on topics of mutual interest (CX 247#) and identified # # among the topics. (CX 247-B#) At an Olin/Nissan meeting in June, 1982, the Nissan representative made note of Olin's views regarding cal hypo supply conditions. (CX 248-G#) The Nissan notes to the meeting reflect Olin's observation that # # (CX 248-G#; CX 676-Z168-69#) Olin notes to the same meeting reflect that Olin and Nissan views on the demand and supply situation of both isos and cal hypo were a topic of discussion. (CX 316-B#)

245. Shikoku, a Japanese producer of isos and exporter to the United States, takes into account the competition it faces from cal hypo. Mr. Ishida, the Shikoku representative who testified at the trial, stated that in Shikoku's view "calcium hypochlorite is a major competitive product of the isocyanurate" and that # # is a topic of conversation in meetings with ICI, Shikoku's United States sales agent. (Ishida, Tr. 935; *see also* Pettoruto, Tr. 1321) Shikoku also follows cal hypo price movements (Ishida, Tr. 942) and has asked ICI to # # (CX 577-H#; Pettoruto, Tr. 1401#) Other Shikoku's documents show that Shikoku monitors cal hypo prices, demand, supply, and capacity in the United States. (CX 177-Z3; CX 565-A; CX 577-G#, CX 582-C, D#; RX 148-E; Ishida, Tr. 944-47, 956-57#)

246. ICI America, Shikoku's United States sales representative, also recognizes the degree of competition between isos and cal hypo. (CX 127-K# CX 132-A; Pettoruto, Tr. 1321, 1348#, 1358-62#, 1401#) In August, 1985, ICI America reported to Shikoku that "the influence of cal hypo pricing" was one of five "controlling factors" on iso bulk prices to repackers. (CX 132-A)

247. ICI's James C. Miller told the ITC in March, 1984, that cal hypo is a substitute for isos and that, prior to the ITC **[60]** anti-dumping rulings, decreased cal hypo prices were having a dampening effect on isos prices. (CX 174-Z169-70#)

248. Major pool chemicals repackers and distributors, in assessing their competition, also look at both cal hypo and isocyanurates. For example, Poolquip-McNeme was a distributor of FMC's SUN (iso brand) and a large buyer of FMC's isocyanurates. (Vonderlow, Tr. 4789) Within Poolquip's primary marketing territory, Wayne Vonderlow, the company's director of marketing, believed that cal hypo and isocyanurates are the two most popular sanitizers used by residential pool owners to maintain their pools and that, together, the two products account for virtually all such pool chemical usage. (Vonderlow, Tr. 4819, 4860) The competition between iso and cal hypo in Poolquip's marketing area resulted in market share shifting from cal hypo to isocyanurates. (Vonderlow, Tr. 4848)

249. Steelcrete Company was another major customer/distributor of FMC isocyanurates. (Scott, Tr. 5783) Steelcrete's president, Fred Scott, acknowledged the direct competitive interaction between calcium hypochlorite and isocyanurates. (Scott, Tr. 5826-27) According to Mr. Scott, after FMC acquired the SUN repacker business, the distribution of SUN isocyanurates was restricted to pool professionals. (Scott, Tr. 5749-50) Mr. Scott observed that the withdrawal of the SUN product from department stores, hardware stores and chain stores generally created a void that contributed to Olin's successful efforts to sell its HTH brand of cal hypo through these same outlets. (Scott, Tr. 5826-27)

250. The president of Benson Pump Company, another SUN distributor, considered cal hypo to be the principal alternative to isocyanurates and treated calcium hypochlorite as "a generic term for an alternative to isos . . . ." (Benson, Tr. 4960) Mr. Benson on occasion told his iso suppliers he was considering increasing his cal hypo purchases in an attempt to negotiate better isocyanurate prices. (Benson, Tr. 4960)

251. York Chemical Corporation currently repackages both cal hypo and isocyanurates. (Castagnoli, Tr. 2427, 2429) At one point York only repackaged isocyanurates, but the company nevertheless followed cal hypo prices because, in the words of York's president, "we were aware about the impact that the prices of other dry products would have on our own dry products." (Castagnoli, Tr. 2448) And York communicated with its isocyanurate supplier a concern that low cal hypo prices would adversely effect York's isocyanurate sales volume. (Castagnoli, Tr. 2448, 2488-89) **[61]**

252. Jesse Behnke, a merchandiser for the Home Depot chain of

mass merchandisers, recognized the existence of substantial competition between the two dry sanitizers because isos and cal hypo are viewed by consumers as close substitutes. (Behnke, Tr. 1610-21)

253. Nathaniel Jonas of N. Jonas Company also acknowledged the competition between isos and cal hypo, testifying that isos and cal hypo compete "most directly" with each other. (Jonas, Tr. 2221)

5. Research and Development Competition

254. The research and development efforts of the pool chemicals manufacturers clearly indicate a head-to-head competition between isos and cal hypo, suggesting that the two products belong in the same antitrust market. Olin and PPG, the only significant domestic producers of cal hypo, both have undertaken substantial product development programs to produce cal hypo products simulating the isocyanurate performance characteristics valued by residential pool owners. (CX 548-G, L; Kosche, Tr. 8806-07, 8829-31#)

255. Among residential pool owners, the most popular iso product has long been the large trichlor tablet. (Kosche, Tr. 8821-22#) The large trichlor tablet offers the convenience of a single weekly application. (Kosche, Tr. 8821-22#) The trichlor tablet, once inserted in a feeding device in the pool, dissolves slowly, allowing the chlorine to be gradually released into the pool water over a period of approximately seven days. (Kosche, Tr. 8822-25#) Calcium hypochlorite products, both granules and tablets, are fast dissolving products that typically are applied every day or every other day. (Kosche, Tr. 8826-27#)

256. Olin's 1982 HTH Strategic Plan identified a research program to develop # # (CX 271-R#) The importance of developing more convenient feeding devices for cal hypo was again noted in Olin's 1983 Pool Chemicals Strategic Plan. (CX 259-V#) A 1984 Olin pool chemical plan summary also identified # # (CX 275-V#)

257. At the time of the acquisition, # # (Kosche, Tr. 8851, 8858#) According to Olin's Pool Chemicals 1985 Business Development Plan, the objective of one project was to **[62]** # # (CX 309-J#) # # (Kosche, Tr. 8851#) # # (Kosche, Tr. 8851-52#) # # (Kosche, Tr. 8861-63#)

258. A second major Olin product development program underway in 1985 concerned # # (Kosche, Tr. 8858#)

259. # # was the program designated to receive the largest share of the Olin 1985 budget for calcium hypochlorite product develop-

ment. (Kosche, Tr. 8867-68#) In September, 1985, during the 1986 budget preparation process, a technology presentation proposed that the # # (Kosche, Tr. 8863, 8869#)

260. Also, in 1983 Olin undertook a major product development program to # # so as to reduce the residue sometimes deposited in the pool. (CX 259-T#; CX 294#; Kosche, Tr. 8869#) # # (CX 294#; Kosche, Tr. 8870-71#) As a result, # # (Kosche, Tr. 8872-73#)

261. PPG's cal hypo business manager Richard Hughes estimated that, of PPG's research and development funds allocated over the prior years to cal hypo, # # (Hughes, Tr. 5257-58#) According to Mr. Hughes, # # (Hughes, Tr. 5257, 5259#) # # (Hughes, Tr. 5257-59#)

262. PPG's cal hypo business strategy papers of the 1982-1984 period clearly show that PPG's principal R&D projects that were given "a near term high priority" included development of means of improving the stability of cal hypo, slowing down cal **[63]** hypo's dissolution rate and devising a new cal hypo delivery system, all designed to improve cal hypo's effectiveness and ease of application and to increase consumer acceptance. *See* CX 545-H, L; CX 548-C, G, L, N; and, CX 550-B. PPG's 1984 Calcium Hypochlorite Business Paper also stated that PPG had recently introduced cal hypo tablets and noted that the slow release benefit of the tablets was attractive to consumers and made cal hypo "more advantageous to use." (CX 548-G)

263. The R&D efforts of Olin and PPG reviewed hereinabove are targeted to isos and demonstrate that isos and cal hypo compete head-to-head, that they are close enough substitutes for each other and that they belong to the same antitrust market for the purposes of this case.

6. Supply-Side Substitutability

264. In addition to the various factors discussed hereinabove, there are other well-recognized indicia that are useful in determining the product market in a merger case. And one such factor is the supply-side substitutability or unique production facilities or specialized vendors.

265. The evidence is clear that the technology or equipment employed to manufacture isos cannot be used or adapted to produce cal hypo. *E.g.*, CX 442-A,B#; Marcum, Tr. 3979-80; Hughes, Tr. 5191.

266. Other than chlorine and caustic soda, cyanuric acid, the basic

chemical input used to produce isos is different and distinct from the raw materials used to manufacture cal hypo.

267. Thus, there is no production or supply-side substitutability between isos and cal hypo, and this is a factor which argues against placing the two products in the same product market.

7. Convenience Factor

268. The record is clear that isos and cal hypo, the two dry pool chemicals, share a number of technical product characteristics which make them distinctly more convenient for residential pool owners to use and, for that reason, they belong to the same product market. *See* F. 181-89, *supra.*

269. However, this is not to ignore the existence of significant differences in the degree of convenience between isos and cal hypo such that consumers appear to be willing to pay for iso products not insignificant price premium more than 10% over cal hypo prices. **[64]**

270. For one thing, isos are stabilized and generally last longer than cal hypo. In order to stabilize a pool sanitized with cal hypo, one must occasionally add cyanuric acid to the pool water. (Kennedy, Tr. 588; Schaub, Tr. 2181-83; Marshall, Tr. 1688-89) Dichlor can last up to four times as long as cal hypo. (Aston, Tr. 4462-63) Isos generally need to be added to the pool water about once every four days, while cal hypo must be added every two days. (Behnke, Tr. 1686-87; Marcum, Tr. 5207-08)

271. Secondly, unlike isos, cal hypo can leave a residue in the pool water because it contains insolubles. (Arakelian, Tr. 5979-80) This is a particular problem in areas with hard water. (Christensen, Tr. 1826-27) Cal hypo, when such residue deposits on the bottom of pools, can stain or pin-hole or bleach vinyl-lined pools. (Kennedy, Tr. 607)

272. Also, as noted hereinabove, although both iso and cal hypo products are available in either granular or agglomerated form today, cal hypo is still commonly sold in granular form and needs to be broadcast over the pool water daily or every other day. On the other hand, more isos are sold in compressed tablet or stick form than granular. Compressed iso tablets or sticks are placed into floaters or skimmers to permit them to erode slowly into the pool water. Although compressed and other long-lasting cal hypo delivery devices have been introduced during the recent years, they are not as free from some technological problem as isos and a wide consumer acceptance of these improved cal hypo products is yet to be established. (Spiegel, Tr. 6866-67)

273. However, every form of pool chemical requires a residential pool owner to test and adjust the pH of the pool water on a regular basis, and no pool chemical on the market today frees the consumer altogether from some periodic testing and adjustment chores. That blessed day when one can simply apply a pool chemical product to pool water and forget about pool sanitization for the pool season is not here. In the matter of ease of use and consumer convenience, therefore, it comes down to a matter of degree. And, on the convenience scale, isos and cal hypo are close enough together to set them apart from bleach, which, in those regions of the country where it is generally available, enjoys a substantial price advantage over both isos and cal hypo.

274. It is therefore found that, from a review of such realistic yet circumstantial evidence related to the products produced and sold by the merging firms, the technical product characteristics, the perceptions of sellers and buyers and R&D **[65]** competition between product groups and producers, isos and cal hypo belong to the same antitrust market for the purposes of this case.

C. *Iso Alone Also Constitutes a Valid Product Market*

275. The parties agree that isocyanurates constitute an appropriate product market in this case as alleged in the Complaint.

1. Product Characteristics

276. Dichlor and trichlor are dry pool chemicals. Both are highly concentrated and relatively stable chemicals that retain their sanitizing strength for a long period of time.

277. Because of their dry, highly concentrated, stable characteristics, dichlor and trichlor are similar in their relative ease with which residential pool owners are able to purchase, transport, store and handle them.

278. The ITC report in the isocyanurate dumping proceeding acknowledged that trichlor and dichlor are generally considered interchangeable products. (CX 179-M) Olin has also acknowledged similarities between the two products in the ITC proceeding. (CX 174-Z125#)

2. Production Substitutability

279. The production facilities used to manufacture dichlor and those used for trichlor are largely interchangeable. FMC's isocyanurate

plant at South Charleston consists of three production lines for the chlorination of cyanuric acid into isocyanurates. (CX 64-Z33) As originally built, two lines produced dichlor and one, trichlor. (CX 64-Z33; Collins, Tr. 3829) During 1983, FMC converted one of the two dichlor production lines into a "swing" line capable of producing either dichlor or trichlor. (CX 64-Z33-34; CX 442-A#; Collins, Tr. 3829-30) In 1983 and again in 1984, the FMC swing line produced dichlor for part of the year and trichlor for the remainder of the year. (CX 64-Z34)

280. FMC's modification of a dichlor production operation into a swing line capable of producing either dichlor or trichlor took less than six months to accomplish. The Specialty Chemicals Division's 1982 Strategic Plan presentation to FMC corporate management on September 24, 1982, included a proposal to convert a dichlor production line to trichlor production at an estimated cost of $100,000. **[66]** (RX 125-Z13; Collins, Tr. 3622) By March, 1983, FMC accomplished the conversion and was manufacturing trichlor on two of its three isocyanurate production lines. (CX 64-Z34)

281. Monsanto currently has a trichlor facility that was originally built as a dichlor production facility. (CX 232-W) Prior to 1981, Monsanto used this facility alternately in the course of a production year to make both trichlor and dichlor. (CX 232-Z2)

282. Olin has also acknowledged that it is feasible for an isos producer to shift production capacity readily from dichlor to trichlor. (CX 442-A#; CX 644-F) The ITC report in the isocyanurate dumping proceeding similarly concluded that the same equipment can be used to make dichlor and trichlor. (CX 179-Z41)

3. Perceptions of Buyers and Sellers

283. Buyers and sellers of pool chemicals commonly use the generic term "isocyanurates" or "isos" to refer to a trichlor or dichlor product rather than the more specific term. (CX 672-Z22#; Wilson, Tr. 4240; Hughes, Tr. 5313) Some long time participants in the pool chemical industry are not knowledgeable about the different product characteristics of trichlor and dichlor. Some do not know whether iso tablets are trichlor or dichlor. (Russ, Tr. 5684-85; Scott, Tr. 5847-48)

284. Buyers and sellers of pool chemicals usually monitor marketplace activity concerning isocyanurates in the aggregate only. A typical Monsanto presentation to its repacker customers contained isocyanurate supply and demand estimates, isocyanurate prices,

isocyanurate production capacity estimates, and market share figures for isocyanurates, but no separate data for dichlor or trichlor. (CX 4-D, F-I, K) Similarly, Olin's market studies of pool chemical usage usually contain information and discussion of isos as a single product and do not contain separate dichlor/trichlor data. *E.g.*, CX 284-E, G, Q-Z16#; RX 111#. **[67]**

D. *Liquid Bleach Does Not Belong to the Same Antitrust Market With Isos and Cal Hypo*

1. Pool Bleach is Produced and Distributed on a Local or Regional Basis

285. Pool bleach is produced and sold on a local or regional basis. The use of pool bleach by residential pool owners has historically been confined to a few, well-defined "pockets," comprising often metropolitan areas where pool bleach is produced or the areas within a 200-300-mile radius of a pool bleach plant. Such areas include parts of Florida, southern California, upstate New York and the Detroit-Chicago area. *E.g.*, CX 264-D#; Castagnoli, Tr. 2441-44; Marcum, Tr. 4134#; Smith, Tr. 6687#.

286. Neither Olin nor FMC produced or marketed pool bleach. There is no firm which produces or markets pool bleach on a national scale. There is no national brand of pool bleach (Marcum, Tr. 4135#) while such brand names as SUN (isos) and HTH (cal hypo) are nationally known and widely sold.

287. Bleach is uneconomical to ship long distances. (Marcum, Tr. 4134-35#) There are high transportation costs relative to product price associated with the distribution and sale of pool bleach. (Benson, Tr. 4959; Scott, Tr. 5802-03) Because it is not economical to ship long distances, most pool bleach is sold within a radius of 200 to 300 miles of a bleach plant. (Schaub, Tr. 2110; Wilson, Tr. 4303; Scott, Tr. 5765; Hammersmith, Tr. 6029-30, 6089) When bleach was shipped beyond that area (upward of 400 miles), it was by a distributor who shipped bleach along with dry pool chemicals he sold. (Christensen, Tr. 1858-59)

288. Pool bleach is not widely available in all regions of the country. (Christensen, Tr. 1949, 1968#; Jonas, Tr. 2225-26, 2264) Wayne Vonderlow of Poolquip, whose marketing area stretches from Texas north to the Dakotas in the central United States (Vonderlow, Tr. 4771, 4776-77, 4819), testified that, unlike isos and cal hypo, pool bleach was not widely available in his marketing area. (Vonderlow, Tr.

4834-35) Mr. Castagnoli of York Chemical testified that pool bleach was available and widely used only in certain "pockets" of the country. (Castagnoli, Tr. 2441-44) Although a number of Olin witnesses, who appeared to be bleach enthusiasts, testified that pool bleach marketing is expanding beyond the traditional pockets or regions, the record as a whole clearly and convincingly demonstrates that pool bleach does not compete with iso and cal hypo on a national basis. **[68]**

289. # # (CX 283-D#) # # (CX 264-D#)

290. Respondent argues that bleach is available as a primary pool sanitizer throughout the country and that, in terms of the number of pools, bleach is the third most popular pool sanitizer nationally, with an estimated share of 15-20% of all residential pools. RB at 67-68; *also see* RPF 711-30. However, respondent's argument regarding the national scope of bleach distribution and use is simply not borne out by the record evidence. On the contrary, the local and regional nature and scope of bleach use for residential pools is a fact well-recognized by all segments of the pool chemicals business. The testimony of some bleach advocates regarding their possible future expansion plans or their undocumented and expansive references or top-of-the-head estimates of bleach share of the "market" in some areas of the country, however, is not sufficient to overcome the weight of contrary evidence in the record.

291. Therefore, although pool bleach is a functional substitute for isos and cal hypo for pool sanitization, it would be inappropriate to place bleach in the same antitrust market with isos and cal hypo. We are not aware of any reported merger case where the products included within the relevant product market did not flow or compete within the same geographic market or markets.

2. Technological Product Characteristics and Uses Set Bleach Apart from Isos and Cal Hypo

292. Furthermore, because of certain differences in the product characteristics of isos, cal hypo and bleach, there is a marked convenience gap between isos and cal hypo on the one hand and bleach on the other hand.

293. Pool bleach contains a very low concentration of chlorine. (Pettoruto, Tr. 1349#; Schaub, Tr. 2172; Marcum, Tr. 4132#; Smith, Tr. 6720#) Most pool bleach is sold with a label strength of 10% chlorine content. *E.g.,* Behnke, Tr. 1601; Christensen, Tr. 1782;

Marcum, Tr. 4132#; Benson, Tr. 4913; Roberts, Tr. 5047; Wetzel, Tr. 5431; Moran, Tr. 5597. Thus, pool bleach is almost 90% water. (Marcum, Tr. 4132#; Wetzel, Tr. 5431) In fact, it is not possible to produce liquid bleach with a much higher concentration of available chlorine, in the **[69]** 65 to 75% range. (Schaub, Tr. 2172; Jonas, Tr. 2226) Therefore, much larger amounts of bleach are required to sanitize a pool compared with isos or cal hypo. (Kennedy, Tr. 481; Smith, Tr. 6720#)

294. Pool bleach is considered to be a relatively unstable form of available chlorine. (CX 455-N; Kennedy, Tr. 461; Vonderlow, Tr. 4861-62) Pool bleach is also not as long lasting as the isos or cal hypo (Marcum, Tr. 4140; Wetzel, Tr. 5451) and must be applied more often. (CX 295-H#; Behnke, Tr. 1600; Schaub, Tr. 2187; Smith, Tr. 6720)

295. Pool bleach loses much of its chlorine strength in a relatively short period of time (Kennedy, Tr. 461; Christensen, Tr. 1783; Schaub, Tr. 2048; Castagnoli, Tr. 2508-09; Marcum, Tr. 4133#; Wilson, Tr. 4379; Wetzel, Tr. 5461; Smith, Tr. 6668-69#; Kosche, Tr. 8452-53#) and do so rapidly especially in warm weather or bright sunlight. (Kennedy, Tr. 461-62; Christensen, Tr. 1783; Schaub, Tr. 2048; Castagnoli, Tr. 2508-09; Sossamon, Tr. 4751; Vonderlow, Tr. 4862-63) One witness estimated that pool bleach could lose as much as half of its chlorine content if exposed for one afternoon on a hot, sunny day. (Christensen, Tr. 1783)

296. Pool bleach also has a short shelf life and even when properly stored, loses much of its chlorine content within 25 to 30 days after it leaves the plant. (Behnke, Tr. 1602; Christensen, Tr. 1783; Marcum, Tr. 4133#; Wilson, Tr. 4339; Vonderlow, Tr. 4862-63)

297. Use of a pool bleach also requires more frequent checking of the pH level in the pool water and a greater amount of pH adjusters than do isos or cal hypo. (Kennedy, Tr. 485-86; Schaub, Tr. 2057, 2064, 2179-80; Jonas, Tr. 2226-27) It also requires the use of muriatic acid as a pH adjustor. Muriatic acid is a highly corrosive and reactive material and mixing of bleach and muriatic acid can result in a potentially dangerous situation. (Hughes, Tr. 5291-93, 5357#)

298. Spillage and leaks are also often mentioned as a problem with bleach, which can cause damage to clothes, car seats or skin. *E.g.*, CX 295-H#; Kennedy, Tr. 482; Behnke, Tr. 1600; Schaub, Tr. 2062; Jonas, Tr. 2226; Marcum, Tr. 4133#; Wilson, Tr. 4341; Aston, Tr. 4568; Benson, Tr. 4951; Roberts, Tr. 5125; Hughes, Tr. 5292#. This problem results in part from the use of vented caps, which are required by EPA for all pool bleach containers. (Wilson, Tr. 4341)

299. A survey of residential consumer preferences prepared for Olin by Grey Advertising identified the following **[70]** # # (CX 295-H#) # #

300. FMC's 1980 Strategic Plan looked at the residential pool market and concluded that bleach is an inconvenient product from the standpoint of the residential pool owner. (CX 664-Z4)

301. Witnesses agreed that bleach is an inconvenient product to use. (Kennedy, Tr. 481; Pettoruto, Tr. 1349, 1484#; Jonas, Tr. 2225-26; Castagnoli, Tr. 2509; Marcum, Tr. 4133#; Wilson, Tr. 4338; Sossamon, Tr. 4648#; Hughes, Tr. 5265#; Wetzel, Tr. 5460; Arakelian, Tr. 5975; Kent, Tr. 6614-15#) The convenience gap between isos and cal hypo, on the one hand, and bleach, on the other, is greater than the convenience gap between isos and cal hypo. (Schaub, Tr. 2066; Kamerschen, Tr. 2668-69, 2961-63)

302. Convenience is an important factor in the consumer's choice of pool sanitizer. (CX 264-D#; Bloom, Tr. 661; Vonderlow, Tr. 4859; Hughes, Tr. 5202) Olin documents and consumer surveys conclude that convenience is the most important product characteristic from the standpoint of winning consumer acceptance. (CX 264-D#; CX 276-Z1; CX 295-I#) PPG's Mr. Hughes testified that his firm's consumer surveys identify convenience as the number one factor in choosing a pool chemical, ahead of price. (Hughes, Tr. 5201-02)

303. The evidence is also clear that bleach is not a viable product as a residential pool chemical on a national basis and the principal pool bleach buyers are the pool service industry and commercial and institutional pool operators. (CX 4-M, V; CX 128-B#; CX 430-V#; Jonas, Tr. 2225) Southern California, which is a good bleach market, is known to have a large pool service industry. (CX 486-F#; Christensen, Tr. 1825)

304. Pool service companies generally contract with a residential pool owner to clean the pool and maintain proper pool water sanitization by periodic service visits, generally on a weekly, bi-weekly or monthly basis. *E.g.*, Sossamon, Tr. 4738-39, 4750, 4752-53; Scott, Tr. 5745; Breving, Tr. 6209-10.

305. Pool bleach is not considered a viable pool chemical in New England and the Northeastern United States. **[71]** There is little bleach sold for residential pools in the Eastern United States. (Schaub, Tr. 2163; Jonas, Tr. 2225-26, 2264; Arakelian, Tr. 5922-23) The evidence also strongly indicates that bleach as a residential pool chemical is largely limited for shock treatment or superchlorination. *E.g.*, CX 664-Z.

3. Price Sensitivity

306. The evidence clearly shows that where pool bleach is sold its prices are determined entirely independent of the prices of other pool chemicals such as isos or cal hypo.

307. Bleach prices vary widely from one city to another even within a region, depending on the amount of bleach competition serving the city. (Roberts, Tr. 5097-99; Scott, Tr. 5815-20; Arakelian, Tr. 5933-36; Hammersmith, Tr. 6096; Smith, Tr. 6741#) Fred Scott of Steelcrete did not observe similar variations in the prices of isos or cal hypo in his marketing area. (Scott, Tr. 5821)

308. The only witness from the mass merchandising segment of the pool chemicals business who testified, Jesse Behnke of Home Depot, testified to his perception that "a different customer"—less affluent and more price sensitive customer—buys liquid bleach. (Behnke, Tr. 1613-14) Marshall Bloom of Bio-Lab, the largest repacker of dry sanitizers in this country expressed a similar viewpoint. (Bloom, Tr. 645-48) Bleach is the least expensive pool chemical one can buy.

309. The evidence also clearly shows that the prices of isos or cal hypo are not influenced by bleach prices. It is also clear that residential customers generally do not switch from isos or cal hypo to bleach because of price reduction in bleach.

310. # # (CX 259-I#; CX 260-I#; CX 280-B#; CX 283-E#; CX 284-Q#; CX 647#; *see* Kamerschen, Tr. 2671-73, 2693-94)

311. A July, 1982 Olin analysis of pool sanitizer pricing in the Sunbelt region focuses on the prices of isos and HTH (Olin's cal hypo brand) and contains no mention of bleach prices. (CX 287) # # (CX 311-M#; RX 380-C) **[72]** # # (CX 311-O#)

312. A significant increase in the price of isos or cal hypo would not result in substantial shifting of consumers to bleach. (Christensen, Tr. 1993# [10 to 15% price increase, no shifting]; Schaub, Tr. 2119 [10% increase in cal hypo prices, no substantial shifting]; Jonas, Tr. 2227 [20-25% increase, no substantial shifting]; Aston, Tr. 4501-02 [10-15% increase, no shifting])

313. Fred Scott of Steelcrete testified that his decision to add new pool bleach production capacity was based on an analysis of capacity of existing pool bleach producers in his area. (Scott, Tr. 5854-55) Mr. Scott did not consider cal hypo or iso capacity or supply in his area. (Scott, Tr. 5854-55)

314. It appears to be the general perception of sellers, repackers, and resellers in the pool chemicals business that bleach does not have

much impact on the sales of isos and cal hypo. (Bloom, Tr. 691; Pettoruto, Tr. 1322; Christensen, Tr. 1819, 1821; Schaub, Tr. 2066; Jonas, Tr. 2260; Castagnoli, Tr. 2460)

E. *Exclusion of Other Pool Chemicals, Gas and Chlorinators from the Product Market in this Case Is Appropriate*

315. Other pool chemicals, such as lithium hypochlorite, brominated sanitizers and chlorine gas, chlorine generators, ozonators, and Baquacil, are properly excluded from the scope of the relevant market. These chemicals and devices account for an insignificant portion of overall sanitizer usage in residential pools (CX 664-Z4) and are marginal products which do not constrain the pricing decisions of the producers and sellers of isos and cal hypo. (Kamerschen, Tr. 2813-15#; Ordover, Tr. 9136)

316. Lithium hypochlorite, which is occasionally used as a shock treatment, does not constrain the pricing decisions of suppliers of isos and cal hypo. (CX 471-Z19#; Christensen, Tr. 1933-34) Lithium hypochlorite is expensive, low in chlorine content compared to isos or cal hypo, and has several other disadvantages and few offsetting advantages to justify its greater cost.

317. Brominated sanitizers, which are used mostly in spa and hot tub applications, do not serve to constrain the pricing decisions of suppliers of isos and cal hypo. (CX 127-K#; CX 471-Z20-Z21#; Castagnoli, Tr. 2459; Marcum, Tr. 3985-86, 4128#) Brominated compounds are more expensive and less effective than **[73]** the chlorine-based pool chemicals and have some significant side-effects which have attracted the attention of public health officials.

318. Chlorine gas, which is used almost exclusively in commercial pools, does not constrain the pricing decisions of suppliers of isos and cal hypo. (CX 471-Z21#) Because of the hazards associated with the use of chlorine gas, it is not a product which a residential pool owner could practicably turn to in the event of a rise in the price of isos or cal hypo.

319. Mechanical devices such as chlorine generators and ozonators are expensive devices and do not constrain the pricing decisions of isos and cal hypo. These devices have existed for a number of years and their impact has been insignificant, primarily because of their greater initial cost and operating and repair expense. In addition, ozonators require the use of chlorine-based sanitizer and are not true functional substitutes for isos or cal hypo.

320. Baquacil is a liquid-based system and # # The product is expensive, incompatible with chlorine-based systems, and requires use of two additional products.

V. THE RELEVANT GEOGRAPHIC MARKET

A. *Introduction*

321. The parties disagree on the appropriate geographic market in which to assess the effects of the challenged acquisition. While the Complaint alleges (Complaint ¶ 14) and complaint counsel adhere to a geographic market comprising the United States as a whole, respondent advocates a worldwide market for isos and cal hypo.

322. The purpose of determining a geographic market in this case is of course to assess correctly the effects of the challenged acquisition to see if it is likely to lessen competition substantially "in any section of the country." The traditional approach has sought to determine geographic market boundaries in terms of product movements by the use of so-called Elzinga-Hogarty test. *See* Elzinga and Hogarty, *The Problem of Geographic Market Delineation in Antimerger Suits,* 18 Antitrust Bull. 45, 52-59 (1973).

323. The revised *DOJ Guidelines*' approach goes further and asks whether enough production *capacity* outside the postulated geographic market could be easily diverted into the **[74]** market so as to make a price increase by the sellers inside the market to a supracompetitive level unprofitable. (*DOJ Guidelines* § 2.31) Similar approach might be employed in treating imports of the relevant products into the United States in this case. (Kamerschen, Tr. 2698, 3081-83; Ordover, Tr. 9246-47)

324. However, the economic evidence in the record is not sufficient to permit a rigorous quantitative analysis for making that determination as envisioned by the revised *DOJ Guidelines.* (Kamerschen, Tr. 3081-83) And no statistical analysis of such quantitative data was presented by the economic expert of either party regarding the geographic market issue.

325. In any event, the parties agree that imports of isos and cal hypo into the United States have been substantial and that, therefore, a correct assessment of the competitive effects of the challenged acquisition must take the imports into account.

326. Dr. Ordover, respondent's economic expert witness, has suggested that, in cases where, as here, reliable information is not available on the amounts of foreign capacity which can be readily

diverted to the United States in response to price increases in the United States, the market impact of foreign producers be measured on the basis of actual imports into the United States. (Ordover, Tr. 9651-52; *see* Ordover and Willig, *The 1982 Department of Justice Merger Guidelines: An Economic Assessment,* 71 Cal. L. Rev. 535, 546 (1983)) This approach is in accord with the customary treatment of imports employed in antitrust analysis in recent Section 7 cases.

327. At the same time, it has been recognized that the actual import sales or shipment data, or foreign production capacity may overstate the competitive significance of foreign producers in the United States markets. *See DOJ Guidelines* § 3.23. Also important in this context are such market factors as non-quota restraints or barriers to free movement of products, the direction and extent of exchange rate changes, and the extent of foreign capacity. *Id.*

328. Dr. Ordover, respondent's economic expert, testified that his approach to the geographic market and the treatment of foreign capacity is to include all United States productive capacity, all imports, and that foreign capacity readily divertable to the United States in the event of a domestic price increase. (Ordover, Tr. 9239) However, he would not include within the market the foreign capacity of a firm not presently exporting into the United States. (Ordover, Tr. 9267#) **[75]**

329. Dr. Ordover also indicated that pricing of imports is generally more important than the volume of imports in assessing the possible effects of a merger on competition. (Ordover, Tr. 9657-58)

330. Also, Dr. Ordover has recently expressed the view that, according to the results of mathematical model relating to international trade and international competition, foreign competition is a less reliable restraint on the market power of domestic firms than domestic competition. (Ordover, Tr. 9669-70) In Dr. Ordover's own words:

> This [mathematical model] confirms to some extent the view that, *ceteris paribus,* foreign competition is a less reliable constraint on the market power of domestic firms than is domestic competition. Consequently, in merger analysis, while transnational market definition may certainly be appropriate, it should be used with due regard for its possible fragility.

Ordover and Willig, *Perspectives on Mergers and World Competition,* Antitrust and Regulation, 201, 216 (R. Grierson, ed. 1986).

B. *Recent Patterns of Imports of Calcium Hypochlorite and Isocyanurates and Their Significance in Determining the Relevant Geographic Market in this Case*

331. Data on imports of calcium hypochlorite into the United States are published by the United States Department of Commerce (the "DOC"). (CX 684; Kugelman, Tr. 1262) The DOC data are considered a reliable source of information on calcium hypochlorite imports. (Marcum, Tr. 4179#)

332. Isocyanurates are included in a T.S.U.S.A. category which also includes cyanuric acid as well as its chlorinated derivatives, trichlor and dichlor, namely isos. (CX 179-Z19) Because the DOC import data do not break out isos separately, they are less useful than is the case with the data on calcium hypochlorite imports. (Marcum, Tr. 4179#)

333. Some industry members, including Olin and Monsanto, also attempt to ascertain information on imports from a data base used by *The Journal of Commerce.* (Marcum, Tr. 4006-07; Turnipseed, Tr. 7690-95) *The Journal of Commerce* data, however, are not relied upon by the DOC as a source of import statistics. (Kugelman, Tr. 1262-63) Mr. Marcum of Monsanto acknowledged he has "some difficulty" with **[76]** *The Journal of Commerce* data (Marcum, Tr. 4176#), particularly with instances of double counting (Marcum, Tr. 4177#) and monthly inconsistencies. (Marcum, Tr. 4178) FMC also did not view *The Journal of Commerce* data as particularly accurate. (CX 478-Z11)

334. The record reflects that Olin relied on information from *The Journal of Commerce* to form its perception of the extent of imports of isocyanurate products into the United States. (RX 83; RX 84; RX 102; RX 103; RX 116; RX 117; Turnipseed, Tr. 7695#) Such data were also used for the purpose of developing information in support of Olin's position in the on-going anti-dumping proceeding before the United States International Trade Commission. (Turnipseed, Tr. 7703#)

335. The evidence is clear that the most significant source of imported cal hypo has been Japan. (CX 176-W-X; CX 684) DOC import data on Japanese imports of cal hypo reveal the following trend (data are in pounds of imported product):

1979	4,031,900
1980	5,122,500
1981	6,895,471
1982	6,975,024
1983	10,842,610
1984	8,402,963
1985	7,051,713

(CX 684-B, D, F, H, J, L, S)

336. PPG, one of the major domestic producers of cal hypo, # # (CX 552-E#) Olin and PPG projected that cal hypo imports from Japan are unlikely to increase in the future. (CX 471-Z9#; CX 548-S)

337. Imports of cal hypo are subject to a tariff of 2.4%. (CX 176-V-W) Imports of isocyanurates are subject to a tariff of 3.5%. (CX 179-Z19-Z20)

338. In this proceeding, data on exports of isocyanurates from Japan into the United States have been obtained from the Japanese producers of isos, Shikoku, and Nissan, which ship products to the United States. (CX 236#; CX 237#; CX 674#) **[77]**

339. The data from Shikoku show that # # (CX 583-B#; CX 674-D#) # # (Ishida, Tr. 999#, 1006; Pettoruto, Tr. 1395-96#)

340. The data from Nissan show that its United States exports of isos # # (CX 236-H#; CX 237-H#) Most recent data from Nissan, for the first half of 1986, # # (CX 236-H#; CX 237-H#) # # (CX 242-B#; CX 676-Z128-Z29, Z206-Z07#)

1. Isos and Cal Hypo Are Produced and Sold on a National Basis

341. The evidence clearly shows that isos and cal hypo are produced and marketed on a national basis. The domestic manufacturers of isos and cal hypo market isos and cal hypo nationally and compete on a national basis.

2. Although Substantial Quantities of Imported Isos and Cal Hypo Are Sold in the United States, the Other Evidence Clearly Negates a World Market for the Purposes of this Case

a. *The Evidence Does Not Show a World Market*

342. The evidence does not show that isos and cal hypo are produced and marketed on a worldwide basis or that leading domestic and foreign producers compete for the sale of isos and cal hypo on a worldwide basis. **[78]**

b. *The Recent ITC Dumping Proceedings Involving Imported Isos and Cal Hypo Suggest that Past Import Data May Overstate the Significance of Imports*

343. One type of restraint on foreign competition that is less severe than a quota is an anti-dumping duty order. Testimony concerning the nature and effect of anti-dumping orders and the DOC procedures in conducting administrative reviews of anti-dumping orders was given by John R. Kugelman, a supervisory import compliance specialist with the DOC's International Trade Administration. (Kugelman, Tr. 1229-1301) Mr. Kugelman has some 12-13 years of experience in the review of anti-dumping orders. (Kugelman, Tr. 1231-32)

344. An anti-dumping proceeding is typically initiated upon a petition filed by a representative of the domestic industry allegedly affected by the dumping. An anti-dumping duty order is issued as a result of a bifurcated administrative process involving the DOC and the United States International Trade Commission (the "ITC"). Before an anti-dumping duty order is issued, the DOC must find sales by a foreign producer in the United States at less than the price in that foreign producer's home country (defined, in the parlance of the Tariff Act and applicable regulations, as "sales at less than fair value"), and the ITC must find material injury to a domestic industry as a result of imports of a particular product from a particular country. (Kugelman, Tr. 1233)

345. The effect of an anti-dumping duty order is to require the importer of record to file a cash deposit with the United States Customs Service equal to the amount of estimated anti-dumping duties contained in the order along with other applicable tariffs or duties. (Kugelman, Tr. 1235-36) The product covered by such an order will not be released by Customs for import into the United States until the applicable anti-dumping duties are paid. (Kugelman, Tr. 1237)

346. Periodic reviews of anti-dumping duty orders under Section 751 of the Tariff Act are conducted annually upon request, beginning with the anniversary date of the anti-dumping duty order. The first annual review of an anti-dumping duty order will generally not be completed until twenty-five months after the initial order was issued. (Kugelman, Tr. 1241-42, 1246) However, a procedure for accelerated review of anti-dumping duty orders provided under Section 736 of the Tariff Act allows for a posting of bond in lieu of a cash deposit

pending **[79]** the completion of the review. Normally, a cash deposit is required. (Kugelman, Tr. 1240)

347. Anti-dumping duty orders can be revoked only on a company-by-company basis. (Kugelman, Tr. 1248) In order to have an anti-dumping duty order revoked or set aside, an importer must demonstrate (1) two years of no sales at less than fair value or four years of no imports and (2) no likelihood of resumption of sales at less than fair value in the future and the firm seeking such a revocation order must agree in writing not to sell below fair value in the United States in the future. (Kugelman, Tr. 1248-50) The minimum time required before an anti-dumping duty order could be revoked is about 3 ½ years. (Kugelman, Tr. 1259) Typically, that time in practice has been 6 to 8 years. The oldest anti-dumping order still in effect dates back to 1964. (Kugelman, Tr. 1260)

348. After an order is revoked, the anti-dumping procedure could be reinstituted by the filing of a petition by a representative of the affected domestic industry. (Kugelman, Tr. 1252-53) Reinstating an anti-dumping duty order would not require a new injury investigation by the ITC. (Kugelman, Tr. 1257)

349. No sales-below-fair-value for a period of two years would require a finding of zero or *de minimis* margins for two consecutive administrative reviews covering two full years. (Kugelman, Tr. 1248-49, 1251, 1289) If a first annual review period showed zero or *de minimis* margins and a second annual review period showed margins, then the two-year clock for revocation purposes would re-commence.

350. In order to comply with the requirements of an anti-dumping duty order, the firm subject to the order must adjust its pricing so that its United States price is not below its home market price or the cost of its home market sales. (Kugelman, Tr. 1299) One way for a firm to avoid dumping duties is to simply raise its United States price. (Kugelman, Tr. 1300) Often firms are able to comply by combining the lowering of the home market price and raising of the United States price. (Kugelman, Tr. 1300)

351. The impact of anti-dumping duty orders against a number of Japanese producer/exporters of isos and cal hypo as the result of ITC dumping proceedings will be treated in greater detail in our later discussion of the significance of isos/cal hypo imports from Japan in evaluation of the market share information. *See* F. 585-631, *infra.* **[80]**

c. *Exchange Rates*

352. Changes in exchange rates are obviously an important factor in assessing the extent to which foreign producer-exporters to the United States will be able to influence competition in the United States market. *DOJ Guidelines* § 3.23. This factor will also be discussed further in the later sections. *See* F. 632-40, *infra.*

d. *Capacity, Costs and Other Constraints of Foreign Producer-Exporters*

353. It is also recognized that the extent to which a foreign producer-exporter will be able to influence competition in the United States market is subject to such other constraints as their production capacity, production costs and the nature and extent of commitments to their respective domestic markets and to non-United States export markets. These factors will also be discussed further in the impact of imported isos and cal hypo in the United States market. *See* F. 641-48, *infra.*

354. It suffices here to say that the record as a whole clearly shows that the appropriate geographic market in which to assess the competitive effects of the challenged acquisition is the United States and that, in any event, the significance of imports of isos and cal hypo from foreign producers must fully be taken into account in the ultimate assessment of true competitive effects of the challenged acquisition.

VI. THE EFFECTS OF THE CHALLENGED ACQUISITION

A. *Structure of the Market—Producers and Sellers of Isos and Cal Hypo*

1. Domestic Producers

a. *Olin—Isos and Cal Hypo*

355. At the time of the acquisition, Olin was a major producer and seller of both isos and cal hypo. Olin produced isos at the Lake Charles, Louisiana facility and cal hypo at its Charleston, Tennessee plant. The Charleston plant was capable of producing # # pounds per year for pool chemical use, as an industrial cleanser ingredient and water treatment product. (CX 144-J#) **[81]**

356. At the time of the acquisition, Olin's Lake Charles trichlor plant was the third largest iso manufacturing operation in the United

States and the fourth largest worldwide. (CX 652-A-B#) Olin's PACE brand was the second most popular isocyanurate pool sanitizer in the United States. Olin also has marketed iso pool sanitizers under the ProChlor, Constant Chlor and OCI brand names. (CX 439-A-B#) OCI was a trichlor brand sold in bulk to repackers.

357. Olin's annual isocyanurate production, in thousands of pounds, at its Lake Charles facility for the years 1980 to 1984 was:

1980	1981	1982	1983	1984

\# #

\# #

(CX 441-E-I#)

The 1984 production of # # pounds given here was achieved in a seven-month period from January to July 1984. (CX 441-O#) Projected to a full year, Olin's 1984 production would have been # # pounds.

358. As originally designed and built by Olin, the Lake Charles isocyanurate operation consisted of four facilities: a cyanuric acid plant, a trichlor plant, a dichlor plant and a packaging plant. (Henske, Tr. 7107)

359. According to Mr. Henske, Olin's chairman and CEO, Olin's primary interest in becoming an isocyanurate producer was to market isos as pool chemicals. (RX 35-P#; Henske, Tr. 7103-04) In that regard, Mr. Henske characterized *trichlor* as # # (Henske, Tr. 7125-27#)

360. Olin designed the *trichlor* plant to have a production capacity of # # pounds. (CX 267-A#; Kosche, Tr. 8297) A # # pound cyanuric acid plant was also designed and intended to supply the requirements of both the trichlor and dichlor plants at Lake Charles. (Turnipseed, Tr. 7482; Kosche, Tr. 8297-98) The dichlor plant was described as a # # by Mr. Henske. (Henske, Tr. 7114#) It's design capacity was relatively small, in the range of # # pounds. (Henske, Tr. 7114#, 7227#; Kosche, Tr. 8354#) **[82]**

361. According to Mr. Henske, most of the emphasis on Olin's pilot plant work concerned the *trichlor* production process which began in 1973. (RX 35-F#; Henske, Tr. 7106) The trichlor pilot plant was operated for three to four years before the decision was made to build a product plant on a commercial scale. (Henske, Tr. 7106) On the other hand, the dichlor plant was piloted on a "very modest scale." (Henske, Tr. 7107, 7229)

362. Olin's Capital Appropriations Request ("CAR") for the construction of its Lake Charles facility, which was approved in mid-1977, provided for # # (CX 876-A-B#) The CAR encompassed a 1977-1989 planning period, and was based on the assumptions that (1) the iso segment of the pool chemicals business would grow at # #% per year (CX 876-A#), (2) # # (Kosche, Tr. 8615-22#), and (3) iso supply would exceed demand by about # #% per year. (RX 35-C#) By 1979, it became clear that spending would be higher and market growth slower than had been anticipated in the 1977 CAR, and the capital spending committed to the project was raised to # # an increase of # #%. (CX 876-A#; Kosche, Tr. 8622-23#) Plant construction on all four facilities was completed in late 1979, and by the end of that year, Olin was manufacturing isocyanurates at its Lake Charles plant. (CX 476-F#; RX 35-B#; Kosche, Tr. 8297-98#)

363. By 1982, events disproved additional assumptions of Olin's 1977 CAR. First, FMC, a competing iso producer, had begun pursuing an aggressive iso brand marketing strategy with its SUN brand. Second, iso supply was actually about # # in excess of demand, primarily because the Japanese producers had expanded their combined capacities substantially above what Olin had projected (RX 35-C#) and this, in turn, depressed iso prices # # below the 1977 CAR projections. (RX 35-C#) Third, production problems at the iso facility had caused total capital spending to reach # # (RX 35-B#)

364. From the beginning of iso plant construction in 1977 through the 1980-1982 plant start-up/market development phase, Olin # # (CX 267-M#)

365. As Olin stated in June, 1983 to ITC, # # (CX 750-Z32# [a certified questionnaire form submitted to ITC in the iso dumping proceeding]; Kosche, Tr. 8660-63#)

366. Olin's 1982-1991 PACE (iso) Strategic Plan, prepared in mid-1982, stated (CX 267-A#): **[83]**

# #

367. A substantial portion of Olin's 1980-1982 start-up costs involved the cyanuric acid facility. (Kosche, Tr. 8665#) As Olin told the ITC, the cyanuric acid plant # # (CX 750-Z32#; Kosche, Tr. 8665#) # # (CX 475-N#; Henske, Tr. 7115#) According to Mr. Kosche, the cyanuric acid plant was shut down because of # # and the shutdown decision was justified because Olin had # # (CX 475-N#)

368. Olin's packaging facility # # (Kosche, Tr. 8365-66#)

369. # # (Kosche, Tr. 8352-54#) The plant, however, did become operable and, as far as Mr. Henske was concerned, achieved its design capabilities. (Henske, Tr. 7227-28#)

370. Olin's dichlor plant was ultimately shut down in May, 1982 # # (CX 174-Z157#; Kosche, Tr. 8589#) # # (CX 174-Z157#) # # (CX 174-Z158#)

371. The trichlor plant also experienced start-up difficulties, but they were successfully overcome. (RX 35-B#; Kosche, Tr. 8339-40) By the end of 1981, the trichlor plant had [84] demonstrated its ability to produce at its design capacity. (RX 35-B#) Olin had spent about $12 million in start-up costs on the two iso plants. (Kosche, Tr. 8340-41)

372. In April, 1980, during the start-up phase of the Lake Charles trichlor plant, # # (RX 10-B#; Kosche, Tr. 8631-32#) The plant's "cyanuric acid conversion rate" was # # (Kosche, Tr. 8631#) Olin's 1983 pool chemicals budget, which was prepared in the fall of 1982, treated the effective cyanuric acid conversion rate at Lake Charles as # # (CX 502-M#; Kosche, Tr. 8679-80#)

373. Olin's entry into isos production was premised on a branded marketing strategy. (RX 35-Q#) Olin's 1977 isocyanurate facility CAR did not contemplate iso sales to repackers. (RX 35-C#) By 1980, Olin was contemplating bulk sales to repackers to "base load" the Lake Charles plant, *i.e.*, to keep the plant operating at the highest practical rate. (CX 264-B#) Beginning with the 1980 pool season, Olin marketed its isocyanurates nationally as pool sanitizers under the PACE brand name. (CX 264-A#; Kosche, Tr. 8311)

374. Olin pursued # # (CX 264-B#) and intended to establish PACE as the leading national iso brand and a premium-priced brand. (CX 260-F#; CX 264-B#) During the early 1980's Olin undertook to achieve its PACE marketing goals with # # promote and advertise PACE. (CX 264-B-C#; CX 750-Z32#; Kosche, Tr. 8659#)

375. Olin's marketing strategy for PACE was to sell it through all types of retail outlets including pool stores, mass merchandisers, hardware stores, garden supply stores, grocery stores and drug stores. Olin sold PACE through nonexclusive distributors and also directly to retailers. (CX 259-Q) Olin's distribution strategy met with some resistance from pool dealers who preferred not to carry brands that were also available in discount operations. (CX 260-G#; Castagnoli, Tr. 2485-86; Vonderlow, Tr. 4787#)

376. Olin's ability to # # was a factor taken into consideration by

Olin's planners. (Fortuna, Tr. 8237#) Olin documents show that # # (CX 268-C#)

377. Olin's 1983 Consumer Products Group Strategic Plan **[85]** provided as "Operating Guidelines" for Olin's "Growth" isocyanurate business: # # (CX 259-F#) By March, 1983, Olin had improved its cyanuric acid conversion rate at the trichlor plant from # # (CX 502-S#; Kosche, Tr. 8678-79#) In fact, the plant achieved a conversion rate # # (CX 863-D#) Olin's CA conversion rate of # # Based on its internal analyses, Olin concluded that # # (CX 259-P#; CX 502-S#) And Olin representatives acknowledge that Olin was a # # (CX 656-Z14-15#; Swartley, Tr. 7061-63#; Henske, Tr. 7199-7200#) Olin also was # # (Kosche, Tr. 8546#)

378. A March, 1983 PACE business update concluded that # # (CX 269-C#) # # (CX 269-Z2#) Other Olin cost comparisons show # # (CX 259-R#) # # (CX 263-M, V#) In August, 1983, Olin concluded that # # (CX 749-A#) FMC recognized Olin as the most efficient iso producer (CX 61-V) and # # (RX 310-D#; Marcum, Tr. 4203-04#)

379. During the 1983-1985 period, Olin successfully increased the practical production capacity of its trichlor plant beyond the facility's design-rated capacity. By February, 1983, Olin # # (CX 269-O#) By the second quarter of 1985, # # (CX 441-J#)

380. Olin's PACE sales also grew steadily throughout the 1980-1984 period. Olin gained market share in isos # # (CX 179-Z8; CX 219-A#; CX 220-A#) In 1982, # # (CX 498#) In 1984, the PACE sales volume # # (CX 832-A#; Fortuna, Tr. 8145#)

381. In the marketplace, Olin established PACE as one of the only two national brands of iso sanitizers, the other being FMC's SUN brand. **[86]**

382. Olin was, and still is, the only domestic iso producer vertically integrated in urea, an important input material for the production of cyanuric acid. (CX 375-P, R#) FMC viewed Olin as having the best raw materials position of any isos producer because of its vertical integration in urea, chlorine, and caustic soda, the three key input materials for CA production. (CX 664-Z23#) Prior to the acquisition, Olin believed # # (CX 749-A#) After the acquisition, Olin became the only fully vertically integrated producer selling isos in the United States, producing internally all of the input materials required for the production of isocyanurates.

383. During the trial of this case, Olin expended much trial time and

efforts to develop a detailed and extensive record designed to show that (1) the CA production technology employed by Olin at Lake Charles had not been tested and employed successfully theretofore on a commercial scale by any producer anywhere in the world and it proved to be an uneconomical CA production process, a costly and long-drawn lesson to be learned by Olin before it decided to shut down its CA plant in the spring of 1981; (2) Olin's dependence on purchased CA (from Nissan of Japan) placed Olin under a serious cost disadvantage as a producer-seller of isos; (3) Olin's trichlor and dichlor production plants also encountered a series of unexpected and costly technical difficulties, until Olin decided to "waterbatch," for the time being, the entire iso production facilities at Lake Charles in July, 1984, thereafter becoming a repacker-seller of Monsanto-tolled isos. *See* RPF at 81-137. Olin now argues that for these reasons it was never a viable competitor in the United States isos market and sustained enormous financial losses from its Lake Charles venture before it acquired FMC's CA/iso production technology assets and business in 1985. *See* RB at 91-96.

384. The evidence also shows that, after Olin suspended its trichlor production at the Lake Charles plant, Olin continued to be a major contract producer-seller of isos (PACE brand) through its raw materials tolling agreement with Monsanto ("Monsanto Toll") (CX 469#), which obligated Olin to take # # pounds of isos per month from Monsanto. (CX 469-C#)

385. Thus, the record as a whole demonstrates that, although Olin lacked its own cyanuric acid (CA) supply, had to depend on purchased CA, and ceased to produce isos by late summer of 1984, Olin was a committed, viable and major producer-seller of isos up to the time Olin commenced the FMC acquisition negotiations in earnest. **[87]**

386. Olin entered the production of cal hypo in 1928, and in the same year introduced the HTH brand pool sanitizer. At the time of the acquisition, Olin's calcium hypochlorite facility in Charleston, Tennessee, was the largest cal hypo manufacturing operation in the world. The annual cal hypo production capacity of the Charleston plant was # # at the time of the acquisition. (CX 441-J#) Mr. Turnipseed, addressing the ITC in May, 1984, remarked that "Olin sells most of its calcium hypochlorite in the residential swimming pool market." (CX 173-K)

387. Olin also owns a chemical plant in Niagara Falls, New York, where it produced cal hypo until September, 1982. (CX 384-D#)

Robert Yohe, President of Olin's Chemicals Group, testified on May 14, 1985, # # (CX 473-A, D, I-J)

388. The cal hypo # # (CX 441-E-G#) Olin's annual cal hypo production, in thousands of pounds, for the years 1980-1984 was as follows:

	1980	1981	1982	1983	1984	
Charleston#						#
Niagara#						#

(CX 377-Z15#; CX 384-F#; CX 441-E-I#)

389. Olin is also the 50% owner of a cal hypo production facility in Johannesburg, South Africa. The facility is operated under the joint venture named Aquachlor Pty. Ltd. The plant opened in 1974 and has an annual cal hypo # # (CX 441-D#) Aquachlor does not export to the United States.

390. Olin periodically assesses the manufacturing costs of other cal hypo producers and has # # (Henske, Tr. 7243#) # # (Hughes, Tr. 5250#) Mr. Henske acknowledged that Olin is the leading producer of cal hypo and has the # # of the cal hypo business in this country. (Henske, Tr. 7156#, 7168#) **[88]**

391. PPG acknowledges Olin's leadership position in the cal hypo business. (CX 545-D; CX 548-H; CX 549-C) PPG's Richard Hughes estimates that Olin has historically had over # # of the domestic cal hypo business and that Olin's HTH accounts for # # of branded cal hypo sales. (Hughes, Tr. 5353-54#) Toyomenka, a leading importer of Japanese cal hypo, also acknowledges Olin's dominant position as a supplier of cal hypo in the United States. (CX 613-A#) Pool sanitizer repackers consider Olin to be the leading marketer of cal hypo. (Marshall, Tr. 1156-57#; Schaub, Tr. 2097-98; Castagnoli, Tr. 2532)

392. Olin is acknowledged to be the pricing leader in cal hypo. (CX 119-L; CX 173-Z35, Z44-45; CX 175-Z58; CX 360-A#; Castagnoli, Tr. 2532) Typically, Olin's pricing lead is followed by PPG. (CX 360-A#) Also, Olin's HTH brand of cal hypo commands a premium price in the marketplace. (CX 173-O; CX 175-W; CX 660-C#; Hughes, Tr. 5304#; Henske, Tr. 7156#)

393. Increased cal hypo prices in the 1979 to 1981 period were led by Olin, with others following. (CX 175-Z70) # # (CX 647-B#) # # (CX 499-M#; CX 545-B)

394. Olin typically announces its cal hypo prices for the following pool season on October 1 of each year. (CX 175-Z2) This has been

recognized as reflecting annual increase in cal hypo prices which are surely to be followed by others. (CX 377-Z26#)

395. In 1984, Olin announced two cal hypo prices, the first in May, 1984, less than one month after the ITC iso anti-dumping decision. (CX 113-C) Later in 1984, Olin led a second cal hypo price increase, which met with little resistance. (CX 312#; CX 361-B; CX 482#)

396. Shortages of cal hypo were reported in April and May of 1984, around the time of the first 1984 cal hypo price increase, and Olin put customers on allocation, at a time when Olin had substantial excess capacity. (CX 382-Z7; CX 383-I-J)

397. In order to support and promote its HTH sales Olin has used a number of programs. Olin employs national advertising, including network television (CX 481-F#), provides cooperative advertising and distributor incentive programs for its customers (CX 176-Z14-15). Olin publishes the Poolife magazine with a circulation of 1.2 million that provides advice and information on a variety of topics of interest to pool owners and contains discount and rebate coupons for HTH and other Olin **[89]** brands. (CX 481-F#) Olin also employs dealer incentive programs that enable dealers to earn vacation trips based on high sales volumes. (CX 481-F#; Marshall, Tr. 1164-65)

398. Thus, Olin is indisputably the industry leader in the production and sale of cal hypo for pool use in the United States. And, in the dry pool chemicals market comprising isos and cal hypo Olin was one of the top firms, if not the leading firm, in this country.

b. *FMC Corporation—Isos*

399. At the time of the acquisition, FMC's South Charleston, West Virginia isos plant was the second largest isocyanurates manufacturing operation in the world. (CX 652-B#) The South Charleston isos plant was part of FMC's CDB business and included facilities for producing the two isocyanurate products, trichlor and dichlor, and also a facility for producing cyanuric acid. (CX 64-Z33-34; Collins, Tr. 3829) FMC began iso production at South Charleston with a single dichlor line in 1963. In 1969, FMC opened a second dichlor line and in 1974 added the trichlor line. (CX 64-Z33) In 1983, FMC completed the modification of a dichlor line to swing between production of dichlor and trichlor.

400. At the time of the challenged acquisition, the practical annual capacity of FMC's isocyanurate production facilities was as follows:

	Annual Production Capacity (million pounds per year)
Dedicated dichlor line	17
Dichlor swing line	16
Total maximum dichlor capacity	33
Dedicated trichlor line	13
Trichlor swing line	10
Total maximum trichlor capacity	23

(CX 64-Z33-34)

And, FMC's annual isocyanurate production (in thousands of [90] pounds) for the years 1980-1984 was as follows:

1980	1981	1982	1983	1984
24,100	33,000	35,200	32,000	36,000

(CX 64-Z37)

FMC marketed isocyanurates for pool use under the SUN brand and operated a repacking facility in Livonia, Michigan. (CX 64-Z25)

401. Prior to 1978, FMC produced and sold bulk isocyanurates to pool chemical repackers under the "CDB" trademark and bulk dichlor to industrial accounts under the "Clearon" trademark. (CX 278-Z7#)

402. FMC entered the branded distribution of isocyanurate pool sanitizers in 1978 when it acquired the Sun Cleanser Company, a large regional isocyanurate repacker that marketed isos under the SUN brand name. (Collins, Tr. 3570) Thereafter, FMC undertook a major advertising and promotional campaign to establish SUN as a national brand. This strategy was designed to achieve market share growth. (Collins, Tr. 3794)

403. According to John Christensen of Chem Lab, # # (Christensen, Tr. 1810#) Mr. Christensen believed that aggressive pricing was # # (Christensen, Tr. 1811#) He characterized the iso pool chemical situation on the west coast several years ago as a # # (Christensen, Tr. 1810#) Charles Schaub of Coastal, another large repacker, also acknowledged that he purchased isos from FMC because FMC was more competitive than Olin or Monsanto. (Schaub, Tr. 2106)

404. A Monsanto pricing summary document reflects that:

1) # #
2) # #
3) # #

4) # # **[91]**
5) # # and
6) # #
(CX 191-B, D#)

405. The record reveals several other instances where FMC was exerting downward pressure on pricing. (CX 107-B; CX 108-B; CX 109-B; CX 112-B; CX 215-A; CX 216#; CX 217-A; CX 221-A#) These documents include 1983 (CX 108-B; CX 109-B) and 1984 (CX 221-A#) as well as 1982 and previous years.

406. FMC's efforts to increase SUN's market penetration were successful. In 1979, its first full year of marketing SUN, FMC had established SUN as the leading national isos brand. (Collins, Tr. 3777)

407. In 1979, FMC corporate management embarked on a business restructuring program designed to increase the value of FMC's stock. The program included the development of uniform, corporate-wide standards of minimum acceptable financial performance to be used to identify, and to either shut down, liquidate or sell, those business units with substandard performance without a reasonable prospect of meeting the standards. (Furrer, Tr. 3347-48)

408. FMC's measures of financial performance to judge its business units under the corporate restructuring program included ROI (return on investment), CFROI (cash flow return on investment as an inflation-adjusted version of ROI), ROWC (return on working capital, used in determining ROI), and ROCE (return on capital employed, used in determining ROE (return on equity)). John R. Furrer, FMC's Vice President of Corporate Development, who headed the business restructuring program, testified that FMC regarded CFROI to be "the most important of all." (Furrer, Tr. 3348-50, 3493)

409. FMC's corporate planning department established the following corporate "hurdle rates" for three of the above-listed measures:

Return on working capital (ROWC)—15%
Return on capital employed (ROCE)—15%
Cash flow return on investment (CFROI)—9% **[92]**

Mr. Furrer testified that these hurdle rates were to be measured uniformly on a historical cost basis. If measured on a current cost basis, the ROCE corporate hurdle rate would be about 7%. The ROWC and CFROI hurdle rates would also be lower when judged on a current cost basis. (RX 134-Z47; CX 29-I; Furrer, Tr. 3458, 3493-94; Collins, Tr. 3693-94)

410. FMC's business restructuring analysis involved two separate tracks. Mr. Furrer and members of his corporate planning staff would meet with the group managers for each of FMC's businesses where the planning staff presented its views about how the business unit measured up against the hurdle rates and the likely future performance of the business. Each business unit was required to respond in its biannual strategic planning process, after which the process moved on to resolve any remaining differences between the corporate planning staff and business unit management, with a view to a determination of whether the business was to be a candidate for liquidation or divestiture under the restructuring program. (Furrer, Tr. 3351-53)

411. In 1980, when FMC completed the review of all of its business units, there were thirty-five business units within the corporation. In 1987, that number had declined to twenty-five business units, primarily due to divestiture of the units pursuant to the corporate restructuring process. (Furrer, Tr. 3346)

412. Under any of the three principal financial measures used by FMC, the CDB business fell below corporate hurdle rates. (Furrer, Tr. 3357-58) Using FMC's internal accounting procedures, the CDB unit had a CFROI of 6.5% in 1978 and 9.3% in 1979. (RX 132-Z1) The CDB business performance was somewhat better when measured by the ROCE or ROWC. Thus, according to FMC's internally established corporate hurdle rates, the CDB business became by 1980 a potential candidate for divestiture unless the management perceived near-term prospects of improvement and a reasonable expectation of attaining hurdle-clearing financial performance.

413. Because of FMC's internal accounting procedures, however, it is not easy to assess the profitability of FMC's CDB business for the purpose of objectively determining the *viability* of FMC's isos business as a going concern. Although FMC, as required by the Securities Exchange Commission ("SEC"), reports its financial results to its stockholders and to the public, under the generally accepted accounting principles on the basis of *historical* cost accounting, FMC internally employed *current* cost accounting. (Collins, Tr. 3721-22, 3906) **[93]**

414. It is well-recognized that using current cost accounting for measuring profitability uniformly results in lower profits or greater losses than result from the use of historic cost accounting. (Collins, Tr. 3724, 3730-31) Using current cost accounting for measuring ROI

(return on investment) results in uniformly lower rates than result from the use of historic cost accounting. (Collins, Tr. 3726-27, 3731) And, all of the record testimony of Mr. Collins, FMC's CDB Director, regarding the profitability or lack thereof of the CDB business referred to profits based on current cost accounting. (Collins, Tr. 3724-25, 3740, 3780)

415. In any event, about January, 1980, FMC's corporate planning department concluded that improvement of the isos business was unlikely because (1) FMC did not have a good cost position in comparison to the other isos producers; (2) there was significant isos overcapacity; (3) the SUN brand national marketing strategy had alienated its traditional repacker customers; (4) competitive pressure from the Japanese iso exporters and from Olin would have a long-term depressing effect on iso prices; and (5) isos were a commodity chemical. (CX 667-A, B; Furrer, Tr. 3357-60; Collins, Tr. 3583-88, 3619-20) During a subsequent Board presentation by Mr. Furrer, FMC's senior corporate management identified the CDB business as a potential target for divestiture, and Mr. Furrer informed Mr. McMinn, then head of FMC's Industrial Chemicals Group, of the Board's views. Mr. McMinn directed the CDB management to prepare a response. (Furrer, Tr. 3428-29, 3357-58)

416. In its response (contained in the 1980 Strategic Plan) the CDB business management proposed to operate the business for another two years in the maintain-and-selectively-invest mode rather than in the run/sell mode. (RX 125-E, G, H; RX 134-Z36, Z37, Z58; Furrer, Tr. 3357-58; Collins, Tr. 3577-78, 3593-95) The resulting agreement between the corporate planning group and the CDB management, as embodied in the 1980 Master Contract (RX 133-D-F), allowed continued CDB operation under certain operating parameters, including selective capital investment and maximization of short term cash flow.

417. During the 1982 strategic planning process, the CDB business management team identified and reviewed four options to be recommended to the corporate planning group. They were (1) to invest in a new plant using FMC's Sulfolane technology to produce cyanuric acid; (2) to buy Olin's trichlor plant at Lake Charles and build a CA plant; (3) to enter into a joint venture with Olin, including construction of a new CA plant using the Sulfolane technology; and (4) to exit the isos business. (RX 125-P,Q) The CDB management decided to recommend the exit **[94]** option. (RX 125-B; *see* Furrer, Tr. 3373-74; Collins, Tr. 3625, 3627, 3807-08)

418. FMC's corporate planning department accepted the CDB recommendation. In a memorandum dated September 2, 1982, and addressed to both the President and CEO of FMC, the corporate planning department advised that (RX 380-A): "The Specialty Chemicals Division has recommended that we withdraw from the CDB business. Group management and Corporate Development support this recommendation."

419. Respondent contends that at that point a "final" exit decision had been made by FMC. *See* RPF 412.

420. Although the record reflects that FMC's corporate management evidently decided to sell the CDB business eventually, FMC also decided to continue to operate the business in a mode FMC described as "run/sell." And, in the run/sell mode, FMC continued to make capital investments in the CDB business to improve manufacturing costs and to increase isocyanurate production capacity through debottlenecking. It was recognized that such expenditures would contribute to CDB's profitability and make the business more saleable. (RX 125-Z13, Z18; Collins, Tr. 3819-21)

421. Viewed thus, the 1982 master contract does not reflect a definitive and final exit decision but does define the specific operating strategies under the run/sell mode. (RX 133-A-C; Furrer, Tr. 3482; Collins, Tr. 3828-29) In brief, the 1982 master contract envisioned continued operation of the business within certain parameters until such time as an acceptable sale has been concluded.

422. In his March, 1984 testimony before the ITC's Japanese dumping proceeding, Mr. Collins testified that FMC had reduced capital expenditures and curtailed research and development to minimize the negative impact of Japanese dumping. (Collins, Tr. 3836) Mr. Collins also testified that, if FMC could get some pricing in the right direction, it could make the CDB business into a good business. (Collins, Tr. 3838) During his testimony, Mr. Collins did not say that FMC was considering exiting the CDB business. (Collins, Tr. 3840-41)

423. In August, 1984, a CDB plan update was prepared by the division which analyzed and rejected a shutdown decision. (CX 29-A, F; Collins, Tr. 3844-45) The recommendation of the division was to continue an operating plan of run/sell for the next 18-24 months, at which time the business would be reevaluated. (CX 29-A; Collins, Tr. 3846) This run/sell **[95]** recommendation was approved and endorsed by corporate management. (Furrer, Tr. 3489; Collins, Tr. 3846, 3856)

424. The highest ranking FMC official to testify in this case, John R. Furrer, Vice President of Corporate Development, stated that he had never seen a corporate document that talked about an irrevocable decision by FMC to exit the CDB business (Furrer, Tr. 3423-31, 3440) and Mr. Collins, the director of the CDB business, testified that at the time the run/sell mode was reaffirmed in the fall of 1984, he would not say it was an irreversible decision. (Collins, Tr. 3863)

425. Furthermore, FMC was not conducting its CDB business in a manner consistent with a decision to shut down or liquidate that business. The 1982 CDB master contract reflects the strategies of increasing capacities, debottlenecking, and cost reduction programs, all of which were implemented. (RX 133-A-C; Collins, Tr. 3828-31) In May, 1985, there was a project at FMC that would expand cyanuric acid capacity at South Charleston by 5 to 10 million pounds. (Collins, Tr. 3868-69)

426. Liquidation of FMC's CDB business would not have been economically attractive because of the relationship of the business' net present value to its liquidation value, and because of the increasing value of continuing to operate the business. Shutdown value is the after-tax present value of going through the process of going out of business. Net present value is the value of a stream of cash flows that are projected to be generated by a business over a period of time and discounted to present value. (Furrer, Tr. 3457-58)

427. At the time of the 1982 shutdown analysis, the net present value of continuing to operate the CDB business was $9 million (RX 125-Q; Furrer, Tr. 3464), while the net present value of shutting the business down was $9.4 million. (RX 125-U; Furrer, Tr. 3462) Even though comparable values were derived for continuing to operate the CDB business and for shutting it down, the division recommendation was to operate the business in a run/sell mode. (RX 125-Z18)

428. The next and last shutdown analysis prepared by FMC of its CDB business was in August, 1984. (CX 29; Collins, Tr. 3845-47) FMC's conclusion was that the net present value of continuing to operate the CDB business was $31 million, while the net present value of shutting the business down was $15 million. (CX 29-A, I, J) # # (CX 29-A) # **[96]** # (CX 474-V-W#)

429. The evidence also shows that FMC's plans and prospects for the CDB business were optimistic during 1984 and 1985. The CDB business budgeted its operating profit before tax for 1985 at $3.6 million. (CX 707-I#) The 1985 budget was approved in November,

1984 by corporate management. (Collins, Tr. 3732) On February 22, 1985, in its April forecast, FMC's CDB business increased its expected operating profit before tax over its 1985 budget from $3.6 million to $6.2 million. Virtually all of the increase was attributed to expected price increases for isos and manufacturing efficiencies at the South Charleston plant. (CX 715-A-B) For the first three months of 1985, the CDB business realized an actual operating profit of $2,784,000, while the April forecast for the period anticipated a lower profit of $2,557,000. (CX 718-B; Collins, Tr. 3740-41) The director of the CDB business stated that, on either a current cost or historic cost basis, the business showed a trend from the red to the black. (Collins, Tr. 3730) And Mr. Furrer, the only member of FMC's corporate management to testify, stated that the net present value of operating the CDB business was three times greater in 1984 than in 1982. (RX 125-Q; CX 29-A; Furrer, Tr. 3464)

430. At the time of the sale of FMC's CDB business to Olin, FMC expected the profitability of the business to increase. The CDB plan summary prepared in August, 1984 indicated that as business performance improves under current conditions, the business' value as well as its saleability should also improve. (CX 29-A; Collins, Tr. 3845-46) That summary also forecast increasing profits and cash flow for the CDB business, with net profits after tax increasing from $2.8 million in 1984 to over $11 million by 1989. (CX 29-I) It also forecast increasing capital expenditures and operating profits greater than cash flow. (CX 29-I)

431. # # (CX 263-C, E, I, S#; CX 405-H#) # # (CX 405-P#; CX 474-V, W#)

432. Between 1980 and the announcement of the sale to Olin, FMC was increasing both the sales and the market share of its CDB business. In 1980, FMC estimated its share of the isos market to be 26.5%. By December of 1984, FMC believed that its share of the market had increased to 37%. (CX 34-L) **[97]**

433. From 1983 to 1984, FMC projected an increase in its market share of the SUN/repacker volume from 29% to 40.5% while reducing advertising and selling expenses. (CX 70-Q) This increase was at the expense of importers. (CX 70-T) For the same period, FMC projected an increase in its market share of its total iso volume from 38% to 44% at the expense of importers. (CX 70-S)

434. However, the evidence also shows that the continued operation of the CDB business in the "run/sell" mode after 1982 within the

parameters defined in the master contract also meant that, in addition to limiting capital expenditures, FMC's iso marketing efforts had to be scaled down substantially from the previous levels. A number of former FMC/CDB isos customers testified that FMC's promotional and cooperative advertising programs, as well as FMC's brand and dealer support declined noticeably from late 1982 through 1984. *E.g.*, Aston, Tr. 4433-36, 4438-40, 4445; Vonderlow, Tr. 4800, 4842-44; Benson, Tr. 4922-23#; Roberts, Tr. 5056-58; Wetzel, Tr. 5386-88; Kent, Tr. 6545-50; Russ, Tr. 5666; Arakelian, Tr. 5889-90, 5950-51.

435. Also, in December, 1984, before FMC signed the Letter of Intent with Olin, FMC wrote off the CDB assets, along with four or five businesses, and took a $167 million charge against corporate earnings. FMC knew that had it continued any of these written-off businesses, it would incur substantial tax penalties. (Furrer, Tr. 3416-19)

436. In 1983, following the "run/sell" decision, FMC undertook relatively limited efforts to sell the CDB business, claiming at trial that as a practical matter, a general economic downturn at that time made an extensive buyer search unnecessary. (Furrer, Tr. 3382-84)

437. During the 1984 strategic planning process, FMC reassessed the CDB business. (CX 29#; Collins, Tr. 3845) The 1984 CDB Strategic Plan, completed in August, 1984 and subsequently approved by FMC's corporate management, concluded that: # **[98]** #
[CX 29-A#; Furrer, Tr. 3489; Collins, Tr. 3844-46)

438. FMC was acknowledged to be a less efficient producer of trichlor than either Monsanto or Olin. (CX 749-B#; RX 132-V#) FMC's trichlor conversion rate was estimated to be in the # # (RX 132-V#) FMC was, however, acknowledged to be a more efficient producer of dichlor than Monsanto. (CX 749-B#; RX 132-Q#) Hence, FMC was able to reduce costs by swapping CA or dichlor for trichlor with Olin. (CX 174-Z157#; CX 519#; CX 520#; CX 521#; CX 523#; Collins, Tr. 3825-26, 3870)

439. FMC's isocyanurate business assets included its 50% interest in Chlor-Chem, Ltd., a British company with a facility, located at Widnes, England, that produced dichlor, trichlor and cyanuric acid. (CX 179-Z39; CX 465-J) Chlor-Chem was a joint venture in which FBC Holdings Ltd. owned the other 50% share. (CX 179-Z39; CX 256-H; Furrer, Tr. 3526-27) FBC is owned by Schering AG. (CX 450-Z1#)

440. Chlor-Chem began producing isocyanurates in 1972. Its annual isocyanurate production capacity, at the time of the acquisition, was

approximately # # pounds. (CX 64-Z23#) Chlor-Chem was reportedly the largest European isos producer. (CX 27-B) Chlor-Chem had been producing # # (CX 64-Z24#)

441. Since the formation of the Chlor-Chem joint venture, FMC had exclusive marketing control over all Chlor-Chem isocyanurates sold outside the United Kingdom. (CX 64-Z20#) On occasion, FMC has imported small amounts of isocyanurates from Chlor-Chem to the United States. The total such imports (in thousands of pounds) for the years 1980-1984 were as follows:

1980	1981	1982	1983	1984
0	723	33	0	42

(CX 64-Z22)

442. Chlor-Chem produced cyanuric acid utilizing dry pyrolysis technology and supplemented its internal production with CA purchased from Nissan of Japan and CdF of France. (CX 64-Z21; Kitagawa, Tr. 2392-94#) **[99]**

c. *Monsanto Company—Isos*

443. At the time of the acquisition, Monsanto's isos plants—a dichlor plant in Luling, Louisiana, and a trichlor plant in Sauget, Illinois—represented the largest isocyanurates manufacturing operation in the world. (CX 232-Q-R, T; CX 652-B#; Marcum, Tr. 3951#) Monsanto has been a producer of isocyanurates since the late 1950's. Monsanto also manufactures crude cyanuric acid at the Luling plant. (Marcum, Tr. 3950-51)

444. Monsanto formerly sold granular CA for use as a pool water stabilizer. Since late 1984, however, Monsanto has used its entire CA capacity for internal use as the principal ingredient of the trichlor and dichlor it produces. (Marcum, Tr. 3949-50) Monsanto's cyanuric acid conversion rate at its Sauget trichlor plant is # # At the time of trial, Monsanto's cyanuric acid # # (Marcum, Tr. 4053, 4068#)

445. Monsanto does not produce all its raw material requirements for iso production, but buys chlorine and caustic soda. (CX 664-Z22; Collins, Tr. 3816-17) Monsanto also buys urea for CA production. (Marcum, Tr. 4053#)

446. Approximately # # of Monsanto's trichlor output is sold as pool sanitizers and # # of its dichlor output is sold for the same end-use, with the remainder being used for industrial applications. (Marcum, Tr. 4055#) Approximately # # of Monsanto's total isos output is exported, with that percentage # # (Marcum, Tr. 4057#)

447. Monsanto sells isocyanurates exclusively in bulk form to repackers and industrial accounts. The company has never sold its isocyanurates directly to distributors or dealers. (Marcum, Tr. 3961-63, 3966-67) Monsanto's isocyanurate business is designated its ACL business, and it sells bulk isocyanurates to repackers under the "ACL" trademark. ACL 90 is the Monsanto bulk trichlor product, and ACL 56, ACL 59 and ACL 60 are its bulk dichlor products. (CX 232-W, Z2: Marcum, Tr. 3948, 4118-19)

448. Monsanto's annual isocyanurate production, in thousands of pounds, for the years 1980-1984 was as follows:

1980	1981	1982	1983	1984
31,579	33,069	27,351	30,732	48,718

(CX 232-Q-R) **[100]** At the time of the acquisition, Monsanto's annual isocyanurate production capacity was # # pounds. The Luling dichlor plant had a # # pound capacity and the Sauget trichlor plant had # # pounds of capacity. (CX 232-W)

449. In the pool chemicals business, Monsanto is recognized as the price leader of isocyanurates sold in bulk to domestic repackers. (CX 75-D#; CX 240-G#; CX 677-Z19#; Pettoruto, Tr. 1376#) Many in the industry also recognize Monsanto as the suppler that has generally attempted to increase bulk isocyanurate prices. (CX 9-H, M, Z21, Z32; CX 107-B; CX 117-B; CX 132-A; RX 127-Y#; Bloom, Tr. 712; Christensen, Tr. 1815#; Collins, Tr. 3806-07) Monsanto's high price policy is regarded as "firmly entrenched." (CX 9-Z32)

450. Mr. Marcum of Monsanto testified that # # (Marcum, Tr. 4190#) A Monsanto September, 1983 pricing recommendation memo acknowledged that Monsanto had # # (CX 218-A#)

451. In the fall of 1983, while iso prices were actually declining, Monsanto announced that its 1984 price would remain unchanged from the 1983 level. (CX 218-A#) In September, 1984, Monsanto announced a 15 cent per pound iso price increase (from $1.30 to $1.45) for the 1985 season, which was followed by both the domestic producers and the Japanese importers. (CX 222-A#; CX 223-A#) On July 25, 1985, Monsanto's ACL managers decided on a 15 cent increase in iso prices (from $1.45 to $1.60) to be publicly announced in September, 1985 for the 1986 season. (CX 223-A#) By early August, Monsanto's customers and at least one competitor had learned of Monsanto's planned price increase. (CX 132-A; CX 565-A) Monsanto's September, 1985 increase became the industry list price for 1986. (CX 448-C; CX 449-A; Jonas, Tr. 2246#; Marcum, Tr. 4118-19#)

452. Monsanto's iso salesmen are not seen as highly involved with the pool chemical business; they are not pool chemical specialists, but rather are responsible for several other non-pool chemicals manufactured by Monsanto. (CX 9-H; Wilson, Tr. 4263)

453. Monsanto is perceived to have a cost advantage over other isos producers in terms of cyanuric acid production costs. (CX 34-X; CX 259-P#; CX 502-S#; CX 664-Z22; RX 32-M#) However, Monsanto's cost advantage may be offset to some extent by Monsanto's multiple locations for iso production. (CX 664-Z22) **[101]**

454. Monsanto has been plagued by production problems (CX 570-D#; CX 571-C#; CX 604-B; CX 615-A#; Marcum, Tr. 3954, 4036) and product quality problems. (CX 174-Z1-2, Z173#; CX 179-Z7; CX 515#) Monsanto is perceived to have been losing market share to Olin and FMC. (CX 9-Z21-22; CX 179-Z8, Z24; CX 219-A#; CX 220-A#; Marcum, Tr. 4049)

455. Monsanto is perceived by some to lack a strong commitment to the iso business. (CX 9-V) In 1982, FMC perceived Monsanto to be # # its isos business. (CX 462-D#)

456. Monsanto's ACL business suffered a decline in its annual sales volume during the period 1979-1982 # # (CX 225-D#; Marcum, Tr. 4198#) The gross profits achieved by Monsanto's ACL business declined over the 1979-1982 period from # # (CX 225-D#; Marcum, Tr. 4198#) The return on capital ("ROC") for Monsanto's ACL business declined over the 1979-1982 period, # # (CX 225-D#; Marcum, Tr. 4198#)

457. In 1983, Monsanto's ACL business management anticipated that the performance of its isocyanurate business would improve substantially in the near future. (CX 225-G; Marcum, Tr. 4199#) # # (CX 225-I#; Marcum, Tr. 4200#) Monsanto's ACL business actually exceeded its 1983 planning goals for gross profits in both 1984 and 1985. # # (CX 225-I#; Marcum, Tr. 4200#) # # (CX 225-I, K#; Marcum, Tr. 4201#)

458. After the consummation of the Olin/FMC acquisition, Monsanto's ACL management continued in their optimistic financial projections for the ACL business. In February, 1986, Monsanto knew about the acquisition and was fully aware of some post-acquisition market developments, including a plant expansion by CdF of France and Sigma's entry into the United States (CX 227-D#; CX 229-C#; Marcum, Tr. 4043-44, 4193-97#) # # (CX 225-K#; Marcum, Tr. 4201#)

459. A repacker witness testified that he believed that Monsanto approved of # # (Christensen, Tr. 1985#) Also, a number of repacker witnesses believed that if Olin were to raise its iso prices in the future, Monsanto would do the same. (Bloom, Tr. 712; Marshall, Tr. 1164; Castagnoli, Tr. 2481) **[102]**

460. Some repackers view Olin as their competitor inasmuch as Olin sells bulk pool chemicals to them and also sells its branded isos and cal hypo directly to distributors, who are repackers' pool sanitizer customers. A number of repacker witnesses voiced a strong concern that, should Olin's acquisition be permitted to stand, Olin may choose to force repackers' profit margins down to an unacceptable level by raising its bulk prices to repackers and lowering its prices to distributors. It is said that such a profit squeeze will drive many repackers out of business, leaving Olin free to raise its branded pool chemical prices to the distributor, all to the detriment of the consumer. *E.g.*, CX 116-D; Kennedy, Tr. 530-31; Marshall, Tr. 1162-64; Christensen, Tr. 1893-99; Schaub, Tr. 2112; Castagnoli, Tr. 2537-39; Wilson, Tr. 4328-29.

461. Mr. Marcum of Monsanto testified that Monsanto views repackers as # # (Marcum, Tr. 4083-84#) Monsanto has attempted to assuage repackers' concerns by # # (Marcum, Tr. 4081-83#)

462. Mr. Marcum further testified that Monsanto is "quite committed to this [isos] business" which, in the past thirty years, has generally # #; the isos business is considered "part of the long-range plan for" Monsanto. (Marcum, Tr. 4078-79#)

d. *PPG Industries—Cal Hypo*

463. PPG Industries ("PPG") has been producing cal hypo in the United States since 1942, initially at a plant in Barberton, Ohio, and since 1984, at a new plant in Natrium, West Virginia. # # (CX 552-E-G#)

464. The new technology and integrated production of chlorine and caustic at Natrium help to make PPG a relatively low cost producer of cal hypo. (CX 548-H)

465. PPG's annual cal hypo production, in thousands of pounds, for 1980-1985 was as follows: **[103]**

	1980	1981	1982	1983	1984	1985
Natrium#						#
Baberton#						#

(CX 551-E#; CX 552-B#)

466. PPG sells its cal hypo as pool chemicals and for industrial use. Its cal hypo sales account for about 0.1% of PPG's total sales. (Hughes, Tr. 5160) PPG sells approximately # # of its cal hypo in bulk form to repackers and approximately # # to distributors of swim pool sanitizers packaged primarily under their own private labels. (Hughes, Tr. 5222-23#) PPG also exports approximately 20% of its cal hypo overseas. (Hughes, Tr. 5182)

467. PPG's October, 1984 Calcium Hypochlorite Business Strategy Paper, published after PPG's Natrium plant was on-line, states that "Olin is the dominant force in the swimming pool chemical business." (CX 549-C; *see also* CX 545-D; CX 548-H) PPG's stated objective is to become second to Olin in the cal hypo business with a 20 to 25% share (CX 545-F) and acknowledges that it is unable to compete on a par with Olin in the cal hypo business (CX 548-R). PPG's April 1, 1984, Business Strategy Paper states (CX 548-H): "To effectively compete and grow the calcium hypochlorite business, PPG must develop markets and customers that Olin cannot serve or chooses not to serve . . . ."

468. Similarly, PPG has followed Olin's pricing in the past and will continue to do so in the future. PPG's 1982 Business Strategy Paper indicates PPG's strategy is "to follow competitive pricing and achieve our position as an alternate source to Olin." (CX 545-G) PPG's 1983 Calcium Hypochlorite Profit Plan states that "PPG will continue to follow Olin's price leadership as marketplace conditions dictate on calcium hypochlorite." (CX 547) Richard Hughes, PPG's cal hypo business manager, acknowledged that PPG follows Olin's pricing lead. (Hughes, Tr. 5290) And, in the 1984 Calcium Hypochlorite Profit Plan, PPG stated a concern, in setting prices for its Pittclor brand of cal hypo, to refrain from "giving confusing signals to Olin." (CX 550-K)

469. PPG's 1982 Business Strategy Paper, after noting that PPG would follow Olin's pricing lead, stated that PPG's "[p]rivate label product will continue to be sold at prices which reflect the cost of promotional and advertising programs available with HTH and Pittclor but not provided with private label product." (CX 545-G-H)

This suggests that PPG's cal hypo prices to repackers were largely indexed to Olin's. **[104]**

470. PPG pursues a strategy of marketing private label brands of cal hypo to major distributors and dealers. (CX 547-B, C; CX 548-G-H, K; CX 549-A; Christensen, Tr. 1890-91; Hughes, Tr. 5301) PPG's private label program provides labeling, packaging, delivery service, warehousing and market research. (CX 549-A) PPG's own brand, Pittclor, accounts for less than 5% of PPG's domestic cal hypo sales and the company does not plan to increase its sales of or support for Pittclor. (CX 548-J, K; CX 549-A, D; CX 550-C; Hughes, Tr. 5173, 5301) Pittclor is not viewed as a major factor in the marketplace. (CX 5-B; Christensen, Tr. 1890-91)

471. PPG's long term strategy in its cal hypo business is "to emphasize profitability versus large sales volume gains" (CX 548-J) and regards cal hypo business to be attractive "because of the high returns generated, limited number of competitors, and the healthy, stable growth rate." (CX 548-J)

472. It is also # # (CX 552-H#) PPG's Mr. Hughes acknowledged that PPG would support price increases if it thought the market would bear such an increase. (Hughes, Tr. 5290) Also, the perception in the industry is that PPG tends to follow Olin's pricing lead in cal hypo. (CX 312#; CX 360-A#; Bloom, Tr. 712; Castagnoli, Tr. 2458, 2532-33)

473. PPG announced a 10% increase in the price of cal hypo on August 2, 1985, effective September 15, 1985. (CX 681)

474. Although PPG to date has been "moderately successful" in the cal hypo business (CX 27-C), PPG is not perceived as a threat by Olin. (CX 326) Even after the development of new technology and the construction of the Natrium plant, PPG's costs are not as low as Olin's. (Hughes, Tr. 5250; Henske, Tr. 7243#) And PPG's advertising and service support for its cal hypo products has historically been less than that of Olin. (Wetzel, Tr. 5475-76)

475. PPG plans to increase its output over 1986 and 1987 levels in 1988 and 1989 by "grow[ing] approximately twice as fast as the market growth of the business," *i.e.*, grow at an 8% annual rate, by taking market share from Olin, the Japanese and Saskatoon. (Hughes, Tr. 5166-67)

476. PPG can increase cal hypo output at the Natrium plant without any plant expansion and intends to do so in 1987-88 if market demand for cal hypo increases. (Hughes, Tr. 5162-63) PPG has also **[105]** # # (Hughes, Tr. 5222#)

2. Foreign Producer/Importers

a. *Shikoku Chemical/Mitsubishi/ICI America*

477. Shikoku Chemical Corporation ("Shikoku"), a Japanese firm, manufactures CA, trichlor and dichlor at its plant in Kagawa Prefecture, Japan. (CX 179-Z36) Shikoku sells isos for export into the United States to Mitsubishi International Corporation of Japan. Mitsubishi International, a trading company, transports the isos to the United States and, through its subsidiary Mitsubishi America, sells to ICI Americas, Inc. ("ICI America"), which is the importer and marketer for Shikoku isos in the United States. (CX 125-A#; CX 126-A#; Pettoruto, Tr. 1311-12, 1314-15) Shikoku has been selling isos in the United States for fifteen years. (Ishida, Tr. 918; Pettoruto, Tr. 1311) ICI America is a wholly-owned subsidiary of Imperial Chemical Industries, PLC, a United Kingdom concern. (CX 179-Z21) ICI America imports Shikoku isos in 250-280 pound fiber drums and resells the product in the United States to pool chemical repackers. (Ishida, Tr. 931)

478. Shikoku's annual exports of isocyanurates to the United States, in thousands of pounds, for the years 1980-1985 were as follows:

1980	1981	1982	1983	1984	1985

\# #

(CX 583-B#; CX 674-C, D#)

479. Shikoku's capacity for iso production is # # (CX 674-D#) # # (Ishida, Tr. 966#; Kamerschen, Tr. 2700#) # # (Ishida, Tr. 965#; Kamerschen, Tr. 2701#)

480. The quality of Shikoku/ICI America's isos is said to be as good as or better than that of any domestic producers. (Jonas, Tr. 2315-16#) The service is good and there are no problems with delivery. (Sossamon, Tr. 4624-25) ICI America has a reputation of matching lower prices of domestic producers. (Wilson, Tr. 4276) In addition to isos made by Shikoku, ICI **[106]** America also sells in the United States Baquacil, a pool chemical product produced by its parent company, Imperil Chemical Industries Plc.

481. Shikoku is thought to be a high cost iso producer. (CX 34-X; CX 259-R#; CX 269-Z12#; CX 502-Y#; RX 32-O#; Turnipseed, Tr. 7883#) Energy costs are higher for Shikoku, and for Japanese firms generally, because of reliance on imported oil. (CX 332-G#; CX 377-

N#) Transportation costs also are higher for Japanese firms selling in the United States than for domestic firms.

482. Shikoku does not produce chlorine, caustic soda or urea but rather buys these raw materials for CA from outside suppliers. (Ishida, Tr. 966-67#) Olin considered Shikoku to have higher CA costs than # # (CX 259-P#; CX 269-Z14#; CX 502-S#; RX 32-M#; Swartley, Tr. 7059-60#; Turnipseed, Tr. 7883#) FMC similarly considered Shikoku to be a high-cost CA producer. (CX 34-X)

483. Shikoku has a policy of strong commitment to its long standing export customers. Norihisa Ishida, General Manager of Shikoku International, explained:

> If we have a long time customer, and if we find certain parts of the market that pays [sic] much more for the same product, . . . we don't feel that comfortable . . . reduc[ing] the quantity, volume, to the existing long time customer and shift[ing] to the higher priced customers.

(Ishida, Tr. 969) Shikoku also has substantial market presence in other export markets, including Europe, Australia, New Zealand, and South America. (CX 9-Z27, Z29; CX 127-H#)

484. Mr. Ishida explained that Shikoku also has a policy not to commit a substantial portion of the company's iso sales to a single market. (Ishida, Tr. 924) The United States is and has been for years Shikoku's largest iso market. At one time, the United States accounted for about 50% of Shikoku's iso sales. (Ishida, Tr. 923) In 1981, Shikoku decided to hold the percentage of its total sales going to the United States market long term at below 50% in order to reduce the risk of overcommitting to the United States market. (Ishida, Tr. 922-24)

485. Because of its higher costs, capacity constraints, and commitment to other export markets (CX 9-Z29; CX 127-H; Kamerschen, Tr. 2705), and because of the constraints resulting from the iso dumping proceeding and the increasingly unfavorable yen/dollar exchange rates, Shikoku is unlikely in the future to **[107]** increase its United States exports significantly. Thus, it is unlikely that Shikoku will exercise a restraining influence on iso price increases in the United States market.

486. # # (CX 266-E#) # #

487. Comparing Shikoku's size with Olin's, Shikoku used the analogy that # # (CX 333-A#) # # (CX 797-D#) # # (CX 797-C#) # # (CX 333-A; Turnipseed, Tr. 7879#)

b. *Nissan Chemical/Toyo Menka—Isos*

488. Nissan Chemical Industries, Ltd. ("Nissan Chemical" or "Nissan") is a Japanese manufacturer and United States exporter of CA and chlorinated isocyanurates. The company is headquartered in Tokyo and manufactures these products at its Toyama, Japan plant. Nissan has manufactured CA and chlorinated isocyanurates since the mid-1960's.

489. Nissan's isos are exported to the United States by Toyo Menka Kaisha, Ltd., a Japanese trading company, whose wholly owned subsidiary Toyomenka (America), Inc. serves as the importer and marketer in the United States (CX 179-Z37; CX 676-N#) Toyomenka America sells isos only to repackers. (Christensen, Tr. 1975#)

490. Nissan's annual exports of isocyanurates to the United States, in thousands of pounds, for the years 1980-1985 were as follows:

1980	1981	1982	1983	1984	1985

\# #

(CX 236-H#; CX 237-H#)

491. # # (CX 676-Z206-07#) # # (CX 236-H#; CX 237-H#) **[108]** # # (CX 677-Z10-11#)

492. Nissan's initial isos capacity was approximately # # (Bloom, Tr. 705#) Nissan purchases its chlorine and caustic on the outside. (CX 676-Z32#; Ishida, Tr. 982-83#) # # (CX 240#) and has sold CA to other iso producers, including Olin (CX 475-N#; CX 811-A#; RX 49-D#; RX 50-A#), Chlor-Chem (CX 64-Z21; Kitagawa, Tr. 2392-94#), Shikoku (CX 664-Z26-27; Swartley, Tr. 7405#; Turnipseed, Tr. 7760#), and Delsa (RX 358-C#).

493. Chlorine and caustic soda are a significant component of Nissan's costs. # # (RX 265-A#) Nissan has increased its production capacity for CA, dichlor and trichlor twice through debottlenecking over the past five years. In 1983, Nissan's CA capacity increased from # # per year to # # per year, and in 1984, to # # per year. (RX 279#) Trichlor powder annual capacity expanded in 1984 from # # to # # and again in 1986 to # # (RX 278#) Nissan also expanded its dichlor annual production capacity in 1984 from # # and, in 1986, to # #. (CX 237#; CX 676-Z58-Z60#) Nissan has also explored the feasibility of two or three further debottlenecking operations of isocyanurate capacity, with the potential addition of two or three million pounds. (CX 676-Z46-Z47#)

494. # # (CX 676-Z207#) # # (CX 236-J#; CX 237-J#) # #

(Christensen, Tr. 1800, 1802#) # # (CX 676-Z57-60#) # # (CX 676-Z60#)

495. # # internal cost estimates place Nissan at a cost disadvantage compared to domestic iso producers (CX 34-X; CX 259-R#; CX 269-Z11#; CX 502-Y#; RX 32-O#), although these same analyses show Nissan to be on a par with or better than the domestic producers in terms of its cyanuric acid costs. (CX 34-X; CX 259-P#; CX 269-Z13#; CX 502-S#; RX 32-M#) **[109]**

496. # # (CX 266-E#)

497. There is evidence indicating that Toyomenka America sold # #. (CX 677-Z180, Z181#) In 1985, York Chemical, a repacker, was facing a significant shortage of isos supply because of Monsanto's production difficulties and York's underestimation of its customers' demand. York was able to make up some of the shortfall by purchasing product from Toyomenka America on relatively short notice and at competitive prices. (Castagnoli, Tr. 2490-91) A witness testified that in 1986, Toyomenka America was selling trichlor at # #. (Bloom, Tr. 745-46#)

c. *Nippon Soda/Toyomenka—Cal Hypo*

498. Nippon Soda Company, Ltd. ("NISSO") produces cal hypo in Nihongi, Japan. (CX 175-Z54; CX 388-A; CX 429-E#) Toyomenka (America) Inc. is the exclusive marketer of Nippon Soda cal hypo in the United States. (CX 175-Z54) Nippon Soda produces several grades of cal hypo, some of which is a 60% grade, unsuitable for swimming pool use. (CX 429-K-L#; CX 553-A) Nippon Soda did not receive EPA approval to sell 65% grade cal hypo in the United States until 1983. (CX 175-Z93)

499. Nippon Soda's production capacity for pool sanitizer cal hypo is 35,274,000 pounds annually. (CX 388-B) In a May, 1984 statement to the ITC, a Nippon Soda official said that Nippon Soda had little excess cal hypo capacity, that it had no plans to expand capacity, and that any expansion would take at least two years to implement. (CX 175-Z55; CX 373-B; CX 388-B) # # (CX 377-M#; Kosche, Tr. 8959#) # # (Kosche, Tr. 8964-65#)

500. Nippon Soda is the largest of the three Japanese cal hypo producers (CX 271-I#) but reportedly follows the pricing lead of the smaller Toyo Soda. (CX 323-A#) It has been observed that Nippon Soda's cal hypo business can be adversely affected during times of caustic soda shortage. (CX 332-F#)

501. The volume of Nippon Soda cal hypo exported to the United States # # (CX 611-Z19#) **[110]**

502. Nippon Soda currently also produces less than a million pounds of isocyanurates in Japan and sells isos in Japan and Europe. (CX 323-B#; Ishida, Tr. 976-78) Direct evidence of Nippon Soda's iso production capacity was unavailable at trial. The plant's announced capacity was 6.6 million pounds. (Ishida, Tr. 977) Estimates by Olin and others place Nippon Soda's iso capacity at approximately 7 million pounds. (CX 259-H#; CX 323-B#; CX 390-B#; CX 393-C#; CX 396-B#; CX 416-Z4#; CX 450-I#; CX 451-C#; CX 465-K; CX 651-B#; CX 676-Z152#; CX 871-C#)

503. Nippon Soda isos have not been sold in the United States. (CX 323-B#; Marcum, Tr. 3968) Nippon Soda is not a member of Isocyanurate Industry Ad Hoc Committee, nor has it been in contact with the Ad Hoc Committee since experiencing production difficulties. (Ishida, Tr. 972-73; Marcum, Tr. 3970) Olin has acknowledged that Nippon Soda has had "considerable difficulties" with its isos manufacturing facility. (Turnipseed, Tr. 7539-40) A January, 1985 FMC internal estimate placed Nippon Soda's capacity at zero after learning of a rumored shutdown. (CX 668-C#)

d. *Toyo Soda—Cal Hypo*

504. Toyo Soda Manufacturing Co., Ltd. ("Toyo Soda"), through its 34.5% owned subsidiary, Nisshin Denka Company, Ltd., manufactures cal hypo in Yamagata Prefecture, Japan. Toyo Soda also sells chlorine and caustic soda. (CX 429-Z10-11#) Toyo Soda cal hypo is imported and sold in the United States by ICD Group, Inc. (CX 120-B) and by Nissho Iwai American Corporation. (CX 254) Based on available data, the highest annual volume of Toyo Soda cal hypo imported into the United States has been approximately 4.4 million pounds. (CX 120-B; CX 254-B-C)

505. # # (CX 416-D#) Another estimate places Toyo Soda at a 12 million pound level. (CX 5-A) A significant portion of Toyo Soda's production (an estimated 20-35%) is of the lower-grade 60% cal hypo, which is unsuitable for pool use. (CX 332-F#; CX 429-Z15#) The bulk of Toyo Soda's cal hypo production, including that imported to the United States, is of the less desirable 70% variety, which is considered a potential fire hazard. (CX 429-Z15#; CX 553-B; Castagnoli, Tr. 2432) ICD has been unable to market Toyo Soda's 65% cal hypo product in the United States as a pool sanitizer because it has lacked the necessary EPA registration. (CX 123-D-E)

506. In April, 1984, Olin advised the ITC that the Toyo Soda cal hypo plant was believed to be operating at # # of capacity. (CX 377-M#) **[111]**

507. # # (CX 332-F#) # # (CX 429-Z10) # # (CX 323-A#), # # (CX 271-J#; CX 332-H#) Toyo Soda's cal hypo product has reportedly had some problems with granulation, which have hurt sales in the United States. (CX 613-B#)

e. *Other Japanese Cal Hypo Producer/Exporters*

508. Nankai Chemical Industry Co., Ltd. ("Nankai") manufactures cal hypo in Kochi Perfecture, Japan. (CX 429-Z32#) Nankai also sells chlorine and caustic. Nankai cal hypo is imported into the United States by Nishho Iwai American Corporation and distributed in the United States by ICI. (CX 124-A#; CX 254)

509. # # (CX 416-D#) Other estimates put Nankai at somewhat lower levels. (CX 5-A; CX 427) Most of Nankai's cal hypo sales are in Japan (CX 332-G#), with less than 20% being exported to the United States. (CX 427) A large portion of Nankai's production (an estimated 25-40%) is devoted to 60% cal hypo, which is unsuitable for pool use. (CX 332 G#; CX 429-Z38#) In addition, all of Nankai's cal hypo imports into the United States in 1983 were of the less desirable 70% variety. (CX 553-B)

510. Based on available data, the highest annual volume of Nankai cal hypo imported into the United States has been 828,000 pounds. (CX 254-B) Nankai cal hypo is said to be inferior to that of the domestic cal hypo producers. (CX 613-B#; Castagnoli, Tr. 2432-33) Nankai has reportedly had production difficulties. (CX 418-B)

511. Japanese cal hypo producers, as a group, are believed to have been operating # # (CX 545-E; Hughes, Tr. 5319-20#) # # (CX 175-Z7)

512. There is also industry perception that Japanese cal hypo product quality is not as good as that of the domestic producers. (CX 344-B#; CX 525#; Kennedy, Tr. 505-08; Hughes, Tr. 5320-21#; Wetzel, Tr. 5471-74) The Japanese product does not dissolve as well as United States material. (Kennedy, Tr. 505-08; Wetzel, Tr. 5471-74) Much of the Japanese cal hypo imported **[112]** is of the 70% variety, which is considered a potential fire hazard. (CX 127-Q#; CX 173-M; CX 549-C) Also, about one-quarter of the combined Japanese cal hypo capacity is believed to be for the production of low strength bleach powder which is not acceptable for swimming pool use in the United States. (Hughes, Tr. 5319-21#)